

# Asia Spotlight: Future Mobility

Are the global trend leaders  
already in place?



# Contents

---

- 04 Does Asia = Innovation, China = Growth?
- 06 Electrification and the Policy Push
  - 06 China domination of demand, supply and policy
- 12 Island “Autonomy”
  - 12 Singapore: ready to perform
  - 14 Japan: Consortium approach to “driverless” adoption
- 15 Drilling Deep for Data Infrastructure
- 16 Smart(phone) Mobility First



# Does Asia = innovation, China = growth?

In our earlier Thematic Insights, we highlighted some of the leading examples of innovation and growth linked to the Future Mobility value-chain in Asia.<sup>1</sup> Investors in the electrification and automation of transportation and the new business models of mobility have been keenly aware of Asian businesses and their role in the potential future ecosystem. Western companies have been under pressure to be agile in adapting their own businesses to succeed in Asia, or else risk losing relevance – even in their home markets.

For example, China has arrived at a clear global leadership position in electric vehicle technology and manufacturing – one that it is now leveraging worldwide.<sup>2</sup> It has placed “New Energy” vehicles among its top national priority topics and has supported this with a quota-like system. China has also sought a key role in the core underpinning of connected and autonomous vehicles: 5G systems and data infrastructure. As we will describe, Singapore and Japan have also taken strong positions in the race toward autonomous technology, while Indonesia, Malaysia, Singapore, India and China have seen leading innovations in mobility operations.

<sup>1</sup> We described the case for the global transition to a new mobility ecosystem in “Future Mobility: Understanding a new transport ecosystem”, MSCI, June 2020 and the potential impact of the COVID-19 pandemic on such trends in “Post-Pandemic Reflections: Future Mobility; COVID-19’s potential impact on the new mobility ecosystem”

<sup>2</sup> <https://courses.nus.edu.sg/course/geoykyg/internet/Papers/NEVs-ADP.pdf>

## Exhibit 1: Overview of Asia-Pacific outlook for Future Mobility

Source: Neckermann Strategic Advisors, July 2020

### > Mobility Operators

**China:** Fully half of the world’s daily ridehailing trips are in China, having eclipsed the US. 75% of young consumers would ride in autonomous vehicle

**SE Asia:** Indonesia, Malaysia, Singapore clear leaders in expanding “on-demand” concept

### > Fleet Management

**China:** Growth continues in fleet management; Didi/Toyota alliance expanding; Softbank invests in Didi autonomous fleet operation

**SE Asia:** Grab, GoJek impacting ownership

### > Systems & Data

**China:** 5G leadership will support success in autonomous vehicle pilots; central data management an advantage for autonomous

**SE Asia:** Singapore autonomous & Maas backed up by data infrastructure

### > Manufacturers

**China:** Dominant in e-buses. Auto manufacturers quickly expanding out of China and into Europe / America. Geely, BYD, SAIC also with alternate brands

**Other Asia:** Japan and Korea lead in FCEV. Toyota and others in autonomous mobility projects

### > Technology

**China:** Leader in supply to EV (mining, batteries). Baidu, Didi, AutoX, Pony.ai accelerate autonomous development

**SE Asia:** Singapore autonomous projects have led the world before

### > Mobility Aggregators

**China / SE Asia:** Softbank, Tencent, Ant Financial Services driving integration of new services into mobility aggregators.





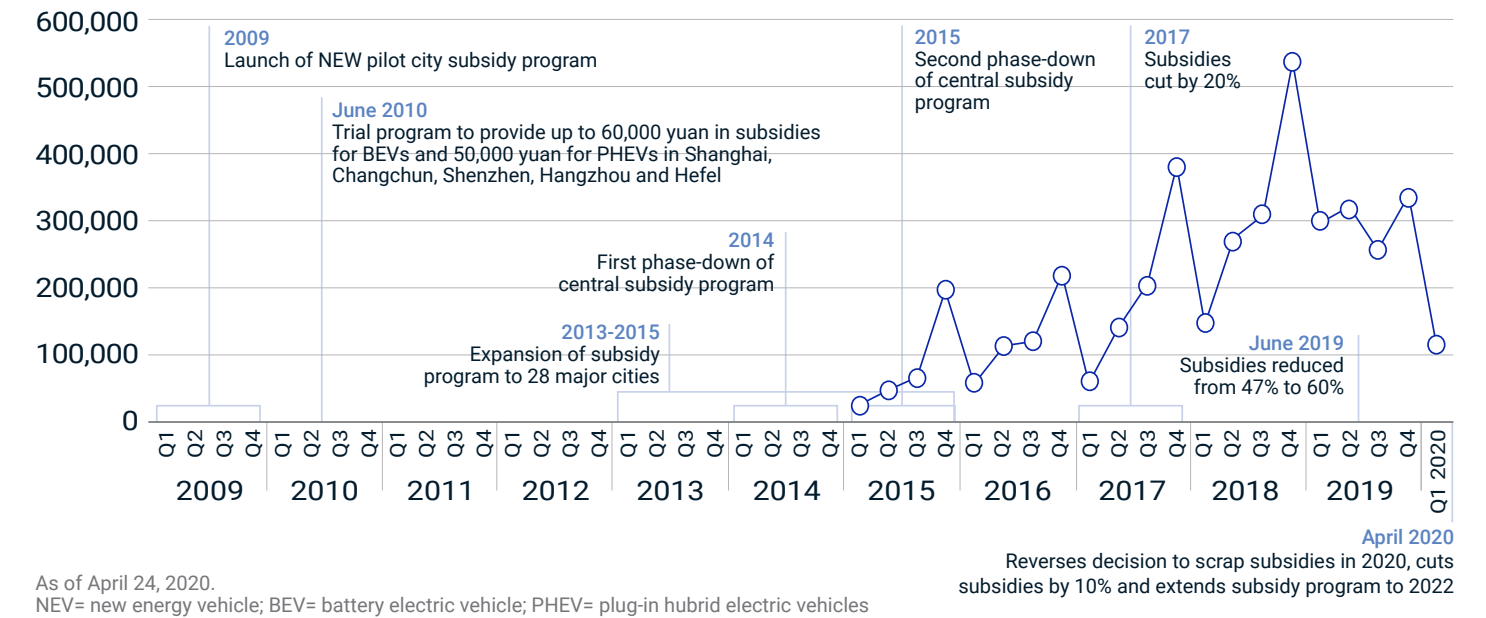
# Electrification and the Policy Push

## China domination of demand, supply and policy

In 2009, China implemented a “New Energy Vehicle” (NEV) mandate with the aim to develop a leading position in the (then) nascent low-carbon vehicle market while simultaneously addressing air pollution and emissions issues. The plan was reinforced in 2016 with a key demand-generating incentive that replaced previous direct-subsidies. NEVs were made exempt from a 10% vehicle purchase tax. To further spur supply growth, China has yearly-increasing production mandates for car manufacturers, building on previous targets: 14% of production should be NEV in 2021, 16% in 2022, and 18% in 2023.<sup>3</sup>

## Exhibit 2: Timeline of China's subsidy program for NEV

Sources: www.gov.cn; The international Council on Clean Transportation



As of April 24, 2020. NEV= new energy vehicle; BEV= battery electric vehicle; PHEV= plug-in hybrid electric vehicles

● Quarterly new energy vehicle sales in China since Q1-15

The net result has been that, of a global stock of 7.2 million plug-in passenger cars (battery electric, plug-in hybrid and fuel-cell EVs) by the end of 2019, 3.35 million (47%) were registered in China, a proportion that is not expected to change significantly until at least the middle of the 2020s.<sup>4</sup> It is not just the EV market share that is higher than most other countries, but – because of the sheer scale of the market – China’s share of global EV sales. In its 2020 Electric Vehicle Outlook, Bloomberg New Energy Finance predicts 54% of all EV sales worldwide to be in China, dropping to 33% by 2040 (while still

remaining the single largest market for EV), as other regions catch up.<sup>5</sup>

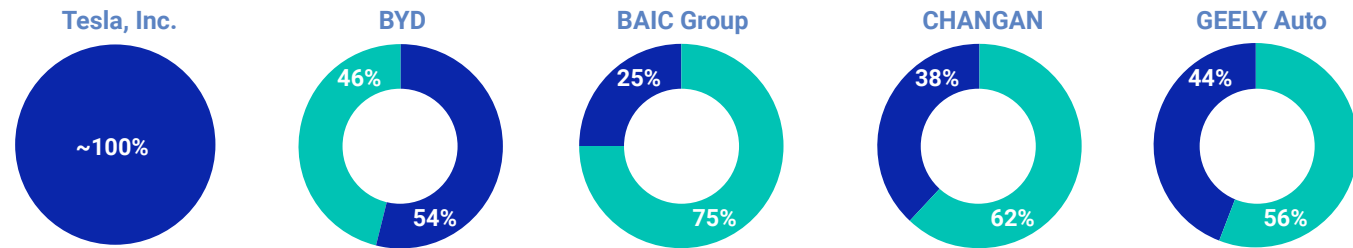
Notably, as of 2019, around one-third of NEVs in China are registered with fleets – and especially, ridehailing-provider Didi.<sup>6</sup> The exception to this is Tesla, whose vehicles are sold only to individual owners.

3 <https://insideevs.com/news/430197/china-nev-credit-ratios-2021-2023/>  
 4 <https://www.iea.org/reports/global-ev-outlook-2020>  
 5 <https://about.bnef.com/electric-vehicle-outlook/>  
 6 Automobility Ltd. Bill Russo, CEO. Personal communication to Neckermann Strategic Advisors.

**Exhibit 3:**  
**Fleet vehicles as proportion of total NEV sales, 2019**

Automobility Ltd, July 2020. Personal communication to Neckermann Strategic Advisors.

**Top EV OEM Sales Breakdown by Customer Segments (%)**



Note: ratio for BYD, BAIC, Changan and Geely is based on accumulative sales from Jan. 2019 to Oct. 2019

- Fleets
- Individual owners
- Fleet sales only counts vehicles sold directly to operators / service providers
- Significant number of NEVs sold to individual owners are also used as a service vehicles registered on mobility platforms, esp. economic models

- Mobility services segment played a critical role in the introduction of EVs, mainly driven by the limited availability of license plates
  - As of June 2019, there are close to 1mn BEVs registered with **Didi**, accounting for **35%** of the total EV population across China. While its mileage travelled reached 1.2 billion km, making up **42.6%** of the national total mileage traveled by BEVs

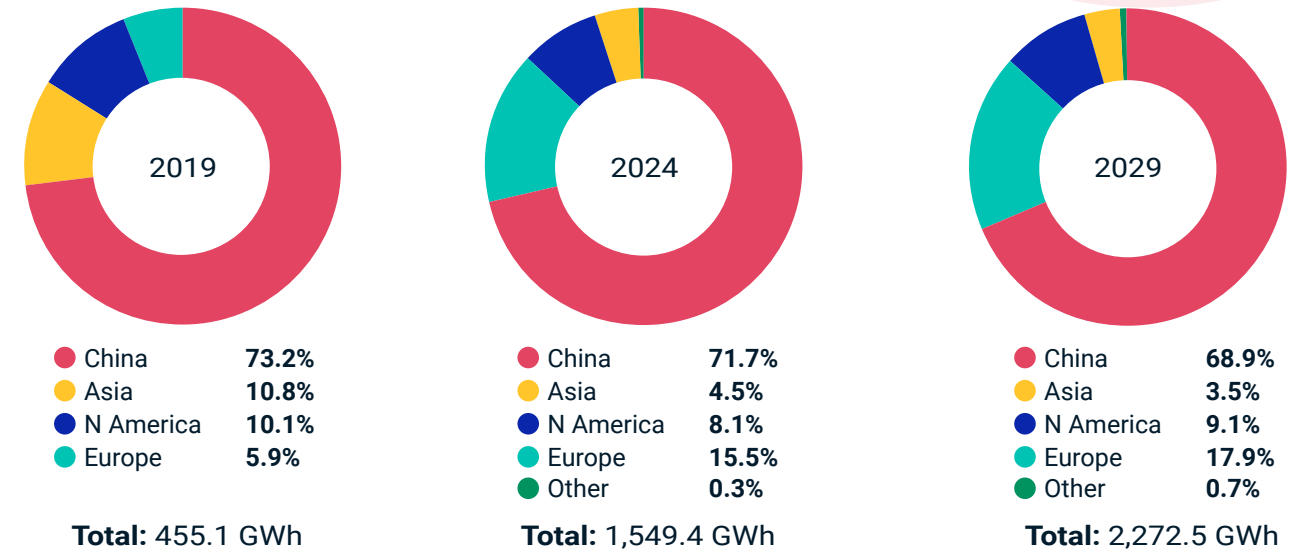
China's dominance in transport electrification is even more pronounced in relation to buses. In 2019, Europe managed to more than double its electric bus registrations to 2,000 and North America reached just over 500 new electric buses. Meanwhile, China already has a fleet of over 500,000.<sup>7</sup>

Leadership in battery-electric vehicles is enabled and reinforced by China's dominance in battery technology and production. Electric passenger cars, commercial vehicles and buses make up the vast majority of demand for global lithium and lithium-ion battery demand. Policies that promote electric mobility help China to be at the forefront of what has been described in front of the US Senate Committee on Energy and Natural Resources Committee as a "global battery arms race".<sup>8,9</sup>

Within battery technology, China has a considerable lead across most parts of the value-chain (except mining). In 2019, it held 80% of global production capacity for mid-stream chemical refining, and 73% of capacity for lithium ion battery cells.<sup>10</sup> China has over 40 large-scale battery production plants known as "megafactories" in operation; in comparison, the US has just three.

**Exhibit 4:**  
**Share of lithium-ion megafactory production capacity**

Benchmark Mineral Intelligence 2020, cited in European Battery Alliance: <https://www.eba250.com/battery-industry-development-europe-is-gaining-momentum/>



Given this dominance in battery technology, manufacturers worldwide have little choice – for the moment – than sourcing batteries from Chinese makers. For example, China's Contemporary Amperex Technology Limited (CATL) will supply batteries to Tesla for its Model 3 built in Shanghai – a significant step for the Ningde-based company, given that Tesla had previously worked exclusively with Japan's Panasonic and South Korea's LG.<sup>11</sup> It also counts the VW Group among its customers, is "set to make more than 70% of the batteries required by BMW," and in July 2020 received additional investment from Honda.<sup>12,13</sup>

7 Bloomberg New Energy Finance Electric Vehicle Outlook 2020 <https://bnef.turtl.co/story/evo-2020/>  
 8 <https://about.bnef.com/blog/will-the-real-lithium-demand-please-stand-up-challenging-the-1mt-by-2025-orthodoxy/>  
 9 [https://www.energy.senate.gov/public/index.cfm/files/serve?File\\_id=6A3B3A00-8A72-4DC3-8342-F6A7B9B33FEF](https://www.energy.senate.gov/public/index.cfm/files/serve?File_id=6A3B3A00-8A72-4DC3-8342-F6A7B9B33FEF)  
 10 [https://www.energy.senate.gov/public/index.cfm/files/serve?File\\_id=6A3B3A00-8A72-4DC3-8342-F6A7B9B33FEF](https://www.energy.senate.gov/public/index.cfm/files/serve?File_id=6A3B3A00-8A72-4DC3-8342-F6A7B9B33FEF)  
 11 <https://europe.autonews.com/suppliers/teslas-deal-catl-could-be-key-china>  
 12 <https://www.autonews.com/china/bmw-boosts-battery-cell-order-catl>  
 13 <https://www.prnewswire.co.uk/news-releases/catl-and-honda-sign-agreement-to-form-comprehensive-strategic-alliance-on-batteries-for-new-energy-vehicles-891547707.html>



South Korea's LG, China's BYD and Japan's Panasonic round up the top four producers of lithium-ion batteries for EVs,<sup>14</sup> illustrating the region's global dominance – a lead which may remain even following a potential transition from lithium-ion to other promising battery concepts. Toyota, Hyundai, Nissan and Honda are among the leading OEMs researching solid-state battery technology, along with Germany's Volkswagen and BMW.<sup>15</sup>

In the Asian EV manufacturing landscape, only Japan and South Korea are currently home to industries of global relevance. In South Korea, the governmental ambition remains to build a leading position in Hydrogen fuel-cell electric vehicle (FCEV) technology.<sup>16</sup> However, with fewer than 8,000 fuel-cell passenger cars sold globally in 2019, even their national leader, Hyundai, has refocused its fuel-cell activities towards heavy-duty trucks, with aiming to produce just 1,600 units by 2025.<sup>17</sup>



Japan's Toyota, who has produced over 15 million hybrid vehicles since 1997, also has begun to expand its fully battery-electric and fuel-cell product portfolio.<sup>18</sup> However, Toyota's modest activity in FCEVs will mainly serve China; it has joined five Chinese OEMs in a United Fuel Cell System consortium.<sup>19</sup> Although the air pollution crises<sup>20</sup> that have plagued India would seem to position it for growth in electrified mobility, the country still has far to go: India sold just 3,400 EVs in the Financial Year 2019-2020 and only opened its first public EV charging plaza in July of 2020.<sup>21,22</sup>

- 14 <https://www.benchmarkminerals.com/who-is-winning-the-global-lithium-ion-battery-arms-race/>
- 15 <https://techcrunch.com/2020/06/16/volkswagen-sinks-another-200-million-into-solid-state-battery-company-quantumscape/>
- 16 <https://www.reuters.com/article/us-southkorea-president-newdeal/south-korea-to-spend-95-billion-on-green-projects-to-boost-economy-idUSKCN24F0GA>
- 17 <https://thedriven.io/2020/07/08/hyundai-ships-first-fcev-heavy-duty-trucks-to-switzerland/>
- 18 <https://newsroom.toyota.eu/toyota-passes-15-million-hybrid-electric-vehicles-global-sales/>
- 19 <https://www.electrichybridvehicletechnology.com/news/joint-ventures/toyota-forms-alliance-with-chinese-auto-giants-to-create-fuel-cells-for-trucks.html>
- 20 <https://www.unenvironment.org/news-and-stories/story/new-wave-air-pollution-crises-what-can-be-done>
- 21 <https://www.bloomberquint.com/business/electric-vehicle-sales-in-india-up-20-in-2019-20-industry-body-says>
- 22 <https://auto.hindustantimes.com/auto/news/india-s-first-public-ev-charging-plaza-inaugurated-in-delhi-41595299680054.html>



# Island “Autonomy”

## Singapore: ready to perform

While China’s policies lead Asia and the world in electrified Future Mobility and have also generated some highly credible developments in autonomous technology,<sup>23</sup> Singapore’s policies set it at the top of KPMG’s annual “Autonomous Readiness Index”, ahead of The Netherlands, Norway, the US and Finland.<sup>24</sup>

Having been the first city in the world to pilot robo-taxis in 2016, Singapore continues to strengthen its leadership position through policy measures and targeted investment.<sup>25</sup> It has enabled autonomous testing across all public roads in the western part of the island – some 1,000 km. It has a thorough governance framework for autonomous vehicles and the city-state aims to implement driverless buses already from 2022.

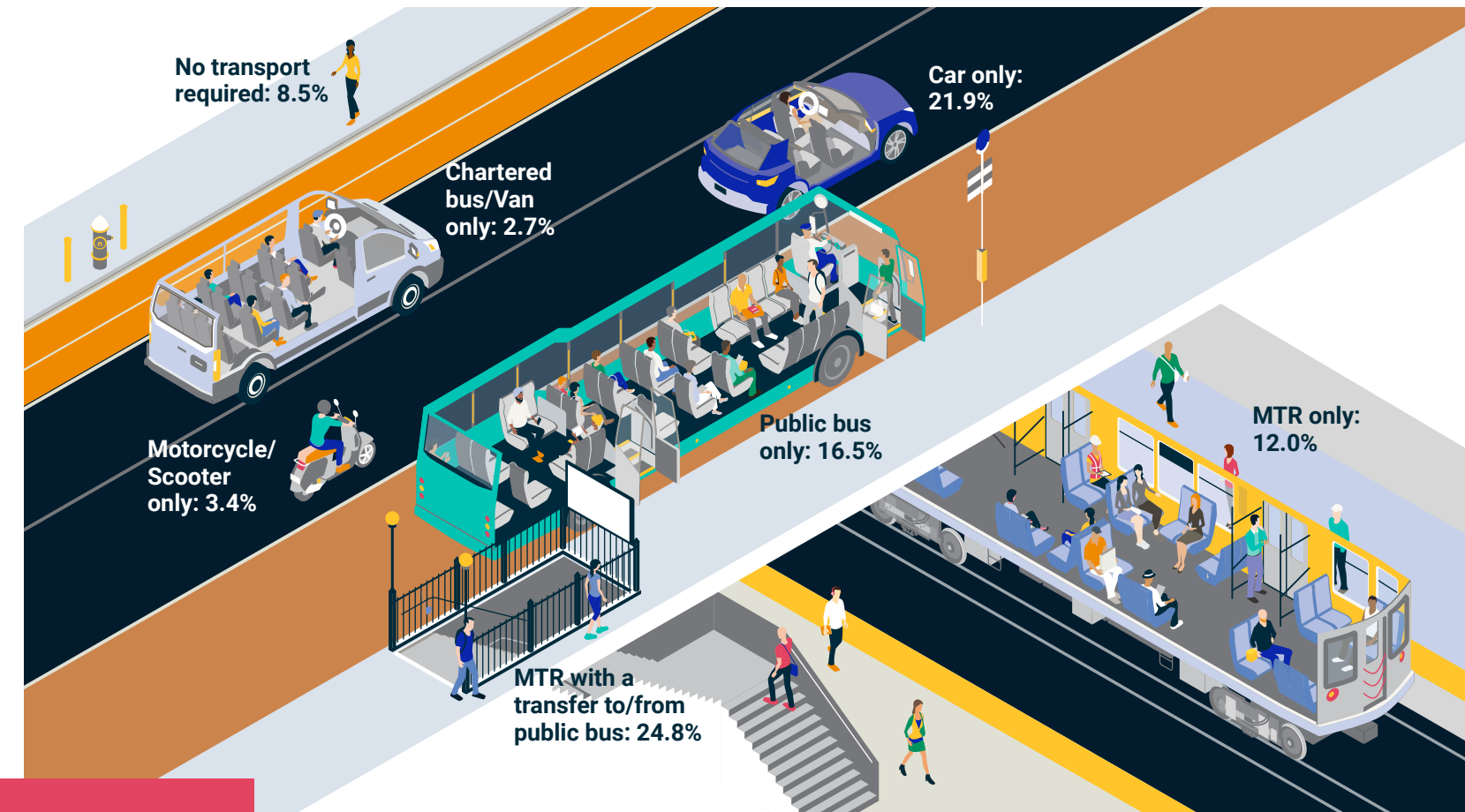
While manufacturing of autonomous vehicles is unlikely there, Singapore’s Economic Development Board (EDB) has declared development of technology and business models for autonomous mobility a key priority for the city-state.<sup>26</sup> It has attracted a number of R&D centres, including from Aptiv, Delphi, Continental and EasyMile.<sup>27</sup>



### Exhibit 5: Transport modal share in Singapore

[https://www.singstat.gov.sg/-/media/files/visualising\\_data/infographics/ghs/highlights-of-ghs2015.pdf](https://www.singstat.gov.sg/-/media/files/visualising_data/infographics/ghs/highlights-of-ghs2015.pdf)

#### Usual modes among working persons travelling to work



Finally, KPMG rates Singapore highest worldwide for consumer acceptance of autonomous vehicles, not least due to its long-standing “car-lite” policy. With fewer than a third of residents using a private car in Singapore, the potential for on-demand, shared and autonomous transport to grow quickly on the island nation is certainly plausible.

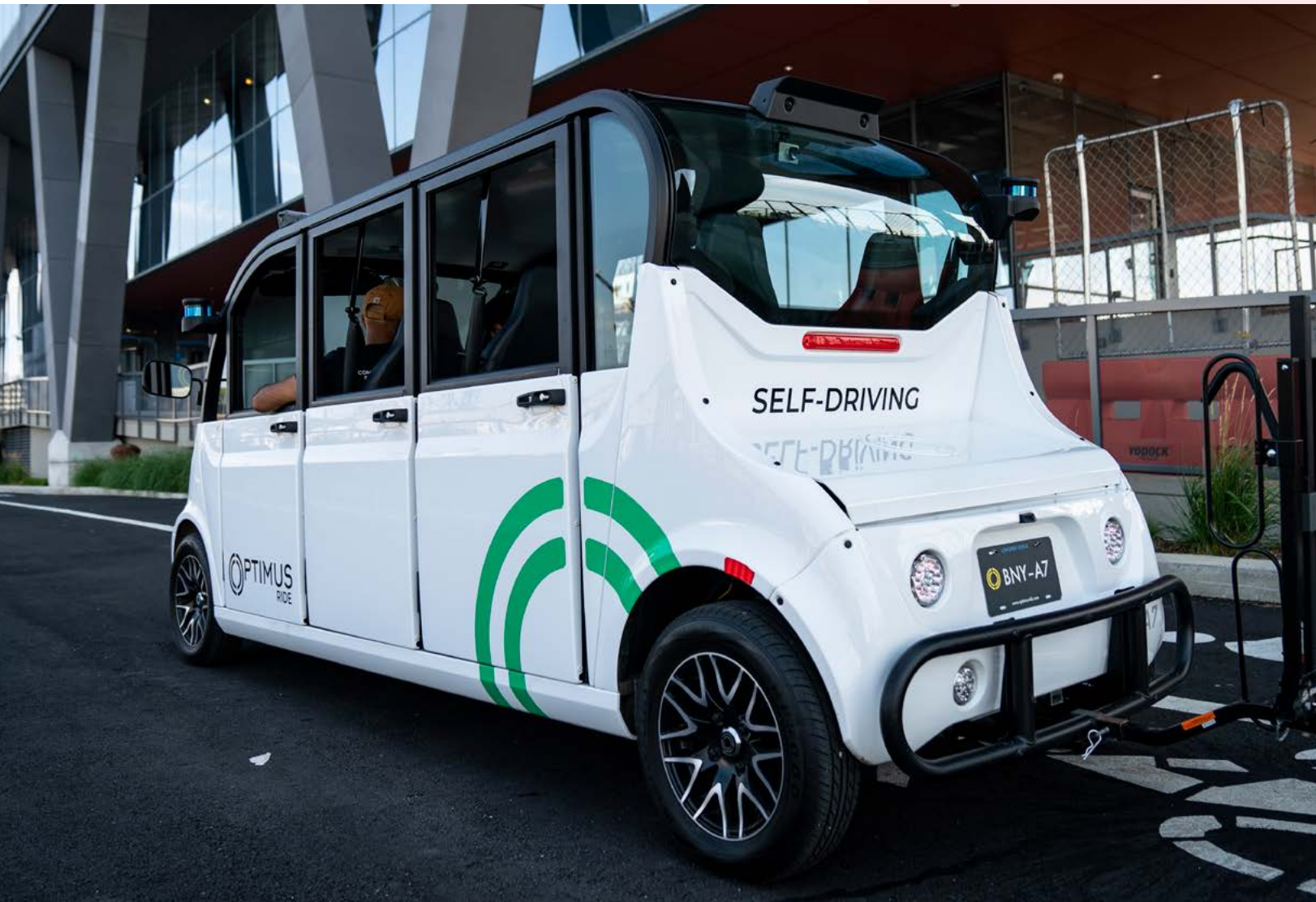
<sup>23</sup> <https://www.ozy.com/the-new-and-the-next/chinas-robotaxis-race-forward-amid-pandemic/329013/>

<sup>24</sup> <https://home.kpmg/xx/en/home/insights/2020/06/autonomous-vehicles-readiness-index.html>

<sup>25</sup> <http://bgr.com/2016/08/25/self-driving-taxi-service-nutonomy/>

<sup>26</sup> <https://www.straitstimes.com/business/economy/with-driverless-cars-no-pipe-dream-edb-sees-mobility-as-next-growth-industry-for>

<sup>27</sup> <https://www.intelligenttransport.com/transport-news/73480/autonomous-rd-team-singapore/>



### Japan: Consortium approach to “driverless” adoption

With a similar national ambition for leadership of on-demand and autonomous mobility services, Japan is taking a consortium approach. Isuzu, Suzuki, Subaru, Daihatsu, Mazda and truck-maker Hino have joined with Toyota, Honda, and telecommunications and media giant SoftBank in a joint-venture entitled MONET.<sup>28</sup>

Where the now-delayed 2020 Olympics was once targeted for the launch date for a self-driving ridehailing and passenger bus services in Tokyo, the pandemic has seen instead the acceleration of autonomous delivery and service robots. ZMP Inc. released both a four-wheeled delivery robot and an 'Anti-Coronavirus Robot Squad' in Tokyo in August 2020.<sup>29</sup>

To the degree that patents are a leading indicator of innovation and future industry profitability then Japanese OEMs seem well poised. Both Toyota and Honda are in the top 5 of global companies with patents in autonomous technology.<sup>30</sup>

Finally, and with a nod toward the connection between Smart Cities and Future Mobility, Toyota has announced plans for Woven City: a highly digital test environment for driverless vehicles and more at the base of Mt. Fuji. At a 175-acres, it is twice the size of Korea’s K-City, an artificial town built for autonomous vehicle testing that opened in late 2017.<sup>31</sup>

### Data infrastructure and new connectivity

For the connected economy and urban environment the broadband and wireless data infrastructure become as central as drilling platforms and tanker fleets were to the petro-economy. Now the mobile & communications infrastructure is moving towards 5G.

The global battle for 5G leadership is ongoing, with strong positions being taken against China’s Huawei by some western

governments. However, the new standard is a key enabler for high-tech industries, including Future Mobility. For the west, the choice is one between control and network security vs. timing. Between implementing existing and tested 5G technologies or strategically planning for delay as western 5G industries ramp up. Either way, Asia seems likely to win in the short to mid-term: according to the industry’s trade-body, GSMA, 70% of the world’s 5G subscribers are already in China and even by 2025, 50% are still expected to be in Asia. 10% of Asia mobile subscriptions are forecast to be 5G by 2022<sup>32,33</sup>

For autonomous vehicles – that are expected to generate well over 2 Terabytes of data per day – 5G promises to represent a five-fold improvement on latency, a hundred-fold increase in data volume relative to 4G, at a positional accuracy of one metre.<sup>34</sup> While 5G is not a prerequisite for the Future Mobility ecosystem, it can clearly act as a catalyst for growth and adoption and moreover, makes the region more attractive for testing, development and the roll-out of the technology.

<sup>28</sup> TechCrunch June 29, 2019, <https://tcrn.ch/2NI3f7d>

<sup>29</sup> <https://www.japantimes.co.jp/news/2020/09/19/business/coronavirus-japanese-robots/>

<sup>30</sup> <https://www.iam-media.com/patent-and-sep-trends-autonomous-driving-technologies>

<sup>31</sup> <https://qz.com/1121372/south-korea-opens-k-city-the-latest-fake-town-built-for-self-driving-cars/>

<sup>32</sup> <https://asia.nikkei.com/Spotlight/5G-networks/China-closes-in-on-70-of-world-s-5G-subscribers>

<sup>33</sup> <https://www.gsma.com/newsroom/press-release/gsma-asia-set-to-become-worlds-largest-5g-region-by-2025/>

<sup>34</sup> <https://5g-ppp.eu/wp-content/uploads/2015/02/5G-Vision-Brochure-v1.pdf>



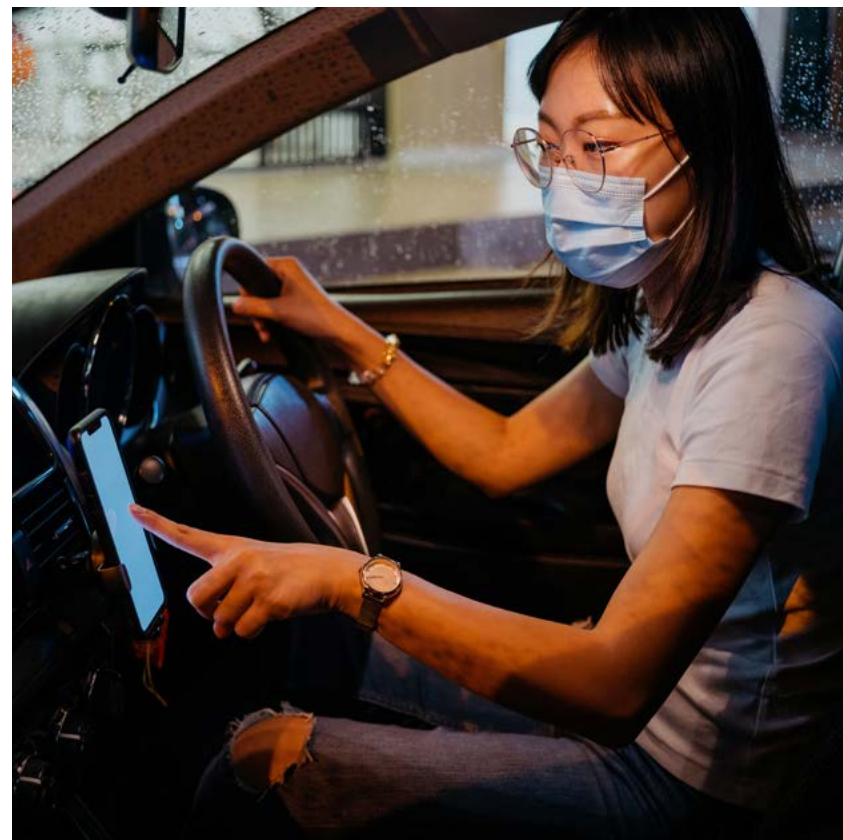
# Smart(phone) mobility first

Mobility Operators and Mobility Aggregators represent the final two segments of the Future Mobility value-chain.<sup>35</sup> For those elements, business models and consumer software differentiate – not manufacturing and data infrastructure.

## Asia turns to the Smartphone for mobility

Bill Russo, an automotive industry expert based in China, notes that a lack of a prevailing car-culture is actually an enabler for China when it comes to leadership across multiple parts of the Future Mobility value-chain.<sup>36</sup> The same can be said of Indonesia, Malaysia and Singapore: smartphone penetration among millennials is universal<sup>37</sup> and on-demand mobility has become pervasive.

Grab (based in Singapore and backed by SoftBank) and Gojek (based in Jakarta and backed by Tencent among others) have leveraged their initial strength in ridehailing to expand into food delivery, hotel reservations and even financial services. Along with China's WeChat and AliPay, and India's Ola and Jio, these companies have become so-called "superapps". These are mobile-phone apps that cover so many parts of daily life that they gradually displace countless other, single-purpose apps on smartphones.



It's a trend that is closely watched by Western technology firms; Amazon and Facebook have expressed the desire to pursue similar, mobility-integrated superapp strategies - they will turn to Southeast Asia for learnings (if not users).<sup>38</sup>

These superapps also effectively become the aggregators of mobility-services across Asia – a walled garden blocking the influence of OS makers or alternative social/messaging platforms. WeChat, who boasts over one billion users, already integrated public transport payments in 2017, Alipay allows its users to order and pay for taxis worldwide, and the Ola app includes carsharing in Bengaluru.<sup>39,40,41</sup>

Without Asia, the picture of the Future Mobility ecosystem globally would be much less evolved. Over the last decade, rather than being a follower, the region has produced leadership positions both in terms of scale and innovation. With this momentum and the support of policy, technology and investment, Asia-Pacific seems likely to be hard to dislodge at the corporate or national level.

- 35 "Future Mobility: Understanding a new transport ecosystem", MSCI, May 2020
- 36 Correspondence with Bill Russo, CEO of Automobility Limited, based in China by Neckermann Strategic Advisors
- 37 The Economist Intelligence Unit <https://eiperspectives.economist.com/technology-innovation/asias-digital-millennials-mobile-social-and-borderless>
- 38 <https://skift.com/2019/12/04/amazon-adds-bus-tickets-in-india-in-pursuit-of-superapp-strategy/>
- 39 <https://techwireasia.com/2020/07/wechat-how-open-agile-culture-built-the-worlds-first-superapp/>
- 40 <https://www.caixinglobal.com/2019-07-31/100-million-transit-riders-are-paying-with-wechat-mini-program-tencent-101445697.html>
- 41 <https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/ola-unveils-self-drive-car-sharing-offering-ola-drive/articleshow/71627395.cms>

**MSCI would like to thank Lukas Neckermann, Managing Director of Neckermann Strategic Advisors for useful discussions and insightful analysis of this megatrend which has greatly facilitated the preparation of this document.**

Lukas Neckermann is the author of three books: "The Mobility Revolution" (2015), "Corporate Mobility Breakthrough 2020" (2017), and "Smart Cities, Smart Mobility: Transforming the Way We Live and Work" (2018). His most recent study, "Being Driven" has just been released as an eBook.



## Contact us

[clientservice@msci.com](mailto:clientservice@msci.com)

### AMERICAS

Americas	1 888 588 4567 *
Atlanta	+ 1 404 551 3212
Boston	+ 1 617 532 0920
Chicago	+ 1 312 675 0545
Monterrey	+ 52 81 1253 4020
New York	+ 1 212 804 3901
San Francisco	+ 1 415 836 8800
São Paulo	+ 55 11 3706 1360
Toronto	+ 1 416 628 1007

### EUROPE, MIDDLE EAST & AFRICA

Cape Town	+ 27 21 673 0100+
Frankfurt	49 69 133 859 00
Geneva	+ 41 22 817 9777
London	+ 44 20 7618 2222
Milan	+ 39 02 5849 0415
Paris	0800 91 59 17 *

### ASIA PACIFIC

China North	10800 852 1032 *
China South	10800 152 1032 *
Hong Kong	+ 852 2844 9333
Mumbai	+ 91 22 6784 9160
Seoul	00798 8521 3392 *
Singapore	800 852 3749 *
Sydney	+ 61 2 9033 9333
Taipei	008 0112 7513 *
Thailand	0018 0015 6207 7181 *
Tokyo	+ 81 3 5290 1555

## About MSCI

MSCI is a leading provider of critical decision support tools and services for the global investment community. With over 45 years of expertise in research, data and technology, we power better investment decisions by enabling clients to understand and analyze key drivers of risk and return and confidently build more effective portfolios. We create industry-leading research-enhanced solutions that clients use to gain insight into and improve transparency across the investment process.

To learn more, please visit [www.msci.com](http://www.msci.com)

The information contained herein (the "Information") may not be reproduced or disseminated in whole or in part without prior written permission from MSCI. The Information may not be used to verify or correct other data, to create indexes, risk models, or analytics, or in connection with issuing, offering, sponsoring, managing or marketing any securities, portfolios, financial products or other investment vehicles. Historical data and analysis should not be taken as an indication or guarantee of any future performance, analysis, forecast or prediction. None of the Information or MSCI index or other product or service constitutes an offer to buy or sell, or a promotion or recommendation of, any security, financial instrument or product or trading strategy. Further, none of the Information or any MSCI index is intended to constitute investment advice or a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such. The Information is provided "as is" and the user of the Information assumes the entire risk of any use it may make or permit to be made of the Information. NONE OF MSCI INC. OR ANY OF ITS SUBSIDIARIES OR ITS OR THEIR DIRECT OR INDIRECT SUPPLIERS OR ANY THIRD PARTY INVOLVED IN THE MAKING OR COMPILING OF THE INFORMATION (EACH, AN "MSCI PARTY") MAKES ANY WARRANTIES OR REPRESENTATIONS AND, TO THE MAXIMUM EXTENT PERMITTED BY LAW, EACH MSCI PARTY HEREBY EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. WITHOUT LIMITING ANY OF THE FOREGOING AND TO THE MAXIMUM EXTENT PERMITTED BY LAW, IN NO EVENT SHALL ANY OF THE MSCI PARTIES HAVE ANY LIABILITY REGARDING ANY OF THE INFORMATION FOR ANY DIRECT, INDIRECT, SPECIAL, PUNITIVE, CONSEQUENTIAL (INCLUDING LOST PROFITS) OR ANY OTHER DAMAGES EVEN IF NOTIFIED OF THE POSSIBILITY OF SUCH DAMAGES. The foregoing shall not exclude or limit any liability that may not by applicable law be excluded or limited.

The process for submitting a formal index complaint can be found on the index regulation page of MSCI's website at: <https://www.msci.com/index-regulation>.