Validation Report

Reference Number: PVR-252
Project Number: 34472
Loan Number: 1996
November 2013

People’s Republic of China: Wuhan Wastewater Management Project

Independent Evaluation Department
Asian Development Bank
ABBREVIATIONS

<table>
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<th>Abbreviation</th>
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<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
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<tr>
<td>EIA</td>
<td>environmental impact assessment</td>
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<td>EIRR</td>
<td>economic internal rate of return</td>
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<td>IED</td>
<td>Independent Evaluation Department</td>
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<td>LAR</td>
<td>land acquisition and resettlement</td>
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<td>M&amp;E</td>
<td>monitoring and evaluation</td>
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<td>MEP</td>
<td>Ministry of Environment Protection</td>
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<td>O&amp;M</td>
<td>operation and maintenance</td>
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<td>PCR</td>
<td>project completion report</td>
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<td>WMG</td>
<td>Wuhan municipal government</td>
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<td>WPMO</td>
<td>Wuhan Project Management Office</td>
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<td>WUDDC</td>
<td>Wuhan Urban Drainage Development Company</td>
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<td>WWTP</td>
<td>wastewater treatment plant</td>
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NOTE

In this report, “$” refers to US dollars.

Key Words

asian development bank, land acquisition and resettlement, performance evaluation, sewer network, urban drainage, urban environment, wastewater charges, wastewater collection and treatment, wastewater treatment plants, water quality

The guidelines formally adopted by the Independent Evaluation Department (IED) on avoiding conflict of interest in its independent evaluations were observed in the preparation of this report. To the knowledge of IED management, there were no conflicts of interest of the persons preparing, reviewing, or approving this report.

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I. PROJECT DESCRIPTION

A. Rationale

1. The report and recommendation of the President (RRP)\(^1\) had reported that the cumulative effect of innumerable point and nonpoint discharges was being felt throughout the downstream reaches of the Changjiang (Yangtze River) and the East China Sea. The RRP described Wuhan as a center of industry, transport, and communications and is strategically located halfway along the several thousand kilometer reach of the Changjiang. In 2000, Wuhan’s wastewater discharge totaled 2.05 million cubic meters per day, consisting about three-fourths of domestic sewerage and one-quarter of industrial wastewater. The two existing wastewater treatment plants (WWTPs) could only treat 6% of the wastewater generated. In Wuhan, 56% of the rivers and 89% of the lakes were polluted by organic, nitrogen, and phosphorous waste. The existing septic tanks could not effectively treat wastewater due to the

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high population density, hydrologic, and soil conditions. Together with inadequate sewers, these resulted in sewage overflows. The people living in Wuhan were adversely affected by the lack of adequate wastewater management and water resources protection. Negative impacts were being manifested on public health, the living environment, risks to drinking water supplies, and the adverse influence on economic development.

2. The project loan modality was considered appropriate given the People's Republic of China’s (PRC) experience in implementing ADB-funded wastewater and water supply projects. The lessons learned were applied to the project design as appropriate.

B. Expected Impact

3. The project’s wastewater collection and treatment systems were designed as an integral part of the larger Wuhan Urban Wastewater Management Master Plan, which aimed to ensure that Wuhan’s wastewater treatment rate would reach approximately 70% by 2010. Together with capacity-building activities for corporate governance, wastewater management, and environmental monitoring, these were intended to contribute significantly to pollution control and environmental management in Wuhan and the Changjiang basin.

4. Three impacts were specifically identified in the RRP. The first was pollution reduction, water resources protection, surface water quality improvement, and living conditions improvement so that urban environment and amenities could facilitate increased economic growth opportunities, employment, business, tourism, and recreation. Associated targets were specified as (i) 100% of relevant water bodies in Wuhan meeting water quality targets by 2010, (ii) public satisfaction with the urban environment increasing by 25% by 2010, and (iii) increased opportunities for economic growth and employment (without specific indicators).

5. The RRP identified poverty reduction as the second impact, although this was not cited as an intended project impact in the project completion report (PCR). Indicators were specified as (i) improved living conditions in the poor areas, (ii) 45% of construction jobs for the poor, (iii) 77 full-time jobs for the poor, and (iv) the poor (assumed to account for 20% of connections) are connected to water and sanitation services at the same rate as the non-poor.

6. The third intended impact in the RRP was institutional development of the Wuhan Municipal Wastewater Company achieved with an indicator that the self-sustaining management operation and financing would be achieved by January 2007. The PCR used the standardized English name of the Wuhan Municipal Wastewater Company, which is, Wuhan Urban Drainage Development Company (WUDDC). The PCR reported that WUDDC achieved the management capacity as indicated in the RRP.

C. Objectives or Expected Outcomes

7. The first objective in the project framework is increased coverage of urban wastewater systems in Wuhan. Indicators were (i) achieving the Wuhan municipal government goal of 56% of wastewater treated by end of 2007; and (ii) collecting and treating wastewater in Sanjintan (up to 68%), Huangjiahu (42%), and Luobuzui (53%) areas by 2010. The second objective was to undertake enterprise-wide reform of WUDDC with a view to providing management and financial autonomy.

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2 See para. 14 of the RRP for an assessment of lessons learned with similar projects in the PRC.
D. Components and Outputs

8. The envisaged outputs of the project included (i) completion of three WWTPs, (ii) completion of sewers, (iii) introduction of effective operating regime, (iv) improvement in the surface water quality, (v) improvement in public health and living conditions, (vi) increasing job opportunities for the poor, and (vii) self-financing of wastewater services.

9. The project outputs were organized into three components: (i) Component A, Wastewater Collection and Treatment in Sanjintan; (ii) Component B, Wastewater Collection and Treatment in Huangjiahu; and (iii) Component C, Wastewater Collection and Treatment in Luobuzui. The Wuhan Project Management Office (WPMO) requested that a portion of the loan be allocated for water quality modeling, project implementation assistance, training center provision, and water quality monitoring instruments.

E. Provision of Inputs

10. At appraisal, the total cost was $193.6 million, with the base cost of all three WWTPs at $149.6 million. The financing plan provided foreign exchange for $83 million by ADB and another $3.8 million by the WUDDC. Local currency costs were to be financed by the China Industrial and Commercial Bank ($23.8 million) and WUDDC ($83.0 million).

11. Among the identified financial risks were (i) failure to increase the required amount of tariffs on time, (ii) nonpayment of wastewater charges, (iii) significant errors in estimates of water sales, (iv) lack of WUDDC autonomy, and (v) the failure of WUDDC to secure local loans. These risks could affect project construction since tariff revenues and loans were to provide the counterpart funding and ensure the long-term financial viability of the project. Project design mitigated these risks through (i) guarantees by the Wuhan municipal government (WMG) to provide counterpart funds if WUDDC could not; (ii) assurances and requirements for loan effectiveness, including tariff increases and financial autonomy; and (iii) rigorous and conservative estimates of water sales and conservative financial planning.

12. The project made provision for 65 person-months of international and 130 person-months of domestic consulting services to support WPMO and WUDDC in project implementation and capacity building. The consultants, recruited as a firm, would provide assistance to WPMO in the areas of ADB procedures and reporting, design review, procurement, quality control, construction supervision, start-up testing, commissioning, operation and maintenance (O&M), and implementation of the project performance management system. The consulting firm would also provide advice, guidance, and training for capacity building to strengthen WUDDC in relevant areas.

13. The WUDDC retained local design institutes and tendering and construction supervision companies to assist in project implementation. The design institutes completed the engineering designs for the three WWTPs, sewer network and rehabilitation subcomponents, and pumping stations. The tendering company assisted the WUDDC in contract tendering, and preparing bid evaluation reports and contracts. Construction supervision and quality control were carried out by the construction supervision company.

F. Implementation Arrangements

14. The WMG was designated as the executing agency for the project. A project leading group headed by the vice mayor, representing provincial and municipal bureaus and agencies,
provided guidance and support to the project. The WMG designated the WPMO to coordinate and manage the project. The WUDDC was the project implementing agency under the WPMO. These arrangements were consistent throughout the project.

15. While WUDDC used local design institutes and consultancies for detailed engineering design, tendering and construction supervision, and for support to project implementation, capacity building support was provided by international consultants. Training programs strengthened the capacity of WUDDC in wastewater management, O&M of wastewater facilities, financial management, corporate development, government policy, and project management and administration.

16. The key loan conditions and covenants addressed the financial autonomy aspects of WUDDC. These related to tariff levels to achieve full cost recovery without government subsidy, and financial ratios dealing with capital structure and liquidity.

II. EVALUATION OF PERFORMANCE AND RATINGS

A. Relevance of Design and Formulation

17. The PCR rated the project *highly relevant* to the immediate and long-term objectives of the Government of the PRC and country partnership strategy of ADB. This validation also rates the project *highly relevant*. The project was developed as an integral part of the government’s program to alleviate serious environmental problems affecting the quality of water bodies within and around the project area. Government efforts to protect the urban environment by improving water quality and wastewater treatment were in line with ADB country partnership strategy. The strategy supported reforming water supply and wastewater tariffs and strengthening institutional capacity to implement commercial principles in the water sector. The project was designed through a project preparatory technical assistance and included support for project management and implementation through consultants’ inputs and several rounds of local, international, and on-the-job training of the project personnel.

B. Effectiveness in Achieving Project Outcomes

18. The PCR rated the project *effective*. This validation also rates the project *effective*. Overall, the project contributed to 87% of urban wastewater flow being collected and treated by end of 2011 against the target of 56% by end of 2007. The Sanjintan WWTP exceeded its estimated 97% target of wastewater collected and treated toward the end of 2009 against a target of 68% by 2010. The Huangjijahu WWTP achieved 94% by mid-2010 against its target of 42% by 2010. At the time of PCR preparation in December 2011, the performance of the Luobuzui WWTP was slightly below target (45% against a target of 53%) and the PCR noted that full capacity would be achieved by late 2011 following completion of the remaining sewer construction. Most project facilities were constructed as appraised. The PCR noted that project facilities are of good quality, well maintained, and are operating efficiently. Effluent quality data provided by the WUDDC showed that all WWTPs were operating well within their design parameters and required standards. Dewatered sludge was being hauled to designated landfills as intended.

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19. Project facilities were constructed in accordance with national standards and technical specifications. The facilities were of good technical quality and will ensure the sustainability of project benefits in the long term. The treatment technologies adopted for WWTPs were technically and commercially sound. Trained personnel were noted to be in place to handle operational and technical problems. Demand for project services was increasing as WWTPs reached full capacity. Continuing sewer network construction under the existing sewer rehabilitation program was being undertaken to ensure wastewater collection and treatment in line with the government's policy of wastewater management. Branch sewer connections are also essential to improving sewer coverage to ensure that WWTPs received adequate wastewater to fully use their capacity.

20. WUDDC reforms were not as effective as envisaged. At project completion, WUDDC was still functioning as a state-owned enterprise. However, this did not impinge on the development of WUDDC. It has made progress in developing programs for wastewater reuse, sludge treatment and utilization, odor control, energy recovery, and involving the private sector in wastewater treatment in Wuhan, which went beyond the original project objectives. However, it is still to achieve management and financial autonomy.

C. Efficiency of Resource Use in Achieving Outputs and Outcomes

21. The PCR rated the project implementation efficient. This validation also assesses the project efficient. The economic internal rates of return (EIRRs) of the project and each WTTP component were recalculated based on the actual cost. The base-case EIRRs were 18% for the Sanjintan component, 17% for the Huangjiahu component, 15% for the Luobuzui component, and 17% for the project as a whole—the same as at appraisal.

22. The actual project cost increased to $212.7 million, marginally higher than the original $194 million at appraisal. However, the base cost was higher by more than 20% ($190.2 million as opposed to the appraisal estimate of $156.2 million). The foreign exchange cost decreased from the original estimate of $87 million (45% of the total cost) to $80 million (38% of total cost), while the local currency cost increased from $107 million (55%) to $132 million (62%). The increased foreign exchange cost for Luobuzui WWTP mainly resulted from the depreciation of the US dollar, while the increased local cost was caused by higher land acquisition and resettlement (LAR) for the Luobuzui component.

23. The loan became effective on 30 April 2004 and the closing date was originally set for 31 December 2008 but was extended by 12 months to 31 December 2009 to accommodate the delay in constructing the Luobuzui WWTP. The plant site was relocated and a number of sewer networks were repackaged in response to resettlement difficulties and alignment with the construction of new roads in the project area. The project loan account was closed on 27 September 2010. Better coordination among stakeholders throughout the implementation period could have lessened some project delays, such as the LAR for the Luobuzui component.

D. Preliminary Assessment of Sustainability

24. The PCR rated the project less likely sustainable. This validation also views the project less than likely to be sustainable. Despite the commitment by WMG to pursue institutional and tariff reform in the wastewater sector, and to transform the WUDDC into an independent and self-financed entity, the process had been slow. Stronger support is needed from government agencies, such as the municipal financial bureau, pricing bureaus, and environmental protection
bureau, to ensure that succeeding wastewater tariff increases are granted to achieve full cost recovery and long-term sustainability.

E. Impact

25. This validation rates the project impact significant (the PCR did not provide a rating). With project components constructed, pollutant flow into water bodies are decreasing and surface water quality is improving. Public satisfaction with urban environment improvement was evident as 70% of the respondents reported satisfaction in a 2009 socioeconomic survey. Improved wastewater treatment and collection and the protection of raw water supplies directly and indirectly benefited over 8 million residents of Wuhan. In addition, improved water quality in rivers and lakes in Wuhan benefited 20 million urban residents downstream of Wuhan along the Yangtze River. Other impacts included those linked to decreased incidence of waterborne disease, such as reduced medical expenses and earning losses from lost work days and the consequent increased amount of disposable income and poverty reduction.

26. The project contributed to local economic growth and has generated employment during construction and operation. For the construction of project components, 1,288 person-years of local labor was used, with monthly salaries ranging from CNY1,500 to CNY3,000. The consequent benefits were estimated to be CNY34.7 million over the project period. In addition, 161 permanent staff were hired for the regular O&M of WWTPs and sewer networks at an average salary of CNY2,500 per month. Increased local economic growth, employment, and improved social security helped to reduce local poverty. The lowest tier of per capita urban income increased from CNY225 per month in 2001 to CNY240 per month in six suburban districts and to CNY300 per month in seven urban districts in 2008. The lowest per capita minimum life guarantee of famers increased from CNY1,000 per year in 2001 to CNY1,500 per year in 2008. To support poor households, the WMG has subsidized the wastewater tariff since 2001. Data from the Wuhan Municipal Civil Affairs Bureau showed that in November 2009, 174,000 people received the WMG subsidy, amounting to CNY4.2 million.  

III. OTHER PERFORMANCE ASSESSMENTS

A. Performance of the Borrower and Executing Agency

27. The PCR rated the performance of the borrower satisfactory and this validation also rates it satisfactory. The WMG through the WPMO provided full support to the project during implementation. The WPMO staff regularly visited the WUDDC and project sites to ensure the timely execution of activities. Both the WPMO and the WUDDC had available experienced staff and deployed it for the project. Mutual coordination between the WPMO and the WUDDC was effective. The provision of counterpart funds was adequate and timely.

28. The WUDDC demonstrated commitment to enterprise reform, but stronger support is needed from government agencies such as the municipal financial bureau, pricing bureaus, and environmental protection bureau to ensure that the WUDDC was granted timely approval for the wastewater tariff increases to achieve full cost recovery and long-term sustainability. These should have been achieved in the course of the project.

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6 See, for example, the wastewater volumes collected and treated at post project compared to pre-project volumes.
B. Performance of the Asian Development Bank

29. The PCR rated the performance of ADB in managing and administering the project satisfactory and this validation agrees with this rating. ADB sent nine missions for a total of 139 staff days. The review missions provided timely inputs and suggestions to the WPMO and the WUDDC to improve and facilitate project implementation. The responses of ADB to inquiries were also prompt and useful, coming from both the resident mission in Beijing and headquarters in Manila. Both the WPMO and the WUDDC were satisfied with the performance of ADB during project implementation.

C. Others

30. Most loan covenants were complied with by 2007. The WUDDC persevered with efforts to increase wastewater tariffs to ensure full compliance with loan covenants. It has been requesting tariff increases since 2007, but the requests were not approved by the WMG as an anti-inflationary measure by the central government. The PCR noted that the current wastewater tariffs were lower than that required for full cost recovery.

31. Various public surveys indicated that residents in Wuhan did not support the proposed wastewater tariff increases as the cost of treating water and wastewater in Wuhan was expected to be low because of the municipality’s abundant water resources compared with other large municipalities in the PRC. The WUDDC’s latest request for wastewater tariff increase was made in the second quarter of 2011. It is apparent that regular tariff reviews and increases are required to ensure the financial viability of the project. The WUDDC is initiating a broad public campaign to raise people’s awareness of wastewater treatment and environmental protection to elicit a positive response to the proposed wastewater tariff increase. Coordination among the government agencies is also required to implement wastewater tariff increases effectively.

32. The LAR plans for the project were implemented as approved by ADB (initially designed in 2002 and updated in 2006). This implementation was also in accordance with ADB Involuntary Resettlement Policy (1995), the Land Administration Law of the People’s Republic of China, and the rules and regulations of the WMG. During project implementation, in 2005, land previously designated for the Luobuzui WWTP was reallocated. The plan was then updated and approved in June 2006 by the WMG and ADB. It included resettlement impacts, plans for compensation and restoring incomes and livelihoods, and the implementation status of other components.

33. All affected people were informed of the land compensation rates and were compensated accordingly based on the land acquisition agreement. Some affected people took compensation and obtained employment. Others either stayed and continued farming or accepted the arranged employment as wage earners. In five villages and one state-owned fish farm affected by the project, cash compensation and/or employment opportunities were provided to farmers who lost land. The PCR noted that the living standards of the affected people have improved, or are similar to what they were before the project.

34. The project was assessed as environmental category A, or potentially involving significant adverse environmental impacts, and was required to prepare an environmental impact assessment (EIA) and an environmental management plan. The prepared EIAs guided all environmental activities carried out by WUDDC. Mitigation measures proposed in the EIAs and recommendations from ADB safeguard review missions, were implemented and ensured
that WWTP construction and operation complied with environmental requirements. The cost of environmental protection, including mitigation during construction and introducing green belts and buffer zones around the WWTPs, amounted to CNY7 million.

IV. OVERALL ASSESSMENT, LESSONS, AND RECOMMENDATIONS

A. Overall Assessment and Ratings

35. The PCR rated the project *successful*. This validation also rates the project *successful*. This highly relevant project was the first step of a major and successful partnership between Wuhan municipality and ADB. The project and the preceding project preparatory technical assistance implemented the government's development strategy and the sector strategy of ADB. Its objectives were effectively and efficiently achieved, resettlement work was successful, social impacts were positive, and project infrastructure continued to generate benefits.

36. The benefits of the project facilities were evident in adjacent water bodies and downstream of the WWTPs along the Yangtze River. The use of effluent for landscaping has extended the economic life of the landfills and the use of methane gas from the anaerobic digestion tanks has saved utility costs. Effluent quality data provided by the WUDDC showed that all WWTPs were operating well within their design parameters and required standards.

37. The institutional improvement and tariff increase measures have been slow to implement and requires greater attention from the WMG to ensure that the WUDDC operates more independently and achieves financial autonomy.

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<tr>
<th>Criteria</th>
<th>PCR</th>
<th>IED Review</th>
<th>Reason for Disagreement and/or Comments</th>
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<tr>
<td>Relevance</td>
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<td>Effectiveness in achieving outcome</td>
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ADB = Asian Development Bank, IED = Independent Evaluation Department, PCR = project completion report

Note: From May 2012, IED views the PCR's rating terminology of "partly" or "less" as equivalent to "less than" and uses this terminology for its own rating categories to improve clarity.

Source: ADB Independent Evaluation Department.

B. Lessons

38. This validation agrees with the lessons learned, particularly with the PCR assessment of the wastewater tariff. It is noted that the delay in the tariff increase was not only due to lack of support from relevant government agencies, but mainly because of the WMG's concerns on
social instabilities caused by inflation and overall prices increases in recent years. This is important to note if the cost recovery policy dialogue is to be further strengthened.

C. Recommendations for Follow-Up

39. This validation also agrees with the general and project-related recommendations of the PCR. Follow-up monitoring reports, such as sewer branch connections and sewer network construction, M&E, and project performance monitoring system, should be developed by the WMPO and the WUDDC so that the full benefits and impacts of the project can be assessed, particularly on tariff increases and institutional reforms.

V. OTHER CONSIDERATIONS AND FOLLOW-UP

A. Monitoring and Evaluation Design, Implementation, and Utilization

40. The covenants on Project Performance Management System framework and the requirement for a midterm review were complied with. It is noted that the ADB midterm review mission, conducted in November 2006, was effective and provided clear guidance and action plans to resolve project issues, such as financial management, environment and resettlement monitoring, benefit indicators, and reporting. Midterm reviews are not always given such weight but, in this case, the result of this midterm review was helpful in ensuring project effectiveness.

41. The risk analysis identified financial risks, including failure to increase tariffs on time, the required tariff amount, and nonpayment of wastewater charges, among others. Although the mitigation plan worked, it would perhaps have been more effective if, having identified the risks very clearly, policy reforms had been given more emphasis at project appraisal stage.

B. Comments on Project Completion Report Quality

42. The PCR is rated satisfactory. The PCR generally provided adequate information to support the application of ratings, although the efficiency rating did not fully conform to PCR guidelines of providing separate ratings for financial, economic, and process efficiency. The EIRR assessments were appropriately made, including the use of standard sensitivity tests. In other cases, information not relevant to the assessment in question was included. There were varying degrees of treatment of safeguard issues with thorough discussion of resettlement, but very little reference to gender issues, and throughout the project (from project design to PCR) poverty reduction was not treated in depth.

C. Data Sources for Validation

43. This validation used the following documents: the RRP, PCR, and back-to-office reports of the PCR mission and midterm review mission. This validation has also made reference to the RRP on project number 42011 or the Proposed Loan to the People’s Republic of China: Wuhan Urban Environmental Improvement Project, dated June 2010.

D. Recommendation for Independent Evaluation Department Follow-Up

44. A project performance evaluation review may not be necessary.