

## SECTOR ASSESSMENT (SUMMARY): AGRICULTURE AND NATURAL RESOURCES, AND WATER SUPPLY AND OTHER MUNICIPAL INFRASTRUCTURE AND SERVICES

### Sector Road Map

#### 1. Sector Performance, Problems, and Opportunities

1. Over the past 30 years, the urban population of the People's Republic of China (PRC) has grown from 191 million to 691 million, rising from 19.4% to 51.3% of the total population.<sup>1</sup> By 2045, the urban population is expected to reach 70% of the total population or about 1 billion.<sup>2</sup> The fast-growing urban population requires major investments in urban infrastructure, including wastewater collection and treatment systems, and urban flood control facilities. The PRC's urban areas still face environmental threats from pollution of rivers and lakes despite the significant increase in (i) the number of wastewater treatment plants (WWTPs) in cities,<sup>3</sup> from about 1,000 in 2006 to 2,600 in 2010; (ii) the overall wastewater treatment capacity, from about 7,000 cubic meters per day (m<sup>3</sup>/day) in 2006 to 12,000 million m<sup>3</sup>/day in 2010; and (iii) the wastewater treatment rate from 55.7% in 2006 to 82.3% in 2010.<sup>4</sup> Under the PRC's national water quality standards, 18% of monitoring points in the PRC are class V+.<sup>5,6</sup> In 2010, the Ministry of Housing and Urban–Rural Development surveyed 351 cities and found that since 2008 (i) 61% of the cities had waterlogging;<sup>7</sup> (ii) 75% had a maximum waterlogging depth of more than half a meter; and (iii) 57% had a waterlogging duration of more than 12 hours.<sup>8</sup>

2. Huainan Municipality, located in the north–central part of Anhui Province, spans both banks of the Huai River, with 87 kilometers (km) of the river flowing through the municipality. Its total land area is 2,895.4 square kilometers (km<sup>2</sup>), of which the urban area is 1,609 km<sup>2</sup> (54%). The total population is 2.46 million: the registered population living in urban areas comprises 46.3%, and actual residents living in urban areas comprise 63.7%.<sup>9</sup> Huainan is the second largest city by population in Anhui Province and is a prefecture-level municipality subject to the jurisdiction of the Anhui provincial government. Huainan has the largest coal reserves in the eastern PRC; in 1999, the State Council designated it as the energy production base for coal and electricity in the eastern PRC. The gross domestic product (GDP) in 2010 was CNY60.3 billion: 8% from agriculture, 64% from industry and construction, and 28% from services.<sup>10</sup> The economic development of Huainan has been making great progress through the implementation of the Hefei Economic Circle strategy, which includes Hefei and Huainan municipalities and two county-level cities. To help implement the Hefei Economic Circle, Huainan issued several plans for integration with Hefei Municipality, including the Hefei–Huainan Integration Plan (2008–2020)

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<sup>1</sup> National Bureau of Statistics. 2011. *Statistical Communiqué of the People's Republic of China on the 2011 National Economic and Social Development*. Beijing.

<sup>2</sup> United Nations. 2009. *World Urbanization Prospects*. The 2009 Revision Population Database.

<sup>3</sup> Provincial-, prefecture-, and county-level cities.

<sup>4</sup> Ministry of Housing and Urban-Rural Construction. 2012. *State of PRC's Urban Drainage and Wastewater Treatment 2006–2010*. Beijing.

<sup>5</sup> Class III water is suitable as a supply source for municipal drinking water treatment and for swimming; class IV water is suitable for use as a general industrial water supply and for recreational use involving no direct human contact with the water; class V water is suitable only for agricultural water supply and general landscaping use; and class V+ water is unsuitable for any use (PRC Environmental Water Quality Standard GB 3838-2002).

<sup>6</sup> State Council. 2011. *National Twelfth Five-Year Plan for Environmental Protection*. Beijing.

<sup>7</sup> Waterlogging is flooding where storm-water runoff in excess of the capacity of drainage system converges in low-lying areas.

<sup>8</sup> ADB. 2012. *Technical Assistance to the People's Republic of China for the Urban Stormwater Management and Waterlogging Disaster Prevention*. Consultant's final report. Manila.

<sup>9</sup> Anhui Provincial Statistical Department. 2002. *Anhui Statistical Yearbook, 2002–2012*. Hefei.

<sup>10</sup> Hong Kong Trade Development Council. Huainan (Anhui) City Information. <http://china-trade-research.hktdc.com/business-news/article/Fast-Facts/Huainan-Anhui-City-Information/ff/en/1/1X000000/1X0740EM.htm>

approved by the State Council in December 2012. Rapid urbanization and economic development in Huainan,<sup>11</sup> along with lagging infrastructure development, has resulted in heavy pollution load—mainly caused by domestic wastewater and solid waste—to the existing urban water channels and lakes.<sup>12</sup> At the same time, flood control capacity of the urban water systems is insufficient; various locations in Huainan experience flood damage caused by waterlogging every year.

3. Huainan is making continued efforts to develop wastewater collection and treatment system using funds from foreign governments and international organizations, subsidies from the central government, and tariff revenues. During 2005–2011, Huainan invested CNY46.5 billion in a wastewater collection and treatment system. In urban areas—including Baogongshan, Datong, Tianjiaan, and Xiejiaji districts<sup>13</sup>—the eastern WWTP was constructed in 2002 funded by the government of the Netherlands; the western WWTP was constructed in 2008 funded by the World Bank. Huainan Capital Water Company (HCWC) is operating both WWTPs based on the Concession Agreement of Urban Water Supply and Drainage Project in Anhui Huainan made between the HCWC and the Huainan municipal government (HMG) on 20 December 2004. Construction of the Meilu WWTP in Fengtai County in 2008 was self-funded. During 2000–2011, Huainan increased the length of sewers from 430 km to 679 km. Each of the eastern and western WWTPs has treatment capacity of 100,000 m<sup>3</sup>/day. However, only 90,000 m<sup>3</sup>/day of wastewater is being treated in the eastern WWTP and 73,000 m<sup>3</sup>/day in the western WWTP, as wastewater collection system coverage is still low: with 64% for eastern urban areas and 66% for western urban areas, despite the increased length of sewers. At the Mailu WWTP, only 20,000 m<sup>3</sup>/day of wastewater is being treated despite its capacity of 25,000 m<sup>3</sup>/day. In addition, wastewater generated in Huainan increased from 160,000 m<sup>3</sup>/day in 2009 to 228,000 m<sup>3</sup>/day in 2011. As a result, although the development of wastewater collection and treatment systems is being accelerated, the treatment rate has remained at approximately 75%. The volume of wastewater at the eastern WWTP will be more than 100,000 m<sup>3</sup>/day in 2014, and more than 150,000 m<sup>3</sup>/day in 2019; while at the western WWTP, it will be more than 100,000 m<sup>3</sup>/day in 2018. On 29 September 2012, HCWC and the HMG completed the Agreement on the Expansion of Urban Wastewater Treatment Plant. Based on this agreement, expansion of the eastern WWTP to 150,000 m<sup>3</sup>/day will be completed in 2014 and the second expansion to 200,000 m<sup>3</sup>/day in 2019. For the western WWTP, the expansion to 150,000 m<sup>3</sup>/day will be completed in 2018.

4. The urban area in Huainan is served partially by a combined sewer system (CSS), and partially by a sanitary sewer system (SSS). Under the CSS, wastewater collected through combined sewers—together with storm water during floods—is transferred through urban water channels partly to the eastern or western WWTP, but most directly transferred into the lakes and Huai River without treatment. Under the SSS, wastewater collected through sanitary sewers is directly transferred to the WWTPs, and discharged into the lakes and Huai River after treatment. Water quality in all six urban water channels in the urban area of Huainan are class V+ because they are used to convey both wastewater and storm water. Of the five lakes in the urban area, water quality in Long Lake and Dajiangou Wetlands are class V+ due to direct wastewater discharge into their water bodies, class IV in Gaotang Lake, and class V in Shijian Lake.<sup>14</sup> The HMG has been improving the urban water and lake environment, including improving the wastewater collection and treatment system, dredging urban water channels and lakes annually,

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<sup>11</sup> From 2000 to 2011, the population increased from 2.06 million to 2.46 million; and the GDP from CNY14.0 billion to CNY60.3 billion. Huainan Municipal Statistical Bureau. 2012. *Huainan Statistical Yearbook*. Huainan.

<sup>12</sup> Untreated industrial wastewater is not being discharged into urban water channels, lakes, or Huai River in Huainan.

<sup>13</sup> The same as the project area.

<sup>14</sup> Currently, Caoling Lake is filled with fly ash produced by private companies; the lake has no water.

and increasing public awareness to reduce garbage dumping in waters. However, sludge, sediment, and solid waste have accumulated in the channels and lakes over time, causing increasing deterioration of the urban water and lake environments. Under both the PRC's twelfth five-year plans (2011–2015) for environmental protection and for water pollution control in key watersheds, the Huainan section of Huai River is considered a priority section and needs to be maintained at class III. While many of the subsections in Huainan are class III, some subsections are class IV, V, or even class V+ at various times.

5. Two types of flooding are relevant to Huainan: (i) overflows from Gaotang Lake and Huai River, and (ii) urban waterlogging. Historically, Huainan has been highly vulnerable to flooding from Huai River. Over the years, various flood control projects have been implemented to control flooding from Huai River. The Huai River Basin Flood Control Plan targets a 1 in 100 year flood as design standard for key industrial cities along the river, including Huainan.<sup>15</sup> For Huainan, this target will be achieved in 2015. The municipality is also vulnerable to flooding from Gaotang Lake. Gaotang Lake, which flows into Huai River through Yao River, has a catchment area of approximately 1,500 km<sup>2</sup>. The area along Gaotang Lake in the Huainan has 22,000 residents, major roads (i.e., State Highway 206), and a new high-speed railway station. During storm events and when the water level in Huai River is high, the water level in Gaotang Lake rises and floods the surrounding plains. Flooding has occurred every 3–4 years, and large floods have occurred every 8–10 years inundating a 1–10 km<sup>2</sup> area. The HMG will develop a new waterfront district. By 2020, 5.6 km<sup>2</sup> of the new district will be built up with a planned urban population of 20,000; by the time it reaches its planned built-up area of 25 km<sup>2</sup> in 2030, the district will have the capacity for 280,000 residents.

6. For the most of the urban area in Huainan, storm-water runoff flows through the urban water channels and lakes to Huai River. Some parts of the area drain to Wabu Lake in the southwest and Gaotang Lake in the east. Each of Caoling Lake, Dajiangou Wetlands, Long Lake, and Shijian Lake has a pump station that discharges storm water from the lake to Huai River. Currently, many of the urban water channels and pump stations are designed for a 1 in 5 year flood. The HMG has been conducting various measures to improve urban flood management, including improving urban water channels and drains to increase flood flow capacity, preparedness for and emergency response to floods, and post-flood recovery. However, the reduced capacity of the urban water channels—due to siltation and garbage accumulation, as well as the insufficient capacity of the pump stations—still causes waterlogging throughout the urban area almost every year during rain events.

## 2. Government's Sector Strategy

7. **Agriculture and natural resources sector.** The government's focus under the Twelfth Five-Year Plan includes resource-conserving and environment-friendly development, and more sustainable use and management of water. Particular concerns include (i) pollution of water bodies, (ii) deterioration of biodiversity, and (iii) weak infrastructure. Water resources management has been accorded increasing priority over time. The decree on Reform Measures for Accelerating Development of Water Conservation was the first document issued by the State Council in 2011. It focuses on (i) flood control, (ii) wetlands conservation, (iii) lake and river pollution control, and (iv) ecological and biodiversity management.

8. **Urban development sector.** Acceleration of urban development is a priority under the Twelfth Five-Year Plan; investments of about \$1 trillion in urban infrastructure are expected during 2011–2015. The government is prioritizing a process of urbanization and urban

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<sup>15</sup> Huai River Conservancy Commission. 2004. *Huai River Basin Flood Control Plan*. Bebgbu.

development that provides the greatest possible economic and social benefits across the country while safeguarding the environment. Key principles for environmentally sustainable urban development include adherence to ecological principles, conservation, and waste minimization. A high priority is accorded to making all cities livable by improving the urban environment, including efforts to reduce pollution.

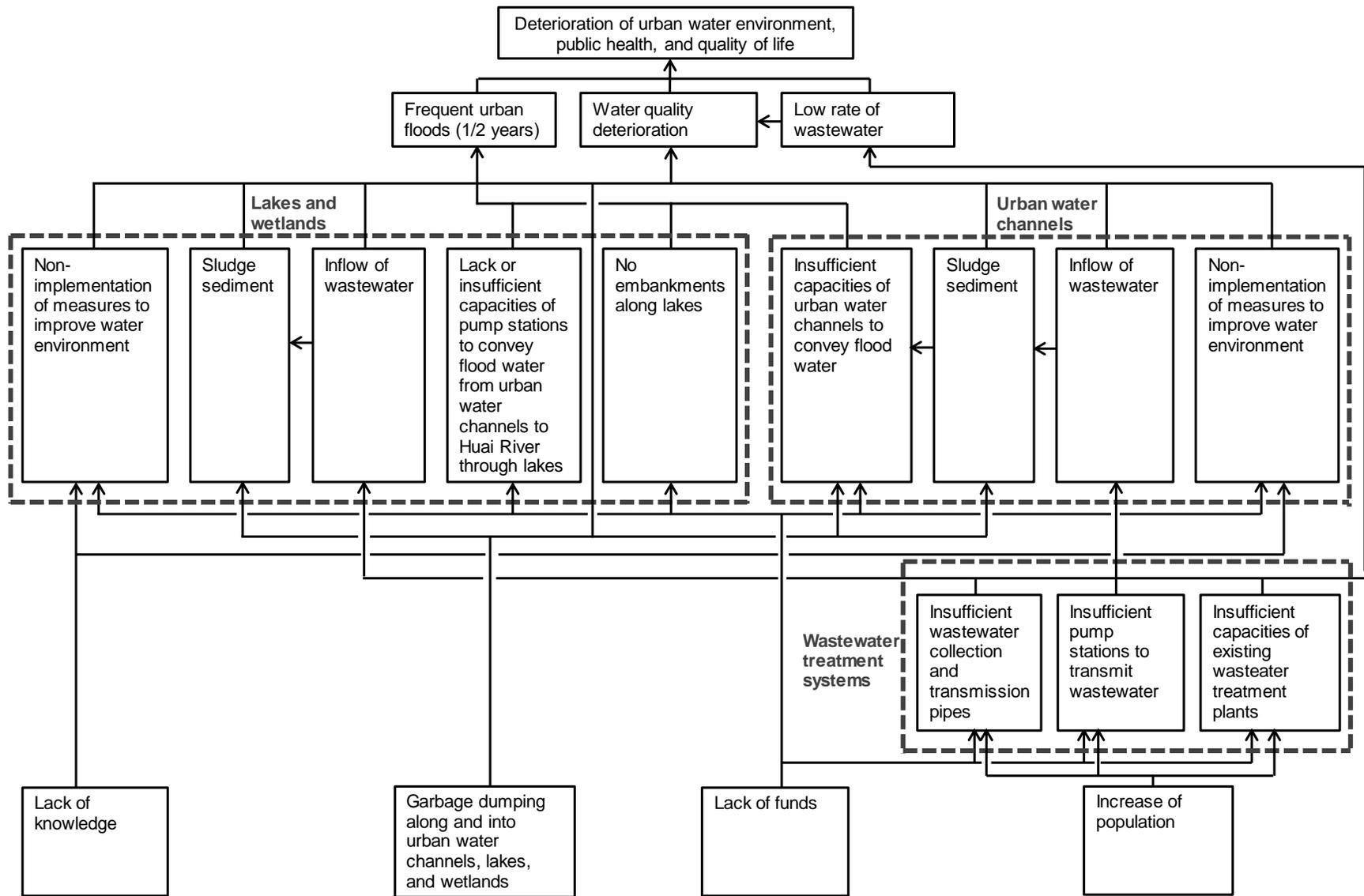
9. **Huainan.** To facilitate the development of Huainan, the HMG prepared the Huainan Municipality Master Plan, 2010–2020, which was approved by the provincial and central governments. The plan sets targets for 2020 for the water environment (water quality in urban water systems improved to class IV or above) and flood management (storm-water management system designed to handle a 1 in 20 year rain storm). The HMG also prepared (i) the Special Plan for Sewerage Works in the Western Urban Area (2004–2020), (ii) the Special Plan for Drainage Works in the Gaotang Lake New District (2010–2030), and (iii) the Plan for Urban Drainage Works (2010–2020).

### 3. ADB Sector Experience and Assistance Program

10. **Agriculture and natural resources sector.** The Asian Development Bank (ADB) has developed a diverse and active portfolio in natural resources management and sustainable water resource use, including wetland preservation, water resources development, and biodiversity and ecosystem management. Lending in the agriculture and natural resources sector increased sharply during 2006–2011, totaling \$1.3 billion, with annual lending of about \$200 million compared with annual lending of about \$80 million during 2001–2005. In line with the PRC's Twelfth Five-Year Plan goals and objectives, ADB will assist the government in identifying and applying sustainable natural resources use models in lesser-developed regions. Support to be provided will include water resources management, lake and wetland protection, and nonpoint source pollution control. One aspect of natural resources management that will be increasingly emphasized is rural pollution control. ADB assistance will support government efforts to reduce lake and river pollution and improve biodiversity management.

11. **Urban development sector.** By the end of 2011, ADB had approved 36 loans totaling \$4.1 billion. The loans have financed water supply, wastewater treatment, urban transport, flood control, solid waste management, and central heating. ADB urban sector assistance has recently given greater focus to lesser-developed central, western, and northeastern regions, supporting new urban infrastructure and rehabilitation or extension of existing infrastructure to promote stronger environmental management and to stimulate economic growth. ADB will continue to support integrated and coherent interventions guided by well-prepared urban development plans to promote economic growth and environmental sustainability. ADB will assist the PRC in dealing with the urgent issues of pollution and resource degradation. Support is likely to include a focus on clean water, urban sewerage and sanitation, wastewater and water reuse, and sludge management. ADB's urban lending program could deliver up to 16 loans with a total investment of \$1.9 billion during 2012–2015.

# Problem Tree for Agriculture and Natural Resources, and Water Supply and Other Municipal Infrastructure and Services



Source: Asian Development Bank.

**Sector Results Framework**  
**(Agriculture and Natural Resources, and Water and Other Municipal Infrastructure and Services, 2011–2015)**

Country Sector Outcomes		Country Sector Outputs		ADB Sector Operations	
Outcomes with ADB Contribution	Indicators with Targets and Baselines	Outputs with ADB Contribution	Indicators with Incremental Targets	Planned and Ongoing ADB Interventions	Main Outputs Expected from ADB Interventions
<b>Agriculture and Natural Resources:</b>					
Increased agricultural productivity and improved quantity and quality of natural resources	Pollution of freshwater bodies reduced by 8% in 2015 from 12.7 billion chemical oxygen demand units in 2010	Agricultural and natural resource-related infrastructure and system expanded, improved, and well managed	Wastewater treatment pipes and sewage network increased by 160,000 km Daily wastewater treatment capacity increased by 420 million tons	<p><b>Planned key activity areas</b> Water resources management and flood protection (62% of lending in the sector) Land, forestry, and biodiversity (10% of lending in the sector)</p> <p><b>Planned projects</b> (2012–2015, total \$1.05 billion) Water resources management and flood protection: 4 projects (\$600.0 million) Land, forestry, and biodiversity: 1 project (\$100.0 million)</p> <p><b>Ongoing projects with approved amounts</b> Water resources management and flood protection: 6 projects (\$584.8 million) Land, forestry, and biodiversity: 5 projects (\$231.9 million)</p>	<p><b>Planned projects</b> (2012–2015) About 850 km of wastewater treatment pipes constructed Capacity to collect and treat about 700,000 tons/day of wastewater</p> <p><b>Ongoing projects</b> 100 km of wastewater treatment pipes and sewage network constructed 29,460 tons/day of wastewater collected and treated</p>
<b>Water and Other Municipal Infrastructure and Services:</b>					
Competitive, green, and inclusive urbanization	Urban population with access to improved sanitation increased from 58% in 2008 to 65% in 2015	Water supply, wastewater, and solid waste management systems; and other municipal infrastructure and services expanded and improved	Wastewater treatment increased from 150 million m <sup>3</sup> /day in 2010 to 180 million m <sup>3</sup> /day by 2015	<p><b>Planned key activity areas</b> Lending operations, \$1.9 billion total investment in water supply, wastewater, solid waste management, heating, gas, urban transport, and river rehabilitation.</p> <p><b>Planned projects</b> (2012–2015, total \$1.90 billion) Water supply and sanitation (\$378 million)</p> <p><b>Ongoing projects</b> (\$2,287 million) Water supply and sanitation (\$895 million)</p>	<p><b>Planned projects</b> (2012–2015) Additional water and wastewater capacity operating (1,385,000 m<sup>3</sup>/day)</p> <p><b>Ongoing projects</b> Additional water and wastewater capacity operating (2,654,000 m<sup>3</sup>/day)</p>

ADB = Asian Development Bank, km = kilometer, m<sup>3</sup>/day = cubic meter per day.

Sources: ADB. 2012. *Country Partnership Strategy: People's Republic of China, 2011–2015*. Manila, linked documents: Assessment (Summary): Natural Resources and Agriculture and Sector Assessment (Summary): Urban Development.