ADB

Technical Assistance Report

Project Number: 39028
December 2006

Mitigation of Transboundary Air Pollution from Coal-Fired Power Plants in North-East Asia

Asian Development Bank

ABBREVIATIONS

ADB	–	Asian Development Bank
FGD	–	flue gas desulfurization
GW	–	gigawatt
NDRC	–	National Development and Reform Commission
NEASPEC	–	North-East Asia Subregional Program for Environmental Cooperation
NO_x	–	nitrogen oxide
PRC	–	People's Republic of China
SO_2	–	sulfur dioxide
TA	–	technical assistance
UNESCAP	–	United Nations Economic and Social Commission for Asia and the Pacific

TECHNICAL ASSISTANCE CLASSIFICATION

Targeting Classification	–	General intervention
Sector	–	Energy
Subsector	–	Energy sector development
Themes	–	Environmental sustainability, regional cooperation, capacity development
Subthemes	–	Clean production, control of industrial pollution, institutional development regional public goods

NOTE

In this report, "$" refers to US dollars.

Vice President	C. Lawrence Greenwood, Jr., Operations Group 2
Director General	H. Satish Rao, East Asia Department (EARD)
Director	A. Terway, Energy Division, EARD
Team leader	A. Maxwell, Environment Specialist, EARD

I. INTRODUCTION

1. Regional dialogue on environmental cooperation in North-East Asia commenced in 1993 as a follow-up to commitments made during the Earth Summit.[1] The first intergovernmental meeting held in Seoul, Republic of Korea in February 1993 led to the establishment of the North-East Asia Subregional Program for Environmental Cooperation (NEASPEC). The secretariat for NEASPEC is located at the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) in Bangkok, Thailand. The Asian Development Bank (ADB) has supported NEASPEC since its formation, including two previous regional technical assistance grants.[2] During the 10th NEASPEC Senior Officials Meeting in Okinawa, Japan in November 2004, subregional partners requested continued ADB support for mitigation of transboundary air pollution from coal-fired power plants and a draft concept paper was presented. The draft concept paper was endorsed by the 11th NEASPEC Senior Officials Meeting in Seoul, Republic of Korea, 24–25 October 2005. The technical assistance (TA) was included in the ADB regional assistance pipeline in 2005,[3] and will include participation from the People's Republic of China (PRC), Mongolia, the Republic of Korea, and Japan.

2. An ADB mission visited UNESCAP in Bangkok from 10 to 15 August 2006 to discuss the project design. A joint ADB and UNESCAP Fact-Finding Mission visited PRC, the Republic of Korea, Mongolia, and Japan from 17 to 30 September 2006 and reached agreement with the respective governments regarding the TA's impact, outcome, outputs, implementation arrangements, and financing arrangements. The TA project design and monitoring framework is provided in Appendix 1.

II. ISSUES

3. Transboundary air pollution from coal-fired power plants is a major regional environmental issue in North-East Asia. The emissions from tall stacks disperse pollutants into the upper atmosphere, contributing to transboundary pollution, such as acid rain, with impacts occurring considerable distances from the source of the pollution. Acid deposition can cause deterioration in public health, reduced agricultural productivity, damage to infrastructure, and ecosystem degradation. Sulfur and nitrogen oxide emissions are the major causes of long-range acid deposition. Prevailing wind conditions in North-East Asia are generally from west to east; however, they can vary considerably. Limitations of climatic modeling and relevant data have made it difficult to achieve scientific and political consensus on the relative impacts from transboundary pollution. Recent studies[4] have indicated that in July 2002, 25–39% of sulfur deposition in the Republic of Korea and 28–48% in Japan was sourced from PRC. During the same period, up to 21% of sulfur deposition in some areas of PRC was sourced from the Republic of Korea and Japan. The cost of transboundary pollution from coal-fired power plants is considerable. The PRC State Environment Protection Administration estimates that each ton of sulfur dioxide (SO_2) discharged may cause up to $2,500 of economic losses in PRC.

4. The North-East Asian economies are all dependent on coal-fired power generation, but to varying degrees. In PRC, total installed capacity in 2005 was 517 gigawatts (GW), the second

---

[1] Agenda 21 Action Program for Sustainable Development, United Nations Conference on Environment and Development, held in Rio de Janeiro in June 1992.

[2] ADB. 1996. *Technical Assistance for Environmental Cooperation in North-East Asia*. Manila (TA 5695-REG for $495,000, completed in 1998), and ADB. 1999. *Transboundary Environmental Cooperation in North-East Asia*. Manila (TA 5865 REG for $350,000, completed in 2004).

[3] The TA first appeared in *ADB Business Opportunities* on 9 April 2005.

[4] Secretariat of Working Group for Long-range Transboundary Pollution (LTP) Project. 2006. *Annual Report, the 6th Year Joint Research on Long-range Transboundary Air Pollutants in Northeast Asia*. Seoul, Government Publication.

highest in the world, of which 75.6% (391 GW)[5] was from coal-fired power plants. Total installed capacity in Mongolia is 0.83 GW (2005) with 100% coal-fired, grid-connected generation. In the Republic of Korea, total generation capacity in 2005 was 60 GW with 28.9% consisting of coal-fired generation. In Japan, total installed capacity in 2000 was 229 GW with 12.8% being coal-fired.[6]

5. The economies of North-East Asia, particularly PRC, have experienced sustained growth in recent decades and continued growth is anticipated. Growing energy demands from the expanding economies will be supplied predominantly from coal-fired generation. In PRC, it is estimated that installed coal-generated capacity will be 750 GW by 2010. To help meet PRC's energy demands, 11.1 GW of new coal-fired generation capacity is being considered in southern Mongolia by 2015. Increasing coal-fired power generation has the potential to exacerbate acidic transboundary deposition across North-East Asia. In PRC in 2005, total SO_2 emissions reached 25.9 million tons, the highest in any country in the world. While SO_2 emissions declined during the 1990s, SO_2 emissions rose 27% between 2001 and 2005. The main reason for the increase was the rapid 64% expansion in coal-fired generation capacity (238 GW in 2000 to 391 GW in 2005) and relatively low installation of emission-control equipment.

6. Based on international experience, a number of approaches have been proven successful in reducing emissions from coal-fired power plants. Many countries are diversifying power generation by introducing less-polluting fuels. In Japan, although the share of coal in power generation is expected to rise to around 24% in 2030, compared with 14% in 1990, the selection of imported low-sulfur coal is prioritized. In the Republic of Korea, the Government is diversifying electricity generation, strengthening national SO_2 emission standards, and introducing stringent energy efficiency regulations in the industrial sector. Market mechanisms such as "cap and trade" systems are being implemented in a number of countries to control SO_2 emissions. The United States is operating a successful SO_2 trading system, the Republic of Korea (Seoul) is developing an SO_2 trading scheme, and PRC is currently developing a national SO_2 "cap and trade" system.

7. A number of North-East Asian countries are using pollution-abatement equipment to reduce emissions that lead to acid deposition. In Japan, 96% of coal-fired power plants are installed with desulfurization-abatement equipment and 94% are fitted with either low nitrogen oxide (NO_x) burners or selective catalytic reduction for NO_x control (2000). In the Republic of Korea, 65% of coal-fired power plants are installed with flue gas desulfurization (FGD) equipment (2001). In PRC, in 2005, 53 GW of installed capacity, or 14% of installed coal-fired generation, has been fitted with FGD equipment.[7] FGD equipment is currently being installed in over 100 GW of generation capacity in PRC. Mongolia has not installed FGD equipment in any of its coal-fired power plants. Due to high maintenance requirements and high operating costs for emission-abatement equipment, dedicated maintenance programs and effective compliance monitoring are required to achieve targeted emission reductions. Other successful methods for reducing sulfur oxide and NO_x emissions have included improving operational energy efficiencies of power plants, and increasing demand-driven energy use management to reduce coal consumption.

8. The North-East Asian nations recognize the economic and social impact from coal-fired power plant emissions. In response, a number of regional dialogues have emerged, such as the Long-Range Transboundary Pollution Initiative and Acid Deposition Monitoring Network in East Asia, which focus on coordination of a range of transboundary air pollution issues. On a national

[5] China Electricity Council. 2006. *2005 Annual Statistics Report on Power Industry*. Beijing. (5 September).
[6] Japan Central Research Institute of Electric Power Industry. 2006. *Air Pollution Control in Japan*. Unpublished. (2000 data).
[7] Department of Environmental Protection and Resource Conservation, NDRC website, 2005 data.

basis, each country is actively addressing emission-abatement challenges. For example, in PRC, the 11th Five-Year Plan (2006–2010) has established an emissions-reduction target for SO_2 of 10%. This will be a major challenge as generation capacity, which is dominated by coal-fired generation, is predicted to increase by 45% during the same period. ADB has been actively supporting North-East Asian regional and in-country efforts to reduce acidic deposition from coal-fired power plants and improve air quality. ADB's assistance has included (i) two previous TA projects to support regional environmental cooperation on transboundary air pollution, (ii) a number of loans targeting improvements in air quality and reductions in coal consumption, such as Loan 1890-PRC: Acid Rain Control and Environment Improvement, Loan 1548-MON: Ulaanbaatar Heat Efficiency Project, and Loan 1715–PRC: *Shanxi Environment Improvement Project*, and (iii) support for the Clean Air Initiative in Asian Cities. The proposed TA is consistent with ADB's second medium-term strategy (2006–2008), which prioritizes regional cooperation and environmental management. The proposed TA is also consistent with the ADB country strategy and program (2004–2006)[8] pillars of improving the environment and promoting regional cooperation.

III. THE TECHNICAL ASSISTANCE

A. Impact and Outcome

9. The impact of the TA will be reduced transboundary air pollution. The outcomes will be enhanced environmental cooperation among countries of the North-East Asia subregion relating to transboundary air pollution, increased technical capacity and knowledge transfer regarding prevention and management of transboundary pollution, and enhanced capacity for management of coal-fired power plant emissions in Mongolia through development of emission standards.

B. Methodology and Key Activities

10. The following activities will be conducted under the TA:

(i) **Component 1. Air Pollution Abatement Plans.** The TA will assist in developing air pollution abatement plans to minimize transboundary impacts from coal fired power plants. Activities will include (a) preparation of abatement plans, (b) audits of the priority emission sources to identify required infrastructure installations, (c) development of project pre-feasibility studies, and (d) assessment of benefits to transboundary pollution from implementation of the abatement plans.

(ii) **Component 2. SO_2 Emission Regulation and Compliance**. The TA will (a) assess compliance issues relating to SO_2 emission regulation policy implementation, and (b) based on international experience, provide recommendations on regulatory and market based alternatives for SO_2 emission compliance management, particularly relating to management of transboundary air pollution.

(iii) **Component 3. Mongolian Power Plant Emission Standards.** As a key recommendation from an earlier TA,[9] assistance will be provided to develop emission standards and other regulatory documentation for coal-fired power plants in Mongolia. The scope will cover existing and proposed coal-fired power plants.

[8] ADB. 2003. *Country Strategy and Program (2004-2006), People's Republic of China*. Manila (October).
[9] ADB. 1999. *Technical Assistance for Transboundary Environmental Cooperation in North-East Asia*. Manila (TA 5865–REG, for $350,000, which was completed in 2004).

(iv) **Component 4. Knowledge Transfer and Dissemination**. The TA will assist in the preparation of (a) training workshops for power plant staff, (b) regional workshops and site visits to showcase regional advances in power plant efficiency improvements and pollution-abatement technologies, (c) transboundary air pollution seminars or expert workshops, and (d) dissemination materials, including project website and brochures.

(v) **Component 5. Demonstration Project and Management Modules.** Component 5 will consist of demonstration activities, including abatement technology and management modules. A range of alternative projects and modules have been proposed by the participating countries. Initial activities under the TA will identify and assess, in close coordination with participating countries, suitable demonstration activities. Activities will be prioritized and selected based on (a) potential for technology transfer, (b) quantification of potential impact on reduction of transboundary pollution, (c) resource requirements, and (d) potential for replication.

11. The main deliverables from the TA will be (i) air pollution abatement plans, (ii) power plant audit reports, (iii) emission standards and other management documentation for Mongolian coal-fired power plants, (iv) workshops and study tours to improve capacity building and facilitate knowledge transfer, and (v) a website and written documentation to disseminate project results.

C. Cost and Financing

12. The total cost of the TA is estimated at $1.2 million, of which $900,000 will be financed on a grant basis by ADB's TA funding program. The governments of PRC and Mongolia and UNESCAP will each provide in-kind contribution of $100,000 in the form of office space, facilities, and salaries of counterpart staff. The governments of Japan and the Republic of Korea have agreed to extend in-kind support through the review of study reports by industry experts; access to relevant models; and active participation in knowledge-sharing training programs, workshops and seminars. Details of the cost estimates and financing plan are provided in Appendix 2. The consulting services will target assistance to PRC and Mongolia. Government resources will fund the participation of officials from the Republic of Korea and Japan in TA events. The TA will cover travel expenses for resource persons from the governments of the Republic of Korea and Japan to attend training activities; however, remuneration and per diem will be covered by the Republic of Korea and Japan.

D. Implementation Arrangements

13. The TA will be implemented over a 3-year period from January 2007 to January 2010. The TA will be conducted under the NEASPEC regional grouping. ADB will be the Executing Agency for the TA, supported by UNESCAP. ADB will take the lead on Components 1, 3, and 5 and UNESCAP will take the lead on Components 2 and 4. The national implementing agencies for the TA will be (i) China Electricity Council, directed by NDRC for PRC; (ii) Ministry of Nature and Environment for Mongolia; (iii) Ministry of Foreign Affairs and Trade for the Republic of Korea; and (iv) Ministry of Environment for Japan.

14. NEASPEC has established counterpart agencies in each participating country. In Mongolia and the Republic of Korea, these are the same as the TA implementing agency; however, for PRC and Japan, the NEASPEC counterpart agency is the Ministry of Foreign Affairs. The NEASPEC counterpart agencies will coordinate the annual Senior Officials Meeting, which will include formal submission of the TA outputs and endorsement by the participating countries. UNESCAP will

coordinate annual TA review meetings, tentatively programmed to be side meetings to the annual Senior Officials Meeting.

15. The TA will provide 13 person-months of international consulting services in the areas of (i) emission abatement, (ii) air pollution regulation, and (iii) air quality policy. The TA will provide 30 person-months of national consulting services in the areas of (i) emission control, (ii) air pollution regulation, (iii) power plant operation, (iv) air quality policy, (v) emission standards, and (vi) air quality. The consultants will be engaged by ADB in accordance with the *Guidelines on the Use of Consultants* (2006). The services of consultants will be provided through a consulting firm selected using the quality- and cost-based selection method, following submission of simplified technical proposals. Outline terms of reference for the consulting services are provided in Appendix 3. Separate reports will be prepared for each component. The consultants will prepare a consolidated TA report at the conclusion of TA activities. The consultants' reporting requirements are outlined in Appendix 1. Some minor equipment may be financed under the TA and will be procured by the international consultants in accordance with ADB's *Procurement Guidelines*. This equipment will be handed over to the participating government implementing agencies upon completion of the TA.

IV. THE PRESIDENT'S DECISION

16. The President, acting under the authority delegated by the Board, has approved the provision of technical assistance not exceeding the equivalent of $900,000 on a grant basis for Mitigation of Transboundary Air Pollution from Coal-Fired Power Plants in North-East Asia, and hereby reports this action to the Board.

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
Impact Reduced transboundary air pollution	• SO_2 emission reductions from priority infrastructure projects o >90% SO_2 removal from plants with installation of FGD, 1 year after installation o >5% additional SO_2 removal from plants with improved management, 1 year after implementation • Reduced transboundary SO_2, 1 year after implementation of abatement plan	• Operational reports from infrastructure projects included in the abatement plan • Annual transboundary pollution monitoring and modeling results from EANET and the LTP project	**Assumptions** • Participating countries implement abatement plans. • The Mongolian Government enforces emission standards.
Outcomes Enhanced environmental cooperation among countries of the North-East Asia subregion on transboundary air pollution	• Establishment and implementation of transboundary air pollution abatement plans by 2009 • Sustained participation in regional dialogue on transboundary air pollution, as evidenced by national participation at all annual Senior Officials Meetings	• Technical completion report and technical assistance performance evaluation report NEASPEC Senior Officials Meeting reports	**Assumptions** • Participating governments remain interested in regional cooperation on transboundary pollution. • Participating governments provide adequate resources for ongoing regional activities. • The Mongolian Government agrees to implement emission standards.
Increased technical capacity and knowledge transfer regarding prevention and management of transboundary pollution	• Three workshops for power plant technical staff conducted • Technology 'showcase' tours completed	• Workshop completion reports • "Showcase" tour completion reports	**Risks** • Political and diplomatic developments may prevent comprehensive engagement in regional dialogue.
Enhanced capacity for management of coal-fired power plant emissions in Mongolia	• Approval and adoption of national coal-fired power plant air emissions standards	• Technical Assistance Completion Report • National database of approved standards	
Outputs 1. Transboundary air pollution abatement plans	• Submittal of final abatement plans by consultants to governments 2 months prior to 13th NEASPEC Senior Officials Meeting. Approval by governments of the abatement plans at the same meeting	• TA consultants' reports and TA progress reports	**Assumptions** • Stakeholders participate in consultations and workshops. • Governments find abatement plans acceptable.
2. Mongolian power plant emission standards	• Emission standards submitted to the Mongolian Government 5 months after TA commencement • Emission standards accepted by the Mongolian Government 3 months after submittal	• TA consultants' reports and TA progress reports • Correspondence with the Mongolian Government	**Risks** • Lack of consensus between participating countries • Difficulties encountered in accessing restricted data • Trained staff move positions

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
3. Demonstration projects	• Demonstration projects completed by end of second year after TA commencement	• TA consultants' reports and TA progress reports	
4. Knowledge transfer (including workshops, technology transfer, and demonstration activities) and dissemination	• Minimum of 100 power plant staff trained by the end of the TA project • Annual expert workshops completed and reports submitted • Website operational 10 months after TA commencement • Dissemination material prepared, approved, and disseminated 18 months after TA commencement	• TA consultants' reports and TA progress reports	
Activities with Milestones Activity 1: Air Pollution Abatement Plans 1.1 Submit an inception report 2 months after component commencement 1.2 Submit the draft audit and abatement plan report 11 months after component commencement 1.3 Finalize the audit and abatement plan report within 1 month after submittal of draft report Activity 2: SO_2 Emission Regulation and Compliance 2.1 Submit an inception report 2 months after component commencement 2.2 Submit the draft consultants report 6 months after component commencement 2.3 Finalize the consultants report within 1 month after submittal of draft report Activity 3: Mongolian Power Plant Emission Standards 3.1 Submit an inception report 2 months after component commencement 3.2 Submit the draft power plant emission standards 4 months after component commencement 3.3 Finalize the power plant emission standards within 1 month after submittal of the draft power plant emission standards 3.4 Submit emissions abatement report 6 months after component commencement 3.5 Finalize the emissions abatement report within 1 month after submittal of the draft power plant emission standards Activity 4: Knowledge Transfer and Dissemination 4.1 Conduct annual power plant operator training workshops for 3 years after TA approval 4.2 Conduct technology 'showcase' tour by the end of the first year after TA approval 4.3 Complete annual transboundary air pollution seminar or expert workshops for 3 years after TA approval 4.4 Submit workshop reports 2 weeks after completion of the workshop Activity 5: Demonstration Project and Management Modules 5.1 Submit project selection report, including implementation schedule and financing plan, 2 months after component commencement			**Inputs** • **ADB: $900,000** grant to be financed by ADB's TA funding program • **UNESCAP**: **$100,000** in-kind contribution in the form of office space, facilities, and salaries of counterpart staff • **Governments of PRC and Mongolia: $100,000 each** in the form of office space, facilities, and salaries of counterpart staff • **Governments of Japan and the Republic of Korea** have provided significant support to previous NEASPEC technical assistance packages, and have agreed to continue similar support for the proposed TA, subject to budget availability.

ADB = Asian Development Bank; EANET = Acid Deposition Monitoring Network in East Asia; FGD = flue gas desulfurization; LTP = long-range transboundary pollution; NEASPEC = North-East Asia Subregional Program for Environmental Cooperation; PRC = People's Republic of China; SO_2 = sulfur dioxide; TA = technical assistance; UNESCAP = United Nations Economic and Social Commission for Asia and the Pacific.

COST ESTIMATES AND FINANCING PLAN
($'000)

Item	Total Cost
A. Asian Development Bank (ADB) Financing[a]	
1. Consultants	
a. Remuneration and Per Diem	
i. International Consultants	220.0
ii. National Consultants	105.0
b. International and Local Travel	90.0
2. Transboundary Pollution Assessment/Modeling	80.0
3. Demonstration Modules/Projects	180.0
4. Training, Seminars, and Conferences	
a. Power Plant Staff Training Workshops	55.0
b. Regional Workshops and Site Tours	55.0
c. Transboundary Seminar/Expert Workshops	40.0
5. Information Dissemination	20.0
6. Miscellaneous Administration and Support Costs	10.0
7. Contingencies	45.0
Subtotal (A)	**900.0**
B. UNESCAP Financing	
1. Office Accommodation and Facilities	20.0
2. Remuneration and Per Diem of Counterpart Staff	80.0
Subtotal (B)	**100.0**
C. Government of the People's Republic of China Financing	
1. Office Accommodation and Facilities	40.0
2. Remuneration and Per Diem of Counterpart Staff	60.0
Subtotal (C)	**100.0**
D. Government of Mongolia Financing	
1. Office Accommodation and Facilities	40.0
2. Remuneration and Per Diem of Counterpart Staff	60.0
Subtotal (D)	**100.0**
Total	**1,200.0**

[a] Financed by ADB's technical assistance funding program.
Source: ADB estimates.

OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

A. Component 1 – Air Pollution Abatement Plans

1. Component 1 will require (i) an international emission abatement specialist (2 person-months), (ii) a Chinese national emission control engineer (6 person-months), and (iii) a Chinese national power plant operation specialist (6 person-months). The international and national specialists will undertake the following tasks:

(i) Work closely with the national implementing agencies to identify target point sources.
(ii) Conduct technical audits of the targeted point sources to identify potential for reducing emissions that lead to transboundary air pollution. This may include installation requirements and operational improvements for emission-abatement equipment, compliance improvements, and management improvements.
(iii) Develop an emission-abatement plan for the focal geographical area.
(iv) Provide recommendations for knowledge transfer and capacity-building exercises in the target area, which will be incorporated and funded from Component 4.
(v) Assess potential emission reductions from implementation of abatement plan and quantify impact to transboundary pollution. Quantify economic and social benefits from assessed emission reductions. Assess environmental co-benefits from the implementation of the abatement plans.
(vi) Hold preliminary workshops with national and provincial stakeholders to discuss proposed activities under the technical assistance (TA). Conduct final workshops with stakeholders to discuss results of the TA.
(vii) Component 1 will be conducted within the People's Republic of China (PRC) and Mongolia.
(viii) The international consultant will act as team leader for Component 1 and will work closely with the national consultants to achieve the proposed scope of works. The international and national consultants will work closely with national implementing agencies and stakeholders concerned.
(ix) Submit draft report presenting audit results and abatement plans. Submit draft report for for technical review by (a) technical institutes of participating countries, (b) relevant national implementing agencies, (c) the Asian Development Bank (ADB), and (d) the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). Incorporate comments received into the final report.

B. Component 2 – SO_2 Emission Regulation and Compliance

2. Component 2 will require (i) an international pollution control regulatory specialist (3 person-months), and (ii) a Chinese national pollution control regulatory specialist (6 person-months). The international and national specialists will undertake the following tasks:

(i) Undertake a desk top study of SO_2 emission regulation policy implementation in PRC and Mongolia. Assess alternative regulatory options based on international experience.
(ii) Conduct site visits to relevant stakeholders to assess compliance issues with existing regulatory frameworks.

(iii) Provide detailed recommendations on regulatory and market based alternatives for the SO_2 emission compliance management, particularly relating to management of trans-boundary air pollution.
(iv) Work closely with implementing agencies from each participating country.
(v) The international pollution control regulatory specialist will act as team leader for Component 2. He or she will work closely with the national pollution control regulatory specialist to achieve the objectives of Component 2.
(vi) Prepare report detailing (a) compliance issues relating to SO_2 emission regulation policy implementation in PRC and Mongolia, and (b) recommendations on regulatory alternatives for the SO_2 emission compliance management, particularly relating to management of trans-boundary air pollution.
(vii) Submit draft report for technical review by (a) technical institutes of participating countries, (b) relevant national implementing agencies, (c) ADB, and (d) UNESCAP. Incorporate comments received into the final report.

C. Component 3 - Mongolian Emission Standards

3. Component 3 will require (i) an international air quality policy specialist (2 person-months), (ii) a Mongolian national legal specialist (6 person-months), and (iii) a Mongolian national emission standards specialist (6 person-months). The international and national specialists will undertake the following tasks:

(i) Assess current power plant generation in Mongolia and the proposed coal-fired power plant construction in southern Mongolia.
(ii) Work closely with the Mongolian Ministry of Nature and Environment, Ministry of Fuels and Energy, and other relevant ministries to draft national standards for coal-fired power plant air emissions. The standards will be based on relevant international examples and adopted to comply with Mongolian requirements.
(iii) Conduct consultation workshops with relevant government officials, power plant operators, and other concerned stakeholders.
(iv) Submit draft emission standards to (a) relevant Mongolian ministries and technical institutes, (b) ADB, and (c) UNESCAP. Incorporate comments received into the final emission standard.
(v) Assess emission-abatement facilities required for new power plants constructed in Mongolia.
(vi) Working closely with Mongolian officials, assess the following for new power plant construction in Mongolia: (a) procedures to ensure compliance with emission standards, (b) reporting requirements for power plant emissions, and (c) reporting formats and procedures.
(vii) Assess existing national emission compliance mechanisms and enforcement capacity.
(viii) Assess requirements for transboundary monitoring sites in southern Mongolia to monitor transboundary impact from proposed power plant construction.
(ix) Prepare a report providing recommendations for (a) required abatement facilities for new power plants in Mongolia; (b) emission compliance procedures; (c) emission reporting requirements, including reporting formats; and (d) transboundary monitoring requirements in southern Mongolia.
(x) Submit draft report for review by (a) relevant Mongolian ministries and technical institutes, (b) ADB, and (c) UNESCAP. Incorporate comments received into the final report.

(xi) The international consultant will act as team leader for Component 3 and will work closely with the national consultants to achieve the proposed scope of works. The international and national consultants will work closely with national implementing agencies and concerned stakeholders.

D. Technical Assistance Coordinator

4. **International Air Quality Specialist** (6 person-months over a 1.5 year period). The international air quality specialist will act as a project coordinator for a range of activities under each component. In particular, the international air quality specialist will be responsible for coordination activities under Component 4: Knowledge Transfer and Dissemination, and Component 5: Demonstration Project and Management Modules. The position will be based in ADB headquarters, Manila, Philippines; however, it may require extended periods working in the participating countries and in Bangkok, Thailand to coordinate activities with UNESCAP. The consultant will conduct the following activities:

(i) Coordinate TA implementation according to the proposed scope of works.
(ii) Coordinate TA activities between the consultants, implementing agencies, ADB, and UNESCAP.
(iii) Prepare progress reports at regular intervals during the TA implementation.
(iv) Liaise directly with relevant stakeholders in each country.
(v) Monitor TA progress against established schedule for submission of reports and other deliverables.
(vi) Provide technical analysis and review consultants' reports.
(vii) Prepare a consolidated TA report, including separate consultants' reports.
(viii) Coordinate workshops, site tours, and seminars, including identification and screening of activities.
(ix) Coordinate preparation of dissemination materials, including website design and brochures.
(x) Component 5. In close coordination with the implementing agencies, conduct a screening of the proposed demonstration projects and management modules and prepare a detailed implementation schedule and financing plan.