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Study on Climate Cooperation Opportunities in Key BRI Cities

10th

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Abstract

Since the “Belt and Road” initiative was proposed in 2013, it has always adhered to the concept of openness and integrity, striving for high-standards in sustainable and people-centered development. The BRI has become a popular platform for international cooperation in today’s world. In March 2022, the National Development and Reform Commission, the Ministry of Foreign Affairs, the Ministry of Ecology and Environment, and the Ministry of Commerce once again jointly issued the *Guideline on Promoting the Green Development of the Belt and Road* (hereinafter referred to as the *Guideline*), emphasizing that the BRI should “strengthen international cooperation on climate actions and promote the establishment of a fair, reasonable, and win-win global climate governance system.” Under the BRI’s green cooperation framework, climate mitigation and adaptation has become a key pillar for cooperation, city-level cooperation to deliver climate actions has been recognized as having significant potential to contribute to the global response to climate change. It is now the case that more than 1,000 cities around the world have pledged to work towards the goal of carbon neutrality by 2050, thereby creating more inclusive and resilient urban economies.

In order to actively address climate change, accelerate the emission reduction targets of the Paris Agreement, further implement South-South cooperation and relevant key areas of the *Guideline*, BRI International Green Development Coalition and C40 Cities Climate Leadership Group have jointly compiled the *Study on Climate Cooperation Opportunities in Key Cities along the Belt and Road — Collaboration on Climate Actions among Developing-country Cities in the Context of Carbon Neutrality*. The study has selected eight key cities in BRI countries in Africa, South America and Asia, as well as several cities in China, for this targeted research. Taking into account urban climate action plans, focused the study and analysis of urban climate risks and opportunities, medium and long-term climate strategies, mitigation and adaptation targets, as well as typical government measures being undertaken and/or planned. The study also summarizes the potential priority cooperation sectors within cities that are located in BRI member countries, as well as briefly introducing several models of urban climate financing with case study references.

Given the current challenges being faced commonly across key cities in BRI countries, the following three suggestions are outlined with the intention of promoting the enhanced and accelerated construction of the 21st century Green Silk Road via the BRI. **Firstly**, sufficiently utilize the existing platforms. Create a city-level demonstration cooperation network for addressing climate change. Further support and promote urban action and cooperation in addressing climate change. And city-level demonstration and cooperation networks on climate change should be developed with city “one-stop” demonstration bases. Furthermore, BRI



member countries should always be supported to choose suitable solutions according to their own needs and context within these cooperation networks. **Secondly**, strengthen capital access for climate actions in cities in BRI countries. As such, international financial policies should be shared and cities and their host countries should be assisted in optimizing a list of climate cooperation needs and project categories to improve the efficiency of international cooperation. **Thirdly**, city level assessment, monitoring and adaptation processes should be enhanced in relation to climate risks; thereby helping to establish sound climate adaptation assessment and monitoring mechanisms and improve the ability of BRI member countries to adapt to environmental and climate risks.

Chapter 1: Cities and Climate Change

Extreme weather is becoming a new normal. Countries across the world have experienced frequent and deadly heat waves in recent years, many breaking temperature records. Climate change has therefore brought about existential threats and challenges to the future survival and development of human society. The scale and scope of the challenges are expanding day by day, ranging from threats to natural ecosystems to the social and economic systems which they underpin. The World Meteorological Organization has warned that climate change has led to an increase in extreme heat around the world, which is expected to further intensify in the future. More frequent heat waves, droughts and floods have exceeded the survivable limits of some plants and animals – for example decimating some tree and coral species. The world now faces multiple climate hazards that are inevitable. Some of the impacts will be irreversible. This confluence of extreme weather and climatic events is exacerbating a series of unmanageable impacts, including water and food crises, particularly in Africa, Asia, Central and South America, some small islands and the Arctic. BRI countries are already being hit hard by climate change. According to the latest assessment of the Intergovernmental Panel on Climate Change (IPCC), if human beings do not seriously limit carbon emissions right now then floods, crop failure, water depletion, wetland and rainforest loss and other phenomena will increase significantly in the coming decades, and the spread of diseases will accelerate rapidly. All these impacts point towards a severely grim and deepening crisis.

I. Urban climate risk and response

The severe impacts of climate change are unfolding in cities, leaving them at the forefront of the climate crisis. We live in an age of urbanization, with more than half of the global population already living in urban areas. The figures for urban residents globally are projected to increase by 2.5 billion by 2050, with nearly 90% of such growth coming from Asia and Africa. As

engines of social innovation and economic prosperity, cities also contribute nearly 80% of global energy consumption and more than 70% of global greenhouse gas emissions. The global response to climate change will depend on the actions of cities. There are multiple, dynamic and complex interactions between the urban system and the climate system. Urban development and human activities directly affect climate change, and conversely, climate change directly affects the function of urban systems.

Infrastructure systems around the world, such as energy, transport systems, information and communications, water and drainage, environment sanitation, and healthcare, will be put to the test of extreme weather conditions such as floods, storms, droughts and heat waves. Cities are increasingly affected by the risks brought by climate change, with details shown as follows:

1. Extreme temperatures and urban heat island effect. The risks posed by heat waves to urban construction, people's health, economic development, social culture and infrastructure may continue to worsen. It is estimated that between half and three-quarters of the population could be at risk from the combination of extreme heat and humidity by 2100.
2. Urban flooding. The increasing frequency and intensity of extreme precipitation is likely to expand the area affected by flooding. And the increase of urban impervious areas also pushes up the risk of urban water logging. Asian cities, in their rapid urbanization process, will be at even greater risks of flooding. Increased flooding not only causes huge economic losses but also triggers health risks. Rising sea levels, increased tropical storms, and heavy rainfall will enhance the probability of coastal urban flooding, and more than 1 billion people in low-lying areas worldwide are estimated to be at risk of specific coastal climate hazards by 2050.
3. Urban water shortage and drinking water security. Climatic factors (e.g., rising temperatures, decreased regional precipitation and drought) and urbanization (e.g., land-use change, migration, over-exploitation and utilization of water resources) affect the supply and security of water resources. By 2050, nearly a third of the world's cities could run out of available water. About 350 million urban people around the world will face water shortage caused by

severe drought under the 1.5°C warming, and this number will be 410 million if the global warming hits the 2°C mark.

4. Other risk factors. Disasters such as cold waves, landslides, fires and air pollution are more prone to threaten cities, residential areas and key infrastructure under the impact of climate change.

Cities around the world are increasingly being affected by climate-related disasters, and more frequent and intense climate disasters are posing harm to urban populations, increasing affected areas and exacerbating disaster losses. Urban expansion, spatial changes and the destruction of ecosystem services undermine the adaptive capacity of cities, and the resulting exposure and vulnerability increase the risk of climate change. Globally, places with fastest deterioration in vulnerability and exposure are those with limited adaptability, particularly informal residential areas in low and middle- income countries and centers in small and medium size cities.

Modern cities not only undertake the functions of economic development, social progress, production and services, but also shoulder the tasks of meeting the needs of current and future survival and development of humans. The scheme of cities will produce significant results, and the decisions of urban governments will determine the local development trajectory and “lock in” the city’s remaining carbon budget. By 2030, about 60% of the world’s urban areas will still require improvement. As cities, especially those in BRI member countries, struggle to meet the needs of their growing populations and address the challenges such as housing, air pollution, and traffic congestion, they will have the opportunity to develop green infrastructure and achieve the historic leap of urbanization by devoting scarce resources to areas such as clean transportation and zero-carbon buildings. Therefore, it is critical to ensure that urban planning and investment priorities align with the concept of climate resilience.

Achieving the goal of keeping global temperature rise within 1.5°C will require communities around the world to make concerted efforts. To effectively address the risks and challenges posed by climate change, cities need to work on both mitigation and adaptation, explore green and low-carbon development path, adjust industrial and energy structure, improve energy

efficiency in various industries, innovate practices in sustainable production and consumption, improve the climate resilience of urban infrastructure, reduce vulnerability to climate change, ensure urban safety, and achieve sustainable development.

II. International city-level cooperation

Governance capacity, financial support and urban infrastructure decide a city's ability to cope with climate change, and such an ability varies widely. Clearly, climate change requires concerted efforts from the international community. North-South cooperation is the foundation of the global response to climate change, and South-South cooperation is an integral part of global cooperation. Developing countries share similarities in climate actions. For the developing world, South-South cooperation is the specific practice to help each other and explore solutions, and the key approach to achieve common development. Such cooperation will give rise to extensive actions on a wider scale. Knowledge and experience sharing, technology transfer, and capacity building at technical and institutional levels remain the key areas of climate cooperation among developing countries.

By further strengthening cooperation among developing countries, the Belt and Road Initiative will promote economic development and basic needs such as infrastructure construction, basic industry development, specialized trade and investment, and financial cooperation for its members. Also, it will spread friendship and forge a path of prosperity, peace, innovation, openness and civilization, which is highly consistent with the main goals of the new type of South-South cooperation: complement each other's advantages, promote joint efforts of poverty alleviation and achieve common development.

By January 6, 2023, China had signed more than 200 BRI cooperation documents with 151 countries and 32 international organizations, covering connectivity, investment, trade, finance, science and technology, society, culture, people's livelihood, maritime affairs and e-commerce, and including 27 European countries, 40 Asian countries, 52 African countries, 11 Oceanian countries, 9 South American countries and 12 North American countries. China and BRI countries will continue to deepen cooperation and strengthen institutional coordination. By the

end of 2021, China had established working groups on trade with 17 countries and investment cooperation with 46 countries and regions.

Therefore, the BRI Green Development Coalition and other cooperation platforms came into being and have become important platforms for South-South cooperation on climate change, creating a new paradigm of mutually beneficial cooperation for BRI member countries. As of now, China has allocated a total of RMB 1.2 billion yuan for South-South cooperation on climate change, signed 41 cooperation documents on climate change with 36 developing countries, and adopted various approaches of cooperation such as jointly constructing low-carbon demonstration zones, providing climate-related materials such as weather satellites and photovoltaic power generation systems, conducting capacity training, and providing assistance to relevant countries in climate actions.

Data suggests that from 1995 to 2015, BRI countries accounted for 7 of the top 10 countries most severely affected by climate disasters, and the loss caused by climate disasters in BRI countries is higher than twice the global average. These countries urgently need to carry out more extensive international cooperation on climate change on a larger scale, so that climate vulnerabilities can be improved. According to the official website of the United Nations Framework Convention on Climate Change, 194 member countries have announced their Nationally Determined Contributions (NDCs), and 1,136 cities in its Race to Zero Campaign have so far pledged to work towards becoming carbon neutral by 2050. Europe has also pledged to play a leading role in climate actions, setting ambitious targets and guidance for such commitment. As part of the Horizon Europe program, the EU has launched the European mission of delivering 100 climate-neutral and smart cities by 2030. The mission aims to deliver those cities and then make them centers of experimentation and innovation that all European cities can follow by 2050. Net Zero Cities will help Europe achieve its climate-neutral ambitions by providing Europe's climate-neutral and smart cities with professional services, helping cities overcome the structural, institutional and cultural barriers, so that they will become carbon neutral by 2030.

The Climate Action Planning Framework of C40 Cities Climate Leadership Group (hereinafter referred to as C40) aims to support member cities in developing their climate action plans with the ambition and practices needed to achieve the targets of the Paris Agreement. As for now, 74 out of 97 C40 member cities had a climate action plan (CAP) aligned with the 1.5°C ambition of the Paris Agreement¹, protecting residents, and the corresponding strategies and actions to deal with climate change are in progress.

At present, approaches of international cooperation at the city level fall into three categories: The first is international sister cities, a kind of friendly cooperation between the local governments of various countries (provinces, states, cities and counties) through the form of agreements to promote mutual understanding and carry out exchanges and cooperation in economy, science and technology, culture and other aspects in line with national needs and the development of bilateral relations. It is short for “sister cities, provinces and states”. Internationally, it is also called twin town or twin city. The agreement on sister city relations shall come into force after jointly signed by the leaders (or designated representatives) of the two local governments. The second is the implementation of bilateral cooperation framework, where cities are stipulated as the performing entities. Compared with the first one, the communication and cooperation between cities are relatively indirect. The third is cooperation and communication on specific themes through various types of NGOs (such as C40, BRIGC, ICLEI, UCLG, etc.). Under this format, exchanges and cooperation among cities are more flexible, diverse and efficient, playing a key role in knowledge and experience sharing, policy research, capacity building and information sharing.

Based on the above background, in order to actively respond to climate change, achieve the targets of the Paris Agreement and further implement the South-South cooperation on climate change, C40 and BRI International Green Development Coalition jointly carried out this research, which selected and analyzed 8 key cities in BRI countries and several cities in China, summarized key areas of city-level climate actions, priority investment directions and

¹ Includes six Chinese cities which have completed research reports and will integrate into their public policies in due course.

investment values of cities in BRI countries combining with their climate plannings, briefly introduced several models of urban climate financing, listed certain successful cases worth learning from, and put forward suggestions on the direction of improvement for the weak links in climate actions for cities in BRI member countries.

This report aims to help cities identify key risks and opportunities, strengthen their confidence in green urban development, improve their problem-solving skills, promote the close integration of competent government and effective international markets in cities, encourage cities to move from planning to pilot, from pilot to project, from project to market cooperation and comprehensive promotion, and achieve urban climate ambitions.

Chapter 2: Climate Ambitions and Strategies of Typical BRI Cities

Between urban systems and climate systems, there exist multi-tiered, dynamic, and complex interactions. Climate change brings various types and degrees of risks to cities in different regions. And cities with different basic conditions, governance capabilities, and economic strength demonstrate different levels of resilience when facing climate changes, which means that the coping strategies and goals vary. In order to better reflect the regional differences of cities, the differences in climate risks they face, and the differences in urban ambitions and coping strategies, and considering that the regions with rapid urban population growth in the next few decades will be Africa and Asia, this report selects cities located in Africa, South America and Asia as the research object. These cities are in countries along the “Belt and Road” and are important economic centers in their respective countries. They are leading cities in regional climate actions. Most of them have formulated and released plans to deal with climate change and have set clear climate mitigation and adaptation goals. Their pioneering role and leadership will have a profound positive impact on the regions. In this chapter, we focus on the research and description of urban climate risks, medium and long-term vision, mitigation and adaptation goals, and key strategies and measures, in order to present to cities and relevant stakeholders the effective strategies and pathways that cities can adopt to comprehensively improve climate resilience under different risks, and, furthermore, to strengthen the determination of cities in BRI countries to address climate changes, and accelerate the process of global action on climate change.

The cities analyzed in this report are as follows:

Table 2-1 List of cities analyzed in this report

Continent	City	Country
Africa	Addis Ababa	Ethiopia
	Dar es Salaam	Tanzania
	Accra	Ghana
South America	Buenos Aires	Argentina
	Quito	Ecuador
Asia	Jakarta	Indonesia
	Kuala Lumpur	Malaysia
	Quezon City	The Philippines
	Beijing, Shanghai, Shenzhen, Wuhan, Chengdu, Qingdao, Hangzhou, etc.	China

It should be noted that though current Chinese urban planning has paid attention to various aspects of climate change, no comprehensive and systematic special plan to deal with climate change has yet been formulated. That being said, China has been committed to the goal of carbon neutrality by 2060, and under this goal, various industries/departments have been continuously improving cities' ability to cope with climate change. Many cities have created remarkable achievements in carbon neutral strategies and actions, which can be shared and exchanged with cities in other BRI countries. For this reason, in this report, we will analyze China's national-level climate change strategies, goals and plans, outlining the clearly defined planning and main action strategies of Chinese cities in coping with climate change, so as to provide reference information for other cities and relevant parties to learn from.

I. Overview of the main commonalities of climate actions in target cities

The selected objects for analysis are all central economic cities in BRI countries. These cities enjoy a good foundation for international climate cooperation, and have many common characteristics in terms of development, such as the growth of urban population and the rising demand for buildings, transportation, solid waste treatment, resource supply, and health security. Climate resilience is a common goal pursued by all these cities. Eight international cities in Africa, South America, and Southeast Asia have all set 2050 carbon neutral goals. The basic information of each city, such as population, emissions, major climate risks, and sister cities in China, is shown in Table 2-2. The climate change action plan is based on development needs and major climate risks, and responds from two directions: mitigation and adaptation.

Table 2-2 Population, emissions and major climate risks of the cities

Continent	City	Population	Emissions (tCO ₂ e)	Major climate risks	Sister cities in China
Africa	Addis Ababa	3.3 million (2016)	14.5 million (2016)	Floods, extreme precipitation, heat waves, droughts	Beijing
	Dar es Salaam	7.047 million (2016)	12.7617 million (2016)	Temperature extremes, droughts, floods and rising sea levels	Jinhua
	Accra	2.34 million (2017)	2.405 million (2015)	Impact of sea level rise, floods, heat waves, droughts on energy security, health risks, food crisis due to reduced agricultural production	Shenzhen
South America	Buenos Aires	3.08 million	13 million (2015)	Floods, coastal	Beijing,

Continent	City	Population	Emissions (tCO ₂ e)	Major climate risks	Sister cities in China
America	Aires	(2020)		flooding, heat waves	Guangzhou, Hebei Province
	Quito	2.2 million (2019)	7.61 million (2015)	Droughts, heat and heavy rainfall	Guangzhou
Asia	Jakarta	10.63 million (2019)	53.6 million (2016)	Floods, storms, rising sea levels, droughts	Beijing, Shanghai
	Kuala Lumpur	About 2 million (2019)	25 million (2017)	Heat, floods and storms, droughts	
	Quezon City	3 million (2016)	8.01 million (2016)	Extreme heat, droughts, tropical storms and floods	Shenyang

According to the GHG inventory, the main emission sources of a city include transportation, energy, construction and waste. In order to achieve the goal of urban carbon neutrality, targeting on main emission sources, key cities have formulated corresponding measures to reduce emissions and have set development goals for departments. Priority has been given to these efforts to mitigate climate change.

In terms of transportation emission reduction, priority has been given to the promotion of green vehicles and green travel. Featuring zero-emission, the electrification of buses has been listed as the priority measure by Addis Ababa, Accra, Dar es Salaam, Buenos Aires, and Quito. (see Table 2-3)

Table 2-3 Targets of bus electrification rate

City	By	Targets
Addis Ababa	2050	100%
Accra	2050	90%
Dar es Salaam	2050	80%
Buenos Aires	2050	100%
Quito	2040	100%

Chinese cities generally adopt the strategy of using electric or clean fuel vehicles (such as hydrogen fuel) for new buses, moving towards the target of “clean energy for all urban buses”. Some leading cities such as Shenzhen and Hangzhou have already achieved such a target. In addition, the promotion of Bus Rapid Transit, Light Rail Transit and Metro has become one of the important measures to reduce traffic emissions in the climate action plans of the eight international cities (see table 2-4 for details). In terms of improving travel methods, these cities generally start by improving travel conditions, such as strengthening bicycle lanes, pedestrian greenways, and adjusting public transportation networks, so as to encourage public transportation and green travel, and to reduce the use of private cars to cut emissions.

Table 2-4 Statistics on transportation emission reduction methods

City	Emission reduction method
Addis Ababa	BRT, light rail transit
Accra	BRT
Dar es Salaam	BRT, metro
Quezon	BRT
Buenos Aires	Subway, bus

In terms of energy and construction, commonly adopted measures include improving industrial and building energy efficiency and increasing the use rate of renewable energy. In

international urban climate action plans, we can also see measures such as LED lighting, solar/efficient water heaters, electric stoves and clean stoves, residential energy-saving equipment, building photovoltaics, enhanced residential buildings, energy efficient buildings, renewable energy, and energy efficiency improvement of industrial facilities.

Table 2-5 Statistics of energy utilization modes

Energy utilization modes	City
LED lighting	Addis Ababa, Dar es Salaam, Quito
Solar/efficient water heater	Addis Ababa, Dar es Salaam, Jakarta, Kuala Lumpur, Buenos Aires, Quito
Electric stove and clean stove	Addis Ababa, Dar es Salaam
Residential energy-saving equipment	Quito
Building photovoltaics	Accra, Dar es Salaam, Buenos Aires
Enhanced residential buildings	Buenos Aires
Energy efficient building	Addis Ababa, Dar es Salaam, Jakarta, Kuala Lumpur, Quezon
Renewable Energy	Dar es Salaam, Quezon, Jakarta, Quito
Energy efficiency improvement of industrial facilities	Addis Ababa, Dar es Salaam, Jakarta, Quezon

Industrial energy efficiency, green buildings and renewable energy are the main directions of actions for Chinese cities in the future. The difference is that after years of energy-saving technological transformation in the industrial field, China has achieved remarkable results in its top ten energy-saving renovation projects (LED lights, motor system, waste heat utilization, energy management system, etc.). High-efficiency lighting has been widely used in Chinese cities. There are many varieties of energy-saving electrical appliances, and the market share is

gradually expanding. Affordable photovoltaic equipment has driven the wide application and marketization of industrial and commercial distributed photovoltaics in China.

In 2022, the State Council issued the “14th Five-Year Plan” *Comprehensive Work Plan for Energy Conservation and Emission Reduction*. Facing the vision of carbon neutrality and emission peak, ten key projects for energy conservation and emission reduction were deployed, namely: green upgrading projects for key industries, upgrading projects of the energy conservation and environmental protection for industrial parks, urban green energy-saving renovation projects, transportation and logistics energy-saving and emission-reduction projects, agricultural and rural energy-saving and emission-reduction projects, public institution energy efficiency improvement projects, pollutant emission reduction projects in key areas, coal clean and efficient utilization projects, volatile organic compound comprehensive treatment projects, and environmental infrastructure improvement projects. Compared with the energy efficiency improvement methods of the above-mentioned cities, the energy conservation and emission reduction policies and mechanisms adopted by China are more comprehensive, and the green transformation effect is more remarkable.

In terms of waste management, the eight selected key cities primarily take measures including recycling of paper and plastics, organic waste composting/anaerobic fermentation, wastewater treatment, biogas collection, construction of landfills, and landfill gas collection. Kuala Lumpur has also set a target of community coverage (50%) for the dissemination of knowledge on zero waste strategies. Chinese cities, after undergoing the phase of “being besieged by waste”, are now moving towards “zero-waste cities” step by step. After the reduction, sorting, recycling and harmless treatment of waste, our goal is to achieve zero solid waste landfill (such as Wuhan, Qingdao, Shenzhen, Hangzhou, Shanghai), which is one of the important measures for Chinese cities to control non-carbon dioxide GHG emissions.

The specific content of climate ambitions and strategies for each city is introduced below.

II. Addis Ababa

(1) City profile

Addis Ababa is the capital of Ethiopia, a country in east Africa. It is also home to the headquarters of the African Union and its predecessor, the Organization of African Unity. Addis Ababa is located on a plateau at an altitude of 2,400 meters. It means “fresh flowers” in the local Tigray language. It is a state-level special city with more than 80 different ethnic groups speaking more than 80 different languages. There are Christian, Islamic and Jewish communities. The urban population of Addis Ababa in 2016 was around 3.3 million and is growing at an annual rate of 8%. Accounting for 17% of the country’s total population, the city’s population will be about 9.8 million by 2037. The rapid growth of the population will bring additional pressure to the city’s infrastructure and resources. The city is one of the international sister cities of Beijing. In December 2017, Addis Ababa was rewarded as one of 2017 top ten spring cities in the world. On December 26, 2019, it ranked 114th in the list of 2019 top 500 global cities. More than half of the enterprises in the country are concentrated in the southwest of the city, and the southern suburbs are industrial areas. There is a coffee trade center in the city. It has highway and railway transportation hubs, and there are flights connecting with domestic cities and African, European and Asian countries. The city is built on the hillside, and can be divided into the upper city and the lower city according to the terrain. The upper city is mainly for residential and commercial functions; the lower city is the distribution area of government agencies, international airports, and large hotels, with a large number of modern high-rise buildings. Addis Ababa plays an important role in Ethiopia’s economic development and is the country’s main economic and industrial center. It contributes about 38% to the gross national product (GDP). The service industry accounts for 63% of the city’s GDP, industry 36%, and agriculture 1%. From the perspective of the global economic environment, Addis Ababa is in an economically backward area. For a period of time, the Chinese government has provided strong support in different forms, aiding the construction of many infrastructure projects such as roads, bridges,

and highways. At the same time, the Ethiopian government is allowed to open Asian routes centered on China, which undoubtedly plays a role in promoting economic development for a country with an underdeveloped economy.

(2) Urban climate characteristics and emissions

Addis Ababa is located on the Ethiopian plateau. Ethiopia is a tropical country with a climate between the tropical desert climate of North Africa and the tropical rainforest climate of central Africa. The climate of the city is cool, with an eternal spring. Surrounded by undulating and overlapping mountains, the city is a good place for tourism and vacation. Climate change is one of the major threats faced by Addis Ababa. Frequent floods, extreme precipitation and high temperatures leading to heat waves and droughts, along with other climate hazards, have posed significant risks to the development of this capital city and the country's climate change goals and green economy visions.

According to the Ethiopian government, about 90% of Ethiopia's electricity supply by 2021 came from hydropower, 8% from wind and 2% from thermal power. A high reliance on hydropower makes the country's electricity supply system fragile in the face of extreme weather. To this end, the government is actively promoting diversified energy supply, with emphasis put on areas such as photovoltaic, wind power, geothermal energy and other low-carbon energy.

(3) Urban planning and actions against climate change

To address the risks of climate change, the Addis Ababa Environmental Protection and Green Development Commission, in cooperation with the C40 Cities Climate Leadership Group, formulated the *Urban Climate Action Plan (2021-2025)* (hereinafter referred to as the *Plan*), which divides actions into two categories: mitigation and adaptation, and identified related priority mitigation actions and adaptation actions, to promote Addis Ababa towards the 2050 vision of a climate resilient, inclusive, and carbon neutral city. Figure 2-1 below is about: to improve the public transport network, green travel is advocated.



(Source of Figure 2-1: <https://www.bjd.com.cn/>)

According to the emission reduction targets formulated in the *Plan*, and based on the BAU scenario, Addis Ababa will reduce emissions by 41% by 2030, 60% by 2040, and 76% by 2050. In the *Plan*, priority actions for climate mitigation mainly focus on sectors such as waste, transportation, and energy, while adaptation actions for climate mitigation mainly focus on urban planning, food security, and infrastructure construction. The specific actions are summarized as follows:

Table 2-6 Priority actions for climate mitigation of Addis Ababa

Sector/industry	Priority actions
Actions for climate mitigation	
Waste	Facilitate waste classification system
	Build composting facilities
	Enhance sewage/wastewater treatment systems
Transportation	Improve vehicle efficiency through higher emission standards
	Improve public transport network
	Facilitate the conversion to non-motorized transport

	Improve fuel efficiency by shifting to hybrid/electric vehicles or biofuels
Energy	<p>Improve the approval process for new buildings</p> <p>Improve the energy efficiency of existing buildings</p> <p>Improve the energy efficiency of industrial facilities</p> <p>Increase the amount and forms of power generation using renewable energy</p> <p>Facilitate the transformation of high-efficiency stoves</p> <p>Upgrade street lighting</p>
Actions for climate adaptation	
Urban planning	<p>Increases resilience to floods, drought and temperature extremes</p> <p>Increase green vegetated buffer zones in urban agglomerations and areas prone to flood, landslide and subsidence</p> <p>Take into account climate change in specific large office projects</p> <p>Increase urban greening and plant heat-resistant and drought-tolerant vegetation to prevent loss of green space</p>
Key ecosystem	<p>Restore deforested areas to reduce soil erosion, enhance biodiversity, and improve ecosystem resilience</p> <p>Provide water for nature and greenfield irrigation during heat waves and droughts</p>
Food security	<p>Build a sustainable agricultural urbanism (AU) system</p> <p>Conduct technical capacity building activities for urban agriculture farmers</p> <p>Improve water security through rainwater harvesting and irrigation management for urban agriculture</p>
Infrastructure	<p>Update infrastructure design standards and improve infrastructure networks (traffic, waste and sewage networks)</p> <p>Create a more detailed risk area-to-infrastructure risk map</p> <p>Improve city maintenance and emergency response capabilities</p>
Energy	<p>Build smart grids to create energy-efficient urban power distribution networks</p> <p>Watershed management to protect hydropower potential and water resources</p>

Water resource	Protect rivers and prohibit the discharge of solid waste, debris and harmful spread/pollutants Efficient wastewater treatment and stormwater management Accelerate much-needed water investment in water-insecure and underserved areas
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Therefore, implementing the transition under the ambitious climate action plan, climate actions at city level could be taken to reduce greenhouse gas emissions by 35% through improvements in energy efficiency of new buildings, 23% through improvements in the efficiency of industrial energy and fuel conversion, 15% through motor vehicle fuel shift and efficiency improvement, 14% through shifting to public transportation, 6% through hot water and cooking fuel shift and efficiency improvement, 3% through recycling, and 2.4% through encouraging cycling and walking.

Table 2-7 Action targets of relevant industries and sectors in Addis Ababa

Sector/industry	Targets of actions
Mitigation targets	
Waste management	<ul style="list-style-type: none"> · The compost and re-utilization rate of organic waste reaches 70% (2050) · End landfilling of organic waste (2050) · Increase the recycling rate of paper and plastic to 30% (2050) · The rate of anaerobic treatment of wastewater increases from 0% (2016) to 70% (2050)
Transportation	<ul style="list-style-type: none"> · Private car travel decreases from 10.8% (2016) to 1.2% (2050) · Facilitate the shift of travel modes from motor vehicles/motorcycles/buses to walking: walking travel increases to 80% (2050) · Expand LRT and BRT passenger capacity · 100% electrification of public transport (2050) · 10% of motorcycles and taxis switched from petrol-powered ones to

	<p>electric-driven ones (2050)</p> <ul style="list-style-type: none"> · Reduce diesel-powered trucks, increase biodiesel usage and conversion to electric drive (where technology permits) · Raise emission standards to improve vehicle energy efficiency
Improve building energy efficiency	<ul style="list-style-type: none"> · 100% utilization rate of solar water heaters for new residential and commercial areas (2030) · 100% utilization rate of electric furnaces in newly built residential areas (2030)
	<ul style="list-style-type: none"> · 75% utilization rate of solar water heaters in existing buildings (2050) · 50% utilization rate of LED lighting in existing buildings (2030) · Conversion rate to electric furnace in existing residential and commercial areas reaches 90% and 100% respectively (2050) · Enhance energy efficiency by establishing an incentive mechanism to carry out energy audits in the industrial sector
Street lighting efficiency	<ul style="list-style-type: none"> · 100% utilization rate of LED street lamps (2030)
Adaptation targets	
Urban planning	<ul style="list-style-type: none"> · 100% rate of climate-compatible/climate-tolerant new developments (2050) · Green coverage increases by 10% in the short term (2025) and 20% in the medium term (2030)
Infrastructure	<ul style="list-style-type: none"> · Increase climate resilience parameters of existing and new infrastructure to 50% and 100% respectively and mainstream them (2030)
Sanitation	<ul style="list-style-type: none"> · Maintain 30% of urban green public space (2023) to reduce urban heat island effect and flooding
Water resource	<ul style="list-style-type: none"> · 40% increase in per capita daily water consumption (133l/c/d by 2030)
Key ecosystem	<ul style="list-style-type: none"> · The regional distribution rate of urban green space and green public space



	reaches 30%, and the area of public green open space within 500 m radius of residents is at least 0.3 hectares (2030)
Food security	· Increase the proportion of urban agricultural production to GDP to 50% (2030)
Energy	· Consistent with relevant mitigation action targets (see climate priority mitigation action target table for details)

(4) Summary

The areas of climate vulnerability identified in Addis Ababa include floods, extreme precipitation and heat waves and droughts caused by high temperatures. According to these climate characteristics, special attention should be paid to low-lying areas, and industries that are more sensitive to climate change, such as energy, transportation, food security, and water resources, and targeted adaptation measures should be taken.

Based on the characteristics of urban climate risk and vulnerability, the city has formulated targeted adaptation actions and measures, such as increasing green vegetation buffer zones in urban agglomerations and areas prone to floods, landslides, and subsidence, increasing the much-needed water investment in water-insecure and underserved areas, and reducing the impact of extreme events. Moreover, it has updated the infrastructure design standard and improved the infrastructure network (transportation, waste and sewage networks) to improve the effectiveness of adaptation.

In terms of policy formulation, Addis Ababa has issued special documents to formulate climate change adaptation plans and mitigation action goals, clarify climate adaptation goals, and special plans for key areas such as high temperature, floods, and drought.

In terms of target setting, Addis Ababa has formulated action targets for relevant industries and sectors, prioritized mitigation actions on waste, transportation, and energy, and set adaptation action goals for urban planning, food security, and infrastructure construction. Through the above-mentioned multiple initiatives to solve energy, transportation and waste emission issues,

it is ensured that the city is on a low-carbon and resilient development path, and is moving towards the 2050 vision of a climate-resilient, inclusive, and carbon-neutral city.

III. Accra

(1) City profile

With a population of about 2.34 million (2017), Accra is the capital city as well as the political, economic and cultural center of Ghana. It is located in West Africa and belongs to the sub-Saharan region. 70% of Ghana's industries are concentrated around Accra. Accra and Shenzhen, China are international sister cities. Ghana is made up of 260 political and administrative units known as Metropolitan, Municipal and District Assemblies (MMDAs), of which the Greater Accra region on the southern coast of Ghana consists of 29 MMDAs. The influx of immigrants has led to rapid urban sprawl and population growth of Greater Accra which houses 18% of the country's population and 30% of the urban population.

Greater Accra contributes about 25% of the country's GDP, with a per capita GDP of US\$3,388 in 2019. The industry is dominated by wholesale and retail trade and manufacturing. 42% of the population is engaged in sales and services, 24.7% in production, transportation and equipment operation, and 7.9% in agriculture, hunting, forestry and fishing. Accra's transportation facilities include roads and railways and Kotoka International Airport, the only international airport in Ghana, which operates flights to the African continent and beyond and was voted "Best Airport in Africa" by Airports Council International in 2019 and 2020.

(2) Urban climate characteristics and emissions

The climate in Accra is dry and hot, with an annual precipitation of 723 mm. The average annual temperature is above 26°C, with a small annual and daily temperature range. May to October is the rainy season and November to April is the dry season. The average annual rainfall is 2,180 mm in the southwest and 1,000 mm in the north. It enjoys a typical tropical climate with average

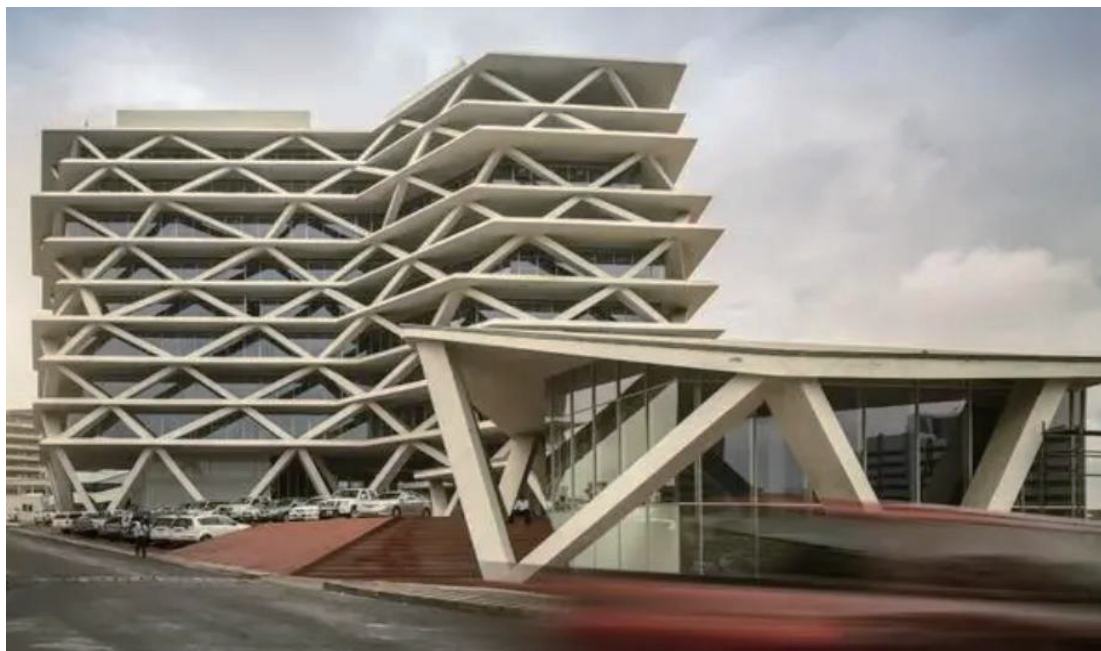
temperature of 21-32°C. Key climate risks in Accra include rising sea levels, floods and heat waves, impacts of droughts on energy security, sanitation and health risks, and the food crisis due to reduced agricultural production.

According to Accra's 2015 greenhouse gas emission inventory, the total emissions of the year were 2.405 million tons of carbon dioxide equivalent, and the main sources of emissions include: waste discharge accounted for 44%, transportation 30%, and stationary energy 26%. In terms of waste discharge, wastewater discharge accounted for 14%, incineration 3%, composting 0.4%, solid waste landfill 17%, and solid waste open dumping 10%. In terms of transportation, road vehicles and railways accounted for 29%, fugitive emissions (coal, oil, gas) 0.6%, and local ships 0.4%. In terms of stationary energy, civil accounted for 13%, commercial 3%, and industry 10%.

(3) Urban planning and actions against climate change

The Accra Metropolitan Assembly (AMA) has developed a climate action plan, the first of its kind at the local level, which is based on the national climate policy and is aligned with Ghana's sustainable development goals. The climate action plan was developed with the engagement of stakeholders and is based on three core principles: inclusivity, participation and ownership, which are also the basis for practices and climate action plans. The plan proposed a series of actions that, if implemented, will achieve significant reductions in greenhouse gas emissions, improve quality of life, create green jobs, and put the city on a path to climate resilience and carbon neutrality by 2050.

Accra will take climate action over the next five years to lead the city towards a low-emission climate resilient development path by 2050, and will formulate short-term (2025) priority climate actions and long-term visions (2050) in solid waste treatment, construction, transportation, and land planning. The figure below (Figure 2-2) shows green and energy-saving buildings designed in Accra.



(Source of Figure 2-2: Hunan Daily)

Table 2-8 Accra’s short-term priority climate actions

Sector/industry	First five-year priority climate actions (2020-2025)
Solid waste and sewage	<ul style="list-style-type: none"> Solid waste optimization strategies Source separation of dry and wet waste Non-landfill treatment of organic waste New sanitary landfill and gas capture
Energy, construction and industry	<ul style="list-style-type: none"> Support the implementation of net metering policies in Ghana Agree to procure renewable energy from IPPs Green resilient building project Improve the efficiency of industrial facilities
Transportation	<ul style="list-style-type: none"> Conversion to a low emission BRT system Build shaded sidewalks to protect pedestrians Develop Accra’s low emissions mobility strategy
Land use and space planning	<ul style="list-style-type: none"> Climate change risk and impact assessment Update the local spatial plan for Accra’s CBD



	Prepare and implement a climate resilient coastal management plan
	Apply innovations in food production, storage and processing
Climate change poses threats to governance mainstreaming	Establish a climate change resilience steering committee
	Establish a special team for exploring and testing new financing models
	Establish city-level adaptation technical working groups

Accra has formulated clear long-term goals (2050) (Table 2-9) for the above industries in the *Plan*, and has planned to formulate detailed goals in stages from 2030 to 2050 in the future. After continuous evaluation and inspection, Accra is striving to find new funding and update action plans.

Table 2-9 Long-term (2050) visions for climate actions of Accra

Sector/industry	Accra Vision 2050
Solid waste and sewage	Landfill gas collection rate reaches 90%
	Zero waste of environmental and drainage systems
	80% of wastewater collected from biogas is treated
Energy, construction and industry	50% of building photovoltaic installation
	45% of electrified operation for industry
	Improve the energy efficiency of buildings and facilities (including air conditioning systems)
Transportation	Integrate hub and spoke public transport network; user-friendly platform
	90% of buses powered by electricity
	40% walking and cycling for mobility
Land use and space planning	Protect assets and services of vulnerable populations from climate catastrophe

	Walkable CBD and fully covered drainage system
	Waterfront and coastal collaborative protection
Climate change threatening governance mainstreaming	Establish an effective climate change governance framework Inclusive climate action and community governance

(4) Summary

In order to achieve the 2050 low-emission climate resilient development goal in 2050, based on the main emission sources, Arak has formulated priority climate action plans around solid waste and sewage, energy, construction and industry, transportation, land use and spatial planning, and climate change threatening governance mainstreaming. The plan has a clear scope, specific targets, and strong operability, so it is easy to achieve short-term action goals. At the same time, in the city's long-term climate action (2050) vision plan, detailed and specific goals have been designed to match with short-term planning in terms of the 14 subcategories out of the 5 major categories of solid waste and sewage, energy, construction and industry, transportation, land use and space planning, and climate change threatening governance mainstreaming, so as to ensure that the city embarks on a low-carbon and resilient development path.

IV. Dar es Salaam

(1) City profile

Dar es Salaam is located on the Swahili coast, in eastern Africa, and belongs to the sub-Saharan region. It is the most populous city in Tanzania and an important economic center in the region. Now it has become an international friendship city of Jinhua City, Zhejiang Province. The current population of Dar es Salaam is more than 7 million. In the past three decades, the average population growth rate is about 5% per year. It is the fastest growing city in East Africa and one of the fastest growing cities in the world. It is estimated that by 2030 Dar es Sa Ram's population will reach 9.7 million and 15.6 million by 2050.



As of 2021, Dar es Salaam's GDP was about \$6 billion, accounting for about 13% of the country's GDP. This is mainly due to the city's position as Tanzania's commercial and financial hub, as well as the advanced ports and transport facilities. In addition, Dar es Salaam is an important tourist destination with many historic buildings, cultural attractions and beautiful beaches, which generates considerable economic revenue for the city. Due to overly rapid urban growth, most of the city's land is unplanned, densely populated informal settlements (as shown in Figure 2-3) that lack essential water supply, sewage and waste disposal services.



(Source of Figure 2-3: *Shanghai Manual: a Guide for Sustainable Urban Development in the 21st Century*)

(2) Urban climate characteristics and emissions

The city enjoys an equatorial climate. Due to its low latitude and the influence of the Indian Ocean monsoon, the climate is hot and humid, with an annual average temperature of 25.8°C. The daily temperature range (10°C) is greater than the annual range (4°C), which is a characteristic of the city's climate. Dar es Salaam has abundant rainfall and surface water, with an average annual precipitation of 1100 mm. The rainy season is from April to September every year, and the dry season is from October to March of the next year, and the climate is relatively hot; in the baking sun, the temperature may reach as high as 45°C. The maximum rainfall is seen

from March to June, and there are 32-48 days with thunder and lightning throughout the year. The main climate risks faced by Dar es Salaam include temperature extremes, drought, flooding and submersion due to rising sea levels. According to the 2016 greenhouse gas emission inventory, Dar es Salaam's emissions are about 12.7617 million tons of carbon dioxide equivalent. This is the first emissions inventory for Dar es Salaam, showing that the city's largest source of emissions is the stationary energy sector, which accounts for 54%, followed by waste at 25% and transport at 21%. The subsector with the highest emissions is residential, followed by road transport and industry.

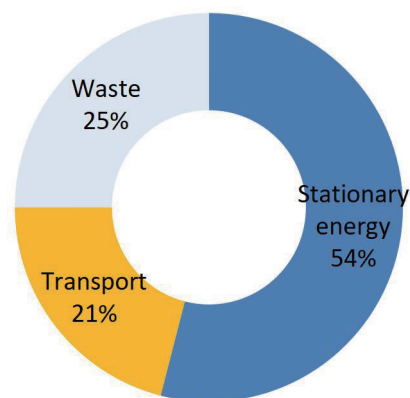


Figure 2-4 Sectoral emissions in Dar es Salaam in 2016

Source: Dar es Salaam Climate Action Plan 2020-2050

(3) Urban planning and actions against climate change

Dar es Salaam is committed to ensuring that all citizens and communities are supported in addressing the impacts of climate change and benefited from the transition to a low-emissions future. It has made an unconditional commitment to achieve the targets set out in the city's "Ambitious Action" scenario: reducing emissions by 29% by 2030 and 65% by 2050 compared to the business-as-usual scenario (BAU). The climate goals set by Dar es Salaam have emerged as Africa's model in sustainable, resilient, and low-carbon development.

In the meanwhile, Dar es Salaam is committed to supporting the goals of the *Paris Agreement*

and the *Deadline 2020* programme, which means achieving at least a 30% reduction in greenhouse gas emissions by 2030 compared to BAU, and achieving carbon neutrality by 2050. Separately, the *Extended Action Plan* for Dar es Salaam shows that, subject to relevant support, the city is on track to reduce emissions by 43% by 2030 and 87% by 2050, which is a conditional target. The climate actions identified to achieve its climate goals are organized around areas such as clean and secure energy, sustainable resources, green mobility, climate resilient urban planning, and solid waste management, incorporating the highest priorities for mitigation and adaptation actions.

Table 2-10 Mitigation and adaptation actions of Dar es Salaam

Sector/industry	Mitigation and adaptation actions
Clean and secure energy	Enhance energy security and energy system resilience Promote public-private partnerships to invest in modern and renewable energy services and projects Improve the resilience of energy systems to the impacts of climate change Develop regulations to encourage household-scale renewable energy Encourage programs to improve industrial facilities, including fuel switching Promote programs to improve energy efficiency of industrial facilities, including fuel switching
Sustainable resource management	Formulate regulations and policies for coke production and use Invest in the protection and maintenance of watersheds and catchments, including flood protection and stormwater harvesting Promote integrated water resource management and development programs Develop strategies and regulations to ensure sustainable extraction of groundwater resources

	Promote initiatives for conservation of aquatic ecosystems and sustainable aquaculture
Green and resilient urban environments	<p>Develop natural green space</p> <p>Mainstream climate change concerns into infrastructure design and development planning</p> <p>Promote the use of climate adaptation technologies in infrastructure design and development</p> <p>Integrate climate change concerns into urban and rural planning</p> <p>Install solar lights on all public roads and public places</p>
Sustainable mobility	<p>Introduce real-time traffic management</p> <p>Develop a public transport master plan and improve the feeder bus system</p> <p>Promote and improve the efficiency of the existing metro network and build more lines by 2040</p> <p>Build a public transport hub</p> <p>Increase use of alternative fuels such as electricity</p> <p>Promote the shift of long-distance freight from road to rail to improve freight efficiency</p>
Solid waste management	<p>Invest in the construction of solid waste dumping sites</p> <p>Increase installation of new wastewater treatment systems to facilitate methane recovery</p> <p>Improve waste recycling</p> <p>Promote wastewater reuse and recycling technologies</p>
Disaster and risk management	<p>Promote climate-related disaster risk reduction in urban and rural planning</p> <p>Strengthen monitoring systems for coastal resource management, erosion and sea level rise, and improve monitoring and early warning systems for sea level rise and extreme weather events</p> <p>Strengthen the sharing of weather forecast information</p>

The quantified targets of various climate mitigation actions of Dar es Salaam are listed in the table below.

Table 2-11 Quantified targets of climate mitigation actions of Dar es Salaam



Sector	Target	2030	2050
Clean and secure energy	Proportion of renewable energy in primary energy consumption	75%	85%
	Percentage of buildings equipped with solar PV	10% residential and 2.5% commercial	40% residential and 10% commercial
	Proportion of energy-efficient residential buildings	5%	15%
	Proportion of buildings equipped with solar water heating systems	30%	70%
	Proportion of buildings equipped with energy-efficient facilities	5%	50%
	Proportion of buildings upgrading lighting to LED	50%	100%
	Ratio of ultra-high-efficiency equipment	30%	58%
Sustainable resource management	Proportion of households using advanced/high-efficiency stoves	30%	70%
	Proportion of households using solar water heaters	30%	60%
	Proportion of new buildings equipped with advanced culinary equipment	50%	100%
Sustainable mobility	Reduce the proportion of travel by small cars	53%	25%
	Proportion of BRT trips	20%	40%
	Proportion of bicycle trips	3%	8%
	Proportion of trips on foot	17%	25%
	Proportion of electric buses	20%	80%

	Proportion of CNG buses	5%	15%
	Proportion of electric private cars	10%	50%
Solid waste management	Waste paper recycling rate	35%	80%
	Waste plastic recycling rate	35%	80%
	Kitchen waste composting rate	35%	80%
	Landfill gas collection rate	15%	45%
	Proportion of wastewater treated with advanced technologies (activated sludge treatment and/or anaerobic digestion with biogas capture)	15%	50%

(4) Summary

As can be seen from the above table, Dar es Salaam has set a number of quantified targets for climate mitigation actions in terms of clean and secure energy, sustainable resource management, sustainable mobility and solid waste management, and each target includes that by 2030 for short-term assessment and that by 2050 for long-term vision. In its long-term vision, the city is committed to building a resilient community and environment, adapting to flood risks, saving water resources and clean energy, and improving community resilience by reducing vulnerable groups, and benefiting society at the level of health, economy, ecosystem and environment, society and community.

V. Jakarta

(1) City profile

Jakarta is the economic center of Indonesia. Its economy is dominated by the financial industry, accounting for 28.7% of the country's GDP. Together with the surrounding Greater Jakarta area, it constitutes the fourth largest city in the world. It is the capital and largest city of Indonesia, as

well as the largest city in Southeast Asia. It is located on the northwest coast of Java Island, with an urban area of about 740 square kilometers and a population of 10.56 million. The surrounding Greater Jakarta area has more than 30 million residents. Jakarta is Shanghai's international sister city. In 2021, Jakarta's per capita GDP reached US\$19,195, which was 4.41 times the national average and 13.35 times that of the province with the lowest per capita GDP.

(2) Urban climate characteristics and emissions

Jakarta has a tropical rainforest climate with an average annual temperature of 27°C. Affected by the equator, from November to April next year, it is west monsoon and from May to October, it is east monsoon. The population of Jakarta is expected to grow to 12 million by 2050. Due to the increase in population, Jakarta is facing a serious “urban crisis”. Problems such as traffic congestion, urban pollution, and ground subsidence are becoming more and more serious. Natural disasters such as flooding, volcanic eruptions, and earthquakes also cast a shadow over urban development. The picture below (Figure 2-5) shows the seawall in Jakarta, and it can be seen that the ground is sinking.



(Source of Figure 2-5: visual. people. cn)

In the face of sea level rise, Jakarta's natural disadvantage is obvious. It is one of the most low-lying, as well as one of the important cities closest to the sea in the world. The whole city is located in a basin on the northwest coast of Java Island, at the estuary of the Java Sea at the mouth of the Jakarta Bay Ciliwung River. The northern part of the city is a low-lying flat alluvial plain, and the southern part is relatively mountainous. There have been some areas with an altitude of -2 meters, that is, below sea level.

The low-lying terrain directly makes Jakarta extremely vulnerable to floods during the flood season. A total of 13 rivers flow through the urban area of Jakarta. The rivers in the southern mountainous areas converge in the lowlands of the northern alluvial plains, making it difficult to discharge into the Bay of Jakarta, resulting in frequent floods during the rainy season. However, the existential crisis in Jakarta today is not directly caused by rising sea levels, but because the megacity itself is sinking: Jakarta is the fastest sinking city in the world, with an overall sinking rate of 5-10 centimeters per year. Some of its coastal areas in the north are sinking at a rate of 25 centimeters a year, and over the past two decades, parts of the north have already sank 4 meters. For comparison, the sea level rise rate in the waters around Indonesia is about 4mm per year. Climate change has brought more and more extreme weather, leading to more frequent urban flooding in Jakarta, and more water sources being polluted after floods, which has caused more consumption of groundwater.



(On January 1, 2020, the suburbs of Jakarta were flooded. Source of Figure 2-6: Twitter)

In 2016, Jakarta recorded GHG emissions of 53.6 MtCO_{2e}, of which 57% was related to grid electricity consumption and 22% was related to fuel consumption of off-grid electricity. An analysis has shown that emissions would grow by 400% from 2010 to 2050 under a business-as-usual scenario. There is ample room for Jakarta to reduce GHG emissions in the sectors of stationary energy, transport and waste treatment, which could help to create jobs, promote equity and improve air quality.

(3) Urban planning and actions against climate change

DKI Jakarta's 2050 urban vision includes: using clean energy in the building environment and industry, high-quality public transportation and safe solid waste management; to become a climate resilient city which could provide equitable opportunities for all residents and create safe, healthy and spiritually enriched lives through urban planning, public services, education, strong cultural heritage and sustainable innovation. In order to achieve this vision, DKI Jakarta has set targets for climate change adaptation and mitigation.

In order to achieve carbon neutrality, DKI Jakarta has committed to reduce greenhouse gas

emissions by at least 49% from 2016 to 2030 compared with BAU scenario (10.65 billion tons of carbon dioxide equivalent), and 62% by 2050 compared with BAU scenario (18.95 billion tons of carbon dioxide equivalent). To achieve the above goals, Jakarta has identified 14 actions with high impact potential as priority strategic climate actions.

Table 2-12 Priority strategic climate actions of Jakarta

Sector	Strategic actions
Mitigation actions	
Construction and Industry	Energy efficiency of commercial buildings
	Industrial energy efficiency
	Green building policy revision
Transportation	Develop public transport
	Electric vehicles for government
Solid waste	Landfill gas collection system
	Anaerobic fermentation of slaughterhouse waste
	Anaerobic fermentation of municipal organic waste
Adaptation actions	
Tackle climate risk	Early warning systems and emergency response planning to predict climate events
	Expand regional healthcare coverage during climate change
	Land use planning and control
	Provide reliable access to clean drinking water
	Retrofit and build urban drainage systems to enhance urban flood resilience
	Protection against coastal flooding, erosion and wear

Classified as “adaptation” and “mitigation”, the relevant quantitative targets are detailed as follows:

Table 2-13 Climate mitigation and adaptation goals in Jakarta's *Climate Action Plan 2021-2050*

Sector	Details	Target by 2030	Target by 2050
Mitigation goals			
Energy	Solar energy (photovoltaic)	10%	25.0%
	Hydropower (large-scale)	5.0%	5.0%
	Geothermal	7.0%	7.0%
	Biofuels	2.0%	5.0%
	Natural gas	14.0%	11.0%
	No. 2 distilled oil	37.0%	31.0%
	Coal (bituminous or black coal)	25.0%	16.0%
Construction and industry ²	Proportion of buildings upgrading hot water systems to high efficiency water heaters	40% ^[r]	80% ^[r]
		60% ^[c]	90% ^[c]
	Proportion of buildings equipped with energy efficient equipment	40% ^[r]	80% ^[r]
		60% ^[c]	90% ^[c]
Transportation	Bus (BRT)	7.7%	15.4%
	MRT and LRT	3.9%	11.6%
	Tram	7.7%	11.6%
	Cycling	1.0%	5.0%
	Walking	1.0%	5.0%
Solid waste	Total percentage of waste reduction	38.0%	70.0%
	Percentage of waste recycling (landfill reduction)	38.0%	70.0%
	Percentage of composting (landfill reduction)	5.0%	15.0%

² [r] stands for residential buildings, [c] stands for commercial building

Tackle climate risks			
Tackle climate risks	Proportion of communities in Jakarta trained and educated to deal with climate hazards	50%	80%
	Percentage of operational early warning systems and disaster information and monitoring systems	100%	100%
	Reduce land subsidence	75%	100%
	Clean piped water supply coverage	70%	100%
	Land use percentages according to provincial planning and regulations	75%	100%
	Green land with storage/drainage function in compliance with provincial regulations	30%	>30%
	Kilometers of new embankments	3km	7.2km
	Inundated areas managed by emergency teams	35%	80%

(4) Summary

In response to climate risks, Jakarta has set up an early warning system and emergency response plan to predict climate events in climate adaptation actions, retrofit and built urban drainage systems to enhance urban flood disaster resilience, and has taken targeted measures to prevent coastal flooding, erosion and wear, etc., so as to reduce the impact of extreme weather disasters on the city. At the same time, Jakarta has clarified the specific timetable for climate mitigation and adaptation goals in the *Climate Action Plan 2021-2050*, with quantitative detailed goals being formulated, and goals for deep emission reduction by 2050 being set. The climate goals are entrenched upon the release of the *Plan*, so as to ensure that the city's climate resilience goals can be realized.

VI. Kuala Lumpur

(1) City profile

Kuala Lumpur is the capital and largest city of Malaysia. The metropolitan area covers an area of 243 square kilometers with an average altitude of 21.95 meters. Together with the 10 surrounding municipalities, it forms the National United City, also known as the Greater Kuala Lumpur Region. According to the Malaysian Bureau of Statistics, the total population of Kuala Lumpur in 2018 was 1.7952 million (including 246,000 foreigners), with a male to female ratio of 1.38, which accounted for 5.54% of the total population of Malaysia. Kuala Lumpur has dense buildings, and 76% of the land has become urban built-up areas. Its GDP in 2021 was US\$190.1 billion, which is equivalent to 1.13 trillion yuan, and the per capita income was 145,916.6 yuan.

(2) Urban climate characteristics and emissions

The urban natural landscape of Kuala Lumpur, including rivers, urban parks and hillsides, has been preserved as the accumulation of development practices over the past ten years. As a tropical city located on the equator, Kuala Lumpur has the typical characteristics of Southeast Asia. It is bordered by the Titiwangsa Mountains in the east and Sumatra, Indonesia in the west. It enjoys a tropical rainforest climate, which is warm and summer-like all year round, with abundant sunshine and rainfall. The temperature is stable all year long. The highest temperature is between 31 and 33 degrees Celsius, and has never exceeded 37.2. The average annual rainfall is 2,600 mm. Although June and July are relatively dry, the average monthly rainfall mostly exceeds 127 mm.

When forest fires break out in Sumatra, the resulting dust and ash will cause severe smog in Kuala Lumpur, which is the main source of pollution in the urban area. There is also air pollution caused by open burning, automobiles and construction activities. Moreover, extreme weather frequently occurs in Kuala Lumpur, and there have been historical records of major

flood events. After a qualitative climate risk assessment, Kuala Lumpur identified four major climate hazards, namely heat, floods (Figure 2-7) storms, and droughts.



(Source of Figure 2-7: www.huanqiu.com/)

According to 2017 data, Kuala Lumpur's total emissions of the year were around 25 million tonnes of CO₂e, and transportation and stationary energy were the main sources of greenhouse gas emissions, accounting for 56% and 41% of emissions, respectively, and road transportation (55.3%) and commercial energy use (24%) are the main reason behind the high emissions of the transportation and stationary energy sectors (Figure 2-8).

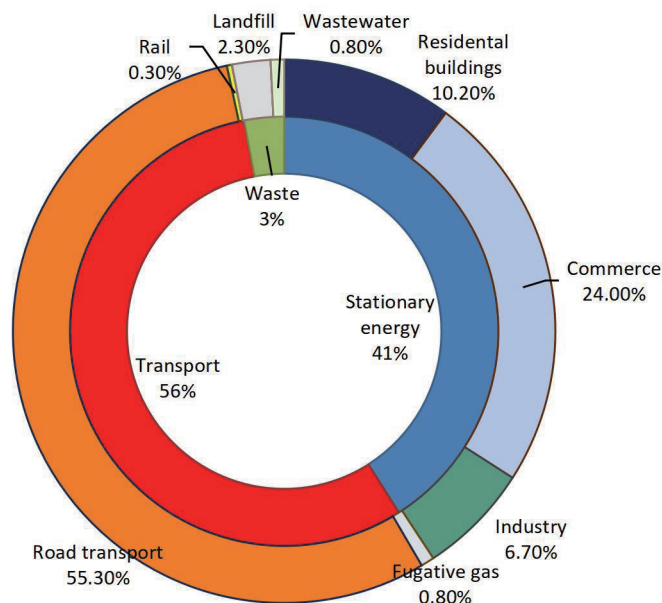


Figure 2-8 Sector and sub-sector emissions in Kuala Lumpur in the 2017 Basic Emissions Inventory

Data source: Kuala Lumpur Climate Action Plan 2050

(3) Urban planning and actions against climate change

Since the beginning of the 21st century, the Kuala Lumpur City Hall has been committed to developing the city into a sustainable and livable one, which can be seen from its 21st Century Agenda, Kuala Lumpur Carbon Management Plan, 2030 Kuala Lumpur Low Carbon Society Blueprint and the Draft Kuala Lumpur Structural Plan 2040, among other initiatives. To accelerate action, the Kuala Lumpur City Hall has developed the Kuala Lumpur Climate Action Plan 2050 to guide local councils and stakeholders in achieving the goals of the Paris Agreement in an inclusive manner. This plan is an expansion of the goals of Kuala Lumpur's 2030 low-carbon society blueprint and it establishes a clear pathway to ensure that Kuala Lumpur is carbon neutral and climate resilient by 2050.

The Kuala Lumpur City Council has set ambitious climate targets: to reduce emissions by 70% by 2030 and 93% by 2050 compared to business as usual. The Kuala Lumpur government has recognized that strong partnerships with stakeholders across all key sectors are essential to the realization of these ambitious goals. It has defined the pathways and actions needed for the

power, buildings and transport sectors and sub-sectors.

The emission reduction targets by sector are divided into two scenarios: city council-led and collaboration. For the power industry, under the city council-led scenario, it is planned to reduce emissions by 7.1% by 2030 and 13.2% by 2050; under the collaboration scenario, emissions would be reduced more sharply: 30.6% and 36.6% respectively. Specific strategies include grid decarbonization, establishment of distributed renewable energy, popularization of building photovoltaics and other renewable energy, and to eliminate fossil fuel power generation by 2050.

For the construction industry, under the city council-led scenario, it is planned to reduce emissions by 11.4% by 2030 and by 23.3% by 2050; due to the increased use of efficient equipment under the collaboration scenario, the expected emission reduction would be slightly higher, 13.7% and 26.5% respectively. The key strategies adopted include improving the energy efficiency of new buildings through the building envelope and energy-efficient equipment, and improving the energy efficiency of existing buildings through the improvement of energy-efficient equipment (air conditioning, lighting, water heaters, etc.). Moreover, government incentives should be increased, while subsidies for inefficient equipment should be canceled.

The transportation industry has the amplest room for emission reduction. Under the council-led scenario, it is planned to reduce emissions by 50.1% by 2030 and 93.1% by 2050. Due to the high popularity of electric vehicles under the collaboration scenario, these numbers would be 65.5% and 93.1% respectively. Specific measures include promoting public transport, reducing the use of diesel, and increasing electric vehicles.

Based on this, Kuala Lumpur formulated the *Climate Action Plan*, starting from the five climate strategies to carry out specific climate actions. The strategies cover the main areas of its climate action process, including travel and infrastructure, green adaptive city, energy-efficient and climate-resilient buildings, waste intelligence, and disaster management. Starting from the above strategies, climate priority actions are formulated (Table 2-14). In terms of mobility and

infrastructure, active mobility modes are encouraged, namely walking, cycling and shared bicycles. Residents are encouraged to travel by public transportation of which convenience is improved. In terms of building a green city, green areas can be increased by building parks to reduce the impact of the heat island effect. In the construction industry, there are plans to promote energy-efficient buildings with high standards and strict scrutiny. In addition, Kuala Lumpur also plans to introduce programs on intelligent waste management and disaster management, so as to reduce the impact brought by them.

Table 2-14 Kuala Lumpur’s priority climate actions

Sector	Priority climate actions
Mobility and Infrastructure	Give priority to active mobility modes in street design, such as introducing pedestrian priority mode and reducing the use of private cars
	Create a route network of safe walking and promote active mobility to improve public health and public mental health.
	Increase affordable housing in areas with good public transportation, improve and expand existing bus routes, and encourage residents to choose public transportation
Green adaptive city	De-pave community public spaces, increase the permeable surface of the public space, guarantee the runoff of rainwater, and provide additional community leisure spaces
	Conserve parks and increase biodiversity areas, mitigate the impacts of urban heat island and stormwater runoff by increasing planted area, and protect sensitive biodiversity areas
Energy efficient and climate resilient buildings	Increase building vegetation coverage, reduce urban heat island at building scale, facilitate stormwater and pollution management
	Review low-carbon building checklists, reduce building energy consumption and improve climate resilience through technical codes
	Establish a building performance benchmarking and rating system, improve energy

	efficiency development, and increase the maximum allowable building energy intensity
	Develop routes to near-zero emission buildings, including emission reduction strategies for the building life cycle
Smart waste management	Develop a waste master plan to reduce solid waste, including waste reduction, strategies and infrastructure for waste reuse and recycling
Disaster management	Develop flood management and response plans and build resilience to floods through early warning systems and disaster response plans
	Develop heat management and response plans, increase citizen awareness of heat-related health effects, monitor local weather conditions, and reduce the impact of extreme heat
	Develop drought management and response plans, raise awareness among citizens about water efficiency, increase water storage capacity at the city level, and reduce the impact of extreme droughts on citizens

In response to the above priority actions, Kuala Lumpur has set short-term (2025), medium-term (2030) and long-term (2050) goals.

Table 2-15 Targets of Kuala Lumpur’s climate strategies and priority actions

Climate strategies	Priority climate actions	Target		
		2025	2030	2050
Mobility and Infrastructure	Street design that prioritizes active mobility	Implement 5 traffic calming demonstration projects every year	150 km of bicycle lane network	300 km of bicycle-only lane network
	Comfortable and safe walking network	50km of pedestrian priority streets; Enhanced first and last mile facilities at 12 CBD transit stations	More than 50% of active mobility is in the shared mode	300 km of pedestrian priority street network; more than 70% of active mobility is in



				the shared mode
Green adaptive city	Conserve parks and increase biodiversity areas	30% of the entire territory of Kuala Lumpur is covered by forests	Create and maintain 50km ² of green public space;	Plant more than 5 million trees
	De-pave community public spaces	5 PPP adaptation project communities per year	25% of ground is permeable and/or stagnant	De-pave communities in 50% of the areas
	Conduct low-impact development	Increase water retention capacity by 20% through eco-based solutions or low-impact development (LID)	-	LID covers the whole territory of 60km ²
Energy efficient and climate resilient buildings	Low carbon building inventory approval	Approval for the inclusion of the Low Temperature Carbon Steel (LCB) List	-	Buildings 100% meets LCB list requirements
	Road map for near-zero-emission buildings	Formulate LCB road map; subsidize 3-5 demonstration projects	More than 30% of buildings meet minimum energy consumption targets	All commercial buildings meet the target Building Energy Intensity (BEI);
	Building vegetation coverage	Complete 5 green building vegetation coverage demonstration projects	Complete 10 green building projects	Complete 30 green building projects
Smart waste management	Waste master planning Solid waste reduction	Popularize zero waste strategy to reduce community waste by 50%	Full implementation of zero waste strategy	Waste recycling rate exceeds 40%;

(4) Summary

Kuala Lumpur has carried out climate vulnerability assessments to identify climate risks and vulnerabilities in different regions, sectors and groups of people in the city, paying special attention to low-lying areas, energy, transportation, construction and other industries that are sensitive to climate change, as well as the elderly, children, and the disabled people who are inherently more sensitive to climate risks, and taking targeted adaptation measures.

Based on the assessment results of climate risk and vulnerability, Kuala Lumpur has carried out targeted adaptation actions and measures. For example, in the face of extreme rainstorms and urban waterlogging, it has improved its physical infrastructure, formulated flood management and response plans, strengthened the ability to resist floods and reduced the impact of extreme events through early warning systems and disaster response plans. Moreover, with its ecological infrastructure, the city has protected its parks, and has increased its biodiversity areas and cultivated areas, so as to mitigate the impact of urban heat island and stormwater runoff, increase the effectiveness of adaptation, and create other co-benefits. Lastly, with its social infrastructure such as social security, intelligent waste management, emergency sanitation and health facilities, the city has protected its vulnerable groups and sensitive industries, and has reduced secondary disasters and slow-onset losses that may be caused by extreme events.

In terms of goal setting, Kuala Lumpur has set up climate strategic priority action goals, including multi-dimensional goals by 2025, 2030 and 2050, making it more trackable. Moreover, more attention has been paid to quantitative description in the setting of specific goals, such as “create and maintain 50km² of green public space”, “300 km of bicycle-only lane network” and so on. Compared with the proportional goal setting of other cities, this method is more operable, and is worth learning.

VII. Quezon City

(1) City profile

Quezon City is located in the Philippines and was established on October 12, 1939 by *Federal Act No. 502*. It is a satellite city of Manila, the capital of the Philippines. It is located 8 kilometers northeast of Manila and occupies about a quarter of Metro Manila. Quezon City is a highly urbanized city mainly because of its strategic location and potential for diverse urban development. In 2016, the population of Quezon was estimated at 3 million, with an average annual growth rate of 1.17% from 2010 to 2015. According to 2019 data from the International Monetary Fund (IMF), its GDP was \$117.7 million.

(2) Urban climate characteristics and emissions

Located in the tropical climate zone, Quezon is warm and humid, with an annual average temperature of about 26 degrees Celsius. There are two seasons in a year: the dry season, from November to April, and the rainy season, from May to October. During the rainy season, Quezon is subject to typhoons and tropical depressions which may bring heavy rainfall (Figure 2-9) and storms.



(Source of Figure 2-9: China-Philippines Mutual Aid Platform)

Land in Quezon City is primarily used for residential and commercial purposes, with considerable areas devoted to open spaces and parks. The main climate risks faced by Quezon include: extreme heat, drought, tropical storms and floods.

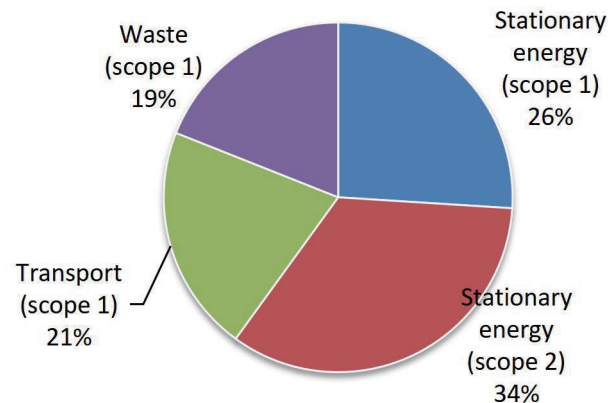


Figure 2-10 Greenhouse gas emissions by industry in Quezon City

Source: *Quezon City Enhanced Local Climate Change Action Plan 2021-2050*

In 2016, Quezon City’s total greenhouse gas emissions were about 8.01 million tons of carbon dioxide equivalent, which mainly came from the stationary energy sector, with Scope 2 accounting for 34% and Scope 1 26%³; followed by transportation and waste, accounting for 21% and 19%. Quezon’s 2050 vision is to be a sustainable, carbon neutral, climate resilient and inclusive city.

(3) Urban planning and actions against climate change

The *Enhanced Local Climate Change Action Plan 2021-2050* affirms the city’s commitment to a sustainable future aligned with the goals of the *Paris Agreement* and the United Nations Sustainable Development Goals. The *Plan* formulates a strategic framework and road map to strengthen climate resilience, achieve carbon neutrality, promote the development of a green economy, and build high-quality communities that are livable for all. By championing climate

³ To facilitate the description of direct and indirect emission sources, improve transparency, and serve different types of institutions, climate policies and business objectives, the GHG Protocol has set three “scopes” (Scope 1, 2 and 3) for greenhouse gas accounting and reporting. Scope 1 is direct greenhouse gas emissions, Scope 2 is indirect greenhouse gas emissions from electricity, and Scope 3 is other indirect greenhouse gas emissions.

leadership, Quezon City aspires to be the leading city in the Philippines driving inclusive, ambitious, pragmatic and transformative climate action to enhance urban climate resilience and promote green economic development while providing a livable and high-quality living environment for all.

The overall reduction target of Quezon City is a 30% reduction in greenhouse gas emissions by 2030, equivalent to a reduction of 3.6 MtCO_{2e}, compared to the BAU scenario, and a commitment to net zero emissions by 2050. The overall adaptation goal is to increase the adaptive capacity of communities and the resilience of natural ecosystems to the impacts of hurricanes, floods, droughts, and heat.

In terms of **climate change mitigation goals**, the Quezon City government will strongly support the achievement of the 30% emission reduction goal by 2030, mobilize the necessary financial resources, capacity building and legislative mechanisms, and implement the prioritized climate change mitigation actions on a large scale. Successful urban climate action will involve broad collaboration of all parties, including the national government, private stakeholders, the majority of young people and international partners.

There are some prerequisites for the scheduled emission reduction targets. First, it is assumed that the Philippine government can achieve the national renewable energy target of 35% in the *Philippine Energy Plan 2016-2030*. Second, large-scale public infrastructure projects, such as new railways, should be completed between 2020 and 2030. Third, some private companies could make a significant contribution to the low-carbon transition by directly improving urban water and electricity distribution systems. Ultimately, support from international partners in funding, technologies, and capability building is indispensable.

In terms of **climate adaptation goals**, Quezon City's adaptation goals emphasize building and strengthening the resilience of its ecosystem and communities to climate risks and threats in a "step-by-step" manner, helping to mitigate climate change while protecting the city from the threat of global warming. Therefore, Quezon City sets out priority climate actions in the following areas in the *Enhanced Local Climate Change Action Plan 2021-2050 (the Plan)*.

Table 2-16 Quezon City’s priority climate actions

Sector	Strategy	Priority climate actions
Food security	Promote urban agriculture and localized food production	Improve urban farms and food production
Water resources	Enhance water security through robust demand-side management	Promotes water conservation and rainwater harvesting
	Build green and gray infrastructure to mitigate flooding and support the water cycle	Nature-based solutions such as drainage swales and flood storage basins
Ecosystem and environmental stability	Prioritize organic, paper and plastic waste treatment through a circular economy	Recycling of organic waste sources
		Avoid waste through green purchasing schemes and banning single-use plastics
		Wastewater treatment systems and facility upgrades
		Recycling of plastic and waste paper
		Circular business model
	Promote nature-based solutions to reduce heat and drought	Build a network of green corridors
Climate smart buildings	Green, energy efficient and resilient buildings	Formulate sustainable action plans for urban biodiversity
		Urban green building code revision
		Incentivize the installation of large and medium-scale renewable energy facilities in high-energy-consuming areas
Sustainable energy	Ensure access to clean and affordable	Mainstream energy efficiency in residential, commercial and industrial sectors
		Solarize all city-owned facilities in three phases



	renewable energy	Take full advantage of the renewable energy policy mechanisms set out in the <i>Renewable Energy Act 2008</i> , including incentive schemes
	Mainstream energy efficiency and energy conservation in public buildings	Mainstream local energy efficiency and conservation programs into the management of government-owned buildings and facilities
	Active transportation by expanding cycling and walking modalities	Integrate cycling and walking trails
		Supplement national public transport with connectivity facilities
	Clean and efficient local BRT and government vehicles contribute to air quality improvement	Local rapid transit system
		Procure zero-emission vehicles for government-owned buses and motor vehicles
		Air quality monitoring and information systems

Table 2-17 Goals of Quezon City’s climate actions

Sector	Target
Food security	Increase the availability, stability and accessibility of safe and healthy food
Water resources	Increase water accessibility, safety, and equity; optimize urban water system management that contributes to flood mitigation
Ecosystem and environmental stability	Reduce the impact or pressure of waste on the environment and ecosystems and achieve a 50% waste diversion target by 2030

Climate smart buildings	Increase green, energy-efficient and resilient buildings, with 80%-100% of permitted buildings compliant with new green building codes by 2025
Sustainable energy	Accessible, clean and affordable renewable energy, 100% of municipal buildings and facilities covered by solar energy by 2030
	Encourage active mobility, increase cycling rate from 2.2% in 2016 to 6.6% in 2030, and increase cycle lanes from 55 km in 2016 to 350 km in 2030
	Expand the use of public transport, increase the proportion of bus travel from 6.6% in 2016 to 8.5% in 2030, and railway travel from 4.2% in 2016 to 6.0% in 2030

(4) Summary

In response to the above priority actions, Quezon City has also formulated short-term goals by 2030 in various fields, including food security, water resources, ecosystem and environmental stability, climate-smart buildings, and sustainable energy. It has also emphasized knowledge and capacity development in the Plan, that is, strengthening the capacity building of city departments, external stakeholders and community institutions, and carrying out cross-cutting strategies and actions. In addition, the *Plan* also pays attention to the safety of vulnerable groups. By reducing the size of vulnerable groups and increasing services for them at the community level, the safety and well-being of groups affected by climate change are guaranteed.

VIII. Buenos Aires

(1) City profile

With a population of more than 3 million, Buenos Aires is the economic and political capital of the Argentine Republic, as well as the largest and most densely-populated city domestically and the seventh largest city in Latin America by population. It has 48 administrative districts, each with its own unique sociocultural and economic characteristics. It is the international sister city of China's Hebei Province, Beijing and Guangzhou.

The city is dominated by the service economy, which accounts for 83% of the gross regional product. At the national level, more than 50% of exported services originate in Buenos Aires. According to data released by the Bureau of Statistics in 2019, the city's GDP was about 850 billion pesos, equivalent to about 11.52 billion US dollars.

(2) Urban climate characteristics and emissions

Buenos Aires enjoys a temperate continental humid climate with four distinct seasons. It is hot and humid in summer and cold and dry in winter. In summer (December to February), the average temperature is about 28 degrees Celsius, and the highest temperature can reach more than 38 degrees Celsius. Precipitation is high with a chance of heavy rain and lightning. In autumn (March to May), the average temperature gradually drops, but the wind strengthens. The main climate risks faced by Buenos Aires include: floods, coastal flooding, and heat waves, mainly flood disasters. Buenos Aires is flanked by two rivers, the Rio de la Plata to the east and the Matanza-Riachuelo to the south, and it also has 11 hydrological basins. Additionally, rainfall has increased by 32% since 1960, exacerbating the threat of flooding.

In 2017, Buenos Aires pledged to become a carbon neutral city by 2050. Now, it has decided to accelerate its emissions reduction plan, speeding up actions to combat climate change in the short to medium term, in order to meet the goal of reducing emissions by more than 50% by 2030. This medium-term goal makes Buenos Aires one of the most ambitious cities in the world to reduce emissions. Greenhouse gas emissions in Buenos Aires totaled 13 million tons of CO₂e in 2015, which mainly came from the use of stationary electricity, followed by transportation services, and finally waste disposal (Figure 2-4).

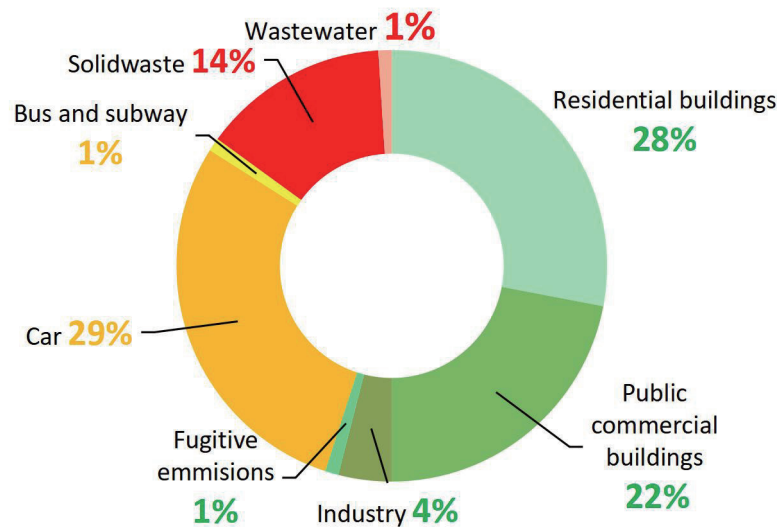


Figure 2-11 Greenhouse gas emissions by industry in Buenos Aires (2017)

Data source: Buenos Aires City Climate Action Plan 2050

The power sector is the largest source of greenhouse gas emissions, accounting for 31%. This is because Buenos Aires relies on the national electricity energy system, which is largely based on fossil fuels. Liquid fuel vehicles such as gasoline and diesel, on the other hand, account for 26 percent of emissions due to the lack of electric vehicles. The use of natural gas has gradually expanded in Buenos Aires and throughout the country, mainly for heating, domestic water heating or cooking. Taxis and private cars emit less, accounting for 24% of total emissions. Solid waste accounts for 14% of emissions. Other fuels such as LPG and sewage account for 5%.

(3) Urban climate characteristics and emissions

Buenos Aires made a commitment in 2017 to become a carbon-neutral city by 2050. In its *Climate Action Plan 2050* (referred to as the *Plan*), more ambitious goals and strategies have been developed, covering all sectors and activities that cause greenhouse gas emissions. It has planned to significantly reduce emissions by 2030, thereby further reinforcing the commitment to achieve carbon neutrality by 2050. Based on the provisions of the *Paris Agreement*, the GHG emission reduction target specified in the *Climate Action Plan 2050* is, starting from 2015, to reduce emissions by 52.9% by 2030 and 84% by 2050.

Table 2-18 Targets by sector in Buenos Aires 2050 Climate Action Plan

Sector	2030 medium-term goal	2050 long-term goal
Transportation	Low-emission cars account for 30% of total car sales	Low-emission cars account for 100% of total car sales
	50% zero-emission buses	100% zero-emission buses
	Passengers use public transport for 75% of their trips	Passengers use public transport for 80% of their trips
Waste	Green waste composting accounts for 80%	80% organic waste (food disposal)
		100% paper and cardboard handling
Energy	15% of residential energy comes from photovoltaics	30% of residential energy comes from photovoltaics
	30% of enhanced residential buildings	80% of enhanced residential buildings
	40% of new buildings are equipped with solar water heating systems	70% of new buildings are equipped with solar water heating systems

Moreover, in response to frequent heat waves and floods, Buenos Aires began to incorporate more citizens into climate governance strategies. Workshops were held for vulnerable groups, informing the elderly of the real-time conditions of heat waves; and making those living in the Riachuelo River Basin (Figure 2-12) aware of the situation of flooding and pollution. The workshops enable neighboring regions to exchange views on climate issues and solutions and will empower vulnerable groups such as the elderly, which not only create a space for communication between the government and neighbors, but also provides a space for the exchange of strategies, information and solutions on climate change among neighbors.



(Source of Figure 2-12: Best Power)

Table 2-19 Overview of Buenos Aires’ priority climate actions and targets

Sector	Priority actions	Targets
Green city	Planting trees and expanding green areas	By 2025, an average of up to 400m of green public space will be formed; by 2050, 100,000 new trees will be planted
Green mobility	Pedestrian priority	Create 15 new pedestrian areas by 2030
	Meeting streets	Build 48 meeting streets by 2030
	Bicycle travel	1 million bicycle trips per day by 2023
	Efficient public transport	30% reduction in travel time on new ‘metro and bus’ corridors by 2035
	Low emission public transport	100% zero-carbon public transport by 2050
Clean city	Strengthen family houses	80% of residential buildings are retrofitted by 2050
	Efficient urban logistics	2 ultra-low emission zones are built by 2030

Energy efficient buildings	More efficient new construction	Reduce emissions by an average of 3.5 million tons of CO ₂ equivalent per year by 2050
	Indoor energy efficiency	100% of public buildings have energy efficiency plans by 2025
Clean energy	Towards cleaner energy	Residential rooftop solar photovoltaic energy accounts for % of residential energy consumption by 2050
Waste management	Towards a circular economy	Composting rate of green waste reaches 80% by 2030
	Strengthen and improve waste sorting at source	100% disposal of paper and board by 2050
	Waste disposal	Disposal rate of organic waste (food) reaches 80% by 2040

(4) Summary

Based on the identified climate risks and major emitting industries, medium-term and long-term goals for major sectors have been formulated by the municipal government. As far as the transportation department is concerned, it is planned to achieve 80%-100% coverage of the three aspects by 2050: encouraging the sales of low-emission cars, expanding investment in zero-emission buses, and encouraging public transportation travel. Considering adaptability and overall benefits, the *Plan* proposes to increase tree planting by 25% by 2025, build 15 pedestrian areas by 2030, and achieve air quality in full compliance with WHO standards by 2050.

To achieve the ambitious climate change goals, the city has identified priority actions in different areas, covering green city (figure 2-12), green mobility and clean city, and has taken into account care for vulnerable groups. Through measures such as building integrated communities, safeguarding public health and food security, and providing green schools, it aims to achieve the construction of an inclusive city by 2050.

IX. Quito

(1) City profile

Quito is the capital as well as the second largest city and the political, economic, cultural and transportation center of Ecuador, and the provincial capital of Pichincha Province. It is located in the canyon at the southern foot of Pichincha Volcano, 24 kilometers south to the equator line. It is the capital closest to the equator in the world, with a population of 2.8 million, according to data in 2020. Quito is an important industrial city in Ecuador and one of the agricultural and animal husbandry bases of Pichincha Province. Its industries include textiles, clothing, food, metal machinery, chemicals, medicine, tobacco, and leather. According to data released by the Bureau of Statistics in 2019, the city's GDP was approximately US\$9.42 billion. Quito and China's Guangzhou City are international friendship cities.

(2) Urban climate characteristics and emissions

Quito is located in the heart of the Andes in Ecuador, and enjoys the subtropical plateau climate. Due to the high altitude, the annual average temperature in Quito is about 13 degrees Celsius, and the main climate disasters include drought, high temperature and heavy rainfall. Quito's carbon footprint mainly comes from transportation, solid waste management, industrial production and household energy consumption, agriculture in rural areas and land use change. In 2015, the total annual emissions of Quito were 7,611,216 tons of carbon dioxide equivalent, of which transportation accounted for 40%, energy 26%, agriculture, forestry and land use change 24%, and waste 10%. From a per capita perspective, in order to achieve its 2050 carbon neutrality goal, the carbon dioxide equivalent emissions need to be reduced from 3 tons in 2030 to 1 ton in 2050.

(3) Urban planning and actions against climate change

Quito has proposed major climate actions to achieve its long-term vision of carbon neutrality and climate resilience by 2050, aiming to promote necessary policy formulation and action

arrangements to slow down the growth of carbon footprints, improve urban resilience, and strengthen society’s ability to respond to climate change, so as to ensure the well-being, health and quality of life of the population. The climate action plan puts forward different requirements for various departments, and proposes 19 actions around different themes such as sustainable buildings and urban growth drivers, land use, environmental functions, and governance methods.

The *2050 Quito Climate Action Plan* sets positive and feasible goals for the next stage of climate action, in which the emission reduction plan is divided into short-term (2023), medium-term (2030) and long-term (2040-2050) goals. Starting from 2015 and by 2023, carbon footprint is to be reduced by 560,000 tons of carbon dioxide equivalent (10% of the total carbon footprint); by 2030, greenhouse gas emissions are to be reduced by 30% and adaptation investment is to be increased by 20%; by 2050, climate neutrality is to be achieved. This action plan lays the foundation for medium and long-term planning and the realization of the 2050 climate neutrality goal.

Table 2-20 List of climate priority actions of Quito

Sector	Strategy	Priority actions
Sustainable buildings and urban growth	Sustainable and eco-efficient buildings with reduced carbon footprint and improved resilience	Eco-efficiency tools and regulations for new construction (residential and commercial) Building eco-efficiency monitoring and evaluation system Eco-efficiency of existing buildings (residential-commercial) Climate finance projects for the management of heritage buildings in the Quito ancient city
	Climate compatible urban standards	Develop a zero-emission urban standard for the Quito ancient city

		Heatwave and runoff urban standards for resilient public spaces Guidelines for climate change adaptation and mitigation in urban and agricultural expansion areas
	Decarbonization of the energy mix	Short-to-medium term distributed renewable energy generation policy Implementation of off-grid household renewable systems (solar, wind) outside the grid system
	In compliance with climate-neutral land use	Prioritize resilient areas with favorable soil banks to reduce climate hazard risk Establish a land management mechanism for rational use of cultivated land and its capacity Integrate standards and measures to reduce risk of extreme events and climate vulnerability in river management plans
Integrated water resources management	Improve infrastructure resilience to climate change	Sustainable urban drainage systems (SUDs) Optimize the operation of water supply system based on hydrological analysis Reduced water footprint, hydroelectric power generation
Waste management	Utilization of organic waste	Use organic waste from the market Eco-zone projects using organic waste at household and community levels Landfill gas collection
Sustainable mobility	Zero-emission public transport	Urban bus corridor electric mobility project Solutions and projects for urban electrification Optimize and create road profiles for bike lanes
	Comprehensive and	Adjustment of regular and feeder routes and frequencies

	efficient public transport	
	Traffic activity	Sustainable urban mobility program Add bike lanes to strengthen public bike programs

According to Quito’s climate action plan, the emission reduction measures of various industries and their development goals at different stages are summarized in the following table:

Table 2-21 Industrial emission reduction measures and stage objectives of Quito

Sector	Priority climate actions	Goal	
		Mid-term goal	Long-term goal
Transportation	Zero-emission transport	52% of electric buses (2030)	100% of electric buses (2040)
	Integrated public transport	13% of travel by private car, 20% by walking or cycling, and 67% by public transport (2030)	7% of travel by private car, 25% by walking or cycling, 68% by public transport (2050)
	Zero emission city	Recycling electric vehicles (2023), 100% implementation of public bike station scheme and island intermodal (2030)	—
	Enhance urban traffic mobility	—	Plan 700 km of bicycle lanes (2040)
Architecture	Develop sustainable buildings	40% reduction in household energy consumption in eco-efficient houses (2030)	All new and existing residential and commercial buildings are equipped with energy efficient lighting systems (2050)
	Reduce carbon footprint	50% of new buildings will use water pumps, solar energy and	60% of new buildings are equipped with water pumps, solar

		other energy-efficient equipment and technologies to heat water (2030)	energy and other energy-efficient equipment and technologies to heat water (2050)
Energy	Decarbonization of the energy mix	Renewable resources (hydropower) account for 90% (2023) Solar power generation reaches 10% (2030)	Solar energy application rate reaches 15% (2050)
Waste management	Waste recycling	Per capita urban solid waste production reduces by 4% (2023)	80% recycling rate of potentially recyclable waste (paper and plastic) (2050)
	Organic waste utilization	Establish organic waste recycling centers in at least four districts (2023)	80% organic waste utilization through composting and food recycling (2050)
	Harvest landfill gas to generate electricity	The installed capacity of landfill and biogas plants is increased to 7MW, which can capture 80% of the total gas produced by the landfill (2030)	—
Environmental capability	Carbon and water footprint offset	200 hectares of vegetation are ecologically restored (2030)	100% land restoration (2050)

(4) Summary

In addition, Quito has set a series of climate adaptation actions in the fields of water resource management, land planning and use, environmental greening, and infrastructure. In terms of water resource management, the city plans to promote water footprint and carbon footprint



offsets, improve water resource management infrastructure and treatment systems, and maintain biodiversity and carbon sinks in water areas in key areas. In terms of land planning and use, Quito City plans to integrate the concepts of sustainable development and climate adaptability, enhance the city's climate resilience in planning, and use land according to the characteristics of various industries. Quito City is committed to preserving the natural integrity in the field of environmental greening, while strengthening the management of environmental functions, building and protecting more green spaces. It has also planned to complete the construction of five "urban green networks" by 2050. For infrastructure construction, the city has set the overall goal of guaranteeing basic services for all citizens and promoting the construction and renovation of new public works to withstand the risks posed by climate change.

X. Summary

The IPCC AR6 report of the United Nations Intergovernmental Panel on Climate Change made a comprehensive assessment of urban adaptation paths, believing that there is a wide range of adaptation deficits in cities on all continents, and there is a general tendency to emphasize mitigation and neglect adaptation. In the future, vulnerable urban areas, groups, and fields should especially strengthen current adaptability, advance adaptation planning, and tap adaptation potential. By combining and analyzing the climate risks, mid- and long-term visions, mitigation and adaptation goals, and key strategies and measures of climate adaptation actions in the above eight cities, it can be found that the action plans of the target cities are described in varying degrees of detail, mainly involving waste, transportation, energy, etc.

Based on the set goals and visions, the target cities set up practical actions based on their own advantages. For example, Addis Ababa, Quezon, and Quito have specially planned urban agriculture to ensure urban food security. In addition to the resilience of engineering facilities and social infrastructure, Dar es Salaam has proposed an action plan to create a resilient economy, which includes promoting diversified tourism products and promoting the diversification of sustainable livelihoods in communities that rely on natural capital in the city.

Funding is an implicit and key element. Most cities have emphasized the problem of funding gaps in the difficulties and obstacles. Some cities (such as Accra) have made it clear in their action plans that they need to establish special groups to explore and test new financing models. Some cities in China (such as Beijing, Shanghai, Wuhan, Shenzhen, Chengdu) are carrying out climate investment and financing pilot projects to further promote urban climate actions.

At the same time, the target cities have set ambitious renewable energy targets in their climate action plans. Dar es Salaam strives to increase the proportion of renewable energy in primary energy consumption; Jakarta increases the proportion of solar energy in energy consumption. Several target cities have set transportation electrification goals: Jakarta requires to increase the use of green transportation; and Buenos Aires strives to build efficient and low-emission public transportation. Through Table 2-22, it can be preliminarily concluded that in 2030, there will be great investment potential in the electric vehicle, green building, and public transportation industries. Jakarta, Kuala Lumpur, and Quezon City are located in Southeast Asia, where future major investments will be concentrated in the field of green buildings. Buenos Aires and Quito are in Latin America, where future investment will be concentrated in the field of green buildings and green transportation.

An overview of the climate actions of each target city is shown in the table below:

Table 2-22 Overview of climate actions and targets of the target cities

City	Sector/industry	Climate mitigation priority actions	Related industry goals and visions
Addis Ababa	Waste, transportation, energy, urban planning, ecosystems, etc.	Facilitate waste classification system Construct composting facilities, etc.	The composting rate of organic waste is 70% (2050) Eliminate landfill dumping of organic waste (2050)
Accra	Solid waste and sewage, energy building, transportation, etc.	Solid waste optimization strategies Separation of dry and wet waste at source, etc.	Landfill gas collection rate reaches 90% Environment and drainage system zero waste
Dar es Salaam	Clean and secure	Enhance energy security and	Increase the proportion of



Salaam	energy, sustainable resource management, green and resilient urban environment, etc.	energy systems resilience Foster public and private sector partnerships to invest in modern renewable energy services and projects, etc.	renewable energy in primary energy consumption Increase the proportion of solar photovoltaic installations in buildings
Jakarta	Construction and industry, transportation, solid waste, addressing climate risks, etc.	Energy efficiency in commercial buildings Industrial energy efficiency Green building policy revision Development of public transport, etc.	Improve the application range of energy fields such as solar energy, large-scale hydropower, and geothermal Increase the proportion of green transportation Increase the proportion of waste recycling
Kuala Lumpur	Mobility and infrastructure, green adaptive cities, energy-efficient and climate-resilient buildings, smart waste management, etc.	Promote walking, increase biodiversity areas, formulate zero-emission building routes, reduce solid waste generation, etc.	Street design that prioritizes active mobility Conservation of parks and enhancement of biodiversity areas Design a near-zero emission building road map
Quezon City	Food security, water resources, ecosystem and environmental stability, climate-smart buildings, sustainable energy, etc.	Promote urban agriculture and localized food production Build green and gray infrastructure to mitigate flooding and support water cycle Prioritize the treatment of organic, paper and plastic waste Ensure access to clean and affordable renewable energy	Increase the availability, stability and accessibility of safe and healthy food Increase the accessibility, safety and equity of water resources; Increase green, energy-saving and resilient buildings
Buenos Aires	Green city, green travel, clean city, energy-efficient building, clean energy, waste management, etc.	Increase the total sales of low-emission cars and the proportion of zero-emission buses Improve the composting rate of green waste Increase the proportion of photovoltaics, enhanced	Plant trees and expand the green area Create multiple pedestrian areas that meet the street Create efficient public transport and low-emission transport Strengthen family housing

		residential buildings, solar water heating systems, etc.	renovation and improve efficient urban logistics Towards a cleaner energy, circular economy
Quito	Sustainable buildings and urban growth, integrated water resource management, waste management, sustainable mobility, etc.	Sustainable and eco-efficient buildings with reduced carbon footprint and improved resilience Climate compatible urban standards Improve infrastructure resilience to adapt to climate change	Promote zero-emission vehicles and integrated vehicles Develop sustainable buildings and reduce carbon footprint Waste recycling, organic waste utilization, etc.

XI. Chinese cities

(1) Climate vulnerability

As the largest developing country, China has a higher level of climate vulnerability than the global average. Climate change has had serious adverse effects on China’s natural ecosystems and such effects have spread to the economic and social systems. The *National Climate Change Adaptation Strategy 2035* has pointed out that due to the complexity of China’s climate, climate change and its impacts vary in different regions. Northeast China mainly faces the risks of summer floods and increased vulnerability of permafrost. The contradiction between supply and demand of water resources in North China is prominent, and the urban heat island effect is serious. Urban rainstorms and waterlogging, as well as high temperature and heat waves, have become more and more frequent in East China. Rising sea levels are threatening the safety of coastal cities. Drought and flood disasters occur frequently in central China, with increased risk of ecosystem degradation and declined level of biodiversity. Extreme weather and climate events such as high temperature and heat waves, torrential rain and floods, typhoons, and storm surges happen frequently in South China. As for Northwest China, it is witnessing recurrent

snowmelt floods and the increased vulnerability of water resources and ecosystems. In Southwest China, aridity has become more and more serious, and the pressure on water and soil conservation and biodiversity protection is increasing.

(2) Emissions and carbon neutrality goals

China attaches great importance to addressing climate change. As the largest developing country in the world, China has overcome its own economic and social difficulties, implemented a series of strategies, measures and actions to address climate change, participated in global climate governance, and achieved positive results. In 2020, China announced new targets and measures for nationally determined contributions to address climate change: China's carbon dioxide emissions will peak before 2030, and strive to achieve carbon neutrality before 2060; by 2030, its carbon dioxide emissions per unit of GDP will drop by more than 65% compared with 2005, and the proportion of non-fossil energy in primary energy consumption will reach about 25%, while forest stock will increase by 6 billion cubic meters compared with 2005, and the total installed capacity of wind power and solar power will reach more than 1.2 billion kilowatts. The *National Climate Change Adaptation Strategy 2035* issued in 2022 clearly states that the pilot projects of climate-adaptive cities will make significant progress in 2025, and that a climate-adaptive society will be basically established by 2035.

There are only 30 years between carbon peak and carbon neutrality, and China faces many challenges before truly achieving the above goals. As China is advancing industrialization and urbanization, its economy is still maintaining a medium-to-high speed growth, and its energy consumption continues to maintain a rigid growth. The challenge lies in the fact that China's economy is prone to heavy industry, energy is prone to coal, and efficiency is low. The high-carbon path over the years has a large inertia. Taking the energy structure as an example, fossil energy consumption accounts for about 85%, and coal-fired power generation even accounts for about 62% of the total power generation; in terms of industrial structure, the world-recognized high-carbon and difficult-for-emission reduction industries, including coal,

steel, petrochemicals, and cement, account for an excessively high proportion.

Achieving carbon neutrality is a wide-ranging and profound economic and social change that requires arduous efforts. The Chinese national government has issued the *Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality in Full and Faithful Implementation of the New Development Philosophy* and *Action Plan for Carbon Dioxide Peaking Before 2030*, which constitute the top-level design documents for carbon peaking and carbon neutrality, and are the governing documents in the “1+N” policy system. Other documents include the implementation plans for energy, industry, urban and rural construction, transportation, agriculture and rural areas and other sub-sectors. China is also actively planning for guarantee programs such as technology, finance, price, carbon sinks, energy transformation, coordination of pollution and carbon reduction, further clarifying the timetable and road map for carbon peak and carbon neutrality, and comprehensively promoting the realization of positive results.

In 2021, in order to guide and coordinate carbon neutrality and carbon peaks, the central government established a leading group. All provinces (autonomous regions and municipalities) followed the lead and successively set up leading groups for carbon neutrality and carbon peaks to strengthen the coordination of work. Actions on addressing climate change cover a wide range of areas. In order to strengthen coordination and form a joint force, China has established a national leading group on climate change, energy conservation and emission reduction, with the Premier of the State Council as the team leader and 30 relevant ministries and commissions as the members, which was followed by the establishment of provincial-level leading groups. China’s “14th Five-Year Plan” and the 2035 long-term goal outline set carbon dioxide emissions per unit of GDP as a binding indicator, and all provinces (autonomous regions, municipalities) in China regard addressing climate change as an important content of the “14th Five-Year Plan”, specifying goals and tasks.

In order to ensure the realization of the planning and goals, China has determined the provincial carbon emission targets by category, taking into account the development stage, resource endowment, strategic positioning, ecological environmental protection and other factors of

various provinces (autonomous regions, municipalities). Assessments have been conducted on the responsibilities of provincial governments in the control of greenhouse gas emissions, of which results serve as an important basis for the comprehensive evaluation of the main responsible persons and leading groups of each province (autonomous region, municipality), as well as the reward & punishment and appointment & dismissal of leaders. Provincial governments also conduct similar assessments on the lower-level administrative regions, so as to ensure that actions on addressing climate change and reducing greenhouse gas emissions are effective.

(3) Main actions of cities to address climate change

As the supporting force of economic development and the main area to deal with climate change, Chinese cities are actively taking actions to respond to relevant national policies, and are formulating plans and strategies related to climate change in light of their own development level, industry and resource conditions. According to the relevant plans released by some cities (including Beijing, Shanghai, Shenzhen, Wuhan, Chengdu, Qingdao, Hangzhou, etc.), including but not limited to the “14th Five-Year Plan” period ecological environmental protection planning, climate change planning, green transformation and development plan, optimization of energy structure and promotion of urban green development action plan, comprehensive disaster prevention and mitigation plan, “zero waste city” construction implementation plan, sponge city construction special plan, carbon peak implementation plan, etc., we summarize the main actions of Chinese cities to deal with climate change, as shown in the following table:

Table 2-23 Major actions of Chinese cities to address climate change

Task	Action	Itemized action	Related quantitative indicators
Comprehensively promote green and low-carbon circular development	1. Deeply promote the optimization and adjustment of industrial structure	1. Systematically promote industrial structure upgrading 2. Continuously promote industrial green transformation 3 Deeply promote	<ul style="list-style-type: none"> The proportion of non-fossil energy consumption is $\geq 50\%$ in Chengdu, $\geq 20\%$ in Hangzhou, $\geq 20\%$ in Shanghai, $\geq 20\%$ in Wuhan, $\geq 15\%$ in Qingdao, \geq

		energy-saving refined management 4. Strengthen energy conservation and carbon reduction of new infrastructure	14.4% in Beijing, and about 32% in Shenzhen
1. Deeply promote low-carbon transformation of energy structure		1. Control the scale of fossil energy utilization 2. Vigorously promote the utilization of renewable energy 3. Accelerate the construction of new power systems 4. Promote the electrification of end-use energy fields 5. Improve energy utilization efficiency	
3. Solidly promote the transformation and upgrading of urban functions		1. Lead the green upgrade of urban planning and construction 2. Promote the differentiated development of key regions 3. Comprehensively promote the transformation and optimization of regional functions	
4. Promote industrial green and low-carbon transformation and upgrading		1. Control the development of high-carbon projects and eliminate backward production capacity in accordance with laws and regulations 2. Promote the low-carbon transformation of traditional manufacturing 3. Build a green manufacturing system	



		4. Implement differential electricity prices and expand its implementation scope	
	5. Create a green and low-carbon circular economic system	<ol style="list-style-type: none"> 1. Promote digital transformation of the economic system 2. Realize low-carbon circular development of economic industry 3. Accelerate the cultivation and development of strategic emerging industries and future industries 4. Vigorously develop green modern service industry 5. Accelerate the development of ecological circular agriculture 6. Encourage the development of energy-saving and environmental protection industries 	
Strictly control greenhouse gas emissions in key areas	1. Comprehensively promote low-carbon development in the construction sector	<ol style="list-style-type: none"> 1. Promote the green and low-carbon transformation of urban and rural construction 2. Strictly implement energy-saving standards for new buildings 3. Vigorously promote ultra-low energy consumption buildings 4. Promote energy-saving renovation of existing buildings 	<ul style="list-style-type: none"> • By 2025, the proportion of new buildings that implement green building standards will be 100% in Beijing, 100% in Qingdao, 100% in Chengdu, 100% in Wuhan, and 100% in Hangzhou • Proportion of star-rated and above green buildings in new buildings, Qingdao \geq 60% • By 2025, the proportion of

		<p>5. Strengthen the refined management of energy consumption in building operation</p> <p>6. Conduct demonstrations of ultra-low and near zero energy consumption buildings</p>	<p>prefabricated buildings in new civil buildings is $\geq 50\%$ in Wuhan, $\geq 35\%$ in Pearl River Delta cities, $\geq 60\%$ in Shenzhen, and 35% in Hangzhou</p>
	2. Strive to build a low-carbon transportation system	<p>1. Promote the low-carbon transformation of transportation equipment and accelerate the optimization of vehicle structure</p> <p>2. Actively guide green mobility</p> <p>3. Build a green and efficient transportation system</p> <p>4. Accelerate the construction of green transportation infrastructure</p> <p>5. Accelerate transportation fuel substitution and optimization</p> <p>6. Build an efficient smart transportation system</p>	<ul style="list-style-type: none"> • By 2022, strive for more than 70% of green mobility in 60% of the cities • By 2025, the sales of new energy vehicles in China reaches about 20% of the total • By 2025, in addition to emergency rescue support, the proportion of new and updated buses using clean and new energy is 100% in Qingdao, 100% in Wuhan, and 100% in Shenzhen • By 2035, strive to fully electrify vehicles in the public sector, and pure electric vehicles become the mainstream of new vehicles • Support places where conditions permit to set up pilot areas where fuel vehicles are prohibited, and on the basis of success, coordinate research and formulate a timetable for the withdrawal of fuel vehicles
	2. Continuously	1. Improve the overall	



	<p>promote energy conservation and carbon reduction in public institutions</p>	<p>coordination mechanism for energy conservation and carbon reduction in public institutions, strengthen the management capacity of energy and resource conservation, and accelerate the formation of a comprehensive energy conservation and carbon reduction work system.</p> <p>2. Implement the total amount control of energy resources, continuously improve the utilization efficiency of energy resources in public institutions, further increase the proportion of renewable energy, and extensively carry out green life creation actions such as energy-saving institutions.</p> <p>3. Promote public institutions to play a leading role in low-carbon development.</p>	
	<p>3. Control non-carbon dioxide greenhouse gas emissions</p>	<p>1. Control methane emissions from oil and gas systems</p> <p>2 Control GHG emissions in industrial production processes</p> <p>3 Control methane and nitrous oxide emissions from the agricultural sector</p> <p>4 Control methane and nitrous oxide emissions from waste treatment</p>	<ul style="list-style-type: none"> • By 2025, the national urban solid waste recycling rate reaches more than 35%, and the harmless treatment rate of urban solid waste reaches no lower than 99% • Construction of “Zero Waste Cities”: Shenzhen, Qingdao, Wuhan, Hangzhou; Shanghai: zero solid waste landfill
Enhance carbon	1. Systematically	1. Enhance carbon sink capacity	<ul style="list-style-type: none"> • The forest coverage rate is

sink capacity	improve the carbon sink capacity of urban ecosystems	<p>of forestry ecosystem</p> <ol style="list-style-type: none"> 2. Increase wetland carbon sink 3. Consolidate the carbon sink capacity of agricultural ecosystems 4. Improve the service function of urban ecosystem 	<p>66.85% in Hangzhou, 45% in Beijing, 41% in Chengdu, 37% in Shenzhen, 19.5% in Shanghai, and 15% in Qingdao</p> <ul style="list-style-type: none"> • Realize “green to be seen within 300 meters, gardens to be seen within 500 meters”
Strengthen the construction of urban climate adaptability	1. Strengthen climate change adaptability	<ol style="list-style-type: none"> 1. Improve the ability of urban lifelines to cope with climate change 2. Perfect urban nature-based solutions 3. Adjust and optimize the layout of urban functions 4. Strengthen urban flood defense capacity and water supply guarantee 5. Strengthen the adaptability of urban energy, transportation, and sanitation infrastructures and climate resilience in the economic and social fields 	<ul style="list-style-type: none"> • By 2025, the ratio of the city’s sponge city area reaching the standard will be $\geq 40\%$ in Beijing, $\geq 40\%$ in Shanghai, $\geq 50\%$ in Wuhan, 55% in Hangzhou, and $\geq 80\%$ in Shenzhen • Focus on 31 key flood control cities and cities along major rivers. By 2025, waterlogging points that seriously affect production and living order will be completely eliminated, and the phenomenon of “see the sea from the city” will no longer appear in new urban areas; by 2035, drainage and waterlogging prevention capabilities will better match the requirements for building climate-adaptive cities, sponge cities, and resilient cities • By 2035, cities at the prefecture level and above across the country will fully implement the construction of
	2. Establish a climate crisis prevention system	<ol style="list-style-type: none"> 1. Strengthen climate risk identification and disaster assessment 2. Improve the meteorological disaster monitoring, forecasting and early warning system, and improve the early warning level in key and vulnerable areas 3. Improve comprehensive disaster prevention, mitigation and relief capabilities 	



		<p>4. Promote government service platforms, community perception facilities and home terminal connectivity, and develop community-benefiting services such as intelligent early warning</p> <p>5. Focus on improving the risk protection capabilities of vulnerable groups</p>	climate-adaptive cities
Improve governance capabilities for responding to climate change	1. Strengthen the construction of laws and regulations and standards	<p>1. Improve legal systems and policy measures</p> <p>2. Accelerate the standardization of energy conservation and carbon reduction</p>	
	2. Strengthen target responsibility and supervision and assessment	<p>1. Consolidate the target responsibility supervision system</p> <p>2. Improve the decomposition and assessment mechanism</p> <p>3. Strengthen the management of energy saving and carbon reduction in key units</p>	
	3. Explore the market mechanism for addressing climate change	<p>1. Further improve market mechanisms such as carbon emissions trading</p> <p>2. Actively participate in the national carbon market</p> <p>3. Promote energy price reform</p> <p>4. Build a green financial support system</p> <p>5. Explore the inclusion of the</p>	

		carbon inclusive mechanism into the carbon trading market	
	4. Establish a digital and intelligent management system	<ol style="list-style-type: none"> 1. Consolidate the data foundation 2. Compile greenhouse gas emissions inventory 3. Establish a greenhouse gas emission monitoring system 	
	5. Construct a pattern of joint action by all	<ol style="list-style-type: none"> 1. Guide the low-carbon supply of commodities and advocate simple and moderate green consumption 2. Advocate a low-carbon healthy lifestyle 3. Strengthen the content construction of climate change publicity and education 	
Promote scientific and technological innovation and pilot demonstrations	1. Accelerate technological innovation for energy saving and carbon reduction	<ol style="list-style-type: none"> 1. Increase support for energy-saving and carbon-reducing technological innovations 2 Demonstration and promotion of innovative technology applications 3. Strengthen the research on major basic issues and the cultivation of professional talents 	
	2. Optimize the energy-saving and carbon-reducing service industry	<ol style="list-style-type: none"> 1. Actively cultivate a policy environment conducive to industrial development 2. Vigorously develop energy-saving and 	

		carbon-reducing financial services	
	3. Strengthen the construction of pilot demonstration projects	1. Strengthen the construction of low-carbon pilot demonstration projects 2. Carry out climate investment and financing pilot projects	

(4) Summary

Among cities around the world, there exists large gaps in resource endowment, economic conditions, and climate characteristics. To improve the adaptability of urban systems, we shall take into consideration a multiplicity of factors such as risk assessment, policy, capital, technology, and international cooperation.

First of all, we should carry out a comprehensive climate vulnerability assessment. We should identify the climate risks and vulnerabilities of different regions, sectors and population groups in the city, and take targeted adaptation measures. Based on the assessment results of climate risk and vulnerability, cities can design their own adaptation actions and measures. For example, in the face of extreme rainstorms and urban waterlogging disasters, cities can try to transform their physical infrastructure.

Secondly, we should formulate policies and regulations that are in line with reality. Cities need to formulate climate change adaptation plans and policies, clarify climate adaptation goals and indicators, and develop special plans for key areas such as temperature rise, flood disasters, drought, water supply, and public health. In addition, since adaptation to climate change involves multiple functional departments, the government needs to establish or make good use of existing mechanisms to ensure the sound coordination and cooperation among relevant departments.

Thirdly, we should introduce social capital to make up for the lack of funds. Adaptation to climate change requires us to give full play to the leading and mobilizing role of public funds.

For private capital, adaptation projects are not very attractive for investment due to factors such as scale, return on investment, and climate performance evaluation. Therefore, we could resort to mixed financing methods to leverage public funds and attract private capital to projects and industries with adaptation benefits.

Fourthly, we should establish a sound adaptation evaluation index system. We should regularly conduct assessments and disclosures of adaptation effectiveness. For infrastructure improvement projects or nature-based solutions in which positive results have been achieved, we should strengthen the experience summary of the implemented action items, and summarize the models that can be promoted and applied.

Fifthly, we should strengthen international exchanges and cooperation. By strengthening international exchanges and practices, we should improve climate adaptation governance and actions step by step. To address climate change, a challenge shared by all countries, relevant adaptation practices have been carried out in different regions and some positive results have been achieved. By strengthening international exchanges and cooperation, we can not only exchange experience, improve our climate adaptation policy systems, but also broaden financing channels to support the construction of urban climate adaptation.

Chapter 3: Climate Action Priorities and Cooperation

Opportunities in BRI Cities

Based on the above city level case studies in BRI countries, this chapter analyzes the common measures being taken to deal with climate change in developing country cities. The chapter compares and summarizes the priority areas for climate action and cooperation, as well as briefly describing the industrial partnership potential for specific sectors in these cities. Some major international financing service platforms are presented for the awareness of city officials and other relevant urban policy stakeholders. In addition, the BRI International Green Development Coalition (BRIGC) and the C40 Cities Climate Leadership Group organized a series of side events during the 27th session of the Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC) to seek the views of city representatives from China and Africa in relation to their interests in city level climate change cooperation - these discussions are also outlined in this chapter.

I. Key areas of urban climate action

Mitigation and adaptation are the two priority responses to climate change. Concerning climate adaptation, the Sixth Assessment Report (AR6) report of the Intergovernmental Panel on Climate Change (IPCC) made a comprehensive assessment of urban adaptation pathways due to widespread adaptation deficits and a tendency to emphasize mitigation whilst neglecting adaptation in cities across all continents. In the future, it will be necessary to strengthen adaptation planning and implement adaptation practices in vulnerable urban communities. Climate change severely impacts human settlements and critical infrastructure, touching on a range of sectors vital to stable economic functioning, including energy, water, food, transportation, health, sewage treatment, communication systems, etc. In turn these impacts are felt throughout urban social support systems, including cultural practices, capital availability,

social protection, community, health, education, etc. Natural infrastructure is also negatively impacted through the degradation of green and natural space .

As such, 21 measures are proposed in the AR6 report for urban climate resilience development. Enhanced engineering infrastructure is seen as a foundation for urban climate resilience, helping cities deal with climatic disasters. Moreover, the integration of adaptation measures across a range of infrastructure systems can create interlocking effects. Climate change adaptation in engineering infrastructure covers everything from urban morphology and architectural form, to architectural design, information and communication technology (ICT), energy, transportation, water and sanitation, flood management, and coastal management. There is also considerable overlap between dealing with the adaptation of urban infrastructure and climate mitigation measures, as is evidenced by analyzing the ambitions and action strategies outlined in the on climate change plans of cities within this report.

From looking at the climate actions of a range of cities, the common measures being taken for climate mitigation and adaptation as follows:

Table 3-1 Priority areas for city responses to climate change

Industry	Key areas
Urban morphology and construction	<ul style="list-style-type: none"> • Risk control: urban climate risk assessment, planning and early warning systems; emergency plans for urban disaster prevention and mitigation, emergency shelter engineering facilities • Urban development: public transportation-oriented development (TOD)/ecological environment-oriented development (EOD); complex functional neighborhoods (green and thriving neighbourhood, 15-minute living circles); urban low-impact development; street LED lighting • Waste management: increase recycling and improve waste disposal • Urban economy: urban climate finance mechanisms and solutions; urban circular economy system construction

Industry	Key areas
Energy	<ul style="list-style-type: none"> • Digital management: smart cities, disaster monitoring, information warning and dissemination <hr/> <ul style="list-style-type: none"> • Fossil energy control: control and reduce the scale of fossil energy; upgrade coal-fired units • Vigorous development of renewable energy: establish incentive policy for renewable energy development; enhance the proportion of renewable energy; develop local renewable energy (distributed photovoltaic (PV), wind energy, green hydrogen, solar water heaters, heat pumps, clean stoves, etc.) • Grid upgrade: electrification of end-use energy; integrated of generation, grid, load, and storage (building urban smart microgrids); the digital transformation of energy (efficiency power plants) • -Energy system: demand-side response mechanism and system implementation; energy institutional mechanism reform; energy security system and emergency response program • Digital management: energy management system
Architectural design and construction	<ul style="list-style-type: none"> • Green building (eco-building) standards and incentives • Low-carbon structural buildings • Prefabricated buildings • Structural optimization on building energy use (e.g. building photovoltaic) • Application of energy-efficient facility
Transportation	<ul style="list-style-type: none"> • Improve emission standards: upgrading infrastructure standards for roads, ports, railways, parking lots, etc.; vehicle emission standards; production and promotion of low- and zero-emission vehicles • Incentives to optimize urban vehicle structure (e.g., the exemption for auto-purchase tax, green-car subsidies, shared vehicle management, etc.) • Encourage public transportation: decarbonize and electrify public transportation; create safe and convenient



Industry	Key areas
	non-motorized travel conditions (pedestrian greenways, bicycle lanes, traffic calming demonstration projects) <ul style="list-style-type: none"> • -Improve green transportation infrastructure (such as shore power equipment at port berths, shore power facilities at container wharfs, and charging stations for electric vehicles) • Intelligent transportation management
Water supply and drainage	<ul style="list-style-type: none"> • Management and optimization of urban water resources • Sewage and wastewater treatment • Biogas collection and utilization

II. Identified priority city climate action cooperation areas of opportunity

The IPCC report provides scientific guidance for climate cooperation among BRI cities. In practice, the requirements of developing countries and developing country cities must underpin such cooperation. Thus, in-depth research on the real world needs of cities in addressing climate change form the basis for assessing the priority direction of city-to-city climate cooperation. During COP27, representatives from developing countries, especially those from BRI countries, showed great concern and interest in China’s climate goals. Furthermore, this interest extended to initiatives and achievements being taken in and by China in dealing with climate change, including the actions of cities. However, despite discussions and exchanges, as it stands the understanding of Chinese city level climate action efforts are limited amongst BRI countries. A baseline understanding of China and Chinese cities’ efforts on developing renewable energy and promoting electric vehicles and related technologies exists, but not always wider work in other areas of addressing climate change. Therefore there is a desire to learn more about Chinese cities’ experiences and practices, across a broad range of climate action topic areas.

Cities are not only acting as the main implementer of national level climate policy and targets, but also can supplement the national level policy with concrete measures and actions, therefore become a main force to promote and accelerate climate actions. It is clear that city-level

cooperation in fighting climate change has great potential along BRI and can make a significant contribution to the global response to the climate crisis. For one thing, city-level cooperation between China and other BRI countries is less subject to geopolitical fluctuations and can be sustained and consistent; for another, such cooperation can respond to local economic and social needs via sharing recent development experiences from Chinese cities but applying these in context. Compared to the long time period it has taken from initial industrialisation to initiating the low carbon transition in western developed countries and cities, representatives from developing countries are often able to relate to the experience of Chinese cities in coping with development and climate change, thereby finding these experiences more instructive. Case studies from Chinese cities can provide approachable and applicable mitigation and adaptation solutions for climate change action in cities in developing countries - Chinese cities have faced similar challenges in recent decades and continue to do so, given varying development levels across the country. Taking into account the cooperation between the BRIGC and C40, the key areas of concern raised by representatives of cities in BRI countries during COP27, and the existing plans of cities in tackling climate change, it is recommended that priority be given to city level climate cooperation in the following areas:

- **Renewable energy:** Many major cities in BRI countries have set ambitious renewable energy targets in their urban climate action plans, and China is a global leader in renewable energy manufacturing and production capacity with extensive overseas investment experience. For this reason, Chinese cities will be able to share their experiences in deploying distributed photovoltaic power systems, solar LED lights, solar water heaters, clean stoves, anaerobic fermentation (biogas) systems, distributed wind power systems, centralized photovoltaic products and other wind power solutions .
- **Clean transportation:** Many cities have set transportation electrification targets. China has by far the world's largest fleet of electric public transport vehicles. As a result, Chinese cities and associated stakeholders are amongst the global leaders in their



knowledge of electric vehicle roll out and supporting infrastructure. Many cooperation lessons can be exchanged on electric vehicles, one of the most visible areas of innovation in urban climate action, which holds great economic development potential along the BRI. Further specific areas of cooperation could include bicycles and bicycle infrastructure, electric bicycles, electric motorcycles, new energy vehicles, charging stations, clean energy vessels, Bus Rapid Transit (BRT), tramway, subways, etc.

- **Tackling carbon and air pollution:** A number of cities are still facing serious air pollution challenges as well as dealing with the unfolding impacts of climate change. Therefore, China has put forward governance concepts for addressing both carbon and air pollution as part of a green growth agenda. Cities have continued to implement a large number of air pollution control measures in the past two decades whilst ramping up climate action. In the past decade air quality has been significantly improved in Chinese cities and greenhouse gas emissions have been greatly reduced after the implementation of measures that led to those reductions in air pollution. As a result a number of developing country cities have expressed their desire to establish exchanges and cooperation with Chinese cities to understand the synergies between tackling air pollution and mitigating climate change.

Due to differing levels of economic development as well as other prevailing socio-economic conditions in BRI countries, cooperation models will have to flexibly respond to local conditions and there may be a preference in certain circumstances to focus on mature products/technologies, short implementation cycles, as well as projects with obvious benefits and clear business models. Based on this observation, a range of further specific cooperation opportunities has been identified, including:

Table 3-2 Priority areas for industrial and technology exchange

Sector	Key areas
Energy-saving terminal	Popularization and application of energy-saving lamps, televisions,

appliances	refrigerators, freezers, split air conditioners, rice cookers, electric fans, washing machines, electric stoves, etc.
Buildings	Promotion and application of prefabricated buildings, energy-saving building materials, intelligent HVAC (heating, ventilation and air conditioning) systems, engineering construction services
Industrial energy efficiency	LED lighting, motor system energy-saving transformation, utilization of waste heat and pressure, high-efficiency boilers, project implementation and promotion of energy management systems, and promotion and application of smart grid equipment (such as smart meters on the power consumption side and intelligent communication equipment)
Water resource management	Solar water pumping (photovoltaic water pumps), production and supply of clean drinking water, wastewater and sewage treatment
Solid waste management	Popularization and application of garbage harmless treatment, landfill gas collection and utilization system
Disaster prevention and mitigation	Promotion and application of environmental monitoring equipment, disaster prevention and reduction water conservancy infrastructure, sanitation infrastructure, communication infrastructure and related construction services.

It should be noted that since there are further differences between geographies, including climate conditions, and stakeholders governances, there will also be the need to conduct in-depth research that addresses local economic, social and environmental policies and associated governance systems when exploring the possibility of deploying climate solutions in BRI country cities, based on the experiences of Chinese cities. This is to say that Chinese city climate action experiences must be filtered through the lens of real world conditions in BRI

country cities, if city-to-city climate cooperation is to be truly successful. Much sensitivity and nuance must be placed on this point.

It should also be pointed out that, many mega-cities from emerging economies have carried out effective climate action practices, especially in the areas of climate action plan, policymaking and technology application which accord with the local economic status and climate risks. Through city-level cooperation, Chinese cities would also be inspired by the experiences from other developing country cities in supporting their own climate action towards the Dual-Carbon Targets. Chinese cities and international developing cities should jointly raise their climate ambition and work together to contribute to global climate action.

III. Industrial and jobs potential of urban climate cooperation

According to the International Finance Corporation (IFC) report on urban climate investment the cumulative climate investment opportunities in emerging markets for 6 key urban sectors (see Table 3-3) will reach \$29.4 trillion by 2030. More than half of the investment requirements in cities are in the East Asia Pacific region. Further to this, United Nations (UN) figures project a global population of 7.5 billion people by 2030. Of these, 4.1 billion will live in urban areas with more than half of this urban population expected to live in Asia, including all of South Asia and the East Asia Pacific region. This is consistent with the scale of investment opportunities in this region. There are opportunities for low-carbon transitions in cities which are experiencing population growth, most prominently in sub-Saharan Africa, South Asia, and the East Asia Pacific region. At the same time there is significant potential and need for investment in megacities in South Asia and the East Asia Pacific region to achieve emissions reductions.

Table 3-3 2030 Urban investment potential by industry and region

Unit: US\$ billion

	East Asia Pacific region	South Asia	Europe and Central Asia	Middle East and North Africa	Sub-Saharan Africa	Latin America and the Caribbean	Total
Waste	82	22	17	28	13	37	200
Renewable energy	266	141	88	31	89	226	842
Public Transportation	135	217	116	281	159	109	1000
Climate-smart water resource	461	110	64	79	101	228	1000
Electric Vehicle	569	214	46	133	344	285	1600
Green Building	16000	1800	881	1100	768	4100	24700
Total	17500	2500	1200	1700	1500	5000	29400

(Source: Climate investment opportunities in cities - an IFC analysis (2018))

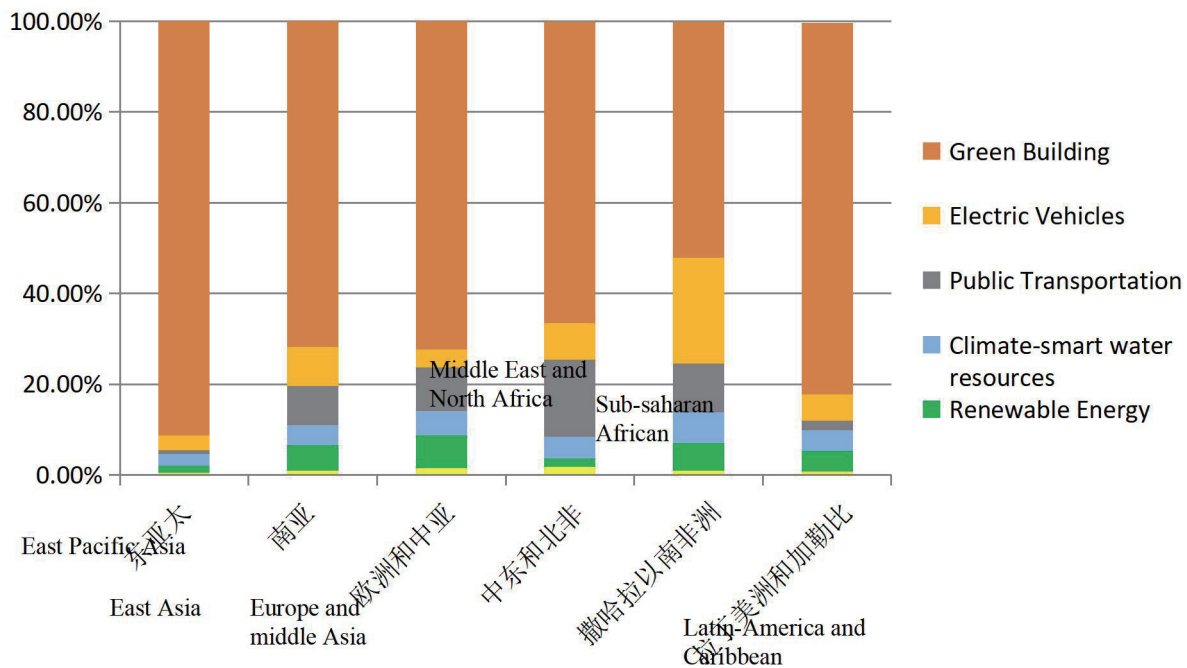


Figure 3-1 Industry share of investment opportunities in cities by region

Source: Climate investment opportunities in cities - an IFC analysis (2018)

The data outlined above suggests that green buildings will be a major industry growth area in cities, necessary to accommodate strong growth in urban populations. It is anticipated that approximately \$24.7 trillion investment in green buildings will be required in total, including both new construction and renovation of existing buildings. Improving low-carbon travel is also an area that will stimulate significant economic activity. It is expected that a surge in public transport infrastructure and electric vehicles will be needed, with investment requirements for these sectors expected to be \$1 trillion and \$1.6 trillion respectively. In addition, water resources are of course a primary area of concern for the proper functioning of cities, given increasing water stress in a warming world. As such, climate-smart water resources have been highlighted as necessitating \$1 trillion in investment, which reflects the priority of water supply in enhancing urban climate resilience.

According to the IFC analysis Addis Ababa, Accra, and Dar es Salaam are the three Sub-Saharan African cities which have amongst the most significant economic development and

investment opportunities by 2030 in a broad range of sectors including electric vehicles, green buildings, and public transportation. Jakarta, Kuala Lumpur, and Quezon City in Southeast Asia have been identified as having considerable potential and need to scale green buildings. Buenos Aires and Quito in Latin America, also have considerable opportunities to focus on green buildings. This IFC analysis combined with climate action priorities and targets of the eight typical BRI cities highlighted in this report, indicates that the following areas are where increased economic exchange and activity needs to be stimulated:

Table 3-4 Typical areas for enhanced economic activity in BRI cities

City	Sectoral area	Action targets in the area
Addis Ababa	Transportation	100% electrification of public transportation (2050)
	Construction	100% solar water heaters for residential and commercial sites (2030)
Accra	Solid waste disposal	80% of sewage treatment with biogas collection
	Transportation	90% of electric buses
	Energy	50% of building photovoltaic installations
Dar es Salaam	Energy	85% of renewable energy in primary energy consumption (2050)
	Transportation	Electric buses up to 80% (2050)
Jakarta	Energy	25% solar coverage (2050)
Kuala Lumpur	Construction	Completion of 30 green energy buildings (2050)
Quezon City	Energy	100% solar coverage of all municipal buildings and facilities (2030)
Buenos Aires	Transportation	Zero-emission transit system (2050)
	Energy	30% of residential energy from PV; 70% of new buildings with solar hot water systems (2050)
Quito	Energy	90% renewable energy (hydropower) (2023); 10% solar power (2030)

China has long attached great importance to addressing climate change, a trend that continues to strengthen as a whole series of climate action strategies and measures are implemented whilst the government continues to play a strong role in global climate governance processes. According to the national climate change strategy, China’s provincial, municipal and local governments are required to formulate corresponding development plans based on local conditions. As described in Chapter 2, covering the priority actions of Chinese cities in response to climate change, the current climate action investments in Chinese cities have mainly been focused in the areas of clean energy, green buildings, green transportation, solid waste management, and sponge city implementation. The relevant quantitative goals of some cities are shown in the table below:

Table 3-5 Climate targets of selected Chinese cities by sector

Investment fields	Goals for action in this field
Energy	<ul style="list-style-type: none"> Proportion of non-fossil energy consumption: Chengdu \geq 50%, Hangzhou \geq 20%, Shanghai \geq 20%, Wuhan \geq 20%, Qingdao \geq 15%, Beijing \geq 14.4%, Shenzhen at about 32%
Buildings	<ul style="list-style-type: none"> By 2025, the proportion of new buildings that implement green building standards: 100% in Beijing, 100% in Qingdao, 100% in Chengdu, 100% in Wuhan, and 100% in Hangzhou Qingdao: \geq 60% of newly-built buildings are star-rated and above green buildings By 2025, the proportion of prefabricated buildings in new civil buildings: Wuhan \geq 50%, Pearl River Delta cities \geq 35%, Shenzhen \geq 60%, Hangzhou 35%
Transportation	<ul style="list-style-type: none"> By 2025, the sales of new energy vehicles in China will reach about 20% of the total sales of new vehicles In 2025, in addition to emergency rescue support, the proportion of new and updated buses with clean energy and new energy will be 100% in Qingdao, 100% in Wuhan, and

100% in Shenzhen

- By 2035, the country will strive to fully electrify vehicles in the public sector, and pure electric vehicles will become the mainstream of new vehicles sold
- Support places where conditions permit to set up pilot areas where fuel vehicles are prohibited, and on the basis of success, coordinate research and formulate a timetable for the withdrawal of fuel vehicles.

Solid waste management	<ul style="list-style-type: none"> • By 2025, the national municipal solid waste recycling rate will reach more than 35%, and the harmless treatment rate of municipal solid waste will not be lower than 99%. • Construction of “Zero Waste Cities”: Shenzhen, Qingdao, Wuhan, Hangzhou, Shanghai with zero solid waste landfill
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Urban climate adaptation capacity building	<ul style="list-style-type: none"> • By 2025, the ratio of the city’s sponge city area reaching the standard, which will be $\geq 40\%$ in Beijing, $\geq 40\%$ in Shanghai, $\geq 50\%$ in Wuhan, 55% in Hangzhou, and $\geq 80\%$ in Shenzhen • Focus on 31 key flood control cities and cities along major rivers across the country. By 2025, waterlogging points that seriously affect production and living order will be completely eliminated, and the phenomenon of “see the sea from the city” will no longer appear in new urban areas; by 2035, drainage and waterlogging prevention capabilities will better match the requirements for building climate-adaptive cities, sponge cities, and resilient cities. • By 2035, cities at the prefecture level and above across the country will fully implement the construction of climate-adaptive cities
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IV. Financing mode and service platform

Financing is a necessary and important part of developing urban climate mitigation and adaptation action. A city's ability to make climate-sector investments often depends on their ability to allocate existing budgets and raise revenue. As cities expand, traditional fiscal tools

such as taxation and transfer payments no longer meet the financing needs for all necessary climate actions. Cities therefore face investment barriers and the viability of project planning is limited by financial constraints. Commercial and institutional investors require attractive returns on their investments, and private capital managers are unlikely to invest in infrastructure unless there are tangible opportunities that meet their risk-reward criteria - as a result this often leaves cities with large gaps between their ambitions and available financing. City climate action infrastructure projects are often limited due to these barriers, especially for cities in BRI countries. However, the possibility exists for cities to explore a variety of existing financing mechanisms as well as to adopt innovative financing modes tailored to their specific circumstances.

(1) Funding sources

The transition to carbon-neutral and climate-resilient cities requires significant investment and the proportion of projects funded entirely by cities' own resources decreases as projects scale and capital costs rise. Because city-level actions are decided and designed for implementation by municipalities, most climate actions are likely to be publicly funded (both at the municipal level or other higher levels of local government). However as project scale increases so does upfront investment as well as operation and maintenance costs; combined with many city governments struggling to establish sufficient access to capital markets this makes it difficult for cities to meet their climate action and infrastructure development needs.. Municipal governments need to broaden and deepen their traditional sources of financing (including revenue through taxes, tariffs and fees, debts and equity financing, land financing, and national government transfer payments) by mobilizing more private capital.

To attract private capital investment in urban climate actions a number of flexible methods might be adopted. For urban energy efficiency projects, contract energy management methods can be utilized to reduce energy demand through renovation and upgrading, with the cost savings recycled, in part, to financially support the project itself. Public-private partnerships are

the primary mechanism for financing capital-intensive and sustainable infrastructure. As a public financing tool, the land value acquisition mechanism not only encourages the development of green infrastructure, but also facilitates the use of private capital. Debt financing instruments such as bonds and loans can be used to supplement public finances, allowing cities to obtain long-term debt at stable prices to encourage investment in sustainable infrastructure. In developing countries with underdeveloped domestic financial markets or limited access to capital markets, loans and guarantees from governments or development financial institutions can support debt financing for urban infrastructure. Grants and government subsidies are especially important for cities with limited public resources, and can be used to support projects with large potential benefits. Equity-based instruments can also be used to support sustainable infrastructure investments. With support from a range of stakeholders, some pioneering cities are vigorously developing specific financial vehicles to promote private sector green investment.

(2) Financing modes and cases

Municipal governments can select the most appropriate financial tools when considering their funding and financing options and, if necessary and relevant, draw on best practices from across the world. Municipal financing mechanisms can have a profound impact on the ability of local and national governments to meet their investment requirements and eliminate financing deficits. The design of these mechanisms needs to be country-led and adapted to local realities, policy feasibility, and development needs. Financing modes may include traditional credit, bond, and leasing approaches, as well as innovative Public Private Partnerships (PPPs), land value capture, and green bonds. Below is a brief introduction to some practical cases, for reference.

Credit financing mainly includes commercial bank loans, policy-related bank loans, export credits, foreign government loans (sometimes accompanied by a portion of grants), syndicated loans, and loans from international financial institutions. International financial institutions providing project loans include the World Bank (WB), IFC, Asian Development Bank (ADB), BRICS Development Bank, African Development Bank (ADB), Asian Infrastructure Investment

Bank (AIIB), European Investment Bank (EIB) and other global or regional financial institutions.

Credit financing: Biogas project at Mandalay wastewater treatment plant in Myanmar

Myanmar's urban population is rapidly growing and highly vulnerable to extreme weather associated with climate change. With urban areas expected to account for 50% of GDP by 2030, urban climate vulnerability could have a potentially devastating impact on the country. According to statistics, Mandalay City produces about 60,000 cubic meters of sewage every day. If it is not properly treated, it will cause serious pollution and harm to the local environment. The Biogas Project of Mandalay Sewage Treatment Plant in Myanmar is a project that aims to use organic waste generated during the sewage treatment process in Mandalay City to generate renewable energy (namely biogas). The project is jointly supported by the Myanmar government and international financial institutions, including the Asian Development Bank, European Investment Bank and World Bank. The Asian Development Bank provided \$6.2 million in climate adaptation financing (in addition to a \$4 million grant and a \$60 million loan). The Biogas Project of Mandalay Sewage Treatment Plant in Myanmar collects and utilizes the biogas produced by the sewage treatment plant to reduce energy costs and reduce greenhouse gas emissions. The project is financed by Myanma Awba Group and Yoma Micro Power, using green debt financing and financing methods provided by international financial institutions, and loans from the Asian Development Bank. The government as a borrower borrows from the bank to support the construction and operation of the project.

This project is Myanmar's first sewage treatment plant project applying biogas technology, which can help improve the environment and ecosystem of Mandalay City, benefit the local community, and solve the environmental problems and energy shortages faced by Mandalay City. After the project is completed, biogas will be used to generate electricity for sales, as well as other incomes such as organic fertilizers, etc., to repay the principal and interest of the loan, and create employment opportunities and economic benefits for the local area.

By 2023, the plant is expected to be carbon neutral and at least 50% of energy can be self-sufficient.

Bond financing mainly includes corporate bonds and convertible bonds, and green bonds issued through government financing platforms act as a type of corporate bond. Cities issuing bonds are usually required to obtain a bond credit rating, disclose investment risks and boost investor' confidence.

Green bond financing: Johannesburg's urban green bonds

Johannesburg has pioneered the use of green bonds in emerging markets to raise funds for sustainable urban development projects. In line with the green bond principles, the city issued a 10-year city bond worth \$143 million in 2014, the first green bond issued in Johannesburg. This aligned with the city's energy and climate change strategies and action plans which identified key low-carbon projects in a range of sectors, including energy, water, waste and transport. These plans give investors the confidence that through sound planning and design of projects, they can guarantee both considerable risk-reward and environmental and social benefits. As of early 2018, these projects included investments in 150 new hybrid and 30 biogas buses, the establishment of a waste-to-energy plant, energy-efficiency buildings (including the implementation of 42,000 smart meters), wastewater treatment, and water management initiatives such as water meter installation, reservoir upgrades, and water pressure management. The bonds allow the city to meet its commitment to address climate change while receiving a market-related financial return.

The bond's rating of aa reduces risk for investors and makes the investment more attractive. The bond's popularity among private investors was an important factor for its success. In 2014, an auction for potential investors was 150% oversubscribed, and international and domestic publicity played a key role in raising awareness of the importance of green bonds and boosting investors' confidence.

Lease financing includes finance lease (i.e. financial lease), leaseback (i.e. sale and leaseback) and other methods, and the lessee can get financing for the full price of the equipment.

Lease financing: Santiago electric buses

Santiago de Chile plans to fully electrify public transportation by 2035, and the city is making great efforts to develop clean electric buses through an innovative investment and financing mode. 2017 witnessed the start of an electric bus pilot in the city. The Ente nazionale per l'energia elettrica (Enel) from Italy purchased two 12-meter K9FE electric buses from BYD Auto from China and leased them to Santiago's bus operator, Metbus, for operation. During the one-year trial period, the two electric buses traveled more than 100,000 kilometers and carried more than 350,000 passengers. Through cost calculations, Metbus found that the operating costs of purely electric buses can be reduced by 70% compared to traditional diesel buses, so Metbus continued its partnership with Enel X (a subsidiary of Enel), an Italian electric integrated energy services company, and BYD to expand its bus electric scale by adding 100 and 150 electric buses in 2019 and 2020, respectively.

Bus operating companies, electricity providers, municipalities, and automotive companies are involved in the process. The municipality provides subsidies for the purchase of the replacement fleet



as well as operating subsidies, and the ownership and operation of the electric buses are separated, with the energy company and the bus operating company being responsible for them respectively. The bus operating company is only responsible for bus operation and basic maintenance, and does not need to purchase buses, but leases them instead of buying them, with the option to acquire ownership at the end of the lease period (10 years). The energy company acts as the financial agent and energy supplier, purchasing and leasing the electric buses to the bus operator, and securing the charging infrastructure and electricity supply. Maintenance responsibility for the electric buses is based on contractual agreements between stakeholders. In this pilot in San Diego, the car dealer BYD is responsible for maintenance and repair of vehicles, including the battery pack and electric drive system.

San Diego's electric bus investment and financing mode has been key to the rapid expansion of the city's electric bus fleet. In addition to Metbus, other San Diego transit operators have used a similar mode to purchase and operate electric buses. For instance, the Gildenmeister Transport partnering with France's GDF Suez (Engie) purchased Chinese Yutong E12 electric buses; the NeoT Green Mobility bought 25 King Long DM2800 electric buses from China for Transdev.

Apart from traditional credit, bond and lease financing, there are a number of emerging approaches to infrastructure project financing, including Build-Operate-Transfer (BOT), Public-Private Partnership (PPP), Transfer-Operate-Transfer (TOT) and other concession approaches, as well as Land Value Capture (LVC), Asset-Backed Securities (ABS), Real Estate Investment Trust (REITs), Infrastructure Investment Trusts (IITS), and climate insurance.

PPP financing: Beijing metro Line 4

Beijing metro Line 4, with a length of 28.2 km and 24 stations and an average daily passenger flow of over 1 million, is the first PPP project in urban rail transportation in China. The total investment of the project is 15.3 billion RMB, divided into two parts: Part A, including tunnel caverns and stations, is funded by the Beijing Municipal Government, amounting to 10.7 billion RMB, accounting for 70% of the whole project; Part B, including electromechanics, signals, vehicles, etc., amounting to 4.6 billion RMB, is funded by Beijing MTR Corporation Limited ("Beijing MTR"), a PPP project company, which is formed by Beijing Infrastructure Investment Company Limited ("BII"), Hong Kong MTR and Beijing Capital Group in the ratio of 2:49:49.

After the completion and acceptance of the Line 4 project, Beijing MTR acquired the right to use the assets of part A of Line 4 through a lease. It is responsible for the operation and management of Line 4, the maintenance of all facilities (including both A and B parts) and the renewal of assets except for the cavern, as well as the commercial operation in the stations, earning a reasonable return on

investment through subway fare income and commercial operation in the stations. At the end of the 30-year concession period, Beijing MTR will hand over the Part B project facilities to the designated department of the municipal government intact and free of charge, and return the Part A project facilities to Line 4 Company.

Through the clever design of the fare and passenger flow mechanism, the project has a reasonable revenue distribution as well as an effective risk-sharing mechanism, which finds an effective balance between the economic interests of social investors and the public interests of the government, and improves the management and service efficiency of Beijing's rail transportation sector while bringing reasonable expected returns to social investors. The innovative PPP mode utilizes incentives for private companies to maximize profits as a means of balancing investment risks and returns. The BII, as a risk-sharer, is required to compensate its joint venture partners when profits are significantly lower than expectations, thereby providing a guaranteed return on investment for its partners. At the same time, Hong Kong MTR and Beijing Capital Group are incentivized to maximize efficiency in pursuit of excess profits.

PPP financing: LED street lighting project in Brazil

Most of Brazil's over 5,000 municipalities still rely on outdated, inefficient high-pressure sodium lamps and, to a lesser extent, mercury vapor lamps. Because of the high energy consumption and low reliability of these inefficient bulbs, municipalities often face expensive operation and maintenance costs and safety issues due to power outages, etc.

LED technology for public street lighting has been shown to deliver energy savings of 40-70%, up to 80%, when used with "smart" management and control systems. In addition to energy savings and maintenance costs reduction, improving lighting quality can have broad socio-economic benefits, such as enhancing safety and increasing local economic activity, making high-crime areas brighter and safer. While LED technology has matured internationally, many Brazilian municipalities still struggle to secure financing due to low credit ratings and restrictions on public debt. The private sector has an important role to play in helping municipalities overcome these challenges and bring efficient LED bulbs to where they are most needed.

In partnership with the IFC and the WB, GIF supported the Brazilian public bank CAIXA to build a PPP system for modernizing public street lighting in 10 Brazilian municipalities. It provided financial and technical support by assisting CAIXA and other stakeholders in developing a standardized approach to structuring readiness capacity of PPP transactions and developing project. In addition to this standardized PPP mode and procurement and contracting documents for municipal public street lighting, the project used a hybrid financing structure to develop financeable and affordable business models with the support from climate funds, public and private sector investments, and the WB.

In March 2022, GIF, in partnership with the World Bank Group (WBG) and the Federal



government of Brazil, released a guidance for practical street lighting structure to assist public managers and their teams in structuring street lighting projects. The step-by-step guide draws on lessons from the first round of structures for PPP projects implemented in Brazil's public street lighting project.

Ten pilots are being planned, with five cities already implementing LED technology and five more in the approval process to begin procurement. Private sector capital is expected to be employed approximately \$251 million. The success of the pilots will allow CAIXA to replicate the mode in other Brazilian cities and create financing mechanisms for other sectors.

Through GIF's support to Brazilian institutions' capacity building, more cities will be able to benefit from standardized transactions, reducing transaction costs and shortening project timelines. In addition, financing mechanisms can be replicated in other countries through other national or regional banks to develop their own public street lighting programs.

These Non-traditional financing mechanisms have received increasing attention. For example, the New Urban Agenda (NUA) specifically addresses LVC, and several development banks at the regional level, including the Asian Development Bank, the Inter-American Development Bank (IDB) and the World Bank, have issued reports highlighting the important role LVC can play in meeting urban service and infrastructure needs. LVC is a fiscal policy tool that can allow local governments to recoup a portion of the increase in land and property values resulting from public investment to improve nearby urban infrastructure, which in turn improves housing quality, jobs, transportation and social welfare. The increase in value can be used as a source of revenue to secure or compensate for upfront infrastructure funding, or it can be used to promote the development of more compact cities. Particularly when traditional sources of public funding are limited, cities can receive additional funding by taxing the direct beneficiaries of public facility improvements. This approach can promote infrastructure cost-sharing, as well as deliver win-win outcomes for both public and business stakeholders by creating private economic value that benefits the region.

LVC converts land value appreciation to public revenue through taxes and fees, or through land improvements to benefit communities. In practice, the implementation and specifics of LVC may vary from place to place, and it includes a range of tools with a common goal - returning

land values to the public. Tools include property taxes, land value taxes, public land leases, special assessments, transfer of development rights, improvement contributions, land readjustment programs, transportation utility fees, development impact fees and development right levies over buildings, inclusive housing and zoning. These mechanisms can be promoted on both private and public lands depending on local conditions. National legislation and frameworks are critical to achieving such local revenues, as only high-level governments have the power to establish laws, regulations and tax regimes. In addition to improving the urban environment and the ability of self-finance infrastructure, cities benefit from improved municipal revenues, increasing their overall attractiveness to social capital. However, limitations in institutional authority, insufficient land control and lack of secure property rights, weak technology and data systems, and lack of knowledge and management capacity can hinder the successful implementation of LVC in cities. The following are a few examples of different tools for LVC.

Table 3-6 Different tools and cases of LVC

Tool	Case
<p>Renovation donations and special assessments</p> <p>The owner of a specific property subsidizes the city government for the cost of infrastructure or service improvements.</p>	<p>Colombia’s Manizales levies renovation fees on property owners for funding urban infrastructure and road improvements, urban renewal, and the renovation of landmark projects like Alfonso Lopez Plaza.</p>
<p>Developer exactions</p> <p>A developer offers cash, land or other in-kind contributions to the city for special approval or permission to develop and build a parcel of land to offset additional public services required for new</p>	<p>The city of Cordoba, Argentina, by virtue of Section 180-188 of the provincial constitution, collects fees from developers who seek to change existing building regulations.</p>

development.

Impact fees/associated fees

Developers subsidize a one-time fee to the city for the impact on certain public services and infrastructure, and the City then invests the revenue received into public services and infrastructure services.

Florida's Orange County funds parks, fire stations, patrol officers and other public safety inputs through impact fees.

Rail plus property co-development model

When a new railway is built, the government transfers the land development rights to a public transportation agency at pre-development prices. The agency then partners with private developers to develop property along the new railway, sharing the profits and investing them in improvements to the railway system and other public facilities.

China's MTR Corporation (MRT) has used this model successfully for over 30 years to build vibrant communities, open spaces and a cumulative 221 km of railway systems. MRT once raised \$1.5 billion a year on a self-sustaining railway plus property model.

Land readjustment

The landowner brings the lands of the municipality or developer together for the completion of the redevelopment project. The new infrastructure and public services built on the land will increase the value of the property in the new development zone. Each landowner will then receive a small new parcel of improved land with

Tokyo railway network in Japan was one of the most successful cases of large-scale redevelopment in the 20th century, and land readjustment was one way for financing.

a higher value.

Transfer of development rights

A landowner pays the government to transfer the potential development density (as defined by local planning laws or ordinances) from one parcel to another non-adjacent but denser parcel. The revenue the city received can be used for public investment, and the transfer of density can be better adapted to future urban planning.

Pennsylvania in the United States protects farmland and natural resources through the transfer of development rights. Transferring development of these places to cities also means better adaptation to development. This approach protects farmland and natural resources and generates funds for public investment.

Inclusive housing/inclusive zoning

A developer provides a certain amount of low- or moderate-income housing to a city, thereby acquiring the right to build market-value housing or commercial housing.

Subsidized housing in Beijing, China - Newly supplied commercial housing in each district of Beijing is allocated with public rental housing, subsidized rental housing and corresponding motor vehicle parking spaces every year according to a certain percentage of the floor area of newly supplied residential projects.

(3) Major service platforms for urban climate financing

Reputable metropolises and mega-cities can often have good access to a variety of financing options mentioned above, but cities in developing countries generally face high debts, and most small and medium-sized cities still need external technical support to establish a stable urban climate finance ecosystem and integrate climate issues into their achievable development frameworks. In order to explore the integration of green development and debt reduction, to support green finance in developing countries, and to encourage the integration of green investment and financing into project construction, some international institutions have established relevant initiatives and tried to meet the needs of developing countries. This report

compares more than 20 initiatives/programs and platforms launched by international financial institutions, NGOs, companies, etc. that support urban climate resilience solutions.

Table 3-7 Cities climate finance initiatives/programs

Initiative/Program	Initiator	Geographical scope
Global Infrastructure Facility (GIF)	G20	Africa, East Asia Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia
Global Infrastructure Facility (GIF) Special Fund	Asian Infrastructure Investment Bank (AIIB)	AIIB member countries
China South-South Cooperation Fund on Climate Change	China South-South Cooperation Fund on Climate Change	Developing countries
C40 Cities Finance Facility	C40 Cities Climate Leadership Group	Developing countries
Green Investment Principle (GIP) for the Belt and Road Initiative	Green Finance Committee (GFC) of China Society for Finance and Banking City of London and many other institutions	Global
Global District Energy in Cities Initiative	United Nations Environment Programme Global Environment Facility Sustainable Energy for All	Global
Financing Sustainable Cities Initiative	WRI Ross Center for Sustainable Cities	Global

Initiative/Program	Initiator	Geographical scope
	C40	
Africa Climate Resilient Investment Facility (AFRIRES)	World Bank	Sub-Saharan Africa, Middle East, North Africa
100 resilient cities	100 Resilient Cities	Global
Africa50	African Development Bank	Sub-Saharan Africa, Middle East, North Africa
City Credibility Program	World Bank	Global
Financing Energy for Low-carbon Investment - Cities Advisory Facility (FELICITY)	European Investment Bank GIZ	Global
Green cities framework	European Bank for Reconstruction and Development (EBRD)	South Asia, Europe and Central Asia, Middle East and North Africa
HSBC Sustainable Finance Fund	HSBC	Global
InfraFund	Inter-American Development Bank	Latin America and the Caribbean
NEPAD Infrastructure Project Preparation Facility	African Development Bank	Sub-Saharan Africa, Middle East, North Africa
Transformative Actions Program (TAP)	ICLEI	Global
Low Carbon City Lab	Climate-KIC	Latin America, East Asia Pacific, South Asia, Europe, Sub-Saharan Africa and North Africa
Urban Financing Partnership Facility	Asian Development Bank	East Asia Pacific, South Asia, Europe, Central Asia
Urban Climate Change Resilience	Asian Development Bank	Central and West Asia (Pakistan), South



Initiative/Program	Initiator	Geographical scope
Trust Fund		Asia (Bangladesh, India, Nepal), Southeast Asia (Indonesia, Philippines, Myanmar, Vietnam)
Urban Green Bonds	South Pole Climate Bonds Initiative	Global
Clean Technology Fund	Climate Investment Fund	East Asia Pacific, Latin America and the Caribbean, South Asia, Europe and Central Asia, Middle East, Sub-Saharan and North Africa
City Resilience Index	England Arup International Consultants Co. Ltd.	Global

Chapter 4: Policy Recommendations

Green development cooperation as part of the “Belt and Road” initiative holds the potential to provide cities in developing countries with solutions to mitigate and adapt to the impacts of climate change. These solutions may range from policy tools, financing channels, technology exchange, public education programs, capacity building, and personnel training. Green development in developing countries must respect local development needs and be applied in specific geographical and cultural contexts. It is therefore imperative to strengthen existing BRI green cooperation to open up practical cooperation channels between cities in BRI countries and China. This can help bring experience from China’s recent modernization into a framework of global urban climate cooperation, unleashing the potential of South-South cooperation in response to climate change.

What needs to be emphasized is that economic development is still a priority for BRI countries. From the strategic climate planning of cities in BRI countries

It's clear that city-level climate action is mainly influenced by finance and the availability of optimal policy solutions (including but not limited to local policies and regulations, technologies, products and services). One significant exception to this is for policies related to the transformation of electricity and transportation structures, which are often affected by national level policy and financing decisions. The variety of stakeholders (including government departments, research institutes, financial institutions, international organizations, enterprises, etc.) committed to promoting climate cooperation along the BRI will be required to keep a focused problem-oriented approach to city level solutions, taking advantage of respective institutional strengths to help cities identify key risks and opportunities. The need also exists to integrate BRI city development planning to align with global green development trends, thereby promoting local green industries with access to international markets and facilitating cities to move from planning to pilot projects and eventually scaled solutions with strong industrial exchange and maturity. To this end, the following areas are proposed as the focus of the next

phase of work in response to the common needs and weaknesses of cities in BRI countries in the field of climate action:

I. Create a city-level demonstration cooperation network for addressing climate change

Existing collaboration platforms should be leveraged to increase the exchange of appropriate technologies and solutions. Existing cooperation platforms such as the BRIGC and C40 should be fully utilized to share experience technology deployments at city level in response to the climate crisis. This should be done in a way that allows advanced Chinese to undertake active dialogue with cities and countries jointly building the “Belt and Road,” It will be necessary to undertake scientific and technological cooperation based on the requirements of different regions, combined with local social, economic and demographic conditions. Relevant institutional partners can support cities to reduce informational, technological and financial barriers, whilst paying due attention to local conditions. .

Further support and promote urban action and cooperation in addressing climate change. Cities are important implementers of policies and measures to address climate change. Many cities in BRI countries, including the eight cities selected in this report, have formulated detailed urban climate action plans. These action plans consider and reflect a variety of regional development and climate risk characteristics. By taking the lead in implementing climate actions, these cities can therefore provide references for other cities in their regions. It will be important for city officials to take a lead in designing relevant cooperation models at the city level, encouraging South-South urban climate cooperation and playing their role in national climate goals under the framework of development initiatives such as the “Belt and Road”.

Establish and strengthen a diverse and active multi track dialogue mechanism for urban sustainable development cooperation. Cities in BRI countries often have common elements within their resource endowments, industrial structures, capital access structures, as well as their technology and market demand conditions. There is an urgent need to establish a flexible and

informative urban dialogue mechanism with a range of working “tracks”. It is proposed that on-site exchange visits for city government representatives from developing countries to China's leading climate actions demonstration cities are held. With the exchange of relevant policy and technology solutions under the framework of the BRI, on one hand, global south cities would better understand the ideas and actions for the coordinated reduction of pollution and GHGs and the carbon peaking and neutrality planning. On the other hand, Chinese cities would build-up the understanding of the climate ambition from global south cities and get inspiration from their planning and successful practices.

Forge demonstration bases of applicable technologies for cities in BRI countries. The domestic and international cooperation network of the BRIGC can be leveraged to build “one-stop” demonstration base for cities to provide visits, training, technology demonstrations, cooperation negotiation frameworks, information consultation and procurement services.

II. Strengthen capital access for climate actions in cities in BRI countries

Share international financial policies with cities in BRI countries. Due to differing stages of economic development and other prevailing local conditions, some BRI countries have yet to develop policies to support industrial cooperation in green and low-carbon fields (such as renewable energy and clean transportation). It is important to help cities to carry out early demonstration projects, so as to gradually establish sound industrial and fiscal policies that can attract international financing to bridge the funding gap needed to achieve carbon neutrality in their countries.

Provide industrial and fiscal policy tools for the development of low-carbon industries in cities. Share the policy experience of China and other BRI countries in terms of incentives and subsidy policies in renewable energy, new energy vehicles and other fields, enhance the management capacity of urban climate-related industries, strengthen the confidence of relevant cities in low-carbon transformation, and help improve market mechanisms in key sectors of green low-carbon transformation such as renewable energy in BRI countries. Help improve the

government's financing capacity, so that it can carry out project planning from various funding channels such as special bonds in a targeted manner according to project characteristics and repayment sources. Promote innovation in the green finance market, encourage the development of innovative products such as urban sustainable development-linked bonds, catastrophe insurance, and climate risk insurance in key areas, and play an active role in the financial market in providing funds to address climate change.

Help city governments make better use of international multilateral and bilateral funding resources. Help cities in BRI countries establish and improve diversified financial support mechanisms, and help them become familiar with and use the resources of multilateral financial institutions such as the World Bank, the Asian Development Bank (ADB), the Asian Infrastructure Investment Bank (AIIB), the New Development Bank, the African Development Bank, and financial mechanisms such as the Green Climate Fund, the Global Environment Facility, the Global Infrastructure Facility, the China-Africa Cooperation Fund, etc, empower cities to actively seek international funding and bilateral and multilateral loans and grants to invest in their climate change response areas. Assist cities and their host countries to optimize the list of technical equipment needs and the list of feasible project categories for climate cooperation to enhance the efficiency of international cooperation.

III. Improve city assessment and monitoring of climate risks and adaptive capacity

Establish and improve the mechanism of climate adaptation assessment and monitoring of the “Belt and Road” project. Help cities strengthen the monitoring and assessment of comprehensive disaster risks under the influence of climate change, scientifically analyze their current climate change situation, identify the main impacts and risks of climate change on the city's society, economy and ecology according to the predicted trends of regional climate change, and reasonably assess the vulnerability of different areas, regions and people in the city. At the same time, strengthen cities' climate risk management for infrastructure (such as transportation,

buildings, energy, health, etc.) and major projects. In addition, combine modern information and big data technologies to strengthen monitoring and risk warning of climate change impacts of infrastructure and major projects, effectively monitor weak sections and various risk parts, dynamically assess risk levels and intensities, and improve cities' implementation of risk management systems for infrastructure and major projects.

Promote the effective integration of climate change adaptation into the establishment and revision process of the technical standard of infrastructure and major projects in BRI countries and cities. Assist them to gradually improve the technical standard system of infrastructure and major projects that are compatible with climate change. Enhance the capacity of BRI countries to adapt to environmental and climate risks. As cities are expanding rapidly, and given the long-term financial and carbon lock-in effects once the infrastructure is built, all relevant partners should strengthen city cooperation and exchange, and help cities plan high-quality and moderately advanced infrastructure projects to enhance their climate disaster-resistance capability. Since cities have different infrastructure conditions in transportation, energy, and flood control, and many places have difficulties in coping with extreme climate disasters, we strongly urge all parties to strengthen their attention and cooperation to support cities in climate change adaptation, enhance their climate resilience, and reduce the climate and environmental risks of investment.

Guide cities to strengthen the adjustment of disaster prevention and mitigation deployment in response to climate change impacts, focusing on strengthening comprehensive management in areas where climate hazards are aggravated and where disaster risks may change significantly. Share China's experience in sponge city construction and other aspects, improve the climate resilience of infrastructure and major projects in urban transportation, water, energy in developing countries. In addition, fully consider the adverse effects of climate change on major projects, adjust project layouts, and improve construction and scheduling operations. Encourage the adoption of urban greenways, ecological parks, ecological corridors and other nature-based solutions to enhance the climate resilience of cities, promote



cities to optimize the spatial layout of major infrastructure, strictly limit construction activities in high-risk areas, and reduce the risk of investment losses. Strengthen cooperation in integrated urban disaster management and promote cities to gradually implement improvement plans of climate disaster resilience.

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Annex: List of climate finance initiatives/programs

Initiatives/Programs	Initiator	Scope	Industry	Major Goals
Global Infrastructure Facility (GIF)	G20	Africa, East Asia Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia	Energy, information and communication technology (ICT), urban solid waste, social infrastructure, transportation, water resources, sewerage and drainage	<p>As a G20 initiative, GIF is a global collaborative platform that integrates efforts to promote private sector investment in sustainable and high-quality infrastructure projects in developing countries and emerging markets.</p> <p>GIF provides funding through technical assistance grants or advisory support to help select, design, structure and prepare high-quality, financeable, sustainable infrastructure programs and projects in emerging markets that are attractive to private capital. From project concept to financial closure, GIF provides comprehensive design, evaluation, structuring, and transaction support to bring sustainable, high-quality infrastructure projects to market and attract private sector investment where it is most needed.</p>
GIF, Special Fund	Asian Infrastructure Investment Bank (AIIB)	AIIB members	Energy, information and communication technology (ICT), urban solid waste, social infrastructure, transportation, water resources, sewerage and drainage	<p>As a GIF technical partner, the AIIB has a special GIF fund that can help its member countries access grant resources for Project Readiness Assessments (PRA), Project Definition Activities (PDA), and Project Preparation Structure Activities (PPSA).</p> <p>The AIIB is a multilateral development bank whose mission is to finance future infrastructure with sustainability at its core. By working with partners, the ADB unlocks new capital to invest in infrastructure related to green and technology, and promotes regional connectivity to meet the needs of its clients.</p>

Initiatives/Programs		Initiator	Scope	Industry	Major Goals
China Climate Fund	South-South Cooperation	China South-South Climate Cooperation Fund	Developing countries	Transportation, energy production and access, buildings, industry, facilities, water security, food, health, ecosystems and ecosystem services, forestry and land use, infrastructure and built environment, people and community livelihoods	<p>During Chinese President Xi Jinping's visit to the United States in September 2015, the Chinese government officially announced the establishment of the China South-South Climate Cooperation Fund with a contribution of RMB 20 billion.</p> <p>The fund aims to support other developing countries to address climate change and transition to green and low-carbon development, including enhancing their capacity to use Green Climate Fund funds and climate resilience, and strictly controlling investments in domestic as well as foreign high-pollution and high-emission projects. The establishment of the fund is a pragmatic move by the Chinese government to promote South-South cooperation in climate governance and provide support to countries and regions that are lagging behind in development.</p>
C40 Cities Finance Facility	C40	Global	Green buildings, energy conservation, renewable energy, public transportation/mobility, green transportation/electric vehicles, waste management, water supply and water treatment, street lighting, green industrial development	<p>The purpose of the C40 Cities Finance Facility is to conduct project preparation and capacity building, and to share knowledge and build partnerships between financial institutions and C40's network of more than 90 of the world's largest cities.</p>	
Green Investment Principles for the Belt and Road	Green Finance Committee (GFC) of the China Society of Finance and Banking, the	Global	Green investment	<p>Integrate low-carbon and sustainable development issues into the Belt and Road Initiative on the basis of responsible investment, and work to strengthen the environmental and social risk management of investment projects and promote the greening of the "Belt and Road" investments.</p>	

Initiatives/Programs	Initiator	Scope	Industry	Major Goals
	City of London and more than 30 other institutions			GIP will develop and support the methodology and tools for green investment in the "Belt and Road" Initiative, helping to improve the capacity and capability of relevant institutions to implement green investment principles and assess progress.
District Energy in Cities Initiative	United Nations Environment Programme (UNEP), Global Environment Facility, Sustainable Energy For All initiative (SE4ALL)	Global	Green buildings, energy conservation, renewable energy, waste management, water supply and water treatment	The District Energy in Cities Initiative is a public-private partnership of 40 partners that aims to accelerate the transition of cities in emerging economies and developing countries to low-carbon, climate-resilient societies through modern district energy systems.
Financing Sustainable Cities Initiative	World Resources Institute (WRI) Ross Center for Sustainable Cities, C40	Global	Green buildings, energy conservation, public transportation/mobility, green transportation/electric vehicles, waste management	The Financing Sustainable Cities Initiative aims to help cities accelerate and expand investment in sustainable urban solutions through the development of innovative business models.
Africa Climate Resilient Investment Facility (AFRIRES)	World Bank	Sub-saharan Africa, Middle East, North Africa	Renewable energy, water supply and water treatment	AFRI-RES is a network of technical experts that aims to strengthen the investment capacity of African institutions (including national governments, river basin organizations, regional economic communities, and power pools) and the private sectors (project developers and financiers) to plan, design, and implement climate change resilient infrastructure. A core function of AFRI-RES is to facilitate interaction between



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Initiatives/Programs	Initiator	Scope	Industry	Major Goals
				policy makers, financiers, project developers, and scientific and engineering experts to develop and mainstream relevant new practices. The scope of AFRIS-RES covers different sectors and different stages of the planning and project development process. The majority of its targeted investments are projects located in cities, with roads and electricity being two priority areas.
One Hundred Resilient Cities	One Hundred Resilient Cities	Global	Green buildings, energy conservation, renewable energy, public transportation/mobility, green transportation/electric vehicles, waste management, water supply and water treatment, street lighting, green industrial development	100 Resilient Cities is a collaborative network that aims to help cities around the world become more resilient to physical, social and economic challenges. This includes large-scale natural disasters and local day-to-day stresses such as unemployment and chronic food and water shortages.
Africa50	African Development Bank (AfDB)	Sub-saharan Africa, Middle East, North Africa	Green buildings, renewable energy, public transportation, water supply and water treatment, street lighting, green industry development	Africa50 is an infrastructure investment platform that contributes to Africa's growth by developing and investing in financeable projects, catalyzing public sector capital and mobilizing private sector finance with differentiated financial returns and impact to contribute to Africa's growth. A large portion of Africa50's investment targets are projects needed by cities. Africa50's main target sectors are transportation and power. Projects in the transport sector include roads, airports, ports and logistics, many of which are in urban contexts. It was established under a governance structure led by the African Development Bank.
City Creditworthiness	World Bank	Global	Urban finance, urban development	The City Creditworthiness Initiative is composed of two primary components: the City Creditworthiness Fellowship and the City

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Initiative				Creditworthiness Implementation Program. Together, they provide a series of training programs to help 300 cities in 60 low- and middle-income countries improve their financial position and secure the private sector investments they need to finance climate-smart infrastructure and services.
Financing Energy for Low-carbon Investment - Cities Advisory Facility (FELICITY)	European Investment Bank, GIZ	Global	Energy conservation, waste management, water supply and water treatment, street lighting	FELICITY's goal is to support emerging economies, namely Brazil, China and Mexico, through technical assistance and financing of sustainable infrastructure projects.
Green Cities Framework	European Bank for Reconstruction and Development (EBRD)	South Asia, Europe and Central Asia, the Middle East and North Africa	Energy conservation, public transportation/mobility, green transportation/electric vehicles, waste management, water supply and water treatment, street lighting	The Green Cities Framework aims to address the most pressing environmental and climate change challenges in cities through targeted planning, capacity building, project development and investment.
HSBC Sustainable Financing Programme	Hong Kong and Shanghai Banking Corporation (HSBC)	Global	Green buildings, energy conservation, renewable energy, public transportation/mobility, green transportation/electric vehicles, waste management, water supply and water treatment	The HSBC Sustainable Financing Programme aims to achieve the transition to a low carbon economy by investing in energy efficiency, renewable energy, new technologies and infrastructure, and helping clients manage the risks of the transition. The majority of these investments are focused on cities. The HSBC Sustainable Finance team has a dedicated division for the financing of BRT transit.
InfraFund	Inter-American Development	Latin America and the Caribbean	Green buildings, energy conservation, renewable energy, public transportation/mobility, green	The InfraFund aims to help public, private and mixed capital entities in Latin America and the Caribbean identify, develop and prepare bankable and sustainable infrastructure projects that have

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	Bank (IDB)		transportation/electric vehicles, waste management, water supply and water treatment	the potential for financial closure. Divided by sectors, the InfraFund approved 9 energy projects (5 of which are renewable energy and energy efficiency projects), 7 transport projects (including airports, roads, bus rapid transit systems and railroads), 5 water and drainage projects and 2 technical cooperation for multi-sector projects.
NEPAD Infrastructure Project Preparation Facility (NEPAD-IPPF)	AfDB	Sub-saharan Africa, Middle East, North Africa	Energy conservation, ICT, renewable energy, public transport/mobility, green transport/electric vehicles, water supply and water treatment	The NEPAD-IPPF is a special multi-donor fund that aims to increase the number of regional infrastructure projects to be prepared and implemented in promoting economy, environment, social and gender equality, and to increase funding and improve stakeholder interactions. Activities eligible for funding include pre-feasibility studies, feasibility studies, project architecture, capacity building for infrastructure development, and promotion and creation of a favorable environment for regional infrastructure development.
Transformative Actions Program (TAP)	ICLEI	Global	Energy efficiency, renewable energy, public transportation/mobility, green transportation/electric vehicles, waste management, water supply and water treatment	TAP is a fund for project planning and project preparation developed by ICLEI and its partners. It is an incubator that supports local and regional governments to promote low to zero emissions and resilient development by catalyzing capital flows. Through TAP, local and regional governments receive support to develop transformative local infrastructure projects. The program aims to connect local climate actors, technical experts and financial institutions.
Low Carbon City Lab (LoCaL)	Climate-KIC	Latin America, East Asia Pacific, South Asia, Europe,	Climate finance, green buildings, energy conservation, public transportation/mobility, green	The LoCaL is a flagship program designed to unlock finance for cities. Public and private organizations work together to create innovative tools and solutions tailored to cities and investors.

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		sub-Saharan Africa and North Africa	transportation/electric vehicles, waste management, green industrial development	
Urban Financing Partnership Facility	ADB	East Asia Pacific, South Asia, Europe, Central Asia	Green buildings, renewable energy, public transportation/mobility, green transportation/electric vehicles, waste management, water supply and water treatment	The aim of the Urban Financing Partnership Facility is to raise and utilize development partner funds for investment co-financing in urban environmental infrastructure projects and support a wide range of technical assistance to help lay the groundwork for such projects.
Urban Climate Change Resilience Trust Fund (UCCRTF)	ADB	Central Asia, West Asia (Pakistan), South Asia (Bangladesh, India, Nepal), Southeast Asia (Indonesia, Philippines, Myanmar, Vietnam)	Energy efficiency, renewable energy, public transportation/mobility, green transportation/electric vehicles, waste management, water supply and water treatment	The UCCRTF is a \$150 million multi-donor trust fund administered by ADB under the Urban Financing Partnership Facility. The Rockefeller Foundation and the governments of Switzerland and the United Kingdom support the fund. It aims to support fast-growing cities in Asia to reduce the risks poor and vulnerable people face from floods, storms or droughts, by helping to better plan and design infrastructure to invest against these impacts. The fund also aims to scale up investments in urban climate change resilience (UCCR), especially for the urban poor across 25 secondary cities in Asia, including Bangladesh, India, Indonesia, Myanmar, Nepal, Pakistan, the Philippines and Vietnam.
Green Bonds for Cities	South Pole Group, Climate Bonds Initiative	Global	Green building, energy conservation, renewable energy, public transportation/mobility, green transportation/electric vehicles, waste management, water supply and water	The Green Bonds for Cities aims to support cities in emerging, developing and countries in transition to enter the green bond market. The project aims to enable more local governments to use debt markets to finance low-carbon infrastructure, with the goal of commercializing project.



BRIGC

Initiatives/Programs	Initiator	Scope	Industry	Major Goals
			treatment, green industry development	
Clean Technology Fund	The Climate Investment Funds	East Asia Pacific, Latin America and the Caribbean, South Asia, Europe and Central Asia, Middle East, Sub-Saharan and North Africa	Energy efficiency, renewable energy, public transportation/mobility, green transportation/electric vehicles, agriculture and forestry	The Clean Technology Fund aims to promote low-carbon technologies that have significant potential to reduce greenhouse gas emissions in the long term. More than \$4 billion (75 percent of the fund's resources) has been approved for renewable energy, energy efficiency and clean transportation.
City Resilience Index	Arup International Consultants (United Kingdom) Co. Ltd.	Global	Green buildings, energy conservation, renewable energy, public transportation/mobility, green transportation/electric vehicles, waste management, water supply and water treatment, street lighting	The City Resilience Index is a tool designed to inform all cities about how they can best respond to the risks posed by climate change by identifying vulnerabilities and making recommendations for improvement.