Report Number: ICRR0022463

1. Project Data

Project ID P130786	**Project Name** Urban Scale BEE and RE
Country China	**Practice Area(Lead)** Energy & Extractives

L/C/TF Number(s)	Closing Date (Original)	Total Project Cost (USD)
TF-14522	31-Dec-2018	11,825,641.98
Bank Approval Date	**Closing Date (Actual)**	
26-Apr-2013	31-Dec-2019	

	IBRD/IDA (USD)	Grants (USD)
Original Commitment	12,000,000.00	12,000,000.00
Revised Commitment	11,825,641.98	11,825,641.98
Actual	11,825,641.98	11,825,641.98

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2. Project Objectives and Components

a. Objectives

According to both the Global Environment Facility Grant Agreement (p.6) dated July 4, 2013, and the Project Appraisal Document (PAD, p.4) dated March 28, 2013, the project objective was “to improve selected national and city-level policies for: (i) the promotion of low-carbon, adaptive, and livable urban forms; (ii) an increase in energy efficiency in public and commercial buildings; and (iii) the scale-up of commercially viable rooftop solar photovoltaic deployment.”

The global environment objective of the project was "to reduce carbon dioxide emissions from buildings in selected Chinese cities by supporting improved policy making and implementation in promoting low-carbon, adaptive and livable urban forms, increasing energy efficiency in public and commercial buildings, and scaling up commercially viable rooftop solar PV deployment" (PAD,p.4).

This review will assess the project objective as defined in the grant agreement. The objective will be parsed into three:

Objective 1: To improve selected national and city-level policies for the promotion of low-carbon, adaptive, and livable urban forms.

Objective 2: To improve selected national and city-level policies for an increase in energy efficiency in public and commercial buildings.

Objective 3: To improve selected national and city-level policies for the scale-up of commercially viable rooftop solar photovoltaic deployment.

Note: Although the target value of one of the objective-level indicators, i.e., the number of renewable energy service contracts, was reduced at the second restructuring, this change did not diminish the level of ambition of Objective 3. Therefore, this review will not administer a split assessment of the project outcome.

b. Were the project objectives/key associated outcome targets revised during implementation?
Yes

Did the Board approve the revised objectives/key associated outcome targets?
No

c. Will a split evaluation be undertaken?
No

d. Components
The project consisted of four components with multiple sub-components:

A. Promoting the Development of Low-Carbon, Adaptive and Livable Urban Forms. *(Appraisal cost: US$8.76 million; actual cost: US$8.70 million)*

a. **National support for development of low-carbon, adaptive, and livable (LOCAL) urban forms:** This sub-component consisted of the following technical assistance activities: (i) consultancy services for carrying out empirical studies and analyses and a review of urban development policies to improve statutory urban planning standards and regulations; (ii) conferences, workshops, training programs and an annual conference for capacity building of concerned government agencies and the public to build national consensus; and (iii) pilots for the development of LOCAL urban forms in selected cities.

b. **Beijing Municipality studies and analyses:** This sub-component was to finance consultancy services for carrying out empirical studies and analyses in Beijing Municipality for the improvement of statutory urban planning standards and regulations.
c. **Ningbo Municipality studies and pilot:** Consultancy services were to be financed under this sub-component to carry out empirical studies and analyses in Ningbo Municipality for the improvement of statutory urban planning standards and regulations. Additionally, this sub-component was to support the revision of the development master plan, development of associated construction-control plans, and carrying out of a comprehensive transport planning exercise as a pilot to demonstrate the impact of LOCAL urban planning and design in the city of Damuwan.

B. Improving Energy Efficiency in Public and Commercial Buildings. *(Appraisal cost: US$18.53 million; actual cost: US$60.67 million)*

a. **National support for energy performance benchmarking and disclosure (EPB&D) for large public and commercial buildings:** This sub-component was to support the following activities: (i) the development of a model methodology and national guidelines for EPB&D based on the pilot programs to be carried out in Beijing and Ningbo; and (ii) the design and implementation of a national program for EPB&D replication in additional cities.
b. **Improvement of policies and implementation capacity in Beijing Municipality:** This sub-component was to support three groups of activities: (i) design and implementation of a mandatory EPB&D program for large public and commercial buildings and implementing a pilot program for these building types; (ii) studies and analyses, and development of policies for the promotion of green buildings and energy efficiency in buildings, and establishment of an online registry of and certification platform for green buildings; and (iii) outreach to capacity building of local stakeholders and construction trades regarding the new or revised policy and regulatory requirements.
c. **Improvement of policies and implementation capacity in Ningbo Municipality:** This sub-component was to support the following activities: (i) design and implementation of a mandatory EPB&D program for large public and commercial buildings and establishment of an online energy monitoring program for such buildings; (ii) demonstration of bioclimatic and cost-optimal designs for new green buildings and green building retrofitting through Green Building subprojects at Ningbo University; and (iii) carrying out policy studies and capacity building of local stakeholders and construction trades regarding the new or revised policy and regulatory requirements.

C. Scaling up Commercially Viable Rooftop Solar PV Deployment. *(Appraisal cost: US$2.00 million; actual cost: US$3.30 million)*

This component was to finance technical assistance activities to support the implementation of the Beijing Rooftop Solar Photovoltaic Scale-Up Project (BJSPVP, P125022). It consisted of four sub-components:

a. Provision of engineering and technical assistance support in photovoltaic (PV) systems to Beijing YuanShen Energy Saving Company Limited (YuanShen), the renewable energy service company (RESCO) responsible for implementing BJSPVP, demonstration of the RESCO business model for large-scale grid-connected rooftop PV deployment, and independent monitoring and evaluation (M&E) of the implementation and results of the RESCO business model.
b. Demonstration of two-way metering of electricity in Beijing Municipality.
c. Establishment of an online monitoring system for rooftop PV system and a solar-energy information portal in Beijing Municipality.

d. Improvement of renewable energy education in schools and other education institutions in Beijing Municipality.

D. Project Management. *(Appraisal cost: US$1.30 million; actual cost: US$0.89 million)*

This component was to support project management, implementation, and M&E.

Revised Components

One of the two green building demonstration projects to be implemented at the Ningbo University under the second component was cancelled because of additional investment requirement to obtain the fire and safety certificates from the municipal government to implement the project. Instead, the project was restructured to support an alternative green building demonstration project, i.e., the Ningbo Kitchen Waste Treatment Plant. The increase in the construction cost of the demonstration project was funded by the local counterpart (ICR, p.29).

e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project Cost: The total project cost was originally estimated at US$30.59 million. In December 2019, the project closed with a total cost of US$73.58 million. The increase in the project cost was because of the change of the project activity under the second component from renovation of buildings to a kitchen waste treatment facility (see Revised Components above).

Financing: At appraisal, the Global Environment Facility (GEF) grant was estimated at US$12.00 million. By project closing in December 2019, the project had disbursed US$11.83 million of the grant.

Borrower contribution: At appraisal, the borrower's contribution was estimated at US$18.59 million. At project closing, the borrower's actual contribution was US$61.74 million because of the change in the project scope under the second component (see Revised Components above).

Restructurings: There were two project restructurings:

- **First Restructuring (Level 2 – March 31, 2018):** This restructuring included changes to institutional and disbursement arrangements. The Ministry of Housing and Urban-Rural Development (MOHURD), one of the four project implementation entities, delegated its project implementation responsibility to the Center of Science and Technology for Construction (CSTC), one of its affiliated but legally independent entity. Additionally, the project's designated account was relocated from the Ministry of Finance (MoF) to CSTC. The process initiated by the MoF in early 2017 to relocate designated account management from the MoF to project implementation agencies necessitated these changes (Restructuring Paper, Report No: RES30528, pp.4-5)
- **Second Restructuring (Level 2 – December 18, 2018):** The project, through its third component, supported the Beijing Distributed Solar Photovoltaic Scale-Up Project (BJSPVP). In order to match the project closing extension of BJSPVP to December 31, 2018, the closing date of this project was also extended by 12 months from December 31, 2018 to December 31, 2019. This closing date extension allowed the alignment of the implementation of both projects. This extension also provided

additional time for the completion of project activities under other components, such as the construction of a municipal composting facility (see Revised Components above). The project closing extension was expected to allow time to draw policy recommendations and disseminate findings of the low-carbon urban form studies conducted under the first component for four cities, i.e., Beijing, Ningbo, Qingdao, and Taiyuan (Restructuring Paper, Report No: RES34337, pp.5-6). Additionally, the target values of two project objective level indicators were decreased to be consistent with the BJSSPVP: i) number of renewable energy service contracts signed from 765 to 400 (these contracts were to be signed under BJSSPVP and monitored under this project); and ii) CO2 emissions reduction associated with GEF assistance from 85,120 tons per year to 70,000 tons per year (Restructuring Paper, Report No: RES34337, pp.6)

Dates: The project was approved on April 26,2013. The Grant Agreement was signed on July 4, 2013 and became effective on August 26,2013. The Mid-Term Review was conducted in October 2016. The original closing date was December 31,2018. In the second restructuring, the closing date was extended by 12 months, and the project closed on December 31, 2019. The reasons for closing date extension have been outlined in the second restructuring entry above.

3. Relevance of Objectives

Rationale

Project objectives were highly relevant to the country context at project closing in December 2019. In line with its rapid economic growth and development, China has been experiencing rapid urbanization for more than three decades. In 2019, around 60 percent of the population lived in the cities and it is projected that by 2030 this will increase to 70 percent corresponding to more than 1 billion people. Rapid urbanization in the country followed a carbon-intensive development path, contrary to the government's higher objective to lower energy intensity and carbon intensity at national, municipal, and district levels as defined in the 13th Five-Year Plan (FYP) for 2016 to 2020 (ICR, p.17). The FYP covers all three project objectives in Chapter 34 Develop Harmonious and Pleasant Cities (LOCAL urban forms), Chapter 43 Promote Economical and Intensive Resource Use (energy efficiency) and Chapter 36 Promote Coordinated Urban and Rural Development (distributed energy-rooftop solar). The project is a small-budget technical assistance project. It aimed at addressing the barriers to the development of LOCAL urban forms, energy efficiency applications in large public and commercial buildings and integration of distributed energy to the municipal grids. This was to be achieved through the development of national and city-level policies and regulations, and the demonstration of their applicability by implementing pilot sub-projects. The project objectives were appropriately pitched for the development status of the country. Beijing and Ningbo municipalities had the capacity to successfully implement the project along with the Ministry of Housing Urban-Rural Development. Beijing as the nation's capital was to serve as an example for the whole nation, and Ningbo already had experience with sustainable urbanization. Therefore, the capacity in these two cities, coupled with the government's commitment to the project, was sufficient to expect the achievement of the objectives.

Project objectives were also highly aligned with the Bank's country strategy as defined in the China Country Partnership Framework (CPF) for Fiscal Years 2020-2025. The project objectives fall under the second engagement area of "Promoting greening growth" of the CPF. The project sought to address the carbon-intensive and high-energy consumption urban growth patterns under the strategic objective of "promoting

low-carbon transport and cities" (CPF, Objective 2.5, p.27) and greenhouse gas emissions through energy efficiency applications and local utilization of and effective integration of renewable energy under the objective of "facilitating the transition to a lower carbon energy path" (CPF, Objective 2.1, p.27).

At the time of project appraisal, the Bank had been a development partner of China in energy efficiency and renewable energy interventions for more than two decades. This project was a first-time effort "to build upon ongoing and new projects and analytical work by taking a step in addressing some of the cross-cutting linkages to urban spatial planning" including LOCAL urban forms, energy efficiency and renewable energy in the form of distributed energy (PAD, p.4). When assessed with respect to the Bank's relevant country and sector experience, the project objectives were adequately challenging and consistent with progress over time as compared with earlier and ongoing projects.

Overall, the relevance of objectives at the time of project closure was high.

Rating
High

4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective
To improve selected national and city-level policies for the promotion of low-carbon, adaptive, and livable urban forms.

Rationale
Theory of Change for Objective 1

The first project objective was to promote low-carbon, adaptive, and livable (LOCAL) urban forms through the improvement of selected national and city-level policies. The project was to support the carrying out of empirical studies and analyses and review of urban development policies based on the experience to be gained from city-level pilots, the first being in the Darwan district of Ningbo Municipality. The pilot was to consist of the revision of the urban master plan, preparation of construction control plans, and planning and concept design of the transport system for the new town in Darwan. The findings of this pilot and the results of the studies were to be disseminated to the central government and municipal officials through conferences, workshops, training programs, and a conference to be convened annually. These activities were expected to result in the following intermediate outcomes: (i) improved key statutory urban planning standards and regulations; (ii) enhanced knowledge about and national consensus on policy directions in urban planning; and (iii) demonstration of LOCAL urban forms through city initiatives in piloting and adopting urban planning and design principles and practices (PAD, p.5). These were expected to lead to establishing linkages between national and city level efforts that were to form the basis of a national dissemination platform to

promote the replication of good practices and policies in LOCAL urban forms, thus achieving the project objective (PAD, p.3).

Since this was a technical assistance project with a small budget, it would not be realistic to expect a nation-wide implementation of LOCAL urban forms as a project result. The main expected outcome was "improved policies" defined in the ICR (p.11) as "new or upgraded statutory, legal, or regulatory imperatives, as well as enhanced knowledge, capacity, experience, and tools to develop them and ensure their quality execution." The project was to address the barrier of unconducive urban spatial planning standards and regulations to the implementation of LOCAL urban forms, and it was expected that this would lay the groundwork and create an enabling legal framework for the replication of such forms at the municipal level demonstrated by a pilot in Ningbo. Overall, the causal pathways from inputs to outcomes were valid and direct, and the outcomes achieved could be attributed to the project's intervention.

Outputs

- The project financed 39 empirical studies and analyses (see ICR, Annex 1.B Key Outputs by Component, pp.50-53 for a detailed list). No target was set for the total number of studies to be financed under the project at appraisal.
- In addition to Beijing and Ningbo (Damuwan New Town), the project financed the preparation of urban form studies for the Western Technological Innovation Harbor in Shaanxi Province (Shaanxi Xixian New Area) and the Jinzhong Starting District in Taiyun City (ICR, p.20). The target was to complete urban form studies for four cities.
- Based on the findings of the urban form studies, three city pilots of LOCAL urban planning design were implemented, as planned, in Damuwan in Ningbo, in Shaanxi Xixian New Area and Jinzhong Starting District in Taiyun City.
- The project financed trainings, workshops, conferences and overseas study tours to Germany, France, and Italy (Aide Memoire, December 2019 p.26). The ICR did not provide detailed information about the contents of these activities. The target was to train 150 mayors and city planning officials on LOCAL urban forms. The project financed the training of 295 national policy makers, city managers and planners (ICR, p.19).
- The project financed the organization of the Urban Development and Planning Conference that served as a national-level communication platform (ICR, p.30).

Outcomes

- As a result of the studies and analyses conducted under the project, Ministry of Housing and Urban-Rural Development (MOHURD) prepared draft national guidelines for LOCAL urban forms and recommendations on revisions of national statutory urban planning regulations and standards (ICR, p.18). Three standards developed under the project were implemented: (i) Standards for Planning and Design of Urban Residential Areas; (ii) Urban Drainage Planning Standard; and (iii) Standards for Planning of Urban Integrated Transportation System. A fourth one, i.e., Standards for Planning and Design of Walking and Bicycle Systems, was drafted at the time of project closing.
- The findings of the studies and analyses resulted in recommendations and improvements for 28 regulations and standards at the national and municipal levels (ICR, p.18). These covered areas, such as low-carbon city, urban-rural planning, municipal works, ecological and environmental safety, environmental quality, and engineering safety, and were reflected in the planning of five new urban zones: (i) Beijing Master Plan; (ii) Damuwan New Town in Ningbo; (iii) the Shanxi Taiyuan Science

and Technology Innovation City; (iv) the Core Area of the Jinzhong Starting District; and (v) the new Campus Town of Xian Jiatong University of Shaanxi Fengxi New Town. (Aide Memoire, December 2019, pp.3-4)

- The Beijing Housing and Urban-Rural Development Commission (BHURDC) incorporated the LOCAL planning and design suggestions of the studies and analyses in the new edition of the city's urban master plan (ICR, p.19).
- The Ningbo Housing and Urban-Development Committee (NHURDC) incorporated the project studies' recommendations of LOCAL principles into administrative laws and statutory planning, and low-carbon construction requirements into the planning and management of construction land uses (ICR, p. 19).
- The outcome expected from the training of mayors and senior planning officials was to build national consensus on the adoption of LOCAL urban forms and capacity development. According to the reports of the project implementation agencies, these trainings "improved the corresponding capabilities of national policy makers, city managers and planners in low-carbon livable cities" and "raised the green and low-carbon development concept of government officials and employees of the sector, and enhanced their understanding and abilities of implementing relevant policies" (ICR, p.19).

Overall, the project achieved its goal of developing policies based on LOCAL principles and piloting these in selected cities. However, as reported in the ICR prepared by MOHURD (p.11), the replication of LOCAL urban forms at the national level could be difficult because of complex coordination requirements. Promotion and replication of these urban forms require the involvement of diverse stakeholders responsible for urban planning, architectural design, heating, and ventilation design, therefore, coordination among these stakeholders could be a barrier for replication of these LOCAL urban forms.

Rating
Substantial

OBJECTIVE 2
Objective
To improve selected national and city-level policies for an increase in energy efficiency in public and commercial buildings.

Rationale
Theory of Change for Objective 2

The second project objective was to increase energy efficiency in large public and commercial buildings through the improvement of selected national and city-level policies. There were major barriers for the implementation of energy efficiency activities in large public and commercial buildings (ICR, p. 7), in addition to unconducive urban spatial planning standards and regulations, inadequate measurement and disclosure of energy performance data, scarce empirical evidence on benefits, and misguided design practices. The project sought to address these barriers by supporting the development of a methodology and national guidelines for energy performance benchmarking and disclosure (EPB&D) and the design and implementation of mandatory EPB&D programs for large public and commercial buildings in Beijing and Ningbo. The project was also to support the improvement of energy efficiency policies and the establishment of online registry and certification platform for green buildings in Beijing and online energy monitoring program in Ningbo. Technical assistance

was to be provided to local stakeholders and construction trades to build capacity for the fulfillment of new and revised policy and regulation requirements in energy efficiency. Lastly, the project was to support green building subprojects at Ningbo University to demonstrate bioclimatic and cost-optimal designs.

These activities were expected to result in the implementation of a methodology and guidelines for EPB&D for large public and commercial buildings, expansion of city-level EPB&D programs including online registry and monitoring, and improved policies and supporting mechanisms for energy efficiency applications. The expected impact of the project in the long-term was the scaling up of green buildings in Beijing and Ningbo, and replication of such applications in other cities.

Like in Objective 1, it would not be realistic to expect a nationwide application of EPB&D programs and implementation of green building designs as a result of the limited intervention of the project. However, the project was expected to create an enabling legal framework for future scaling-up of green buildings in large public and commercial buildings by establishing nationwide EPB&D guidelines, implementation of these programs in Beijing and Ningbo, and demonstrating the successful implementation of green building subprojects as pilots. Overall, the causal pathways from inputs to outcomes were valid and direct, and the outcomes achieved could be attributed to the project's intervention.

Outputs

Under Component 2, the project financed 40 activities (see ICR, Annex 1.B Key Outputs by Component, pp.53-58 for a detailed list). The main outputs of those activities were as follows:

- At the national level, EPB&D methodologies, guidelines, and systems for large public and commercial buildings were developed and approved. This was achieved through the addition of a methodological requirement to the Technical Standard for Ultra-low Energy Building of Public Institutions for evaluating and monitoring building performance and operation.
- A national program for EPB&D was prepared as planned.
- Mandatory EPB&D methodologies, guidelines, and systems for large public and commercial buildings were developed at the municipal level, i.e., Beijing and Ningbo.
- The Green Building Application Platform and the Building Energy Benchmarking Platform were built in Beijing.
- The Building Energy Consumption Monitoring Platform was built in Ningbo.
- Two green building demonstration projects, i.e., New Sci-Tech Service Building of Ningbo University and the Ningbo Kitchen Waste Treatment Plant, were completed in Ningbo, as planned.
- In Beijing, 4,423 stakeholders were trained through training and dissemination activities. In Ningbo, 2,810 stakeholders were trained in workshops. For each city the target was 1,000 stakeholders. The topics covered in these trainings were green buildings, prefabricated buildings, three-dimensional greening, solid waste management, and scaling-up of green building (ICR, p.22).
- Study tours were organized to the United States, Canada, and Germany.

Outcomes

- At the national level, new policies, regulations and standards were developed or existing ones were revised, as planned, such as green building energy conservation design, green construction standards, green building engineering construction acceptance specification, and green building evaluation (Aide Memoire, December 2019, p.5).

- EPB&D methodologies, guidelines, and systems for public and commercial buildings developed under the project were implemented in public hospitals in Beijing and Ningbo.
- In Beijing, findings of studies and analyses were incorporated into the following policies, measures and plans: Ultra-low Energy Building Policy, the Green Building Policy, the Prefabricated Building Policy, the Building Energy Conservation Measures, Beijing's 13th Five-Year Plan, and the Public Building Energy Efficiency Improvement Action Plan (Aide Memoire, December 2019, p.5).
- In Beijing, 47.2 million square meters were certified as green buildings floor area. The target was 15 million square meters.
- In Ningbo, 333 buildings are connected to the energy consumption monitoring platform. The energy consumption of these buildings is monitored real-time (ICR, p.20). There was no target set for this outcome.
- The benchmarking methods and information disclosure system developed under the project were replicated in Qingdao and Chongqing, respectively.

The project achieved its goal in developing EPB&D guidelines to address the barrier of setting-up systems to collect and share primary data on buildings. The energy performance data recording, evaluation and sharing systems are now transparent and consistent. Availability of these systems are expected to result in more energy efficiency improvements in large public and commercial buildings and support long-term planning of such improvements. The project's goal of consensus building and knowledge sharing was achieved, and pilot project demonstrated the successful implementation of these systems. Given the central and local government's commitment to lower the country's dependence on fossil fuels, it should be expected that the EPB&D systems would be replicated in other regions and cities in the medium-term. However, the different economic and development levels of cities, the technical complexity of building energy efficiency benchmarking, and the constructors' reluctance to disclose energy consumption data still remain as obstacles to the replication of energy performance benchmarking and disclosure methodology and guidelines in other cities (MOHURD Implementation Completion Report, p.11).

Rating
Substantial

OBJECTIVE 3
Objective
To improve selected national and city-level policies for the scale-up of commercially viable rooftop solar photovoltaic deployment.

Rationale
Theory of Change for Objective 3

The third project objective was to scale-up commercially viable rooftop solar photovoltaic (PV) deployment. Upon initial review, this objective as stated seems misleading in light of the activities that were actually implemented, because the objective calls for change in national and city-level policies, but the activities were not directly related (ICR, p.12). However, they were not entirely irrelevant in the sense that new and important operational policies were put into place as shown by the following activities: (i) demonstration of renewable energy service company (RESCO) model for large scale grid connected rooftop solar PV in Beijing; (ii)

provision of engineering and technical support to the YuanShen Energy Service Company; (iii) independent monitoring and evaluation of the implementation and results of the RESCO model; (iv) demonstration of the two-way metering in Beijing; (v) establishment of an online monitoring system for rooftop solar PV systems; and (vi) improvement of renewable energy education in schools. These activities were expected to develop local capacity for rooftop solar PV deployment by addressing the barriers of lack of experience and lack of blueprint for the integration of distributed power (power from rooftop solar PV systems). They were centered in Beijing and designed to support the Beijing Rooftop Solar PV Scale-Up Project (BJSPVP) (PAD, p.7). They were expected to result in "strengthening the management capacity of the electricity utility and providing essential information for the Beijing Municipal Government to monitor the valuation and deployment of local green energy" (ICR, p.9). As a result of the establishment of two-way metering, the utility was to improve its technical capacity to adequately handle intermittent power supplied by rooftop solar PV systems to the grid. The expected outcome was increased deployment of grid-connected rooftop solar PV systems through RESCO model in Beijing. Although the BJSPVP financed the rooftop solar PV systems, the technical assistance activities of Component 3 were consistent with the theory of change and objectives of the BJSPVP in a supporting capacity; moreover, outcomes expected from this technical assistance support were on the critical path to scale up rooftop solar PV systems in Beijing. Therefore, this review approaches the assessment of Objective 3 within this coherent framework. Overall, the causal pathways from inputs to outcomes were valid and direct.

Outputs

Following outputs were achieved under the third component (see ICR, Annex 1.B Key Outputs by Component, pp.58-60 for a detailed list):

- PV systems related engineering and technical support were provided to YuanShen—a renewable energy service company implementing the BJSPVP—such as Operational Guidelines for the Whole-process Project Management of PV Power Projects in Public Institutions, General Rules for Distributed Solar PV Systems' Operation, Management and Maintenance, and Market Evaluation Report on the Promotion of Rooftop Solar PV in Other Public Institutions.
- The project financed the Case Study of "Sunshine Campus Project."
- The project financed the provision of monitoring and evaluation services by the Chinese Academy of Sciences for the Sunshine Campus Project, such as comprehensive performance evaluation, annual monitoring report, interim reports, publicity science program and general evaluation of the BJSPVP.
- Three study tours were organized to the United States, Canada, and Europe.
- Two-way metering was piloted by the Beijing Energy Saving Company—the grid company in Beijing—to integrate rooftop solar PV systems to the grid.
- Solar energy information portal was established.
- Renewable energy education platform was developed, 20 demonstration classrooms were established, and teachers were trained.

Outcomes

- The installed rooftop solar PV capacity in Beijing increased by 102.2 MW against the target of 100 MW, this was achieved under the BJSPVP supported by this project.
- The project supported the commercial and technical capacity of YuanShen. The company signed 324 renewable energy service contracts. The target was 400 contracts.

- The piloting of the two-way metering system to integrate distributed energy generated by rooftop solar PV systems to the grid resulted in the acceptance of the system by the initially reluctant State Grid, the state-owned transmission and distribution utility (ICR, p.22). The utility controls 82 percent of the transmission and distribution system nation-wide and plans to allow intermittent renewable energy penetration to the system up to 35 percent as a result of the pilot that showed the viability of two-way metering (ICR, p.30).
- The Beijing Solar Information Portal hosted by the Beijing Energy Conservation and Environment Protection Center was functional. At project closing, 260 rooftop solar PV systems were registered to the portal, and their real-time data were disclosed. There was no target set for this outcome. At the time of the writing of this review in April 2021, the portal was not accessible (www.re-bj.com).
- The evidence is insufficient to show the immediate outcome of the technical assistance provided to improve renewable energy education in schools and educational institutions in Beijing through the development of a renewable energy education platform, establishment of 20 demonstration classrooms, and training of teachers. The impact of these activities should be expected to materialize in the medium- and long-term in scaling-up renewable energy in the city through increased knowledge and awareness.

The project activities were critical in addressing the barriers and initial hurdles stemming from limited knowledge and experience. The piloting of the two-way metering successfully demonstrated the practicality of the system to connect intermittent power generated by rooftop solar PV systems to the grid. This was an important barrier that had to be addressed to scale up the installation of rooftop solar PV systems. The achievement of service contracts was lower than the target and the evidence was insufficient to assess the impact of the technical assistance on energy education in schools and educational institutions in Beijing.

Rating
Substantial

OVERALL EFFICACY
Rationale
The project achieved its goal of developing policies for LOCAL urban forms and piloting them in Beijing, Ningbo and three other cities, but the difficulties in coordinating various stakeholders is still a potential barrier for nationwide replication of these urban forms. Therefore, the project's efficacy in achieving the first objective is rated substantial. The project also achieved its goal of developing energy performance benchmarking and disclosure (EPB&D) methodologies and guidelines, that were piloted in Beijing and Ningbo and two additional cities. The project successfully piloted two green building projects. However, the technical complexity of building energy efficiency benchmarking and the constructors' reluctance to disclose energy consumption data still remain as obstacles to the replication of these methodologies and guidelines in other cities. The project's efficacy in achieving the second project is rated substantial. Regarding the third objective, although the achievement in service contracts was lower than the target, and evidence was insufficient to assess the impact of the technical assistance on energy education in schools an educational institutions, the project successfully demonstrated the applicability of two-way metering to connect intermittent power generated by rooftop PV systems and supported YuanShen to develop a renewable energy service company model. These

achievements were on the critical path to scale up rooftop PV systems. Therefore, the project's efficacy in achieving the third objective is rated substantial. Overall, the efficacy of the achievement of the project development objective is rated substantial.

Overall Efficacy Rating

Substantial

5. Efficiency

Economic Analysis

A "with-project" and "without-project" analysis was conducted at appraisal. Without project, Beijing and Ningbo municipalities would still be expected to implement energy efficiency and renewable energy activities, but the impact would be limited because of limited knowledge and experience in addressing barriers and overcoming initial hurdles in policy and program design (PAD, pp.44-45). It was estimated that the impact of the without-project scenario on scaling-up energy efficiency and renewable energy applications would be limited resulting in a total lifetime avoided carbon dioxide emissions of 20 million metric tons.

The with-project scenario defines the technical assistance activities as being on the critical path in scaling up energy efficiency and renewable energy applications by increasing knowledge and experience, and also supporting the creation of an enabling legal framework for replication nation-wide. The reduction of carbon dioxide emissions expected in with-project scenario was 35 million metric tons, which was 15 million metric tons higher (that is attributable to the project) than the estimated achievement under the without-project scenario over a period of 15 years (PAD, pp.46-47). Assuming that US$12 million of GEF grants would be disbursed fully, the undiscounted unit cost of one metric ton of carbon dioxide was expected to be US$0.8.

At appraisal, the reduction in carbon dioxide emissions directly attributable to the project was estimated at 85,120 metric tons per year. This target was revised down to 70,000 metric tons at the project restructuring. At project closure, the actual reduction in carbon dioxide emissions was around 82,000 metric tons. Based on the data collected from the project implementing entities, the total reduction in carbon dioxide emissions at project closure, including direct and indirect reductions, was estimated at 1.06 million metric tons per year. This implies a total reduction of 15.9 million metric tons of carbon dioxide emissions over a 15-year period, slightly higher than the estimate at appraisal. This resulted in an undiscounted unit cost of US$0.75 per metric ton of carbon dioxide, which was lower than the appraisal estimate of US$0.8.

Administrative and Operational Efficiency

The project delivered technical assistance within budget. Project's deliverables were based on extensive research analysis and found to be high quality (ICR, p.28). The findings of the studies and empirical analyses were incorporated into the relevant national and local guidelines, policies, and regulations. The project implementation entities reported that technical assistance support had "a positive impact on their performance, and institutional capacity building" (ICR, p.28). However, implementation of some activities was delayed at the start of the project, such as the delay in the Damuwan pilot because of the difficulties in revising the urban master plan to incorporate low-carbon elements. There were also delays because of insufficient policy

coordination, such as the obstacles faced in receiving municipal certification for the pilot project in Ningbo, and lack of sufficient research time for LOCAL urban form studies to draw conclusions (ICR, pp.32-33). The change in the pilot project in Ningbo also resulted in a cost increase that was covered by the borrower (see section 2.d Components, Revised Components). Despite minor shortcomings, which were addressed adequately during project implementation, the Project Steering Committee under the Ministry of Housing and Urban-Rural Development successfully coordinated the project activities among project implementation entities. The Monitoring and Implementation System established to monitor GEF financed projects was critical in standardizing and efficiently implementing procurement, funds withdrawal and payments, document filing, and project data provision, and managing personnel change (ICR, p.33).

Overall, the project's efficiency in achieving project objectives is rated substantial.

Efficiency Rating

Substantial

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal		0	0 ☐ Not Applicable
ICR Estimate		0	0 ☐ Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome

The relevance of the project objectives is rated high. The project's overall efficacy and efficiency in achieving the project objectives are both rated substantial. Overall, the outcome rating is satisfactory.

a. Outcome Rating

Satisfactory

7. Risk to Development Outcome

A reversal of the policies and regulations developed under the project is highly unlikely. The recommendations of the studies and empirical analyses are incorporated into the national and municipal statutory regulations and policies. These were also included in the 13th Five-Year Plan strategies of the cities. Therefore, given the commitment of the Government of China and the municipal governments to promote LOCAL urban forms, increase energy efficiency applications in large public and commercial

buildings and increase the use of rooftop solar PV systems, the risk of a reversal of the relevant policies and regulations developed under the project is low.

The uncertainty caused by the outbreak of the Covid-19 pandemic is expected to have minimal adverse impact on the project outcomes. Energy efficiency and rooftop solar PV system applications are effective responses to energy price fluctuations. Increased application of energy efficiency and rooftop solar PV solutions would contribute to economic growth during the Covid-19 pandemic and more so after the end of the pandemic. They also contribute to long-term sustainable economic growth by lowering energy consumption and reducing greenhouse gas emissions.

However, difficulties in policy coordination among numerous stakeholders and differences in the economic and development levels of the cities are two major obstacles for the nation-wide replication of project outcomes. The project's long-term impact will depend on the scale replication of the project's outcomes in other cities. According to Ministry of Housing and Rural-Urban Development (MOHURD), policy coordination among various stakeholders in areas such as urban planning, architectural design, heating and ventilation designs stands out as a potential risk for the promotion of low-carbon livable urban forms at the national level. Furthermore, the technical complexity of building energy efficiency benchmarking and the constructors' reluctance to disclose energy consumption data are seen as obstacles to the replication of energy performance benchmarking and disclosure methodology and guidelines in other cities. Overcoming these obstacles in cities with lower economic and development levels could be a challenge for scaling-up of project's outcomes (MOHURD Implementation Completion Report, p.11).

8. Assessment of Bank Performance

a. Quality-at-Entry

At project entry, the goal of promoting energy efficiency and renewable energy was of high strategic priority because of the heavy dependence of the Chinese economy on fossil fuels. Experience gained in previous projects was reflected in the project's design and approach: starting major national initiatives with pilots to give cities and regions freedom to experiment while providing empirical evidence for consensus building through knowledge sharing, and later incorporating these findings into national and regional guidelines and policies (PAD, p.8); the so-called research-pilot-adopt-replicate model. The project's approach was complex; the promotion of three different, but related, topics, i.e., LOCAL urban forms, energy efficiency in large buildings, and rooftop solar PV systems, were to be supported by technical assistance and demonstration pilots. The technical aspects of the two pilot projects were sound. Economic analysis was adequately conducted in accordance with the GEF and Bank requirements. All four project implementation entities had sufficient administrative and financial management capacity, but the risks related to coordination among various stakeholders in promoting LOCAL urban forms and the technical complexity of benchmarking building energy performance and disclosure were correctly identified as significant risks (PAD, p.13). The overall risk assessment was realistic and mitigation measures were in place. Project implementation arrangements were adequate. Fiduciary aspects of the project were clearly defined; internal control and audit arrangements were sufficient. The environmental impact of the pilot projects was sufficiently assessed. However, there were shortcomings in the M&E design, mostly because of the difficulties in capturing the qualitative outcomes of technical assistance support (see section 9. M&E Design, Implementation and Utilization below).

Quality-at-Entry Rating
Satisfactory

b. Quality of supervision
Thirteen supervision missions were held: one approximately every six months, including site visits. As noted by the project implementation entities (ICR, p.37), the Bank's project team closely monitored the project's progress and shared their management experience and professional knowledge with the personnel in the project implementation entities that was critical in successfully completing the project activities. The project team's supervision of the fiduciary and safeguard aspects of the project was adequate. The project was restructured twice to address the changes in project implementation and activities. The Implementation Status and Results Reports and Aide Memoires were detailed and candid in reporting performance. The project team's focus was on the successful completion of the project activities. There were shortcomings in improving the M&E framework to capture the achievement of project outcomes and the project objectives to promote LOCAL urban forms, increase energy efficiency applications and scale up rooftop solar PV systems (see section 9. M&E Design, Implementation and Utilization below).

Quality of Supervision Rating
Satisfactory

Overall Bank Performance Rating
Satisfactory

9. M&E Design, Implementation, & Utilization

a. M&E Design
The theory of change showing how the key activities and outputs were to lead to the outcomes was sound. The objective-level indicators were designed to measure the preparation and issuance of national guidelines and methodologies. There were 14 intermediate results indicators that were mostly adequate to capture the implementation of the project activities. Technical assistance support given to YuanShen was not captured by the results framework. The indicators were specific, achievable, and time-bound, but recording of performance on key indicators was mostly either Yes or No. There was a genuine effort to have sufficient number of indicators to capture project's achievements, but they were mostly at the output level. The M&E arrangements were sufficiently embedded institutionally, and the project implementation entities had the capacity to monitor and evaluate project progress.

b. M&E Implementation
The indicators included in the results framework were regularly measured and reported. The use of Project Monitoring and Implementation System ensured the accuracy of information. All project documents were electronically recorded into the system, which was accessible to project evaluation

teams and the Bank's supervision mission teams. The target values of some indicators were revised during implementation in line with the changes in the BJSPVP, such as number of renewable energy service contracts concluded and the reduction in carbon dioxide emissions. These did not have a direct impact in improving the M&E quality of the project. The shortcomings in the results framework were not corrected to adequately capture the achievement of project outcomes. The focus of M&E remained at the output level and captured the implementation progress.

c. M&E Utilization

The M&E findings were reported regularly to stakeholders at the national and municipal levels and also to the Bank. The project had a complex design consisting of four separate project implementation entities and numerous contracts. The M&E findings were successfully used to make necessary changes to project activities, such as the revision made to one of the demonstration pilots in Ningbo, to enable their successful completion. The M&E data were used to provide evidence of application of inputs and achievement of outputs. The focus on the achievement of outcomes was weak.

Overall, M&E quality is rated modest because of the significant shortcomings in M&E design and implementation that made it difficult to assess the achievement of the stated objectives and test the links in the results chain. This review was able to assess the achievement of the project objectives based on the additional evidence presented in the ICR, such as anecdotal evidence or evidence from the project completion reports of the project implementation entities, and the evidence in Implementation Status and Results Reports and Aide Memoires.

M&E Quality Rating

Modest

10. Other Issues

a. Safeguards

At appraisal, the project was classified as Category B under Environmental Assessment (OP/BP 4.01). No other safeguards policy was triggered.

Environmental Assessment (OP/BP 4.01): The project was classified as Category B because of the limited adverse environmental impacts expected during the construction of the two green building demonstration projects in Ningbo, such as noise, dust, solid waste, safety, and social disturbance. These impacts were expected to be site-specific, insignificant, and easily mitigated (PAD, p.15). Environmental Management Plans (EMP) were prepared in accordance with the national and Bank requirements. Public consultations were conducted during environmental assessment and the EMPs were disclosed locally on the websites of the Ningbo Municipality and the Ningbo University, and in the Bank's InfoShop. The project implementation entity "screened environmental impacts, prepared sub-project technical and environmental

documents, and supervised implementation as required" (ICR, p.35). The project was compliant with the Environmental Assessment safeguard policy through to project closing.

Involuntary Resettlement (OP/BP 4.12): This safeguard policy was not triggered at appraisal or during project restructurings. However, land acquisition was needed for the construction of the Ningbo Kitchen Waste Treatment Plant that was added to the project scope at the first restructuring. Forty-seven families were impacted by this project. The project-affected families moved to their new houses in 2019. Compliance with the Bank's Involuntary Resettlement safeguard policy was monitored and affirmed under the Bank-financed Ningbo Urban Domestic Waste Collection and Recycling Demonstration Project (ICR, main text and footnote 16, pp.35-36).

b. Fiduciary Compliance

Financial Management

At appraisal, the project implementation entities prepared and adopted the Financial Management Manuals. Trainings were provided to the project financial staff before and during project implementation. Budgeting, flow-of-funds, and reporting arrangements were in place before the start of project implementation. The Ministry of Finance issued the accounting policy, procedures, and regulations related to the project. The auditors were the Audit Service Center of China National Audit Office for Foreign Loan and Assistance Projects, Beijing Municipal Audit Office, and the Ningbo Municipal Audit Office (PAD, p.28).

Financial management of the project was conducted as planned. There were no issues with the availability of counterpart funds. The project's financial management complied with the Bank's requirements. The audit reports were submitted on time and were unqualified. All project funds were accounted for at the time of project evaluation.

Procurement

Procurement was implemented in accordance with the Bank's procurement policies and procedures. The Project Monitoring and Implementation System was used to standardize the procurement procedures for all project implementation entities. The Bank's project team carried out post procurement reviews on a sampling basis every year. No major deviation from the Bank's procurement requirements was reported. The overall procurement was found satisfactory.

c. Unintended impacts (Positive or Negative)

None.

d. Other

None.

11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Satisfactory	Satisfactory	
Bank Performance	Satisfactory	Satisfactory	
Quality of M&E	Modest	Modest	
Quality of ICR	---	Substantial	

12. Lessons

Of the several lessons in the ICR, the following two have high value for broad applicability and replicability in similar Bank projects in the future.

Evidence-based policies piloted at the city and regional levels can facilitate the replication of such policies nation-wide by informing positive statutory and regulatory changes. The project was designed as a research-pilot-adopt-replicate model for policy development to promote LOCAL urban forms and increase energy efficiency in large public and commercial buildings. Based on the theoretical framework that was formed by methodical research, the LOCAL urban form policies and energy performance benchmarking and disclosure methodologies were piloted in Beijing and Ningbo. The results of these pilots were used to create consensus on the applicability of these solutions. These were also replicated in two more cities, i.e., Qingdao and Chongqing, during project implementation. Despite some risks associated with the different economic and development levels of other cities for the nation-wide replication of the outcomes, the research-pilot-adopt-replicate model, a common model used in China, was successful in introducing these new and innovative solutions to the country.

Energy efficiency primary data need to be made available in order to enable the valuation of energy efficiency improvements, which could result in the substantial replication of such improvements. The introduction of energy performance benchmarking and disclosure methodology and guidelines resulted in a transparent and consistent system of data recording, evaluation, and sharing. Lack of data about energy performance of buildings was a major barrier to the implementation of energy efficiency improvements. Availability of such data also supports long-term planning of building energy efficiency improvements. Through comparison and disclosure of energy efficiency data, the decision-makers can determine whether a building should be retrofit or rebuilt in a most cost-effective way.

13. Assessment Recommended?

No

14. Comments on Quality of ICR

The ICR provides a detailed overview of the project. The narrative is candid. There is sufficient clarity in the report's message. It is internally consistent. The Annex 1, Results Framework and Key Outputs provides detailed information about the project's activities and outputs. The report is mostly evaluative and consistent with the Bank guidance. There is a logical linking and integration of the various parts of the report. The theory of change is adequately presented, and the report attempts to emphasize how activities informed outputs and outcomes, but the focus is more on outputs and less on outcomes. The achievement of the project outcomes and objectives are assessed by the achievement of the target values of the indicators, which did not fully encompass the project outcomes. This shortcoming is partially addressed by additional evidence from the ICRs of the project implementation entities and anecdotal evidence. The ICR's lessons are mostly useful and based on evidence outlined in the report. The M&E Quality is rated substantial in the text, but the narrative in that section does not support a substantial rating. On the other hand, the M&E Quality rating is recorded as modest in the Data Sheet of the ICR. The ICR is substantially longer (39 pages) than recommended in the Bank guidance (15-20 pages).

a. Quality of ICR Rating
Substantial