

## URBAN RIVER AND WETLAND REHABILITATION AND POLLUTION CONTROL





## Sangay Penjor, Director Urban and Social Sectors Division (EASS)

#### **Disclaimer:**

The views expressed in this document are those of the author, and do not necessarily reflect the views and policies of the Asian Development Bank (ADB), its Board of Directors, or the governments they represent. ADB does not guarantee the accuracy of the data included in this document, and accept no responsibility for any consequence of their use. By making any designation or reference to a particular territory or geographical area, or by using the term "country" in this document, ADB does not intend to make any judgments as to the legal or other status of any territory or area.





### CONTENTS

#### **1. Brief Introduction**

- ADB Urban and Social Sector in the PRC
- Strategic Policy TAs

#### 2. Urban and River and Wetland Rehabilitation and Pollution Control Projects

- Songhua River Basin Water Pollution Control and Management Project
- Nanjing Qinhuai River Environmental Improvement Project
- Xinjiang Akesu Integrated Urban Development and Environment Improvement Project
- Jiangxi Pingxiang Integrated Rural-Urban Infrastructure Development Project
- Hubei Huanggang Urban Environment Improvement Project

#### 3. Conclusion





## **BRIEF INTRODUCTION**





### ADB OPRC Partnership for a Better World ADB Urban and Social Sector in the PRC: Sector Objectives and Operational Priorities

- ADB support in the urban and social sectors aligned with the PRC's social and economic priorities of Thirteenth Five-Year Plan
- A strong infrastructure and development focus on "western and northeastern regions" for inclusive growth especially of small- and medium-sized cities
- A "green urban portfolio" for environmentally sound and lowcarbon development
- Vocational education, elderly care and elderly accessibility, and urban-rural integration for inclusive urbanization
- Support TVET reforms-demonstration & innovation
- TA support develop health sector, social assistance systems, human resource needs
- Strong regional linkages with CAREC and GMS – RCI, and knowledge sharing





## **ADB Urban and Social Sector in the PRC:** Urban Development: Past and Ongoing Assistance

- As of 31 December 2013, ADB provided urban sector loans amounting to \$4.96 billion
- Effective policy dialogue through strategic policy and advisory TAs
- Focus on projects with innovation and strong demonstration and catalytic effects





## ADB Urban and Social Sector in the PRC: Urban Development: Planned Approach

- Effective policy dialogue at national level through strategic policy and advisory TAs with strong demonstration effects
- Innovative projects that promote integrated green, competitive and inclusive urban-rural development-Flagship Projects
- Projects that contribute to regional cooperation, urban-rural development, reduce carbon footprint, pollution control, and enhance climate change resilience, and are replicable



### ADBJORC Partnership for a Better World ADB Urban and Social Sector in the PRC: Education, Health, Social Development: Past and Ongoing Assistance

- As of 31 December 2015, ADB provided education loans amounting to \$300 million
- Support TVET reforms and Demonstrate innovation in TVET
- Provide TA to develop the health sector, social assistance systems, and human resources needs
- Engage in elderly care and civil society organization's role in service delivery



### ADBJORC Partnership for a Better World ADB Urban and Social Sector in the PRC: Education, Health, Social Development: Planned Approach

- Develop elderly care programming, process first elderly care project
- Continue reforms in TVET and tertiary education to improve quality, relevance and industry participation
- Strengthen quality of teachers at all levels
- Develop targeted programs for social services/education to reduce inequities
- Use innovative financing modalities





## **Strategic Policy TAs**

- TA 2773: Water Supply Tariff Study
  - National Guidelines on Water Tariffs
- TA 3749: Preparing the National Guidelines for Urban Wastewater Tariffs and Management Study
  - National Guidelines on Wastewater Tariffs
- TA 4702: Study on Sustainable Urbanization in Metropolitan Regions
  - Identification of key issues and policy recommendations
- TA 7002: Urban Wastewater and Solid Waste Management for Small Cities and Towns
  - Regulation for wastewater and solid waste management
- TA 7533: Policy Study on Strategic Options for Urbanization in the PRC
  - Inputs to the new type urbanization plan
- TA 8165: Management of Uncontrolled Landfills
  - Technical Guidelines (aiming at providing practical guidance on various management options and solutions available)
- TA 8447: Strategies for involving Social Workers in Social Assistance
  - Implementation manual output which has helped MOCA and MOF to issue guidance on the creation of pilots for innovative approaches to social worker integration in selected counties across the country
- TA 8672: Strategic Elderly Care Services Development in Yichang
  - Multisectoral strategic plan to develop elderly care services (financing, services, human resources, investments) as part of the urban development plan





# URBAN AND RIVER AND WETLAND REHABILITATION AND POLLUTION CONTROL PROJECTS









Songhua River Basin Water Pollution Control and Management Project







## 13 November 2005, chemical factory explosion – Jilin city along Songhua river



#### ADB3OPRC 同行三十载, 携手惠四方 Partnership for a Better World







## Benzene chemical slick in Songhua – Harbin section















### **ADB Harbin Water Supply Project**









#### ADB3OPRC 同行三十载, 携手惠四方 Partnership for a Better World







# **Songhua River Basin Water Pollution Control and Management Project: Combatting Pollution in Songhua River Basin** An EARD-PSOD Collaborative Approach

#### 16 years

of sovereign and nonsovereign operations

in Northeast PRC



AFP

# SCALE





- PRC's 3rd largest river basin after the Yangtze and Yellow Rivers
- 60m Population (11% live in poverty counties)
- The Basin covers Heilongjiang, Jilin and Inner Mongolia Provinces
- 35% urban population in 2000 (55% now)





**POLLUTION** One of the most polluted river basins in the PRC

# Only 34% of urban wastewater treated

Very few existing sanitary landfills

Polluted water source for water supply

1/3 of the rivers water quality was Class V (some worst than V)

**Constrained urban development** 

Impact on people health



#### ADB3OPRC 同行三十载, 携手惠四方 Partnership for a Better World

# **ADB's ENGAGEMENT**





# **STRATEGY & SEEDS**

#### TA to Support SRB Water Pollution Control Masterplan



#### 15 years investment plan

Long-term water pollution control master plan

Policy inputs to the 11th FYP, monitoring and control system, and **SRB Commission** 

Reaching high level Government decision makers Tactful engagement of all stakeholders Continuous tariff reform dialogue Encouragement of the use of private sector financing and PPP



# OUTCOME

Sovereign

### **SRB Water Pollution Control & Management Project**

Total project cost\$425 millionADB finance\$200 million

ADB3OPRC 同行三十载, 携手惠四方 Partnership for a Better World

Sectors: wastewater, water supply, solid waste and capacity building

### Scope: 2 Provinces, two EAs 34 subprojects, 33 IAs in 28 cities.

Completed with:

- Minimal cost increase
- No delay
- Minimal change in scope
- 98% disbursement





# OUTCOME

NonSovereign

**Client: Longjiang Environmental Protection Group** 

Phase I and II: \$135m ADB loans, \$9m equity

Growth under ADB financing: +130% capacity...55% share of province NE PRC's 1<sup>st</sup> commercial sludge plant

E&S and governance performance improved

ADB's equity exit: \$9m invested, exit at \$31m in 4.5 years (IRR: 31.2%)

#### **Co-investment mobilized**





#### SUBPROJECTS IN OPERATION



# RESULTS

- ✓ 57 subprojects
  39 Sov./18 NS
- More than half of original targeted cities served
- ✓ Impact on more than 60 million people and the whole Songhua River ecosystem
- About 10 million people directly affected





# RESULTS



✓ From 34% to 80% of wastewater treated

- ✓ 10 sanitary landfills with operating capacity of 2,341 t/d
- Beneficiary reuse of the WWT sludge
- All municipal urban drinking water sources met national standards



# **LESSONS/TAKEAWAYS**

"One ADB" solutions possible when upstream conditions are well established and synergies anticipated

Sovereign operation can create enabling environment and attract PPP activities

ADB3OPRC 同行三十载, 携手惠四方 Partnership for a Better World

Nonsovereign selectivity and eligibility criteria for sponsors identified within an overall investment plan

Comprehensive approach requires strategy, strong partners, patience and long term engagement





# THE FUTURE

Story is on-going... new project in Heilongjiang and possible other NSO opportunities

Replicability for other river basins in PRC (Yangzi, Pearl, Yellow) or other countries

High level and quality strategic study

Need to be upgraded to promote **advanced environmental and urban development concept** such as "sponge city", "zero waste city", "circular economy", "smart city"





## Conclusion

- Second water source needed.
- Today, Harbin has high quality water.









31









### **Project Impact:**

 The expected impact of the Project is improved urban environment, public health, and quality of life of urban residents and businesses in Nanjing City. The expected outcome of the Project is improved management of surface water resources in Nanjing.





### **Project Amount and Timeline:**

- \$100 million approved by ADB in December 2006 (total project cost \$236.1 million)
- Project Completion: 30 June 2013





### **Project Objectives:**

The Project will help Nanjing, the capital city of Jiangsu Province to:

- reduce water pollution in the Qinghuai river and protecting water resources;
- reduce economic losses and disruption to livelihoods from frequent localized flooding;
- promote sustainable economic development;
- improve the environment, living conditions, and public health standards;
- develop an integrated wastewater and sludge management system;
- improve service efficiency through increased competition and private sector participation;





### **Project Results:**

The Project is on track to be completed by 30 June 2013 and the following targets are expected to be substantially achieved:

- project benefits reaching 2.7 million urban residents of Nanjing, whose living conditions and public health standards will improve from (i) reduced pollution of Nanjing's surface water, (ii) protection from flooding and elimination of hazards associated with poor drainage, and (iii) reduction in the incidence of waterborne diseases;
- achieving treatment of 85% of wastewater generated and significantly reducing annual pollution loads in the Qinhuai River and thereby in the Yangtze River Basin (YRB);
- significantly reducing flooding in urban areas;




# NANJING QINHUAI RIVER ENVIRONMENT IMPROVEMENT PROJECT

# **Project Results:**

- increasing the efficiency and management capacity of the Implementing Agencies;
- improving cost recovery through a better tariff structure, with gradual increases to achieve full cost recovery. The financing of wastewater treatment infrastructure directly from wastewater tariff increases will have a demonstration impact on wastewater tariff reform in both the PRC and elsewhere in Asia; and
- completion of the urban wetland component ahead of schedule which will contribute to improvement of water quality, flood storage, and habitat conservation.





# NANJING QINHUAI RIVER ENVIRONMENT IMPROVEMENT PROJECT

## Lessons:

- The following are some initial lessons which will be assessed in detail after project completion:
- Extensive consultation, and providing adequate compensation and improved living conditions resulted in successful resettlement of affected persons in accordance with the resettlement plans;
- Strong project start-up and effective monitoring has contributed to the project being on track for completion by 30 June 2013;
- Sound institutional arrangement and management is important for effective conservation of the Qinhuai river.
- High quality systematic planning and design of each of the identified activities including flood control, sewage interception, landscaping, and pollution control has ensured smooth implementation.





# XINJIANG AKESU INTEGRATED URBAN DEVELOPMENT AND ENVIRONMENT IMPROVEMENT PROJECT

Akesu Duolang Wetland Rehabilitation and Pollution control





# Xinjiang Akesu - Background



Location on NW margin of Tarim basin, in the alluvial plain of Akesu river

40





# Xinjiang Akesu - Project

# **Impact** Socially inclusive and environmentally sustainable urbanization in Akesu

**Outcome** Improved use of urban infrastructure and services and environment quality in Akesu



# Outputs

- I. Urban infrastructure and services improved
  - 2. Akesu Duolang wetland rehabilitated and protected
  - Project and urban environmental management and inclusive capacity enhanced





# Xinjiang Akesu – **Output Details**

Output	Details and Scope of Main Construction	Project Direct Costs (RMB million CNY)
Akesu Duolang wetland rehabilitated and protected	Wetland project with total area of 95.73 m2, in which the water conservancy project includes dredging of canal through 1937m, isolated area around lake with 36,000 m3, weir 2910m, dredging sedimentation tank with 500,300 m3; other works include an entrance gate, buildings for management station 500m2, cofferdam demolition 3.75 km, processing revetment 7506m3, construction of 25,000 m2 of wetlands patrol road, 5 sets of researching and monitoring equipment, a watch tower, wetland shelterbelt project 43 000 m2.	14.07041



#### **Function Division of Duolang Wetland Project**

Wetland project is divided into three function areas, total area is 95.73 hectares (1436 mu)

#### **Sediment Precipitation Area**

The area is 24.3 hectares (364 mu). It accounts for 25% of the total area of Duolang River wetland comprehensive regulation project. The main function is water source conversation, water storage, flood detention, sediment precipitation and to supply the habitat for fish and bird.

#### **Treatment Area of Wetland Project**

The area is 29.5 hectares (443 mu). It accounts for 30% of the total area of Duolang River wetland comprehensive regulation project. The main function is water purification, heavy metal adsorption, degradation of organic pollutants, water restoration and to promote water cleanness and transparency.

#### **Biodiversity Conversation Area**

The area is 35.2 hectares (529 mu). It accounts for 37% of the total area of Duolang River wetland comprehensive regulation project. The main function is water source conversation,

eutrophication prevention, and to offer the clean water for urban landscape and supply the living, habitat and breeding environment for wetland wild animals and plants.

Except the above three function areas, the restoration work of the wetland includes 6.7 hectares (100 mu) deepening and broadening reconstruction project of the canal for water release.





# Xinjiang Akesu – **Renderings**

Sediment Precipitation Area



Treatment Area of Wetland Project



# Proposed Loan to the People's Republic of China Jiangxi Pingxiang Integrated Rural-Urban Infrastructure Development

# **Pilot Sponge City**

#### **Project Team**

Stefan Rau, Urban Development Specialist, EARD / Mission Leader

- R. Benigno, Senior Operations Assistant, EARD
- C. Chu, Senior Portfolio Management Officer, People's Republic of China Resident Mission, EARD
- M. Dela Cruz, Associate Project Officer, EARD
- M. Gupta, Principal Safeguards Specialist (Resettlement), EARD
- Y. Hirao, Financial Control Specialist, Controller's Department
- S. Kawazu, Senior Counsel, Office of the General Counsel
- K-J. Kim, Senior Transport Specialist, EARD
- K. Koiso, Procurement Specialist, Operations Services and Financial Management Department
- U. Kumar, Economist, Economic Research and Regional Cooperation Department
- A. Morel, Environment Specialist, EARD
- S. Robertson, Natural Resources and Agriculture Specialist, EARD
- G. Tadevosyan, Safeguards Specialist, EARD
- Y. Zhou, Senior Water Resources Specialist, EARD
- L. Zou, Principal Financial Management Specialist, EARD
- Jingmin Huang, Senior Urban Development Specialist, RSDD / Peer Reviewer



## PRC'S CITY CLUSTERS SYSTEM PLAN: PINGXIANG IN "CENTRAL TRIANGLE" WUHAN – CHANGSHA – NANCHANG



### **HEADWATER MUNICIPALITY**



## ALONG URBAN CORRIDOR EAST OF CHANG-ZHU-TAN





#### ADB3OPRC 同行三十载, 携手惠四方 Partnership for a Better World PROJECT LOCATION:

PRC'S CITY CLUSTERS SYSTEM PLAN . PINGXIANG IN "CENTRAL TRIANGLE"



## BALANCING URBAN-RURAL DEVELOPMENT STRENGTHEN COUNTY CITIES, LINK URBAN AND RURAL AREAS





## **DEMONSTRATION FEATURES**

- (i) Urban-rural flood risk management and climate resilience partnerships;
- (ii) Ecological river management supporting sustainable urban-rural sponge city development;
- (iii) Community-based environment supervision and roads safety education teams.







## **KEY DEVELOPMENT CHALLENGES**

POVERTY, RURAL-URBAN GAP, NEED FOR ECONOMIC REVITALIZATION

#### 1. Flooding, increased frequency and severity

In 1998, 2001, 2002, 2010, and 2014 floods affected 496,000 people and caused the collapse of 2,682 houses and significant economic losses in the agriculture due to flooding of farmland

#### 2. Water pollution of surface- and groundwater

Largely domestic wastewater is discharged untreated and runoff from coal mines makes its way to the rivers which often serve as water sources

#### 3. Limited Rural-Urban linkages

Reduce opportunities of rural residents to sell produce, access jobs, training and education, health services. This lack of roads and public transport is a major constraint to improving rural opportunities, incomes, and livelihoods.

#### 4. Lack of institutional capacity and awareness

Environmental management ability and financial management capacity low, public awareness of environmental and health issues low





## **PROJECT ADDRESSES DEVELOPMENT CHALLENGES**

- 1. Promote rural-urban integration and improve living conditions in rural areas to reduce rural-urban migration;
- 2. Improve river environment and safety by reducing flood risk for about 308,000 residents;
- 3. Reduce water, soil, and groundwater pollution by increasing wastewater treatment rate from 75.8% in 2012 to 81.0% directly benefit 175,000 residents and improve water safety;
- 4. Improve connectivity for more than 247,000 farmers and residents of rural townships and villages to access urban markets, jobs and services, and enable tourism in rural and natural areas; and
- 5. The structural interventions of the project are complemented by several non-structural initiatives to increase project sustainability and to enhance the local capacity for development.





## IMPACT, OUTCOME AND OUTPUTS

**Impact:** competitive, green, and inclusive integrated urban-rural development in Pingxiang **Outcome:** improved environment, access, and safety of rural and urban residents in Pingxiang

#### **Outputs:**

### 1. Improved and integrated flood risk management and river rehabilitation

8 rural-urban rivers: (i) 71 km of riverworks including about 128 km of new and rehabilitated embankments, revetments, and toe zone protection, (iii) removal of river sedimentary deposits, (iv) construction/reconstruction of 31 small hydraulic weirs for farmland irrigation, (v) 90 hectares of revegetation, and (vi) 46 hectares of wetland protection and rehabilitation.

## 2. Improved wastewater collection and treatment

Sewer pipe networks in Lianhua County and Xiangdong District and two new sewer pipe networks and wastewater treatment plants (5,000 / 2,500 m<sup>3</sup>/day) in 2 townships (total sewers184km).

## 3. Improved rural-urban linkages

44-km rural-urban Class II road with a width of 10 meter (m), 6 bridges and 1 tunnel 482 m. 1 of 4 bypass roads in Pingxiang Transport Plan (2012), linking towns/villages to urban/industrial areas.

## 4. Project management support and capacity development

(i) project management for PMO and PIUs, (ii) urban-rural flood risk management partnership development; (iii) urban-rural river environment and water pollution reduction partnership development; (iv) wastewater management system design, construction, management, operation, services and tariff reform, and rural wastewater and sanitation solutions and management;
(v) rural road and traffic safety, sustainable rural-urban transport, and public transport management; and (vi) urban-rural development and governance partnership development.







Flaure 9-49: Common Animale Seen Along Project Rivers















## OUTPUT 2: WASTEWATER MANAGEMENT: COUNTY CITIES NETWORKS AND TOWNSHIPS NETWORKS + WWTPS



## WATER SAFETY PLANS FOR MUNICIPALITY AND COUNTIES

Process step	Hazardous event	Hazard	Likelihood	Se verity	Rish score	Risk rating with no control	Control measures in place and proposed to manage significant risks	Validation of control measures	Likelihood	Se wertty	Rish score	Risk rating post- control	Remark	Actions required (Investigation or Improved controls)
Catchme nt	Animal activities around catchment area	Microbial pollutant	7	4	28	Very high	Set up monitoring facilities, strengthen promotion and communication approach for catchment protection; enhance patrol frequency	Monitored by displayer, raw water	7	4	28	Very high		Basic raw water quality sampling test every 15 days; when necessary, provisionally specified test also applies if situation changes
	Seasonal sand dig from the upstream of the Rilver, resulted in turbidity increase, heavy metal exceed the raw water quality standard	Microbial pollutant; chemical pollutant	4	4	16	Betwee n mediu m and high	Enhance patrol and inspection, increase communication trequency; once discover the exceeding occasion, increase the chemical dosing volume	Treated water turbidity test	4	2	80	Mediu m		Increase the raw water quality analyses; Contact the EPA for coordination
	Piled domestic solid waste around the catchment, caused microbial poliution and heavy metal poliutant exceed the standard required source water quality	Microbial pollutant; chemical pollutant	7	4	28	Very high	Enhance patrol, increase chemical dosing volume, contact counties and towns around the catchment to clean up the solid waste source	Treated water quality test, patrol and timely inform the towns and villages around	7	1	7	Mediu m		
	Domestic septic tanks leak or overflow in dry season	Microbial pollutant	3	3	9	Mediu m	Enhance promotion to remind residents around the catchment area to clean up their septic tanks timely		3	2	6	Mediu m		
	Domestic septic tanks leak and overflow in raining season	Microbial pollutant	2	5	10	Medlu m	Increase the chemical dosing volume, increase disinfection		2	4	8	Medlu m		
	Domestic septic tanks normally do not treat the bottom with cement, with direct contact with the soil	Microbial pollutant	7	5	35	Very high	Enhance promotion		7	5	35	Very Ngh		







## **OUTPUT 3: IMPROVING RURAL-URBAN LINKAGES**





#### **Best practices:**

Adoption of integrated and climate-resilient design for flood risk management through ecological river management, and preparation of water safety plans flood safety through ecological rivers with floodplains and green space preserved to accommodate seasonal water level fluctuations and increase the capacity for stormwater retention and discharge. This effectively reduces flood peak elevations and improves water quality through filtration by green buffer zones between human development and the river.

#### **Innovative demonstration features:**

(i) urban-rural flood risk partnerships and flood resilient farming,
(ii) promotion of an urban-rural compensation mechanism for floodplain conservation;
(iii) urban-rural institutional partnerships to coordinate climate resilience, water safety, agritourism development, and local food to market management; and
(iv) pilot community-based environment supervision and roads safety education teams (CERTs) that will develop and implement community environment management rules to foster environmentally sustainable behavior and to facilitate community awareness on road safety and maintenance program





## **PROJECT COSTS AND FINANCING PLAN**

Item				Amount			
Α.							
	180.58						
	37.80						
	70.77						
	2.80						
		291.95					
Β.	B. Contingencies						
C.	8.94						
	337.81						
Sourc	e	Amount (\$ million)	Share of Total (%)				
Asia	n Development Bank ordinary capital resources						
(loan	n)	150.00	44%				
<b>D</b> :							

Pingxiang municipal government and county/district			
governments	187.81	56%	
Total	337.81	100%	
Source: Asian Development Bank actimates			

Source: Asian Development Bank estimates.



## PINGXIANG FLOOD-CHALLENGED - FLOOD RISK REDUCTION TOP PRIORITY

**Flood frequency and severity have increased significantly**. Floods in 1998, 2001, 2002, 2008, 2010, and 2014 affected more than 496,000 people, caused collapse of more than 2,600 houses, and significant economic losses in agriculture.

After major flood on 25 May 2014 caused estimated \$115 million in economic losses. all local governments prioritized river component

Rainy season from April–June flood events occur for several days. Water levels rise by up to 4 meters above normal levels for a 1-in 20-year flood



## ADB OPRC Partnership for a Better World MOST RIVERBANKS HAVE INADEQUATE FLOOD PROTECTION, OBSTACLES IN RIVERS, SEDIMENTATION RAISED RIVERBEDS, AND CONSTRAINING WALLS





# ADB ADDED VALUE: INTRODUCING AND CONVINCING GOVERNMENT AND ENGINEERS OF INTEGRATED GREEN INFRASTRUCTURE APPROACH

- ADB provided training on ecosystem-based flood risk management and integrated ecologically sound river management (and sponge city pilot development) to local governments, stakeholders, and domestic engineers, including an initial review of the locally proposed gray infrastructure a
- 2. ADB classified and qualified habitat types and prepared inventory of plant and animal biodiversity and identified environmental protection and sensitivity priorities and opportunities also studying existing river edge conditions
- 3. ADB analyzed threats to river ecology from point and non-point pollution sources, solid waste dumping, and other threats - and water safety assessment and identified improvement measures including wastewater collection and treatment (part of project) and using ecosystems services to clean and filter water
- 4. ADB reviewed original local design and proposed a maximum of ecosystem based adaptation and climate resilience improvements including floodplain preservation and wetland rehabilitation and riparian landscape rehabilitation and replanting and ecological river embankments with planted soft water edges, agriculture shelterbelts etc. where ever adequate and possible.
- 5. ADB worked directly with domestic engineers and government to achieve the maximum possible design transformation from gray to green infrastructure directly including ADB proposals in amended and improved local FSRs (in the process ADB was literally struggling for every square meter of green and every tree )

64

## PRIORITY ENVIRONMENTAL PROTECTION AND REHABILITATION PROJECTS LIANHUA AND LUXI RIPARIAN REVEGETATION AND WETLAND PROTECTION





## ASSESSMENT OF EXISTING PROJECT RIVER EMBANKMENT TYPES



500 ADB

#### ADB3OPRC 同行三十载, 携手惠四方 Partnership for a Better World EVALUATION OF EXISTING NATURAL RESOURCES LIANHUA COUNTY





## RIVER FUNCTION ZONING LIANHUA COUNTY



- Ecological Landscape Sections optimize existing natural wetlands and riparian forest, introduce hardscape features, provide a transition between urban and non-urban areas;
- Historic and Cultural Sections Create space for themed activities along the urban waterfront; provide linear urban green space (only in Lianhua);
- Urban Ecological Section –Create urban wetland park based on existing wetlands and riparian forest. Provide landscape and nature-based activities for citizens (in Luxi only);
- Water-based Leisure Section Soften and enhance the connection between water body and land, provide open space for residential areas; and
- Natural Rural Sections preserve existing wetlands and shoreline vegetation, and space for naturebased leisure activities.



#### ADB3OPRC 同行三十载, 携手惠四方 Partnership for a Better World DESIGN OF KEY NODES LIANHUA COUNTY 1





- Preserve new retaining wall on the southwest side, and raise the existing road to meet flood protection standards;
- Preserve large trees along the road on the southwest side, and plant more trees along the shoreline to improve connectivity of the riparian tree belt;
- Plant shoreline aquatic plants along the existing pebble beach on the southwest side to form riparian wetlands;
- Preseve existing forested areas on the northwest and north east sections, build up natural slopes to meet flood protection requirements;
- Preserve high quality wetland habitat at the confluence of the two rivers, and use wetland islands to improve landscaping and provide opportunities for leisure activities.





Gansu Urban Infrastructure Development and Wetland Protection Project



# Loan 2903-PRC: Location Zhangye and Wetlands



## ADB3OPRC Partnership for a Better World Loan 2903-PRC: Gansu Urban Infrastructure Development and Wetland Protection Project

- Project supports lesser developed regions in the People's Republic of China (PRC)
- Support aligned with PRC's Western Development Program
- Project approved in September 2012
- Project implementation 2013 to 2018
- ADB loan in the amount of \$100 million




## Loan 2903-PRC: Gansu Urban Infrastructure Development and Wetland Protection Project

#### Impact and Outcome

socioeconomic development & improved environment in Dingxi & Zhangye. improved urban infrastructure, municipal services, and environment in Dingxi and Zhangye

#### **Outputs**

(I) Improved urban infrastructure operating in Dingxi. Urban roads and their associated facilities, bridges, stormwater and sewer pipes.

(II) Improved urban infrastructure operating in Zhangye. Urban roads and their associated facilities, bridges, stormwater and sewer pipes.

(III) Restored and protected wetland in Zhangye. Zhangye National Wetland Park and nearby wetlands: (a) wetland protection; (b) wetland restoration, and (c) wetland sustainable utilization.

(IV) Project management and capacity development.





## Zhangye National Wetland Park (ZNWP) Inner Area

#### Habitats of the inner area:

- Rich biodiversity
- reed beds of Phragmites sp. and bulrushes Typha sp.,
- scattered stands of trees,
- agricultural land (principally corn),
- a mosaic of ponds and marshes, and
- small, slow-flowing channels.

#### Challenges of the inner area:

- Artificial lakes and small channels throughout
- Old sluice gates in some areas indicate water flow has been managed for many years by farming communities and by park management.
- Livestock (mainly sheep) is grazing in some parts of the area.







## ADB3OPRC Partnership for a Better World Zhangye National Wetland Park (ZNWP) Inner Area conditions



75

ADB3OPRC 同行三十载,携手惠四方 Partnership for a Better World

## Zhangye National Wetland Park (ZNWP) Inner Area

#### Habitats of the outer area:

- agricultural land and sections of the Heihe River.
- river is braided, shallow (<1 m depth) and rocky,
- mosaic of small channels and pools interspersed with
- exposed river beds of gravel, sand and low banks.
- River width ranges from 100 to 400 m.
- open woodland (canopy 5-30 m height),

#### Challenges of the outer area:

- riverbank near main roads degraded, with litter or rock debris and discarded landfill
- Surrounding land converted for agriculture (corn, rice, other crops)
- Arterial and small roads go through outer area
- Residential small settlements and villages.
- Forest understory largely cleared and grazed by sheep





## Zhangye National Wetland Park (ZNWP) Outer Area conditions







78

## Zhangye National Wetland Park (ZNWP) Challenges

Highly modified wetland landscape including roads, electricity pylons and easements.

Wetland habitats in the park represent the result of long-term human occupation (many centuries or more), recent restoration efforts, and natural re-growth in previously cleared areas.

Water resources and natural wetlands in Zhangye declining rapidly: uncontrolled urbanization,

irrational land use for agriculture expanding farmland reclamation, Increasing industrial sites and production

Water and soil pollution from domestic, industrial and agriculture sources

Inventories of flora and fauna for the ZHWNNR include some of the species which occur in the park. The park includes 1,733 ha of wetlands (38% of total park area), comprising 1,581 ha natural wetlands and 152 ha artificial wetlands



## Zhangye National Wetland Park (ZNWP) Component (3): Zhangye Wetland Protection, Restoration, Sustainable Use, and Management

- wetland protection, comprising construction of four protection stations, a center combining police, patrol, research/monitoring and education facilities, watch-towers, park boundary demarcation, associated equipment for all services, and an comprehensive education and capacity building program;
- (ii) wetland restoration, comprising restoration of 1,400 ha of wetland and woodland habitats in the park and planting of native and naturalized plant species; and
- (iii) wetland sustainable utilization, comprising activities designed to promote sustainable eco-tourism and public education in the park.



### ADBJORC Partnership for a Better World Zhangye National Wetland Park (ZNWP) Component (3): Zhangye Wetland Protection, Restoration, Sustainable Use, and Management

#### **Subcomponent 1: Wetland Protection**

construction of four protection stations, a police station, a research/monitoring station, an education center, three watch-towers, park boundary demarcation, patrol facilities, associated equipment for all services, and an comprehensive education and capacity building program. The latter program will comprise installation of educational boards and signs, basic and advanced training for park staff (wetland ecology, management, administration etc), outreach to local schools, and working with local communities to reduce the impacts of agriculture on the park's wetlands. To minimize the construction footprint of these activities, one protection station, the police station, the research/monitoring station and the education center will be merged into a single building.

#### **Subcomponent 2: Wetland Restoration**

restoration of wetland and woodland habitats at the four main sites within the ZNWP with natural habitats and cover an area of 1,400 ha. The sites cover the area of the experimental zone of the Zhangye Hei River Wetland National Nature Reserve which is within or adjacent to the ZNWP. The sites are degraded from previous recreational activities, illegal agriculture, grazing and clearance. Rehabilitation will involve a combination of fencing and livestock exclusion to assist natural regeneration, planting of native and naturalized plant species (400 ha). Individual rehabilitation plans will be developed for each site during detailed engineering design in consultation with local communities, and with involvement of a wetland specialist, and tailored to local conditions.

#### Subcomponent 3: Wetland Sustainable Utilization

promote sustainable tourism and public education in the park, and increase tourists to Zhangye and market the wetlands as part of the unique brand (mountains, glaciers, deserts, landforms, wetlands, culture, history of the Hexi Corridor) of the municipality. Project activities will supplement a range of facilities already in the park. The proposed activities will be located in the inner area of the park, and will comprise: (i) construction of small infrastructure (23 viewing pavilions, seven kiosks, seven parking lots for the park's electric-powered tour cars, eight public toilets, interpretative signs); (ii) 11.1 km of paved park roads (to supplement the 21.8 km of existing roads in the inner area); (iii) 4.12 km of boardwalks (to supplement the 4.82 km of existing boardwalks in the inner area); (iv) pedestrian bridges and water overflow pipes; (v) landscaping; and (vi) the installation of lighting at park entrances and around buildings.



#### ADB3OPRC Partnership for a Better World Zhangye National Wetland Park (ZNWP) Wetland Sustainable Tourism







- Wetland protection contributes to climate change adaptation and mitigation
- Restoration of wetlands improves water retention and improve carbon storage capacity.
- Protection and maintenance of natural habitats is recognized by the Intergovernmental Panel on Climate Change (IPCC) as important reducing vulnerability to climate change,
- Large, diverse areas of natural habitat are more resilient to change than smaller, degraded areas.



Wetland protection and sustainable management contributes to:

- Implementing priority goals of the City
- Promoting sustainable tourism and branding for Zhangye
- Implementing the city master plan that positions Zhangye as an environmentally friendly and livable city
- Pollution reduction aligned with city masterplan expanding capacity of wastewater treatment plant, relocating an industrial zone away from the wetland area, and promoting ecotourism.



Wetland protection and sustainable management contributes to:

- Protect and rehabilitate biodiversity wetland vegetation communities, amphibian species, more than 15 animal species and 100 bird species, including migratory waterfowl.
- Park of 1,733 ha of wetlands (38% of total park area), comprising 1,581 ha natural wetlands and 152 ha artificial wetlands.
- Implementation of ZWP Master Plan (2009-2018)
  - protect wetland and improve ecological function;
  - wetland rehabilitation and woodland habitats restoration at six sites
  - promote sustainable wetland use
  - scientific research and education;
  - comprehensive education and capacity building program





# HUBEI HUANGGANG URBAN ENVIRONMENT IMPROVEMENT PROJECT

SUMMARY FOR URBAN RIVER AND WETLAND REHABILITATION AND POLLUTION CONTROL LECTURE

Summary | June 2016





# Background



- Located on the north bank of the middle reach of the Yangtze River
- 78km east of Wuhan, capital of Hubei Province
- One of the poorest municipalities in the province
- Low urbanization rate (35.7%)

- Part of Wuhan 1+8 megacity cluster, supported by the PRC's Rise of Central China Plan
- Emerging manufacturing industries with good connectivity
- Rich historical, cultural and human resources









### Deteriorating urban environment - lakes and rivers

- Polluted with organic matters and nutrients: class V water quality
- Silted with polluted sediments, blocking natural hydraulic circulation
- Failed embankments and weak resilience to floods
- Adversely affecting public health and safety



#### ADB3OPRC 同行三十载, 携手惠四方 Partnership for a Better World

## Project

#### Outputs • Urban lake and river enhancement

- Solid waste management
- Capacity development and institutional strengthening



#### Outcome by 2020

- Improved urban environment in Huanggang
  - Water quality improved to class IV in Baitan and Chiye lakes (2012 baseline: class V)
  - Return period of seasonal flooding in New Eastern District is reduced to 20 years (2012 baseline: 5 years)

#### Inputs

- ADB Loan: \$100 mil
- Huanggang Municipal Gov't: \$71.3 mil
- Domestic bank: \$81.3 mil

#### Urban Lake and River Enhancement Component

- Project Lakes and Rivers

   (including areas for Sediment Dredging, Embarkment Strengthening, and Ecological Restoration)
   Surface-flow Constructed Wetland
   Subsurface-flow Constructed Wetland
   Multi-use Nonmotorized Pathways and Bridges
- Sluice Gates



Lakes and Rivers

---- Hydraulic Circulation

#### Solid Waste Management Component





# ADB3OPRC Repair More And River Rehabilitation

Structural	Lake and River sediment dredging: remove nutrient laden sediments from lakes and
Measures	rivers, excavate river bank soil and widening the river course in rivers and re-establish
	natural hydraulic circulation between lakes and rivers.
	<ul> <li>Lake and River embankment strengthening, and ecological restoration: construct ecological flood retention embankments with vegetated buffer strips, aquatic vegetation, embankment strengthening</li> </ul>
	• Surface-flow constructed wetland: create 80 ha of surface-flow constructed wetland in Chiye Lake and Chushui River.
	<ul> <li>Subsurface-flow constructed wetland: establish 4 subsurface-flow constructed wetlands and 4 detention basins in Baitan and Chiye lakes.</li> </ul>
	• Sluice gates: construct and upgrade 2 sluice gates in Linglong and Jinshui rivers
	Equipment for waste collection (2 boats)
	• Construct a waste transfer station and provision of 260 waste bins around the lakes.
	<ul> <li>Purchase two vehicles to collect, transport, and compact waste; and</li> </ul>
Non	• Public awareness campaigns on solid waste sorting, reuse, recycling, and safe
Structural	disposal, to change people's behavior (throwing garbage into lakes and rivers etc.)
Measures	<ul> <li>Institutional strengthening of Huanggang Municipal Government on wetlands operation and management, water quality monitoring and forecasting including nonpoint source pollution control, and lake ecology and biodiversity.</li> </ul>

# **Special Features**

Plays an integral part of implementing the Huanggang Municipal Urban Master Plan

ADB3OPRC 同行三十载, 携手惠四方 Partnership for a Better World

- Integrated approach to urban lake pollution control and environmental management
  - focuses on nonpoint source pollution control that complements Huanggang's point source pollution control measures
- Hydraulic and water quality model
   developed to support the project design and
   analyze the impact of project interventions
- Water quality monitoring and forecasting system will be developed for systematic and continuing water quality management
  - demonstrates sustainable pollution control and ecological preservation replicable in cities along the Yangtze River and elsewhere in the PRC.







## **CONCLUSION**



