

Environmental Assessment Report

Environmental Impact Assessment
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People's Republic of China: Shanxi Small Cities and Towns Development Demonstration Sector Project – Pingyao Huiji River Treatment Project

Prepared by Pingyao County Development and Reform Bureau for the Asian Development Bank (ADB).

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Asian Development Bank

Pingyao Huiji River Treatment Project

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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1 Project Background

Located in the south-east of the central Taiyuan Basin in the middle reaches of the Fenhe River, Pingyao, a renowned historic Ancient City, is easily accessible to the National Highway 108 and Qi-Lin Expressway crossing Fen-Tun Highway respectively and with the Nan-tong-pu Railway and the National Highway running side by side along within its territory.

Huiji River is 3.5 km away from Pingyao ancient city and Yihui Reservoir was built at the intersection of its eastbound and westbound branches. The dam height is 20.4m, and its length is 730m. There are some supporting facilities such as spillways and spillway tunnel, etc. The storage capacity of reservoir is 26,300,000m³ and its effective storage capacity is 6,400,000m³. The reservoir was designed in accordance with “just once in one century” standard, was checked in accordance with “Just once in one thousand years” standard, thus it is a mid-size one whose primary function is flood control and irrigation and secondary function is supplying water for Pingyao County.

The riverway is flexural and blocked and due to the inefficient management in recent years and severe conditions like dumping rubbish into the riverway as well as encroachment of buildings and fields, the normal flood passing has been severely affected. The current flood passing is in a poor state between the downstream of Yihui Reservoir and section along the Dong-Xia highway. The riverbed was severely damaged by human activities and became very rough. The riverbanks on both sides have collapsed and blocked the flood discharge.

Pingyao old town is the political, economic and cultural center of Pingyao County with a population of more than 80,000 people. It houses a great number of key plants and mines at province and county levels. Many important communication arteries like railways and roads run through Pingyao old town. Pingyao old town boasts a very critical location and even became more important at home or abroad, esp after Pingyao old town was listed as one of the world cultural heritage by UNESCO. Once it was flooded, the losses and social and political impact would be enormous. Therefore, the treatment of Huiji River is imperative.

It is imperative to treat Huiji River comprehensively in hope that the economy in Pingyao old town can develop in a healthy way and a good environment can be provided to the foreign and domestic investors. On top of that, water will be stored in the riverway of main areas so that the treatment project of Huiji River can be an ecological project which gives consideration to urban beautification and tourism, on the premise of guaranteeing flood control safety.

Project site location and the proposed Pingyao City overall development plan are shown in Appendix Figure 1 and 2.

2 Project Description

The scope of the comprehensive treatment of the Huiji Riverway extends from the downstream of the Yinhuai Reservoir in the south to the Huiji Bridge in the north, total length of which is 7,211.7 meters. Details of the River treatment plan include:

- Treatment and dredging of riverway for flood control: total length of 7,211.7m;
- Riverway slope protection: total treatment length will be 2,396.4m;
- Riverbed anti-seepage project: total length of riverbed to be treated will be 3,093.6m;
- Riverway embankment: a dike of totally 3,190.6m long will be built;
- Water storage and beautification project: three rubber dams for water storage will be installed through the riverway, with a total length of 3,093.6m.

Proposed project execution scheme is shown in Appendix Figure 3. Total investment of the proposed Huiji River treatment project is estimated to be RMB 263.12 million, among which 130.2 million will be loaned from ADB and 132.92 million from local government. According to proposed project schedule and ADB's requirements the whole project execution period will last two years, from Jan. 2009 to Dec. 2010.

2.1 Engineering Design and Execution Plan

2.1.1 Riverway Embankment

According to Pingyao City Overall Layout Plan (from 1999 to 2020) the flood control capability of Huiji River shall meet a "once in 50 years" standard, corresponding maximum flow rate of which is 420m³/s.

The whole embankment plan is divided into two sections: one for the non-water-storage section of the River (mark 0+340~2+736.4), and another for the water-storage section. Within the non-water-storage section two levels (inner and outer) of dikes will be constructed. The inner one will be 2.2 meters high with a slope of 1:6. The slope will be lined with geotextiles and then covered by bricks. Another layer of gravels will be filled between geotextiles and bricks. The dike base will be filled by gabion with stones. Investment for the dike is estimated to be about RMB 2,783 per running meter. The sidewalk is close to the inner dike and 5 meters wide. The outer dike is planned to be higher than the designed flood level, top of which is 6 meters wide. The slope of the outer dike will be covered by grass and bricks.

Two levels of dikes will also be built along the water-storage riverway. Height of the inner dike will be 2.8m, which will be made of reinforced concrete. Top of the dike will be 0.4m wide, while the bottom is 3.7 meters wide. Investment for the dike is estimated to be about RMB 2,834 per running meter. The sidewalk and outer dike will be the same as that within the non-water-storage section.

2.1.2 Riverbed Treatment and Water Storage

Water resources required by the water storage project will come from Yinhui Reservoir, annual demand of which is estimated to be 171,900m³. The storage capacity of the Reservoir is designed to be 26,300,000m³. According to local statistic data annual fresh water collection volume into the Reservoir was separately 9.68 million m³ for 2003, 2.17 million m³ for 2004, 4.30 million m³ for 2005 and 9.43 million m³ for 2006. Currently the Reservoir only supplies water for irrigation, annual consumption of which is about one million m³. As a result Yinhui Reservoir can supply adequate water resources for the proposed Huiji River water storage project.

Upon evaluation and comparison of several options for water block and storage a measure of rubber dam is recommended. A kind of rubber bag will be filled with water and then act as a dam, which is convenient for dam height adjusting in case of flood. Other advantages of rubber dams include low cost, convenience for construction and operation, etc. Three rubber dams are proposed to be built along the riverway from Ducao to Huiji Bridge, details of which are shown in the table below:

Table 2.1: Proposed Rubber Dams

Dam No.	1#	2#	3#
Location	190m downstream Dongwaihuan Bridge (Mark 4+000)	90m downstream Jiuyan Bridge (Mark 4+870)	97m downstream Dongwaihuan Bridge (Mark 5+830)
Water Storage Length (m)	1263.6	870	960
Height (m)	3.5	2.5	2.5
Length (m)	50	50	50
Designed water filling volume of the bag (m ³)	951.21	429.06	429.06
Bag Inside Pressure Ratio	1.4	1.58	1.58
Maximum Bag Wall Tolerance Intensity (kN/m)	441	270	270
Bag Safety Factor	8	8	8
Bag Filling Time (hr)	31.71	14.3	14.3
Bag Emptying Time (min)	39.63	17.9	17.9

Total water storage capacity will reach 264,200m³ after completion of the project. In order to reduce land occupancy and investment a 150m-deep well will be equipped close to each rubber dam for water supply. Fresh water supply rate of the well is estimated to be 30m³ per hour. The rubber dams will be installed on plane bases

which are 1.1m thick and based on concrete layers. The dams will be anchored with bolts. Dam control rooms including pumps will be built outside the dike nearby the dams. The rubber dams will be regularly checked and well maintained.

According to local geological data and information horizontal anti-seepage measures are more feasible than vertical ones. As recommended in the project feasibility study report the riverbed will be firstly ground and leveled and then lined with a layer of geotextile membrane. Another 0.1m-thick layer of gravels will be placed on the geotextile membrane. The top layer will be a plate of reinforced concrete. All the potential gaps will be filled with waterproof strips. Cost for the proposed anti-seepage measure will be about RMB114.18 per square meters.

2.2 Construction Plan

The whole construction period is estimated to last 15 months. Maximum labor force for construction will be about 1854. Main tasks include construction preparation, riverbed dredging and grounding, anti-seepage treatment of riverbed, dike construction and slope protection, rubber dam installation, etc. Estimated main construction workload is shown in the table below:

Table 2.2 Project Construction Workload

Item	Earth Excavation	Earth Filling	Rocks/Stones	Concrete	Geotextile Membrane
Volume/Quantity	262,200m ³	73,000m ³	37,000m ³	99,000m ³	261,000m ²

2.2.1 Current Conditions and Resources for Construction

The project site is close to Pingyao City, where transportation is convenient. Raw materials and fuels used for construction can be transported from roads passing by the site. Existing dikes can also be used for transportation. Raw materials including cement, rocks/stones, sand, gravels, steels and fuels are available from Pingyao and neighboring cities. Other materials such as bricks, gabions, geotextile membranes and rubber dam bags are proposed to be purchased through bidding process.

Temporary electricity used for construction can be imported from local power grid. Temporary water is proposed to be drawn from local wells or supplied by neighboring water resources.

2.2.2 Construction Diversion

Temporary structures for river diversion during construction will be designed to withstand flood happening once in five years, maximum flow rate of which is estimated to be about 89.7m³/s. A two-stage diversion dam made by earth and stone will be constructed at each rubber dam site.

3 Description of the Existing Environment

3.1 Physical Environment

3.1.1 Atmosphere and Climate

According to local environmental baseline monitoring data (monitored at 4th~9th Dec. 2007) air quality in Pingyao City was not good. Daily average concentration of SO₂ in the air ranged from 0.099~0.357mg/m³ (relevant PRC air quality standard GB3095-1996 limit is 0.15mg/m³), which was not in compliance with PRC standard. Regarding the other two monitored factors, PM₁₀ and NO₂, daily average concentrations were separately 0.033~0.117mg/m³ (PRC standard: 0.15mg/m³) and 0.024~0.056mg/m³ (PRC standard: 0.12mg/m³).

Climate in local area is classified as temperate continental climate, experiencing monsoons and semi-arid conditions. The main climate features are cold winter with little snow, dry spring with winds and the temperature differences are large between day and night. In addition, it is hot and rich in rain in summer, while cool and lovely in autumn. Average annual temperature is 10.4 . The extreme maximum temperature is 39.6 and the extreme minimum temperature is -24.1 . It has sufficient sunshine with average annual sunshine time of 2433.2h. The average annual precipitation is 439mm and average annual evaporation capacity is 1771.9mm, the relative humidity is 60%. The average depth of seasonal frozen soil is 54cm and the non-frost season is 158 days. The dominant wind direction is SW with average annual speed of 2.2m/s.

3.1.2 Water Environment

The major rivers running through Pingyao City include Fen, Huiji, Liugen, Chengjian, Ciyao and Lvyuan River:

Fen River is the longest one with a total length of 25km, and the average width is 0.5km.

Huiji River used to be called Zhongdu River with a total length of 44km, and the average width is from 50 to 200meters. Its drainage area covers 313 square kilometers.

Liugen River has a total length of 36.7km and its drainage area covers 215.79 square kilometers.

Chengjian River has a total length of 313km and a width of about 40-150meters. Its drainage area covers 141.8 square kilometers.

Ciyao River originates from Ciyaogou at Jiaocheng county and flows through Jiaocheng, Wenshui and Pingyao, and flow into Fen river at the south bridge of Jiexiu. Lvyuan River has a total length of 31.5km with its drainage area of 181.5 square kilometers.

Shanxi Provincial Environmental Monitoring Station was appointed by the project owner to conduct sampling and analysis of surface water and groundwater during

16th~18th Aug. 2008. Sampling locations are shown in Appendix Figure 4. Analysis data are shown in the Table 3.1 and 3.2 below:

Table 3.1 Surface Water Quality Monitoring Data

Sampling Location	Sampling Date	pH	SS (mg/L)	COD _{cr} (mg/L)	BOD ₅ (mg/L)	NH ₃ -N (mg/L)	Petroleum (mg/L)	Sulfide (mg/L)	Temperature ()
1# Yinhui Reservoir	16 th Aug.	8.13	6	17	2.0L	0.106	0.02	0.138	24.0
	17 th Aug.	8.21	4	15	2.0L	0.101	0.03	0.105	24.5
	18 th Aug.	8.29	6	17	2.0L	0.101	0.05	0.146	23.5
2# Huiji River, 500m downstream Yinhui Reservoir	16 th Aug.	9.08	22	38	2.4	0.240	0.01	0.389	24.0
	17 th Aug.	9.22	12	44	4.0	0.284	0.02	0.259	24.0
	18 th Aug.	9.33	14	43	3.5	0.279	0.07	0.389	23.5
3# Huiji River, XiGuo Village Bridge Section	16 th Aug.	8.33	106	312	28.8	57.9	0.55	5.51	22.0
	17 th Aug.	7.93	129	681	53.2	143	0.77	8.01	22.0
	18 th Aug.	8.47	112	757	75.2	144	0.50	5.38	22.5
4# Huiji River, Jiuyan Bridge Section	16 th Aug.	7.92	89	342	22.9	111	0.93	4.54	23.5
	17 th Aug.	8.00	92	587	45.8	88.4	0.56	2.21	22.0
	18 th Aug.	8.06	81	721	74.7	85.7	0.56	6.02	24.0
Relevant PRC Water Quality Standard (GB3838-2002) Limit, Class IV		6~9	/	30	6	1.5	0.5	0.5	/

According to the data above water quality of Huiji River was poor and excessive concentrations of COD, BOD, NH₃-N, petroleum and sulfide were identified.

Table 3.2 Groundwater Quality Monitoring Data

Sampling Location	Sampling Date	pH	Total Hardness (mg/L)	Fluoride (mg/L)	NH ₃ -N (mg/L)	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Bacteria numbers per mL	Sulfate (mg/L)	Coliform numbers per L	COD _{Mn} (mg/L)	Temperature ()	Well Depth (m)	Water Level (m)
1# Yinhui Village Well	16 th Aug.	7.98	307	0.61	0.025L	24.4	0.005	1	27.9	<3	0.5	14.5	130	60
	17 th Aug.	7.97	308	0.61	0.025L	24.5	0.005	4	27.6	<3	0.5	15.0	130	60
2# Xiguo Village Well	16 th Aug.	8.36	299	0.64	0.034	2.11	0.003	5	92.9	<3	0.6	16.0	150	60
	17 th Aug.	8.38	297	0.62	0.029	2.09	0.003	2	97.7	<3	0.6	16.0	150	60
3# Electric Locomotive Factory Well	16 th Aug.	8.07	444	0.59	0.151	14.4	0.010	44	188	<3	0.9	18.0	120	30
	17 th Aug.	8.05	445	0.58	0.146	14.9	0.010	36	192	<3	0.8	18.0	120	30
Relevant PRC Groundwater Quality Standard (GB14848-93) Limit, Class III		6.5~8.5	450	1.0	0.2	20	0.02	100	250	3.0	3.0	/	/	/

According to the data above groundwater quality in local area can meet Class III (applicable to groundwater resources for drinking and living) standard of PRC Groundwater Quality Standard (GB14848-93).

3.1.3 Topography and Soil

In Pingyao there are four topographically different areas: low mountain area, loess hilly area, sloping plain area and alluvial plain area.

The low mountain area accounts for 44.2% of the total area. It mainly includes Mengshan, Qianzhuang, Duancun and Buyi, most of which are mountains with elevation of over 1000 meters. The loess hilly area accounts for 14.4% of the total area. It mainly includes Zhukeng, Duancun with elevation from 800 to 1,000 meters. The sloping plain area accounts for 13.8% of the total area. It mainly includes Gutao, Hongshan and Xiangheng with sedimentary landforms which are formed by the river alluvium, and the elevation is from 750 to 800 meters. The alluvial plain area accounts for 27.6% of the total area. It mainly includes Ninggu, Xiangle with sedimentary landforms, and the elevation in the low areas is from 735 to 750 meters.

Soils are complex and variable in this region influenced by natural conditions and human activities including geology, landform, climate, hydrology and vegetation. There are totally 8 types of soil: eluvial cinnamon soil, mountain cinnamon soil, soil of cinnamon soil, light cinnamon soils, cinnamon and light colored meadow soil, light colored meadow soil, salt and light colored meadow soil, light colored meadow saline soil.

3.2 Ecological Environment

Wild vegetation is distributed in the middle mountain belt with elevation of over 1700 meters. Wood plants are mainly found in this region including Chinese pine, aspen, birch and grass-shrub vegetation. The natural vegetation coverage is 70%.

Vegetation is rarely planted in the low mountain area with elevation of 1000-1700meters. Only some Chinese pine and north China larch plantation could be found.

Wild animals identified in Pingyao include leopard (*Panthera pardus*), wild pig (*Sus scrofa*), red deer (*Cervus elaphus*), blue sheep, wolf, golden eagle (*Aquila chrysaetos*), black stork (*Ciconia nigra*), sparrow hawk (*Accipter nisus*) etc. Leopard, golden eagle and black stork are listed as first-level protection animals in China, while red deer, blue sheep and sparrow hawk are second-level.

3.3 Social and Economic

According to the general planning of Pingyao city, the characteristics of the city would be the center of politics, economy, culture and transportation. It is an important city depending on tourism with the distinct national characteristics in Jinzhong. Food, textile and machinery are the leading industries. In the new industrial zone, it mainly develops new materials, machinery manufacturing, food processing and textile.

The city is 40km in length of north-south and 30km in width of west-east. The total

area is 126 square meters including 420sqms plain area, 266sqms hilly area and 574sqms mountain area. The total farmland area is 53630 hectare. It has 9 villages, 5 towns, 4 community workstations, 349 administrative villages and 449 natural villages. The city has a population of 0.48million, of which agricultural population is 0.42million and non-agricultural population is 0.065million. There are totally 394 schools in Pingyao including five high schools. Individual hospitals are distributed through the city and small towns.

At the end of 2006, Pingyao's GDP reached 3.9 billion and financial revenue stood at 0.5 billion. It fully develops agricultural economy and the total yields of grain reached 0.19 million tons. Industries vary from mining, metallurgy, coking to rubber, food and construction materials manufacturing. Tourism in Pingyao has grown rapidly in recently years.

Transportation in Pingyao is convenient. Railways and highways passed through the city. All the small towns are connected by roads.

Pingyao is known for its rich mining resources and abundant in coal reserves. The total area containing coal is 1246.9 square meters, taking up 98.96% of the total area. The total coal reserve in Pingyao is 11.296 billion tons, which accounts for 10.44% in the prediction of coal reserves in Shanxi province. Other resources identified in Pingyao include iron, lime, etc.

As one of the World Cultural Heritages, Pingyao Ancient City is the most famous and important heritage in Pingyao. Besides the Ancient City, there are two temples (Shuanglin Temple in Xianghuan, and Zhenguo Temple in Dapu) which are also considered as National Heritage for Protection. At the provincial level, there are six other heritages for protection, which separately are Dacheng Palace in Wen Temple, Cixiang Temple, Qingxu Taoist Temple, Municipality Building in Gutao, Rishengchang Piaohao (ancient bank) Relic and Jinzhuangwen Temple.

4 Anticipated Environmental Impacts and Mitigation Measures

Potential negative environmental impacts caused by the project execution mainly come from construction activities. Temporary impacts on the ambient air and ecological environment, construction noise and waste as well as limited wastewater are anticipated to be generated by the following activities: digging, land filling, earthwork, transportation, construction material piling up, equipment installation and etc. Installation of geotextile membrane for anti-seepage treatment of the riverbed may impact the current ecological environment in the river. Very limited negative impacts will be generated during project operation.

4.1 Impacts on the Ambient Air and Mitigation Measures

4.1.1 Anticipated Impacts

The main air pollutant generated during the construction period is the construction dust, which is generated through fugitive emission. Activities such as site cleaning, digging and construction material transportation will produce relatively more dust, while the activities such as material piling up and equipment installation will generate a relatively smaller quantity. Considering the pollutants are discharged discontinuously and the heights of dusts generation points are also low, the affected region only suffer temporarily influences with a limited scope. However, at the construction site, the workers will be exposed to high concentration dust, which would cause negative impact on not only the workers' health status, but also the construction activity. In addition, the block renovation project has many working sites located in and near the sensitive areas, for example the residential area, the construction dust might be blown away and affect the surrounding residence when there is big wind.

4.1.2 Mitigation Measures

The dusts are mainly produced in the pipeline network engineering, and thus the countermeasures will be provided with a special focus in this field.

a. Measures on pollution generated by the pipeline digging activity

The major problem is caused by the digging and the conservation of the earthwork and the requirements are provided as following:

- Regarding pipelines which are away from the residential areas: the construction area should be planned and bounded with relevant devices. This would help to prevent the scattering of dust on the one hand, limit the occupied area to avoid unnecessary destroy of the plants on the other.
- Regarding the pipelines which are located near the residential area, business building, and along the roads and streets: Before the commencement of the construction, the project proponent should clearly define all the construction boundaries and set relevant bounded devices. The construction should be

implemented road by road. For each road, the digging, placement of pipelines, earthwork backfilling, and redundant earthwork cleaning should be carried out continuously to minimize the influenced duration. The piled earthwork should be wetted and covered to prevent blowing dust. In addition, the project proponent should disclose the construction plan to the stakeholders to avoid unnecessary problems due to insufficient communication.

b. Pollution prevention measures on transportation

The project proponent should set requirements on the management of transportation vehicles. The transportation roads should be cleaned in time to avoid dust blowing. Vehicles should limit the speed when entering into the construction site to avoid blowing dusts.

c. Pollution control during the material and soil conservation and mixing of concrete

The construction site should be wetted to avoid blowing dust, and during the days in big wind, the wetting frequency should be increased. If the material can easily generate dust, it should be covered when be placed in the open air.

The concrete mixing station should be located inside the workshop, or else, the project proponent should purchase pre-mixed concrete to avoid the onsite mixing process.

d. About the surface recovery post the construction

After the construction, the surface should be recovered in accordance with the environmental function zoning requirements. The destroyed plants should also be recovered;

The remaining soils should be transported to the designated site for landfill with proper containment measures.

4.2 Impacts on Surface Water and Mitigation Measures

During the construction period, water is mainly used for concrete mixing, road cleaning, soil and site wetting, and for domestic usage. As the major pollutant is SS, the engineering wastewater is not heavily polluted. The domestic wastewater will contain COD, BOD₅ and SS. Because the domestic waster will be generated with a small quantity, and will not be discharged into surrounding rivers, the negative impacts are insignificant and acceptable.

Supposed pollution prevention measures are provided as below:

- The construction entity should centralize the living area, and establish domestic wastewater collection, treatment, and utilization facilities to minimize the negative impacts;
- The wastewater generated through pipeline cleaning should firstly undergo a sedimentation, and then be discharged into the municipal pipeline system for further treatment. Direct discharge into the surface water environment should be strongly restricted.

4.3 Noise Impacts and Mitigation Measures

4.3.1 Noise Sources

In the earthwork phase, noises are mainly produced by the moving of equipment and vehicles, such as digger, bulldozer, and loader; in the tamping phase, noises are mainly generated by tamper and concrete mixer; in the pipe laying phase, noise sources are assessed to be the crane and cutter; noises produced from bulldozers, loaders, and transportation vehicles are evaluated to be the major sources in the backfilling phase. Main noise sources during construction are provided in the table below:

Table 4.1 Noises generated from construction activities

Activities	Noise Sources	Noise Level (dBA)	Type
Earthwork	Bulldozer	78~96	Intermittent
	Digger	85~95	Intermittent
	Loader	80~90	Intermittent
	Vehicles	70~80	Intermittent
Tamping	Tamper	70~90	Intermittent
	Concrete Mixer	80~90	Intermittent
Structuring	Vibrator	85~100	Intermittent
Equipment Installation	Crane	70~80	Intermittent
	Lifter	70~80	Intermittent

4.3.2 Noise Mitigation Measures

As some of the construction sites are located closely to the sensitive points, such as the residential area, the countermeasures should be strengthened to minimize the negative impacts. The principles are provided below:

- The construction planning should be properly designed to ensure the high noises phases are centralized to facilitate the implementation of noise control measures.
- The construction plan should be disclosed to stakeholders to seek agreements;
- Noise abatement measures should be setup around the construction sites.
- High noise generating machines should not be operated during the nights when the sites are located closely to the residential areas.
- Low noises generation equipment should be selected with a high priority; equipment maintenance should be performed regularly to avoid unnecessary noise generation.
- High noises generation should be placed either inside a cabin, or be surrounded with noise abatement material. This principle is very important for the construction near the sensitive areas.
- The transportation route should be properly designed to minimize the negative impacts on the residence.
- All through the construction period, the project proponent and the construction

entity should setup a reporting system to collect feedback from the stakeholders. Correction measures should be carried out timely when problems are discovered.

4.4 Solid Waste Impacts and Mitigation Measures

Solid waste generated during the construction period includes rest earthwork, construction garbage and domestic solid wastes.

4.4.1 Treatment of rest earth work

According the project construction plan the rest earthwork after construction will be around 189,200m³ and be delivered to backfill site in the east of Pingyao. This backfill site is appointed by Pingyao government and meets the requirement for deposit of rest earth work due to small volume. All rest earth work will be backfilled in compliance with management request of the backfill site. If the construction team implements protection treatment according to assessment request, the treatment of the rest earth work will meet the request of environment protection.

Based on the requirement for ecological protection, the following elements should be considered during assessment of rest earth work treatment:

- Disposal of rest earthwork should not impact surrounding environment and be supplemented by security measure such as collapse prevention.
- Rest earthwork should not contain harmful component and be good for plant recovery.
- Environment and ecological protection requirement should be met after disposal in order to prevents secondary pollution and solid and water loss.
- The management of rest earth work should be controlled to prevent for the pollution.

Feasibility study report does not cover specific pollution control requirement for delivery because of the construction specialty. In order to minimize environment pollution by delivery, the following measurement is issued in the assessment report:

- Rest earth work should be cleared and delivered to backfill site in an enclosed system in time according to progress of construction.
- The delivery should comply with earth delivery requirement: earth should be covered; car speed should be limited; impacts on the surrounding sensitive points should be minimized.

4.4.2 Treatment of construction and domestic solid waste

Construction garbage includes brickbats, ash slurry, and waste raw material, should either be treated by construction team, or be transported to the land fill site for disposal; domestic solid wastes should be collected with rubbish cans, and then be transported by the “Environment Sanitary” system to the final disposal site.

The pollution caused by construction and domestic solid wastes is temporary and will disappear after construction activities are finished.

5 Conclusions and Recommendations

5.1 Conclusions

The implementation of the Huiji River treatment project will bring positive impacts on local environment as following: the new flood prevention and control standards will guarantee the security of lives and properties at either bank of the Huiji River due to the flood control capacity improvement; the water storage project will bring fresh water at the length of 3,093.6meters in the riverway and make the city more beautiful, and even will to some extent adjust the local climate; in addition, after the treatment of Huiji River local wastewater will not discharge into the River and will be collected into Pingyao wastewater treatment plant and treated. Thus, water quality of Huiji River will be highly improved.

Although some negative impacts will be generated during project construction these impacts will be temporary and be reduced to minimum by relevant mitigation measures. Regarding land acquisition and resettlement of affected local households detailed resettlement and compensation plan has been made (refer to the project resettlement plan) in order to bring minimum negative impacts on local people and livings.

Feedback from public participation (questionnaires sent to local communities and surveys) showed that most (94.9%) of the interviewed people supported this project and thought the project will benefit local environment, society and economy.

In respect of environmental protection this project is feasible, which can do benefits to local environment, society and economy.

5.2 Recommendations

- To strengthen environment management and supervision on project activities, improve relevant personnel's awareness of environmental protection, especially during construction period, and regularly communicate with local EPB.
- To strictly follow relevant regulations, policies and procedures regarding resettlement compensation and stakeholder consultation, and establish communication and grievance mechanism.

Appendix Figures

Figure 1 Project Location Map

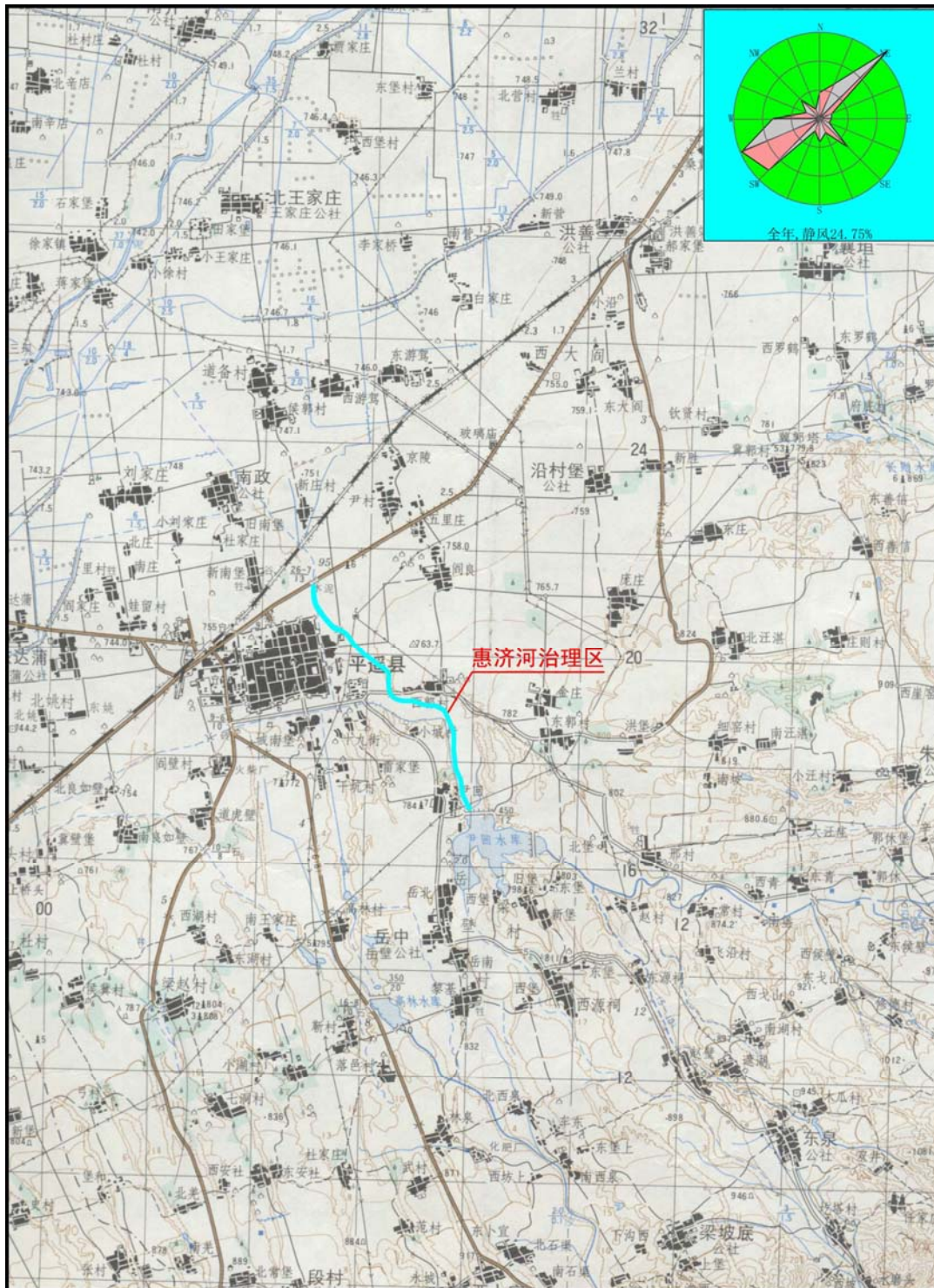


Figure 2 Pingyao City Overall Development & Huiji River Treatment Plan

亚行贷款平遥县惠济河河道治理工程项目区位图

ADB Financed Huiji River Improvement of Pingyao Subproject Location Map

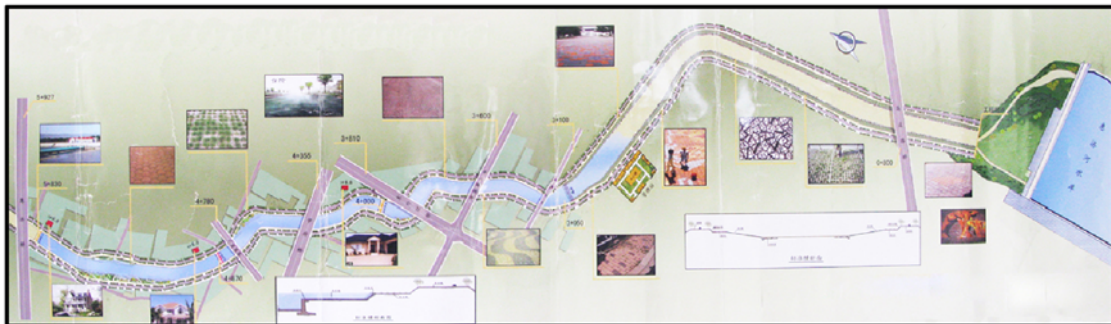
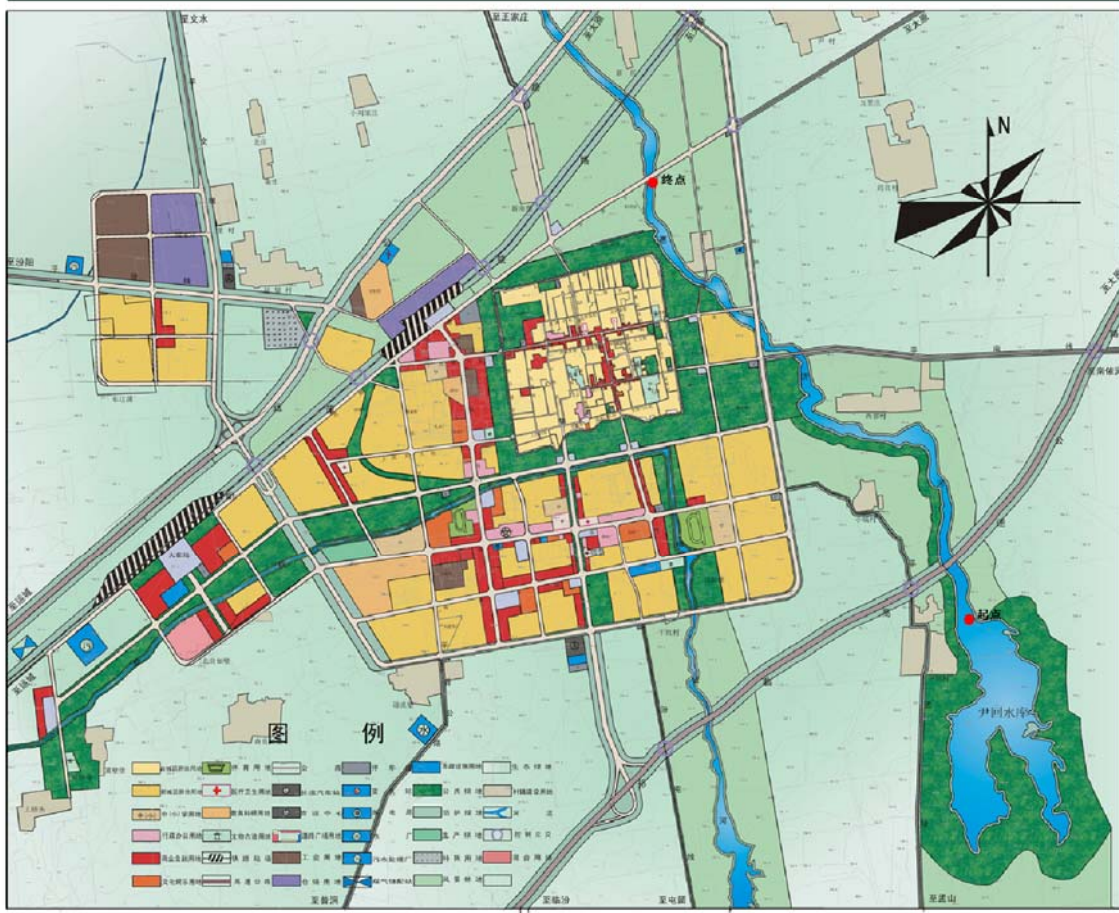


Figure 3 Huiji River Treatment Project Scheme

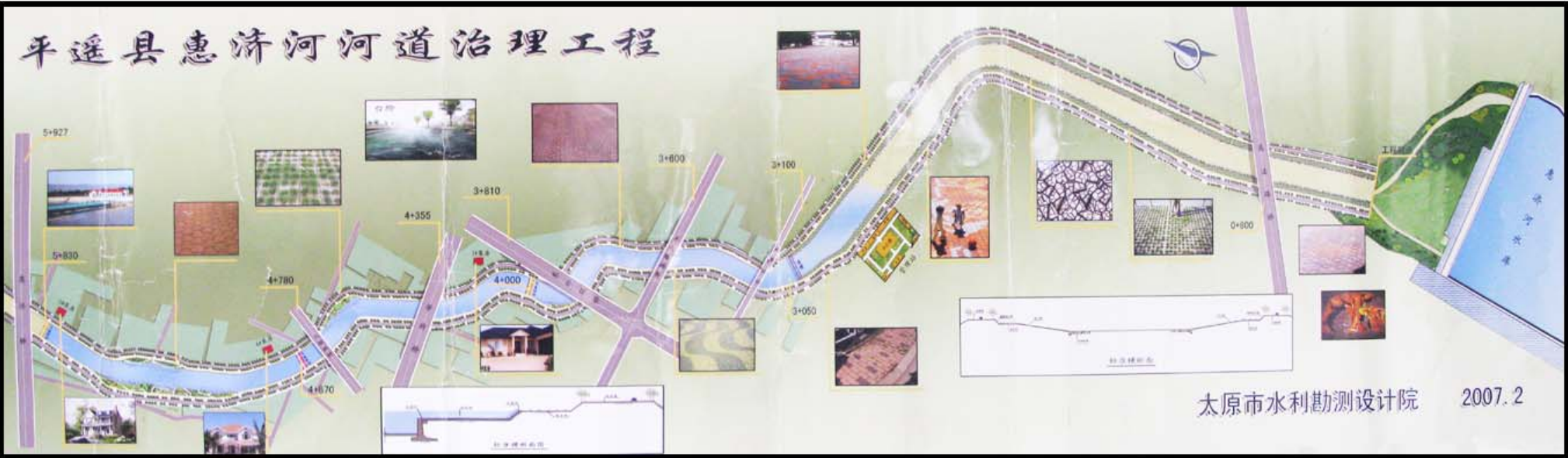


Figure 4 Environmental Baseline Monitoring (Air, Surface Water, Groundwater) – Sampling Locations

