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on Rehabilitation of Water Bodies and Adjacent Land

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ACRONYMS & ABBREVIATIONS

ADB	-	Asian Development Bank
CBD	-	Central Business District
CDIA	-	Cities Development Initiative for Asia
CNY	-	Chinese Yuan, the currency of the PRC
DCP 2001/02	-	Regulatory Detailed Control Plan for the Old City of Yangzhou
DI	-	Design Institute
EIA	-	Environmental Impact Assessment
EPB	-	Environmental Protection Bureau (Municipal authority)
FB	-	Finance Bureau (Municipal authority)
FSR	-	Feasibility Study Report
FAR	-	Floor Area Ratio
GTZ	-	Deutsche Gesellschaft f. Technische Zusammenarbeit (German Agency for Technical Cooperation)
HCFCI	-	Historic Culture Famous City Institute
KfW	-	Kreditanstalt für Wiederaufbau
km	-	Kilometer
km^2	-	Square kilometer
MPC	-	Municipal People's Congress
m^2	-	Square meter
m^3	-	Cubic meter
m^3/d	-	Cubic meters per day
OCO	-	Old City Office
OCPM	-	Old City Protection and Management Department
TOR	-	Terms of Reference
UPB	-	Urban Planning Bureau
UPDI	-	Urban Planning & Design Institute
WTP	-	Water Treatment Plant
WWTP	-	Wastewater Treatment Plant
YCB	-	Yangzhou Construction Bureau
YFCC	-	Yangzhou Famous City Construction Company
YGMO	-	Yangzhou Gas Management Office
YHCRI	-	Yangzhou Historic City Research Institute
YTB	-	Yangzhou Tourism Bureau
YTTB	-	Yangzhou Transportation Bureau
YUP&GIC	-	Yangzhou Urban Planning and Geographic Information Center
YUPB	-	Yangzhou Urban Planning Bureau
YZUP&GIC	-	Yangzhou Urban Planning & Geographic Information Center
$, US$	-	U. S.Dollars, the currency of the United States

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INTRODUCTION

The City of Yangzhou is determined by two main features, the immediate proximity to water evident through the neighborhood to the mighty Yangtse River and the Grand Canal built originally alongside the historical ancient city of old Yangzhou with a smaller canal linking the city proper turning ancient Yangzhou into a port city. On the other hand, by this Yangzhou emerged as a rich merchant city never shy to display its wealth creating beautiful famous gardens and mansions within the city walls. Thus Yangzhou has always been known as a city of culture and wealth, embedded in a wide almost maritime landscape, with a rich fauna & flora of the fertile marshes of the delta of the Yangtse River. Hence the city has a century old heritage of wetlands that surrounds it and became the root of its legendary wealth and laid the cornerstone of its famous culture.

Yangzhou is located in the central part of Jiangsu with the lower reaches of the Yangtze River in the south and the Jianghuai plain in the north. With nearly 2500 years of history in the urban area, Yangzhou has 3 districts (Guangling, Weiyang and Hanjiang), 3 county-level cities (Jiangdu, Gaoyou and Yizheng) and Baoying County. There are 87 villages and towns and also 11 sub-district offices in the whole city with a total area amounting to 6634 square kilometers (urban area 988.81 sq.kms.) and total population of 4.5361 million (urban population 1.1252 million). Yangzhou, located at east longitude 119 ° 01 ' (the area of Yizheng Yiju and Qingshan) to 119° 54 ' and also north latitude 31° 56 ' to 33° 25 ' (the area of Baoying Xianfeng and Jinghe), lies to the south of Yangtze River, to the north of Huaian and Yancheng, closely to the east of Yangchen and Taozhou and to the west of Tianchang (in Anhui province), Nanjing and Huaian. There is an 80.5 kilometers riverbank line towards the Yangtze River in Yangzhou and the surrounding towns include Yizheng, Hanjiang and Jiangdu. The imperial Hangzhou - Beijing Canal flows across the region with an overall length of about 140 kilometers. From the north to the south, it links Baima, Baoying, Gaoyou and Shaobo lakes, and then gives into the Yangtze River. The urban area of Yangzhou is located at the intersection of Yangtze River and Hangzhou – Beijing Canal at east longitude 119 ° 26 ' and north latitude 32 °24 '.

Yangzhou is not only a scenic city with a beautiful landscape, but also a city rich with culture containing a galaxy of celebrities throughout Chinese history and a city with many centuries' old sites. Located in and around Yangzhou is the oldest canal in China, mausoleums of Han and Sui emperors, historical sites of the ancient city in the Tang and Song Dynasty and private gardens from both the Ming and Qing Dynasty. With numerous manmade gardens and landscapes, beautiful natural sceneries Yangzhou is rich in tourist resources and attracts plenty of tourists both from China and abroad.

In 1998, Yangzhou was awarded the title of an Excellent Tourist City in China. Shouxihu, the well known lake that also has a garden, and the ancient Daming temple are both scenic spots with a AAAA level in China. The He garden, Ge garden, the historical city from Tang Dynasty, Gaoyou Mengchengyi, Puhading tomb and the dwelling place in Longqiuzhuang are all historical and cultural relics that are under direct state protection. The Qianlong water tourism route in the famous Shouxihu lake is listed as a national level tourism route and recommended by China Tourism Administration to tourists both from China and abroad.

By taking advantage of the opportunities of being a famous city with scenic characteristics for years, Yangzhou has attached much importance to its history, culture, water, landscape

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and its elegance. It has also successfully developed a group of new, famous and delicate tourism products and further developed and perfected its local culture tourism, e.g. Shouxihu Qianlong water tourism route, the Gaoyou lake tour for a unique fishing adventure and the Yizheng ecological tour. In addition to these previous achievements, a number of new tourist spots have been formally included, e.g. the Wang courtyard, the royal tomb of the Han ruler Guang Ling with its museum, the Gaomin temple, Puhading cemetery, many other scenic spots along the ancient canal in the urban area, the tomb of the Sui Yang emperor, industrial arts exhibition grounds of a jade ware factory, the western suburb forest park, the Yizheng Dengyue lake tourism & vacation resort and the Jiangdu Longshuan square.

Yangzhou, one of the first 24 historical and cultural cities approved by the State Department in 1982, offers an abundance of manmade landscapes and many historical sites. The classical gardens that can be found in Yangzhou are all of a very high artistic standard combining both the elegance of the Southern style with the grandeur that is mostly found in China's North.

There are 50 travel agencies of all kinds and 36 restaurants that possess star level. Starting in the Year 2000, Yangzhou periodically holds a Tourism and Trade Festival with the aim to promote tourism. In 2007 Yangzhou received ~15 million domestic and foreign tourists and the estimated revenue from it according to local sources might have made ~RMB 15 billion.

Significant steps have been undertaken by the city government of Yangzhou to conserve the historical parts of the old centre of Yangzhou, increase the attractiveness of the centre for residents and tourists, and upgrade housing conditions. However for some time this has been regarded as an exercise fully financed by the city's public funds not only for public infrastructure but also as for the upgrading of the housing stock. Only recently this strategy has been modified and for the first time subsidy schemes for private house owners willing to upgrade their houses was introduced. Simultaneously, public budgets have been limited also for water supply and drainage as well as solid waste in the old centre. They do, however, remain a problem and the majority of the housing stock does not have own sanitary facilities. Public toilets and the private sewage collection systems remain part of the daily life. As a result many of the younger and wealthier residents moved out and left mainly low-income groups and the older generations behind who have limited financial resources.

In addition, public infrastructure has partly been upgraded and comprehensive conservation and development plans for the conservation of physical structures have been carried out. Development plans for further infrastructure, the development of tourist attractions, traffic concepts and parking schemes etc. have also all been done.

Since end of last year the city is now also looking into the upgrading of the ancient canal system that surrounds the old city and equally keeps it alive. The ancient canal is connected to the ancient imperial canal, many hundred years old, linking Hangzhou with Beijing. This water body has remained intact in shape but has been used as drainage system over the years of industrialization of modern China and in particular the new China, after 1949.

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The proposed canal rehabilitation and wetland park project can provide Yangzhou with the unique chance to create almost downtown a wetland area. This area could even partly become a nature reserve park, where no activities other than visiting would be allowed. And it could also house a number of small scale activities ranging from small scale farming to related services to the neighboring areas with several thousand small and medium sized flats with inhabitants of the typical modern Chinese middle class

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SECTION 1: URBAN MUNICIPAL ENGINEERING

1.1 Background

The proposed wetland park project is an important part for the rehabilitation and improvement of the Ancient Canal in Yangzhou City. It will utilize the ecosystem of wetlands to abate pollution in the area, balance the water quality along this part of the Ancient Canal and improve the environment of the surrounding area. It will provide a unique chance for Yangzhou City to create a natural and environmentally friendly area that includes a recreational public park. Table 5-1 shows some general data on the local climate situation (and on earthquakes) in Yangzhou City. The climate of the wetland park is mild throughout the year. The wetland function in Yangzhou can be fully exploited even during the winter season.

Table 5-1 Climate and Earthquake Data in Yangzhou City

No.	Description	Value
1	Climate	
1.1	Temperature (Annual)	
	Max. Value	39.1℃
	Min. Value	-17.7℃
	Annual Average Value	14.8℃
1.2	Rainfall (Annual)	
	Average Amount	1046mm/a
	Highest Daily Amount	278.3mm
	Days with rainfall	115 days
1.3	Frost	
	Yearly freezing days	12
	Yearly freezing days with ice	47
	Yearly frost free days	306
1.4	Humidity	
	Average Annual humidity	79%
1.5	Air pressure	
	Average pressure	1015.9mbar
1.6	Wind	
	Average annual wind velocity	3.3 m/s
	Maximum instantaneous value	29.0m/s
	Wind origin in summer	Southeast
	Wind origin in winter	Northeast
1.7	Snow	
	Maximum snow depth	38.0cm
2	Earthquake	
	Earthquake intensity degree	7

The proposed project area is situated at the Sanwan section of the Ancient Canal in Yangzhou. It will be accessible by the East Kaifa Road from the North side and by Yangzijiang Road

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from the South. The total proposed area comprises of 1,558 mu (about 104 ha), which includes 1,004 mu (67 ha) land and 554 mu (37 ha) of surface water.

1．2 Application of Wetland for Water Quality Improvement

Wetland has been widely used as a technical approach to construct artificial ecosystems for improving water quality in general, such as Shiyan River Artificial Wetland Park in Shenzhen City, Taihang Artificial Wetland Parker in Shanxi Province and Jiuxi Wetland Park in Yunnan Province. Wastewater has been treated and reused successfully as a water source in agriculture, aquaculture, golf courses and green belt irrigation. This conceptual change has successfully induced many innovative processes for treating wastewater treatment as “water pollution control” to produce useful resources (water) rather than as an economic liability. The wastewater treatment normally does not bring any economic liability but environmental pollution reduction. However, the construction of a wetland park can raise the value of the surrounding area. It can also be part of a park or greening around buildings to generate some economic income.

The interest in wastewater treatment systems using aquatic plants can be attributed to three basic factors:

- Recognition of the natural treatment functions of aquatic plant systems as nutrient sinks and buffering zones.
- In the case of wetlands, emerging or renewed application of aesthetic, wildlife, and other incidental environmental benefits associated with the preservation and enhancement of wetlands.
- Rapidly escalating costs of construction and operation associated with conventional treatment facilities.

In aquatic plant treatment systems, wastewater is mainly treated by means of bacterial metabolism and physical sedimentation. The aquatic plants themselves do not play a major role for the treatment of the wastewater. Wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to maintain saturated conditions. These can be either pre-existing natural wetlands (e.g. marshes, swamps, bogs, cypress domes and strands, etc.) or artificially constructed wetland systems. Artificial wetland systems can range from the creation of a marsh in a natural setting where no previous marsh was present to the intensive construction involving earth moving, grading, impermeable barriers or erection of tanks or trenches.

The vegetation that is introduced or emerges from these artificial systems will generally be similar to those found in the natural wetlands. There are three basic functions of wetlands that make them potentially attractive for wastewater treatment:

- Physical entrapment of pollutants through sorption in the surface soils and organic matters.
- Utilization and transformation of organic pollutants by microorganisms.

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- Low energy and low maintenance requirements to attain consistent treatment levels.

1．3 Types of Artificial Wetland System

Wetlands are comparatively shallow bodies (typically less than 0.6 m (2 ft)) of slow-moving water in which dense stands of water tolerant plants such as cattails, bulrushes, or reeds are grown. In the artificial systems, these bodies are artificially created and are typically long, narrow trenches or channels.

Constructed wetlands are either free water surface systems (FWS) with shallow water depths or subsurface flow systems (SFS) with water flowing laterally through the sand or gravel. Aquatic plant systems are shallow ponds with floating or submerged aquatic plants. The most thoroughly studied systems are those which use water hyacinth or duckweed. These systems include two types based on the dominant plant types. The first type uses floating plants and is distinguished by the ability of these plants to derive their carbon-dioxide and oxygen needs from the atmosphere directly. The plants receive their mineral nutrients from the water.

The second type of system consists of submerged plants and is distinguished by the ability of these plants to absorb oxygen, carbon-dioxide, and minerals from the water column. Submerged plants are relatively easily inhibited by high turbidity in the water because their photosynthetic parts are below the water. The surface area for the constructed marshes ranges from 24.6 to 39.6 m^2/m^3 of applied wastewater per day (23-37 ac/mgd). Based on our site visits, most villages discharged wastewater directly into the nearby river. Considering the quantity and quality of these discharges, the wetland system has the capability to collect and treat the wastewater. This will save the cost of building a centralized wastewater treatment plant.

a. Free Water Surface Systems (FWS)

These systems typically consist of basins or channels, with some sort of subsurface barrier to prevent seepage, soil or another suitable medium to support the emergent vegetation, and water at a relatively shallow depth flowing through the unit. The shallow water depth, low flow rate and the presence of the plant stalks along with long, narrow channels will help to reduce the effect of wastewater by-pass the system without treatment Water temperature has a large influence on microbial activity and must be known rather accurately to predict the extent of Biological Oxygen Demand BOD_5 degradation in the constructed wetland.

b. Subsurface Flow Systems (SFS)

These systems are essentially horizontal trickling filters when they use rock media. The system is fortified with emergent plants with extensive root systems through the media. The “root-zone method” and “rock-reed-filter” are other names for these systems that have been used in the literature. Alternative SFS using sand or soil media are also used. Unlike the FWS system equation, in which the specific surface area is important but not critical, the media porosity is critical to predicting the required area for a given level of treatment. Media porosity has a direct mathematical relationship with the microbial degradation rate constant as well as the hydraulics of the system.
A SFS wetland is an artificially constructed wetland consisting of a trench or bed underlain with an impermeable layer of clay or synthetic liner. The bed contains media which will

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support the growth of emergent vegetation. The system is built with a slight inclination (1-3 percent) between inlet and outlet. As shown in Figure 5-1, primary or pond effluent is introduced into the end of the system where it flows into a transverse channel filled with broken stones. Alternatively, the inlet channel can be a perforated or gated pipe. From there the wastewater flows horizontally through the rhizosphere of the wetland plants. During the passage of the wastewater through the rhizosphere, the wastewater is treated by filtration, sorption and precipitation processes in the soil and by microbiological degradation. The resulting physical-chemical and biochemical processes correspond to the mechanical and biological processes in conventional mechanical treatment systems including denitrification. The effluent is collected at the outlet channel which is often filled with coarse gravel and may be discharged directly into the receiving water body.

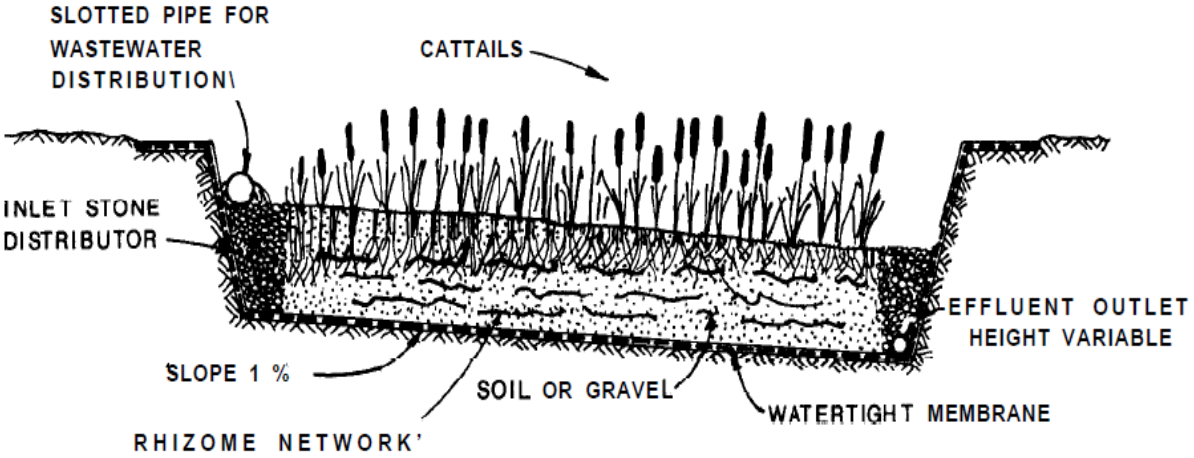

Figure 5-1 Typical Subsurface Flow Wetland Systems

1 . 4 Performance Expectations

Wetland systems can significantly reduce BOD_5, Suspended Solids (SS), nitrogen, as well as metals, trace organics, and pathogens. The basic treatment mechanisms include sedimentation, chemical precipitation and adsorption, and microbial interactions with BOD_5, SS, and nitrogen, as well as some uptake by the vegetation. The performance of several pilot-scale wetland systems is summarized in Table 5-2.

Table 5-2 Performance of Pilot-Scale Constructed Wetland Systems (1)

Location	Wetland Type	Effluent Concentration, mg/L				
		BOD_5	SS	NH4	TN	TP
Listowel, Ontario	Open water, channel	10	8	6	8.9	0.6
Arcata, CA	Open water, channel	<20	<8	<10	11.6	6.1
Santee, CA	Gravel-filled channels	<30	<8	<5	-	
Vermontville, Ml	Seepage basin wetland			2	6.2	2.1

SS removal is very effective in both types of artificial wetlands. Most of the removal occurs within the first few meters beyond the inlet, owing to the quiescent conditions and the

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shallow depth of liquid in the system. Controlled dispersion of the influent flow with proper diffuser pipe design can help to ensure low velocities for solid removal and even loading of the wetland so that anoxic conditions are prevented at the upstream end of the channels.

Nitrification/denitrification is the major path of nitrogen removal cycle [1]. A removal rate of 60-86 percent was reported by Santee. It has been shown that artificial wetlands may be managed so as to fuel the process of denitrification by using carbon sources derived from biomass produced within the wetlands itself[2]. Nitrogen (TKN) removals have been reported that indicate detention times of 5-7 days will generally produce an effluent with TKN <10 mg/L. Phosphorus removal in many wetland systems is not very effective because of the limited contact opportunities between the wastewater and the soil. The exceptions are the submerged bed designs when proper soils are selected as the medium for the system. The presence of iron and aluminum along with significant clay content will enhance phosphorus removal process[1].

1 . 5 Process Variables

Artificially constructed wetland systems can be considered as attached biological growth reactors, and their performance can be described with first-order plug-flow kinetics. There are two goals for organic load control in an artificial wetland system. The first is the provision of a carbon source for denitrifying bacteria. The second is the control of organic loading to prevent overloading the oxygen transfer ability of the emergent plants in the wetland system. If the carbon source is not available for denitrification, then a lower overall nitrogen removal rate will result. However, the heavy organic loading, especially if not evenly distributed, will cause the plant to die off and creates unpleasant odours. Commonly used emergent plants can transmit 5-45 g O_2/d per m^2 of wetland surface (45-400 Ib/ac-d). At a typical oxygen transfer rate of 20 g/m^2-d (180 Ib/ac-d), the organic loading rate for a wetland should be 133 kg BOD_5/ha-d (118 Ib/ac-d) [1].

Hydraulic loading rate for FWS systems is closely tied to the hydrological factors for each wetland and these factors are specific to the site. Organic loading rate is also closely tied to the hydraulic loading rate. Hydraulic loading rates of 150-500 m^3/ha-d (16,000-54,000 gpd/ac), have been reported [3].In general, the site-specific conditions of weather, soil conditions (permeability especially), and vegetation type must be considered in establishing the hydraulic loading rate. From the results obtained at Listowel, Ontario, Canada, it appears that hydraulic loading rates of 200 m^3/ha-d will provide maximum treatment efficiencies[1]. Treatment performance in artificial wetlands is a function of the retention time and other factors. Ground slope, water depth, vegetation, areal extent, and geometric shape control the flow velocity and, thus, the retention time through a wetlands treatment system. A retention time of 6-7 days has been reported to be optimal duration for the treatment of wastewater[4]. Shorter retention times do not provide adequate time for pollutant degradation to occur; longer retention times can lead to stagnant, anaerobic conditions.

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[1] The data source is Natural Systems for Waste Management and *Treatment by* Reed, S.C., E.J. Middlebrooks and R.W. Crites in 1987.

[2] The data source is *Nitrogen Removal in Artificial Wetlands* by Gersberg, R.M., B.V. Elkins, C.R. Goldman on Water Res. 17:1009-1014, 1983.

[3] The data source is *Wetland Systems for Wastewater Treatment: Engineering Applications by* Hantzsche, N.N in *Ecological Considerations in Wet/and Treatment of Municipal Wastewaters,* Van Nostrand Reinhold Co. NY, pp. 7-25, 1985.

[4] The data source is *The Use and Potential of Aquatic Species for Wastewater Treatment* by Stephenson, M. et. al., Appendix A. The Environmental Requirements of Aquatic P/ants. SWRCB Publication No. 65. Sacramento, CA. October 1980.

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Artificial wetlands systems offer several potential advantages as a stormwater or wastewater treatment process. These potential advantages include simple operation and maintenance, process stability under varying environmental conditions, lower construction and operating costs, and in the case of free water surface systems, the possibility to create a wildlife habitat. The potential problems with free water surface constructed wetlands include mosquitoes among other start-up problems in establishing the desired aquatic plant species for both FWS and SFS wetlands alike. The design of the artificial wetland will be based on the local environmental conditions, wastewater quantity and quality as well as expected amounts of stormwater runoff.

The CDIA team has conducted many site visits in order to better understand the local condition and the associated issues. Open discussions with the relevant local government agencies that were involved in the project were also performed to gather the opinion from the government side. Based on these findings and discoveries, the CDIA team was able to come up with a preliminary proposal that is in line with what the Yangzhou municipal government had expressed as ideas on the wetland park, that would be appropriate in order to handle these issues and after all in accordance with the current local conditions.

1．6 Proposed Approaches

Existing Drainage Condition

Based on the “Yangzhou City’s Urban Water Environment Improvement Master Plan (2005 – 2020)”, the Ancient Canal’s main functions are tourism, flood drainage and waterway transportation. Currently, the interception of pollution sources has not been completed in this area. The wastewater still flows into canal from the surrounding residential and industrial area. Meanwhile, the flow of the Ancient Canal is controlled by the water sluince gate. The normal flow rate is very small or even still in most of the time, which caused so far the weak self cleaning ability of the canal water body. Therefore eutrophication is very common in the Ancient Canal and the classification of the water quality in the Ancient Canal is class V or worse. It cannot meet the requirement for utilizing the canal neither for leisure nor as an environmental-friendly resource. The current environmental condition has adverse effect on the quality of public living and future city development. The household wastewater from the local residents is not treated at all before being discharged to the canal. The farmers also use the canal water in combination with feces and other compost material as fertilizers. Storm water runoff will also wash down pollutants from the streets and buildings to the Ancient Canal. Along the Qili River, the interception pipeline was not completed due to the question of whether to install a bridge or not. This river is seriously polluted by the wastewater discharge in the area with the Ancient Canal as its final receiving body. This will seriously affect the quality of the population living around the Canal and any future city development and will certainly become a serious health hazard if not dealt with.

Applicable Document and Standards

a. Applicable Document

Yangzhou City Master Plan《扬州市城市总体规划》 (2005-2020)

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Yangzhou City Urban Water Environment Rehabilitation Plan《扬州市城市水环境整治规划》 (2005-2020)

Yangzhou City Urban Flood Control Plan (May 2003)《扬州市城市防洪规划》（2003 年 5 月）

Yangzhou City Urban Drainage Plan《扬州市城市排水工程规划》 (2007-2020)

National Uniform Municipal Engineering Budget Estimation Sheet in Jiangsu Province《全国统一市政工程预算定额江苏省单位估价表》 (2000)

Jiangsu Province Construction Engineering Cost Estimation Index《江苏省建筑工程造价估算指标》(2002)

Yangzhou City Current Relative Charge Standard《江苏省扬州市现行的有关取费标准》

Similar Engineering Technical Economic Index (类似工程技术经济指标)

Geography Map (1:1000)

c. Applicable Standards

Code for Design of Outdoor Sewerage Engineering (GB50014-2006)
Environment Quality Standard of Surface Water (GB3838-2002)
Code for Scenic Area Planning (GB 50298-1999)
Code for Design of Park (CJJ48-92)
Guiding Principles for the Planning and Design of Urban Wetland Parks (Trial)
Code for Urban Construction and Acceptance of Landscape Engineering (CJJ/T82-99)
Urban Wastewater Engineering Planning (GB50318-2000)

The Proposed Approach

The proposed project site is located in the south edge of Yangzhou city and is divided by the canal into two sections.

The municipal engineering works in this project includes pollution sources control, first-flush stormwater collection, sedimentary dredging, constructed wetland and landscaping construction in the surrounding area of the site. These actions will help to reduce the pollution, rehabilitate the ecological structure of the hydro-ecosystem and enhance the biological diversity to reconstruct the ecosystem.

a. Pollution Sources Control

One of the major pollution sources is the Qili River, which is polluted by the upstream industrial wastewater discharge. In this regard, the City has upgraded the Liuyu wastewater treatment plant and constructed a new sewer system to intercept wastewater from upstream factories. These works are proposed to be completed by 2010. After removing these pollution sources, the water influx quality from the Qili River will be greatly improved.

The other existing pollutions are from the surrounding area's unplanned residential and industrial wastewater discharges. At the same time, the City has plans to upgrade the new

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sanitary sewage collection system to meet the future residential land development of the surrounding area. The wastewater is proposed to be collected and sent to Tangwang wastewater treatment plant located at the southern end of the City.

b. First-flush Stormwater Collection

Yangzhou has an annual average precipitation of 1,054 mm, which is higher than the national average of 648 mm. Site visits have suggested that waste and other kind of pollutants are present in the surrounding area. According to international experience, the non-point source pollution to surface waters is mainly caused by stormwater runoff, especially during the first 30 min to 1 hour of a storm event. The environmental impact can be more serious with the combined sewer systems in the area. The proposed wetland can be used as a treatment facility to treat the first-flush storm runoff.

The proposed storm water catchment area is about 750 mu (50 ha). To pre-treat the first flush runoff, a retention pond is recommended to be implemented before the wetland. The retention pond can help to catch the suspended solid and other pollutants to reduce the hydraulic loading impact to the wetland. In the wetland, the up-zone is used for catching the storm water. The under-zone is the main wetland water body. The sketch of the pond and wetland section is shown in Figure 5-2.

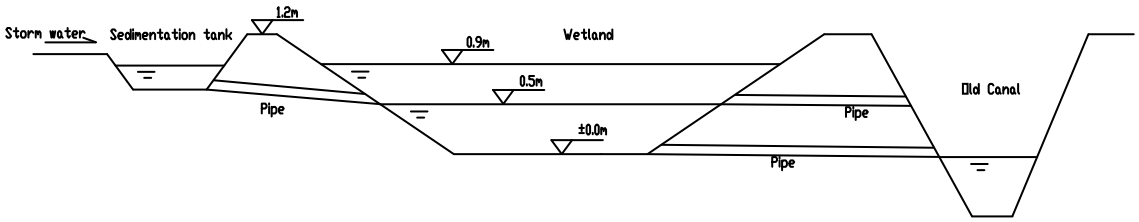

Figure 5-2 Sketch of West Wetland Section

The recommended water depth of the wetland is 1.0 to 1.1 m, which includes 0.5 m wetland (under) zone and 0.4 m up-zone (stormwater). The storm water intensity equation for Yangzhou City is[5]:

$$q = 8248.13\ (1 + 0.641\log P)/(t + 40.3)^{0.95}$$

In general: q: Rainfall Intensity (L/s-hm2);
P: Design Storm Returning Event
t: Time of the Rainfall (minutes)

`

The rainfall is assumed fitting HUFF distribution. Based on above stormwater intensity equation, the HUFF distribution rainfall at 100 year storm event is shown in Figure 5-3.

[5] The data source is *Water and wastewater Design Manual – Vol.5* by Municipal Engineering Design Institute of Beijing in February, 2004.

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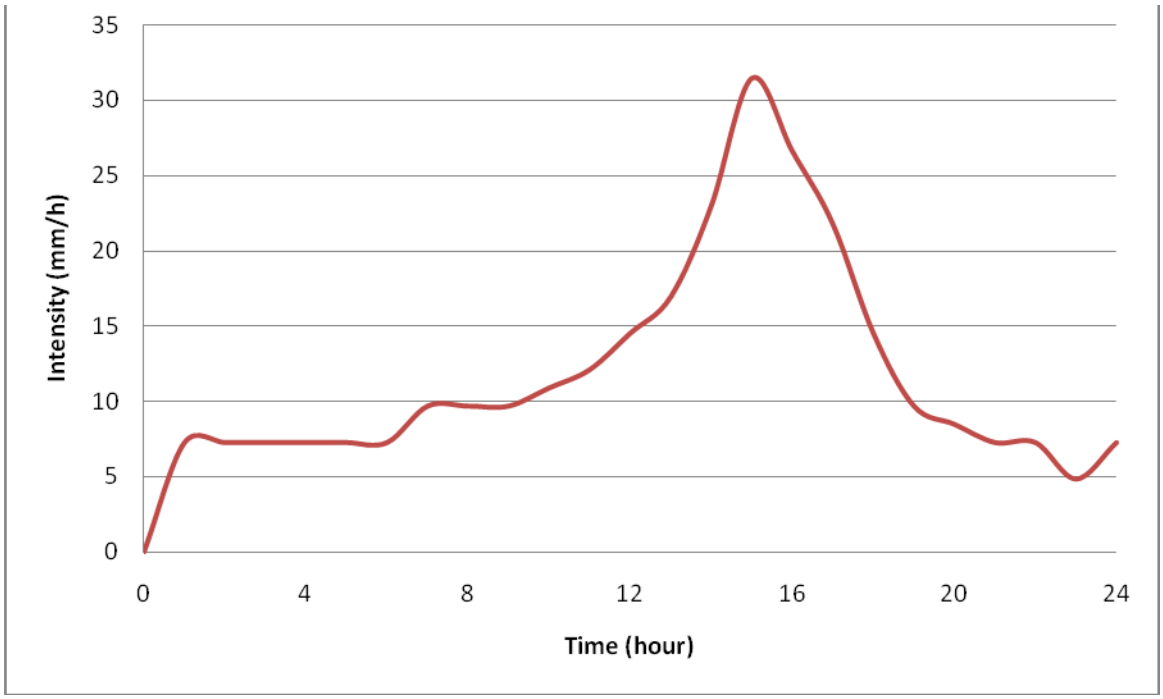

Figure 5-3 100 Year Storm Event Huff Distribution

Using USEPA SWWM 5.0 program, in the 100 year storm event, the peak discharging flow rate to the wetland will be 3.8 m^3/s. The hydraulic retention time for the stormwater is recommended to be 96 hours. The total required water surface will be about 20 ha and the required depth is 0.4 m. The total required water surface will be about 20 ha and the required depth for stormwater storage is 0.45 m. The water level in the wetland at 100 year storm event is shown in Figure 5-4. The detail calculation results by SWMM 5.0 are attached in Appendix A.

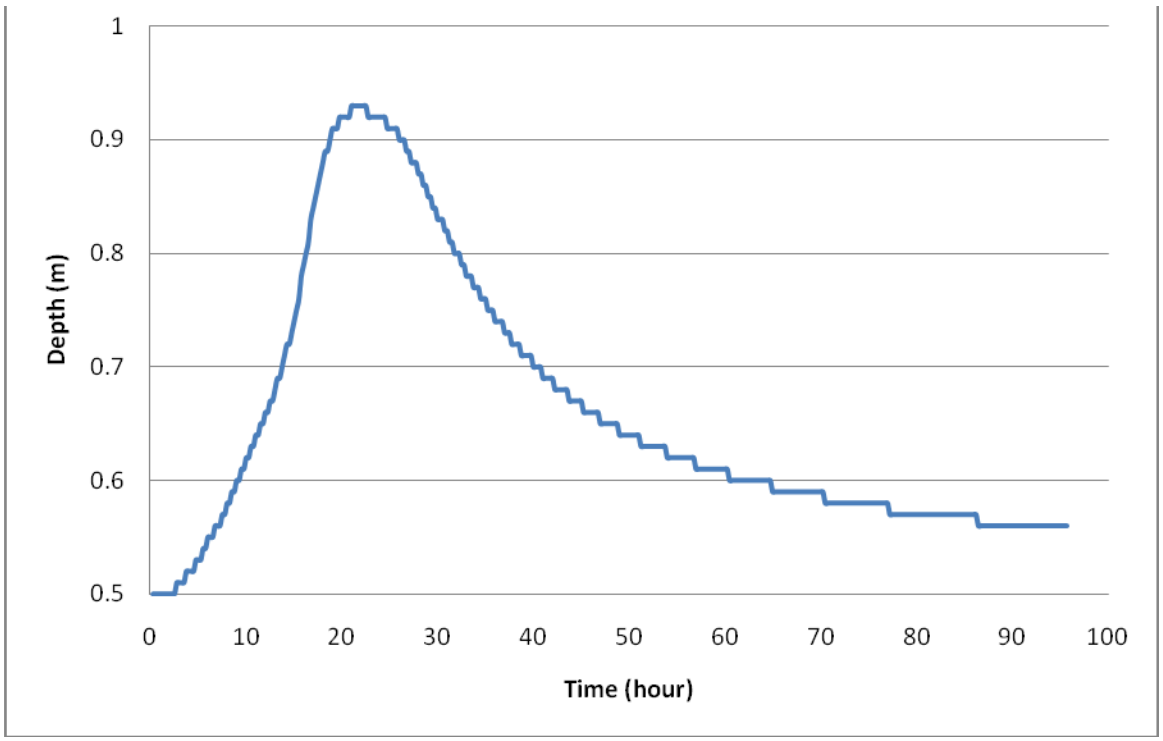

Figure 5-4 Water Level in Wetland at 100 Year Storm Event

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The permanent water level in the wetland is 0.5 m and the maximum water level in 100 year storm event will reach 0.93 m.

c. Sediment Dredging

The purpose of ponds dredging is to remove the build-ups of sediment within the ponds and channels. In order to carry out this dredging process, one or more dredging machines equipped with the necessary equipment will be required.

Figure 5-5 Ponds and channels dredging machine

According to the national agricultural environment protection standards, untreated sediment cannot be used as a soil replacement on agricultural land. Proper treatment techniques must be adopted for the treatment of the sediment so that it can meet the standards for being utilized as a soil conditioner without causing secondary environmental pollution. However, these dredged sediments are often heavily polluted and hard to be efficiently treated as soil conditioner. The best option for the dredged sediment disposal is usually to store the dredged sediment and gradually treat the sediment by composting.

The site should be designed and positioned with water resource protection (storm water runoff and drainage from the sediments must be controlled) and air pollution prevention and control (the process of composting will create H_2S, CH_4 and other emissions) so that the general environmental protection objectives can be achieved.

The site must be equipped with facilities to prevent any secondary pollution to the surrounding environment. The site must also have sufficient space for the different sediments of varying quality. It is more efficient to separate the different sediments contaminated by different pollutants.

Sediment treatment processes include dewatering, stabilization and effluent treatment. The main treatment units are filtration, stabilization and sedimentation. Figure 5-5 illustrates one applied site layout for the sediment treatment and disposal.

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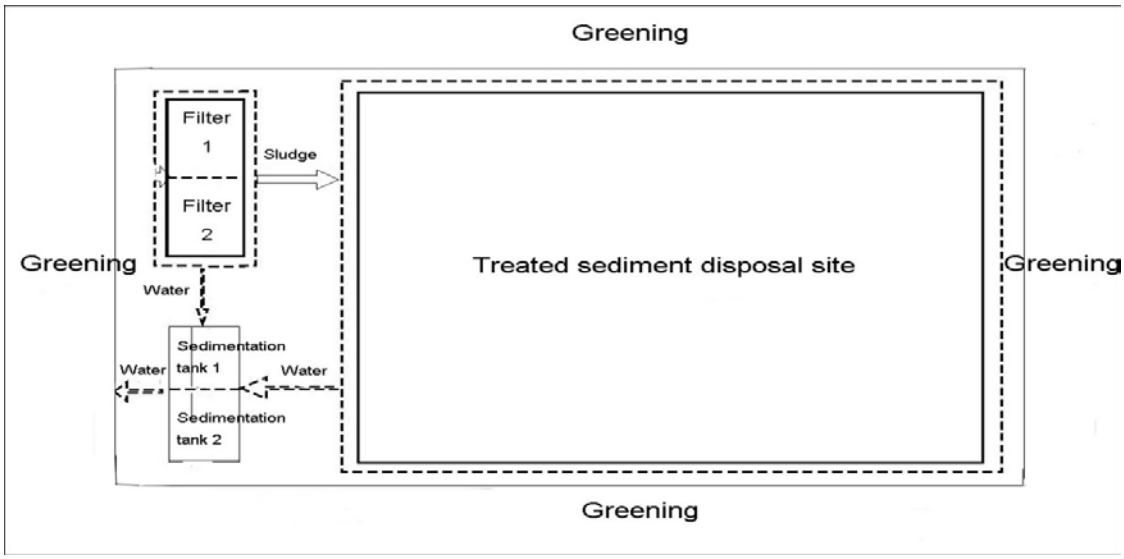
Figure 5-6 Sediment Treatment and Disposal Site Layout



The water and solids will be separated in the sedimentation tank 1 and 2 with a retention time of over three days. Based on previous experience, the solid volume ratio is 20%. The solid volume of supernatant is equal to be 1% or less. The stockpiling site should be divided into several units which will add the retention time of the water and improve the natural sedimentation effect. A layer of clay will cover the sediment to prevent secondary pollution. The best time for carrying out dredging works is from the beginning of winter to the end of next spring, when the water levels in the canal and existing pond area will be at their lowest level. The low intensity of sunshine and cooler temperature will reduce algae growth and facilitate the removal of the algae from the canal. Through an implementation of the above processes the efficiency of the dredging works can be further enhanced.

Quality control on the dewatering process and supernatant quality of the dredged sediment will be enforced. The potential secondary pollution of the leachate should also be considered. The area and depth of the sediment dredging project should be consistent with the actual sediment condition during the implementation of dredging. Only the surface layer with high pollutant concentration should be dredged. Disturbance to the sediments should be limited in order to minimize the amount of the dredged material being resuspended in the water.

Sediment dredging should be conducted across the entire project area, which may include the canal and the existing pond. The dredging depth can be between 50 and 70 cm.

d. Constructed Wetland

e.

Two artificial wetlands are recommended to be constructed on the east and west side of the canal. Figure 5-7 shows the proposed location of the two wetlands.

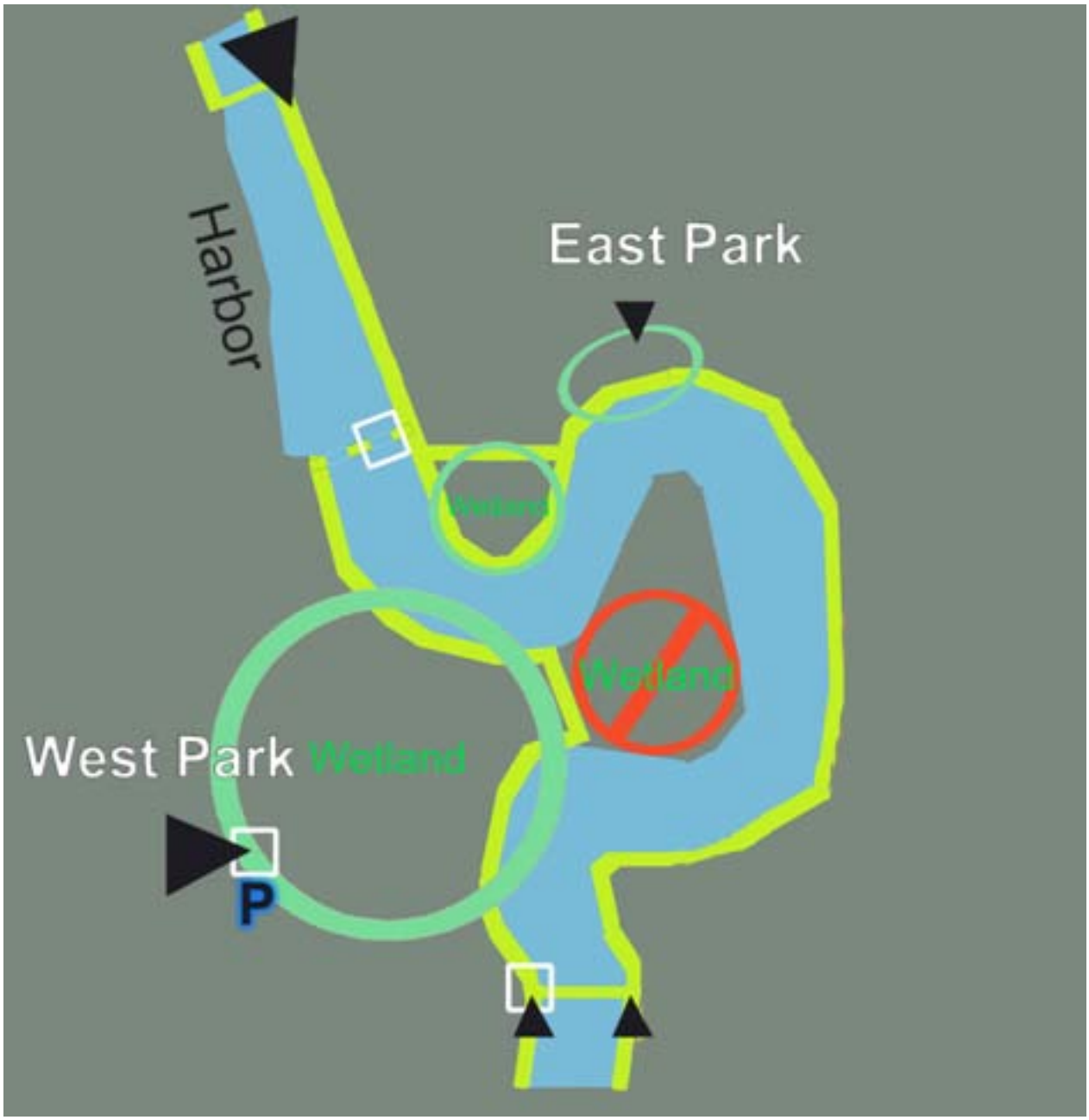


Figure 5-7 two wetlands to be proposed

The current water quality of this Ancient Canal is below class V, the proposed east wetland park can utilize the water treatment function to help improving water quality of the canal. The SFS is recommended to be applied for canal water quality improvement.

The proposed west wetland is recommended to accept the stormwater runoff from the surrounding residential area. The planned catchment area is about 750 mu (50 ha). The wetland permanent water body is brought from canal and stormwater runoff. In the wet storm season, the stormwater runoff will be treated by the wetland before released to the canal. The SFS will be also applied in this area.

Cattails, bulrushes, reeds and other submerged plants can be used as the aquatic plants in this wetland. In the shallow water areas, emergent vegetations such as cattail, lotus and calamus should be planted.

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The wetland management should include technical maintenance of water supply pipe, facilities and vegetable plants, routine checking of each process unit, pump, valve, pipe and channel, and sedimentary dredging when necessary. A good plant management technique is very important for the successful operation of the wetland system for the creation of a delicate natural balance. The continuous supply of nutrient and water are critical for the normal growth of the plants. The plants can be damaged by high concentration of toxic matter. It is important to check the nutrient and toxic matter periodically and maintain a balanced influent to the wetland.

In the autumn, the upper part of the plants will dry out and die. Trimming of the plants will be required to protect the water from the release of organic matter and nutrient into the water again during the decomposition of the dead plant. There is no need to remove any natural grass in the wetland. However, if the natural grass grows too much, then partial removal is necessary to protect the wetland eco-system.

The insects and other pests are also having adverse impact to the wetland system operation, which should be checked regularly. The introduction of some natural predators of these insects and pests such as birds and other animals in the reserved zone will allow the wetland system to become naturally sustained. Toxic insecticides or pesticides are not suggested to be employed as they are not an environmentally friendly way of controlling the insects and pests population. The residue chemicals will flow into the channel by the rainfall, which will damage the surrounding ecosystem badly.

1.7 The Recommendations for the Next Stage

In the next stage, the following actions are recommended to be finished:

a) The water quality of the canal should be fully monitored, especially the water quality after upstream pollution source control and inception project. This should be established as the base line to protect the water quality of the Ancient Canal.

b) The local geotechnical conditions need to be investigated, such as the ground water level and quality, soil condition, etc.

c) The design of the wetland should incorporate the ability for treating the wastewater from the local shops, villages and visitor centers that are being discharged to the wetland. A wastewater pretreatment facility should be installed to ensure that the water quality of the discharge will not exceed the handling capacity of the wetland.

d) The interception of pollutants from the surrounding shops and plants that are directly discharged into the Ancient Canal should be reinforced, such as the Qili River. The treatment ability of wetland can be guaranteed only when the pollution source is identified and controlled. The wetland system will also have a buffering ability in case of accidental release of pollutant.

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e) The potential secondary pollution from nitrate and heavy metals on the dredged sediment will be controlled according to the quality test result. The disposal of the treated sediment should take into account of all the potential environmental impacts. The following solutions are alternatives to be considered during the treated sediment disposal stage:

1. Agriculture, garden and forest utilization. The sediments may contain organic matter and nutrients that can often be used as organic compost which are beneficial for vegetation. In China, “Environmental Quality Standard for Soils” (GB15618-1995) and “Standard of Sewage Sludge Applied to Agricultural Soils” (GB4284-84) set the standards for the sediments to be used as organic compost. The nutrients in the sediment can promote the growth of the vegetation in the farm land, forest and garden. If the sediment is used for non-agricultural purposes, then the secondary pollutant content of the sediment will be not a concern through the food chain.

2. Landfill site cover. The landfill close cover is composed largely of inorganic material with little nutrients in it, which is not good for the growth of vegetation. The treated sediment can add nutrients to the top soils and promote the growth of plants, which will help to reduce soil erosion on the landfill cover. In this application, the secondary pollution of sediment will not affect the food chain. For this intended application, the treated sediment must be dry enough to meet the requirements on anti-seepage from the landfill and stabilization as cover material. In this application, there should be no secondary pollution to the environment.

3. Earth fill. Under proper conditions, the sediment can be stabilized to change its characteristics from high water content and low strength to low water content and higher strength. The treated sediment can then be used as earth fill for engineering projects in the city. The potential applicable projects would be:

    i. Embankment or riverbank reinforcement project: the solidified sediment can be a cost-effective replacement for other conventional construction materials. It can meet the requirements of side slope stabilization, anti-seepage and erosion control.

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ii. Road project foundation and earth fill projects: the solidified sediment can be stabilized to replace the conventional sub-grade construction or earth fill materials for a cost-effective solution to meet the project requirements.

iii. Construction material. The sediment can be used as construction material in industrial settings. The construction material industry has many requirements that can benefit through the reuse of this treated sediment as raw material. In many instances, the use of stabilized sediment can be a cost-effective replacement or supplemental raw material for construction.

4. The treated sediment disposal can also be combined with the WWTP's sludge treatment and disposal project for mutually beneficial reuse consideration.

f) Education on public awareness for environmental protection is also deemed an effective safe guard measure to ensure the effectiveness of the wetland and the project objectives of restoring the surface water's assimilation ability while improving the water circulation and the water quality. The wetland park includes training center for environment and ecology protection education for the general public. This will help to educate the citizens to understand the principle and purpose of a wetland.

g) Prohibit the dumping of waste along the channel and in the existing ponds. If wetland system is created in this area, then the removal of the previously illegally dumped waste in the ponds and along the rivers is very important. The contamination of the channel and other surface waters can also be influenced by a groundwater contamination in this area, e.g. all the cooling liquid of the recycled refrigerators is infiltrated to the ground and preventive measures from spreading or migrating to surface waters would have to be undertaken.

All above may significantly affect the wetland engineering design, which should be fully investigated and studied in the next stage of work.

Public education on environmental protection awareness is an effective measurement to ensure that the wetland can become an environment and recreation resource.

The Yangzhou Wetland Park ecosystem will have two wetland areas. The concept of this project includes pollution source control, first-flush stormwater collection, sediment dredging and a constructed wetland.

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The prime benefits of the wetland will be wastewater treatment, first-flush stormwater treatment, sediment pollutants removal, Ancient Canal water quality improvement, raising public awareness and education on environmental protection, and last but not least leisure plus an increase of land value all around this wetland park.

A wetland park of this kind is one of the more successful role models in the protection, retrieval and reasonable use of wetlands, even - or in particular in modern cities.

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SECTION 2: URBAN PLANNING

2.1 Review of Yangzhou Rehabilitation of Canal Banks

2.1.1 Policy and Practice

Yangzhou is traversed by many water courses like the Liao Jia Gou and the historic Grand Canal connecting to Yangze River (Chang Jiang) which forms the southern boundary of the city, the Ancient Canal and numerous creeks. Along the larger water courses due to convenient access to water transportation and sewage, since more than 50 years land along the ancient canal was often used for industrial production. Because of ongoing pollution of water and air some years ago the Yangzhou city government decided to successively replace the factories by other land-uses.

Meanwhile several factories have been closed or moved, especially along the Ancient Canal. The Ancient Canal banks had been favored within that program, as it is a water course essential to the tourism development of Yangzhou Old City.

2.1.2 Mechanisms and Instruments

In general the city provides new development areas for the factories to be moved. Depending on existing contracts (e.g. land use rights) the abandoned factory sites are cleared by the factory management or the city administration. The land use rights for cleared areas are then auctioned. New developments shall follow the master planning of Yangzhou City, but are handled flexibly, as far as the intended development does not introduce new pollutive activities. The master plan (status 2003) sets canal bank areas to residential land use, commercial, health facilities, education, large scale markets and public green. Four areas are designed to become larger public green spaces (on the map only three are to be seen) and some industrial areas are maintained.

But the current master plan is in reviewing process, which shall be finished end of 2010. The new plan period will extend from 2009 to 2030. The CDIA team was provided with an unofficial (not approved) “Urban Vision General Plan” (市区远景总图), which serves as the basis for discussion of the master plan review. According to this draft probably most industrial land uses will be replaced by other land uses, mostly residential. The green space seems to be reduced and the large scale market is no longer depicted.

The city government tries to introduce some specific tasks into contracts with new investors, like developing public areas (e.g. green belts along the canal banks) additionally to their private commercial investment.

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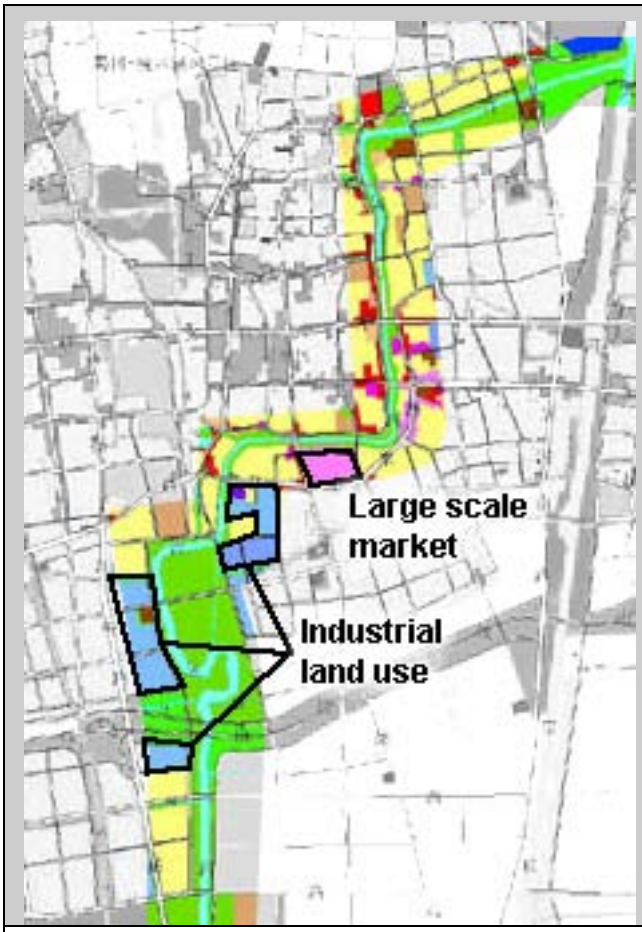
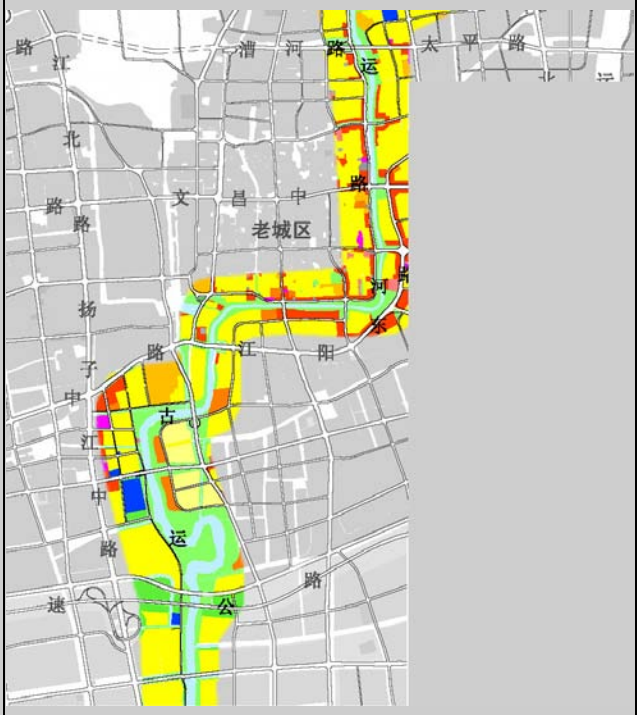


2020 Land use along the Ancient Canal
(Reference: Yangzhou Master Plan 2003)



Possible 2030 land use along the Ancient Canal
(Reference: Urban Vision General Plan 2009)

2.1.3 Institutional Arrangements

It seems that the Yangzhou Urban Planning Bureau (YUPB) is not involved in the development of strategies for the river and canal banks, instead more or less only designing the master plan following political decisions. The YUPB is not involved in the detail planning of the river and canal bank re-development, which seemingly is out-sourced to specialized planning bureaus. Implementation of river and canal bank re-developments is the task of the Yangzhou Construction Bureau, which delegates the specific re-development tasks to referring departments. In the case of this CDIA project the counterpart was decided to be the Yangzhou Water Gate Office, also called: Yangzhou Flood Control Office. The WGO is supervising the on-going extension of the city's sewage network. The Yangzhou Environment Protection Bureau (EPB) is very much concerned with pollution control (air, soil and surface water quality assessments), but does not yet have enough capacity to do groundwater assessments.

2.1.4 Strengths and Weaknesses

Strengths	Weaknesses
The city government continuously re-develops river and canal banks since several years	Usually re-development means erasing existing structures completely, nearly no re-use of buildings, endangering historic structures

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Strengths	Weaknesses
Most re-development planning is committed to further public uses along the river and canal banks	The concerned offices failed to force investors to develop public areas according to the contracted standards
The sewage pipe system is successively renewed and extended	Against the strong commercial interests of existing factories the administration is relatively weak in forcing factories to reduce feeding of polluted water into public water bodies

2.2 Canal Rehabilitation Activities

According to a study by the Yangzhou University [cf. Yangzhou University Institute of Architectural Design (June 2009)], during the 10th Five-Year-Plan period since end of 1990s the city spent more than 10 billion RMB (approx. 1.1 billion EUR) on rehabilitation projects along the Ancient Canal. On a canal length of 13.5 km the projects contained the removal of 100 factories, relocation of 3200 families, demolition of 500,000 sqm of housing, 1.28 Mio cbm mud clearance, construction of 5 sluices and 800,000 sqm new green space, including 11 garden parks.

Many factories close to Yangzhou Old City moved away to new city quarters. Both banks of the Ancient Canal have been re-developed along the eastern edge of the Old City on a length of approximately 2.5 km. The re-development comprises residential development, hotels, clubs, entertainment and shopping facilities, public squares and green promenades.

Some new residential developments on the eastern bank (opposite Dongmen Square) have been realized in quite high quality standards. The promenade on the canal bank facing the Old City has been constructed uninterruptedly on a length of approx. 4.5 km connecting the north-east and the south-west corners of the Old City, in this way completing the pedestrian network to allow walks all around the Old City. On the opposite side another promenade is about to be completed soon. Near the Nanmen Square at the Old City's south-western corner, where comprehensive archeological excavation is in progress, the promenade connects to a re-development area with reconstructed traditional architecture (Guang Yuan Ding Shan and along Xiang Shui He, a small feeder creek).

At the south-east corner of the Old City three big plots shall be developed soon. Two plots lie idle, with no investor in sight. One plot is under construction for a large complex of a hotel and business clubs. South of Nanmen Square recently an old traditional residential area had been completely demolished between Nanmenwai Dajie and the canal bank. This area is under planning now, for residential, shopping and tourism development.

The city government now intends to extend the re-development scheme to the north and the south of the Old City. In the north, where the Ancient Canal connects to the Grand Canal, a concrete factory shall be removed and a power plant is under discussion for removal. In the south a machine factory (opposite of Nanmen Square) shall be moved. A pesticide factory approx. 1 km further south, which had been under discussion for removal, recently has been decided to stay for

Canal Rehabilitation Projects – Finalized or under construction

Mai Fen Chang - Wheat Flour Factory Museum and Restaurant

Housing opposite Dongmen Square
[Photo: Zhuang Ping, April 2009]

Hotel opposite Dongmen Square
[Photo: Zhuang Ping, April 2009]

Mouth of Xiaoqinhuai He

Ancient Canal promenade

Hotel and club compound
[Photo: Zhuang Ping, April 2009]

Canal Corner park

Old Brewery
[Photo: Zhuang Ping, April 2009]

Area 1912

Guang Yuan Ding Shan

Xiang Shui He

Ancient Canal promenade

Canal Rehabilitation Sites – prepared for future projects

Nanmenwai Dajie

Nanmenwai Dajie

Xuningmen Lu / Pifang Lu [Photo: Zhuang Ping, April 2009]

Jiangyang Dong Lu [Photo: Zhuang Ping, April 2009]

Nan Men Excavation at Nantong Xi Lu

an undefined period, as it seems to be decided not to disturb it because of the highly profitable business it represents. About one kilometer further down the canal an area of noticeable landscape with three canal bends shall be developed as a wide public open space. Nearby factories and a power plant shall be moved in the long run. This may well become a questionable issue later-on, because these factories are either rather new developments, even undergoing extensions now, or are so far of relative importance for the city's power supply.

2.3 Approaches with Cost Recovery

It is not known whether the factories had to settle all the costs referring to their removal themselves or to which extend the city government covered these expenses. But it seems that the city government does not do a comprehensive cost-benefit analysis including all costs. Also, it could not be evaluated, if e.g. the high quality residential areas opposite of Dongmen Square have been sold successfully (although this would affect the city only indirectly). The apartments' price of 8000 RMB/sqm seems to be on the upper end within the city center.

As far as the re-developments are private activities, e.g. the hotel and club site at the south-east corner of the Old City, the direct revenue for the city is only the payment for the land use right. Selling of land use rights for commercial areas mostly is thought as a means to finance the construction of public spaces. Continuous income is planned through entrance fees and renting out of minor commercial facilities inside these public areas rather than through fiscal earnings e.g. profit taxation of private business.

2.4 Canal Rehabilitation / Re-Development Scheme

The limited work period for this pre-feasibility study did not allow elaborating a re-development scheme for all potential rehabilitation areas along Yangzhou's canal and river banks. In general the city government's approach to change the land uses into less polluting ones and to mix residential with commercial, tourism and recreational facilities is recommendable. On the other hand the CDIA team proposes to keep more of the existing structures, to renovate and re-use them instead of completely erasing the partially interesting historic townscape of the past 50 years. This concerns industrial buildings as well as agricultural land uses.

2.5 Procedures and Instruments

Land pooling is the preferred method of the Yangzhou Construction Bureau while preparing any urban development project. As in China individual ownership of land is not allowed, the right to use land is temporarily allocated to "possessors". The procedure to be allocated with the right to use land, formerly used by various possessors, usually is quite time consuming. But in the case of government owned areas the Land Resource Bureau helps to shorten the approval time to approximately 3 months in general.

For the development of the intended wetland park, which is now largely used by farmers and small industry enterprises, all land occupiers shall be compensated by the city government. The numerous migrant workers, running garbage recycling businesses on the western canal bank until the beginning of the CDIA project in September 2009, had been removed already by the end of January 2010 and the area surface had been cleared from garbage. It is not known, if these people have been relocated to other city areas, which are better suited for garbage recycling, or whether they have been compensated.

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2.6 San Wan Gong Yuan – Wetland Park Project

2.6.1 Project site selection and location

The city government decided not to use the CDIA consultancy for the rehabilitation of former industrial sites along water courses as had been intended earlier. That is why the Yangzhou Construction Bureau had to do additional investigation about which site or project may be suitable. The project area of "San Wan Gong Yuan" for the pre-feasibility study finally was selected by the YCB after extended discussion with Yangzhou Land Resource Bureau.

Location of the wetland park project in Yangzhou City

"San Wan Gong Yuan" is located near the geographical center of Yangzhou City on both sides of the Ancient Canal, which is a part of the famous historic Grand Canal system. The Grand Canal flows through the city of Yangzhou from northeast of the Old City to south where it leads into the Yangzi River. Along to the eastern and southern border of the Old City (this section called "Ancient Canal") part of the canal had been integrated into the city's historic fortification system. The master plan since 2003 depicts this area as a large green open space. In 2009 the city government then decided to develop it into a "Wetland Park".

The map clearly shows that the planned park, though of possibly 70 ha size, will not provide as many recreational opportunities and varying landscapes as the huge, nationwide famous "Shou Xi Hu Park" can offer in the north of Yangzhou City. Also San Wan Gong Yuan will be a bit more distant from the economic and touristic center of the Old City than the "Shou Xi Hu Park". San Wan Gong Yuan will have to develop special features to become an interesting place, making it different while enable it to compete with its big brother in the north. For this the intended "wetland feature" is essential. To support a sustainable development the planned park should firstly serve as recreational area for the southern part of Yangzhou and especially for the new large residential settlements nearby.

Compared with the current master plan the size of the green open space was reduced to about 50% of its formerly proposed size. The project area consists of three parts: one part on the canal's west bank and two parts on the east bank. These two parts are separated by a recently constructed educational facility of the city government. The exact boundary of the project area had not been fixed and the CDIA team had been asked for proposals. The boundary used by the CDIA team for site survey and investigation referred to the first proposal of the Water Gate Office. During the drafting of the development framework some minor amendments were proposed. The final definition will be up to the Yangzhou Construction Bureau in cooperation with the contracted designer. Though it is obvious that the canal itself, its banks and the adjacent land are essential parts of the intended park and influencing each other, the Yangzhou Construction Bureau did not include the water body of the Ancient Canal as a part of the "San Wan Gong Yuan" project area. Nevertheless the CDIA team extended its investigation on the water course and its specific requirements.

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2.6.2 Existing land-use and landscape

Compared with most other sections of the Ancient Canal in Yangzhou the "San Wan Gong Yuan" project area is characterized by a really amazing landscape of three sharp bends (which give this area its name) in a 150 - 200 m wide canal. Large strips along the banks are green, somehow "wild" areas. The adjacent land is rather flat and partially lies below water level, needing dams to be protected from constantly being flooded. The land currently hosts manifold functions like housing (4 villages), recreation, agricultural and fish farming, landfill and dumping, harbor and industrial activities (cf. report of environmental specialists).

Garbage Recycling - August 2009

Garbage Recycling area cleared - January 2010

The south west part of the area, including the peninsula in the Ancient Canal, had been a niche production area for low level garbage recycling, reasonably dirty. The garbage re-cycling area was mixed with village houses and farms. The village-scape is characterized by detached and rather dispersed houses, which is different from the villages on the eastern side of the canal, where houses mostly stand in alignment. Vegetable planting grounds and garbage piles were positioned close to each other. After strong recommendation by the CDIA environmental specialists this unorganized garbage collection and unhealthy living conditions for villagers and workers was quickly terminated by the Yangzhou city government in January 2010.

New large residential housing areas at the eastern border of the planning area

The two eastern parts of the area include some small rural factories and larger thoroughly planted agricultural land as well as villages. Village houses stand in alignment, rather regular and seem to be in better condition than the village houses on the western side of the canal. The eastern villages

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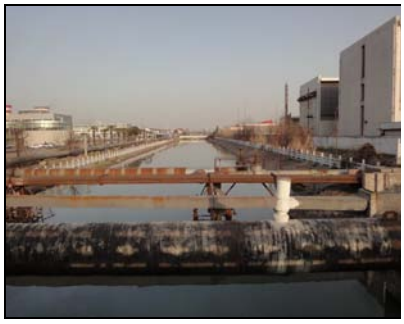
apparently have been thoroughly planned. Along the eastern border of the project area large new residential quarters are under construction, about to be finished soon; whereas the western border is defined nearly completely by large scale industries.



Feeder canal – view to planning site

Large vehicle factory

Future park entrance road

The canal banks are not kept clean, though in some parts they show a relatively "natural" appearance. The northern part of this project's canal banks are used as ship docking area, serving for factories and a power plant. As to now there is no landscape which could already be identified as initial part of a recreational area or showing somehow a "natural" landscape. Only the peninsula in the center and the land triangle in the northern bend carry a rather "nature-like" appearance. The mentioned land triangle quite often is flooded, while the peninsula is nearly completely covered with fish ponds.

2.6.3 Valuable features

First of all the Ancient Canal itself is the most valuable part of the planning area. Especially the water body with its three sharp bends forms an important historic landscape. Secondly, the area has been used for farming since long. Reasonable parts of the area are still agricultural land and villages, with few disturbances from modern industrial development. Most valuable agricultural areas are located along the eastern side of the canal, while fish ponds are to be found inside the conspicuous three fold turn of the waterway. Canal banks, water bodies, ponds, the village houses and farms are valuable features of the townscape in this area, especially in four small, well-kept villages. The rural character of this area is predestinated to provide a specific and rather unique atmosphere to the intended park and has been considered in the redevelopment scheme.

2.6.4 Development Objectives

The future Park and its associated developments shall serve three main objectives: (a) supply the city and its residential quarters with recreational space, (b) re-introduce a nature-like environment into a dense urban pattern and (c) offer sustainable commercial opportunities to local people.

The dense Old City and the southern parts of Yangzhou have hardly left any green open space of reasonable size for relaxation. Historic private gardens are more used as tourism sites instead of green public open space. Also along the Ancient Canal there is no big size public open area yet. In consequence the intended park shall serve as a space for relaxation, especially for the surrounding residential area, but also for all Yangzhou citizens. Close to the city center, it would be easily accessible to the public. The park shall also function as a buffer zone between adjacent residential settlements at the eastern edge and industrial land (in the west of the park exist several factories). According to Yangzhou Urban Planning Bureau the CDIA team learnt that the Wetland Park shall be developed as natural as possible. With the priority target of a mostly nature-like wetland park the Yangzhou Urban Planning

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Most village houses are in good condition

Vegetable farming

Villagescape

Fish Ponds

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Bureau proposes to develop at maximum 5 % of the wetland park with tourism facilities like small shops, playgrounds and exercise areas for adults to perform traditional activities like Tai Ji Quan.

Redevelopment of the land shall consider its surrounding land use and environmental issues. Surrounded by settlements (manmade "hardware") a park shall make natural beauty a readily available issue again to the citizens.

Urbanization in Yangzhou also continuously eliminates highly valuable farm land, which usually forms part of the "natural" character of a landscape. The wetland park project opens the chance to keep and integrate such farmland and small villages with their commercial capacities into the redevelopment scheme. To keep the villages in the wetland park would be rather interesting for modern urban life. Located not far away from the city center it could be developed for instance as an educational place for agriculture activities, which increasingly are no longer known to urban youth growing up in the environment of big cities.

村庄何去何从？Where do the villages go? Advantages and disadvantages of two strategies				
	搬掉村庄 Removal of villages		**保留村庄** Keeping the villages	
费用 Costs	搬迁费用 重新安置费用 补偿费用	Removal costs Resettlement costs Compensation costs	无额外费用 同时新型农业能给居民带来额外的收入	No additional costs ***Instead*:** modern, eco-friendly ("clean") agriculture as a new economic chance for local farmers
对公园的影响 Impact on park character	与其它的城市公园类似	No big difference with other standard city parks	具有农业特色，农产品的生产、销售对于城市居民尤其是儿童具有极大的吸引力及教育作用	Integration of lively agricultural activities Production and sale of agricultural goods are attractive and educational for citizens, especially for children

Service facilities shall be constructed near the park or partly inside the park. Ecological aspects of new buildings shall be carefully considered. Though this would possibly increase costs, such eco-structures would demonstrate more respect to the nature in a wetland park and could function as models for other urban developments also in other parts of China.

There are several probably contaminated areas along the canal. The park itself is close to some factories. Advanced biological pollution treatment technologies could be used in the park. The constructed wetland could thus also become a Chinese model place for presenting treatment of polluted water by special plant purification systems.

2.7 Issues to be specifically addressed

2.7.1 Financial and economic issues

The construction of a wetland park could become very costly, especially if the existing situation is

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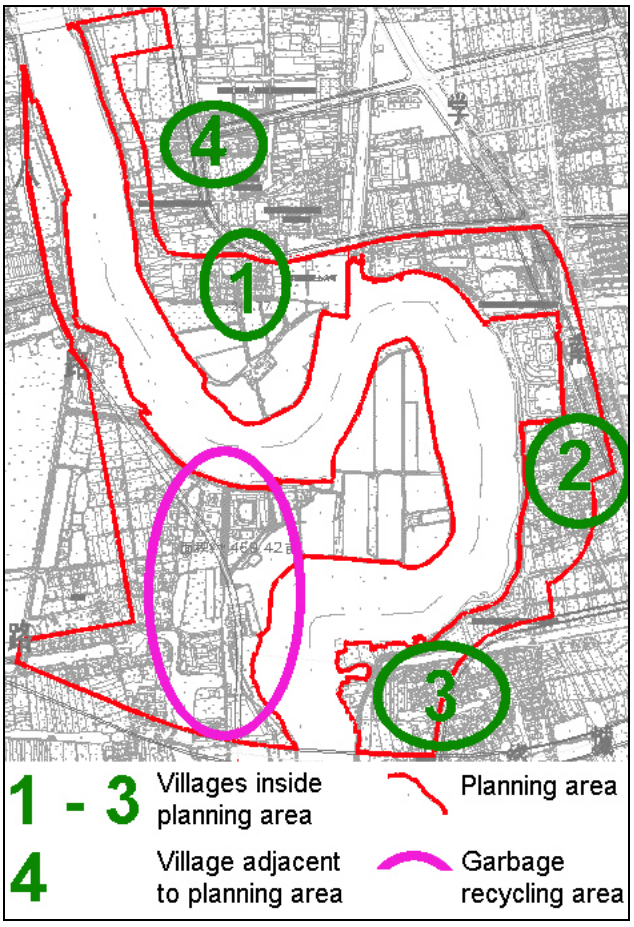
considered with its probably contaminated soils and only relatively small areas of originally nature-like resp. wet lands. High-tech products for gardening or landscaping, eco-friendly park equipment and specific wetland technology are still limited to a small market in China. Those products are more expensive than goods needed for the construction of normal parks. Different from a real estate or other investment activities, the development of a park itself can hardly produce direct profit. Recreational park development has more social and cultural significance rather than direct economic benefit. Its positive impact on the economy is mostly indirect through influencing the overall marketability of a city as a whole (like Shou Xi Hu Park) or a city quarter adjacent to a park. Therefore usually it is governments who invest in park development, not private companies. An exception may be pure entertainment parks, which allow a high density of profitable fairground facilities. However, mixed models are possible though need to be carefully pondered by the local government in order not to get overwhelmed by the plain commercial interest of the private party involved.

On the other hand, eco-friendly technologies must not always be costly. There are rather simple but effective methods for pollution treatment or a wetland park design, which admittedly demand non-standard approaches. This needs careful consideration by professional landscape planners who are well experienced in wetland park design, which is considerably different from standard park design. One common principle for a sustainable park design is to make full use of local resources rather than demolishing and rebuilding existing structures.

2.7.2 Social issues

The closest beneficiary groups of the park will be the expected large number of future residents in the newly constructed housing areas east of the planning area; followed by all the citizens of Yangzhou and visitors from outside of Yangzhou. Not to forget all those who are working in the nearby industries, who may spend their work breaks here. Hence the significance of the wetland park development is foremost aimed at a public interest rather than straight economic benefit. While there will be an economic benefit later of most likely a broad and much deeper impact than a downright entertainment profit, it stays an indirect benefit as the city of Yangzhou will become a more attractive place to go to, and stay.



Additionally the future living conditions of the villagers inside the planning area need to be carefully considered. It happens quite often in China that the pressure of planning projects on existing situations is rather neglected, no matter topographical issues or social issues. The common way of dealing with existing residents is to relocate them. The residents either will be offered money or apartments for compensation. In many cases, although residents are not satisfied with the quality or quantity of the compensation, they have to follow the

development plan by the city government.

Three villages with six settlements and a population of around 2700 people (cf. social expert's report) exist in the project area. Income resources for most of the villagers are in vegetable farms and fishing ponds near the village houses. In case they would be relocated, their livelihood will be totally changed. If they would stay instead, their farming activities could be integrated into the development of the park forming an economically speaking highly valuable item for visitors as well as for the municipal fiscal authorities as they will generate income and later-on pay taxes. On top they will be less affected by the construction of the park and even may become directly involved as local labor force. Leave or stay, this depends on the decision making process. Normally farmers, the most affected stakeholders, though they are owners of land use rights as well, are not included in the decision making process. The CDIA project framework carefully cares for their interests in this development strongly suggesting to rather involve them than sending them off.

2.7.3 Cultural issues

The three bends of the canal including the adjacent wetlands form a historic landscape, which is unique in this section of the Ancient Canal (cf. map "Location of the wetland park project in Yangzhou City"). During design discussions for this area it had been proposed some times to straighten the canal here by cutting the nowadays peninsula off the land in order to ease the ship traffic. Such intervention is explicable for traffic interests, but would intensely hurt the charm of this landscape. While traffic of large pushed barge trains may be reduced after some time or even stopped and replaced by small boat traffic, it is not necessary to change the traffic conditions here.

Also the agricultural landscape is part of this historic landscape. The area has been used since long for agriculture activities, mainly farming and fishing. Villages along the great canal could have been found in hundreds and thousands. Most of such cultural landscape is disappearing, or exist only in remote areas nowadays. The villages in the San Wan area are so close to the city of Yangzhou that they are also endangered to vanish. Village houses with farming and fishing could contribute to a unique and special cultural landscape inside the city of Yangzhou in future, an amazing island of tranquility in the rapid and vibrant urban development, perfectly fitting into a nature-like "wetland park".

2.7.4 Educational Issues

A wetland park is a special type of park which is quite different in its design and features from standard parks in China. The standard parks mostly provide manifold entertainment facilities in a manmade "green" environment, which serves as decoration and resembles more to gardens than to natural landscapes. In contrary a wetland park is focusing on a natural (or nature-like) environment to support development of flora and fauna in their own biological societies. Such parks ask their visitors to become nature observers for a more passive and contemplative perception.

Due to its wetland character this has an educational function for citizens in terms of natural science. Wetland areas are rather rare inside modern cities. Cities tend to keep nature away. People have to travel far to learn about nature. Therefore a wetland park as a green oasis inside a city would be a site of natural education within easy reach for citizens. Its educational aspects include various sciences like biology (studies of flora and fauna), agriculture science, water and pollution treatment technologies.

Cities separate nature from human beings. Children growing up in cities do not have sufficient personal experience with nature. In most of today's Chinese cities, where nature is disappearing rapidly, wetland parks could supply educational opportunities of high significance, where children can find an alternative playground to get close experiences with plants and animals.

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2.7.5 Environmental issues

The peninsula on the east canal bank is regularly flooded and therefore only used temporarily for agricultural activities. The peninsula on the western canal bank had been diked and is nearly fully covered by fish ponds (which are now partially polluted by dumping of garbage and chemicals). Hence both areas are already predestined to be developed specifically as wetlands; the latter case demonstrating especially, how to recover from pollution.

The design of the wetland park has to consider the flood line (cf. Ministry of Construction of P.R. China (2005), Blue Line Management Regulations). The "Blue line" is the border line to separate water adjacent land and other land uses. The line shall be identified in the city's master plan or other development plans. In case that has not yet been defined for this area, either the responsible Yangzhou Bureaus shall be asked for consultancy or respective regulations have to be applied.

Industrial land use dominates the western edge of the planning area, while to the east residential areas form the edge. Because of the larger area the western wetlands could offer specific biological waste water treatment to the industrial neighbors. Supposing that the glass factory and the power plant at the north-west edge of the planning area will stay for a longer period, this could create problems through their needs for unloading sand and coal from ships; the latter especially carrying the risk of air and soil pollution by coal dust (needs more investigation).

Another not yet clarified potential risk is the ship transport of raw materials and end-products to and from the pesticide factory close to the north of the planning area. According to the "Dangerous Chemicals Safety Regulations" [cf. The State Council of the P.R. China (2002a)] storage and production places for dangerous chemicals must keep certain distances from water bodies like rivers and lakes (Art. 10). Certain dangerous chemicals can be transported along the inner rivers with government's permissions only (Art. 40). The direct impact e.g. through wind erosion of ship loadings on the areas adjacent to the canal banks could not be evaluated in the project period. This must be done later. Also, later a specific risk protection or risk management in case of accidents of such ship transports of hazardous materials should be prepared as this could not yet be identified.

2.7.6 Transportation issues

- Impact of water traffic safety regulations

Even though the water body of the canal is not considered to be part of the wetland park project, the ship traffic has strong influence on the connectivity of the parks on both canal banks. Interviews with the Yangzhou Transportation Bureau (YTB) and the Sea Affairs Office (SAO) made it clear that the commercial ship traffic passing through the "San Wan" project is rather sensitive to other traffic crossing the canal. For transportation safety reasons ships and harbors have to follow procedures approved by the appropriate management office [cf. The State Council of the P.R. China (2002b)] and the responsible authorities have to guarantee specific dimensions of the navigation channel.

An economically efficient mass transport of chemicals, sand and coal for the factories near the "San Wan" project requires long pushed barge trains. These barge trains can reach a length up to 300 m. That's why especially the three canal bends challenge the ship's masters to perform safe maneuvers, which according to YTB excludes the construction of an additional bridge in the bends.

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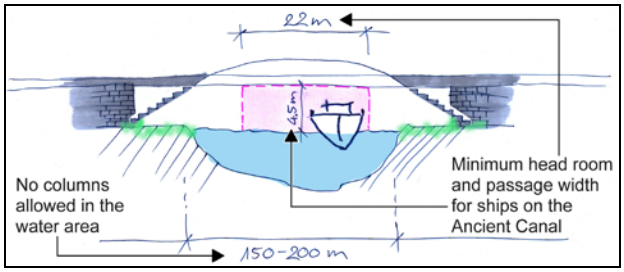
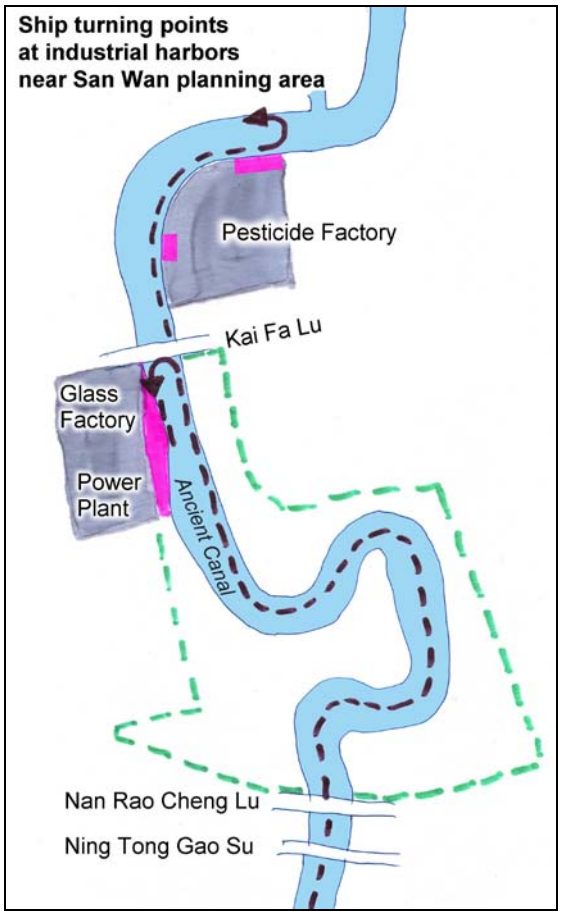


Aerial view (Google Earth, 2008 Feb):
Pushed barge trains maneuvering south of the power plant harbor around the east bank wetland peninsula

- Dealing with the harbor area

West of the Ancient Canal, adjacent to the northern part of the planning area, exist a glass-ware factory and an electric power plant. Here the canal bank on a length of about 250 m is used as industrial harbor to unload coal and raw materials for these industries. It seems that at least in the mid-term run the harbor will be needed for these industries. Even though this area was proposed to become a part of the planned wetland park, the CDIA team did not recommend doing that. Only in the very long run, if ever the power plant may be removed, it is conceivable that there could be a park entrance in this part.

Another issue is introduced by the need of the barge trains to turn around on the Ancient Canal. While entering the area from the south (coming from Chang Jiang), after un- or uploading at the factories they are not allowed to proceed straight to the north and pass through the Old City area. So, near both docking stations (harbors) all ships have to make a U-turn and head back to south. It is questioned by the YTB, if in the neighborhood of the turning point south of Kai Fa Lu an additional bridge could get a construction permit.



- Change of street network

The new street network on the eastern canal bank, as proposed by the Yangzhou Urban Planning Bureau, cuts through the existing villages. However, one of CDIA proposal's center issues is the protection of a true and economically sustainable balance in this area, which includes the villages. That's why a slight amendment to the planned street network is recommended (cf. "San Wan Gong Yuan" Development Framework, hereunder). The amended network may even provide better proportions for future urban development.

- Problems of a park entrance from the western side

Except from the western side of the planning area convenient entrance sites can be produced easily. But along the border of the western park the above mentioned harbor, large industrial sites and planned new main roads (along the southern border) leave only narrow space for an attractive and convenient park entrance, which has to accommodate management and gate facilities as well as spacious car and bicycle parking. The concrete margins for the western entrance, which is one of the main entrances, needs further investigation by the detail planners.

Points of investigation for western park entrance

2.8 Village-Park-System

Considering the restrictions by water traffic safety regulations and all other given conditions as described above, we recommend to use the following principles:

- Development of two parks with readily distinguishable characters on each side of the Ancient Canal (in the following referred to as “West Park” and “East Park”)
- Improvement and integration of agricultural land and villages on the east side
- Both canal banks shall be made publicly accessible on full length to pedestrians and bikers only
- No additional bridges between the existing Kai Fa Lu Bridge and the planned Nan Rao Cheng Lu Bridge; new pedestrian bridges only as attachment to the existing and the planned street bridges. Ferry boats to cross the canal only under special traffic regulation.

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2.9 San Wan Gong Yuan - Development Framework

The development framework is a basis for further detailed planning, currently in progress. The detailed planning has been contracted to Nanjing Forestry University under the supervision of the WGO. The Yangzhou Construction Bureau proposes to consider the CDIA ideas in the detail plan of the wetland park.

Nevertheless, according to YCB's earlier demand for proposals for definition of a reasonable park boundary, the area of this development framework differs from what is referred to by WGO, because the CDIA development framework recommends to rather integrate the existing villages instead of destroying them (cf. "Parameters of new developments).

2.9.1 Relations of the "East Park" and the "West Park"

- Park type and entrance fees

The "East Park" as a chain-linkage of various uses and designs (village-park-agriculture-wetland-village …) shall be publicly accessible and its access free of charge. The area shall serve as a neighborhood recreational area, including shopping (especially farm shopping) and a small but significant wetland area.

The entire "West Park" shall be a constructed wetland park with exemplary character for renaturing formerly contaminated city areas, where visitors shall be charged an entrance fee. A core zone shall be left to a natural, undisturbed development. The "West Park" of San Wan Gong Yuan shall also serve research purposes and include educational facilities with a strong focus on children and students.

2.9.2 The "East Park"

Considering that in China too much agricultural land is continually vanishing through urbanization we refer to the gradually emerging debate in China, obviously taking place mainly among professionals yet, but internationally in discussion since long, about general new approaches to city development. It was summarized by Prof. Dr. Klaus Toepfer, the former Executive Director of the "United Nations Environment Programme" (UNEP), who said that cities in the past were thought as market places and places of consumption mostly, so that they became the biggest consumers of externally produced goods in the world, being rather "unproductive". To develop them more sustainable in future, cities must be re-thought as "productive" places.

On March 5, 2010, the Chinese Premier Wen Jiabao outlined a similar national policy to the "Third Session of the Eleventh National People's Congress". He mentioned particularly:

"… In accordance with the requirements for balancing urban and rural development, we need to make solving problems faced by agriculture, rural areas, and farmers a top priority in all our work; further strengthen our policies to aid agriculture and benefit farmers; coordinate industrialization, urbanization, and agricultural and rural modernization; … We will move forward with the construction of modem agriculture demonstration sites. … When developing urban and rural areas, we must adhere to the strictest possible systems for protecting arable land and economizing land use to genuinely safeguard the legitimate rights and interests of farmers. …" [underlining by author].

The economic impact of this would be to provide jobs, generate income, stipulate consumption and generate taxes, allow nearby resources to flourish by providing goods & services for immediate or direct use and consumption. This will cut costs and other unnecessary or unwanted impacts of transportation (e.g. air pollution, heavy road deterioration).

Therefore the CDIA proposal only regards the old, worn out industrial sites within the East Park area as disposable land use. The industries should be moved to modern and better controlled industrial

sites in Yangzhou (as was done with many in recent years) and their land be developed step by step to several parks of various sizes. The concept for the East Park is to integrate the new parks and other existing (mostly rural) land-uses into an "eco-village-park", which will show how a future society can harmonize civilized living, nature and agriculture inside an urban environment. This park would be formed by a chain of various land-uses along the canal bank (e.g.: park - village - agriculture - wetland - and so on). A green belt with walkways along the canal bank would link these segments and allow visitors to enjoy nicely designed park areas and normal farm life as well as the average natural fauna & flora of such a landscape during one single promenade. This would increase and re-establish people's awareness of how they live, how they and everybody depend on farming and what impact their living has on their neighborhood, which can remain plain nature.

The local farmers could specialize on eco-friendly agriculture, establish "clean food" shops in their villages and incorporate information facilities, hence becoming producers, traders and educators in one, who rather make a profit on that and start paying taxes instead of living on public subsidies or salaries off the municipal budget.

Each village in several development steps would install a new and possibly natural waste water sewage system leading to biological water purification plants, which only feed purified water into the canal. With this set of activities the villages themselves become a model for a fully self-sustained rural development and an attraction to many park visitors in the same time. Visitors would be coming even from afar to study such a model site.

One area needs to be treated differently: the land triangle in the northern canal curve (nearly a peninsula) is a very low laid land and will be regularly flooded. This area can be regarded as the only area in the entire San Wan Gong Yuan, which is nearly "natural wetland" already. Because the regular flooding is a precondition for the true "wetland" qualities, this land triangle shall only be changed to a minor degree by adding a promenade along the canal bank and a promenade shortcut along the dam (which is protecting the adjacent village) to allow passing the area in case it is flooded.

2.9.3 The "West Park"

This area is completely surrounded by industries and arterial roads. That is also the reason why it could develop in the past as a "backyard" (a neglected backside area) and start to widely accommodate rather dirty garbage recycling activities. At the time of final survey end of January 2010 the recycling activities had been removed and the surface had roughly been cleaned. The waste dumped into fish ponds had not been removed though. It is not known, if the city government followed CDIA's recommendation to move this garbage recycling to another, more appropriate and better managed and supervised place in Yangzhou city.

The "West Park" shall be renatured to become a "wetland park" and the fish ponds shall be connected to the water body of the canal, as soon as its water quality could have been improved.

> *Renaturation is a process of returning natural ecosystems or habitats to their original structure and species composition.* ***Restoration requires a detailed knowledge of the original species, ecosystem functions and interacting processes involved****; Including planting of new trees and, particularly, of native plants in disturbed sites where the vegetation cover has been destroyed, to stabilize the land surface from wind and water erosion and to reclaim the land for other uses. Revegetation practices are employed in mined lands, roadsides, parks, wetlands, utility corridors, riparian areas, etc. [European Environment Agency (January 2010)]*

Due to its location in an area surrounded by industrial buildings there may be a psychological barrier to visit the western park. For this reason the entrance from the west along the edges of industry plots requires a special and careful design to make it more attractive for potential visitors. This may change

after some time, when disturbing industries will have moved away or changed in character (the city in the long run wants to have "high-tech industry here"). However, currently this situation actually even opens a great chance to develop a really protected area for plants, birds, fishes and other small species.

The "West Park" as a whole and especially its eco-core zone would become an outstanding research area of provincial or even national importance to find and improve methods for recovering significantly disturbed inner-city areas and how to bring green, nature-like open space back into the city. This will put Yangzhou on the map in regard to scientific research even nationwide. Education and science as cornerstones of national prosperity can focus in Yangzhou's San Wan Gong Yuan on new, multi-functional approaches to green spaces as a means to cleaner, healthier and more sustainable urban development. Such place of research would attract biologists, environment planners, water treatment experts and landscape designers from all over China to study its unique features.

2.9.4 ECO Core Zone in the "West Park"

A green belt in the "West Park" with walkways for visitors is proposed on nearly the full length of the canal bank. But in a small section the promenade shall bypass a sensitive area: the peninsula with the current fish ponds could become an ecological core zone, where animals and plants could settle without any direct disturbance by people. This is an important feature for a Eco-core zone as only that provides significant results for scientist over a longer period. In order to later become such a scientific research focus, this is an indispensable feature and a prerogative for scientists.

After the fish ponds have been cleaned, the ponds in future may be opened to the canal water body to allow aqua-life connecting. But this would only be reasonable after the water quality of the canal itself has been cleaned up and improved significantly.

The wetland, marked in the "San Wan Gong Yuan" Village-Park-System as "nature reserve" (cf. above map), includes the entire peninsula, which is partially now used for garbage dumping and fish ponds. The idea is to prohibit access by visitors into this area, as to allow flora and fauna to develop on its own biological "natural" conditions. Flora and fauna would "renature" this area by themselves (in contrast to a man-made "park") and create a basis for small animals, especially birds, of high natural and scientific value in the city landscape. Therefore access shall be allowed to researchers only and to especially skilled workers (to maintain flood protection systems and the canal bank). Wild life can however still be observed from outside and from the opposite (eastern) canal bank.

2.9.5 Promenade

The promenade along the canal banks are only one part of the pedestrian walkways, but its most important part. They are connectors to the city pedestrian network; accompany the most interesting water-land-edge and in the same time serve as entrance facilities. The promenade shall be prolonged along the canal banks to the north and to the south, running under the street bridges to connect to the city pedestrian network. The new municipal training center on the eastern canal bank should hand off a land strip along the water to allow a consistent promenade network.

All walkways in the parks shall be designed to allow mixed traffic of pedestrians and bikers. Car traffic must be prohibited. On the other hand, the construction of these walkways needs to fulfill the requirements for emergency traffic as of ambulances, fire brigades and police cars. Especially along the canal banks many benches shall be installed for recreation and for observing nature. Where the promenade runs along a village the resident farmers could establish shops to sell their farm goods directly to visitors.

The existing northern wetland peninsula on the east canal bank, which is flooded regularly, additionally to the bank promenade, needs a bypass at the dry village edge on a dam. So that visitors may enjoy the round tour also during flood times. (cf. above description of the "East Park")

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2.9.6 Harbor area

The canal bank along the narrow northern strip of the "West Park" area is a 250 m long docking station for unloading of fuel for the neighboring power plant and other goods (e.g. sand) for a nearby glass factory. Since this strip is nearly fully used by industrial activities it is recommended not to establish a public entrance here for access to the "West Park".

Harbor area at the power plant near Kai Fa Lu
(red lines: northern park boundaries, as proposed by WGO)

As long as the harbor near the power plant (cf. above "Transportation Issues") is needed for unloading of coal and industrial raw material, this area is not suitable as an entrance area for park visitors and thus is not included in this system. At its southern end a small boat transfer-service could be installed, because here the traffic crossing with in- and outgoing barge trains could be coordinated safer than in other parts of San Wan.

2.9.7 Linking the parks and the city / entrances and gates

Considering the safety conditions given by the Yangzhou Transportation Bureau and the Sea Affairs Office (cf. Meeting Minute of 2&4 Dec 2009) there should be no additional bridge between the already existing street bridge at the north boundary of the project area and the planned bridge at the south boundary of the project area. Technically it would be no problem to attach special pedestrian bridges to the construction of the above mentioned street bridges. Also a carefully regulated and operated boat traffic crossing the Ancient Canal in the straight part north of San Wan shall be applicable. In detail the links are as follows:

a) Three Main entrances connect to the city street network.

b) It is recommended to establish a public bus circle line between minimum three points: (a) the Old City center (e.g. Dongmen Square) and the main entrances of (b) the western and (c) the eastern parks. In the same time the bus line could serve the new municipal training center and the planned shopping areas on the eastern canal bank.

c) At each main gate a reasonably dimensioned car & bicycle parking shall be provided.

d) Management & maintenance facilities are to be provided within the main entrance areas. That includes referring structures at the proposed ferry boat docking station on the western canal bank

e) Five subsidiary entrances connect the close neighborhoods to the parks. One of them in the south will be a gated entrance.

f) Three gates to the "West Park" serve as visitor access control, where admission fees are paid. These are the west main entrance, the south subsidiary entrance and the canal crossing ferry boat service.

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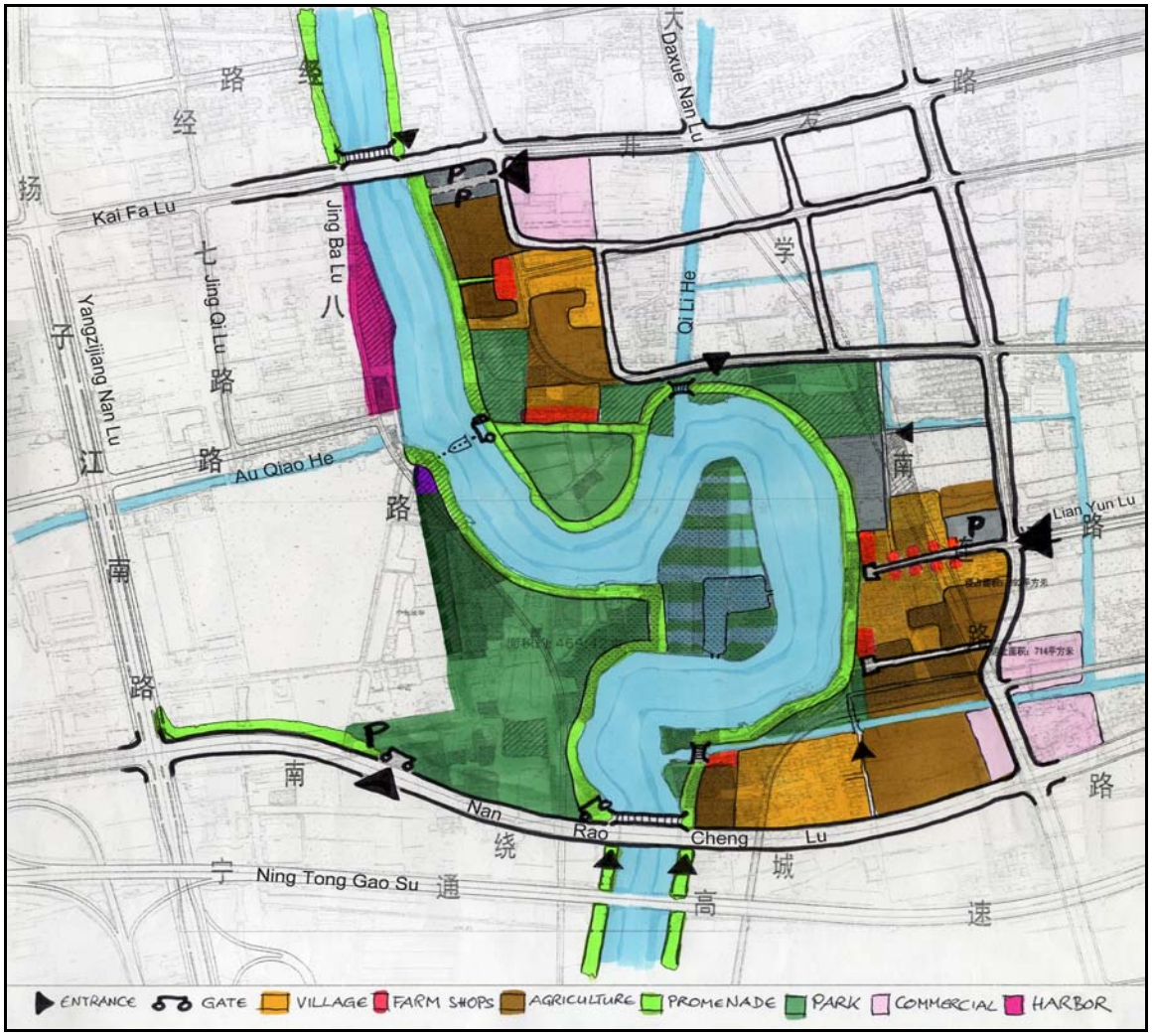
g) The northern pedestrian bridge (attached to “Kai Fa Lu Bridge”) would connect the San Wan Gong Yuan with the other promenades along the Ancient Canal leading to the city center.

h) The southern pedestrian bridge (attached to “Nan Rao Cheng Lu Bridge”) would connect the parks on either side of the Ancient Canal.

i) Small boats, either following a fixed time schedule and/or regulated by traffic lights, link the two parks in between the bridges, at the south end of the industrial harbor.

j) In the long run, after removing factories and the power plant harbor as well as stopping the commercial pushed barge train traffic a tourism shuttle boat service can be established between the Old City and the “San Wan Gong Yuan”.



Yangzhou Canal Rehabilitation – CDIA Project: “San Wan Gong Yuan” Development Framework, January 2010 (The project village-park-system and development framework layout will be supplied in original scale as additional files on a CD)

2.10 Parameters of new developments

The size of the planning area in the beginning was given with about 67 ha by the Water Gate Office and later corrected to about 58 ha. After discussing this issue the Yangzhou Construction Bureau declared that the boundary of the area had not been defined finally, and that the CDIA team is invited to deliver proposals for a reasonable demarcation. The CDIA team then based all investigation on the larger proposal, and later made a proposal to extend the planning area, including the majority of the existing village and farming areas. That is why the total area listed hereunder differs from the

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originally presented size.

San Wan Gong Yuan Project Element	Size	Unit	Remarks
Ancient Canal (water surface)	35.9	ha	not included in park area
Commercial Areas (additional to Village Shops)	7.5	ha	not included in park area
Harbor	2.9	ha	not included in park area
Promenade (area)	**12.5**	ha	
Promenade (length)	*4200*	*m*	in average 30m wide
Standard Parks	**9.1**	ha	
Wetland Parks	**20.3**	ha	including facilities
Eco Core Zone	*7.6*	*ha*	included in Wetland Parks
Agriculture	**16.6**	ha	
Villages	**16.6**	ha	
Farmer Shops	*1.6*	*ha*	included in villages
Total Area (estimation)	**75.1**	ha	

Remarks:

- The promenades along the canal banks have been estimated with an average width of 30 m.
- All measurements have been estimated based on the hand-drawn map of the development framework. The total area differs from the planning area as given by Yangzhou Construction Bureau, because the CDIA development framework proposes to include the villages and agricultural area as well as a shifting of commercial areas to slightly different positions and to exclude the harbor area and the commercial area.

- Architectural requirements and building heights

In the villages, basically existing village houses should be kept as it is. They can be changed, renovated or reconstructed, but the houses should keep a countryside style and a local Yangzhou style. Further new construction should be restricted or strongly controlled. Architecture inside the park should be designed as landscape architecture, integrated into the natural environment. In terms of building heights they should be less than three floors in general. Most of the buildings should be one or two floors high. Only in particular situations they may be three floors high.

2.11 Construction Costs

This pre-feasibility study does not provide a specific cost estimate, because this is depending on the more detailed draft for the wetland park, which is currently in the process of being designed and will not be finished before the end of this consultancy. Therefore the CDIA team had to relate to the political declaration of intended public investment for the park.

The construction shall be financed by public funds. During the steering committee meeting 12 December 2009 the concerned chief engineer of the Water Gate Office reported the approval by the city government of a 348.5 Mio RMB budget for the construction of the wetland park. In the final presentation meeting this figure was corrected to 326 Mio RMB. This budget includes roughly 150 Mio RMB for land compensation and initial works, e.g. planning works.

2.12 Comparison of CDIA proposal and Yangzhou University proposal

2.12.1 Introduction of Yangzhou University proposal

Invited by Water Gate Office of Yangzhou Construction Bureau, the Yangzhou University Architecture Design Institute developed „Yangzhou Ancient Canal San Wan Wetland Park Project Proposal“ (in Chinese 扬州古运河三湾湿地公园工程项目建议书) in June 2009.

According to the “Master Plan of Yangzhou City (2005-2020)” industrial factories (especially

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polluting factories) along the entire canal shall be moved out step by step. Instead residential areas, as well as commercial and cultural facilities shall be developed. Besides, the area west of the San Wan Park is for industrial use. However, these shall be clean and modern and preferably high technology industries, not heavy industries, which may be polluting. In the master plan the park has been identified by the Yangzhou authorities themselves as a city park for recreational use, especially for the residents living nearby.

According to the Yangzhou Urban Water Environment Treatment Plan 2005-2020 (扬州市城市水环境治理规划 2005～2020), the functions of the park shall be entertainment, recreation, release from floods and transportation. The proposal does not provide details about floods, e.g. size of area for flooding, or about the function for "transportation". It only mentions once that floods are to be considered. In the proposal it is also mentioned that along the canal a zone of 30 meter green open space should be guaranteed on both sides.

The proposal stated that all existing buildings (around 30,000 sqm floor area) should be demolished. Newly constructed buildings in the park shall be designed in "countryside style" or "traditional style". Buildings shall be constructed on 20 Mu of land (ca. 13,300 sqm), with a total floor area of 40,000 sqm. Recreation and sport facilities shall be developed on an area of 7,000 sqm. The document mentions that a waterway shall be cut through to make the canal flow straight. It mentions several times a 'central island'. However, it does not clearly state where this 'central island' is located, resp. where the waterway shall cut through.

According to the WGO boundary proposal the size of the whole park shall cover 1004 Mu (which equals to ca. 67 ha).

Future land use in the park	**Mu**	**ha**
Wetland	260	17.33
Green area (trees and bushes)	660	44.00
Buildings	20	1.33
Landscape facilities	*3*	*0.20*
Streets and squares	53	3.50
Play ground and entertainment place	11	0.70
Total Area	**1004**	**66.86**

Remarks: "Landscape facilities" means small facilities such as low walls, small walkways, bridges and so on. They are not calculated as being part of the built-up area and are instead included in other land uses.

2.12.2 Evaluation and Comparison with CDIA proposal

- Functions and urban context (relation to city, neighborhood and agriculture)

In fact, the document proposes a complex modern park including many existing ponds. It has considerations to the neighboring residential lands as a public park for residents. It shall be an enclosed park, separated from surrounding neighborhoods. Agriculture is not included in the park planning ideas.

- Environmental issues (influence on water and land quality)

The proposal has a strong emphasis on improving water quality. It says water quality shall rise from level V to level IV. Several high technologies of water treatment shall be implemented in the park construction. However, it does not consider improving land quality.

The construction of the park itself will bring "nature like" green to the "artificial" urban settlement.

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Therefore, it has a positive influence on the environment. However, during the construction of the park, environment issues should be considered such as environment friendly materials and energy saving techniques.

- Water courses related issues (transportation, traffic safety)

The proposal does not consider plans and investments into transportation of goods or visitors. However, it proposes an emphasis on the reconstruction of the canal banks.

- Infrastructure related issues (accessibility, sewage)

The proposal does not mention other accessibility issues. Sewage is mentioned: all the waste water should be treated. Polluted water should not be fed into the canal. Ecological methods (not specified) should be used for canal water treatment.

- Social issues (affected population, influence on working places)

The proposal does not have any consideration for affected population. All existing population should be moved out. With the opening of this park, a very limited number of working places will be added to the local economy. However, people doing these jobs will be employed by the municipal government. They will add costs to the city budget instead of earning fiscal income for it. In addition this does not necessarily contain offers to the existing population.

2.12.3 Comparison with CDIA proposals

- Proposals equivalent to CDIA proposal

a) Water treatment: waste water should be treated before entering the canal.

b) Green belt: green open space along the canal is considered.

- Proposals in conflict to CDIA proposal

a) Social issues: villagers are not cared for in the proposal of Yangzhou University. However, it is an important economic and social aspect, which should not be ignored for social as well as for cost reasons as it may even become more and more costly, on the long run without returns.

b) Respecting the existing conditions: there exists farming, fishing and other agriculture activities in the affected villages. In the proposal of Yangzhou University, existing agricultural activities are not part of the future development.

c) Connecting with urban surroundings: the CDIA proposal provides a careful consideration on the impact of surrounding industries, residential areas and transportation of dangerous goods on the canal. However, the proposal by Yangzhou University does not provide any substantial consideration of industrial neighborhood and goods transportation or related service.

2.12.4 Indications of works to be done on rehabilitation of water bodies and adjacent land

For the implementation of this project the following works have to be done as the next steps:

- To involve more important stakeholders in the planning and development process

The wetland park has its special function in regard to education and scientific research. Therefore, the needs of such institutions have to be included in the design. Their opinions should be asked during the development process. At moment, the Water Gate Office of Yangzhou Construction Bureau is in charge of planning and implementation of the park. However, the plan of the park and its future use are closely linked with other institutions such as the environmental bureau, the transportation bureau, the agriculture research institution and so on. The park shall be developed on a basis of correct and extensive social background instead of creation on an empty site, which it is not. The Water Gate

Office of Yangzhou Construction Bureau could function as a coordinator. Therefore it should certainly not be the only one office which decides upon the future of the wetland park.

- To introduce the specifications of wetland parks to the authorities

For most Chinese authorities, wetland parks or areas are a new phenomenon. Local authorities see wetland parks simply as parks with patches of "wet" land or lakes, ponds and rivers in it. Concepts like sustainable development, ecological concepts and social aspects are merely known and if so not important issues for them. If they know of them they normally do not relate them to a wetland area. Instead the involved authorities are actually seeing wetlands and wetland parks as a means to introduce modern and therefore normally very expensive high technologies to the parks. It is not known that careful planning and designing can and should be based on the existing situation by making use of existing resources, and that it should instead refer to reaching an ecological balance of that particularly area, where a wet flora and fauna should feel welcomed, protected and at home. In addition, it should in future be understood by the involved authorities that this kind of park adds a highly valuable asset to the living quality of their city. Therefore training of cadres and other authorities and the rising of general public awareness on wetland parks and their ecological design is necessary. If ever possible, site visits, training courses and seminars in successfully implemented wetland parks shall be offered to the decision-makers. Yangzhou City can well become a forerunner of this kind of development in China and in future serve as a training ground for cadres and authorities from other urban settlement and areas suffering from similar symptoms.

2.13 Requirements for Subsequent Preparatory Work

- To define a clear border of the park

Until now, the border of the park is not clearly defined. Therefore, the surrounding residential and industrial areas are constantly eating up more of the land of the proposed wetland park piece by piece. That makes it difficult to safeguard sufficient size of land for its development. The existing land which could be used is already much smaller than the size originally shown in the current Yangzhou Master Plan (reduction of more than 50%). Plants and animals can live in an eco-system only when it is providing a certain scale. Besides, for a city like Yangzhou, the built-environment is increasing while the natural environment is disappearing. A strict border for a wetland park soon is necessary to be defined.

- To compare the cost of different plans

An ecological wetland park shall be sustainable in economic terms including those of direct cost as well. The cost of different plans should be carefully compared. Social aspect should also be included in the cost calculation. It seems that plans which are superficial, exaggerated and expensive are more preferable for authorities other than modest, low cost, and useful but not "shining" or "showing" grand designs. Hence, more and more budget is demanded for the park construction instead of saving cost by design and purpose. An elaborate cost calculation based on a careful comparison will help the decision-makers to understand the sustainable way of realizing the wetland park development, also in economic terms.

2.14 Annex

2.15 References

European Environment Agency (Jan 2010): EIONET Thesaurus, European Environment Information and Observation Network, Copenhagen (http://www.eionet.europa.eu/gemet/concept?ns=1&cp=7104)

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Ministry of Construction of P.R. China (2005): Blue Line Management Regulations, Beijing (城市蓝线管理办法)

Ministry of Transport of P.R. China (1999): Regulation of Navigation Safety Management and Water and Underwater Construction, Beijing (中华人民共和国水上水下施工作业通航安全管理规定)

Beijing Turenscape Company (2009): The Hou Tan Wetland Park of World Expo 2010, Shanghai (上海世博会园区后滩湿地公园设计) (http://www.chla.com.cn/html/c149/2009-02/28064.html, visited on 26.02.1010)

The State Council of the P.R. China (2002a): Dangerous Chemicals Safety Regulations, Beijing (危险化学品安全管理条例)

The State Council of the P.R. China (2002b): Inner River Transportation Safety Regulations, Beijing (中华人民共和国内河交通安全管理条例)

Yangzhou University Institute of Architectural Design (June 2009): Yangzhou Grand Canal San Wan Wetland Park Project Proposal, Yangzhou (扬州古运河三湾湿地公园工程项目建议书)

2.16 Additional documents

Following documents are supplied as external files on CD:

- Map: Location of the Wetland Park Project in Yangzhou City (English, Format JPG)
- Map: Location of villages in planning area (English, Format JPG)
- Aerial Views: Montages of Google Earth Screen shots (Format JPG)
- Plan: San Wan Gong Yuan – Village-park-system (English, Format JPG)
- Plan: San Wan Gong Yuan – Development Framework (English, Format JPG)
- PowerPoint Presentation: Wetland Park Development Frame - Final Report (English/Chinese, Format PPS)
- Selection of photos of the project area (Format JPG)
- Shanghai WORLD EXPO 2010 – Wetland Planning (Chinese, Format DOC)

2.17 Shanghai WORLD EXPO 2010 – Wetland Planning

The following example of Shanghai WORLD EXPO 2010 – Wetland is presented here, to illustrate the possibility of integrating existing structures. In the Shanghai case these are existing industrial structures, which in Yangzhou could be existing villages. Yangzhou additionally has the advantage to not only integrate the structures but human resources in the form of the village population too, which would make the entire “San Wan Gong Yuan” area very lively and sustainable.

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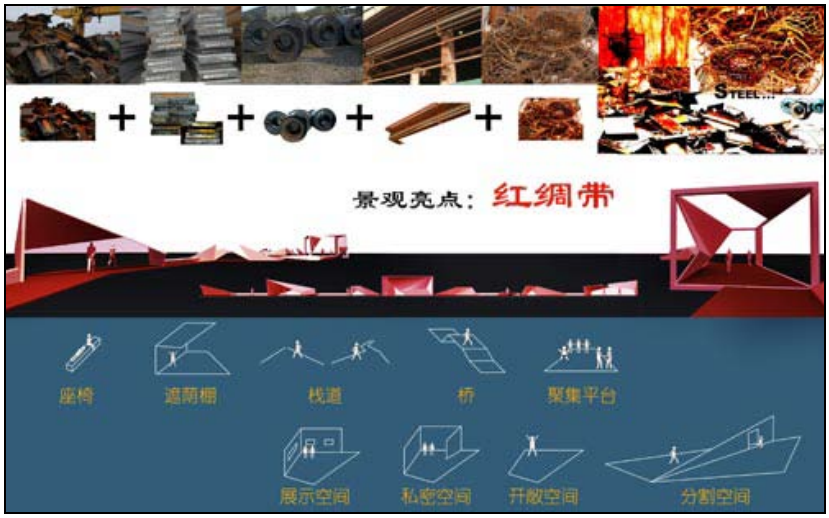
Shanghai Expo Hou Tan Wetland Park Design

2009-04-09 Author: Beijing Turenscape Company

Reference: http://www.chla.com.cn/html/c149/2009-02/28064.html, visited on 26.02.1010

(The following is a translation of the Chinese original, which will be included in the additional documents)



The 2010 Shanghai Expo Hou Tan Park is located at the bank of Huang Pu River, west to the Ni Jia Bang and east to Pu Ming Road along Da Pu Qiao Tunnel. The total size of the Hou Tan Wetland Park is about 18.2 ha.

The design features of the plan can be summarized as “Four Civilizations linked by a Blue Belt”. “Blue Belt” means overall structure framed by “three belts - one area - three squares - nine gardens” and pedestrian network. Four civilizations include “Return of Tan”, “Five Crop Farm”, “Industrial Heritage” and “Post-Modern Industrial Ecological Culture”.

Six questions and challenges faced by the design of Shanghai Expo Hou Tan Wetland Park

Firstly, the Hou Tan Area still keeps the only natural wetland in Shanghai city along theHuang Pu River which has experienced changes over two thousand years of history and witnessed ups and downs of an agricultural economy. How to follow the principle of an eco design, respect existing space and satisfy multi-experience needs?

Secondly, how to conserve, recover and reconstruct eco-wetland?

Thirdly, a huge amount of visitors are expected to visit World Expo within a limited period. Designed daily visitor number is 400,000 while peak day is 600,000 and for extreme peak days 800,000.

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A reasonable capacity in the Hou Tan Wetland Park is a number of 26,600 persons and the maximum capacity is reached at 37,800 persons. The south of the wetland park is connected with west entrance square of the Expo Park. A water entrance at the center of the wetland park is the only entrance by water to the south of the World Expo Park. The east of the wetland park is connected with the World Expo central green open space. The question is how to circulate smoothly such a big number of visitors?

Fourthly, according to the requirements for flood resistance based on the master plan of the World Expo, designed height of flood resistance standard is 6.7 meter which is to avoid flood frequency of once in 1000 years. The average mean tide level of Huangpu River is at 2.24 meter, the mean high tide level is at 3.29 meter and the average low water level is at 1.19 meter. It could be observed that the height difference between flood resistance standard and average normal water level is around 5 meters. Thus the problem occurs how to overcome the height difference between flood resistance standard and a wetland park?

Fifthly, the function of the World Expo site will be changed after the event. During the Expo period, the function of the wetland park is identified as a safe circulation and relaxation area while the function of the park will be more focused on wetland protection, aesthetical aspects of an eco-wetland area, and on science and education. The question is how to satisfy the different needs during and after the World Expo?

The sixth question would be how to implement modern concepts together with high technologies for the development of the Hou Tan Wetland Park?

The following six design strategies are proposed for comprehensive solutions.

The first design strategy is to link the park with the “four civilizations”. Based on this plan, different layers are designed to accommodate “four civilizations”, which are a wetland eco-landscape layer, an agricultural civilization landscape, an industrial civilization heritage layer, and a post-industrial civilization experience layer. These four layers are linked by a time sequence, a space background and a site character that integrate with each other and thus can and will function together.

The second design strategy is to develop a wetland base by “Three Belts and One Area”. The plan is structured by “two bunds in harmony with each other”. The base includes four parts: an eco-plants belt, an inner river purification wetland belt, a farm belt and an authentic wetland protection area.

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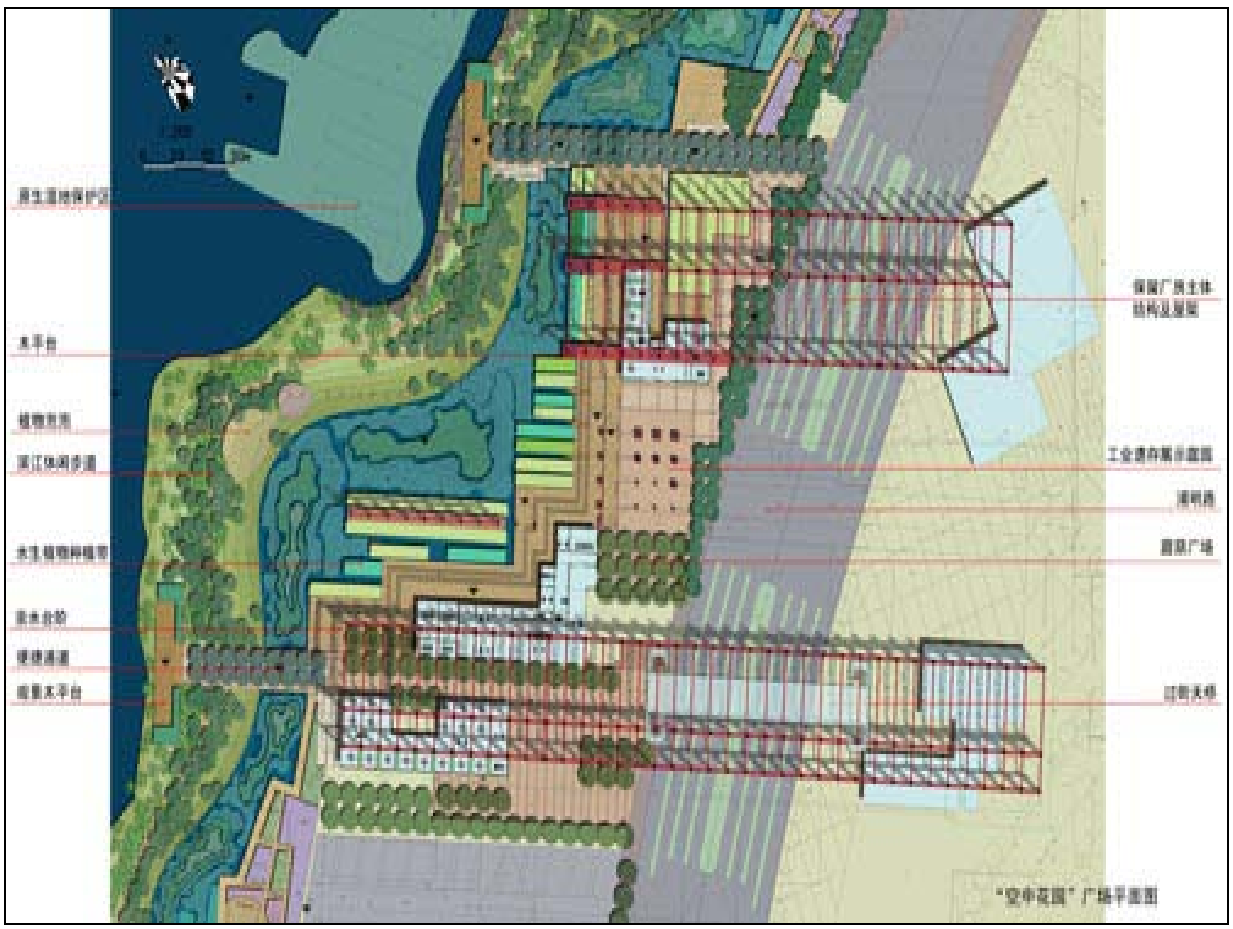
The third design strategy is to include “three squares and nine gardens”, meaning a pedestrian network transportation system. The transportation system in the park is characterized by a transportation network comprising of one ring and nine lines, a relaxation space of three squares and nine gardens. Three squares are a) a Sky Garden Square to the west (reuse of industrial building), b) a Water Gate Harbor Square at the center and c) a Flowing Garden at the east (connected with the exhibition area). The “Nine Gardens” are several places for the arts in the wetland park so as to create a multi-experience space. Networks of a pedestrian system link all the different spaces and thus a comfortable pedestrian system is in place.

The fourth design strategy is to use various terraces. The plan introduces agricultural layers and landscape layers established in terraces to balance the height difference between flood control line and inner wetland river purification area.

The fifth design strategy is to implement a way of flexible design to satisfy needs both during and after the EXPO event. Principles of saving resources and minimizing changes after the World Expo event are to be followed. The design takes full consideration of the park functions after the event. Flexibility for the use during and after the event is integrated into the design of a functional architecture, public facilities, pavement and other aspects.

The sixth design strategy means high technology led by eco-concepts. Ecological and cultural concepts are included in the design process of Hou Tan Wetland Park, in terms of methods and technologies for reconstructing the Wetland Park, conservation and re-use of industrial heritage and other ecological and sustainable development.



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SECTION 3: ENVIRONMENTAL ANALYSIS

The city government of Yangzhou intends to re-develop water-front land and commission the Cities Development Initiative for Asia (hereinafter refer to "CDIA") to perform a pre-feasibility study for the proposed project. It is understood that the government plan to build a wetland park (San Wan Gong Yuan) in an area which consists of residential housing, farm land, ponds, and some historical and present industrial activities. The proposed area with approximately 1558 mu , including land area 1004 mu and water area 554 mu, is located at 4.5 km south of the city center. The ancient canal passes through the area with flow direction from south to north.

Peter Kraemer and Brooks Li were hired as Independent environmental experts to assist to provide economically and suitable solutions concerning on soil and groundwater issues.

3.1 Objectives

The objectives of this consultancy are:

a. make an overall assessment of the major environmental issues to be addressed in the context of urban upgrading and redevelopment in Yangzhou's old city center;

b. identify the re-development needs for the wetland park area and propose if needed design solutions. Special attention must be given to the specific circumstances of existing infrastructure, limited space, conservation efforts and modernization needs;

c. list the minimum requirements for any subsequent, necessary preparatory (feasibility) work for the pilot area regarding identified environmental issues, and to participate in the preparation of the final report under the supervision of the team leader..

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3.2 Summary (Environmental)

According to site observation, interview with local authorities and residential people in the project area and review of available information, the results can be summarized as follows:

In general, from the environmental point of view the project area with its ponds and wetland areas appears to be a possible location for a wetland park and will be significantly more environmentally friendly than the present use.

The present use of the project area includes a variety of different activities. The following land uses have been identified:

Total project land area: approximate 669,668 m²

1. Landfill and Dumping Area approx. 24,000. m² (3.6 %)
2. Present Industrial Activities approx. 109,200 m² (16.3%)
3. Former Recycling Activities at Former Industrial Property approx. 16,100 m² (2.4%)
4. Former recycling Activities approx. 64,300 m² (9.6%)
5. Residential Area approx. 96,400 m² (14.4%)
6. Agriculture Land approx. 146,000 m² (21.8%)
7. Sand Pit approx. 5,400 m² (0.8%)
8. Green Land approx. 126,500 m² (18.9%)
9. Public Park approx. 6,700 m² (1.0%)
10. Fish Pond approx. 75,000 m² (11.2%)

The different land uses are illustrated in the attached map.

In the areas of No. 1 to No. 4 a contamination of the underground due to present or past activities can not be excluded. For the remaining areas significant pollution is not expected, but can not be excluded. In the next phase, the areas of No.1 to No. 4 should be further investigated in detail and an underground investigation plan should be developed. Following the soil and groundwater investigations, a preliminary cost estimate for remediation requirements can be prepared.

The remediation requirements and remediation target values have to be developed based on the planned use of individual areas in the project area. New developing national and local regulations have to be applied, for example the new regulation of Jiangsu Province (*the Regulation on Prevention and Control for Environmental Pollution from Solid Waste of Jiangsu Province put into force since 1st January 2010*). In order to ensure that responsible individuals or companies contribute to the remediation costs according to their liability, it is recommended to identify the major present potential polluters, including the companies or persons responsible for the ongoing waste dumping activities.

For the construction of the wetland park, the present environmental legislation requires for example the preparation of an environmental impact assessment (to be conducted by a certified Environment Impact Assessment) institute)

During the site visit a number of ongoing activities were identified that obviously lead to a pollution of the environment. The cost for corrective measures will rise until these activities are stopped. The activities of concern are e.g.:

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1. Waste dumping activities.

Along the banks of the canal, in ponds and in individual areas in the project area large amounts of waste have been dumped. The dumping including the dumping of industrial waste is ongoing. It can not be excluded that the dumped wastes already lead to groundwater contamination that requires remediation. Since all dumped wastes may have to be removed for the creation of the wetland park, the immediate stop of these activities is necessary to avoid rising costs for corrective actions.

2. Former recycling Activities

During the site visit on 25 January 2010 we noted that nearly all recycling activities have been moved. Therfore we refer to this area as 'former' recycling activity area. Subject of the recycling activities were mostly plastic items, such as empty beverage bottles etc. which appear to represent only a limited hazard to the environment. However, the recycling activities included also the dismantling of refrigerators. It is unclear if the hazardous cooling liquid is discharged properly or a contamination of the underground is ongoing. Considering the large number of dismantled refrigerators, this appears to be a significant issue with potential major contamination of the underground. It is recommended to clarify the present disposal of the cooling liquid. In case the present disposal of the cooling liquid presents a hazard to people or environment, these activities should be stopped immediately.

3. Pollution via Qili-River

During the site visit, the Qili-River, a contributory of the Ancient Channel, was black colored and appeared to be biologically dead with dead fishes drifting on the surface. Since the river affects the area of the planned wetland park and a rehabilitation of the river may require significant time, we recommend to identify the source of contamination in order to prevent the creation and release of the pollution as soon as possible.

3.3 Introduction

Urban water body rehabilitation is a priority for many cities in China as it has been in Yangzhou. As the national south-north water diversion project will have its starting point in the city of Yangzhou. Special focus was given by the municipal, provincial and state governments to Yangzhou's water bodies in hope to excel the project and guarantee the optimal result..

Urban development and industrial growth have led to serious pollution of rivers and canals in the past. Relocation of polluting industries, introduction of cleaner technologies in industries, river bank rehabilitation, river beds clean ups and increase of self-purification capacities of water bodies have been discussed and applied with some success.

CDIA assistance will help to provide pre-feasibility support to structure river / canal rehabilitation in line with land development with focus on wetland development along their banks. CDIA support will combine identification of technical measures to be undertaken for rehabilitation of water bodies and of most suitable solutions for redevelopment of its adjacent land to make efforts financially sustainable. CDIA support would also include identification of financing partners to initiate identified pilot projects.

This project will provide integrated solutions for relocation (if necessary), clean up and re-development in the context of overall development of Yangzhou's urban area.

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The support on river / canal rehabilitation will be carried out in combination with urban upgrading support as both projects can benefit from each other if located in adjacent areas and some of the expertise needed can be utilized for both projects.

The city government of Yangzhou has decided on a pilot area approximately 1558 mu, including land area 1004 mu and water area 554 mu located at 4.5 km south of the city. The major objective for land redevelopment is to create a wetland area (named San Wan Gong Yuan)for recreational purposes with some other forms of integrated applications. An electronic map which addresses boundary (red line) for the proposed area was provided by the Yangzhou Urban Planning Bureau (UPB) with assistance of the Yangzhou Construction Bureau (CB) prior to the 2nd Visit.

Peter Kraemer and Brooks Li hired by CDIA as environmental specialist are to assist this pre-feasibility study on Land Redevelopment in Yangzhou.

3.4 Organization and Schedule

Peter Kraemer and Brooks Li are hired as independent consultant to finish the assistance work within the 3 months project period (from mid October 2009 to mid January 2010). Based on the preliminary site visit on 22nd -24th September 2009, subsequently site visit for detail investigation was completed on 4th -6th November 2009. The officer of Yangzhou Environmental Protection Bureau (EPB), Mr. Liu Yulin was interviewed twice and relevant documents were provided for review during the site visits.

3.5 Analysis of Development Issues

3.5.1 Current Situation

The proposed area is located at approximately 4.5 km south of the city center. A detailed site visit was performed to identify the present use of the area and to identify any potential environmental risks and requirements to convert the area to a wetland park.

Immediately north of the project area is East Kaifa Road and Jiangsu Yangnong Chemical Co. Ltd. located on the opposite side of the road. The project area is bounded to thermal power plant, Trail Truck Company and subsequently following to Food Company and Middle Yangzijiang Road. Immediately south of the project area is Ningtong High Way and residential houses located on the opposite side of the High Way. At east of the project area, there are numerous residential houses and farm land.

According to the interview with residents and Yangzhou environmental officer, the site was used on agriculture purpose before 1980. Since the 80s some industrial factories commenced its operations at the proposed area or near the area. Some companies have been closed and some were relocated. No detail information of these companies was available for review. The on-going waste dumping and segregation activities were observed during the site tour. According to the local residents, the waste segregation activities have been occurring for over ten years.

A site visit was conducted on 4th-6th November 2009 to fully understand the currently situation within the boundary of the proposed area. The project areas are used for fish ponds,

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rural/agricultural purpose, industrial property and a small (presumably illegal) landfill area (waste dumped by trucks in ponds). The activities occur at the site are classified with the following categories based on the present land utilities:

- landfill and dumping area, 24,000 m², 3.6 %;
- present industrial activity, 109，200 m², 16.3 %;
- former recycling activities at former industrial property,16，100 m², 2.4 %;
- former recycling activities, 64,300 m^2, 9.6%;
- residential area, 96,400 m^2, 14.4%;
- agricultural land, 146,000 m^2, 21.8%;
- sand pit, 5,400 m^2, 0.8%;
- green land, 126,500 m^2, 18.9%;
- public park, 6,700 m^2, 1.0%;
- fish pond, 75,000 m^2, 11.2%

The detail areas located are shown in the Appendix A.

The significant activities happen at the site are in placed as the following description:

Landfill and Dumping Area

This land use covers approximately 24,000 m² (3.6%) of the proposed land area..

During the 2nd site visit, the following waste dumping and segregation activities were observed at the proposed area:

- Ongoing waste dumping activities. The use of fish ponds as waste dump has significantly increased since the first visit in September 2009. One fish pond has been half filled with industrial waste including paint or dye; one fish pond has been filled with garbage and plastic waste;
- Approximately 100 or more truck loads of construction waste (including asbestos) and other wastes (e.g. Picture tubes (TV-Bildröhren, 电视显像管), plastic bags, and foam materials) have been dumped along the streets and river banks. Some burned ashes were observed at the bank along the ancient canal;
- Some solid domestic wastes were dumped at the residential areas;
- One pond has been completely destroyed and filled with concrete drainage and wild-growing plants in the adjacent pond is suffering due to the drainage from a local concrete mixing plant.

China has issued a series of standards regarding solid waste disposal and treatment which stipulate measurements to be taken against soil and groundwater pollution. However no measure to be taken against soil and groundwater pollution was observed at the subject areas during the site audit. The contamination of soil and groundwater at the proposed area could not be excluded. Waste burning along the river bank might also generate some persistent organic pollutants (POPs) (e.g. dioxins).The wastes have to be removed and the

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remaining contamination has to be cleaned ups as wetland parks cannot tolerate any waste dumping practices.

Potential underground contamination: Waste dumping activities and incineration at open area could have been leading to soil and groundwater contamination.

Present Industrial Activities

This land use covers approximately 109,200 m² (16.3%) of the proposed land area.

During the site tour, tens industrial factories were observed within/partly within in the boundary of the proposed site. The name of some factories was not visible due to the limited available information or factories closedown. The existing industrial activities range from machinery, chemical drum reconditioning (water flush cleaning), color package material, stamping, shoe production, concrete mixing, plastic box production and other diverse activities (general mechanical processing, plastic crashing and wood processing).

According to the information provided by the local EPB, 2 factories have been closed due to bankruptcy and another 2 factories have been shutdown in 2008 and 2009. Among of these enterprises, only one factory holds all the required environmental impact assessment files, including the inspection and acceptance certificate of their environmental facilities (Please refer to Appendix B).

Some of the former factories have been demolished and other former factories (for example, the former shipyard) have been occupied for other use (e.g. wood processing and painting, plastic crashing and wastes recycling).

The industrial operations which involve hazardous materials (including the former industrial use) might pose potential adversely environmental impact for the proposed project (e.g. contaminated soil and groundwater, asbestos, residual hazardous substance at the site).

Except the adjacent coal power plant and the chemical facilities located at the north of the project area, no major air emission source is in place in the immediate vicinity of the park.

During the site tour, no significant source of noise to the environment was observed.

Potential underground contamination: Former and present industrial activities could have been leading to soil and groundwater contamination.

Former Recycling Activities at Former Industrial Properties

This land use covers approximately 16,100 m² (2.4%) of the proposed land area.

According to the site observation, large residential areas and some closed factories appear to be used for waste recycling. No detailed information was provided by the local residents. Due to the lack of information about the former industrial operation and the current activities, the contamination of soil and groundwater at these areas could not be excluded. Of special concern is the recycling of refrigerators. It is unclear, if the cooling liquid has been disposed properly. It can not be ruled out that significant quantities have been drained to underground.

Potential underground contamination: Former industrial and ongoing recycling activities could have been leading to soil and groundwater contamination.

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Former Recycling Activities

This land use covers approximately 64,300 m² (9.6%) of the proposed land area.

Large amount of plastic items were observed at the residential yards, along the river banks and fish ponds. The items consist mostly of plastic goods that are segregated at this location and then shipped to other locations. (e.g. empty beverage bottles, lubricating oil bottles, rubbers and tyres). In some areas where lubricating oil bottles are stored, large oil stains could be seen on the unpaved surface. Other waste household appliances were dismantled to recycle nonferrous metal as reported (e.g. refrigerators and Picture tubes (TV-Bildröhren, 电视显像管)).

It appears to be only a limited hazard to the environment posed by the recycling of plastic items. However the dismantling of refrigerators with cooling liquid could raise significant environment concern. It is unclear if the hazardous cooling liquid is discharged / disposed off properly or a contamination of the underground is ongoing.

Potential underground contamination: the improperly disposal of waste coolants and storage of the oil container as well as the electronic parts might have been leading to soil and groundwater contamination.

Residential Area

This land use covers approximately 96,400 m² (14.4%) of the proposed land area.

Residential areas are occupied by village houses and adjacent gardens. These buildings are mixed with industrial properties and most buildings in the western project area are used for wastes recycling (see above). In some areas small livestock breeding activities were found in the residential areas (e.g. pigs and poultry). It is obviously that no sewage system is in place in most of the residential areas. However it is expected that only limited contamination to environment was caused by the local residential areas and small livestock breeding activities.

Agricultural Land

This land use covers approximately 146,000 m² (21.8%) of the proposed land area.

Agricultural lands are around the residential areas and mostly cash crops were planted at the time of site visit. Part of lands along the river banks and fish pond are also developed and cultivated by vegetables. It is expected that pesticides, fertilizes and herbicides were used before. However potential environment concern for soil and groundwater contamination from these activities is expected to be limited.

Sand Pits and Sand Transfer Area

This land use covers approximately 5,400 m² (0.8%) of the proposed land area.

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A sand pit located at the western part is used for sand storage. No significant environmental concern was found at the time of site visit. Therefore the potential environment concern for soil and groundwater contamination from these activities is considered to be limited.

Green Land

This land use covers approximately 126,500 m² (18.9%) of the proposed land area.

Green lands in the project area comprised of the wild-growing plants along the river banks and streets, as well as fresh water pits/ponds covered fully with floating aquatic plants. However the on-going waste dumping and landfill activities are destroying the natural green land areas. One pond has been completely destroyed and filled with concrete drainage and wild-growing plants in the adjacent pond is suffering due to the drainage from a local concrete mixing plant. Based on current knowledge, potential environment concern for soil and groundwater contamination in these areas is limited.

Public Park

This land use covers approximately 6,700 m² (1.0%) of the proposed land area.

A local public park (Jiulong Park) located at the eastern project area is designed with good landscape. It also benefits the proposed wetland park project. Based on current knowledge, potential environment concern for soil and groundwater contamination in this park can be considered to be limited.

Fish Ponds

This land use covers approximately 75,000 m² (11.2%) of the proposed land area.

Several fish ponds located at the western part were observed during the site visit. According to the local residents, freshwater fish are cultivated in these ponds. These ponds would also be very helpful to keep more water bodies in a wetland park area. Based on currently knowledge, potential concern for soil and groundwater contamination is limited. However, it can not be excluded that waste dumping has led to a contamination of the sediments in the ponds.

Other Issues

During the site visit, the Qili-River, a contributory of the Ancient Channel, was black colored and appeared to be biologically dead with dead fishes drifting on the surface. Since the river affects the area of the planned wetland park and a rehabilitation of the river may require significant time, we recommend to identify the source of contamination in order to prevent the creation and release of the pollution as soon as possible.

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3.6 Development Need

It is understood the Yangzhou Government intend to develop an attractive scene at the proposed area. The site is located at approximately 4.5 km of the southern of the urban center. It is occupied by industrial enterprises, residential houses, agricultural lands, fish ponds and natural wild-growing plant. No major air emission source was in place in the adjacent area, except the thermal power plant and the adjacent chemical facilities located north of the site. No major noise source was observed at the site from the adjacent activities. The significant issues may rise from the potential contaminated soil and the polluted water resources at the site.

It is very important for the Yangzhou government to build an attractive wetland park at an area with uncontaminated land, clean water bodies, fresh air and silent environment. Therefore the significant environmental impact by the water bodies and potential contamination present in the soil and groundwater should be taken into account.

3.7 Project Identifications

Environmental Impacts

Based on the site observation and interview with the local residents, adversely environmental impact should be addressed as follows:

Water Resources

The site is located in a remote area away from the city center in which industrial enterprise, residents and other waste collection activities formed the core of its function. Wastewater effluents which flow into the canal are from upstream and adjacent industrial treated wastewater, domestic wastewater and runoff from the solid waste collection areas. During the site visit, the water of the canal tributary (Qili river) was black colored with dead fishes drifting in the river. According to interviewed local by-passers, the river appears to show this characteristic quite often.

The Yangzhou Environmental Protection Bureau has performed periodically surface water monitoring program in Yangzhou. According to the local environmental officer, the surface water in the ancient canal is classified as a Type V water body *(Environmental Quality Standard for Surface Water (GB 3838-2002))*. Type V surface water are only used in agricultural water zones and other scenic water zones purpose. It is reported that biochemical oxygen demand (BOD), dissolved oxygen (DO), nitrogen-ammonia ($NH4^+$-N) are detected to be exceeding the standard. No specific data on sample position and monitoring results for the ancient canal was reported. It is told that environmental monitoring of the surface water in the proposed area has not been performed.

The detail section as well as regulation requirements can be referenced from the report prepared by the international / national water resources and wastewater specialist.

Atmospheric Environment

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Except the adjacent thermal power plant and the adjacent chemical facilities, there is no major air emission source at the site. Therefore the adversely impact of air emission could be expected to control in reasonable level.

Soil and Groundwater

During the site visit, the following waste dumping and segregation activities were observed at the proposed area:

- Ongoing waste dumping activities. The use of fish ponds as waste dump has significantly increased since our last visit in September 2009. One fish pond has been half filled with industrial waste including paint or dye; One fish pond has been filled with garbage and plastic waste;
- Approximately 100 or more truck loads of construction waste (including asbestos) and other wastes (e.g. Picture tubes (TV-Bildröhren, 电视显像管)), plastic bags, and foam materials) have been dumped along the streets and river banks, some burned ashes were observed at the bank along the ancient canal;
- Some domestic solid wastes were dumped at the residential area;
- The waste segregation activities in the project area include the dismantling of significant numbers of refrigerators. It was observed that the refrigerators were delivered to the project area including the hazardous cooling liquid. The interviewed persons refused to provide information about the disposal of the cooling liquid (which could be several tons). In case the liquid is released to the underground, the impact can be described as severe.

Given the history of waste segregation and dumping activities as well as the adjacent river situation, the potential contaminated soil and groundwater caused by these activities could not be excluded.

Solid Wastes

The solid wastes generated at the site consist of general industrial wastes, hazardous wastes, the domestic wastes and the residue wastes from the waste segregation activities. Except the industrial wastes and hazardous wastes, domestic solid wastes were dumped at the residential area and other wastes were dumped along the streets and river banks. The compliance of general industrial wastes and hazardous wastes need to be confirmed in the next step if required. The use of fish ponds as waste dump has significantly increased since our last visit in September 2009. One fish pond has been half filled with industrial waste including paint or dye; one fish pond has been filled with garbage and plastic waste. It is understood that the proposed project area is not a legal landfill sites.

This would need a lot of excavation work during the construction work and subsequently external man-made land to fill in for the landscape.

The improper disposal of the solid wastes may also cause potential adversely impact on the soil and groundwater. (Please refer to *soil and groundwater paragraph*).

Therefore the solid wastes at the proposed sites are also a significant issue to environment.

Noise Environment

During the site tour, no significant source to noise environmental was observed. Therefore the adversely impact of air emission could be expected to control in reasonable level.

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3.8 Requirements of Environmental Legislation

3.8.1 General Requirement on Environmental Permits

According to the Regulation on Planning Environmental Impact Assessment (hereafter EIA) (effective since 1st October 2009), departments of State Council, governments and other departments at and above city levels should perform planning environmental impact assessment for their projects which planning on lands utility, construction, development and utility planning of regions/catchment/ territorial waters area (refer to integrated planning), and other specific planning of industry, agriculture, livestock breeding, forest, energy, water conservation, transportation, city development, tourism and natural resources development.

A planning EIA should be considered according to the subject regulation. It depends on discretion of the city environmental protection bureau.

In China, construction projects are obliged to perform an EIA of the planned industrial activity according to *P.R.O. law "Regulations on the Administration of Construction Project Environmental Protection (1st November 1998)"* and the hereof deriving *"Provisions on the Classificatory Examination and Approval of EIA Documents of Construction Projects (1st January 2003)"*.

The type and comprehensiveness of an EIA depends on the classification of the planned industrial activity according to the inherent potential impact on the environment. These classifications are defined as follows by the Article 16 of *the "P. R. O. Law on Environmental Impact Assessment (effective since 1st September 2003)"* and Article 6 of *the "P. R. O. law Regulations on the Administration of Construction Project Environmental Protection (29th November 1998)"*.

Class 1 / EIA Report Statement

Possibly causing "major" environmental impacts, an Environmental Impact Report Statement has to be prepared including a full assessment on the generated environmental impact

Class 2 / EIA Report Form

Possibly causing "light" environmental impacts, an Environmental Impact Report Form has to be prepared with a general analysis or issue-specific analysis on the generated environmental impact.

Class 3 / EIA Registration Form

Only "minor" environmental impacts might potentially be caused by the site; a normal EIA is not required and the provision of a comparably simple Environmental Impact Registration Form is regarded as sufficient.

Independent of the classification or the herby defined type of EIA, the assessment has to be developed and provided to the related authorities during the project feasibility stage subsequent to obtaining the initial 'Project Planning Permit'. The document then has to be evaluated and approved by the involved authorities prior to construction as a necessary prerequisite for securing a final operation permit. The combination of the Project Design

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Approval (see below), the EIA Evaluation & Approval and the so called YANSHOU Inspection / Three Synchronies Inspection (upon completion of construction and after a three month trial operation period) are the basis to obtain the final approval, the so called 'Approval of Construction Project Environmental Impact Inspection and Acceptance Certificate'.

Therefore the proposed project should obtain the applicable permits according to the existing procedures and legislation framework. The adversely impact of wastewater, air emission, solid wastes, noise at the boundary as well as potential contaminated soil and groundwater should be considered in the EIA.

3.8.2 Atmospheric Environment

China has its *Ambient Air Quality Standard (GB3095-1996)* which stipulates three types of standards based on the category area located. It depends on the local EPB discretion. During the site tour, except the adjacent thermal power plant and the adjacent chemical facilities, no major air emission source was in placed at the site or the adjacent area. Therefore the adversely impact of air emission could be expected to control in reasonable level which could meet the atmospheric environment requirement.

3.8.3 Soil and Groundwater

According to the official Reply Letter Regarding on the Applicable Standard for Soil Remediation to Guangdong EPB dated 13th November 2009, it is understood that no legislation at the central environmental authority currently exists on contaminated land cleanup and remediation. However, China is in the process of developing risk-based standards for soil and groundwater, having already published a set of risk based guidelines which are likely to form the basis to clean-up standards in the near future. These guidelines are:

- *Environmental Quality Standards for Surface Water (GB3838-2002);*
- *Groundwater Quality Standard (GB/T 14848-1993);*
- *Soil Environmental Quality Risk Assessment Criteria for Industrial Enterprises (HJ/T25-1999);*
- *Environmental Quality Standards for Soil (GB15618-1995) and;*
- *Standard of Soil Quality Assessment for Exhibition Sites (HJ350-2007).*

Meanwhile, the Ministry of Environmental Protection (MEP) is working out a series of Environmental Site Assessment guidelines regulating the technical specifications for environmental site investigations, technical specifications for site environmental risk assessments, technical specifications for remediation of contaminated land and technical specifications for site environmental monitoring. Among the above mentioned 4 guidelines, 3 of them have been published for consultation. Other specifications are being drawn up. The following guidelines and regulation concerning on environmental site assessment and remediation are under consultation:

- Technical Specification for Environmental Site Assessment;
- Guideline for Risk Assessment of Contaminated Sites;
- Guidelines for Soil Remediation of Contaminated Sites;
- Temporary Measure on Soil Environment Management of Contaminated Sites.

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Beside that, the former State Environmental Protection Administration (SEPA) issued *the Circular on Enforcement of Implementation of Environmental Pollution Prevention and Control during the Enterprise Relocation* in 2004. It requires:

1) All laboratories, Treatment, Storage and Disposal (TSD) sites and sites that produce hazardous waste are required to perform soil analysis when relocating to a new site and when an existing site is used for different purposes. The soil analysis must be conducted by a qualified environment monitoring station at the provincial or higher level. Completed soil analysis reports must be submitted to the provincial or higher level EPB for examination to determine the need for a remediation action plan. The local EPB will have the authority to supervise and manage the implementation of remediation action plans.

The soil analysis report must include an assessment of the environmental impact on soil. This assessment should include a discussion regarding: the type of contamination; degree and extent of contamination; potential sources of contamination such as underground pipelines and storage tanks; soil and groundwater contamination status; and other influencing conditions.

2) A scheme of investigation, exploration and monitoring of soil contamination status must be prepared for an industrial area where construction or relocation activities are being carried out. Investigation of possible pollution sources must be conducted within a construction area, and a clean up and remediation plan must be prepared and implemented.

3) The former enterprise must take responsibility for the soil contamination, and is liable for any remediation.

When sites relocate or when an existing site is used for different purpose, EPBs should pay particular attention to soil contamination and prepare a pollution assessment scheme as soon as possible. Any serious contamination should be promptly reported to the EPA.

On 6th June 2008 the MEP announced a directive *Opinion on Enhancing Prevention and Control of Soil Contamination* to local EPBs which discloses a new timetable and clear statements on soil protection as follows:

The local EPBs should focus on abandoned contaminated industrial lands which would transfer to non-industrial use on purpose;

Local EPBs should perform systematically investigation to understand the pollutants, extent and scope of contaminated soil and groundwater at the site as well as the adjacent area. Files and information management system on the contaminated land should be set up;

Polluters will hold liability for land pollution, regardless of any change in their management structure, including relocation, restructuring, merger or dissolution;

The company which inherits the debts and rights (of the polluter) should burden the responsibility for providing financial assistance to restore the productivity of polluted land. If the polluter does not exist, or could not identify the pollution liability due to the historic reasons, the local government would be responsible for remediation in accordance with regulation requirements.

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The authority will strengthen the supervision of soil pollution from chemical plants, electroplate factories and crude oil storage facilities; and the administrative system associated with soil protection would be basically established in 2015.

In Jiangsu Province, the people's government of Jiangsu Province promulgated *the Regulation on Prevention and Control for Environmental Pollution from Solid Waste of Jiangsu Province* on 23rd September 2009. The regulation requires that enterprises which once have generated, collected, stored, utilized or disposed industrial solid wastes are to be terminated or relocated; they shall perform an assessment of the subsoil and groundwater to identify the site situation. The assessment report would be submitted to the local EPBs at county level. If the soil or groundwater is detected to be contaminated, remediation shall be required and the relevant expense (e.g. environmental monitoring, assessment and remediation) would be paid by the polluter. This regulation will put into force since 1st January 2010.

The project will involve several existing factories, the former industrial facilities and some area where solid wastes dumped. The development of the proposed area should lead to the relocation/closure of the existing industrial sites and wastes dumping area; therefore a site environmental assessment shall be performed prior to the development of San Wan Gong Yuan.

3.8.4 Solid Wastes

According to *the Law on the Prevention and Control of Environmental Pollution by Solid Waste of P.R. China (Revised in 2004),* units and individuals that collect, store, transport, utilize or treat solid waste shall take measures to prevent the scattering, running off, leaking and seeping of solid waste, as well as other measures against environmental pollution; it shall not be allowed to dump, pile up, discard or let drop solid waste without authorization. All units and individuals shall be prohibited to dump or pile up solid waste to rivers, lakes, canals, channels, reservoirs and the bottomlands, banks and slopes below the highest water lines of such sites, and other sites that are prohibited dumping and piling up castoffs by laws and regulations.

Urban domestic wastes shall, in accordance with provisions of the competent administrative department of environmental sanitation, be put in the designated places but not be discarded, littered or piled up anywhere else at will.

According to *the Management Provision on urban Construction Trash* (effective since 1st June 2005), all units and individuals are prohibited to dump or pile up construction wastes at will.

At the mean time, *the Law on the Prevention and Control of Water Pollution of the P.R. China* require that any beaches or bank slopes below the highest water level of rivers, lakes, canals, irrigation channels and reservoirs shall be prohibited from being used to pile or deposit solid wastes and other pollutants.

China has issued a series of standards on solid waste disposal and treatment which stipulate measures to be taken against soil and groundwater pollution:

- *Standard for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes (GB18599-2001);*

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- *Standard for Pollution Control on the Landfill Site of Domestic Waste (GB16889-2008);*
- *Standard for Pollution Control on the Domestic Waste Incineration (GB18485-2001);*
- *Standard for Pollution Control on Hazardous Waste Storage (GB18597-2001);*
- *Pollution Control Standard for Hazardous Waste Incineration (GB18481-2001);*
- *Standard for Pollution Control on the Security Landfill Site for Hazardous Wastes (GB18598-2001);*
- *Environmental Sanitation Standard for Incineration of Medical Treatment Wastes (GB/T18773-2002).*

It appears that the on-site solid dumping activities are illegal due to the failure of measures taken to prevent the soil and groundwater pollution. Therefore the removal of the landfill wastes and dumping wastes should be necessary prior to the construction period.

3.8.5 Environmental Noise

China has revised *Emission Standard for Industrial Enterprises Noise at Boundary (GB 12348-2008)* and developed *Emission Standard for Community Noise (GB 22337-2008)* which stipulates noise standards should be in compliance to the Industrial enterprises and communities. It also depends on the EPB discretion.

During the site tour, no significant source to noise environmental was observed. Therefore the adversely impact of air emission could be expected to control in reasonable level.

3.9 Recommendations and Conclusions

1. Stop the on-going waste dumping activities. It is assumed that it is not only an environmental requirement, but also in the economic interest of Yangzhou to stop these activities;

2. Dumped waste should be excavated and disposed off properly;

3. The construction bureau should put environmental considerations on the feasibility study process, which should cover the adversely impacts on waste resources, air emission, soil and groundwater as well as noise emission;

3. An EIA should be conducted by a certified EIA institute in accordance with regulation requirements;

4. Given the existing situation and our knowledge, a detail environmental investigation and evaluation as well as subsurface soil and groundwater sampling and analysis shall be performed to identify the potential contamination areas and investigate the potential pollutants, extent and scope of the contaminations at present, especially some POPs (e.g. dioxin).

Landfill and Dumping Areas e.g. the <u>dumped waste in the pond:</u> use an excavator to dig several small pits to identify the content of the dump and take samples for analyses from the pits.

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Present and Former Industrial Areas: Inspect in detail and identify areas of potential underground contamination. Perform a suitable number of shallow soil borings (down to the groundwater table at approx. 2-4 meter) and groundwater monitoring wells in those areas and analyze soil and groundwater samples.

The Areas Formerly Used for Recycling Activities: perform drillings in a grid (for example grid 40 x 40 meter, 2 meter deep). Install a suitable number of monitoring wells, based on the results of the soil analyses.

Residential and other areas(e.g. Agriculture Land and Sand Pits): Inspect in detail to identify potential areas of underground contamination.

It is expected that detail environment investigation and soil and groundwater sampling and analysis should be conducted prior to the EIA process. It can also be combined with the EIA process;

5. If contamination is detected, the risk assessment of the contaminated sites should be carried out. If the risk is not in the acceptable level, concept design for remediation project should be developed and the remediation project should be performed, especially for some specific purpose to the sensitive people, e.g. children amusement park;

6. For those existing licensed factories which are required to be relocated, these factories shall perform the required Phase I and Phase II environmental assessment according to the new regulation of Jiangsu Province. The expense for the subject assessment and remediation project should be paid by the existing enterprises or deducted from the relocation compensation. For the contaminated area and/or former industrial property where the polluter does no longer exist or the pollution liability could not be identified due to historic reasons, the local government may be responsible for remediation in accordance with regulation requirements.

7. Re-nature areas that have been adversely affected in the past, for example pond filled with concrete sludge.

3.10 Appendices

APPENDIX A Site Plan and Classification

APPENDIX B Entreprises List

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SECTION 4: SOCIAL DEVELOPMENT ANALYSIS

4.1 Introduction

Historically, the Beijing-Hangzhou Grand Canal saw Yangzhou rising as a center of salt business and an important transportation hub between China's ancient north and its south. As such the Grand Canal certainly laid the ground for the cultural prosperity of Yangzhou during the Ming and Qing Dynasties.

However, over time the area's urban development and its industrial growth have led to more and more serious pollution of the famous regions and places the ancient canal cuts through. Many ideas and concepts on relocation of polluting industries, the introduction of cleaner technologies in its industries, costly river bank rehabilitation, river bed clean ups and the increase of natural self-purification capacities of water bodies have been discussed and even partly applied by the city government of Yangzhou.

As early as in 2003 Yangzhou was the first municipality in China to have its Eco City Plan approved by the National Ministry of Environmental Protection. The nationwide eco city movement is the most prominent of the Chinese responses to the concept of sustainable development. The upgrading and conservation of the ancient canal is now supposed to be a part of the blanket scheme of Yangzhou urban upgrading strategy.

CDIA attempts to provide a pre-feasibility support to help structuring this river/canal rehabilitation in line with its land development scheme. This will focus on the wetland development along the canal banks. The CDIA support will combine identification of technical measures to be undertaken for rehabilitation of water bodies and help to identify and suggest suitable solutions for a redevelopment of its adjacent strips of land. This is to allow the efforts being socially, economically and financially truly sustainable. Eventually

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the CDIA support would also suggest ways how to identify financing partners to allow identified pilot projects to be realized.

The city government of Yangzhou has decided to carry out the project in a pilot area of San Wan, roughly 65 ha. The pilot area is located in the south of the Yangzhou Old City and wandered by the Ancient Canal. The major objective of the project is to create a wetland area for recreational and educational purposes with other forms of utilization like economic ones integrated in a way that it will be a truly self-sustained area while still being a model of a real wetland.

The CDIA project report will provide integrated solutions for relocation (if necessary), clean up and re-development in the context of overall urban development of Yangzhou.

4.2 Objectives of the Social Analysis

The overall aim of the social analysis is to support the team by addressing social issues that will arise when developing the pilot area such as resettlement, change in economic perspectives or access to services. The study should be gender-sensitive. The specific objectives are:

(1) undertaking a rough assessment of the social situation by evaluating secondary data and sample surveys;

(2) identifying possible range of resettlement envisaged by the city government of Yangzhou and describe mechanisms to mitigate social impacts;

(3) identifying possible changes in the economic situation of the residents and describe possible mechanisms to optimize the benefits / minimize negative impacts;

(4) identifying impacts for access to social services and describe requirements to be included in further development;

(5) listing requirements to be included in subsequent feasibility work;

(6) providing adequate input to the overall report.

4.3 Methodology

In this social development assessment, the methods of literature study, focus group discussions, key informant interviews and on-site observation have been used.

Literature study The following documents and materials have been reviewed: (i) Yangzhou 11th Five-Year Socio-Economic Development Plan; (ii) Yangzhou Urban Upgrading Strategy (2007, jointly done by GTZ, Yangzhou Municipal Government and Cities Alliance); (iii) Statistical Yearbooks of Yangzhou Municipal; (iv) land acquisition and house demolition policies; (v) The proposal of wetland park in San Wan done by the Architecture Design Institute in Yangzhou University.

Focus Group Discussion Different social groups in the pilot area of San Wan have been interviewed during the site investigation. They are: villagers (including the elderly, women, young generation and the poor people); workers in small enterprises and migrated people as

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well. These group discussions have been used to assess the possible affected social groups and their specific socio-economic situations with respect to accessibilities of public infrastructures and social services, income levels and sources, opportunities of possible changes in their economic situations.

Key informant Interview Relating key informants have been interviewed including: affected village leaders; the director of the Water Gate Office under the supervision of Yangzhou Construction Bureau; affected enterprise owners. Some directly affected villagers and migrated workers have also been interviewed. The interviews focus on defining the range of affected social groups and their general socio-economic situations.

4.4 Socio-Economic Situations in San Wan

The San Wan area is mainly dominated by agricultural land, industry land and fish ponds. The use of the area as agricultural land has been decreasing year by year. With the speeding up of the general development and the overall construction of the surrounding city parts, the existing farm land around and partly within the San Wan area has been transformed into built land and became subject to a complete change in its use. Hence many villagers have become non-agricultural workers due to the loss of their land.

The future wetland park is divided by the Ancient Canal into an eastern and a western side. On the eastern side, there are five different village groups[6]. housing fifteen small private enterprises that are all in operation. On the western side, there is only one village group named Liutang.

4.5 Population Characteristics

Locally registered villagers including agricultural and non-agricultural population represent the main part of the population living in the San Wan area. Besides, there is a small part of migrated non-registered people living there.

Table 4-1 Population in San Wan (2009)

Village group	Administrative Village	Location of The Wetland Park	Local Population (Person)		Migrated Population	Total Population
			Agricultural	Non-Agricultural		
Xinzhuang (新庄)	Wenfeng（文峰）	East Side	188	130	100	418
Zhangxiang（张巷）	Jiulong (九龙)	East Side	240	12	30	282
Jiulong (九龙)	Jiulong (九龙)	East Side	180	50	-	230
Jiangyi（蒋一）	Jiulong (九龙)	East Side	240	-	20	260
Jianger（蒋二）	Jiulong (九龙)	East Side	200	30	-	230
Liutang（刘塘）	Erqiao (二桥)	West Side	300	-	-	300

[6] The village group is the bottom level in the rural administrative system in China. One village group consists of villagers. One administrative village consists of several village groups. One township comprises several administrative villages.

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Total	1,348	222	150	1,720

Source: Interviews with village leaders.

It has been reported upon interviewing the village leaders that an estimated total of 1,720 people inhabit the wetland area, of which 78.4% are agricultural population, 13% are non-agricultural people, 8.6% are migrated people.

Agricultural people are mainly making their living by growing crops as well as by non-farm earnings such as non-farm jobs, land and houses renting out. Non-agricultural people are just a small group among the local villagers. They mainly became workers when their land had been turned into non-agricultural land for different uses some time ago. Migrated people then came from poorer rural areas to rent some of the remaining farm land to do vegetable cultivation or to run small businesses such as shops and other services in the villages.

Besides, quite a number of workers (an estimated 400 people) are employed in private enterprises located in the east of the proposed wetland park. Most of them work in the villages and live in neighboring villages outside the future wetland park area.

4.6 Economic Situation

With the urbanization of Yangzhou municipal area per capita farming land area is now rather small in San Wan since lots of land had been turned into roads, bigger commercial or industrial sites. In the east, per capita farming land is 0.7-0.8 Mu (0.047-0.053 Ha) for villagers, except for Xinzhuang villagers who have a lower per capita farming land with only 0.4-0.5 Mu (0.027-0.033 Ha). In the west, Liutang villagers share the same land area like in Xinzhuang (0.4-0.5 Mu).

Livelihoods in the east villages of Zhangxiang, Jiulong, Jiangyi and Jiang'er continue to depend on agricultural production where the majority of farmers retain their rural base of land, labour and agricultural tools. Over 60% of household income derived from the agricultural sector in particular on vegetable cultivation. However, the trend of livelihood diversification is growing with the economic development of Yangzhou in terms of increases in work opportunities, land acquisitions as well as migration flows.

Xinzhuang in the east and Liutang in the west have smaller farming land than that of other villages where non-farming earnings accounted for a significant share of household income (55%).

Table 4-2 Structures of Income Sources in Villages (2009) (CNY)

Village Group		Per Capita Annual Income	%Agriculture Income	%Non-Farm Job Income	%Land and House Renting Income	%Salary
East	Xinzhuang（新庄）	18,000	45	30	10	15
	Zhangxiang（张巷）	12,000	60	30	5	5
	Jiulong（九龙）	7,000-8,000	65	22	3	10
	Jiangyi（蒋一）	8,000-10,000	60	30	5	5
	Jianger（蒋二）	8,000-10,000	65	27	3	5
West	Liutang（刘塘）	12,000	45	35	20	-

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Source: Interviews with village leaders.

On average, per capita annual income in project villages was more than CNY10,000 in 2009, of which per capita income was the highest in Xinzhuang (CNY18,000) and the lowest in Jiulong (CNY7,000-8,000).

The table 4-2 indicates that four income groups comprising of sources of crop cultivation, non-farm job earnings, letting out land or houses and other salary constitute the main sources of livelihoods. On average, cash crop (vegetable) cultivation and non-farm jobs are the first two sources of income for villagers, respectively accounting for 56.7% and 29% of the total household annual income. Land or house letting/renting is more popular in Xinzhuang and Liutang than elsewhere, where letting/renting land or house sharing adds up to 10% representing 21% of the total annual income of the households. The share of salary income is significant for villagers in Xinzhang and Jiulong with 15% and 10% respectively.

4.7 Social Services

There are adequate social services available in San Wan. Three primary schools and two secondary schools are available for the villagers, about 1-1.5 km away from the villages. Besides schools in these villages, villagers could choose from other schools in neighbouring Yangzhou city parts. Villagers do also have convenient access to the local health facilities including private clinics and health care centers at villages and two township-level hospitals. Well-known hospitals in Yangzhou city like SuBei Hospital and WenHe hospital are also available and accessible. It has been noted that there is no such social service directly in the San Wan project area.

4.8 Private Small Enterprises

An estimated fifteen private-owned small enterprises are located in the eastern part of the future wetland park where the industrial activities range from machinery, color package material, shoe production, plastic box production, to wood processing, etc. The total number of employed workers could probably reach 400-500 people largely non-local resident workers. Some enterprises are actually very small with only few workers and manufacturing base of just one house. Bigger ones have about 20 people employed and occupy with their manufacturing base an area of about 30-50 Mu (2-3.3 Ha).

Some enterprise owners are local villagers, in particular village cadres. Some are non-locals who have bought or rented collective land from villages.

4.9 Social Impacts Analysis

4.9.1 Description of the Project

The project of the wetland park is proposed to have three components with different functions. First is the establishment of a “Village-Park System” along the eastern canal bank that shall be a chain-linkage of various uses and designs (village-park-agriculture-wetland-village etc.).

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This will be publicly accessible and free of charge. The area shall serve as neighborhood recreation area, including shopping (especially farm shopping) and a small wetland area. In some parts biological water treatment technology shall be integrated. Second is the "West Park", a man-made, but as such re-natured wetland park including an eco-core zone, which shall develop by itself while depending on its own biological "natural" conditions. Third is the connection network from the wetland park to Yangzhou city, e.g. through building pedestrian walkways along the canal banks, establishing a bus circle line and (in the long run only) a boat shuttle.

4.9.2 Overall Social Benefits

The project will help improving the rehabilitation of the ecological system of the Ancient Canal in the part where it runs through Yangzhou city: (i) reducing discharge of untreated wastewater to the water body of the canal. (ii) reducing solid waste pollutant loading along the canal banks and (iii) building a natural wetland park.

The project will also serve as a vivid eco-education site for the local population, schools, universities and visitors through building a natural wetland park as a green land inside the city as well as introducing private farmers' eco-agricultural activities.

The local residents around the future wetland park including the population within the project area as well as the entire population in Yangzhou would benefit from the project. Directly, the local people will enjoy the clean and green living environment created by the large area of the wetland park. The quality of life for the people will be improved because most of the wetland park will be developed to become various levels of public parks, last but not least for high quality of recreational purposes. Residents will have easy access to these green spaces by pedestrian walkways along the canal banks from the wetland park to Yangzhou city center.

Yangzhou citizens and visitors will be enjoying the natural and alive "museum" to learn nature sciences like biology, eco-agricultural science, pollution treatment, etc. In particular, the wetland park can provide a good research area for nature science in universities. Children will have a model place to play and learn at the same time.

Eco-agriculture development will contribute to the increase in local farmers' income through high qualified and green agricultural products and other services, often related to processing and marketing these products.

Residents can also benefit from accelerated development of eco-tourism industry and the increased values of land and properties. New business opportunities linked to the public parks and eco-tourism will develop and so income of residents will rise .

The value of the land and properties will be increasing with improved living conditions, better environment and rehabilitation of the eco-system alongside the Ancient Canal. The residents will finally benefit from the added value of the land in and around the parks.

4.9.3 Social Impacts

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There are five social groups in San Wan area initially identified as affected groups by the proposed wetland park. Main social impacts on these affected groups have three dimensions illustrated in table 5-1:

1. Loss of land and income sources due to the land acquisition and resettlement especially for villagers in the west of wetland park;
2. Economic uncertainty and income instability during their economic transition from conventional vegetable cultivation to a newly high-tech eco-agriculture especially for villagers on the eastern side of the wetland park ;
3. Resettlement will result in disrupted existing social networks, which is an important asset for a stable social peace, where residents maintain and develop their livelihoods;

The range of resettlement is sufficiently big on the western side of the future wetland park. The population to be resettled is an estimated maximum of 300 villagers in Liutang village group.

The impact on Chahe Township will also be relatively significant as their area of fish ponds is going to be a part of the wetland park.

The negative influence on small private-owned enterprises could be limited since most of them could remain at their existing places and continue running their business.

Table 5-1 Affected groups and Social Impacts

Affected Groups	Social Impacts	Impact Level	
		Significant	Limited
Villagers in the east	◆ Five villages (estimated 1,420 people) will be directly affected by the project. ◆ Some of land will be lost permanently through the construction of the parks and some of the land will be occupied by temporary construction use. ◆Income instability during Villagers' economic transition form conventional vegetable cultivation to a newly, high-tech eco-agriculture.	*	
Villagers in the west	◆ Villagers would lose their income from letting land and houses or from land output. ◆ Villagers' land will be permanently requested for construction of preserved and untouched wetland park. ◆ Villagers have to be resettled to the outside of the wetland park. ◆ Existing social networks will be disrupted. ◆ It would to some extent be difficulty to re-establish new sources of independent or entrepreneurial income.	*	
Chahe (汊河) Township	◆ Estimated 100 Mu (6.7Ha) fish ponds owned by Chahe Township will be removed and transformed into a part of the wetland park.	*	
Small private-owned	◆ A few number of private enterprises might be moved out.		*

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enterprises Government training center	◆ Land strip of the center along the water will be requested for building the walkways network connecting with the city.	*

4.9.4 Social Risks and Mitigation Measures

The social risks for different affected groups might have: (i) unwillingness to adopt an eco-agriculture as well as lack of experience or skill to do it for villagers in the east; (ii) lack of consultation and participation program for better understanding relocated households' willingness to be moved out and the difficulties faced by them; (iii) inadequate resettlement or compensation plans including issues of fair and prompt payment of compensation, transitional arrangements, income restoration and other social disruptions; (iv) inadequate implementations of resettlement or compensation plans in terms of fairly and transparently distributing compensation; (v) lack of channels for complains and appeals from affected population; (vi) lack of awareness of environment protection for remained residents; (vii) insufficient plans and implementations of resettlement for a few number of heavily polluting manufactures to be moved out.

Specific social risks for each affected group and mitigation measures have been listed in a detailed way in table 5-2.

Table 5-2 Social Risks and Mitigation Measures

Social Groups	Social Risks	Mitigation Measures
Villagers in the east	● Potential unwillingness to adopt the system eco-agriculture ● Lack of experience or skill so far to do the eco-agriculture ● Inadequate compensation plan for land use including issues of fair and prompt payment of compensation ● Inadequate implementations of the compensation plan in terms of fairly and transparently distributing compensation ● Lack of eco-agriculture development plans involving transitional arrangements, income restoration and increasing ● Lack of channels for complaints and appeals from affected villagers. ● Lack of consultation and participation during the project process ● Lack of awareness of environment protection	● Public education of awareness and knowledge on eco-agriculture ● Eco-agriculture development plans with technical trainings, income restoration and establishment of eco-agricultural production market network, etc. ● The complete participation and consultation program ● Public education on awareness building of environment protection
Villagers in the west	● Inadequate resettlement plans including issues of fair and prompt payment of compensation, transitional arrangements, income restoration and other social disruptions ● Inadequate implementations of resettlement plans in terms of fairly and transparently distributing compensation ● Lack of channels for complains and appeals from residents. ● Lack of consultation and participation	● The resettlement framework addressing key social risks ● Periodic information disclosure ● The complete participation and consultation program

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Chahe (汊河) Township	• The profit loss for Chahe Township government	• The specific and practical plan of profit restoration for Chahe Township
Small private-owned enterprises	• Insufficient plans and implementations on resettlement • Lack of awareness of environment protection	• The reasonable and practical plan on resettlement of manufactures • Public education on awareness building of environment protection
Government training center	• Small land strip loss • Lack of awareness of environment protection matching the rehabilitation of eco-system	• The specific and practical plan of income restoration for the training center • Public education on awareness building of environment protection

4.9.5 Gendered Impact Analysis

There is no gender disaggregated data available so that the gendered impact analysis has been based on interviews with women and men, and on site observations as well.

Gender Analysis in Villages Vegetable cultivation practices are almost completely labour intensive where both women and men are involved in. Male dominated activity is ploughing, while female dominated activities are transplanting, weeding and vegetable selling. Other activities like puddling fertilizer application and harvesting are done by both women and men. In addition, women are also involved in chicken feeding.

Household work is performed exclusively by women, apart from their agricultural work. They need to do the cooking, washing and care for small children in their households.

Thus, Women play a crucial role in the household economy as they are involved in most production activities with men as well as they are mainly responsible for domestic work.

Besides the agricultural production activities, women are engaged in non-farming earning activities with men in different fields in which women tend to go to the service industries, while men are in construction field and manufactures. .

With field investigation, women's activities are to a large extent characterized by age. Women aged above 55 heavily rely on land like men from which they obtain a stable income through either growing vegetable or renting out land. This group is not well educated so that it would be more difficult for them to learn new things. Middle-age women (35-55 years old) have to engage in agriculture as well as in non-farm jobs such as service industries and small businesses since the agricultural land has become smaller and smaller. Women aged below 35 make their living largely on non-farm jobs rather than on agriculture depending on their more advantages in age and education than that of women in old and middle age.

Women will benefit from the improved living environment and quality of life as will men. But they may not be able to benefit from the project as much as men because women have less representation in decision-making in public affairs, less education and often a lower level

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of technical know-how, more burden from household chores. Women's specific needs, concerns and constraints should be carefully addressed during the project design and implementation.

Gender Analysis in Small Enterprises Workers employed in small enterprises are dominated by male in terms of male bosses, male skilled workers. Therefore, women are a vulnerable group in enterprises particularly during the transitional phase. Particular attention would need to be paid to female workers during the process of resettlement or improvement of production standard.

4.10 Conclusions

The project of the future wetland park will be located in San Wan area which is now dominated by agricultural land, industrial land and fish ponds, inhabited by village groups, and occupied by private small enterprises as well.

Population characteristics in the project area are largely dynamic. Local registered villagers including agricultural and non-agricultural population represent the main part of the population living in San Wan area. There is a small part of migrated non-registered people scatted in San Wan area, who came from poorer rural areas to rent some of the remaining farm land to do vegetable cultivation or to run small businesses such as shops and other services in the villages. Besides, some private-owned enterprises are located in the east part of the proposed wetland park.

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Agricultural population are the local villagers for whose vegetable cultivation, non-farm jobs income, land or house letting and salary income are consisted of four major income sources. A small number of non-agricultural people is workers, who lost their own land with the rapid urbanization of Yangzhou. Private enterprise owners and employed workers are largely non-local people.

The project will contribute to the rehabilitation of the ecological system of the Ancient Canal and the entire Yangzhou city and will act as a vivid eco-education site for the local population, schools, universities and visitors. The local farmers and the whole residents in Yangzhou will benefit from the project through: (i) reducing discharge of untreated wastewater to the water body of canal. (ii) reducing solid waste pollutant loading along the canal banks and going into the soil and into the ground water. (iii) improved living environment and hence of quality of life. (iv) accelerated development of tourism industry and increased values of land and properties.

Citizens will also be enjoying the natural and alive "museum" to learn nature science like biology, eco-agricultural science, pollution treatment, etc provided by the planned wetland park.

Local farmers' income will increase through highly qualified and green agricultural products and other services, often related to processing and marketing these products.

Residents can also benefit from accelerated development of eco-tourism industry and the increased values of land and properties. New business opportunities linked to the public parks and eco-tourism will develop and the income of residents will increase.

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Social groups will to some extent be affected by the project. They are: local villagers, Chahe Township and small enterprises. Main social impacts are: (i) loss of land and income sources due to the land acquisition and resettlement; (ii) economic uncertainty and income instability caused by economic transition from conventional vegetable cultivation to a high-tech eco-agriculture; (iii) disrupted existing social network given the resettlement.

The range of resettled population is not big only focusing on one village group (an estimated 300 people).

Social risks have been identified as follows: (i) unwillingness to adopt eco-agriculture as well as lack of experience or skill to do it for villagers in the east; (ii) lack of consultation and participation program for better understanding relocated households' willingness to be moved out and the difficulties to be faced by them afterwards; (iii) inadequate resettlement or compensation plans including issues of fair and prompt payment of compensation, transitional arrangements, income restoration and other social disruptions; (iv) inadequate implementations of resettlement or compensation plans in terms of fairly and transparently distributing compensation; (v) lack of channels for complaints and appeals from affected population; (vi) lack of awareness of environment protection for remaining residents; (vii) insufficient plans and implementations of resettlement for a few number of heavily polluting manufacturers.

However, social risks will be mitigated through: (i) formulating the resettlement framework to address key resettlement issues; (ii) formulating a specific and practical plan of income restoration; (iii) developing the participation and consultation program to better understanding the local population's needs, constraints and opportunities during the implementation process; (iv) conducting public education program on environment protection since the locals are supposed to be a major strength for supports in the rehabilitation of eco-system of the Ancient Canal and Yangzhou city; (v) preparing the eco-agriculture development plan for affected villagers in the east.

Gendered social impacts are not remarkable at the stage because without gender disaggregated data at village level and without information available at household level there cannot be said more.

4.11 Further Analysis Needed For The Next Step

The following recommendations can be made for the next step:

- Further identification and assessment of affected groups by the project as well as specific social impacts on different groups within the boundary of the future wetland park once it is defined.
- Resettlement costs need to be calculated to understand appropriate compensation standards for each affected group.
- Resettlement plans need to be formulated to guide a fair and transparent resettlement implementation in particular addressing the compensation standards for villagers on the western side of the wetland park.
- Public participation and consultation program should be strengthened.

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- The eco-agriculture development and education plan need to be developed for the affected villages in the east.
- Public education strategies on environment protection should be developed.
- Socio-economic household surveys need to be conducted and analyzed to understand specific livelihoods for the local population.
- Further gender analysis need to be conducted to understand the different effects and impacts of the project on women and men.

SECTION 5: PROJECT FINANCE REVIEW AND RECOMMENDATIONS

5.1 Wetland and its economic chances in the City of Yangzhou

There are many meanings of what wetlands could be. However, the main characteristic of a wetland park would be to have an area that is preserving a wetland eventually combining it with an option for people to visit it.

In this particular case, the wetland area would be located in the heart of an urban settlement. This is in part a new issue for a Chinese city and in fact for most cities in the world. It would be a pity and even a waste not to make use of the existing wetland area along the ancient canal as a recreation area as it is located in the center of Yangzhou City. Such a wetland park could serve many purposes:

- As a green lung of the city
- As a recreational area for the people of Yangzhou
- As an educational and research area for visitors from near and far
- As an entertainment area on the outer borders of the wetland with a limited amount of activities as shopping and dining.

Through the first three bullet points the physical and social well being of the local population is directly benefiting. Through the third point partly and the fourth point there are plenty of more benefits indirectly supporting the first three ones through economic activities, given they do not interfere too strongly with the foremost eminent characteristics of a wetland: a

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nature reserve where the typical fauna and flora of the wetlands flourish and develop naturally benefiting the neighboring urban quarters as a healthy, biologically and physically attractive settlement for humans.

5.2 Economic benefits of a wetland in the City of Yangzhou

Such highly valuable benefits define the full cost/benefit analysis and involved investment/profit calculations. All four issues, costs and benefit as well as involved investment and resulting profit are characterized each of them by social, economic and physical parameters. Their value must be expressed in money terms as well as in general terms.

The CDIA proposal is a pre-feasibility study and it is too early to attach price tags to each of the project issues. But the report outlines basic data that make it easy to work out what investment may be needed, where profit lies, how much it may cost and what the benefit could be. Given the scarce data the CDIA team obtained from the Yangzhou municipal government its proposal can only provide a general comprehensive view on what the CDIA team thinks is possible in the San Wan area. The CDIA team hopes to help the Yangzhou municipal government with this report to get a deeper understanding of a wetland as a municipal park, a comprehensive fact finding for it in order to get to a decision whether to build it or not.

However, the next step for the Yangzhou municipal government would be to turn all the CDIA findings and suggestions into a full fledged feasibility study which will provide the plain project idea with the necessary monetary data. This will be easy to do since the general framework has been laid with this project report.

The CDIA team would like to remind YCB that benefit not always equals profit. The monetary outcome may be not a direct one but might be delayed, which is not unusual and even adequate for a municipal investment. After all a municipal government is not a private sector company and must keep all municipal issues in a healthy social, still cost efficient balance.

5.3 Tourist reasons supporting a wetland park in the City of Yangzhou

Before getting into the matter a last word on what is the typical image of Yangzhou City as a historical as well as modern city in China.

The history of gardens in Yangzhou goes back over a 1000 years. Since then and even earlier the City of Yangzhou has been praised for its beauty and its high impact on the Chinese culture in garden architecture as well as in architecture in general. People from all over the large empire came to visit this place elegance and refinement for its fame and never left disappointed. Poems were written in the most unique calligraphic styles and painters left their legacy that can still be seen, leaving one of the most impressive treasures in Chinese history of art: the “Eight Devils of Yangzhou”, a school of painters whose influence on Chinese paintings is lingering until today. It is through their style of art that Chinese painting got

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closest ever to the appreciation of nature. All this happened right there in Ming and Qing dynasty's Yangzhou.

Today, modernization has left its marks on China and it has not always expressed itself as remarkably beautiful. The city has been recognized as an outstanding tourist place. But a place with historic merits hardly can make a living of its gone-by fame. So the City of Yangzhou must do something to truly regain its reputation not only as a historic place but also as a place where modern culture and civilization is present.

This proposal for a wetland park can be seen as a modernization of the concept of the art of the classic gardens in Yangzhou. It will put Yangzhou back on the map with the first wetland garden in China. Yangzhou can thus become the first city in China, where people can live directly in harmony with nature without harming each other, and right in the city center. This will support tourism largely and generate income from the related infrastructure. Visitors and tourists can stay in the ancient city centre hotels, enjoy the classic tourism goals there and still easily reach the wetland park area for either leisure or for education. This will support the city's hotels and restaurants and generate income from other than the classic sites.

Back in history, the Yangzhou gardens would only be accessible for the emperor, the privileged owners of the gardens and their guests, who went there to enjoy nature and culture while at the same time appreciating it and learning something about it. In modern Chinese society anybody would be allowed to go relaxing in nature, enjoy healthy products of eco-friendly agriculture and at the same time learning how nature and human beings can live together in a harmonious way.

By presenting this wetland park as a contemporary version of the classic Yangzhou garden accessible and enjoyable for every citizen the CDIA team offers an opportunity to reintroduce the leading issue of Yangzhou's culture: the garden.

While it is impossible to quantify now how much income will be generated from this additional tourism site, there are means and ways to do that in a full fledged feasibility study that also goes into details regarding connecting the different tourism sites of the City of Yangzhou and how to link them. This aspect is supposed to just broaden the municipal attention and its view to what wetlands can serve for and that it will earn income even from tourism. The city would even use its historic image to introduce a modern and up-to-standard tourism goal that may even be recognized as such worldwide.

5.4 What matters today: education through a wetland park in Yangzhou City

Nowadays the priority of a wetland park in China is not only on entertainment and relaxation but also on education how nature can be present, visible and can still be enjoyed right in the heart of an urban settlement.
This includes learning and research that can not only be seen but also be felt and enjoyed within the City of Yangzhou. This is truly unique and a typical feature adding to the long tradition of the City of Yangzhou inviting people to visit and to stay.

With its university the City of Yangzhou has got the unique chance to position itself as a new centre of excellence in humanities, in natural science and in social sciences. With a feature like a true wetland park in its city centre, Yangzhou can play a distinctive role for students and researchers from near and far.

Economically speaking education nowadays plays also a crucial role for income: if a city can put itself on the map as a centre of studies in a particular field this will certainly invite students and scholars from anywhere. Research entities play a more and more important economic role for creating new enterprises, small and medium sized companies as well as big corporations that act worldwide. Good examples are Suzhou and Dalian, both in China, as well as Silicon Valley and Hartford (both in the US), Oxford (UK) and the new town of Sophia Antipolis (France). All of these cities have been creating their wealth on the back of strong academic excellence circling around a specific topic. In Yangzhou, this topic could be "Nature & Urban Settlement". This is a fast growing field of research as mega-cities are growing by the dozens, especially in Asia and most rapidly in China.

5.4.1 Direct cost & benefit issues supporting a wetland in the City of Yangzhou

Any direct cost and benefit estimates can only be done as a result of what the experts were shown. Therefore the study cannot estimate any investment cost issues, nor benefits in regard to the experts' proposal of what can be done and achieved.

This is why the following report elaborates on remediation costs and benefits rather than on investment costs. Any estimate on investment costs would be beyond reason as long as there has been no more tangible decision into what direction the municipal government plans to go.

5.4.2 Direct cost & benefit issues regarding relocation

For the time being it is impossible to calculate the costs of relocating the local populations as the experts had not been provided with numbers of intended compensation for people to be relocated. It can and should, however, be accounted for that anyone relocated from the future wetland park area, who is now earning an own living and might even become a taxpayer in the near future, will first need to be compensated on the existing buildings he/she owns.

Additionally, each relocated formerly self-employed and rather entrepreneurial person will either need to find a job as an employee or will be out of work. The latter will lead within short to have this person left to state subsidies. Hence these people will add cost to the municipal government deficit rather than contributing to paying it back as a taxpayer. This cost issue will come on top of all investment effected by the municipal government and thus become an extra burden to the municipal budget. It will – carefully said – not invite banks and investors to look into financing a municipality whose budget is in the reds. It can instead be assumed that for some time financiers will rather refrain from financing a negative budget where they do not see substantial improvement within half a generation (15 years), as this is the time to overcome unemployment consequences in average as a result to an unemployed unskilled labor force.

5.4.3 Direct cost estimate for pollution investigation and remediation measures

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The provided data concerning underground contamination are very limited. It was impossible to get more information from the concerned Yangzhou municipal bureaus regarding contamination and existing pollution. Therefore the only available sources of information were site visit and an aerial photography review. Thus the information provided by the authorities about existing and former companies only gives an indication of potential pollution. In order to provide a rough cost estimate the experts developed a possible investigation and remediation scenario. However, such costs are only estimates and the subsequent soil and groundwater analyses may very well lead to significantly higher or lower costs.

5.4.4 Direct cost estimate for soil and groundwater investigation

For the soil and groundwater investigation the experts assumed sampling of hot spots and a grid of drillings in other potentially contaminated areas.

1) Landfill and dumping areas: 10 soil samples at the proposed landfill and dumping areas (approximately 24,000 m^2)
2) An estimated 20 industrial properties (present and former industrial areas) need to be investigated. It is assumed there will be 3 soil drillings needed (2 meters deep, in total 60 drillings) and in average one groundwater monitoring well on each property (approx. 3-4 meters deep, in total 20 monitoring wells)
3) Areas formerly used for recycling (approximately 65,300 m^2) need to perform drillings in a grid (40 x 40 meter, 2 meters deep). Approximately 40 soil drillings (depth 2 meter) may be required. Suitable groundwater monitoring wells could be required based on the results of the soil analyses.

It is estimated that in total 110 soil samples and 20 groundwater samples might need to be selected for chemical analyses. All of these samples are expected to be analyzed for Volatile Organic Compounds (VOCs) and Total Petroleum Hydrocarbons (TPHs).

50% of the samples may have to be analyzed for heavy metals and 25% of all the samples may have to be analyzed for Semi Volatile Organic Compounds (SVOCs).

Overall, the estimated costs for the above described scenario including detailed inspection of areas of potential concern, drillings, analyses, organization, supervision and reporting could reach in total CNY 600,000 to 700,000.

5.4.5 Direct cost estimate for remediation of soil and groundwater

The potentially required remediation may include excavation of dumped waste, soil remediation and groundwater remediation.

Waste dumped in ponds and waste dumped along roads and canals will have to be excavated and disposed of according to the results of the analytical results of the investigation. The experts assume that the waste in the ponds cover an area of approximately 7, 700 m^2, with a depth of approximately 1 m in average. In total the experts estimate approximately 9,500 tons and an average disposal price of 1,500 CNY/ton for hazardous waste. Together with transport, organization and supervision the removal of the backfilled waste may cost an estimated CNY 15 million.

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Considering that the groundwater table in that area is close to the surface, it must be assumed that soil remediation is performed by excavation. If an estimated 1% of the above mentioned investigation area (estimated 2,000 m², 1.8 ton/m³) requires soil remediation to a depth of 1 m, the excavation, disposal, organization, supervision etc. could reach an approximate amount of CNY 5 million.

Overall, such a very rough cost estimate for the removal of wastes and soil remediation would add up to an amount of at least CNY 20 million. This number must be considered only as a first and very rough estimate and it is very likely that is has to be adjusted after the investigation.

The groundwater remediation costs depend on the analytic results, the soil and hydrological conditions, the type of pollutants etc. At present no information is available. The variation of the potential costs can be extreme and at present no cost estimate is possible.

5.5 Deferred benefits gained by a wetland "green" park in Yangzhou City

A municipality has got many social and economic reasons to keep locally registered villagers encouraging them to stay farmers. As such they would remain small entrepreneurs generating income instead of becoming unskilled workers with unsteady lifestyles hence posing a threat to the social balance in the municipal region, in this case in Yangzhou.

Later they will even become taxpayers rather than state subsidy recipients. The municipal government should think over the benefits of such an overall sustainable balance that includes the economic as well as the social balance. Right now the city seems to only follow an all too fashionable but totally misperceived "green dream": employing trained but unmotivated people to farm land that was owned and farmed for decades by others. This may well quickly turn out as a costly error that will end up in a permanent drain of subsidy, e.g. state funds with no own source of income.

Urban sustainable development certainly includes economic as well as social benefits and its costs. The municipal government should not neglect such facts and allow the area to profit by all means, ecologically, economically and socially. Educational measures for the local population will help to put this into being.

This is a step-by-step approach. Therefore the local farmers, who know their land for years, must be encouraged to continue to farm their own land. But they should be obliged to produce "green" products that can sell for a higher price. The buyers, people living nearby willing and able to pay for that better quality, will step-by-step follow the offer and constant supply through and buy the products. This will step-by-step improve the ecological balance of this area and will invite the neighborhood to make use of the area not only for recreation and leisure but also for their own quality and safety in food supply. People will feel happy and privileged to live there and stabilize demand and supply of food, of safe quality housing in this neighborhood without traffic jams, as everything can be done by foot or bicycle.

Therefore this will allow everyone to profoundly profit from this central area instead of only creating an illusion of environmental balance by sticking a green label at an entertainment park. So instead of removing everyone from their home villages to which they feel attached and responsible for, the city government even enhances the social balance in this and the neighboring area through actually giving room for ecological as well as economic re-balancing. This will set a remarkable example for the whole country.

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5.6 Financing a wetland park in Yangzhou City

When it comes to finance such a wetland park, there are mainly three choices outside the municipal budget:

- Bank loans
- Government bonds
- Investors

It seems rather unlikely to get any of those three financing the complete works alone and at once. It is much more probable to gain each of them going for a specific part of the whole. For that it is indispensable for the municipal government to make up its mind which direction to go.

The YZ CB estimates the complete works might cost approximately CNY 330 million. This is a completely unsustainable figure that cannot even be verified, at least on the base of the material the experts received and were allowed to investigate and evaluate.

All estimates that are mentioned under **2.5** had already been done on the grounds of very vague assumptions and by all means need to be supported by all the suggested fact finding measures. This is necessary to avoid later-on disaster when soil or groundwater contamination might break through ruining the wetlands and its economic and social intentions by not allowing the people living there and earning their livelihood through selling their home grown products to continue. Then these people for health reasons might be forced to move out and it may even affect other neighborhoods and their living conditions. So it is impossible to give more precise costs other than the estimated ones for the time being. Hence there can be no amounts calculated for banks and investors right now.

For this reason, and for avoiding undue risk and even rather spreading it for the city government proper, it should be considered to head for a three fold solution, comprising of all three, bank loans, government bonds and leaving parts of the future wetland park to investors.

5.7 Bank loans

There will not be too many parts in a wetland park, where a bank loan would make sense and can be obtained without a full government guaranty provided by the municipal government. The most likely bit might be to allow the villagers obtaining small scale loans from **micro finance** institutes. These companies and micro finance banks are now available anywhere in China. They play a more and more crucial role to create a stable and recession proof class of small and medium sized entrepreneurs and future taxpayers. Address of such micro finance institutes can be found in the annexes under “Addresses of Financial Institutions & Investors”.

Micro finance would be the foremost desirable solution for a financially healthy farmer and service provider. The loans often do not extend CNY 3000 and are to be paid back over a long period. The interest rates are moderate and allow the farmers or service providers to serve and pay back the loan from their income. The loans are based on a business plan and land or machinery that can be pledged as collateral. These could be land use rights, cars or tractors and any other equipment that is able to process agricultural produce into saleable

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goods. The same applies to small service providers. Hair cutters, small shops, repair shops, restaurants, delivery services, all can provide such collateral and make themselves eligible for such loans.

Besides the direct income effects to the household and the surrounding area, these small and medium sized entrepreneurs will quickly turn into taxpayers with the profit they generate.

This sort of bank loan financing is very sustainable as it is rarely building up an amount of bad loans. It is usually tightly controlled by the bank or finance corporation and can avoid early stage bankruptcy by continuously observing he figures of the loan taker involved.

Through this principle, the municipal government can avoid to take up itself any loan finance and even defer the risk of tackling and financing the definitely existing growth potential by only small loans taken directly by the entrepreneur.

This allows the municipal government rather to focus on building roads, bridges and similar infrastructure that are not income sensitive and need to be paid back by taxpayers over a long period.

5.8 Government bonds

Government bonds should be used for all non-profit generating and long term measures like roads, bridges, canal embankments, etc. Such a financing instrument is usually very long term and not attached to direct project income or even profit.

This means of finance should be taken up to finance the enclosed park proper as well as the nature reserve inside the wetland park.

Government bonds should also be used for financing the soil and water remediation if this cannot be paid by the municipal budget. The mentioned purposes are classically financed by such terms as granted along with government bonds. Government bonds can sometimes be supported by loans from development banks like Worldbank or Asian Development Bank.

5.9 Investors

What is left as infrastructure and downright business can and should be financed by private sector capital e.g. investors. This includes all sizes and levels of investments, starting with small shopping malls on the outskirts of the park, then restaurants (chains as well as individual ones), any hospitality services, or even construction of real estate in the neighborhood to finance other municipal budget requiring investments by the city government.

Urban utilities like wastewater treatment plants, even if they are small and/or fully biological can also easily be outsourced and invested by the private sector. This is also true for waste management and processing of waste or recycling it, for instance biological waste. Such works can be fully invested and run privately and would therefore be of the municipal budget. In contrary, if organized and framed well enough they could even earn good returns and thus well contribute to the municipal budget by paying taxes fro their profits.

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It is however rather unlikely investors could be gained for investing the complete wetland park. It is also not advisable to have one private investor organizing and running it alone as the investor would naturally want to seek a maximum profit from it. This would endanger the purpose of a balanced wetland park, where nature needs room to develop slowly and should at least in the core area be left alone to regain its original meaning and natural beauty.

5.10 Suggestions

Finally the CDIA team suggests a mix of how to arrange for the financing of the wetland park:

Step 1: allowing the local population to build up motivation for their own business and then invest

Step 2: shaping a healthy mixture of services and retail business that can be offered and auctioned to the private sector. Then looking for investors and allowing them to build their business

Step 3: approaching real estate investors and offering them adjacent pieces of land, which will then be auctioned. Funds generated from there will be used to be invested by the municipal government to pay for part of the investment needed for the creation of the public part of the wetland park

Step 4: obtaining government bond support for inactive and non-commercially declared parts of the wetland park, e.g. the park proper where there will be no commercial activities

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ANNEX 1: MEETING MINUTES

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City Development Initiative for Asia

Project No. RETA 6293
Prefeasibility Study on
Rehablitation of Water Bodies and Adjacent Land Yangzhou / Jiangsu

Yangzhou Canal Rehab Project (YCR)

Meeting Minutes

Wang Zhiyong	√
Dylan Wang	√
Zhou Kunping	√
Li Ke An	√
Peter Kraemer	√
Bernd Seegers	√

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Christoph Waldersee √

Consultancy Services

CDIA Team Meeting

Yangzhou, 26 January 2010

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Location: Yangzhou Construction Bureau, CDIA office, Rm. 111

Date: 26 January 2010
Time: 9:00 - 15:00 h

Participants:
Mr. Christoph von Waldersee: CDIA Team Leader/Financial Specialist
Mr. Dylan Wang: CDIA Financial Specialist
Mr. Bernd Seegers: CDIA Urban Planning Specialist
Mr. Peter Kraemer: CDIA Environment Specialist
Mr. Li Ke An: CDIA Environment Specialist
Mr. Zhou Kunping: CDIA Water Resource Specialist
Mr. Wang Zhiyong: CDIA Water Resource Specialist

In the morning of 26 January 2010 the CDIA team members had an internal exchange of information and discussion in order to review the situation as found the day before and prepare the following Final Presentation of the CDIA team proposal

Christoph Waldersee welcomed the team inviting it to a final discussion of the prepared proposal. Before starting it he drew the attention again to the points he had mentioned at the set-off of the team's work on this last leg of the Yangzhou CDIA project, comparing cost and benefits on the one side with potential investments and profits on the other side. All this should be measured in regard to physical, social and economic terms.

He stated that unfortunately Sun Dajiang could not participate. For her he wrapped up then her main findings. As one of the aspects he picked the fact that local farmers seemed to have previously hired migrant workers to perform some of the farm works. However, it seemed that all migrant workers had been removed under the request of local government after our last meeting dated 2 December 2009. This is obviously changing the situation and some of the findings of Sun Dajiang. As a consequence, and without evaluating any of the facts some of the related problems might have gone. For instance there could develop some economic disruptions due to the removal of the migrant workers as they had been doing jobs local registered people might not have been ready anymore to do. Furthermore they may have generated income on which they as well as for those they had been working for or they may have been tenants to may have been relying on. This additional income and even the involved exchange of income because of each others dependency on each other may now be gone forever without any replacement. This will not only leave a substantial economic gap for this part of the city. It may even throw people in economic hence social problems by making people who were independent now subject to either state subsidy or force them to migrate again. This creates additional social problems and insecurity.

On the other hand the community should now have even more social and economic reason to keep the locally registered villagers encouraging them to stay farmers. As such they would remain small entrepreneurs generating income instead of becoming unskilled workers with unsteady lifestyles hence posing a threat to the social balance in Yangzhou. On top they would become taxpayers rather than state subsidy recipients. The municipal government should think over the benefits of such an overall sustainable balance, including the economic and the social balance. Right now the city seems to only follow an all too fashionable but totally misperceived "green dream". This will quickly turn out as a costly error that will end up in a permanent drain of subsidy, e.g. state funds with no own source of income.

Urban sustainable development certainly includes economic as well as social benefits and its costs. The municipal government should not neglect such facts and allow the area to profit by all means, ecologically, economically and socially. Educational measures for the local population will help to put this into being. Of course, this can only happen in a step-by-step approach. Therefore the local

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farmers, who know their land for years, must be encouraged to continue to farm their own land. But they could be obliged to produce “green” products that can sell for a higher price. The buyers, people living nearby willing and able to pay for that better quality, will step-by-step follow the offer and constant supply through and buy the products. This will step-by-step improve the ecological balance of this area and will invite the neighborhood to make use of the area not only for recreation and leisure but also for their own quality and safety in food supply. People will feel happy and privileged to live there and stabilize demand and supply of food, of safe quality housing in the neighborhood without traffic jams, as everything can be done by foot or bicycle.

Therefore this will allow everyone to profoundly profit from this central area instead of only creating an illusion of environmental balance by sticking a green label at an entertainment park. So instead of removing everyone from their home villages to which they feel attached and responsible for, the city government even enhances the social balance in this and the neighboring area through actually giving room for ecological as well as economic re-balancing. This will set a remarkable example for the whole country.

As a result the re-natured parts of the wetland park having become true nature reserves, will be a very attractive goal for neighbors and tourists from Yangzhou as well as from other parts from China. People will be able to enjoy and study both, the nature reserves plus the history of the ancient canal and its neighborhood, and the village life where people live and work earning good money by selling directly to the customers in the neighborhood, a really modern economy. This will never be based on state subsidy.

Practically speaking there will still be many issues to be solved. One example would be how to link the more commercial side of the park including the shopping & leisure part on the eastern side of the canal and the more preserved wetlands on the eastern & western side of it. We shall however make our suggestions and see what is acceptable to the municipal government of Yangzhou City.

Bernd Seegers: We learnt from the Yangzhou Transportation Bureau and the Sea Affairs Office (a kind of water way police) that it is very difficult to manoeuvre the ships around the quite sharp canal bends. Some of the pushed barge trains can even be as long as 300m. The Yangzhou University proposed to cutting through the peninsula and make it become an island in order to straighten the shipping channel. To really comfort the ship traffic such new opening must be very wide and thus separate the artificial island completely from the planned wetland park. Also it will have incalculable impact on the water flow speed and thus the bio-systems of the canal banks. Additionally this would change the very special historic landscape of the Ancient Canal significantly. For these reasons the CDIA team should not follow this proposal.
The CDIA proposal consists of two different development strategies:
Firstly along the eastern canal bank (including a small natural wetland area) agriculture and villages shall be protected and developed. This includes new economic activities of the farmers by introducing village shops to sell farming products along the planned promenade and entrance areas.
Secondly the area along the western canal bank shall be completely developed as an artificial wetland park. This wetland park includes the mentioned peninsula, which shall be developed as an eco core zone (closed for human access) that serves as a resting place inside the city for animals (especially birds). This opens the opportunity to use natural predator to naturally control insect populations in the wetland (in order to protect visitors and residential areas from annoyance by mosquitoes) in an ecologically balanced way.
We learnt from the Yangzhou Transportation Bureau that the San Wan section of the Ancient Canal is very sensitive for constructing any additional bridge. For ship traffic safety reasons the Yangzhou Transportation Bureau rejects the proposal of an additional bridge (like a pedestrian bridge) in this area. The Bureau would accept such additional bridge only after high political pressure.
Respecting these arguments the CDIA team shall propose to construct a pedestrian bridge at the south boundary of the park attached to the planned Nan Raocheng Lu (南绕城路). In the north-west corner of the planning area we propose to attach a pedestrian bridge to the existing bridge over Kaifa Lu (开

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发路), which allows visitors to cross the canal and enter the park from the east side. This is necessary, because along the western canal bank an approx. 200 m long ship docking station (industrial harbor with regularly coal and sand unloading activities) hinders hazard-free entrance of visitors.

Bernd Seegers: After our site survey on 25 February it seems that an entrance to the wetland park from the west is very difficult. Most of the western side is blocked by large industrial sites. The planned new major road (Nan Raocheng Lu) along the southern edge will be an elevated road, which can make the construction of an entrance area with car park and management facilities quite challenging. Another planned road between the power plant and the industrial site of "Gang Yang Foods Corporation" will lead to the canal bank but will not allow a reasonable car parking near the wetland park area. The existing Xinyang Lu along the south border of "Zhong Ji Tong Hua" factory seems to be blocked in future by a planned extension to this factory.

Dylan Wang Proposes to remove all gates/access from the West side to limit the impact to the environment and the wild life and still making it more attractive as it seems remote. People who want to visit the wetland park only can get there by boat from the East side. Separating the business and preservation wetland areas will attract people who are interested to take extra steps to see the extra natural wild life and others.

Christoph: supports this good idea. He says we should amend the drawings and the presentation on the PPT to reflect this change. Making this proposal with no entrance at the western side will serve as the most desired result, while the one with an extra entrance will still be an acceptable result. He also raises the point whether there would be any educative issues involved, e.g. training about nature, wild life and history of the ancient canal. This could well serve as a new aspect and additional attraction for the municipal government to turn the area into something useful and not just adding a new entertainment area.

Bernd Seegers: We did not propose specific sites for education (which had been proposed in our annotations to the map to be presented), because we shall not do detailed design works for the scope of this project. For the final presentation we will amend the PPT to reflect the change of ideas concerning the access to the western park.

Christoph Waldersee: The city government of Yangzhou should actually understand the unique chance that they could create here a new point of attraction in line with the garden culture of the old historic city. Yangzhou has always been known for its outstanding gardens and its unique combination of highest traditional Chinese culture as well as being a vibrant economic center today as in the centuries before, the city can add now a new garden in the most avant-garde way hardly seen anywhere else in the world. The combination of having a nature reserve right in the center of the city is not known in China and hardly anywhere else in the world. On top, combining it with true green farming, sustainable social and economic issues will put Yangzhou on the very top of the list of Chinese green cities. Tourists, residents as well as researchers from Chinese and international universities and research institutes, schools from all over the country as well as people interested in new ecological and economic models will come to visit this area. The city of Yangzhou will be able to draw the line between themselves and other places in regard to being a modern and green city that still carefully looks after its long history.

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Meeting Minutes

Wang Zhiyong	√
Dylan Wang	√
Zhou Kunping	√
Li Ke An	√
Peter Kraemer	√
Fan Li	√
Bernd Seegers	√
Christoph Waldersee	√

Consultancy Services

Final Presentation

Yangzhou, 26 January, 2010

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Location: Yangzhou Construction Bureau

Date: 26 January 2010
Time: 15:00 – 18:00 h

Participants:
Mr. Gu Wenming, Vice Director of Yangzhou Construction Bureau (YCB)
Mr. Wang Jinhui, Vice Director of Water Gate Office (YCB)
Mr. Liu Yueliang, Water Gate Office (YCB)
Mr. Wang Yiming, Water Gate Office (YCB)
Mr. Zhang Fuming, Director of Administration Office, (YCB)
Mrs. Wang Ling, Project Coordinator, YCB

Mr. Christoph von Waldersee: CDIA Team Leader / Financial Specialist
Mr. Dylan Wang: CDIA Financial Specialist
Mr. Bernd Seegers: CDIA Urban Planning Specialist
Mrs. Fan Li: CDIA Urban Planning Specialist
Mr. Peter Kraemer: CDIA Environment Specialist
Mr. Li Ke An: CDIA Environment Specialist
Mr. Zhou Kunping: CDIA Water Resource Specialist
Mr. Wang Zhiyong: CDIA Water Resource Specialist

On 26 January 2010 in the afternoon the CDIA team gave its presentation of the final proposal to the representatives from Yangzhou Construction Bureau and the Yangzhou Construction Bureau's Water Gate Office.

Christoph Waldersee introduced into the matter and thanked for the strong support throughout the research works. This third and final presentation meeting was intended to update about the final proposal for the San Wan Wetland Park project

The team has discussed widely the concept of a true and successful wetland park. Of course, there would be many meanings of what it could be. However, the main characteristic of a wetland park would be to have an area that is preserving a wetland area eventually combining it with an option for people to visit it. In this particular case, the wetland area would be located in the heart of an urban settlement. This is in part a new issue for a Chinese city and in fact for most cities in the world. It would be a pity and even a waste not to make use of the existing wetland area along the ancient canal as a recreation area as it is located in the center of Yangzhou City. Such a wetland park could serve many purposes:

- As a green lung of the city
- As a recreational area for the people of Yangzhou
- As an educational and research area for visitors from near and far
- As an entertainment area on the outer borders of the wetland with a limited amount of activities as shopping and dining.

Through the first three bullet points the physical and social well being of the local population is directly benefiting. Through the third point partly and the fourth point there are plenty of more benefits indirectly supporting the first three ones through economic activities, given they do not interfere too strongly with the foremost eminent characteristics of a wetland: a nature reserve where the typical fauna and flora of the wetlands flourish and develop

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naturally benefiting the neighboring urban quarters as a healthy, biologically and physically attractive settlement for humans.

Such highly valuable benefits define the full cost/benefit analysis and involved investment/profit calculations. All four issues, cost and benefit as well as involved investment and resulting profit are characterized each of them by social, economic and physical parameters. Their value must be expressed in money terms as well as in general terms. The CDIA proposal is only a pre-feasibility study and it is too early to attach price tags to each of the project issues. But we have outlined basic data that make it easy to work out what investment may be needed, where the profit lies, how much it may cost and what the benefits could be. Our proposal provides more of a general comprehensive view on what we think is possible in the San Wan area. And we hope to share with the municipal government a fruitful discussion and deepen each other's understanding of this as a fact finding rather than a research project.

However, the next step for the Yangzhou municipal government would be to put our findings into a full fledged feasibility study which will provide the project with the necessary monetary data This will be easy to do since the general framework has been laid by our project. But we would like to remind YCB that benefit not always equals profit, the monetary outcome may be not a direct one but might be sometimes delayed. But we trust that this is adequate for a municipal investment. A municipal government is not a private sector company and must keep all municipal issues in a healthy social, still cost efficient balance.

Before getting into the matter by the experts a last word on what is the typical image of Yangzhou as a historical as well as modern city in China. The history of gardens in Yangzhou goes back over a 1000 years. Since then and even earlier the City of Yangzhou has been praised for its beauty and its high impact on the Chinese culture in garden architecture as well as in architecture in general. People from all over came to visit this place for its fame in all that and never left disappointed. However, modernization has left its marks on China and it has not always expressed itself as remarkably beautiful. The city has regained its reputation as an outstanding tourist place. But a place with historic merits hardly can make a living of its gone-by fame. So the City of Yangzhou must do something to regain its reputation not only as a historic place but also as a place where modern culture and civilization is present. Our proposal of a wetland park can be seen as a modernization of the concept of classic garden arts in Yangzhou. It will put Yangzhou back on the map with the first wetland garden in China. Yangzhou will be the first city in China, where people can live directly in harmony with nature without harming each other, right in the city center. Back then, the Yangzhou gardens would only be accessible for the emperor or the privileged owners of the gardens and their guests, who went there to enjoy nature and culture while at the same time appreciating it and learning something about it. In modern Chinese society everybody would be allowed to go relaxing in nature, enjoy healthy products of an eco-friendly agriculture and at the same time learning how nature and humans can live together in a harmonious way. So we are presenting this wetland park as a contemporary version of the classic Yangzhou garden accessible and enjoyable for every citizen. Nowadays the priority of a wetland park in China is not only on entertainment and relaxation but also on education how nature can be present, visible and can still be enjoyed right in the heart of an urban settlement. This includes learning and research that can not only be seen but also be felt and enjoyed within the City of Yangzhou. This is truly unique and a typical feature adding to the long tradition of the City of Yangzhou inviting people to visit.

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Fan Li then presented and explained the CDIA Development Framework for a San Wan Gong Yuan (Wetland Park):

The location for the wetland park has its own special characteristics of Yangzhou and the Ancient Canal. The canal portion of San Wan Gong Yuan has a historically characteristic irregularity. The CDIA team has extensively analyzed and studied the transportation mechanism along the canal, of the existing villages alongside, their agricultural activities and its natural environment.

Transportation issues: about 70% of the materials transported on this part of the Ancient Canal are a direct threat to human health and environmentally hazardous products as they are raw products of a pesticide factory north of the planned park. The pushed barge trains used for transportation are of extreme length and are very difficult to maneuver, especially with the sharp turns and ship parking along the canal banks. The ships usually need to make a U-turn to dock at the power plant and the factories to unload or upload their cargo. If any bridges are to be constructed, they must meet the requirement of a minimum of 22m width and of 4m depth of the shipping channel as well as bridges with a minimum of 4.5m height's headway. The Yangzhou Transportation Bureau does not support constructing a pedestrian bridge in the section of the canal bends to connect the western and eastern side of the proposed wetland park.

Settlement issues: The CDIA team considers the cost for the relocation and compensation of the villagers, which will become quite costly. Keeping the villagers would reduce the costs, present a new characteristic city landscape and create new income opportunities for the poorer part of the population turning them into entrepreneurs who generate income, provide jobs and services and provide income for the municipal tax authorities. Developing a "clean" eco-agriculture nearby a nature-like wetland would offer new educational approaches especially attracting the interest of school children and university students and researchers.

Services: There will be several villages that will be retained along with the agricultural farm lands. Pockets of park land will be filled-in between the agricultural spaces as well as a true flooding area will be kept and developed as pure wetland area.. A pedestrian walkway (20 – 30m wide green promenade) along the canal invites visitors to observe this chain of multifarious landscapes, including the opportunity for bird watching in a nature reserve on the opposite canal bank. Farm shops can be introduced wherever the villages touch the promenade to allow the public to purchase fresh, locally grown products from highly eco-friendly agriculture. The two main entrances in the East side will be equipped with car and bicycle parking lots.

Because of a difficult traffic situation with several industrial plots blocking the west side of the Wetland Park, there shall be no direct entrance for the public on that side. This western part of the park shall be only accessible via the pedestrian bridge at the south side of the wetland park or a ferry boat in the center of the San Wan Gong Yuan. This will direct the visitor stream first through the more economically orientated eastern park and then lead it into an environmentally harmonious wetland. The ferry boats' crossing is located close to the harbor area near the power plant in a straight section of the Ancient Canal, because a traffic regulation system can be installed here, which will reduce danger of ship collision.
The central peninsula of San Wan Gong Yuan will become a nature reserve and not be accessible by the general public. Only especially skilled maintenance and research workers

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shall be allowed to enter here. This area introduces a resting and nesting place for birds and offers a high value research object for natural development in an urban environment.

The CDIA Team in the process of designing a development framework also reviewed the Wetland Park proposal of Yangzhou University. It is obvious that the proposals of Yangzhou University for waste water treatment and a green belt along the canal banks are very similar to the CDIA draft. In contrary the Yangzhou University proposal does not consider social issues or agricultural concerns. It also contains a weakly elaborated proposal for the straightening of the canal, which may have negative impact on water flow speed, environment and historical landscapes.

Li Ke An/Peter Kraemer:

It is an important aspect of the study to investigate the underground conditions, e.g. concerning contamination. We have done several site visits to the proposed wetland park area. During the last visit (Jan 25), we found that there were tremendous changes in the area. It seems the migrant recyclers were removed from the western part of the area and with them all the material recycled or waiting to be recycled. The cleansing of the site seems to have been an efficient work. As we were told it was ordered by the local government. The removal of the sources of groundwater and soil contamination is important for the success of the wetland park. However, we would need evidence how this was done and whether there remain parts of this in the ground. While having done several site visits, we mapped the present land use at the time of the visits and already then defined areas with potential contamination. These maps can be inspected by the Yangzhou Construction Bureau. We also found obvious contamination, such as areas being backfilled with a number of different construction materials, and two ponds partially backfilled with different not yet identified industrial wastes.

We suggest to inspect the existing and former industrial areas in detail and clearly identify areas of potential underground contamination, perform a suitable number of shallow soil borings (each on every 2sqm, down to the groundwater table at approximately 2-4 m), and perform groundwater monitoring wells to analyze soil and take groundwater samples.

In the area formerly used for recycling activities, it is suggested to perform drilling in a grid (e.g. grid 40x40m, 2m deep), and install a suitable number of monitoring wells, based on the result of the soil analyses.

The dumped wastes in the pond should be investigated (e.g. using an excavator to dig several small pits to identify the content of the dump and take samples for analysis from the pits). The residential and other areas also should be inspected in detail to identify potential areas of any additional underground contamination.

The project finally aims to re-nature the identified areas that had been affected adversely in the past (e.g. pond filled with concrete sludge and other environmental damage). It also aims to make it possible to turn the place into a true wetland park right in the centre of a lively urban settlement like Yangzhou City.

Wang Zhiyong / Zhou Kunping

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Easen colleagues then presented several site pictures of the wetland park area and the directly surrounding areas. It was observed that the water quality is still poor. But there are signs that the local government is placing priority on the environment and water resources.

The current water quality of this Ancient Canal is below class V. The subsurface flow system (SFS) is recommended to be applied for the canal water quality improvement.

The proposed approaches:

- Pollution Source Control
- First-flush Stormwater Collection
- Sediment Dredging
- Constructed Wetland

The proposed western part of the wetland is recommended to accept the stormwater runoff from the surrounding industrial area. The planned catchment area is about 750 mu (50 ha). Cattails, bulrushes, reeds and similar kinds of submerged plants can be used as aquatic plants in this wetland bit. In the shallow water areas, emergent vegetations such as cattail, lotus and calamus should be planted. However, it seems to be of vital importance that,

- The water quality of the canal should be fully monitored.
- The local geotechnical conditions need to be carefully investigated.

Next steps:

- The water quality of the canal should be closely and fully monitored. This should be established as the base line to protect the water quality of the Ancient Canal.
- The local geotechnical conditions need to be further investigated.
- The design of the wetland should incorporate the ability for treating the wastewater from the local shops, villages and visitor centers that are being discharged to the wetland. A wastewater pretreatment facility should be installed to ensure that the water quality of the discharge will not exceed the handling capacity of the wetland.
- The interception of pollutants from the surrounding shops and plants that are directly discharged into the Ancient Canal should be reinforced, such as the Qili River. The treatment ability of wetland can be guaranteed only when the pollution source is identified and controlled.
- The wetland system in itself will also have a buffering ability in case of accidental release of pollutants.
- The potential secondary pollution from nitrate and heavy metals on the dredged sediment will be controlled according to the quality test result. The disposal of the treated sediment should take into account all of the potential environmental impacts. The following solutions are alternatives to be considered during the treated sediment disposal stage:
    1. Agriculture, garden and forest utilization. The sediments may contain organic matter and nutrients that can often be used as organic compost which are beneficial for any vegetation. In China, “Environmental Quality Standard for Soils” (GB15618-1995) and “Standard of Sewage Sludge Applied to Agricultural Soils” (GB4284-84) set the standards for the sediments to be used as organic compost. The nutrients in the sediment can promote the growth of the vegetation in the farm land, forest and garden. If the sediment is used for non-agricultural purposes, then the secondary pollutant content of the sediment will be of no concern through the food chain.

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2. Landfill site cover. The landfill close cover is composed largely of inorganic material with little nutrients in it, which is not good for growth of vegetation. The treated sediment can add nutrients to the top soils and promote the growth of plants, which will help to reduce soil erosion on the landfill cover. In this application, the secondary pollution of sediment will not affect the food chain. For this intended application, the treated sediment must be dry enough to meet the requirements on anti-seepage from the landfill and stabilization as cover material. In this application, there should be no secondary pollution to the environment.
3. Earth fill: Under proper conditions, the sediment can be stabilized to change its characteristics from high water content and low strength to low water content and higher strength. The treated sediment can then be used as earth fill for engineering projects in the city. The potential applicable projects would be:
    a) Embankment or riverbank reinforcement project: the solidified sediment can be a cost-effective replacement for other conventional construction materials. It can meet the requirements of side slope stabilization, anti-seepage and erosion control.
    b) Road project foundation and earth fill projects: the solidified sediment can be stabilized to replace the conventional sub-grade construction or earth fill materials for a cost-effective solution to meet the project requirements.
    c) Construction material: The sediment can be used as construction material in industrial settings. The construction material industry has many requirements that can benefit through the reuse of this treated sediment as raw material. In many instances, the use of stabilized sediment can be a cost-effective replacement or supplemental raw material for construction.
4. The treated sediment disposal can also be combined with the WWTP's sludge treatment and disposal project for mutually beneficial reuse consideration.

Education on public awareness for environmental protection is also deemed an effective safeguard measure to ensure the effectiveness of the wetland and the project objectives of restoring the surface water's assimilation ability while improving the water circulation and the water quality. The wetland park includes training center for environment and ecology protection education for the general public. This will help to educate the citizens to understand the principle and purpose of a wetland.

Questions and Answers:

Mr. Gu Wenming introduced the local participants from the project implementation unit and other related government bureaus. He said they had now seen and much appreciated the CDIA team proposal and a lot of hard work done. Then he invited Mr. Wang Jinhui from the Water Gate Office to introduce the preliminary proposal made by the Nanjing Forestry University. After that he said he would like to discuss everything together.

Mr. Wang Jinhui:
The design of the San Wan Gong Yuan was contracted to Nanjing Forestry University and will be presented to the municipal government on February 5th. The general idea was to make a wetland park according to national and provincial wetland park standards. According to the master plan and guidelines, all villagers and agricultural farmlands will be removed. Some demonstration farmland will be re-introduced after the completion of the wetland. These new

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farmlands will be farmed by newly settled, employed farmers chosen and educated by the city government. The main reason for that is that it would be difficult to handle the original farmers, who also will not be able to learn eco-friendly agricultural techniques.

In order to allow local traffic to work, a bridge will be constructed between the triangular wetland on the east bank and the peninsula on the west bank connecting the two sides.

Bernd Seegers:
In the Nanjing Forestry University's proposal shown here, the wetland park appears to be an amusement park with rollercoaster and other children activities rather than a wetland park.

Mr. Wang Jinhui:
There will be some limited areas for commercial activities. But there are many parts of land that are not allowed to be changed or modified. For example, one is the area of an ancient not anymore existing private garden and another one is the new educational centre on the east bank. The Western entrance to the park area will be on a public road that has an industrial factory in the north next to a combined car parking and highway patrol parking.

Bernd Seegers:
It is a new piece of information to us that the planned southern extension of the industrial site of "Zhong Ji Tong Hua" will not be walled-in and in contrary serve as a parking lot only, allowing to further extend the existing road between the factory and the parking to the east. For this reason we are of course ready to amend the CDIA development proposal and include a public entrance to the wetland park from the western side.

Mr. Gu Wenming:
This is only the 1st draft of the Nanjing University's design. Therefore with the help of the CDIA's proposal, we will take everything from both proposals into consideration. But we would really appreciate if there are further suggestions or recommendations regarding the current design. However, it would be his understanding that the design of the CDIA proposal would focus on attracting investors. But the main concern is to attract business investors for the wetland park.

Bernd Seegers:
It is a difficult situation to have a bridge as per Nanjing Forestry University's proposal in the middle of the sharp canal bends where complicated ship maneuvers take place. At least a pedestrian bridge in this position has to be very long (more than 200m) and thus would be rather costly. Also a flooding plan should be implemented there. Studies show that these areas are very likely to become flooded.

Mr. Wang Jinhui:
The area survived the 2-year recurrence flood and failed the 20-year one. Therefore, the wetland park is designed to be flooded in case of flood season. Both areas (north and south triangle) are designed to be flood inundation area. Concerning the ship traffic, it is thought that an additional bridge would be no problem.

Christoph Waldersee:
What is the budget and who will pay for the wetland park?

Mr. Wang Jinhui:

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CNY 326 million (roughly USD 47 million or EUR 34 million) shall be invested by the city government. Besides, CDIA's assistance would be hoped for.

Christoph Waldersee:
It was the agreed task for this CDIA team to work out a sustainable proposal for a wetland park, which certainly includes a sustainable economic solution of such a project. In the proposal of the Nanjing Forestry University we have just been introduced to, we have to doubt the economics. The concept to combine a true wetland park with plain entertainment in a finally relatively small area seems rather questionable. Therefore we cannot suggest such a very likely unsustainable entertainment park, which may just carry the label of a wetland park but in fact is not having any considerable wetland area of impact. In our steering committee meeting on 2 December 2009 we agreed together with the YZ CB to work out not only the proposal of a wetland park that is on top of the biological facts, but is also able to maintain itself economically as far as possible. Also this is supposed to include a serious contribution to the social balance of Yangzhou City in the full meaning of it. And that is what we have just introduced with our CDIA team proposal.

Mr. Gu Wenming:
This is understood. But it is the hope of the Yangzhou municipal government to obtain support from CDIA in money terms. However, in order to reduce the government's own investment, the two business areas outside of the wetland park could possibly generate income for the project. Especially the selling of land use rights is thought to partly compensate for the investment. Of course, the land to be sold would be from outside of the area of the now considered park.

Bernd Seegers:
CDIA is not commissioned to just generate money through a loan or an investor. The CDIA development framework is designed to support and work out a proposal in form of a pre-feasibility study for a truly sustainable operation of the wetland park. To our opinion it is not sustainable to remove the villages. In comparison with the proposal of an investment of CNY 326 million required for the Nanjing Forestry University's preliminary design, the CDIA proposal is far less costly and will cover up the total investment probably much faster.

Mr. Gu Wenming:
The annotations concerning a sustainable development will be taken in consideration. However, the proposal of the CDIA team may be rather risky and the YCB is not confident if all that can be achieved. The Yangzhou municipal government appreciates the efforts by the CDIA team but would appreciate also the team providing funding for the project.

Christoph Waldersee:
The CDIA team has now made a detailed and realistic proposal for a pre-feasibility study based on facts and the vast experience of the involved experts. It proposes a truly balanced and sustainable wetland park on a comprehensive cost-benefit suggestion. The team worked out and presented this proposal which carries no particular risk. The only real risk involved is in the environmental analysis of the area's potential soil and water pollution. This may indeed show environmental and financial risk. But if these issues are not properly dealt with but instead neglected these risks may even increase in size and thus get an ever bigger burden at a later stage. This is to be evaluated in regard to environmental and health burden as well as the financial cost it may generate if these problems are not dealt with at the right time. Therefore the CDIA team proposal is actually minimizing the risk in an environmental and economic

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sense, as well as regarding social issues. It is actually carefully taking into consideration the social balance including its costs and not only just the entertainment factor.

The subsequent CDIA report, that will be a pre-feasibility study, will allow YCB to go and see banks and apply for a loan or even find investors. It will help everybody to look at the area in a complete way as required by every lender including development banks or commercial investor. CDIA itself does not do funding. But in the report we will of course provide addresses and details that will allow Yangzhou municipal government to go and see such addresses and open the discussion.

Mr. Gu Wenming:
By thanking the CDIA team for its efforts Mr. Gu is closing the meeting. He promises to look closely into the proposal of the CDIA team and compare it carefully with the proposal of Nanjing Forestry University.

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ANNEX 2: ADDITIONAL DOCUMENTS

Following documents are supplied as external files on CD:

- Map: Location of the Wetland Park Project in Yangzhou City (English, Format JPG)
- Map: Location of villages in planning area (English, Format JPG)
- Aerial Views: Montages of Google Earth Screen shots (Format JPG)
- Plan: San Wan Gong Yuan – Village-park-system (English, Format JPG)
- Plan: San Wan Gong Yuan – Development Framework (English, Format JPG)
- PowerPoint Presentation: Wetland Park Development Frame - Final Report (English/Chinese, Format PPS)
- Selection of photos of the project area (Format JPG)
- Shanghai WORLD EXPO 2010 – Wetland Planning (Chinese, Format DOC)
- Environmental related photos
- Enterprises list

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ANNEX 3: LIST OF BANKS AND INVESTORS

1. List of Important National & International Banks in Beijing/China

(Attention: some of the addresses and telephone number might be outdated)

A
ABN AMRO Bank - Beijing Rep Ofc
Rm 3306 Jingguang Centre
Hujialou, Chaoyangqu
Beijing 100020, China
Tel: (86 10) 6501 9597; 6501 3388; 6501 2055
Fax: (86 10) 6501 5110

Agricultural Bank of China
A25 Fuxing Lu
Beijing 100036, China
Tel: (86 10) 6841 3128; 6821 6807
Fax: (86 10) 6821 6807

Agricultural Bank of China - Beijing Branch
15 Shuidaozi Lane, Chongwenqu
Beijing 100062, China
Head Ofc Tel: (86 10) 6701 4245
Planning Ofc Tel: (86 10) 6701 4250
Industrial Credit Ofc Tel: (86 10) 6701 4236
Commercial Credit Ofc Tel: (86 10) 6701 4252
Fax: (86 10) 6701 4227

Agricultural Development Bank of China
23A Dongjianominxiang
Dongchengu
Beijing 100006, China
Tel: (86 10) 524 3311
Fax: (86 10) 523 5059

Alahli Bank of Kuwait (KSC) - Beijing Rep Ofc
Rm 1411, Blk K, Hui Yuan Apartment
8 Anli Lu, Andingmenwai
Beijing 100101, China

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Tel: (86 10) 499 2568
Fax: (86 10) 499 2568

American Express Int'l Inc. - Beijing Rep Ofc
Rm L115D, Shopping Arcade, CWTC
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 2888
Fax: (86 10) 6505 4972

Arab Bank Plc - Beijing Rep Ofc
Room 5-01A, CITIC Bldg
19 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6500 2255, ext. 3510
Fax: (86 10) 6500 3275

Australia & New Zealand Banking Group Ltd - Beijing Rep Ofc (ANZ Bank)
Room 1530, China World Tower, CWTC
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 1602/3
Fax: (86 10) 6505 1604

B

Banca Commerciale Italiana - Beijing Rep Ofc
21/F, Room 8, Capital Mansion
6 Xinyuan Nan Lu
Beijing 100004, China
Tel: (86 10) 6466 0088, ext. 2108
Fax: (86 10) 6466 4067

Banca Di Roma - Beijing Rep Ofc
Room 2604, CITIC Bldg
19 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6500 3716; 6500 4539
Fax: (86 10) 6500 1165

Banca Nazionale del Lavoro
Room 1002, CITIC Bldg
19 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6500 2255, ext. 1020-3; 6500 4212
Fax: (86 10) 6500 3507

Banco Central Hispano - Beijing Rep Ofc
Room C610, Beijing Lufthansa Centre
50 Liangmaqiao Lu
Beijing 100016, China
Tel: (86 10) 6463 8059; 463 8060

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Fax: (86 10) 6461 8959

Banco Exterior de Espana SA - Beijing Rep Ofc
Room 1007, SCITECH Tower
22 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6512 2288, ext. 51007; 6512 3838
Fax: (86 10) 6512 3765

Banco Santander - Beijing Rep Ofc
Unit 23-01, Landmark Bldg
8 Dongsanhuan Bei Lu
Beijing 100004, China
Tel: (86 10) 6506 8020/1
Fax: (86 10) 6506 8023

Banco do Brasil SA - Beijing Rep Ofc
Room 1426-1427, China World Tower, CWTC
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 2288, ext. 1426; 6505 0752
Fax: (86 10) 6505 4620

Bangkok Bank - Beijing Rep Ofc
24 Jianguomenwai Dajie
Beijing 100022, China
Tel: (86 10) 6515 8909; 6515 0241

Bank Austria AG - Beijing Rep Ofc
Room 708, Landmark Tower
8 Dongsanhuan Bei Lu
Beijing 100004, China
Tel: (86 10) 6501 3546
Fax: (86 10) 6501 3547

Bank of America NT & SA - Beijing Rep Ofc
Room 2722-2723, China World Tower, CWTC
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 3508/9
Fax: (86 10) 6505 3509
Bank of China
8 Yabao Lu
Chaoyangqu
Beijing 100020, China
Tel: (86 10) 6519 9114; 6519 9432
Fax: (86 10) 6519 9368

Bank of China - Head Ofc
410 Fuchengmennei Dajie

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Beijing 100818, China
Tel: (86 10) 6601 6688; 6601 4422; 6601 4094
Fax: (86 10) 6601 6869

Bank of China Beijing Trust & Consultancy Corp.
13 Nanlishi Lu
Xichengqu
Beijing 100045, China
Tel: (86 10) 6857 0068
Fax: (86 10) 6857 0046

Bank of East Asia Ltd - Beijing Rep Ofc
Room 316-317, Guangdong Regency Hotel
2 Wangfuging Dajie
Beijing 100006, China
Tel: (86 10) 6513 4243
Fax: (86 10) 6513 4245

Bank of Montreal - Beijing Rep Ofc
Room 707, SCITECH Tower
22 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6512 3441
Fax: (86 10) 6512 3442

Bank of New York
Room 220, Landmark Tower
8 Dongsanhuan Bei Lu
Beijing 100004, China
Tel: (86 10) 6506 6548
Fax: (86 10) 6506 6943

Bank of Nova Scotia (Scotiabank) - Beijing Rep Ofc
Room 1205-1206, China World Tower, CWTC
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 0552, ext. 1205; 6505 2288
Fax: (86 10) 6505 0553

Bank of Tokyo Ltd - Beijing Ofc
2/F, Beijing Forture Bldg
5 Dongsanhuan Bei Lu
Chaoyangqu
Beijing 100004, China
Tel: (86 10) 6591 93701
Fax: (86 10) 6591 9373

Bankers Trust Co. - Beijing Ofc
G/F, Suite 125, Beijing Lufthansa Centre
50 Liangmaqiao Lu

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Chaoyangqu
Beijing 100016, China
Tel: (86 10) 6463 8038; 6463 7909
Fax: (86 10) 6463 8037

Banque Francaise de Commerce Exterieur
Room 2001, CITIC Bldg
19 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6500 2647; 6500 4795; 6591 9010
Fax: (86 10) 6500 4795

Banque Indosuez - Beijing Ofc
Room 1205, CITIC Bldg
19 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6500 3574; 6512 5086; 6513 9747
Fax: (86 10) 6500 4930

Banque Nationale de Paris - Beijing Rep Ofc
Room 3527-3531, China World Tower, CWTC
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 3685/7; 6505 2288, ext. 3527
Fax: (86 10) 6505 3688

Banque Paribas - Beijing Rep Ofc
Room 3136, Beijing Hotel
33 Dongchangan Jie
Beijing 100004, China
Tel: (86 10) 6513 3990/2
Fax: (86 10) 6513 7430

Barclays Bank PLC - Beijing Ofc
Room 1211, SCITECH Tower
22 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6512 2288, ext. 1211
Fax: (86 10) 6512 7889

C
CARIPLO Cassa Di Risparmio delle Provincie Lombarde S.p.A.
Room 706, SCITECH Tower
22 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6512 6788/9; 6512 2288, ext. 706
Fax: (86 10) 6512 7359

CITIC Industrial Bank
6 Xinyuan Nan Lu

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Beijing 100004, China
Tel: (86 10) 6512 2233
Fax: (86 10) 6466 1059; 6466 1061

Chase Manhattan Bank, N A - Beijing Rep Ofc
Room 509, SCITECH Tower
22 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6512 3457; 6512 2288, ext. 5509/10
Fax: (86 10) 6512 3693

China Eximbank
75 Chongnei Dajie
Beijing 100005, China
Tel: (86 10) 6513 2288
Fax: (86 10) 6523 6641; 6523 6632

China Investment Bank
88 Xuanwai Dajie
Xuanwuqu
Beijing 100052, China
Tel: (86 10) 6304 3388; 6303 2366
Fax: (86 10) 6303 1944/5
Citibank N A
18/F, Room 1, CITIC Bldg
19 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6500 4425
Fax: (86 10) 6512 7930

Commerzbank Rep Ofc Beijing
8/F, 8-4, CITIC Bldg
19 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6500 4959; 6500 3703; 6500 2255, ext. 3840
Fax: (86 10) 6500 3161

Commonwealth Bank of Australia - Beijing Rep Ofc
Room 2910, China World Tower
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 5350-2
Fax: (86 10) 6505 5354

Credit Lyonnais - Beijing Rep Ofc
Suite 1803, CITIC Bldg
19 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6500 4562; 6500 8444
Fax: (86 10) 6500 4479

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Credit Suisse - Beijing Rep Ofc
31/F, Silver Tower
2 Dongsanhuan Bei Lu
Beijing 100027, China
Tel: (86 10) 6410 6866/6467 1199
Credit Suisse First Boston Hong Kong Ltd Beijing Rep Ofc
31/F, Silver Tower
2 Dongsanhuan Bei Lu
Beijing 100027, China
Tel: (86 10) 6467 1199
Email: csfbbj@public3.bta.net.cn

Credito Italiano - Beijing Rep Ofc
Room 608, SCITECH Tower
22 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6512 6968; 6512 7183
Fax: (86 10) 6512 7184

D
Dai-Ichi Kangyo Bank - Beijing Rep Ofc
Room 2620-2624, China World Tower, CWTC
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 2305/6
Fax: (86 10) 6505 2304

Deutsche Bank AG
Beijing Branch
Tel.: 0086-10-6505 2305 - Anna Jin
Hong Kong Branch
Tel.: 00852-2203 8403 - Michael West

E
Everbright Bank of China
Everbright Bldg
6 Fuxingmenwai Daije
Beijing 100045, China
Tel: (86 10) 6851 5577
Fax: (86 10) 6857 1260; 6857 1290

Export-Import Bank of Japan - Beijing Rep Ofc
East Bldg 1
23 Qianmen Dongdajie
Beijing 100006, China
Tel: (86 10) 6512 6617; 6512 5119
Fax: (86 10) 6512 0572

F

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First National Bank of Chicago - Beijing Rep Ofc
Suite 1605, CITIC Bldg
19 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6500 3281; 6500 3514
Fax: (86 10) 6500 3166

G

Generale Belgian Bank Rep Ofc
Bldg 3, Zijin Guest House
9 Chongwenmen Xidajie
Beijing 100005, China
Tel: (86 10) 6513 3310; 6513 3394
Fax: (86 10) 6512 9810

Goldman Sachs (China) L.L.C. - Beijing Rep Ofc
Unit 1102-1104, Landmark Bldg
8 Dongsanhuan Bei Lu
Beijing 100004, China
Tel: (86 10) 6501 2183
Fax: (86 10) 6506 6240

H

HSBC
G/F, Block A, Beijing COFCO Plaza,
8 Jianguomen Nei Da Jie, Dong Cheng District,
Beijing 100005, China
Tel: (86-10) 6526 0668
Fax: (86-10) 6526 0669

Hua Yin Int'l & Trust Co. Beijing Ofc
Huitong Ci, Deshengmen Xidaije
Beijing 100035, China
Tel: (86 10) 6601 4571; 6601 9064/5
Fax: (86 10) 6601 9059

Hypo- und Vereinsbank (Unicredito) AG
Office Unit C305, Lufthansa Centre
50 Liangmaqiao Lu
Beijing 100016, China
Tel: (86 10) 6465 1923
Fax: (86 10) 6465 1921

I

ING Bank of Beijing Rep Ofc
Room 1510, Landmark Bldg
8 Dongsanhuan Bei Lu
Beijing 100004, China
Tel: (86 10) 6501 1955
Fax: (86 10) 6501 1957

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Industrial & Commercial Bank of China
15 Cuiwei Lu, Haidan Qu
Beijing 100036, China
Tel: (86 10) 6821 7273
Fax: (86 10) 6821 7920

IFC-International Finance Corporation
A member of World Bank Group
1501, China World Tower 2
1, Jian Guo Men Wai Ave.
Beijing 100004, China
Tel.: 0086-10-6505 8686
Fax: 0086-10-6505 9808

K
Keppel Bank of Singapore Ltd - Beijing Ofc
Unit 1502, Landmark Bldg
8 Dongsanhuan Bei Lu
Chaoyangqu
Beijing 100004, China
Tel: (86 10) 6501 3530; 6501 6688, ext. 21502/14
Fax: (86 10) 6501 2188

Korea Exchange Bank - Beijing Rep Ofc
Room 0617, China World Tower, CWTC
1 Jianguomenwai Dajie
Beijing 100020, China
Tel: (86 10) 6505 4245/6
Fax: (86 10) 6505 4247

Korea First Bank - Beijing Ofc
Room 315, Bright China Chang Bldg
1 Jianguomenwai Dajie
Beijing 100005, China
Tel: (86 10) 6510 1714
Fax: (86 10) 6510 1716

M
Merrill Lynch Int'l Beijing Ofc
Room 3301-3302, China World Tower, CWTC
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 0290
Fax: (86 10) 6505 0278

Mitsubishi Bank Ltd - Beijing Rep Ofc
Room 1901, CITIC Bldg
19 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6500 3345

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Fax: (86 10) 6512 7131

Mitsubishi Trust & Banking Corp. - Beijing Rep Ofc
Room 304, Changfugong Ofc Bldg
26A Jianguomenwai Dajie
Beijing 100022, China
Tel: (86 10) 6513 9016/7
Fax: (86 10) 6513 9226

N
Nanyang Commercial Bank - Beijing Rep Ofc
1/F, Lijingyuan
Jianguomenwai Dajie
Beijing 100020, China
Tel: (86 10) 6595 4728

Nomura Securities Co. Ltd - Beijing Rep Ofc
Room 2018, Beijing Fortune Bldg
5 Dongsanhuan Bei Lu
Beijing 100004, China
Tel: (86 10) 6500 4807; 6501 4320
Fax: (86 10) 6500 3958; 6501 4394

Nordbanken AG Beijing Ofc
Room 107, Jianguo Hotel
5 Jianguomenwai Dajie
Beijing 100020, China
Tel: (86 10) 6500 2233, ext. 105/7; 6501 8357
Fax: (86 10) 6501 8357

P
People's Bank of China
32 Chenfangjie
Xichengqu
Beijing 100800, China
Tel: (86 10) 6601 5522; 6601 3194/6

R
Rabobank Nederland, Shanghai Branch
33/F, China Merchants Tower (Shanghai)
161 East Lu Jia Zui Road
Pudong New Area
Shanghai 200120, China
Tel.: 0086-21-5888 9888
Fax: 0086-21-5887 0647

RZB Raiffeisen Zentralbank Oesterreich AG
Beijing Branch
Mr. Andreas Werner, Ms Sylvia Lutz, Ms Andrea Zechner
200 Beijing International Club

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21 Jian Guo Men Wai Ave.
Beijing 100020, China
Tel.: 0086-10-6532 3388
Fax: 0086-10-6532 5926

Republic National Bank of New York - Beijing Rep Ofc
Room 2201, Landmark Tower
8 Dongsanhuan Bei Lu
Beijing 100004, China
Tel: (86 10) 6506 6548/9; 501 6688, ext. 22201/11
Fax: (86 10) 6506 6943

Royal Bank of Canada
Suite 618-620, China World Tower, CWTC
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 0358
Fax: (86 10) 6505 4206

S
Sanpaolo-Instituto Bancario San Paolo Di Torino
Room 2626-2628, China World Tower, CWTC
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 3090-2
Fax: (86 10) 6505 3098

Societe Generale - Beijing Rep Ofc
Room 1504, CVIK Tower
22 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6512 3650; 6512 3666
Fax: (86 10) 6512 7485

Standard Chartered Bank - Beijing Rep Ofc
14/F, Hong Kong Macau Centre
2 Chaoyangmen Beidajie
Beijing 100027, China
Tel: (86 10) 6501 1578/9
Fax: (86 10) 6501 1577

Sumitomo Bank Ltd - Beijing Rep Ofc
Room 2902-2904, Jingguang Centre
Huijalou, Chaoyangqu
Beijing 100020, China
Tel: (86 10) 6500 1151; 6501 3388, ext. 29021-3
Fax: (86 10) 6500 4745

Svenska Handelsbanken - Beijing Rep Ofc

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Room 1505, CITIC Bldg
19 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6500 2255
Fax: (86 10) 6512 6692

Swiss Bank Corp. - Beijing Rep Ofc
Room 3623-3624, China World Tower, CWTC
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 2213-5
Fax: (86 10) 6505 1179

T
The Hong Kong & Shanghai Banking Corp. Ltd Beijing Branch
Jianguomenwai Dajie
Beijing 100020, China
Tel: (86 10) 6500 1121; 6500 2233, ext. 145
Fax: (86 10) 6500 1074

Tokai Bank Ltd - Beijing Rep Ofc
Room 3202, Jianguang Centre
Huijalou, Chaoyangqu
Beijing 100020, China
Tel: (86 10) 6500 2506; 6505 3203
Fax: (86 10) 6500 3079

U
Union Bank of Finland Ltd - Beijing Rep Ofc
Room 905, Landmark Tower
8 Dongsanhuan Bei Lu
Beijing 100004, China
Tel: (86 10) 6501 2181
Fax: (86 10) 6501 2182

Union Bank of Switzerland - Beijing Rep Ofc
Suite 1610, China World Trade Tower, CWTC
1 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6505 2283-5
Fax: (86 10) 6505 2286

W
Westdeutsche Landesbank - Beijing Rep. Office
50 Liangmaqiao Lu
Beijing 100016, China
Tel: (86 10) 6465 1936
Fax: (86 10) 6465 1912

Westpac Banking Corp. - Beijing Rep Ofc

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Room 506, SCITECH Tower
22 Jianguomenwai Dajie
Beijing 100004, China
Tel: (86 10) 6512 2288, ext. 506/26
Fax: (86 10) 6512 3780

2. List of Major International Development Finance Companies (Selection)

World Bank

World Bank Resident Mission in China
9/F, Bldg A, Fuhua Mansion
8 Chaoyangmen Beidajie, Dongchengqu
Beijing 100027, China
Tel: (86 10) 6502 3361
Fax: (86 10) 6502 1686

Asian Development Bank

Asian Development Bank
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
Tel (+63-2) 632-5470
Fax (+63-2) 636-2347
www.adb.org/privatesector

KfW Group: DEG-Deutsche Investitions- und Entwicklungsgesellschaft mbH

Jochen Steinbuch
Vice President
DEG-Beijing Office
jochen.steinbuch@deginvest.com

Address:
1150, Sunflower Tower
37, Mai Zi Dian Street
Beijing 1000026, CHINA

World Bank Group: IFC International Finance Corporation

SUN Hao
Senior Investment Officer
Hsun1@ifc.org

Address:
1501, China World Tower 2
1, Jian Guo Men Wai Da Jie
Beijing 100004, CHINA

Tel.: +86-10-5860 3062
Fax: +86-10-5860 3100

3. Selected Investment Companies, Private Investors & Equity Funds:

1.
Beijing Time Fortune Investment & Management Co., ltd.
Mr. YU Yuan 余远, President
Hua Xia Yin Hang Da Sha (HUA XIA Bank Building), 8th Floor
22, Jian Nei Da Jie
Beijing 100005
Tel: 85237084/85237082
Fax: 85237083

2.
Beijing Unisplendour Investment Management Co., ltd.
Ms Vivian HUANG Yun 黄 昀, General Manager
C-26, SP Tower, Tsinghua Science Park Building 8
East Gate of Tsinghua University, Haidian District
Beijing 100084
Fax: 82150335
Tel: 82150331/82150326

3.
Prof. Dr. Theo LEUENBERGER
Ermitagestrasse 9
CH-4144 Arlesheim/Switzerland
Tel: +41 61 7013845
FaX: +41 61 7020612
e-mail: theo_leuenberger@bluemail.ch

4.
AMI ENGINEERING AS
Mr. Willy JOHANSEN
Managing Director
Beijing, Chaoyang District
Radisson SAS Bldg., Rm. 318
Mobile:1350 101 9492

5.
Greater China Environmental Protection Co., Ltd.
Mr. Dominic YIN, Chairman and CEO
EESCO P2E2 Hong Kong Ltd.
EPPA Enterprises Ltd.
Unit 904, Two Chinachem Exchange Square
338 King's Road, North Point, Hong Kong
Mobile: +852 9038 3468 +86 1360 289 0347
e-mail: dyeppa@gmail.com

6.
The Capstone Group
Mr. GONG Zhao (Richard)
Mr. JIANG
Partners
Beijing Office:
1 Zhongguancun Nandajie
Friendship Hotel Yiyuan 62518
Beijing 100873
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