



Pre-Feasibility Study Anxiang Urban Water-Environment Integrated Development Project

August 2015
Executive Summary



i. The Project

A. Rationale

1. Anxiang is a County Town that sits astride the Songzi River, northwest of Dongting Lake in Hunan Province. The Songzi River is the main water supply for Anxiang, flowing between the Yangtze River and Dongting Lake, and supports river based transportation. Anxiang relies on Songzi River and three others – Hudu, Ouchi and Lishui – for all its productive water (Agriculture and aquaculture) across the rich floodplain area of Dongting Lake. Anxiang is one of 25 Counties that border Dongting Lake and are collectively part of the new nationally instituted Dongting Lake Ecosystem-Economic Development Zone (DLDZ)¹.

2. Anxiang County is one of 6 counties in Changde District, about 65 km northeast of Changde City. Anxiang town sits within two of the five county polders, protected from floods arising annually from the Songzi and other rivers. Following completion of the 3 Gorges Dam on the Yangtze River, the main flood risks now come from rainfall (storms) and poor internal polder drainage. As Anxiang has grown, urban water and environmental management has not kept pace. Urban infrastructure urgently needs to be improved (better drainage, improved water quality, more managed green zones) for the health and well-being of the increased urban population, and to fulfil Anxiang's aim to be a future demonstration and urban improvement leader in DLDZ.

3. Anxiang urban water quality (rivers, lakes) needs to be improved, to strengthen the rural and urban economy for one of the poorest counties around Dongting Lake². As Anxiang's urban population is growing, its economic activity needs protection from recurrent floods to make migrant settlement more attractive. Better drainage, improved water quality, and establishment of new green zones and amenity areas will improve urban living conditions. Infrastructure development priorities have been identified by Anxiang County Government (ACG) in its Urban Master Plan³ (UMP) for implementation between 2016 and 2025. The development focus is on improving infrastructure and management capacity for effective and integrated flood mitigation, drainage (stormwater and wastewater), rehabilitation of open waterways, and pollution monitoring to improve urban open water quality and the associated environment.

4. Whilst Anxiang is considered to be a poor county, a majority of the poor people live in the town. Many of the poor are adversely affected by the recurrent storm induced floods that occur several times each year, as they reside in the older housing areas that are subject to flooding. Improved drainage will therefore benefit the less fortunate poorer residents of Anxiang. Better drainage will also ensure the town suffers fewer floods and economic disruption each year, providing a healthier living environment. Anxiang can progress to become a leader in integrated water-environment development for the DLDZ.

B. Scope, Impact and Outcome

5. The scope of AUWEIDP⁴ lies in Anxiang urban area, which covers about 32km² (including Shenliu and Dajinggang), and sits within two flood protection polders (Anzaao and

¹ DLDZ is the region around Dongting Lake targeted for accelerated growth under the national Dongting Lake Ecosystem-Economic Development Plan. China aims to restore the Dongting Lake region to maximise food and fish production, and Anxiang aims to be a leading demonstration County for modern urban infrastructure development and economic growth within the DLDZ. In particular, development emphasis will be given to integrate planning across multiple sectors to strengthen natural resource and public services management and support business and infrastructure investment.

² Anxiang is one of the 10 poorest counties in Hunan province, and the poorest county in Changde district.

³ Anxiang Urban Master Plan (2002 to 2020), Anxiang County Government (revised 2011).

⁴ PFS of Anxiang Urban Water Environment Integrated Development Project

Anbao Polder). The proposed project will involve integrated development of water control infrastructure with associated environmental improvement measures to minimise flooding (typically three events per year), improve stormwater and wastewater drainage systems, increase wastewater treatment capacity (residential and industrial), re-establish natural 'dumb' rivers (surface water drainage paths) through the town, provide more green zone areas for runoff pollution management, and create recreational and amenity areas. The infrastructure works will be complimented with institutional capacity building to strengthen integrated planning across sectors, and to establish effective monitoring of the urban water resources and environment.

6. The project impact will take an integrated approach to improve: (i) water safety (flood mitigation); (ii) water circulation (better connectivity within and between internal and external rivers); (iii) water ecology throughout Anxiang Town (maintenance of water and environment system with better water quality). Through the approach of "Better Water, Better City" promoted by the Mayor, the town will have an improved urban environment, and enhanced public health and quality of life for the residents of Anxiang.

7. The outcome will be reduced wet season disruption and economic loss for the urban residents, and an improved, more livable and healthier environment for the growing population. The integrated development approach will provide a demonstration model for cooperative planning and implementation that would be applicable for similar urban development needs across the DLDZ.

C. Project Description

8. The following potential investment project packages for Anxiang integrated water management infrastructure and environment, as a demonstration for the broader DLDZ, have been identified and assembled within a prioritised investment program:

(1) Urban Wastewater and Stormwater Drainage Systems

9. Several packages are proposed to construct separate drainage systems in Anxiang town, including: 47.14 km of wastewater pipeline and 42.55 km of stormwater pipeline, in the old urban area (12 km²) and east urban area (12 km²) of Shenliu; and in Dajinggang Industrial Park (8 km²). Three existing drainage pump stations will be upgraded with increased capacity. These proposed works are in accordance with the Anxiang Urban Master Plan (UMP) and work plan of the Housing and Urban-rural Development Bureau (HURDB). With these subprojects, the occurrence of floods in Anxiang urban area will be reduced from once in three to once in twenty years.

(2) WWTP Upgrade and Expansion

10. Wastewater drainage will soon exceed the existing treatment capacity (WWTP) in Anxiang East (Shenliu), whilst a new WWTP is urgently needed in Anxiang West (Dajinggang). The objective is to ensure WWTP effluent will comply with the national standard of Class IA. To achieve this, the Shenliu WWTP capacity will have to be increased to 40,000 tons/day whilst the new Chengxi WWTP (Dajinggang) will require a capacity of 10,000 tons/day for the wastewater from the new Industrial Park, residential and commercial areas. The aim is to achieve wastewater treatment capacity for the Anxiang urban area of 90% with these subprojects. The new WWTP in Dajinggang, is the first priority, with Shenliu WWTP capacity increase to follow.

(3) Sponge City and Low Impact Development Conservation

11. General non-point water pollution from overland flow (stormwater runoff) into open waterways can be mitigated by adopting Sponge City and Low Impact Development (LID) technology. It is proposed that several measures be trialed to mitigate urban runoff and manage non-point source pollution in Anxiang. Used already in major cities across China, these measures can be implemented as a demonstration for application in County-level towns across the DLDZ. Proposed measures will include: the installation of permeable pavement (48,342 m² in residential blocks, 17,500 m² alongside main municipal roads); the establishment of stormwater wetlands (55,000 m²), the creation of vegetation buffer zones alongside waterways (55,200 m²); and the installation of stormwater infiltration and purification measures in open spaces (parks). These measures will help to reduce overall surface runoff coefficient⁵ to 0.6 in Anxiang urban area.

(4) Dumb River Rehabilitation

12. Natural waterways or 'dumb' rivers need to be restored to provide the main stormwater drainage paths. Integrated with the street drainage system, the waterways will be provided with adjacent green zones for pollution management and to provide public amenity areas in the town. Several dumb rivers will be rehabilitated over several years, in harmony with urban area growth. The rehabilitation will involve Mengjiazhou (13.36 km), Shuyuanzhou (10.4 km) and Guanlinghu (5.4 km) Dumb Rivers in Anxiang (Shenliu). The rehabilitation works will include reconnecting river sections, reformation of a river section with detention capacity, and the creation of a green ecological corridor development (109.7 ha) and wetlands (35.07 ha) alongside these rivers. In Mengjiazhou, 22 ha of ecological revetment will be installed in the river section for aeration and filter of river low flows. Water quality in the dumb rivers, currently below Class V, will be improved to at least Class IV (National Standard: GB3838-2002) with these subprojects by 2020.

(5) Capacity Building

13. To ensure and manage the integrated water resource and environmental development and future management between all the responsible ACG institutions, it is proposed that 5 new automated river water quality and 2 new drainage monitoring stations be constructed. These will monitor drainage discharge into the Songzi River and Mengjiazhou Dumb Rivers. Relevant institution staff will be trained in monitoring procedures, interpretation of results, and taking action related to those results. Training will also be provided to strengthen overall institutional capacity to plan and manage integrated cooperative practice for urban infrastructure development and maintenance. The training program will strengthen awareness among the institutions and encourage community involvement in the integrated development, management and future sustainable operation of the investments.

D. Project Investment Costs

14. The project is estimated to cost a total of US\$ 211.42 million. The project costs are divided into the five main infrastructure components, plus an overall capacity building component across all institutions involved in the project. Each component will be implemented as per priorities described in the implementation plan. The following Table

⁵ Surface runoff coefficient: the ration of runoff depth (mm) and rainfall precipitation (mm), reduced coefficient means reduced urban stormwater runoff.

illustrates the breakdown of costs between components and priorities, including contingencies (30%) and planning and design costs (10%).

No.	Component	Priority 1	Priority 2	Priority 3	Priority 4	Amount (USD Million)
	Period	2016-2017	2018-2020	2018-2020	Post 2020	All
1a	Urban Wastewater and Stormwater Drainage Systems	25.05	42.36	/	/	67.42
1b	Pump Stations Upgrade	/	10.16	20.32	/	30.48
2	WWTP Upgrade and Expansion	15.81	27.10	/	/	42.90
3	Sponge City and Low Impact Development Conservation	1.72	9.04	7.86	7.18	25.80
4	Dumb River Rehabilitation	/	/	12.09	31.35	43.44
5	Capacity Building and Monitoring			0.68	0.70	1.38
	Total					211.42

E. Implementation Arrangements

15. The project includes activities to upgrade and expand urban infrastructure and create environmental amenity features. The integrated developments across several sectors and institutions will be supported with institutional strengthening and development of monitoring capability. Drainage, flood management and environmental-ecosystem improvements will be managed by: the Housing and Urban-rural Development Bureau (HURDB); waterway and waterbody improvements will be guided by the Water Resource Bureau (WRB); and institutional capacity building for integrated water and environment management will be coordinated and overseen by the Environmental Protection Bureau (EPB). A total of 34 project packages are proposed for implementation, in three phases with 4 priority levels. The implementation period for each of the packages varies, with priority 1 packages over the period 2016 to 2017, priority 2 and 3 packages over 2018 to 2020, and priority 4 packages post 2020.

F. Project Benefits

16. The residents in Anxiang town (Shenliu and Dajjिंगgang) will derive mostly indirect benefits as the majority of the expected project benefits are non-market benefits that will accrue to the town community and/or region. In terms of economic value (in monetary terms), the main benefits derive from:

- (1) Avoided waterway rehabilitation costs. Capital costs to be avoided in future would be USD 14 million and avoided maintenance costs would be USD 0.7 million each year.
- (2) Avoided damages due to reduced urban flooding. The average annual damages – or the benefit from damages avoided – amounts to USD 9.68 million per annum. This will be annual expenditure saved, which would accrue to the households and entities whose facilities would be protected from future flood damage.
- (3) Uplift in land value thanks to improved eco-environment. The premium on land value would be USD 23.8 million, which will be a one-time benefit to be realised by real estate developers and households.

(4) Avoided development costs on flat sites. USD 14.96 million would be saved on capital costs for future conventional pit and pipe drainage that could be distributed to developers.

(5) Increased value to tourism reliant on waterway health. The tourism benefit created by the project is estimated to be CNY 102 million (USD 16.4 million) annually, that would flow to tourism and associated industries.

ii. Due Diligence

A. Technical

17. A technical assessment has been undertaken on the proposed AUWEIDP projects in accordance with the related Government urban planning and policy documentation. Site visits were undertaken in the Anxiang urban area and multiple interviews have been held with staff from the local bureaus, and with affected communities. Plans were analysed and the most urgent infrastructure, environment and institutional needs and practical solutions for improving Anxiang's water environment have been prioritized, in keeping with the Urban Master Plan. Priority is given to improving and separating the stormwater and wastewater drainage, and ensuring there is sufficient infrastructure capacity to alleviate flooding at the earliest stage. Second priority goes to increasing wastewater treatment and disposal capacity to meet projected growth as per the UMP. The third major infrastructure priority is to reconnect urban 'dumb' rivers, and mitigate the deterioration of open water quality within the urban environment. A new monitoring system for non-point source pollution control for waterways will be linked with environmental green zone measures and overseen by a trained and integrated institutional system.

B. Economics and Financing

18. AUWEIDP has limited revenue-generation opportunity, so a cost-benefit analysis has been conducted to assess the overall impact for improving economic and social welfare of the urban community. A discounted cash flow model has been used for 20 year period, with current costs and benefits (financial prices) converted to economic value using various accepted conversion factors. The economic costs did not include price contingencies, interest during construction, or any transfer payments (e.g. taxes, duties or subsidies). The calculated economic internal rate of return (EIRR) is 16.9%, above the target social discount rate of 12%. Sensitivity analysis confirms the project is resistant to economic risks. Change to key variables - adversely and/or independently - by 30% still has an ENPV above zero, therefore the project is economically and socially feasible and would generate attractive economic benefits for Anxiang County, through avoidance of adverse social and physical damage with associated costs. Increased social well-being arising from improved social amenity for local residents would generate additional benefits after project implementation.

19. The investment plan involves five components with a total of 34 project packages. There are four finance sources that could be used to meet the needs of particular project packages. These are private partner investment, local government investment, transfer payments from higher governments and repayable loans. Loans include not only funds from banks and non-banking financial institutions, but also possible international concessional lending. As shown below, on average about 10% of the funding will come from the private investors, 10% from local governments, 30% from grants of higher governments and 50% from borrowing (loans).

Funding Source by Year

Year	2016	2017	2018	2019	2020	2021	2022	Amount (USD Million)	%
Costs for all project packages	21.29	21.29	42.98	42.98	42.98	19.95	19.95	211.42	100
Private partners	2.77	2.77	4.06	4.06	4.06	0.00	0.00	17.73	8.4
Total from local government	1.73	1.73	3.85	3.85	3.85	2.00	2.00	19.00	9.0
Total from higher governments	4.02	4.02	13.58	13.58	13.58	7.98	7.98	64.73	30.6
Total from borrowing	12.77	12.77	21.49	21.49	21.49	9.98	9.98	109.97	52.0
Total financing	21.29	21.29	42.98	42.98	42.98	19.95	19.95	211.42	100

C. Poverty and Social

20. Anxiang is a relatively poor county. The project will contribute to poverty reduction by ensuring that poor communities have safe and reliable access to better water quality and the associated environment, thereby providing an improved healthy environment. Improved water management, with reduced pollution and flooding, will provide better living and working conditions for the town residents, and will be particularly beneficial for vulnerable groups in flood prone areas. Some inclusive suggestions to strengthen and improve the opportunities and livelihood of the vulnerable groups are outlined in the main report.

D. Safeguards

21. According to planning estimates, the project will permanently acquire 400.5 mu (26.7 ha) of rural land, including 368.5 mu (24.6 ha) of farmland, 2 mu of unused land and 30 mu (2 ha) of rural construction land. The project will permanently use 1,329.1 mu (88.6 ha) of state-owned land; and will temporarily occupy 970.9 mu (64.7 ha) of land during construction. It is estimated that over 200 people will be adversely affected by land acquisition and house demolition.

22. Should the Project apply for an ADB loan, then ADB’s safeguards policies would be applicable. With over 200 affected people, the Project would be classified as Category A for resettlement. The PMO would need to engage an experienced resettlement consultant to prepare a full draft Resettlement Plan (RP) for ADB’s review. A full feasibility study would have to be prepared, to be updated once the detail design is completed, with an updated RP for approval prior to construction. The draft RP and final RP should follow ADB’s Safeguard Policy Statement (SPS, 2009) and its procedural requirements regarding land acquisition and resettlement, as outlined in ADB’s guidelines and handbooks on resettlement. According to the costs estimate, the total resettlement cost for this project is about CNY 196.61 million (USD 31.7 million).

23. Anxiang County has a high proportion of migrant settlers, many of which have come from Jianxi province, Hubei province and other Hunan provincial cities. There are no substantive ethnic minority groups within these migrants, nor within the established Anxiang County population. Therefore, as per ADB’s safeguards policy, this project is categorized as Category C for indigenous and ethnic minorities, so no special ethnic minority report or action is needed.