SECTOR ASSESSMENT (SUMMARY): MULTISECTOR (AGRICULTURE, NATURAL RESOURCES, AND RURAL DEVELOPMENT; AND WATER AND OTHER URBAN INFRASTRUCTURE AND SERVICES)

Sector Road Map

1. Sector Performance, Problems, and Opportunities

1. The People's Republic of China (PRC) has made significant progress in addressing its many environmental challenges, including the water and pollution intensity of the overall economy, forest coverage, and energy conservation. Water is likely to be the most pressing resource bottleneck to the economic growth of the PRC until 2030. The water crisis in the PRC is already costing the country at least 2.3% of gross domestic product, of which 1.3% is attributable to water scarcity and 1.0% is from the direct impacts of water pollution.[1] Growth in the PRC's population, cities, and economies will drive continuous growth in demand for water. Climate change also requires better water resources management and disaster management strategies to lessen the constraints that water scarcity puts on economic and urban development.

2. Water scarcity and water pollution have important social impacts. The main one relates to the health risks resulting from polluted sources of drinking water. Empirical analysis examined the linkages between surface water quality and digestive cancers, highlighting the strong links between water pollution and health in the PRC, as well as the large gains from efforts to reduce pollution. Drinking water in many rural areas is unsafe, with unhealthy levels of hazardous materials, such as high concentration of fluoride. Safe drinking water and adequate sanitation are central to people's lives. Improved water supply and sanitation are closely linked to progress in health, education, gender equality, and environmental sustainability. Better wastewater disposal and drainage, and nonpoint source pollution control, would improve health outcomes and human productivity by reducing the prevalence of water-related infections and diseases.

3. Many rivers and lakes in the PRC are adversely affected by excessive pollution, and poorly designed water engineering facilities that interfere with natural flow regimes and often exacerbate the effects of pollution. The problems are more severe in lakes as they are more hydrologically enclosed than rivers, so they accumulate pollution more easily and are more susceptible to the adverse effects of poorly designed water regulation infrastructure. Out of the 26 key national lakes monitored in 2010, 77% were classified grade IV or lower, which means unhealthy for human contact.[2]

4. Degradation of lakes in the PRC has been a major concern to the national government, which has been increasing its investments in lake protection and rehabilitation. The government realized the importance of pollution prevention in lakes by drawing lessons from the rehabilitation of polluted lakes, such as Chao Lake in Anhui Province; Dianchi Lake in Yunnan Province; and Tai Lake in the eastern PRC, which were rehabilitated at very high cost. Experience has shown that it is very difficult and ineffective in large lakes to restore water quality once it is polluted. For example, billions of dollars have been invested in the management of Dianchi Lake since 1990s, but its water quality has not improved significantly.

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[1] Asian Development Bank (ADB). 2011. *Eco-Compensation for Watershed Services in the People's Republic of China*. Manila.

[2] Class III water is a suitable supply source for a municipal drinking water treatment plant 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 (Environmental Quality Standards for Surface Water GB 3838-2002).

5. **Dongjiang Lake.** Located in south Hunan Province, Dongjiang Lake is a reservoir formed after the construction of Dongjiang Dam in 1986 on the Leishui River, a tributary of the Xiang River. Dongjiang Lake is a multipurpose reservoir for hydropower, flood control, water supply, and irrigation. It has a surface area of 160 square kilometers and a total storage capacity of about 8.12 billion cubic meters. Dongjiang Lake was prioritized for support in the National Plan for Relatively Good-Quality Lake Ecological and Environmental Protection, 2013–2020, jointly released by the Ministry of Environmental Protection, the Ministry of Finance, and the National Development and Reform Commission. The lake is a strategic water source for supporting resource-saving and environment-friendly social development in Hunan Province. Maintaining healthy environmental services in Dongjiang Lake is vital to achieving sustainable development of the Xiang River basin, one of the major regions of the government's Yangtze River Economic Belt Initiative. The Xiang River basin is home to about 40 million people and accounts for over 70% of Hunan Province's total gross domestic production. In addition to supplying water to Chenzhou Municipality and Zixing City, Dongjiang Lake serves as a backup water source for Hunan Province's major cities of Changsha, Xiangtan, and Zhuzhou in the Xiang River basin to improve the water security of 13 million people in these cities. The lake's large storage capacity greatly improves flood and drought management for the downstream cities and navigation of the downstream Xiang River. It also helps dilute water pollution in the downstream of Xiang River by releasing water.

6. Hunan Provincial Government (HPG) and local governments have prioritized environmental protection of Dongjiang Lake. Protection zones have been established in the Dongjiang Lake basin in accordance with the provincial-approved Dongjiang Lake Basin Water Environmental Protection Regulation (2002). Since 2002, HPG and local governments have invested nearly CNY1 billion in protection of the lake, including closure of mines, removal of cage fishing, ship renovation and improvement, and job training for nonfarming opportunities. Continued efforts by HPG, local governments, and local people help maintain the good water quality of the lake to meet national standards for drinking water sources.

7. However, heavy agricultural activities and growing urbanization in the lake basin have posed greater risks of water pollution in the lake. The water quality of Dongjiang Lake has been deteriorating since the 1990s as a result of agricultural nonpoint source pollution, inadequate wastewater treatment facilities, lack of solid waste management, and significant soil erosion around the lake. The trophic state index for Dongjiang Lake was 25.8 in 1991 and 29.5 in 2010.[3] Although the 2010 trophic state index is acceptable for drinking purposes, the value in 2010 was significantly higher than in 1991. A review of 15 monitoring stations from 1991 to 2010 has shown that Dongjiang Lake is generally in the oligotrophic to mesotrophic conditions. However, among the 15 locations, water quality in 12 locations was poorer in 2010 than in 1991. Water quality fluctuations are random and without a significant seasonal pattern or synchronization, so the pollution challenges are not likely from a single source.

8. **Point and nonpoint source pollution.** Agriculture is the major source of pollution in the lake catchment, accounting for about 48% of the total pollutants. Other sources include domestic wastewater (25%), industry (14%), water transportation (9%), and tourism (4%). Every year, the pollutants discharged into the Dongjiang Lake area contain 9,038 tons of chemical oxygen demand, 1,741 tons of ammonia, and 363 tons of total phosphorus. The pollution increase is especially significant in the area surrounding the lake. Only a few townships have wastewater treatment facilities, and the wastewater from most of townships and villages scattered around the lake is directly discharged to the streams, which drain to the lake. Fertilizers, cage fishing, and livestock are key contributors of ammonia, nitrogen, and total phosphorus in the lake.

[3] The trophic state index is a measure of how much nutrient, such as nitrogen and phosphorus, is in a lake or other body of water. A lake can be put into one of three possible classes: oligotrophic, mesotrophic, or eutrophic.

9. Solid waste collection and treatment facilities for townships and villages have yet to be established in the basin. As the population increases, garbage production also rises. Only a few villages have household trash collectors or collection bins in designated locations. Furthermore, public collection tanks are often not emptied on time and overflow of rubbish is common. Consequently, garbage is discarded on roadsides and open spaces around houses. This not only has an adverse visual impact on the surrounding environment, but also seriously threatens the health of local villagers. Because of the lack of transfer and disposal, rubbish has been stacked on unused land. Some villages burn their rubbish, causing significant adverse impacts to the surrounding environment and the living conditions of local residents.

10. **Inadequate water supply facilities.** A large number of residents, particularly rural communities in Zixing City, do not have access to piped water supply, although they are close to the lake. They use water drawn from various sources without proper treatment. This is not only a burden for the residents, but also exposes them to health risks and, in turn, affects the lake water quality. The existing water treatment plants in the towns of Zixing City use surrounding small-scale water reservoirs and mountain springs or rivers as water sources, but these are subject to seasonal changes and weak self-purification capacity during drought. The villages beyond the service area of existing water supply plants are served by small-scale temporary water supplies, which have lower safety standards. Most rural residents drink well water or stream water of poor sanitary quality, especially during rainy seasons when wells are often flooded, seriously polluted, and of extremely turbid water quality. Furthermore, some rural villages are located within high-fluorine and high-arsenic areas.

11. **Low flood protection level.** With the large flood storage capacity of Dongjiang Lake, the downstream of the lake has been protected from major floods. However, the flood protection of the upstream and surrounding areas of the lake is low, with capacity only against flood recurrence of about 2 years. The rivers have been frequently impacted by floods over the years, resulting in river blockage and bank erosion that reduce flood discharge capacity. Most of the rivers do not have bank protection, which results in erosion of neighboring farmland during floods and causes sedimentation in the rivers. Frequent floods have brought extreme impacts on the lives and production of the riparian villagers. Farmers particularly suffer from loss of properties, farmlands, or even life. For example, a severe flood in July 2006 caused 142 casualties, 2,563 collapsed houses, and 200 hectares of damaged farmland.

12. **Soil erosion and ecosystem.** Limited livelihood and employment opportunities and lack of arable land result in the conversion of slopes for farming by local communities. In the areas around Dongjiang Lake, soil erosion is intensifying and occurrence of natural disasters is increasing. Soil erosion in the project area covers 1,087 square kilometers and average annual soil erosion reaches 4 million tons, causing river siltation in some sections of the rivers and even forming sand deltas at some river estuaries to Dongjiang Lake. The 55,000 hectares of national and provincial public forest around the lake area greatly contribute to water and soil conservation. However, fires and pest disasters often occur because of the low quality of the forest, and the eco-efficiency of the forest is relatively low. The lake areas are abundant with bamboo resources, and can be a major source of income for local residents while protecting the environment.

13. **Inadequate institutional coordination and capacity.** Dongjiang Lake basin covers Zixing City and the counties of Guidong, Rucheng, and Yizhang in Chenzhou Municipality. The Dongjiang Lake environmental protection bureau (EPB) was established under the Chenzhou Municipal Government in 2003 to coordinate environmental protection in the basin. However, the Dongjiang Lake EPB does not have (i) adequate tools and capacity for coordinating and monitoring environmental protection activities in the entire basin, or (ii) an ecological and environmental monitoring and management information system. It needs to be empowered with

adequate human and financial resources to assume responsibility for environmental management of the entire lake basin.

2. Government's Sector Strategy

14. Overall, the PRC aims to build a harmonious and moderately prosperous society through livelihood improvement, equitable urbanization and coordinated urban–rural development, and regionally balanced and environmentally sustainable growth. Integrated water resources management and lake protection have gained increasing priority. The national government's action plan for water pollution prevention and control, released in April 2015, lists a number of measures to tackle water pollution and improve water and ecological quality by 2030.[4] The plan includes the following specific indicators: by 2020, (i) the quality of over 70% of the water body in seven key river basins, such as the Yangtze River and Yellow River, will reach level III or above; (ii) the amount of foul water in urban built-up areas will be controlled and will not exceed 10%; (iii) the water quality of 93% of the sources for urban water supply will reach Class III or above; and (iv) 70% of costal sea water quality will reach Class I and/or II.

15. Eco-compensation is a new policy instrument for environmental management and a new way to adjust the interest relationship between the upstream and downstream. In the eco-compensation of water source areas, downstream water users fund the ecological restoration and environmental protection in upstream water source areas to achieve the established targets on water quality and quantity. The national government is increasingly promoting the use of eco-compensation mechanisms to protect the environment, particularly those dealing with water quality in the upstream and downstream of the river basins.

16. In 2013, Hunan Provincial Government issued a master plan for Xiang River basin that emphasizes the conservation of natural resources and protection of the environment, and requires integrated management of the Xiang River basin.[5] The plan aimed at developing the Xiang River basin in multiple dimensions, emphasizing sustainable industrial development, efficient navigation and waterways, and protection of cultural and biodiversity, of which Dongjiang Lake was determined to be a critical protection area for water source and natural environment. Hunan Provincial National People's Congress issued the Dongjiang Lake Basin Water Environmental Protection Regulation in 2002. The regulation imposes controls on development of the basin and restricts various activities in different protection zones that may cause adverse impact on the water environment. Chenzhou Municipal Government and Zixing City Government have attached great importance to Dongjiang Lake's environmental protection and have established Dongjiang Lake Water EPB to coordinate, guide, and monitor environmental protection of the Dongjiang Lake basin.

17. The project is consistent with the national government's goal of building a harmonious and prosperous society through regionally balanced and environmentally sustainable growth. It is consistent with the priorities of the comprehensive reform agenda announced at the Third Plenary Session of the Eighteenth Communist Party of China Central Committee to construct better environmental infrastructure and strengthen institutional development and environmental services at the local level.[6] The project supports the national government's recently released Yangtze River Economic Belt Initiative to construct an ecological ecosystem corridor along the

[4] The State Council of the People's Republic of China. 2015. China announces action plan to tackle water pollution. 16 April. http://english.gov.cn/policies/latest_releases/2015/04/16/content_281475090170164.htm

[5] Development and Reform Commission of Hunan Province. 2013. Master Plan for Scientific Development of Xiang River Basin. http://www.hnfgw.gov.cn/hgzh/qygh/37668.html

[6] Passed at the Third Plenum of the 18th Central Committee of the Communist Party on 12 November 2013.

river by improving watershed management, water pollution control and prevention, and ecological rehabilitation.[7]

3. ADB Sector Experience and Assistance Program

18. The Asian Development Bank (ADB) has fostered a diverse and active portfolio in natural resources management and sustainable water resource use, lake and wetland preservation, biodiversity and ecosystem management, water supply and wastewater treatment, solid waste management, and environmental improvement. ADB's assistance to the PRC's water resources sector has been effective in addressing a range of water resources protection problems, with a positive impact on water resources, pollution control, and public health. Lending in the agriculture and natural resources sector has increased in 2006–2012 over 2000–2005. Since 1998, about 16 ADB loan projects to the PRC's water resources sector have been financed. Up to 2014, ADB had approved more than 30 urban development and environmental improvement projects in the PRC with a total loan amount of about $5 billion. ADB has been supporting the PRC's development initiatives, focusing on the provision of infrastructure and the creation of an enabling environment to lay a foundation for sustainable socioeconomic development.

19. ADB has extensive experience in lake and wetland protection. In 2008, it published *Reviving Lakes and Wetlands: Lessons Learned from the PRC*.[8] The report reviewed experiences in several lake and wetland rehabilitation projects in the PRC and concluded that the following four key elements need to be present for successful rehabilitation: (i) strong and consistent political leadership, (ii) integrated planning and analysis, (iii) effective management structures (particularly for control of land use in the catchment area), and (iv) effective financial engineering.

20. The project builds on ADB's experiences and lessons from previous projects, and knowledge generated from policy-oriented studies on integrated water resources management, water supply, wastewater treatment, urban and rural development, and flood and wetland management in the PRC and other countries. Experience suggests that project investments are effective when they are part of well-conceived and broader water resources management plans and approaches, and when such support is accompanied by capacity building to strengthen water resources management and public awareness of the environment and sanitation.

21. Major lessons from those earlier projects incorporated in the current project design are (i) an integrated approach of structural and nonstructural measures to water resources management; (ii) wide community participation and increased public awareness for environmental improvement; (iii) linking environmental protection with livelihood opportunities; (iv) coordinated management of urban–rural planning, and management of resources and services to facilitate integration and linkage to infrastructure; (v) an institutional and cost recovery mechanism for effective operation and maintenance of the facilities; and (vi) eco-compensation as an effective tool for maintaining environmental services.

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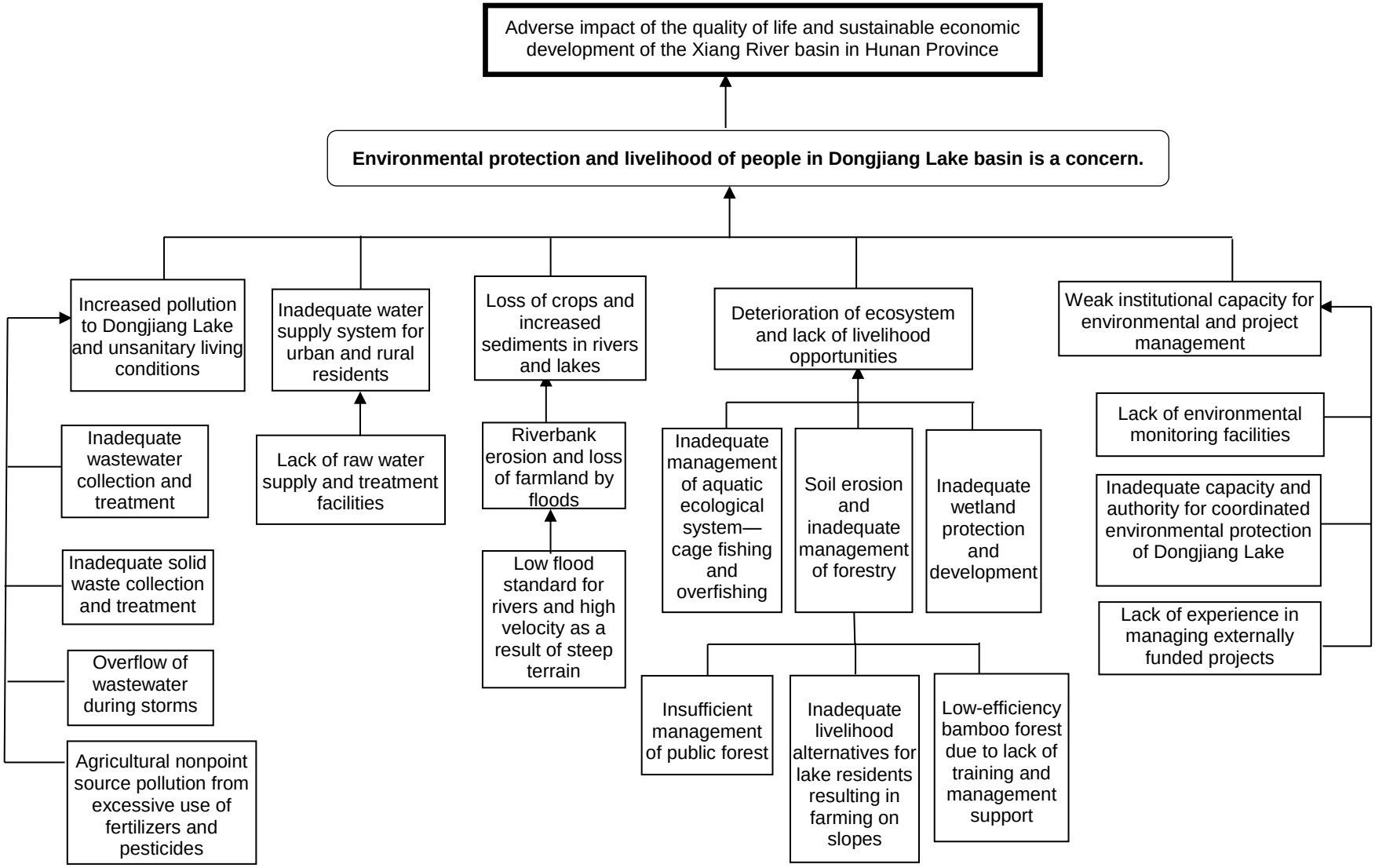
[7] The State Council of the People's Republic of China. 2014. Guide on Promoting the Development of the Yangtze Economic Belt. http://www.gov.cn/zhengce/content/2014-09/25/content_9092.htm.

[8] Q. Zhang et al. 2008. *Reviving Lakes and Wetlands: Lessons Learned from the Peoples' Republic of China*. Manila: ADB.

PROBLEM TREE FOR MULTISECTOR
(Agriculture, Natural Resources, and Rural Development; and Water and Other Urban Infrastructure and Services)



Source: Asian Development Bank.