

Leading new energy vehicle cities in China: The 2022 market

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This briefing surveys China's top-performing city markets for new energy vehicles (NEVs) as of 2022, updating our previous analysis of 2021 data.¹ In the Chinese context, NEVs refer to battery-electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), and hydrogen fuel-cell electric vehicles (FCEVs). As in our previous report, we identify the top cities and analyze sub-categories for new energy passenger cars and commercial vehicles.² We also analyze market features by city class, an unofficial but widely used grouping of cities into six classes: Tier 1 (highest), New Tier 1, Tier 2, Tier 3, Tier 4, and Tier 5. Generally, higher-rated cities have larger populations, stronger economic strength, and better business competitiveness.³

All analysis in this briefing is based on ZEDATA's insurance data of vehicles produced domestically in China.⁴

2022 SALES OVERVIEW

In 2022, China's NEV market achieved a third consecutive year of growth. Annual NEV sales hit a record high of 6.8 million, almost double the sales in 2021.⁵ As shown in Figure 1, market growth was mainly driven by the passenger car sector, which grew by 94% year-on-year to comprise 96% of all new energy vehicle registrations in China in 2022. Meanwhile, commercial vehicles—including all types of buses and trucks—grew

1 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/>.

2 In China, passenger cars are motor vehicles with four wheels that carry people and have no more than nine seats and a maximum designed gross vehicle weight less than or equal to 3,500 kg; commercial vehicles refer to all other vehicles and include trucks, buses, and utility vehicles.

3 "New Tier 1 City List for 2023 Disclosed," YiMagazine, May 30, 2023, <https://www.datayicai.com/report/detail/999638>; Yidan Chu et al., *Assessment of Leading New Energy Vehicle City Markets in China and Policy Lessons* (ICCT: Washington, DC, 2022), <https://theicct.org/publication/china-city-markets-new-energy-sep22/>.

4 ZEDATA, "Vehicles Produced Domestically in China," accessed July 20, 2023, <http://www.zedata.cn/>.

5 China Association of Automobile Manufacturers (CAAM), "2022年12月汽车工业经济运行情况 [Economic Performance of the Automobile Industry in December]," January 12, 2023, https://www.miit.gov.cn/jgsj/zbys/qcgy/art/2023/art_ff136c2c686a4728a4905e62a7e991d6.html. Note that the sales data in CAAM's paper are higher than the registration data that we analyzed throughout our analysis due to statistical aperture differences.

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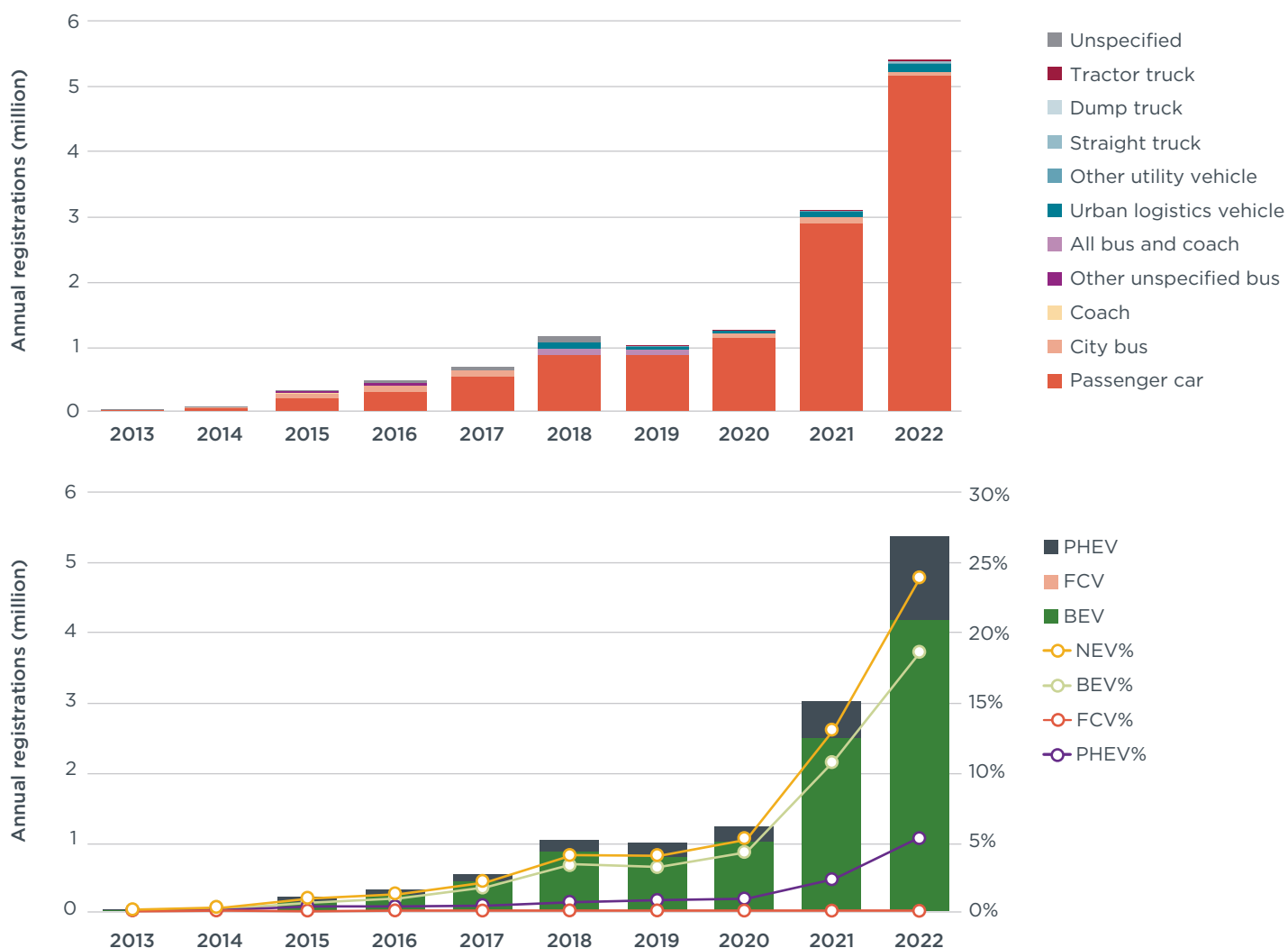
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by 79% from 2021 to make up the remaining 4% of the NEV market. NEV market penetration (i.e., the share of NEVs among all vehicles registered), reached 24% in 2022, almost double that of 2021.

BEVs accounted for 77.6% of NEVs registered in 2022, corresponding to 18.7% of market penetration; cumulatively, BEVs made up 79.9% of all NEVs registered in China from 2013 to 2022. PHEVs represented 22.0% of NEV registrations, corresponding to 5.3% of market penetration in 2022 and 20% of NEV registrations over 2013-2022. Meanwhile, the FCEV market was still in the early stage in China, making up 0.4% of NEV registrations and 0.02% of market penetration in 2022 and 0.1% of cumulative NEV registrations from 2013 to 2022.

Figure 1
Annual registrations of new energy vehicles in China from 2013 to 2022 by vehicle category (top) and by technology (bottom).

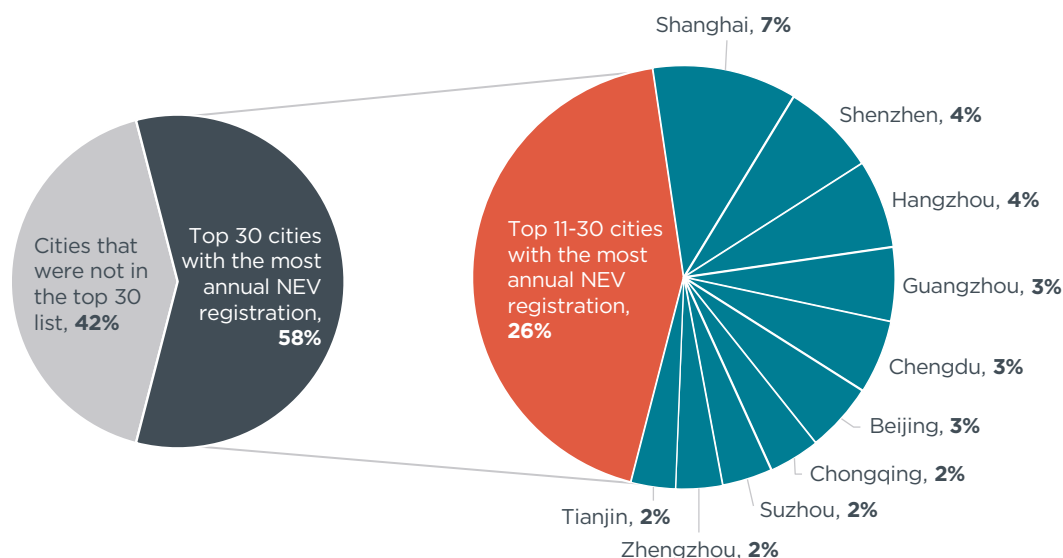


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Cities have been at the forefront of new energy vehicle deployment in China, particularly megacities, defined as those with a resident population of over 10 million. However, the share of NEV registrations in the top cities has decreased in successive years: In 2022, the 30 cities with the highest NEV deployment were responsible for 58% of all registrations in China, down 4 percentage points from 2021 and 11 percentage points from 2020. The market concentration in megacities also contracted: Shanghai's

share of national annual NEV registrations dropped from 8% to 7%, Shenzhen's from 5% to 4%, and Guangzhou's and Beijing's from 4% to 3% (Figure 2). Overall, the top 10 cities in terms of NEV registrations in 2022 were the same as in 2021, with some changes in ranking.

Figure 2
New energy passenger car and commercial vehicle registrations in Chinese cities, 2022.



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The increased market share in smaller cities has been largely driven by the national NEVs to the Countryside program, which started in July 2020.⁶ By June 2023, a total of 4.12 million NEVs had been sold under this program, involving over 140 NEV models from 45 vehicle manufacturers and representing 35% of NEVs sold nationally during this period.⁷ City-level efforts, such as participation in national NEV promotion pilot programs, have also been important factors in the increase in NEV sales in smaller cities in China.

LEADING CITIES FOR NEV DEPLOYMENT

Figure 3 shows the top 10 cities in terms of absolute number of NEV registrations and NEV market penetration in 2022. Shanghai had the highest deployment of both BEVs and PHEVs; in total, over 300,000 NEVs were registered in Shanghai in 2022, representing nearly 50% of all vehicles sold in the city. Shenzhen and Hangzhou were close behind; each had over 200,000 NEV registrations and an NEV market penetration rate exceeding 40%.

Most of the NEVs deployed in these top 10 cities were BEVs, and a majority were passenger cars. As shown in Figure 3 (see rightmost chart), seven of the top 10 cities for NEV penetration in 2022 were neither Tier 1 nor New Tier 1: Sanya, Liuzhou, Haikou, Wenzhou, Wuhu, Luoyang, and Lishui. All seven had NEV market penetration rates of over 30%.

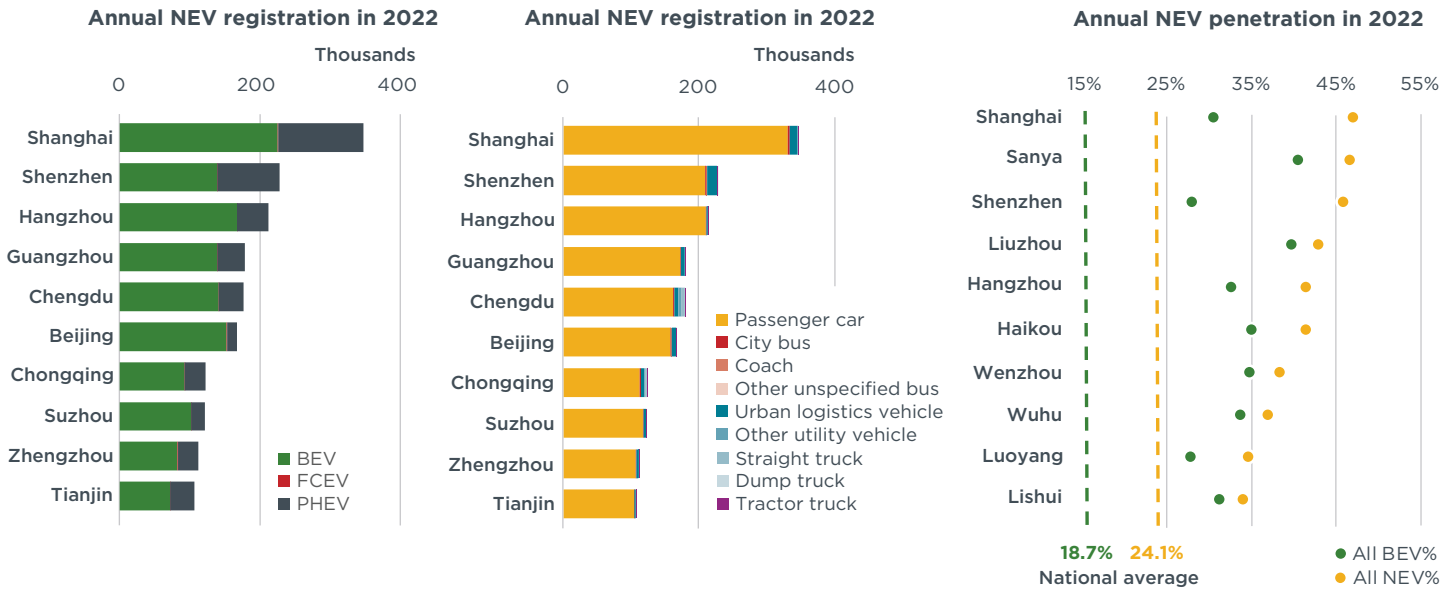
⁶ Lingzhi Jin and Yidan Chu, *Beyond Cities: Efforts to Expand Equitable Access to Electric Vehicles in China* (Washington, DC: ICCT, 2023), <https://theicct.org/ev-ldv-equitable-access-china-jun23/>.

⁷ Ministry of Industry and Information Technology, “关于开展2023年新能源汽车下乡活动的通知 [Notice on Launching the 2023 New Energy Vehicles To the Countryside],” June 15, 2023, https://wap.miit.gov.cn/zwgk/zcwj/wjfb/tz/art/2023/art_6dbc82a29e604abb99a42cd4cf4924ca.html.

Figure 3

Top 10 Chinese cities by annual new energy vehicle registration (left and middle) and new energy vehicle penetration (right), 2022.

The NEV penetration ranking excludes cities with NEV registrations below 10,000 in 2022.



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NEW ENERGY PASSENGER CAR MARKET

MARKET CHARACTERISTICS BY CITY CLASS

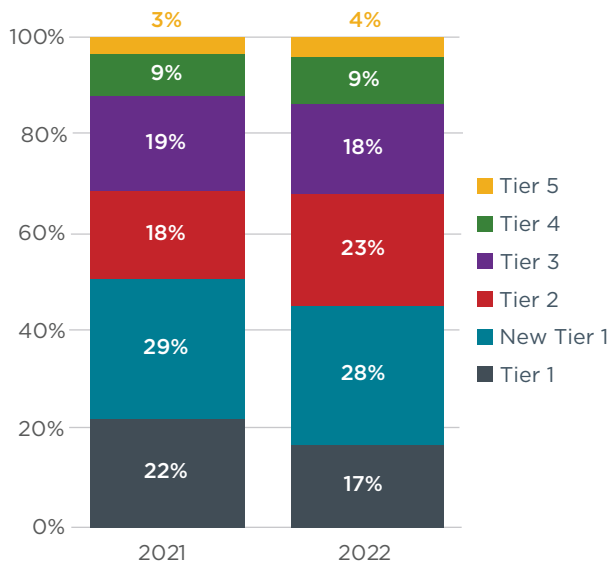
Smaller cities made up a larger share of the new energy passenger car (NEPC) market in 2022 than in 2021. As shown in Figure 4, cities in Tiers 2-5 accounted for 55% of all NEPC registrations in 2022, up from 49% the year prior. In contrast, the share of registrations in Tier 1 cities—namely the four megacities of Beijing, Shanghai, Guangzhou, and Shenzhen—decreased from 22% to 17%. These trends partly reflect the success of the government’s NEVs to the Countryside program, noted above, in driving up NEPC uptake in smaller cities, as most vehicle models sold under this program have been passenger cars.⁸

⁸ Jin and Chu, *Beyond Cities: Efforts to Expand Equitable Access to Electric Vehicles in China*.

Figure 4

Share of new energy passenger car registrations in China by city tier, 2021 and 2022.

Tier classification changes in 2022, especially in Tiers 4 and 5, mean the results of the two years are not 100% comparable.

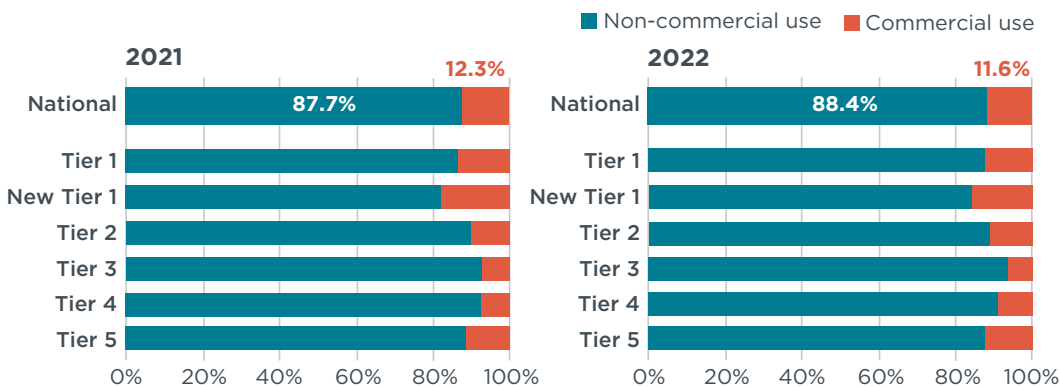


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The respective shares of NEPCs used for commercial and non-commercial purposes registered in 2022 remained almost unchanged from 2021, with non-commercial use vehicles making up the vast majority of the fleet. As shown in Figure 5, in 2022, 88.4% of NEPCs registered nationwide were for non-commercial use (e.g., private-use cars and government or corporate vehicles), a 0.7 percentage point increase from 2021. The remaining 11.6% of vehicles were for commercial use (e.g., taxis and rental and ride-hailing cars). As in 2021, Tier 3 cities continued to have the highest share of non-commercial use NEPC registrations among all tiers in 2022, while New Tier 1 cities once again had the highest share of commercial use NEPC registrations.

Figure 5

New energy passenger car registrations by utility type across city classes, 2021 and 2022.

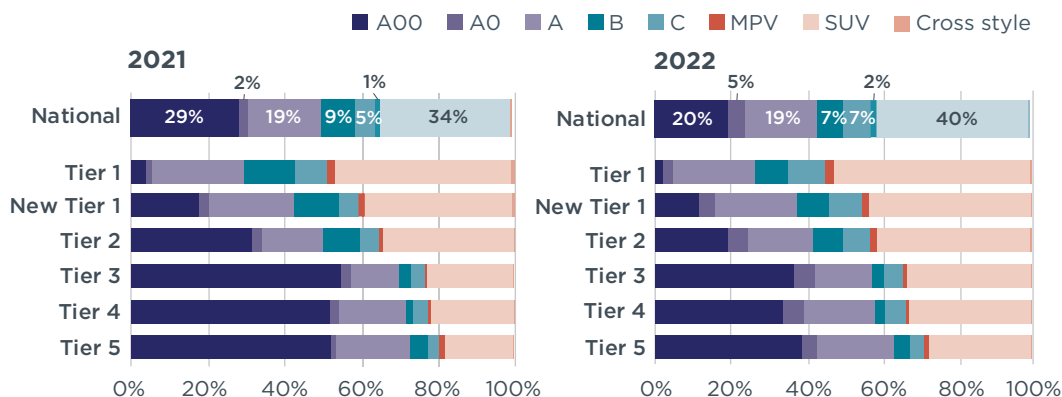


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As Figure 6 shows, in 2022, for the first time, the collective market share of segments B and C vehicles (primarily big and high-end cars), sport utility vehicles (SUVs), and multipurpose vehicles (MPVs) was larger than those of smaller-sized cars of segments A00 (microcars), A0 (small cars), and A (compact cars). At the national level, SUVs

and A00 vehicles remained the most popular vehicle sizes, but the market share of the former increased by 6 percentage points and the latter dropped by 9 percentage points in 2022. At the city class level, SUVs were most prevalent in Tier 1 cities, where their corresponding market share increased by 6 percentage points from 2021 to 2022. Meanwhile, Tier 5 replaced Tier 3 as the city class with the highest proportion of A00 vehicles, which made up nearly 40% of NEPC registrations in Tier 5 cities in 2022.

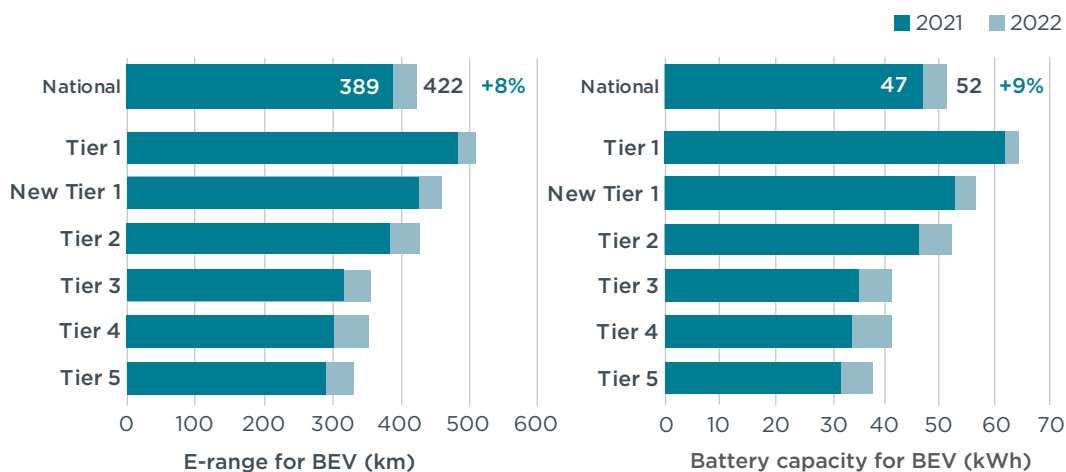
Figure 6
Composition of new energy passenger car registrations by segment across city classes, 2021 and 2022.



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Fleet-average technical performance, particularly in the range and battery capacity of BEV models, continued to improve in 2022. Figure 7 compares these two parameters in 2021 and 2022. At the national level, average BEV electric range was 422 km and average battery capacity was 52 kWh in 2022, corresponding to increases of 8% and 9%, respectively, from 2021. Similar to 2021, the highest average range and battery capacity were found in Tier 1 cities and the lowest in Tier 5 cities, although performance improvements were seen across all tiers. Greater average electric range and capacity in higher city classes is likely attributable, in part, to variations in typical traveling distance in different tiers. Consumers in smaller cities typically need to travel shorter distances, while consumers in larger cities may require a longer-range BEV due to longer commutes or frequent intercity travel.

Figure 7
Average electric range and battery capacity of BEVs across city classes, 2021 and 2022. Percentages indicate the change in national average from 2021.



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Figure 8 compares the best-selling battery-electric passenger car models in 2021 and 2022. The Hongguang Mini remained the most popular model nationally; registrations of the model rose from 390,000 in 2021 to 410,000 in 2022, although its registration share among BEVs decreased from 16.5% to 10.3%. This implies an increase in the variety of BEV models and strengthened competitiveness of other brands in 2022. As in 2021, the most popular BEV models at the city class level were the Tesla Model Y (for Tiers 1 and New Tier 1) and Hongguang Mini (for Tiers 2-5). The Tesla Model Y represented 13.4% of BEVs registered in 2022 in Tier 1 cities and 11.4% in New Tier 1 cities, up from 11.4% and 9.1% in 2021, respectively. Hongguang Mini registrations increased at all city levels from 2021 to 2022, but its market share among BEVs registered decreased by 8.2 percentage points in Tier 2 cities, 10.9 percentage points in Tier 3 cities, 14.2 percentage points in Tier 4 cities, and 13.7 percentage points in Tier 5 cities.

Figure 8

The most popular battery electric passenger car models and their market shares at the national and subnational levels in 2021 and 2022.

2021			2022		
Region / the most popular BEV model / market share			Region / the most popular BEV model / market share		
National	Hongguang mini	16.5%	National	Hongguang mini	10.3%
Tier 1	Tesla Model Y	11.4%	Tier 1	Tesla Model Y	13.4%
New Tier 1	Tesla Model Y	9.1%	New Tier 1	Tesla Model Y	11.4%
Tier 2	Hongguang mini	17.8%	Tier 2	Hongguang mini	9.6%
Tier 3	Hongguang mini	28.7%	Tier 3	Hongguang mini	17.8%
Tier 4	Hongguang mini	33.4%	Tier 4	Hongguang mini	19.2%
Tier 5	Hongguang mini	41.0%	Tier 5	Hongguang mini	27.3%

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The most popular PHEV model in 2022 was the BYD Song Plus SUV, which overtook the best-selling model in 2021, the Li ONE. As shown in Figure 9, the BYD Song Plus was the top-selling PHEV at the national level and across all city classes, accounting for more than 21% of PHEV registrations in every tier. This may reflect changing consumer preference in favor of low-cost models. The BYD Song Plus costs CNY 159,800–189,800 and offers a pure electric range of 110 km, around 150 kW maximum electric motor power, and 4.5 L/100 km fuel consumption under the minimum charge status. The Li ONE, an extended-range electric SUV model, costs CNY 349,800 and has a 180–188 km pure electric range, 245 kW electric motor power, and 8.8 L/100 km fuel consumption under the minimum charge status.

Notably, apart from Tesla, the best-selling BEV and PHEV models at both the national and city tier levels were from native Chinese brands. This implies wide-range acceptance of native brands in China's NEPC market.

Figure 9

The most popular plug-in electric passenger car models and their market shares at the national and subnational levels in 2021 and 2022.

2021			2022		
Region / the most popular PHEV model / market share			Region / the most popular PHEV model / market share		
	National	Li ONE 17.5%		National	BYD Song Plus 22.9%
Tier 1		Li ONE 13.9%	Tier 1		BYD Song Plus 23.4%
New Tier 1		Li ONE 23.0%	New Tier 1		BYD Song Plus 22.7%
Tier 2		Li ONE 25.2%	Tier 2		BYD Song Plus 21.3%
Tier 3		BYD Qin 21.5%	Tier 3		BYD Song Plus 23.2%
Tier 4		BYD Qin 28.4%	Tier 4		BYD Song Plus 23.7%
Tier 5		BYD Qin 25.6%	Tier 5		BYD Song Plus 25.0%

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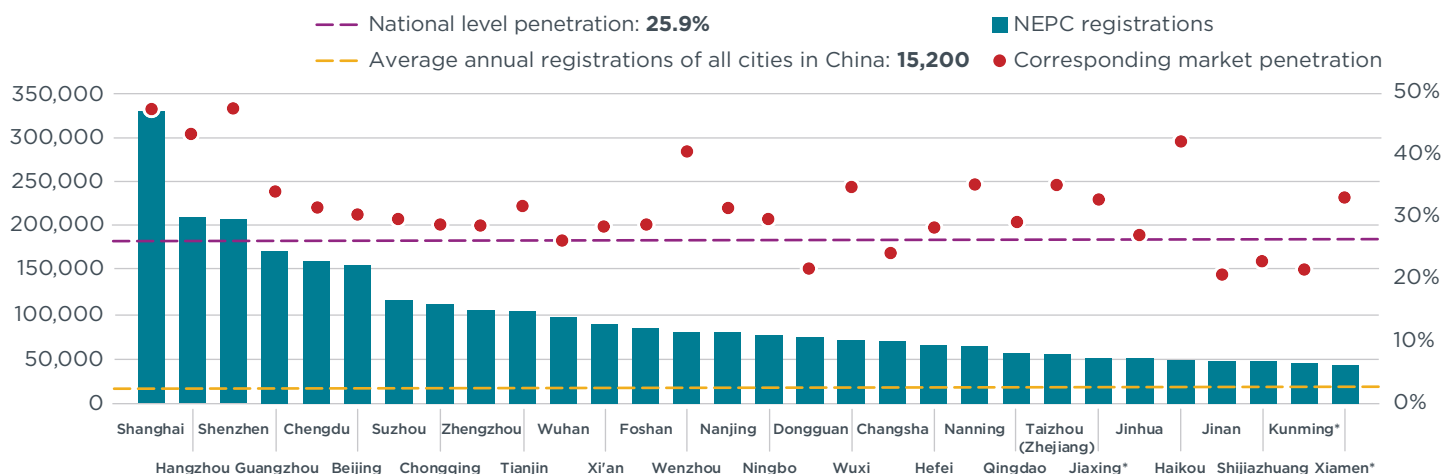
CHARACTERISTICS OF THE TOP 30 NEPC MARKETS

Leading Chinese cities recorded higher NEPC registrations and market penetration in 2022, but their collective contribution to national totals shrank slightly. Figure 10 displays the top 30 city markets with the highest NEPC registrations in 2022, which collectively accounted for 58% of the national total—a four percentage decrease from the top 30 city markets in 2021.⁹ NEPC registrations in the top 30 cities in 2022 ranged from nearly 44,000 in Xiamen to almost 330,000 in Shanghai, with an average of 99,600, up from an average of 60,000 in 2021. The market penetration of NEPCs among all passenger vehicles registered in 2022 ranged from 21% in Jinan to 47% in Shanghai, with an average of 33%, compared with an average of 20% the year prior. Liuzhou, Luoyang, and Taiyuan dropped from the top 30 cities in terms of NEPC registrations in 2022 and were replaced by Jiaxing, Kunming, and Xiamen.

⁹ Chu and He, *Leading New Energy Vehicle City Markets in China: A 2021 Update*.

Figure 10

New energy passenger car registrations and market penetration in the top 30 cities in China, 2022.



Asterisks (*) denote cities that were new members of the top 30 list in 2022.

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Figure 11 examines the respective shares of non-commercial use and commercial-use vehicles in top 30 NEPC city markets. Non-commercial use NEPCs, namely private-use and corporate fleets, remained the top vehicle utility type across these leading cities: On average, 86% of NEPCs registered in the top 30 cities in 2022 were for non-commercial use, closely resembling the percentage in 2021 (85%). Jiaxing (Zhejiang Province) had the highest percentage of non-commercial use NEPC registrations in 2022, while Kunming (Yunnan Province) had the highest percentage of commercial use registrations. Shijiazhuang (Hebei Province) and Chengdu (Sichuan Province) had the highest percentages of non-commercial use and commercial use NEPC registrations, respectively, in 2021.

The market dominance of non-commercial use—especially private-use—NEPCs in leading cities may be linked to local subsidies for consumers. Intended to stimulate the economy in response to COVID-19, these incentives varied from CNY 1,000 to CNY 10,000 across cities and were only available for the purchase of non-commercial use NEVs. These incentives were implemented in many Chinese cities, including the megacities of Beijing, Shenzhen, and Shanghai, from 2020 to 2023.¹⁰

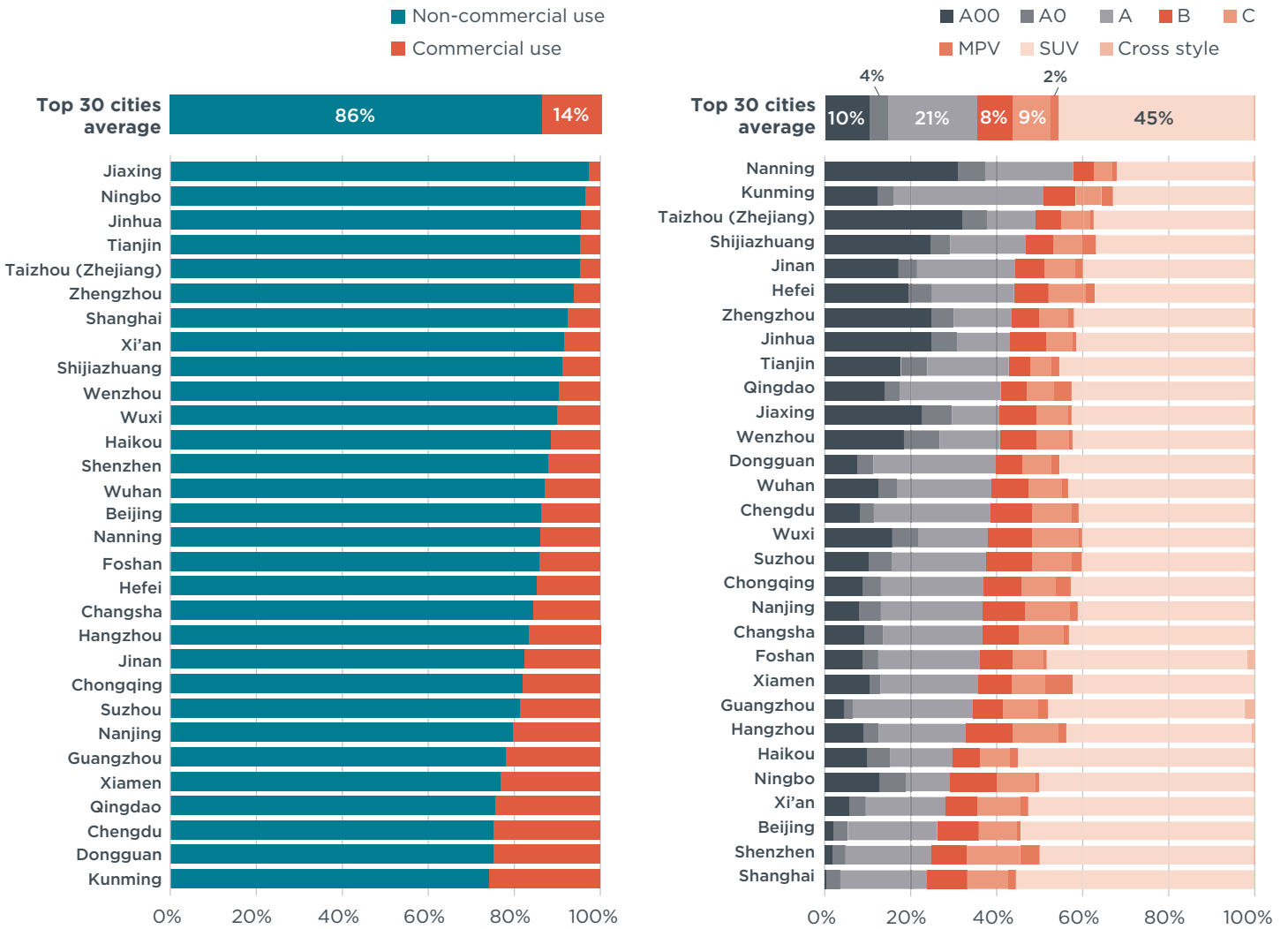
As at the national level, high-end and larger vehicles were more popular than smaller cars (A00, A0, and A segments) in these leading cities (Figure 11, right). SUVs were the most popular segment in 2022, with an average market share of 45% among all NEPCs registered in the top 30 cities, five percentage points higher than in 2021. Shanghai was the leading SUV market in this regard, with a market share of 56%.

¹⁰ “汽车补贴燃起来了：深圳最壕成都最卷，武汉地方保护杭州最人性 [Local Vehicle Subsidies are Coming! Shenzhen is the Most Generous, Chengdu’s Promotion is the Largest, Wuhan Protects Local Enterprises, and Hangzhou Shows Humanistic Concern],” *Sohucity*, March 29, 2023, https://m.thepaper.cn/newsDetail_forward_22481718.

Figure 11

Composition of the new energy passenger car market by ownership type in the top 30 cities, 2022.

Cities on the left are ranked by their non-commercial use market share, and on the right are ranked by combined market shares of smaller-size cars (A00, A0, and A segments).



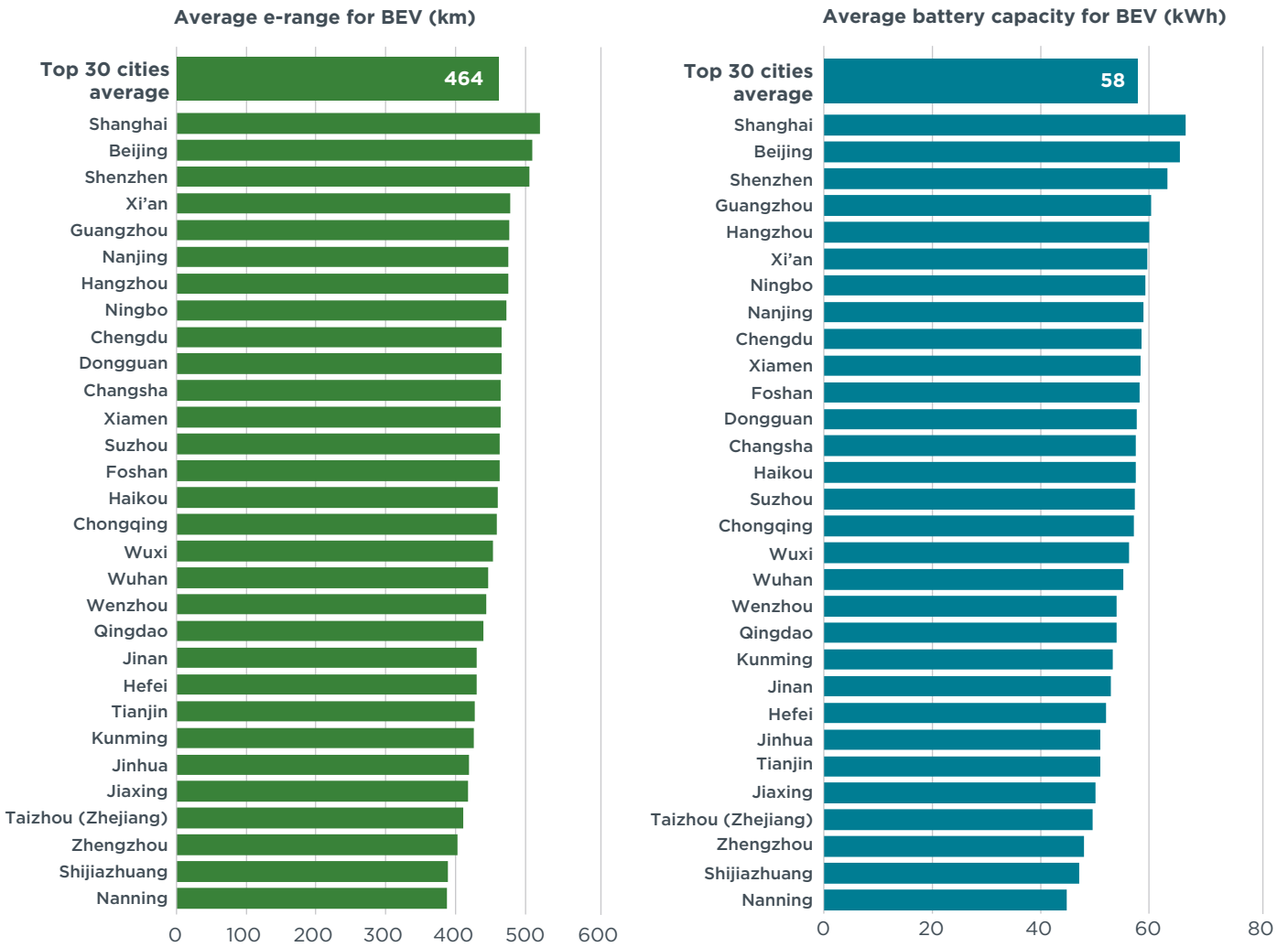
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Similar to national trends, the technical performance of passenger BEV models registered in the top 30 city markets improved in 2022 (Figure 12). Average BEV electric range and battery capacity were 464 km and 58 kWh in 2022, respectively, up from 432 km and 54 kWh in 2021. The average electric range varied from 388 km in Nanning (Guangxi) to 521 km in Shanghai in 2022; by comparison, in 2021, it ranged from 291 km in Liuzhou to 487 km in Shanghai. The number of top cities with an average BEV electric range above 300 km also increased, from 29 in 2021 to 30 in 2022.¹¹ Average battery capacity ranged from 45 kWh in Nanning to 67 kWh in Shanghai in 2022, an increase from 29 kWh in Liuzhou to 63 kWh in Shanghai in 2021.

¹¹ The minimum electric range for a BEV to qualify for China's national purchase subsidy in the final phase in 2022 was 300 km.

Figure 12

Composition of the new energy passenger car market by segment in the top 30 city markets, 2021 and 2022.



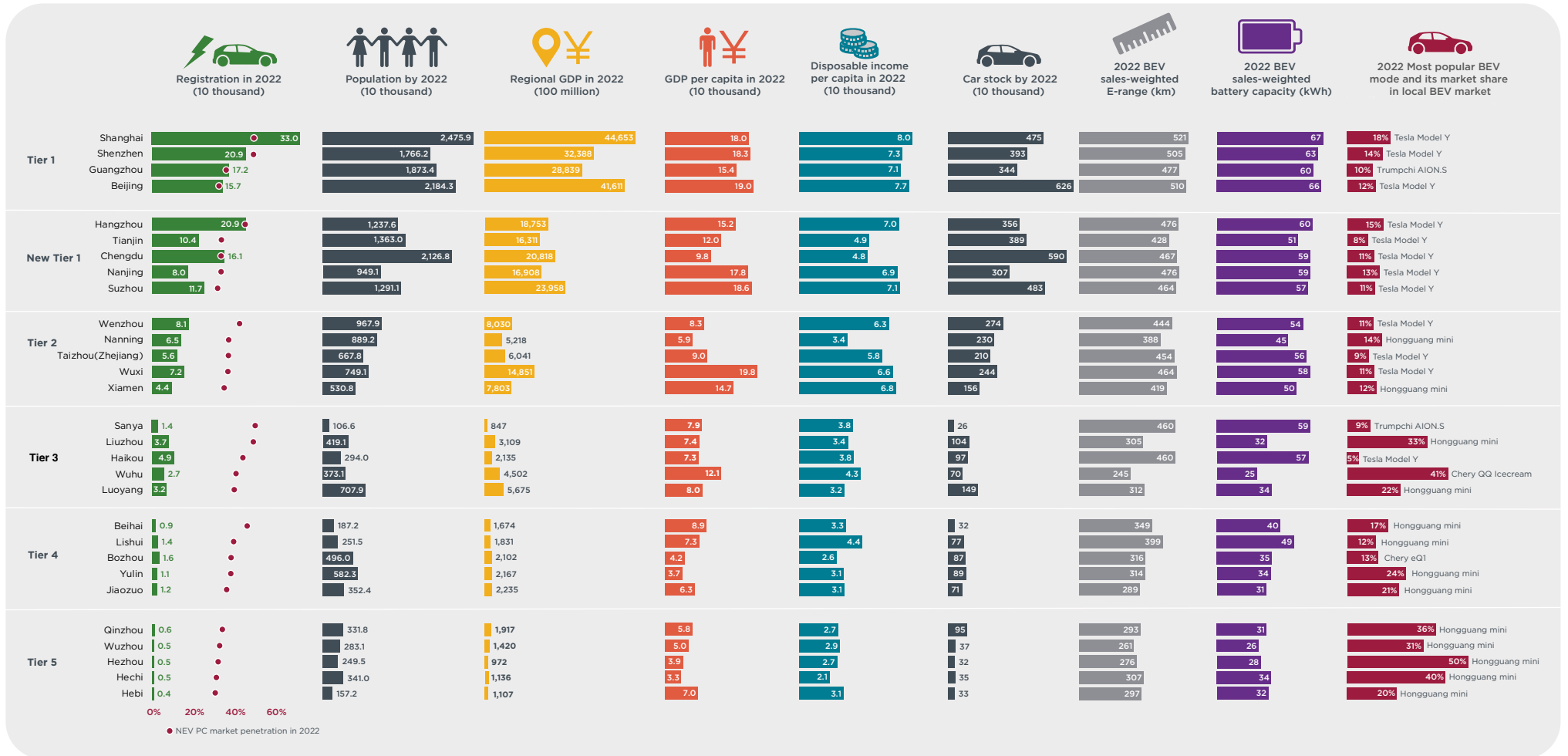
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LEADING NEPC MARKETS IN EACH CITY CLASS

Figure 13 examines the top NEPC markets of each city class based on NEPC market penetration instead of absolute number of new registrations to normalize the differences between big and small vehicle markets. NEPC market performance is presented alongside demographic and socioeconomic characteristics and information on the technical performance of BEVs and the best-selling BEV models for each city class.

Figure 13
Demographic, socioeconomic, and new energy vehicle market characteristics of the top five cities in each city class by new energy passenger car market penetration in 2022. There are only four Tier 1 cities.

Top cities in Tier 5 were filtered with a threshold of 3,900 NEPC registrations (90th percentile among all Tier 5 cities) due to the presence of some cities with high NEPC penetrations but less than 1,000 NEPC registrations.



Overall, in 2022, Tier 1 saw a shift in city rankings in terms of NEPC market performance, while New Tier 1, Tier 2, and Tier 3 each had one new city enter their top-five city list. Meanwhile, the most significant changes in leading NEPC markets occurred in Tier 4 and Tier 5 cities.

Tier 1 cities had an average of 216,800 new NEPC registrations in 2022, a 36% increase from 2021. Registrations varied from 156,900 in Beijing to 329,800 in Shanghai. Shanghai replaced Shenzhen as the Tier 1 city with the highest market penetration; Shenzhen was second, followed by Guangzhou and Beijing. The average NEPC market penetration in Tier 1 cities was 40% in 2022, up from 30% the previous year.

Tier 1 cities have instituted local policies to increase NEPC sales, such as vehicle registration restriction policies and incentives for vehicle replacement. Beijing, for example, set a larger license plate quota for battery electric cars (63,600) than for other fuel-type cars (28,600), while the other Tier 1 cities placed a registration cap only on internal combustion engine cars and exempted NEPCs.¹² To boost the consumption of NEVs, all four Tier 1 cities offered vehicle replacement subsidies in 2022, which varied from CNY 8,000 to CNY 10,000 per vehicle. In addition, Guangzhou and Shenzhen offered a CNY 8,000 subsidy for each new NEV purchased, and Beijing provided road access privileges for passenger BEVs.¹³

The New Tier 1, Tier 2, and Tier 3 classes each saw one change in their top-five NEPC city market rankings: Suzhou (Jiangsu Province) replaced Zhengzhou (Henan Province) in New Tier 1, Taizhou (Zhejiang Province) replaced Taiyuan (Shanxi Province) in Tier 2, and Wuhu (Anhui Province) replaced Ningde (Fujian Province) in Tier 3. Average NEPC registrations in the top five cities in each of these tiers in 2022 were 134,000 in New Tier 1 (a 64% increase from 2021), 63,600 in Tier 2 (a 102% increase), and 31,800 in Tier 3 (a 43% increase). Between 2021 and 2022, average NEPC market penetration in the top five cities in New Tier 1 grew from 21% to 34%, that of Tier 2 grew from 19% to 36%, and that of Tier 3 grew from 30% to 42%—the highest average among all tiers.

Similar to Tier 1 cities, New Tier 1, Tier 2, and Tier 3 cities adopted policy approaches to promote the uptake of NEPCs in 2022. For example, Hangzhou, Tianjin, Haikou, and Sanya each adopted vehicle registration restriction policies that exempt NEVs, though these policies vary in mechanism (e.g., auction or lottery) and registration ceiling.¹⁴ Chengdu, Wenzhou, Sanya, and Haikou offered vehicle replacement subsidies for NEVs ranging from CNY 2,000 to CNY 8,000, and Hangzhou, Tianjin, Nanjing, and

¹² In Beijing, NEVs only refer to BEVs. Guangzhou also instituted a quota for qualified non-plugged-in hybrid electric vehicles.

¹³ Shanghai Municipal Development and Reform Commission, “关于印发《上海市促进汽车消费补贴实施细则》的通知 [Notice on Issuing Shanghai’s Implementation Measures for Subsidies to Promote Automobile Consumption],” June 15, 2022, <https://www.shanghai.gov.cn/202215gfwj/20220827/64cc5fa61c664ada8dac05adae919a03.html>; Beijing Municipal Commerce Bureau, “印发《北京市关于鼓励汽车更新换代消费的方案》的通知 [Notice on Issuing Beijing’s Plan for Encouraging Automobile Renewal and Consumption],” June 26, 2022, https://www.beijing.gov.cn/zhengce/zhengcefagui/202206/t20220627_2751690.html; People’s Government of Guangdong Province, “关于印发广东省进一步促进消费若干措施的通知 [Notice on Issuing a Slew of Measures to Further Promote Consumption in Guangdong Province],” April 28, 2022, https://www.gd.gov.cn/zwgk/wjk/qbwj/yfb/content/post_3920955.html.

¹⁴ Lingzhi Jin, *Accelerating New Energy Vehicle Uptake in Chinese Cities: A 2023 Policy Update in a Post-subsidy Era* (Washington, DC: ICCT, 2023), <https://theicct.org/publication/accelerating-new-energy-vehicle-uptake-in-chinese-cities-2023-policy-update-post-subsidy-era-dec23/>.

Wuxi offered purchase subsidies for NEVs ranging from CNY 1,200 to CNY 12,000.¹⁵ Sanya and Haikou also offered a subsidy for vehicle charging of CNY 1,500–CNY 2,000. Finally, Liuzhou—where manufacturers FAW, DFMC, SAIC-GM-Wuling, and China National Heavy Duty Truck Group all have factories—offered a subsidy of CNY 150,000–CNY 200,000 to qualified local NEV manufacturers to boost production.¹⁶

Among the five top cities in Tier 4, only two from the 2021 list—Jiaozuo (Henan Province) and Beihai (Guangxi)—remained in 2022, with Lishui (Zhejiang), Bozhou (Anhui), and Yulin (Guangxi) added to the 2022 list. For Tier 5, all leading cities were different from 2021, with Qinzhou, Wuzhou, Hezhou, and Hechi (all in Guangxi) and Hebi (Henan) constituting the 2022 list. The average number of NEPC registrations among the top five cities in Tier 4 was 12,100, a 52% increase year-over-year, while the average NEPC market penetration was 37%, up from 22% in 2021. The top five cities in Tier 5 had an average NEPC market penetration of 30% in 2022, higher than the national average of 26%.

Among the 29 leading cities listed in Figure 14, eight are in the Guangxi region. This implies the effectiveness of “Guangxi Mode,” a regional initiative to replicate the policies and practices of Guangxi’s most successful NEV city market, Liuzhou, in other cities in the region.¹⁷ Starting in 2021, the Guangxi government switched the focus of fiscal incentives to charging infrastructure, offering three-year subsidies for the establishment and operation of charging and battery-swapping facilities, as well as battery recycling.¹⁸

The Tesla Model Y and Hongguang Mini EV were the most popular BEV models in all 29 city markets, except in four cities—Sanya, Guangzhou, Wuhu, and Bozhou. The latter three cities all have relationships with the makers of the most popular BEVs in the respective markets: GAC Group, which produces the Trumpchi AION.S compact car, is headquartered in Guangzhou, and Chery is headquartered in Wuhu, which is located in the same province as Bozhou.

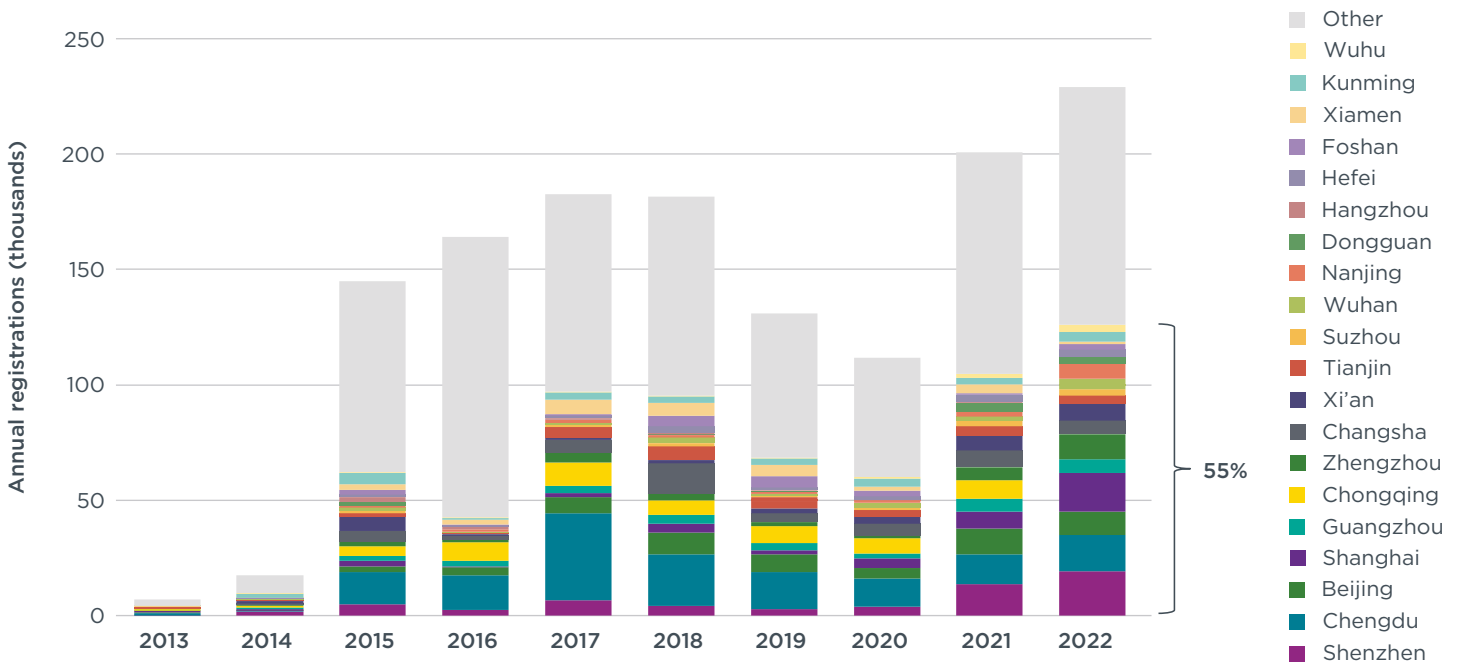
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- 15 Chengdu Municipal People’s Government, “关于印发成都市优化交通运输结构促进城市绿色低碳发展行动方案、成都市优化交通运输结构促进城市绿色低碳发展政策措施的通知 [Notice on Issuing the Action Plan, Policies, and Measures for Optimizing Transportation Structure to Promote Green and Low-carbon Development in Chengdu],” July 11, 2022, https://cds.sczfwf.gov.cn/art/2022/7/11/art_15398_184560.html; Wenzhou Municipal People’s Government, “我市置换新能源汽车补助申领办法公布 [Wenzhou City Announces Application Methods for Replacement Subsidy of New Energy Vehicles],” May 13, 2022, https://www.wenzhou.gov.cn/art/2022/5/13/art_1229569120_59164434.html; Department of Industry and Information Technology of Hainan Province, “关于印发海南省2022年鼓励使用新能源汽车若干措施的通知 [Notice on Issuing a Slew of Measures to Encourage the Use of New Energy Vehicles in Hainan Province in 2022],” March 30, 2022, <https://www.hainan.gov.cn/hainan/tjgw/202203/ee4404d44cd543e3905e34689b9c0dd7.shtml>; Hangzhou Municipal Commerce Bureau, “关于印发 2022 年杭州市新能源汽车购车补贴实施细则的通知 [Notice on Issuing the 2022 Implementation Rules for New Energy Vehicle Purchase Subsidies in Hangzhou],” June 28, 2022, http://www.tonglu.gov.cn/art/2022/7/22/art_1229285683_59007273.html; Nanjing Municipal People’s Government, “我市开展私人新能源乘用车补贴抽奖活动 总额5000万元 每辆最高补贴1.2万元 [Nanjing Launches Private New Energy Passenger Car Subsidy Lottery with a Total Amount of 50 Million Yuan, with a Maximum Subsidy of 12,000 Yuan Per Vehicle],” July 12, 2022, https://www.nanjing.gov.cn/zzb/ywdt/njxx/202207/t20220712_3640893.html; Wuxi Municipal People’s Government, “关于加快新能源汽车推广消费若干政策措施的通知 [Notice on Several Policies and Measures to Accelerate the Promotion and Consumption of New Energy Vehicles],” June 6, 2022, <https://www.wuxi.gov.cn/doc/2022/08/29/3741824.shtml>.
- 16 Liuzhou Municipal Industry and Information Technology Bureau, “关于印发柳州市2022年汽车促销扩产活动方案的通知 [Notice on Issuing the Activity Plan of the 2022 Vehicle Promotion and Production Expansion in Liuzhou],” December 28, 2022, http://gxj.liuzhou.gov.cn/zwgk/fdzdgnr/zcwj/bjgfwj/t19700101_3199126.shtml.
- 17 Yidan Chu et al., *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/>.
- 18 Development and Reform Commission of Guangxi Zhuang autonomous region, “广西壮族自治区新能源汽车推广应用三年行动财政补贴实施细则》操作指引 [Operational Guidelines for the Implementation Rules of the Three-Year Action Financial Subsidy for the Promotion of New Energy Vehicles in Guangxi Zhuang Autonomous Region],” November 4, 2022, <http://fgw.gxzf.gov.cn/zfxgkzl/wjzx/zcjd/zczy/t13284339.shtml>.

NEW ENERGY COMMERCIAL VEHICLE MARKET

OVERALL MARKET TRENDS

The new energy commercial vehicle (NECV) market continued to grow in 2022. Over 236,000 NECVs were registered in China in 2022, with a market penetration of 9.3%, up from 4.6% in 2021. As shown in Figure 14, the top 20 cities in China in terms of cumulative NECV registrations between 2012 and 2022 contributed 55% of the new NECVs registered in 2022, up from 52% in 2021. Many leading cities, such as Chengdu, Chongqing, Zhengzhou, Changsha, Dongguan, Wuhu, and Shijiazhuang, had road access privileges in place for new energy trucks in 2022 to boost NECV uptake, which may be a reason for their corresponding market performance.¹⁹

Figure 14
Registrations of new energy commercial vehicles in the top 20 cities, 2013–2022.



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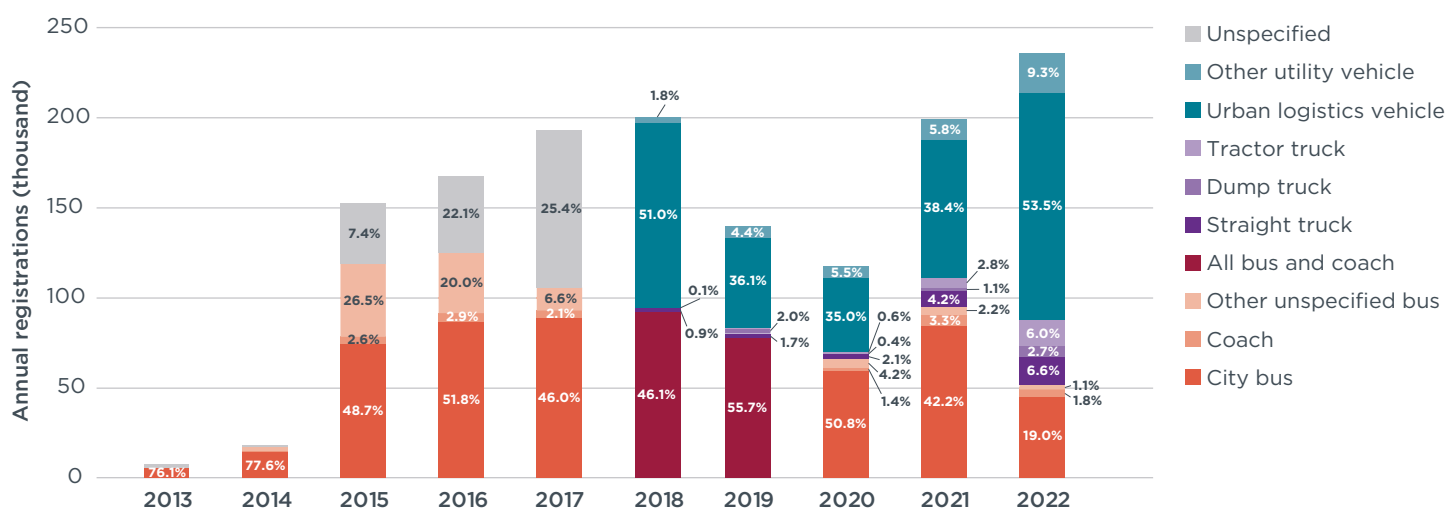
Figure 15 depicts the market trends of NECVs by major vehicle categories. Buses and coaches dominated the early NECV market in China but their share of registrations has steadily declined, hitting a record-low combined market share of 22% in 2022. Four truck categories were the main drivers of NECV registration growth in 2022:

¹⁹ Chengdu Municipal Public Security Bureau, “2022年关于对部分货车采取交通管理措施的公告 [Notice on Adopting Traffic Management Measures for a Part of Trucks in 2022],” July 26, 2022, <https://mp.weixin.qq.com/s/mTWOxw2s1WTQvo6anZwZFW>; Chongqing Municipal Public Security Bureau, “重庆市公安局促进汽车消费畅通物流运输10条措施解读 [Notice on Issuing the “10 Measures by the Chongqing Municipal Public Security Bureau to Promote Automobile Consumption and Facilitate Logistics and Transportation],” June 23, 2022, https://www.cq.gov.cn/zt/yhyshj/zcjd/202206/t20220623_10850714.html; Zhengzhou Municipal Public Security Bureau, “关于市区道路交通管理措施的公告 [Notice on Management Measures for Road Traffic in Urban Areas],” November 22, 2021, <https://zzga.zhengzhou.gov.cn/jfgg/6089729.jhtml>; Changsha Municipal Public Security Bureau, “关于长沙市部分区域及路段限制货运车辆通行的通告 [Notice on Restricting the Passage of Freight Vehicles in Parts of Areas and Road Sections in Changsha],” August 31, 2022, https://www.yuhua.gov.cn/zwgk97/xxgkml/384213/550556/550566/202209/t20220905_10787554.html; Dongguan Municipal Public Security Bureau, “关于调整东莞市大城区及主要干道交通管制措施的公告 [Notice on Adjusting Traffic Management Measures in Big Urban Areas and Main Roads],” July 21, 2020, https://www.autothinker.net/editor/attached/file/20220505/20220505110200_37810.pdf; Hefei Municipal Public Security Bureau, “关于进一步优化芜湖市中心城区货运车辆通行政策的通告 [Notice on Further Optimizing the Freight Vehicle Traffic Policy in the Central Urban Area of Wuhu],” September 24, 2022, <https://gaj.wuhu.gov.cn/openness/public/6596351/35706041.html>; Shijiazhuang Municipal People’s Government, “石家庄市人民政府关于市区道路通行管理的通告 [Notice of the Shijiazhuang Municipal People’s Government on Traffic Management of Urban Road],” December 9, 2021, <https://www.sjz.gov.cn/col/1490076478426/2021/12/10/1639099863136.html>.

urban logistics vehicles (which increased by 65% from 2021), straight trucks (88%), dump trucks (183%), and tractor trucks (156%). The growing cost advantage of NECVs over diesel and gasoline counterparts due to increased fuel prices, as well as the popularization of battery-as-a-service ownership schemes that reduce NECVs' upfront cost, likely contributed to the prominent increase in sales of new energy trucks and urban logistics vehicles.²⁰ The increased variety of new energy truck models may also help explain such growth: in 2022, 1,966 new energy cargo vehicle models applied to be listed in the national recommended NEV catalog, 49% more than in 2021.²¹

Figure 15
Registrations of new energy commercial vehicles in China by broad category, 2013–2021.

Data were not available to allow differentiation between city buses and coaches in 2018 and 2019.



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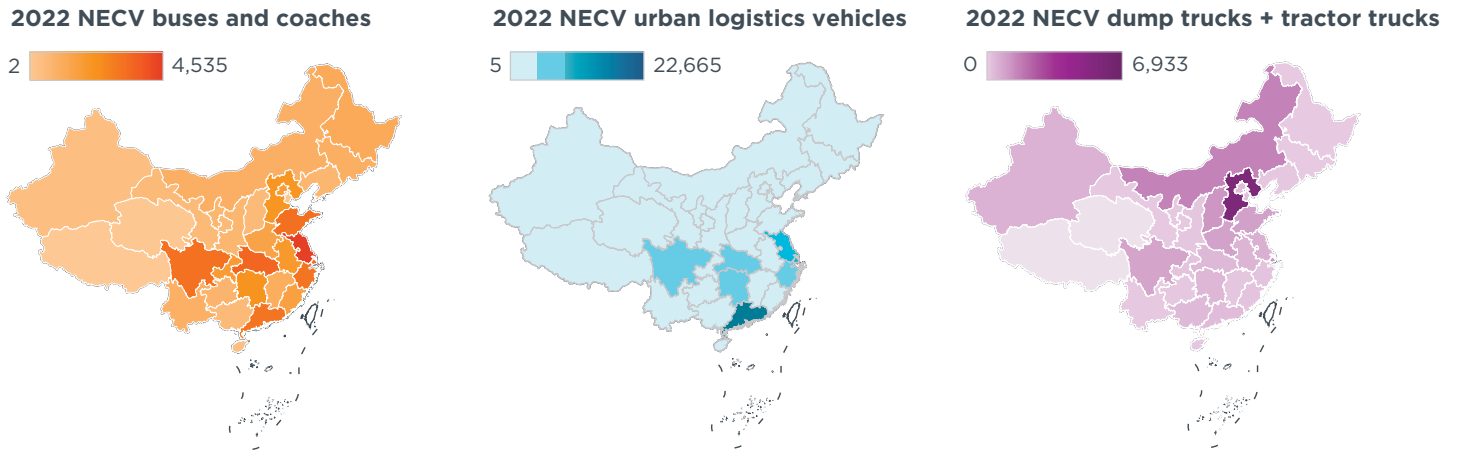
Figure 16 plots the spatial distribution of new NECVs registered in 2022 by major vehicle category. Similar to 2021, Jiangsu, Guangdong, Sichuan, Shandong, Hubei, and Zhejiang Provinces had the most registrations of NE buses and coaches. There were between 3,200 and 4,600 registrations of these vehicles in each of these provinces in 2022, down from between 5,000 and 8,000 registrations in 2021. Guangdong, Jiangsu, and Shanghai remained the top three provinces for new energy logistics vehicle registrations, followed by several provinces in Central China. Meanwhile, Hebei Province was once again by far the largest market for heavier truck categories, namely dump trucks and tractor trucks, with nearly 7,000 registrations—3,000 more than were registered in 2021. After Hebei, Inner Mongolia and Shanghai deployed roughly 1,800 and 1,500 new energy dump truck and tractor trucks in 2022, respectively—up from 200 and 300, respectively, in 2021.

20 Alimire, “国内油价迎下半年第三涨，柴油价格重返‘8元时代’ [Domestic Oil Prices Rise for the Third Time in the Second Half of the Year, and Diesel Prices Return to the ‘8-Yuan Era’],” *Timeweekly*, November 7, 2022, <https://36kr.com/p/1991422390151169>.

21 China Automotive Technology and Research Center, Nissan (China) Investment Co., Ltd., and Dongfeng Motor Co., Ltd., 中国新能源汽车产业发展报告 [Annual Report on New Energy Vehicle Industry in China (2023)] (Beijing, China: Social Sciences Academic Press, 2023).

Figure 16

Spatial distribution of registrations of new energy commercial vehicles that carry passengers, urban logistics vehicles, and tractor and dump trucks in mainland China, 2022.



Note: Data is only available for the areas shown in color.

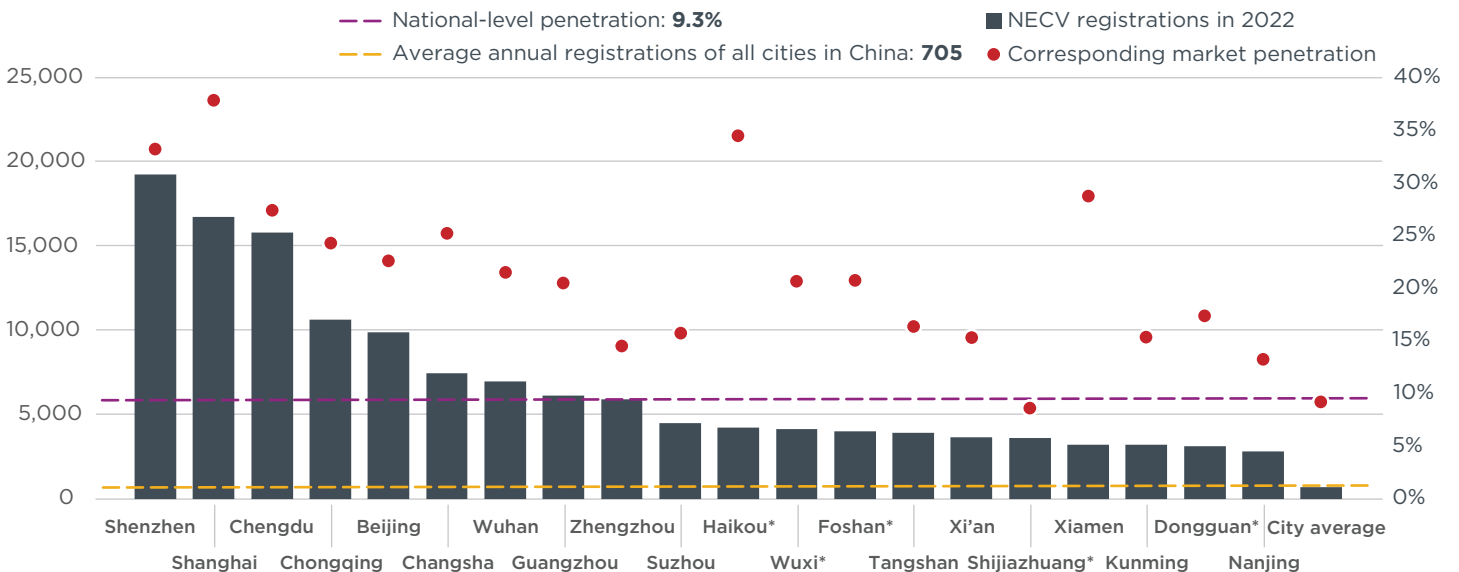
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LEADING CITY MARKETS

Figure 17 shows the 20 cities with the most NECV registrations in 2022. Haikou, Wuxi, Foshan, Shijiazhuang, and Dongguan entered the top 20 city list in 2022, replacing Shenyang, Tianjin, Ningbo, Harbin, and Jinan. These 20 cities had an average of 6,950 NECV registrations and an average NECV market penetration of 22%; eight had more than 6,000 NECV registrations, and 19 had a market penetration above 10%. In 2021, by contrast, seven cities had more than 6,000 registrations and eight had a market share above 10%, with an average of 5,544 and 10%, respectively, across the top 20 cities that year. As discussed below, the leading cities in 2022 had policies in place specifically to encouraged the deployment of NECVs.

Figure 17

New energy commercial vehicle registrations and market penetration in leading cities, 2022.

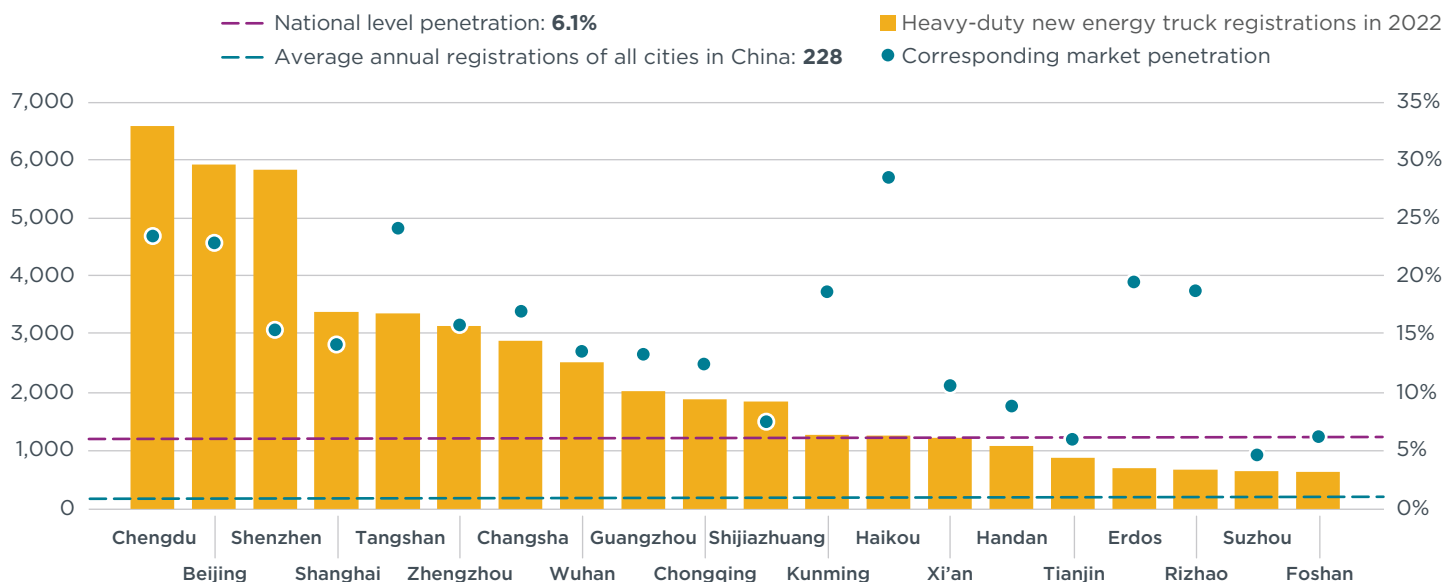


Asterisks (*) denote cities that were new members of the top 20 list in 2022.

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Nearly 70,000 heavy-duty new energy trucks were deployed in China in 2022, with a market penetration of 6.1%, approximately 3 percentage points lower than that of NECVs and 20 percentage points lower than that of NEPCs.²² Figure 18 presents the top 20 cities in terms of heavy-duty new energy truck registrations in 2022; collectively, they made up 70% of the national total. Market penetration varied from 29% in Haikou to 5% in Suzhou.

Figure 18
Heavy-duty new energy truck registrations and market penetration in leading cities, 2022.

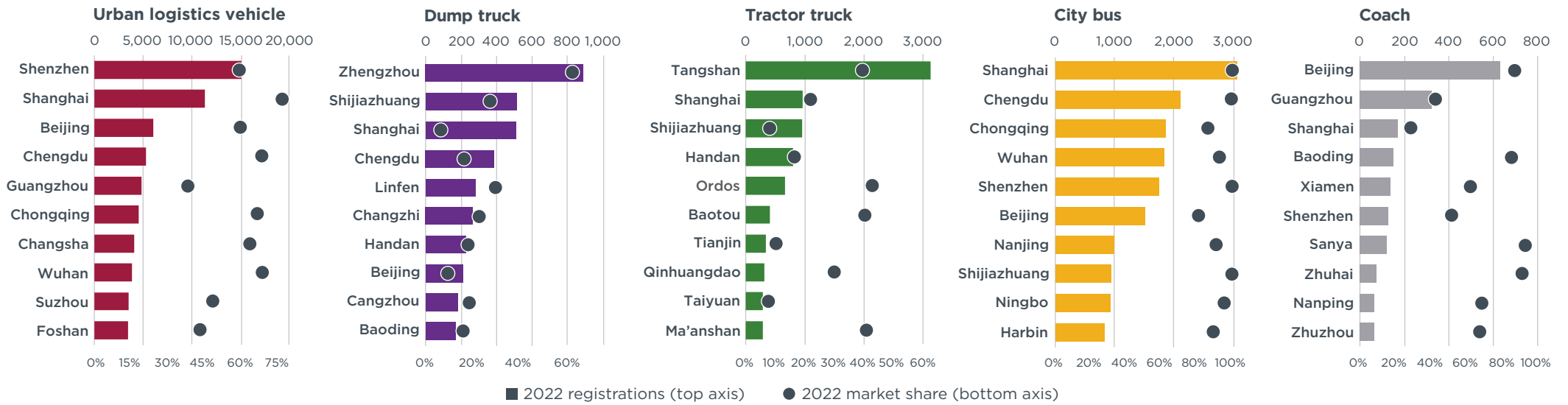


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Figure 19 shows the top cities for overall new energy vehicle deployment in 2022 across the five NECV categories: urban logistics vehicles, dump trucks, tractor trucks, city buses, and coaches. Cities are ranked by absolute NECV registrations in 2022. The bars (top axis) denote the market size, and the dots (bottom axis) represent the corresponding market penetration. The following subsections highlight select policy drivers shaping each market.

²² Heavy-duty truck here refers to a truck with a gross vehicle weight above 3.5 tonnes.

Figure 19
Registrations and market penetration rates of various types of new energy commercial vehicles in the top 10 cities for each category, 2022.



URBAN LOGISTICS VEHICLES

In 2022, 126,000 new energy urban logistics vehicles were registered in China, a 65% increase from the previous year. This corresponds to a 30% market penetration rate, more than double the level in 2021. The top 10 cities collectively accounted for 49% of total national registrations, 13 percentage points lower than the contribution of the top 10 cities in 2021, implying growing uptake outside of the top markets to date. Seven of the top 10 leading cities are either demonstration cities or candidate pilot cities in the national Green Freight Demonstration program, which supports the adoption of new energy trucks, among other elements.²³

DUMP TRUCKS AND TRACTOR TRUCKS

There were over 20,500 new energy dump trucks and tractor trucks registered in 2022 in China, a 164% increase year-over-year. This corresponds to an 8% market penetration in 2022, up from 1% in 2021. The top 10 leading city markets for dump trucks by absolute vehicle registrations were responsible for 56% of the national total, down from 75% in 2021, implying diminishing market concentration. Zhengzhou maintained its leading position in terms of absolute registrations of new energy dump trucks (nearly 900) and market penetration (62%). The remaining top 10 cities all had fewer than 520 registrations, with market penetration ranging from 6% in Shanghai to 29% in Linfen. Tangshan continued to be the national leader in overall new energy tractor truck registrations, with over 3,000, representing 22% of the national total (down from 41% in 2021). Meanwhile, new energy tractor truck market penetration was highest in Ordos, Ma'anshan, and Baotou, which each had rates of 40% or above.

In 2022, environmental policies continued to play a significant role in the new energy dump truck and tractor truck markets. Zhengzhou, for instance, offers road access (except during rush hours) to new energy heavy-duty vehicles that are used for transporting construction waste and concrete, in a bid to reduce air pollution.²⁴ Other policies include the *Technical Guidelines for Emergency Emission Reduction Measures for Key Industries in Heavy Pollution Weather*.²⁵ Nineteen of the 20 leading cities for new energy dump trucks and tractor trucks in 2022 were under the scope of this policy. The exception, Chengdu, is located in Sichuan Province, which implemented a similar rating system in 2022; Chengdu also set a target of retiring all China III emission standard trucks by 2025 and offered subsidies of up to CNY 300,000 for the replacement of older trucks with new energy vehicles until the end of 2023.²⁶

The initiation of the national battery-swapping pilot program in 2021 was another factor behind the prominent growth of new energy dump trucks and tractor trucks in 2022. Tangshan (Hebei Province) and Baotou (Inner Mongolia) were enlisted in

23 Ministry of Transport, “首批16个‘绿色货运配送示范城市’出炉 [Name List of the 16 Pilot Cities for Green Freight Demonstration Program Released],” August 12, 2021, http://www.gov.cn/xinwen/2021-08/12/content_5630889.htm; Ministry of Transport, “三部门联合启动城市绿色货运配送示范工程 [Three Departments Jointly Launched the Green Freight Delivery Demonstration Program],” December 27, 2017, http://www.gov.cn/xinwen/2017-12/27/content_5250767.htm.

24 Zhengzhou Municipal People's Government, “关于印发郑州市新能源渣土车推广实施方案郑州市推广使用纯电动混凝土运输车实施方案的通知 [Notice on Issuing the Implementation Plan for Promoting the Use of New Energy Waste Trucks and Electric Concrete Transport Vehicles in Zhengzhou],” December 8, 2021, <https://public.zhengzhou.gov.cn/D0104X/6153007.jhtml>.

25 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/>.

26 Department of Ecology and Environment of Sichuan Province, “省环科院有序开展四川省重污染天气重点行业绩效分级工作 [The Provincial Department of Ecology and Environment Carried Out the Performance Grading Work of Key Industries with Heavy Pollution Weather in Sichuan Province in an Orderly Manner],” Press release, August 30, 2022, <http://sthjt.sc.gov.cn/sthjt/c103878/2022/8/30/bde3e8f52ede41388e2c6ff5dd3e87c2.shtml>; Chengdu Municipal People's Government, “关于印发成都市优化交通运输结构促进城市绿色低碳发展行动方案、成都市优化交通运输结构促进城市绿色低碳发展政策措施的通知 [Notice on Issuing the Action Plan, Policies, and Measures for Optimizing Transportation Structure to Promote Green and Low-carbon Development in Chengdu],” July 11, 2022, http://cde.sczfw.gov.cn/art/2022/7/11/art_15398_184560.html?areaCode=510100000000.

this program for particular heavy-duty vehicle segments.²⁷ As part of this program, Tangshan achieved its initial target of deploying 1,300 heavy-duty trucks capable of swapping batteries in its port, steel companies, and mining sites in 2022; established an additional target of 1,300 in 2023; and planned to build 60 new battery-swapping stations over these two years.²⁸ Over half (54%) of the new energy dump trucks and tractor trucks deployed in Tangshan in 2022 were capable of battery-swapping. Other cities in the same province also took steps to promote new energy heavy-duty trucks, such as Shijiazhuang, Handan, and Qinhuangdao.

CITY BUSES AND COACHES

Nearly 45,000 new energy city buses were newly registered across China in 2022, a 47% decrease compared to 2021. This corresponded to a 96% market penetration in 2022, a slight decline from 97% in the previous year. Of the 10 leading cities for new energy city buses listed in Figure 19, Shanghai, Shenzhen, and Shijiazhuang realized full electrification in 2022, while Chengdu, Wuhan, Nanjing, and Ningbo were close to full electrification, with new energy city bus penetration rates exceeding 90%. Over 4,100 new energy coaches were registered nationwide in 2022, a 37% decrease from the previous year. The corresponding market penetration in 2022 was 27%, up from 20% in 2021.

China's central government reduced financial support for new energy buses and coaches in 2022, even as it increased deployment targets for these vehicle types. National subsidies for city bus and coach purchases were reduced by 20% compared to the 2021 level, with an upper limit of CNY 64,800.²⁹ Meanwhile, a national registration target of 72% of all new buses and coaches to be new energy vehicles by 2025 was set in 2022; for context, market penetration was 66% in 2020, 76% in 2021, and 77% in 2022.³⁰

Subnational governments took steps to promote new energy buses and coaches in 2022. For example, Hainan Province offered up to CNY 20,000 for each new energy tourism bus or coach registered locally.³¹ As a result, Sanya, a city with tourism as a major contributor to its local economy, chose many new energy products for its coach fleet. Meanwhile, Guangzhou, Shenzhen, and Zhuhai, in Guangdong Province, adopted a common goal of electrifying all buses and coaches, and to have 85% new energy buses and coaches in stock in the Pearl River Delta region starting from 2020.³²

27 Ministry of Industry and Information Technology, "工业和信息化部启动新能源汽车换电模式应用试点工作 [Ministry of Industry and Information Technology Launched a Pilot Project for the Application of Battery Swapping Mode for New Energy Vehicles]," Press release, October 28, 2021, https://wap.miit.gov.cn/jgsj/zbys/gzdt/art/2021/art_db26aa91d0434fe98efd2b2937a4173e.html.

28 Tangshan Municipal Industry and Information Technology Bureau, "关于对《唐山市新能源汽车换电模式应用试点实施方案（2022-2023年）》公开征求意见的通知 [Solicit Public Opinions on Tangshan's Implementation Plan for the Pilot Application of New Energy Vehicle Battery Swap Mode (2022-2023)]," July 25, 2022, <https://news.0haochuangkou.com/article-6-12206.html>.

29 Ministry of Finance, "关于2022年新能源汽车推广应用财政补贴政策的通知 [Notice on the Fiscal Subsidy Policy for the Promotion and Application of New Energy Vehicles in 2022]," December 31, 2021, https://www.gov.cn/zhengce/zhengceku/2021-12/31/content_5665857.htm.

30 The State Council, "国务院关于印发“十四五”现代综合交通运输体系发展规划的通知 [Notice Issuing the Development Plan for the Modern Comprehensive Transportation System during the '14th Five-Year Plan']," December 9, 2021, https://www.gov.cn/zhengce/content/2022-01/18/content_5669049.htm. Percentages for 2021 and 2022 reflect ICCT estimates.

31 The People's Government of Hainan Province, "《海南省2022年鼓励使用新能源汽车若干措施》 [Hainan Province's Measures to Encourage the Use of New Energy Vehicles, 2022]," March 30, 2022, <https://www.hainan.gov.cn/hainan/tjgw/202203/ee4404d44cd543e3905e34689b9c0dd7.shtml>.

32 Department of Transport of Guangdong Province, "广东省人民政府办公厅关于加快新能源汽车推广应用的实施意见 [Opinions of General Office of the Guangdong Provincial People's Government on Accelerating the Promotion and Application of New Energy Vehicles]," March 28, 2016, http://td.gd.gov.cn/ztl/lscx/channel5/3/content/post_2621214.html.

SUMMARY

This paper identifies leading cities for the NEV market in China based on 2022 market data. Overall, NEV sales in China hit a record high of 6.8 million in 2022, almost double the total in 2021. Passenger cars comprised the majority of such sales as the market penetration of new energy passenger cars reached 25.9%, up from 14.2% in 2021. The market penetration of new energy commercial vehicles also grew—to 9.3% in 2022, from 4.6% the year prior—albeit with a smaller absolute number of registrations. Central government policies and programs, in addition to innovative policy efforts at the city level, collectively contributed to the prominent growth in the Chinese NEV market.



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