



Report and Recommendation of the President to the Board of Directors

Project Number: 51181-001
November 2017

Proposed Loan People's Republic of China: Air Quality Improvement in the Greater Beijing–Tianjin–Hebei Region— Regional Emission-Reduction and Pollution-Control Facility

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Asian Development Bank

CURRENCY EQUIVALENTS

(as of 7 November 2017)

Currency unit	–	yuan (CNY)		
CNY1.00	=	\$0.1514	or	€0.1299
\$1.00	=	CNY6.6045	or	€0.8578
€1.00	=	CNY7.6995	or	\$1.1658

ABBREVIATIONS

µg/m ³	–	microgram per cubic meter
ADB	–	Asian Development Bank
AQI	–	air quality index
BTH	–	Beijing–Tianjin–Hebei
CAAP	–	Comprehensive Action Plan for Air Pollution Prevention and Control
CECEP	–	China Energy Conservation and Environmental Protection Group
CECEP Huayu	–	CECEP Huayu Fund Management Co., Ltd.
CO ₂	–	carbon dioxide
ESCO	–	energy service company
ESMS	–	environmental and social management system
LNG	–	liquefied natural gas
PAM	–	project administration manual
PM _{2.5}	–	particulate matter less than 2.5 micrometers in diameter
PRC	–	People’s Republic of China

NOTE

In this report, “\$” refers to United States dollars, and “€” refers to Euro.

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PROJECT AT A GLANCE

1. Basic Data		Project Number: 51181-001	
Project Name	Air Quality Improvement in the Greater Beijing–Tianjin–Hebei Region—Regional Emission-Reduction and Pollution-Control Facility	Department /Division	EARD/EAEN
Country Borrower	China, People's Republic of People's Republic of China	Executing Agency	China Energy Conservation and Environmental Protection Group (CECEP)
2. Sector	Subsector(s)	ADB Financing (\$ million)	
✓ Energy	Energy efficiency and conservation		49.00
	Renewable energy generation - geothermal		100.00
	Renewable energy generation - solar		50.00
Agriculture, natural resources and rural development	Rural solid waste management		100.00
Transport	Multimodal logistics		50.00
	Urban public transport		100.00
Water and other urban infrastructure and services	Other urban services		50.00
	Total		499.00
3. Strategic Agenda	Subcomponents	Climate Change Information	
Inclusive economic growth (IEG)	Pillar 1: Economic opportunities, including jobs, created and expanded	Mitigation (\$ million)	450.00
Environmentally sustainable growth (ESG)	Global and regional transboundary environmental concerns	CO ₂ reduction (tons per annum)	5,000,000
	Natural resources conservation	Climate Change impact on the Project	Medium
	Urban environmental improvement		
4. Drivers of Change	Components	Gender Equity and Mainstreaming	
Governance and capacity development (GCD)	Institutional development	No gender elements (NGE)	✓
Knowledge solutions (KNS)	Application and use of new knowledge solutions in key operational areas		
	Knowledge sharing activities		
	Pilot-testing innovation and learning		
Partnerships (PAR)	Bilateral institutions (not client government)		
	Commercial cofinancing		
	Private Sector		
Private sector development (PSD)	Promotion of private sector investment		
5. Poverty and SDG Targeting		Location Impact	
Geographic Targeting	No	Rural	Medium
Household Targeting	No	Urban	High
SDG Targeting	Yes		
SDG Goals	SDG3, SDG7, SDG9, SDG11, SDG13		
6. Risk Categorization:	Complex		
7. Safeguard Categorization	Environment: FI Involuntary Resettlement: FI Indigenous Peoples: FI		
8. Financing			
Modality and Sources		Amount (\$ million)	
ADB		499.00	
Sovereign Project (Regular Loan): Ordinary capital resources		499.00	
Cofinancing		0.00	
None		0.00	
Counterpart		1,537.70	
Beneficiaries		759.20	
Others		748.40	
Project Sponsor		30.10	
Total		2,036.70	

Source: Asian Development Bank

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I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on a proposed loan to the People's Republic of China (PRC) for the Air Quality Improvement in the Greater Beijing–Tianjin–Hebei Region—Regional Emission-Reduction and Pollution-Control Facility.¹

2. The proposed project is the third in a multiyear, multisector Asian Development Bank (ADB) support program for air quality improvement in the greater Beijing–Tianjin–Hebei (BTH) region. The first loan, approved in 2015, focused on reforming policy and strengthening regulatory capacity in Hebei province.² The second loan, approved in 2016, targeted better access to finance, especially for small and medium sized-enterprises, to scale up investments in pollution-reduction projects in the region.³ This third project will complement the previous projects and will directly help remove barriers to deploying high technologies that could reduce air pollution from industries, urban infrastructure, and agriculture.⁴

II. THE PROJECT

A. Rationale

3. The greater BTH region is one of the most important economic regions in the PRC, generating about one-third of the country's gross domestic product. However, it also has a high concentration of people and energy-intensive and highly polluting industries, which resulted in widespread air pollution.⁵ Cities in the greater BTH region consistently rank highest in the country for high concentration of particulate matter less than 2.5 micrometers in diameter (PM_{2.5}) and other air pollutants that contribute to the high air quality index (AQI) level.⁶ High levels of PM_{2.5} are serious health risks and can lead to premature deaths.

4. The Government of the PRC recognizes the importance of managing air pollution. In 2013, it launched the Comprehensive Action Plan for Air Pollution Prevention and Control (CAAP), 2013–2017, which introduced the PRC's most stringent measures to reduce air pollution.⁷ It set specific emission-reduction targets on levels of sulfur dioxide, nitrogen oxide, PM_{2.5}, and volatile organic compounds nationally and for the BTH region. The government in its Thirteenth Five-Year Plan (Thirteenth plan) further requires hundreds of cities to meet good or excellent air quality standards 80% of the time and has set a cap on total energy consumption.⁸ In support of CAAP

¹ The greater Beijing–Tianjin–Hebei region refers to Beijing and Tianjin municipalities; Hebei, Henan, Liaoning, Shandong, and Shanxi provinces; and Inner Mongolia Autonomous Region.

² ADB. 2015. *Report and Recommendation of the President to the Board of Directors: Proposed Policy-Based Loan to the People's Republic of China for the Beijing–Tianjin–Hebei Air Quality Improvement—Hebei Policy Reforms Program*. Manila.

³ ADB. 2016. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the People's Republic of China for the Air Quality Improvement in the Greater Beijing–Tianjin–Hebei Region—China National Investment and Guaranty Corporation's Green Financing Platform Project*. Manila.

⁴ "High technologies" refers to technologies that have higher upfront costs but better life-cycle value than widely used technologies, or have been proven at scale in other countries but are not deployed at scale in the PRC.

⁵ More than half of the PRC's pollution-intensive steel and cement production capacity, about one-third of the PRC's cars and other automobiles, and about 28% of the PRC population are concentrated in the greater BTH region.

⁶ AQI is a common measure of the quality of air and its potential health impacts. AQI considers six atmospheric pollutants: sulfur dioxide, nitrogen oxide, particulate matter less than 10 micrometers in diameter, PM_{2.5}, carbon monoxide, and ozone. In the PRC, the AQI is categorized from 50 (excellent) to 500 (severe pollution).

⁷ Government of the PRC. 2013. *Comprehensive Action Plan for Air Pollution Prevention and Control of the People's Republic of China*. Beijing.

⁸ Meaning they must score below 100 on the PRC's AQI. Government of the PRC. 2015. *The 13th Five-Year Plan for Economic and Social Development of the People's Republic of China, 2016–2020*. Beijing.

implementation, ADB contributed, targeted, and coordinated financing of \$800 million (footnotes 2 and 3) and the World Bank did the same for \$1 billion. Since then, air pollution and PM_{2.5} concentration levels across the BTH region have declined each year—by 10.4% in 2014, 14.3% in 2015, and 7.8% in 2016—reversing the trend of increasing air pollution in the pre-CAAP years. The number of days with good AQI has also improved across the region, demonstrating the effectiveness of CAAP and its actions.

5. Despite this initial improvement, the annual average PM_{2.5} concentration level across more than 95% of the cities in the region is still above World Health Organization and national ambient air quality standards.⁹ In the first quarter of 2017, PM_{2.5} levels also rebounded in the region for the first time since 2013 in tandem with high economic growth rates. Thus, efforts need to be intensified and supplemented with fundamental changes in the region's energy and industry structure by adopting cleaner production methods and high technology. This is essential to decouple robust economic growth from rising air pollution.¹⁰

6. In response to CAAP, industrial enterprises chose to invest in low-cost, end-of-pipe measures instead of more advanced and cleaner technologies. The main reasons for these are (i) enterprises are currently prioritizing investments in end-of-pipe control measures which give immediate benefits but do not address the underlying issues; (ii) enterprises' preference of following cheaper, high-return investments in capacity expansion and diversification instead of capital-intensive, modest-return investments in pollution reduction; (iii) limited knowledge of financially viable high-technology options; and (iv) absence of appropriate financing vehicles and instruments to deal with associated risks. The PRC has made efforts to strengthen environmental monitoring and enforcement through reform of the Environmental Protection Law. In November 2016, it issued the Implementation Plan for the Licensing System to Control Pollutant Emission and announced the impending implementation of an environmental protection tax with effect from 1 January 2018. These are in early stages of implementation, and complementary measures to support investments in pollution reduction will provide better outcomes.

7. The PRC's economic structure is gradually moving away from export-oriented industrial growth to consumption-based growth of the service industry. But systematic microeconomic transformations in industries and infrastructure services are needed to enhance the environmental outcomes of this macroeconomic transformation. Meeting longer-term air quality standards can be achieved only if major polluting sources adopt high technologies and cleaner production practices to meet stringent emission standards. In addition to stringent standards and a robust enforcement system, investments in air pollution reduction must be cost-effective to business owners. The role of advanced or high technologies in such a paradigm is important because it can improve process efficiency while reducing emissions.

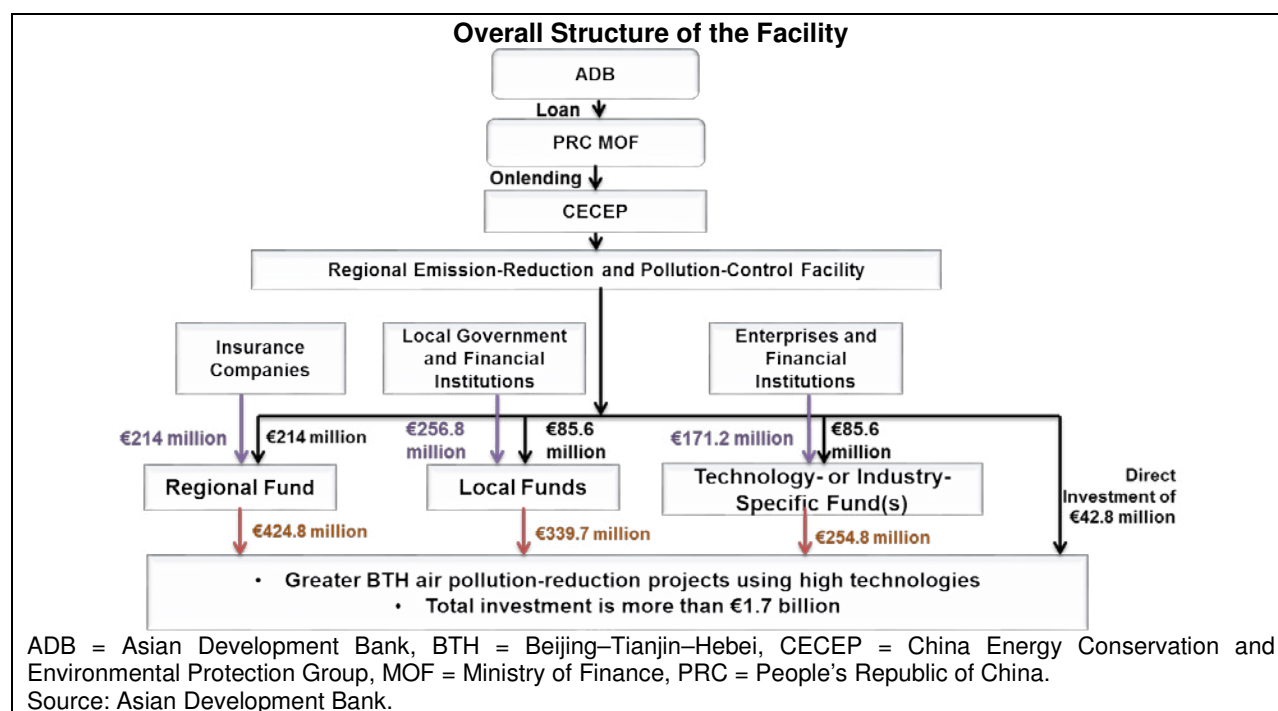
8. Advanced or high technologies must be combined with appropriate financing to overcome existing barriers (para. 6). In industry and infrastructure services, high technologies can be combined for a more comprehensive low-emission solution for any specific application. An energy-efficient building retrofit, for example, could include rooftop solar energy, more efficient lighting, advanced thermal management systems for space heating and cooling, and an intelligent digital control system that ensures that all these high technologies work in sync as a system. But to be successful in this strategy requires bringing together a high level of technical expertise on

⁹ A targeted PM_{2.5} reduction of 40% from 2013 levels will still be about 50 micrograms per cubic meter (µg/m³) or about 50% higher than the national standard. The air quality standard for PM_{2.5} in the PRC (GB 3095-2012) is 35 µg/m³, compared with 15 µg/m³ for the United States and Japan, and 10 µg/m³ for the World Health Organization.

¹⁰ China Council for International Cooperation on Environment and Development. 2015. *Performance Evaluation on the Action Plan of Air Pollution Prevention and Control and Regional Coordination Mechanism*. Beijing.

high technologies, appropriate financing, and innovative business models. Demonstrating this approach through a selected portfolio of subprojects distributed across various industries and infrastructure services in the greater BTH region can reinforce confidence in the commercial viability of such an approach and stimulate further demand.

9. The project will implement the strategy described in para. 8 by establishing a regional emission-reduction and pollution-control facility for the greater BTH region. The facility will support deployment of high technologies in major emitting industries. It will be held at and controlled by the China Energy Conservation and Environmental Protection Group (CECEP),¹¹ which is highly regarded for its high level of technical expertise across key sectors. It also has a proven record of successfully managing similar investment funds. It will identify subprojects, match them with appropriate business models for deploying high technologies at scale, and provide financing through the facility. The facility will have a fund-of-funds structure with three types of complementary investment funds: a regional fund,¹² provincial or municipal funds involving local government investors,¹³ and technology- or industry-specific funds targeting high-polluting sources.¹⁴ In addition, the facility is expected to invest about 10% of the facility amount directly into some highly potent pollution-reducing subprojects. The figure provides an overall structure of the facility.



¹¹ CECEP is the PRC’s largest state-owned enterprise focused on energy conservation and environmental protection, with total assets of CNY144 billion. Its main business is in the areas of energy efficiency, clean energy, environmental protection, and recycling of resources.

¹² The facility is expected to provide up to CNY1.75 billion, and the People’s Insurance Company of China has proposed to contribute at least CNY1.75 billion (with an option for a maximum CNY4.25 billion). This fund is mainly used to support CECEP-led projects in the greater BTH region.

¹³ The Jinan municipal government is expected to contribute CNY500 million, the facility expects to provide CNY500 million, and the Industrial Bank Co., Ltd. is expected to contribute CNY1 billion. Discussion with other municipal governments is also ongoing, including with the Shenyang and Zhangjiakou municipalities.

¹⁴ A Deep-Well Geothermal Development Fund is being set up to support deep-well geothermal for clean heating technology. The Dezhou municipal government proposes to contribute CNY100 million, the facility is expected to provide CNY150 million, and the Shanghai Pudong Development Bank is expected to contribute CNY750 million.

10. The facility will provide debt and equity investments to eligible subprojects, but will limit the aggregate amount of equity investments. All equity investments will be protected with a creditworthy put option¹⁵ against a third party or will have a viable exit strategy that will enable CECEP to recover the investment in a timely manner.¹⁶ Investee companies will have the following necessary characteristics: (i) profitable, (ii) a professional management team, and (iii) clear routes of enhancing value. In the case of put-protected equity, the facility or the funds may support (i) special purpose vehicles for stand-alone equity investments to finance financially viable and capital-intensive subprojects where the sponsor lacks sufficient registered capital to raise necessary debt funding, or (ii) enterprises with capital-intensive investments that need equity financing matching their risk profiles.¹⁷

11. The facility will set up an energy service company (ESCO) fund to support energy-saving and emission-reduction subprojects in the iron and steel industry.¹⁸ ESCOs have been effective in driving energy-efficiency investments in other countries, and is a priority for the Government of the PRC. But the region only has a limited number of ESCOs with the capacity to finance and implement complex and larger industrial energy-efficiency projects. An Steel Group Energy Saving Technology Co., Ltd., which is expected to cofinance this fund with the facility and a commercial bank, is an ESCO under the An Steel Group.¹⁹ It is one of only two registered ESCOs recognized by the National Development and Reform Commission and the Ministry of Finance in the iron and steel industry. An Steel ESCO has identified for potential investments more than 80 subprojects in the iron and steel industry.²⁰ In addition, two CECEP “super ESCOs” may receive funding through the regional fund for further investment in qualified subprojects.²¹

12. The project fully aligns with the priority of ADB’s country partnership strategy, 2016–2020 for the PRC in support of the government’s priority to realize ecological civilization.²² The project also supports the priorities of ADB’s Midterm Review of Strategy 2020 to mitigate climate change and promote environmental sustainability.²³ Some key features of the proposed project are briefly described in paras. 13–18.

13. **Innovative use of financial intermediation loan modality.** The project will use the financial intermediation loan modality, which is best suited to (i) extend the project’s reach across

¹⁵ A put option is an option contract in which the beneficiary of the put option obtains the right to sell a specified quantity of a security at a specified price within a fixed period or on the occurrence of certain events.

¹⁶ Equity investments without a put will be provided in limited cases to support the expansion of proven, financially and economically viable high technologies by companies that cannot meet commercial banks’ collateral or the funds’ debt requirements.

¹⁷ Most investments into the funds will be equity so that the funds themselves are not indebted. But the funds will be required to use facility’s money primarily to invest as debt or as put-protected equity in subproject companies. The put provider must not have a poor credit record, as recorded in the People’s Bank of China’s credit history database. The creditworthiness of the put providers needs to be monitored semiannually by CECEP, and in case their creditworthiness drops, CECEP must inform ADB to take additional measures to mitigate the risks.

¹⁸ The An Steel Group, one of the largest steel producers in PRC with a production capacity of 33.2 million tons, is expected to contribute CNY100 million to the fund. The facility will contribute CNY300 million and the Shanghai Pudong Development Bank is expected to contribute CNY1.2 billion. This is considered an industry-specific fund.

¹⁹ An Steel Group Energy Saving Technology Services Co., Ltd. was formally established in 2010 with a registered capital of CNY20 million, which gradually increased to CNY100 million.

²⁰ The iron and steel industry is a major polluting source. A high concentration of iron and steel plants exacerbates poor air quality in the region.

²¹ A super ESCO is an entity normally established to facilitate large-scale implementation of energy-efficiency projects and support capacity building and project development activities of private ESCOs.

²² ADB. 2016. *Country Partnership Strategy: Transforming Partnership: People’s Republic of China and Asian Development Bank, 2016–2020*. Manila.

²³ ADB. 2014. *Midterm Review of Strategy 2020: Meeting the Challenges of a Transforming Asia and the Pacific, 2008–2020*. Manila.

multiple sectors and a wide range of enterprises and locations; (ii) aggregate investments with a payback period of 5–7 years; (iii) work in close partnerships with large commercial banks, institutional investors, and provincial and/or municipal governments to enhance their understanding of risk allocation and appraisal to scale up deployment of high technologies; and (iv) recycle loan proceeds during the loan tenor to leverage project impact. Reflows from the first batch are expected to be relent to at least an additional batch of subprojects with an estimated investment of €1.3 billion.

14. **Leverage large cofinancing.** Each fund under the facility will leverage different sources of cofinancing. Specifically, the regional fund will leverage, for the first time, about €214 million in cofinancing from an institutional investor for ADB operations in the PRC. The local funds will leverage about €256.8 million from provincial or municipal governments and local financial institutions. The technology- or industry-specific funds will leverage about €171.2 million from industry and financial institutions. Considering the large investment needs of about CNY1.8 trillion, such leveraging is essential to maximize project impact.

15. **Enable high technology deployment across key sectors.** The facility's focus is on high technologies across key polluting sectors. CECEP developed robust project selection criteria to ensure that high technology remains a priority in selected subprojects. This is best illustrated in the first batch of subprojects that have been pre-appraised (paras. 31–36).

16. **Achieve high co-benefits of climate change mitigation.** Since fossil fuel burning is a common source of air pollution and carbon dioxide (CO₂) emissions in the BTH region, all subprojects supported by the facility will achieve significant CO₂ mitigation. It is estimated that by the closing of this loan, the facility will contribute 5 million tons of CO₂ mitigation each year.

17. **Improve sustainability via market-based approach.** All facility investments are at market prices to help ensure the facility's sustainability. The participation of a wide array of cofinanciers will also help the cofinanciers gain better insights into the facility's operation and the merits of investing in high technology for emission-reduction and pollution-control projects. This may ensure their future interest in similar investments across the region and in the PRC.

18. **Improve corporate governance.** CECEP is one of the largest state-owned enterprises in the PRC. The setup of this facility has brought in an international dimension and introduced many good practices into the project design, especially in the financial, environmental, and social management of the facility. In addition, a higher level of due diligence, cofinancier partnerships, and investment decision-making practices will further enhance CECEP's capacity and governance across this facility's operation. Many of these good practices are anticipated to spill over to other parts of CECEP's governance and management.

B. Impact and Outcome

19. The project is aligned with the following impact: air pollution reduced and public health in the BTH region improved (consistent with CAAP and Thirteenth plan). The project will have the following outcome: air pollution reduced and high technology deployed across the greater BTH region.²⁴

²⁴ The design and monitoring framework is in Appendix 1.

C. Outputs

20. **Output 1: Regional Emission-Reduction and Pollution-Control Facility established.** By 2023, the project will establish a facility comprising regional, municipal, or provincial and technology- or industry-specific funds totaling €428.0 million.

21. **Output 2: High technologies to reduce air pollution in agriculture, distributed energy, heating, transport, and iron and steel industry deployed.** By 2023, the facility will provide at least €1,721.2 million in financing for deploying high technologies to reduce emissions and pollution. This output will cover the (i) construction of three biogas and organic fertilizer production facilities, (ii) natural gas production from coke oven gas established at two coke oven facilities, (iii) two smart micro-grids constructed in industrial parks, (iv) geothermal-based district heating provided to two million square meters of floor area, (v) completion of energy-efficiency measures in five iron and steel plants, and (vi) hydrogen fuel cell based public transport pilot tested.

22. **Output 3: Capacity of key stakeholders to deploy high technologies for pollution reduction in the greater BTH region improved.** By 2023, the project will train at least 200 individuals from five key stakeholders in high technologies, selection of appropriate business models, and investment decision-making. In addition, the project will prepare and disseminate a guideline on selecting, appraising, and implementing such projects in selected industries.

D. Summary Cost Estimates and Financing Plan

23. The investment cost of the first batch of subprojects is estimated to be €1,747.0 million (Table 1), including financial charges.²⁵

24. The government has requested a loan of €428.0 million from ADB's ordinary capital resources to help finance the project. The loan will have a 15-year term, including a grace period of 10 years;²⁶ an annuity repayment at the 10% discount rate option; an annual interest rate determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; a commitment charge of 0.15% per year; and such other terms and conditions set forth in the draft loan and project agreements. Based on this, the average loan maturity is 12.95 years, and there is no maturity premium payable to ADB. ADB lending is expected to leverage €1,293.2 million or about three times its amount through commercial financing, local government investments, and counterpart contributions. This includes estimated ut €642.0 million from institutional investors, local governments, and commercial banks; and €651.2 million from subborrowers.

25. The Ministry of Finance will onlend the ADB loan proceeds to CECEP on identical repayment terms, tenors, and pricing terms of ADB's loan in euros. CECEP will bear the interest and foreign exchange risk of the ADB loan. Fund flow, implementation, and risk-sharing arrangements are described in the project administration manual (PAM).²⁷ The financing plan for the anticipated first batch of subprojects is in Table 2.

²⁵ An entrusted loan refers to the extension of credit by a bank as an agent of entrusted funds from the facility or fund. The bank will administer the debt but assumes no credit risk.

²⁶ A longer grace period is essential to seek the rollover of ADB loan proceeds and larger impacts.

²⁷ Project Administration Manual (accessible from the list of linked documents in Appendix 2).

Table 1: Indicative Investment Amounts for First Batch of Subprojects
(€ million)

Item	Amount ^a
A. Subproject Investment Cost^b	
1. Subprojects supported through entrusted loans	1,464.4
2. Subprojects supported through equity investment	256.8
Subtotal (A)	1,721.2
B. Project Management Expenses	25.8
Total (A+B)	1,747.0

^a Includes taxes and duties of €99.93 million. Such amount does not represent an excessive share of the project cost and applies only to ADB-financed expenditures.

^b In late-2017 prices as of 7 November 2017. Includes interest and commitment charges. Interest during implementation was estimated at the 5-year forward euro interbank offered rate plus an effective contractual spread of 0.5%. Commitment charges for an ADB loan were estimated at 0.15% per year to be charged on the undisbursed loan amount. The total financial charges of the ADB loan during implementation were estimated at €5.5 million. However, they are not included in the table to avoid double counting because CECEP can recover this through the interest on subloans and return on equity investments in companies and funds.

Source: Asian Development Bank estimates.

Table 2: Financing Plan for First Batch of Subprojects
(€ million)

Item	Amount
A. Asian Development Bank	428.0 ^a
B. Local governments, institutional investors, and commercial banks	642.0
C. China Energy Conservation and Environmental Protection Group	25.8 ^b
D. Sub-borrowers	651.2 ^c
Total (A+B+C+D)	1,747.0

^a Comprises €385.2 million to support the entrusted loan and €42.8 million for equity investment.

^b Includes costs for the project management office, consulting services, and hedging exchange rate and interest rate risks.

^c Includes counterpart contributions to investments supported by the entrusted loans and equity investment.

Source: Asian Development Bank estimates.

E. Implementation Arrangements

26. CECEP will be the executing agency. CECEP's majority-owned subsidiary, CECEP Huayu Fund Management Co., Ltd., (CECEP Huayu) or another CECEP subsidiary, with equivalent experience, approved by ADB after due diligence, will be the facility and fund manager (the Management Company).²⁸ CECEP Huayu has extensive experience in the design, implementation, supervision, evaluation, financing, and management of energy-efficiency and environmental protection funds. CECEP Huayu has managed many of CECEP's clean energy funds. The project's implementation structure is in the figure on page 3.

27. CECEP has an excellent grasp of the best available technologies and how best to finance and implement them.²⁹ CECEP's expertise will be made available to the Management Company, the facility, and the funds by way of an experts' committee that will advise the Management Company and the funds on potential investments. As the fund manager, the Management

²⁸ CECEP Huayu was established in 2011 to focus on investments in energy conservation and environmental protection, and has managed more than CNY7 billion in funds. CECEP Huayu has three shareholders, with CECEP Capital, a second-tier subsidiary of CECEP, holding a controlling ownership interest of 55%. Integrity due diligence of CECEP, CECEP Huayu, and Shanghai Pudong Development Bank has been undertaken in consultation with ADB's Office of Anticorruption and Integrity and Office of Cofinancing Operations.

²⁹ CECEP's subsidiaries are involved in industrial and building energy efficiency, solid waste treatment, solar and wind energy, soil remediation and pollution control, and organic and inorganic waste recycling. CECEP also has an extensive network of internal and external experts in these sectors; and extensive experience in planning, implementing, and monitoring investments in them.

Company will assess and approve investments in the funds and individual subprojects through an investment committee. The investment review and approval process will include investment structuring to mitigate technical and financial risks and appraisal of environmental and social impact and risk under an environmental and social management system (ESMS).³⁰ The Management Company's due diligence will consider technical merit, credit quality, and environmental and social impacts based on the subproject selection criteria.³¹

28. The implementation arrangements are summarized in Table 3 and described in detail in the PAM (footnote 27).

Table 3: Implementation Arrangements

Aspects	Arrangements
Implementation period	May 2018–May 2023
Estimated loan closing date	30 November 2023
Management	
(i) Oversight body	NDRC and MOF
(ii) Executing agency	CECEP
(iii) Financial intermediary and implementing agency	CECEP will bear the credit risk of the facility. CECEP will establish investment committees for the facility and each fund. ADB will require CECEP to obtain a no objection from ADB for entrusted loans where the amount of ADB loan proceeds to be invested is above the free limit of €80 million. CECEP and the facility will contract with the entrusted bank to administer accounts and provide cofinancing.
(iv) Implementation unit	The PMO established in CECEP Huayu will act as the main implementation unit and will have about 20 full-time staff. CECEP will enter into a strategic cooperation framework agreement with China Environmental Resources Technology Co., Ltd. to provide expertise on environmental assessment and monitoring. CECEP will also establish an experts' committee to support technical appraisal and monitoring.
Procurement	The investee companies will use commercial practices acceptable to ADB for procuring goods and services using the proceeds of the subloans and equity investments. ADB has prepared a procurement manual to provide guidance on how commercial practices can be adopted in a manner consistent with ADB's procurement principles.
Retroactive financing and/or advance contracting	The executing agency may sign subloan agreements prior to the loan agreement signing with ADB, and this will be deemed as advance contracting. Retroactive financing may be provided to refinance loans made for a subproject or to finance any subproject that was self-financed by its owners and started before the effective date, provided that expenditures being financed or refinanced were incurred not earlier than 12 months prior to the signing of the loan agreement, and that the subproject was vetted under CECEP's environmental and social management system and is fully compliant. Total retroactive financing will not exceed 20% of the loan amount.
Disbursement	The loan proceeds will be disbursed following ADB's <i>Loan Disbursement Handbook</i> (2017, as amended from time to time) and detailed arrangements agreed between the government and ADB and described in the project administration manual as special disbursement guidelines. ^a

ADB = Asian Development Bank; CECEP = China Energy Conservation and Environmental Protection Group; CECEP Huayu = CECEP Huayu Fund Management Co., Ltd.; MOF = Ministry of Finance; NDRC = National Development and Reform Commission; PMO = project management office.

^a Project Administration Manual (accessible from the list of linked documents in Appendix 2).

Source: Asian Development Bank.

³⁰ Financial Intermediary: Environmental and Social Management System Arrangement (accessible from the list of linked documents in Appendix 2). CECEP and CECEP Huayu will adopt and implement the ESMS for the facility and for each fund following national policies and regulations and ADB's Safeguard Policy Statement (2009). CECEP will conduct environmental and social due diligence to confirm compliance with the ESMS and national environment, health, and safety law and regulations before a subproject is approved.

³¹ The eligibility criteria for the financed subprojects are in Appendix 3 of the Project Administration Manual and the Financial Intermediary: Environmental and Social Management System Arrangement (footnote 27 and 30).

III. DUE DILIGENCE

29. The PAM details the subproject selection criteria, covering applicable technical, financial, economic, and environmental and social safeguard requirements. It also includes guidelines on the screening and appraisal of individual transactions (footnote 31). ADB requires CECEP to prepare appraisal reports to verify compliance with the selection criteria and obtain ADB's no objection for subprojects using debt financing that (i) are financed with retroactive financing, (ii) receive ADB financing exceeding the free limit of €80 million for entrusted loans, or (iii) require any equity investment to be undertaken.

A. Technical

30. ADB carried out a detailed appraisal of six representative potential subprojects with good potential for replication.³² The cost of the representative subprojects is estimated at €225.6 million. Another set of potential subprojects with total investment of €4 billion is currently being screened and appraised. Technical due diligence of representative subprojects verified (i) the technical feasibility and appropriateness of the proposed technologies to maximize energy savings and pollution reductions and (ii) the estimated cost. The high technologies used in the representative subprojects are briefly described in paras. 31–36.

31. **Deep-well geothermal district heating.** The facility will support deployment of deep-well geothermal technology to overcome barriers such as higher capital cost and weak capacity and understanding on drilling, geological condition, and perceived technical and financial risks. The facility will support mature drilling technology for geothermal wells and use tailwater recharging technology for sustainable heat extraction without any water depletion.³³ This subproject can provide continuous heating, and even cooling, using 100% renewable energy with no direct emissions. By demonstrating the technology and its financial viability at existing heating tariffs, the subproject will help its wider deployment.

32. **Industrial by-product gas use.** The subproject will use coke oven gas to produce liquefied natural gas (LNG) for use in transportation, instead of the current practice of using coke oven gas to generate onsite electricity and steam or to produce urea or methanol, which produce high air pollution.³⁴ In addition, LNG is a cost-competitive and less polluting fuel for heavy-duty and long-distance transportation compared to diesel. This subproject will improve the availability of LNG supply and encourage more truck owners to retrofit their trucks to use LNG as fuel.

33. **Hydrogen-based low-emission transport.** The subproject will use surplus wind energy to produce hydrogen in sustainable transport applications via investments in hydrogen fuel cell buses. This is an innovative renewable energy storage solution that will help reduce curtailment of renewable energy, mainly from wind farms. Using hydrogen as transport fuel to displace diesel is one of the best applications in terms of reducing the public health hazards posed by PM_{2.5} emissions from diesel combustion in the greater BTH region.

³² The technical description of the representative sample subprojects is in the Introduction of Technologies Used for Representative Subprojects (accessible from the list of linked documents in Appendix 2).

³³ Tailwater recharging technology recharges water back to the underground reservoir after purification to avoid reservoir water depletion and environmental pollution.

³⁴ The coke oven by-gas utilization is a high policy priority in the greater BTH region. The ADB loan in footnote 2 included this policy action for Hebei.

34. **Advanced biogas and organic fertilizer.** The subproject uses anaerobic fermentation technology for biogas production. The produced biogas is then purified and compressed. The compressed biogas is sold to consumers to replace gasoline and diesel for transport in the filling station. In the PRC, organic waste production from straw, livestock manure, and agricultural waste exceeds 3.5 billion tons per year. However, the lack of an appropriate business model has delayed the scale-up of this technology. The special feature of this subproject is a well-designed business model that can solve the problems faced during the biogas industry development, such as low economic performance and unsustainable feedstock supply. The organic fertilizer produced by this subproject could improve soil and air quality in the long run.

35. **Smart industrial zone development.** The subproject creates a micro-energy grid network consisting of a few sub-micro-energy grids, including incorporating a broad spectrum of clean energy (natural gas trigeneration, rooftop solar, and concentrated solar thermal technologies); energy storage technology; energy efficiency; and intelligent energy management systems to improve energy use in a high-technology industrial zone. It also optimizes energy use by allowing for energy trading between the sub-grids and with the regional grid for bidirectional power trade.

36. **Super energy service company.** The subproject comprises a package of investments in industrial waste heat recovery, energy-efficiency improvement, and emission-reductions. The business model presented is important in that the energy recovery-and-use process effectively pays for the emission-reduction requirements processes, which would otherwise be unprofitable, i.e., the subproject will prove that pollution control can be financially self-sustaining. The PRC's iron and steel industry has great energy-saving and emission-reduction potential. The subproject is replicable throughout the iron and steel industry in the PRC.

B. Economic and Financial

37. Financial due diligence confirmed CECEP's financial viability. CECEP has a strong financial standing and can meet financial obligations and debt service payments without difficulty.³⁵ The integrity due diligence on CECEP and CECEP Huayu showed no negative findings. Subprojects, subborrowers, and equity investees will need to meet economic and financial viability criteria, as documented in the PAM. The financial assessment of the facility and the funds demonstrated their sustainability under prudent loss assumptions.³⁶

38. ADB calculated the financial internal rate of return for the appraised representative subprojects, which is 7.9%–38.0% and is higher than the weighted average cost of capital. The economic internal rate of return of the appraised subprojects is 7.5%–44.0%.³⁷ The non-incremental benefits of the representative subprojects include the avoided use of coal, diesel, petroleum, and nitrogenous fertilizer, as well as external benefits of CO₂ emissions and local pollutant abatement. Global environmental benefits from CO₂ abatement are valued at the 2016 global social cost of carbon of \$36.30 per ton of CO₂, adjusted to 2017 price levels, and increased annually by 2%. Local environmental benefits from pollutant emissions abatement are valued by estimating the cost of premature mortality (labor loss) associated with the pollutants.

³⁵ Financial Management Assessment (accessible from the list of linked documents in Appendix 2).

³⁶ Financial Analysis and Economic Analysis (accessible from the list of linked documents in Appendix 2).

³⁷ Based on ADB's Guideline for the Economic analysis of Projects, projects that primarily generate environmental benefits (such as pollution control, protection of ecosystem, flood control and control of deforestation), the minimum required EIRR can be lowered to 6%.

C. Governance

39. **Financial management assessment.** ADB conducted the financial management assessment following ADB's Financial Management and Analysis of Projects.³⁸ The result showed that CECEP has adequate financial management systems and procedures in place to meet ADB requirements. CECEP's 2012–2015 external audit reports had an unqualified opinion. The financial management risk before mitigation is *moderate* (footnote 35).

40. **Procurement risk assessment.** Procurement will follow ADB Procurement Guidelines (2015, as amended from time to time) applicable to financial intermediation loans, and appropriate procedures will be adopted. ADB conducted procurement assessment on representative potential subprojects. It showed that candidate investees' procurement practices followed established domestic commercial practices, and procurement procedures aligned with PRC procurement laws acceptable to ADB. Use of procurement agencies will be encouraged, where procurement capacity is weak. To provide guidance, ADB has prepared and included a project-specific procurement manual in Appendix 5 of the PAM.

41. **Corruption prevention.** ADB's Anticorruption Policy (1998, as amended to date) was explained to and discussed with the government and CECEP. The specific policy requirements and supplementary measures are described in the PAM.

D. Poverty, Social, and Gender

42. The project will reduce air pollution and mitigate the negative social and economic impacts of local pollution. Improved air quality will directly benefit 371 million people, of whom 155.4 million are women, including 15 million poor people in the BTH region, of whom 5.4 million are poor women. In addition, the project will indirectly create new employment.

E. Safeguards

43. The project is classified *financial intermediary* for the environment, involuntary resettlement, and indigenous peoples.³⁹ ADB conducted environmental and social due diligence on CECEP's existing portfolio and safeguard policies, institutional capacity, and six sample subprojects. ADB and CECEP jointly developed an ESMS to meet national laws and the requirements of ADB's Safeguard Policy Statement (2009). The ESMS provides guidance on (i) screening, categorization, and review of subprojects; (ii) organizational structure and staffing, including skills and competencies in environmental and social areas; (iii) capacity building; (iv) grievance redress; and (v) monitoring and reporting. Subprojects classified *category A* for the environment and *category A* and *category B* for involuntary resettlement and indigenous peoples are excluded from ADB financing. The ESMS will be approved by ADB and fully implemented prior to first disbursement.

F. Summary of Risk Assessment and Risk Management Plan

44. Significant risks and mitigation measures are summarized in Table 4 and described in detail in the risk assessment and risk management plan.⁴⁰ The integrated project benefits and impacts are expected to outweigh the costs.

³⁸ ADB. 2005. *Financial Management and Analysis of Projects*. Manila.

³⁹ ADB. Safeguard Categories. <https://www.adb.org/site/safeguards/safeguard-categories>.

⁴⁰ Risk Assessment and Risk Management Plan (accessible from the list of linked documents in Appendix 2).

Table 4: Summary of Risks and Mitigation Measures

Risks	Mitigation Measures
Macroeconomic slowdown constrains (i) investments from cofinancing partners in the facility and (ii) private sector investment in high-technology projects with high perceived risk.	The investment requirements for BTH will be driven primarily by regulatory pressure, which will require structural adjustments in certain sectors. Initial assessment of subprojects presented to CECEP and ADB suggests that the investment pipeline will remain robust even in a macroeconomic downturn.
Weak demand from potential borrowers slows implementation.	Achievement of air pollution-control objectives in the BTH area will require more than \$30 billion in new investments in the immediate future. Based on the review of initial subproject proposals, demand for financing is strong and is expected to increase as the government maintains regulatory pressure for air quality improvements.
A possible conflict of interest may arise in situations where the facility and the funds will finance subprojects of companies affiliated with CECEP.	The following measures were included in the project design: (i) limiting financing of such subprojects to the regional fund with participation by non-CECEP-affiliated investors or otherwise with ADB approval, and (ii) including mechanisms for review and approval or waiver of conflicts of interest, that are acceptable to ADB and approved by all fund investors.
A potential fund mismatch may occur when using loan proceeds to invest equity.	Equity investment by the facility or the funds will only be allowed if (i) it is protected with a put option by a creditworthy third party or (ii) there is another viable exit strategy. Every equity investment requires ADB's prior approval. ADB has set an aggregate limit for equity investments. CECEP will monitor the creditworthiness of the put provider for put-protected equity, and actions will be taken if the creditworthiness drops.
Insufficient fund management staffing.	The Management Company will get its new recruitment plan approved by CECEP and execute it in a timely manner.
Poor investment performance.	The Management Company needs to get the market-based compensation incentive policy for its staff approved by CECEP and implement it.

ADB = Asian Development Bank, BTH = Beijing–Tianjin–Hebei, CECEP = China Energy Conservation and Environment Protection Group.

Source: Asian Development Bank.

IV. ASSURANCES

45. The government and CECEP have assured ADB that implementation of the project shall conform to all applicable ADB policies, including those concerning anticorruption measures, safeguards, gender, procurement, consulting services, and disbursement as described in detail in the PAM and loan documents.

46. The government and CECEP have agreed with ADB on certain covenants for the project, which are set forth in the draft loan agreement and project agreement.

V. RECOMMENDATION

47. I am satisfied that the proposed loan would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve the loan of €428,000,000 to the People's Republic of China for the Air Quality Improvement in the Greater Beijing–Tianjin–Hebei Region—Regional Emission-Reduction and Pollution-Control Facility, from ADB's ordinary capital resources, in regular terms, with interest to be determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; for a term of 15 years, including a grace period of 10 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan and project agreements presented to the Board.

Takehiko Nakao
President

23 November 2017

DESIGN AND MONITORING FRAMEWORK

Impact the Project is Aligned with			
Air pollution reduced and public health in the BTH region improved (Comprehensive Action Plan for Air Pollution Prevention and Control of the PRC and the Thirteenth Five-Year Plan) ^a			
Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting Mechanisms	Risks
<p>Outcome Air pollution reduced and high technology deployed across the greater BTH region</p>	<p>By 2024:</p> <p>a. At least (i) one million tons of standard coal equivalent saved; (ii) six million cubic meters of synthetic natural gas produced, (iii) 5,000 GWh of micro-grid and rooftop electricity used, and (iv) 100 million square meters of clean space heating provided (2016 baseline: all 0)</p> <p>b. At least (i) five million tons of CO₂, (ii) 20,000 tons of SO₂, (iii) 3,000 tons of NO_x, and (iv) 3,000 tons of PM_{2.5} emissions avoided per year (2016 baseline: 0)</p>	<p>a. Semiannual implementation reports prepared by CECEP</p> <p>b. Subproject completion reports prepared by CECEP</p>	<p>Macroeconomic slowdown constrains (i) investments from cofinancing partners in the facility and (ii) private sector investments in high-technology projects with high perceived risk.</p>
<p>Outputs</p> <p>1. Regional Emission-Reduction and Pollution-Control Facility established</p> <p>2. High technologies to reduce air pollution in agriculture, distributed energy, heating, transport, and iron and steel industry deployed</p>	<p>By 2023:</p> <p>1. The facility comprising regional, municipal or provincial and technology- or industry-specific funds totaling €428.0 million established (2016 baseline: Not established)</p> <p>2a. At least €1,721.2 million in financing provided by the facility, cofinancing, and counterpart financing (2016 baseline: 0)</p> <p>2b. At least (i) construction of three biogas and organic fertilizer production facilities, (ii) natural gas production from coke oven gas established at two coke oven facilities, (iii) two smart micro-grids constructed in industrial parks, (iv) geothermal-based district heating provided to two million square meters of floor area, (v) completion of energy-efficiency measures in five iron and steel plants, and (vi) hydrogen fuel cell based public transport pilot tested (2016 baseline: all 0)</p>	<p>1. Semiannual implementation reports prepared by CECEP</p> <p>2a–b. Subproject completion reports prepared by CECEP</p>	<p>Weak demand from borrowers may slow implementation.</p>

Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting Mechanisms	Risks
3. Capacity of key stakeholders to deploy high technologies for pollution reduction in the greater BTH region improved	<p>By 2023:</p> <p>3a. At least 200 individuals from five key stakeholders trained in high technologies, selection of appropriate business models, and investment decision-making (2016 baseline: 0)</p> <p>3b. Guideline on selection, appraisal, and implementation of such projects prepared and disseminated by CECEP (2016 baseline: Not prepared)</p>	3a–b. Semiannual implementation reports prepared by CECEP	
<p>Key Activities with Milestones</p> <p>Output 1: Regional Emission-Reduction and Pollution-Control Facility established</p> <p>1.1 Establish BTH-dedicated emission-control and pollution-reduction facility (Q2 2018)</p> <p>1.2 Leverage CNY6 billion in commercial cofinancing by the facility (Q3 2023)</p> <p>Output 2: High technologies to reduce air pollution in agriculture, distributed energy, heating, transport, and iron and steel industry deployed</p> <p>2.1 Implement integrated low-emission solutions for municipal and agriculture waste projects (Q4 2020)</p> <p>2.2 Promote super ESCOs and implement energy-efficiency improvement and emission-reduction projects in industries (Q4 2019)</p> <p>2.3 Implement industrial by-product gas use project (Q4 2020)</p> <p>2.4 Implement deep-well geothermal for district heating project (Q4 2020)</p> <p>2.5 Implement smart industrial zone development project (Q4 2019)</p> <p>2.6 Promote hydrogen-based low-emission transport projects (Q1 2023)</p> <p>Output 3: Capacity of key stakeholders to deploy high technologies for pollution reduction in the greater BTH region improved</p> <p>3.1 Adopt and implement ESMS (Q4 2017)</p> <p>3.2 Gain approval of ESMS by ADB (Q4 2017)</p> <p>3.3 Organize workshops on project appraisal and management (Q4 2018)</p> <p>3.4 Organize workshops on new business models for high technologies (Q4 2021)</p> <p>3.5 Organize workshops on high technologies (Q4 2022)</p>			
<p>Inputs</p> <p>ADB: €428,000,000 (loan)</p> <p>Subborrowers: €651,200,000</p> <p>Local governments, commercial banks, and institutional investors: €642,000,000</p> <p>CECEP: €25,800,000</p>			
<p>Assumptions for Partner Financing</p> <p>Not applicable.</p>			

ADB = Asian Development Bank, BTH = Beijing–Tianjin–Hebei, CECEP = China Energy Conservation and Environmental Protection Group, CO₂ = carbon dioxide, ESCO = energy service company, ESMS = environmental and social management system, GWh = gigawatt-hour, PM_{2.5} = particulate matter less than 2.5 micrometers in diameter, SO₂ = sulfur dioxide, NO_x = nitrogen oxide.

^a Government of the PRC. 2013. *Comprehensive Action Plan for Air Pollution Prevention and Control of the People's Republic of China*. Beijing; and Government of the PRC. 2015. *The 13th Five-Year Plan for Economic and Social Development of the People's Republic of China, 2016–2020*. Beijing.

Source: Asian Development Bank.

LIST OF LINKED DOCUMENTS

<http://www.adb.org/Documents/RRPs/?id=51181-001-3>

1. Loan Agreement
2. Project Agreement
3. Sector Assessment (Summary): Multisector (Agriculture, Natural Resources, and Rural Development; Energy; Finance; and Transport)
4. Project Administration Manual
5. Contribution to the ADB Results Framework
6. Development Coordination
7. Financial Analysis
8. Economic Analysis
9. Country Economic Indicators
10. Summary Poverty Reduction and Social Strategy
11. Risk Assessment and Risk Management Plan
12. Financial Intermediary: Environmental and Social Management System Arrangement

Supplementary Documents

13. Introduction of Technologies Used for Representative Subprojects
14. Initial Environmental Examination for Representative Subprojects
15. Detailed Economic Analysis on the Representative Subprojects
16. Financial Management Assessment
17. Procurement Risk Assessment and Management
18. Detailed Sector Assessment: Agriculture, Natural Resources, and Rural Development; Energy; Finance; and Transport
19. Interventions in the Greater Beijing–Tianjin–Hebei Region in Accelerating Air Quality Improvement
20. Framework for the Beijing–Tianjin–Hebei Air Quality Improvement Program, 2016–2020
21. Indicative Subprojects