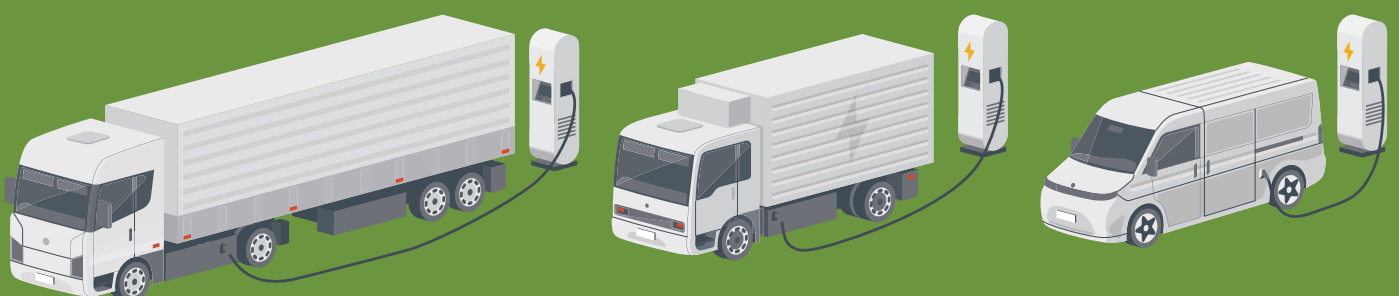
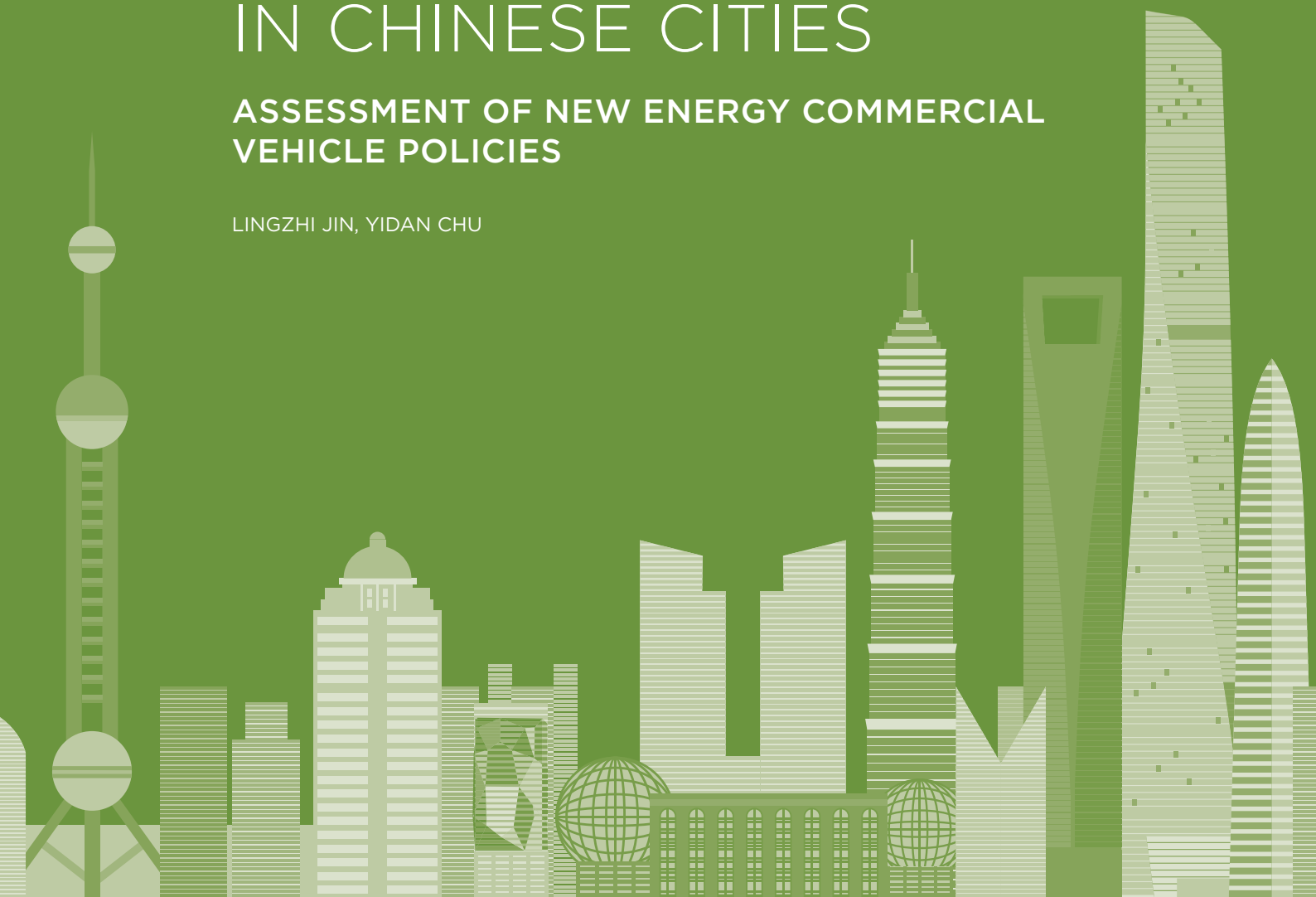


ACCELERATING NEW ENERGY VEHICLE UPTAKE IN CHINESE CITIES

ASSESSMENT OF NEW ENERGY COMMERCIAL VEHICLE POLICIES

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EXECUTIVE SUMMARY

China is a pioneer in developing the market for new energy commercial vehicles (NECVs), and the uptake is progressing faster in some cities than in others. This paper provides a review of major NECV policies in 10 cities in 2020—along with the relevant national policies that guided city actions—and compares these policy initiatives with market performance. The cities selected for this review vary greatly in size and other characteristics, but all have had greater-than-average success in at least some segments of the NECV market. These leading cities offer important lessons for understanding the factors that help drive NECV uptake.

The NECVs considered cover major fleet types other than private passenger cars, including medium- and heavy-duty vehicles (M&HDV), light commercial vehicles, and commercial cars (taxis and transportation network company vehicles such as ridesharing and ride-hailing). The 10 cities are Shenzhen, Shanghai, Beijing, Guangzhou, Tianjin, Chengdu, Nanjing, Xiamen, Haikou, and Handan.

From this review, we draw the following main conclusions:

Central policies were the main driver of new energy M&HDV uptake, and many of these policies were driven by the need to improve air quality. One impactful policy mandated restrictions on production capacity and on the use of conventional fuel trucks for key industries in certain regions during heavy-pollution days if clean transportation requirements were not met. Cities with these restrictions had, on average, almost three times the number of new registrations for new energy dump trucks and tractor trucks and twice the market share of these vehicles than other cities in 2020.

Green Freight cities outperformed others in new energy urban logistics vehicle uptake. Preferential road access combined with operation subsidies were measures widely adopted by Green Freight cities participating in the national program to promote more new energy urban logistics vehicles. These cities, on average, had 13 times the registrations and almost 4 times the market share of non-Green Freight cities in terms of newly registered new energy urban logistics vehicles in 2020. These numbers are even higher for cities that also had clear and specific preferential road access policies.

The combination of scrappage incentives and NEV incentives can encourage the adoption of NECVs, especially in the medium- and heavy-duty segments. Some leading cities provided incentives for retiring China III vehicles and some other cities required early retirement or removal of conventional fuel vehicles in fleets to qualify for certain NEV subsidies. This combined with NEV incentives—including vehicle replacement subsidies and usage-phase incentives—can motivate the transitioning of fleets to NEVs.

Planned phase-out of road transportation certificates for conventional fuel vehicles was a widely used measure for reaching full electrification targets of taxis and TNC vehicles. Cities also imposed additional requirements for replacing vehicles at taxi and transportation network companies, including setting timelines for the turnover of a conventional fuel fleet.

Our recommendations:

China could consider further encouraging local governments to accelerate the adoption of new energy M&HDVs. There was a policy gap at the city level for the new energy M&HDV segments. Enhanced local government policies could be developed based on carbon reduction goals, air quality improvement needs, and local conditions.

Consider pairing operation subsidies with verification of use (mileage) and performance requirements on a continuous basis. Mileage and technical requirements can be gradually increased through adopting a tiered structure for mileage requirements in relation to operation subsidies.

Consider additional requirements on commercial vehicle owners and users to qualify for government fiscal or other support. Examples include sharing data for mileage verification, setting increasingly stringent technical thresholds for vehicles and batteries, and accelerating the retirement or renewal of conventional fuel vehicles.

Cities and other government entities can set ambitious targets and formulate supporting measures for each vehicle type or application scenario to help ensure these targets are met. Because commercial vehicles serve many sectors, it is critical that government entities collaborate with other stakeholders, including other government departments and industries, to develop policies to reach the goal of clean air.

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ACRONYMS

| | |
|-------|-------------------------------------|
| BEV | Battery electric vehicle |
| CV | Commercial vehicle |
| FCEV | Fuel-cell electric vehicle |
| HDV | Heavy-duty vehicle |
| MDV | Medium-duty vehicle |
| M&HDV | Medium- and heavy-duty vehicle |
| MEE | Ministry of Ecology and Environment |
| NECV | New energy commercial vehicle |
| NEV | New energy vehicle |
| PHEV | Plug-in hybrid electric vehicle |
| TNC | Transportation network company |

INTRODUCTION

China is a trailblazer in the promotion and adoption of new energy commercial vehicles (NECVs), especially when it comes to electric buses. In recent years, buses and coaches accounted for about half of all NECV sales in the country. In 2021, while total commercial vehicle (CV) sales decreased by 6.6% compared to 2020, battery electric CV sales increased significantly, by 57%, with approximately 182,000 sold. That same year sales of plug-in hybrid electric CVs decreased by 24% to around 3,000 sales. Compared to the booming new energy passenger car (NEPC) market, the pace of NECV uptake has been slow. NECV sales were only around 10% of the size of NEPC sales in 2020, and just 6% of the size of the NEPC market in 2021 (China Association of Automobile Manufacturers, 2022).

This report compares NECV policy drivers in China with market performance by reviewing policies and incentives in 10 leading cities. We also consider major national policies that guided city actions in 2020. In addition to light CVs and medium- and heavy-duty vehicles (M&HDVs), we include commercial car fleets such as taxis and ridesharing and ride-hailing cars from transportation network companies (TNCs) in this analysis. We refer to all of these vehicles for non-private and commercial use collectively as CVs in the rest of the paper.

Figure 1 shows the leading NECV city markets in terms of new registrations in 2020 for various vehicle types. There are a large number of city-level policies that are potentially relevant to the new energy vehicle market, although it is often difficult to obtain data and policy documents from smaller cities; therefore, we selected 10 of these leading cities for a deeper look into city-level policies. The 10 were chosen based on a variety of factors, including a desire to capture cities from different tiers and locations in the country, information availability, and cities' interest in further engagement. Cities are unofficially classified into tiers in China based on factors such as population and the size of the economy. Tier 1 and New Tier 1 cities are the most well-developed metropolises, and many of them are centrally administered municipal or provincial capitals. The 10 cities chosen include four Tier 1 cities (Shenzhen, Shanghai, Beijing, and Guangzhou), three New Tier 1 cities (Tianjin, Chengdu, and Nanjing), one Tier 2 city (Xiamen), one Tier 3 city (Haikou), and one Tier 4 city (Handan). Including cities of different tiers in our analysis provides a more comprehensive policy picture. Other than Haikou, Handan, and Xiamen, which are shown in Figure 1, the remaining selected cities were also among the top 10 in terms of total NECV registrations in 2020. Though the markets in Haikou and Xiamen are smaller, they had high NECV market shares of 5% and 7%, respectively, when considering CVs of all fuel types, which was more than double the national average. Other selected cities also had higher-than-average NECV market share.

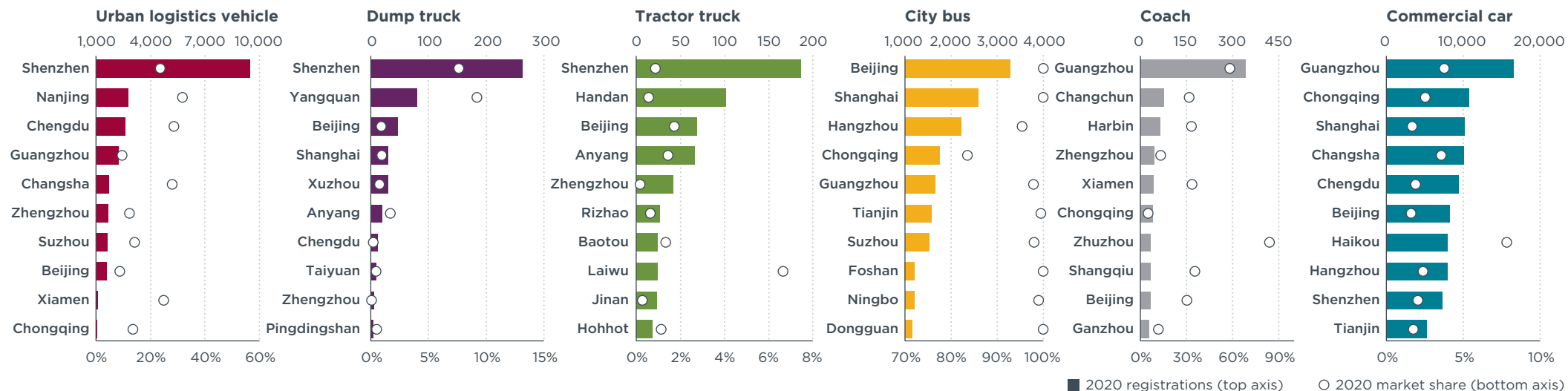


Figure 1. New NECV registrations and market share of top 10 cities by vehicle type, 2020.

Note: The new energy commercial car market share is among all passenger cars, while others are among their respective commercial vehicle type. Adapted from Chu et al. (2022).

Only a small number of fuel-cell electric vehicles (FCEVs) were registered in China in 2020. Major local policy efforts for FCEVs only started to get underway in late 2020, after the central government released the details of FCEV pilot cities (Jin & He, 2020). Thus, this paper focuses on policies for battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs). The leading cities in Figure 1 had few new FCEVs registered in 2020, except for around 400 fuel-cell electric city buses in Guangzhou.

CENTRAL POLICIES

Major new energy vehicle (NEV) central policies are discussed in our companion report on private NEPCs (Jin et al., 2023). They include central planning, NEV purchase subsidies, tax incentives, and charging infrastructure awards, and most of them also apply to commercial vehicles. In this section, we discuss relevant central policies with a focus on NECVs.

Central planning such as the 2012–2020 and 2021–2035 NEV industry development plans set overall targets for NEV development. For example, the 2021–2035 plan targets about 20% of NEVs in new vehicle sales by 2025. Other than central planning for the overall NEV industry, certain central policies are vital in the uptake of NECVs (Table 1). These policies target segments such as commercial diesel vehicles and engines (there are not many diesel passenger cars in China), urban logistics vehicles, and vehicles used for the transportation of bulky goods such as iron and steel. Local governments have adopted policies to further implement the requirements in these central policies.

Table 1. Major types of central policies that are geared toward NECVs

| Policy type | Example | Year | Summary | Select targets in identified areas |
|---------------------------------------|--|--------------------------------|--|---|
| Environmental | National Plan of Blue-Sky Defense | 2018 | Plans identify key regions (Beijing-Tianjin-Hebei and surrounding areas, abbreviated as Jing-Jin-Ji, Yangtze River Delta, Fen-Wei Plain in all plans; and an additional six cities in Inner Mongolia in the Clean Diesel Action Plan) for emissions control; the plans set targets and encourage local governments to establish incentives for phase-out of diesel vehicles and promote the adoption of NEVs | 80% new NEV or clean energy for public service vehicles ^a and new vehicles at ports, airports, and railyards in key regions, and these are to be mainly NEVs |
| | Clean Diesel Action Plan | 2019 | | By the end of 2020, Jing-Jin-Ji and Fen-Wei Plain should retire at least one million diesel vehicles older than China III. |
| | Green Mobility Action Plan | 2020 | | NEV and clean energy vehicle stock to be at least 60% in key regions and 50% in others |
| | Annual air pollution control action plans during autumn and winter | | | In terms of PM _{2.5} concentration and heavy pollution days. Goal varies by region. |
| Transport | Three-year Action Plan for Promoting Transport System Structural Adjustment | 2018 | Aims to promote green freight and a more efficient transport system by means such as demonstration projects and incentives for urban logistics and other freight vehicles, especially in Jing-Jin-Ji, Yangtze River Delta, Fen-Wei Plain, Inner Mongolia and Liaoning Province | 80% NEV or China VI in new urban logistics vehicles in urban areas in areas identified, and 50% in other urban areas. |
| | Green Freight Initiative | 2018 | Aims to encourage the uptake of urban logistics vehicles by pilots in selected cities | Cities set their own targets but need to be approved |
| Environmental policies for industries | Opinions on Promoting the Implementation of Ultra-low emissions in the Steel Industry | 2019 | Target key industries such as steel in Jing-Jin-Ji, Yangtze River Delta, and Fen-Wei Plain for emissions reduction by implementing a rating system, which restricts production and transportation activities based on the rating | — |
| | Technical Guidelines for Emergency Emission Reduction Measures for Key Industries in Heavy Pollution Weather | 2019, updated in 2020 and 2021 | | — |

^a Public service vehicles include buses, taxis, urban logistics vehicles, sanitation vehicles, and postal vehicles.

ENVIRONMENTAL POLICIES

Central policies focused on the environment aim to reduce emissions and improve air quality. Diesel vehicles account for the majority of the CV fleet and are a major source of pollution in many areas. Central policies, such as the four plans listed in Table 1, serve as important guidance for local governments, especially those in the key regions (hereafter “Key Regions”) that have higher levels of pollution and thus are critical areas for air quality improvement.

Key Regions include Hebei, Shanxi, Shanghai, Zhejiang, Jiangsu, Anhui, Shandong, Henan, and Shaanxi provinces, and two cities, Beijing and Tianjin. These regions, also referred to as Jing-Jin-Ji, the Yangtze River Delta region, and Fen-Wei Plain, are identified as targets for the policies listed in Table 1, with the exception of the Green Freight Initiative. Figure 2 shows the location of the Key Regions and also the Green Freight cities mentioned later in this section. The Clean Diesel Action Plan also includes six cities in the Inner Mongolia Autonomous Region as key regions, and the Three-year Action Plan for Promoting Transport System Structural Adjustment includes Liaoning and the Inner Mongolia Autonomous Region as key regions.¹ These regions are not shown in Figure 2.

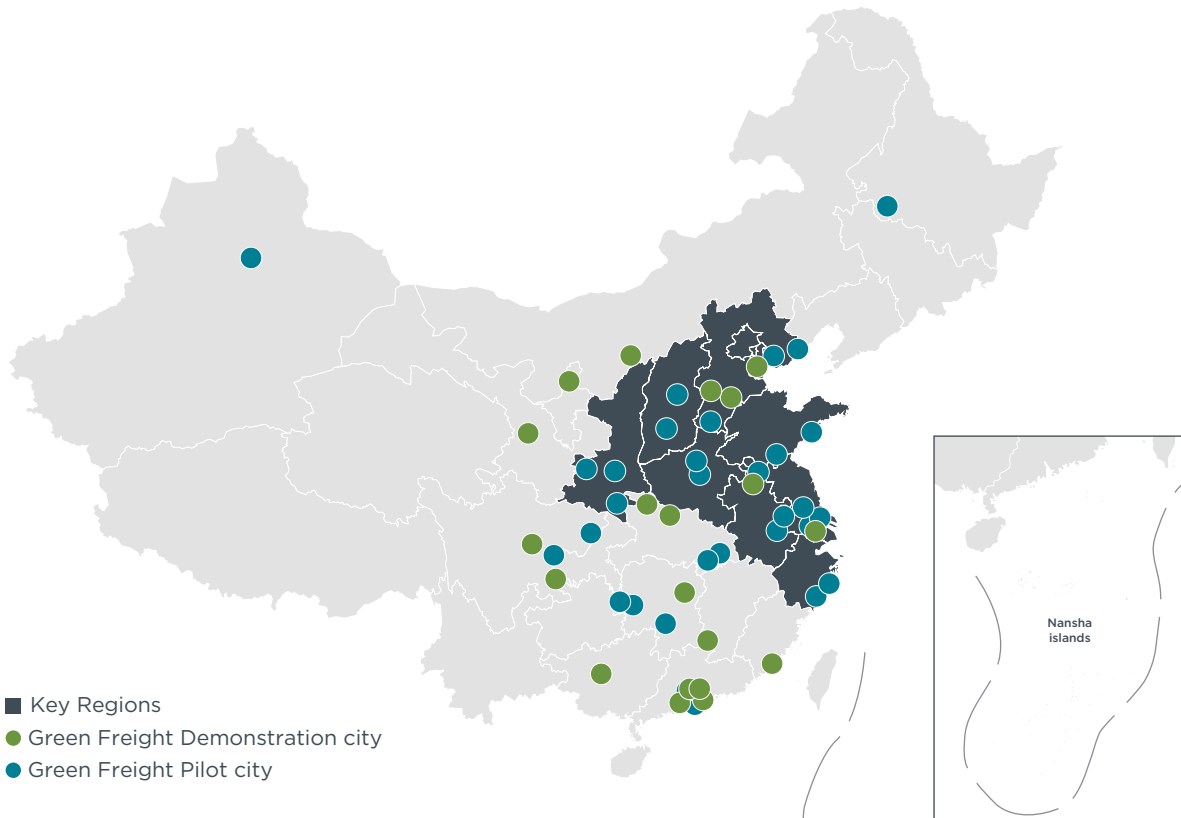


Figure 2. Key Regions considered in this analysis, Green Freight Demonstration cities, and Green Freight Pilot cities.

TRANSPORT POLICIES

Central transport policies aim to upgrade the transport system to be more efficient and cleaner. The Three-Year Action Plan for Promoting Transport System Structural Adjustment, issued in 2018, uses demonstration projects and incentives for urban logistics vehicles and other freight vehicles, especially in Key Regions plus Inner Mongolia and Liaoning Province (Office of the State Council, 2018). The plan aims to

¹ Hohhot, Baotou, Ulanqab, Ordos, Bayannur, and Wuhai.

achieve 80% NEV or China VI new urban logistics vehicles sales in urban areas in the Key Regions identified above, and 50% in other urban areas.

Led by the Ministry of Transport, the Green Freight Initiative aims to encourage the uptake of urban logistics vehicles, similar to how the Ten Cities, Thousand Vehicles program targeted passenger vehicles (Ministry of Finance of the People's Republic of China, 2009). Cities that apply for the pilot program are selected based on economic and policy foundations such as the size of the city, current and potential needs for the transportation of goods, infrastructure, and supporting policies. Green Freight Pilot cities are required to develop action plans that are approved by provincial and central governments and are evaluated annually based on performance. Those that achieve the set targets after 3 years are named Demonstration cities and enjoy more beneficial policies (Ministry of Transport of the People's Republic of China, 2022a). The Pilot and Demonstration cities are collectively referred to as Green Freight cities.

In 2018, the Ministry of Transport selected 22 cities as pilots. After 3 years, 16 cities were named Demonstration cities based on good performance, and the other six were granted an additional year to achieve their targets (Ministry of Transport of People's Republic of China, 2021). In 2019, another 24 cities were selected as pilots and in 2022, 31 additional cities were added as pilots (Ministry of Transport of the People's Republic of China, 2019, 2022b).

Five of the 10 leading cities selected for this report are Green Freight Demonstration cities (Chengdu, Guangzhou, Shenzhen, Tianjin, and Xiamen) and one (Nanjing) is among the 2019 pilots.

ENVIRONMENTAL POLICIES FOR KEY INDUSTRIES

The central government and regional governments also target key industries for emissions reduction. In 2019, the Ministry of Ecology and Environment (MEE) issued a document outlining efforts to reduce emissions from the iron and steel industry (Ministry of Ecology and Environment, 2019a). It requires that at least 80% of the bulky products and materials to and from iron and steel factories be transported through rail, waterways, pipelines, belt conveyors, or other low-emission methods. If this requirement is not met, then the on-road transport for the remaining bulky products and materials should be through NEVs or vehicles certified to China VI (or China V before the end of 2021). In addition, the steel industry in Key Regions can use only new energy or China VI heavy-duty vehicles on heavy pollution days with orange or higher warnings.

Following this requirement on the iron and steel industry, the MEE issued an environmental performance rating policy later in the same year that specifies emission reduction measures on heavy pollution days for 15 key industries in Key Regions (MEE, 2019b); the number of key industries was increased from 15 to 39 in 2020 (Ministry of Ecology and Environment, 2020). These include iron and steel coking, production, and refining, and the manufacturing of petrochemicals, cement, and pesticides, among others. Businesses are given a rating of A to D based on their emissions and reduction measures, and those that rank A can take voluntary action during heavy pollution days. Others must limit emissions from production and transportation activities on heavy pollution days, with businesses that rank D having the most stringent restrictions. To earn an A rating, a key transportation metric is that businesses transporting bulky products and materials need to reach targets similar to those for the steel industry: at least 80% of these products should be transported through low-emission ways such as rail, waterways, and NEVs, with the rest through NEVs or China VI vehicles (or China V before the end of 2021). Other businesses need to use NEVs or China V or above vehicles. This is a major driver for businesses to adopt NEVs, as heavy pollution days are not rare in these areas.

NEV PURCHASE SUBSIDIES

Like for passenger cars, purchase subsidies from the central government for CVs were gradually phased down with successively tightened technical requirements; the central government now encourages shifting support to the use phase. The central subsidy was initially scheduled to be phased out by the end of 2020 but it was extended to 2022. In 2020, the maximum subsidies for light-, medium- and heavy-duty freight-carrying vehicles were CNY 18,000, CNY 35,000, and CNY 50,000 for BEVs, respectively,² and CNY 0, CNY 20,000 and CNY 31,500 for PHEVs, respectively. Non-private and commercial passenger cars receive 70% of the passenger car subsidies.

To prepare for the removal of the subsidies, the Chinese central government in March 2019 encouraged local governments to eliminate local purchase subsidies for most NEVs (Ministry of Finance of the People's Republic of China, 2019). Therefore, in most cities in 2020, the only local purchase subsidies were for FCEVs (before April) and new energy buses. In April 2020, the universal purchase subsidy was replaced by financial awards in select pilot cities for FCEVs based on how well the pilot cities achieve their targets (Jin & He, 2020).³

2 Light: less than 3,500 kg; medium: at least 3,500 kg and no more than 12,000 kg; heavy: more than 12,000 kg.

3 Targets can include different parts of the value chain such as technology, manufacturing, and deployment, and this allows locally suited plans and growth of the overall industry.

CITY POLICIES

There were a growing number of city-level targets and incentives in 2020 to promote the purchase and use of NECVs. Some incentives—such as reductions in parking, charging, and toll road fees and support for public charging infrastructure support—applied to all NEVs and are documented in the companion report on private NEPCs (Jin et al., 2023). In this section, we focus on those specific for NECVs.

OVERVIEW OF POLICIES AND INCENTIVES IN CITIES

Table 2 provides an overview of the incentives available in 2020; they are described in detail in this section across the 10 cities selected for this study. Government vehicles are included in targets but they are usually not eligible for financial incentives and road transportation certificates do not apply. In terms of preferential road access, government vehicles tend to follow those of passenger cars, but government vehicles in some cities might be subject to slightly more restrictions during heavy pollution days. Coaches are also not included in other incentives since few cities had dedicated incentives for these vehicles.

Implementation of the six incentives varies by city. Six cities in this report were Green Freight Initiative Pilots. Five cities are in the Key Regions for air pollution control specified in the central policies described above. Most cities had targets for government vehicles, taxis, TNC vehicles, urban logistics vehicles, buses, coaches (or some subtypes), and certain types of special-purpose vehicles. Only a few cities had targets for certain types of M&HDVs.

Operation subsidies, incentives, and preferential road access were adopted by most cities. By vehicle type, the most incentives were for urban logistics vehicles, followed by taxis and TNC vehicles. Haikou, Shenzhen, and Guangzhou were the leaders in terms of the number of actions taken.

Cities could use general municipal funding to provide fiscal support to select NEV fleets without having a dedicated program or policy. It is difficult to determine the scale and level of support by vehicle type without a detailed breakdown of general municipal expenditures. Thus, this type of support might not be fully captured in the table below.

Table 2. Overview of NECV policy and incentive by city, 2020

| City | City-level Action | | | | | | | | | | | | | | | | | | | | | | | | | | | | Total | | | | | | | |
|--------------|--------------------|-------------|------------|-----------|-----------|-----------------|-----------|----------|-----------------|-------------|---|----------|-----------------|----------|-----------------|---------------------------------|----------|----------|-----------------|----------|---------------------------------|-------------|----------|----------|-----------------|--------------------------|-----------------|-------------|----------|----------|----------|-----------------|----------|-----------------|-------------|------------|
| | Central planning | | Target | | | | | | | | Vehicle replacement subsidy and incentive | | | | | Operation subsidy and incentive | | | | | Road transportation certificate | | | | | Preferential road access | | | | | | | | | | |
| | Green Freight City | Key Regions | Government | Taxi | TNC | Urban logistics | Bus | Coach | Special purpose | Other M&HDV | Taxi | TNC | Urban logistics | Bus | Special purpose | Other M&HDV | Taxi | TNC | Urban logistics | Bus | Special purpose | Other M&HDV | Taxi | TNC | Urban logistics | Bus | Special purpose | Other M&HDV | | Taxi | TNC | Urban logistics | Bus | Special purpose | Other M&HDV | |
| Beijing | | ● | ● | ● | ● | ● | ● | ● | ● | | ● | | | | | | | | ● | ● | | | | | | | | | ● | ● | | | | | 13 | |
| Chengdu | ● | | ● | ● | ● | ● | ● | | ● | ● | ● | | | | | | | | | | | | | | | | | ● | ● | | | ● | | 12 | | |
| Guangzhou | ● | | ● | ● | ● | ● | ● | ● | ● | | | | ● | | | | ● | | ● | | | | ● | ● | | | | | | | | | ● | 15 | | |
| Haikou | | | ● | ● | ● | ● | ● | ● | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ● | | | | | | | | | ● | 20 | | |
| Handan | | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | | | | | | | | | | | | | | | | | | | | ● | 11 | | | |
| Nanjing | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | | | | | | | | | | | | | ● | | | | | | | | ● | 11 | | | |
| Shanghai | | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | | | | | ● | ● | | | | | ● | | | | | | | | | ● | 14 | | | |
| Shenzhen | ● | | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | | | | | | ● | | | | | ● | | | | | | | | ● | 14 | | | |
| Tianjin | ● | ● | ● | ● | ● | ● | ● | ● | ● | | | | | | | | | | | | | ● | | | | | | | | | | ● | 11 | | | |
| Xiamen | ● | | ● | ● | ● | ● | ● | ● | ● | | | | | | | | | | | | | | | | | | | | | | ● | ● | 10 | | | |
| Total | 6 | 5 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 4 | 3 | 0 | 1 | 2 | 1 | 1 | 3 | 2 | 3 | 3 | 1 | 2 | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 10 | 0 | 0 | 8 | 131 |

● 100% NEV new sales and replacement target; ● 100% NEV stock target or has already achieved it by the end of 2020; ● others; ● 100% NEV or clean energy vehicles in full electrification targets, or has already achieved it by the end of 2020; ● restrictions on high-emitting conventional fuel vehicles only.

TARGETS

Table 3 catalogs city targets for NECVs and government fleets in 2020. Government vehicles are not commercial vehicles and usually are not eligible for other financial incentives, but are included here because many local governments have set NECV stock or sales targets due to the relative ease of electrification of this group. For special purpose vehicles and other M&HDVs, cities' targets could include all or only some subtypes of these vehicles, as noted.

Special-purpose or utility vehicles encompass a wide range of vehicle types, including postal, sanitation, engineering, operation, on-site vehicles, and other vehicles built for special purposes. Cities in Table 3 have targets for one or more types of special-purpose vehicles.

Table 3. City new energy vehicle fleet targets, 2020

| | Government | Taxi | TNC | Urban logistics | Bus | Coach | Special purpose | Other M&HDV |
|-----------|------------|----------------|----------------|-----------------|----------------|--------|-----------------|-------------|
| Beijing | ● | ● | ● | ● | ● | ● (cm) | ● | |
| Chengdu | ● | ● | ● | ● | ● | | ● | ● (ct) |
| Guangzhou | ● | ● | ● | ● | ● | ● | ● | |
| Haikou | ● | ● ^a | ● ^a | ● | ● ^a | ● | ● | |
| Handan | ● | ● | ● | ● | ● | ● (cm) | ● | ● (hd) |
| Nanjing | ● | ● | ● | ● ^b | ● | ● (cm) | ● | |
| Shanghai | ● | ● | ● | ● | ● | ● (cm) | ● | ● (fv) |
| Shenzhen | ● | ● | ● | ● | ● | ● | ● | ● (en) |
| Tianjin | ● | ● | ● | ● | ● | ● (cm) | ● | |
| Xiamen | ● | ● | ● ^c | ● | ● | ● | ● | |

● 100% NEV new sales and replacement target; ● 100% NEV stock target or had already achieved it by the end of 2020; ● others; ● clean energy or NEV vehicles in full electrification target.

Abbreviations: cm: commute/company coach for employees; ps: public service; ct: construction, including muck and concrete trucks; hd: heavy-duty vehicles; fv: freight vehicles, which generally refers to all types of non-passenger vehicles, including urban logistics vehicles, straight trucks, dump trucks, tractor trucks, etc.; en: engineering, including but not limited to dump trucks, cement mixers, and trailers.

^a In 2021, Hainan Province (capital city Haikou) updated the targets so that all new sales and replacements of buses and TNC vehicles, and 80% of sales and replacement of taxis, should be NEVs.

^b Nanjing targeted 50% of NEV in new urban logistics vehicles; Jiangsu Province (capital city Nanjing) more recently set a 100% NEV or clean energy vehicle target for public service vehicles, including urban logistics vehicles.

^c In 2021, Xiamen started to require that all new sales and replacements of TNC vehicles be BEVs.

Almost all cities had targets for public service vehicles and government fleets, though the stringency of the targets varies: 22 cities had 100% stock targets, 16 had 100% new sales and replacement targets, and others had lower targets. All of our selected cities' targets include sanitation and postal vehicles; some cities have additional targets on vehicles at ports, airports, and railway yards, and a few cities also have targets on specific vehicles, such as those used for municipal management and forestry management.

Some targets were mandatory and enforced through road transportation certificates or other means (see section below), but many were not. Some cities had already achieved 100% electrification targets for certain CV types by the end of 2020, such as buses in Shenzhen and Guangzhou, and taxis and TNC vehicles in Shenzhen.

PURCHASE SUBSIDIES

In 2020, the only local purchase subsidies for most cities were for FCEVs (before April) and for buses. The matching local subsidy was usually a percentage of the central subsidy with the total subsidy capped at a percentage of the vehicle sales price or the manufacturer's suggested retail price. Vehicles purchased using government financial

funds were excluded from subsidies. Commercial vehicle subsidies usually included a mileage requirement. For example, the March 2019 notice from the central government required that some vehicles be driven at least 20,000 km in the first 2 years after purchase (Ministry of Finance of the People’s Republic of China, 2019). Special-purpose vehicles that are used for public service or on-site applications—such as sanitation vehicles, fire trucks, airport logistics vehicles and vehicles for construction purposes—were usually exempted from mileage requirements.

Cities such as Beijing, Guangzhou, Tianjin, and Xiamen still had subsidies for buses in 2020; all were 50% of the central subsidy except for Tianjin at 25%. Notably, Chengdu provided CNY 42,000 for new battery electric taxis starting in September 2020, but phased down this subsidy in 2021 and 2022. The CNY 42,000 subsidy for battery electric taxis was split among Chengdu (35%), the city where the vehicle was manufactured (50%), and the city where the vehicle was registered (15%).

VEHICLE REPLACEMENT SUBSIDIES AND INCENTIVES

A few cities had vehicle replacement incentives for replacing conventional fuel vehicles with NEVs (Table 4). Beijing, Chengdu, and Shenzhen’s incentives were all for taxis and required the replacement vehicle to be a BEV. Haikou’s incentive was part of Hainan Province’s policy, which focused on diesel vehicles of all sizes, but did not require the new vehicles to be NEVs.

Table 4. Vehicle replacement subsidies and incentives, 2020

| City | Vehicle type | Incentive | Notes |
|-----------|-----------------|---|--|
| Beijing | Taxi | Subsidy based on battery purchase price, up to CNY 73,800 | Requires BEV with a range of no less than 300 km and can accommodate battery swapping |
| Chengdu | Taxi | For early replacement of dual fuel taxis to BEVs, CNY 800/month for the remaining time of the 60-month operation period, up to CNY 19,200 | |
| Guangzhou | Bus | Emissions reduction award for early replacement of non-BEVs to BEVs | Award = (purchase price of non-BEV – received BEV purchase subsidy) x remaining operating years/8 years – residual or net value of vehicle |
| Haikou | Diesel vehicles | CNY 7,000–CNY 25,000 depending on vehicle type for scrappage of old polluting vehicles | New vehicles could be China VI, clean energy, or new energy |
| Shenzhen | Taxi | Additional operating right or license awarded based on 10% of new BEVs | |

Sources: Beijing Municipal Bureau of Finance (2019); Chengdu Municipal Transportation Bureau (2020); Guangzhou Municipal Bureau of Transportation (2020); Hainan Provincial Department of Ecology and Environmental Protection (2018); Shenzhen Municipal Transportation Commission (2017)

OPERATION SUBSIDIES AND INCENTIVES

Six out of the 10 cities provided operation subsidies and incentives in 2020 (Table 5). Most of these policies for CVs have mileage requirements, which means that subsidies are given out after mileage verification. If this requirement is not met, subsidies would be reduced or withheld. This is to incentivize higher utilization and was implemented as a response to earlier experiences when some NEVs were purchased for the subsidy but not actually used. Some of these policies were part of the policy package to encourage consumption during the initial phase of the pandemic, such as the subsidy in Haikou, and were extended after 2020.

Table 5. Operation subsidies and incentives, 2020

| City | Vehicle type | Incentive | Notes |
|-----------|-----------------|--|---|
| Beijing | Urban logistics | A total of CNY 70,000 per vehicle over 3 years | Requires BEV less than 4,500 kg. Annual mileage requirement of 10,000 km. Businesses need to replace at least five vehicles with NEVs in the first year. Urban area access certificates were awarded if at least 20 vehicles are replaced at the same time |
| Guangzhou | Bus | A subsidy of CNY 370,000–590,000 per vehicle for BEVs depending on time of purchase and vehicle size, given out over an 8-year period | Annual mileage requirement of 30,000 km Subsidy is reduced proportionally if mileage requirement is not met |
| | Taxi | CNY 10,000 comprehensive usage subsidy for new battery electric taxi | Requires range ≥ 400 km, energy consumption ≤ 13.6 kWh/100 km, wheelbase ≥ 2700 mm, length ≥ 4,750 mm |
| Haikou | All vehicles | Hainan Province awarded CNY 10,000 comprehensive usage subsidy for new NEVs sold and registered in the province | |
| Shanghai | Taxi and TNC | A charging fee subsidy of CNY 0.4/kWh | Deducted from point of payment on municipal platform |
| Shenzhen | Urban logistics | Tiered subsidy based on battery capacity, up to CNY 75,000 per vehicle in the 3-year period from mid-2018 to mid-2021: ≤ 30 kWh: CNY 750/kWh 30 kWh < size ≤ 50 kWh: CNY 600/kWh 50 kWh < size: CNY 500/kWh | BEV annual mileage requirement of 15,000 km in the first year and adjusted to 10,000 km from the second year Additional requirements on businesses in terms of number of BEVs owned |
| Tianjin | Container truck | Road toll waived for NEV, clean energy and China V or above container trucks that pass through one of the five specific highway stations and Tianjin port | |

Sources: Beijing Municipal Commission of Transportation (2020); Guangzhou Municipal Bureau of Industry and Information Technology (2020); Guangzhou Municipal Bureau of Transportation (2020); Hainan Provincial Department of Commerce (2020); Shanghai Development and Reform Commission (2020); Shenzhen Municipal Commission of Transportation (2018); Tianjin Municipal Commission of Transportation (2019)

To give a sense of the scale of subsidies provided, Shenzhen’s program for urban logistics vehicles was almost CNY 100 million in 2020; this was disbursed to 28 companies and 6,941 vehicles (Shenzhen Municipal Transportation Bureau, 2021). Hainan Province’s total subsidy exceeded CNY 260 million in 2020.

ROAD TRANSPORTATION CERTIFICATES

A road transportation certificate, or operation certificate, is required for some CVs to operate on the road. Some cities are setting policies to fully electrify taxis and TNC vehicles by ceasing to issue certificates for conventional fuel vehicles (Table 6). This is only relevant to taxis and TNC vehicles; in 2018, the Ministry of Transport stopped requiring road transportation certificates for regular freight vehicles 4,500 kg and under, which covers most urban delivery vehicles (General Office of the Ministry of Transport, 2018). The electrification of buses and public service vehicles, such as sanitation and postal trucks, is not normally achieved through road transportation certificates because the city often has power over their purchasing decisions or contracts. In most cities, other trucks and special-purpose vehicles do not currently have full electrification targets.

These policies usually have a phase-in period, meaning that recently purchased conventional fuel vehicles would still be able to obtain a certificate and in-use vehicles might still be able to renew for a period of time. These policies often have technical requirements for NEVs to qualify for a certificate. For example, Haikou requires that the wheelbase should be at least 2,600 mm and an electric range of at least 150 km; Shenzhen requires a wheelbase of more than 2,650 mm; Chengdu requires a wheelbase of more than 2650 mm, a length more than 4,590 mm and an electric range of 400 km; and Nanjing requires the wheelbase to be more than 2,650 mm and a range of at least 300 km.

Table 6. Effective dates when road transportation certificates stopped being issued to conventional fuel vehicles

| Vehicle type | City | Effective | Notes |
|--------------|-----------|-----------|---|
| Taxi | Guangzhou | Oct. 2018 | Additional requirement of at least 80% BEV in new NEVs in 2018, increasing by 5% every year |
| | Shanghai | June 2019 | |
| TNC | Chengdu | July 2021 | Though the policy was finalized in 2021, a similar proposal was released in Aug. 2020. Certificates to BEV or FCEV only. |
| | Guangzhou | Dec. 2019 | Certificates to BEV or FCEV only |
| | Haikou | Jan. 2019 | |
| | Nanjing | June 2019 | Certificates to BEV only. All in-use vehicles should meet the requirement by the end of 2019 |
| | Shenzhen | Jan. 2017 | Certificates to BEV only. In-use non-BEVs were able to renew for a maximum of three years and the fleet should be all electric by the end of 2020 |
| | Xiamen | Feb. 2021 | Though the policy was finalized in 2021, a similar proposal was released in Nov. 2020. Certificates to BEV only |

Sources: Guangzhou Municipal Commission of Transportation (2018); Guangzhou Municipal Transportation Bureau (2019); Haikou Municipal Transportation and Port and Shipping Administration (2019); Nanjing Municipal Bureau of Transportation (2019); Shanghai Municipal Transportation Management Office (2019); Shenzhen Municipal People's Government (2017); Xiamen Transportation Bureau (2020)

PREFERENTIAL ROAD ACCESS

In 2020, all 10 cities provided preferential road access for NEVs, while eight out of the 10 cities provided more substantive incentives, especially for urban logistics vehicles, by restricting access for conventional fuel vehicles in addition to high emitters (Table 7). Shenzhen is one of the pioneers in implementing zero-emission delivery zones (green freight zones) in China. In 2018, it established one such zone in each of its 10 districts. The total area of these zero-emission delivery zones is about 22 km², approximately 1.1% of the city's area. Before 2020, Chengdu used an auction mechanism for urban area access certificates for diesel freight vehicles cleaner than China IV, with a price of a few thousand CNY. The number of certificates issued was gradually reduced every year until 2020 when they stopped being issued to diesel vehicles. Other cities that have adopted preferential road access incentives include Changsha, Dongguan, Liuzhou, Qingdao, and Sanya.

Table 7 focuses on preferential road access for taxis, TNC vehicles, urban logistics and other freight vehicles. Buses, sanitation, postal, and other public service vehicles are usually exempted from road access restrictions. Cities vary in whether they exempt taxis and TNC vehicles from restrictions on passenger cars. Urban logistics vehicles usually fall in the category of light or micro freight vehicles, which are under 4,500 kg and less than 6,000 mm in length. Some of the policies specifically refer to urban logistics vehicles, while others apply to more freight vehicles used for the transportation of goods.

Many cities banned high-emitting yellow-label vehicles (gasoline vehicles not meeting China I and diesel vehicles not meeting China III) from roads, and some also have road access restrictions on China III diesel vehicles. Some cities also set restrictions on heavy pollution days or ad-hoc temporary restrictions over certain periods of time. The table does not attempt to capture every road restriction for each city but focuses on the ones that make the most difference between a conventional fuel vehicle and an NEV in terms of road access.

Table 7. Road access restrictions on conventional fuel vehicles and incentives for NEVs, 2020

| City | Vehicle type | Restrictions on conventional vehicle | Incentives for NEV |
|--|-----------------|--|--|
| Beijing | Urban logistics | No freight vehicles within Fifth Ring Road from 6 a.m. to 11 p.m. | Only vehicles with an access certificate can travel within Fifth Ring Road during non-rush hours from 6 a.m. - 11 p.m. NEVs had two more hours of access time than diesel vehicles. Target: By the end of 2020, BEVs make up more than 90% of vehicles weighing less than 4,500 kg that are issued access certificates |
| | High emitter | China III (or older) diesel vehicles were banned at all times | Not applicable to NEVs |
| | TNC | Restriction on road access based on last digit of license plate (restricted on 1 out of 5 weekdays) within Fifth Ring Road from 7 a.m. to 8 p.m. | BEVs were exempted |
| China 1 and 2 light-duty gasoline vehicles were banned from road during orange warning heavy pollution days; on top of it, China 3 and above were restricted based on odd/even license plates (restricted every other day) during red warnings | | BEVs were exempted | |
| Chengdu | Freight vehicle | Light freight vehicles banned from urban areas from 7 a.m. to 9 p.m.; larger regular freight vehicles banned from inner urban areas from 7 a.m. to 8 p.m. and from outer urban areas during rush hours | NEVs were exempted |
| | | Restrictions during heavy pollution days generally include those for China III or older vehicles, large freight vehicles and certain construction vehicles; limited road access in urban centers based on odd/even license plates for all vehicles | NEVs were exempted |
| | TNC | Restriction on road access based on last digit of license plate within Ring Expressway from 7:30-9:30 a.m. and 5-7 p.m. | NEVs were exempted |
| Guangzhou | High emitter | China II or below diesel vehicles banned from all roads | Not applicable to NEVs |
| | | Restrictions during heavy pollution days include those for China 3 or older vehicles; limited access in urban centers based on odd/even license plates for all vehicles | NEVs were exempted |
| Haikou | Freight vehicle | Some roads were forbidden at all times, such as Haixiu Expressway, while others at certain times. Light and micro freight vehicles banned during rush hours; heavier vehicles banned from 6 a.m.-9 p.m. | NEVs exempted from time-based restrictions, although all freight vehicles, including NEVs, were not permitted on Haixiu Expressway at any time. |
| Handan | Freight vehicle | Medium and heavy vehicles banned from low-emission zones and certain areas | Medium and heavy NEV more likely to get an access certificate if necessary |
| | | Diesel vehicles ($\geq 3,500$ kg) older than China IV were banned from low-emission zones | Not applicable to NEVs. |
| | | During heavy pollution days, medium and heavy freight vehicles were generally banned from urban areas | NEVs were exempted. |
| Nanjing | Freight vehicle | Different restrictions for different types of freight vehicles in different areas and times. | New access certificates before the end of 2020 and all certificates after 2020 will only be issued to NEVs. Businesses that excel in green freight enjoy more road access and parking benefits |
| Shanghai | High emitter | Yellow-label vehicles banned on road. China III diesel vehicles had no access to central areas 6 a.m.-1 a.m. | Not applicable to NEVs. ^a |
| Shenzhen | Freight vehicle | Light-duty diesel freight vehicles had no access to 10 zero-emission delivery zones in the city | BEVs can access |
| | | China III diesel freight vehicles with a Shenzhen license plate restricted based on odd/even license plate | Not applicable to NEVs |
| | | Restrictions for conventional fuel micro and light freight vehicles in many areas at different times, and more extensive restrictions for medium- and heavy-duty freight vehicles | Light and micro BEVs could travel at all times except 7 a.m.-8 p.m. on Shennan Road; medium and heavy BEVs less than 6 m had less benefits (same restriction as conventional fuel micro and light vehicles) |
| | | Vehicles with non-local license plates were not allowed during rush hours | NEVs were exempted |
| Tianjin | Urban logistics | Access restrictions from 7 a.m. to 10 p.m. within Outer Ring Road | Light and micro NEVs with access certificates were exempted |
| Xiamen | Freight vehicle | Restrictions for conventional fuel freight vehicles in many areas at different hours during daytime | NEVs were exempted |
| | High emitter | China II or below diesel vehicles banned from all roads except highway. China III diesel freight vehicles had no access to two central districts during daytime until July 2020 and no access at all after that | Not applicable to NEVs |

^a Shanghai also had restrictions on freight vehicles with non-local license plates and local freight vehicles without an access certificate. In 2021, Shanghai started to give priority to NEVs when issuing access certificates and aimed to only grant access to BEVs and FCEVs in the future.

Sources: Beijing Municipal Commission of Transportation (2019); Beijing Municipal People's Government (2016); Chengdu Municipal Bureau of Economy and Information Technology (2019); Chengdu Public Security Bureau (2020); Chengdu Traffic Management Bureau (2020); General Office of the Municipal Government (2017); Guangzhou Environmental Protection Bureau (2017); Haikou Public Security Traffic Police (2020); Handan Ecological Environment Bureau (2019); Shanghai Municipal Commission of Transportation (2015); Shanghai Municipal Commission of Transportation (2020); Tianjin Development and Reform Commission (2017); Traffic Police Bureau of Shenzhen Public Security Bureau (2019); Traffic Police Bureau of Shenzhen Public Security Bureau (2021); Xiamen Municipal People's Government (2019)

COMPARISON OF POLICY ADOPTION TO NECV MARKET

URBAN LOGISTICS VEHICLES

Green Freight cities, especially Green Freight Demonstration cities, show a significantly higher new energy urban logistics vehicle uptake (Figure 3). One important contributor is that Green Freight cities are required to develop specific action plans and adopt measures to increase new energy urban logistics vehicle uptake. On average, for newly registered new energy urban logistics vehicles, Green Freight cities have 13 times the registrations and 3.6 times the new vehicle market share of non-Green Freight cities in 2020. Furthermore, Green Freight Demonstration cities—those that have already achieved their targets and passed the evaluation—had 19 times the registrations and 5 times the market share for newly registered new energy urban logistics vehicles than non-Green Freight Demonstration cities in 2020.

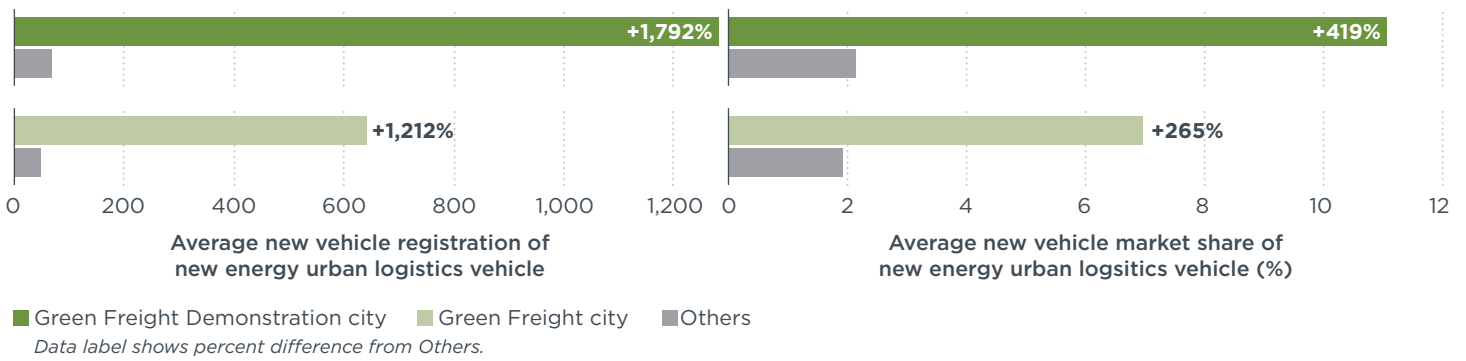


Figure 3. Differences in new energy urban logistics vehicle new vehicle registrations and market share between different cities, 2020.

Note: Green Freight cities include Green Freight Demonstration and Pilot cities. The “Others” bar refers to all cities that are not Green Freight Demonstration cities in the top subplot and to all cities that are not Green Freight cities in the bottom subplot.

While Figure 3 shows the better-than-average performance of Green Freight cities, Figure 4 illustrates how Green Freight cities rank compared with other cities. Forty cities—led by Shenzhen, Nanjing, Chengdu, Guangzhou, Changsha and Zhengzhou—were home to 90% of the new energy urban logistics vehicle registrations in China in 2020. Among them, about half are Green Freight cities (eight Pilot cities and 11 Demonstration cities). Only cities with more than 100 new energy urban logistics vehicle registrations in 2020 were included in Figure 4.

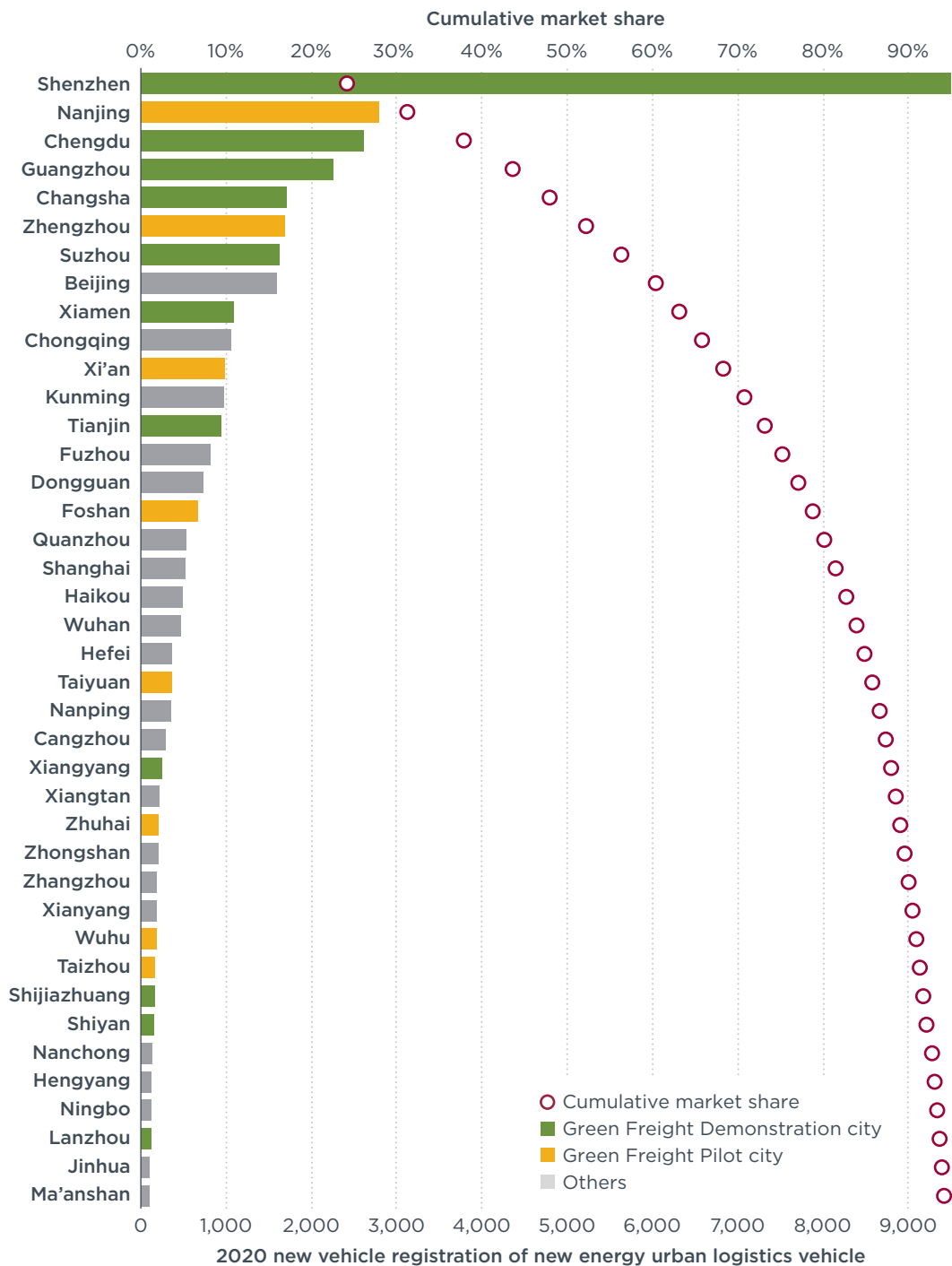


Figure 4. Leading cities in new energy urban logistics vehicle new vehicle registrations and their corresponding cumulative market share, 2020

Preferential road access combined with operation subsidies and incentives prove to be powerful tools for advancing new energy urban logistics vehicle uptake in these leading cities, including our selected cities. The top 10 cities in Figure 4 provided clear preferential road access for new energy urban logistics vehicles. Cities are considered to have clear and actionable preferential access policies if they established implementation details such as those listed in Table 5 in terms of vehicle type, time, and area of restriction. Some cities might stipulate in action plans that relevant departments should establish preferential road access for NEVs, but clear implementation details were still not available as of 2020. As shown in Figure 5, Green Freight cities with clear preferential road access policies for new energy urban logistics vehicles had 4 times the registration and 2.5 times the market share, on average, for newly registered new energy urban logistics vehicles in 2020.

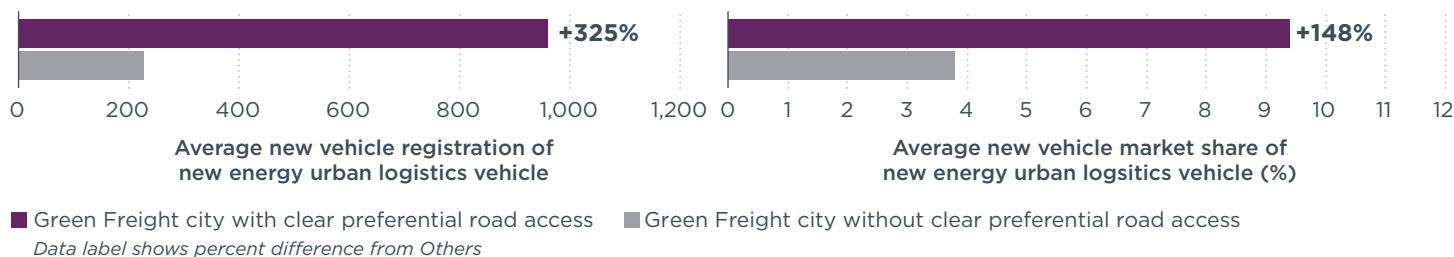


Figure 5. Differences in new energy urban logistics vehicle new vehicle registrations and market share between Green Freight cities with and without a clear preferential road access policy, 2020.

Many cities have adopted preferential road access as a measure to improve traffic and air quality as well as to encourage new energy urban logistics vehicle uptake, including Dongguan, Shanghai, Nanchang, Lanzhou, Luoyang, Qingdao, Shijiazhuang, Handan, and Tangshan. This echoed the central guidance of not implementing road access restrictions on new energy urban logistics vehicles.

Cities like Shenzhen and Beijing also supplemented preferential road access with operation subsidies—to help keep the total cost of ownership of new energy urban logistics vehicles on par with diesel vehicles—and mileage requirements to incentivize higher utilization. Both cities’ subsidies were distributed over 3 years, with Beijing requiring 10,000 km annual mileage and Shenzhen requiring 15,000 km annual mileage (lowered to 10,000 km since the second year due to the pandemic). In the first year of Shenzhen’s subsidy scheme, from 2018 to 2019, the share of new energy urban logistics vehicles that met the mileage requirement increased from less than 20% to around 45% (Liu et al., 2020). The mileage requirement is often verified with a municipal or provincial NEV data-collection platform.

MEDIUM- AND HEAVY-DUTY VEHICLES

On average, cities in Key Regions—where the previously discussed central policies all have a special focus—had almost three times the registrations and twice the market share of newly registered new energy dump trucks and tractor trucks than other cities in 2020 (Figure 6).

The rating system for businesses in key industries in Key Regions, as mentioned in the central policy section, has a significant impact on driving new energy dump truck and tractor truck adoption. These trucks are most often used in key industries such as iron and steel and, unlike a target, the rating system identifies clear responsible bodies (specified key industries), implementation details (such as the different evaluation criteria and restrictions), and monitoring and verification measures.

This ratings policy is innovative in that it involves emissions control for both stationary sources (industries) and mobile sources (trucks used in these industries). It highlights the need for collaboration between different government departments and with other stakeholders—especially considering that commercial vehicles usually service other sectors—to develop actionable policies to reach the goal of clean air.

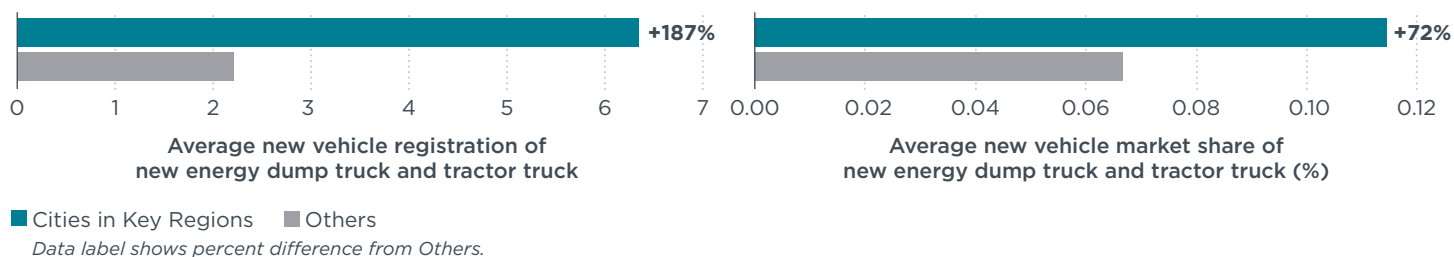


Figure 6. Differences in new energy dump truck and tractor truck new vehicle registrations and market share between cities in Key Regions and others, 2020.

Among the top 30 cities in terms of 2020 new energy dump truck and tractor truck new vehicle registrations, 21 are in Key Regions (Figure 7). These cities—led by Shenzhen, Beijing, Handan, Anyang, Yangquan, and Zhengzhou—were home to almost all new energy dump and tractor truck registrations in China in 2020. Handan, a key base of steel and coal industries in the Key Regions, is subject to both the air pollution control policies and the restrictions for key industries based on ratings. The high number of registrations in the city are reflective of these policies.

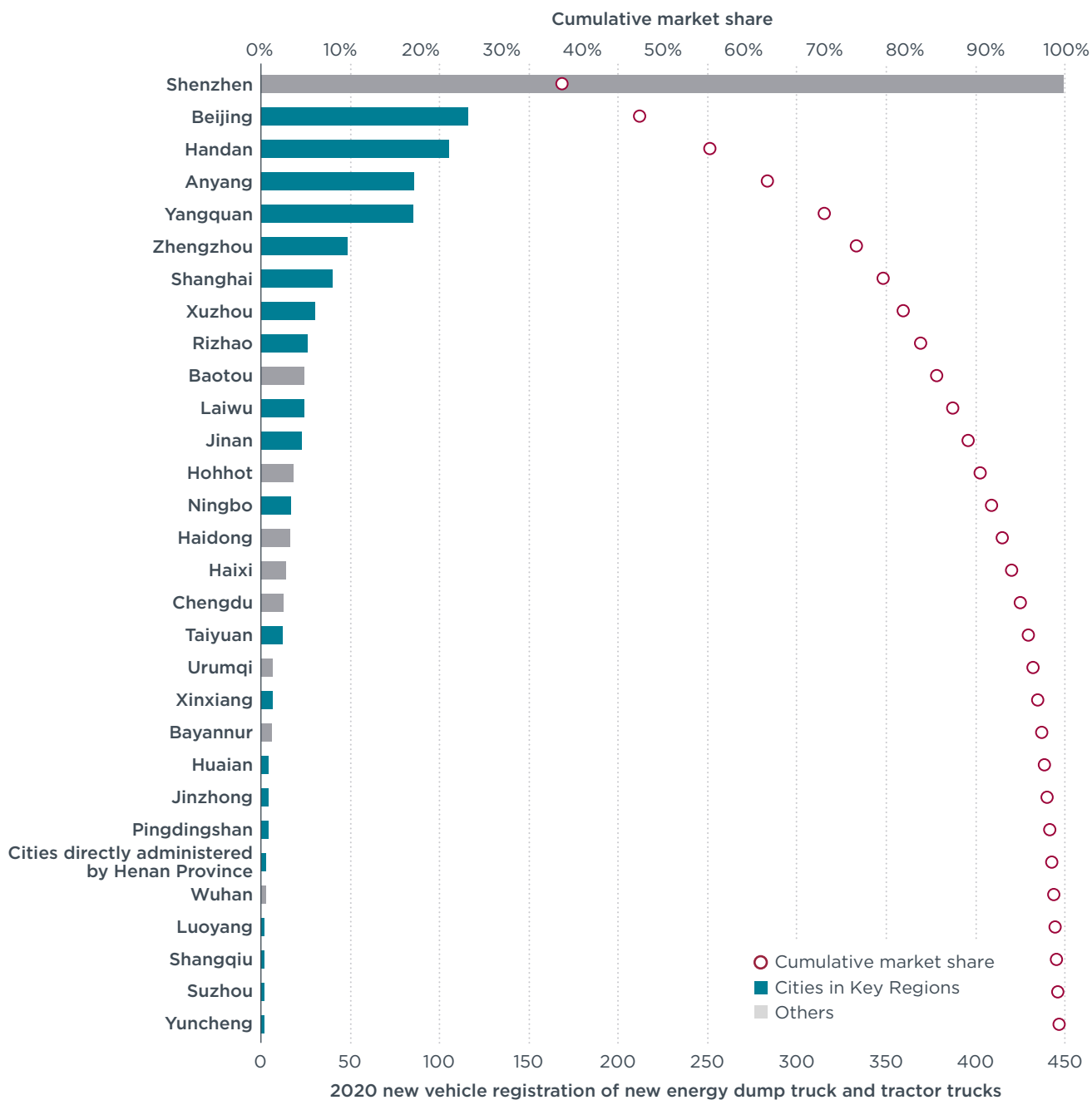


Figure 7. Leading cities in new energy dump truck and tractor truck new vehicle registrations and their corresponding cumulative market share, 2020

Central policies often only provide general strategies and targets, and local governments need to develop a roadmap to reach such targets. Therefore, local governments play an important role in ensuring that the strategies are implemented, and the targets can be met. Among our selected cities, Shenzhen, Shanghai, Chengdu, Handan, and Beijing are in the top 10 in terms of new energy dump truck or tractor

truck registrations in 2020. Shenzhen, Shanghai, Chengdu, and Handan had targets on freight vehicles, and all of them had targets on special-purpose vehicles.

Some cities combined scrappage incentives with measures such as NEV preferential road access and vehicle replacement incentives to encourage the replacement of conventional fuel vehicles with NEVs. For example, Beijing and Shenzhen provided incentives for early retirement of China III or older vehicles. Beijing's 2020 program provided CNY 14,000 for the retirement of a China III gasoline freight vehicle (General Office of Beijing Municipal People's Government, 2020) and Shenzhen provided up to CNY 66,500 for the early retirement of a heavy China III diesel freight vehicle (Shenzhen Municipal Ecology and Environment Bureau, 2018).

Shenzhen was the leading city in new energy M&HDVs such as dump trucks and tractor trucks. Apart from the scrappage incentive and preferential road access mentioned above, Shenzhen set a target of 20% clean energy heavy-duty freight vehicles by 2020. It also had a target of 100% BEVs for new engineering vehicles, including dump trucks, cement mixer vehicles, tractor trucks, and sanitation vehicles by 2021. In 2018, Shenzhen published a plan to promote the adoption of battery electric heavy-duty dump trucks and set a target of 3,000 vehicles by the end of 2019. This plan also provided a subsidy for battery electric heavy dump trucks at CNY 3.56/km and up to CNY 800,000 per vehicle. These vehicles needed to be put into operation between late 2018 and the end of 2019, but the mileage can accrue until late 2025. The dump trucks also needed to meet certain technical criteria, including a 300 km electric range, and the subsidy would only be awarded upon verification of mileage. In 2020, 3,224 battery electric dump trucks from 44 companies qualified, totaling approximately CNY 270 million. The 2021 budget for this award was CNY 300 million.

TAXI AND TNC VEHICLES

Road transportation certificates combined with operation and vehicle replacement incentives are an effective way to encourage and ensure electrification targets for taxis and TNC vehicles are met.

Out of the seven cities that are both in our selected city list and the top 10 cities in terms of 2020 commercial car registrations, four cities no longer issued road transportation certificates to conventional fuel vehicles for either or both taxis and TNC vehicles. One city, Chengdu, released such a proposal in mid-2020, which was officially adopted in 2021.

In addition, almost all cities provided additional incentives for taxis or TNC vehicles. These included operation subsidies for taxis in Guangzhou, operation subsidies for both types of fleets in Shanghai and Haikou, vehicle replacement incentives in Shenzhen, Chengdu, and Beijing, and preferential road access for TNC vehicles in Chengdu and Beijing. These incentives provided support to help these commercial fleets reach 100% electrification targets.

CITY BUSES

China has been a pioneer in the electrification of city buses since a decade ago. In 2020, over 80% of new city buses registered in China were NEVs. Fully 90% of Chinese cities had over 90% NEVs in their new city bus fleets, and many fleets have already reached 100% electrification in new sales or stock. For example, Shenzhen achieved 100% electrification in its city bus fleet in 2017, and Guangzhou achieved the same in 2018. The success can be attributed to central planning, including purchase and operation subsidies, as well as local initiatives.

The central government allowed cities to continue subsidizing city buses and coaches with mileage requirements after 2019 (when most local subsidies were discouraged)

and encouraged cities to substitute universal subsidies with more targeted awards starting in 2020. Though the central subsidy was phasing down from 2020 through 2022, there is still considerable support for city buses and coaches, especially coaches for public use. For example, the 2020 subsidy scheme tightened the threshold for electric energy consumption for regular battery electric buses from 0.19 Wh/km·kg to 0.18 Wh/km·kg while keeping the base subsidies, subsidy caps, and multipliers the same as in 2019. As mentioned in the central policies section, the central government also provided operation subsidies to new energy city buses from 2015 through 2019 if they met their promotion targets, and reduced fuel subsidies to conventional fuel city buses if those targets were not met.

With this background of central government support, the leading cities set ambitious targets coupled with subsidies. Four of the cities highlighted in this report—Beijing, Shanghai, Guangzhou, and Tianjin—were among the top 10 cities for new energy city bus registrations in 2020 and had a 100% electrification stock target. Beijing, Guangzhou, and Tianjin also provided local purchase subsidies at 50%, 50%, and 25% of the central subsidy respectively. In addition, Guangzhou offered an operation subsidy of CNY 370,000–590,000 per vehicle for BEVs depending on time of purchase and vehicle size, given out over an 8-year period with verification of mileage (30,000 km annually), and a vehicle replacement subsidy for early retirement of non-BEV city buses for BEVs.

COACHES

The ten cities with the highest number of new energy coach registrations in 2020 included three of the cities selected for this report (Guangzhou, Xiamen, and Beijing). All three cities had local purchase subsidies for new energy coaches in 2020. Moreover, Guangzhou and Xiamen were among the few cities that had targets for coaches in earlier years. These cities are also passenger transportation hubs within their respective provinces.

Based on Guangdong Province's guidance from 2016, Guangzhou required at least 50% NEVs in public service vehicles starting in 2017 and increased that requirement by 5% annually in its 2017–2020 NEV development plan (General Office of the People's Government of Guangdong Province, 2016). Among these NEVs, BEVs shall be at least 30% and increase by 5% annually. In 2018, Guangdong Province further encouraged the accelerated adoption of new energy coaches by: opening intercity new energy coach routes in the Pearl River Delta Region, electrification of short- and medium-distance routes in areas with more road passenger transport, gradually expanding electrification of passenger transport to all routes in rural areas and between urban and rural areas, and electrification of connection routes to and from airports, train stations, and light rail (Guangdong Provincial Department of Transportation, 2018). In addition, Guangzhou requires that 100% of its new government vehicle be NEV, which could include coaches.

For Xiamen, its 2017 NEV policy specified that 50% of coaches should be NEVs by 2020 where feasible (General Office of Xiamen Municipal People's Government, 2018). Its 2018 Blue-Sky Defense plan specified that the electrification rate of tourist coaches should be higher than the national average, and gradually increases the share of BEV required (Xiamen Municipal People's Government, 2018).

CONCLUSIONS AND POLICY IMPLICATIONS

The following highlights emerge from the above review and analysis of NECV policies in China in 2020.

Central policies were the main driver of new energy M&HDV uptake, and many of the policies came from the need to improve air quality. One impactful policy was the performance rating policy that requires clean transportation for key industries in Key Regions, such as iron and steel, if businesses want to avoid operation interruptions during heavy-pollution days, which were not rare in these areas. On average, cities in Key Regions had almost three times the number of registrations and twice the market share of newly registered new energy dump trucks and tractor trucks than other cities.

Green Freight cities outperformed others in new energy urban logistics vehicle uptake; preferential road access combined with operation subsidies were widely adopted measures. Green Freight cities, on average, had 13 times the registrations and almost 4 times the market share of non-Green Freight cities in terms of newly registered new energy urban logistics vehicles. These numbers were even higher for Green Freight Demonstration cities. Many leading cities imposed road access restrictions on freight vehicles, including urban logistics, but exempted or gave privileges to NEVs. Restrictions were imposed for everyday operations, on heavy-pollution days, and for vehicles with non-local license plates. Some cities, such as Suzhou and Shenzhen, also established low- or zero-emission delivery zones that only NEVs or BEVs can access. In addition, some cities provided operation subsidies (with verification of usage or mileage) to lower the total cost of ownership of NEVs.

The combination of scrappage incentives and NEV incentives can encourage the transition of CVs, and especially M&HDVs, to NECVs. Some leading cities provided incentives for retiring China III vehicles. Beijing, Shanghai, and Shenzhen, for example, required early retirement or removal of conventional fuel vehicles in fleets to qualify for certain NEV subsidies. This combined with NEV incentives—including vehicle replacement subsidies and usage-phase incentives, such as operation subsidies, fee reductions, and preferential road access—can motivate the transition of fleets to NEVs.

Planned phase-out of road transportation certificates for conventional fuel vehicles was a widely used measure for reaching full electrification targets of taxis and TNC vehicles. For taxis and TNC vehicles to reach 100% electrification in new sales and stock, many cities ceased to issue road transportation certificates to conventional fuel taxis and TNC vehicles. Cities also imposed additional requirements for replacing vehicles at taxi and TNC companies, such as use of a particular technology (e.g., BEV only or NEV), minimum all-electric range, and setting timelines for the renewal of a conventional fuel fleet.

Cities included additional considerations to qualify for fiscal support in order to accelerate the replacement of in-use conventional fuel vehicles and ensure the performance and emission benefits of NECVs. Common policy tools included mileage requirements: Subsidies are given out over or after several years when the vehicle has been driven a certain number of miles. Verifying the mileage requires sharing information with a government data collection platform. Requiring higher utilization of NEVs helps ensure that existing conventional fuel vehicles are driven less and that the emission-reduction benefits of NEVs are fully realized.

The successful experiences of these leading cities, and the results of various policy actions in China, can provide valuable lessons in how to boost NECV uptake in China and elsewhere. Our recommendations are as follows:

China could further encourage local governments to accelerate the adoption of new energy M&HDVs through the development of policies based on carbon reduction, air quality improvement needs, and also local conditions. There was a policy gap at the city level for the new energy M&HDV sector. Local policies could be encouraged through means such as breaking down the overall target for specific regions, industries, and departments, developing a more detailed roadmap on how to reach targets, and by providing more guidance in transforming strategies to actionable policy measures.

Consider pairing operation subsidies with verification of use (mileage) and performance requirements on a continuous basis. Mileage and technical requirements can be gradually increased through the adoption of a tiered structure for mileage requirements in relation to operation subsidies.

Consider additional requirements on CV owners and users to qualify for government fiscal or other support. Examples include sharing data for performance monitoring and diagnosis, setting stringent technical thresholds for vehicles and batteries, increasing the number of NEVs in fleets, and accelerating the retirement or renewal of conventional fuel vehicles. Policies can set stepwise goals, such as the replacement of a certain share of conventional fuel vehicles in fleets with NEVs in the next few years.

Cities and other government entities can set ambitious targets and formulate supporting measures for each vehicle type or application scenario to ensure these targets are met. Many cities in China have targets for NECVs, but not all cities have detailed planning for each vehicle type and matching policy actions. For M&HDVs, for example, cities can start with pilots in specific application scenarios, such as the dump truck pilot in Shenzhen. For coaches, cities could consider setting interim goals and demonstration routes for commuter and short-distance coaches and gradually expand to longer-distance ones.

Government entities with oversight for mobile sources of pollution should collaborate with other stakeholders to develop actionable policies to reach the goal of clean air. Such collaboration among government departments, industries, and other stakeholders is necessary because commercial vehicles usually service more than one sector. Different government departments also usually have different authorities for NEV deployment.

REFERENCES

- Beijing Municipal Bureau of Finance. (2019, July 17). Notice on the update of the incentive policy for taxis to pure electric vehicles. <https://www.evpartner.com/news/12/detail-46416.html>
- Beijing Municipal Commission of Transportation. (2019, August 14). Implementation plan for preferential road access of new energy logistics distribution vehicles in Beijing. <https://www.evpartner.com/news/12/detail-46947.html>
- Beijing Municipal Commission of Transportation. (2020, August 20). 2020 Beijing new energy light truck operation incentive program. <https://www.evpartner.com/news/12/detail-53186.html>
- Beijing Municipal People's Government. (2016, November 21). *Announcement of the Beijing Municipal People's Government on adopting temporary traffic management measures in response to heavy air pollution*. http://www.beijing.gov.cn/zhengce/zhengcefagui/201905/t20190522_59695.html
- Chengdu Municipal Bureau of Economy and Information Technology. (2019, October 11). *Several policies in Chengdu to support the development, promotion and application of hydrogen energy and new energy vehicle industry*. <http://gk.chengdu.gov.cn/govInfoPub/detail.action?id=111884&tn=6>
- Chengdu Municipal Transportation Bureau. (2020, November 25). *Chengdu encourages pure electric cruise taxis to pilot the implementation of financial incentives*. <http://gk.chengdu.gov.cn/govInfo/detail.action?id=124085&tn=6>
- Chengdu Public Security Bureau. (2020, February 26). Adjusting the regulations on the traffic management of freight vehicles in urban areas during the period of pandemic. <https://www.evpartner.com/news/12/detail-50582.html>
- Chengdu Traffic Management Bureau. (2020, April 26). Announcement on the implementation of temporary traffic management measures during the period of heavy air pollution. <https://www.evpartner.com/news/12/detail-51575.html>
- China Association of Automobile Manufacturers. (2022, January 13). Statistics of the automobile industry in 2021. <https://news.luosi.com/articles-13419.html>
- Chu, Y., He, H., Jin, L., Wang, X., Zhang, J., Hao, F., & Zhang, Y. (2022). *Assessment of leading new energy vehicle city markets in China and policy lessons*. International Council on Clean Transportation. <https://theicct.org/publication/china-city-markets-new-energy-sep22/>
- General Office of Beijing Municipal People's Government. (2020, March 27). *Beijing's plan to further promote the phase-out and renewal of high-emission old motor vehicles (2020-2021)*. http://www.gov.cn/xinwen/2020-03/30/content_5497179.htm
- General Office of the Ministry of Transport. (2018, December 25). *Notice of the General Office of the Ministry of Transport on canceling the road transport certificate and driver's qualification certificate for general freight vehicles with a gross mass of 4.5 tons and below*. http://www.gov.cn/xinwen/2018-12/25/content_5351931.htm
- General Office of the Municipal Government. (2017, August 29). *Notice of the General Office of the Municipal Government on printing and distributing the implementation plan for the promotion and application of new energy vehicles in Nanjing during the 13th Five-Year Plan*. http://www.nanjing.gov.cn/zdgc/201810/t20181022_573741.html
- General Office of the People's Government of Guangdong Province. (2016, March 28). Implementation opinions on accelerating the promotion and application of new energy vehicles. <https://www.ushui.net/law/v?id=vv0179f3c102114ddf5b9e01e3025a8063917ec9cde34917a9a6&title=%E5%B9%BF%E4%B8%9C%E7%9C%81%E4%BA%BA%E6%B0%91%E6%94%BF%E5%BA%9C%E5%8A%9E%E5%85%AC%E5%8E%85%E5%85%B3%E4%BA%8E%E5%8A%A0%E5%BF%AB%E6%96%B0%E8%83%BD%E6%BA%90%E6%B1%BD%E8%BD%A6%E6%8E%A8%E5%B9%BF%E5%BA%94%E7%94%A8%E7%9A%84%E5%AE%9E%E6%96%BD%E6%84%8F%E8%A7%81>
- General Office of Xiamen Municipal People's Government. (2018, January 2). Notice of the General Office of Xiamen Municipal People's Government on printing and distributing the implementation opinions on accelerating the promotion and application of new energy vehicles to promote industrial development. <https://www.xmecc.com/html/2018/1/2/2018010208514277832730159.html>
- Guangdong Provincial Department of Transportation. (2018, May 4). *Guangdong Provincial Department of Transportation on speeding up the transportation industry notice on the promotion and application of new energy vehicles*. <http://www.jieyang.gov.cn/attachment/0/18/18095/164333.pdf>
- Guangzhou Environmental Protection Bureau. (2017, May 24). *Guangzhou bans all yellow-label vehicles from July*. http://www.gd.gov.cn/gdywdt/dsdt/content/post_77632.html
- Guangzhou Municipal Bureau of Industry and Information Technology. (2020, April 3). Notice of Guangzhou Municipal Bureau of Industry and Information Technology on printing and distributing several measures in Guangzhou to promote automobile production and consumption. <https://new.qq.com/omn/20200404/20200404A02YT500.html>

- Guangzhou Municipal Bureau of Transportation. (2020, February 24). Notice of Guangzhou Municipal Bureau of Transportation and Guangzhou Municipal Bureau of Finance on printing and distributing financial subsidy and incentive measures for the promotion and application of new energy buses in Guangzhou. <https://www.ushui.net/law/v?id=v79f3v01c102114ddf5b9c4373b412ac9d2055ed02385f73576a>
- Guangzhou Municipal Commission of Transportation. (2018, May 23). *Notice of Guangzhou Municipal Commission of Transportation on accelerating the promotion and application of new energy taxi*. http://jtj.gz.gov.cn/gkmlpt/content/5/5494/post_5494037.html
- Guangzhou Municipal Transportation Bureau. (2019, December 31). *Notice of Guangzhou Municipal Transportation Bureau on clarifying the technical standards for online booking of taxi vehicles*. http://www.gd.gov.cn/zwgk/wjk/zcfgk/content/post_2938447.html
- Haikou Public Security Traffic Police. (2020, January 1). *From July 1st, Haikou Public Security Traffic Police will further adjust the traffic area and time of trucks*. http://www.haikou.gov.cn/root9/0109/201912/t20191231_1480564.htm
- Hainan Provincial Department of Commerce. (2020, September 29). *Seven measures to promote consumption in Hainan Province*. <https://dofcom.hainan.gov.cn/dofcom/zwdt/202009/9a6708576f7843ac97a7b198fe8c0c83.shtml>
- Hainan Provincial Department of Ecology and Environmental Protection. (2018, September 12). *The notice on printing and distributing the implementation plan for the elimination of old cars and pollution control in Hainan Province*. <http://www.sanya.gov.cn/jtjstj/bmwjxx/201809/e0d7d42e1b6b4e168571b43b1155f195.shtml>
- Handan Ecological Environment Bureau. (2019, September 25). Announcement on the designation of the low emission control area for freight vehicles in Handan City. https://www.thepaper.cn/newsDetail_forward_4645224
- Jin, L., & He, H. (2020, August 19). Ten cities, thousand fuel cell vehicles? China is sketching a roadmap for hydrogen vehicles. *ICCT Staff Blog*. <https://theicct.org/ten-cities-thousand-fuel-cell-vehicles-china-is-sketching-a-roadmap-for-hydrogen-vehicles/>
- Jin, L., Chu, Y., & Wang, X. (2023). *Accelerating new energy vehicle uptake in Chinese cities: Assessment of policies for private passenger cars in leading city markets*. International Council on Clean Transportation. <https://theicct.org/publication/pv-chinese-cities-new-policies-feb23/>
- Liu, Q., McLane, R., Mullaney, D., & Wang, Z. (2020). *Putting electric logistics vehicles to work in Shenzhen: Policy volume*. Rocky Mountain Institute. <https://rmi.org/insight/putting-electric-logistics-vehicles-to-work-in-shenzhen/>
- Ministry of Ecology and Environment of the People's Republic of China. (2019a, April 28). *Opinions on promoting the implementation of ultra-low emissions in the steel industry*. https://www.mee.gov.cn/xxgk2018/xxgk/xxgk03/201904/t20190429_701463.html
- Ministry of Ecology and Environment of the People's Republic of China. (2019b, July 26). Guiding opinions on strengthening response to heavy pollution weather and consolidating emergency emission reduction measures. <https://www.chndaqi.com/news/294692.html>
- Ministry of Ecology and Environment of the People's Republic of China. (2020, June 29). *Technical guidelines for emergency emission reduction measures for key industries in heavy pollution weather (Revised 2020)*. <http://sthj.qhd.gov.cn/BAFa08c0dc/New/qhdsthjFile/2020-07-14/6ed57c13-fa3f-47c7-9ffe-2badf6b61d82.pdf>
- Ministry of Finance of the People's Republic of China. (2009). *Notice on implementing energy-saving and new energy vehicle pilot programs*. https://www.gov.cn/zwgk/2009-02/05/content_1222338.htm
- Ministry of Finance of the People's Republic of China. (2019). *Notice on further improving the financial subsidy policy for the promotion and application of new energy vehicles*. http://jjs.mof.gov.cn/zhengcefagui/201903/t20190326_3204190.htm
- Ministry of Transport of People's Republic of China. (2021, August 6). *Notice on naming 16 cities as Green Freight Demonstration cities*. http://www.gov.cn/zhengce/zhengceku/2021-08/12/content_5630892.htm
- Ministry of Transport of the People's Republic of China. (2019, December 10). The second round of Green Freight Pilot cities. <http://www.ndanev.com/2019/12/24/%E7%AC%AC%E4%BA%8C%E6%89%B9%E5%9F%8E%E5%B8%82%E7%BB%BF%E8%89%B2%E8%B4%A7%E8%BF%90%E9%85%8D%E9%80%81%E7%A4%BA%E8%8C%83%E5%B7%A5%E7%A8%8B%E5%88%9B%E5%B%BA%E5%9F%8E%E5%B8%82%E5%90%8D%E5%8D%95%E5%85%AC/>
- Ministry of Transport of the People's Republic of China. (2022a, March 14). *Measures for the administration of demonstration projects of urban green freight distribution*. http://www.gov.cn/zhengce/zhengceku/2022-03/16/content_5679316.htm
- Ministry of Transport of the People's Republic of China. (2022b, October 9). The third round of Green Freight Pilot cities about to come. <https://m.evpartner.com/news/detail-63528.html>

- Nanjing Municipal Bureau of Transportation. (2019, June 5). Guidelines for the evaluation of offline service capability of Nanjing online taxi booking platform company. <https://www.evpartner.com/news/12/detail-45684.html>
- Office of the State Council. (2018, September 17). *Three-Year Action Plan for Promoting Transport Structural Adjustment (2018-2020)*. http://www.gov.cn/zhengce/content/2018-10/09/content_5328817.htm
- Shanghai Development and Reform Commission. (2020, April 29). Several measures to promote automobile consumption. <https://www.evpartner.com/news/12/detail-51525.html>
- Shanghai Municipal Commission of Transportation. (2015, September 1). *Road restrictions on yellow-label vehicles*. <https://gaj.sh.gov.cn/shga/wzXxfbGj/detail?pa=110ef360e4374a41b57f4646c2d7d11025bf3ac66f6cfb218f2367982c969f9d>
- Shanghai Municipal Commission of Transportation. (2020, March 31). Road restrictions of China III vehicles released. <http://sh.bendibao.com/traffic/2019929/211096.shtm>
- Shanghai Municipal Transportation Management Office. (2019, May 23). Notice on suspending the renewal of conventional fuel vehicles for cruise taxis in this city. <https://www.evpartner.com/news/12/detail-45097.html>
- Shenzhen Municipal Commission of Transportation. (2018, June 19). *Notice on issuing the measures for the administration of special funds for the development of Shenzhen's modern logistics industry*. http://www.sz.gov.cn/zfgb/2018/gb1055/content/post_4986056.html
- Shenzhen Municipal Ecology and Environment Bureau. (2018). *Measures for awards and subsidies for early retirement of old vehicles in Shenzhen (2018-2020)*. <http://meeb.sz.gov.cn/attachment/0/128/128624/2016179.pdf>
- Shenzhen Municipal People's Government. (2017, January 20). *Interim measures for the administration of online taxi service management in Shenzhen*. http://www.sz.gov.cn/szsrnzfmhwzqkml/szsrnzfmhwzqkml/gzwj/gz/content/post_7786512.html
- Shenzhen Municipal Transportation Bureau. (2021, September 30). *Shenzhen Municipal Transportation Bureau's 2020 departmental final accounts*. http://www.sz.gov.cn/cn/xxgk/zfxgj/zjxx/gbmczyjs/content/post_9229880.html
- Shenzhen Municipal Transportation Commission. (2017, December 14). *Notice of the Shenzhen Municipal Transportation Commission on matters related to the promotion and application of pure electric cruise taxis from 2017 to 2020*. http://jtys.sz.gov.cn/szsjtysjwzqkml/szsjtysjwzqkml/zcfgjzcid/zcfg/cskygj/content/post_5564360.html
- Sina news. (2019, January 28). The ride-hailing vehicles in Haikou may reach full electrification. <http://auto.sina.com.cn/news/hy/2019-01-28/detail-ihrfqzka1729653.shtml>
- Tianjin Development and Reform Commission. (2017, June 19). *The special action plan for cost reduction and efficiency enhancement in the logistics industry in Tianjin*. http://www.tj.gov.cn/zwgk/szfwj/tjzrmzfbgt/202005/t20200519_2370376.html
- Tianjin Municipal Commission of Transportation. (2019, January 22). *The city's expressway differentiated toll policy is fully implemented*. http://www.gov.cn/xinwen/2019-01/09/content_5356216.htm
- Traffic Police Bureau of Shenzhen Public Security Bureau. (2019, June 14). *Continuing to set up green logistics zones to prohibit the passage of light diesel trucks*. http://ga.sz.gov.cn/ZT/ZDXZJC/ZDZJYJ/content/post_1299052.html
- Traffic Police Bureau of Shenzhen Public Security Bureau. (2021, June 30). *Announcement of the Traffic Police Bureau of Shenzhen Public Security Bureau on continuing the implementation of preferential policies for new energy pure electric logistics vehicles*. http://www.sz.gov.cn/szzt2010/wgkzl/jcggk/jcygk/zdzcjc/content/post_8908658.html
- Xiamen Municipal People's Government. (2018, December 21). *Implementation Plan of Xiamen City's Three-Year Action Plan for Winning the Blue Sky Defense War*. http://xm.fjsen.com/wap/2018-12/27/content_21821461_all.htm
- Xiamen Municipal People's Government. (2019, December 8). *Restricting the passage of high emission motor vehicles*. <https://www.waizi.org.cn/rule/79499.html>
- Xiamen Transportation Bureau. (2020, October 14). *Rules for the implementation of Xiamen's online booking taxi operation and service management*. <https://m.evpartner.com/news/detail-53935.html>



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