



Concept Paper

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Proposed Loans People's Republic of China: Xiangtan Low-Carbon Transformation Sector Development Program

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Asian Development Bank

CURRENCY EQUIVALENTS

(as of 6 November 2018)

Currency unit – yuan (CNY)

CNY1.00 = \$0.1444

\$1.00 = CNY6.9258

ABBREVIATIONS

ADB	–	Asian Development Bank
EBA	–	ecosystem-based adaptation
GHG	–	greenhouse gas
GPP	–	green procurement policy
ICT	–	information and communications technology
kt CO ₂ e	–	kiloton of carbon dioxide equivalent
NDC	–	nationally determined contributions
OCB	–	open competitive bidding
RDF	–	refuse-derived fuel
SRF	–	solid recovered fuel
WTE	–	waste-to-energy
XMG	–	Xiangtan Municipal Government
PRC	–	People's Republic of China

NOTE

In this report, "\$" refers to United States dollars.

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PROGRAM AT A GLANCE

1. Basic Data		Project Number: 52230-001	
Project Name	Xiangtan Low-Carbon Transformation Sector Development Program	Department/Division	EARD/EASI
Country Borrower	PRC People's Republic of China	Executing Agency	Xiangtan Municipal Government
2. Sector	Subsector(s)	ADB Financing (\$ million)	
✓ Transport	Urban public transport	80.00	
Information and communication technology	ICT infrastructure	40.00	
Public sector management	Public expenditure and fiscal management	50.00	
Water and other urban infrastructure and services	Urban flood protection	30.00	
		Total	200.00
3. Strategic Agenda	Subcomponents	Climate Change Information	
Inclusive economic growth (IEG)	Pillar 2: Access to economic opportunities, including jobs, made more inclusive	Climate Change impact on the Project	Medium
Environmentally sustainable growth (ESG)	Disaster risk management Eco-efficiency Environmental policy and legislation Urban environmental improvement		
4. Drivers of Change	Components	Gender Equity and Mainstreaming	
Governance and capacity development (GCD)	Civil society participation Institutional development Public financial governance	Some gender elements (SGE)	✓
Knowledge solutions (KNS)	Application and use of new knowledge solutions in key operational areas		
5. Poverty and SDG Targeting		Location Impact	
Geographic Targeting	Yes	Urban	High
Household Targeting	No		
SDG Targeting	Yes		
SDG Goals	SDG3, SDG11, SDG12		
6. Risk Categorization:	Complex		
7. Safeguard Categorization	Environment: B Involuntary Resettlement: B Indigenous Peoples: C		
8. Financing			
Modality and Sources		Amount (\$ million)	
ADB		200.00	
Sovereign Project (Regular Loan): Ordinary capital resources		200.00	
Cofinancing		0.00	
None		0.00	
Counterpart		200.00	
Government		200.00	
Total		400.00	
Currency of ADB Financing: USD			

I. THE PROPOSAL

1. The proposed Xiangtan Low-Carbon Transformation Sector Development Program will complement the Xiangtan municipal government's efforts to transform Xiangtan from a carbon-intensive, heavily polluting city to a low-carbon, climate resilient, and livable one.¹ The program comprises (i) a project loan to invest in priority infrastructure, and (ii) a policy-based loan to support necessary policy reforms of the municipal government to enable Xiangtan's successful low-carbon transformation. The program is aligned with key operational priorities of Strategy 2030 of the Asian Development Bank (ADB): tackling climate change, building resilience, enhancing environmental sustainability, and making cities inclusive and more livable. The program is aligned with the country partnership strategy for the People's Republic of China (PRC), 2016–2020, which highlights strategic support to the PRC's sustainable economy through translating innovative ideas into a program, while addressing complex issues like pollution control, climate actions, and inclusive and green cities development.

II. PROGRAM AND RATIONALE

A. Background and Development Constraints

2. **The People's Republic of China's carbon peaking commitment.** Climate destabilization and threatened ecosystems are growing more prevalent with increased evidence of climate-induced risks and losses. The 21st Paris Conference of the Parties to the United Nations Framework Convention on Climate Change mobilized most countries towards a greater commitment to climate actions. The PRC, a signatory to the agreement, committed to its nationally determined contributions (NDCs) of a carbon emissions peak by 2030 with best efforts to achieve an earlier peak. Recognizing the importance of cities in achieving NDCs, the government of the PRC has implemented its Low-Carbon Cities Initiatives since 2010. Currently, 87 cities and provinces are registered and committed to contribute to NDC targets by building growth models customized to their local conditions.

3. **Xiangtan's commitment to low-carbon development.** Xiangtan, an old industrial town undergoing rapid urbanization and industrial transformation, is located 40 kilometers south of Hunan's capital, Changsha, with an administrative area of 5,006 square kilometers, a population of approximately 2.9 million, and an urbanization rate of 60%–65% in 2016.² Located within the Changsha–Zhuzhou–Xiangtan cluster city, Xiangtan has been a key economic driver of Hunan province. Its growth also led to a substantial increase in greenhouse gas (GHG) emissions: from 26,270 kilotons of carbon dioxide equivalent (kt CO₂e) in 2005 to 50,560 kt CO₂e in 2015. Emissions from energy and industrial activities doubled and those from transport activities increased five times. Even with its effort to reduce GHG intensity per unit of gross domestic product (GDP) by 60% during that period, Xiangtan's GHG intensity is still much higher than that in Hunan province or the PRC.

4. Xiangtan possesses strategic importance nationally and regionally. Xiangtan is a part of nation-wide initiative as an integrated transport hub, a “two-oriented society comprehensive reform” area, and a low-carbon city.³ Xiangtan is the first smart pilot and green GDP city selected by the Hunan provincial government. Efforts to implement actions under these schemes are reflected in Xiangtan City Master 2010–2020; City Development plan 2016–2020; Xiangtan Thirteenth Five-Year Plan 2016–2020; and Xiangtan Low-Carbon City Pilot Implementation Plan 2017–2030. The

¹ The program is included in ADB. 2017. *Country Operations Business Plan: People's Republic of China, 2018–2020*. Manila. The program was initially titled Hunan Xiangtan Low Carbon City Development with stand-alone project-based lending. An initial draft of the design and monitoring framework is in Appendix 1.

² Xiangtan Municipal Government. 2016. *Xiangtan City Housing, Urban and Rural Construction Network*. Xiangtan.

³ “Two-oriented society” refers to the concept of sustainable socioeconomic development through resource conservation and environment protection.

last directly links to the municipal government's carbon peaking commitment by 2028, localizing the PRC's NDC target. An abatement gap of about 11,000 to 40,000 kt CO₂e per year indicates the immense challenge of the scale of GHG reduction.⁴ Though the municipal government has begun initial works, more significant and orchestrated actions are needed to achieve the target.⁵

5. **Challenges in low-carbon transformation.** The municipal government's low-carbon transformation faces two major challenges. First, while its revenues have reduced over the years, large public investments, supported by debt and with poor financial viability, have continued to finance urban expansion, phaseout of polluting industries, site remediation, and ecological rehabilitation. Second, while utilities and public services remained at minimum cost, accumulated debt put tremendous pressure on the municipal government's financial performance. Energy sector activities, including energy supply and processing, and industrial energy uses, contribute 60%–70% of the total GHG emissions in Xiangtan. However, the municipal government's direct interventions have been constrained because the dominant energy market players are state-owned enterprises. As a first step, the proposed program aims to find new solutions to help the municipal government construct innovative and progressive paths for low-carbon transformation.

B. Sector Development Program and ADB's Value Addition

6. Low-carbon transformation is a long-term process, but consolidated efforts from all important stakeholders of the society can expedite it.⁶ Holistic and integrated approaches rather than sector development in silos can reinforce various ongoing interventions with complementary effects. Sector policies should create coherent and predictable processes to achieve carbon reduction. Appropriate incentives and mechanisms need to be articulated well to involve and activate different stakeholders.⁷ Applying systems-thinking to technical, policy, and institutional reforms, coupled with proper implementation, is likely to result in effective low-carbon city transformation.

7. The program comprises of (i) a policy-based loan supporting reforms that will update existing policies and introduce innovative measures to unlock potentials for carbon reduction; and (ii) a project focusing on the priority infrastructure and systems improvement, which can drive low-carbon behavior changes and improve resilience from climate-induced risks. Smart management systems, based on information and communications technology (ICT), will improve the operational efficiency of the systems; asset, knowledge, system, and demand-side management will foster continuous low-carbon transformation. ADB's expertise acquired through past projects, knowledge products, and innovation-driven thinking will support the Xiangtan municipal government and carefully design the program to incorporate the guiding principles of systems-thinking and human-centered design, and to enhance institutional capacity to implement the program with success.⁸

⁴ ADB. 2017. *Technical Assistance Completion Report: Modelling Urban Low-Carbon Development in Xiangtan in the People's Republic of China*. Manila.

⁵ The Xiangtan municipal government established a low-carbon leadership group, retrofitted existing buildings for energy efficiency, replaced a number of buses to fuel efficient ones, and commenced ecological rehabilitation works.

⁶ Low-carbon development here refers to sustainable development grounded in systems-thinking and guided by quantifiable indicators of GHG emissions, which encourages integrated city planning, collaborative and coherent sector development, resilience improvement by taking preventive approach, and active governance through engaging and activating all stakeholders by providing the right incentives.

⁷ For businesses, financial incentives would be the most effective. Good infrastructure and systems make citizens' low-carbon actions convenient and easy. Government leadership and commitment can create the right policies and an enabling environment, which can signal the market and reduce future uncertainty in low-carbon transformation.

⁸ A human-centered design approach aims to make systems usable and useful by focusing on users, their needs, and their requirements to enhance system effectiveness and efficiency, user satisfaction, accessibility and sustainability.

C. Impact, Outcome, and Outputs of the Sector Development Program

8. The expected impact of the program will be carbon emissions peak achieved in Xiangtan by 2028. The expected outcome will be the use of low-carbon enabling systems in Xiangtan increased. The program will have four outputs. Outputs 1, 2, and 3 will be under the project loan, while output 4 will be supported by the policy-based loan.

9. **Output 1: Integrated, low-carbon urban transport system established.** As the large increase in 2005–2015 in GHG emissions from transport will likely continue, transforming the urban transport system with enhanced public transport is urgent. The program will implement an extensive bus priority system integrated with traffic signal control to discourage use of private cars. The program will equip bus stations with real-time bus information and fare system innovation to enhance user convenience. The bus system will be expanded, improved, and integrated with the bicycle network and pedestrian facilities to ensure seamless access to public mobility systems, including the access for persons with disability. The program will introduce parking policy to complement the improved public transport infrastructure (see output 4), and will deploy a clean bus fleet and renewable-energy based electric-charging stations to curb carbon emissions.

10. **Output 2: Green or blue-green infrastructure expanded.** Climate risks and vulnerability assessment show that Xiangtan at high risk of extreme one-day precipitation, extreme temperature changes, and drought. Due to more frequent and intensified climate-induced risks like flooding, Xiangtan has experienced associated economic losses.⁹ Ecosystem-based adaptation measures using urban water (blue) infrastructure with green assets and ecosystem services are effective measures for flood control, drought mitigation, heat stress reduction, and carbon sink, which also provide co-benefits like aesthetic quality, recreational and restorative capacity, improved local air quality, and health benefits.¹⁰ Using scientific data and socioeconomic analysis, the program will determine high risk and vulnerable areas and implement suitable ecosystem-based adaptation measures to improve the city's physical resilience. Enhanced risk response and management will improve Xiangtan's resilience and complement output 1 by creating a more aesthetically pleasing city, and in turn encouraging walkability, cycling, and public transport use.

11. **Output 3: Enabling systems based on information and communications technology for informed decision-making installed.** ICT-based systems can improve operational efficiency, provide real-time information to facilitate users' behavior change, record information, and track performance of low-carbon transformation. Priority areas for comprehensive ICT-based data and knowledge management systems include (i) comprehensive transport management and user-information systems to complement output 1; (ii) heat and energy management system and control centers at major industrial parks; (iii) public buildings energy management system; (iv) emissions monitoring systems; and (v) low-carbon products and lifestyle promotion platform.¹¹

12. **Output 4: Low-carbon transformation policy reforms adopted.** To provide the right incentives and expedite the low-carbon transformation, the program will accompany priority infrastructure improvements with policy, institutional, and operational reforms and outreach

⁹ The 2015 Xiangtan's Flooding Prevention Report recorded that 152 households were damaged by heavy rainfall in June 2015; 1,453 people were relocated; and direct economic loss was CNY74.7 million. The 2017 flood in Hunan province affected over 12 million people, with 83 dead or missing. Over 1.62 million people were relocated across the province, including Xiangtan.

¹⁰ Adding grass and trees to streets, green roofing, green facades, filtration trenches, porous pavement, rainwater retention ponds, urban gardens and agriculture, water roofs, and infiltration fields are some examples that provide a carbon sink, cooling effect, and water conservation among others.

¹¹ It will address traffic management, safety, traffic flows, parking, mobility assessment, real-time public transport information to customers, transport infrastructure capacity issues, and other transport related services to enhance sustainable urban transport systems.

activities. Introduction of parking policy will complement output 1. Enhancing risk management systems will complement output 2. Tariff reforms to target carbon- and resource-intensive industries will improve efficiency, reduce carbon, and further induce cleaner production and product innovation. Enhancing building and energy performance standards will decarbonize energy systems. The program will introduce novel but proven policy like green procurement policy to lower GHG emissions in the public sector and obtain other environmental, social, health, economic benefits, while influencing the market.¹² Through this policy, the program will develop innovative financing models and mechanisms to promote low-carbon energy systems and industries to overcome challenges in direct public investments. The program will include a capacity building and outreach program to successfully implement reforms and low-carbon behavior.

D. Development Financing Needs and Budget Support

13. The program cost is estimated at \$400 million. The policy-based loan component is estimated to cost \$100 million, of which ADB will finance \$50 million. The investment component is estimated to cost \$300 million, of which ADB will finance \$150 million.

E. Implementation Arrangements

14. The Xiangtan municipal government will be the executing agency and the implementing agency of the program.¹³ The Hunan provincial government will provide guidance and supervision to the municipal government in project processing and implementation. The project management office is established at the municipal government, is chaired by the executive vice mayor and vice mayor, and consists of members from various municipal government bureaus.

III. TECHNICAL ASSISTANCE

15. The program preparation technical assistance (Appendix 3) is estimated to cost \$1.7 million, which will be financed by (i) ADB's Transaction Technical Assistance Facility of the PRC: Supporting Project Preparation, \$400,000; (ii) Clean Energy Financing Partnership Facility, \$500,000; and (iii) Urban Environment Infrastructure Fund, \$300,000; and the East-Asia Knowledge Partnership Fund, \$500,000 on a grant basis.¹⁵ The preparation will ensure high program readiness and program compliance with ADB and government requirements.

IV. DUE DILIGENCE REQUIRED

16. Due diligence will be carried out to develop the program constituents, and address various issues identified during project processing, including:

- (i) **Technical.** The TA will carry out a comprehensive Xiangtan urban sector analysis, including social and environmental issues, policy assessment, tariff study, social surveys, critical infrastructure and high economic zone mapping, climate risk response assessment. Technical due diligence on investment components will ensure technical

¹² Green procurement policy (GPP) institutionalizes the process of public authorities in procuring goods, services and works that are lowering GHG emissions and other environmental negative impacts when compared to goods, services and works with the same primary function that would otherwise be procured. Vienna in Austria reduced over 100,000 tons of carbon dioxide (CO₂) between 2004 and 2007 and saved €44.4 million through its EcoBuy program. Copenhagen in Denmark purchased new servers with better quality, reduced CO₂ emissions by 3,550 tons or 75%, and saved DKK 1.6 million annually for less energy and servicing. Witnessing the GPP benefits, five PRC cities—Beijing, Urumqi, Shenzhen Guangming district, Tianjin Binhai and Jizhou districts—are preparing GPP.

¹³ Procurement, including consulting services, will follow ADB Procurement Policy (2017, as amended from time to time) and Procurement Regulations for ADB Borrowers (2017, as amended from time to time).

¹⁵ The Transaction Technical Assistance Facility of the PRC: Supporting Project Preparation was initially approved in December 2017 and the memo, including the proposed program, was approved in May 2018. Currently the team leader is exploring the possibility of an approval of \$500,000 from E-Asia and Knowledge Partnership Fund.

- feasibility, suitability and appropriateness of technology.
- (ii) **Economic and financial.** The TA will prepare a cost and financing plan and carry out economic and financial analyses and a financial management assessment of the key agencies to determine the financial and economic viability and sustainability of the investment and policy-based loan.
 - (iii) **Governance.** The TA will carry out a governance risk assessment for public financial management, procurement, anticorruption, policy, and legal issues for the program.
 - (iv) **Poverty and social.** Following the initial poverty and social assessment (Appendix 4), the TA will carry out due diligence to improve social and gender dimension of the project and the consultation and participation plan.
 - (v) **Safeguards.** The program is proposed to be category B for environment, B for involuntary resettlement, and C for ethnic minorities. The TA will prepare necessary safeguards documents in accordance with ADB's Safeguard Policy Statement, 2009.

V. PROCESSING PLAN

A. Risk Categorization

17. The program is classified *complex* due to inadequate capacity of the Xiangtan municipal government to implement externally financed projects.

B. Project Procurement Classification

18. The recommended procurement classification of the program project component is category A and overall risk is rated *high* (Appendix 4).

C. Resource Requirements

19. Resource requirements for the program preparation technical assistance consultants are accessible in Appendix 3. The estimated internal resource requirements are: 16 weeks for a mission leader; 12 weeks for a deputy mission leader; 8 weeks for each specialist in economics, financial management, public finance, public-private partnership, infrastructure, climate risk management, safeguards; and 4 weeks for specialists on procurement, project implementation and counsel.

D. Processing Schedule

Table 1: Proposed Processing Schedule

Milestones	Expected Completion Date
Concept paper clearance	November 2018
Fact-finding mission	October 2019
Management review meeting	January 2020
Loan negotiations	April 2020
Board consideration	July 2020
Loan signing	September 2020
Loan effectiveness	November 2020

Source: Xiangtan Municipal Government and Asian Development Bank estimates.

VI. KEY ISSUES

20. The program will be carefully designed to avoid the issue of foreign debt ceiling with the Xiangtan municipal government.

PRELIMINARY DESIGN AND MONITORING FRAMEWORK

Impact the Sector Development Program is Aligned with:			
Carbon emissions peak achieved in Xiangtan by 2028 (Government of Xiangtan Low-Carbon City Pilot Implementation Plan, 2017–2030) ^a			
Results Chain	Performance Indicators with Targets and Baselines and/or Indicative Policy Actions	Data Sources and Reporting Mechanisms	Risks
Outcome Use of low-carbon enabling systems in Xiangtan increased	By 2027 a. Public transport and non-motorized transport users increased by XX% (2020 baseline: xx%) b. XX tons of CO ₂ emissions reduced (2020 baseline: xx) c. XX of people protected from flooding (2020 baseline: xx)	a. Progress review reports to Xiangtan low-carbon city pilot implementation plan, 2017–2030 (frequency: XX) b. Xiangtan GHG inventory (annual assessment)	Leadership change and the risks of commitment changes at XMG ^b
Outputs 1. Integrated, low-carbon, urban transport system established 2. Green or blue-green infrastructure expanded 3. Enabling ICT-based systems for informed decision-making installed	By 2026 1a. XXX kilometers of bus priority corridors installed (2020 baseline: 0%) 1b. XX clean and energy efficient buses deployed (2020 Baseline: XX) 2a. XX square meters of urban greening areas expanded (2020 baseline: xx) 2b. XX cubic meters of water retention capacity added (2020 baseline: xx) 3a. Intelligent transport management and information system installed (2020 baseline: 0) 3b. Smart building energy management system installed (2020 baseline: 0) 3c. Online platform of low-carbon lifestyle installed (2020 baseline: 0)	For outputs 1–3: progress reports	Changes in administrative procedures in government that delay provision of agreed counterpart funds for the program

Results Chain	Performance Indicators with Targets and Baselines/ Indicative Policy Actions	Data Sources and Reporting Mechanisms	Risks
4. Low-carbon transformation policy and reforms adopted	<p>4a. Parking policy issued by the XMG (2020 baseline: not issued)</p> <p>4b. Action plan on climate risk response management issued by the XMG (2020 baseline: not issued)</p> <p>4c. Utility tariff reform issued by the XMG (2020 baseline: not issued)</p> <p>4d. GPP and GPP action plan issued (2020 baseline: not issued)</p>	<p>4a. The XMG-issued parking policy</p> <p>4b. The XMG-issued action plan</p> <p>4c. The XMG-issued utility reform notice</p> <p>4d. The XMG-issued GPP</p>	<p>Lack of political will to pursue reforms</p> <p>Delays in the approval process at the XMG</p>

Key Activities with Milestones

1. Integrated, low-carbon, energy efficient urban transport system designed and established.

- 1.1 Complete detailed design (2022)
- 1.2 Complete civil works (2026)
- 1.3 Complete clean bus fleet procurement (2026)

2. Green or blue-green infrastructure expanded for increasing carbon sink, lessening heat stress, and enhancing climate adaptation for flooding and drought.

- 2.1 Complete detailed design (2022)
- 2.2 Complete civil works (2026)

3. Enabling systems for informed decision making installed and institutional capacity strengthened.

- 3.1 Complete detailed design (2022)
- 3.2 Complete system installation (2025)
- 3.2 Complete system testing and trial operation (2026)

4. Low-carbon transformation policy and reforms adopted.

- 4.1 Announce parking policy (2026)
- 4.2 Announce action plan on climate risk response management (2026)
- 4.3 Announce utility tariff reform (2026)
- 4.4 Announce GPP policy (2026)

Project Management Activities

Recruit program implementation support consultants (Q1 2021)

Award procurement contracts (2021–2025)

Budget Support

ADB: \$200 million (regular loan)

Government: \$200 million

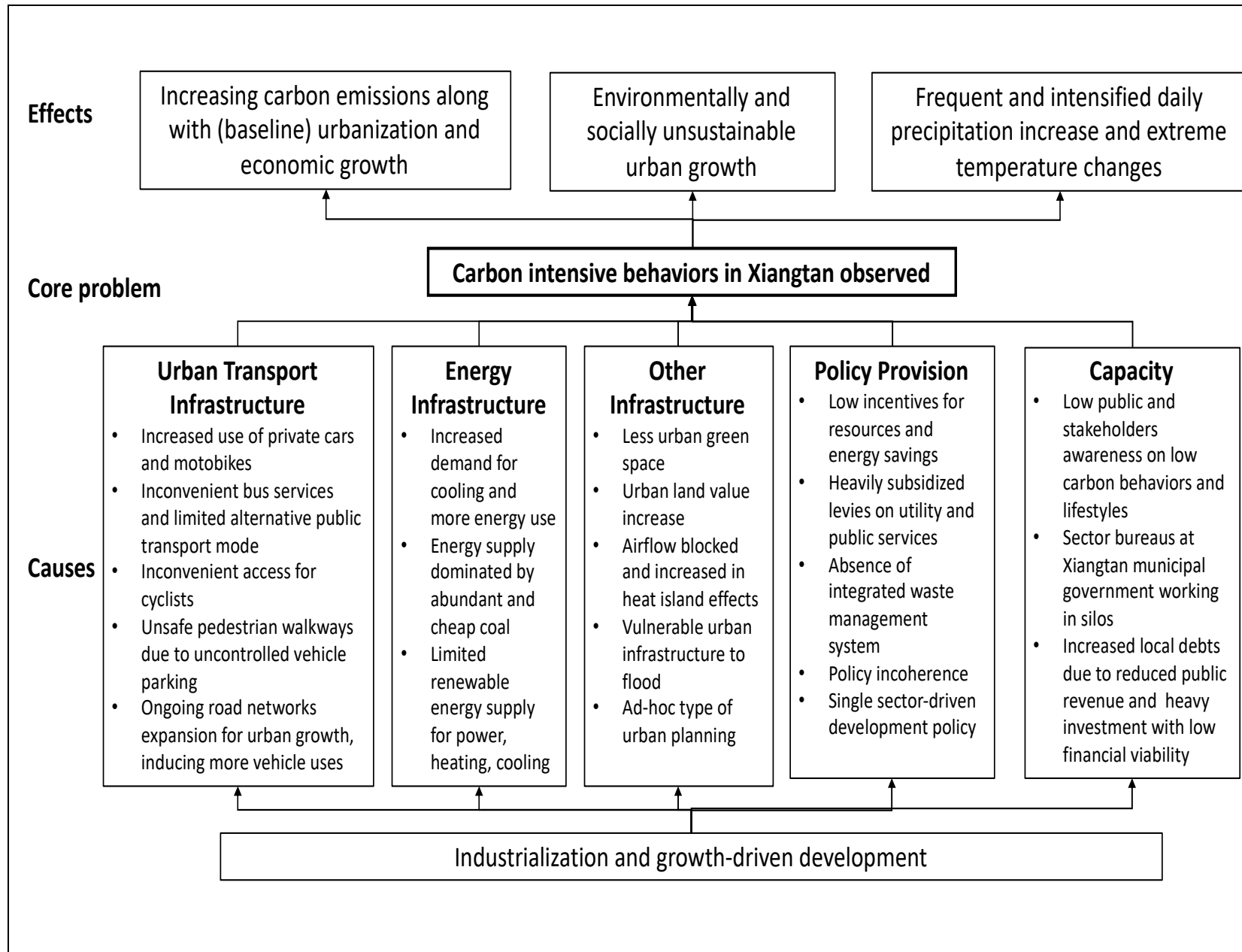
CO₂ = carbon dioxide, GHG = greenhouse gas, GPP = green procurement policy, ICT = information and communications technology, PRC = People's Republic of China, XMG = Xiangtan Municipal Government, Q = quarter.

^a Government of People's Republic of China. 2017. *Government of Xiangtan Low-Carbon City Pilot Implementation Plan, 2017–2030*. Xiangtan.

^b The term of the current XMG mayor will end in 2021 and there will be a possibility of change in mayor.

Note: Technical assistance will be financed on a grant basis with \$400,000 from the Transaction Technical Assistance Facility of the People's Republic of China, \$500,000 from the Clean Energy Financing Partnership Facility, \$300,000 from the Urban Environment Infrastructure Fund and \$500,000 from the East-Asia Knowledge Partnership Fund.

Source: Asian Development Bank.



TECHNICAL ASSISTANCE FACILITY UTILIZATION UPDATE

1. The proposed sector development program comprises (i) a project loan to invest in key low-carbon infrastructure, and (ii) a policy-based loan to support policy and governance reforms necessary to the Xiangtan municipal government for a successful low-carbon city transformation. The program preparation technical assistance will support the municipal government in carrying out a detailed assessment of current policy and governance systems relevant to low-carbon city transformation, preparing a detailed plan for policy reforms, and conducting due diligence of the investment component to ensure the program complies with Asian Development Bank (ADB) and government requirements.
2. The program preparation technical assistance will be supported by various funds amounting to (i) \$400,000 from the Transaction Technical Assistance Facility of the People's Republic of China (PRC);¹ (ii) \$500,000 from the Clean Energy Financing Partnership Facility; (iii) \$300,000 from the Urban Environment Infrastructure Fund; and (iv) \$500,000 from the East-Asia Knowledge Partnership Fund.
3. The program preparation technical assistance (TA) will deliver the following outputs:
4. **Output 1: Technical feasibility assessments conducted.** The TA will conduct a comprehensive sector analysis for Xiangtan that will feed into the detailed design of the program. The sector analysis will assess specific systems; governance, including analyzing roles and capacities of various public and private actors; policy, including regulative, market-based, and information-based policy measures, tools, and tariffs; the legal framework; integrated urban planning capacity; and climate risk response. The analysis will carry out a social and environmental issues study and map critical infrastructure and high economic zones. A range of social surveys will assess public awareness and level of understanding on low-carbon actions, practices, and lifestyles; current challenges and hurdles for low-carbon behaviors; determinant factors for behavior changes; and willingness to pay for a low-carbon, inclusive, clean and green services and living environment. Results of the social surveys will inform the design and implementation of all program outputs.
5. The TA will conduct technical due diligence on investment components to ensure technical feasibility, suitability, and appropriateness of technology. This includes assessing: (i) the urban transport system and the technical feasibility of designing a city-wide bus rapid system integrating non-motorized transport modes facilities to maximize energy efficiency; (ii) the technical feasibility of clean bus and electricity charging stations to ensure correct selection and deployment of clean energy technologies and renewable energy sourced charging stations for electronic vehicles; (iii) the technical design of information technology based smart energy management systems to ensure operational efficiency, real-time information provision, and knowledge management; and (iv) the technical design of an urban adaptation mapping tool and the technical and financial feasibility of selected ecosystem-based adaptation measures.
6. The technical assessment and feasibility for the policy reform will
 - (i) assess existing policy and policy measures, including sector-specific, national, provincial, and local policy measures that would incentivize low-carbon behavioral changes;

¹ TA 9437-PRC was initially approved on 5 December 2017 with an amount of \$2.05 million. The changes in the TA amount and implementation arrangements for the TA were approved on 27 June 2018, including \$400,000 to support the program preparation for the proposed Xiangtan low-carbon transformation sector development program.

- (ii) identify policy gaps and incoherence;
- (iii) propose a wide range of reform measures, including tariff reforms to penalize carbon intensive actions and incentivize efficient use of energy and resources, particularly targeting industries that are major sources of greenhouse gas (GHG) emissions;
- (iv) identify various clean energy technologies available and suitable to Xiangtan—including waste-to-energy (WTE) technologies; wind, solar, and geothermal energy supply systems; and renewable and clean energy-based district heating and/or cooling systems—and assess their potential deployment in Xiangtan and quantify their carbon reduction potentials, especially as policy reform focuses on carbon reduction by incentivizing economic actors to directly use clean energy technologies and/or use public services provided by clean technologies;
- (v) develop a technical proposal for green procurement policy; and
- (vi) develop supporting materials for policy reforms and capacity building.

7. **Output 2: Procurement plans formulated.** The TA will prepare procurement plans for the investment component; assess and propose performance-based and/or operation and maintenance contracts; and assess procurement capacity.

8. **Output 3: Financial and economic due diligence completed.** Financial and economic due diligence for the investment component will include a financial management assessment of relevant entities and the design of funds flow, accounting, auditing, and financial reporting arrangements, including any necessity or capacity for using the advance procedure or the statement of expenditure procedure.

9. **Output 4: Safeguards due diligence completed.** The TA will conduct an environmental and social assessment, including climate risks and vulnerability, and prepare due diligence documents for the investment component.

10. **Output 5: Sector and social assessments prepared.** The TA will carry out urban sector, social development, and gender assessments.

Table A3.1: Summary of Major Outputs and Activities

Outputs	Delivery Dates	Key Activities with Milestones
Output 1: Technical feasibility assessments conducted	Q4 2019	<ul style="list-style-type: none"> a. Design and appraise bus priority system and traffic signal management b. Design and appraise NMT lanes and facilities integrated with bus route corridors, bus stations c. Conduct due diligence on technical design and engineering for electricity charging stations d. Prepare a comprehensive intelligent transport management IT system design e. Prepare an intelligent industrial energy management system design f. Prepare an intelligent building energy management system g. Assess and prepare technical proposal on parking policy and management for policy reform h. Assess and prepare technical, financial and market assessment reports on waste-to-power/heat/fuel i. Assess and prepare technical, financial and market assessment reports on distributed energy and district heating and cooling based on renewable energy and/or clean energy j. Propose policy reform measures k. Propose green procurement policy and GPP actions l. Propose communication strategy and action plan for low-carbon lifestyle promotion m. Propose the design of low-carbon lifestyle online platform
2. Output 2: Procurement plans formulated	Q4 2019	<ul style="list-style-type: none"> a. Prepare procurement plans for low-carbon transport; urban green infrastructure investment; smart IT information and management systems b. Conduct procurement risk assessment c. Prepare procurement plan for the proposed loan d. Prepare open competitive bidding (OCB) master bidding documents for the first designated OCB procurement packages
3. Output 3: Financial and economic due diligence completed	Q4 2019	<ul style="list-style-type: none"> a. Prepare financial analysis for the proposed investment component b. Conduct financial management assessment c. Prepare economic analysis for the proposed investment component d. Prepare the design of funds flow, accounting, auditing, and financial reporting arrangements, including any necessity or capacity for using the advance procedure or the statement of expenditure procedure
4. Output 4: Safeguards due diligence completed	Q4 2019	<ul style="list-style-type: none"> a. Conduct environmental due diligence b. Prepare environmental impact assessment due diligence report c. Conduct climate risks and vulnerability assessment d. Prepare CRVA report e. Collect emissions data and health-related cost data f. Develop baseline and emission reduction scenarios for the proposed low-carbon investment

		g. Conduct air quality improvement and health benefit assessment for the proposed project h. Conduct and prepare poverty analysis and social assessment for the proposed project i. Conduct social safeguards due diligence j. Prepare IR and IP report
5. Output 5: Sector and social assessments prepared	Q4 2019	a. Prepare sector assessment reports, including integrated urban planning, urban transport, building energy, climate risk response and management assessment b. Prepare poverty and social analysis report c. Prepare gender assessment and gender action plan d. Conduct social survey on low-carbon lifestyle and prepare a technical proposal on promoting low-carbon lifestyle e. Identify and prepare a proposal on suitable technical and non-technical options to promote a low-carbon lifestyle

CRVA = climate risk and vulnerability assessment, GPP = green procurement policy, IR = involuntary resettlement, IP = indigenous peoples, IT = information technology, NMT = non-motorized transport, OCB = open competitive bidding, Q = quarter.

11. **Resources under the technical assistance facility.** A total of 120 person-months (international, 53.5 person-months and national, 68 person-months) of consulting services will be required in accordance with the ADB Procurement Policy (2017, as amended from time to time) and its associated project administration instructions and/or staff instructions. Consultants will be engaged using both individual consultant and firm selection methods. To select consulting firms, the quality- and cost-based selection method using a 90:10 quality–cost ratio (estimated budget) with biodata technical proposal will be used. The initial consultants' input allocation from the TA facility, the Clean Energy Financing Partnership Facility, the Urban Environment Infrastructure Fund, and the East-Asia Knowledge Partnership Fund is in Table A3.2.

Table A3.2: Updated Consultants' Input Allocation from the Technical Assistance Facility
(person-month)

Item	International	National
Urban and climate change specialist and team leader	3	
Urban transport planner	2	3
Bus priority system expert	1.5	3
Travel demand modeling specialist	1	2
Clean fleet and e-charging station specialist	1	2
Urban adaptation expert	3	
Urban resilience planning expert	3	
Hydraulic modelling expert	1.5	
Urban adaptation map design expert	1.5	
Ecosystem-based adaptation engineer	1.5	3
Intelligent transport system designer	3	2
Smart energy city architect	3	2
Digital technology expert	3.5	3
Innovation policy and governance expert	3	
Policy researcher on building and energy systems innovation		3
Policy researcher on urban planning and transport system innovation		3
Green public procurement specialist	2	3
Policy and legal system specialist		4
Waste-to-energy (RDF and SRF) expert	1	1.5
Waste-to-energy (non-combustion) expert	1	1.5

Distributed energy and district heating and cooling expert	1	1.5
Building energy expert	1	1.5
Energy efficiency and renewable energy specialist	1	1.5
Parking policy specialist	1	1
Public finance and fiscal management specialist	2.5	3
Human-centered design specialist	1	1
Communications and behavior change specialist	1.5	2
Project and institutional coordinator		6
Environment safeguards expert	2.5	3
Social development and gender specialists	1.5	2
Resettlement specialist	1	3
Economist	1.5	1.5
Financial management specialist	1.5	3
Procurement specialist	1	2
Total	53.5	68

RDF = refuse-derived fuel, SRF = solid recovered fuel.

Table A3.3: Updated Budget Allocation from the Technical Assistance Facility
(\$'000)

Item	Total
1. Consultants	
a. Remuneration and per diem	
i. International consultants	963.0
ii. National consultants	408.0
b. Out-of-pocket expenditures	
i. International and local travel	158.0
ii. Reports and communications	10.0
2. Studies and Surveys	70.0
3. Contingency	91.0
Total	1,700.0

LIST OF LINKED DOCUMENTS

<http://www.adb.org/Documents/LinkedDocs/?id=52230-001-ConceptPaper>

1. Initial Poverty and Social Analysis
2. Outline Terms of References for Consultants
3. Project Procurement Classification