Environmental Monitoring Report

Project Number: 35340 (Loan 2176)
July 2009

People's Republic of China: Fuzhou Environmental Improvement Project

Prepared by Fuzhou Project Management Office with assistance of Black & Veatch International Company

Asian Development Bank

FUZHOU ENVIRONMENTAL IMPROVEMENT PROJECT

FUZHOU ADB LOAN PROJECT MANAGEMENT OFFICE

Semi-Annual Environmental Report

As of 31 May 2009

July 2009

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ABBREVIATIONS

ADB	Asian Development Bank
B&V	Black & Veatch International Company
BOT	Build, Operate and Transfer
CSC	construction supervision company
EA	executing agency
EEM	external environmental monitoring
EIA	environmental impact assessment
EMC	environmental monitoring consultant
EMP	environmental management plan
EPB	environmental protection bureau
FEMS	Fuzhou Environmental Monitoring Station
FMEPB	Fuzhou Municipal Environmental Protection Bureau
FMG	Fuzhou Municipal Government
FPMO	Fuzhou ADB Loan Project Management Office
FUVCDC	Fuzhou Urban Visual Construction and Development Company
FWECDC	Fuzhou Water Environment Construction and Development Company
GDP	gross domestic product
IA	implementing agency
PRC	People's Republic of China
RMB	Renminbi Chinese Yuan
US$	US Dollars
WWTP	wastewater treatment plant

I. INTRODUCTION

1.1 General Introduction

This report is the third semi-annual environmental report for the Fuzhou Environmental Improvement Project (the Project) for the period from 1 Dec 2008 to 31 May 2009. It is prepared by the Fuzhou Project Management Office (FPMO) with the assistance of Black & Veatch International Company (B&V). B&V has been providing consulting services to FPMO who is the Executing Agency (EA) for the Project.

ADB funded civil work contracts have progressively been awarded since Nov 2006, and construction of the first awarded contract started in Jan 2007. This Report describes the activities undertaken in the period from Dec 2008 till May 2009 with respect to the implementation of the environmental management plans (EMPs) of the project components. This Report contains the following activities and topics: (i) the environmental institutional strengthening and capacity building, (ii) mitigation measures undertaken to minimize adverse environmental impacts arising from the construction of the Project facilities, (iii) environmental monitoring and assessment, and (iv) conclusions and suggestions.

1.2 Description of the Project

This Project has the following three structural components, and the project location is shown in **Figure 1**:

- Component A - Yangli Phase 2 Sewer Networks: to construct 253.25 km of new sewers, rehabilitate 27 km of existing sewers, and construct and upgrade 2 pumping stations;
- Component B - Lianban Sewer Networks: to construct 127 km of new sewers, rehabilitate 76 km of existing sewers, and construct 3 pumping stations; and
- Component C - Nantai Island Inland Creek Rehabilitation: to rehabilitate 12 inland creeks with a combined length of about 48 km; dredge and/or excavate 3.63 million tons of earthwork; construct varying widths of stone-lined rectangular channels and 1 rubber dam; and rehabilitate 4 existing flood gates.

There is also a Capacity Building component (Component D) which is non-structural in nature to support project implementation and training of the implementing agencies (IAs). One important element in this component is institutional strengthening, capacity building, and training in environmental management. The target trainees include the FPMO and IAs as well as contractors and construction supervision companies. The purpose is to build up the capacity of these entities so that they are more capable in implementing the EMP and environmental monitoring.

The total estimated project cost is US$ 185.5 million of which US$ 55.8 million is loaned by the ADB to the People's Republic of China (PRC) and then on-lent to the Fuzhou Municipal Government (FMG). The counterpart funding of the Project is about US$ 130 million which is being provided by a combination of domestic borrowing and FMG equity.

1.3 Description of the Environment

As the capital of Fujian Province, Fuzhou is one of the important cities in Southeast China, and is the Province's main political, economic, trade, information and cultural center. Fuzhou is located in eastern Fujian Province, adjacent to the China East Sea. Nantai Island is located south of Fuzhou at Cangshan which is one of Administration Districts of Fuzhou. As of the end 2007, the Fuzhou residential population is 6.76 million.

The terrain of Fuzhou is characterized as hilly with low mountains that generally form a semi-circular land shape. Hot spring water is generated within the basin. The topography of Nantai Island is characterized as hilly in the northwest and middle, and broad alluvial plain in the southeast, sloping from northwest to the southeast of the island.

The Project area has a subtropical marine monsoon climate, warm and humid, with abundant precipitation mostly falling during summer. The average annual precipitation is 1,343 mm, approximately 75% of which falls during April to September accompanied by frequent typhoons. The average annual temperature is 19.6 ^{0}C. The hottest month is July, and the highest temperature over the years is 39.9 ^{0}C. The prevailing wind direction through the year is from the southeast, with the average and the highest wind speeds being 2.7 and 31.7 m/s, respectively.

Fuzhou has complicated waterways in the urban area. There are over 70 inland rivers including Guangming Gang, Jin'an River and Baima River, with a total length of 99.3 km in the northern bank of Min River. Other than a few rivers including Jin'an River, most of the other rivers are small and without natural sources. These inland rivers join Min River and their hydrological conditions are subjected to the influence of tide from Min River and the operations of flood gates along the rivers. Flood control is the primary function of these inland rivers. Most of these inland rivers have little natural runoff other than the wastewater discharge to them. The inland rivers in the city require flow augmentation from Min River to flush their stagnant water, typically with a total flow of about 30 m^3/s.

Min River is the largest river in Fuzhou, and traverses Fuzhou from the northwest to southeast, with a total length of approximately 150 km. The main trunk of Min River was divided into the northern and southern branches at Huaian by Nantai Island. Min River has a large water flow and the annual average flow is about 1,713 m^3/s, and average annual runoff flow reaches 55.1 billion m^3. Min River is the most important water source and is also the primary receiving water body for wastewater, and navigation channel for the Fuzhou urban area.

Native vegetation has been damaged by human activities, and currently secondary and planted vegetation forms a relatively simple biota structure. There are no large wild animals inhabiting within the Project area, and most of the wild animals are mice. There are two small wetlands in the eastern Nantai Island that are major bird habitat areas. There are no forests (secondary or native), nature reserves, rare or endangered species in the Project area.

The predominant industries in Fuzhou include machinery, metallurgy, electronics, light industry, food, textile, pharmaceutical and high tech. The gross domestic product (GDP) of Fuzhou in 2007 was RMB 197.459 billion, approximately RMB 29,210 per capita.

II. CIVIL WORK CONSTRUCTION PROGRESS

The implementation agency (IA) for Components A and B is the Fuzhou Water Environment Construction and Development Company (FWECDC), while the Fuzhou Urban Visual Construction and Development Company (FUVCDC) is the IA for Component C. They have the ultimate responsibility for all aspects of Project construction including environmental protection and adverse impact mitigation during the construction.

So far, 20 civil contracts of Components A, B and C (9, 6 and 5 respectively) have been awarded, 4 of which were awarded in this reporting period. Among the 20 awarded contracts, 3 have been substantially completed. As of 31 May 2009, 70%, 35% and 4% of civil work has been completed respectively to the three components.

Component A - Yangli Phase 2 Sewer Networks

One more civil contract was awarded in this reporting period. As of 31 May 2009, nine out of the ten civil works contracts have been awarded. Construction of eight awarded contracts is ongoing with one (YGII-03) suspended, awaiting retendering. As of 31 May 2009, about 171km of sewer has been completed, which accounts for 70% the total length of this component. About 3.3% of progress was made in this reporting period (from 1 Dec 2008 to 31 May 2009).

Construction of the Yangli WWTP Phase II extension, with an A^2O treatment process, was completed in Oct 2008 and since then been operational.

Component B - Lianban Sewer Networks

One more civil contract (LG-07) was awarded in this reporting period. As of 31 May 2009, six out of the eight civil works contracts have been awarded. However, two (LG-01 and LG-03) of the eight contracts will be re-tendered, so the construction of only four awarded contracts is ongoing during the reporting period. Due to various reasons such as land matters and hard geological conditions, the whole construction progress is rather slow. As of 31 May 2009, about 42km of sewer construction has been completed, which accounts for 35% of the total length of this component. About 19.4% of progress was made in this reporting period.

Efficient implementation of Component B is also dependent on the construction of the proposed Lianban wastewater treatment plant (WWTP). The Lianban WWTP being implemented using a BOT approach was awarded in May 2009. It is under the design stage and construction is expected to commence in Jul 2009. The estimated cost of Lianban WWTP is RMB 240 million, half of which for land acquisition and the other half for construction.

Component C - Nantai Island Inland Creek Rehabilitation

As of 31 May 2009, 5 out of the total 15 civil contracts have been awarded invovling the Yuejin, Longjin and Puxia rivers, of which 4 constracts have started construction. To date, about 2.3 km of river rehabilitation completed accounting for 4% of the total length of this component.

III. ENVIRONMENTAL INSTITUTIONAL STRENGTHENING AND CAPACITY BUILDING

3.1 Institutional Arrangements and Improvement

The environmental management system which was established during the inception stage of the Project implementation consultancy (see the *May 2008 Semi-Annual Environmental Report*) has progressively been improved and strengthened during this reporting period. All new awarded civil contracts have been managed with personnel designated for environmental management, monitoring, supervision and reporting for the respective components. Their responsibilities and interactive cooperation are also clearly defined. FPMO and IAs have been actively communicating with Fuzhou Municipal Environmental Protection Bureau (FMEPB) on environmental management and monitoring issues for the construction phase of the Project, and FMEPB has been providing supports and instructions to the related matters.

3.2 Responsibilities and Performance

FPMO

The FPMO continues to play critical roles in the overall management establishing policies, report review, monitoring and coordinating of environmental management, and also in coordination with ADB, the IAs, B&V and related government departments. During this reporting period, the FPMO continues to actively coordinate with the related parties including FMG, FMEPB and IAs on the external environmental monitoring (EEM) procedure. Consequently, the Fuzhou Environmental Monitoring Station (FEMS) has provided some related environmental monitoring data on the Project to facilitate the preparation of this semi-annual environmental report. FEMS has also been well prepared for detailed external environmental monitoring.

IAs

The two IAs, FWECDC and FUVCDC have designated their environmental personnel whose relevant duties and performance to date are shown in **Appendix 1a**.

Contractors

The contractors appointed for the ongoing 19 civil work contracts under Components A, B and C have designated staff from their site management team to be responsible for internal monitoring and management at each construction section. The designated environmental personnel of the contractors are shown in **Appendix 1b** which also show their relevant duties and performance to date.

Construction Supervision Companies

To date, four construction supervision companies (CSCs) have been appointed:

- For Component A - Fuzhou Chengjian Construction Supervision Co., Ltd;
- For Component B - Guangzhou Municipal Engineering Supervision Co., Ltd;

- For Longjin and Yuejin rivers under Component C - Fuzhou Minshui Engineering Construction Supervision Co., Ltd; and
- For Puxia river under Component C - Chongqing River Engineering Construction Supervision Co., Ltd.

The CSCs have appointed their respective environmental supervision engineers to be responsible for environmental supervision for all awarded civil work contracts. The designated environmental supervision engineers of the CSCs and their relevant duties and performance to date are shown in **Appendix 1c**.

Environmental Monitoring Consultant

B&V's Environmental Monitoring Consultant (EMC) has initiated meetings with a number of project related parties, assisted in arranging for EEM, and helped the FPMO in the preparation of this Semi-Annual Environmental Report (as of 31 May 2009).

3.3 Observations at Site Visits and Corrective Advising

FPMO, IAs and B&V conducted a series of site visits to some ongoing civil works sites under Components A, B and C. **Appendix 4** presents some photographs showing the general conditions of the sites.

It was observed that the advanced technology adopted and proper construction arrangement has minimized negative impacts on environment, land subsidence and road traffic disturbance typically associated with pipe construction. Fences were established surrounding the sites. Permission granted by the authority for sites' temporary occupation and public notices issued by the contractors are posted on the fences. Under Contract YGII-01, a large banyan tree is affected by the pipe laying. The contractor timely reported the matter to the municipal garden management agency that will replant the tree. Some completed civil works sites of networks were also visited, and the road reinstatement was observed to be satisfactory.

At the Yuejin River reach under Contract Yuejin C1 within the compound of the transportation vocational school, both the river lining and landscaping have been completed, showing marked visual improvement compared to its previous conditions.

Comparison of the Yuejing River C1 contract in the vocational school
before, during and after the rehabilitation

Some problems were also found during the site visits:

- At some river rehabilitation sites, some excavated and dredged material is stockpiled along the river bank. It is reported that the material is meant to be reused or transported to some appointed landfill sites. However, no efforts have been made to prevent water and soil loss. The contractors have been advised to take corrective actions to minimize soil erosion, prevent dredged material flowing back into the rivers and avoid creating secondary environmental pollution. The contractors have also been advised that sampling and testing of the dredged material is necessary before such material is used for backfilling or agricultural purposes, to prevent any unfavorable impacts on soil, groundwater or crops.
- Some rivers such as the Yuejin River have been intentionally blocked to create the necessary construction condition for Component C or other projects on Nantai Island.

Due to a lack of natural flow, the already polluted river water has further deteriorated and promoted fly and mosquito breeding. FUVCDC has been advised to start construction as soon as possible to quickly end the current negative impacts on local residents' normal life.

- Demolition waste has been allowed to remain at some sites, causing river blockage, and negative impacts on traffic and the local residents' living environment. It is suggested all kinds of material be managed properly and the river rehabilitation work commence as soon as possible to improve the situation.

3.4 Reporting

In this reporting period, the following environmental reports have been prepared:

- 4 Environmental Supervision Monthly Reports for Component A, by Fuzhou Chengjian Construction Supervision Co. Ltd (Jan to May 2009);
- 6 Environmental Supervision Monthly Reports for Component B, by Guangzhou Municipal Engineering Supervision Co. Ltd (Dec 2008 to May 2009);
- 4 Supervision Monthly Reports including environmental chapter for Component C, by Fuzhou Minshui Engineering Construction Supervision Co., Ltd (Dec 2008 to May 2009);
- One Semi-annual Environmental Management Performance Report by FWECDC, dated 30 Jun 2009;
- One Semi-annual Environmental Management Performance Report by FUVCDC, dated 30 Jun 2009;
- The environmental section in the Semi-annual Progress Report as of 31 May 2009; and
- Semi-annual Environmental Report as of 31 May 2009 (this report).

Semi-Annual Environmental Reports

The first and second semi-annual environmental reports were submitted to ADB in Jun 2008 and Jan 2009 respectively and have been accepted. However the reports were deemed to have weakness in summarizing environmental impacts as no physical monitoring results have been recorded. This weakness stems from the fact that no external monitoring agencies were engaged to conduct physical monitoring of the necessary environmental parameters. During this reporting period, although no external monitoring exercise was conducted, FEMS provided some relevant regular monitoring data to support this report and improve the environmental quality assessment level for the Project area. Now that FEMS has been formally appointed as the external monitoring agency, external monitoring exercise will be carried out from Jul 2009. It can therefore be expected that the monitoring results will be incorporated into next semi-annual environmental report (as at end Nov 2009) to accomplish the external environmental monitoring tasks.

In addition, according to ADB's requirement, a Chinese version of the semi-annual environmental report will be submitted to FMEPB when the report in English is submitted to ADB.

The next Semiannual Environmental Report will be submitted to ADB in Dec 2009. Subsequent submission of Semi-annual Environmental Reports would be at 6 monthly intervals in December and June.

Other Reports

Along with the advance construction status of Components A and B, the related environmental supervision work has also been satisfactory. Monthly reports by the environmental supervision engineers have been prepared in a timely manner, and the reports' quality has been gradually improved. However, both the quality and timeliness of submission of the environmental supervision monthly reports of Component C are still to be improved

In this reporting period, both FWECDC and FUVCDC have duly prepared and submitted their semi-annual environmental reports.

IV. IMPLEMENTATION OF MITIGATION MEASURES

The implementation of mitigation measures undertaken by the contractors is generally satisfactory and in line with the revised EMPs. In this reporting period, the EMPs have been incorporated in the contract documents by the two IAs according to ADB's requirements.

4.1 Component A - Yangli Phase II Sewers

Construction of Component A continues in this reporting period. Construction activities of the sewers have produced some unfavorable environmental impacts such as wastewater, dust, noise, and traffic impact etc. However, proper implementation of mitigation measures by the contractors along with adoption of optimized design, reasonable construction arrangements and advance techniques has mitigated the impacts produced in the construction phase. To date, there has been no significant impact on the sensitive areas in the vicinity. Road reinstatement after sewer construction and rehabilitated river reaches with landscaping and turfing are all observed to be satisfactory. The detailed mitigation measures implemented are presented in **Appendix 2a**.

Construction of the Yangli WWTP Phase II extension was completed in Oct 2008 and since then been operational. The relevant pollution control facilities have been constructed and well operated, and mitigation measures have been properly implemented. As such, there is no significant secondary pollution produced due to the operation of the WWTP. FPMO and FWECDC are required to work closely with FEPB for their guidance and advice on the implementation of mitigation measures and environmental monitoring.

4.2 Component B - Lianban Sewers

Construction of Component B also continues in this reporting period. Similar to Component A, with proper implementation of the mitigation measures as well as other comprehensive technology, the impacts during the construction phase have been mitigated. To date, there has been no significant impact on the sensitive areas in the vicinity. Road reinstatement after sewer construction is observed to be satisfactory. The detailed mitigation measures implemented are presented in **Appendix 2b**.

In addition, both the Lianban sewer network and Lianban WWTP are scheduled to be completed by the end of 2010, so that the potential impacts caused by untreated waste water collected through the network to the Min River will be avoided. FPMO and FWECDC are required to work closely with FEPB for their guidance and advice on the implementation of mitigation measures and environmental monitoring.

4.3 Component C - Nantai Island Creek Rehabilitation

Construction of 3 civil contracts for Longjin and Yuejin Rivers under Component C continues in this reporting period. Puxia Contract 1 construction commenced in April 2009 and Puxia Contract 2 has just been awarded. Construction activities such as earth excavation and bank lining have produced some unfavorable environmental impacts such as dust and noise etc. However, proper implementation of mitigation measures by the contractors along with adoption of optimized design, and reasonable construction arrangements has mitigated the impacts produced in the construction phase. Detailed mitigation measures implemented are presented in **Appendix 2c**.

V. ENVIRONMENTAL MONITORING AND ENVIRONMENTAL QUALITY

5.1 Environmental Monitoring

5.1.1 Internal Environmental Monitoring

Internal environmental monitoring at construction sites has been conducted by contractors' qualified personnel and supervised by CSCs to ensure the contractors take proper mitigation measures. The internal monitoring results have shown that for the ongoing construction site

areas, the environment has been well maintained; no significant environmental problems have taken place.

5.1.2 External Environmental Monitoring

FMG has appointed the Fuzhou Environmental Monitoring Station (FEMS) under FMEPB to undertake that the external environmental monitoring exercises involved in the Project, and the necessary cost will be covered by fiscal allocation to FEMS. In this reporting period, FPMO has been actively coordinating with FMEPB and FEMS on the EEM arrangement, carrying out project scope discussion, conducting site visits and preparing the monitoring programme. Detailed external environmental monitoring is expected to start from July 2009.

In addition, FEMS has studied the location of the ongoing civil contracts, compared them with their regular monitoring points and then selected the most relevant monitoring data the in terms of surface water, ambient air and noise, for FPMO's use in the preparation of this semi-annual environmental report (as presented in Section 5.2 below).

5.2 Environmental Quality

5.2.1 General Environmental Situation

Information in FMEPB's website shows that from Dec 2008 to May 2009, the water quality of the Min River (Fuzhou Kuiqi section) was of Class III standard, which remained satisfactory. It also shows that in the forth quarter of 2008 and first quarter of 2009, 50% and 62.5% respectively of the monitored inland creeks in the Fuzhou urban area met national standard. This indicates that the water quality of the creeks was poor in general.

It was reported that the ambient air quality during the six months in the reporting period was acceptable with the Air Pollution Index (API) being 71, 59, 63, 62, 64 and 61 respectively which are all falling in the good field of API from 51 to 100.

As one of the key national environmental protection cities, 24-hour continuous noise monitoring is conducted in the built-up area of Fuzhou. It shows that in the forth quarter of 2008 and the first quarter of 2009, 100% and 60% respectively of the daytime monitoring results met national standards. However, none of the night time monitoring results met the standards.

5.2.2 Environmental Situation of the Project Area in the Reporting Period

With a delay in appointment of an external monitoring agency, basic data for reporting was lacking. In order to make preparation of this semi-annual environmental report possible, FPMO coordinated with FEMS in matching their regular monitoring points with the construction site locations of the Project. Some relevant and useful monitoring data was therefore made available to FPMO to reflect the basic situation and changes in the environmental quality of the Project area.

It is shown from the monitoring and assessment results that in this reporting period, the level of major pollutants of the Yuejin, Lulei and Longjin rivers have become lower than in the same period of last year. However, water quality is generally still worse than Class V. Both the ambient air quality and sonic environmental quality in the Project area generally met the relevant standards. The assessment results did not show that the construction of the Project has had unfavorable impacts on the environment of the Project area.

VI. CONCLUSIONS AND RECOMMENDATIONS

At the time of preparation of this Report, construction activities are ongoing under Components A, B and C. To date, the contractors of all the awarded contracts have been implementing mitigation measures and the negative impacts on the environment have been reduced to a minimum level possible during construction. The monitoring and evaluation exercise has revealed that the EMPs are generally being satisfactorily implemented, and the following conclusions can be drawn:

- The environmental management system which was established during the inception stage of the Project implementation consultancy has progressively been improved and strengthened during this reporting period. Coordination between the FPMO, IAs and FMEPB has been undertaken for better implementation of the EMPs and to comply with the environmental requirement of the Project Agreement.

- Construction of Components A, B and C is ongoing during this reporting period. Noise, dust and solid waste pollution during construction have been minimized through undertaking the relevant mitigation measures. There has been no significant negative impact on the sensitive areas in the vicinity.

- FPMO has been coordinating with FMEPB and FEMS on the EEM arrangement, and detailed external environmental monitoring is expected to commence in July 2009.

- Monitoring data for the first half year of 2009 collected from the local EPB's website shows that the water quality of Min River is satisfactory and meet Class III standard. The air quality of the urban area is good, however the quality of the sonic environment remains less than satisfactory for the whole urban area.

- Specific monitoring results for the Project area show that the water quality of the inland creeks is still poor and worse than Class V. However, both the ambient air quality and the sonic environmental quality in the Project area meet relevant standards. There is no evidence to show that the construction of the Project has had unfavorable impacts on the environment of the Project area.

APPENDIX 1:
ENVIRONMENTAL PERSONNEL AND PERFORMANCE

A1-1: IAs' environmental personnel and performance in this reporting period from 1 Dec 2008 to 31 May 2009

Component	IA	Chief Person		Contact	Performance
A. Yangli Phase II Sewers B. Lianban Sewers	FWECDC	Director of Admin Office	Fan Xiaohui	0591-83339737 fzshj@163.com	Implemented the EMPs; supervised and coordinated the Contractors and Supervision Company's environmental work; prepared Components A and B semi-annual environmental management performance report for the 1st half year of 2009; and assist in preparation of this 2009 May Semi-Annual Environmental Report.
C. Nantai Island Inland Creek Rehabilitation	FUVCDC	Deputy General Manager	Zheng Yanbin	13705056313 zhangzuochao@hotmail.com	Implemented the EMP; supervised and coordinated the Contractors and Supervision Company's environmental work; prepared Component C semi-annual environmental management performance report for the 1st half year of 2009; and assist in preparation of this 2009 May Semi-Annual Environmental Report.

DUTIES:

- to refine and implement the EMP;
- to ensure the mitigation and monitoring measures recommended in the EMPs and EIAs are incorporated into the design and bidding documents;
- to supervise and coordinate implementation of mitigation measures and internal monitoring in construction phase;
- to analyze internal monitoring weekly reports ;
- to organize external compliance monitoring;
- to monitor and coordinate environmental supervision;
- to establish, organize and carry out training plan;
- to establish and implement publish consultation plan;
- to prepare semi-annual progress report and annual environmental report with assistance of the Consultant; and
- to undertake other related work as required.

A1-2: Appointed contractors' environmental personnel for the ongoing contracts in this reporting period from 1 Dec 2008 to 31 May 2009

Component	Construction Section	Contractor	Environmental Person
A. Yangli Phase II Sewers	YGII-01	Civil Engineering Company of China Construction Fifth Engineering Bureau	Gong Zhiyong
	YGII-02	Fujian Rongshen Municipal Engineering Co., Ltd	Fang Jianlin
	YGII-03	Civil Engineering Co. of China Construction Fifth Engineering Bureau	Zhang Youhui
	YGII-04	Zhejiang Dacheng Construction Group Co., Ltd.	Cheng Yuanzhong
	YGII-05	Beijing House Development Group Municipal Engineering Co., Ltd	Chen Yingying
	YGII-06	Fujian Rongshen Municipal Engineering Co., Ltd	Rao Huiyu
	YGII-07	Beijing House Development Group Municipal Engineering Co., Ltd	Zhuang Guiqing
	YGII-08	SCG Bridge Tunnel and Port Construction Co., Ltd	Ye Chaojun
	YGII-09	Fujian Rongsheng Municipal Engineering Co., Ltd.	Chen Simin
B. Lianban Sewers	LG-02	Shanghai Longyu Construction	Zhou Yeguo
	LG-05	Shenzhou Construction Co., Ltd.	Yang Zhiwei
	LG-06	Beijing House Development Group Municipal Engineering Co., Ltd	Yue Yuxiang
	LG-07	SCG Bridge Tunnel and Port Construction Co., Ltd.	Wang Zhen
C. Nantai Island Inland Creeks Rehabilitation	Longjin	Shandong Yellow River Engineering Bureau	Li Xiang
	Yuejin C1	Anhui Water Resources Development Co., Ltd	Guan Yong
	Yuejin C2	Zhejiang Guangchuan Construction Co., Ltd	Wang Dongxu
	Puxia C1	Gezhouba (Group) Shanxia Enterprise Co., Ltd	Ji Liaoyuan

DUTIES:

- to implement mitigation measures during construction phase;
- to establish internal monitoring plan and detailed action plan as needed;
- to carry out internal monitoring, maintain relevant records, produce weekly reports, and submit to the relevant CSC and IA;
- to participate relevant environmental training;
- to assist with public consultation;
- to assist with resolving environmental problems accoutered in construction; and
- to provide information and undertake other work as required.

A1-3: Appointed CSCs' Environmental Personnel and Performance for the Ongoing Contracts

Component	Construction Section	CSC	Chief Person	Performance
A. Yangli Phase II Sewers	YGII-01	Fuzhou Chengjian Construction Supervision Co., Ltd	Lin Lixin	Conducted environmental supervision; and prepared and submitted 4 integrated supervision monthly reports for all ongoing contracts.
	YGII-02		Wang Weimin	
	YGII-03		Yang Feng	
	YGII-04		Liang Ruiquan	
	YGII-05		Huang Xinguang	
	YGII-06		Su Xiarong	
	YGII-07		Zou Lufeng	
	YGII-08		Chen Gang	
	YGII-09		Huang Xinguang	
B. Lianban Sewers	LG-02 LG-05 LG-06 LG-07	Guangzhou Municipal Engineering Supervision Co., Ltd	Zhang Qingyao	Conducted environmental supervision; and prepared and submitted 6 monthly supervision reports.
C. Nantai Island Inland Creeks Rehabilitation	Longjin Yuejin C1 Yuejin C2	Fuzhou Minshui Engineering Construction Supervision Co., Ltd	Wu Zhongwei	Conducted environmental supervision; and prepared and submitted 4 monthly supervision reports of which the quality needs to be improved.
	Puxia C1	Chongqing River Engineering Construction Supervision Co., Ltd	Luo Yubin	Just started environmental supervision with no monthly supervision report prepared yet.

DUTIES:

- to participate various review meetings and recommend environmental improvement to construction arrangements, technical issues, progress etc.;
- to review environmental performance of construction equipment;
- to supervise the implementation and any changes of mitigation measures;
- to inspect ambient environment and impacts;
- to report and help to deal with any environmental problems or accidents encountered;
- to prepare monthly environmental supervision report and submit to NPMO and the respective IA; and
- to participate in construction completion audit in terms of environmental aspects, and submit related reports or certification as needed.

APPENDIX 2:
IMPLEMENTATION OF MITIGATION MEASURES IN CONSTRUCTION PHASE

2a: Implementation of Mitigation Measures in Construction Phase for Component A

1. Construction Wastewater and Treatment

Wastewater generated in the construction phase comprises the slurry water from pipe jacking, the pumped groundwater from excavation and the domestic wastewater of workers in their living camps. Direct discharge of the wastewater without proper treatment would cause urban environment polluted.

- The slurry from pipe jacking is settled in containers established at site for sedimentation. All of the containers are emptied every day. The settled sludge is transported by enclosed trunks to the designated locations for disposal. The supernatant is reused for pipe jacking. As such, there is no wastewater discharge on the sites. As the geological condition is complex at the Tongpan Road sites, a grab has been used to excavate slurry out from the caissons. In order to avoid any muddy runoff flowing onto streets, brick or sandbag retaining walls have been built to block, and the Contractor has taken action to scrub and clean the street should the roads be dirtied.
- When groundwater is pumped out of excavation pits, it is similarly settled in sedimentation tanks before discharge into storm sewers.
- There are typically about 10 workers and management staff members living in each camp. Their total daily water consumption is 2 m^3, of which about 80% become domestic wastewater and is discharged into sewer for treatment at the municipal treatment plant.

2. Dust and Exhaust Emission Control

Due to different subsoil conditions and groundwater distribution, some excavation sites are more prone to dust problems than others during construction. Proper arrangements have been made to minimize the excavation areas and to use water spray to reduce dust. For areas where groundwater table is rather shallow, the excavated materials are typically slurries and do not create dust nuisance. Covering or water spraying on exposed construction materials is carried out to prevent dust, and the excavated material storage duration is minimized to reduce the impact. Hoarding has been set up along the construction sites for closure, which helps minimize dust problems affecting the vicinity. Construction vehicles for dusty material or solid waste transportation are covered or enclosed with speed control. To control exhaust emission from construction machinery and vehicles, periodical vehicular maintenance is carried out. Vehicles with emission exceeding the standards are not permitted to enter the construction sites.

3. Noise and Control

Various types of construction machinery are used in construction including grabs, loaders, hoists, drilling machines, air compressors, water pumps, crushers, engines, trucks and so on. Their noise level normally ranges from 90 to 108 dB(A), which indicates they are all highly noisy machinery. Especially when breaking up road surfaces, the noise always creates significant impacts on the surrounding and nearby residents. Pipe jacking is adopted where appropriate in most contracts to reduce road opening, and construction section by section also shortens the duration of noise pollution at each section. Hoarding set up along the construction sites can work as sound barrier to screen out some construction noise. Construction machinery is arranged to be as far away from the residents as possible. Periodic maintenance and spot checks on noise emission are conducted by the contractors for all construction machinery. No large scale construction activities are carried out at sensitive areas or during sensitive hours. When construction has to be conducted at night time (for example when sinking caissons) manpower combined with hoists is adopted to reduce noise impacts on the nearby residents.

4. Solid Waste and Disposal

Component A involves constructing new sewers and rehabilitating existing sewers. Both pipe jacking and open excavation have been adopted as the key methods in pipe construction. Most of the solid waste generated in construction is the excavated material from open trench or caisson excavation, or pipe jacking slurry or dredged material from existing sewers. In general, pipe jacking reduces earth excavation. During this reporting period, some 22,038 m^3 of solid waste has been generated as presented in **Table A2-1**, and total solid waste generated to date under this component is about 247,000 m^3. All excavated material has not been reused for backfilling but transported to designated landfills for disposal as excess excavated material. The landfill sites have been assigned by the local solid waste management authority. The solid waste collection, transportation and disposal work is subcontracted out by the contractors to specialist solid waste collectors. It was reported that the dredged material is normally sent to landfill and not used in agricultural application. The contractors have been requested to conduct sampling and testing of dredged material before it is sent for agricultural use.

Table A2-1: Solid Waste Generated in Construction by Component A
(from 1 Dec 2008 to 31 May 2009)

Contract	Open Excavation (m^3)			Caisson Excavation (m^3)			Pipe Jacking Slurry (m^3)	Dredged Material from Pipeline (m^3)	Total Solid Waste (m^3)
	Excavation	Backfilling	Excess	Excavation	Backfilling	Excess			
YGII-01	0	0	0	0	0	0	195	0	195
YGII-02	0	0	0	0	0	0	472	0	472
YGII-03	0	0	0	0	0	0	225	0	225
YGII-04	0	0	0	0	0	0	0	0	0
YGII-05	3,730	2,320	3,730	0	0	0	0	0	3,730
YGII-06	0	0	0	0	0	0	0	0	0
YGII-07	2,950	2,670	2,950	300	0	300	1,095	0	4,345
YGII-08	3,279	2,658	3,279	1,551	20	1,551	1,581	0	6,411
YGII-09	6,660	4,540	6,660	0	0	0	0	0	6,660
Total	**16,619**	**12,188**	**16,619**	**1,851**	**20**	**1,851**	**3,568**	**0**	**22,038**

5. Ecological Impact and Mitigation

Some greenbelts or roads have to be temporarily occupied for construction. In such cases, the contractors have to report to and obtain approval from the relevant government departments. After the construction is completed, the roads are reinstated. For the disturbed greenbelts, certain compensation is paid to the local garden management authority which is responsible for turfing and planting. Besides, no excavation is allowed to be carried out on rainy days, and all solid waste generated during construction is timely transported off site to prevent stock piling at site for too long a period. The use of pipe jacking has also reduced ground subsidence and soil erosion. All these mitigation measures have contributed to soil erosion control and urban ecological environment protection.

6. Historic Cultural Relics Discovery and Protection

To-date there is no report on historic cultural relics and old trees encountered at the construction sites. Under Contract YGII-01, a large banyan tree is affected by the pipe laying. The contractor timely reported the matter to the municipal garden management agency who will replant the tree.

7. Social Impacts and Mitigation

Pipe construction in the urban areas would bring certain inconvenience to local traffic, residents, and public facilities etc. In order to minimize the negative impacts, coordination meetings are held with public representatives for their better understanding of the Project and seeking their feedback and supervision. Besides, hoarding is set up along the construction site to separate the construction activities from social surroundings. Proper construction arrangements are made to avoid affecting existing pipelines and cables, and any affected facilities are timely. Some

roads are temporarily occupied for pipe construction, and this has impacts on local traffic. The contractors take active actions to reduce the impacts by constructing road diversions, putting up indication signs and appointing coordinators for traffic diversion and direction.

8. Construction Camps Environmental Conditions

One construction camp is established for each construction section under Component A for about 30 workers on average and 50 workers at peak time. The camps are apartments rented from local residents with well-equipped facilities and good sanitation. Domestic water comes from the municipal water supply system, and wastewater generated is discharged into local sewers. Domestic refuse from the camps is collected in garbage bins and transported away by the public sanitation department.

9. Emergency and Response

The contractors have established a construction safety system, prepared emergency procedures, and equipped with security facilities. All these measures have been approved by the relevant government departments, and the related documentation is registered in local security examination stations. Security personnel appointed at each construction site conducts frequent inspections in order to timely detect any safety risks. All construction workers have been given safety training, and signed safety commitments. When violations are detected (for example workers were not wearing safety helmets, fences were not closed or slurry was left on road) by the supervision engineers, they would be properly dealt with and timely rectified. Such violations are disclosed to all workers as case studies for learning purposes.

10. Environmental Protection and Monitoring Measures Implemented in Yangli WWTP

Construction of the Yangli WWTP Phase II extension was completed in Oct 2008 with the process of A^2O, and operation is ongoing now. The environmental inspection and acceptance has not been conducted yet waiting for FMEPB's arrangement. Water quality of the effluent for both Phase I and Phase II can meet Class 1B of the *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB18918-2002). The dewatered sludge was transported to Hongmiaoling Sanitation Landfill Site for disposal. Major part of the influent is domestic wastewater, resulting in a low metal content in the sludge, so agricultural use of the sludge in the near future is under consideration. Sludge incineration for electricity generation is a longer term option. A well equipped laboratory has been set up in the WWTP with nine professional staff to carry out periodical sampling and testing of both influent and effluent. In addition, online monitoring facilities have been established and connected to FMEPB's network to make the flow and the concentration of COD, NH_3-N and total phosphorus be monitored by FMEPB at any moment. A total of 119 staff members are working in Yangli WWTP. Their water use comes from municipal water supply system, and the generated wastewater is treated by the WWTP. Domestic garbage is collected and transported to the designated landfill site in a timely manner. The relevant pollution control facilities have been constructed and well operated, and mitigation measures have been properly implemented. As such, there is no significant secondary pollution produced due to the operation of the WWTP. FPMO and FWECDC are required to work closely with FEPB for their guidance and advice on the implementation of mitigation measures and environmental monitoring.

2b: Implementation of Mitigation Measures in Construction Phase for Component B

1. Construction Wastewater and Treatment

Wastewater generated in the construction phase comprises the slurry water from pipe jacking, pumped groundwater from excavation and domestic wastewater from construction camps. The slurry from pipe jacking is settled in containers, 3 in a series, established at site for primary sedimentation, secondary sedimentation and supernatant storage. All these containers are emptied daily. The settled sludge at the bottom is then transported to designated locations for disposal. Clear supernatant is reused in the pipe jacking operation. Where required, groundwater is pumped out of excavations and is similarly settled in sedimentation tanks before

discharge into storm sewers. Domestic wastewater generated is discharged into local sewers.

2. Dust and Exhaust Emission Control

Due to different subsoil conditions and groundwater distribution, some excavation sites are more prone to dust problems than others during construction. Proper arrangements have been made to minimize the excavation areas and to use water spray to reduce dust. For areas where groundwater table is rather shallow, the excavated materials are typically slurries and do not create dust nuisance. Covering or water spraying on exposed construction materials is conducted to prevent dust, and the excavated material storage duration is minimized to reduce the impact. Hoarding has been set up along the construction sites for closure, which helps minimize dust problems affecting the vicinity. Construction vehicles for dusty material or solid waste transportation are covered or enclosed with speed control. To control exhaust emission from construction machinery and vehicles, periodical vehicular maintenance is carried out. Vehicles with emission exceeding the standards are not permitted to enter the construction sites.

3. Noise and Control

Various types of construction machinery are used in construction including grabs, loaders, hoists, drilling machines, air compressors, water pumps, crushers, engines, trucks and so on. Their noise level normally ranges from 90 to 108 dB(A), which indicates they are all highly noisy machinery. Especially when breaking up road surfaces, the noise always creates significant impacts on the surrounding and nearby residents. Pipe jacking is adopted where appropriate in most contracts to reduce road opening areas, and construction section by section also shortens the duration of noise pollution at each section. Hoarding set up along the construction sites can work as sound barrier to screen out some construction noise. Construction machinery is arranged to be as far away from the residents as possible. Periodic maintenance and spot check on noise emission are conducted by the contractors for all construction machinery. No large scale construction activities are carried out at sensitive areas or during sensitive hours. When construction has to be conducted at night time (for example when sinking caissons) manpower combined with hoists is adopted to reduce noise impacts on the nearby residents.

4. Solid Waste Disposal

Component B involves constructing new sewers and rehabilitating existing sewers. Pipe jacking, pipe pulling and open excavation have been adopted as the key methods in pipe construction. Most of the solid waste generated in construction is the excavated material from open trench or caisson excavation, or pipe jacking slurry or dredged material from existing sewers. In general, pipe jacking reduces earth excavation. During this reporting period, some 30,364 m^3 of solid waste has been generated as presented in **Table A2-2**, and total solid waste generated to date under this component is about 112,996 m^3. All excavated material has not been reused for backfilling but transported to designated landfills for disposal as excess excavated material. The landfill sites have been assigned by the local solid waste management authority, and the solid waste collection, transportation and disposal work is subcontracted out by the contractors to specialist solid waste collectors. It was reported that the dredged material is normally sent to landfill and not used in agricultural application. The contractors have been requested to conduct sampling and testing of dredged material before it is sent for agricultural use.

Table A2-2: Solid Waste Generated in Construction by Component B
(from 1 Dec 2008 to 31 May 2009)

Contract	Open Excavation (m^3)			Caisson Excavation (m^3)			Pipe Jacking Slurry (m^3)	Dredged Material from Pipeline (m^3)	Total Solid Waste (m^3)
	Excavation	Backfilling	Excess	Excavation	Backfilling	Excess			
LG-02	0	0	0	16,062	2,920	16,133	243,313	2,076	261,522
LG-05	22,241	19,252	9,826	0	0	0	0	0	9,826
LG-06	23,000	15,000	26,000	2,700	200	2,700	1,400	0	30,100
LG-07	200	200	200	2,000	0	2,000	0	0	2,200
Total	**45,441**	**34,452**	**36,026**	**20,762**	**3,120**	**20,833**	**244,713**	**2,076**	**303,648**

5. Ecological Impact and Mitigation

The use of pipe jacking has reduced ground subsidence and soil erosion. Excavated material is transported off site, and no excavation is carried out on rainy days. These mitigation measures have helped protect the ecological environment.

6. Historic Cultural Relic Discovery and Protection

To-date there is no report on historic cultural relics and old trees encountered at the construction sites.

7. Social Impacts and Mitigation

Pipe construction in the urban areas would bring certain inconvenience to local traffic, residents, and public facilities etc. In order to minimize the negative impacts, coordination meetings are held with public representatives for their better understanding of the Project and seeking their feedback and supervision. Besides, hoarding or fencing is set up along the construction site to separate the construction activities from social surroundings. Proper construction arrangements are made to avoid affecting existing pipelines and cables, and any affected facilities are timely reinstated.

Designated traffic coordinators have been appointed by the contractors to be responsible for traffic diversion and direction. For some sections, the construction affects the entire width of the road. As such, discussions between the relevant parties were held to work out appropriate road diversion schemes. Also, safety and indication signs, night lighting and bulletin boards are set up to minimize traffic congestion caused by construction.

8. Construction Camps Environmental Conditions

One construction camp is established for each construction section under Component B for about 20 workers on average and 40 to 50 workers at peak time. The camps are apartments rented from local residents with well-equipped facilities and good sanitation. Domestic water comes from the municipal water supply system, and wastewater generated is discharged into local sewers. Domestic refuse from the camps is collected in garbage bins and transported away by the public sanitation department.

9. Emergency and Response

The contractors have established a construction safety system, prepared emergency procedures, and equipped with security facilities. All these measures have been approved by the relevant government departments, and the related documentation is registered in local security examination stations. Security personnel appointed at each construction site conducts frequent inspections in order to timely detect any safety risks. All construction workers have been given safety training, and signed safety commitments. Most of the workers execute their work in compliance with the safety rules. Some potential dangers or violation activities (for example workers were not wearing safety helmets, materials were piled improperly, fences were not closed, caution signs and lights were not well set up, solid waste was not transported out in time etc.) were identified by the supervision engineers and properly dealt with and timely rectified.

10. Environmental Protection and Monitoring Measures Implemented in Lianban WWTP

The Lianban WWTP being implemented using a BOT approach is under the design stage and construction is expected to commence in Jul 2009, so no mitigation measures have yet been implemented in the reporting period. Both the Lianban sewer network and Lianban WWTP are scheduled to complete by the end of 2010, so that potential impacts caused by untreated waste water collected through the network to the Min River will be avoided. FWECDC has committed to ensure the BOT developer to implement the environmental mitigation measures as prescribed in the full EIA for Lianban WWTP during the construction and operation phases. FPMO and

FWECDC are required to work closely with FEPB for their guidance and advice on the implementation of mitigation measures and environmental monitoring.

2c: Implementation of Mitigation Measures in Construction Phase for Component C

1. Water Pollution and Control

During construction within some original rivers under Component C, cofferdams for river diversion were constructed section by section to prevent re-suspending the river sediment from causing secondary pollution to downstream areas. There is no specific labor camp established along the rivers. Workers are housed in rental residential houses in the urban areas. Domestic water is from the municipal water supply system, and wastewater generated is discharged into local sewers.

2. Dust and Exhaust Emission Control

Water content in the excavated earth in river work is rather high, so there is little dust produced during excavation. When excavation took place in dry and windy weather, the contractors would use water spray to reduce dust in a timely manner. To control exhaust emission from construction machinery and vehicles, periodical vehicular maintenance is carried out by the contractors. Vehicles with emission exceeding the standards are not permitted to enter the construction sites to minimize the impacts of exhaust emission on the ambient air. During the construction of some heavily polluted creeks such the Yuejin River, odor is released when the river sediment is disturbed. The odor has unfavorable impacts on the nearby residents. However, as the rehabilitation activity is being conducted section by section and only several weeks is spent on each section, such odor impact would disappeared after construction is completed at that section.

3. Noise and Control

Various types of construction machinery are used in construction including grabs, loaders, hoists, drilling machines, air compressors, water pumps, crushers, engines, trucks and so on. Their noise level normally ranges from 90 to 108 dB(A), which indicates they are all highly noisy machinery. Construction machinery is arranged to be as far away from sensitive points such as classrooms and residential apartments as possible. Periodic maintenance and spot checks on noise emission are conducted by the contractors for all construction machinery. Construction schedule has been arranged properly to reduce noise impacts on the nearby residents' living, study and rest.

4. Solid Waste and Disposal

Demolition waste has been allowed to remain at the site in Gaohu Village along the Yuejin River, causing negative impacts on traffic and the local residents' living environment. It is reported by the IA that the material either is meant to be reused or will be transported to some appointed landfill sites. It is suggested all reusable material to be used for future backfilling be stockpiled at designated areas, and not spread over areas indiscriminately. Other recyclable waste should be promptly transported off site. All the other demolition waste should be disposed of out of the site at designated landfills. It is anticipated that the situation will be greatly improved once the actual river rehabilitation work commences. FUVCDC is therefore requested to arrange for the river rehabilitation work to commence as soon as possible.

During construction of other rivers, both the excavated earth and the dredged material from river channels are stockpiled along the river bank. It is reported by the contractors that the material is meant to be reused or transported to some appointed landfill sites. However, no efforts have been made to prevent water and soil loss. The contractors have been advised to take corrective actions to minimize soil erosion, prevent dredged material flowing back into the rivers and avoid creating secondary environmental pollution. Sampling and testing of the dredged material is necessary before such material is used for backfilling or agricultural purposes, to prevent any unfavorable impacts on soil, groundwater or crops. In this reporting period, 2.3 km of river work

and 592,076m^3 of earth excavation have been completed in Component C with a total of about 438,100 m^3 of solid wastes generated during construction with the details presented in **Table A2-3**. To date, total solid waste generated under this component is about 443,100 m^3.

Table A2-3: Solid Waste Generated in Construction by Component C

(from 1 Dec 2008 to 31 May 2009)

Contract	River Channel Excavation (m^3)			River Dredging (m^3)			Total Excavation (m^3)		
	Excavation	Backfilling /Reuse	Excess	Dredged	Backfilling /Reuse	Excess	Excavation /Dredged	Backfilling /Reuse	Excess
Longjin	86,670	15,841	70,829	130,005	23,761	106,243	216,675	39,602	177,072
Yuejin C1	56,743	12,898	43,845	85,115	19,437	65,768	141,858	32,335	109,613
Yuejin C2	72,220	11,673	60,596	108,330	17,510	90,819	180,550	29,183	151,415
Puxia C1	0	0	0	52,993	80,290	0	52,993	80,290	0
Total	**215,633**	**40,412**	**175,270**	**376,443**	**140,998**	**262,830**	**592,076**	**181,410**	**438,100**

5. Ecological Impact and Mitigation

Some greenbelts have to be temporarily occupied for construction. In such cases, the contractors have to report to and obtain approval from the relevant government departments. After the construction is completed, the lands are reinstated. For the disturbed greenbelts, turfing and planting are undertaken there. In addition, slopes of the channel are reinstated with turfing after the construction of the river reaches. This not only contributes to landscaping but also plays a role in protecting the urban ecological environment. Besides, no excavation is allowed to be carried out on rainy days to prevent water and soil loss.

6. Historic Cultural Relics Discovery and Protection

To-date there is no report on historic cultural relics and old trees encountered at the construction sites.

7. Social Impacts and Mitigation

River rehabilitation in the urban areas would bring certain inconvenience to local traffic, residents, and public facilities etc. In order to minimize the negative impacts, coordination meetings are held with public representatives for their better understanding of the Project and seeking their feedback and supervision. Besides, hoarding or fencing is set up along the construction site to separate the construction activities from social surroundings.

8. Emergency and Response

The contractors have established a construction safety system, prepared emergency procedures, and equipped with security facilities. All these measures have been approved by the relevant government departments, and the related documentation is registered in local security examination stations. Security personnel appointed at each construction site conducts frequent inspections in order to timely detect any safety risks. All construction workers have been given safety training, and signed safety commitments. The identified potential dangers or violation activities are properly dealt with and timely rectified.

APPENDIX 3:
ENVIRONMENTAL MONITORING AND ASSESSMENT IN CONSTRUCTION PHASE

1. Background

With a delay in appointment of an external monitoring agency, basic data for reporting was lacking. In order to make preparation of this semi-annual environmental report possible, FPMO coordinated with FEMS in matching their regular monitoring points with the construction site locations of the Project. Some relevant and useful monitoring data was therefore made available to FPMO to reflect the basic situation and changes in the environmental quality of the Project area.

2. Water Quality Monitoring and Assessment for the Project Rivers

Longjin, Yuejin and Lulei rivers are among the regular monitoring rivers of the FEMS. The monitoring points of them are shown in **Figure 1** of the above main text, and the parameters include permanganate index (COD_{Mn}), ammonia nitrogen (NH_3-N) and pH value. In this report, the average monitoring values of two comparable periods, the first half of 2008 (from Dec 2007 to May 2008) and the first half of 2009 (from Dec 2008 to May 2009), have been selected to reflect the changes of the water quality in the same period of the two years. The water quality monitoring data in the two periods for the three rivers is presented in **Table A3-1**, and the comparison can be seen in **Figure A3-1** and **Figure A3-2**.

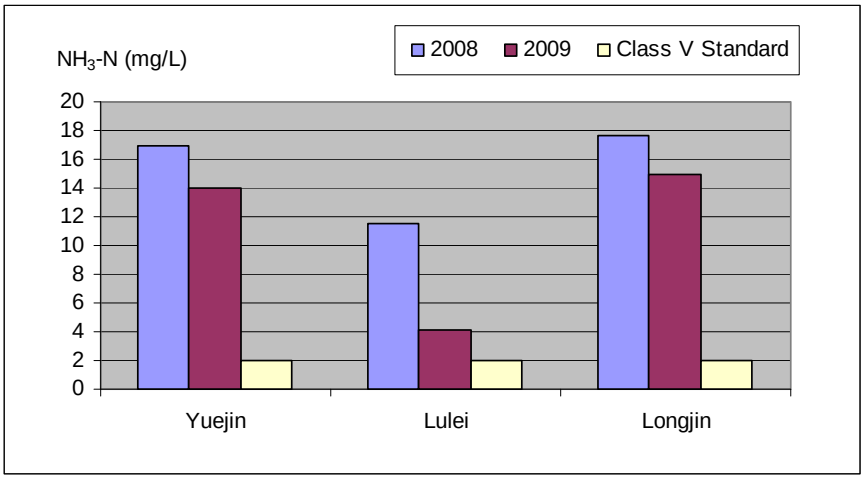

Figure A3-1: Comparison of NH_3-N Level of the Project Rivers for Same Period of 2008 and 2009

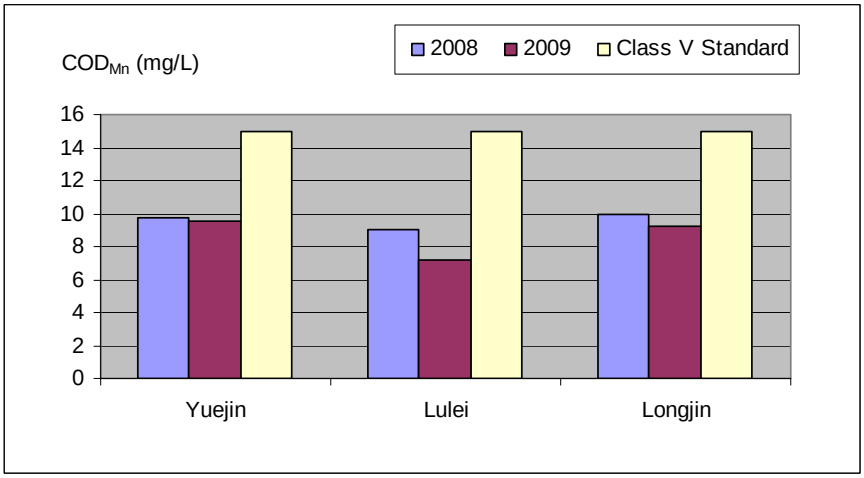

Figure A3-2: Comparison of COD_{Mn} Level of the Project Rivers for Same Period of 2008 and 2009

Table A3-1: Water Quality Monitoring Results of the Project Rivers

Unit: mg/L excluding pH

Rivers	1st half of 2008			1st half of 2009		
	pH	NH_3-N	COD_{Mn}	pH	NH_3-N	COD_{Mn}
Yuejin	7.2	16.92	9.7	7.12	14.03	9.5
Lulei	7.14	11.57	9	7.15	4.16	7.2
Longjin	7.21	17.67	9.9	7.09	14.92	9.2

It can be seen from the above table and figures that the level of the both NH_3-N and COD_{Mn} in this reporting period has become lower than that in the same period of last year. The *Environmental Quality Standards for Surface Water* (GB3838-2002) for water quality assessment is adopted in this report. The standard values are presented in **Table A3-2**, and the assessment results are given in **Table A3-3**.

Table A3-2: Standards for Basic Parameters

Environmental Quality Standards for Surface Water (GB3838-2002)

Parameter			Class I	Class II	Class III	Class IV	Class V
pH			6 ~ 9				
COD_{Mn}	mg/L	≤	2	4	6	10	15
NH_3-N	mg/L	≤	0.15	0.5	1.0	1.5	2.0

Table A3-3: Water Quality Assessment Results for the Project Rivers

Rivers	1st half of 2008				1st half of 2009			
	pH	NH_3-N	COD_{Mn}	In General	pH	NH_3-N	COD_{Mn}	In General
Yuejin	I	>V	IV	>V	I	>V	IV	>V
Lulei	I	>V	IV	>V	I	>V	IV	>V
Longjin	I	>V	IV	>V	I	>V	IV	>V

Although the level of major pollutants of the three rivers has declined in this year, the general water quality is still worse than Class V with NH_3-N significantly exceeding the standard. It is believed that the pollution of the rivers mainly came from direct discharge of untreated domestic wastewater and leachate from domestic garbage indiscriminately discarded along the rivers.

3. Ambient Air Monitoring and Assessment for the Project Area

Among the regular air monitoring points of the FEMS, only Fuzhou University, Tea Association and Fuzhou Normal School are located in the Project area. These relevant monitoring points are shown in **Figure 1** of the above main text, and the parameter is inhalable particles (PM_{10}). In the same way, the average monitoring values of two comparable periods (first half of 2008 and first half of 2009) are used to reflect the changes of the air quality in the same period of the two years. The air monitoring data in the two periods for the three points is presented in **Table A3-4**, and the comparison can be seen in **Figure A3-3**.

Table A3-4: Ambient Air Monitoring and Assessment for PM_{10}

Unit: mg/m^3

Point	Average Monitoring Values		Standard Value *	Assessment Results
	From Dec 2007 to May 2008	From Dec 2008 to May 2009		
FZ University	0.077	0.074	0.10	Meet the standard
Tea Association	0.0913	0.065	0.10	Meet the standard
FZ Normal School	0.082	0.081	0.10	Meet the standard

* Annually average value of Class II standard of the *Ambient Air Quality Standard* (GB 3095-1996)

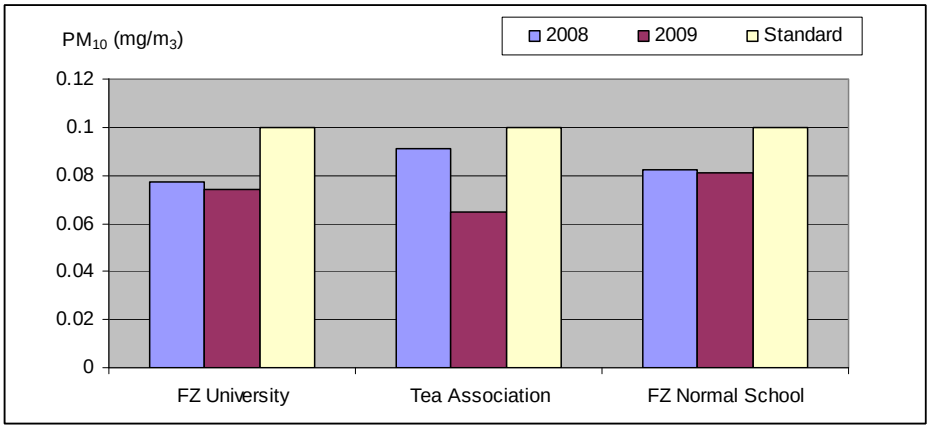

Figure A3-3: Comparison of PM_{10} Level of the Project Area for Same Period of 2008 and 2009

It can be seen from the above table and figure that the level of PM_{10} in this reporting period has become lower than that in the same period of last year, and the ambient air quality in the Project area for the two periods have been satisfactory and met the Class II standard of the *Ambient Air Quality Standard* (GB 3095-1996).

4. Ambient Noise Monitoring and Assessment for the Project Area

There are some regular noise-monitoring points of the FEMS located in following areas of the Project. The regular monitoring exercise is conducted in October each year. In this report, the monitoring values of 2008 and 2009 are used to compare the sonic environmental quality in the two years. The noise monitoring data in the two periods for the monitoring points is presented in **Table A3-5**, and the comparison can be seen in **Figure A3-4**.

Table A3-5: Daytime Noise Monitoring and Assessment

Component Area	Limit Value* (dB)	2008		2009	
		Monitoring (dB)	Assessment	Monitoring (dB)	Assessment
Component A area	60	57.3	Meet standard	57.4	Meet standard
In which: Xindian Area	60	57.3	Meet standard	57.9	Meet standard
FZ University Area	60	58.7	Meet standard	59.1	Meet standard
Tonghu Area	60	58.0	Meet standard	57.6	Meet standard
Gushan Area	60	55.5	Meet standard	55.3	Meet standard
Component B area	60	55.9	Meet standard	56.7	Meet standard

** Environmental Quality Standard for Noise* (GB 3096-2008) Class II limit value

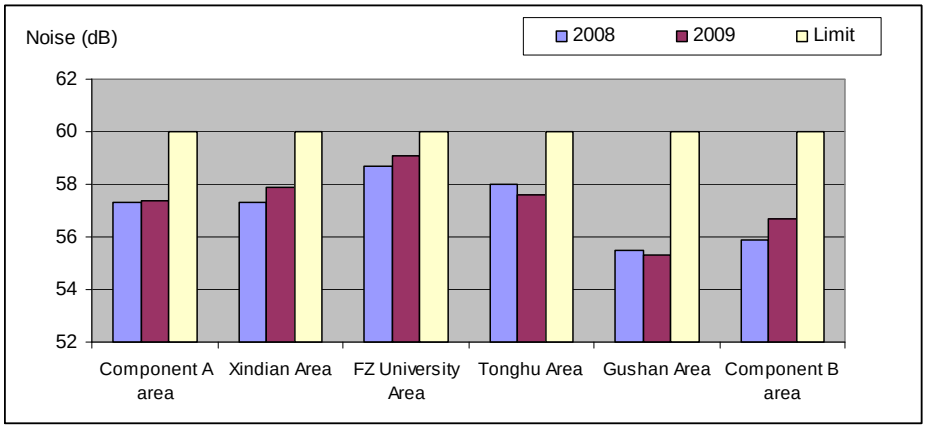

Figure A3-4: Comparison of Noise Level of the Project Area for Same Period of 2008 and 2009

It can be seen from the above table and figure that the noise levels in 2008 and 2009 are lower than the standard limit value, which shows that the sonic environmental quality in the Project area is satisfactory and meets Class II standard of the *Environmental Quality Standard for Noise* (GB 3096-2008).

5. Conclusions of the Environmental Assessment for the Project Area

In this reporting period, the level of major pollutants of the Yuejin, Lulei and Longjin rivers has become lower than that in the same period of last year, but the general water quality is still worse than Class V. Both the ambient air quality and the sonic environmental quality in the Project area meet the relevant standards. The assessment results do not show that the construction of the Project has unfavorable impact on the environment.

APPENDIX 4:
PHOTOGRAPHS

Component A:
Yangli Phase II Sewer Networks

Construction site of Zuohai Pumping Station

Component A:
Yangli Phase 2 Sewer Networks

Reinstated road after sewer construction under YGII-07 contract on Tongpan Road

Component B:
Lianban Sewer Networks

Hoarding and notice posted outside LG-02 construction site near South Second Ring Road

Component B:
Lianban Sewer Networks

Caisson construction on YGII-07 construction site on Jinzhou South Road

Nantai Island Inland Creek Rehabilitation

Upstream reach of Yuejin River after the river rehabilitation work is completed under C1 Contract

Nantai Island Inland Creek Rehabilitation

Yuejin River reach under construction

Nantai Island Inland Creek Rehabilitation

The existing Yuejin River reach at Gaohu Village before construction

Nantai Island Inland Creek Rehabilitation

Demolition waste in Gaohu Village along the Yuejin River waiting for removal

Component C: Nantai Island Inland Creek Rehabilitation

Longjin River reach to be rehabilitated in the police school

Component C:
Nantai Island Inland Creek Rehabilitation

Longjin River reach under construction in the police school

Component C:
Nantai Island Inland Creek Rehabilitation

Puxia River reach under construction near the new exhibition center

Component C:
Nantai Island Inland Creek Rehabilitation

Newly completed bank of the Puxia River reach at exhibition center