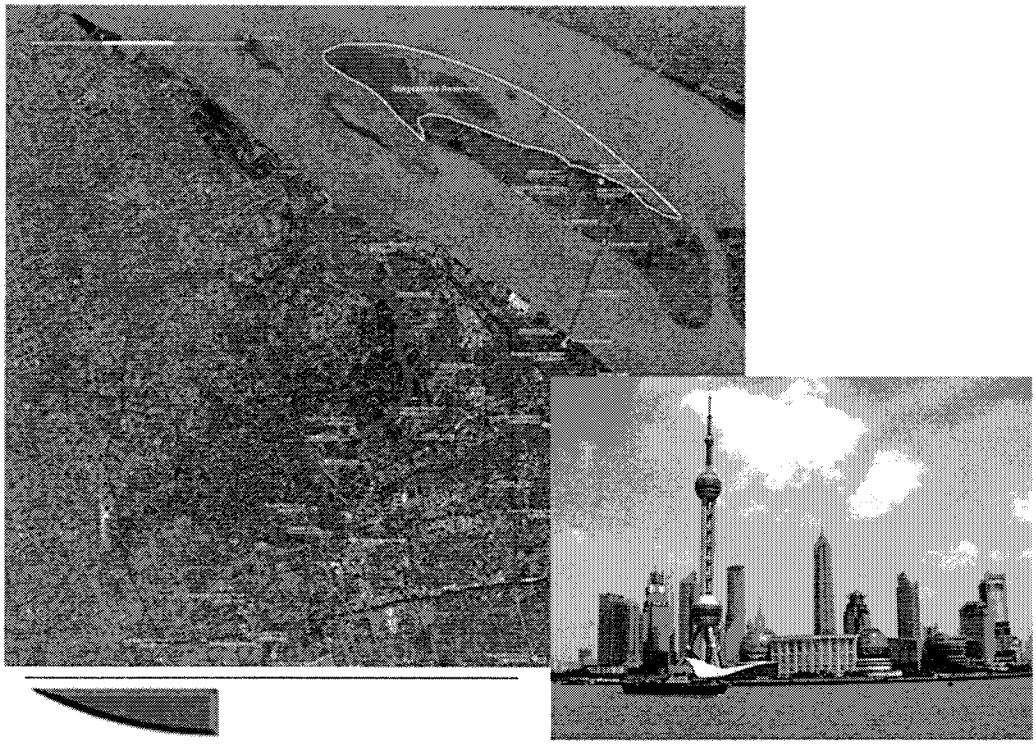
SHANGHAI APL – PROJECT MANAGEMENT OFFICE



SHANGHAI URBAN ENVIRONMENT PROJECT (SHUEP)

APL3
STRATEGIC STUDIES AND PROJECT PREPARATION

R5 – APL3 EA SUMMARY

DRAFT VERSION

AUGUST 2008
1 35 0335 – R5 DRAFT

SOGREAH CONSULTANTS

SOGREAH CONSULTANTS

SHANGHAI URBAN ENVIRONMENT PROJECT – APL 3

R5 – APL3 EA SUMMARY – DRAFT VERSION

IDENTIFICATION N° : 1350335 – R5 DRAFT

DATE: AUGUST 2008

This document has been produced by SOGREAH Consultants as part of the FASEP Grant (French Government Grant) to Shanghai Municipal Government.

This document has been prepared by the project team under the supervision of the Project Director following Quality Assurance Procedures of SOGREAH in compliance with ISO9001.

INDEX	PURPOSE OF MODIFICATION	DATE	AUTHOR	CHECKED BY	APPROVED BY (PROJECT MANAGER)
A	First Issue	August 2008	ZX/LXX	BYn	GDM

INDEX	DISTRIBUTION LIST	CONTACT ADDRESS
1	SHUEP APL PMO (Mr QIU Wenjin, Mr Xin GONGFU)	Qiuwj@shdrc.gov.cn xgfu@sh163.net
2	Shanghai Chengtou/UDIC (Mr. XIN Qiang) SWA (Ms. Xu Yizhi)	xinqiang@chengtou.com yzxu@swj.shanghai.gov.cn
3	The World Bank (Mr Hiroaki SUZUKI, Mr Geoffrey READ)	hsuzuki@worldbank.org gread@worldbank.org
4	French Government (DGTPE Paris, MEF Shanghai)	julien.denormandie@dgtpe.fr wengsi.tang@missioneco.org
5	SOGREAH (Head Office)	alain.gueguen@sogreah.fr magnus.holmer@sogreah.fr pierre.galzin@sogreah.fr sandra.notebart@sogreah.fr

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS, ACRONYMES AND UNITS

APL	Adaptable Program Loan
BOD_5	Biochemical Oxygen Demand (5 days)
COD	Chemical Oxygen Demand
CRE	Chief Resident Engineer
CSE	Construction Supervision Engineer
CSEA	Construction Supervision Environmental Adviser
CSEMP	Construction Site Environmental Management Plan
DCRE	Deputy Chief Resident Engineer
DFV	District Financing Vehicle
EA	Environmental Assessment
EMP	Environmental Management and Monitoring Plan
EMS	Environmental Monitoring Station
EPB	Environmental Protection Bureau
ESD	PMO-Environmental and Social Division
ESFI	Environmental and Social Field Inspector
ESU	Environmental and Social unit
MEP	Ministry of Environment Protection
NCP	Nuisance Control Plan
PIU	Project Implementation Unit
PMO	Project Management Office
PPE	Personal Protective Equipment
PRC	People's Republic of China
SAES	Shanghai Academy of Environmental Sciences
SCAESAB	Shanghai City Appearance and Sanitation Bureau
SEP	Shanghai Environment Project
SHUEP	Shanghai Urban Environment Project
SMG	Shanghai Municipal Government
SRS	Standard Site Inspection Review Sheet
SS	Suspended Solids
SSP	Shanghai Sewerage Project
SWA	Shanghai Water Authority
SWAOD	Shanghai Water Assets & Operations Division
TA	Technical Assistance
WB	World Bank
WTS	Western Trunk Sewer
WTW	Water Treatment Work
WWTP	Wastewater Treatment Plant

CURRENCIES

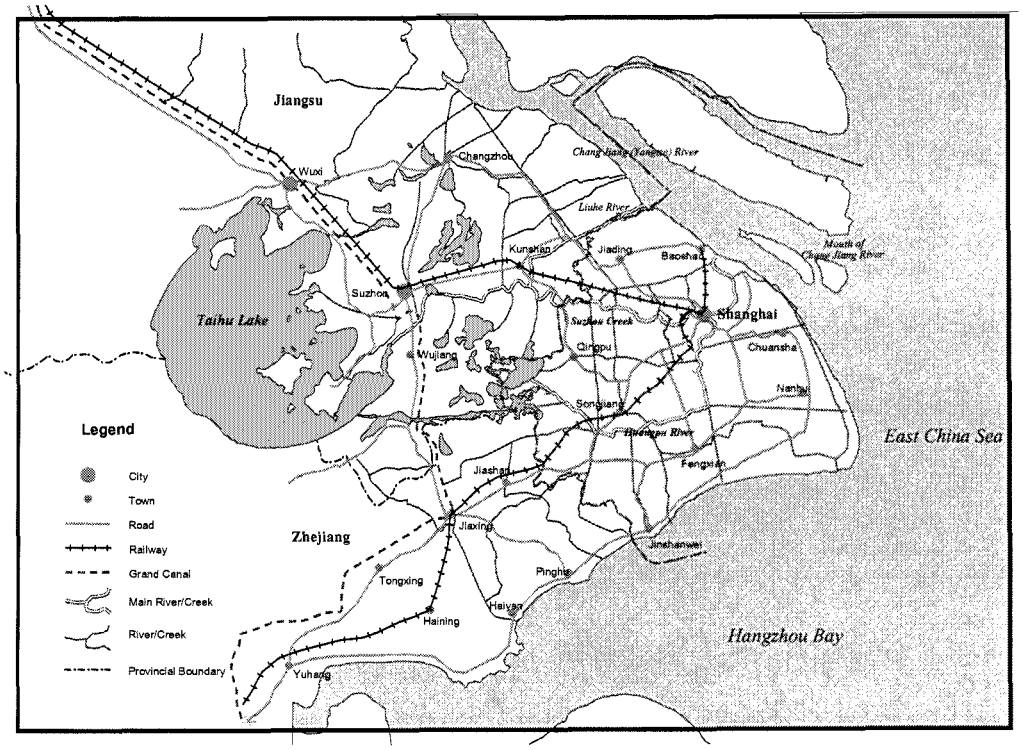
RMB	Chinese Yuan (Renminbi)
USD	United States Dollar
Conversion rate:	1 USD = 6.9 RMB

1. INTRODUCTION

1.1. SHANGHAI MUNICIPALITY

With a total population of 18 million inhabitants[1] in 2006 , Shanghai is China's largest city and the third largest in Asia. Together with Beijing, Chongqing and Tianjin, Shanghai is one of the municipalities under direct control of the Central Government. Situated within the Yangtze Delta Region stretching from Ningbo in Zhejiang Province to Nanjing in Jiangsu Province, Shanghai is at the apex of a very large, highly urbanised and rapidly industrialising corridor. The economy and population of the Shanghai Metropolitan Region have grown rapidly during the past decade, while giving rise to improved standards of living have lead to a series of significant development challenges.

FIGURE 1-1: SHANGHAI MUNICIPALITY WITHIN THE YANGTZE DELTA REGION



1.2. THE SHANGHAI URBAN ENVIRONMENT PROJECT

The Shanghai Urban Environment Project (SHUEP) is intended to provide a sustainable environmental setting for the long-term economic and social development in the Municipality of Shanghai (see Figure 1-1) while supporting the provision of urban infrastructure.

The SHUEP which was approved by the World Bank in June 2003 aimed to support SMG to:

[1] *from the Shanghai Statistical Bureau*

- Implement the urban environment goal of its development strategy and thereby help to ensure that economic growth takes place in an environmentally and institutionally sustainable manner;
- Provide major long-term environmental benefits to its millions of citizens and to the ecology of Shanghai Municipality; and
- Develop innovative policies, institutional reforms and financing methods that are needed to support the environmental goals and that will serve as models for local government and environmental reform throughout China.

Recognising that to achieve the desired development goals may require many years to resolve and cannot be addressed by a conventional[2] (or typical) investment operation, the SHUEP has been devised as an Adaptable Program Loan consisting of a series of loans over a 7-10 year period, divided into 3 phases. A key requirement of the APL is that there is a clear and feasible development program in place to guide implementation of the projects and to provide clear milestones and benchmarks for policy and institutional reform.

1.2.1. THE OVERALL APL FRAMEWORK

The overall framework for the SHUEP APL has been formulated in the Development Programme for Shanghai APL Project. As indicated in the document, the framework complies with (and has indeed been built upon) the Tenth Five Year Plan and the Shanghai General Master Plan.

The APL has been divided into three phases. Each phase has a broad theme leading to a series of objectives, components, actions and triggers, and performance indicators.

Although initially the core program/themes of the APL appears to form a continuum in time, in conceptual terms each phase is designed to give prominence to one aspect of the urban environmental strategy being pursued. As described in the Project Appraisal Document:

> *In Phase 1 prominence is given to further developing the underpinnings and enabling condition to pursue an integrated/regional approach to environmental issues. Investments included in this phase are those that are already known to be priority components of the integrated/regional approach (including the protection of upstream sources for water supply, expansion of shared landfills, complementary investments to increase efficiency of earlier investments). Further development of integrated/regional programs and related investments is expected to be continued during subsequent phases. Phase 1 will also test new approaches to upgrading urban environmental services in a poorer, underserved area through a pilot program.*
>
> *Phase 2 supports implementation of programs that address environmental issues of greater complexity and respond to the deepening of SMG's work on the environmental agenda (including solid waste management program consolidation, bond finance and a district financing vehicle, and continue to expand the pilot approaches to upgrading urban environment services in poorer, underserved areas). Preparations for these Phase 2 activities are to be made during implementation of Phase 1.*

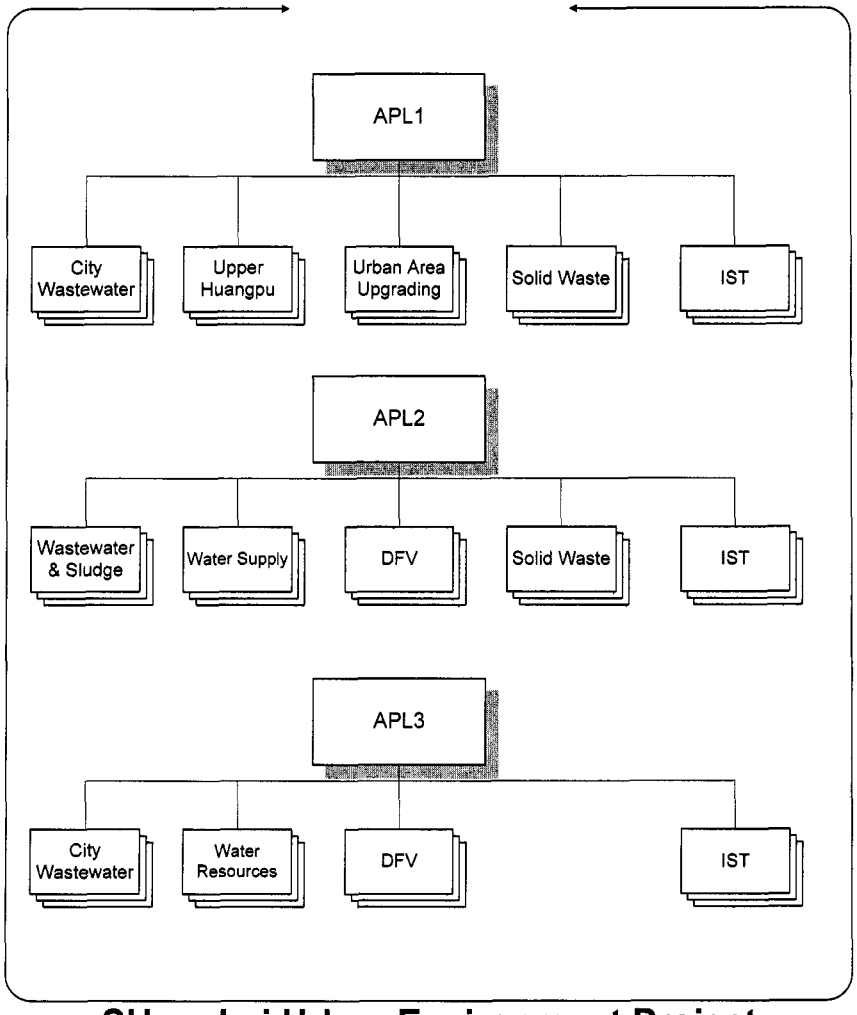
[2] *It should not however be ignored that Shanghai has had a long and fruitful relationship with multi-lateral lending agencies such as the World Bank. Significant Projects in the environment sector include:*

- *Shanghai Sewerage Project,*
- *Shanghai Environment Programme*
- *Second Shanghai Sewerage Programme*
- *Suzhou Creek Rehabilitation*

Phase 3 is the stage at which the Shanghai authorities hope to begin realising the fruits of their efforts to build up to a sustainable financial system for urban environment services. It is anticipated that further improvements to the operations, management and finances of at least some urban environment service utilities over the course of Phases 1 and 2 would enable the move beyond the municipal budget to finance their capital investments on acceptable terms, either on the capital markets and/or obtaining finance from a sustainable district financing vehicle. Complementing this is the development and establishment during Phases 1 and 2 of the supply side, including enabling capital market/financing arrangements and institutions. Phase 3 also continues the deepening of the environmental agenda, moving on to begin pursuing some of the improvements in air quality potentially available from the increased supply of natural gas to the Shanghai metropolitan area.

A summary of the sectors and key components proposed for inclusion in the Shanghai Urban Environment Project is included in Figure 1-2.

FIGURE 1-2: OVERVIEW OF SECTORS INCLUDED IN THE DIFFERENT PHASE S OF THE SHANGHAI APL



1.2.2. PHASE 3 OF THE APL (APL3)

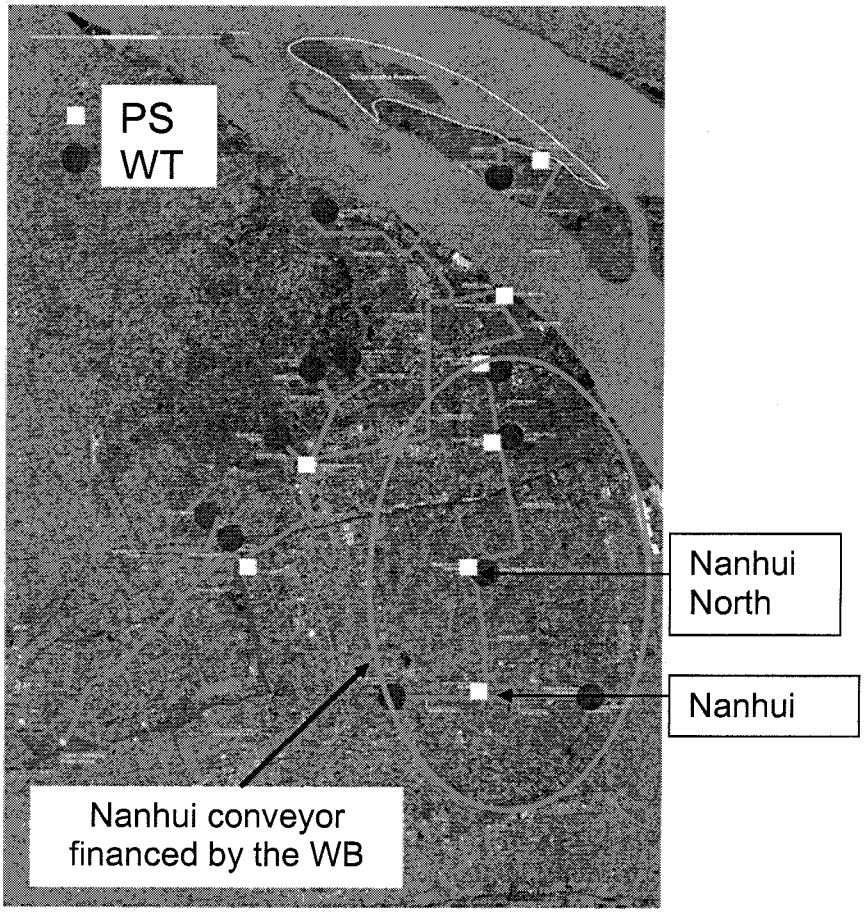
SHUEP APL3 is planned to continue with the improvements to the infrastructure and environmental needs of the city proper, focusing on the Raw Water Supply and Wastewater sectors. The estimated cost of the project is USD 565.63 Million (or equivalent to RMB 3,959.36) including physical and price contingencies, taxes and duties. Cost estimates are based on feasibility studies with unit prices in December 2007.

Two main physical works have been identified for World Bank financing as part of APL3:

The **Nanhui Raw Water Conveyor** is part of the QingCao Sha Raw Water Project (QCSRWP) as shown by the following figure. This component includes the construction of the following infrastructure:

- The Nanhui North and Nanhui Pumping Stations (PS);
- Twin, 2000mm diameter, 20.04km long (each) raw water conveyors connecting Jinhai pumping station with Nanhui North pumping station;
- Twin, 1800mm diameter, 11.1 km long (each) raw water pipes connecting the Nanhui North PS with the Nanhui PS;
- Twin, 1600mm diameter, 8.67 km long, raw water pipes connecting the Nanhui PS with the Huinan WTP
- Twin, 1000mm diameter, 8.55 km long (each) raw water pipes connecting the Nanhui PS with the Hangtou Water Treatment Plant (WTP);

FIGURE 1-3: THE NANHUI RAW WATER CONVEYOR AS PART OF THE QINGCAOSHA RAW WATER PROJECT

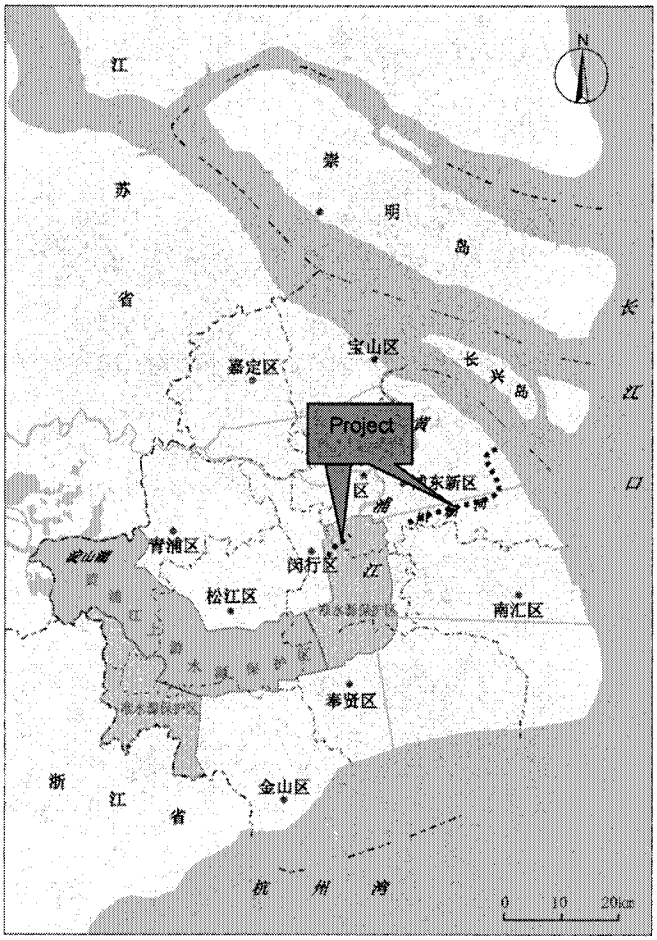


The **Bailonggang Southern Collector Extension** includes the construction and renovation of the following infrastructure:

- the construction of wastewater conveyor systems in the eastern section of southern drainage area,
- the improvement of the original 24.6km long southern trunk sewage;

As part of APL3, the World Bank also aims at developping innovative policies, institutional reforms and financing methods (in particular with regard to District Financing Vehicle -DFV strengthening) that are needed SHUEP.

FIGURE 1-4: THE BAILONGGANG SOUTHERN COLLECTOR EXTENSION



1.3. PURPOSE AND SCOPE OF THIS REPORT

In accordance with PRC National Regulations and the World Bank Operational Policy 4.01 related to Environmental Assessment, the infrastructure components of the Project fall under the Category A project and as such, have been subject to full EA. A second major objective is to prepare an Environmental Management Plan which should provide the operational basis for the implementation of mitigation measures both during construction and operation stages of the project.

In order to comply with PRC Regulation "Strengthening Environmental Impact Assessment (EIA) Management for the Construction Project Loaned by International Finance Organisation" of June 21, 1993 and with World Bank Safeguards Operational Policy, the Project Management Office (PMO) and the Project Owner have commissioned the **Shanghai Institute for Investigation Design and Research** to carry out the EIA study for Nanhui Raw Water Conveyor component, and **Shanghai Academy of Environmental Sciences** for Bailonggang Southern Collector Extension component.

This document summarises the Environmental Assessment for Shanghai APL3 based on the following documents:

- Environment Impact Assessment Report for Nanhui Raw Water Conveyor project, Shanghai Institute for Investigation Design and Research, May 2008.
- Environment Impact Assessment Report for Bailonggang Southern Collector Extension project, Shanghai Academy of Environmental Sciences, first version on 4 July 2008 and second version on 24 July 2008..
- Enviornment Management Plan for Nanhui Raw Water Conveyor project, Shanghai Institute for Investigation Design and Research, June 2008.
- Environment Impact Assessment Report for Qingcaosha Reservoir and Intake Pump Project (simplified version).

Main relevant regulatory, policy and administrative requirements for environmental assessment of development projects in China applied in the EA are as follows:

- Law of Environmental Protection of the PRC (December 26, 1989);
- Law of Air Pollution Prevention and Control of the PRC (April, 2000);
- Law of Water Pollution Prevention and Control of the PRC (revised on May 15, 1996);
- Law of Environmental Noise Pollution Prevention and Control of the PRC (October 29 1996);
- Law of Solid Waste Pollution Prevention and Control of the PRC (October 30, 1995);
- Law of Environment Impact Assessment of the PRC (Approved in October 2002 and implemented since September 1, 2003);
- Law of Cleaning Production Promotion of the PRC(June 29, 2002);
- Policy on Municipal Solid Waste Disposal and Pollution Prevention Technology (May 2000)
- Management Regulations on Environmental Protection for Construction Projects (November 18, 1998);
- Circulation on Strengthening EA for Construction Projects Receiving International Financing of 1993;
- Technical Guidelines for Environmental Impact Assessment (HJ/T2.1-93);

- Environmental Protection Design Provisions for Construction Projects (November 29, 1998);
- Regulations of Shanghai Environmental Protection (rev. May 27, 1997);
- Functional Division of Shanghai Water Environment (1997);
- Functional Division of Shanghai Ambient Atmospheric Quality (1997);
- Notification on the Implementation of the Amended Functional Division of Shanghai Ambient Atmospheric Quality (2004);
- Shanghai Urban Master Plan(1999-2000)
- Eleventh Five Year Plan of Shanghai National Economic and Social Development
- Shanghai Wastewater Treatment System Plan (2005-2020)
- Shanghai Three-Year Environment Protection, Construction and Action Plan for 2006-2008
- Shanghai Water Supply Plan

Of the ten World Bank safeguard policies, Environmental Assessment (OP/BP/GP4.01) and Involuntary Resettlement (OP4.12) are applied to the physical components financed by the World Bank. As discussed in Chapter 2, there are a number of linkage components, most notably in relation to the Qincaosha Water Supply Projects which potentially involve both natural habitats and dam safety. These latter aspects have been developed in specific reports and are not developed further in this report. Since there are no project components that would involve indigenous people, forest, pest control chemicals, cultural property, international waterways, or construction in disputed areas as defined under the World Bank's OP7.60, safeguard policies related to these are not applicable.

1.4. ORGANISATION & LAYOUT OF THE EA REPORT

The ensuing chapters of this report deal with the following topics:

Chapter 2 *Project Background & Description*

Provides an overview of the regional context of the overall SHUEP components, covering not only APL3 but APL1 and APL2. The chapter then describes in detail the two major physical components of the APL3, namely:

- Water Supply Managment Component;
- Waste Water Management Component.

Chapter 3 *Environmental Baseline Situation*

Provides a general summary of the environmental baseline conditions within Shanghai Municipality.

Chapter 4 *Impact Assessment & Mitigation*

Presents in a summarised format the different impacts associated with each component together with a series of mitigation measures.

Chapter 5 *Project Alternatives*

Summarises the main alternatives for project construction and operation

Chapter 6 *Public Consultation & Disclosure*

Summarises the results of the two Public Consultations and the different measures related to information disclosure.

Chapter 7 *Environmental Management Plan*

Summarises the major elements of the EMP for APL3

Chapter 8 *Findings & Conclusions*

Summaries the main findings and conclusions of the EAs for APL3

2. PROJECT BACKGROUND & DESCRIPTION

2.1. SHUEP FRAMEWORK ENVIRONMENTAL ASSESSMENT

The basis of the SHUEP APL is the Development Programme finalised in early 2002. This programme was formulated of a framework complying with the Tenth Five-Year Plan and Shanghai General Master Plan as well as the basic requirements of master plans for environmental protection sectors.

As a long term development strategy, Shanghai has adopted a City Master Plan (1999-2020) which has been approved by the State Council, with an objective for Shanghai to become an international centre for economics, financing, trade and shipping. Shanghai's Tenth Five Year Plan and Eleventh Five Year Plan are part of the implementation of the long term strategy. SHUEP's goals and physical investments completely comply with the city Master Plan which calls for centralized sewage treatment, including centralized wastewater treatment for Upper Huangpu Catchment, to protect drinking water sources in upper and lower Huangpu areas and to protect the environment.

The policy, financial, institutional and capacity building initiatives are an integral part of SHUEP and are the assurance for efficient and effective implementation, operation and sustainable development of urban environment infrastructure and management system. This complies with the policy spirit and principles of Shanghai City Master Plan as well as the direction of the city's reform.

Since approval of the SHUEP, the importance of environmental protection as part of Shanghai's overall development has been enhanced by the adoption of the "Better City, Better Life" strategy associated with the award to Shanghai of the 2010 Universal Exposition. SHUEP Phase 3 has been developed in accordance with the original development programme and associated sector palnning but has also demonstrated the adaptability of the program by re-aligning the sectors included within the SHUEP with respect to the priorities of SMG. Thus, the water supply component has been brought into the SHUEP in line with Shanghai's goal to supply tap water fit to drink by 2020; the wastewater component will solve the urgent demand for additional wastewater transfer and guarantee the wastewater treatment rate reach 75%.

The implementation of new financing mechanisms will be implemented as part of APL3 by the issue of a bond for financing environmental infrastructure and the development of the "District Financing Vehicle".

2.2. APL3 PROJECT DESCRIPTION

Four components in APL3:

- Qingcaosha Nanhui Raw Water Conveyor
- Bailonggang Southern Collector Extension
- District Financing Vehicle Componet
- Institutional Strengthening Component

Table 2-1 provides a summary of the physical investment components of APL3 forming the subject of the EA documentation.

TABLE 2-1: INVESTMENT COMPONENTS OF THE APL3

Project components	Project Owner/Sponsor	Contents of the project
Qingcaosha Nanhui Raw Water Conveyor	Shanghai Qingcaosha Investment Construction and Development Ltd.	• The Nanhui North and Nanhui Pumping Stations (PS); • Twin, 2000mm diameter, 20.04km long (each) raw water conveyors connecting Jinhai pumping station with Nanhui North pumping station; • Twin, 1800mm diameter, 11.1 km long (each) raw water pipes connecting the Nanhui North PS with the Nanhui PS; • Twin, 1600mm diameter, 8.67 km long, raw water pipes connecting the Nanhui PS with the Huinan WTP • Twin, 1000mm diameter, 8.55 km long (each) raw water pipes connecting the Nanhui PS with the Hangtou Water Treatment Plant (WTP);
Bailonggang Southern Collector Extension	Shanghai Urban Drainage Company	• the construction of wastewater conveyor systems in the eastern section of southern drainage area, • the improvement of the original 24.6km long southern trunk sewage; • newly construct 4 pump stations, upgrade 2 pump stations.
District Financing Vehicle Component	Shanghai Chengtou Corporation	DFV is a subsidiary of the Shanghai Chengtou Corporation (10%) and of the Shanghai Chengtou Environmental Industry Development Company (90%). The rationale of establishing DFV was to develop a relevant know-how to deal with small scale projects (in particular selection criterions, safeguards measures, monitoring of procurement process, private sector participation arrangements...) when dedicated to sub-urban towns or districts. The DFV has presently a limited staff of 7 which care about following projects: waste water and landfill in Chongming Island, waste water collection in other sub-urban districts).
Institutional Strengthening Component		Strengthen Shanghai government and relative agencies on consolidated water management and capability development.

The estimated cost of the project is USD 565.63 Million (or equivalent to RMB 3,959.36) including physical and price contingencies, taxes and duties. Cost estimates are based on feasibility studies with unit prices in December 2007. Physical and price contingency is set at 10% for the Qincaosha Nanhui Raw Water Conveyor and Bailonggang Southern Trunk Sewer (Puxi Section). Summary cost estimates are listed as follows:

Project Cost by Component	RMB Million	USD Million
Qingcaosha Nanhui Raw Water Conveyor	2,490.15	355.74
Bailonggang Sothern Trunk Sewer (Puxi Section)	441.09	63.01
District Financing Vehicle Component	700.00	100.00
Institutional Strengthening Component	35.00	5.00
Total Base Cost	3,666.24	523.75
Physical and Price Contingency	293.12	41.88
Total Project Cost of APL3	**3,959.36**	**565.63**

Note: Forex USD 1 = RMB 7.0

2.3. LINKAGE PROJECTS

For the water supply subcomponent, the following linkage projects are identified:

Linkage Project (1): The Qingcaoshao (QCS) Water Resource Project. QCS Water Resource Project includes three main parts:

Part A: QCS Reservoir and water intake pumps and sluice gates. This part mainly the engineering works located inside Changxing Island, including construction QCS Reservoir and Changxing Island Water Convey System. The Changxing Island Water Distribution Pipelines will transfer raw water from QCS Reservoir to the Inverted-siphon.

Part B: Yangtze River Cross Trunk. Inverted-siphon conveyors cross Yangtze River, and convey raw water from Changxing Island Water Convey System to mainland of Shanghai.

Part C: Land Pipelines and Pumping Stations. This part is connected with the Yangtze River Inverted-siphon, transfer raw water to mainland Water Treatment Plants. The key associated works in this part include: a) Wuhaogou Pump Station, which is the connector between Yangtze River Inverted-siphon and Land Pipelines of Shanghai, and b)Jinhai Sub-Branch Conveyor and Jinhai Pump Station, which convey water to Nanhui Raw Water Conveyor.

The following figure 2-1 shows the three parts of QCS Water Resource Project. The construction of Part A: "QCS Reservoir and water intake pumps and sluice gates", had already been started in January 2007 and will finish in the end of September 2010. Part B and Part C have also been under preparation or partly construction based on government plan. The proposed water supply component to be loaned by WB, "Nanhui Raw Water Conveyor Project", is one of the main components under Part C, which transfer raw water to the south-east direction of Shanghai city.

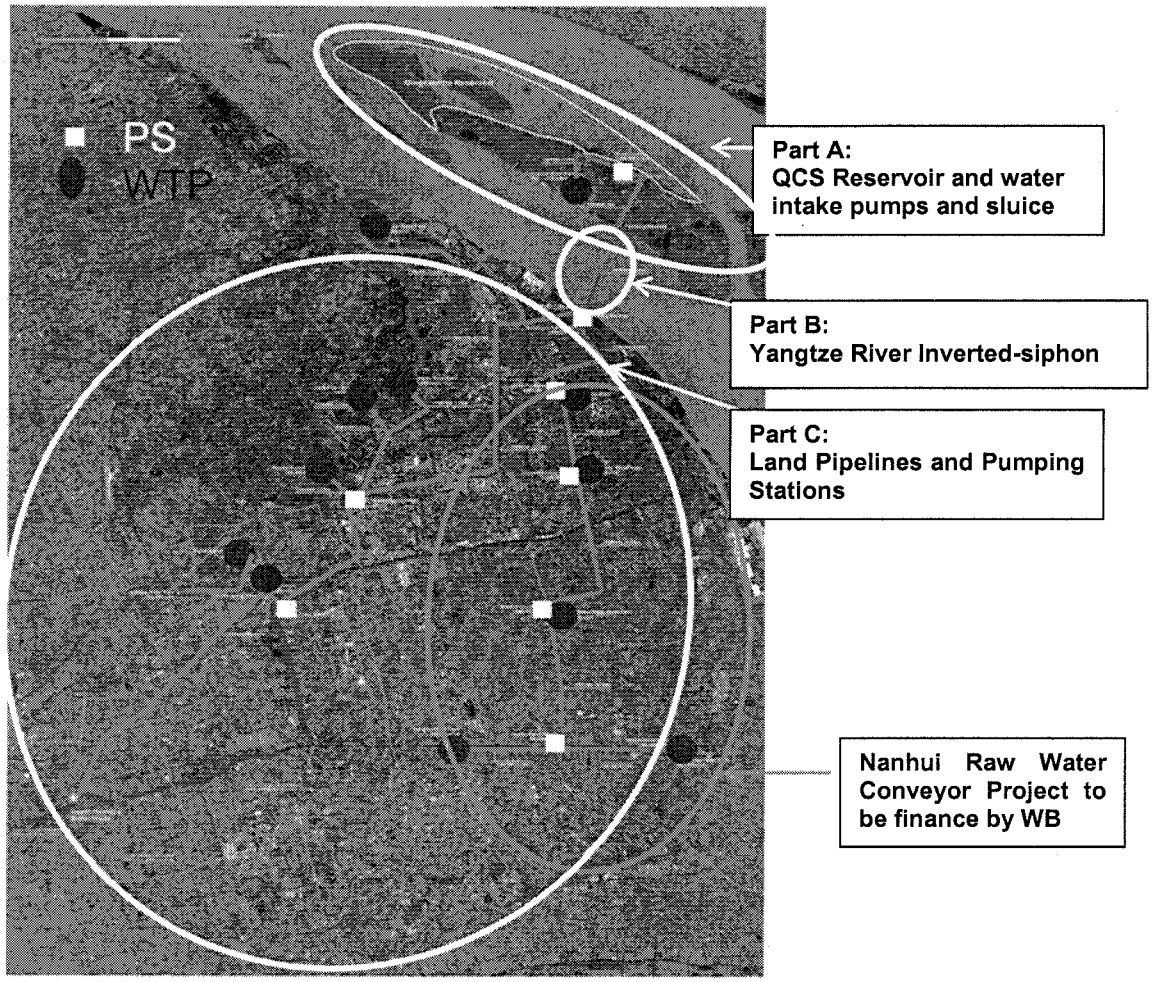
Linkage Project (2): Water Treatment Plants, especially sludge treatment and disposal in five water plants which will receive raw water from Nanhui Raw Water Conveyor Project.

For the wastewater subcomponent, there is one linkage project:

Linkage Project (3): The existing Bailonggang WWTP, especially in terms of sewage volume, treatment capacity, sludge management and its compliance with relevant environmental quality and discharge standards.

Due diligence review for above three linkage projects are summarized in Section 4.4 of this report.

FIGURE 2-1: LINKAGE PROJECT - QCS WATER RESOURCE PROJECT



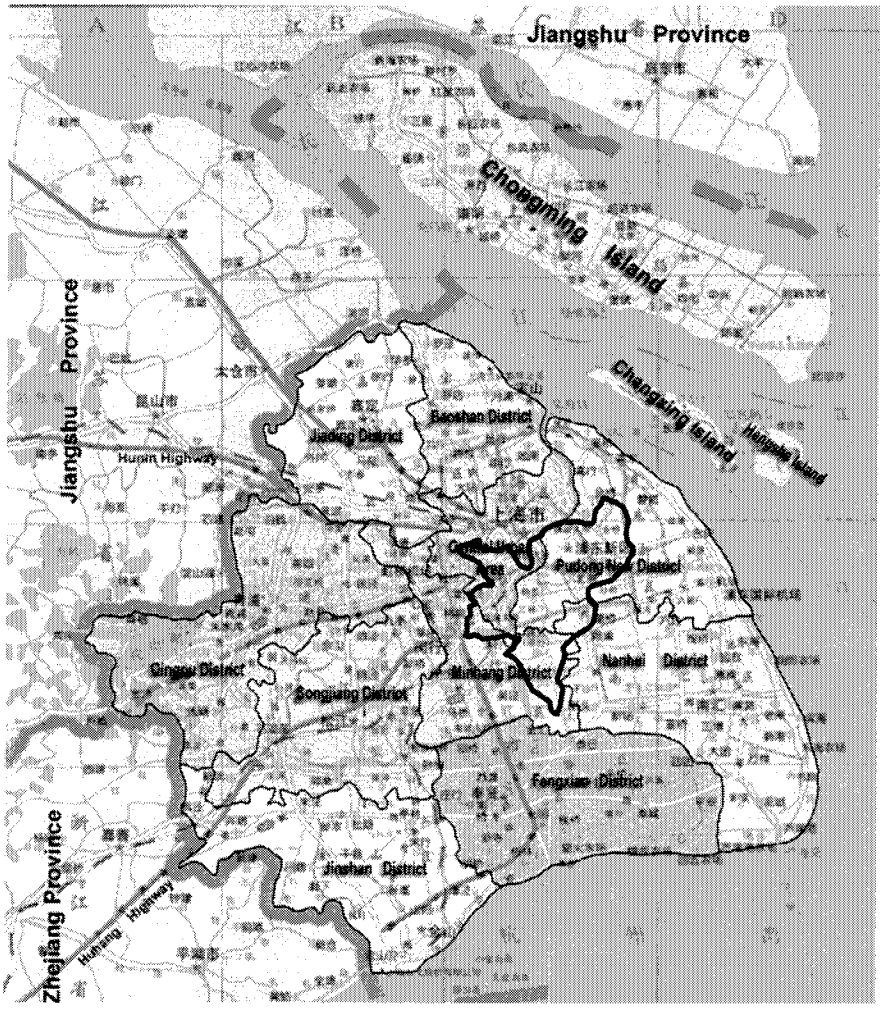
3. ENVIRONMENTAL BASELINE SITUATION

3.1. PHYSICAL ENVIRONMENT

3.1.1. GEOGRAPHY

The water supply component is located within the Shanghai Pudong New District and Nanhui District, east of Shanghai city. The wastewater component is spreading from Minhang District, Xuhui District, Nanhui District and Pudong New District, also goes through Huating Town, Sanlin Town, Kangqiao Town, Cuanshaxin Town and Heqing Town. Both the water supply and wastewater component are located in the east part of Shanghai Municipality, which is at the southeast edge of the estuary in Yangtze River Delta. In the area, the topography is relatively uniform ranging from 3.8 to 5.0mAOD.

FIGURE 3-1: SHANGHAI MUNICIPALITY



3.1.2. GEOLOGY

The regional geology of the area of Shanghai is generally composed by a top layer of alluvium, marine and fluvial deposits to a depth of 30m. Underneath the alluvium, there are tertiary volcanic rocks and Jurassic volcanic rocks.

The volcanic activities of late Jurassic in this area is controlled by the regional fracture structure of Fengjing-Chuansha base. The volcanic basin of Jinqiao Structure develops on this fracture, and is widely distributed to the northwest.

3.1.3. CLIMATE

Shanghai has the obvious subtropics climate characteristics. The average annual temperature is 15.7°C with an extreme temperature of 37.0°C and a lowest temperature of -7.4°C. The average annual precipitation is 1127.7mm and the average mean sunshine time is approximately 2,170 hours. On the coast, the average rainfall may be higher and reach 1,428.5mm. The average relative humidity is 80%.

The annual average wind speed in this area is 3.2m/s. The main wind in the region is from southeastern direction. Secondary winds are from the northwest and northeast.

Average annual temperature in urban districts was 16.2°C, the sunshine time was 1,700 hours and the rainfall was 931.2mm. About 50% of the rainfall in a year occurs in the flood season from May to September, which could be divided into 3 periods: spring rain, plum rain and autumn rain. The area is often struck by typhoon or tropical storms during the wet seasons. There were 3-4 intense typhoons in the past 10 years.

3.1.4. HYDROLOGY

The location of main rivers and reservoirs in the project area are shown on Figure 3-2.

FIGURE 3-2: SURFACE WATER LOCATION IN THE SHUEP AREA

Rivers and lakes

Shanghai is covered by a complex and dense surface water network with the density of 26~27km/km^2 including rivers and lakes, most of which belong to the Taihu Lake Basin. The main river, Huangpu River, originates from Taihu Lake which is located 113km away. It is 1113.4km long from Taihu Lake to Wusongkou with the width about 400m and the depth about 7-9m. Mijiadu is the major discharge canal of Taihu Lake with the average annual flow rate of about 300m^3/s.

Yangtze River is the biggest water resource going through Shanghai. The Shanghai section of the river is approximately 15km wide with the average flow rate about 29,300m^3/s. The highest tide observed of this river section is 5.64m. Huangpu River and Yangtze River are the main water supply source of Shanghai.

The inner rivers have water level of approximately 2.5m to prevent flood and to ensure the navigation and agricultural irrigation. As Shanghai is located on the East China Sea, inner canals are under tidal influence.

When entering the sea the impact scope of the water from Yangtze River could reach 50 km, and normally the inland will not be impacted by saline intrusion, unless there is spring tide or the water level of inner rivers is too low. About 468,000,000 tons of mud and sand are flushed from Yangtze River into the sea, most of which is accumulated at the estuary of Yangtze River and the northern bank of Hangzhou Bay. The sand content of water from Yangtze River is higher than that of water from Huangpu River.

3.1.5. BEACH CHARACTERISTICS

The riverside area from Laohaibin to Sanjiagang is in total 24km long, where grass seedling land, reed land and beaches are sporadically distributed with the total area of about 535.2ha.The riverside area from Sanjiagang to Panjiahong is 11.7km long with 399.4ha grass seedling land and reed land. There is a large area of beach, in which there is about 865.4ha of beach above 2-3m and about 166.7ha available for land reclamation. The eastern bank of Wusongkou is used as a 2,000m bathing beach.

3.1.6. GROUNDWATER

In the area of Shanghai, the ground water level is relatively high with the water table depth ranging from 0.5 to 1.5m.

The deep groundwater in Shanghai area is mainly stored in the sand and gravel soils of variable thickness. There are four types of aquifers in the area located to depth ranging from 20-30m to 240-250m. Shallow groundwater is brackish and becomes fresher with depth. The ground water in the shallow layers has been widely exploited.

3.1.7. NATURAL DISASTER

The district is located at the front edge of Yangtze Delta in the mid-latitude of Latitude North, which is affected by monsoon with variable and complex climate and frequent hazardous weather.

- Typhoon: The typhoon period is from July to September every year. Typhoon intensity is amplified when there are meteorological tides.
- Drought: The drought happens between summer and autumn, with tens of years historical record.

- Hailstorm: It happens normally between April and August, for example, in 1971, 1975, 1977 and 1985.
- Tornado: Tornado happened in September in 1956, 1962 and 1976, which brought severe damage to the local area.
- Earthquake: The project area is located to the east of seismic region of Kunshan-Huzhou in the Yangtze Delta which experience occasional low frequency earthquake. The national anti-seismic standard for Shanghai construction is 6 Degree.

3.2. WATER QUALITY AND YANGTZE ESTUARY

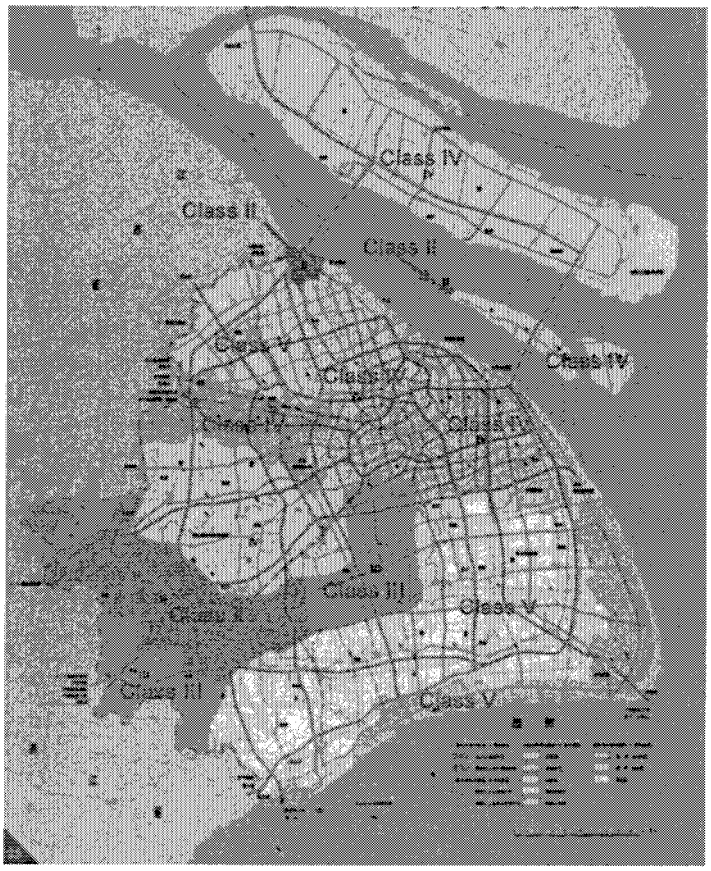
3.2.1. WATER QUALITY INSIDE SHANGHAI CITY

Based on available information[3], the water quality in main river sections inside Pudong New District showed that, from 2003 to 2005, water quality was around Class IV to worse than Class V; organic materials, such as NH3-N and TP, are the main polluted indicators. Generally in Nanhui District, the water quality of main rivers sections is worse, around Class V to worse than Class V; NH3-N, TP, BOD5, CODcr are main pollutions.

The following table shows the planned water quality objectives of surface water bodies in Shanghai Municipality:

[3]*Environment Impact Assessment Report for Nanhui Raw Water Conveyor project, Shanghai Institute for Investigation Design and Research, May 2008.*

FIGURE 3-3: WATER QUALITY ZONES OF SURFACE WATER BODIES IN SHANGHAI MUNICIPALITY



3.2.2. WATER QUALITY IN YANGTZE ESTUARY

[4]According to some research and comprehensive analysis, the water quality in Yangtze Estuary could be described as following:

Dissolved Oxygen (DO)

DO in Yangtze Estuary reaches seawater Class I during dry season. Its average value is 9.44 mg/L and varies between 8.3~ 11.3 mg/L.

In wet seasons, DO values vary between 2.4 ~ 8.5 mg/L with average value 6.2 mg/L. It only exceeds seawater Class IV in some area of the bottom level.

COD

During dry season, COD varies between 0.12 ~ 3.13 mg/L, average value is 1.2 mg/L. while during wet season, it varies between 0.15 ~ 2.76 mg/L, with average value 1.1 mg/L. In general, the seasonal variation is not significant, and the value in inner area is higher than offshore and open sea.

[4] *Effects of South-to-North Water Diversion Project (East Line) on the Yangtze Estuarine Ecosystem, LU Jianjian, HE Wenshan*

The value of COD has a close correlation with runoff and salinity which could be reflected from past observed data.

nutrients

Inorganic nitrogen value in Yangtze Estuary varies between 0.053 ~ 1.900 mg/L in dry season while between 0.036 ~ 1.763 mg/L in wet season. Yangtze runoff has a remarkable effect on the distribution of Inorganic Nitrogen and its concentration which has increased more than 9 times in last 40 years.

Total Phosphorus value in Yangtze Estuary varies from 0.01 ~ 0.081 mg/L, average value is 0.020 mg/L. the distributions on surface and bottom are similar: decreasing from inner area to open sea. The TP value has significantly increased more than 200% in the last 20 years.

Saline intrusion in Yangtze estuary

The salinity in Yangtze Estuary is less than 5‰ while in the open sea is 5‰ ~ 25‰. When Salt water comes with tides into Yangtze Estuary, it can always affect the raw water supply for Shanghai.

There are two ways for saline to affect Qingcaosha Reservoir: from North Branch, and from South Branch. The former way is the critical one which may affect future Qingcaosha Reservoir the most.

3.3. ECOLOGICAL ENVIRONMENT

Project area is inside the Shanghai urban district, with typical urban ecology character. In the north of Shanghai Urban city, Changxing Island and Hengsha Island inside Yangtse estuary, own some nature ecological areas.

Changxing Island is one of the key inhabitats of birds of Yangtze River area, the main birds are winter migratory birds (appeared in Winter) and traveller birds (appeared in Spring and Autumn). Main plants are reed, sweet wormwood herb and few-flower wildrice

In the Yangtse estuary, aquatic community structure is complex. Aquatic biology belongs to three categories: freshwater-trend biology, freshwater biology, and coastal low-salty biology. Nearby Changxing Island, the water area belongs to mid-level ecology sensitive area; aquatic resource is fruitful and rich. The area is also the migration channel of precious animals (such as China sturgeon) and economic fishery (such as sword anchovy and eel fish); the spawning and baiting area for Yangtze phoenix anchovy and whitebait.

3.4. SOCIAL AND ECONOMIC CONDITIONS

Shanghai had experienced rapid economic development and become the development leader of Yangtze Delta Region. In 2005, GDP of Shanghai reached 914.395 billion RMB, 11.1% increase compared to last year, the 14th consecutive annual growth with double-digit development rate.

Secondary and tertiary industries had jointly promoted the city's economic growth, the tertiary industry production reach 50.2% of the city's GDP. In 2005, disposable income per resident in urban and rural family reached 18,640 RMB and 8,340 RMB respectively, maintaining a relatively rapid growth while narrower gaps.

4. IMPACT ASSESSMENT AND MITIGATION

The project's objective is to improve the water supply capacity and waste water management in Shanghai in order to increase the quality of life of the urban residents and to comply with national and Shanghai environmental plans. The eventual environmental impacts of such projects are obviously beneficial. However, some impacts with detrimental effects may result from projects implementation, mainly during its construction, with significant land acquisition and resettlement issues, as well as local impacts directly involved by construction activities.

The following sections summarise the key benefits and impacts from the project.

4.1. POSITIVE BENEFITS

Generally the project is physical investment project without financial profits, belongs to in social infrastructure project and environment benefit project. After the implementation, the urban wastewater collection and treatment will be increased, the water supply capacity enhanced, and urban environment is improved.

4.1.1. QINGCAOSHA NANHUI RAW WATER CONVEYOR COMPONENT

Shanghai is stepping forward to a modern international metropolis, with stricter requirements on water quality. According to the "Shanghai water supply planning", until 2020, 50% of incremental water requirement of Shanghai city is from Pudong and Nanhui districts. As one of the key components of Qingcaosha Water Resource project, the Nanhui Raw Water Conveyor Component will provide raw water to Pudong and Nanhui Districts, so as to meet the pressing water demands of these two districts. In particular, the project will bring the following benefits:

(1) Increase of water supply capacity

After the construction, the project will supply raw water to WTPs within Pudong and Nanhui Districts, so to meet the requirement of increased water demands and urban development. Specially, Nanhui District is the agriculture protection district of Shanghai, Pudong District is with the fastest-growing population of Shanghai. Through the water supply investment, further stimulating the local industrial and agricultural economy development, be benefit to realize the objectives of Shanghai modern agricultural development.

(2) Improvement of water quality

Nanhui Raw Water Conveyor Component will provide quality raw water from Yangtze River to 5 WTPs, where water from upstream Huangpu River is currently used, the quality of which is not stable, and can not meet the required standards of "Surface Water Quality Standard". With better treated water quality, the urban environment and public health can be improved.

(3) Correspondence with other projects

The Nanhui Raw Water Conveyor Component is in line with and harmonized with the river embankment construction, contributing to the water and environment improvement of Dazhi River and the surrounding ecological conditions.

(4) Consistency with urban master plans

4.1.2. BAILONGGANG SOUTHERN TRUNK SEWER EXTENSION

(1) Increase wastewater collection rate, provide environment protection guarantee to urban development

The project will significant increase wastewater collection capacity of Minhang district and nearby areas, and facilitate the harmonization between ecology and economy.

(2) Solve wastewater overflow problem during rainy seasons

Currently certain quantity of combined wastewater has to be discharged into river directly, which has caused serious pollution problem to Huangpu River. The Bailonggang Southern Collector Extension component will solve this overflow problem completely.

(3) Act as a key component of Shanghai sewerage network

The Bailonggang Southern Collector Extension project, will bring forward the completion of smooth wastewater fluency inside Shanghai city. And through the centralized treatment, remove pollutions, improve water quality, and promote environment situations significantly.

(4) Important works to comply with urban plans and meet the required targets

4.2. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES DURING CONSTRUCTION PHASE

Limited negative impacts on soil, air, water, acoustic environment, flora/fauna and surrounding communities are expected during construction. The impacts will be temporary and localized, and if proper mitigation measures are implemented during the construction period, the impacts can be minimized or even eliminated. The residual impacts are judged to be insignificant. The potential construction impacts include:

(1) Soil.

Potential environmental impacts on soil by the Project include (i) soil erosion, (ii) soil contamination, (iii) temporary and permanent acquisition of agricultural land, and (iv) impact from construction traffic. Soil erosion may be caused by the excavation of pipe trenches and spoil earthwork from pipeline construction, as well as by site preparation for construction of the pump stations and river works. Mitigation measures will include (i) covering temporary soil stockpiles, (ii) minimizing active excavation areas during pipe laying, (iii) appropriate re-compaction of pipe trenches, and (iv) installation of sediment fences where appropriate to minimize sediment runoff. Disturbed surfaces, such as re-compacted pipeline trenches, will be re-vegetated to minimize erosion. Soil contamination may be caused by inappropriate storage and disposal of hazardous construction materials. Mitigation measures will include appropriate storage of hazardous materials in secure, covered areas with secondary containment. All waste will be removed from sites to approved waste disposal sites.

(2) Water.

Potential environmental impacts on water resources by the Project include (i) increased sedimentation of adjacent water resources from construction activities, and (ii) inappropriate wastewater disposal. Construction activities will disturb surface soils and have the potential to increase sediment runoff into adjacent waterways. Inappropriate disposal of domestic wastewater from construction camps and disposal of wash down water from construction equipment and vehicles have the potential to affect adjacent surface water resources.

Especially for wastewater component, Bailonggang Southern Collector Extension project will spread across 17 local rivers, of which Pudong Channel and Cuanyang River have navigation function, other rivers perform flood protection functions. In the project construction, the advanced technology - pipe jacking technology, will be used, no impact to the rivers function performance. But during the construction, the engineering activities will bring forward higher suspended solid (SS) concentrations, river water quality will be temporarily impacted by SS, BOD, COD and NH3-N; with the completion of construction, the impact will be stopped.

To reduce the impacts to water bodies, mitigation measures will include installation of appropriate septic disposal systems at construction camps. All construction equipment wash down areas should be equipped with water collection basins and sediment traps.

(3) Air Quality and Noise.

Potential environmental impacts on air quality and noise during construction include (i) dust from construction activities, (ii) construction vehicle emissions, and (iii) construction noise. Fugitive dust may be caused by excavation, demolition, vehicle movement, and materials handling, particularly downwind from the construction sites. Mitigation measures will include water spraying of transportation routes and materials handling sites where dust is being generated. Particular attention will be paid to dust suppression adjacent to sensitive receptors such as schools or residential areas. Materials will be stored in appropriate places and covered or sprayed to minimize fugitive dust. Materials will be covered during transportation to avoid spillage or dust generation. Air pollution may be caused by emissions from vehicles and construction machinery. Vehicles and construction machinery will be properly maintained and will comply with emission standards. Noise may be caused by construction equipment and vehicular movement, potentially affecting residents of nearby residential areas and schools. Vehicles and construction machinery will be required to be properly maintained and to comply with emission standards. Construction will be prohibited between 22:00 and 06:00 in sites adjacent to residential areas. Mitigation measures will include strict compliance with noise standards.

(4) Waste Management.

For the water supply component, during construction, the domestic solid waste is estimated to be 73 t/d, construction solid waste is also with big quantity. For wastewater component, the balance spoil and solid waste is estimated as 1,069,713 m^3. All the solid waste will have no hazardous or harmful composition. Both of the two sub-projects will first utilize the soil and waste into construction works, the residual waste will be sent to solid waste landfill stations designated by sanitary agencies.

Inappropriate waste storage and disposal has the potential to affect soil, groundwater, and surface water resources and consequently the impact on public health. Mitigation measures will include appropriate storage of construction materials and waste in secure, covered areas with secondary containment. All waste will be removed from sites to approved waste disposal sites. There will be no on-site landfills at any of the construction sites. Construction waste will be promptly removed from the sites. Burning of waste will be prohibited.

(5) Flora and Fauna.

In the wastewater component, during construction, the project will temporarily demolish 60400 m^2 grass land, remove 8 arbour trees, occupy 2000 m^2 orchard garden. After the construction, 6100 m^2 grass land will be permanently occupied. All the impacted grass or trees are in common category, not the precious species or valuable arbores. Compared to the whole grass area of the district, the impacted grass area is only in a small percentage; the impact to the urban ecology and greening performance is little and acceptable.

According to "Shanghai Greening Regulation" (17th January 2007), trees or shrubs will only be felled or removed if they impinge directly on the permanent works or necessary temporary works. After pipe-laying construction, the trenches will be re-vegetated. Approval should be acquired from Shanghai Green Land Bureaus for tree cutting ahead of time. The number of trees that are identified for removal should be counted during the design stage; compensation fee for greening and removal should be paid to government, or re-plant at least the same number of trees in the same area.

Other potential impacts on flora and fauna from the proposed Project include the impact on primary biology in rivers, such as plankton, algae, and fish. The impacts are temporary and localized, which will disappear after the project construction.

(6) Social Issues.

Potential social impacts include (i) traffic congestion, (ii) interruption to municipal services, and (iii) threats to public safety. Traffic congestion may be caused by an increase in construction traffic in urban areas. Roads may be fully or partially closed during construction, causing temporary inconvenience to residents, commercial operations, and institutions. Construction scheduling will consider impacts to traffic congestion. In conjunction with the relevant authority and traffic plans will be prepared before construction begins in congested urban centers. Construction of project facilities may require relocation of municipal utilities such as sewers and pipelines. This may require temporary suspension of services to adjacent communities. Construction activities will be planned with a view to keeping disturbances to utility services to a minimum. Temporary land occupation will be planned well ahead of construction to minimize the impact of the disturbance. Land will be reinstated to its original condition upon completion of construction. Construction sites will be located in residential and commercial urban areas, which may present a threat to public safety. Mitigation measures will include implementation of safety measures at the construction sites to protect the public, including warning signs to alert the public of potential safety hazards and barriers to prevent public access to construction sites.

(7) Cultural property.

According to field survey and document analysis, no cultural property has been identified along the routes of the project areas.

Once and if some culture relic is dig out, according to Article 32 of "Culture Relic Protection Law", the contractors will protect the site immediately and report to local culture administration agency. Once the agency receives the report or notice, arrives to the construction site within 24 hours, and provides the disposal opinions within 7 days. Once the key important relics are found, it should be reported to State Council Culture Relic Administration, who should respond within 15 days.

(8) Crossing large and important infrastructures

For both water and wastewater components, along the proposed pipeline routes, large and important infrastructures will be encountered and crossed, such as the maglev, A2 and A20 viaducts and navigation rivers.

For the wastewater component, also goes through overpass bridges for 5 times, and maglev train railroad for 1 time.

Inside the project feasibility study reports, the technical options had been detailed designed. The engineering works are feasible adopting pipe-jacking, pipe-bridge and inverted siphon; relative urban plans can also be fitted and met. Even if the soil layer is disturbed to some extent, the base of the infrastructures will not be impacted. The environment impact is also acceptable.

(8) Change Course of Huajinggang Channel

In the wastewater component, 200m section of a local river, Huajinggang Channel, has to change its course, the impact of which is acceptable, as it is an urban river with little biology, and the environment situation on river surface is typical urban greening area without precious plants or animals. The typical impact is from construction activities. Based on analyses, after the course change, the water discharge and water resource allocation will not be affected.

During the change of Huangjinggang course, the sediments characteristic has not been assessed in terms of its heavy metal concentrations yet, it is not judged yet whether it is hazardous waste or not. The final disposal plan for excavated solid waste will be established based on its characters.

4.3. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES DURING OPERATION PHASE

(1) Noise

For water supply and wastewater components, the noise impact is mainly from pump stations.

In the water supply subproject, during the operation of Nanhui North pump station, noise level on the pump boundary (1 m outside of the pump) is about 80 dB(A). The noise level on the pump station boundary is calculated out and it is justified the noise level is within the required Class II standard of "Noise Standard of Industry Boundary" (GB 12348-90), the noise impact to surrounding areas is small.

In the wastewater subproject, all the proposed pump stations are located inside the urban greening district, no sensitive objectives within nearby 600 m area. The pumps are selected submerged centrifugal pump or scroll mix-flow pump, the noise impact is relative small and little no noise pollution.

(2) Solid Waste

During the operation phase of both the wastewater and water supply components, the project solid waste is mainly from operation staff and pumping screens. The quantity is small. It will commission sanitary departments to collect and clean the waste in fix time; the impact to environment is little.

(3) Wastewater

During the operation phase of both the wastewater and water supply components, the wastewater is mainly the domestic wastewater from operation staff. COD, BOD, NH3-N and oil are main pollution parameters. All the wastewater should be collected and treated before final disposal.

(4) Bad odour

The pumping station will utilize ionized oxygen technology to remove bad odor. The physical works are complete covered, inside gas will be collected and centralized treated by ionized oxygen technology, and then discharge through 15m-height funnel chimney. According to practical monitoring data and analysis, the H2S and NH3 discharge concentrations and rates are well below required standards. In the project, no residents locate within 100m area of the pumping station. So there is no negative impact to environment.

4.4. DUE DILIGENCE REVIEW OF LINKAGE PROJECT

(1) Qingcaosha Reservoir Water Resource Project (Associated Pumping Stations and Trunk Conveyors)

As discussed in section 2.3 of this report, QCS Water Resource Project includes three main parts:

- Part A: QCS Reservoir and water intake pumps and sluice gates, including construction QCS Reservoir and Changxing Island Water Distribution Pipelines.
- Part B: Yangtze River Cross Trunk.
- Part C: Land Pipelines and Pumping Stations. The key associated works include: a) Wuhaogou Pump Station, and b) Jinhai Sub-Branch Conveyor and Jinhai Pump Station.

To justify the associated impact from the linkage parts, the EIA report for above linkage projects are reviewed, the key impacts and mitigations include:

a) During the construction stage, the major potential impacts relate to dredging and reclamation activities. However, the sandy type of the concerned sediments and the selection of cutter suction dredges will significantly reduce the release of fine sediment in the river and the risk of impact on the aquatic ecosystem because of the turbidity. The dredged sediment will be disposed into a dedicated area, isolated by a dike from the Yangtze river and from the future QCS reservoir. The drainage water from this disposal area will be diverted towards sedimentation facilities before being discharged into the Yangtze.

b) All other typical impacts resulting from construction activities will be mitigated through obligations made to the Contractors: noise, dust, construction and domestic waste, public health and sanitation in worker camps, hazardous products management (particularly used engine oil, bilge waters).

c) During the operation period, water quality will be closely monitored upstream the intake for early detection of pollution hazard of the water resource and in the QCS for reservoir to anticipate any eutrophication trend.

d) Protection areas will be declared around the QCS reservoir following the Protected Water Resource regulation for Class I (200 m distance from the QCS reservoir perimeter and 500 m radius around the water intake) and Class II (2500 m upstream and 1500 m downstream the water intake) and a Qincaosha Water Source Protection Regulation will be implemented. This status will made compulsory the treatment prior to discharge of any urban or industrial wastewater from Chongming and Changxing islands.

e) The Operator will develop an Emergency Preparedness and Response Plan in order to deal efficiently with any accidental situation threatening the water quality and supply: accidental chemical spill in the Yangtze, ship collision near or upstream the reservoir intake.

f) In order to avoid accidental trapping in the reservoir of rare or endangered species as the Chinese Sturgeon, a protection system will be installed at the sluice gate entrance and the pump intake of the QCS reservoir.

g) In order to limit the eutrophication risk, ecosystem restoration works will be carried out within the reservoir area, including the introduction of selected algae feeding fish species and the organization of fishery activities.

The construction of Part A of QCS Project, "QCS Reservoir and water intake pumps and sluice gates", had been started in January 2007. Part B and Part C have also been under preparation or partly construction based on government plan. No complains received yet for the incompliance. For more information, please see following separate EIA reports:

- Summary Environment Impact Assessment Report of QCS reservoir
- Environment Impact Assessment Report of Yangtze River Cross Trunk

- Environment Impact Assessment Table of Changxing Island Water Distribution Pipelines, Shanghai Institute for Investigation Design and Research, April 2007
- Environment Impact Assessment Table of Wuhaogou Pump Station, Shanghai Institute for Investigation Design and Research, June 2007
- Environment Impact Assessment Table of Jinhai Sub-Branch Pipelines, Shanghai Institute for Investigation Design and Research, August 2007

(2) Sludge Treatment of WTPs

Related to the water supply component, the local WTPs (existing Huinan WTP, Hangtou WTP, Chuansha WTP and planned Nanhui North WTP and Huinan New WTP) which will receive raw water from Nanhui Raw Water Conveyor Project, will produce certain sludge during the daily operation.

According to the history sludge monitoring data from Shanghai Water Supply Plant and Shanghai Construction Science and Study Institute, the heavy metals inside the WTP sludge is within required concentration of "Pollution Control Standards of Sludge used in Agriculture" (GB4284-84). The sludge from above WTPs will be temporary stored inside the stack sheds after dewatering, and then be sent out for green lands or filling materials by commissioned agency, no significant environment impact during operation.

(3) Bailonggang WWTP

Bailonggang WWTP is located in Pudong New district. It was constructed in two stages with assistance from the World Bank as part of the SSP2 Project. In 1999, the 1st phase was finished with 1.72 million m3/day preliminary treatment capacity. In 2004, the primary chemical enhanced treatment process with capacity of 1.2 million m3/day was installed with P removal as its primary target. Currently two further stages are being implemented:

- Upgrading by 0.6 million m3/day amount part of the 1.2 million m3/day capacity from chemical enhancement to biological treatment process;
- Installing a new treatment train with capacity of 0.8 million m3/day and applying biological treatment process;

These works will be finished by the end of 2008 with the WWTP attaining a total capacity of 2 million m3/day.

According to the EIA report for Bailonggang Southern Collector Extension project, the following issues are noticed for Bailonggang WWTP daily operation:

a) Wastewater treatment effluent can not meet the required standards.

According to the monitoring data of Bailonggang WWTP in 2005, 36.86% is treated through installed chemical enhanced primary treatment facility, with the remainder (73.14%) treated by its preliminary treatment facility. When applying national discharge standard of GB18918-2002 of Class II discharge standards, the chemical enhanced treatment process cannot meet the COD, BOD limits and SS limits. For most of the time, no problem has been detected for N-NH3, P-PO4 and total P. This is of course not surprising given that the enhanced primary WWTP was not designed to treat organic pollution but was targeted to treat phosphorus, identified at the time as being the critical parameter with regard to pollution of the East China Sea.

b) Sludge treatment

Currently the WWTP sludge is sent to Laogang Solid Waste landfill after dewatering. As forecasted, after Bailonggang WWTP extension and upgrading, the quantity of sludge (dried sludge) will be about 268t/d.

At the WWTP site a sludge treatment project; will be implemented shortly as part of the APL2; the technical process adopted is digestion + drying, with designed treatment capacity of 204 t/d. This will permit a wide range of sludge disposal options including use as a soil enhancer to be envisaged. Whereas the estimated sludge quantity of 268 tons/day is based upon the future estimated influent wastewater quality, the current proposed sludge treatment capacity of 204 ton/day has been determined based upon current influent wastewater quality, which is expected to change in the future. A space has been reserved already for the future extension to 268 tons/day when the influent wastewater quality reaches the targeted values.

c) Noise situation

According to the monitoring data of noise situation at WWTP boundaries, the noise level can satisfy the Class II standard of "Urban Regional Noise Standards" (GB3096-93). Currently the south of WWTP is agriculture land; the north of WWTP is bank of Yangtze River. All the sensitive objectives are far away to the WWTP.

d) Odour situation

One out of three measurements undertaken for odour level in Bailonggang Wastewater Works was 1.1 times higher than the national odour standard of GB14554-93. This was explained by the existing sludge treatment practise – existing sludge temporary ponds in Bailonggang Wastewater Works. It is expected the situation will be improved when the Bailonggang Sludge Treatment Facility is implemented

4.5. RISKS

(1) Earthquake

In case of a strong earthquake either in Shanghai or nearby areas, wastewater and water supply pipes under ground would be seriously impacted.

After studying the hundreds of years statistic data of Shanghai earthquake, the occurrence possibility of 7-degree magnitude is very small, while generally below 6-degree magnitude. It is suggested to adopt anti-earthquake design to 7-degree magnitude, strengthen construction supervision, so to make well preparation for earthquake protection.

(2) Typhoon, rainstorm, tide and lightning strike

Since most all the project facilities are buried underground, typhoons, rainstorms, tide and lightning strike would exert little impact.

(3) Pipeline crack and rupture

Pipelines will encounter and cross roads and rivers many times in this project. In case of road-base settlement or sinking, pipelines will be cracked or ruptured; water/wastewater would leak out.

In order to eliminate hidden risks, it is proposed that before construction, necessary exploration of pipeline foundation should be carried out, road bearing capacity should be calculated, and the embankment should be strengthened to prevent the impact of quicksand.

(4) Repair and maintenance of wastewater system

Once some facility of wastewater system met leakage or block problem by accident, or during daily maintenance, working staff has to enter the pipelines or catchment wells, where high concentration H2S maybe exists. To prevent the poisoning risk, it must:

- First fill in safety review tables for underground operation; carry out safety education to operation workers;

- Carry out H2S monitoring by specialized workers, accompanied with medical and rescue staff;
- Wearing gas masks when enter underground wells, immediately be back out to the ground once abnormal feeling;
- Strengthen occupational safety training for monitoring and operation, improve the emergency feedback education, and carry out group simulation for emergent accidents.

4.6. RESETTLEMENT

Resettlement impacts have been identified and resettlement plan (RP) prepared in accordance with PRC Land Administration Law and WB's Policy on Involuntary Resettlement.

- **Nanhui Raw Water Conveyor project** will involve the acquisition of 37 mu. The land acquisition will affect 3413 m^2 houses and 2 companies. The total cost for both land acquisition and resettlement is estimated to be RMB 18.5 million at 2007 price.
- **Bailonggang Southern Collector Extension** will involve the land acquisition of 49 mu. The land acquisition will affect XXX m^2 houses and XX companies. The total cost for both land acquisition and resettlement is estimated to be RMB XXXX million at 2007 price. (Data to be filled in when received from Resettlement Report)

The RP provides a socio-economic profile of affected persons (APs), scope of impacts, entitlement of AP's compensation, legal framework, public consultations, grievance procedures, rehabilitation measures, budget and implementation milestones. Resettlement requirements have been incorporated into project design. All APs will be compensated and resettled in a timely and adequate manner in accordance with the RPs so that they will be at least as well of as they would have been without the Project.

5. PROJECT ALTERNATIVES

5.1. WITH AND WITHOUT PROJECTS

With and Without the Water Supply Component

Based on the environment benefit and social economic development, this project analyzed the conditions of without water supply project. After analysis, the conclusion shows that without the water supply sub-project, the concerned urban districts will not meet the future water demand necessary to achieve the social and economic development targets and a part of the population will continue to rely on poor raw water resources. The project is necessary.

With and Without the Wastewater Component

Based on the environment benefit and social economic development, this project analyzed the conditions of without wastewater project. After analysis, the conclusion shows that without the wastewater sub-projects, increased volumes of untreated domestic and industrial wastewater along with the rapid industrialization, urbanization and population growth in the area, will be discharged and polluted the receiving waters directly. The surface water quality would continue to deteriorate, threatening drinking water safety, groundwater quality, ecosystem and aquatic life, fisheries, agriculture production relying on irrigation, and the standard of living for the residents in the project districts, and eventually weakening the ability for sustainable economic development in the region. The project is necessary.

5.2. ALTERNATIVE LOCATIONS

Water supply system layout

Refer to pipe system layout, the following principles are considered, and the most suitable layouts are selected.

- Try to utilize the convenience of landform elevation difference;
- Avoid environmentally sensitive spots and minimize resident's removal and building demolition;
- Low investment for pipe construction

Sewage Drainage System Layout

According to the local landform and sewage discharge characters, and based on the local wastewater treatment plans, the drainage system was arranged with high collection ratio and economic efficiency. The following items are also considered:

- Convenient to be constructed and maintained;
- Avoid environmental sensitive spot;
- Available space for future extension;
- Good geo-condition and consistent to drainage construction regulation;
- Saving investment and operation cost;
- Consistent to local planning.

5.3. ALTERNATIVE TECHNICAL PROCESS AND DESIGN

(1) Construction method

After alternative analysis, the pipe-jacking technology is mainly used for most parts of construction process; the open-dig technology is adopted in some rural places.

(2) Pipeline materials

Steel pipe have been selected for pipe-jacking construction; ductile iron pipe will be used for sections constructed by open-digging technology.

(3) Deodorant technology

The following 6 technologies are compared:

A. biological filter.

B. chemical filtration purification equipment

C. biological washing deodorant equipment.

D. combined biology deodorizing equipment TJDP.

E. natural plant extracts spray device

F. active oxygen purification

Active oxygen purification, also called free-ion oxygen de-odour technology, have been selected, because it is a process used in Shanghai in recent years, which has the advantages of low cost in operation, little land occupation, convenient in utilization, etc.

6. PUBLIC CONSULTATION & INFORMATION DISCLOSURE

According to China environmental protection laws and regulations, management rules and World Bank environmental assessment policy (OP4.01), public participation work was carried out during Environmental Assessment to involve the people directly or indirectly related to this project.

6.1. WATER SUPPLY COMPONENT:

Two rounds of public consultation and two rounds of information disclosure had been carried out:

(1) Public Consultation

Focused on local people to be affected by the proposed project, the representative communities and agencies are interviewed. Huinan Water Treatment Plant in Nanhui District, Tangrenyuan Community in Pudong Tang Town, Tuanxin Village in Nanhui District Datuan Town, Qigan Village in Nanhui District Zhoupu Town and Yaoshi Village of Cuansha Town are specially visited.

The first round of public consultation was conducted in March 2008. Approaches of questionnaire investigation and on-site interview are used in this round of public consultation. Focus on the residents to be impacted during the project, 100 questionnaires were distributed, 97 ones reclaimed. 100% interviewed people regarded this project is necessary and important, 94.8% considered the project will promote local economy, 97.9% regarded the local water supply condition will be improved. Also, most of recommendations and concerns were given to (1) noise and dirt impact during construction; (2) guarantee that mitigation measures should be implemented during the construction phase

The second round of public consultation was carried out in May 2008. Local interviews were carried out focus on the communities in project area; provide feedbacks of EIA reports on public concerns to project impacts. Generally, 100% of the interviewed people supported the Project, agreed with mitigation measures, and expressed the expectation that the project will bring significant environmental benefits.

(2) Information Disclosure

The first disclosure of Project information was carried out in March 2008. A project summary was publicized on community bulletin boards of project areas. Project introduction, possible impacts, and proposed mitigation measures are publicized. The information disclosed communities/agencies include Huinan Water Treatment Plant in Nanhui District, Tangrenyuan Community in Pudong Tang Town, Tuanxin Village in Nanhui District Datuan Town, Qigan Village in Nanhui District Zhoupu Town and Yaoshi Village of Cuansha Town.

The second round of information disclosure was carried out in May 2008. Updated information on the project scope, environmental impacts, and mitigation measures were published on www.envir.gov.cn and www.sidri.com, including project introduction, environment impacts, mitigation measures and treasures, assessment conclusions, methods and ways to get summary EIA report, detailed ways on collection public opinions, and implementation/time schedule. Also on the newspaper of Liberate Daily, on 22 May 2008, the project information is also publicized.

6.2. WASTEWATER COMPONENT

(1) Public Consultation

Focused on local people to be affected by proposed project, the residents along the project pipelines are interviewed. Lijing Landscape Garden, Huajing New Village, Huaxin Community, Heqing Community and Tangxiang Centre Village are specially visited, respectively located in Minhang District, Xuhui District, Nanhui District and Pudong New District.

The first round of public consultation was conducted from 15 April to 23 June 2008. Website internet investigation is adopted; an internet questionnaire together with project information is publicized on the website of http://www.envir.gov.cn/eia/2008/0527/. Total 3168 persons visited the website, about daily 113 persons visited, 25 questionnaires are effective. Also, opinions from relative government agencies and experts were also collected.

The second round of public consultations was carried out from 23 June to 30 June 2008. Local interviews and on-site questionnaires were used focused on the communities in project area. 95 questionnaires were delivered, 90 ones are effective. Also carry out expert interviews on relative specialists and government officials.

97% of the interviewed people agreed with the Project. While dissatisfied with current status of water pollution, most of the interviewed people expressed their eager to solve the existing problems of water pollution. During the consultation, the local people also expressed the concerns on impacts during construction phase, such as sanitation of construction site, noise and odour impacts, and would like construction agencies to take suitable measures to mitigation the impacts.

(2) Information Disclosure

The first disclosure of Project information was carried out in May 2008. A project summary was publicized on website of http://www.envir.gov.cn/info/2008/2008527788.htm .

On the 1st July 2008 of "Wen Hui Daily" newspaper, the project content, scope and contact persons were published, comments and suggestions from residents or agencies were welcomed to be provided .

The second round of information disclosure was carried out in July 2008. On http://www.saes.sh.cn/cn/public_doc_project.asp?id=375, simplified project EIA report was published, including project introduction, environment impacts, and mitigation measures.

Also, project summary was publicized on community bulletin boards of project areas, including Lijing Landscape Garden, Huajing New Village and Huaxin Community, etc. No complains received after the information disclosure.

7. ENVIRONMENTAL MANAGEMENT PLAN

7.1. OBJECTIVES OF EMP

The role of the EMP is to outline the mitigation, monitoring and institutional measures to be considered during project implementation and operation to avoid or control adverse environmental impacts, and the actions deemed necessary to implement these measures. The EMP provides the crucial link between impacts and alternative mitigation measures evaluated and described in the EA reports and the way these measures are implemented to achieve their mitigation objectives. For each proposed measure, the EMP defines the technical content, the estimated cost, the schedule of implementation, the role and responsibilities of Government Agencies, the source of funding and the way to monitor the results.

7.2. CONTRACTUAL DISPOSITIONS

To secure an efficient implementation of the environmental and social mitigation measures, these measures must be presented in the main contractual documentation which includes 1) The Memorandum of Contract Negotiation and 2) the Technical Specifications, through a clear reference to the EA and EMP and should be detailed in the Technical Specifications. Thus, the preparation of detailed environmental and social specifications for the Contractor will be a first mitigation measure proposed prior to the bidding process, with the objective to have eventually a contractual document which establishes clearly the obligations of the contractor, the quantities of work involved and the related cost of measures.

7.2.1. OBLIGATIONS OF THE CONTRACTOR

It is proposed to develop detailed environmental and social specifications for the Contractor, which can be in the future easily adapted to the specific context of each considered project. These specifications will be organized into 4 sections:

- Section A : Environmental Protection Management
- Section B : Labor Camps and Occupational Health Management
- Section C : Safety Management
- Section D : Social Management

Each section will address 2 aspects: 1) *Sub-Section 1*: description of the Contractor's obligations with regards to those aspects covered by the section; and 2) *Sub-Section 2*: description of performance indicators that will be monitored for deciding payment of the services.

Section A will specify the Contractor obligations regarding the preparation of a Construction Site Environmental Management Program (CSEMP) aiming at protecting the work sites and their surroundings against potentially adverse impacts. The Contractor's CSEMP will include the facilities and procedures for the management of camps and construction wastes, the soil conservation measures and proposed rehabilitation works once the construction ends, the measures aiming at protecting cultural and ecological assets if any, the preventive measures against water pollution and the monitoring program (air, water).

Section B will address the minimum standards to be implemented in the labour camps and facilities regarding issues as workers accommodation, food supply and canteen, waste management, water supply, treatment of sewage and sanitary conditions on site.

Section C will address safety issues, and the related Environmental Specifications will cover two distinct aspects, i) On-site Safety, Personal Protection Equipment (PPE), and Medical issues, and ii) Off site Safety issues. On-site Safety, PPE, and medical aspects address all the measures the Contractor needs to implement to ensure a safety standard equivalent to international practice, and to provide appropriate medical emergency procedures for the workforce. Off-site Safety concerns all issues to be dealt with outside construction sites proper. It covers traffic hazards resulting from the transport of equipment to or from the construction sites, and focuses mainly on the trunk sewer component which will involve construction activities along about 1000km in populated and high traffic density areas. For Off-site issues, the Environmental Specifications will define objectives. The Contractor will detail in its proposal the plan he intends to implement to achieve these objectives.

Section D will define the framework conditions for the Contractor to manage social issues related to construction activities. Most of these conditions will focus on how to reduce nuisance to residents, mainly anticipated from noise, from the temporary road closures and the cut-off of electricity, gas, water or telephone services when laying the trunk sewer network. The contractors will be requested to prepare a *Nuisance Control Plan (NCP)* which will be discussed with Project authorities and other Municipal Agencies concerned and with affected residents during information and consultation meetings. Issues to be discussed will focus on the procedures to be applied by the contractor prior to close a road or to cut-off water, gas or any other service, and on the general nuisance as access to buildings and shops, noise and air pollution.

7.3. ORGANIZATION FOR EMP IMPLEMENTATION

The SHUEP implementation will be managed by a Project Management Office (PMO) under the Shanghai Municipal Government. Under this PMO, two Project Implementation Units (PIU) will be created, one for the waste water component, one for the water supply component. The PMO will be assisted by an independent Construction Supervision Engineer (CSE) during the construction stage of the facilities. It is proposed to strengthen environmental and social management during the implementation of the EMP at both PMO and CSE levels.

To ensure that applicable national, provincial and municipal environmental laws, regulations and standards, as well as WB environmental and social requirements are respected during Project preparation and implementation, an Environmental and Social Division (ESD) will be established within the PMO. During construction stage, the ESD will have the responsibility to coordinate monitoring activities with the contractors and concerned government agencies, to ensure the effective implementation of the mitigation measures decided in the EMP. The ESD will be composed of 2 specialists, one Head of the Department (Environmental Specialist) and one Resettlement Coordinator. These two specialists will be assisted by a full time secretary. It is assumed that accountancy needs of the ESD will be satisfied on a part time basis by the accountancy staff of the PMO.

At field level, the ESD will rely on the Construction Supervision Engineer, through an Environmental and Social Unit (ESU) including a Construction Supervision Environmental Adviser (CSEA) assisted by Environmental and Social Field Inspectors (ESFI). It is proposed to appoint 1 ESFI to each component (waste water and water).

7.3.1. ENVIRONMENTAL MANAGEMENT PROCEDURES

The management of the environmental and social monitoring effort will involve open communications between the field personnel of the CSE, the ESD and the PMO. An important element of the communication process will be the organized transfer of information concerning situations that do not comply with the project environmental requirements, specifications, goals or objectives. These situations are identified on site by the CSEA and his ESFI staff, and then reported when appropriate at higher level for decision. To help focus senior management attention on the most important issues, non-compliance observations will be separated into 3 levels on the basis of importance, and communications requirements for the observations will be commensurate with the severity of the non-compliance situation.

7.4. COST ESTIMATE FOR EMP

The implementation of the EMP measures relies on the intervention of several parties involving funding from different budget lines or sources. Most of the activities involve routine measurements, field sampling or testing are to be provided by the contractor, and will be included in his tendered cost. These costs will be presented in his tender in accordance with the requirements and specifications of the bidding documentation. However, the rather limited budgets involved in environmental activities are probably not sufficient to raise a strong interest from the Contractor. Until environmental protection practices become a fully integrated part of construction contracts, penalties are the most efficient way to expedite the process. For that reason, it is suggested to establish a contractor obligations budget to a fixed percentage of the construction costs, say 4%. This amount will be split into 2% direct fees to be paid to the contractor in accordance with the progress of the work, and 2% as a retainer, to be paid in accordance with the actual goodwill demonstrated by the Contractor in the implementation of environmental and social measures and for efficient and quick correction of non-compliance.

Operational costs for the ESD will be included in the global *Project Management Cost* related to the PMO and the PIUs. Office and field equipment as well as transportation facilities costs will also be included in the same budget. Monitoring activity by ESFI and CSEA staff is part of the *Construction Management and Supervision Cost* of the Project. Training requirements involving foreign consultancy will be included in the *Technical Assistance budget* for the project.

Provision will also be allocated to ESD for the appointment of domestic or foreign specialists on an ad hoc basis, if circumstances during the construction stage require such high level expertise. These will also be charged to the *Technical Assistance budget* for the project. The budget estimates are to be provided in the EMP report of each component.

7.5. EMP OF WS AND WW COMPONENTS

7.5.1. SUMMARY EMP FOR WS COMPONENT

Potential Impact	Mitigation Measures	Implementation Agency	Supervision Agency	Monitoring Indicators	Monitoring Frequency	Monitoring Locationl	EMP Budget (yuan)
Construction Phase							
dust	Spray water for transportation routes and materials handling sites where dust is being generated. Materials will be stored in appropriate places and covered or sprayed to minimize fugitive dust. Materials will be covered during transportation to avoid spillage or dust generation.	Contractor	Shanghai Municipal/(Nanhui District, Pudong District) EPB	TSP	1 time/year, 2 days/time, 2 times/day	1 in construction site of Nanhui North Pump Station, 25 at sensitive points along routes	762,000 (including monitoring fee 55,200)
wastewater	Install appropriate septic disposal systems at construction camps and operation sites. All construction equipment wash down areas will be equipped with water collection basins, including oil separators, and sediment traps. Set up erosion control measures and appropriate engineering design to minimize generation of sediment runoff during construction activities.	Contractor	Shanghai Municipal/(Nanhui District, Pudong District) EPB	SS, Oil	1 time/year, 1 day/time, 2 times/day	Each wastewater discharge points	
Noise	Vehicles and construction machinery will be required to be properly maintained and to comply with relevant emission standards. Construction will be prohibited between 22:00 pm and 8:00 am, 12:00 pm to 14:30 adjacent to residential areas.	Contractor	Shanghai Municipal/(Nanhui District, Pudong District) EPB	Leq	1 time/year, 1 day/time, each one time in day and night.	25 at sensitive points along routes	

Potential Impact	Mitigation Measures	Implementation Agency	Supervision Agency	Monitoring Indicators	Monitoring Frequency	Monitoring Locationl	EMP Budget (yuan)
Solid Waste	Timely clean-up, truck out the garbage in covered vehicles or in closed containers. Appropriate storage of hazardous materials and waste in secure, covered areas with secondary containment. All waste will be removed from sites to approved waste disposal sites by licensed contractors. There will be no on-site landfills developed at any of the construction sites. Construction waste will be promptly removed from the sites.	Contractor	Shanghai Municipal/(Nanhui District, Pudong District) EPB	—	—	—	
Ecology	Optimize construction routes; reduce land occupation. Forbid excessive deforestation during construction. Implement soil and water conservation measures. Replant trees and vegetation on completion of construction.	Contractor	Shanghai Municipal/(Nanhui District, Pudong District) EPB	—	—	—	
Public Health and Safety	Enhance hygiene and sanitation of the construction camp. Health checks will be provided regularly. Clinics facilities will be provided in construction camps. Strengthen education and training for disease prevention for epidemic diseases.	Contractor	Shanghai Municipal/(Nanhui District, Pudong District) EPB	—	—	—	
Social Impact	Construction activities will be planned to minimize duration of disturbance to utility services. Construction scheduling will consider impacts on traffic congestion. Implement safety measures at the construction sites to protect the public, including warning signs to alert the public of potential safety hazards and barriers to prevent public access to construction sites.	Contractor	Shanghai Municipal/(Nanhui District, Pudong District) EPB	—	—	—	
Cultural property	Once and if some culture relic is dig out, the contractors will protect the site immediately and report to local culture administration agency.	Contractor	Shanghai Municipal/(Nanhui District, Pudong District) EPB	—	—	—	
Operation Phase							

Potential Impact	Mitigation Measures	Implementation Agency	Supervision Agency	Monitoring Indicators	Monitoring Frequency	Monitoring Locationl	EMP Budget (yuan)
Noise	Select low-noise pumps, install noise prevention facilities, construct green lands around pump stations.	Operator	Shanghai Municipal/(Nanhui District, Pudong District) EPB	Leq	1 time/year, 2 day/time, each two times in day and night.	Each in North, South, West, East of Nanhui North Pump station.	100500 (including monitoring fee 4,800)
Ecology	Restoration and compensation green parks by new trees. The tree re-planting will be carefully designed with full considerations of the impacts to the ecological balance to ensure the introduced species will help increase biodiversity while at the same time protect the indigenous wild trees.			—	—	—	
Wastewater	Domestic wastewater should be collected and treated by municipal wastewater treatment facilities.	Operator	Shanghai Municipal/(Nanhui District, Pudong District) EPB	—	—	—	
Solid Waste	Provide dustbins for collection, timely clean-up and transportation in covered containers by Nanhui sanitary department.	Operator	Shanghai Municipal/(Nanhui District, Pudong District) EPB	—	—	—	
Pipeline safety	Designate protection area around pipeline routes (8m along the pipelines sides), set up permanent protection signs, strengthen routine monitor and protection.	Operator	Shanghai Municipal/(Nanhui District, Pudong District) EPB	—	—	Along pipelines	

7.5.2. SUMMARY EMP FOR WW COMPONENT

Potential Impact	Mitigation Measures	Implementation Agency	Supervision Agency	Monitoring Indicators	Monitoring Frequency	Monitoring Locationl	EMP Budget (yuan)
Before Construction							

Potential Impact	Mitigation Measures	Implementation Agency	Supervision Agency	Monitoring Indicators	Monitoring Frequency	Monitoring Locationl	EMP Budget (yuan)
Dust from demolish buildings	Spray water on transportation routes and materials handling sites where dust is being generated. Materials will be stored in appropriate places and covered or sprayed to minimize fugitive dust. Materials will be covered during transportation to avoid spillage or dust generation.	Contractor	Drainage company/ EPBs in relative districts	—	—	—	30,000
Noise	Control construction activities with heavy noise between 10:00 PM and 6:00 AM.	Contractor	Drainage company/ EPBs in relative districts	—	—	—	
Social	Implement Resettlement Plan in compliance with ADB policies.	Drainage company	Governments of relative districts	—	—	—	
Construction Phase							
Dust	Install dust preventions defences surrounding the material dumps. Construction sites should have solid soil surface. Within 30 days after construction completion, the site should be flatted, deposited soil should be cleaned.	Contractor	Drainage company/ EPBs in relative districts	TSP	1 time/year, 2 days/time, 2 times/day	6 pump stations, 5 sensitive points along routes	67,800 (including monitoring fee 37,800)
Noise	Applications to relative agencies should be carried out before construction during nights in sites adjacent to residential areas. Strict compliance with noise standards.	Contractor	Drainage company/ government department in relative districts	Leq	1 time/year, 1 day/time, each one time in day and night.	5 sensitive points along routes	
Solid Waste	Inappropriate waste storage and disposal has the potential to affect soil, groundwater, and surface water resources and consequently public health. Mitigation measures will include appropriate storage of construction materials and waste in secure, covered areas with secondary containment. All waste will be removed from sites to approved waste disposal sites. There will be no on-site landfills at any of the construction sites. Construction waste will be promptly removed from the sites.	Contractor	Drainage company// EPBs in relative districts/Spoil soil management departments	—	—	—	

Potential Impact	Mitigation Measures	Implementation Agency	Supervision Agency	Monitoring Indicators	Monitoring Frequency	Monitoring Locationl	EMP Budget (yuan)
Wastewater	Install appropriate septic disposal systems at construction camps. All construction equipment wash down areas should be equipped with water collection basins and sediment traps.	Contractor	Drainage company/ EPBs in relative districts	SS, Oil	1 time/year, 1 day/time, 2 times/day	57 working wells, 6 wastewater discharge points at 6 pumping stations	
Ecological environment	According to "Shanghai Greening Regulation" (17th January 2007), trees or shrubs will only be felled or removed if they impinge directly on the permanent works or necessary temporary works. After pipe-laying construction, the trenches will be re-vegetated. Approval should be acquired from Shanghai Forest Bureau for tree cutting ahead of time.	Contractor	Drainage company/ Green Land Bureaus in relative districts	—	—	—	
Social	Carefully review and investigate the underground pipelines and facilities to be impacted. Carry out alternative analysis for pipeline routes. Construction scheduling will consider impacts to traffic congestion.	Contractor	Drainage company/ EPBs in relative districts/ Transportation departments	—	—	—	
Culture relics	Once and if some culture relic is dig out, the contractors will protect the site immediately and report to local culture administration agency.	Contractor	Culture relics protection departments in relative districts	—	—	—	
Operation Phase							
Bad odour	Select advanced technologies for odour removal. Strengthen daily operation of pumping station management, guarantee normal operation. Set 30 m sanitation buffer zone.	Drainage	EPBs in relative districts	H2S, NH3, Odour concentration	1 time/year, 2 samples /time	6 pumping stations	270,000 (including monitoring fee 90,000)

Potential Impact	Mitigation Measures	Implementation Agency	Supervision Agency	Monitoring Indicators	Monitoring Frequency	Monitoring Locationl	EMP Budget (yuan)
Noise	Select low-noise pumps, install noise prevention facilities, construct green lands around pump stations.	Drainage	EPBs in relative districts	Leq	1 time/year, one in each boundary direction, each one time during night and daytime	6 pumping stations	
Wastewater from pump stations	Collected by networks and centralized treated.	Drainage	EPBs in relative districts	pH, SS, COD, BOD5, NH3-N, TP, TN, Oil	4 time/year, 2 samples /time	6 pumping stations	
Ecology	Restoration and compensation green parks by new trees. The tree re-planting will be carefully designed with full considerations of the impacts to the ecological balance to ensure the introduced species will help increase biodiversity while at the same time protect the indigenous wild trees.	Drainage	Green Land Bureaus in relative districts	—	—	—	
Solid Waste	Provide dustbins for collection, timely clean-up and transportation in covered containers by Nanhui sanitary department.	Drainage	EPBs in relative districts	—	—	—	
Environment risks	Adopt anti-earthquake design to 7-degree magnitude; strengthen construction supervision, so to make well preparation for earthquake protection. Once working staff has to enter the pipelines or catchment wells to repair, it should carry out H2S monitoring by specialized workers, accompanied with medical and rescue staff. Strengthen occupational safety training for monitoring and operation, improve the emergency feedback education, and carry out group simulation for emergent accidents.	Design institute/Drainage	EPBs in relative districts				
Pipeline safety	Designate protection area around pipeline routes (10m along the pipelines sides), set up permanent protection signs, and strengthen routine monitor and protection.	Drainage	EPBs in relative districts	—	—		

8. FINDINGS AND CONCLUSIONS

The environmental assessment for SHUEP APL3 has drawn the following conclusions:

- As previously concluded from the APL1 and APL2, the SHUEP is well integrated with Shanghai's Master Plan which has been approved by the State Council and will contribute significantly to the strategic objectives for the city's development and environmental protection. Since approval of the SHUEP, the importance of environmental protection as part of Shanghai's overall development has been enhanced by the adoption of the "Better City, Better Life" strategy associated with the award to Shanghai of the 2010 Universal Exposition.

- SHUEP Phase 3 has demonstrated the adaptability of the program by re-aligning the sectors included within the SHUEP with respect to the priorities of SMG. Thus, the water supply management components have been brought into the SHUEP in line with Shanghai's goal to supply tap water fit to drink by 2020. .

- The project's objective is to improve the water supply and the waste water management in Shanghai in order to increase the quality of life of the urban residents and to comply with national and Shanghai environmental plans. The eventual environmental impacts of such projects are obviously beneficial. The proposed Project will have significant positive environmental impacts in the project area, including enhanced urban water supply and improved river quality of Yangtze River.

- However, some impacts with detrimental effects may result from projects implementation, mainly during its construction, with land acquisition and resettlement issues, as well as local impacts directly involved by construction activities. To further ensure environmental protection and proper implementation of mitigation measures, a stand-alone environmental management plan has been developed involving government and professional institutions for supervision, monitoring, and management of environmental affairs of the SHUEP APL3.

- Extensive community consultation indicated that most of the affected people have a positive attitude toward the Project and that they believe it will benefit the local environment, living standards, and economic development. Negative opinions on the Project focused on localized noise, odor, and air pollution associated during construction phase. The environmental mitigation measures have been developed to address these specific concerns.