Document of
The World Bank

Report No: ICR00002116

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-97018)

ON A

GRANT

FROM THE

GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF US$6,163,636

TO

CHINA

FOR THE

SINO-SINGAPORE TIANJIN ECO-CITY PROJECT

January 24, 2017

Social, Urban, Rural, and Resilience Global Practice
East Asia and Pacific Region

CURRENCY EQUIVALENTS
(Exchange Rate Effective February 5, 2010)

Currency Unit =	Chinese Yuan (CNY)
Appraisal	Completion
Effective February 5, 2010	Effective June 30, 2016
CNY 1.00 = US$0.146	CNY 1.00 = US$0.151
US$1.00 = CNY 6.8	US$1.00 = CNY 6.6

FISCAL YEAR
January 1–December 31

ABBREVIATIONS AND ACRONYMS

CPS	Country Partnership Strategy
ETS	Emissions Trading Scheme
FM	Financial Management
GBES	Green Building Evaluation Standard
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEO	Global Environment Objective
GHG	Greenhouse Gas
GOC	Government of China
ICR	Implementation Completion and Results Report
ISR	Implementation Status and Results Reports
IOI	Intermediate Outcome Indicator
KPI	Key Performance Indicator
M&E	Monitoring and Evaluation
O&M	Operation and Maintenance
PAD	Project Appraisal Document
PDO	Project Development Objective
PIA	Project Implementing Agency
PMO	Project Management Office
SSTEC	Sino-Singapore Tianjin Eco-City
SSTECAC	Sino-Singapore Tianjin Eco-City Administrative Committee
TA	Technical Assistance
TECI	Tianjin Eco-City Construction and Investment Company
TMG	Tianjin Municipal Government
TOD	Transit-Oriented Development
TTL	Task Team Leader

Senior Global Practice Director:	Ede Jorge Ijjasz-Vasquez
Practice Manager:	Abhas K. Jha
Project Team Leader:	Gang Qin
ICR Team Leader:	Xueman Wang

CHINA
Sino-Singapore Tianjin Eco-City Project

CONTENTS

A. Basic Information

Country:	China	Project Name:	GEF Sino-Singapore Tianjin Eco-City
Project ID:	P098915	L/C/TF Number(s):	TF-97018
ICR Date:	01/24/2017	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	People's Republic of China
Original Total Commitment:	USD 6.16M	Disbursed Amount:	USD 6.16M
Revised Amount:	USD 6.16M		
Environmental Category: B		**Global Focal Area: C**	
Implementing Agencies: Tianjin PMO under Tianjin TURCCC Finance Bureau, Sino-Singapore Eco-city Tianjin			
Cofinanciers and Other External Partners:			

B. Key Dates

Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	11/24/2009	Effectiveness:		12/14/2010
Appraisal:	02/01/2010	Restructuring(s):		• 04/17/2013 • 12/02/2014
Approval:	07/22/2010	Mid-term Review:	09/15/2012	10/30/2014
		Closing:	06/30/2016	06/30/2016

C. Ratings Summary

C.1 Performance Rating by ICR

Outcomes:	Moderately Satisfactory
Risk to Global Environment Outcome	Substantial
Bank Performance:	Moderately Satisfactory
Borrower Performance:	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance

Bank	Ratings	Borrower	Ratings
Quality at Entry:	Moderately Satisfactory	Government:	Not Applicable
Quality of Supervision:	Moderately Satisfactory	Implementing Agency/Agencies:	Not Applicable
Overall Bank Performance:	Moderately Satisfactory	**Overall Borrower Performance:**	Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	Yes	Quality of Supervision (QSA):	None
GEO rating before Closing/Inactive status	Satisfactory		

D. Sector and Theme Codes		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Public Administration-Transportation	**12**	**12**
Public Administration-Energy and Mining	**23**	**23**
Energy Efficiency in Heat and Power	**65**	**65**
Theme Code (as % of total Bank financing)		
Urban Development -Urban Infrastructure and Service Delivery (17) -Service and Housing for the poor (30)	47	47
Climate Change	53	53

E. Bank Staff		
Positions	**At ICR**	**At Approval**
Vice President:	Victoria Kwakwa	James W. Adams
Country Director:	Bert Hofman	Klaus Rohland
Practice Manager/Manager:	Abhas Kumar Jha	Ede Jorge Ijjasz-Vasquez
Project Team Leader:	Gang Qin	Hiroaki Suzuki
ICR Team Leader:	Xueman Wang	
ICR Primary Author:	Xueman Wang	

F. Results Framework Analysis

Global Environment Objectives (GEO) and Key Indicators(as approved)

Help SSTECAC develop SSTEC as an energy and resource efficient and low GHG emissions city.

Revised Global Environment Objectives (as approved by original approving authority) and Key Indicators and reasons/justifications

N/A

(a) GEO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Enabling policy, regulatory and institutional framework for materializing the vision and objectives of the SSTEC master plan.			
Value (quantitative or Qualitative)	The SSTEC master plan did not adequately address the nonphysical aspects required to implement the plan	establishing enabling policy, regulatory and institutional framework for materializing the vision and objectives of SSTEC master plan		Substantially achieved. SSTEC reached most of its major KPIs; key recommendations from the TA components have been integrated into its management system.
Date achieved	06/30/2010	12/31/2015		06/30/2016
Comments (incl. % achievement)	Substantially achieved. The project helped SSTEC establish framework to manage municipal financing, resource management, and monitoring mechanisms.			
Indicator 2 :	Share of public transport mode within SSTEC (percentage)			
Value (quantitative or Qualitative)	0%	45%	N. A	40%-50%
Date achieved	06/30/2010	12/31/2015	12/31/2015	12/31/2015
Comments (incl. % achievement)	Substantially achieved.			
Indicator 3 :	Incremental annual energy savings in the GEF Grant-funded two pilot green			

	buildings, which exceed the minimum requirements of the current GBES of SSTEC (in Mwh -Megawatt)			
Value (quantitative or Qualitative)	In Mwh 0% In tCO2 0%	In Mwh 5453 In tCO2 3132		In Mwh 6529 In tCO2 3555
Date achieved	06/30/2010	12/31/2015		12/31/2015
Comments (incl. % achievement)	Achieved -20% above energy efficiency target; 14% above carbon emission target.			

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	KPI reviewed and secondary KPIs developed			
Value (quantitative or Qualitative)	No secondary indicators	KPI reviewed and secondary KPIs developed		Achieved.
Date achieved	06/30/2010	12/31/2015		06/30/2012
Comments (incl. % achievement)	22 indicators in six major categories were broken down into secondary indicators for difference sector areas and used by government entities in-charge (i.e.environment Bureau and others).			
Indicator 2 :	City Based GHG calculated			
Value (quantitative or Qualitative)	0.00	City Based GHG calculated		Calculation completed
Date achieved	06/30/2010	12/31/2015		12/31/2015
Comments (incl. % achievement)	City based GHG is calculated in emission intensity (emission used per unit of GDP in US$ million). In 2015, total CO2 emission of the eco-city is estimated as 2.1 million tons, and its emission intensity is 102 tons CO2/million US$.			
Indicator 3 :	Finance and economic analysis conducted for key investment components for alternative decisions			
Value (quantitative or Qualitative)	0.00	Finance and economic analysis conducted for key investment		Achieved.

		components for alternative decisions		
Date achieved	06/30/2010	12/31/2015		06/30/2012
Comments (incl. % achievement)	Investment analysis model was developed and applied to calculation of subsidies and cost for RE investment.			
Indicator 4 :	SSTEAC fiscal finance model developed			
Value (quantitative or Qualitative)	0.00	SSTEAC fiscal finance model developed.		achieved
Date achieved	06/30/2010	12/31/2015		06/30/2012
Comments (incl. % achievement)	Financial model was developed in 2012 and supported Eco-city's 2013-2023 GDP and revenue projections.			
Indicator 5 :	Policy, regulatory incentives framework developed for achieving KPIs			
Value (quantitative or Qualitative)	0.00	Policy, regulatory incentives framework developed for achieving KPIs		Achieved.
Date achieved	06/30/2010	12/31/2015		06/30/2016
Comments (incl. % achievement)	Incentive framework developed to support resource management in building, transport and energy use.			
Indicator 6 :	Institutional structure and mechanism established for SSTEC planning, construction and management.			
Value (quantitative or Qualitative)	The SSTEC master plan did not adequately address the nonphysical aspects required to implement the plan	Institutional structure and mechanism established for SSTEC planning, construction and management.		Achieved.
Date achieved	06/30/2010	12/31/2015		06/30/2016
Comments (incl. % achievement)	Strength and weakness of the institutional structure of the SSTEC was analyzed and recommendations were made. Institutional structure involving all stakeholder agencies was established for the eight key city administrative areas.			

Indicator 7 :	Institutional structure and mechanism established for stakeholder coordination			
Value (quantitative or Qualitative)	The SSTEC master plan did not adequately address the nonphysical aspects required to implement the plan	Institutional structure and mechanism established for stakeholder coordination		Achieved
Date achieved	06/30/2010	12/31/2015		12/31/2012
Comments (incl. % achievement)	A coordination committee for all key agencies meets annually, and teams at working level meet twice a month. A special PMO was established for coordination among stakeholder agencies for key investment projects.			
Indicator 8 :	MIS for planning, implementation management and monitoring developed			
Value (quantitative or Qualitative)	The SSTEC master plan did not adequately address the nonphysical aspects required to implement the plan	MIS for planning, implementation management and monitoring developed		Achieved.
Date achieved	06/30/2010	12/31/2015		12/31/2012
Comments (incl. % achievement)	MIS system was set up and is playing a central role in the development of a smart eco-city, integrating data and information of all aspects of city management for analysis and decision making.			
Indicator 9 :	Dissemination strategy prepared and activities initiated			
Value (quantitative or Qualitative)	0.00	Dissemination strategy prepared and activities initiated		Achieved.
Date achieved	06/30/2010	12/31/2015		06/30/2013
Comments (incl. % achievement)	Dissemination strategy had been prepared and activities initiated since 2013.			
Indicator 10 :	Integrated public transport sector strategies developed.			
Value (quantitative or Qualitative)	private car oriented transport strategy	Integrated public transport sector strategies developed.		Strategy developed
Date achieved	06/30/2010	12/31/2012		12/31/2012

Comments (incl. % achievement)	A strategy was developed on public transport network which centrals around three vertical lines and one horizontal line and 12 circles to facilitate the access to public transport by residents.			
Indicator 11 :	Lifecycle financial analysis of various transport options undertaken			
Value (quantitative or Qualitative)	0.00	Lifecycle financial analysis of various transport options undertaken		Analysis was undertaken and completed.
Date achieved	06/30/2010	12/31/2012		12/31/2012
Comments (incl. % achievement)	Analysis was carried out on economic options of achieving green trip targets, in particular with respect to the target of achieving green trips by 90% by 2020.			
Indicator 12 :	Policy, regulatory, enforcement, institutional and financial frameworks established			
Value (quantitative or Qualitative)	0.00	Policy, regulatory, enforcement, institutional and financial frameworks established		Achieved.
Date achieved	06/30/2010	12/31/2012		12/31/2012
Comments (incl. % achievement)	SSTEC public transport system includes eight bus lines operated with natural gas vehicles. The residents can take these buses free of charge.			
Indicator 13 :	Detailed implementation plans prepared			
Value (quantitative or Qualitative)	0.00	Detailed implementation plans prepared		Achieved.
Date achieved	06/30/2012	12/31/2012		12/31/2012
Comments (incl. % achievement)	8 bus lines established; a public transport network was formed.			
Indicator 14 :	Intelligent Transport System (ITS) conceptualized			
Value (quantitative or Qualitative)	0.00	Intelligent Transport System (ITS) conceptualized		Achieved

Date achieved	06/30/2010	12/31/2012		12/31/2012
Comments (incl. % achievement)	Different mode for traffic management was analyzed to develop ITS.			
Indicator 15 :	Operational and Management plan for transitional arrangement developed			
Value (quantitative or Qualitative)	0.00	Operational and Management plan for transitional arrangement developed		Achieved.
Date achieved	06/30/2012	12/31/2012		12/31/2012
Comments (incl. % achievement)	In the absence of the metro line, the SSTEC had prepared a phased approach including increasing the bus lines to 8 to facilitate public transportation.			
Indicator 16 :	Space heating/cooling energy efficiency level of the pilot green buildings - Pilot public housing			
Value (quantitative or Qualitative)	0.00	70%		70%
Date achieved	06/30/2010	12/31/2011		12/31/2013
Comments (incl. % achievement)	Achieved.			
Indicator 17 :	Space heating/cooling energy efficiency level of the pilot green buildings - Pilot middle school			
Value (quantitative or Qualitative)	0.00	100%		46%
Date achieved	06/30/2010	12/31/2012		12/31/2015
Comments (incl. % achievement)	The solar panels were not installed and the heating/cooling system was powered by gas, The heating system is also being operated more than expected to increase students comfort. As a result, the measured energy efficiency level was lowered to 46%.			
Indicator 18 :	Renewable energy share of the pilot green buildings (Pilot public housing)			
Value (quantitative or Qualitative)	0.00	60%		9.9%
Date achieved	06/30/2010	12/31/2012		12/31/2015
Comments (incl. % achievement)	Short of target by 50%. The solar panels for power supply were not installed due to considerations over cost effectiveness and operational difficulty			

Indicator 19 :	Renewable energy share of the pilot green buildings (Pilot middle school)			
Value (quantitative or Qualitative)	0.00	60%		9.45%
Date achieved	06/30/2010	12/31/2012		12/31/2015
Comments (incl. % achievement)	the solar power panels were not installed. Only solar tap water system was installed			
Indicator 20 :	Incremental annual energy savings and GHG reduction (Pilot public housing, Mwh)			
Value (quantitative or Qualitative)	0.00	3319		4902
Date achieved	06/30/2010	12/31/2015		12/31/2015
Comments (incl. % achievement)	Exceeded the target by 48%.			
Indicator 21 :	Incremental annual energy savings and GHG reduction (Pilot public housing, tCO2e)			
Value (quantitative or Qualitative)	0.00	2425		2928
Date achieved	06/30/2010	12/31/2015		12/31/2015
Comments (incl. % achievement)	Exceeded the target by 20%			
Indicator 22 :	Incremental annual energy savings and GHG reduction (Pilot Middle School, Mwh) (Megawatt hour(MWh),			
Value (quantitative or Qualitative)	0.00	2134		1627
Date achieved	06/30/2010	12/31/2015		12/31/2015
Comments (incl. % achievement)	Short of target by 24%: energy used for cooking was higher than estimated as the middle school serves food for people living nearby; the heating system is powered by natural gas instead of electricity as originally designed			
Indicator 23 :	Incremental annual energy savings and GHG reduction (Pilot Middle School, tCO2e)			
Value (quantitative or Qualitative)	0.00	707		628
Date achieved	06/30/2010	12/31/2015		12/31/2015

Comments (incl. % achievement)	short of target by 11%. Reason see IO22.			
Indicator 24 :	Percentage of the buildings exceeding the energy efficient standards of the current GBES of SSTEC			
Value (quantitative or Qualitative)	0.00	25%		94%
Date achieved	06/30/2010	12/31/2015		12/31/2015
Comments (incl. % achievement)	Exceeded the target by 69%			
Indicator 25 :	Revision of SSTEC GBES and its detailed guidelines			
Value (quantitative or Qualitative)	original SSTEC GBES	Revision of SSTEC GBES and its detailed guidelines		Achieved
Date achieved	06/30/2010	12/31/2012		12/31/2012
Comments (incl. % achievement)	Standards and guideline developed have been adopted in supporting GBES implementation.			
Indicator 26 :	Regulatory, incentive and awareness campaign measures promoting replication of the new technologies			
Value (quantitative or Qualitative)	0.00	Regulatory, incentive and awareness campaign measures promoting replication of the new technologies		Achieved.
Date achieved	06/30/2010	12/31/2012		12/31/2012
Comments (incl. % achievement)	The implementation manuals supported by the project were adopted by the SSTECACÃ□Â¢ s construction bureau to enforce GBES compliance. The examples set by the investment in the two green buildings were promoted by the SSTECAC, through trainings and worksh			
Indicator 27 :	Additional TA for integrated water master plan			
Value (quantitative or Qualitative)	lack of integrated water strategy and management	water strategy completed and		achieved

		accepted by Eco-city		
Date achieved	06/30/2015	06/30/2015		06/30/2016
Comments (incl. % achievement)				
Indicator 28 :	updating public transport master plan			
Value (quantitative or Qualitative)	transport plan only apply to the original size of SSTEC	updated public transport plan		plan submitted and accepted by SSTE
Date achieved	06/30/2015	06/30/2016		06/30/2016
Comments (incl. % achievement)				
Indicator 29 :	green building promotion			
Value (quantitative or Qualitative)	further promotion of green building is needed	material to promote green buildings		achieved
Date achieved	06/30/2015	06/30/2016		06/30/2016
Comments (incl. % achievement)	Video and promotion material was produced to promote green buildings and good practice for middle school and public housing.			
Indicator 30 :	M&E equipment to support establishment of renewable energy monitoring platform			
Value (quantitative or Qualitative)	lack of equipment	Equipment procured and installed		Achieved.
Date achieved	06/30/2015	06/30/2016		01/31/2016
Comments (incl. % achievement)	The platform combined real-time data from major sources of energy use (buildings, constructions, etc.) to provide, on a monthly basis, accurate information and analysis on the use of energ			

G. Ratings of Project Performance in ISRs

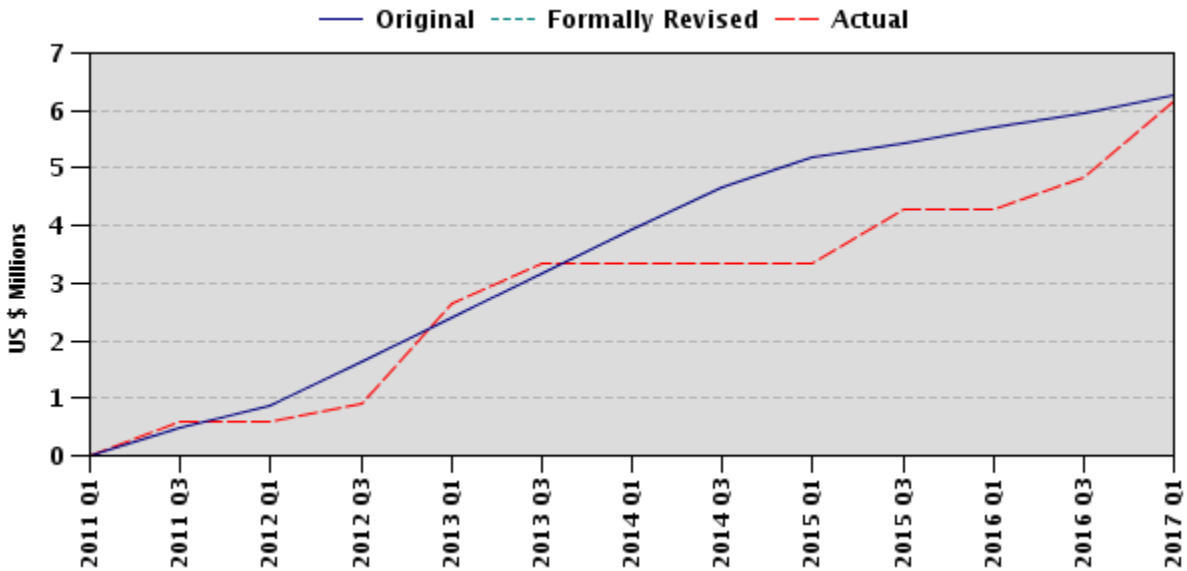
No.	Date ISR Archived	GEO	IP	Actual Disbursements (USD millions)
1	06/28/2011	Moderately Satisfactory	Moderately Unsatisfactory	0.60

2	02/20/2012	Moderately Satisfactory	Moderately Satisfactory	0.60
3	05/17/2013	Satisfactory	Satisfactory	3.33
4	12/03/2013	Satisfactory	Satisfactory	3.33
5	06/16/2014	Satisfactory	Satisfactory	3.33
6	12/16/2014	Satisfactory	Satisfactory	3.33
7	05/06/2015	Satisfactory	Satisfactory	4.30
8	10/25/2015	Satisfactory	Satisfactory	4.30
9	04/29/2016	Satisfactory	Satisfactory	4.82

H. Restructuring (if any)

Restructuring Date (s)	Board Approved GEO Change	ISR Rating at Restructuring		Amount Disbursed at Restructuring in USD Millions	Reason for Restructuring and Key Changes Made
		GEO	IP		
04/17/2013	N/A	MS	MS	3.1	Replaced PIA for green building middle school - Tianjin Eco-City construction and Investment Company by Center for Real Estate Registration and Transaction of SSTECAC
12/02/2014	N/A	S	S	3.1	To utilize US$1.9million balance of grant funding

I. Disbursement Profile



1. Project Context, Global Environment Objectives, and Design

1.1 Context at Appraisal

Country Context

1. The speed and scale of China's urbanization rate is unprecedented. Over the past three decades, about 260 million people have moved from rural areas to cities. China's urbanization is projected to reach about 70 percent—or 1 billion people—by 2030.[1] This rapid urbanization has become a major driver for the high growth and supported China's economic transformation.

2. However, the breakneck pace of China's urbanization has also led to severe environmental degradation. China is the biggest greenhouse gas (GHG) emitter in the world, accounting for almost 29 percent of global CO_2 emissions. The costs of environmental degradation and resource depletion in China approached 10 percent of gross domestic product (GDP) over the past decade.[2]

3. Recognizing these challenges, the Government of China (GOC) launched a new pattern of urban development, calling for 'building a resource-conserving and environment-friendly society' in its 11th Five-Year Plan (2006 to 2010). In 2007, the GOC announced the China National Climate Change Program, which established targets at the national and the local levels for climate change mitigation. Both the Ministry of Environment Protection and the Ministry of Housing and Urban-Rural Development developed a national framework for 'eco-cities' with the objective of promoting resource efficiency in cities and in urban infrastructure constructions.

4. In response to the GOC's plans, the 'eco-city' initiatives were developed in more than 100 cities across China in 2010. These eco-cities were very diverse in size and objectives. In the absence of comprehensive national standards for eco-city development and a credible process for monitoring progress, many of these 'eco-cities' became 'marketing tools' or were 'simplified' to mean the construction of green spaces and surface beautification.

Sino-Singapore Tianjin Eco-City

5. Following earlier bilateral cooperation between the Governments of China and Singapore for the Suzhou Industrial Park in China, the two countries signed a Framework Agreement in November 2007 to collaborate on the development of a new city, Sino-Singapore Tianjin Eco-City (SSTEC), which would serve as a model of sustainable urban development. The agreement elevated city development to the level of intergovernment cooperation, and enabled SSTEC to benefit from strong political commitment as well as Singapore's extensive knowledge and experience.

6. SSTEC was selected from among four candidate cities.[3] The site of SSTEC was converted from nonarable salt land into valuable economic land, without sacrificing agricultural

[1] World Bank. 2014. "Urban China: Toward Efficient, Inclusive, and Sustainable Urbanization." 88172.
[2] World Bank. 2012. "China 2030: Building a Modern, Harmonious, and Creative High-Income Society."
[3] The candidate cities included Tianjin, Tangshan, Baotou, and Urumqi.

land. SSTEC is located on the outskirts of Tianjin Binhai New Area—the powerhouse of Tianjin's economic and demographic growth. As depicted in the map, it is about 45 km from Tianjin (see the maps).

7. SSTEC was envisioned as an 'economically sustainable, socially harmonious, environmentally friendly, and resource-conserving' city, which would become a 'model eco and low-carbon city, replicable by other cities in China'. It aimed to achieve this vision by taking an integrated approach to planning a new urban area in an environmentally sustainable manner.

Rationale for the World Bank Involvement

8. The master plan for SSTEC was approved in 2008, targeting 350,000 people living in an area of 34.2 $km^2$by 2020. The eco-city was planned to be compact, with a mix of land uses, following transit-oriented development (TOD) principles. The new city was designed to accommodate 190,000 jobs— about 80 percent of the projected working population of SSTEC. The preliminary investment cost for public infrastructure and facilities for the entire SSTEC area was estimated at CNY 25.5 billion (US$3.8 billion). The construction of SSTEC began in September 2008 and Phase 1 (7.8 km^2) was completed in 2015.

9. The master plan had its shortcomings. For example, the plan focused on construction and technology/engineering aspects of the city, but it did not adequately address the nonphysical aspects required for the implementation, such as policy, regulation and incentives, and institutional mechanisms to maintain and operate infrastructure facilities.

10. The master plan included many high-level concepts and principles. A challenge facing SSTEC was to mainstream and translate these concepts and principles in the project implementation process. To address the challenges, the Tianjin Municipal Government (TMG) and the Sino-Singapore Tianjin Eco-City Administrative Committee (SSTECAC) requested the support from the World Bank through the Global Environment Facility (GEF) Sino-Singapore Tianjin Eco-City Project (SSTECP). The World Bank with its extensive experience in urban development and capacity building, both in China and around the world, stood ready to play an important role in (a) knowledge transfer, and (b) demonstration of the good practice in standard setting.

11. The project objective was consistent with one of the five pillars of the World Bank's Country Partnership Strategy (CPS) for China 2006–10 (Report No. 35435-CN, approved by the Board on May 23, 2006), which focuses on managing resource scarcity and environmental challenges. This pillar supported China's efforts to meet its ambitious goals for creating a more resource-efficient, less-polluting society under China's 11th Five-Year Plan. It also supported China's undertaking to improve energy efficiency, expand the use of renewable energy, and address climate change**.**

1.2 Original Global Environment Objective (GEO) and Key Indicators

12. The GEO was to assist the eco-city's administration to develop SSTEC as an energy- and resource-efficient and low-GHG emissions city. The GEO was identical in the Project Appraisal Document (PAD) and the Grant Agreement.

13. The project outcome indicators were (a) enabling policy, regulatory and institutional framework for materializing vision and objectives of SSTEC; (b) percentage of public transport mode share is higher than 45 percent by 2015; and (c) incremental annual energy savings and GHG reduction in the two GEF grant-funded pilot green buildings, which exceed the minimum requirements of the current Green Building Evaluation Standard (GBES) of SSTEC.

14. There were minor variations in wording between the main body of the PAD and annex 3 of the document, which presents the results framework and monitoring arrangements.

1.3 Revised GEO and Key Indicators, and reasons/justification

15. Not applicable.

1.4 Main Beneficiaries

16. The PAD did not explicitly identify project beneficiaries. However, it is clear that the SSTECAC and the TMG would benefit from the following project activities: (a) institutional strengthening would result in more efficient urban management; (b) the proposed transport mode would lay out a foundation for developing a public transport system within SSTEC; (c) the green building pilots and associated technical advisory services would help technical staff implement the GBES requirements. In addition, the SSTEC residents would benefit from energy-efficient buildings, reduced water consumption, green public spaces, improved community facilities, and better public transportation.

1.5 Original Components

17. The project had three components that were intended to combine sectoral interventions in transport and buildings with regulatory and institutional strengthening activities.

Component 1: TA[4], Software, and Equipment for Implementation Framework of the SSTEC Master Plan and Dissemination Activities (US$1,437,000) - 'Enabling Framework'

18. Subcomponent 1A: Eco-city advisory panel (US$440,000) for providing advisory service on (a) implementation of the SSTEC master plan; (b) management and coordination of the project; (c) monitoring and evaluation (M&E) of master plan implementation; and (d) replication and dissemination of the experience of master plan implementation.

19. Subcomponent 1B: TA, software and equipment for creating an implementation framework for the SSTEC master plan (US$997,000), which included assisting the SSTECAC to

(a) develop policy, regulations, incentives, and institutional frameworks; for example, promotion of efficient energy/resource use and achieving key performance indicators (KPIs) in water, solid waste, and energy;

[4] TA = technical assistance.

(b) develop financial and economic analysis models for investment decisions on projects, and public infrastructure facilities;

(c) review KPIs, calculate GHG emissions, and so on; and

(d) provide on-the-job training on selected topics.

Component 2: TA for Public Transport System (US$713,000) - 'Green Transport'

20. This component provides technical advisory services on TOD, including (a) carrying out a review and gap analysis across all stages of planning; (b) preparing a detailed public transport network and incremental services delivery plan; (c) feasibility studies on public transport; and (d) institutional arrangements.

Component 3: Green Building Pilot Investment and TA (US$4,013,636) - 'Green Buildings'

21. Subcomponent 3A: Piloting investment in two green buildings (US$3,663,636)—public housing for low-income segment of SSTEC households and a middle school, including the provision of incremental construction costs of energy/water efficiency and renewable energy use.

22. Subcomponent 3B: Technical advisory services for GBES implementation (US$350,000).

1.6 Revised Components

23. Subcomponent 1A (establishing eco-city advisory panel) was canceled because of lack of response from the short-listed consultants when the procurement for consultants to serve the committee was carried out in 2011. The failure to recruit any experts to serve on the proposed panel was largely because of (a) the purpose, scope of work, and deliverables of the proposed services were unclear; and (b) the budget appeared to be too small to gain traction from external experts, particularly considering the 60-month duration of the contract. The task team concluded in 2013 that the absence of this component had not caused any deleterious impact on the project as the SSTECAC had stepped up its coordination efforts and relied less on external advisory support.

24. In addition to the cancellation of Subcomponent 1A, the actual contract price for Subcomponents 1B (framework for master plan implementation) and 3A (investment in two green buildings) was less than the estimated price owing to competitive bidding. All these changes resulted in a total savings of US$1.9 million. In December 2014, as part of the conclusion of the midterm review, the following new activities were added to the existing components (second restructuring package) to utilize the total savings of US$1.9 million.

- Under Component 1 - Enabling Framework
    - Integrated water technical assistance (TA) (US$500,000)
    - M&E equipment and software for energy utilization (US$740,000)
- Under Component 2 - Green Transport

- Updating transport planning and strategy (US$500,000)

- Under Component 3 - Green Buildings
  - Promoting and strengthening green building awareness (US$160,000)

25. A detailed table that outlines the rational and description of the new components is included in annex 2.

26. Table 1 lists the final components included in the project.

Table 1

Component 1 **Enabling Framework**	**Component 2** **Green Transport**	**Component 3** **Green Buildings**
• Policy, regulatory, incentive and institutional framework, including integrated water TA • Financial models • Development of monitoring mechanisms of the SSTECP implementation, including energy utilization • Capacity building	• Review and gap analysis • Preparation of detailed public transport network and incremental service delivery plan, including short-term implementation of bus services • Preparation of public transport preliminary feasibility study and concept designs • Institutional development for public transport service provision • Updating transport master plan TA and preparing transport strategy for expanded SSTEC	• Pilot investment • Green building TA • Promotion of green building awareness

1.7 Other Significant Changes

27. **Change in institutional arrangements.** A Level II restructuring exercise was carried out in April 2013 to change the Project Implementing Agency (PIA) for the green building pilot investment for the middle school. The Tianjin Eco-City Construction and Investment Company (TECI), which was the PIA, was replaced by the Center for Real Estate Registration and Transaction of Sino-Singapore Tianjin Eco-City. TECI's limited capacity to execute the infrastructure and develop property in the eco-city resulted in very slow progress, which necessitated the change.

28. A second Level II restructuring was carried out in December 2014 to utilize the balance of the grant funding of US$1.9 million as discussed in section 1.6.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design, and Quality at Entry

Soundness of Background Analysis

29. The background analysis for the project was generally comprehensive. Firstly, this project was proposed in response to the call by the GOC for green and sustainable growth. The concepts promoted by the project, such as TOD, resource efficiency, and integrated urban planning, were intended to demonstrate a green urban growth model and best practices for building 'eco-cities'.

30. Secondly, the project design benefited from the World Bank's extensive analytical work in the urban areas. For example, the China-GEF-World Bank Urban Transport Partner Program (P090335) provided lessons on the importance of the World Bank's involvement in the upstream project cycle, including in the planning process. Such lessons were incorporated in the design of this project, with funding allocated to help SSTEC review its master and sectoral plans. The project further benefited from the World Bank's initiative on ecological and economic urban development. In FY2010, the World Bank published ECO2 Cities (Ecological Cities as Economic Cities - Technical Assistance Report - 59012), which articulated a conceptual and operational framework for approaching sustainable urban development in an integrated manner. As part of the 'real case' study for the ECO2 Cities report, an Analytical and Advisory Activity was conducted to review SSTEC's master plan and sector plans. Some components of the project reflected the findings of such analytical work, such as the review of KPIs for the eco-city and TOD for urban transport.

31. The analytical work and studies offered a strong technical basis for shaping the project's design in building a resource-efficient city. However, while there were considerable efforts to provide experience and information on technical standards and practices for the eco-city, there was little analysis on some of key aspects for a new city's development, for example, implications of this type of 'green field development' on population density and urban sprawl, the challenges for the eco-city's connectivity, and understanding social dimensions that motivate people to move to a new city, leaving behind their social and cultural networks. Lessons could have been drawn from the successes and failures of developing new cities, which would have been extremely relevant to Tianjin Eco-City, in particular, in the context of risk analysis and developing mitigation strategy.

Assessment of Project Design

32. The design of the project was generally sound. The achievement of the Project Development Objective (PDO) was measured through three KPIs, which included the enabling framework for materializing the vision of the SSTEC master plan, the share of public transport modes, and GHG emission reductions in buildings. These three components are the key pillars for resource management in cities. The project design reflected useful analytical work related to implementation of the master plan conducted for this project as indicated in the section above.

33. While the two components—green transport and green buildings—were generally well designed, the first component—the enabling framework, however, appeared very broad and too

ambitious in its scope of work. This component, though rightly targeting policy and institutional strengthening, covered a wide range of areas, from regulation, financial management (FM), and advisory services to general capacity building. One of the subcomponents, eco-city advisory panel, for example, was so vaguely defined that there was little response from consulting firms to the request for expression of interest, resulting in the cancellation of this subcomponent.

34. Furthermore, the lack of a robust intermediary outcome measure for this component made it very difficult to track the progress and assess the impact of the activities included in this component (section 2.3)

Assessment of Government Commitment

35. The project was initiated at the request of the TMG and SSTECAC, both of which were highly committed toward effective project implementation. The TMG committed a total funding about 58US$ million to complement the project implementation. A Project Management Office (PMO) was created just for this project, which was led by the senior officials (at deputy director general level) of the TMG's construction bureau and the vice chairman of the SSTECAC. To implement the project, specific 'Project Management and Implementation Measures' were issued by the PMO.

Assessment of Risks

36. The PAD did not provide an overall risk rating, but listed three major risks: (a) SSTEC may not attract business investments and would then become a satellite residential town or eco-enclave (rated Modest after risk mitigation); (b) substantial delays in construction of the metro rail system would affect TOD implementation (rated Substantial after risk mitigation)*;* and (c) the project would fail to deliver the objectives of the SSTEC master plan (rated Substantial after risk mitigation).

37. The risks were correctly identified and the first two types of risks – (a) and (b) mentioned in paragraph 36 above were indeed materialized. Risk mitigation measures recommended in the PAD were undertaken by SSTEC, including developing economic and industrial plan for attracting business investment and phased approach to public transport. However, a weakness in the risk analysis was the underestimation of the complexity and time needed for the population growth in a new city. During the project preparation phase, a large-scale National Animation Center that was supposed to create 12,000 jobs was under construction, and a public relations firm was hired by the Government to promote investment. While these were promising developments, having 'hardware', - buildings, and an industrial park, does not necessarily create jobs. The project appeared too optimistic on job creation and attraction of new residents and thus did not prepare an adequate mitigation strategy in the event that the residents fall far short of what was envisaged within the planned time frame.

Quality at Entry

Rating: Moderately Satisfactory

38. The project was timely and responded to the GOC's call for a resource-conserving and environment-friendly urban development. The technical analysis prepared by the task team to

support master planning and eco-standard setting was generally sound. However, the project did not adequately address the complexity of developing a new city. As such, project risks were underestimated and the mitigation strategy was not robust.

2.2 Implementation

39. The project was completed on schedule. During the first year of implementation, there was a delay in hiring consultants for the work under the first two components—enabling framework for the master plan and green transport. This was largely because of the decision by the SSTECAC to focus on Component 3—energy-efficient building investment and the associated procurement process. However, SSTEC quickly rectified the problem of the delay. All the agreed outputs under the revised components were delivered during the project implementation period, some of which were completed ahead of time, such as green investment in public housing. The World Bank's supervision missions consistently rated the project implementation as satisfactory from 2013 until project completion in June 2016. The project indicators were deemed fully achievable by project closing.

40. The project was restructured twice: the first time in 2012, to replace the PIA for the middle school; and the second time in 2014, to include new components, as a result of midterm review findings (see sections 1.6 and 1.7). These restructurings were timely responses to the changing circumstances.

41. For example, activities were added to the green transport mode component (Component 2). In 2014, the TMG had decided to expand SSTEC's territory from 34.2 km^2 to 150.58 km^2 by integrating two adjacent areas—the Binhai Tourism Area and the Tianjin Marine Economic Area. The expansion was part of the Government's strategy to promote regional integration, streamline administrative management across different areas, and scale up best practices implemented by the eco-city.[5] In response to the change, new TA activities (US$500,000) on transport were included to (a) update the existing model developed through previous work to provide items such as mode share, public transit passengers, travel distance, and motor vehicle GHG and pollutant emissions, based on the expanded territory; and (b) prepare a comprehensive transport strategy for the planning bureau.

Factors during Implementation That Contributed to Project Outcomes

42. **High level political commitment of the GOC.** The development of the eco-city was a result of the framework agreement between the Chinese and Singapore Premiers—the second consecutive project with high-profile Sino-Singapore cooperation.

43. The smooth implementation of the project should be in part attributed to a highly committed and dynamic PMO, which included representatives from the Tianjin Urban and Rural Construction and Communication Commission and SSTECAC. The PMO was formed by the TMG to facilitate implementation. The core team of the PMO comprised a group of highly motivated and committed professionals drawn from different departments of the SSTECAC

[5] Tianjin Eco-City Development Plan 2014 to 2020 issued by SSTEC.

(such as planning, finance, and environment), who facilitated effective implementation of the various project components.

44. **Experience with the Singapore model.** The eco-city was, to some extent, modeled after Singapore's development. City officials and urban planners benefited from the experience and lessons learned from Singapore. Study tours were organized by the Government of Singapore for Chinese municipal officials to gain first-hand information. To date, the Government of Singapore still has an office within SSTEC to facilitate collaboration and engagement.

Factors That Gave Rise to Problems

45. **Slow population growth in the eco-city.** The eco-city was planned to accommodate 350,000 residents and 190,000 jobs by 2020. While people are gradually moving into the city (partly driven by city schools that have attracted almost 3,000 students), the pace of population growth and job creation is much slower than originally envisaged. By 2016, the city has about 40,000 residents.

46. The majority of the activities supported by the project was not directly affected by the low growth in residents as project implementation was not linked to the population increase in the city. However, it certainly affected the level of the implementation of the recommendations produced under various components. For example, the project proposed methodologies for a comprehensive monitoring and tracking of the city's KPIs. Those methodologies were developed based on a much larger population base, which was difficult to apply to the current status of the city development.

47. **Delay in building light rail and metro rail systems that connects the eco-city to adjacent areas.** Component 2 of the project, green transport, was originally designed on the basis of the principle of TOD, which promotes the mixture of residential and business developments and a walkable neighborhood located within a half-mile of public transportation. The absence of the metro rail made it difficult for the TOD-based road network envisaged in the project design to materialize. Nevertheless, to address the issue, the SSTECAC increased public bus lines and the time period for which free services would be provided to promote the use of public transportation, a key recommendation from the project.

2.3 Monitoring and Evaluation (M&E) Design, Implementation, and Utilization

48. **Design.** The M&E design was generally comprehensive. The GEO had three KPIs: (a) enabling policy, regulatory and institutional framework for materializing the vision and objectives of the SSTEC master plan; (b) increasing the share of public transport within SSTEC; and (c) incremental annual energy savings and GHG reduction in the two GEF grant–funded pilot green buildings, which exceeded the minimum requirements of the current GBES of SSTEC.

49. The second and third indicators were quantified, with specific targets to be reached. The first indicator, however, was vague and overly ambitious. The SSTEC's master plan was very broad, requiring time, effort, and resources to achieve its vision. Given the limited resources and the scope of activities provided by the project, it would be unrealistic to achieve the intended outcome of the first indicator.

50. The intermediate outcome indicators (IOIs) for the three project components are primarily output based—measured by completion of specific activities, that is, 'KPI reviewed', 'finance and economic analysis conducted', and 'SSTEAC fiscal finance model developed'. With the exception of the IOI related to the pilot investment in green buildings, the IOIs are a simple checklist; for example, the report is completed and accepted, which were neither quantified nor qualified. As such, it is difficult to track whether and how the output was used and progress was made and what impact has been generated through the project.

M&E Implementation and Utilization

51. Data collection and reporting for M&E was undertaken by the PMO. As most of the project indicators under Components 1 and 2 were output-based, the project progress reports simply recorded the completion of the activities. Thus, the project's progress reporting did not fully measure whether these activities result in the outcomes required to achieve the goals of these components and the PDOs. Indicators were added to new components, but similar to existing components, all of them were output-based, such as 'reported completed and accepted by SSTECAC'.

52. For the component on pilot investment in green buildings, the implementing agency collected data and monitored energy savings, emission reductions, and the use of renewable energy on an annual basis after the completion of building construction. The information was incorporated into semiannual progress reports as well as the borrower's Implementation Completion and Results Report (ICR).

2.4 Safeguard and Fiduciary Compliance

Safeguards - Environment

53. The project was correctly classified as a Category B, with only the Environmental Impact Assessment (OP 4.01) safeguard triggered. Environmental impacts from pilot building construction (a middle school and public housing) were moderate, confined, and of temporary nature, as detailed in the SSTEC Green Construction Code. Following the development of the Environmental Management Plan, related training was also provided. The Environmental Management Plan has been included, or referred to, in bidding documents and contracts.

54. While the TA activities would not create any direct adverse environmental impact, the studies would support the overall implementation of the SSTEC master plan and could lead to downstream development that might potentially have environmental impacts. The Guidelines of the Environmental Impact Management, acceptable to the World Bank, were prepared for the TA components.

Social

55. Implementation of the safeguard instrument Resettlement Policy Framework has been satisfactory for the project. All the project pilot investment on buildings were on existing public land. Throughout implementation, no additional land acquisition or resettlement occurred and no social risks or negative impacts emerged. According to the due diligence review conducted for

project preparation, 1,057 people in Wuqi village were affected in 2008 when the village land was acquired for the eco-city development before project identification.

56. All the people resettled since displacement in 2008 were very satisfied with the compensation and livelihood rehabilitation, and they reported being very happy with their post-resettlement life. It was confirmed during the project implementation period that the livelihoods of resettled people were restored according to project supervision follow-ups. During the project lifetime, skill development and reemployment assistance were provided for the affected people in the working-age group from previously affected enterprises and villages. Sustainable income generation such as social insurance for the resettled farmers was also provided.

Financial Management

57. Appropriate FM arrangements were put in place to ensure proper use and accounting of project funds. Project audit reports were provided for the entire implementation period with unqualified (clean) audit opinions. No FM-related issues were raised in the audit reports. Overall FM compliance was rated **satisfactory** throughout project implementation**.**

Procurement

58. The project includes some high-value consulting services contracts and small-value contractors through national competitive bidding and shopping methods. The overall procurement progress was satisfactory, and no substantial deviations from the World Bank's policies and requirements were identified in the procurement prior and post reviews throughout the project implementation period. The only complaint received from one consultant was about payment delay. At the request of the World Bank, the PMO quickly rectified the problem by actively communicating with the consultant in writing and making payment on time.

2.5 Post-completion Operation/Next Phase

59. **Continuation of the utilization of guidelines, tools, models, and platforms**. The project has generated guidelines, standards, toolkits, and modeling systems. A number of these products will continue to play a role in resource management of the eco-city. Examples include the SSTEC GBES, the renewable energy utilization monitoring platform, and fiscal financial models.

60. **Extension of the eco-city standards to newly merged areas.** The eco-city has now incorporated two adjacent areas. The KPIs used for the eco-city supported by the project would continue to be utilized in new areas, according to the Tianjin Eco-City Development Plan (2014–2020) issued by SSTEC in July 2015 ('Development Plan'). These KPIs include GHG emission intensity targets, 100 percent green buildings, renewable energy utilization, and public housing. The Development Plan states that "these indicators represent and define the very basic concept behind the eco-city. Promotion and extension of the KPI indicator systems is essential to achieve the objective of new urbanization set out by the central government, which is resource-efficient and environment-friendly to preserve social harmony."

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design, and Implementation

Relevance of Objectives

Rating: High

61. At project approval, the PDO was highly relevant to the priorities of both the national and the municipal Governments and aligned with the World Bank strategies. The project was initiated and prepared in response to the Government's push for 'clean growth' set out in the 11th Five-Year Plan (2006 to 2010) and fully consistent with the World Bank's CPS for 2006–2010 (see section 1.1).

62. The PDO has been relevant to the GOC's and the World Bank's strategies to pursue resource-efficient and low carbon development pathways during the entire project implementation period. China's 13th Five-Year Plan (2016–2020) has set emission intensity targets for 2020 and incorporated green development as a priority. In 2012, the National Development Reform Commission launched a low-carbon city program, which drew participation from over 42 cities and provinces. As China has committed to its GHG emissions peaking around 2030 under the Paris Climate Agreement, efforts to reduce emissions will be further intensified. Cities will play a central role in China's climate change mitigation strategy. The project objectives also remain highly relevant to the World Bank's FY2013–2016 China CPS, particularly to the pillar of 'supporting greener growth'.[6]

63. The PDO is also consistent with the World Bank Group's Climate Change Action Plan (issued in April 2016), which aims to increase its climate investment from the current US$2.2 billion a year to a goal of US$3.5 billion a year. Supporting cities in addressing climate challenges and integrating low carbon development into urban planning are key components in the World Bank Group's Action Plan.

Relevance of Design and Implementation

Rating: Modest

64. As a whole, the three components of the project were relevant and clearly linked to achieving the PDO, and were designed to enable the SSTECAC to implement its low-carbon and resource-efficient strategy. First, the project rightly tackled the three basic urban functions that are critical in achieving the eco-city's objectives: transport, buildings, and city management. The first two sectors account for over 85 percent of the emissions and energy use of the eco-city. It was clear that the fulfillment of the eco-city's objectives would depend on how the SSTECAC manages these two sectors. Second, a combination of infrastructure investments (in green buildings) together with the TA component to improve green building management was well

[6] World Bank CPS on "greener growth - by helping China shift to a more sustainable energy path; enhancing urban environmental services; promoting low-carbon urban transport; piloting sustainable natural resource management approaches; … and strengthening mechanisms for managing climate change."

designed to demonstrate economic benefits for energy efficiency while strengthening the capacity of implementing green building regulations. Third, the intervention in transport at its design stage was strategic. The eco-city started from 'scratch'. Developing public transport strategy, road networks, and bus service plans and management, supported by the project, were essential to operationalize the concept and objectives of promoting 'walkability' and 'green trips'.

65. The project has, however, some major weakness. The coverage of the activities in the first component, enabling framework, was too broad and overly ambitious, given the limited resources. Even though the support covered key policy areas relevant to promoting energy and resource efficiency and low carbon emissions, the range of activities from policy, regulatory and institutional frameworks to financing models and monitoring mechanisms, posed tremendous challenges in achieving intended outcomes in all targeted areas. The second weakness is related to the results framework, which did not capture the impact or intermediary outcomes of some of the project activities, especially those related to the 'enabling framework', which made it difficult to assess the actual outcome as discussed in section 2.1. Also the concept of "transit oriented development" (TOD) was highlighted in PAD as one of the key objectives of the Eco City. But very few metrics that would help define TOD were included in the result framework of the project. Similarly, there is no solid basis to argue the implementation of the TOD concept under the project, undermining Tianjin's effectiveness as an Eco-city. As such the overall relevance of design and implementation was rated as Modest.

3.2 Achievement of Global Environmental Objectives

66. The GEO was realized in two ways: (a) achieving resource efficiency and low carbon development by supporting two major urban sectors—transport and buildings, including the relevant enabling framework; and (b) strengthening the SSTECAC's resource management capacity by supporting an enabling framework that covers policy, institutions, financing, monitoring, and capacity building. Specifically, the PDO included three elements: (a) establishing a public transport mode and service to facilitate 'green trips', (b) promoting energy savings and GHG reduction through green building pilot investment and TA, and (c) strengthening the SSTECAC's resource management capacity.

Establishing a Public Transport Mode and Service to Facilitate 'Green Trips'[7]

Rating: Substantial

67. This project component had two phases: Phase I, which was completed in October 2012, focused on supporting SSTEC in developing an integrated public transport system. Phase II, which started in 2015 as part of the second project restructuring, was intended to design a comprehensive transportation mode and strategy for the expanded SSTEC (150.58 km^2).

[7] According to SSTEC's KPIs, green trips refer to non-motorized individual car transport, that is, cycling, walking, and trips on public transport.

Phase I

68. During project appraisal in 2010, SSTEC did not have any public transport network. The original plan on transport was largely based on a one-to-one ratio of households-to-car ownership, and there was little attention or arrangements for pedestrian or non-motorized paths. To date, SSTEC's intercity public transport system includes eight bus lines operated with natural gas vehicles. The residents can take these buses free of charge. In 2015, the person-times for bus trips were about 3.24 million person-times. Within SSTEC, there are 19 lines of school buses and in 2015, students transported by school buses reached about 110,000 person-times.

69. Phase I supported 16 studies with the output covering five areas: (a) a transport model that incorporated 'nonmotorized' pathways to facilitate walkability; (b) a plan for the transport network; (c) a public transport service plan; (d) fiscal assessment and pricing policy for public transportation; and (e) management and institutional setup for the SSTECAC's transport bureau.

70. Notable examples of the impact of these reports include the following:

- The plan on service management for public transport, including bus stop selection, routing, bus operation and maintenance (O&M), was adopted by the SSTEC public transportation company. Based on the recommendations, the locations of the bus stops were selected and designed such that the residents could find a bus stop within 100–200 m from the gate of their residential complex.

- The reports strongly recommended that, to achieve the green trip targets, SSTEC would need to make the city more pedestrian- and cyclist-friendly, and increase the low cost of public transport. Based on these recommendations, SSTEC enhanced 'non-motorized' pathways to facilitate walkability. Special lanes have been created for cycling and a program to promote green trips on bicycles has been prepared to encourage and guide the residents to choose cycling for their trips.

71. The PDO set the target of reaching 30 percent of 'green trips' by 2013 and 45 percent by 2015. The calculation by the eco-city on the number of 'green trips' in 2015 was between 40 percent and 50 percent.[8] The target was largely fulfilled if taken the lower end of the range (40 percent) and overachieved if taken the higher range of the target (50 percent).

Phase II

72. The Phase II study, which was completed around the time of the project closure, produced a strategy and transport plans for the expanded SSTEC (the original site of SSTEC plus two new areas added to SSTEC), including (a) a transport model to assess options for carrying out 'green trips'; (b) an integrated transport plan for three areas; (c) a road network that integrates the new areas to the original site of SSTEC; and (d) public transport planning and TOD development. The studies were submitted to, and accepted by, SSTEC at the closure of the

[8] Methodology by SSTEC: the calculation of 'green trips' was based on the following formula:
$\left(\frac{\text{Estimated green trips (by bikes,buses,and walking}}{\text{Total estimated trips by individuals}}\right) = \left(\frac{3{,}914000\sim4{,}82.4000)}{9{,}6306000}\right) = 40.64\%\sim50.09\%.$

project. The SSETEC indicated that its transport bureau was studying the findings of the reports, which were expected to lay out some groundwork as SSTEC starts to prepare its transport strategy and plan for the expanded city.

Promoting Energy Savings and GHG Reduction through Green Building Pilot Investment and TA

Rating: Substantial

73. The project provided pilot investment in two green buildings—a middle school and a public housing for low-income households; and TA for enhancement and implementation of the GBES of SSTEC, for achieving energy savings and GHG reduction.

Pilot investment

74. The total of US$2.4 million was used for 'enhancement measures' including energy-efficient windows, insulation walls and roof, and solar heating system.

75. The pilot housing achieved its outcome targets for energy savings and GHG emissions in 2014, ahead of the schedule. Through in-house lighting, cooking, and other electrical devices the savings reached 4,902 MWh, exceeding the target by 48 percent and resulting in GHG emission reductions of 2,928 tCO_2. Similar package of enhance measures was also made for the middle school, which resulted in energy savings of 1,627 MWh, equivalent to 707 tCO_2, which was about 10 percent lower than the target. The slight shortfall was largely because (a) the energy used for cooking was higher than estimated because the middle school serves food for people living close to the school as there were no restaurants or canteens in the area; and (b) the heating system is powered by natural gas instead of electricity as originally designed.

76. The piloting on the use of renewable energy was not satisfactory in achieving its target of 60 percent of renewable energy use for public housing and 20 percent for the middle school set out in the IOIs. In 2015, the former reached 9.9 percent and the latter 9.45 percent. One of the main reasons was related to the difficulties of solar panels in driving full operation of heating/cooling systems to keep the level of 'comfort' in cold winters and hot summers. As such, the installed solar system has not been in full operation. Nevertheless, the two pilot green buildings have both exceeded the minimum requirements of the current GBES. Taken together, the total incremental annual energy savings is 6,529 MW compared to the GEO Indicator 3 target of 5,453 MW, resulting in emission reductions of 3,551 tCO_2, against the GEO Indicator 3 target of 3,132 tCO_2e.

Reducing building energy use through the GBES enhancement

77. The SSTEC GBES is more stringent than those prescribed under the national standard. The project produced implementation manuals for the GBES, providing guidelines for the evaluation and verification process for compliance with green building standards. The PDO set a target of 25 percent buildings in SSTEC to exceed the energy-efficiency standards under the current SSTEC GBES.

78. In 2015, all the buildings in the eco-city have complied with the GBES and about 93 percent of the buildings have exceeded the GBES requirements, among which 42.7 percent of the buildings have reached the highest national standard, three stars.

79. The implementation manuals supported by the project were adopted by the SSTECAC's construction bureau to enforce GBES compliance. The examples set by the investment in the two green buildings were promoted by the SSTECAC, through trainings, workshops,[9] and videos, and played a positive role in disseminating good practice.

Strengthening the SSTECAC's Resource Management Capacity

Rating: Substantial

80. The TA package targeted the SSTECAC's institutional strengthening and capacity for monitoring the use of resources. The SSTEC master plan did not adequately address the nonphysical aspects required to implement the plan. The project helped SSTEC establish mechanisms to manage municipal financing, resource management, and a monitoring system, including the following:

Developing financial and investment models

81. The project developed financial revenue and expenditure models to help SSTEC manage its municipal financing. The model has been used by SSTEC's finance bureau in day-to-day work, such as the preparation for the annual budget, as well as for the five-year planning exercise for the eco-city's fiscal balance. The project also produced an economic model for assessing major investment projects. The model is now used by SSTEC's finance bureau, economic bureau, and city management bureau to assess large investment projects such as renewable energy.

Establishing policy incentives for implementation

82. A key recommendation from the TA component was to provide incentives to operators and residents to implement the eco-city standards and regulations. Various mechanisms and incentive measures were proposed to promote renewable energy use, waste management, green buildings, and public transport. A number of recommendations have been adopted by SSTEC, such as free-of-charge public transport services, subsidies to reward the implementation of high green building standards, and reward points for recycling garbage, as specified in the relevant administrative and operational rules for the eco-city.

Monitoring system for resource management and use

83. **KPI implementation**. The eco-city had 22 KPIs at the time of appraisal, ranging from natural environment, man-made environment, lifestyle, infrastructure, management, technology

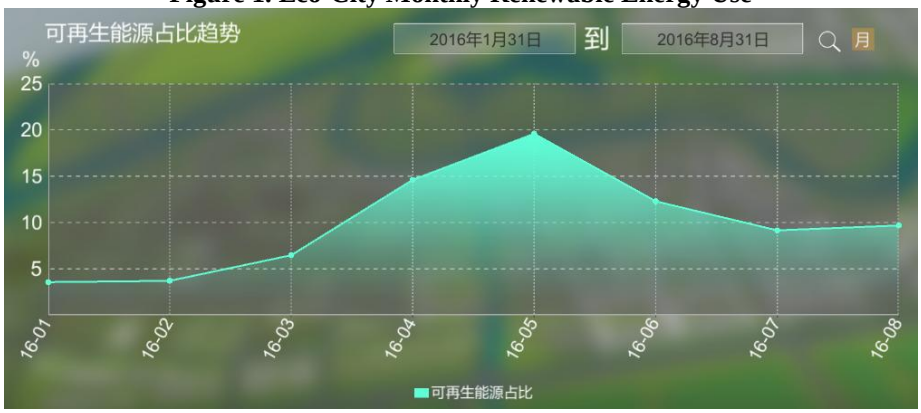
[9] In August 2011, SSTECAC organized a training on green buildings with the participation of 30 people from the relevant government agencies in the SSTECAC and TMGs; in November 2015, the SSTEC organized a major conference of Green Building Coalition to discuss technical standards for buildings in severely cold areas.

innovation, and employment. A comprehensive review of the KPIs supported by the project was carried out and recommendations were made on how the KPIs could be improved and monitored.

84. For example, the eco-city originally set a GHG emission reduction target of 2 tons per capita by 2020. Based on the recommendation from the report, the indicator was revised to an intensity target relative to a unit of GDP output to address the uncertainty of population and GDP growth. The TA also provided customized inventory tools for SSTEC to monitor and track GHG emissions from major sources of emissions. The baseline data and the tools are currently used by SSTEC's environment bureau.

85. **Energy monitoring platform.** With the support of the project, including purchasing necessary equipment for monitoring, the Tianjin Eco-City has established an energy management platform housed in city management bureau. The platform combined real-time data from major sources of energy use (buildings, constructions, and so on) to provide, on a monthly basis, accurate information and analysis on the use of energy, in particular on renewable energy. For example, if energy use exceeds the monthly target, the system will automatically send a red alert. The platform also records renewable energy use and becomes a very useful tool for monitoring and tracking the percentage of renewable energy in the eco-city. Figure 1 shows the monthly use of renewable energy in the eco-city between January and August 2016. SSTEC intends to promote the platform in other cities. This platform is managed by the City Management Bureau.

Figure 1. Eco-City Monthly Renewable Energy Use



Note: The text in the chart shows the ratio of renewable energy use between January 31, 2016 and 31 August, 2016.
Source: presentation by SSTEC administration bureau.

'Soft' impact of the TA package

86. During the interviews of SSTEC staff from various departments (including the finance, environment, transport, and urban management bureaus), very strong and positive feedback was received from the staff on the 'soft' impact generated by the TA activities. All of them had indicated that the consultations, workshops, and the interaction with international experts offered excellent opportunities for them to learn international best practices and exposed them to new concepts of urban design and management. For example, an employee of the finance bureau indicated how the learning experience from the presentations by the experts on investment risk analysis had enabled the staff to develop their own system for risk management. The impact of the learning would be difficult to quantify, but should not be underestimated.

3.3 Efficiency

Rating: Modest

87. The efficiency analysis includes two aspects: incremental cost analysis for green buildings and assessment on TA components related to enabling framework and transport.

Incremental Cost Analysis on Investment and Enhancement in Green Buildings (US$2.4million – about 39 percent of the Total GEF Grant)

88. As part of the requirement by GEF, an incremental cost analysis was conducted, largely based on the assumptions of CO_2 emission reductions from direct and indirect sources as a result of the implementation of the green building component.

89. Direct emission reductions would generate from the pilot investment in the two buildings, estimated at annual energy savings of 5453 MWh and emission reductions at 3,132 tCO_2e. The incremental cost to be financed by the GEF was projected at US$3.66 million at the time of the project appraisal. The payback period was calculated for 8 years for the public housing and 12 years for the middle school.

90. The total emission reductions from these two buildings in 2015 were 3,556 tCO_2 and annual energy savings of 6530 MW with actual GEF investment of US$2.4 million. Annex 3 provides data on energy savings from each source. Following the same approach used at the time of the project appraisal, the payback time should be less than 8 years for public housing and 12 years for the school largely because the incremental cost was less than what was originally allocated.

91. The indirect emissions were calculated based on the assumption that at least 25 percent of the buildings would implement measures to be more energy efficient than the minimum requirement of the GBES by 2015. Assuming that the same standard used in the two pilot buildings would be replicated, an estimated emission reductions of 115,353 tCO_2 would be generated annually by 2020.

92. In 2015, all the buildings in the eco-city complied with the GBES and about 93 percent of the buildings exceeded the GBES requirements, which is 3.7 times higher than the target set in the PAD, among which 42.7 percent of the buildings reached the highest national standard, three stars. This could be translated to emission reductions of at least 426,806 tCO_2e annually, following the same approach and assumptions.

93. The cost analysis for investment carried out in 2010 did not take into account the cost of carbon. A very important change over the past five years has been the preparation and launch of the emissions trading scheme (ETS) by the GOC to put a price on carbon. At the time of project appraisal, CO_2 was not in any way ‘priced’. In 2013, Tianjin, as one of seven pilots for emissions trading selected by the GOC, officially launched its ETS, covering enterprises from key industrial sectors, whereby the companies would have to pay for each ton of emissions in excess of their emissions quotas. A ton of CO_2 traded at the Tianjin Environment Exchange was priced

at US$2.88 in June 2016; in Beijing, the price was US$8.14 per ton; while in Shenzhen, it was US$5.04.[10] The GOC has announced that a national ETS will be launched in 2017. It would be difficult to project the price range of emission for the next 20 years. However, the World Bank has, since 2015, recommended the "use of social value of carbon in economic analysis of investment projects" with the base price set at US$30 per ton to increase to US$80 per ton by 2050.[11] Using the World Bank's shadow carbon price, the annual cost savings from direct emissions reductions of the pilot investment alone could be US$106,680; and for indirect emissions US$12.8 million annually (see annex 3).

Incremental Cost Analysis for TA Components - Transport and Enabling Framework (52.5 percent of the Total GEF Grant)

94. In addition to the support to green buildings, the project supported TA transport system and a comprehensive enabling framework. The project roughly estimated total emission reductions at 392,782 tCO_2 based on the assumption that the eco-city fully implements its KPIs in 2020 and has a population of 350,000. However, the project also recognized that quantifying carbon emission reductions as a result of implementing TA components would be extremely difficult because there was no established methodology and there were too many interrelated factors. Instead, the project opted for a qualitative incremental cost assessment: (a) achieving a higher green transport mode share; and (b) increased likelihood of successful implementation of the master plan and, thus, reduced citywide CO_2 emissions; and (c) demonstration impact that the model for resource efficiency could be replicated by other cities in China.

95. While efficiency gains would be difficult to quantify for TA components, substantive outcomes have been achieved in both transport and the institutional capacity in implementing the master plan. First, the creation of a strong public transport system and improved transport services enabled the eco-city to achieve green transport mode share between 40 percent and 50 percent in 2015, as indicated in section 3.2. In the absence of a good public transport system, private cars would have been used for transit, and the trend would be difficult to reverse.

96. Second, the FM system, the energy monitoring system, and the incentive mechanisms supported by the project, led to improved capacity and institutional framework for comprehensive implementation of the master plan instead of a sole focus on physical infrastructure, as discussed in section 3.2. The significance of these impacts cannot be underestimated.

97. Third, on citywide carbon emissions, the SSTECAC's environment bureau estimated about 2.1 million tons of CO_2 total emissions for the eco-city in 2015. A comparison analysis, either with the city's previous emissions or with other cities, may not be meaningful because the eco-city is still at the early stage of development and the population is simply too small. One can assume, however, that the city's emissions would have been much higher if the SSTECAC did not adopt green transport mode and did not achieve high compliance rate of green building standards—the two major undertakings supported by the project.

[10] International Carbon Action Partnership at https://icapcarbonaction.com/en.
[11] World Bank Guidance Note on Social Value of Carbon in project appraisal, July 2014.

Demonstration Effects Analysis

98. Last but not the least, the eco-city's demonstration impact is substantial. Because of high visibility and political commitment by the GOC, the top leadership regularly paid visits to the city, including the high-profile visit by President Xi Jinping in May 2013, who instructed the SSTEC to set an example for other Chinese cities in building a resource-efficient and environment-friendly and socially harmonious society. In 2013, the State Council approved a proposal to develop the first National Green Development Demonstration District in SSTEC.

99. Owing to the very successful implementation of green building standards by the eco-city, in 2015 the GOC has decided to establish 16 green building areas/districts in other Chinese provinces to follow SSTEC's approach to achieve 100 percent green standard. Numerous workshops were held by SSTEC's various bureaus (for example, environment, transport, and finance) to share SSTEC's experience. According to SSTEC's statistics, in 2016 alone, the SSTEC received 60 groups and 900 people from other countries and international organizations and 600 groups and 14,000 people from other Chinese cities, provinces and domestic institutions, to visit and learn from the experience of SSTEC. That being said, it is, however, unclear to what extent these benefits were attributable to the project.

Consideration of Population Size in the Eco-City

100. An important factor that cannot be ignored in considering efficiency is the size of the population of the eco-city. While the actual implementation of the project was not directly affected by the slow population growth, the underlying assumptions were that the urban facilities would be used by a much larger population than the current base. A much smaller population base means the project benefits would not be as large as originally estimated.

101. Nevertheless, the estimate of reaching 350,000 people by 2020 was simply too optimistic. Then the eco-city suffered some initial setbacks in attracting residents for a variety of reasons; to name a few: (a) the financial crisis in 2008 affected business development; (b) the Government's policy on real estate control to cool down the overheated real estate market, including 'Hukou' system, prevented non-Tianjin residents from purchasing housing in the eco-city; and (c) the lack of good connectivity of the city and the delay in building the light rail to connect the eco-city to other parts of Tianjin made the city much less attractive for companies to move in.

102. It is very difficult to project future growth of population in SSTEC. A new city may take time to mature and reach the targeted size. A good example is Binhai New Development Zone—an adjacent district to the eco-city, which took 30 years to reach the population of 200,000 and now is a vibrant business and commercial district in bigger Tianjin area. The eco-city with only about a few years of development still has a long way to go.

103. There has been some encouraging progress and the efforts by the SSTECAC are starting to bear fruit. For example, the school system (including the middle school supported by this project) has become a major driver for people to move into the eco-city for its high quality of education. As of March 2016, the school which runs from kindergarten and primary school to middle school, has accepted about 2,800 students. The demand is growing faster and higher than what the current school facility can accommodate. The job creation also sees some positive

development. At the end of 2015, more than 3,000 enterprises have registered in SSTEC, and about 8,500 jobs were created by SSTEC, excluding the jobs for the construction workers.

104. In 2015, the SSTECAC reported rapid growth compared with 2014 in GDP (41 percent) and public financing (32 percent). It has also successfully issued offshore bonds in the amount of CNY 1 billion. The high growth has provided sound financial basis for the city's future development.

105. Another important development is the building of the light rail. After years of delay, finally, in April 2016 construction was kicked off. The railway line is 44 km, linking the eco-city with the high-speed railway between Tianjin and Beijing and is due to be completed by 2020. The railway line will potentially play a critical role in shaping the eco-city's connectivity and public transport network. Finally, the GOC has launched regional integration of Beijing, Tianjin, and Henan province (Jingjinji region). The location of SSTEC could be strategic to serve as a satellite city for a large integrated region with the population of more than 100 million and the size of 215,870 km².

106. Despite these positive signs, one cannot ignore the fact that at the project closure, the overall population is only about 40,000 and is unlikely to reach the target of 350,000 by 2020. As such, some recommendations made by the project are unlikely to materialize and the much smaller population raises the question on efficiency of using urban facilities and services. The efficiency is thus rated modest.

3.4 Justification of Overall Outcome Rating

Rating: Moderately Satisfactory

107. The project's overall outcome is Moderately Satisfactory. The PDO remained highly relevant to both the Government's strategies and to the World Bank's CPS in relation to climate action plans, low carbon transport and green urban growth. The design relevance was substantial, and the project has substantially achieved its PDO. However, the project efficiency was modest.

4. Assessment of Risk to Development Outcome

Rating: Substantial

108. The risk to the development outcome is rated substantial mainly because of the concern on how the standards and KPIs would be applied to expand the eco-city (150 km^2). The integration of the two adjacent areas to the eco-city was intended to overcome fragmentation and push economic and urban development at scale, which could play a positive role in attracting investment, job creation, and residents. The implementation of KPI and monitoring of some of the performance standards could be challenging in a much bigger area. There is also uncertainty over the types of industry that the eco-city would host, which would have significant implications on the core value of the development outcome.

109. Recognizing all these risks, the SSTECAC issued its 'Development Plan' (2014–2020) to reaffirm the objectives of the eco-city and the extension of the KPI indicator system to all the new areas. The plan further lays out the three pillars of the eco-city's industry structure which

would be supported by (a) new energy and environment service and products; (b) Internet and research and development services; and (c) the education, culture, and tourist industry.

5. Assessment of Bank and Borrower Performance

5.1 Bank

(a) Bank Performance in Ensuring Quality at Entry

Rating: Moderately Satisfactory

110. The project was conceived and designed to be highly relevant to both the national strategy on urban and climate change as well as the World Bank's strategic engagement with China. The task team at preparation comprised members with appropriate specializations given the focus of the project, such as transport, energy, urban development, and financial analysis. Alternatives for implementation were considered during the preparation stage, and institutional arrangements that involved both the Tianjin Government and SSTECAC were appropriate given the governance structure of the SSTECAC.

111. The three components of the project were well designed to offer a package of support to the client—from the top-level concept design, analytical, and implementation tools to pilot investment and institutional strengthening. These activities responded to the needs of SSTEC and complemented each other to strongly align with the achievement of the PDO.

112. Despite the substantive analytical work for project preparation, the risks faced by the eco-city in attracting business investment were underestimated and thus the mitigation measures presented at the time of appraisal were inadequate. However, the other two major risks were correctly rated as Substantial after mitigation.

(b) Quality of Supervision

Rating: Moderately Satisfactory

113. The first supervision was conducted in October 2011. However, no supervision was carried out in 2012 partly because the first batch of contracts related to public housing were completed in late 2011 or early 2012 and the second batch of contracts (middle school) were not ready for procurement. Nevertheless, the sustainable development sector manager and sector director for East Asia and Pacific and a member of the task team visited the eco-city in May 2012 and discussed with SSTEC and the PMO on the overall project implementation. The Task Team Leader at that time used the mission for a lending operation in Tianjin and met the PMO in November 2012 to address concerns on the Project Implementation Unit (PIU) for the middle school. These discussions led to an agreement between the PMO and the World Bank on the restructuring package by replacing the PIU for the middle school. Despite the absence of supervision missions in 2012, no negative impact was reported on the project implementation and the project proceeded according to the agreed schedule. In 2013, a new Task Team Leader was appointed. Since then, supervision missions were carried out twice a year (excluding the ICR mission in 2016), and most of the project activities were completed or nearing completion by the scheduled project completion date.

114. In response to the new development of the eco-city expansion, the task team included additional components to update the transport plan to cover the new areas. Recognizing the need for a better water conservation and service plan, the surplus funding was used to provide analytical support to the cities in their water management. These interventions were timely in responding to new developments in SSTEC.

115. Project implementation progress was reported, and legal covenants were monitored and enforced. However, given that the KPIs for the project were vague, it would have greatly facilitated the tracking of progress and monitoring of impact had the Implementation Status and Results Reports (ISRs) provided more specific descriptions of the outcome and impact of the individual items listed in the results framework.

116. Overall, this was a relatively high-risk project. During implementation, the World Bank monitored the risk closely and recognized the possibility that the risk would materialize. However, the World Bank made an informed decision not to cancel or restructure the project because the rewards would be extremely high if the project succeeded.

(c) Justification of Rating for Overall Bank Performance

Rating: Moderately Satisfactory

117. On the basis of the above assessment, the World Bank's performance is rated Moderately Satisfactory. Nevertheless it should also be highlighted that the borrower widely acknowledged the World Bank's support during the preparation and implementation phase of the project, noting that the task team had brought knowledge and practical advice to the SSTECAC to enhance their capacity to implement the project.

5.2 Borrower

(a) Government Performance, Implementing Agency or Agencies Performance

Rating: Satisfactory

118. This rating applies to the Government and PMO, as the PMO comprised the key agencies of the TMG and SSTECAC, which represented the Government. Both the TMG and SSTECAC remained committed partners in the project, working closely with both the World Bank and other implementing agencies to ensure successful preparation and implementation.

119. To facilitate the project implementation, the TMG formed a PMO, which included representatives from the TMG—Tianjin Urban and Rural Construction and Communication Commission, and the SSTECAC. The SSTECAC is the Chinese local authority established to meet the objective of carrying out all the government administrative functions for SSTEC, with an integrated mandate to oversee the eco-city planning and implementation process. The PMO, which was led by two senior government officials, including the vice chairman of SSTEAC, the second in ranking with the SSTECAC, consisted of a team of highly committed professionals from the eco-city's bureaus of finance, environment, planning, transport, and construction. To implement the project, the PMO issued 'Project Management and Implementation Measures'.

The counterpart funds were sufficient—which was about US$58 million —and allocated on time. No major issues with requesting funds or processing reimbursements were encountered.

120. The PMO proactively addressed institutional issues such as proposing to replace the PIU—TECI—when the SSTECAC found that TECI would not be in a position to implement the pilot investment in the middle school.

121. During the first supervision in 2011, the project performance was rated 'modestly unsatisfactory' partly because of the delay in procuring consultant contracting, as the PMO was not familiar with the World Bank's procurement procedures. However, the PMO quickly addressed the issue raised by the World Bank's project team and since then the project performance was consistently rated as 'satisfactory' between 2013 and 2016.

(b) Justification of Rating for Overall Borrower Performance

Rating: Satisfactory

122. On the basis of the justification provided above and taking into account the performance by both the Government and the implementing agency during the project preparation and implementation, the borrower's overall performance was rated Satisfactory. At the time of project closing, the borrower had complied with the covenants and agreements as required to achieve the development outcomes.

6. Lessons Learned

123. **Timely upstream TA to cities can have a significant impact on urban planning and strategy.** Despite the relatively small amount of funding, especially in comparison with the massive investment made in the eco-city by the GOC,[12] the impact of TA on the strategic direction of the eco-city's low carbon development and resource management was substantial, as demonstrated in section 3. The TA activities were initiated during the planning and development phase of the SSTEC, thereby ensuring timely inputs for shaping the modality of the city's resource management and transport mode.

124. **Engagement and dialogue are critical for maximizing the impact of the TA activities.** The project produced numerous reports and analytical products. Utilizing the recommendations of the reports requires putting in place a process and making considerable efforts for dialogue with the relevant agencies. For example, after the submission of the reports by the consultants, workshops and work meetings could have been organized by the World Bank to facilitate the policy dialogue and support the clients for the implementation of the recommendations. Also, the supervision missions for a TA type of project could be enhanced by expert meetings with policy makers in the relevant areas.

125. Also, there is a need for continuous engagement with the Tianjin Eco-City administration even after the closure of the project. Feedback from the SSTECAC staff indicated that the urban planners in Chinese cities are looking to international organizations, such as the World Bank, to

[12] The estimated funding for eco-city in 2010, according to the PAD, was US$3.4billion.

help them learn and understand good international practices and new concepts on urban design and management. SSTECAC staff expressed strong interest in finding a way to continue the engagement with the World Bank so that they can keep learning and leveraging the World Bank's global reach and platforms to share their experiences with other cities in China and beyond.

126. A mechanism or a platform under the World Bank for facilitating the knowledge sharing and forging a peer-to-peer city network would be valuable in maintaining and broadening the engagement with the client cities (even after the project has completed).

127. **Designing a measurable results framework is important for tracking progress of the TA activities.** A major challenge in assessing the outcome of this project is the lack of the information on how the recommendations of the reports were utilized. The results framework of the project was largely output-oriented and there was no reporting requirement on how the output was utilized. Most of the ISRs contained limited information on the actual outcome of the various TA activities. The interviews with clients for this report showed that substantive work and impact have been generated through the project but a better track record would be critical and valuable not only for assessing the outcome of the project but also for knowledge sharing—a key objective for any TA activity.

128. **Tianjin Eco-City's slow population growth offered important lessons on developing a new city.** The site, which was non-arable land, was selected to ensure that the new city was not built at the expense of farmland. As in the case of many other 'greenfield' new city developments in China, the eco-city, despite massive investment and high visibility, faces challenges to attract people to move in within the time frame that was originally planned—350,000 people by 2020. Many reasons contributed to the slow population growth, as discussed in section 3.5. Two factors are worth highlighting:

Understanding Connectivity of a City

129. A critical matter that determines a city's attractiveness and competitiveness is its connectivity—how a city accommodates the movement of people within and going in and out of their environment—including mass transit, road congestion, and airport connectivity. The eco-city is located 45 km away from Tianjin, a city with a population of 15 million people. At the time the city was being built, there was no efficient transport network that would connect the new city to the major economic activities in the 'old' and existing areas. The lack of connectivity of the eco-city proved to be a major barrier for attracting investment and movement of people.

Understanding the Social, Cultural, and Psychological Factors That Motivate People to Move to a New City

130. City planning in China often places an overt thrust on the physical infrastructure within cities—roads, buildings, and so on. However, the livability of a city is not only dependent on physical conditions, but also on its people, their social networks, community, and culture. The factors that drive people's decision to move from a familiar social and environmental setting to a completely new city are manifold. Providing physically better living conditions—new and bigger apartment, for instance, would not be sufficiently attractive, as the experience of the eco-city

demonstrates. Even now it is not uncommon that people who work at Tianjin Eco-City would rather drive every day for two or three hours than living in the eco-city largely because their entire social network is somewhere else—in Tianjin, for example.

131. Finally, there is a question of economic efficiency of 'greenfield' development, such as building a new city. In general, a more compact city with higher population concentration is more efficient and has higher per capita GDP compared with low-density cities. The statistics show that the average population density in China's cities has dropped by more than 25 percent in the last decade as the territorial expansion of cities has far outpaced population growth.[13] Recognizing the challenges, some cities, such as Shanghai, in its master plan for 2040, has imposed the 'ceiling' on land expansion to avoid inefficient sprawl. This is an important lesson for Tianjin's overall urban strategy for future development.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

132. None.

(b) Co-financiers

133. Not applicable

(c) Other partners and stakeholders

134. Not applicable

[13] World Bank. 2014. "Urban China: Toward Efficient, Inclusive, and Sustainable Urbanization." 88172.

Annex 1. Project Costs and Financing

(a) Project Cost by Component (US$1000)

Components	Appraisal Estimate			Additional comp.	Actual/Latest Estimate			Percentage of Appraisal
	SSTEC	GEF	Total	GEF	SSTEC	GEF	Total	
Implementation Framework of SSTEC Master Plan (Enabling Framework)	145	1,437	1,582		606.7	1,991	2,598	130
Advisory services	39.5	440	479.5		0	0	0	
TA, software and equipment	105.5	997	1,102.5		92.8	892.8	985	
Additional TA for integrated water plan				500	49.8	700		
M&E equipment to support establishment of renewable energy monitoring platform				750	464.1	398.8	862.9	
TA for Public Transport System					130	1,214	1,344	170
Transport plan	75	713	788		74.2	714.8	789	
Additional TA for public transport plan				500	56.1	500	556	
Green Building Pilot Investment and TA	57,340	4,010	61,350		57,344	2,926	60,270	97.9
Pilot investment	57,300	3,660	60,960		57,300	2,402	59,702	
TA for GBES	40	350	390		25.1	364.9	390	
Promotion and raising awareness				160	18.6	160	178.6	
Additional TAs for 2 TORs for ICR						27.1		
Project Management Cost	280,000				280,000			100
Total Project Costs	57,900.0	6,160	64,060		58,360.7	6,160	64,520.8	100

(b) Financing

Source of Funds	Type of Co-financing	Appraisal Estimate (US$, in thousands)	Actual/Latest Estimate (US$, in thousands)	Percentage of Appraisal
Borrower		57,900	58,360	100
Global Environment Facility		6,160	6,160	100

Annex 2. Outputs by Component

Table 2.1. Comparison of Outputs by Component, at Appraisal and Completion of Project

Component	Output	Outcome
Component 1: TA, Software and Equipment for Implementation Framework of the SSTEC Master Plan and Dissemination Activities		
Component 1A: Eco-city advisory panel	Canceled	
Component 1B: TA, software and equipment for creating an implementation framework of the SSTEC master plan	The original component design involved providing technical advisory services, capacity building, and associated software and equipment for the implementation of the SSTEC master plan, including the following: (a) Assisting the SSTECAC to develop policy, regulations, incentives, and institutional frameworks for (i) the promotion of efficient energy/resource use and achieving KPIs in the sectors of water, solid waste, and energy; (ii) promotion of green transport trips excluding the public transport development; and (iii) provision of on-the-job training to the SSTECAC staff on policy, regulations, incentives, and institutional frameworks. (b) Assisting the SSTECAC to (i) develop finance and economic analysis models based on lifetime cost-benefit analysis concept and application of this model to key public infrastructure investments; (ii) develop a finance mechanism and plan for capital investment and revenues/expenditures projections for key public infrastructure and public utilities; (iii) develop a SSTEC municipal finance model based on capital investment finance plan and revenues/expenditures projections of the key public infrastructures and facilities; and (iv) provide on-the-job training to the SSTECAC staff on the finance mechanism so developed. (c) Assisting the SSTECAC to (i) review the KPIs and develop additional secondary performance indicators, if necessary; (ii) calculate city-based GHG	Enabled policy, regulatory and institutional frameworks for materializing the vision and objectives of the SSTEC master plan. The framework is now in use. The TA completed 11 reports. These reports have provided guidance on institutional framework, financial sustainability, M&E, and capacity building. Strategic fiscal and risk management models were developed. Geographic Information System and management information system were installed to support the daily project management and M&E.

	emission; (iii) update the project implementation schedule (physical construction and institutional development); (iv) develop a management information system for progress M&E, including the implementation of the social and environmental safeguard measures; and (v) provide on-the-job training to the SSTECAC staff on the monitoring mechanism of the project implementation. (d) Provision of training on selected subjects, including integrated urban planning and management, and lifetime cost analysis, and organization of study tours in global best-practice cities and participation in international conferences and workshops on sustainable urban development/eco-city development.	
Component 2: TA for Public Transport System	Original component design included technical advisory services and logistical assistance to develop an integrated public transport system, focusing on the mass transport system, including bus-rapid-transit, to be introduced as the first step of the project's public transport system and strengthen institutions to support the planning, development, and regulation of public transport, including: (a) carrying out a review and gap analysis across all stages of the planning cycle; (b) preparing a detailed public transport network and incremental service delivery plan, including the phasing of a delivery concurrent with the staged community development and contingent short-term implementation of bus services in lieu of other modal choices; (c) carrying out a preliminary public transport feasibility study, including financial analysis of various options and preparation of concept designs; and (d) making recommendations on institutional arrangements for provision and regulation of public transport services. The scope of work for Component 2 includes: (a) confirmation of KPIs and baseline measurement and establishment of monitoring methods; (b) development of behavioral measures and other incentives aimed at reducing car dependency of future existing residents	The eco-city has utilized the completed public transport guidebook to support the establishment of its first public transportation company in the context of stop selection, bus routing, bus selection, and O&M. Share of public transport mode within SSTEC has gone from zero at project start-up to 40–50%. In addition, the updated master plan would now focus on demand analysis, road traffic, public transportation, slow and static traffic, intelligent transport, transportation management, and preparation of an implementation plan. Sixteen reports have been delivered covering (a) traffic planning modeling; (b) public transport planning; (c) service planning of public transport; (d) financial performance; and (e) suggestions on institutional arrangements. The TA developed the model to simulate the mobility distribution and select the appropriate bus route and stops.

	of the eco-city; (c) further development of green transport standards and practical measures for integration of buildings, sidewalks, and transport facilities through appropriate urban design; (d) specific planning for the phased introduction of services concurrent with community development; and (e) lifetime cost-benefit analysis of transport financing as part of overall financial planning for the city.	
Component 3: Green Building Pilot Investment and TA		
Component 3A: Pilot investment	The original component design involved piloting of the two green buildings (a public housing for the low-income segment of SSTEC households and a middle school), including the provision of incremental construction costs for energy/water efficiency and renewable energy use, the enhancement options to be selected based on the cost increment, energy savings, and replicability.	The incremental annual energy savings in the GEF-funded pilot green buildings amount to 6,529 MW or 120% of the final target of 5,453 MW; and incremental annual energy savings and GHG reduction in the two pilot buildings is 3,551 tCO_2e, or 114% of the end target of 3,132 tCO_2e. Public housing and a middle school were piloted as green building projects. The grant financed the upgrading of heating, ventilation, and air conditioning; lighting; hot water; and an M&E platform.
Component 3B: TA	Provision of technical advisory services and goods to facilitate the reduction of building energy use by supporting the GBES enhancement, the GBES implementation, knowledge transfer, and incentive schemes, including (a) enhancement of the existing GBES by adding more guidance and requirements considering the technical solutions, public awareness, education measures and schemes; (b) design, definition, and documentation of a clear and robust process by which the GBES can be applied and managed; (c) M&E of the performance of two pilot green buildings; and (d) design of incentive schemes to motivate developers to develop high-quality green buildings beyond the minimum requirement of the GBES and to motivate residents to lead a green lifestyle.	Development framework has been established to reduce building energy use, including monitoring indicators and an incentive fund. The monitoring platform is in operation and reporting data. The SSTECAC has conducted analysis on the performances of the green building pilot investment.
Additional TA and equipment		
Additional TA for integrated water master plan	This activity would increase SSTEC's resource efficiency in the water sector by creating (a) a simplified computer model for simulation of water eutrophication; (b) a master plan for the entire water	Four reports were completed: Tianjin Eco-City River System Status Investigation and Analysis Report, River System Interconnection and Circulation Report, Research Report on Optimization of Drainage System, and Research Report on

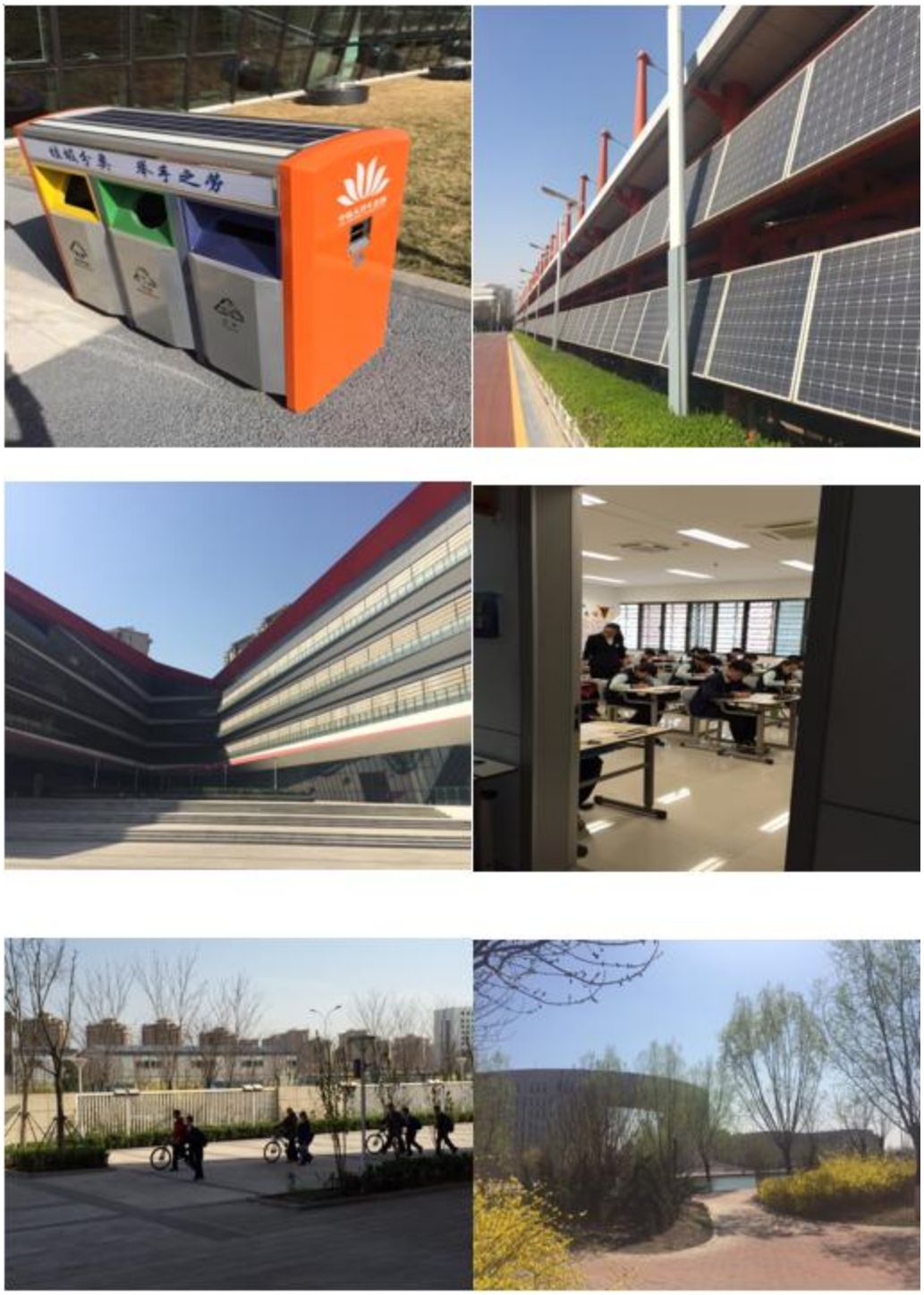
	system; (c) a data collection and analysis system for water system monitoring; (d) an integrated water resource management model; and (e) an early warning system and an emergency preplan in response to accidents.	Rainwater System and Resource Utilization Based on Low Impact Development. Guidance has been provided to the staff and management of the environment bureau with regard to water resource management and drainage systems.
Additional TA for public transport master plan	The Grant Agreement would be amended to provide TA for the transport master plan update and will focus on demand analysis, road traffic, public transportation, slow and static traffic, intelligent transport, transportation management, and preparation of an implementation plan.	Eight reports have been produced by TA consultants. The reports provide detailed analysis of current situation, demand analysis, integrated transport design, urban roads, bicycle, parking policy, and O&M. The reports provide specific recommendations to the management of the transport system, with regard to the specific policy design. The SSTECAC has incorporated some of the policy
Additional TA for green building promotion	Preparation of videos and flyers; organization of knowledge dissemination sessions; and creation of an information section on green buildings on the SSTECAC's webpage. The Grant Agreement would be amended to reflect these additional activities.	Promotional materials have been prepared and disseminated.
M&E equipment to support establishment of renewable energy monitoring platform	(a) Provide funds for M&E equipment and software. (b) Provide funds for TA for the preparation of an M&E program and the provision of training (US$40,000). The additional activities would contribute toward making the SSTEC more energy and resource efficient.	The renewable energy platform is up and running.

Table 2.2. New Subcomponents Included in the Project as a Result of the Second Restructuring

Component	Rationale	Description
Subcomponent 1B (a) - Integrated Water TA	SSTEC had no integrated water master plan	This TA activity comprised various tools and measures to facilitate integrated water planning for the eco-city, which in turn was expected to increase SSTEC's resource efficiency in the water sector. Subactivities included: (a) a simplified computer model for simulation of water eutrophication; (b) a master plan for the entire water system; (c) a data collection and analysis system for water system monitoring; (d) an integrated water resource management model; and (e) an early warning system and an emergency preplan in response to accidents.
Subcomponent 1B (c) - Energy utilization	The SSTECAC realized the importance of M&E for renewable energy utilization and started building its own monitoring platform.	The activities envisaged within this subcomponent would contribute toward making SSTEC more energy and resource efficient. The objective was to (a) provide funds for M&E equipment and software and (b) provide funds for TA for the preparation of an M&E program and the provision of training.

	This subcomponent was already included in the project.	
Component 2 - Transport Management	Enhancing the achievement of the PDO by making SSTEC more resource efficient in the transport sector.	The TA was for updating the transport master plan and to provide support focused on demand analysis, road traffic, public transportation, slow and static traffic, intelligent transport, transportation management, and preparation of an implementation plan.
Component 3 - Green Buildings	To promote and strengthen green building awareness	Preparation of videos and flyers; organization of knowledge dissemination sessions; and creation of an information section on green buildings on the SSTECAC's website.

Figure 2.1. Photos of SSTEC



Note: Photos of SSTEC in April 2016: solar panel used for trash and parking; middle school supported by the project; and public space.

Annex 3. Economic and Financial Analysis

Incremental Cost Analysis

1. As part of the GEF requirement, the incremental cost analysis was conducted for the green building component (Component 3) and the two components related to enabling framework (Component 1) and green transport (Component 2).

A. Green Buildings (Pilot Investment and TA on Improving the GBES)

2. The project was expected to generate direct and indirect GHG emission reductions.

Assumptions and Cost Analysis at Appraisal Stage

Direct Emission Reductions

3. Direct GHG emission reductions would be generated from the two green building pilots for which the proposed GEF project would finance the incremental costs of US$3.66 million for energy/water efficiency and renewable energy measures beyond the minimum requirement of the SSTEC GBES.

4. Using the eQuest building simulation model, the evaluation showed that by incorporating the proposed enhancement options, the pilot public building project can achieve an annual energy saving of 3,319 MWh (1,802 MWh in electricity, 1,478 MWh in heat, and 39 MWh in natural gas) and contribution of renewable energy to the total building energy consumption is about 20 percent. This represents about a 38 percent overall energy saving compared to the GBES baseline and a 70 percent saving on space heating/cooling energy compared to the national guidelines benchmark taken from the 1980–1981 regulations. These energy savings equate to an annual reduction in CO_2 emissions in the range of 2,425 tons. In addition, water saving measures can achieve annual water savings of 24,308 tCO_2. The incremental cost for adopting the proposed enhancements is estimated at US$2.1 million, with about US$1.89 million from GEF. This represents an additional capital cost increase of around 6 percent. The aggregate simple payback period for this incremental investment is around eight years.

5. Using the same approach, the pilot middle school project can achieve an annual energy saving of 2,134 MWh (485 MWh in electricity and 1,649 MWh in heat) and the contribution of renewable energy to the total building energy consumption is about 60 percent. This represents about a 75 percent overall energy saving compared with the GBES baseline and an almost 100 percent saving on space heating/cooling because heating is mainly supplied by solar thermal and cooling is by tunnel ventilation. These energy savings equate to an annual reduction in CO_2 emissions in the range of 707 tons. The incremental cost for adopting the proposed enhancements is estimated at US$3.2 million, with about US$1.77 million from the GEF. This represents an additional capital cost increase of around 14 percent. The aggregate simple payback period for this incremental investment is around 12 years.

6. Together with the public housing pilot, the direct emission reductions from the incremental investment in the two pilots are therefore 3,132 tCO_2e annually.

7. Selection of energy/water efficiency and renewable energy measures for each pilot was based on the lifetime cost effectiveness (positive net present value with a 6 percent discount rate) and replicability. The list of proposed enhancement measures to be financed by GEF for two pilots included energy-efficient window, wall, and roofs (insulation), and so on. The simple payback period for these incremental measures ranged from 1 to 20 years. For certain enhancement options that do not meet the criteria for financial viability such as solar photovoltaic system, the SSTECAC will provide their own financing. Cost-benefit analysis for each proposed enhancement was based on current energy cost, technology, and production cost levels.

Indirect Emissions

8. The project targeted to have at least 25 percent of buildings more energy efficient than the minimum requirement of the GBES by 2015 when the GEF project completed. In addition to the incentive mechanisms to be developed by the TA subcomponent, the SSTECAC has already begun to use incentives such as discounted land price to attract developers to install energy efficiency and renewable energy measures in buildings. SSTEC was expected to be complete by 2020 with about a total of 22.8 million m^2 floor areas. Assuming that the energy/water efficiency and renewable energy measures demonstrated in the two pilots were replicated to 25 percent of SSTEC buildings by 2020, a conservative estimation shows that 115,353 tCO_2e emissions could be reduced annually. Adding the direct emission reductions from the two pilots, this brings an annual reduction of 118,486 tCO_2e in the building sector. Using a 20-year time frame, the direct impacts from the two pilots together with the replication effects on the rest of the buildings in the SSTEC bring a cumulative GHG emissions reduction of 2.3 million tCO_2.

Emission Reduction and Cost Analysis at Completion

Direct emissions

9. The total energy savings from the two buildings in 2015, were 6,529 MWh (table 3.1.), equivalent to emission reductions of 3,556 tCO_2. The actual GEF investment was US$2.4 million for purchasing energy-efficient appliances.

Table 3.1. Middle School

Total Energy Use					**Current Situation**
	Baseline		**Original Design Scheme**		**Total Electricity Use**
	MWh	%	**MWh**	%	**MWh**
Heating	1631.4	51.2	795.8	39.3	677.1
Cooling	189.3	5.9	0	0.0	160.1
Appliance	209.7	6.6	209.7	10.4	184.9
Hot water	300	9.4	300	14.8	288.4
Lighting	320.9	10.1	209.5	10.3	0.0
Cooking	416	13.1	416	20.5	121.2
Ventilation	55.4	1.7	55.1	2.7	120.3
Water pump	21.1	0.7	20.3	1.0	0.0

Parking lighting	28	0.9	13	0.6	0.0
Street lighting	9.2	0.3	5	0.2	9.2
Gymnasium fan	3.4	0.1	0	0.0	0.0
Total	3184.4	100.0	2024.4	100.0	1561.2
Solar domestic water heating system	0	—	159	—	147.47
Solar heating system	0	—	323.4	—	0
Solar electricity generator	144	—	300	—	0
Renewable energy street light	0	—	5	—	0
Total renewable energy use	144	—	787.4	—	147.47
External energy supply	3040.4	—	1237.0	—	1413.77
Renewable energy use	4.52%	—	38.90%	—	9.45%
Energy saving	—	—	1803	—	1627

Table 3.2. Public Housing

Total Energy Use					**Current Situation**	
	Baseline				**Total Electricity Use**	
	MWh	%	**MWh**	%	**MWh**	**kWh/m^2**
Heating	2629.5	39.3	1151.2	27.5	781.32	20.55
AC	778.7	11.6	529.9	12.7	40.33	1.06
Electric appliance	777.7	11.6	777.7	18.6	253.48	6.67
Hot water	1059.6	15.8	847.7	20.3	301.57	7.93
Lighting	661.5	9.9	122.3	2.9	25.38	0.67
Cooking	462.7	6.9	424.1	10.1	95.52	2.51
Elevator	275.909	4.1	220.8	5.3	220.80	5.81
Fans	5.2	0.1	8.8	0.2	220.80	5.81
Water pump	27.9	0.4	85.3	2.0	85.30	2.24
Outdoor lighting	17.4	0.3	10.9	0.3	10.90	0.29
Total	6696.1	100.0	4178.7	100.0	1814.59	47.73
Renewable energy of elevator	0	—	155	—	0	—
Solar hot water	159	—	805	—	179.84	4.73
Solar electricity generator	159	—	960	—	179.84	—
External supply	6537.1	—	3218.7	—	1634.76	—
Renewable energy use	2.37%	—	22.97%	—	9.91%	—
Energy saving	—	—	3318	—	4902.35	—

Indirect Emissions

10. In 2015, all the buildings in the eco-city complied with the GBES and about 93 percent of the buildings exceeded the GBES requirements, which is 3.7 times higher than the target set in the PAD, among which 42.7 percent of the buildings reached the highest national standard, three stars. This could be translated to emission reductions of at least 426,806 tCO_2e annually, following the same approach and assumptions.

Consideration of the price of carbon

11. The World Bank has, since 2015, recommended the use of social value of carbon in economic analysis of investment projects. The numerical values of the social value of carbon recommended for use by the World Bank Group are given in table 3.3. The base estimate starts from US$30 in 2015 and increases to US$80 in real terms by 2050. The low and the high paths for the social value of carbon are added to reflect a range of uncertainties and can be used for sensitivity analysis. These figures will be reviewed and updated periodically as new scientific results or revised political commitments justify it.

Table 3.3. Social Values of Carbon Recommended for the World Bank Group in US$ Per Metric Ton of CO_2 Equivalent (in Real 2014 US$)

	2015	2020	2030	2040	2050
Low	15	20	30	40	50
Base	30	35	50	65	80
High	50	60	90	120	150

12. Using the World Bank's shadow carbon price, the annual cost savings from direct emissions reductions alone for the pilot investment could be US$106,680 in 2015; for indirect emissions it is US$12.8 million in 2015.

Table 3.4. Comparison between the PAD and ICR on Direct/Indirect Emissions from Green Buildings

PAD	ICR
Direct emissions (pilot investment for two buildings)	
3,132 tCO_2e annually of which: • 2,425 tCO_2e per year for public housing • 707 tCO_2e per year for pilot middle school project	3,551 tCO_2e annually of which: • 2,928 tCO_2e per year for public building project • 623 tCO_2e per year for pilot middle school project
Total in 20 years	
62,640 tCO_2	71,020 tCO_2
Indirect emissions	
115,353 tCO_2e annually or 2.3 million tCO_2e over a 20-year time frame, assuming 25% of buildings exceed the GBES	All the buildings in the eco-city complied with the GBES and about 93% of the buildings exceeded the GBES requirements, among which 42.7% of the buildings reached the highest national standard (three stars). A total of 93% building exceeding the GBES, which is almost 3.7 times higher than the target set in the –PAD, would be translated to 426,806 tCO_2e annually or 8.5 million tCO_2e over a 20-year time frame.
Cost of carbon	
Carbon was not priced in 2010	In 2015, using US$30 per tCO_2e (World Bank's social cost of price): • Potential savings from direct emissions reductions is US$106,530; and US$12.8 million from indirect emissions.

B. Incremental Cost Analysis

13. In addition to the support to the green building program through direct investment and TA, the proposed GEF project supports a comprehensive implementation framework and TA targeted on public transport system. Therefore, its impacts not only relate to the activities and pilot investments that the project directly supports, but also relate to how well the SSTEC master plan is implemented, how its KPIs are achieved, and how this eco-city model is replicated in other cities in China. A preliminary 'citywide' estimate shows that if SSTEC can successfully implement its master plan and achieve its stated KPIs, the city could save about 393,000 tCO_2e per year compared to the base case of a common city practice with the same scale. The proposed GEF project would help SSTEC to implement its master plan and materialize its KPIs and estimated carbon emission reductions. However, quantifying the exact impact of the GEF TA Components 2 and 3 on GHG emission reductions is extremely difficult, because there is no established methodology and there are too many interrelated factors that are hard to quantify.

14. Therefore, the incremental cost analysis only applies to green buildings. However, if the impact of the TA components on the implementation framework and public transportation system, and the replication effect to other cities were considered, the indirect GHG emission reductions from the GEF alternative would be substantially higher.

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Hiroaki Suzuki	Lead Urban Specialist	EASUR	TTL
Sing Cho	Urban Specialist	EASCS	Urban
John Hogan	Consultant	EASUR	Green Building
Uprety Kishor	Sr. Counsel	LEG	Legal Matters
Haixia Li	Sr. Financial Management Specialist	EAPFM	Financial Management
Jingrong He	Procurement Analyst	EAPPR	Procurement
Xin Ren	Sr. Environmental Spec.	EASCS	Environment
Yabei Zhang	Energy Economist	EASIN	Green Building
Meixiang Zhou	Social Development Specialist	EASCS	Social Development
Lynn Wang	Consultant	EAPFM	Financial Management
Dahong Li	Consultant	EASCS	Environment
Supervision/ICR			
Suhail J.S. Jme'An	Program Leader	SACKB	TTL (early)
Gang Qin	Sr. Water & Sanitation Specialist	GWA02	TTL (most recent)
Sing Cho	Sr. Water and Sanitation Specialist	GWA02	Urban
Jingrong He	Procurement Specialist	GGO08	Procurement
Haixia Li	Sr. Financial Management Specialist	GGO20	Financial Management
Xin Ren	Sr. Environmental Specialist	GEN2A	Environment
Meixiang Zhou	Social Development Specialist	GSU02	Social Development
Weimin Zhou	Transport Specialist	GTI10	Transport
Xueman Wang	Sr. Carbon Finance Specialist	GSU08	ICR author
Yabei Zhang	Sr. Energy Economist	GEE03	Energy Economy
Lynn Wang	Consultant	GGO20	Financial Management
Ting Zhang	Consultant	GWA02	Project Engineer

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	US$, Thousands (including travel and consultant costs)
Lending		
FY2009	2.78	5,716.95
FY2010	36.63	278,075.68
FY2011	0.00	1,385.18
Total:	39.41	285,177.81
Supervision/ICR		
FY2011	7.35	36,494.76
FY2012	10.08	65,824.21
FY2013	7.26	20,424.09
FY2014	6.55	15,911.54
FY2015	10.18	28,364.34
FY2016	14.53	65,908.02
FY2017	5.73	25,715.89
Total	30.44	119,988.25

Annex 5. Beneficiary Survey Results

Not applicable.

Annex 6. Stakeholder Workshop Report and Results

Not applicable.

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

1. The borrower's ICR was prepared by the Tianjin PMO in June 2016. The ICR consists of 42 pages discussing the following items: (a) assessment of project objective and quality at entry; (b) achievement of objectives and completion of outputs; (c) major factors affecting implementation and outcome; (d) sustainability; (e) World Bank and recipient performance; and (f) lessons learned.

2. While much of the text is descriptive and contains similar information on the project background and outputs that can be found elsewhere in this GEF/World Bank project documentation, the report does provide a valuable summary from the borrower's perspective, especially from the perspective of the sections on sustainability and lessons learned. The key points, analysis, and observations are summarized below.

Sustainability

Prospects for sustainability

3. The PMO recognizes the project to be sustainable from three perspectives; (a) an appropriate institutional arrangements have been made to ensure effective implementation; (b) the SSTECAC has been supporting relevant entities to operate and maintain the facilities of the green building pilot projects; and (c) the green building pilot project has demonstrated financial sustainability, and thus could be replicated in a larger scope.

4. The SSTECAC will continue to exist well beyond the project's implementation period and provide adequate funds for O&M of the middle school (one of the pilot green building projects) from its financial budget, thereby ensuring sustainable operation of the middle school.

5. Under the supervision of the SSTECAC's competent construction department, SSTEC's Housing Company will be responsible for the development, construction, sales, and maintenance of public housing in accordance with market operation principles; give full play to the advantages of both the Government and the company; and join forces to effectively execute the construction and management of the public housing project. Rich construction management experiences have been accumulated in the course of constructing the public housing project (Phase I).

6. The SSTECAC has conducted detailed analysis based on the data recorded by the monitoring platform, and has concluded that residents' behavior and demand will influence the performance of the green buildings. In the future, the real demands of SSTEC's residents will be taken into consideration in follow-up public housing projects, ensuring that the plan is people-centric. The design, construction, and management policies for the public housing projects will be improved and adjusted to meet the low-income groups' demand for public housing as well.

Lessons Learned

7. After eight years of development and construction activities, SSTEC is now in good shape. The successful construction experience can be summarized as follows:

Pay attention to capacity building

8. The SSTECAC has a competent and powerful leading group, guiding the project team to carry out various project activities in an effective and efficient manner, and in accordance with project timelines and targets. In this project, both the World Bank and SSTECAC paid a lot of attention to the capacity building of the management entities. During project preparation, the capacity of the implementation unit was ensured by engaging several experienced staff and experts. A number of workshops and training sessions were carried out with the participation of a wider management group. The dedication of the SSTECAC staff has created a spirit of innovation, efficiency, and rigor.

High-level cooperation and mutual beneficiary mechanism

9. In the early stages of SSTEC construction, the Governments of China and Singapore jointly established a vice premier-level Sino-Singapore Coordination Council, and a minister-level joint working commission. They also established a Chinese Investment Company and a Sino-Singapore Cooperative Joint Venture as the institutions responsible for SSTEC's development and construction. All these mechanisms ensured that SSTEC was constructed, developed, and operated in accordance with the targets set out.

A scientific management system and feedback mechanism

10. The Governments of China and Singapore mobilized top experts to jointly prepare the first ever eco-city indicator framework, establishing benchmarks for the SSTEC in line with global standards, such as 100 percent green buildings, 20 percent renewable energy usage, 50 percent water supply from nontraditional sources, and so on.

Prioritize ecological environment

11. SSTEC's development process has emphasized and prioritized the protection of the ecological environment. With the expansion of SSTEC, similar ideas have been replicated with a wider scope. SSTEC will regularly disseminate and support replication of ideas and practices that prioritize ecology and low carbon development (green buildings, green transport, solid waste classification, solar energy utilization, and so on) for the development of the new areas in SSTEC. The unified policies and standards will be implemented in the entire SSTEC area (although some detailed indicators may vary from place to place) and guide all activities that aim to attract investments.

Establish market mechanisms to catalyze private investment

12. The SSTECAC attaches great importance to attracting investments. To catalyze and raise investment in SSTEC, it ensured that market mechanisms were established. This enabled quick identification of tax revenue sources. SSTEC's financial income has been rising continuously and will be used to support the development and expansion of SSTEC.

Suggestion and Recommendations

13. The PMO has summarized some of the key issues and challenges faced during project implementation. The main issues include inaccurate population estimation in the master plan, the distance from the existing city center and the low level of connectivity; and the lack of job opportunities for local residents. While some of the issues cannot be changed, the PMO does propose sound remediation measures to improve the livability and performance of SSTEC in the ICR.

Infrastructure and supporting services should be further improved

14. Industry development in the SSTEC is relatively weak and there are not enough working jobs for local residents. Industries and counterpart facilities (public transport, healthy and medical facilities, and commercial facilities) should be further strengthened and improved.

More education program on green lifestyle

15. There are individual programs for water saving, energy saving, and so on, but the programs have not been very effective in changing routine behavior. Therefore, the dissemination learnings and promotion of activities for a green lifestyle should be collated and strengthened.

Annex 8. Comments of Co-financiers and Other Partners/Stakeholders

Not applicable.

Annex 9. List of Supporting Documents

1. Project Concept Note
2. Project Appraisal Document, June 2010
3. Loan and Project Agreements
4. Preparation for Sino-Singapore Tianjin Eco-City Middle School Green Building Feasibility Report, December 2009
5. Preparation for Sino-Singapore Tianjin Eco-City Public Housing Green Building Feasibility Report, December 2009
6. Aide Memoires for Preparation and Supervision Missions from January 2011
7. Implementation Status and Results Reports (ISRs)
8. Green Building Energy Efficiency Report, Tianjin Green Building Research Institute, 2015
9. The 13th Five-Year Plan for Tianjin Eco-City Expanded Area, 2015
10. Integrated Plan for Three Districts of Tianjin Eco-City, 2015
11. Green Development Report - M&E Monitoring Platform, Tongji University, 2016
12. Sino-Singapore Tianjin Eco-City Socio-Economic Statistics Report, Statistics Bureau, 2015

(Map IBRD37489 to be inserted)

Map of China

(Map CHN42712 to be inserted)

Location Map of Sino-Singapore Tianjin Eco-City (Tianjin Region Map)