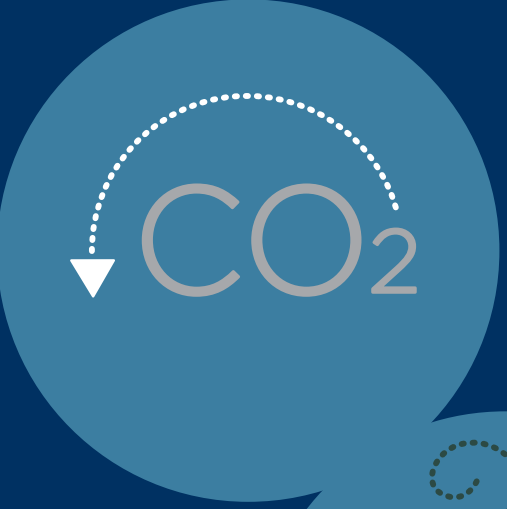
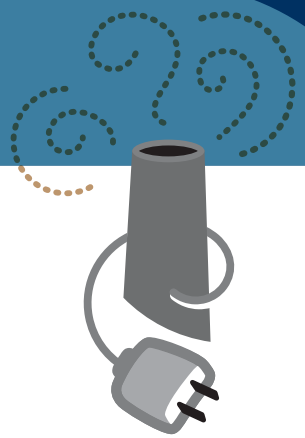


China's Subnational 14th Five-Year Plans:

PROVINCIAL-LEVEL CITIES' CLIMATE GOALS and STRATEGIES



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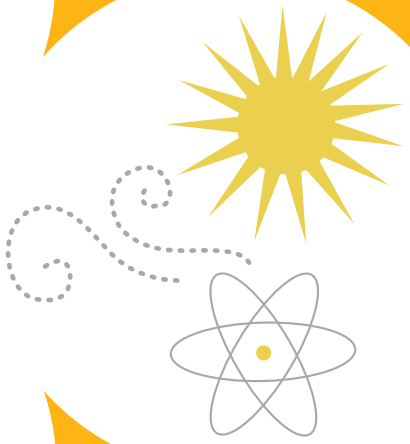

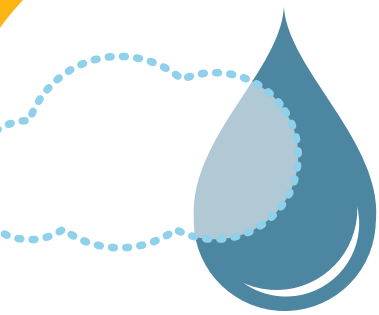

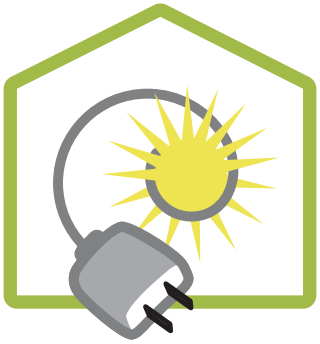

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Introduction

Beijing, Shanghai, Tianjin, and Chongqing are the four municipalities – provincial-level cities (直辖市) – in China directly under the control of the National Government. Under China's governing structure, these four municipalities have the same governing power as other provincial governments.

These municipalities lead the nation in population and economic power (Table 1), and now climate action. In terms of climate governance, they have direct decision-making power to set up climate policies under the National Government's guidance and objectives. Even though they are "cities," they uniquely do not need to coordinate with an overarching provincial government. All four municipalities have released their 14th Five-Year Plans (FYPs) on climate change, and on specific economic sectors and topics, such as energy supply, energy conservation, and environmental protection.

This brief is based on an analysis of publicly-available 14th FYPs across sectors for the four provincial-level municipalities (Beijing, Shanghai, Tianjin, and Chongqing), from July 2021 to December 2022. The types of plans reviewed included - but were not limited to - the 14th FYPs on Environmental Protection, on Energy Saving and Carbon Reduction, and on Energy Supply. A list of all the policies reviewed is at the end of the brief.

Table 1:
SNAPSHOT OF THE FOUR MUNICIPALITIES

	BEIJING	SHANGHAI	TIANJIN	CHONGQING
LOCATION	Capital city in the North China plain	Coastal city at the Yangtze River Delta	North China, inland of Bohai Sea	Mountain city in interior West, upstream of Yangtze river
2021 POPULATION (RANK)	22 million (#3)	25 million (#2)	14 million (#7)	32 million (#1)
2021 GDP (CITY LEVEL GDP RANK)	4 trillion (#2)	4.3 trillion (#1)	1.6 trillion (#11)	2.8 trillion (#5)

CLIMATE IMPACTS

Each municipality faces unique challenges in preparing for and adapting to climate change impacts because of its local climate. For example, Shanghai, a coastal city at the Yangtze River Delta, is vulnerable to sea-level rise and coastal flooding. Chongqing, known as one of the "three ovens" of China for its hot and humid summer, is vulnerable to extreme heat waves. During Summer 2022, Chongqing faced a record-breaking heatwave with temperatures reaching over 40 Celsius (104 Fahrenheit) for

two straight weeks.[1] This affected the economic development of the metro area, brought wildfire and drought risks, and threatened the Yangtze River, the main water source and hydropower source in China. Beijing and Tianjin, located in Northern China with dry climate and low annual precipitation, are threatened by more frequent drought and potential water shortages. While not a main focus, municipalities have laid the foundation to address climate adaptation and resilience in their 14th FYPs. For example, Beijing will start climate impact assessments in key areas like forestry, agriculture, and water resources, and build climate-resilient urban infrastructure.

CARBON TARGETS

All four municipalities have carbon emissions reduction targets in their 14th FYPs. Tianjin and Chongqing have targets aligned with the national targets (i.e., carbon peaking by 2030); and Beijing and Shanghai have targets earlier than the national targets. By 2025, Beijing will reduce total carbon emissions at least 10% from peak level, not including emissions from aviation. Shanghai aims to achieve carbon peaking before 2025, five years earlier than the national carbon peaking target.

The four municipalities are among the first seven pilot carbon trading markets in China started in 2013.[2] The pilot carbon markets covered the key industries such as electric generation, steel and cement manufacturing. The pilot markets provided lessons-learned for the current nationwide emissions trading scheme (ETS).

Energy

All municipalities have their 14th FYPs on Energy Supply that provide targets and policies through 2025 in the electricity sector.

The key two strategies in reducing emissions from energy supply in all FYPs are (1) to increase non-fossil fuel in primary energy consumption by electrifying transportation and industrial sector, and expanding electricity coverage, especially in rural areas; and (2) to reduce the percent of coal in total energy consumption and replace them with non-fossil energy. Each municipality has its own metrics to evaluate the strategies (Table 2). For example, Chongqing aims to achieve 50% of energy capacity as clean energy. For Tianjin, the goal is to keep coal-powered electric capacity capped at 12.5 Gigawatts (GW), even though Tianjin anticipates its total generation capacity to reach 26 GW in 2025 to keep up with the increasing electricity demand. Shanghai's target is to cap coal consumption at 43 million tons and to have renewables account for 8% of the total electricity consumption, an increase from 1.6% in 2019, by replacing local coal with renewables. Improving electric grid reliability, especially in urban core areas, is a key strategy for both Chongqing and Tianjin to reduce fossil fuel in primary energy consumption. As indicated in Chongqing and Tianjin's FYPs, how to maintain grid reliability, especially during peak periods in urban core areas, is a key challenge municipalities face in reducing fossil fuel in primary energy consumption.

The types of renewables or non-fossil sources each municipality includes in its plan are locationally specific. For example, Chongqing plans to take advantage of the hydroelectric generation facilities at the Three Gorges Dam; and Beijing will develop local solar and geothermal based on the already available local resources. Because all of these municipalities do not have a lot of land coverage for additional non-fossil development, another way to increase renewable electricity is to expand inter-provincial

1 (Fok, 2022)

2 The other three provinces and cities are Guangdong, Huban, and Shenzhen.

electricity grid capability to import and share renewable resources. Beijing will work with Tianjin and Hebei, the Jing-Jin-Ji metro area, to develop energy supply networks, and to develop and prioritize wind and solar energy within the metro area. Tianjin will develop high-voltage transmission lines to bring in renewables from Inner Mongolia and other inland provinces. However, natural gas is still in the future energy mix, even though the municipalities are transitioning from coal. Chongqing has abundant natural gas resources and its goal is to increase natural gas to 20% primary energy consumption while reducing coal use to 40%. Shanghai has a similar goal, increasing natural gas use to about 17% while reducing coal use to 30% of the primary energy consumption.

Table 2:
ENERGY METRICS

	BEIJING	SHANGHAI	TIANJIN	CHONGQING
NON-FOSSIL IN PRIMARY ENERGY CONSUMPTION	25%	No target	22%	25%
REDUCE COAL CONSUMPTION BY	Capped capacity at 12.5 million kW	30%	No target	40%

Transportation

The strategies to reduce emissions from the transportation sector are broken down into the strategies for light-duty vehicles, such as passenger cars and personal vehicles, and heavy-duty vehicles, such as freight trucks.

On the light-duty vehicle side, each municipality released detailed FYPs to increase the number of new energy vehicles (NEVs) and the supporting electric vehicle charging stations (EVCS). Each municipality either has a total number of NEVs target or a NEV market share target (i.e., percentage of NEVs out of newly purchased vehicles). For example, Shanghai's aggressive NEV target is that pure electric vehicles will account for 50% market share. Similarly, Tianjin's NEV target is 25% electric vehicle market share. Beijing has a 2 million total NEV in the city target. Each municipality also has the goal to install electric vehicle charging stations (EVCS) to support the increasing NEVs, as shown in Table 3.

Uniquely, Beijing not only has EVCS goals for private residences, shared public places, and workplaces separately, it also has goals for EVCS per area (one within 0.9 km radius in urban area, and 1 within 3 kilometer radius in the entire city) and goals for fast to regular EVCS ratio (2:1 in urban areas and 1:2 in other areas). Both metrics normalize the charging infrastructure needs and can be used to compare infrastructure development if more cities adopt them.

One key policy all municipalities have is to transition public transit vehicles, such as buses, taxis, rideshare vehicles, and delivery vehicles, to NEVs as soon as possible. Tianjin's goal is to have 80% buses, taxis, and delivery vehicles be NEVs, in addition to requiring 30% new or replaced government vehicles as NEVs. Both Beijing and Shanghai aim to have 100% new and replaced buses and taxis to be NEVs.

On the heavy-duty vehicle side, the key policy is to transition from on-road freight to rail and waterborne freight, and for on-road freight vehicles to use cleaner fuel such as liquified natural gas (LNG) and

hydrogen. Shanghai, Chongqing, and Tianjin all have busy port authorities and aim to make the clean energy transition in their ports. Both Chongqing and Tianjin will promote on-shore electric charging, and prioritize electricity, natural gas, and hydrogen at port facilities, and accelerate the transition from diesel to LNG at terminals for ocean-going vessels.

Table 3:
TRANSPORTATION METRICS

	BEIJING	SHANGHAI	TIANJIN	CHONGQING
NEV GOAL	2 million	50% Market Share	25% Market Share	No Goal
ELECTRIC VEHICLE CHARGING STATIONS	700k	100k	No target	50k
HYDROGEN FUEL STATION	No target	70	No target	100

Industry

For these municipalities, the policies to transition to the low-carbon industrial sector are not as specific as the policies outlined in other sectors. One key target all four cities have is to control and reduce energy inputs, especially coal inputs, in the industrial sector. For example, apart from the coal-fired electric generation that is currently under construction, Tianjin will not build new coal plants. Furthermore, it will continue to retire small coal-fired electric generation and co-generation plants. Chongqing will complete retrofits in the steel industry and retire old coal-fired boilers and furnaces used in industrial processes. The municipalities also aim to transition from carbon-intensive industries, such as the petroleum, cement, and steel industries, to high-tech and lower energy use industries, such as renewable energy, biotech, batteries, and advanced technologies.

Table 4:
INDUSTRY METRICS

	BEIJING	SHANGHAI	TIANJIN	CHONGQING
ENERGY USE PER UNIT OF INDUSTRIAL ADDED VALUE	-12%	-13%	No target	No target
CO_2 EMISSIONS PER UNIT OF INDUSTRIAL ADDED VALUE	-20%	-15%	No target	-22%

Buildings

The strategies to reduce emissions from the buildings sector are designed to address both new construction and existing buildings. For new construction, the municipalities aim to expand and expedite their green building standards and green building material requirements. For example, Beijing has been updating its Building Energy Efficiency Standards since the 1980s and released its "80% Building Design Standards" in 2021, meaning that buildings will be 20% more energy efficient than the current standards. Building standards exist in three tiers, Tier 1 is the least stringent and Tier 3 is the most stringent. Beijing will require all new residential buildings to achieve green building standards, and new government-funded and large commercial buildings to achieve Tier 2 or higher in the national green building standards. Similarly, Tianjin's target is to achieve 100% green building in new constructions at the urban center; and Chongqing's target is to have 70% of new buildings be green buildings.

For old and existing buildings, one key strategy is to combine building retrofits and energy retrofits together. Both Chongqing and Tianjin combine both retrofits together to improve the comfort level of the built environment, with additional actions to increase building efficiency, developing community solar, and improving centralized heating and air conditioning efficiency at older buildings. Shanghai passed China's first building energy efficiency benchmarking policy in 2019 in its Changning District, which will assess energy use and identify opportunities for building retrofits.

Table 5:
BUILDING METRICS

	BEIJING	SHANGHAI	TIANJIN	CHONGQING
% GREEN BUILDINGS IN NEW CONSTRUCTION	100%	No target	100% (urban center)	70%

Air Quality and Nature-based Climate Solutions

All municipalities have key targets and metrics in their 14th Five-Year Plans on Environmental Protection, to protect air and water quality, and natural resources, such as forest and wetlands, as shown in Table 6. The targets in this section are closely tied to the targets in other sectors. For example, reducing air pollutants requires clean energy transition from key sectors, such as the heavy industry, energy, and transportation sectors.

All municipalities have wetland protection and increasing urban city parks strategies in their plans. For example, Tianjin will develop a wetland protection system to improve the protection and preservation of the current national wetland parks with regular monitoring and data collection. Shanghai's Thousand Parks Plan will increase the number of community-based parks in the city from the current 400 to more than 1,000. The municipalities also have locationally specific environmental protection strategies. For example, Chongqing, located near the Yangtze River and Three Gorges Dam, designated certain areas as the key environmental and biodiversity protection areas and to strengthen soil erosion prevention policies.

Table 6:
FORESTRY AND AIR QUALITY METRICS

	BEIJING	SHANGHAI	TIANJIN	CHONGQING
% FOREST COVERAGE	44% to 45%	18.5% to 19.5%	13% to 13.6%	52.5% to 57%
PM2.5 ANNUAL AVERAGE CONCENTRATION (MG/M3)	<35	<35	<38	<35
% OF DAYS WITH SATISFACTORY AIR QUALITY	No target	85%	72.6%	92.6%

Conclusion

There are several key policy strategies that China's four provincial-level cities are employing to meet their climate goals across sectors indicating a convergence of approaches. This is important to reduce emissions in all sectors and improve air quality, another important environmental protection policy goal. Reducing coal dependence is an essential component for all of the municipalities. Even though the types of renewables or non-fossil sources each municipality uses to replace coal are locationally specific, the targets on non-fossil sources development are not specified in the 14 FYPs. All of them view the need to expand inter-provincial electricity grid capability as an important component to increase renewable energy use.

In the transportation sector, the key avenues to reduce emissions are focused on light- and heavy-duty vehicles. This includes (1) Increase new energy vehicle (NEV) market share for personal vehicles and transition public vehicle fleet to 100% NEVs; and (2) transition from on-road freight to rail and transition ships to cleaner fuels such as liquified natural gas and hydrogen. The primary strategies in the building sector are to address new and existing buildings. In new buildings, efforts are focused on expanding and expediting new construction green building standards and green building material requirements and linking building and energy retrofits for existing buildings. All municipalities have wetland protection and increasing urban city parks strategies in their plans to reach mitigation and adaptation goals. The combination of these priorities and the various ways that cities plan to meet their sector-specific goals provides insight into ways that cities can collaborate with each other and share implementation lessons to accelerate climate action.

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Chongqing:

14th Five-Year Plan and Outline of Vision 2035

14th Five-Year Plan on Climate Change

14th Five-Year Plan on Energy Supply

14th Five-Year Plan on Environmental Protection

Tianjin

14th Five-Year Plan on Environmental Protection

14th Five-Year Plan on Natural Resources Protection and Utilization

14th Five-Year Plan on Energy Saving and Carbon Reduction - Implementation advice

14th Five-Year Plan on Energy Supply

Beijing

14th Five-Year Plan to Address Climate Change and Energy Conservation

14th Five-Year Plan and Outline of Vision 2035

14th Five-Year Plan on Eco-environmental Protection Plan

14th Five-Year Plan of the Development of New Energy Vehicle Charging and Switching Facilities in Beijing

Shanghai

14th Five-Year Plan and Outline of Vision 2035

14th Five-Year Plan on Environmental Protection

Implementation Plan for Accelerating the Development of New Energy Vehicle Industry in Shanghai (2021-2025)

14th Five-Year Plan on Green Industry

Thousand Park Plan