



Extended Annual Review Report

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Investment Number: 7296
Loan Number: LN2522 and CF53
September 2015

Loan Municipal Waste to Energy Project (People's Republic of China)

This is the abbreviated version of the document that excludes commercially sensitive and confidential business information that is subject to exceptions to disclosure set forth in ADB's Public Communications Policy 2011.

Asian Development Bank

CURRENCY EQUIVALENTS

Currency Units – yuan (CNY)

		At Appraisal	At Project Completion
		24 March 2009	31 December 2014
CNY1.00	–	\$0.14635	\$0.1612
\$1.00	–	CNY6.8331	CNY6.2020

ABBREVIATIONS

ADB	–	Asian Development Bank
CEEEL	–	China Everbright Environmental Energy Limited
CEIL	–	China Everbright International Limited
CEMS	–	continuous emission monitoring system
EBITDA	–	earnings before interest, tax, depreciation, amortization
EIA	–	Environmental Impact Assessment
EIRR	–	economic internal rate of return
EMP	–	environmental management plan
ESMS	–	environmental and social management system
FIRR	–	financial internal rate of return
FY	–	fiscal year
MSW	–	municipal solid waste
PPP	–	public–private partnership
PRC	–	People’s Republic of China
RRP	–	report and recommendation of the President
TA	–	technical assistance
WACC	–	weighted average cost of capital
WTE	–	waste-to-energy
WWTP	–	wastewater treatment plant
XARR	–	extended annual review report

WEIGHTS AND MEASURES

GWh	–	gigawatt-hour
kWh	–	kilowatt-hour
MWh	–	megawatt-hour

NOTES

- (i) The fiscal year (FY) of the borrower ends on 31 December. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2000 ends on 31 December 2000.
- (ii) In this report, "\$" refers to US dollars.

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BASIC DATA
Municipal Waste to Energy Project
(L2522/EI7296/CF53-PRC)

Key Project Data	As per ADB Loan Documents (\$ million)	Actual (\$ million)
Total Project Cost	650.0	1,209.8 ¹
ADB Investment:		
A Loan:		
Committed	100.0	100.0
Disbursed	100.0	100.0
Outstanding		64.3
B Loan		
Committed	100.0	100.0
Disbursed	100.0	100.0
Outstanding		71.4

ADB = Asian Development Bank.

¹ The actual financing cost is higher than originally planned as the projects eventually funded by ADB were bigger. Also, five WTE plants were funded instead of the four originally planned.

Key Dates	Expected	Actual
Concept Clearance Approval	22 January 2009	22 January 2009
Board Approval	4 June 2009	4 June 2009
Loan Agreement	3 September 2009	3 September 2009
Loan Effectiveness	3 September 2009	3 September 2009
First Disbursement	29 November 2010	29 November 2010
Commercial Operations Date		
Loan Closing	3 September 2012	3 September 2012
Months (effectiveness to commercial operations date)		

Project Administration and Monitoring	Number of Missions	Number of Person-Days
Due Diligence and Appraisal	4	24
Loan Negotiations and Signing	3	24
Loan and TA Administration	6	17
XARR Mission	1	13

TA = technical assistance, XARR = extended annual review report.

EXECUTIVE SUMMARY

On 4 June 2009, the Asian Development Bank (ADB) approved (i) a direct loan (A loan) of up to \$100,000,000 from ADB's ordinary capital resources without a government guarantee; (ii) a complementary loan (B loan) of up to \$100,000,000 funded by international banks; and (iii) a Technical Assistance (TA) amounting to \$653,000 funded by the Clean Energy Fund under the Clean Energy Financing Partnership Facility program to China Everbright Environmental Energy Limited (CEEEL). CEEEL is a special purpose company established in 2009 to hold all waste-to-energy (WTE) projects of China Everbright International Limited (CEIL). CEEEL is wholly-owned by CEIL through China Everbright Environmental Protection Holdings. The funds were used to support CEIL's investments in a series of WTE projects in the People's Republic of China (PRC) referred to collectively as the Municipal Waste to Energy Project.

Overall, the project is rated *successful* based on the criteria set out in (i) the Project Administration Instructions 6.07B on the preparation of extended annual review reports for nonsovereign operations issued in July 2008, and (ii) the Guidelines for the Preparation of Project Performance Evaluation Reports on Nonsovereign Operations, issued in November 2014.

The project's development impact is rated *satisfactory* based on four subcriteria: (i) its contributions to private sector development and ADB's strategic development objectives; (ii) economic performance; (iii) environmental, social, health, and safety performance; and (iv) business success.

The project's contribution to private sector development and ADB's strategic development objectives is rated *excellent*. As ADB's first private sector municipal solid waste (MSW) treatment project, the project fully aligns with ADB's Strategy 2020 and has pioneering features that embody ADB's country and energy sector policies and private sector operations strategies. The project introduced state-of-the-art technologies to address urban waste management problems in line with ADB's public sector efforts and can be used by the Government of the PRC as a model for other projects. The project also introduced a new mechanism to improve the efficiency of MSW management and the electricity supply, which creates better living standards in the cities of Jinan, Suzhou, Zhenjiang, Pizhou, and Sanya.

The project's environmental, social, health, and safety performance is rated *satisfactory*. CEIL's environmental and social management system (ESMS) has been fully operationalized with its guiding principles applied to both the corporate and project company levels. These principles include: (i) environmental and social assessment and planning; (ii) compliance with all applicable national, international, and ADB guidelines, requirements, and laws; (iii) avoidance of projects located in environmentally sensitive areas; (iv) designation of appropriate environment, health, and safety staff; (v) health, safety, and emergency response measures; (vi) continued technological improvement; (vii) disclosure of information; (viii) reporting to staff and the public; (ix) budget allocation for environmental and social management activities; and (x) the systematic integration of community development assistance programs in plant operations. The construction and operation of the project created jobs, and provided employment for local communities.

ADB's additionality is rated *satisfactory*. The private sector for MSW treatment and incineration faced market barriers and needed better access to financing. ADB evaluated the environmental benefits often overlooked by commercial banks and provided long-term finance

with appropriate terms and conditions to help actualize the project. Moreover, ADB played a catalytic role in facilitating the deployment of advanced and clean WTE technologies, and demonstrated WTE's potential as a solution to MSW management in the PRC and other developing member countries. ADB financing of WTE and other clean energy projects has encouraged growth and attracted other market players.

ADB's overall work quality is rated *excellent*. CEIL requested ADB to take the lead to arrange a financing package for its projects given ADB's successful track record in structuring and arranging funding. ADB (i) conducted due diligence on technical, legal, environmental, social, and financial aspects; (ii) confirmed the project's sound fundamentals and development impacts; and (iii) structured an innovative portfolio approach. The quality of ADB's work was demonstrated by the signing of the B loan through successful syndication with six banks. ADB closely monitored the project implementation and kept itself fully informed through site visits, reports, financial statements, annual business plans, environmental and social monitoring and reporting, and annual reviews.

Overall, the project is rated *successful*. It has contributed to private sector development and ADB's strategic objectives by having demonstration effects, setting new standards, and improving the market. The project also demonstrated business success, economic sustainability, and satisfactory environmental and social performance.

The main lessons of the project are the importance of (i) ensuring a robust project design, (ii) working with the right sponsor, (iii) providing technical assistance for capacity building to upgrade operations and skills, and (iv) facilitating the transfer of knowledge and technology. ADB's portfolio approach facilitated the financing of multiple projects too small to be financed alone. Hence, choosing the right project sponsor is key to ensuring smooth and successful implementation. Moreover, with support from the technical assistance, CEIL established the ESMS and issued a sustainability report setting new MSW management and WTE standards. The project's successful implementation can be replicated and the technology used in developing member countries. ADB should also share the knowledge acquired from the project with its developing member countries.

I. THE PROJECT

A. Project Background

1. On 4 June 2009, the Asian Development Bank (ADB) approved (i) a direct loan (A loan) of up to \$100,000,000 from ADB's ordinary capital resources without a government guarantee; (ii) a complementary loan (B loan) of up to \$100,000,000 funded by international banks; and (iii) a Technical Assistance (TA) amounting to \$653,000 funded by the Clean Energy Fund under the Clean Energy Financing Partnership Facility program to China Everbright Environmental Energy Limited (CEEEL). CEEEL is a special purpose company established in 2009 to hold all waste-to-energy (WTE) projects of China Everbright International Limited (CEIL).¹ CEEEL is wholly-owned by CEIL which owns it through China Everbright Environmental Protection Holdings. The A loan has a 10 year tenor and a 3 year grace period. The B loan has a 5 year tenor and a 1.5 year grace period. The funds were used to support CEIL's investments in a series of WTE projects in the People's Republic of China (PRC) known collectively as the Municipal Waste to Energy Project (the project).² CEIL has irrevocably and unconditionally guaranteed the loans.

2. The project aimed to support the construction and operation of CEIL's WTE plants through public-private partnerships (PPPs) with advanced clean technologies including (i) grade 1A standard leachate treatment; (ii) grate incinerator technology; and (iii) advanced flue gas emission control. The project was designed to treat MSW in secondary cities in the PRC and supply electricity to the local grid. Under the project, CEIL aimed to (i) develop and invest in WTE plants; (ii) treat 8,000 tons of MSW daily from an urban population of 16 million; and (iii) generate 800 gigawatt-hours (GWh) of electricity annually by 2013.

3. ADB assistance was meant to fund a series of municipal WTE plants through CEEEL according to CEIL's investment plan, which required a total of \$650 million. The A loan facility agreement was signed on 3 September 2009 and amended on 9 August 2010, while the B loan facility agreement was signed on 11 January 2012. The loans were disbursed in multiple tranches, the A loan between November 2010 and November 2011, and the B loan between May 2012 and June 2013.

B. Key Project Features

4. WTE plants incinerate waste, recover waste heat to generate power, purify waste gas, treat leachate, and dispose of ash. Each plant meets the world's most stringent environmental standards by using advanced emissions control equipment.

5. CEEEL sets up and invests in a special purpose project company (WTE project company) for each WTE plant. These companies are required to sign a concession agreement with the municipal government to guarantee the supply of MSW and document the agreed treatment fee. Concessions are awarded on an exclusive basis, for a 25-30 year period. Under the concession agreement, the municipal government grants the project company the right to build, operate, and maintain the WTE plant. After the concession period, ownership of the plant will be transferred to the municipal government.

¹ CEIL was established in Hong Kong and listed on the main board of the Hong Kong Stock Exchange (stock code 257). CEIL has become one of the leading private companies in the environmental protection industry in the PRC.

² ADB. 2009. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance for the Municipal Waste to Energy Project in the People's Republic of China*. Manila.

6. A power purchase agreement is executed between the project company and the local state grid selling all annually generated power to the local grid. Based on the Renewable Energy Law, the project company enjoys full offtake with price premiums of CNY0.25/kWh more than conventional coal-fired plants.³

C. Progress Highlights

7. Since its formation in 2009, CEEEL has performed well as a holding company for CEIL's WTE projects. As of 31 December 2014, CEEEL was operating 14 WTE plants designed to (i) process about 5.1 million tons of household waste per year (13,950 tons per day); (ii) generate about 1.4 billion kWh (1,415 GWh) of green electricity per year; and (iii) reduce greenhouse gases by about 1.7 million tons per year. By the end of 2014, 14 plants were in operation and 13 plants were under construction or being prepared.

8. ADB loan proceeds were channeled to project companies in Jinan, Zhenjiang, Suzhou, Pizhou, and Sanya. By 2014, ADB intervention had resulted in a daily waste processing capacity of 5,800 tons, generated 956 million kWh of green electricity, and reduced greenhouse gas emissions by an estimated 1.2 million tons.⁴

II. EVALUATION

A. Project Rationale and Objectives

9. CEEEL achieved the project objectives by successfully implementing WTE projects and applying the use of clean, reliable, and safe MSW treatment in secondary cities in the PRC where WTE infrastructure is lacking and demand is not fully met. Specifically, the project (i) supported a series of medium-sized WTE plants using clean technologies built through PPPs, (ii) introduced state-of-the-art technologies; (iii) addressed environmental problems by replacing landfills; (iv) enabled ADB to fund multiple municipal WTE projects otherwise difficult to assist directly; and (v) reduced greenhouse gas emissions by eliminating methane gas emissions from landfills and replacing the use of fossil fuels for power generation.

B. Development Impact

1. Contributions to Private Sector Development and ADB's Strategic Development Objectives

10. The project is ADB's first private sector MSW treatment project and aligns fully with ADB's Strategy 2020. Its pioneering features embody ADB's country and energy sector policies and private sector operations strategies. The project has introduced state-of-the-art technologies to address urban waste management problems in line with ADB public sector efforts, and it can be used by the government as a model for other projects.

11. The project introduced a new method to improve the efficiency of MSW management and the electricity supply, creating better living standards in the cities of Jinan, Suzhou, Zhenjiang, Pizhou, and Sanya. By reducing the amount of untreated waste delivered to landfills, the WTE plants reduce pollutants and improve air quality in the vicinity. This benefits everyone, but most especially the poor and disadvantaged who are more often exposed to degraded

³ A feed-in-tariff of CNY0.65/kWh is currently in place.

⁴ China Everbright International Limited estimates: MWh x 1.225 = reduction of greenhouse gas emissions in tons.

environments. The project benefited approximately 18 million city dwellers, 12.5% more than the RRP projections of 16 million.⁵ The WTE plants have received local awards and are seen as demonstration projects. The Jinan WTE plant was awarded the Luban Award representing the nation's highest honor for project quality in 2012–2013, while the Zhenjiang WTE plant received the highest score in the Jiangsu Provincial Assessment. The Suzhou WTE plant is the country's biggest WTE plant and was evaluated as a "AAA" plant by the State Industrial and Information Bureau in 2013.

12. The project has reduced greenhouse gas emissions and diversified energy sources in the PRC. In 2014, the project generated 956 GWh of green electricity and reduced carbon dioxide emissions by 1.2 million tons by eliminating methane and replacing fossil fuels. Since 2011 when the first ADB-financed WTE plant was made commercially operational, the project has generated 3,642 GWh of electricity and reduced carbon dioxide emissions by 4.7 million tons.⁶

13. The project offers a strong model for private sector participation in WTE projects via PPPs in medium-sized municipalities. Encouraged by PPP laws and regulations, local governments have begun to promote WTE projects according to this model. As of 2014, the Fujian local government was preparing 28 PPP pilot projects, Qinghai 80, Anhui 42, Hunan 30, and Sichuan 264. CEIL has set market standards and benchmarks, and helped the government formulate laws at both the national and municipal level.

14. Following the government's efforts to promote environmental protection, several WTE plants have been established since CEEEL's first WTE plant was made operational in Suzhou in 2006. At the end of 2010, 194 WTE plants were in operation and under construction in the PRC. While government statistics are lacking, it is believed that by the end of 2014, about 100 project companies were operating about 160 WTE plants in the PRC, a number that will increase to 384 operating WTE plants by 2020.⁷

15. The market for WTE plants in the PRC is expected to grow almost threefold in the next 5 years. In 2014, CEIL emerged as the top market player in terms of growth and waste processing capacity. The project's contribution to private sector development and ADB's strategic development objectives is rated *excellent*.

2. Environment, Social, Health, and Safety Performance

a. Environment

16. The project was categorized as financial intermediary for environmental impacts in accordance with ADB's Environment Policy (2002).⁸ In line with the ESMS framework agreed upon with ADB, in November 2010 the CEIL board approved its ESMS, which outlined objectives, guiding principles, and responsibilities that are now fully integrated in their overall operations for both corporate and project company groups.⁹

⁵ CEIL Business Plan for China Everbright Environmental Energy, 2015.

⁶ CEIL.

⁷ CEIL Business Plan, 2015.

⁸ A project is classified as financial intermediary if it involves a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all subprojects will result in insignificant impacts.

⁹ Based on the Amended and Restated Facility Agreement, Schedule 10–ESMS Milestones, the Private Sector Operations Department cleared the ESMS on 31 March 2010.

17. Of the five WTE plants supported by ADB loans, the XARR mission visited four, at Suzhou, Zhenjiang, Jinan, and Sanya. The Jinan WTE plant was classified as environment category A due to its capacity (more than 2,000 tons/day) and is considered a “new and greenfield” plant.¹⁰ The other four WTE plants were classified as environment category B¹¹. All five plants are not located in or adjacent to protected areas or areas with high biodiversity, and are more than 300 m away from sensitive receptors that could be affected by the operations. Environmental impacts during construction were assessed as minor, short-term, and temporary, and significant impacts during operation such as emissions, wastewater, bottom and fly ash generation, odor, noise, and occupational and community health and safety concerns have been properly managed, monitored, and reported. CEIL provides the funding and staff needed to implement the mitigating and monitoring measures indicated in the Environmental Management Plan (EMP), and submits environmental monitoring reports in compliance with the loan agreement. These reports, which show test results and the status of CEIL’s compliance with the EMP, applicable laws, and international standards, are published on the ADB website after being reviewed.

18. The four WTE plants that have been visited operate under stringent environmental permits and meet the European Union (EU) Waste Incineration Directive 2000/76/EC on dioxins and nitrogen oxide. CEIL and its project companies have incurred no fines or penalties due to environmental non-compliance; no material environmental claims have been filed; and no grievances or complaints regarding environmental impacts or significant spills have been recorded. CEIL allocates an annual budget to cover expenditure on environmental measures such as waste disposal, pollution treatment, pollutant monitoring, pollution discharge fees, and other environmental management expenses.¹² For its innovation and efforts in protecting the environment, CEIL was recognized by the International Financing Magazine as one of the Top 10 Green Innovation Companies in 2014. The four WTE plants that have been visited are certified by the International Organization for Standardization 14001 and Occupational Health and Safety Assessment Series 18001. This means that all activities impacting health, safety, and the environment are carefully measured and monitored through a system of internal audits and reviewed by independent external verifiers.

19. Based on site visits, meetings, and the review of relevant safeguards and technical documents, it is concluded that the plants adequately meet the EU 2000 flue gas emission standards and the requirements of PRC laws. CEIL’s ESMS has been fully operationalized with its guiding principles applied to both the corporate and project company groups. These principles include: (i) environmental and social assessment and planning; (ii) compliance with all applicable national, international, and ADB guidelines, requirements, and laws; (iii) avoidance of projects located in environmentally sensitive areas; (iv) designation of appropriate environment, health, and safety staff; (v) health, safety, and emergency response measures; (vi) continued technological improvement; (vii) disclosure of information; (viii) reporting to staff and the public; (ix) budget allocation for environmental and social management activities; and (x) the systematic integration of community development assistance programs in plant operations. CEIL fully documents its environmental performance in its annual Environmental and Sustainability Reports published on their website. These surpassing achievements were made

¹⁰ EIA reports are prepared by external consultants hired by CEIL. The 120-day disclosure requirement prior to CEIL board approval of ADB has been applied to the Jinan WTE plant.

¹¹ The four WTE plants that are categorized as B on environment are Suzhou III, Zhenjiang, Pizhou, and Sanya plants. EIA Reports of these WTEs were reviewed prior to disclosure on the ADB website.

¹² Based on the CEIL Sustainability Report, 2014. For example, CEIL has spent CNY85 million on environmental management activities.

possible through both the resources provided by the TA and CEIL's commitment to becoming the market leader not only in terms of financial performance but also in terms of environmental and social best practices. This shows that TA funding in the private sector is necessary and justified to showcase the value of ADB's Safeguards Policy Statement and ESMS.

b. Social Safeguards

20. The project was classified as category B under the ADB involuntary resettlement policy (1995) and C under the indigenous peoples policy (1998). Under the build-operate-transfer (BOT) scheme, land acquisition and house demolition were commenced and implemented by local governments before a concessionaire was selected to manage the construction and carry out operations and maintenance of the plants. Land was transferred to CEIL for the construction of WTE plants in Jinan, Sanya, Suzhou, and Zhenjiang. Social due diligence reports covering past land acquisition audits in Jinan, Suzhou, and Zhenjiang as well as other social aspects and a resettlement plan in Sanya were prepared in alignment with ADB's involuntary resettlement policy and PRC laws and regulations. These were published on the ADB website. As all four plants visited are located in peri-urban areas, the project did not significantly impact ethnic minorities who are considered indigenous peoples.

21. Of the 435.85 mu¹³ of land acquired permanently for the four plants, 355.85 mu were collective land and 80 mu were state-owned farmland. The land acquisition affected 241 households (820 persons) and house demolition affected 226 households (578 people). In total, permanent land acquisition and house demolition by the four visited plants affected 419 households (1,270 persons). The Zhenjiang plant required 135 mu of collective land in Dianshang village resulting in the demolition of an unused kindergarten building and the relocation of 222 households (562 persons) to government relocation buildings in the Yicui and Cuizhu Gardens located in an urban area in of Dagang sub district. The households were provided with a transition and moving subsidy. The relocation has improved their living conditions by increasing the value of their assets and providing them with better access to facilities, services, and job opportunities in expanding industries. The Jinan WTE plant acquired about 179 mu of collective land from 149 households, and carried out demolitions affecting four households (16 persons), which did not require relocation as only their storage buildings were demolished in part. Economic displacement was minimal because the land acquired was unproductive. The village committee also redistributed the available collective land to the villagers, partially replacing the households' acquired lands. Expansion of the access road also partially affected four houses and storage buildings in Jinan. The Suzhou WTE plant, phase III required the acquisition of 41.52 mu of collective land affecting two temporary army structures and abandoned village farmland. Land rental and negotiated compensation fees were paid to Gusu village as a collective income, and distributed to the villagers in the form of shared dividends. The Sanya plant acquired 80 mu of state land affecting four households of Licai farm workers and a nonoperational fish meal plant. Eight jobs were provided to members of the affected four households. An additional 0.15 mu of collective land was acquired for Sanya plant's 35 transmission line towers, affecting 40 households in limited way and not requiring any livelihood restoration.

¹³ A mu is a unit of land measurement in the PRC, the size of which varies with location but is commonly placed at 806.65 square yards (0.165 acre, or 666.5 square meters). Source: The Encyclopedia Britannica. Mou. <http://www.britannica.com/science/mou>

22. Local governments consulted with communities and households affected by land acquisition and resettlement throughout the course of land acquisition and resettlement activities and a grievance redress mechanism was established to address any concerns. During the Zhenjiang plant relocation process, a few affected households raised concerns about the progress of construction of the relocation buildings as they wished to move as soon as possible. CEIL coordinated and monitored this concern closely with the local government, and the local government resolved this concern by regularly updating the affected households on the status of construction and increasing their transition subsidies. All 222 households (562 persons) affected by the Zhenjiang plant were relocated by June 2012. As of May 2015, CEIL and the external monitor verified that no compensation or issues related to land acquisition for the four plants remain outstanding. A reputable external monitoring institution concluded that the incomes and living standards of the affected people had been restored and improved.

23. The WTE plants continue to conduct dialogues with neighboring communities and carry out community development programs during operation. The four plants visited have organized plant visits for interested communities, schools, and government agencies, and are committed to promoting environmental sustainability. They also reach out to neighboring communities by (i) organizing spring festival activities at which rice and other essential food items are distributed to poor families, (ii) providing assistance to poor and vulnerable sanitation workers in the form of medical subsidies, (iii) helping poor students through grants, and (iv) allocating funds to the township for the affected villages.

24. Construction and operation of the four WTE plants generated new jobs, benefiting local communities. Local government agencies and CEIL staff monitored the progress of plant construction, including labour conditions, and the plants implemented a human resource policy in alignment with the national labour laws during operations. Interviewed staff expressed satisfaction with their salaries, benefits, and company training. CEIL is expected to continue to offer training and skills development to new staff, and to promote the transfer of technology.

25. The project's ESHS performance is rated *satisfactory*.

3. Overall development impact rating

26. The overall development impact rating is *satisfactory*. The project has positively impacted and contributed significantly to private sector development and ADB strategic objectives by having good demonstration effects, setting new standards, and improving the market. The project has also demonstrated business success, high economic sustainability, and sound environmental performance and socioeconomic impact.

C. ADB Additionality

27. The value of ADB's additionality was twofold: (i) financing clean technologies at the project level, and (ii) facilitating clean technologies beyond the project interventions. Private MSW treatment and incineration faced market barriers and required better access to financing. ADB evaluated the environmental benefits often unrecognized by commercial banks and provided long-term finance with appropriate terms and conditions to help actualize the project. Moreover, by supporting CEIL as the front runner in the emerging private WTE sector, a company that aims to be the market leader in implementing international best practices and meeting stringent standards, ADB facilitated the deployment of advanced and clean WTE technologies, and demonstrated the effectiveness of WTE as an MSW management solution in

the PRC and other developing member countries. A TA will disseminate lessons learned to municipal governments, policy makers, and the private sector.¹⁴

28. The TA is worth \$653,000 and comprises two components: (i) assessment and evaluation of the WTE plants, and (ii) capacity building of CEIL environmental and social safeguards in relation to the plants. The TA was financed on a grant basis by the Clean Energy Fund¹⁵ under the Clean Energy Financing Partnership Facility and administered by ADB. Under the TA, workshops have been conducted for CEIL staff in charge of environmental and social works to increase their awareness of the relevant ADB policies and improve their skills.¹⁶ CEIL also established its ESMS in keeping with ADB requirements to (i) avoid, minimize, and mitigate adverse impacts on the environment and affected people; (ii) maximize opportunities for environmental and social benefits; and (iii) ensure that corporate environmental and social policies can be efficiently and effectively implemented by all CEIL business units and project companies. This ESMS has set a new market standard.

29. The ADB A loan was catalytic in mobilizing commercial funds through the B loan. ADB mobilized crucial debt financing from both international and local commercial banks. Although international banks were not familiar with cleaner technologies or the WTE sector in the PRC, ADB's presence assured them that WTE plants with cleaner technology are financially and environmentally sound and sustainable in the long-term. Moreover, the portfolio approach enabled ADB to finance a number of WTE plants that are often too small to be financed on a standalone basis. ADB, through the B loan, was catalytic in securing funding to meet the project's requirement.

30. ADB financing of WTE and other clean energy projects encouraged growth and attracted other market players. In December 2012, ADB approved a \$200 million loan to the Dynagreen Waste-to-Energy Project, which was structured in a manner similar to the project. In April 2015, the International Finance Corporation made an equity investment in one of CEIL's companies.¹⁷ Following the success of the project, on 26 September 2012 ADB approved a loan of up to \$200 million to China Everbright Biomass Energy and CEEEL to fund agricultural and municipal WTE projects in the PRC.¹⁸

31. ADB additionality is rated *satisfactory*.

D. ADB Work Quality

32. **Screening, appraisal, and structuring.** WTE has been a target business development area of the Private Sector Infrastructure Finance Division 2 since 2006.¹⁹ In 2008, ADB delivered an Energy Initiative presentation and conducted a workshop in which CEIL participated. CEIL requested ADB to hold follow-up meetings to discuss possible financing of WTE projects. At the time, CEIL had a series of medium-sized WTE plants using the cleanest

¹⁴ ADB. 2009. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan and Technical Assistance for the Municipal Waste to Energy Project in the People's Republic of China*. Manila.

¹⁵ Financing partners are the Governments of Australia, Norway, Spain, and Sweden.

¹⁶ AECOM Asia (AECOM) has been engaged as the consulting firm under the TA.

¹⁷ In 2014, CEIL's environmental water business was spun off via a reverse take offer of HanKore Environment Tech Group and renamed China Everbright Water, which is listed on the Singapore Stock Exchange. The International Finance Corporation is a shareholder with a 1.90% equity holding.

¹⁸ ADB. 2012. *Report and Recommendation of the President for the Proposed Loans to China Everbright International Limited for the Agricultural and Municipal Waste to Energy Project in the Peoples' Republic of China*. Manila.

¹⁹ ADB. 2009. PRC: Municipal Waste to Energy Project. Concept Clearance Paper. Manila.

technologies of all its peers. Although municipal governments were developing an interest in CEIL's cleaner technologies due to increasing awareness of environmental protection, CEIL faced funding constraints as financial institutions remained unfamiliar with the sector and related technologies. Under the concession-based PPP arrangement with the municipal governments, CEIL was responsible for funding the entire project, and was furthermore required to invest equity in US dollars in each WTE project as a foreign investor. Thus, given ADB's successful track record in structuring and arranging funding, CEIL asked ADB to take the lead in arranging the US dollar financing packages of its multiple projects.

33. Following concept clearance in January 2009, ADB conducted due diligence on the technical, legal, environmental, social, and financial aspects of the project, confirmed its sound fundamentals and development impacts, and structured an innovative portfolio approach. The ADB Board granted approval in June 2009 and the ADB facility agreement was signed in September 2009. ADB's performance in relation to screening, appraisal, and structuring is rated *excellent*.

34. **Monitoring and supervision.** The loan disbursements went smoothly. ADB monitored project implementation closely through site visits, reports, financial statements, annual business plans, environmental and social monitoring and reporting, and annual reviews. Both the borrower and guarantor diligently complied with all reporting requirements. ADB consented to waivers and requests for amendments to existing agreements promptly, subject to thorough departmental reviews. All monitoring reports were timely and comprehensive and ADB kept itself fully informed about the project in all relevant areas. ADB's performance in relation to monitoring and supervision is rated *excellent*.

35. ADB's overall work quality is therefore rated *excellent*.

E. Overall Evaluation

36. Overall, the project is considered successful.

III. ISSUES, LESSONS, AND RECOMMENDED FOLLOW-UP ACTIONS

A. Issues and Lessons

37. **Ensure a robust project design.** The portfolio approach was key to mobilizing commercial financing and implementing multiple WTE projects in a timely manner. The ADB loans were provided to a special purpose holding entity and then channeled to each project as either equity or a shareholders loan, with full credit support from the listed parent entity. Each project company then raised local currency loans from local commercial banks. This structure enabled CEIL to manage its projects efficiently and simultaneously expand operations by developing multiple projects in several locations. Although the introduction of a new financing structure requires initial due diligence works, a robust project design will be advantageous during project implementation.

38. **Working with the right sponsor.** A project sponsor's quality, capacity, and integrity play a crucial role in an emerging sector. Since financing individual projects was not considered practical, the ADB loans relied on the sponsor's corporate guarantee. Furthermore, the rapid expansion of WTE projects made significant demands on the company's capacity to provide technical support, staffing, and other operational necessities to meet ADB's stringent requirements. CEIL has proven to be an ideal partner for ADB as it aims to be the leading

industry player not only in terms of scale and operational performance but also in terms of clean technology and meeting strict environmental and social standards. This demonstrates that choosing the right sponsor is key to ensuring a seamless and successful project implementation.

39. **Incorporation of the technical assistance.** The provision of a capacity building TA alongside the loans helped the sponsor upgrade its operations and management process, especially in relation to its environmental management system for WTE projects. The TA was an integral part of the project under which CEIL established an ESMS and issued a sustainability report, thereby setting new WTE standards. Many Private Sector Operations Department projects have replicated this type of dual-assistance arrangement, which should be used whenever possible.

40. **Knowledge and technology transfer.** The project promoter's proficiency in WTE technology received international recognition. Due to rapid urbanization, the proper treatment and incineration of MSW is posing a growing challenge to the governments of most developing countries. This project has shown that WTE projects are environmentally sustainable, and its design, loan structuring, technology, and successful implementation can be replicated in developing countries. ADB should take steps to share the knowledge acquired from this project with its developing member countries.

B. Recommended Follow-Up Actions

41. ADB's support has promoted private investment in MSW treatment and clean energy generation through new technologies by demonstrating their benefits. ADB is satisfied with the financial and operational performance of the borrower (CEEEL) and guarantor (CEIL), and with the operational efficiency of the five WTE plants supported by the A and B loans. The portfolio management team of the Private Sector Operations Department will continue to monitor all loan components and ensure compliance with all covenants and payment obligations.

PROJECT-RELATED DATA

A. Investment Identification

1.	Country	People's Republic of China
2.	Loan Number	LN2522/EI7296/CF53
3.	Type of Business	Waste Management
4.	Project Title	Municipal Waste to Energy Project
5.	Investee Company and/or Borrower	China Everbright Environmental Energy Limited
6.	Amount of Approved ADB Assistance	\$100 million (A Loan), \$100 million (B loan) \$653,000 (TA)

PRC = People's Republic of China, TA = technical assistance, XARR = extended annual review report.

B. Investment Data

1.	Concept Clearance Approval	19 January 2009
2.	Date of Board Approval	4 June 2009
3.	Signing Date of Legal Documents	
	A loan	3 September 2009
	B loan	11 January 2012
4.	Date of Loan Effectiveness	
	In Loan Agreement	
	Actual	
	A loan	3 September 2009
	B loan	23 April 2012
	Number of Extensions	0
5.	Loan Closing Date (end of availability period)	
	In Loan Agreement	11 April 2013
	Actual	
	A loan	3 September 2012
	B loan	28 June 2013
	Number of Extensions	1

LIBOR = London interbank offered rate.

INDUSTRY REVIEW

A. Industry Review

1. Background

1. The People's Republic of China (PRC) is one of the fastest growing economies in the world due to the growth of industries and trade that have in turn produced large amounts of municipal solid waste (MSW). It is imperative for the PRC to dispose of this waste in the most efficient manner possible to preserve the environment. In the PRC, nearly 50% of MSW is left untreated and dumped in landfills that contaminate the soil and groundwater, and result in harmful gas emissions. Increasing numbers of migrants from rural areas live near these landfills and are most vulnerable to air pollution due to a lack of mitigation measures such as air purifiers. Landfill performance is especially a problem in coastal regions that have a high groundwater table and where land values are high. The demand for landfill space and environmental and social concerns are becoming a serious political challenge.

2. According to the Ministry of Housing and Urban–Rural Development in the PRC, in 2012 about 171 million tons of MSW were collected and transported in urban areas all over the PRC. On average, 76% of MSW is properly treated, 84.8% in big cities and 54% in small cities. In 2014, the PRC's total waste incineration reached 780,000 tons per day. The PRC's annual urban MSW generation is expected to reach nearly 200 million tons in 2015 and to exceed 230 million tons by 2020.¹

3. Its huge amount of waste makes the PRC one of the most important markets for waste-to-energy (WTE) plants. The demand for renewable energy in the PRC is increasing and the Government of the PRC is prepared to emphasize the importance of renewable energy further in their energy plan. The PRC's twelfth five-year plan aims to install more than 100 WTE plants during 2011–2015. The PRC's share of the global WTE plant market is expected nearly to double by the end of 2018. The government is currently supporting investments in WTE plants under build-operate-transfer (BOT) and build-operate-own (BOO) models. The market for WTE plants in the PRC is expected to grow almost threefold in the next 5 years. Likewise, revenues from the WTE plant market in the PRC are expected to grow over 18% from 2013 to 2018.

2. Policies

4. In 2014, the PRC issued many intensive environmental protection laws and regulations that are stricter than previous policies. The *Environmental Protection Law* outlines new government responsibilities, illegal pollution discharge penalties, information disclosure regulations, and other stringent measures.

5. In September 2014, the National Development and Reform Commission, Ministry of Finance, and Ministry of Environmental Protection jointly issued the *Notice on the Adjustment of the Pollution Discharge Fee Levy Standard and Other Related Issues*. This notice adjusts the levy standard of the pollution discharge fee and doubles the standards of primary pollutants,

¹ L. Yuanyuan. 2015. "Chinese Waste-to-energy Market Experiences Rapid Growth During Last Five Years." <http://www.renewableenergyworld.com/articles/2015/04/chinese-waste-to-energy-market-experiences-rapid-growth-during-last-five-years.html>.

such as waste gas and wastewater. In addition, the environmental tax plan has been submitted to the National People's Congress, and is expected to be implemented during 2015–2016.

6. To improve management efficiency and environmental standards, the *Pollution Control Standard of Municipal Solid Waste Incineration*² was implemented in July 2014, improving pollution control requirements and setting higher emissions limits. Of these, the emissions limit of the heavy metal mercury and its compounds (a component of fly ash) changed from 0.1 milligram per cubic meter to 0.05 milligram per cubic meter. The control limit of dioxin-like substances was increased to 0.1 nanogram of toxicity equivalent per cubic meter, the same as the EU standard, which is 10 times stricter than the previous standard. Stricter standards and improved governance have supported the upgrading of existing WTE plants and the construction of high standard WTE plants.

7. In 2014, the PRC's investment and financing mechanisms were reformed. The development of a series of targeted policies encouraged social capital to finance projects, which in turn promoted PPPs. At present, there are 40 laws and regulations that serve as a guide to PPP development. The comprehensive enforcement of these policies in 2015 is expected to result in many new PPP WTE projects.

² Jointly issued by the Ministry of Environmental Protection and General Administration of Quality Supervision, Inspection and Quarantine of the PRC.