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The World Bank

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Report No: PAD809

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF US$ 100 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

GUILIN INTEGRATED ENVIRONMENT MANAGEMENT PROJECT

January 8, 2015

Water Global Practice
East Asia and Pacific Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective May 30, 2014)

Currency Unit = RMB
US$ = 6.17 RMB

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AFD	French Agency for Development
AWTP	Average Willingness to Pay
CCTV	Close Circuit Television
CPS	Country Partnership Strategy
DA	Designated Account
EA	Environmental Assessment
EAMMO	Environmental Automatic Monitoring Management Office
EMP	Environmental Management Plan
ERR	Economic Rate of Return
ESMF	Environmental and Social Management Framework
FMM	Financial Management Manual
GAO	Guangxi Zhuang Autonomous Region Audit Office
GEPB	Guilin Municipal Environmental Protection Bureau
GDRC	Guilin Municipal Development Reform Commission
GFB	Guilin Municipal Finance Bureau
GMG	Guilin Municipal Government
GPUB	Guilin Public Utilities Bureau
GSC	Guilin Sewerage Company
GWSC	Guilin Water Supply Company
GFD	Guangxi Zhuang Autonomous Region Finance Department
IBRD	International Bank for Reconstruction and Development
ICB	International Competitive Bidding
IFR	Interim Financial Report
MWCO	Municipal Water Conservation Office
PAPs	Project Affected Persons
PMP	Project Management Plan
PIU	Project Implementing Units
PMM	Procurement Management Manual
MBD	National Model Bidding Documents
MOF	Ministry of Finance
NCB	National Competitive Bidding

NRW	Non-Revenue Water
ROI	Reactive Oxygen Ionization
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SBD	Standard Bidding Document
SOE	Statement of Expenditure
SS	Summary Sheet
TA	Technical Assistance
WSS	Water Supply and Sanitation
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

Regional Vice President:	Axel van Trotsenburg, EAPVP
Country Director:	Bert Hofman, EACCF
Senior Global Practice Director:	Junaid Kamal Ahmad, GWADR
Practice Manager:	Ousmane Dione, GWADR
Task Team Leader:	Sing Cho, GWADR

CHINA
Guilin Integrated Environment Management Project

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PAD DATA SHEET
China: Guilin Integrated Environment Management

Basic Information		
Project ID	EA Category	Team Leader
P133017	A - Full Assessment	Sing Cho
Lending Instrument	Fragile and/or Capacity Constraints [ ]	
Investment Project Financing	Financial Intermediaries [ ]	
	Series of Projects [ ]	
Project Implementation Start Date	Project Implementation End Date	
31-March-2015	31-Dec-2020	
Expected Effectiveness Date	Expected Closing Date	
01-June-2015	31-Dec-2020	
Joint IFC		
No		

Practice Manager	Senior Global Practice Director	Country Director	Regional Vice President
Ousmane Dione	Junaid Kamal Ahmad	Bert Hofman	Axel van Trotsenburg

Borrower: PEOPLE'S REPUBLIC OF CHINA

Responsible Agency: Guilin PMO

Contact: Ms. Wang Chunhui Title: Deputy Director

Telephone No.: 86-773-2825859 Email: glsxmb@163.com

Project Financing Data(in USD Million)					
[X]	Loan	[ ]	IDA Grant	[ ]	Guarantee
[ ]	Credit	[ ]	Grant	[ ]	Other

Total Project Cost:	155.46	Total Bank Financing:	100.00
Financing Gap:	0.00		

Financing Source	Amount
Borrower	55.46
International Bank for Reconstruction and Development	100.00
Total	155.46

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Expected Disbursements (in USD Million)

Fiscal Year	2015	2016	2017	2018	2019	2020	2021
Annual	0.00	8.00	17.00	20.00	20.00	25.00	10.00
Cumulative	0.00	8.00	25.00	45.00	65.00	90.00	100.00

Proposed Development Objective

The proposed project objective is to improve water and sanitation services in Guilin

Components

Component Name	Cost (USD Millions)
Water Supply	36.93
Wastewater Management	79.43
Sludge Management	18.48
Water Quality Monitoring and Pollution Management	1.13
Project Management and Supervision	2.00

Institutional Data

Practice Area / Cross Cutting Solution Area

Water

Cross Cutting Areas

[ ] Climate Change

[ ] Fragile, Conflict & Violence

[ ] Gender

[ ] Jobs

[ ] Public Private Partnership

Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Water, sanitation and flood protection	Wastewater Treatment and Disposal	35		
Water, sanitation and flood protection	Water supply	30		
Water, sanitation and flood protection	Wastewater Collection and Transportation	35		
Total		100		

[x] I certify that there is no Adaptation and Mitigation Climate Change Co-benefits information applicable to this project.

Themes

Theme (Maximum 5 and total % must equal 100)

Major theme	Theme	%
Environment and natural resources management	Pollution management and environmental health	70
Environment and natural resources management	Water resource management	30
Total		100

Compliance

Policy

Does the project depart from the CAS in content or in other significant respects?	Yes [ ]	No [X]

Does the project require any waivers of Bank policies?	Yes [ ]	No [X]
Have these been approved by Bank management?	Yes [ ]	No [ ]
Is approval for any policy waiver sought from the Board?	Yes [ ]	No [ ]
Does the project meet the Regional criteria for readiness for implementation?	Yes [X]	No [ ]

Safeguard Policies Triggered by the Project	**Yes**	**No**
Environmental Assessment OP/BP 4.01	**X**	
Natural Habitats OP/BP 4.04	**X**	
Forests OP/BP 4.36		**X**
Pest Management OP 4.09		**X**
Physical Cultural Resources OP/BP 4.11		**X**
Indigenous Peoples OP/BP 4.10		**X**
Involuntary Resettlement OP/BP 4.12	**X**	
Safety of Dams OP/BP 4.37		**X**
Projects on International Waterways OP/BP 7.50		**X**
Projects in Disputed Areas OP/BP 7.60		**X**

Legal Covenants

Name	**Recurrent**	**Due Date**	**Frequency**
Institutional Arrangements	**X**		

Description of Covenant

PA Schedule Section I.A.1. Provision requiring Guilin to maintain the Project Leading Group, the Project Management Office and the Environmental Automatic Monitoring Management Office.

Name	**Recurrent**	**Due Date**	**Frequency**
Project Management Manual	**X**		

Description of Covenant

PA Schedule Section I.A.4. Provision requiring the Project to be carried out in accordance with the Project Management Manual.

Name	**Recurrent**	**Due Date**	**Frequency**
Safeguards	**X**		

Description of Covenant

PA Schedule Section I.C. Provision requiring the Project to be carried out in accordance with the Safeguards Instruments.

Name	**Recurrent**	**Due Date**	**Frequency**
Sludge Management Center		12 months prior to the commission of the center	

Description of Covenant

PA Schedule Section I.C.5. Provision requiring Guilin to : (a) carry out a least cost analysis for sludge management and afford the Bank a reasonable opportunity to exchange views and make recommendations on said analysis; (b) select the site for the construction of the sludge management center, in accordance with the criteria and the process set forth in the ESMF; (c) proceed to have the EMP updated in form and substance satisfactory to the Bank,

submitted to the Bank for review and approval, and thereafter, adopted and publicly disclosed.

Name	Recurrent	Due Date	Frequency
Financial and Operational Sustainability	X		Annually

Description of Covenant

PA Schedule Section IV. Provision requiring Guilin to cause GWSC and GSC to generate total revenues (operating revenues plus net non-operating income) equivalent to not less than its total operating expenses, excluding depreciation, and provide an annual review of how this requirement will be met by October 31 of each year (starting in 2015).

Conditions

Source Of Fund	Name	Type
IBRD	Subsidiary Agreement	Disbursement

Description of Condition

PA Schedule Section I.A.2. All Project Implementing Units under the project (GWSC and GSC) are required to enter into subsidiary agreements with GMG. These agreements will govern the transfer of loan funds as well as of certain implementation responsibilities to the PIUs. The execution of such agreements, under terms and conditions acceptable to the Bank, is listed as a condition of disbursement in the Loan Agreement.

Team Composition

Bank Staff

Name	Title	Specialization	Unit
Tijen Arin	Senior Environmental Economist	Economist	GENDR
Sing Cho	Urban Specialist	Team Lead	GWADR
Yi Dong	Senior Financial Management Specialist	Financial Management	GGODR
Huiying Guo	Program Assistant	Program Assistant	EACCF
Isabel Duarte A. Jr.	Program Assistant	Program Assistant	GWADR
Zheng Liu	Procurement Specialist	Procurement	GGODR
Xin Ren	Environmental Specialist	Environmental Safeguard	GENDR
Sudipto Sarkar	Lead Specialist	Co-Team Lead	GWADR
Jun Zeng	Social Development Specialist	Social Safeguard	GURDR

Non Bank Staff

Name	Title	City
Joseph Gadek	Senior Sanitary Engineer	
Chirong Huang	Wastewater Engineer	San Diego
Yan Li	Economist and Financial Specialist	Washington, DC
Peishen Wang	Environment Consultant	Winnipeg
Ning Wu	Finance Analyst	Beijing

Locations

Country	First Administrative Division	Location	Planned	Actual	Comments
China	Guangxi Zhuangzu Zizhiqu	Guilin		X	

I. STRATEGIC CONTEXT

A. Country Context

1. China is rapidly transitioning from a rural to a mostly urban economy with more than 60% of the country's GDP being generated in urban areas, and more than half of its population now living in cities, towns and villages. However, to achieve the objectives of a more sustainable and equitable development, the environmental performance of its cities and towns will need to be improved. While China's environmental strategies have had notable success in reducing industrial emissions and pollution and reversal of deforestation, much more has to be done to remedy the serious environmental pollution and degradation resulting from rapid economic growth, urbanization and industrialization in the last few decades.

B. Sectoral and Institutional Context

2. The Guangxi Zhuang Autonomous Region ("Guangxi") is located in the south of China. Despite impressive advances in recent years, average income levels in Guangxi are still only about a third of the national average and there is a high incidence of poverty. To reduce the growing disparity between Guangxi and other provinces and regions in China, the Government is investing heavily in the province to promote economic and social development, alleviate poverty, and expand basic infrastructure and services.

3. Guilin Municipality in Guangxi has a population of 940 thousand people and is expected to grow to 1.14 million by 2025. In 2011, the GDP of Guilin Municipality was US$ 21.5 billion, with an annual growth rate of 20.5%. In 2011, the GDP per capita of Guilin was RMB 25,675 (around US$4,140). Guilin is one of China's most famous tourist destinations with the iconic Lijiang River and surrounding karst formations drawing national and international tourists. In 2012, Guilin City received about 13.6 million visitors. This tourism plays an important role in the local economy with tourism income accounting for close to 20 percent of GDP in 2012.

4. One of the highest priorities of the Guilin Municipal Government (GMG) is to maintain the quality of the Lijiang River. In 2011, Guangxi issued the *Lijiang River Catchment Ecological Environment Protection Regulation* (the Regulation), which became effective on January 1, 2012. The Regulation requires that GMG protects the Lijiang River through the creation of protected areas, the implementation of ecological compensation mechanisms, integrate ecological protection with the city's Development Master Plan, protect water resources by controlling industrial development, shutting down private water wells, expanding and rehabilitating water supply services, managing the allocation of water to different users, and raising awareness on the importance of water conservation. The municipal government also has to strengthen water quality monitoring, expand wastewater collection and treatment services, and protect natural resources, including biodiversity.

5. In December 2012, the State Council passed the *Outline Plan for Constructing Guilin as an International Tourism Destination*, which assigns responsibility for the economic development and the protection of the Lijiang River to various levels of the GMG, linking the performance evaluation of local government officials to these goals.

6. The 12th Five-Year Plan (FYP) of GMG stipulates the creation of a sustainable management mechanism to protect the environment of Lijiang River through the *Planning of Tributary Protection and Development* and implementation of the Regulation. Correspondingly, the GMG is working on controlling pollution discharge by relocating industries, building WWTPs and landfills, and rehabilitating tributaries. The GMG is also establishing the "*Lijiang Ecological Protection Fund*" to compensate income losses due to measures to protect the river. Finally, the GMG environmental protection plan includes measures to protect the Upper Lijiang River Catchment Area located at the Maoer Mountain Natural Protection Zone.

7. The World Bank financed Guangxi Urban Environment Project (GUEP) helped improve the water quality of the Lijiang River and its tributaries. The GUEP, closed in December 2007, focused on improving the environmental conditions in Guilin's core urban area through improving wastewater collection and treatment, effluent regulations, solid waste management, and technical assistance (TA). As a result of the project, wastewater collection and treatment increased from 49% in 1998 to 81% by 2007. Furthermore, the water quality levels in Guilin were maintained, despite rapid development and increase in urban population.

8. **Rationale for Bank Involvement.** As the city's population and tourism continue to rapidly grow, investments to expand and improve access and quality of water and wastewater services are clearly needed to protect local water resources and sustain further development. This is especially relevant to ensure the sustainable use and improve water quality in the Lijiang River. Thus, the proposed project is fully aligned with government plans, both national and provincial, to protect the Lijiang River. This project builds on the successful achievements of the GUEP and will continue to deepen the partnership between the World Bank and the GMG. The project embraces and advances the urban green development agenda, and supports the GMG to fulfill its mandate under the Regulation.

9. The World Bank has brought its international experience into the design of this project, to assist the GMG in increasing the efficiency and quality of water supply and wastewater services by: (i) managing water pressure within the network and improving processes and procedures to control non-revenue water (NRW); (ii) upgrading and rehabilitating aged wastewater treatment plants (WWTPs) and sewerage and drainage infrastructure; and (iii) strengthening water supply and sanitation (WSS) policies, to ensure that these are consistent with the newly enacted national regulations. While the project will contribute to improving river quality, many external factors, such as the protection of the catchment area and control of industrial and non-point sources of pollution, will play an equally important role in improving the overall quality of the environment in Lijiang River.

C. Higher Level Objectives to which the Project Contributes

10. The proposed project is consistent with Guilin's Master Plan, the Guilin 12th FYP, and the Bank's Country Partnership Strategy (CPS) for 2013-2016 (discussed by the Board on November 6, 2012). With regard to the latter, the proposed project is in line with the Strategic Theme One, Supporting Greener Growth. Several outcomes under this theme are expected, such as enhancing urban environmental services and demonstrating pollution management measures. It is also expected that the project will contribute to China's efforts to better manage the water quality of Lijiang River as stipulated in the Outline approved by the State Council.

11. The project is also fully consistent with the 2013 State Government Circular that requires all major cities in China to provide at least 95% of their populations with clean and safe drinking water by 2020. This project will help the city achieve the target by investing in wastewater infrastructure and facilities. The Urban Drainage and Wastewater Treatment Regulation, which came into effect on January 1, 2014, requires cities to build separate wastewater and drainage systems in new development areas, thereby promoting an integrated approach to water quality management and drainage and flood control.

II. PROJECT DEVELOPMENT OBJECTIVE

A. PDO

12. The proposed project objective is to improve water and sanitation services in Guilin.

B. Project Beneficiaries

13. The direct beneficiaries of this project are the population residing in the Guilin Urban Core Area[1] and Lingui District, which are expected to increase to approximately 1.14 million people by 2025. The entire population, including businesses and industries, will benefit from improved access and reliable provision of drinking water that meets national standards, with adequate pressure and fewer disruptions due to pipeline ruptures. In addition, about 132,800 people, not at present supplied with water will be connected to the water network and provided with a better service. The permanent residents of the city and tourists will also benefit from the reduced water pollution as a result of proper wastewater collection and treatment prior to discharge to the Lijiang River.

C. PDO Level Results Indicators

14. In accordance with the project rationale and objective, the key outcome indicators are: (a) number of people in urban areas provided with access to "Improved Water Sources" under the project, and (b) volume (mass) of BOD pollution load removed from the treatment plant under the project. Both are World Bank Core Sector Indicators.

III. PROJECT DESCRIPTION

A. Project Components

15. **Component 1: Water Supply *(US$36.93 million)*.** Investments under this component will improve the water supply system to fully meet current and projected future demand of domestic consumers, commercial and industrial enterprises, an expanding airport, and two expanding universities. The component will involve: (a) installation of a 37 km long trunk water main and associated distribution and reticulation pipelines to serve mainly the Lingui District and Balijie Area; (b) construction of a booster pumping station in Xiufeng District to supply water to the residents in Lingui District and in the vicinity of Guilin Liangjiang Airport; and, (c) provision

[1] Including the Urban Core Area, Diecai- Balijie, Wayao-Dafeng, Qixin, Tieshan, and Yanshan District.

of monitoring and inspection equipment in the network to improve compliance with the new drinking water quality standard; and (d) development and installation of a decision support system (water operation platform) for improved operational efficiency, including drinking water allocation and distribution among service areas, water pressure management, and control of non-revenue water (NRW).

16. The current water treatment capacity can reach 390,000m^3/day and supply an additional 200,000 people with water. In parallel, the local government is preparing an AFD co-financed project to expand the Chengbei WTP to assist in reaching the overall target of providing an additional 248,000 people with water by 2020. The local government also intends to decommission an aging WTP at Dongzhenglu as part of this program.

17. **Component 2: Wastewater Management *(US$79.43 million)*.** This component focuses on maintaining the water quality of Lijiang River by improving the collection and treatment capacity of Guilin's Wastewater Treatment Plants (WWTPs) by: (a) replacing aged equipment at selected pumping stations and the installation of additional odor control facilities including ventilation systems; (b) expanding, replacing or rehabilitating sewer networks and provision of necessary equipment to control leakages or blockage, and replacement and/or rehabilitation of associated manholes; (c) upgrading four WWTPs (Shangyao, Qilidian, Beichong and Yanshan) to improve the quality of effluent discharges, and associated odor control and disinfection equipment to ensure their operations can improve water quality of Lijiang River; (d) upgrading sludge dewatering equipment at three WWTPs (Shangyao, Qilidian, and Beichong) and installing associated ventilation and odor control facilities at all five WWTPs (Shangyao, Qilidian, Beichong, Yanshan and Lingui), and (e) provision of monitoring and sewer maintenance equipment.

18. **Component 3: Sludge Management *(US$18.48 million)*.** This component aims to enhance sludge management thus preventing environmental pollution from inappropriate sludge disposal by: (a) constructing a sludge management center and associated ventilation and odor control facilities; and (b) procurement of sludge hauling trucks and sewer maintenance trucks.

19. **Component 4: Water Quality Monitoring and Pollution Management *(US$1.13 million)*.** This component involves: (a) strengthening of the water quality monitoring system associated with the Lijiang River to enable real-time data collection and processing; (b) development of a pollution management system for the effective monitoring and management of the Lijiang River water quality; and (c) piloting of a pollution source analysis for urban stretches of the Lijiang River.

20. **Component 5: Project Management and Supervision *(US$2.00 million)*.** This component involves the provision of TA and training for project management and supervision, including monitoring of the implementation of the Environmental Management Plan (EMP) and Resettlement Action Plan (RAP). The component will fund: (a) project management, including monitoring and evaluation (M&E); (b) consultancy services for engineering design review and least-cost review of sludge options, and supervision of the implementation of environmental assessments, and resettlement action plans; (c) incremental operating support for PMO operation during implementation; and (d) training and study tours that would in particular assist in the

capacity building of the Project Implementation Units (PIUs) through training on monitoring, operation and maintenance of WTPs/WWTPs and sludge treatment, benchmarking of utilities' operation performance, NRW reduction, and others.

B. Project Financing

Lending Instrument

21. The project will be financed through a IBRD Investment Project Financing (IPF) of US$ 100 million, repayable in 25 years, including a 10-year grace period, level repayment at six-month LIBOR-based US dollar plus variable spread, a front-end fee of 25 basis points, and with all conversion options, and a commitment fee of 0.25 percent on undisbursed loan balance.

Project Cost and Financing

22. The cost estimate of the project is US$ 155.46 million of which US$ 100 million will be financed through IBRD Loan and remaining US$ 55.46 will be funded from the GMG's fiscal revenue as follows: Component 1, RMB 50 million; Components 2 and 3, RMB 280 million and Component 4, RMB 2 million. The GWSC will provide RMB 48 million from its own resources to Component 1.

Table 1. Project Costs

Project Component	Estimated Cost		IBRD US$ (million)
	RMB (million)	US$ (million)	
Water Supply	227.85	36.93	23.53
Wastewater Management	490.02	79.43	60.48
Sludge Management	114.00	18.48	12.93
Water Quality Monitoring and Pollution Management	7.00	1.13	0.81
Project Management and Supervision	12.34	2.00	2.00
Sub-Total:	851.21	137.97	99.75
Contingency	48.98	7.94	0.00
Interest During Construction (IDC) and Commitment Fee	57.36	9.30	0.00
Front-end fee	1.54	0.25	0.25
Total:	**959.09**	**155.46**	**100.00**

C. Lessons Learned and Reflected in the Project Design

23. Lessons learned from recent Bank projects assisting medium-sized cities in developing urban infrastructure in China and in other rapidly urbanizing countries have been taken into consideration for this project, as well as guidance contained in the recent Bank-China Country Water Resources Partnership Strategy (2012). This strategy details the Bank's approach for improved control of water pollution, restoration of ecological environments and water resource

management, all of which are in complete harmony with Guilin's 12th FYP. A number of lessons learned were incorporated into the project design and the key ones are listed here.

24. *Using appropriate technologies that are low cost and easy to operate.* Experience in different projects has shown that regulatory constraints, land availability, and economics greatly affect the sludge treatment and disposal options in different regions. Technologies to manage sludge include dewatering, composting, anaerobic digestion or incineration. However, without proper management, residuals commonly end up in landfill or agriculture applications, adversely affecting the environment. Therefore, special attention was given to ensuring that the proposed sludge management technologies for Guilin were reliable, easy-to-operate and low cost in terms of capital investment and operation. Giving the critical need to preserve Guilin's environment and its limited financial resources, solar drying and composting management facilities were considered as part of the sludge treatment process.

25. *The need for integrated approaches to improve urban environments.* Experience from the GUEP and the Guangdong Pearl River Delta Urban Environment Project have shown that holistic technological and institutional approaches and reforms are necessary to improve the urban environment in a sustainable manner. This project incorporates these lessons by utilizing multiple technologies to improve the urban environment such as upgrading and rehabilitation of infrastructure, incorporation of NRW monitoring mechanisms embedded into Decision Support System, odor control facilities, and a centralized sludge management plant. Currently, GEPB has a legacy system (Excel-based) to capture water pollutant data from control points along Lijiang River and perform water quality monitoring and management. However, such system cannot interchange data with other GEPB's existing systems such as their GIS platform (which is now being used for map generations only) to perform advanced spatial analysis. Component 4 of the project is specifically designed to assist the GEPB through the Environment Automatic Monitoring Management Office (EAMMO) to strengthen the water quality monitoring system associated with Lijiang River and to establish a pollution management system. In addition, a pilot of pollution source analysis via remote sensing technique will be undertaken. The ultimate goal of this component is to establish a real time monitoring system of water pollutant sources. Such monitoring information will be managed in an integrated GIS platform facilitating spatial analysis, emergency response, and early detection as well as "what if" scenarios-based analysis. The monitoring data will also be shared with the public to enhance public awareness and participation in water pollution control programs. At the same time, assistance is being granted to GEPB, GSC and GWSC to strengthen their management capacity and improve their operation efficiency. This is in order to reduce pollution discharged and the enforcement of the pollution management regulation.

26. *Ensuring the financial sustainability of investments by designing cost-recovery mechanisms based on tariffs and assured subsidies from government.* While it is important to ensure cost recovery of WSS services to guarantee sustainability, it is difficult to exclude non-paying households from service. At the same time, facilities need to ensure cost recovery to guarantee sustainability. In order to guarantee that infrastructure financed by the Project is maintained, GWSC and GSC need to ensure cost-recovery either through a proper tariff scheme or appropriate government subsidies or a combination of both. As such, the Bank will work

closely with the PIUs to ensure that appropriate mechanisms are in place to guarantee cost-recovery for the additional cost of capital investment and debt servicing.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

27. Guilin Municipal Government has established a Project Leading Group (PLG) to guide and coordinate the various municipal and local government agencies involved in the project. The PLG is headed by the Executive Vice-Mayor of Guilin and has representatives from all relevant government departments such the Guilin Municipal Development and Reform Commission (GDRC), Guilin Municipal Finance Bureau (GFB), Guilin Municipal Public Utilities Bureau (GPUB), Guilin Municipal Water Affairs Bureau (GWAB), and the Guilin Municipal Environmental Protection Bureau (GEPB).

28. A Project Management Office (PMO) headed by the Director of GDRC has been established under GDRC. The PMO will be responsible for project preparation and implementation, providing guidance to project implementation units (PIUs), and coordination with relevant authorities. The PMO will also be responsible for implementation of Component 5.

29. Two state-owned companies, Guilin Water Supply Company (GWSC) and Guilin Sewerage Company (GSC) along with the EAMMO under GEPB have been designated as PIUs for different components. Table 2 lists each project component and the corresponding PIU. All PIUs were assessed for their capacity to implement the project, procure and manage contracts, conduct financial management, and implement safeguard policies and procedures. A list of relevant staff for each agency, with corresponding areas of expertise and responsibilities, has been reviewed and all PIUs were found competent.

Table 2. Project Implementing Units by Component

Component	PIU
Component 1: Water Supply	GWSC
Component 2: Wastewater Management	GSC
Component 3: Sludge Management	GSC
Component 4: Water Quality Monitoring & Pollution Management	EAMMO
Component 5: Project Management & Supervision	PMO

30. **Construction Supervision.** An independent Supervision Engineer consulting service will be contracted with the responsibility to: (i) review work drawings submitted by contractors; and (ii) supervise contractors, including (a) ensuring quality control; (b) contract management; (c) measurement and payment; and (d) preparing variation orders for contracts as needed. The Supervision Engineer consulting service will be required to have a team of environmental supervisors who can review all works contracts prior to construction and to ensure compliance with all required environmental measures required. A Design Engineer will be contracted to carry out any design changes required by changes in field conditions.

B. Results Monitoring and Evaluation

31. A results-based monitoring and evaluation system (MES) has been agreed and established for the project. The PMO and PIUs will implement the MES using it to monitor and evaluate implementation progress and analyze results towards achieving the project development objective. The PMO and PIUs will use the MES to monitor project outputs and evaluate project outcomes. The system will include a database of: (i) project outcome indicators to measure the achievement of the overall project objective and changes in performance, and (ii) intermediate outcome indicators for each subcomponent with baseline and target values. These intermediate outcome indicators will be reported in semi-annual progress reports to help monitor progress towards achieving key outcome indicators. The PMO and PIUs will keep these reports up-to-date and provide them as needed for the Bank's supervision. Indicators had been discussed and agreed upon during project appraisal and are listed in Annex 1 of this document.

C. Sustainability

32. To ensure the long-term sustainability of the project, careful technical and economic analyses were conducted to ensure necessary resources and capacity will be available to build, maintain, and operate project investments. For Component 1, 2 and 3, detailed assessments were made on the current and future demand for water and wastewater services to properly optimize water supply, wastewater, and sludge infrastructure. Specific technologies are being included in the design of each kind of infrastructure to ensure systems are reliable, easy-to-operate, and affordable. A number of measures have been introduced to enhance the sustainability of project investments including equipment for pipeline inspection to control NRW, installation of a management information system (MIS) platform to manage drinking water allocation. The construction of a sludge management plant piloting new and low-cost technology, such solar drying and composting, will also contribute to the sustainability of the project by promoting low-energy and low-cost solutions.

33. GMG has committed to provide subsidies to GSC, from its general revenues, to ensure full cost recovery of its wastewater operations, including the technical maintenance of assets, to address difficulties arising from the low wastewater tariff. In the case of domestic water users, many households are classified as low-income, so GMG has also agreed to partly subsidize the costs of operating and maintaining water supply services. However, for industrial and service sectors, tariffs will be appropriately raised to cover the full O&M costs of facilities into the future.

34. In terms of the O&M of assets, component 5 will assist in the capacity building of Project Implementation Units (PIUs) through training on monitoring, operation & maintenance of WTPs and WWTPs, sludge treatment (solar drying and composting), benchmarking of utilities' operation performance, NRW reduction, and others to help assist with sustainability issues.

V. KEY RISKS AND MITIGATION MEASURES

A. Risk Ratings Summary Table

Risk Category	Rating
Stakeholder Risk	Moderate
Implementing Agency Risk	
- Capacity	Moderate
- Governance	Moderate
Project Risk	
- Design	Moderate
- Social and Environmental	Substantial
- Program and Donor	Low
- Delivery Monitoring and Sustainability	Moderate
Overall Implementation Risk	**Moderate**

B. Overall Risk Rating Explanation

35. The overall risk rating for the project implementation is Moderate. Risks and associated mitigation measures are summarized in the Operational Risk Assessment Framework in Annex 4. The main risk to the achievement of the PDO is the uncertainty associated with the siting of sludge composting facilities. The risk is that the site will not be agreed upon in a timely manner causing delays in implementation and resulting in a buildup of sludge. To deal with this location uncertainty, an Environmental and Social Management Framework (ESMF) was prepared as a chapter to the EA. There is a small risk that the AFD financed expansion of the Chengbei WTP will not be completed and only 200,000 instead of 248,000 can be provided with improved water services. The risk is small as the WTP expansion project is in final stages of preparation, and the existing system could absorb 80% of the additional demand by 2020. An output indicator related to the expansion of the WTP has been included in this project to ensure systematic monitoring during project implementation. The main risk associated with stakeholders is related to tariff levels and are considered moderate. Risk mitigation measures have been included in project design, including the adoption of a Project Management Manual (PMM), ESMF, and procurement and financial management training for relevant staff.

C. Loan/credit conditions and covenants

36. *Subsidiary Agreements:* All PIUs under the project (GWSC and GSC) are required to enter into subsidiary agreements with GMG. These agreements will govern the transfer of loan funds as well as certain implementation responsibilities. The execution of such agreements, under terms and conditions acceptable to the Bank, is listed as a condition of disbursement in the Loan Agreement.

VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

37. **Financial Analysis.** The financial analysis of the project should ideally be made on the basis of incremental financial benefits and costs. However, because it is difficult to identify the benefits of the Water Supply Component since it is only part of GMG's investment program and there are no incremental benefits caused by the Wastewater Management Component, a financial analysis of the project was not carried out.

38. **Financial Analysis of GWSC and GSC.** A financial analysis of the project companies – Guilin Water Supply Company and Guilin Sewerage Co., Ltd. – was conducted to assess their financial viability and any measures required to help the project companies achieve their financial viability.

39. The financial statements of GWSC over the past 5 years show that it has a reasonably good financial situation. Based on these financial statements, the financial protections of GWSC for the next 25 years were made and the full analysis is recorded in the project file. The results of this analysis show that the current water tariff in Guilin Municipality could generate profits and meet the requirements of full cost recovery and debt service coverage ratio. Table A6.5 in Annex 6, summarizes the financial forecast of GWSC over the period 2014-2025.

40. The financial statements of GSC over the past 5 years were collected and show that GSC has been running at a loss for the last 3 years. In May 2013, GMG agreed to adjust the wastewater tariff in Guilin Municipality to improve GSC's financial situation. Based on this financial information, the financial protections of GSC for the next 25 years were made, and the full analysis is in the project file. The results of this analysis show that the current wastewater tariff in Guilin Municipality is adequate to cover the operating costs, but inadequate to cover additional costs of capital investments and debt servicing. The forecasted financial situation of GSC between 2014 and 2025 are summarized in Table A6.7 in Annex 6 of this document.

41. **Fiscal Impact.** GMG will provide counterpart funds to the project mainly from its fiscal income including tax incomes, non-tax incomes, and transfer payments from provincial and central governments. In 2013, the total fiscal income of GMG was CNY6.7 billion. The counterpart funding requirement for the project is CNY0.33 billion. The average annual counterpart funding required for the project will be less than 1% of fiscal incomes and can be easily met from existing and projected income sources.

Table 3. Fiscal Income Projection for GMG, 2013 - 2019 (RMB million)

	2013	2014	2015	2016	2017	2018	2019
Total Fiscal Income	6,659	7,448	8,263	9,097	9,941	10,789	11,631
GMG's Contribution to Project	-	-	100.4	90.5	71.2	25.0	47.9
% of Contribution to Total Income			1.2%	1.0%	0.7%	0.2%	0.4%

42. **Economic Analysis.** A cost-benefit analysis was carried out to assess the economic viability of the water supply component. The costs of the component include both investment costs and ongoing costs of O&M. The benefits of the investments include: (i) supply of clean water to meet growing demands in currently served areas, and (ii) increased access to clean water in previously unserved areas. The investments will bring other harder to quantify benefits, such as health and environmental benefits associated with improved quality of water supply, better management and conservation of the city's groundwater, and improved security of water supply. At a discount rate of 10 percent, the water supply investments yield an economic internal rate of return (EIRR) of 11.2 percent.

43. Moreover, a set of cost effectiveness analyses were carried out for the wastewater and sludge components. At the feasibility stage, various technical solutions were considered for wastewater treatment, sludge collection, dewatering and disposal and the recommended solutions were selected on a least-cost basis.

B. Technical

44. The project will support the supply of water through the formation of a ring-main supply network. The four existing WTPs have a combined capacity of 440,000 m^3 per day, provide around 330,000 m^3/day of drinking water to 803,000 residents in the Guilin urban area as well as businesses and industries. The proposed expansion of Chengbei WTP, financed from local and AFD funds, and the proposed drinking water mains and distribution network financed by the project should expand services to an additional 248,000 urban residents in 2020 and 340,000 urban residents[2] by 2025 along with public institutions, business and industries in the Guilin Core Area and new urban district.[3] Provision of a ring-main water distribution network will ensure the security of the entire water supply system. The system will thus be protected and operate more flexibly, thereby securing water supplies in the event of the WTP malfunctioning or pipelines bursting or experiencing low pressure.

45. Furthermore, ageing sewer mains throughout the territory are prone to leaks, which pollute soil and groundwater, disrupt traffic flow and cause inconvenience to the public. It is necessary to replace and rehabilitate sewers approaching the end of their service life and deteriorated manhole structures to improve the whole sewer network condition and to maintain an acceptable level of service to consumers. As such, Guilin proposes to invest in replacing and rehabilitating sewer mains using trenchless and/or in-situ liner techniques.

46. Special features of the project include: (a) GWSC using detection equipment to conduct water leak investigations, assess the rehabilitation methods and budgets, and then to demonstrate the effectiveness of water loss recovery in certain areas or districts; and (b) GSC developing a long-term sewer rehabilitation program including (i) preparing an investigation plan for sewer pipelines and manhole structures using robots and close-circuit television (CCTV); (ii) assessing findings, rehabilitation methods and associated repair or replacement methods, schedules, and budgets; and (iii) demonstrating the effectiveness of such rehabilitation activities in certain areas

[2] The number denotes permanent residents plus those who currently un-served by the Guilin Water Supply Company excluding floating population, such as tourists and service providers to tour industries
[3] The GMG is currently moving its offices to the new urban area.

or districts; (c) developing a comprehensive sludge management program for the entire area of Guilin from solar drying pilot testing to the optimizing of composting approaches, which has been developed based on a sludge management plan prepared by sludge experts including options to tackle issues such as the safe disposal of sludge and management of odor.

C. Financial Management

47. Overall, the financial management risk of the project is assessed as moderate. The Bank loan proceeds, including the overseeing of the project's Designated Account (DA), will be managed by Guangxi Zhuang Autonomous Region Finance Department (GFD). A financial management capacity assessment has been conducted, weaknesses identified, and actions to strengthen the project's financial management capacity agreed with the relevant PIUs. With the implementation of the proposed actions, the financial management arrangements satisfy the Bank's minimum requirements under OP/BP 10.00. Further details about the project's financial management are in Annex 3.

D. Procurement

48. Overall procurement risk is considered moderate. Procurement will be conducted by the PMO set up under GDRC and PIUs housed in GWSC, GSC and EAMMO (GEPB). The key issue and risk concerning procurement for implementation of the project is that the PMO and the PIUs have no prior experience implementing Bank-financed operations. This may lead to delays, as well as noncompliance with Bank Guidelines, during project implementation. In order to mitigate these risks, the following actions have been agreed: (i) the implementing agencies hire a Procurement Agent with experience in procurement for projects financed by the Bank or other multilateral financial institutions, under terms of reference (TOR) acceptable to the Bank; (ii) the Bank will continue to provide periodic procurement and contract management training during project implementation. Initial training during project preparation focused on market analysis, procurement strategy and planning, and the differences between Bank procurement policies and procedures and local regulations; and (iii) a Procurement Management Manual, as part of Project Management Manual (PMM), has been prepared to guide procurement practices. The PMO and the PIUs have also prepared a draft procurement plan for the project. The plan is being revised to reflect comments provided by the Bank. The final procurement plan cleared by the Bank has been finalized before the negotiation.

E. Social (including Safeguards)

49. The project will cause involuntary resettlement and OP4.12 involuntary resettlement has been triggered. In accordance with local laws and Bank requirements, a Resettlement Action Plan (RAP) and a Resettlement Policy Framework (RPF) for all the components was prepared in Chinese and English by the Guilin PMO, with assistance from house demolition offices, local land bureaus, affected villages and communities, potentially displaced persons, and Hohai University. During project design, the project owners and design institutes paid attention to possible linkages to associated on-going or planned resettlement practices. As a result, activities linked to the project were identified and included in the project RAP. The RAP and RPF were disclosed to local people on March 3, 2014 and the English version of the documents were

posted on March 12, 2014 at the Bank's Infoshop. Further revised RAP and RPF documents were disclosed on July 8, 2014 at the Bank's Infoshop.

50. **Scope of Impacts**. The project will have social impacts related to the need for land acquisition and the demolition of a number of structures. About 810 people from 193 families will be affected by the acquisition of 8.22 hectares of collective-owned land and the demolition of some 11,800 square meters of structures. Of the 11,800 square meters of structures to be demolished, 10,400 square meters have no legal documents. Project impacts are detailed in the RAP. A more detailed summary of the RAP and RPF are included in Annex 3.

51. **Due Diligence Study**. A Due Diligence Study was conducted with regard to land acquisition of the booster pump station in Xiufeng District acquired in 2011. The study confirmed that land acquisition practices were in line with Chinese laws, no legacy issues have been identified, and there is no evidence to show that the livelihood of Project Affected Persons (PAPs) has been adversely affected as a result of resettlement.

52. **Gender issues.** Gender issues were considered and gender sensitive approaches were applied in resettlement planning. Both males and females affected by the project were consulted during RAP preparation and the social assessment process. Men and women's groups were separately interviewed. Resettlement impacts on men and women were found to have no discrepancies; i.e. both men and women will equally benefit from the proposed project.

F. Environment (including Safeguards)

53. The project will have positive environmental benefits. It will help improve Guilin's overall water quality by reducing pollution of the Lijiang River.[4] These reductions will be delivered through the upgrading of existing WWTPs to meet stricter discharge standards and through the composting of WWTP sludge (presently landfilled or dumped on-site) for reuse as a soil conditioner thus reducing potential secondary contamination of soil and groundwater. The project triggers the Bank's OP4.01 on Environmental Assessment (EA) and has been assigned category A.

54. Major negative environmental impacts during construction are site-specific and can be mitigated by measures included in each EMP. Potential adverse impacts during operation mainly come from the sludge treatment and disposal process and discharge from WWTPs during accidents or operation failure. As a standard urban environment project, negative impacts can be readily avoided and mitigated by sound project design and construction management.

55. **Environmental Assessment (OP. 4.01)**. Following the requirements of the Bank's OP 4.01 and relevant domestic regulations, the EA was prepared by the Provincial Environmental Institute, a certified EA institute with recent experience in other similar Bank projects in the region. Based on the EA, an Environmental Management Plan (EMP) has been developed with general mitigation measures as well as specific measures for each component. A more detailed summary of the EMP is included in Annex 3.

[4] The biological oxygen demand (BOD) and the chemical oxygen demand (COD) are estimated to be reduced by 1,680 tons and 2,770 tons respectively a year.

56. **Natural habitat (OP. 4.04)**. This policy is triggered when a project brings either positive or negative impacts on natural habitats. In this project, the investments and interventions will bring environmental benefits to Lijiang River system and its branches through maintaining or improving water quality.

57. **Public disclosure and consultation.** Three rounds of information disclosure followed by public consultation were conducted during the EA process. The first round was in November 2013 with the project announcement and outline of the EA published on the official websites of Guilin Development and Reform Committee (the PMO) and City Utility Bureau, as well as bulletins in affected communities. The second round took place in January-February 2014 mainly though public notice posted in affected neighborhoods with hard copies available at the PMO's office. The last round of information disclosure was in May 2014 on the same websites with the full text of the draft EA and EMP available for download and in hard copy at the PMO offices. Public consultations were carried out mainly through questionnaire and meetings. Altogether more than 500 people were surveyed covering different age groups, genders, educational backgrounds and occupations, as well as experts and officials of relevant government agencies. Public concerns and opinions expressed during the process have been addressed in the finalization of the EA documentation and incorporated into the project design. The English version EA, EMP and the executive summary were posted on May 15, 2014 at the Bank's Infoshop, and the revised EA, EMP and the executive summary were posted on July 8, 2014 at the Bank's Infoshop.

Annex 1: Results Framework and Monitoring

CHINA: Guilin Integrated Environment Management Program

Project Development Objective (PDO): The proposed project objective is to improve water and sanitation services in Guilin.													
PDO Level Results Indicators*	**Core**	**Unit of Measure**	**Baseline 2013**	**Cumulative Target Values****						**Frequency**	**Data Source/ Methodology**	**Responsibility for Data Collection**	**Description (indicator definition etc.)**
				YR 1 2015	**YR 2 2016**	**YR3 2017**	**YR 4 2018**	**YR5 2019**	**YR6 2020**				
Indicator 1. Number of people in urban areas provided with access to improved water sources under the project	☐	No.	0	20,400	30,000	106,500	147,300	194,700	248,000	Annually	Project progress report	PMO	Cumulative
Indicator 2. Volume (mass) of BOD pollution load removed from the treatment plant under the project	☐	tons/year	0	0	0	372.3	1,025.65	1,036.6	1,113	Annually	Project progress report	PMO	Annual
INTERMEDIATE RESULTS													
Intermediate Result (Component One): Water Supply													
Intermediate Result indicator 1. Number of newly added connections	☐	No.	0		10,000	35,000	49,000	60,000	80,000	Annually	GWSC financial review	PMO/ GWSC	Cumulative
Intermediate Result indicator 2. Expansion of Chengbei WTP and associated distribution pipe completed	☐	%	0			50	54	92	100	Semi-annually	Project progress report	PMO/ GWSC	Cumulative
Intermediate Result (Component Two): Wastewater Management													
Intermediate Result indicator 3. Length of sewer network rehabilitated/constructed	☐	Km	0	10	15	30	35	40	40	Semi-annually	Project progress report	PMO/ GSC	Cumulative
Intermediate Result indicator 4. No. of WWTPs upgraded (the class of effluent emitted IA)	☐	No.	0	0	0	2	2	4	4	Semi-annually	Project progress report	PMO/ GSC	Cumulative

Intermediate Result indicator 5. Compliance with improved effluent discharge standard (Class IA of GB18918-2002) by the upgraded WWTPs	☐	No.	0	0	0	2	2	4	4	Semi-annually	Project progress report	PMO/ GSC	Cumulative
Intermediate Result (Component Three): Sludge Management													
Intermediate Result indicator 6. No. of sludge treatment facilities upgraded in WWTPs	☐	No.		0	0	2	2	3	3	Semi-annually	Project Progress report	PMO/ GSC	Cumulative
Intermediate Result indicator 7. Amount of sludge treated and disposed safely (tons/year)	☐	tons/year	0 (water content 72%)	0	0	0	150	150	150	Annually	Project Progress report	PMO/ GSC	Annual
Intermediate Result (Component Five): Project Management and Supervision													
Intermediate Result indicator 8. Client days of local training and local study tours (based on study/training/trip reports)	☐	No. of days	0	Conduct Training Need Assessment	Prepare Training Plan	Implement Training Plan	300	600	1,000 Conduct Training Evaluation	Semi-annually	Project Progress report	PMO	Cumulative

Annex 2: Detailed Project Description

CHINA: Guilin Integrated Environment Management Project

1. **Water Supply.** The Guilin Core Area[5] covers an area of 90.5km^2 with a population of 803,000 (2011) and is projected to increase to 1,143,500 by 2025. In 2013, GWSC supplied a total of 118.5 million m³ of treated water to service this area, but about 132,800 residents still remain unconnected to water services.

2. Currently, the Lijiang River is the main source of drinking water for Guilin as well as being the key attraction for tourists. The river originates at the Maoer Mountain in Guilin's Xing'an County and flows through the city center for approximately 50 km. Given the growing number of urban settlements along the river, the water quality gradually deteriorates as it flows downstream and more sewage is discharged into it. Some portions of the River currently have water quality of Class III or IV.[6] In 2013, the total annual water supplied increased to 118.5 million m³ which was 80% of the total installed capacity of the four existing water treatment plants (WTPs).

3. As a result of rapid population growth and increasing urban density in Lingui District[7], it is expected that by 2025 the total water supply by GWSC will increase to 473,500m³ a day. This will require an additional 200,000 m³ per day of water supply capacity as well as associated extension of the distribution network and a 40,000 m³ per day booster pumping station. Furthermore, the projected population growth will require the reliable provision of drinking water that meets national standards for an additional 207,700 people by 2025. Residents who are currently not connected to the municipal water network meet their needs by extracting groundwater from backyard wells or from nearby surface water bodies. While the cost of obtaining water from such sources is well below the tariff charged by the water utility, the quality of water is questionable and poses a public health risk. Table A2-1 shows provides details of historic, current and future projections of water supplied in Guilin Core Area and wastewater treated and collected and discharged into the Lijiang River. Addition water supply and sanitation (WSS) data are available in the feasibility study report which is held in the project file.

4. **Wastewater Management and Sludge Management**. Guilin City's drainage system, covering 88.1% of the service areas in 2013, is a combined sewage system, which collects and discharges both wastewater and stormwater into the Lijiang River. The average throughput in 2013 was about 227,200m³ per day or about 54% of the total design capacity of 418,500m³ per day of the six WWTPs. It is projected that by the end of 2025, the total wastewater flow of the Guilin urban area will increase to 342,060 m3 per day. Under the newly announced regulations from the Guilin Municipal Environmental Protection Bureau (EPB) for all wastewater treatment plants (WWTPs), the Guilin Sewerage Company (GSC) will be required to meet new discharge limits to a Class IA standard. Although the WWTPs at their current operation levels have helped reduce water pollution, they have also created a problem with regard to the disposal of dewatered sewage sludge, which poses safety issues and questions over how to cover the costs of disposal. The problem will become more severe when the amount of dewatered sewage sludge quantity

[5] Including the Urban Core Area, Diecai-Balijie, Wayao-Dafeng, Qixin, Tieshan, and Yanshan District.
[6] National Water Quality Classification ranges from Class I or unpolluted to Class V+ or extremely polluted.
[7] Previously known as Linqui County, Lingui District was officially designated as an urban area in January 2013.

grows from the present 160 tons per day to about 184 tons per day from all WWTPs under GSC. This will be further complicated by the fact that the standard limit for water content in sludge will be decreased from 80% to less than 60% as stipulated by the Ministry of Environmental Protection in 2008.

Table A2.1. Guilin Water Supply and Sanitation Services

Guilin WSS Services	2011	2012	2013	2015	2020	2025	2030
Water Supply (1,000 m3/day)							
Water Produced	320.80	312.19	324.54	345.65	404.61	473.50	525.74
Water Sold	269.95	272.62	278.19	297.26	347.96	407.21	452.14
Percentage of Water Sold	84.1%	87.3%	85.7%	86.0%	86.0%	86.0%	86.0%
Wastewater Treated (1,000 m3/day)							
Guilin Core Districts	199.53	209.63	203.14	211.73	239.10	281.92	311.53
Lingui District	20.86	22.42	24.10	32.02	49.70	60.14	72.77
Totol Guilin Urban Districts	220.39	232.04	227.25	243.74	288.80	342.06	384.30
Percentage of Water Sold Treated **in Guilin**	81.6%	85.1%	81.7%	82.0%	83.0%	84.0%	85.0%
Percentage of Water Sold Treated and discharged **to Lijiang River**	73.9%	76.9%	73.0%	71.2%	68.7%	69.2%	68.9%

5. **Water Quality Monitoring and Pollution Management**. Uncoordinated and inadequate monitoring of environmental conditions in Guilin and lack of real-time data hampers the planning, regulation and enforcement of standards by responsible agencies, particularly with regard to drinking water standards, river water quality, pollutant loads from industry, municipal and non-point sources. As a firm part of the city's 12th five-year-plan (FYP), Guilin has begun a pollution monitoring and enforcement drive and is piloting pollution source analysis in the tributary of Nanshi River. GEPB currently has an Excel-based system to record water pollution data from control points along Lijiang River and performs water quality monitoring and management. However, such a system cannot interchange data with GEPB's other existing systems such as their geographical information system (GIS) platform to perform advanced spatial analysis.

6. In order to address the problems and challenges outlined above, the proposed project has been designed with five inter-related components supporting the project development objective including: (1) Water Supply; (2) Wastewater Management; (3) Sludge Management; (4) Water Quality Monitoring and Pollution Management; and (5) Project Management and Supervision. Special and innovative features of the project involve: (a) Guilin Water Supply Company setting up a system to use detection equipment to conduct water leak investigations, assess rehabilitation methods and budgets, and then demonstrate the effectiveness of water loss recovery rates in certain areas or districts; and (b) Guilin Sewerage Company will develop a long-term sewer rehabilitation program including: (i) a plan to investigate sewer pipelines and manhole structures using robotic close circuit television (CCTV); (ii) an assessment of findings, rehabilitation methods and associated repair or replacement methods, schedules, and budgets; and (iii) demonstration of the effectiveness of such rehabilitation activities in certain areas or districts;

and (c) development of a comprehensive sludge management program for the entire area of Guilin ranging from the solar drying pilot testing to optimizing composting efficiencies.

7. ***Component 1: Water Supply ($36.93million).*** This component will invest in the augmentation of the water supply system to meet growing demands by domestic consumers, commercial and industrial enterprises, an expanding airport, and two growing university communities. It will :

(a) install about 37 km of drinking water mains and distribution pipelines linking the Chengbei Water Treatment Plant (WTP, to be expanded from a capacity of 100,000 m^3 per day to 300,000 m^3 per day and funded by the French Agency for Development) mainly serving Lingui District and Balijie Area;

(b) construct a booster pumping station in Xiufeng District with a capacity of 40,000 m^3 per day to supply water to residents in Lingui District and the vicinity of Guilin Liangjiang Airport; and

(c) procure monitoring and inspection equipment for pipeline inspection to improve the control of non-revenue water (NRW) and install a decision support system (DSS) platform for the comprehensive management of drinking water allocation among service areas.

8. ***Component 2: Wastewater Management: ($79.43 million).*** This component focuses on on improving and maintaining the water quality of the Lijiang River for the benefit of local residents and tourists alike through investments to reduce pollutant discharge from all of Guilin's WWTPs. Thus, through the component:

(a) replace malfunctioning equipment at 20 pumping stations (18 sewage pumping stations and 2 storm water pumping stations) and install additional odor control facilities, including ventilation systems;

(b) rehabilitate approximately 40 km of existing sewer networks including replace and or rehabilitate manholes and construct 32 km of new sewer networks;

(c) procure(i) equipment to control leaks or blockages, and (ii) equipment for monitoring and sewer maintenance;

(d) upgrade facilities of the four WWTPs (Lingui, Beichong, Qilidian, and Shangyao) to enable the effluent discharged quality to be upgraded from the current Classes II or IB to Class IA and the replacement of the associated odor control and disinfection facilities at five WWTPs (Shangyao, Qilidian, Beichong, Yanshan and Lingui); and

(e) upgrade sludge dewatering equipment to produce sludge cakes with less than an average of 60% water content for Beichong, Qilidian, and Shangyao WWTPs.

9. The objective of the proposed wastewater treatment investments discussed above is to obtain an effluent quality that meets at least the Class I A level of the *Discharge Standards for Municipal Wastewater Treatment Plant* (GB18918-2002) in compliance with the contaminant concentrations shown in Table A2.2. This is the compulsory requirement imposed by GEPB as the referred WWTPs are located within the key tributary of Lijiang River or Lijiang River itself.

Table A2.2. Discharge Standard for Municipal Wastewater Treatment Plants (mg per liter)

Basic Controlled Indicators		Class I Standard		Class II Standard	Class III Standard
		A	B		
COD		50	60	100	120 (1)
BOD5		10	20	30	60 (1)
Suspended Solids (SS)		10	20	30	50
Animal and Plant Oil		1	3	5	20
Petroleum		1	3	5	15
Negative Ion Surface Active Agent		0.5	1	2	5
Total Nitrogen (as N)		15	20	-	-
NH3-N (as N2)		5 (8)	8 (15)	25 (30)	-
Total P (as P)	Built before Dec 2005	1	1.5	3	5
	Built after Jan 1, 2006	0.5	1	3	5
Color (dilution magnitude)		30	30	40	50
pH		6-9			
Bacillus Coli (count/l)		1,000	10,000	10,000	-

Notes: (1) Removal rate indicators shall be higher than 60% when inlet water COD is higher than 350 mg/l, higher than 50% when BOD is higher than 350 mg/l; (2) Values outside brackets refer to controlled values when water temperature is >12 ℃, those inside refer to controlled values when water temperature is ≤12 ℃

10. The concentrations used to design the treatment process under this project are based on the low-intermediate concentration values of a range usually observed in wastewater produced in China. One of the reasons for the low concentrations of wastewater constituents is that combined sewers are still used in built-up areas, which results in a high run-off and or high groundwater infiltrations collected through the combined sewers diluting the sewage flow transferring to WWTPs.

11. The standard IA applied under this project, as endorsed by GEPB to protect the Lijiang River water environment, requires a high level of removal of carbon-based pollution, especially nitrogen and phosphorous. This required high level of removal can only be achieved through biological treatments that make use of activated sludge processes. These methods are used by WWTPs under the project and consist of mechanical and biological treatment, as well as sludge processing. Due to the inefficiency of aged equipment at WWTPs and higher discharge standards required, including odor reduction requirements, substantial replacement and upgrading is needed to reduce pollution (effluent and odor) and meet the stringent requirements of dewatered sludge before final disposal. For reference, surface water standards in China are categorized below.

Table A2.3. Surface Water Standards in China

Classification	Grade I	Grade II	Grade III	Grade IV	Grade V
Description	Water source and nature reserve areas.	Drinking water supply, endangered fish and breeding areas	Drinking water supplies, general fish reserves, and swimming areas.	General industrial and recreational use. No direct human contact.	For agricultural uses and general scenic purposes.
COD	15	15	20	30	40
BOD^5	<3	3	4	6	10
DO	90% (or 7.5)	6	5	3	2
Acidity (pH)	6-9	6-9	6-9	6-9	6-9
Total Phosphorus	0.02(L/R 0.01)	0.1(L/R 0.025)	0.2 (L/R 0.05)	0.3 (L/R 0.1)	0.4 (L/R 0.2)
Total Nitrogen	0.2	0.5	1.0	1.5	2.0
NH3-N	0.15	0.5	1.0	1.5	2.0
Fecal coliform	200	2000	10000	20000	40000

12. Guilin's sewage collection services are provided through a network of about 500km of sewers and storm drains. Most of these sewer networks are aged and poorly constructed. Some of them are approaching the end of their service life and due to poor installations they have become increasingly difficult and costly to maintain. In view of above, Guilin has proposed the replacement and rehabilitation of some 40km of aged sewers and deteriorated manhole structures in phases over the next 5 years to prevent further deterioration of the sewer network, which may cause higher inflow and infiltration (I&I) and potential contamination to the water source. The project will support Guilin to embark on an improvement program to construct, replace or rehabilitate 54km of sewer using the most innovative construction methods to do so without traditional open-cut construction sewers at an estimated cost of US$30 million.

13. ***Component 3: Sludge Management: (US$18.48 million).*** This component will fund investments that will augment sludge disposal capacity (both qualitative and qualitative), all aimed at improving river water quality. The component will:

(a) construct a sludge management center (the site is to be confirmed under the Environmental and Social Management Framework procedures) with a solar drying facility capacity of 20 tons per day and a composting facility with capacity to treat 130 tons per day and with associated ventilation and odor control facilities; and

(b) purchase 17 sludge hauling trucks and 27 sewer maintenance trucks.

14. ***Component 4: Water Quality Monitoring and Pollution Management (US$1.13 million).*** The objective of this component is to upgrade the water quality monitoring system associated with the Lijiang River to enable real-time data collection and processing, database development for industrial pollution management, and piloting source analysis of major polluters along urban stretches of the Lijiang River. Specifically, the component will:

(a) strengthen the water quality monitoring management system in Guilin;

(b) establish a pollution management system for the effective monitoring and management of the Lijiang River water environment; and

(c) pilot a pollution source analysis of the Lijiang River (urban stretches).

15. ***Component 5: Project Management and Supervision (US$2.00 million).*** This component involves the provision of TA and training for project management and monitoring, including monitoring of the implementation of the Environmental Management Plan (EMP) and Resettlement Action Plan (RAP). It will include (a) project management assistance, engineering design review and least-cost review of sludge management options, (b) external monitoring assistance, (c) incremental operation support to the PMO, and (d) training and study tours. In terms of project management capacity assistance, the component will assist in building the capacity building of the Project Implementation Units (PIUs) through training on monitoring, operation & maintenance of WTPs, WWTPs and sludge treatment (solar drying and composting), benchmarking of utilities' operation performance, and NRW reduction, etc.

Annex 3: Implementation Arrangements

CHINA: Guilin Integrated Environment Management Project

Project Institutional and Implementation Arrangements

1. A Project Leading Group (PLG) has been formed by Guilin Municipal Government (GMG). The PLG is headed by a Deputy Mayor of GMG. The members of the PLG are the responsible directors of Guilin Municipal Development and Reform Commission (GDRC), Guilin Municipal Finance Bureau (GFB), Guilin Municipal Public Utilities Bureau (GPUB), Guilin Municipal Water Affairs Bureau (GWAB), and Guilin Municipal Environmental Protection Bureau (GEPB). The PLG is responsible to provide policy guidance and ensure coordination of important project-related issues. Furthermore, a Project Management Office (PMO) was established in the GDRC in 2013 for this project. It currently has seven staff, including seconded staff from various sector departments. The PMO is responsible for daily coordination and liaising with all government authorities.

2. Guilin Water Supply Company (GWSC) is the implementing agency for the first component related to water supply, Guilin Sanitation Company (GSC) will be the implementing agency for the second and third components related to wastewater and sludge management, the Environment Automatic Monitoring Management Office (EAMMO) under GEPB will be the implementing agency for the fourth component related to water quality monitoring, and finally the TA under the fifth component will be executed by the PMO on behalf of GMG. GWSC and GSC will be responsible for implementation under the leadership of the PLG. They will also operate the assets upon completion of the project and will be the fiduciary agents for the municipality in handling the financial management and procurement for the respective components under their responsibility. Subsidiary Agreements will be entered into by the GMG and GWSC and GSC respectively as a condition for disbursement of the Loan amounts allocated to their respective components.

3. A Supervision Engineer consulting service will be contracted with the responsibility to: (i) review work drawings submitted by the contractors; and (ii) supervise the contractors, including (a) ensuring quality control; (b) contract management; (c) measurement and payment; (d) preparing variation orders for contracts, as needed; and (e) adjudicating issues between the owner (client) and contractors. The Supervision Engineer consulting service will be required to have a team of environmental supervisors who can review all works contracts prior to construction and to ensure that all environmental measures required can be complied with. A Design Engineer will also be contracted to carry out any design changes required by field conditions.

Financial Management, Disbursements and Procurement

Financial Management

4. The financial management capacity assessment identified the following principal risks: (a) financial staff of both PMO and PIUs are relatively new to the Bank's operations, (b) the PMO may not comprehend its responsibility fully and underestimate the workload during project implementation, and (c) the government is required to invest US$61.17 million in the project as counterpart funds yet no financing plan has been agreed upon to date.

5. Agreed mitigation measures to address the above risks include: (a) financial management training (formal and ad hoc) to be provided to the project financial staff; (b) preparation of a financial management manual (FMM), as part of Project Management Manual, clearly stating the responsibility of each entity involved and standardizing financial implementation procedures for the project; (c) a financial plan; and (d) close monitoring and supervision from the Bank during project implementation.

6. Overall, the residual financial management risk after introducing these mitigation measures is assessed as Moderate.

7. **Budgeting.** The annual Project Work Plan, including the budget and other required resources, will be prepared by the PMO and PIUs. The budget for counterpart funds committed by the GMG will be reviewed and approved by the People's Congress and will be included in the corresponding sectoral budget. Budget variance analysis will be conducted on a semi-annual basis by the PMO and PIUs and necessary actions will be taken to make sure the project can be implemented as planned. The Bank will work with the PMO to supervise the project's budgeting system to enhance budget preparation and execution practices during implementation.

8. **Funds Flow**. The Bank loan proceeds will flow from the Bank into a project Designated Account (DA) to be set up at, and managed, by Guangxi Zhuang Autonomous Region Finance Department GFD. GFD will be directly responsible for the management, maintenance and reconciliation of the DA. The PIUs are responsible for preparing disbursement withdrawal applications (WAs) as well as the supporting documents and submitting them to the PMO and then to GFB for review and approval. Withdrawal applications will be reviewed and approved by GFD. The reimbursed funds will be delivered to the municipal finance bureau and then to the PIUs or paid to the contractors directly.

9. **Accounting and Financial Reporting.** The administration, accounting and reporting of the project will be set up in accordance with Circular #13: "Accounting Regulations for World Bank-financed Projects" issued in January 2000 by Ministry of Finance (MOF). The PMO and PIUs will be managing, monitoring and maintaining their project accounting records for their respective activities. Original supporting documents will be retained by the PMO and PIUs. The PMO will be responsible for consolidating the project financial statements prepared by the PIUs. The unaudited semi-annual project interim financial reports (IFRs, format and content) will be prepared in accordance with Circular #13 (as agreed with MOF) and furnished to the Bank by the PMO no later than 60 days following each semester (the due dates will be September 1st and March 1st), in form and substance satisfactory to the Bank.

10. **Internal Control.** All withdrawal applications are subject to the detailed review conducted by the GFB and GFD. An internal control system will be established in each PIU by

following related internal control standards issued by MOF and the main internal control requirements related to the proposed Bank financed project will be integrated into the FMM.

11. **Auditing.** The Guangxi Zhuang Autonomous Region Audit Office (GAO) has been identified as the auditor for the project. An annual audit report will be issued by GAO. The annual audit report of project financial statements must be submitted to the Bank within 6 months of the end of each calendar year. Following the Bank's formal receipt of the audited financial statements from the borrower, the Bank will make them available to the public in accordance with the World Bank Policy on Access to Information.

Disbursements

12. The project includes four disbursement methods: advance, reimbursement, direct payment, and special commitment are available for the project. The primary Bank disbursement method will be advances to the DA. WAs will be prepared to request Bank disbursements and to document the use of Bank funds. WAs will include supporting documents in the form of Statement of Expenditures (SOEs) and Summary Sheets (SS) and source documents identified in the Disbursement Letter issued by the Bank.

13. The DA in US dollars will be opened at a commercial bank acceptable to the World Bank and will be managed by GFD. The ceiling of the DA will be determined and documented in the Disbursement Letter.

14. The World Bank loan would be disbursed against eligible expenditures (tax inclusive) in accordance to the following table:

Table A3.1. Disbursement Categories

Disbursement Categories	IBRD Loan	
	Allocated amount (US$)	**Percentage of Eligible Expenditures to be financed**
(1) Works, Goods, and Consultant Service under Part 1 of the Project	23,500,000	100%
(2) Works and Goods under Part 2 and 3 of the Project	74,000,000	100%
(3) Goods and Consultant Service under Part 4 of the Project	800,000	100%
(4) Consultant Service, Non-consulting Services, Goods, Training and Workshop, and Incremental Operating Cost under Part 5 of the Project	1,450,000	100%
(5) Front-end fee	250,000	Amount payable pursuant to Section 2.03 of this Agreement in accordance with Section 2.07 (b) of the General Conditions
(6) Interest Rate Cap or Interest Rate Collar premium	0	Amount due pursuant to Section 2.08(c) of this Agreement
Total	**100,000,000**	

15. **Advance Contracting and Retroactive Financing**. Retroactive financing of up to US$20 million would be available for eligible expenditures incurred on or after October 1, 2014. Retroactive financing will be processed according to the requirements specified in the loan agreement and project agreement. All advance contracts are listed in the Procurement Plan, and will be subject to Bank prior review.

Procurement

16. **Capacity Assessment:** The procurement capacity assessment identified that the procurement staff of the PMO and PIUs lack of experience with Bank-financed projects and possible influence of local practice on project implementation as the principal risks. The agreed mitigation measures include: (i) procurement under the project will not go through the local procurement transaction platform. Procurement will be organized by the PMO and PIUs in accordance with Bank policy and procedures, under the relevant provisions in the domestic rules and regulations; (ii) an experienced procurement agent has been recruited based on TOR prepared by the PMO and agreed to by the Bank; (iii) continuous procurement training will be provided by the Bank, or training institution(s) acceptable to the Bank, during project implementation to raise awareness of the differences between domestic practices and the Bank's procurement policies and procedures; (iv) PMO has finalized a Procurement Management Manual acceptable to the Bank; and (v) a project management consultant is to be hired by the PMO to assist with design review and contract management. Overall procurement risk is considered as Moderate.

17. **Applicable Guidelines.** Procurement for the proposed project will be carried out in accordance with the World Bank's "Guidelines: Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and IDA Credits & Grants by World Bank Borrowers," dated January 2011 (revised July 2014); "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits & Grants by World Bank Borrowers," dated January 2011 (revised July 2014); and the provisions stipulated in the legal agreements. National competitive bidding (NCB) will be carried out in accordance with the *Law on Tendering and Bidding of the People's Republic of China* promulgated by Order of the President of the People's Republic of China on August 30, 1999, subject to the modifications stipulated in the legal agreements in order to ensure broad consistency with Bank Procurement and Consultant Guidelines.

18. **Procurement of Works & Goods**. Procurement will be done using the Bank's standard bidding documents (SBD) for all international competitive bidding (ICB) contracts and National Model Bidding Documents (MBD), agreed with or satisfactory to the Bank for all national competitive bidding.

19. **Selection of Consultants**. The Bank's Standard Request for Proposal shall be used for selecting consulting firms. Shortlists of consultants (firms) for services estimated to cost less than US$500,000 equivalent per contract may be composed entirely of national consultants, in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines.

20. **Training, Workshops and Study Tours**. Detailed programs for training, including study tours and workshops, will be developed by the PMO during project implementation and will be

included in the annual PIP for Bank review. Expenditures incurred in accordance with the approved programs will be used as the basis for reimbursement.

21. **Procurement Plan**. The procurement plan for the Project, prepared by the PMO, has been reviewed and cleared by the Bank. The plan will be available at the PMOs office, the project database, and on the Bank's external website. The procurement plan will be updated in agreement with the Bank, annually or as required, to reflect project implementation needs and improvements in institutional capacity.

22. **Procurement Methods and Bank Prior Reviews**. The thresholds for procurement methods and Bank prior review are indicated in Table A3.2. Any procurement/selection method under Bank Procurement and Consultant Guidelines, other than those as indicated in Table A3.2, may be used with prior agreement from the Bank.

Table A3.2. Thresholds for Procurement Methods and Prior Review

Expenditure Category	Contract Value (US$)	Procurement Method	Prior Review Threshold
Goods and Non-Consulting Services	≥3,000,000	ICB	All
	<3,000,000	NCB	First 2 NCB goods contracts
	<100,000	Shopping	None
	NA	Direct contracting	All DC contracts
Works/ Supply & Installation of plant and equipment	≥25,000,000	ICB	All
	<25,000,000	NCB	First 2 NCB works contracts and all contract ≥ US$15,000,000
	<200,000	Shopping	None
	NA	Direct contracting	All
Consultants	≥ 300,000	QCBS, QBS	Firms: First contract for each selection method and all contracts ≥ USD300,000 Firms: All SSS contracts; IC: Only in Exceptional Cases; SSS for individual consultant: ≥USD 20 ,000
	< 300,000	CQS	
	N/A	SSS	
	N/A	IC	
Remarks:	ICB –International Competitive Bidding NCB –National Competitive Bidding DC – Direct Contracting NA – Not Applicable QCBS: Quality- and Cost-Based Selection ; QBS: Quality-Based Selection CQS: Selection Based on the Consultants' Qualifications SSS: Single Source Selection; IC: Individual Consultant selection procedure NA: Not Applicable		

23. **Frequency of Procurement Supervision**. In addition to the prior-review supervision carried out by the Bank, the Bank will also carry out procurement supervision or post-review of

procurement activities at least once every 12 months. The post review sampling ratio for the first year of project implementation will be one out of 15 contracts.

Environmental and Social (including safeguards)

24. **Social Safeguards.** The project will cause involuntary resettlement and the impacts were determined during project preparation. In accordance with local laws and Bank requirements, a Resettlement Action Plan (RAP) and a Resettlement Policy Framework (RPF) were prepared in Chinese and English by the Guilin PMO, with assistance from house demolition offices, local land bureaus, affected villages and communities, potentially displaced persons, and Hohai University. During project design, the project owners and design institutes paid attention to possible linkages to associated ongoing or planned resettlement practices. As a result, activities that are linked to the project have also been included in the project RAP. The RAP and RPF were disclosed to local people on March 3, 2014 and the English version of the documents were posted on March 9, 2014 at the Bank's Infoshop, and the revised RAP and RPF were disclosed on July 8, 2014 at the Bank's Infoshop.

25. **Scope of Impacts.** The project will have social impacts related to the need for land acquisition and demolition of a number of structures. About 810 people from 193 families will be affected by the acquisition of 8.22 ha of collective-owned land and the demolition of some 11,800 square meters of structure. Of the 11,800 square meters, 10,400 square meters of land have no legal documents. Project impacts are detailed in the RAP.

26. **Policy Objectives and Legal Framework.** The RAP was prepared in line with relevant Chinese laws and regulations, and World Bank OP 4.12 on Involuntary Resettlement. Key principles, considerations and salient activities for project design and RAP preparation included:

- Acquisition of land and other assets, and relocation of people were minimized as much as possible.
- A socio-economic survey was conducted to determine baseline conditions, especially of Project Affected Persons (PAPs).
- Compensation for houses or other properties were determined at full replacement value.
- Compensation will be provided to all PAPs, including those who lack house registration or other documents, including legal documents.
- Basic infrastructure and service facilities will be provided in areas where PAPs will be resettled.
- Affected persons were consulted during the planning for acquisition of land and other assets, and of the rehabilitation process.
- Financial and physical resources for resettlement and rehabilitation will be made available when required.
- Special consideration was and will continue to be given to vulnerable groups.

- Institutional arrangements have been established to ensure effective and timely design, planning, consultation and implementation of the RAP.
- Effective and timely supervision, monitoring and evaluation of project implementation will be executed.

27. **Compensation Standards**. Land acquisition compensation includes land compensation, a resettlement subsidy, and compensation for standing crops. The land acquisition fund is calculated based on land output value according to local regulation. The compensation rates for structures are determined based on their replacement cost.

28. **Implementation Arrangements.** Multi-level arrangements were put in place to implement the RAP. An independent monitor will be selected to monitor resettlement implementation and livelihood restoration. The PMO will be responsible for internal monitoring and will provide semi-annual internal monitoring reports to the Bank. Details of staffing and their responsibilities are provided in the RAP.

29. **Budget and Funding Arrangement.** The Borrower will make available sufficient resources from counterpart funding to conduct resettlement.

30. **Public Participation.** Project-affected persons and organizations were informed about the project and its impacts through meetings during the preparation of the RAP. Comments and recommendations received during these meetings were incorporated in the RAP and project feasibility study. Public participation will continue during RAP implementation. Project information will be provided to affected persons through television, newspapers, bulletins and posters. The RAP will be summarized in a resettlement information booklet and distributed to affected households.

31. **Gender Issues.** Gender issues were considered and gender-sensitive approaches were used during resettlement planning. Both males and females affected by the project were consulted during RAP preparation and the social assessment process. Men and women's group were separately interviewed. Resettlement impacts on men and women were found to have no discrepancies; both men and women will equally benefit from the proposed project.

32. **Grievance Mechanism.** A grievance mechanism was established during the preparation of the RAP. All relevant telephone numbers were disclosed to PAPs. The PAPs can submit grievances related to resettlement. Written records will be kept of all grievance cases.

33. **Resettlement Policy Framework**. A RPF has been developed according to relevant local laws and regulations as well as World Bank's OP/BP 4.12 on Involuntary Resettlement for any components or investments that might change location during project implementation. The RPF describes the overall legal framework, planning principles, procedures, compensation and rehabilitation approaches, consultation and participation requirements, grievance mechanisms, and organization and monitoring arrangements.

34. **Resettlement Organization.** The PMO will assume overall responsibility for implementing the resettlement program. The PMO will work with the district and county

government offices to implement the resettlement programs. These offices have competent and experienced staffs and their respective responsibilities and functions are detailed in the RAP. Supplemental training will be provided to the project staff during project implementation to increase their capacity for managing resettlement.

Environmental Safeguards

35. The project as a whole has substantial positive environmental impacts as it will upgrade wastewater treatment to meet stricter discharge standards for water and air emissions and improve sludge treatment through a composting and a sun-drying pilot. The latter will help reduce the amount of waste going to the municipal landfill, mitigate potential pollution, and reduce energy consumption during the sludge dewatering process.

36. **Construction Phase**. The impacts of project construction are mostly short-term, such as noise, dust, soil erosion, worker safety and social and traffic disturbance. These concerns are relatively moderate and can be readily minimized by standard measures as stipulated in national and local regulations and codes on construction site management. The PMO will appoint staff responsible for the EMP implementation. Similarly, contractors will be required to appoint at least one staff per construction site to ensure work is carried out according to the EMP and relevant engineering codes.

37. **Operation phase**. Operation of WWTPs and associated pumping stations and pipelines will have limited negative impacts on residents and the surrounding environment, such as odor from aeration, sedimentation and sludge condensation tanks, and noise from pumps. Appropriate mitigation measures are detailed in the EMP (e.g., ensuring a minimum 50m buffer zone from residential areas). More potentially serious concerns include impacts from sludge treatment and outflow from the WWTP in cases of malfunction or failure. Mitigation measures are included in the EMP.

38. As a tourism-oriented city, most of Guilin's wastewater comes from domestic sources. Although Chinese regulation requires that industrial wastewater can only be discharged into the sewerage system after meeting relevant discharge standards through on-site treatment, heavy metals found in sludge at the WWTPs indicate some industries are not following this requirement and discharging directly into the domestic sewerage system. However, the levels of heavy metals found in the sludge are well below China's national standard for using sludge for land applications. As such, most of Guilin's WWTP sludge, after composting at the Shangyao WWTP, is applied in forests and in landscaping.

39. The final application of compost produced by the sludge treatment facility might have long term impacts on the environment, especially flocculants used in sludge dewatering process which might affect soil texture as well as long-term cumulative impacts from heavy metals following years of land application. Guilin Forestry Bureau has agreed to the continued use of sludge compost in forests and for landscaping, but not in food-producing farmland. This is specified in the EMP.

40. The existing sludge composting plant within Shangyao WWTP currently has inadequate odor control and this poses adverse impacts on the ambient environment and surrounding

communities. It is also using land reserved for the expansion of Shangyao WWTP which is now surrounded by residential areas. To cope with an increase in WWTP sludge due to this urban development and to improve sludge treatment, new sludge treatment facilities, improved composting and a pilot for sludge sun-drying are proposed under the project.

41. **Related Activity**. The expansion of Chengbei WTP and associated road and water pipelines connecting it to the Second East Ring Road will be funded separately by the AFD and the local government. These investments are linked to this project as defined by the Bank's OP4.12. Thus a due diligence of their EAs has been carried out, which has verified these meet domestic and Bank requirements. Once the construction of these investments begins, due diligence of their construction and operation will also be conducted.

42. **Alternative Analysis**. Various alternatives, including a "no project" scenario, have been identified and were compared during the EA process aiming to avoid or minimize potential adverse environmental and social impacts. Alternatives considered included different technologies to upgrade WWTPs' to meet higher discharge standards; different methods for odor removal at WWTPs and pumping stations; options for sludge dewatering to 60% water content (including advanced dewatering-composting-land application and advanced dewatering-drying-incineration/landfill). Different options for sludge treatment were compared, namely direct land application, composting, brick-making and landfilling etc. Different composting technologies (open air windrow composting, composting cell and dano- drum composting) were reviewed, based on centralized versus decentralized arrangements. The recommended options are those considered most environmentally sound, economically viable and sustainable.

43. **Environmental Management Plan (EMP).** To effectively address the negative impacts, an EMP was developed for all components. The EMP outlines the institutional arrangement and responsibility of each party (PMO, owners, contractors, supervision engineers, operators, regulating government agencies, etc.) during implementation. The overall responsibility for ensuring the EMP's implementation rests with the PMO. The PMO should have at least one staff in charge of EMP implementation, supervision, monitoring and reporting.

44. The EMP specifies common mitigation measures especially during construction and site-specific measures for individual components especially during operation. The EMP devises a detailed environmental monitoring plan for construction and operation phases covering discharge at source, ambient air, water quality and noise levels with details on parameters to be monitored, location, frequency, the monitoring agency and budget estimates.

45. To ensure effective EMP implementation, a budgeted training plan has been developed with content and arrangements for all parties. The EMP also proposes reporting and supervision schemes for EMP implementation and sets out requirements on reporting by major parties and response procedures to ensure appropriate actions are taken when problems are found.

46. **Environmental and Social Management Framework (ESMF).** To deal with the uncertainty in the location of the sludge treatment plant, an ESMF was prepared as a chapter of the EA. It specifies a set of site selection criteria for the sludge plant stipulates requirements on its EA preparation highlighting public consultation and outlines EA review and approval

procedures. Arrangements for updating the EMP of this subproject are also described in the ESMF with the implementation and supervision mechanism being the same as the overall project.

47. **Public Consultation and Information Dissemination.** Three rounds of information disclosure followed by public consultation were conducted during the EAs preparation. The first round was in November 2013 with the project announcement and EA outlines published at the official websites of Guilin Development and Reform Committee (where the PMO is located) and the City Utility Bureau as well as bulletin board of affected local communities. The second round took place in January and February of 2014 mainly through public notice posted in affected neighborhoods with the draft EA and EMP available at the offices of the PMO and Municipal Drainage Company. The third round was conducted in May 2014 after the ESMF was added to the EA.

48. Public consultations for the EA and EMP were carried out mainly through questionnaire and meetings. The survey involved more than 500 people of different age groups, genders, educational backgrounds and occupations, as well as experts and officials of relevant government agencies. The majority of the public support the project as it is viewed as beneficial for the local environment and quality of life. Public concerns and opinions expressed during the process have been incorporated during the finalization of the EA package and integrated into the project design and environmental mitigation measures. The English version of the EA, EMP and the executive summary were posted on May 15, 2014 at the Bank's Infoshop, and the revised EA, EMP and executive summary were disclosed on July 8, 2014 at the Bank's Infoshop.

Monitoring & Evaluation

49. A result-based monitoring and evaluation system (MES) will be agreed and established under the project, for implementation by the PMO and the PIUs, to monitor and evaluate project implementation progress, and analyze results towards achieving the project development objective under each component. The MES will monitor project outputs and evaluate project outcomes. The system will include a database of: (i) project outcome indicators to measure achievement of the overall project objectives and changes in performance; and (ii) intermediate outcome indicators for each subcomponent with baseline values and target values. Intermediate outcome indicators, will used to monitor progress towards achieving the targets of key outcome indicators, in the semi-annual progress reports. These reports will be kept up-to-date and provided as needed by the Bank, PMO and PIUs. Agreed indicators are listed in Annex 1.

50. Monitoring will include emission and odor monitoring for the sludge management component and safeguards compliance monitoring. GEPB will regularly monitor emissions and odors at the sludge composting plant. Safeguards compliance monitoring, based on the EMP and RAP, will be conducted by the external environmental and resettlement supervision consultants. The Bank will supervise the project twice a year through supervision missions. The definition of the monitoring indicators, methodology, and implementation arrangements are detailed in the PIP.

Role of Partners

51. Guilin is applying for a 25 million Euro loan from the French Agency for Development (AFD) for the expansion of the existing Chengbei Water Treatment Plant, which is linked to our project. The appraisal mission is planned in January 2015, and it is expected that the project will be presented to the AFD Board in the third quarter of 2015. As mentioned earlier, even without the expansion of the Chengbei WTP, the current treatment capacity can supply water to an additional 200,000 residents, which is 80% of the targeted capacity by 2020. The team has met a number of times with the AFD team and to ensure close monitoring during project implementation, an indicator related to the expansion of the WTP was included in the results framework of this project.

Annex 4: Operational Risk Assessment Framework (ORAF)

CHINA: Guilin Integrated Environment Management Project

Project Stakeholder Risks	**Rating**	Moderate		
Description: Guilin city residents may have concerns about increased costs (tariffs) for their wastewater treatment.	**Risk Management:** Government of Guilin city is committed to lowering the costs of water supply through optimizing operations and the financing plan, and gradually adjusting wastewater tariffs based on affordability. Residents are well aware of the water environment situation in Guilin and the related challenges for government. GMG already increased both the water tariff (effective from Feb 1, 2012) and wastewater tariff (effective from May 1, 2013)			
	Resp: Client	**Stage:** Both	**Due Date:**	**Status: Ongoing**
Implementing Agency Risks (including fiduciary)				
Capacity	**Rating:**	Moderate		
Description: The fact that the project management office (PMO) and implementing agency have limited knowledge of the Bank's policies and procedures may affect the project quality and delay the project implementation.	**Risk Management:** Targeted training of the PMO and implementing agency staff on Bank policies and procedures, project management, procurement and financial management, etc. will continue to be provided throughout the early stages of implementation. Specialized consulting firms for technical studies, technical design, EA, RAP, construction supervision, independent monitoring, and implementation support, etc. will be hired to ensure smooth implementation, quality of project activities, and compliance with Bank and government policies and procedures. A project management manual, including procurement and financial management manuals, has been prepared to guide project implementation.			
	Resp: Client/Bank	**Stage:** Both	**Due date:**	**Status:** ongoing
Governance	**Rating:**	Moderate		
Description: Lack of coordination among different sector agencies could lead to indecision on important project issues and interruptions in implementation.	**Risk Management**: Coordination and guidance will be provided by Guilin PLG headed by the executive vice mayor to ensure cross-sector cooperation and timely decision on important policy, organizational and financing issues related to the project. The PMO, located in the local DRC, will be responsible for the day-to-day coordination between the different agencies.			
	Resp: Client	**Stage:** Both	**Due Date:**	**Status:** Ongoing

<table>
<tr><td colspan="2">Project Risks</td><td colspan="4"></td></tr>
<tr><td>Design</td><td>Rating:</td><td colspan="4">Moderate</td></tr>
<tr><td rowspan="3">Description: The self-supplied water of industrial sector is difficult to manage in Guilin urban area. There is a risk that self-water supply industries might not meet effluent discharge standards and might not pay their wastewater tariffs.

Description: The technology for sludge composting is globally and nationally well-proven and while it shows great promise and potential for cost savings, it also carries risks if it is not implemented in a careful and deliberate manner given current food safety issues in China, i.e. if it is used as a fertilizer or soil conditioner for edible crops.</td><td colspan="5">Risk Management: The newly enacted Urban Drainage and Wastewater Treatment Regulation provides a powerful tool for the regulators to enforce the discharge permit system (DPS) throughout the project area, and GMG will have to give their commitment that DPS will be implemented and monitored, and one of the components to be implemented by GEPB will provide this support throughout the project. A self-provided water shutdown plan will be implemented until 2025.</td></tr>
<tr><td>Resp: Client</td><td>Stage: Implementation</td><td>Due Date :</td><td>Status: ongoing</td></tr>
<tr><td colspan="5">Risk Management: Review of the proposed process has been carried out by the most qualified experts in the field engaged by the Water Expert Team (WET), and the experts will be retained during implementation to provide continued guidance to Guilin. They will help prepare a flexible sludge management strategy, which will first review possible end-use / disposal options for sludge and thereof derive and optimize necessary sludge treatment technologies. This is expected to be safer and more cost-effective than the direct construction of a new central sludge composting plant, as formerly envisaged.</td></tr>
<tr><td>Social & Environmental</td><td>Rating:</td><td colspan="4">Substantial</td></tr>
<tr><td rowspan="3">Description: Lack of experience of the implementing agency and PMO in managing and implementing project related environmental management plans and resettlement action plans may result in non-compliance of safeguard policies during implementation.

Description: Initial opposition to the siting of the sludge composting facilities within the potential sites have resulted in the final site selection to be decided during project implementation under an Environmental Management Framework” approach. The risk is that the site will not be agreed upon timely and the important issue of having a well-designed and functioning sludge</td><td colspan="5">Risk Management: Qualified consulting firms experienced in Bank-supported projects have been hired to carry out environmental assessment and resettlement action planning. An EA/EMP and RAP have been prepared in line with Bank policy requirements. These plans will be implemented with external supervision and monitoring. Initial safeguards training has been provided to project staff and further training will be conducted throughout the project period.</td></tr>
<tr><td>Resp: Client</td><td>Stage: Both</td><td>Due Date :</td><td>Status: ongoing</td></tr>
<tr><td colspan="5">Risk Management: Extensive consultations have been carried out with communities surrounding the potential sites following the results of the survey which indicated dissatisfaction with the location of the composting plant in their community. Most of the opposition comes from the environmental conditions surrounding the existing sludge composting facility within urban boundaries. The existing facility is land constrained and poorly operating causing a lot of odor issues in the surrounding community. The new composting plant will be properly designed and operated to keep odors to a minimum. To deal with the uncertainty on the location of the sludge treatment plant, an ESMF was prepared as a chapter of the EA. It specifies a set of site selection criteria for the sludge plant, stipulates requirements on the EA preparation including highlighting public consultation and outlining the EA review and approval procedure. Arrangements for updating the EMP of this subproject are also described with the implementation and supervision</td></tr>
</table>

composting facility not resolved as sludge quantities increase over the life of the project investment.	mechanisms being the same as the overall project.			
	Resp: Client	**Stage:** Both	**Due Date :**	**Status:** ongoing
Program & Donor	**Rating:**	Low		
Description: The associated expansion of the Chengbei water treatment plant funded by AFD or the associated pipe to be built with government funds in the west/south of the urban core area may finish later than the Bank project.	**Risk Management:** The municipal government has agreed to prioritize the funding of these associated works and ensure their completion ahead of the Bank project. The Bank will monitor the progress of those works during implementation to make sure that they are completed timely.			
	Resp: Client	**Stage:** Implementation	**Due Date :**	**Status:** not yet due
Delivery Monitoring & Sustainability	**Rating:**	Moderate		
Description: Financial sustainability for GWC/GSC is difficult to achieve in light of low tariffs and high capital investment requirements in the near future.	**Risk Management:** Break-even O&M cost recovery should be the target under the project i.e. total revenues equivalent to not less than total operating expenses, excluding depreciation. In additional, financial sustainability issues will be monitored throughout project implementation by conducting an annual financial forecast and recommendations will be given on required tariff increases or subsidies from the government in case of delay in tariff increase.			
	Resp: Client	**Stage:** Implementation	**Due Date :**	**Status:** not yet due
Overall Risk Following Review				
Implementation Risk Rating: Moderate				
Comments: Based on assessment of the main risks identified and mitigation measures conceived and taken during project preparation, the overall risk is "moderate" for the project implementation stage.				

Annex 5: Implementation Support Plan

CHINA: Guilin Integrated Environment Management Project

Strategy and Approach for Implementation Support

1. The implementation support plan has been developed based on the Project risk profile as elaborated in the ORAF, and focuses on: (a) implementation agencies' technical capacity; (b) implementation of the EMP and the RAP; and (c) fiduciary aspects, i.e., procurement and financial management.

Implementation Support Plan

2. **Technical Guidance and Results Monitoring.** Bank technical specialists (WSS/Sludge Management) will review and provide advice on technical designs, implementation and results monitoring & evaluation issues, as well as on TA studies. The Bank will facilitate the organization of exchange visits for project agencies to learn from other relevant small town development projects. During preparation, the most qualified international experts have reviewed the proposed sludge management process. These experts will be retained during implementation to provide continued guidance to Guilin in conducting least-cost analysis by first reviewing possible end-use and disposal options for the sludge and thereof deriving and optimizing sludge treatment technologies. This is expected to be safer and more cost-effective than the direct construction of a new central sludge composting plant, as formerly envisaged.

3. **Procurement Management.** Procurement implementation support will include: (a) facilitation of targeted training to procurement staff in the PMO to reinforce training provided during project preparation; (b) reviewing procurement documents and providing timely feedback on the results of prior reviews and post reviews; (c) providing detailed guidance, assistance and interpretation of the Bank's Procurement Guidelines to Project procurement staff; and (d) monitoring procurement progress against the agreed Procurement Plan.

4. **Financial Management.** FM implementation support will include: FM training to build on training provided during project preparation; confirmation of the availability of counterpart funds as per the agreed plan; monitoring compliance with the FMM; monitoring timely submission of IFRs and audit reports (both internal and external) and following up on issues identified during the review of these reports.

5. **Environmental Safeguards.** Implementation support on environmental management will include: site visits to verify compliance with the EMP; review of periodic internal and external environmental monitoring reports; and initiating remedial action, where appropriate in consultation with the Bank Team Leader, on areas of non-compliance with Bank environmental safeguards.

6. **Social Safeguards.** Implementation of the RAP will be the principal focus of implementation support on social safeguards. As with environment, social implementation support will be carried out through site visits and review of internal and external monitoring

reports. Special attention will be paid to ensure that compensation is paid to PAPs in the appropriate amount and in a timely manner, and that complaints are addressed as per the agreed complaints handling procedures.

7. **Use of Country Office Based Staff.** Most of the Bank team members are based in the China country office in Beijing to ensure rapid and effective response to the Borrower's needs for implementation support. Formal supervision and field visits covering all aspects of Project implementation will be carried out semi-annually and will be complemented by need-based visits by small groups.

8. Estimated inputs from different specialists during different stages of Project implementation are summarized below.

Time	***Focus***	***Skills Needed***	***Resource Estimate***
First twelve months	Team Leadership	TTL	5 SWs
	Procurement, training and review	Procurement Specialist	3 SWs
	Financial management and disbursement	Financial Management Specialist	2 SWs
	Social and Resettlement	Social Development Specialist	3 SWs
	Environmental training and supervision	Environmental Specialist	3 SWs
	WSS	WSS Engineer	3 SWs
	Sludge Management	International Sludge Management Specialist	2 SWs
	IT/GIS	IT/GIS Specialist	2 SWs
12-48 months	Team Leadership	TTL	16 SWs
	Procurement, training and review	Procurement Specialist	8 SWs
	FM and disbursement training and FM supervision	FM Specialist	6 SWs
	Social and Resettlement	Social Development Specialist	8 SWs
	Environmental training and supervision	Environmental Specialist	8 SWs
	WSS	WSS Engineer	8 SWs
	Sludge Management	International Sludge Management Specialist	4 SWs
	IT/GIS	IT/GIS Specialist	4 SWs
Other			

Annex 6: Economic and Financial Analysis

CHINA: Guilin Integrated Environment Management Project

I. Economic Analysis

1. This section comprises three parts: (i) a cost-benefit analysis of the water supply investment; (ii) a qualitative assessment of the wastewater investments; and (iii) a cost-effectiveness analysis of the sludge investment.

Component 1.Water Supply

Supply and demand

2. ***Population.*** In 2011, the city of Guilin had a permanent resident population of 935,814. Growing at its current rate of 1.4 percent annually, the city's population will reach 1,143,500 by 2025.

3. ***Access to the municipal water network.*** In 2011, the municipal piped water network in Guilin served a population of 803,000, accounting for 86 percent of the city's population. Over the period of 2008 to 2012, Guilin Water Supply Company (GWSC) had managed to expand the reach of the network at an average annual rate of 1.8 percent. Continuing at this pace, the population with access to the network will reach 90 percent, adding a population of 220,877 to be served by 2025. Among the new population to be served, about 80 percent will be added due to natural population growth in the areas currently served by the network with the remaining 20 per cent to be served as the supply network is expanded.

Table A6.1. Projection of served population and demand for municipal network supply

	Served Population			**Demand** (m^3 per day)		
	2011 Actual	**2025 Projection**	**Incremental**	**2011 Actual**	**2025 Projection**	**Incremental**
Current served areas	803,000[1]	981,210	178,210	275,068	336,115	61,046
New area to be served	-	44,267	44,267	-	15,164	15,164
Total	803,000[1]	1,023,877	**220,877**	275,068	351,278	**76,210**

[1] Permanent residents only

4. ***Unserved population*** In 2011, an estimated 132,814 people relied on water sources outside the municipal network, including (i) decentralized captive water treatment systems (WTPs) operated by enterprises or collectives; (ii) groundwater wells belonging to households or collectives; and (iii) nearby surface water bodies.

a. ***Captive systems***. A sizable portion of the existing off-network water consumption is currently supplied by decentralized captive systems operated by industries, enterprises or collectives. By the end of 2013, the Municipal Water Conservation Office (MWCO) reported 68 such captive systems with a combined capacity of 24,800 cubic meters per

day. To better manage and utilize the city's water resources, NWCO has been gradually closing down these captive systems, resulting in rapid decline in water supply from the captive systems in recent years. Much of the remaining supply from these systems will be closed down and switched to the network in the coming years.

b. ***Groundwater Wells***. Many rural households in the suburbs still rely on groundwater wells for water supply. The water quality from the groundwater wells varies considerably depending on the characteristics of the groundwater, time of year, and proximity to any contamination source. Although many rural households are generally satisfied with the quality of the water supply from groundwater wells, many of them still keep a bulk container (usually 19-liters in size) of distilled water for emergency and/or regular drinking use. With urbanization and population growth, the quality of groundwater supply has gradually declined. To better conserve the city's water resources, the government has mandated conversion from groundwater wells to the network in some villages located near the urban center.

5. ***Network Supply.*** Guilin has four water treatment plants (WTPs) with a combined capacity of 440,000 cubic meter per day, including 3 times 100,000 cubic meter per day from Chengbei WTP, Dongzhenlu WTP, and Dongjing WTPs, respectively, and 140,000 cubic meters per day from Wayao WTP. Due to treatment quality restrictions, Dongzhenlu WTP can only operate at half of its designed capacity of 100,000 cubic meters per day. Thus, as of end 2013, the four WTPs had a combined capacity of 390,000 cubic meters per day.

6. In 2013, a total of 100.4 million cubic meters of clean water was sold from the municipal water network with an average of 274,945 cubic meters per day and 329,934 cubic meters on a peak day, 60 percent of which was for domestic use. Moreover, non-revenue water accounted for approximately 15 percent of the network supply in 2013. By 2025, at the same per capita consumption levels, demand for network water will reach 385,805 cubic meters per day, or 462,966 cubic meters on a peak day.

7. ***Expansion of Chengbei WTP.*** Based on the current projection, demand at the peak load will exceed the combined capacity of the four WTPs in 2014 once non-revenue water is taken into account. As part of the linked activities of the Project, Chengbei WTP will be expanded to add 200,000 cubic meters treatment capacity per day by 2016.

Cost-benefit analysis

8. The economic analysis covers over a 20-year period from 2014 to 2033, inclusive of a 3-year construction period, at the economic opportunity cost of capital of 10 percent. The economic benefits and costs were expressed in domestic currency and constant 2013 prices net of costs of transfer, financial charges and price contingencies. International costs were converted to local currency at an exchange rate of RMB 6.20 to US$1.00. Project costs and benefits were estimated on a without- and with-project basis.

9. ***Costs*** *of* the component include both investments and ongoing costs of operation and maintenance (O&M) as follows:

a) *Investment costs* include: (i) the expansion of the Chengbei WTP of RMB 314.3 million, (ii) project investment in the water main and pipes at RMB 253.6 million; and (iii) subsequent connection costs from the water main to individual households at RMB 1,800 per connection for new households located in current network service areas and RMB 5,230 per connection for households outside. The weighted average cost of connecting the additional 220,877 people (approximately 55,220 households) is around RMB 2,643 per connection.

b) *O&M costs* include: (i) a fixed part estimated at RMB 1.02 million per annum, growing at an average annual rate of 10 percent; and (ii) a variable part at RMB 0.56 per cubic meter, inclusive of a water resources charge.[8] Some savings in O&M costs may be achieved through economies of scale. Compared with the without- project scenario, the incremental operating cost of additional supply equals to the short-run marginal cost (SRMC) of supply, i.e. the variable portion of the O&M cost.

Table A6.2. Summary of project related costs

	Cost (RMB)
Investments	
- Water plant expansion	314.3 million
- Water main	253.6 million
- Distribution	2,463/connection
O&M	
- Marginal portion only (inclusive of a water resources charge)	0.56/m^3

10. ***Benefits*** of the water supply investments include: (i) water supply to meet growing demand in the current service areas of the network; (ii) increased access to clean water supplied from the network in previously unserved areas; and (iii) savings in O&M costs. The project will also bring other benefits, including: (i) health benefits from water quality improvements; (ii) better management and conservation of the city's groundwater; and (iii) improved security of water supply.

11. ***Willingness-to-pay*** for domestic water supply was estimated based on the outcomes from a survey of 1,500 households in five districts of the Chongqing municipality, China in 2006. [9] The analysis of the survey outcomes indicated that WTP for improved water service was between 1.5 to 2.0 percent of the household income. In 2013, per capita disposable income in Guilin was RMB 24,552 ($3,960) and RMB 8,361 ($1,349) for urban and rural residents respectively. Due to the higher nominal urban income in Guilin today compared with that in Chongqing at the time of the survey, a further conservative measure was taken to assume WTP among urban households at 1.0 percent of household income level.

[8]All captive water suppliers are required to pay a water resources charge at RMB 0.12/m3 for ground water supply, and RMB 0.18/m3 for underground water supply. Rural households using backyard wells are currently exempt from paying the charge. GWSC is paying on average RMB0.03/m3 for its water supply.

[9]Wang, H; Xie, J.; and Li, H. "Water Pricing with household surveys: a study of acceptability and willingness to pay in Chongqing, China." China Economic Review 21 (2010) 136-149.

Table A6.3. Summary of Willingness-to-Pay

Consumption group	Willingness-to-Pay
Domestic - Urban - Rural	 1.0% of household disposable income 1.5% of household disposable income
Non-domestic	Current tariff of RMB 2.15 ($0.35) per cubic meter

Result of the Economic Analysis

12. Based on the above assumptions, the Project and its linked investments under the Water Supply component yield an economic internal rate of return (EIRR) of 11.2 percent.

Component 2. Wastewater Management

13. ***Current Situation***. The city of Guilin has six wastewater treatment plants (WWTPs) with a combined installed capacity of 415,000 tons per day. Guilin Wastewater Company owns and operates four out of the six plants, with a combined installed capacity of 355,000 tons per day. Currently, none of these plants meet the national discharge standard for effluent quality of no less than Class IA[10] to be imposed soon by GEPB. The existing odor-control and disinfection facilities in those plants are inadequate, posing environmental and health risks to the neighborhood communities. Moreover, maintenance costs have been rising in recent years due to frequent breakdowns of aging pump stations and wastewater pipelines.

14. The Project will invest in: (i) about 40km of sewer networks will be rehabilitated and 32-km sewer networks will be newly constructed; (ii) 4 WWTPs (Shangyao, Qilidian, Beichong, and Lingui) will be upgraded to Class 1A; (iii) odor control and disinfection facilities to be replaced or upgraded in 5 WWTPs (Shangyao, Qilidian, Beichong, Yanshan and Lingui); (iv) sludge dewatering equipment to be upgraded in 3 WWTPs (Shangyao, Qilidian and Beichong); and (v) aged equipment at 20 pump stations will be replaced and new odor removal equipment to be installed. At 2014 prices, the economic cost of the component is estimated at US$ 448.73 million.

15. ***Cost-effectiveness of the wastewater investments.*** For the upgrade of the effluent quality of the WWTPs, a set of rehabilitation measures were cost effective, on a least-cost basis, over the construction of new treatment facilities. Moreover, new equipment for odor control, sludge dewatering and disinfection will be added to the four WWTPs. At the feasibility stage, four odor-control methods were evaluated, including: reactive oxygen ionization (ROI), chemical absorption, biofilter and liquid atomization. ROI was chosen due to its high operating efficiency as a result of less pressure loss. The lifecycle cost of ROI was also the lowest among the four identified alternatives.

16. The Project investment will reduce the pollutant concentration of the effluent from the four WWTPs thus helping maintain the amenity value of the Lijiang River for tourists and local residents. Currently, the Lijiang River ambient water quality is classified as Class III, suitable for

[10] Source: the *Discharge Standards for Municipal Wastewater* (GB18918-2002)

drinking after treatment. Growing numbers of tourists and residents will increase the total amount of pollutants discharged unless sewage is treated to reach a lower pollutant concentration. Renowned worldwide for its attractive karstic formations along the Lijiang River, Guilin Municipality is a major tourist destination in China, both for Chinese and for international visitors.

17. In 2012, Guilin City received about 13.6 million visitors. The number of visitors has increased steadily from 7.96 million in 2007 and is expected to continue to increase at a similar rate. Guilin's total tourism income in 2012 was about RMB 27.7 billion (about US$ 4.5 billion), which was equivalent to 18.5 percent of its GDP in the same year. However, as the most significant tourist attractions are on or near the Lijiang River and are mostly accessed through boat trips, river water quality is an important factor in Guilin's appeal for tourists. A quantitative estimation of the impact of deteriorating water quality in the Lijiang River on tourist arrivals and therefore tourism income is difficult to assess. However, the sheer size of the sector indicates, that even a small decrease in tourism income would be significant, compared to the cost of the proposed investments. For illustrative purposes, the present value of a 0.25 percent decrease in annual tourism income over 15 years would exceed the total cost of this component.

18. The Lijiang River also provides important amenity value to Guilin's 935,000 residents, who enjoy boating, swimming, strolling or simply relaxing on benches along the river banks. Evidence from a study in Beijing suggests that citizens also derive significant non-use values. Day and Mourato (1998) found that non-use motivations appear to be the most important determinants of river preservation for Chinese citizens: the desire to preserve rivers for future generations or for third parties, for the sake of the animals and plants that find their habitat in river environments and to keep the option of having clean rivers in the future. Given the exceptional scenic beauty and historical significance of the Lijiang River in the Guilin area, it would be by no means a stretch to claim that Guilin residents place similar values on the Lijiang River. No attempt has been made to quantify these values in monetary terms, as it would require broad assumptions.

19. Other non-readily quantifiable, but important benefits of this component include: (a) minimization of discomfort to citizens from odor from Five WWTP and 20 pumping stations, some of which are located in urban areas adjacent to apartment buildings; (b) improved working conditions for workers at pumping stations through the installation of ventilation and odor control systems; (c) savings in treatment costs through prevention of influx of groundwater into sewer pipes which increase the volume of wastewater to be treated; and prevention of groundwater contamination by leakages of wastewater from sewer pipes.

Component 3. Sludge Management

20. ***Current situation***. At present, the moisture content of the treated sludge in Guilin is in the range of 82 to 85 percent. Such high moisture content poses operational and environmental challenges in sludge handling and disposal.

21. The Project will invest in: (i) upgrading the sludge dewatering equipment at the above mentioned four WWTPs to produce sludge cakes with moisture levels around 60 percent; (ii) the

construction of a sludge management plant equipped with a solar drying facility with a capacity of 20 tons per day, and a composting facility with a capacity of 130 tons per day and associated odor-control equipment; and (iii) acquiring a fleet of sludge hauling trucks. At 2014 prices, the investment cost of the component is estimated at US$107.30 million.

22. ***Cost-effectiveness of sludge investments.*** Three sludge post-treatment disposal technologies were evaluated at the feasibility stage, including sanitary landfill, incineration and composting. The lifecycle cost of composting is about one-half to one-third that of incineration. Moreover, once space limitation and additional land requirements are taken into account, composting also surpasses sanitary landfill as the least-cost and is the environmentally more friendly solution. Furthermore, there will be a positive economic value associated with the treated sludge compost as fertilizer even though it will be supplied to the Forestry Bureau free of charge.

II. Financial Analysis

23. To provide Guilin Municipality with additional 200,000 m³ per day of water, GMG will build a new water supply scheme with total investment of about RMB 878.38 million. This new water supply scheme includes the AFD financed expansion of the Chengbei WTP with a new total capacity of 300,000 m³ per day, distribution networks, and booster pumping stations. Requested by GMG, the Bank will finance the construction of one pumping station and 36% of distribution networks, which forms the Water Supply Component of the project. As there is a lack of financial information and data about the new water supply scheme, it is not possible to carry out the financial analysis of the Water Supply Component of the project. However, the investment costs of the new water supply scheme, its O&M costs, and benefits from water sales are included in the financial analysis of the project company.

24. The main feature of the Wastewater Management Component is to upgrade the effluent from Levels II or 1B to Level 1A and control the odor. The aim of the Sludge Management Component is to build a solar drying facility and composting facility to treat sludge from the WWTP and to control the odor. The capacity of WWTPs in Guilin will not be increased. Without the incremental benefits, it is not possible to conduct financial analysis of the Wastewater Management Component. Nevertheless, the investment costs and O&M costs of the Wastewater Management and Sludge Management Components are included in the financial analysis of the project company.

25. Although it is not possible to conduct financial analysis of the project as a whole, the financial analysis of the project companies – Guilin Water Supply Company and Guilin Sewerage Co., Ltd. was conducted to assess their financial viability and measures to help the project companies achieve financial viability.

Financial Analysis of Project Companies

26. **Guilin Water Supply Company** (GWSC) was formed in 1936. It operates 4 water plants which are Chengbei Water Plant, Dongjiang Water Plant, Dongzhenlu Water Plant, and Wayao Water Plant with a total capacity of 440,000 m³ per day. It also operates 3 booster pumping

stations as well. GWSC maintains 1,049km of distribution networks with a diameter more than 80mm.

27. In 2012, GWSC supplied 99.78 million tons of water. It is estimated that by 2025 total water supplied by GWSC would be 473,500 m³ per day. The rate of increase is about 5.9% annually. To meet the new demand, a new water supply scheme including a water supply plant with a capacity of 200,000 m³ per day and distribution network and booster pumping stations will be built under linked projects financed by AFD and local funds. The total investment costs of these projects are estimated at about RMB 878.38 million.

28. The Water Supply Component of this project is a part of the wider new water supply scheme. The total investment of this Component is about RMB 227.85 million. The Bank will provide RMB 145.17 million of loans to support this Component.

29. The financial statements of GWSC over the five year period 2009 to 2013 show that it has a reasonably good financial situation.

Table A6.4. GWSC's Financial Statements and Indicators, 2009-2013 (RMB Million)

	2009	2010	2011	2012	2013
Total Assets	844.2	1,209.2	1,249.2	1,299.7	1,428.8
incl. Current Assets	177.4	223.6	196.8	196.9	308.8
Total Liabilities	424.3	758.0	794.1	778.7	855.9
incl. Current Liabilities	203.2	309.9	293.8	266.5	308.7
Equity	419.9	451.2	455.1	521.0	572.9
Total Revenues	117.7	126.9	136.2	175.7	187.8
Profits	2.5	1.9	3.4	19.7	33.4
Net Income	2.0	1.6	3.2	17.2	28.7
Full Cost Recovery Rate	1.1	1.1	1.1	0.5	1.3
Debt Service Coverage Ratio	4.6	3.9	3.0	0.3	5.8
Working Ratio	73%	78%	78%	70%	65%

30. Based on these financial projections of GWSC for the next 25 years were made and the full analysis is included in the project files. When these projections were prepared, the following assumptions were made:

- The investment for the next 25 years only includes the investments in the new water supply scheme which provide additional water to Guilin Municipality, including the Bank-financed project. The total investment costs were RMB 878.38 million.
- The financing plan for the new water supply scheme includes the Bank loan of RMB 145.17 million, local bank loans of RMB 178.4 million, a € 25 million loan from AFD (about RMB 191.3 million), ear-marked funds from central government for water supply pipelines of RMB100 million, and internal cash of GWSC of RMB 263.51 million.
- The average cost of water production over the past 5 years was used to make projections of future water production costs. The O&M costs include the costs of producing water

such as chemicals, power, salaries, etc. as well as depreciation; sales; overheads; and others. In 2012, the unit cost of water sold was about RMB 1.57/m^3.

- The amount of water to be supplied in 2025 is projected by GWSC and an annual increase rate of 5.9% was used to project annual water supply from 2012 to 2025.
- The water tariff in Guilin Municipality was last adjusted in February 2012. The current tariff for residential users is RMB 1.47/m^3, for non-residential users is RMB 2.14/m^3, and for special purposes is RMB 6.54/m^3.

31. Taking these major assumptions into account, the financial projections of GWSC for the next 25 years were made and the following table summarizes the situation of GWSC until 2025.

Table A6.5. GWSC's Financial Forecast and Indicators, 2014 – 2025 (RMB Billion)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Assets	1.39	1.57	1.75	1.92	1.86	1.87	1.83	1.79	1.76	1.74	1.71	1.70
incl. Current Assets	0.32	0.34	0.38	0.41	0.39	0.41	0.39	0.38	0.39	0.45	0.52	0.60
Total Liabilities	0.72	0.76	0.82	0.88	0.74	0.75	.71	0.67	0.64	0.61	0.58	0.56
incl. Current Liabilities	0.28	0.29	0.31	0.32	0.29	0.29	0.29	0.28	0.28	0.28	0.28	0.28
Equity	0.67	0.80	0.93	1.05	1.12	1.12	1.12	1.12	1.12	1.13	1.13	1.14
Total Revenues	0.19	0.20	0.20	0.21	0.22	0.24	0.24	0.25	0.26	0.27	0.27	0.28
Profits	0.03	0.03	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Net Income	0.03	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Average Water Tariff	1.69	1.69	1.69	1.69	1.69	1.81	1.81	1.81	1.81	1.81	1.81	1.81
Full Cost Recovery Rate	1.2	1.1	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Debt Service Coverage Ratio	1.6	1.5	1.9	1.9	1.8	5.0	1.8	1.9	2.1	2.2	2.2	2.6
Working Ratio	62%	64%	67%	70%	71%	67%	67%	66%	65%	65%	65%	65%

32. The results of this analysis show that the current water tariff in Guilin Municipality could generate profits and meet the requirements of full cost recovery and debt servicing.

33. **Guilin Sewerage Company Limited.** GSC was established in 1997. It operates 4 wastewater treatment plants (WWTPs) which are Beichong WWTP, Qilidian WWTP, Shangyao WWTP, and Yanshan WWTP and they serve Northern District, Eastern District, Middle-Southern District, and Yanshan District in Guilin Municipality. In 2013 the total treatment capacity was 355,000 tons per day. The new Lingui WWTP with 30,000 m^3/day design capacity was handed over to GSC in July 2014, and its asset value is still pending for transfer to GSC.

GSC also operates 22 sewage pumping stations and maintains 271.7km of sewers. In addition, GSC operates 6 rainwater pumping stations and maintains 235km of rainwater networks.

34. In 2012, GSC treated 76.513 million tons of wastewater. It is estimated that by 2025 the wastewater to be treated by GSC will reach 124.850 million tons of wastewater. The annual increase rate is 4.4%. Therefore by 2025, the needed treatment capacity will be 342,060 tons per day, which can be met from the existing as built design capacity of 355,000 tons per day.

35. However, a technical study shows that it is necessary to replace the equipment of pumping stations and control their odor, to rehabilitate the sewer networks, and to upgrade the effluent discharge of WWTPs from Levels II or 1B to Level 1A. Sludge treatment is another aspect that needs considerable improvement.

36. The investment for these replacement, rehabilitation, and upgrade works will increase the costs of wastewater treatment, but not revenue. Thus the financial analysis was made to analyze the financial situation of Guilin Sewerage Co., Ltd. (GSC)and its financial viability.

37. The financial statements of GSC were collected over the 5-year period between 2009 and 2013, and show that GSC ran a loss for the last 3 years. These losses were before depreciation.

Table A6.6. Summary of GSC's Financial Statements, 2009 – 2012 (RMB million)

	2009	2010	2011	2012	2013
Total Assets	545.1	636.8	759.6	838.0	836.9
incl. Current Assets	104.8	96.1	123.4	124.1	165.4
Total Liabilities	174.7	222.7	313.1	370.2	487.1
incl. Current Liabilities	9.7	8.7	8.4	8.9	31.3
Equity	370.3	414.1	446.5	467.8	349.8
Total Revenues	70.4	71.1	73.6	70.5	87.1
Profits	0.4	(0.4)	(4.8)	(8.0)	(4.5)
Net Income	0.4	(0.4)	(4.8)	(8.0)	(4.5)
Full Cost Recovery Rate	0.99	0.99	0.93	0.89	0.95
Debt Service Coverage Ratio	(0.6)	(183.1)	(1.1)	(1.0)	0.3
Working Ratio	101%	101%	107%	112%	106%

38. Based on these financial projections of GSC for the next 25 years were made, and a full analysis is included in the project file. When these projections were prepared, the following assumptions were taken into account:

- The major investment until the year 2025 only includes the Bank financed project to improve wastewater treatment facilities in Guilin Municipality. The total investment costs are RMB 604.02 million.

- The financing plan for the project includes the Bank loan of RMB 490.02 million and GMG's contribution of RMB 114 million.
- The average costs of wastewater treatment over the past 5 years were used to make projections of future wastewater treatment costs. The O&M costs include the costs of chemicals, power, salaries, etc. as well as sales; overheads; and others. In 2012, the unit cost of wastewater treatment was about RMB 0.97/m^3, excluding depreciation.
- The additional costs associated with the project include the costs for running new equipment, costs of odor control, and costs of sludge treatment. According to the engineering estimate, the costs of new equipment and odor control might be 10% of wastewater treatment and the costs of sludge treatment might be RMB400,000 annually.
- The wastewater tariff was collected based on water consumed. Based on historic information, the efficiency of wastewater tariff collection was 76% in 2012. This efficiency was used to project the wastewater tariff collection in the future.
- GMG adjusted the wastewater tariff in May 2013. According to GMG's decree, the wastewater tariff for residential users is RMB 1.05/m^3, and RMB 1.30/m^3 for non-residential users, and RMB 1.55/m^3 for special purposes.

39. Following these major assumptions, projections up to 2025 were made for GSC and summarized in Table A6.7 below.

Table A6.7. Summary of GSC's Financial Forecast, 2014 – 2025 (RMB billion)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Assets	0.72	0.71	0.70	0.69	0.68	0.68	0.67	0.66	0.66	0.66	0.66	0.69
incl. Current Assets	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.05	0.07	0.10
Total Liabilities	0.40	0.47	0.58	0.70	0.79	0.87	0.82	0.77	0.73	0.68	0.64	0.61
incl. Current Liabilities	0.06	0.06	0.08	0.10	0.12	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Equity	0.35	0.27	0.17	0.07	(0.02)	(0.08)	(0.04)	(0.00)	0.04	0.09	0.14	0.19
Total Revenues	0.11	0.11	0.11	0.12	0.12	0.13	0.17	0.17	0.18	0.19	0.19	0.20
Profits	0.00	0.00	0.00	(0.00)	0.00	0.01	0.04	0.04	0.04	0.05	0.05	0.05
Net Income	0.00	0.00	0.00	(0.00)	0.00	0.01	0.04	0.04	0.04	0.05	0.05	0.05
Average Wastewater Tariff	1.15	1.15	1.15	1.15	1.15	1.15	1.49	1.50	1.50	1.50	1.50	1.50
Full Cost Recovery Rate	0.80	0.95	0.86	0.84	0.87	0.83	1.00	1.02	1.04	1.06	1.09	1.20
Debt Service Coverage Ratio	0.52	0.83	0.61	0.48	0.80	0.70	1.16	1.22	1.28	1.36	1.45	2.08
Working Ratio	90%	90%	89%	93%	90%	87%	72%	71%	70%	69%	67%	68%

40. The results of this analysis show that the current wastewater tariff in Guilin Municipality could not help GSC meet the requirements of full cost recovery and debt servicing. Hence, a

break-even covenant has been designed to replace the conventional financial covenant to cope with the local context in Guilin.

41. **Fiscal Impact** The financing plan for the project shows that GWSC will apply for earmarked funds from central government. However, the analysis shows that there is uncertainty about this earmarked fund. GMG agreed therefore to financially support and implement the project in the absence of such earmarked funds.

42. Under these circumstances, the fiscal revenues of GMG were reviewed to assess its availability to provide counterpart funds for GWSC and GSC.

43. The overall fiscal incomes of GMG include tax income, non-tax income, transfer payments from central and provincial governments through tax-sharing arrangements and general transfers. The tax and non-tax incomes account for 40% of total income.

44. The analysis shows that the annual increase rate of GMG's incomes from 2008 to 2012 was over 20%. In the future period for which the projection of GMG's fiscal income was made, the increase would slow down by 10% every year. Incomes which are available to be freely used by GMG are shown in the following table. These incomes are compared with the contribution requirements for GMG to implement the project including the backup function to GWSC. The results of the comparison show that the contribution is less than 1% of GMG's annual income. Therefore, GMG will have no difficulty in the next 5 years to implement the project.

Table A6.8. Fiscal Income Projection for GMG, 2013 – 2019 (RMB million)

	2013	2014	2015	2016	2017	2018	2019
Total Fiscal Income	6,659	7,448	8,263	9,097	9,941.	10,789	11,631
GMG's Contribution to Project	-	-	100.4	90.5	71.2	25.0	47.9
% of Contribution to Total Income			1.2%	1.0%	0.7%	0.2%	0.4%

Annex 7. Map of Project Locations

China: Guilin Integrated Environment Management Project