



Environmental Compliance Report

Project Number: 42117
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PRC: Tianjin Integrated Gasification Combined Cycle Power Plant Project

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Asian Development Bank

**Compliance Report of Tianjin IGCC Project Environmental
Management and Monitoring**

1. Tianjin Integrated Gasification Combined Cycle (IGCC) Project started preparatory work in 2007, by May 2009, most of the preparatory work such as onsite temporary office building construction, foundation treatment, access road construction etc. has been completed. As the Tianjin IGCC project will require huge amount of investment and it is the first IGCC project in the People's Republic of China (PRC), National Development and Reform Commission attaches much importance to the project construction, they have asked the project owner to revise the feasibility study report for several times, and finally approved the project on 9 May 2009 with no implications on scope of work.

2. The Project was officially opened at the Tianjin Harbor Industrial Park on 6 July 2009. The project owner and Executing Agency (EA) Huaneng Greengen Co. has commenced the selection process of construction companies and equipment providers. Tianjin Power Construction Co. has been selected for the construction of foundation treatment and power generation facility while construction company for the coal gasification process is yet to be recruited.

1. Institutional Requirements

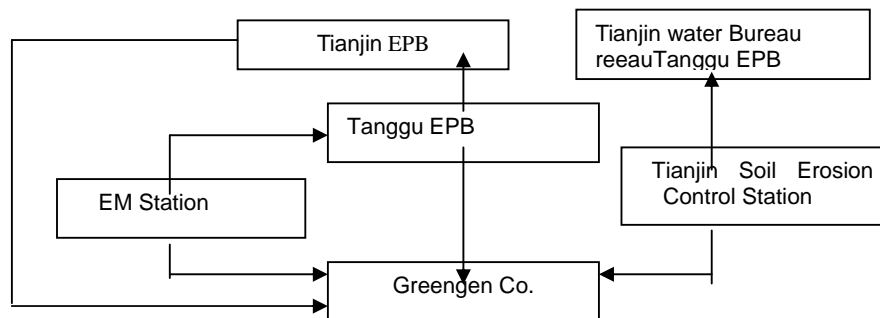
3. Huaneng Greengen Co. has set up an environmental management unit (EMU) for environmental management and operation. As per the project Environmental Impact Analysis (EIA), EMU is included in the project division of Tianjin IGCC project preparation organization.

2. Environmental Management Plan

4. An environmental management plan (EMP) (Appendix 1) included in the Tianjin IGCC Project EIA report has been sent out by the Huaneng Greengen Co. to all companies and organizations involved in the construction of the IGCC project requiring everyone to follow the environmental management plan through construction contracts. Meanwhile, each construction company is required to prepare an EMP for their construction site. The EMU and the contractors are responsible for implementing all environmental mitigation measures identified in the project EIA.

5. The institutional arrangements with regard to environmental management and monitoring have been established and are detailed in the following schematic:

Figure 1: Environmental Management and Monitoring Structure



EM = environmental monitoring, EPB = environmental protection bureau.

6. As per the above schematic the Tianjin Tanggu Environmental Protection Bureau (EPB) through the Tanggu Environmental Monitoring Station is responsible for monitoring the air and water quality, noise, ecological impacts, and solid waste treatment in the project area. The Tianjin Water Bureau through Tianjin Soil Erosion Control Station monitors water and soil loss. Site inspections are undertaken by the Tianjin and Tanggu District EPBs. Annual results

are reported to the Tianjin EPB.

3. Environmental Monitoring Plan

7. According to the EIA and later as determined through the project site characteristics, the environmental monitoring program mainly includes the regular monitoring of air quality, noise impact, solid waste and soil loss at the project site during construction period. The monitoring frequency of the parameters as proposed in the EIA has changed following discussion with the EA. In PRC, the common practice among power plants is to conduct environmental monitoring at the end of project construction, just before project acceptance. For the Tianjin IGCC Project, such environmental monitoring activity is planned to be conducted bi-annually throughout the construction period, see Table 1 below:

Table 1: Summary of Monitoring Plan During Project Construction

Construction	Authority	Monitoring parameter	Monitoring Frequency
	Local EPB	TSP	Bi-annually
Air quality	Local EPB	dB	Bi-annually
Noise	Local EPB	Disposal of hazardous and non-hazardous waste	Bi-annually
Solid waste	Tianjin Soil loss Control Station	Soil loss	Bi-annually
Soil loss monitoring			

dB = decibels (noise monitoring unit), EPB = environmental protection bureau, TSP = total suspended particles.

8. Since the construction of main project components (coal gasification island, power generation island etc.) is expected to start and pick up momentum later in 2009, environmental monitoring is not yet warranted. The IGCC monitoring framework for its operational stage is identical to that recommended in the EIA document.

4. Environmental Infringements

9. The Tianjin IGCC project is still at the stage of site preparation including establishment of civil work foundation and completion of onsite temporary office buildings. The main project components e.g. coal gasification island and power generation island have started construction since July 2009 and so far there has been no environmental infringement recorded for the project construction period.

5. Conclusion

10. During the first half year of 2009, the preparatory work for project construction was completed and the construction activities were limited to small-scale civil work with very minor environmental impact. Environmental mitigation measures such as site restoration, road pavement and water spray, etc. were undertaken to minimize environmental impact. EMU, EMP, and monitoring framework for construction activities have been established to ensure protection of the existing environment. There was no environmental infringement record in the first half year of 2009. In general, the project construction in the first half year of 2009 strictly followed the requirements of the project EIA report. The project implementation is going well in terms of environmental safeguards. This will continue to be monitored closely by Asian Development Bank through regular missions.

ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

1. The environmental management of Tianjin Integrated Gasification Combined Cycle (IGCC) Project forms part of the overall management system of Huaneng Greengen Co. Accordingly, the environmental management should be carried out throughout the whole process of project construction and implemented at each level through establishing link with the production process. The Tianjin IGCC Project's environmental management and monitoring plan includes:

- (i) Framework of environmental management of Tianjin IGCC project;
- (ii) Environmental policy;
- (iii) Environmental management system of Tianjin IGCC Project;
- (iv) Environmental monitoring and management; and
- (v) Review and improvement of environmental management system.

A. Environmental Management of Tianjin IGCC Project

2. The framework structure of the proposed project will be based on the principal of pollution prevention and sustainable improvement. Namely, we will plan the target and process that the environmental management should attain and follow; including checking and identification of issues, implementing timely correction measures to ensure compliance with all relevant legislation.

B. Environmental Policy of the Proposed Project

3. In order to protect and retain the natural environment around the project area the following ways will be used to reduce the environmental impact during project construction and operation:

- (i) Demonstrate responsible attitude toward the implementation of project construction and operational environmental safeguards to ensure environmental protection.
- (ii) Comply with all applicable laws, regulations and other requirements with regard to project construction and operation.
- (iii) Implement environmental pollution precautionary measures, reduce waste generation and adopt environmentally responsible method to process any remaining wastes.
- (iv) Actively carry out and implement effective environmental management system.
- (v) Adopt environmentally friendly construction and operation technologies.
- (vi) Ensure business partners value environment and address environmental issues promptly.
- (vii) Provide environmental information in an open and objective manner.
- (viii) Implement daily environmental monitoring with audit at regular intervals, ensure staff to follow the procedures established, continuously improve the environmental performance so as to minimize the impact of project construction and operation on the natural environment and local community.
- (ix) The highest management personnel are responsible for implementing an action plan based on these policies.

C. Environmental Management System

4. The management of Huaneng Greengen Co. is designated as executive personnel of the company environmental management system. The successful implementation of the system depends on management commitment to continuous improvement of

environmental performance.

1. Environmental Management Organization

5. The Chairman of Huaneng Greengen Co. is the highest governor of Tianjin IGCC project. The chairman has appointed a deputy general manager to be chairman representative, in charge of environment protection. Environmental protection division (included in the project division) has been established to undertake environmental management during project construction. Each construction organization on site has established an environmental management division with a Vice President as the Director, and arranged an environmental engineer for environmental management. Supervision company also has environmental engineer to perform environmental supervision. During project construction, Tanggu Environmental Monitoring Station is engaged by the project owner to perform environmental monitoring, and Tianjin Soil Loss Control Station is invited to perform soil erosion monitoring at the project site.

2. Management Duties

6. **Duties of the Company Chairman.** Responsible for company environmental policy developed in accordance with national, provincial and local environmental policies, laws, regulations and standards; clearly stipulating the role, responsibility and right of the governor representative; providing environmental management with support in terms of human resources, finance and technology.

7. **Chairman Representative.** Performing duties in environmental management on behalf of the chairman, supervising the operation of environmental management system. The main duties include:

- (i) Implementing company environmental policies developed to comply with national laws and regulations, preparing environmental protection plan and implementation details in accordance with the project requirements, and organizing and supervising the implementation of the plan.
- (ii) Responsible for determining qualified organization for the monitoring of three wastes discharges and noise during project construction and operation, and organizing the preparation of environmental monitoring reports.
- (iii) Working out proper control targets of three wastes discharges and the examination indexes of the operation of environmental protection facilities during project construction and operation, organizing the implementation, and monitoring on a regular basis.

8. **Duties of the Staff.** The staff should be engaged in their work with a responsible attitude, and undertake relevant environmental responsibilities relevant to their posts.

D. Environmental Monitoring Plan

1. Environmental Management, Monitoring and Supervising during Project Construction

9. **Organization of Environmental Monitoring.** During project construction, the project construction contractor is required to carry out construction in an environmentally responsible manner, and perform the duties of project environmental protection as detailed in Table A1.1.

10. The construction contractor should appoint a deputy general manager to be the

management representative, in charge of environmental protection and through an environmental management division will be responsible for environmental management during project construction.

Table A1.1: Summary of Mitigations Measures

Impact	Mitigation Measures
Soil erosion	(i) laying compacted topsoil and re-vegetation of exposed surfaces as quickly as possible after construction at each area is completed, (ii) installation of sediment fences for temporary soil stockpiles, and (ii) allowing sediment to settle in sedimentation ponds or storm water channels prior to discharge to Bohai Sea. Impact to soil from construction traffic will be minimized by confining traffic to predetermined roads. Spoil generated from construction activities will be stockpiled, dewatered and used for landscaping purposes where possible or removed from site to approved disposal areas. Sediment fences will be installed around spoil stockpiles.
Soil contamination	(i) installing oil separators at wash down and refueling areas, and (ii) installing appropriate hazardous waste and hydrocarbon storage facilities at site, including secondary containment at fuel storage sites. All septic waste will be collected and removed from site. Spill cleanup equipment will be provided at each construction site, and training will be conducted regarding emergency spills response procedures. All hazardous and non-hazardous waste will be removed from site to approved waste disposal sites. There will be no onsite landfill.
Disposal of septic wastewater	Septic wastewater during the construction period will be collected and disposed offsite, disposed to the industrial park wastewater treatment facilities or treated and recycled onsite. There will be no onsite septic seepage disposal system and no direct discharge of sanitary waste to surface water.
Disposal of wash down water	All equipment wash down areas will include oil separators.
Dust generation	(i) All major access roads will be paved, and water trucks will suppress dust on unpaved roads. (ii) Temporary soil stockpiles will be covered. (iii) Excavation will be limited during windy days (when wind is greater than Grade 4). (iv) Construction workers will be forbidden from burning coal and firewood onsite.
Noise impacts	Equipment and machinery used on construction shall strictly conform to the PRC and local noise standards. All equipment will be properly maintained to minimize noise emissions. Noise emissions from the site will meet relevant national standards. Ongoing noise monitoring will be undertaken to ensure compliance. Mitigation measures during operation for noise impacts on workers will include occupational health and safety practices relevant to PRC standards.
Hazardous and non-hazardous waste	All residential rubbish and waste building material will be collected, stored onsite in appropriate storage facilities and transported offsite to approved disposal facilities. No onsite landfills will be developed. Impacts from transportation and disposal of spoil may include spillage along access roads or offsite leading to vehicle hazards, increased dust or increased mud. Trucks used for transportation of spoil will be covered and any

Impact	Mitigation Measures
	spillage will be cleaned up immediately. Hazardous waste generated during the construction period will be collected and stored separately onsite in approved facilities. Hazardous waste will be removed from site to approved hazardous waste disposal facilities by a licensed waste transportation company.
Impact to livelihoods of residents	(i) Where possible, local labor will be used during construction activities. Locally based suppliers will be used where possible. (ii) Mitigation measures will include provision of health education to workers and provision of hygienic worker accommodation.

11. **Monitoring Plan.** Tanggu Environmental Monitoring Station will be entrusted for environmental monitoring, responsible for the monitoring of “three waste” discharges and environmental quality at project site during project construction. Taking into account the distribution of pollution sources and sensitive targets, pollutant discharge characteristics and local environmental function requirements, determine the sampling points and technical requirements for monitoring water, air, noise and ecological environment. The monitoring plan for the project is detailed in Table A.12 below.

12. The monitoring of construction site is subject to actual situation, and should follow the requirement of local environmental protection department, for example, proper noise monitoring should be conducted for construction with respect to populated area.

13. **Supervision Plan/Supervision Target.** During project construction, environmental supervision is jointly conducted by project owner and supervision companies in accordance with the design of environmental management plan. The supervision responsibilities encompasses all construction units, and timely processing and solving of environmental incidents.

14. **Supervision Content.** Supervision process will be dictated by following applicable national and local policies, laws and regulations on environmental protection, supervising the performance of environmental protection units as per the construction contract signed by the construction unit. The main responsibilities are:

- (i) Preparing environmental supervision plan, working out the environmental supervision items and contents;
- (ii) Performing supervision over individual contractor, preventing and mitigating the environmental pollution by construction activities;
- (iii) Fully supervising and examining the implementation and actual results of environmental protection measures by every construction unit, and timely processing and solving of any minor or major environmental pollution event;
- (iv) Responsible for the implementation of environmental monitoring program, reviewing relevant environmental monitoring reports and where relevant propose requirements/remedies with regard to project construction management to minimize the negative impact of project construction on the environment; and
- (v) Preparing and keeping daily supervision records in addition to the project completion acceptance report.

15. **Environmental Supervision Organization.** Dahua Group Beijing Zhongdalian Consulting Co. and China Chengda Engineering Co. have been selected through bidding

process to be the supervising companies. They will be supervising the project construction and implementation of the environmental protection measures.

2. Environmental Management and Monitoring during Project Operation

16. **Monitoring Organization.** Based on the environmental pollution characteristics of the proposed Project and in discussion with Tianjin Environmental Protection Bureau, it was decided that the environmental monitoring tasks will be performed by the local environmental monitoring station. State-stipulated standard monitoring methods should be adopted, and monitoring report should be submitted to relevant environmental protection department on a regular basis as agreed by all parties involved.

17. **Monitoring Plan.** According to the EIA and site characteristics during project construction, the environmental monitoring program mainly include the regular monitoring of air quality, noise, solid waste and soil loss at project site.

18. In addition to tracking the performance of environmental protection measures and the dynamic change of environmental quality after the project is implemented, the pollutant discharge strength and ecological monitoring should also be carried out with the intention of timely restoring of local ecological environment should it be impacted.

Table A1.2: Summary of Monitoring Plan During Project Construction

Construction	Authority	Monitoring parameter	Monitoring Frequency
Air quality	Local EPB	TSP	Bi-annually
Noise	Local EPB	dB	Bi-annually
Solid waste	Local EPB	Disposal of hazardous and non-hazardous waste	Bi-annually
Soil loss monitoring	Tianjin Soil loss Control Station	Soil loss	Bi-annually

dB = decibel, EPB = environmental protection bureau, TSP = total suspended particles.

**Environmental Monitoring Report of
Tianjin IGCC Project during Project Construction for the First 6
months of Project Construction**

Tianjin Tanggu Environmental Monitoring Station

2009

A. Project Description of Construction Progress

1. Introduction to the Project

1. The Project consists of the development of a 250 megawatt (MW) integrated gasification combined cycle (IGCC) power plant and a research center to further research polygeneration options, especially pilot test hydrogen production and fuel cell power generation. The Project is located in Harbor Industrial Park, Tanggu District, Tianjin, People's Republic of China (PRC). Construction of the industrial park commenced in June 2006 and is expected to be completed in 2020. The Harbor Industrial Park Environmental Impact Assessment (EIA)¹ was completed by Tianjin Environmental Protection Research Institute in 2006. The proposed 250 MW Project will be the first IGCC demonstration project in PRC. The IGCC Project will supply base load electricity to the local grid and will supply steam and heat to facilities within the Harbor Industrial Park. The Project will provide annual electricity generation of 1.5 billion kilowatt-hours. The Project will occupy 20 hectares of newly reclaimed land from the Bohai Sea. The Project will include construction of the following:

- (i) Coal gasifier with a processing capacity of 2000 ton per day (t/d). The coal gasifier used is a two-stage dry pulverized coal gasifier. The production process includes coal grinding and drying, pulverized coal compression and feeding, coal gasification, slag removal, dust removal, wet scrubbing, ash flushing water treatment, and wastewater treatment.
- (ii) Gas turbine and steam turbine combined cycle, consisting of one 171 MW gas turbine, one 110 MW steam turbine and waste heat boiler.
- (iii) Syngas purification system, with a processing capacity of 160,739 Nm³/h.
- (iv) Sulfur recovery system, Shell-Paques biological desulphurization process is used to remove H₂S in the raw gas; its sulfur recovery capacity is 8.27 t/d.
- (v) Flaring system, in case of operation failure, syngas can be flared; the torch is 80 meter high, and 900 millimeter in diameter.
- (vi) Other items including air separation facility (43,497 m³/h), water supply, power supply, ash removal system, wastewater treatment and discharge system, water recycling system, boiler water supply system and fire water system.
- (vii) Storage and transport system, including coal transport, storage and distribution system, emergency ash yard, onsite temporary solid waste yard, oil tank and oil pump room.
- (viii) Temporary workers' accommodation.
- (ix) Permanent office and residential building.

2. Construction Progress and Main Environmental Impact

2. By the end of July 2009, temporary office building, access road, ground treatment and partial site restoration has been completed, and the project construction has entered the construction of main project components including coal gasification island and power generation island. The foundation civil works of coal gasification island has been completed while the air separation buildings are under construction. Main equipments for the Project have been determined while the auxiliary equipments are undergoing bidding process. Construction companies for main project components have been determined.

¹ Environmental Impact Assessment Report of Land Reclamation Project, Tianjin Environmental Protection Research Institute, 2006

3. As the National Development and Reform Commission approved the proposed Project on 9 May 2009, the design institutes concerned are busy with the preparation of construction drawings, and construction companies are conducting preparatory work for large construction activities. It is expected that large construction activities will start their work in September 2009. Based on existing implementation plan, the proposed Project would be completed by the end of 2010, and enter into trial operation early 2011.

4. As the main construction activities have not started, the environmental impact is minimal. The main environmental impacts include air pollution in terms of total suspended particulate (TSP), noise pollution and domestic wastewater pollution.

B. Environmental Monitoring Plan

5. During the past 2 years of project preparation period environmental monitoring was not conducted. On commencement of construction of main project components Tanggu Environmental Monitoring Station will be entrusted to carry out environmental monitoring at project site on a regular basis. Monitoring will comprise mainly air quality, noise environment and solid waste disposal during project construction. Tanggu Soil Erosion Control Station will be entrusted to conduct water and soil loss monitoring at project site.

C. Monitoring Contents

6. The environmental monitoring contents will include both quantitative and qualitative monitoring. The quantitative monitoring will include TSP concentration and noise level. Qualitative monitoring will include solid waste disposal and soil loss.

D. Assessment Standards

7. The assessment standards adopted are those included in the Tianjin IGCC project EIA report approved by the Ministry of Environmental Protection in 2007, and are entailed in the following Standards:

- (i) Standards for ambient air quality(GB3095-1996);
- (ii) Noise limit at boundary of construction and factory area (GB12523-1990).

E. Main Environmental Monitoring Results

1. Water Environment

8. As water is fully supplied by local water company, the water quality for the project construction can be guaranteed, monitoring of surface water and ground water will not be conducted during project construction.

9. Septic wastewater, mainly from temporary office building and construction workers' camps during the construction period is collected and disposed of offsite, There is no onsite septic seepage disposal system and no direct discharge of sanitary waste to surface water.

10. All equipment wash down areas are equipped with oil separators.

2. Air Environment

11. Dust Control.

- (i) All major access roads will be paved, and water trucks are used to suppress dust on unpaved roads;
- (ii) Temporary soil stockpiles will be covered;
- (iii) Excavation is limited during windy days (wind is greater than Grade 4); and
- (iv) Construction workers are forbidden from burning coal and firewood on-site.

12. **Air Quality Monitoring.** During project construction, TSP is the main pollutant. Therefore, TSP concentration will be monitored on a regular basis for air quality monitoring at the project site. In the first half year of 2009, TSP monitoring was not conducted due to absence of any major construction activities. Monitoring results when available will be reported in a format as shown in Table A2.1 below:

Table A2.1: Air monitoring results

Unit : mg/m³

Location	Item	TSP
	Time	
	Daily average	
	Daily average	
	Daily average	

3. Solid Waste Disposal

13. All residential rubbish and waste building materials are collected, stored onsite in appropriate storage facilities and transported offsite to an approved disposal site. No onsite landfill is in operation. Impacts from transportation and disposal of spoil may include

spillage along access roads leading to vehicle hazards, increased dust or increased mud on access roads. Trucks used for transportation of spoil are covered and any spillage is cleaned up immediately. Hazardous waste generated during the construction period is collected and stored separately onsite in approved facilities.

4. Noise Monitoring

14. During the first half year of 2009, noise monitoring was not conducted due to the absence of any major construction activities. Results will be presented in a format as shown in Table A2.2 below:

Table A2.2: Noise monitoring results : dB (A)

Monitoring location	Monitoring date	Monitoring results	
		daytime	night

5. Soil Loss Monitoring

15. Soil loss monitoring mainly focuses on the implementation of soil loss control measures at project site, in the first half year of 2009, soil loss monitoring was not conducted since all of the excavated soil material was used onsite. Soil is considered as valuable resource in the area on the wake of land reclamation operation of Bohai Sea in the vicinity.

F. Quality Guarantee Measures During Monitoring

16. The Tanggu Environmental Monitoring Station is certified by Tianjin Quality and Technical Supervision Bureau (TQTSB). From sample collection, transport and storage, analyzing and testing to data statistics, the whole process is performed strictly under the Station's Quality Manual prescribed by the TQTSB. The analyzing instruments comply with technical requirements of State standards concerned, the monitoring personnel hold appropriate qualification, and the monitored data receive three-level audit consisting of proofing and verification. The monitored data are finally reviewed by technically responsible person in Tianjin Environmental Monitoring Station.

G. Conclusions

17. In the first half year of 2009, the preparatory work for project construction was completed and the project construction activities were conducted on a small-scale with

consequent minor environmental impact. Environmental mitigation measures such as site restoration, road pavement and water spray, etc. were undertaken to minimize environmental impact. Environmental management plan, environmental management unit and environmental mitigation measures for construction activities have been established to ensure the implementation of environmental protection. There was no environmental infringement record in the first half year of 2009. In general, the project construction in the first half year of 2009 strictly followed the requirements of the project EIA report.

PHOTOS AND PROJECT SITE

**Figure A3.1: Ground Treatment of Project Site
(7 December 2007)**



**Figure A3.2: Ground Treatment of Project Site
(25 October 2008)**



**Figure A3.3: Foundation Construction of Coal Gasification Island
(2 April 2009)**



**Figure A3.4: Foundation Treatment of Power Generation Island
(6 July 2009)**



**Figure A3.5: Construction Launch Ceremony of Tianjin IGCC Project
(6 July 2009)**



**Figure A3.6: Construction Site of Air Separation Component
(3 August 2009)**



Figure A3.7: Sketch Map of Tianjin IGCC Project

