

Accelerating new energy vehicle uptake in Chinese cities: A 2023 policy update in a post-subsidy era

Author: Lingzhi Jin

INTRODUCTION

As of 2023, China's central purchase subsidy for new energy vehicles (NEVs) has officially ended.¹ In fact, the central government has gradually phased down purchase subsidies over the past few years before discontinuing them at the end of 2022. Cities have also been scaling back upfront purchase subsidies.² In the meantime, other policies continue to be instrumental in propelling the development of NEVs, such as the NEV mandate, exemptions and reductions of the purchase tax for NEVs, as well as central and local policies supporting carbon peaking and neutrality goals. Furthermore, emerging policy patterns at the city level are arising as a consequence of both central policies and city-level initiatives.

As an update to our previously published reports on NEV policies through 2020, this briefing identifies and summarizes policy trends for new energy passenger cars and commercial vehicles in a post-central-purchase-subsidy era.³ Policies were collected until September 2023. Many city-level policies introduced during the pandemic have been extended into 2022 and 2023, with the major policy types (for example, usage subsidy and preferential road access) remaining largely unchanged as indicated in our previous report. We also discuss important provincial or central policies which—when implemented at the local level—typically include more details based on the local context. The policies are not presented in any particular order.

1 Ministry of Finance of the People's Republic of China, "Notice Regarding the 2022 Financial Subsidy Policy for Promoting the Application of New Energy Vehicles", December 31, 2021, https://www.gov.cn/zhengce/zhengceku/2021-12/31/content_5665857.htm.

2 Hongyang Cui and Hui He, *China announced 2020-2022 subsidies for new energy vehicles*, (Washington, DC: ICCT, 2020), <https://theicct.org/publication/china-announced-2020-2022-subsidies-for-new-energy-vehicles/>; Lingzhi Jin, Yidan Chu, and Xiyuan Wang, *Accelerating new energy vehicle uptake in Chinese cities: Assessment of policies for private passenger cars in leading city markets*, (Washington, DC: ICCT, 2023), <https://theicct.org/publication/pv-chinese-cities-nev-policies-feb23/>.

3 Jin, Chu, and Wang, *Accelerating new energy vehicle uptake in Chinese cities*; Lingzhi Jin and Yidan Chu, *Accelerating new energy vehicle uptake in Chinese cities: Assessment of new energy commercial vehicle policies*, (Washington, DC: ICCT, 2023), <https://theicct.org/publication/commercial-nevs-cities-policies-jul23/>.

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POLICY UPDATES FOR NEW ENERGY PASSENGER CARS

Cities with annual quota systems for license plates continue to have higher than average new energy passenger car uptake

Cities with annual quota systems for license plates—including Beijing, Guangzhou, Hainan Province, Hangzhou, Shanghai, Shenzhen, Shijiazhuang, and Tianjin—accounted for 25% of new energy passenger car (NEPC) sales nationally in 2022. The quota systems impose an upper limit on annual new car registrations. Collectively, the NEPC market share in these cities reached 39% of their total passenger car sales, significantly surpassing the national average of 26%. Table 1 shows details of the quota systems for some of these cities. A combination of factors—such as economic costs, opportunity costs, and the challenges associated with acquiring license plates for conventional fuel cars—continues to drive NEPC adoption in these cities.

Table 1. Details of quotas, 2022.

Area	Mechanism			Quota				Average lottery winning rate		Average auction price (CNY)
	Conventional fuel PC	Energy-saving PC ^a	NEPC	Total for 2022	Conventional fuel PC	Energy-saving PC	NEPC	Conventional fuel PC	Energy-saving PC	Conventional fuel PC
Shenzhen	Auction + lottery	—	No restriction	90,400	90,400	—	—	0.23%	—	44,304
Guangzhou	Auction + lottery	Lottery	No restriction	120,000	108,000	68,000	—	0.48%	80.94%	16,924
Shanghai	Auction	—	No restriction	180,200	180,200	—	—	—	—	92,218
Beijing	Lottery	—	BEV only and no lottery, but limited quota each year. Number here includes individual and family.	92,200	28,600	—	63,600	0.45%	—	—
Tianjin	Auction + lottery + regional quota	Lottery	No restriction	155,000	145,000	10,000	—	1.68%	80.84%	10,477
Hainan province	Lottery	—	No restriction	215,129	215,129	—	—	81.78%	—	—

^a Hybrid vehicles with fuel consumption that is a certain percentage of the regulatory limit. This percentage was 65% in Guangzhou and 60% in Tianjin.

Cities offer replacement subsidies to accelerate in-use fleet turnover

To stimulate the uptake of NEVs despite the phasedown and phaseout of the central subsidy, several cities extended or introduced vehicle subsidies for consumers who replaced a conventional fuel car with an NEPC. Large cities such as Beijing, Chengdu, Guangzhou, Shanghai, and Shenzhen, as well as smaller cities like Wuhan and those in Hainan Province, all had this subsidy in 2022. Some cities, including Beijing and Shanghai, extended it to 2023.⁴ These subsidies typically range from 1,000 CNY to 10,000 CNY.

Alternatively, some cities have opted for a purchase-subsidy approach. For example, Guangzhou and Shenyang provide purchase subsidies even without replacing

4 Jing Ma, "Replacement Subsidy of up to 10,000 CNY for New Energy Vehicles from Mar 1st to Aug 31st," The People's Government of Beijing Municipality, March 2, 2023, https://www.beijing.gov.cn/fuwu/bmfw/sy/jrts/202303/t20230302_2927111.html; Shuang Mei, "Shanghai promotes consumption and continues the implementation of new energy vehicle replacement subsidies," *Xinhuanet News*, March 24, 2023, http://www.news.cn/fortune/2023-03/24/c_1211753402.htm.

an existing conventional fuel car with an NEPC.⁵ In the case of Shenyang, both conventional fuel cars and NEPCs are eligible for the subsidy, with NEPCs receiving an additional 1,000 CNY, so that older, more polluting cars are retired faster.

Cities adopt different strategies for plug-in hybrid vehicles

Plug-in hybrid electric vehicles (PHEVs) continue to play a role in the NEV mix. In China, the proportion of PHEVs among passenger cars has been increasing over the last 3 years, while the PHEV share has been decreasing globally.⁶ Meanwhile, cities are adopting different approaches regarding PHEVs and battery electric vehicles (BEVs).

In 2015, Shanghai stood out as one of the major cities, alongside places like Shenzhen and Xi'an, where the proportion of PHEV passenger cars exceeded that of BEVs.⁷ This trend persisted in Shanghai through 2020 and 2021, with its PHEV share remaining relatively higher than in other cities.⁸ However, starting in 2023, Shanghai stopped exempting PHEV freight vehicles from traffic restrictions on urban roads, while continuing this privilege for BEVs and fuel cell electric freight vehicles. It also stopped offering preferential license plate access to PHEV cars, requiring new PHEV buyers to go through the same quota-system auction process as other conventional fuel car buyers. In addition, for new energy transit buses, the subsidy granted to PHEVs is lower and proportionally reduced based on how the actual fuel savings rate compares with the nominal value recorded in the Ministry of Industry and Information Technology (MIIT)'s product catalogue.⁹ In contrast, Shenzhen relaxed its requirements to apply for a PHEV license plate, making PHEVs more appealing.

It is important to highlight that a previous study indicates that in China and other regions, PHEVs may not deliver significant environmental advantages unless they are frequently operated in their electric mode.¹⁰ In the United States, the Environmental Protection Agency (EPA) is considering reducing the assumed proportion of electric driving for PHEVs and subsequently revising the credit they receive within the EPA's proposed greenhouse gas standards for light-duty vehicles.¹¹ This effort acknowledges the importance of effectively utilizing electric power to maximize the environmental benefits of PHEVs.

Enhancing charging infrastructure in residential neighborhoods, rural and suburban areas, and along highways

In the past 2 years, the central government has issued several documents aimed at incentivizing the enhancement of charging networks. For example, the Guidance to Further Enhance Electric Vehicle Charging Infrastructure Service Capabilities specifies

- 5 Guangzhou Municipal Development and Reform Commission, "Guidelines for Encouraging and Supporting the Promotion and Application of New Energy Vehicles in the Personal Use in Guangzhou", March 31, 2023, http://fgw.gz.gov.cn/tzgg/content/post_8900353.html; Shenyang Municipal Commerce Bureau, "Shenyang's 2023 Automobile Consumption Subsidy Implementation Plan," June 16, 2023, http://swj.shenyang.gov.cn/tzgg/202306/t20230627_4485459.html.
- 6 Yidan Chu and Hongyang Cui, *Annual update on the global transition to electric vehicles: 2022*, (Washington, DC: ICCT, 2023), <https://theicct.org/publication/global-transition-electric-vehicles-update-jun23/>.
- 7 Hui He, Lingzhi Jin, Hongyang Cui, and Huan Zhou, *Assessment of electric car promotion policies in Chinese cities*, (Washington, DC: ICCT, 2018), <https://theicct.org/publication/assessment-of-electric-car-promotion-policies-in-chinese-cities/>.
- 8 Yidan Chu, Hui He, Lingzhi Jin, Xiyuan Wang, Jian Zhang, Fengfu Hao, and Yongwei Zhang, *Assessment of leading new energy vehicle city markets in China and policy lessons*, (Washington, DC: ICCT, 2022), <https://theicct.org/publication/china-city-markets-new-energy-sep22/>; Yidan Chu and Hui He, *Leading new energy vehicle city markets in China: A 2021 update*, (Washington, DC: ICCT, 2022), <https://theicct.org/publication/ev-china-city-markets-2021-update-nov22/>.
- 9 Shanghai Transportation Commission, "Implementation Opinions on Supporting Policies for the Development of New Energy Buses in the City from 2021 to 2023," September 8, 2021.
- 10 Georg Bieker, *A global comparison of the life-cycle greenhouse gas emissions of combustion engine and electric passenger cars*, (Washington, DC: ICCT, 2021), <https://theicct.org/publication/a-global-comparison-of-the-life-cycle-greenhouse-gas-emissions-of-combustion-engine-and-electric-passenger-cars/>.
- 11 Stephanie Searle and Aaron Isenstadt, *Don't plug in your plug-in hybrid? EPA will now hold automakers responsible*, (Washington, DC: ICCT, 2023), <https://theicct.org/us-phev-usage-regs-jun23/>.

that newly constructed residential neighborhoods must ensure that all dedicated parking spaces are NEV-ready, meaning that these spots should have the wiring and power-supply facilities necessary for new charger installations.¹² Another target in the guidance is to have 60% of all highway service areas—and 80% of service areas in key regions—covered by fast chargers by 2025. The action plan for the construction of charging infrastructure along highways specifies that at least 10% of passenger car parking spots must be NEV-ready in service areas along highways.¹³ Additionally, another policy document provides guidance on improving charging infrastructure in suburban and rural areas.¹⁴ These concerted efforts reflect the commitment to expanding charging infrastructure in various settings to accommodate the growing demand for NEVs.

In alignment with central policies, the charging infrastructure planning and development policies of cities and provinces are increasingly adopting similar provisions as shown in Table 2 below. Many policies targeting highways, suburban, and rural areas originate at the provincial level, as these charging locations may not fall directly under the jurisdiction of major cities. For residential neighborhood chargers, Chengdu and many other cities have issued construction and management guidelines. These guidelines serve to clarify responsibilities and overcome obstacles in the installation of residential chargers. Furthermore, compared to a couple of years ago, more cities are adopting the concept of unified construction and unified management. This concept implies that chargers within a neighborhood should be installed and maintained by a single entity or maintained by the company that owns or operates the charger. This approach streamlines the process, ensuring efficient deployment and upkeep of charging infrastructure.

12 National Development and Reform Commission, “Guidance to Further Enhance Electric Vehicle Charging Infrastructure Service Capabilities,” January 10, 2022, https://www.ndrc.gov.cn/xxgk/zcfb/ghxwj/202201/t20220121_1312634.html.

13 Ministry of Transportation, “Action Plan for Accelerating the Construction of Charging Infrastructure along Highways,” August 1, 2022, https://www.gov.cn/zhengce/zhengceku/2022-08/25/content_5706750.htm.

14 National Development and Reform Commission, “Implementation Opinions on Accelerating the Construction of Charging Infrastructure and Support Bringing New Energy Vehicles to the Countryside,” May 14, 2023, https://www.ndrc.gov.cn/xxgk/zcfb/tz/202305/t20230517_1355814.html.

Table 2. Examples of municipal and provincial policies that incorporate charging infrastructure along highways, in residential neighborhoods, and in suburban and rural areas.

Type	City/province	Policy details
Highway	Guangxi	By the end of 2023, at least 20% of parking spots should be equipped with a charger in highway service areas.
	Sichuan	At least 10% of passenger car parking spots should be equipped with a charger, and the rest should be NEV-ready.
	Shandong	By 2025, build 100 charging stations in highway service areas.
Residential neighborhood	Beijing	Build at least 15 pilots neighborhoods with the concept of unified installation and unified management. Expand to all neighborhoods by mid-2024.
	Chengdu	Public charger coverage in all existing neighborhoods with the appropriate construction conditions by 2025. Stakeholders should coordinate on installing chargers at designated parking spots in existing neighborhoods if conditions allow.
	Shanghai	Encourages private enterprises to invest in shared chargers in residential neighborhoods; provides equipment and electricity subsidy.
Suburban and rural areas	Hebei	By 2025, build 1,000 charging infrastructure pilot villages in rural areas.
	Hainan	Install 20,000 chargers in 2022, covering highway service areas and suburban areas.
	Tianjin	Released a guiding document that outlines measures such as streamlining the process for building private chargers and identifying key areas for building public chargers.

Sources: General Office of the People's Government of Guangxi Zhuang Autonomous Region, "Several Measures to Support the Promotion and Application of New Energy Vehicles in Guangxi," November 5, 2022, http://www.caam.org.cn/chn/9/cate_104/con_5235142.html; Sichuan Provincial Development and Reform Commission, "Measures for the Construction and Operation Management of Charging Infrastructure in Sichuan Province," March 24, 2023, <http://fgw.sc.gov.cn/sfgw/c109344/2023/3/31/745a24f9c310493bb19490beb928c469.shtml>; Shandong Provincial People's Government, "Shandong Province's "14th Five-Year Plan" Energy Saving and Emission Reduction Implementation Plan," November 3, 2022, http://www.shandong.gov.cn/art/2022/11/3/art_107851_121839.html; Beijing Municipal Commission of Urban Management, "Pilot for "Unified Construction and Unified Service" of New Energy Vehicle Charging in Residential Areas of Beijing," May 23, 2023, https://www.beijing.gov.cn/zhengce/zhengcefagui/202306/t20230608_3126349.html; Chengdu Economic and Information Bureau, "Implementation Rules for the Construction and Management of Electric Vehicle Charging Facilities in Residential Areas of Chengdu," August 12, 2021, <https://cdjx.chengdu.gov.cn/cdsjxw/c132872/2021-08/23/89dde450d1044a1a068bb107fd5b598/files/797356b5362a4542ab40c643663db977.pdf>; Shanghai Municipal Development and Reform Commission, "Several Policies and Measures to Increase Efforts to Support the Development of Private Investment," May 25, 2023, <https://fgw.sh.gov.cn/cmsres/4e/4e14bf9fe81e44b5b8ec8ff16ff51b26/f59b89d9d23f1c58b547aef920d73b26.pdf>; Hebei Provincial Development and Reform Commission "Implementation Opinions on Accelerating the Construction of Charging Infrastructure in Rural Areas, Promoting New Energy Vehicles to the Countryside and Rural Revitalization," June 2, 2023, https://www.sohu.com/a/686475311_121722639; Changchun Shao, "Several Measures to Encourage the Use of New Energy Vehicles in Hainan Province in 2022," The People's Government of Hainan Province, March 31, 2022, <https://www.hainan.gov.cn/hainan/tingju/202203/7119c88fcac64961ace02720f3229b6f.shtml>; Tianjin Municipal Development and Reform Commission, "Several Measures on Accelerating the Construction of Charging Infrastructure to Better Support New Energy Vehicles Going to the Countryside and Rural Revitalization," June 26, 2023, https://fzgg.tj.gov.cn/zwgk_47325/zcfg_47338/zcwjx/fgwj/202307/t20230707_6346319.html.

Supporting NEVs in suburban and rural areas to address imbalances in NEV uptake

The central government continues to support NEV development in suburban and rural areas with programs such as “NEVs to the Countryside,” which has occurred annually since 2020.¹⁵ Additionally, the Ministry of Commerce organized an automobile consumption promotion campaign that involves localized events to introduce NEVs to suburban and rural areas.¹⁶

Following the lead of the central government, cities have also proactively introduced measures to raise awareness and adoption in these areas. For instance, Wuxi, one of the first cities where the 2023 national “NEVs to the Countryside” event was held, allocated 30 million CNY to support consumers in purchasing NEVs.¹⁷ In the same vein, Tianjin has outlined a strategy encompassing a variety of measures.¹⁸ These include expanding the availability of models tailored to suburban and rural needs, facilitating the trade of used vehicles, and hosting local “NEVs to the Countryside” events. Moreover, they provide an incentive of up to 20% (not exceeding 5 million CNY) of the cost of purchasing new energy cold-chain vehicles to boost public sector NEV adoption in these areas. Anhui Province encourages collaboration between local authorities, manufacturers, and sales enterprises to orchestrate “NEVs to the Countryside” events.¹⁹ Furthermore, they provide a subsidy of 30% of the cost of events, up to 500,000 CNY, to support exhibition and sales events of a certain scale. In another endeavor, Yuncheng has entrusted a designated enterprise with the task of constructing chargers in its suburban and rural areas. This strategic move is aimed at facilitating businesses to establish and maintain chargers in remote regions, where potential profit margins might be relatively slim.

Limited incentives on NEV battery reuse and recycling

The central government has published a range of voluntary and mandatory policies over the past few years to regulate and improve the management of NEV battery reuse and recycling. These policies place expanded responsibility on NEV producers and importers, NEV battery producers and importers, and battery reuse businesses for reusing and recycling their waste NEV batteries. Policies also include a national coding regulation for NEV batteries—similar to vehicle identification numbers for automobiles—and annual reports from automakers on the reuse and recycling status of their batteries. However, further policies and incentives are required to establish a robust management and traceability system and ensure compliance.

Similarly, at the local level, there exists a shortage of incentives, and effectively scaling up these efforts remains a question. Shenzhen led the way in 2018 as the first city in China to offer a subsidy for NEV battery recycling.²⁰ Under this program, manufacturers selling NEVs in Shenzhen were granted a subsidy of CNY 20 per kWh, specifically intended for NEV battery recycling, with a cap of 50% of the total cost.

15 Lingzhi Jin and Yidan Chu, *Beyond cities: Efforts to expand equitable access to electric vehicles in China*, (Washington, DC: ICCT, 2022), <https://theicct.org/ev-ldv-equitable-access-china-jun23/>.

16 Ministry of Commerce, “Notice on Organizing Car Consumption Promotion Activities,” June 8, 2023, <http://www.mofcom.gov.cn/article/zwgk/gkgztz/202306/20230603415295.shtml>.

17 Lingxiao Zhang, “5 million to promote consumption, new energy vehicles to the countryside started in Wuxi,” Autohome.com, June 16, 2023, <https://www.autohome.com.cn/news/202306/1285691.html>.

18 Tianjin Municipal Development and Reform Commission, “Several Measures on Accelerating the Construction of Charging Infrastructure to Better Support New Energy Vehicles Going to the Countryside and Rural Revitalization,” June 26, 2023, https://fzgg.tj.gov.cn/zwgk_47325/zcfg_47338/zcwjx/fgwj/202307/t20230707_6346319.html.

19 Bureau of Commerce of Anhui province “Notice of Anhui Province on Several Measures to Support the Expansion of Automobile Consumption,” March 28, 2023, <https://www.mengcheng.gov.cn/XxgkContent/show/2285055.html>.

20 Development and Reform Commission of Shenzhen Municipality, “Financial Support for the Promotion and Application of New Energy Vehicles in Shenzhen in 2018,” January 18, 2019, http://fgw.sz.gov.cn/zwgk/qt/tzgg/content/post_4584163.html.

However, this subsidy was phased out in 2021. Guangxi Province is one of the few local governments that provided a battery recycling subsidy in 2023. Its NEV Three Year Action Plan extends a subsidy to manufacturers selling NEVs in Guangxi, offering 20 CNY per kWh for recycled batteries and covering 30% of the construction expenses for an NEV battery recycling center from 2021–2023.²¹

Promoting more ambitious NEV deployment in small, delimited areas

Certain cities and provinces encourage the creation of specific, delimited areas for taking more ambitious actions in NEV deployment. These areas could include low- and zero-emission zones, tourist destinations, industrial parks, ports, mining areas, and islands. For example, Hainan Province encourages cities to take the lead in establishing low-emission and zero-emission zones; the province targets having at least one zero-emission zone in each city and county by 2030.²² Fujian Province supports a higher level of electrification in key areas such as the ones mentioned above, and specifically on islands such as Dongshan, Meizhou, and Pingtan.²³

The city of Beihai prohibits new internal combustion engine vehicles from accessing Weizhou Island, while simultaneously encouraging the phase-out of existing internal combustion engine vehicles.²⁴ Beijing's 2021–2025 land-planning document also highlights promoting low- and zero-emission zones in key areas.²⁵ These targeted actions showcase a concerted drive to accelerate the adoption of NEVs in specific localized zones.

POLICY UPDATES FOR NEW ENERGY COMMERCIAL VEHICLES

The landscape for new energy commercial vehicles (NECVs) is shaped by three things: central policies; localized implementation of central initiatives which tailors central policies to regional nuances, amplifying their effectiveness within specific contexts; and the introduction and execution of various pilot programs for NECVs in recent years. These pilot programs serve as experimental platforms, enabling the testing of innovative concepts and policies, thereby fostering targeted expansion within the NECV sector.

Strengthening requirements for key industries during heavy pollution days

In the latest phase of the Clean Diesel Action Plan, a heightened focus is placed on reinforcing requirements for key industries.²⁶ Notably, the plan expands on the current requirement, set in the 2020 performance rating policy, that 80% of key industries in key regions adopt clean transportation methods. Now, 70% of bulk material transportation in other regions within key industries—such as thermal power, iron and steel, coal and coking—should also adopt clean transportation methods, including

21 Guangxi Zhuang Autonomous Region Development and Reform Commission, "Implementation Rules for the Three-Year Action Financial Subsidy for the Promotion and Application of New Energy Vehicles in Guangxi Zhuang Autonomous Region," November 4, 2022, <http://fgw.gxzf.gov.cn/zfxgkzl/wjzx/zcjd/zczy/t13284339.shtml>.

22 Hainan Provincial People's Government, "Notice on Implementation Plan of Carbon Peaking in Hainan Province," September 28, 2022, https://www.ndrc.gov.cn/fggz/hjzy/tdftzh/202209/t20220928_1337488.html.

23 General Office of Fujian Provincial People's Government, "Development Plan of New Energy Automobile Industry in Fujian Province, 2022–2025," April 18, 2022, http://gxt.fujian.gov.cn/jdhy/zxcfg/sjzcfg/202204/t20220422_5897976.htm.

24 Shitao Huang, "Beihai Issued Local Regulations to Protect the Ecological Environment of Weizhou Island," June 1, 2018, <https://www.gxrd.gov.cn/html/art161278.html>.

25 The People's Government of Beijing Municipality, "Beijing's Near-term Land and Space Planning (2021–2025)," February 17, 2022, https://www.beijing.gov.cn/zhengce/gfxwj/202202/t20220219_2612916.html.

26 Ministry of Ecology and Environment, "Action Plan for Battle Against Diesel Truck Pollution 2022," November 10, 2022, <https://www.mee.gov.cn/xgk/2018/xgk/xgk03/202211/W020221116629516131124.pdf>.

NEVs.²⁷ The plan also encourages improving how the rating system works and expanding the number of key industries, which is currently 39.

Consequently, many local governments have released action plans providing more detailed requirements. For example, Henan Province prohibits the addition of new production capacity by specific industries situated in key pollution control areas.²⁸ Simultaneously, Henan mandates that new construction and expansions within these industry sectors meet the stringent A standard under the central government's performance rating policy. This policy assigns a rating of A to D to businesses based on their emissions and emissions-reduction measures. Production and transportation activities are limited during heavy pollution days to various degrees based on this rating. Zhejiang Province aims to elevate 10% of its key industries to a rating of B or above by 2025.²⁹ Guangdong Province encourages cities that have previously grappled with severe pollution episodes to implement the performance rating policy as a proactive means of rectification.³⁰ Sichuan Province enhances the performance rating policy by adding more industry coverage.³¹

Promoting extensive electrification of public-sector vehicles

China has been gaining momentum in its efforts to achieve the ultimate goal of comprehensive electrification of public-sector vehicles. Public-sector vehicles encompass those used in public transportation, vital public services (such as postal, sanitation, logistics, and airport operations), and government agencies.

In 2023, the MIIT unveiled a blueprint for establishing pilot cities for the extensive electrification of public-sector vehicles.³² These targets envision an electrification rate of 80% for transit buses, taxis, sanitation and postal vehicles, and urban logistics vehicles. Additionally, the blueprint aims for a parity ratio of one "standard" charger (converted from one charger based on power level) per "standard" NEV (converted from one NEV based on vehicle type and weight/length) in these pilot cities.³³

While the first pilot cities have yet to be announced, a tiered categorization system will be used to delineate deployment targets in these cities ranging from 20,000–100,000 standard NEVs by 2025. This categorization hinges on multifaceted considerations such as economic development, the foundational state of the NEV industry, and

27 Key regions in the performance rating policy include Hebei, Shanxi, Shanghai, Zhejiang, Jiangsu, Anhui, Shandong, Henan, and Shaanxi provinces, and two cities, Beijing and Tianjin; See Jin and Chu, *Accelerating new energy vehicle uptake in Chinese cities: Assessment of new energy commercial vehicle policies*.

28 Department of Ecology and Environment of Henan Province, "Henan Province's Action plan for the Elimination of Heavily Polluted Events in Autumn and Winter, the Prevention and Control of Ozone Pollution in Summer, and the Pollution Control of Diesel Trucks," March 28, 2023, <https://sthjt.henan.gov.cn/2023/04-04/2719422.html>.

29 Department of Ecology and Environment of Zhejiang Province, "Three-year Action Plan for Ozone Pollution Prevention and Control in Zhejiang Province," December 6, 2022, https://zjcmpublic.oss-cn-hangzhou-zwynet-d01-a.internet.cloud.zj.gov.cn/jcms_files/jcms1/web1756/site/attach/O/7971c1532eb64271931a5cac07f02249.pdf.

30 Department of Ecology and Environment of Guangdong Province, "Implementation Plan for Ozone Pollution Prevention and Control (Collaborative Emission Reduction of Nitrogen Oxides and Volatile Organic Compounds) in Guangdong Province (2023-2025)," February 15, 2023, http://gdee.gd.gov.cn/shbtwj/content/post_4096829.html.

31 Sichuan Provincial Department of Ecology and Environment, "Notice of the Office of the Sichuan Provincial Department of Ecology and Environment on Further Strengthening the Performance Rating of Key Industries in Heavy Pollution Events," March 2, 2023, <http://www.qionglai.gov.cn/gkml/qlssthjj/qtwj/1646328824679378946.shtml>.

32 Ministry of Industry and Information Technology, "Notice Regarding the Organization of Pilots in Electrification of Public Sector Vehicles in Pioneering Areas," January 30, 2023, https://www.gov.cn/zhengce/zhengceku/2023-02/03/content_5739955.htm.

33 A standard charger = a charger x a multiplier. The multiplier is calculated based on power of charger/60kW (rounding down). An adjustment factor of 1.1 is applied to chargers above 180kW after converting to a standard charger. A public sector NEV is counted as 0.6 to 6 standard vehicles, depending on vehicle type and weight/length.

existing NEV deployment status. Cities applying to be a pilot will be required to outline their electrification targets and strategies.

Other public-service vehicles, including those used for engineering, construction, and airport functions, are also targets for extensive electrification. A few cities currently subsidize medium- and heavy-duty trucks. For example, in Chengdu, incentives are provided to replace conventional fuel vehicles with electric ones. Specifically, for construction waste and concrete transport vehicles, Chengdu offers a replacement subsidy of 200,000 CNY and 300,000 CNY per vehicle respectively.³⁴ Box 1 highlights the efforts and progress toward electrification at airports.

BOX 1. ELECTRIFICATION OF VEHICLES AT AIRPORTS

As early as 2015, the Civil Aviation Administration of China (CAAC) embarked on an ambitious journey towards sustainable mobility by designating six airports as the first pilots to transition ground vehicles from using fossil fuel to electricity. The pilot program focuses on addressing pollutants emitted by diesel vehicles during idle and low-speed conditions.

In 2019, in response to the national Blue Sky Defense Plan to combat air pollution, the CAAC unveiled an action plan. More than 200 airports were included in an “oil to electricity” program. Among them, over 60 airports in Jing-Jin-Ji, Yangtze River Delta, and Fenwei Plain were required to reach a 100% electrification rate in new vehicles and equipment (with certain exceptions for fire engines, ambulances, snow-removal vehicles, refueling vehicles, and others that do not yet have corresponding NEV products). Concurrently, other airports were required to reach a 50% electrification rate for new vehicles.

Subsequently, substantial strides have been taken by certain airports to reach these targets. An example is Beijing’s Daxing Airport, where a fleet of more than 1,300 NEVs represents 77% of all vehicles at the airport, as of 2021. Similarly, Kunming Changshui Airport achieved an NEV penetration rate of 74% in 2023.

Sources: Civil Aviation Administration of China, “Civil Aviation Implements the Work Plan of the Three-Year Action Plan for Winning the Blue Sky Defense War,” September 14, 2018, https://www.gov.cn/zhengce/zhengceku/2019-10/12/content_5438712.htm; Qihui Wang, “World Leader! Daxing Airport’s New Energy Vehicles Share Reached 77%,” Sohu.com, November 13, 2020, https://www.sohu.com/a/431649374_362042; Wenjin Sun, “Kunming Changshui: From Green Airport to Double Carbon Target Airport,” CAAC News, February 1, 2023, http://www.caacnews.com.cn/1/5/202302/t20230201_1362162.html.

Battery-swapping technology is gaining momentum

While China’s NEV strategy mainly focused on EV charging stations before 2020, the central government began in 2019 to endorse exploring the exchange of used batteries for fresh ones in vehicles.³⁵ As a result, swap-capable commercial vehicles have been gaining momentum. In 2022, swap-capable NEVs accounted for almost half of the

34 General Office of Chengdu Municipal People’s Government, “Chengdu’s Action Plan for Optimizing Transportation Structure to Promote Urban Green and Low-Carbon Development, and Chengdu’s Policies and Measures for Optimizing Transportation Structure to Promote Urban Green and Low-Carbon Development,” July 2, 2022, http://www.day.gov.cn/day/c142412/2022-07/12/content_90d53c4ebf3b427c_a04b66c3b909c4d8.shtml.

35 National Development and Reform Commission, “Implementation Plan for Promoting the Upgrading of Key Consumer goods and Unimpeded Recycling of Resources (2019-2020),” June 3, 2019, https://www.gov.cn/zhengce/zhengceku/2019-10/08/content_5436974.htm; Chuqing Zhou, “Government Working Report,” Xihua Net, March 12, 2021, http://www.xinhuanet.com/politics/2021-03/12/c_1127205339.htm.

total 25,000 new sales of NEVs, with more than 200 models available.³⁶ By May 2023, the number of battery-swapping stations reached 2,175.³⁷

In 2021, MIIT introduced a 2-year pilot program for swap-capable NEVs.³⁸ Pilot cities include Baotou, Beijing, Changchun, Chongqing, Hefei, Jinan, Nanjing, Sanya, Tangshan, Wuhan, and Yibin. Among these, Baotou, Tangshan, and Yibin would focus solely on swap-capable trucks. The pilot program's overarching objective aimed to deploy 100,000 swap-capable vehicles and more than 1,000 battery-swapping stations across these designated cities. Simultaneously, the initiative strived to refine technology, enhance management systems, establish pertinent standards, and shape supportive policies.

As a result, cities in the pilot program introduced policies to support the deployment of swap-capable NEVs. For example, Nanjing offers an incentive of 100,000 CNY per vehicle per year from 2023–2025 to manufacturers of swap-capable new energy dump trucks.³⁹ This offer is contingent upon the vehicles achieving a minimum annual mileage of 30,000 km. Furthermore, a subsidy of 750 CNY per kilowatt based on rated power of the charging module (up to a maximum of 1.5 million CNY, disbursed over 3 years) was offered for truck battery-swapping stations depending on service performance. Complementing this, an operational subsidy of 0.15 CNY per kWh was also extended. Notably, manufacturers developing new swap-capable models stood to gain substantial support, with up to 10 million CNY in subsidies for each new model introduced to the market.

The impact of the program extended beyond the pilot cities, as various municipalities such as Chengdu and Sanya also implemented policies to bolster the adoption of swap-capable NEVs.⁴⁰

36 Xin Ma, "Ouyang Minggao: The Growth Rate of Electric Heavy Trucks This Year is 90%-100%, and the Proportion of Battery Swap-capable Ones May Reach 70% in the Future," *China Automotive News*, February 18, 2023, https://mp.weixin.qq.com/s?__biz=MzA5MzIzMjIwNg==&mid=2652440222&idx=2&sn=b6032561f225eae5ed1309b230f522d2&chksm=8b8cabbfbcb22a9906ab5f345f20cb4bf921271af9b73930bece20eca8486ab742cbd0e256a&mpshare=1&scene=1&srcid=021956xDqlopZqTMLS7YcQOG&sharer_sharetime=1686250071872&sharer_shareid=3996eece7b3a6cbc175d53ed5deab80a&exportkey=n_ChQIA-hlQdhLGB2omYvTXk4sh8a1FsxLuAQIE97dBBAAEAAAAACQjBp4CyqwAAAAOpnlbLcz9gKNyK89dVj0C4HbOpc%2FsaW5iruHJox2mua2vZRhmNBuvZS4N14XUbjSyqmWZuSP09C%2BJhqagG2IHdDWQNJ0tpGODS%2FL0dLTKml%2FELqMVajtdOwAZUrLn0ypGBkh%2BRhtsOmhORubd6FS4ihLXQ4%2B0JFKIOftsCPCG%2BC9IzuGuvilUnxOSkWNhnmZO%2BLAZ3qDhVost2%2FpWqQKB8nhPqTQiu4aq4%2FyAZx8KvAfnf6n8zQaOMB7U7ooeYXky3Sn6%2FHxfKfG4bKilIYrK0%2FyHzHo4Fg%3D&acctmode=0&pass_ticket=SvmuLkKzvYIN7L7rg50%2BoiZLA%2Bg8WuD1KuxP8dp6xKY%2FZ%2Bq9GfkGRbrPFAsAQhli&wx_header=0#rd

37 Xiaojing Liang, "In the First Five Months, China's Charging Infrastructure Increased by 1.147 million units, and the number of battery swapping stations was 2,175," *itdcw.com*, June 11, 2023, <https://www.itdcw.com/news/hangyeshuju/06111356462023.html>.

38 Ministry of Industry and Information Technology, "The Ministry of Industry and Information Technology Launched a Pilot Project for the Application of Swap-capable New Energy Vehicle," October 28, 2021, https://www.gov.cn/xinwen/2021-10/28/content_5647458.htm.

39 General Office of Nanjing Municipal People's Government, "Implementation Plan for the Pilot Application of Swap-capable New Energy Vehicles in Nanjing (Trial)," September 22, 2022, https://www.nanjing.gov.cn/zdjk/202210/t20221026_3737029.html.

40 Chengdu Municipal Bureau of Economic and Information Technology, "Implementation Plan for the Pilot Application of Battery Swap Mode for New Energy Vehicles in Chengdu," January 17, 2023, <https://www.chinaautoms.com/a/new/2023/0128/22556.html>; Sanya Municipal People's Government Office, "Sanya New Energy Vehicle Battery Swap Model Application Pilot Construction Plan," October 25, 2022, <https://finance.sina.cn/chanjing/gdxw/2022-10-31/detail-imqqsmp4414696.d.html?from=wap>.

BOX 2. TANGSHAN: PIONEERING BATTERY SWAPPING IN TRUCKS

Tangshan is a major industrial city known for its iron and steel industry. It is nestled within Hebei province and situated on the coast of the Bohai Sea. Its Tangshan Port consists of two areas, Jingtang Port and Caofeidian Port. Tangshan was selected as one of the national pilots focusing on battery-swapping trucks in late 2021.

Tangshan's commitment to this innovative endeavor has yielded remarkable outcomes. By early 2023, Tangshan had around 6,000 battery-swapping heavy trucks and 40 battery-swapping stations. The city plans to build another 50 battery-swapping stations in 2023. In both 2021 and 2022, Tangshan achieved the top position in new sales of NE tractor trucks, surpassing its counterparts by a considerable margin, including 3 times the sales of the second city on the list. The city's dynamic industrial landscape, coupled with its strategic port areas, has provided fertile ground for the successful implementation of battery-swapping technology.

Tangshan started planning for a network of four city-level battery-swapping corridors in 2021 (see Figure 1). These corridors were strategically aligned with the distribution of iron and steel factories, the transportation capacity, and the freight load of the Jingtang and Caofeidian ports. With a cumulative length of approximately 620 kilometers, these corridors service numerous iron and steel establishments along the route, accommodating a substantial fleet of battery-swapping heavy trucks. Tangshan's proactive approach translated into rapid progress, with one corridor already operational and the completion of another.

In addition to being one of the national pilots for battery swapping in heavy trucks, Tangshan is also part of the key regions for air pollution control under the Clean Diesel Action Plan and also subject to the performance rating policy. Moreover, the city is one of the Green Freight pilot cities, which is discussed further below. All of these aspects contribute to Tangshan's endeavors toward a more sustainable transportation sector.

Sources: Fan Yang and Penghao Zhao, "Tangshan, Hebei: More than 6,000 heavy-duty trucks have been replaced with batteries, anchoring the new direction of development," *Xinhua Net*, March 25, 2023, http://www.news.cn/fortune/2023-03/25/c_1129463948.htm; Danyang Sun, "Tangshan, Hebei Put into Operation More than 5,000 Heavy-Duty Trucks, Ranking First in the Country," *Sohu.com*, November 10, 2022, https://www.sohu.com/a/604425896_99902275; Tangshan Municipal People's Government Office, "Beautiful Tangshan Construction Action Plan (2023-2027)," March 17, 2023, <http://lvsefazhan.cn/index.php/guozijianguan/1439.html>; Chu and He, *Leading new energy vehicle city markets in China: A 2021 update*; Shiyue Mao, Tianlin Niu, Felipe Rodríguez, Chunxiao Hao, Shuo Wang, and Zhaosheng Zhang, *Real-world use cases for zero-emission trucks: A comparison of electric and diesel tractors in Tangshan, China*, (Washington, DC: ICCT, 2022), <https://theicct.org/publication/real-world-zero-emission-trucks-tangshan-sept23/>.

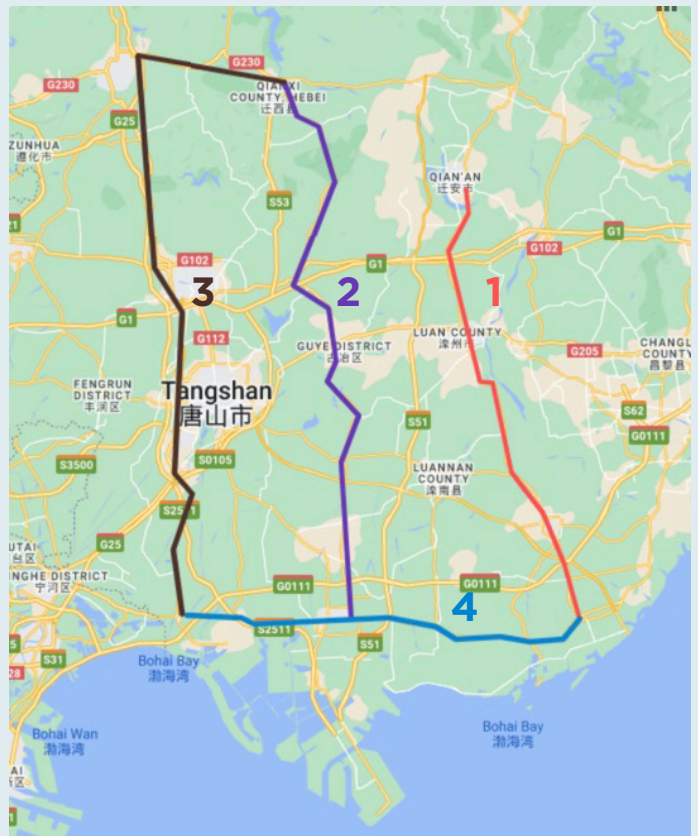


Figure 1. Schematic map of four Tangshan battery-swapping corridors; the corridor color matches the route color.

Green Freight cities are expected to remain at the frontier of supporting new energy urban logistics vehicles

Green Freight cities have consistently positioned themselves as pioneers in the adoption and policy support of new energy urban logistics vehicles (NEULVs).⁴¹ A third round of Green Freight Pilot cities was announced in late 2022. This new batch of cities has started to publish action plans for the pilot period through September 2025. Compared to previous rounds, the third round includes more smaller cities. Table 3 shows select targets for NEULVs in action plans from these cities.

Several similar targets can be identified across these plans, encompassing metrics such as projected new sales, the anticipated share of new sales, and the targeted reduction in per-unit energy consumption by the end of the pilot period. Charging infrastructure targets are specified by the vehicle-to-charger ratio or the number of new chargers or charger stock. In addition to the targets listed in Table 3, other targets include expanding infrastructure for urban logistics vehicles (ULVs), the provision of dedicated or temporary parking spots, improved scheduling, higher vehicle-utilization rates, cost optimization, and advancement of information technology systems.

Table 3. Targets for NEULVs in select round-three pilot cities, for the pilot period October 2022–September 2025.

City	NEULV Target	Charging infrastructure target
Hefei	At least 50% of all new ULV sales are NEULVs; new NEULV sales are equal to 20% or more of the number of NEULVs in use at the start of the pilot	Ratio of least one charger for every four NEULVs
Lianyungang	At least 50% of all new ULV sales are NEULVs; new NEULV sales are equal to 20% or more of the number of NEULVs in use at the start of the pilot	Ratio of at least one charger for every four NEULVs
Panjin	At least 50% of all new ULV sales are NEULVs; new NEULV sales are equal to 20% or more of the number of NEULVs in use at the start of the pilot	Ratio of at least one charger for every four NEULVs
Pingdingshan	Add 300 new NEULVs	150 chargers for NEULVs
Wuhan	Add 4,500 new NEULVs; at least 80% of all new ULV sales are NEULVs	Install 40,000 NEULV chargers; ratio of at least one charger for every four NEULVs

Sources: Hefei Municipal Government Office, “Implementation Plan of Hefei Urban Green Freight Distribution Demonstration Project,” March 2023, https://www.ahqfzx.com/doc_26031416.html; Lianyungang Municipal People’s Government Office, “Lianyungang Urban Green Freight Demonstration Project Implementation Plan,” January 10, 2023, <https://www.lyg.gov.cn/zqlygzfzmhwz/szfbgswj1/content/9cd02ec0-0220-4cf2-adc3-d32220335715.html>; Panjin Municipal People’s Government Office, “Panjin Urban Green Freight Demonstration Project Implementation Plan,” April 23, 2023, <https://www.panjin.gov.cn/html/1875/2023-04-23/content-131435.html>; Pingdingshan Municipal People’s Government Office, “Implementation Opinions on Establishing Urban Green Freight Demonstration Project,” March 24, 2023, <https://www.pds.gov.cn/contents/31699/362535.html>; Wuhan Municipal People’s Government Office, “Wuhan Green Freight Demonstration Project Implementation Plan,” July 25, 2023, https://www.wuhan.gov.cn/zwgk/xxgk/zfwj/bgtwj/202308/t20230804_2242586.shtml.

Continuing to explore expansion of fuel cell electric vehicles through pilots

The central government issued several pivotal policies regarding fuel cell electric vehicles (FCEVs) in 2020, including the notice to establish pilot cities for the hydrogen industry. As a result, governments at different levels have been publishing supporting

⁴¹ Jin and Chu, *Accelerating new energy vehicle uptake in Chinese cities: Assessment of new energy commercial vehicle policies*; Chu and He, *Leading new energy vehicle city markets in China: A 2021 update*.

documents to spur further development in the hydrogen fuel cell realm.⁴² Although total new sales of FCEVs in 2022 doubled from the previous year, the number of sales remains below 4,000 vehicles.⁴³

In the national pilot program, five city clusters were selected as the pilots, including Guangdong, Hebei, Henan, Jing-Jin-Ji, and Shanghai.⁴⁴ The pilot extends until 2025, during which time the central government will undertake annual evaluations and distribute awards accordingly. The central government included the method for determining awards in the 2020 notice. Cities receive a range of credits based on FCEV deployment and technology, as well as hydrogen supply and economic viability. Each credit corresponds to approximately 100,000 CNY. For example, for a commercial FCEV deployed in 2023, the credit received ranges from 0.9 to 3.78, depending on vehicle type, gross vehicle weight rating, and rated power. Key components also qualify for credits, from 0.2–0.3 credits per vehicle. Notably, cities beyond the current phase of pilot programs also have made action plans, including cities in the Sichuan-Chongqing region, the Wuhan region, Shandong Province, Shanxi Province, and Fujian Province. To give an example of the types of fiscal support, Shanghai's policy is highlighted below.

BOX 3. SHANGHAI'S SUPPORTIVE FISCAL MEASURES FOR FCEVS

Deployment: Award of 200,000 CNY per credit, with funding sourced from the central government, city, and the district where the fuel cell system manufacturer is located.

Operation: An annual grant of 5,000 CNY–20,000 CNY per year for freight and transit coaches, extending up to three years, contingent upon meeting the mileage requirement of 20,000 km per year.

Fuel cell transit bus: Purchase subsidy of 800,000 CNY, capped at 3 million CNY per vehicle, encompassing subsidies for both fuel cell system purchase and other life cycle operational costs. Additionally, a distinct operational subsidy of up to 70,000 CNY per vehicle per year.

Key components manufacturing: An additional award of 30,000 CNY per credit, to complement central awards, capped at 30 million CNY for the same component within the same manufacturer.

Hydrogen refueling station construction: Awards of no more than 30% of the investment in equipment purchase and installation, capped at 5 million CNY, 4 million CNY, and 3 million CNY for stations licensed in 2022, 2023, and 2024, or 2025 respectively.

Hydrogen refueling station operation: Awards of 15 CNY/kg in 2022–2023 and 10 CNY/kg in 2024–2025, provided that the retail price does not exceed 35 CNY/kg. Funding sourced equally from the central government, city, and the district where the station is situated.

Sources: Shanghai Municipal Commission of Economy and Informatization, "Implementation Rules for Special Funds for Demonstration and Application of Fuel Cell Vehicles in Shanghai," April 25, 2023, <https://app.sheitc.sh.gov.cn/sjxwxgwj/694841.htm>.

42 Ministry of Finance, "Notice on Launching Pilot Applications of Fuel Cell Vehicles," September 16, 2020, https://www.gov.cn/zhengce/zhengceku/2020-10/22/content_5553246.htm; Lingzhi Jin and Hui He, *Ten cities, thousand fuel cell vehicles? China is sketching a roadmap for hydrogen vehicles*, (Washington, DC: ICCT, 2020), <https://theicct.org/ten-cities-thousand-fuel-cell-vehicles-china-is-sketching-a-roadmap-for-hydrogen-vehicles/>.

43 China Energy News, "Improvement in Hydrogen Fuel Cell Vehicles in Multiple Aspects," February 6, 2023, http://paper.people.com.cn/zgnybwap/html/2023-02/06/content_25964685.htm.

44 For more information about hydrogen policies in Guangdong: Tianlin Niu, Yunxiao Ma, and Yichen Zhang, *Real-world use cases for zero-emission trucks: Market review and policy suggestions for Guangdong Province*, (Washington, DC: ICCT, 2023), <https://theicct.org/publication/real-world-zet-guangdong-oct23/>.

CONCLUSION

China has achieved success in vehicle electrification and remains a global leader in this field.⁴⁵ It maintained its position as the leading electric vehicle market in 2022, with sales of 6.2 million NEVs (an increase of 82% from 2021) representing 59% of total global sales.⁴⁶ As the central purchase subsidy comes to an end, both central and local governments are actively exploring policy alternatives to sustain the growth of NEVs and tackle challenges. These challenges include addressing varying adoption rates across different regions, establishing charging infrastructure along highways and in residential areas, and managing NEV battery recycling. The policy choices and trends outlined in this briefing provide insights into how China is navigating this transition away from central purchase subsidies and toward new incentives and strategies for deploying NEVs.

45 Lingzhi Jin, Hui He, Hongyang Cui, Nic Lutsey, Chuqi Wu, Yidan Chu, Jin Zhu, Ying Xiong, and Xi Liu, *Driving a green future: A retrospective review of China's electric vehicle development and outlook for the future*, (Washington, DC; ICCT, 2021), <https://theicct.org/publication/driving-a-green-future-a-retrospective-review-of-chinas-electric-vehicle-development-and-outlook-for-the-future/>.

46 Chu and Cui, *Annual update on the global transition to electric vehicles: 2022*.