

Urban Mobility in Singapore



DISCLAIMER

EDB provides this presentation (including oral statements) gratuitously for information only and not for any other purpose. While care has been expended in the preparation of this presentation, EDB hereby disclaims all liability including, but not limited to, inaccuracies, incompleteness or lack of suitability for purpose of any information in the presentation.

The Singapore Economic Development Board (EDB)

What We Do

EDB is Singapore's lead agency that plans and executes economic and industrial development strategies for Singapore

Undertake investment promotion and industry development in the manufacturing and tradeable services sectors



Responsible for >30% of Singapore's Annual GDP

- Facilitate investments
- Partner existing base to transform and boost productivity
- Generate growth in adjacent and disruptive areas



Solving Mobility Challenges

Transforming mobility and creating new opportunities



Autonomy and Intelligence



Connectivity



Electrification



Sharing



Singapore's challenge statement for Urban Mobility

To achieve the highest possible Public, Shared and Active Transport mode share without increasing land-take and manpower.

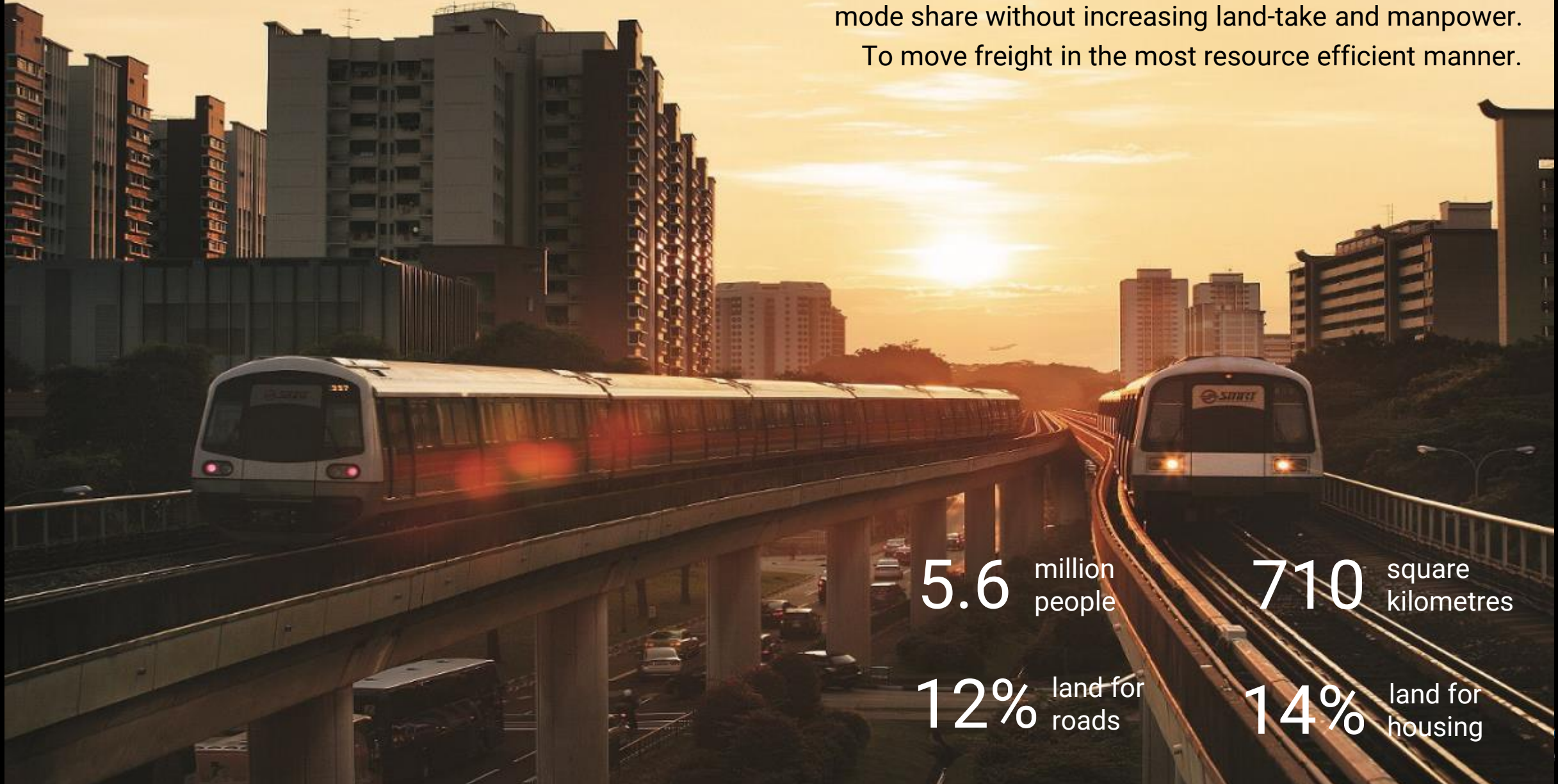
To move freight in the most resource efficient manner.

5.6 million people

710 square kilometres

12% land for roads

14% land for housing





AV Development and Deployment

Collaboration between government,
industry and academics to chart future for
AV-enabled land mobility concepts

Committee on Autonomous Road Transport (CARTS)

- Proactive approach to drive coordination across various agencies for AV-related initiatives
- Members include public sector agencies, international experts, academia and industry players

1

**Crafting the vision for AV
deployment in Singapore**

2

**Regulations &
implementation of AV
testbeds and initiatives**

3

**Industry development for
the urban mobility sector**

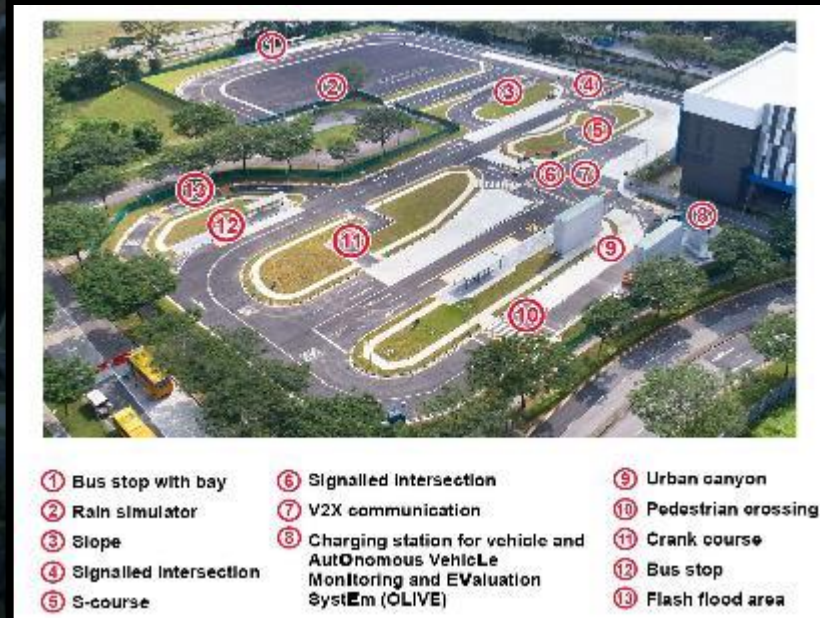
Established infrastructure for AV development

The Centre of Excellence for Testing and Research of Autonomous Vehicles – NTU (CETRAN) is a research initiative to develop standards and practices to facilitate the applications of AVs in urban environments in Singapore.

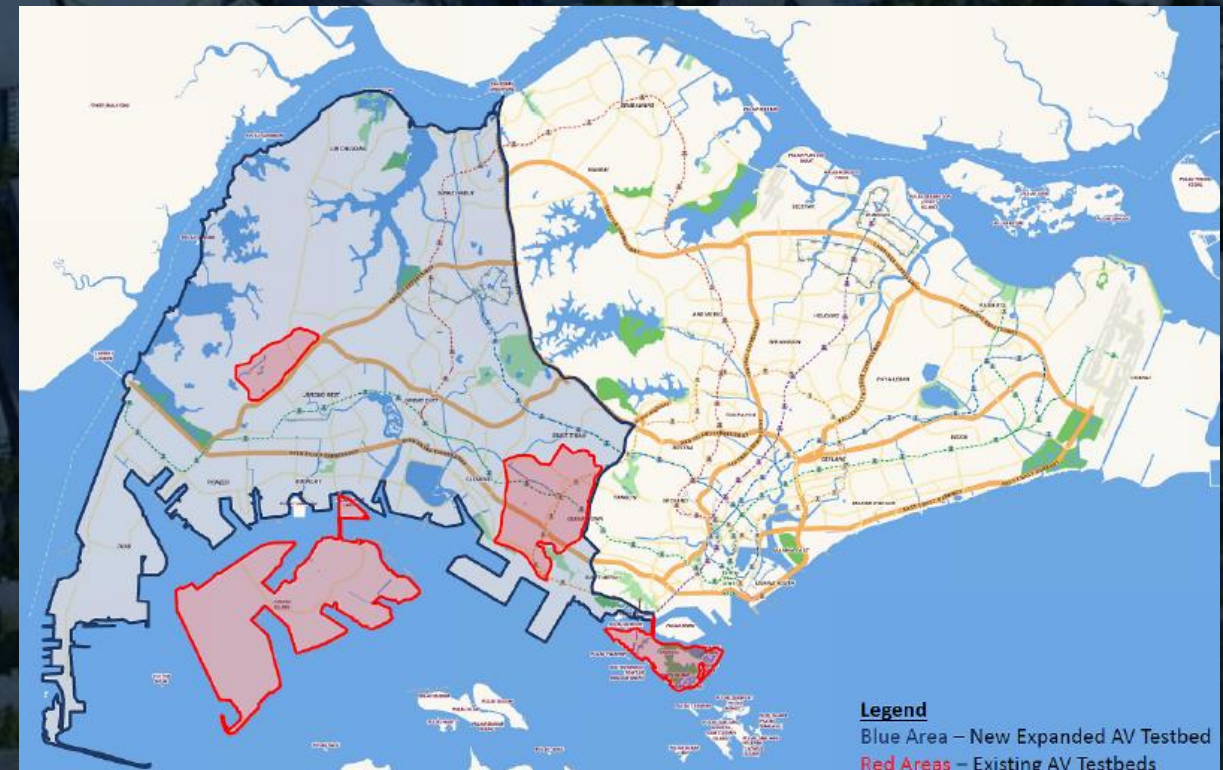
The CETRAN project has several partners, including the LTA, NTU, BMW Future Mobility Research and TÜV SÜD.

Singapore has concentrated testing within **autonomous vehicle test beds** at one-North, Buona Vista, NUS, Sentosa, Jurong Island as well as NTU.

In Oct 2019, the test bed was expanded to the entire Western part of Singapore, including over **1000 km** of public roads.



This 2-hectare test facility will support CETRAN to develop testing requirements for AVs.



Fixed & Scheduled Services



Point-to-Point Mobility-on-Demand



Use cases for AVs in Singapore

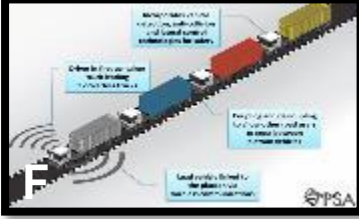


Freight and Logistics



Utility Operations

Growing AV development and testing in Singapore



NTU and Volvo to jointly develop and test autonomous electric buses in Singapore by 2019

Pilot AV deployment in Jurong, Tengah and Punggol

Trials on autonomous utility vehicles at Changi Airport to help ease manpower crunch

Nutonomy developing autonomous Mobility-on-Demand service

Katoen Natie is piloting a driverless truck at ExxonMobil's integrated manufacturing hub

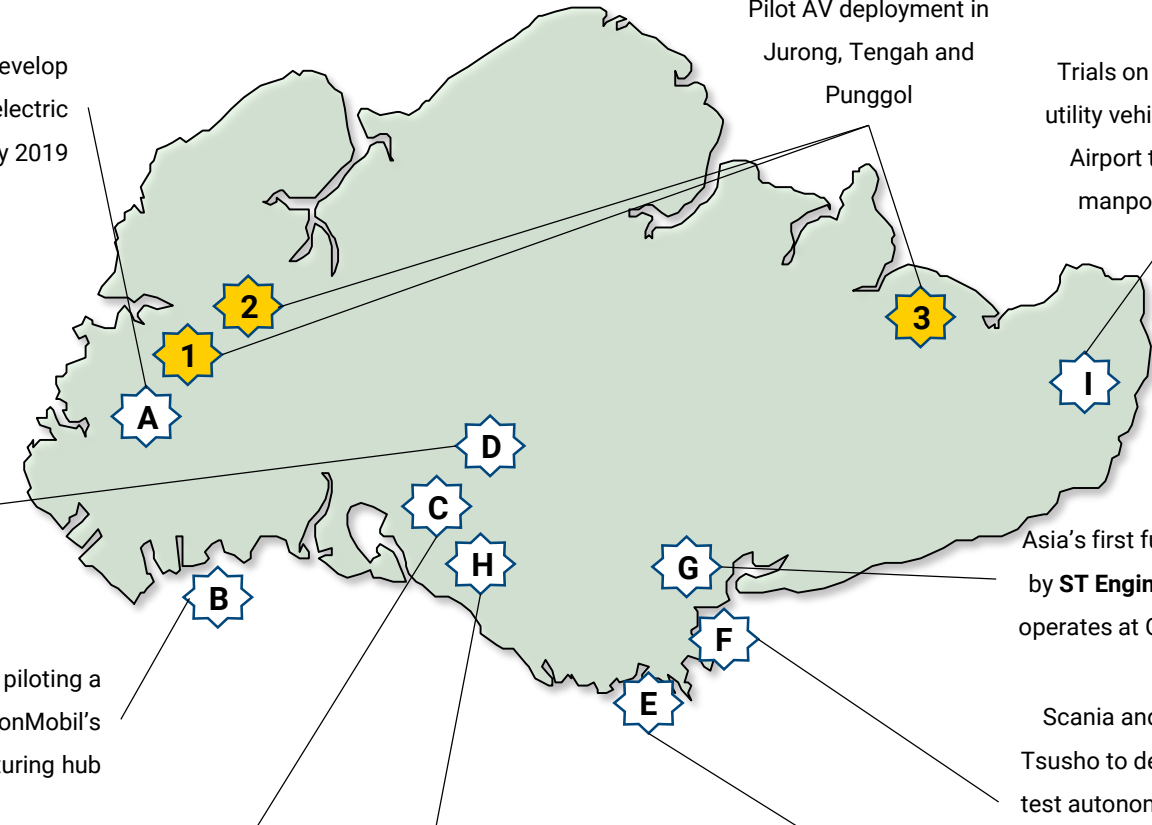
ComfortDelGro is piloting an autonomous shuttle with EasyMile on NUS campus

Moovita developing AVs at Ngee Ann Polytechnic

ST Engineering Land Systems' testing autonomous shuttles at Sentosa in 2020

Asia's first fully operational AV by **ST Engineering** and Nava operates at Gardens by the Bay

Scania and Toyota Tsusho to develop and test autonomous truck platooning system for port terminals



Pilot deployment of AVs in towns

- **July 2015** **Start of Proof-of-Concept Trials**

AV trials in Singapore begin in one-north

- **Jan 2019** **Call For Collaboration for Pilot Deployment of Public AV Buses and Shuttles**

Invite interested companies to submit proposals for the development, testing and commercialisation of AV public transport solution in Singapore.

- **July 2019** Submission of proposals by companies on Call for Collaboration

- **2023 onwards** **Pilot deployment of AVs in 3 towns**



Tengah New Town



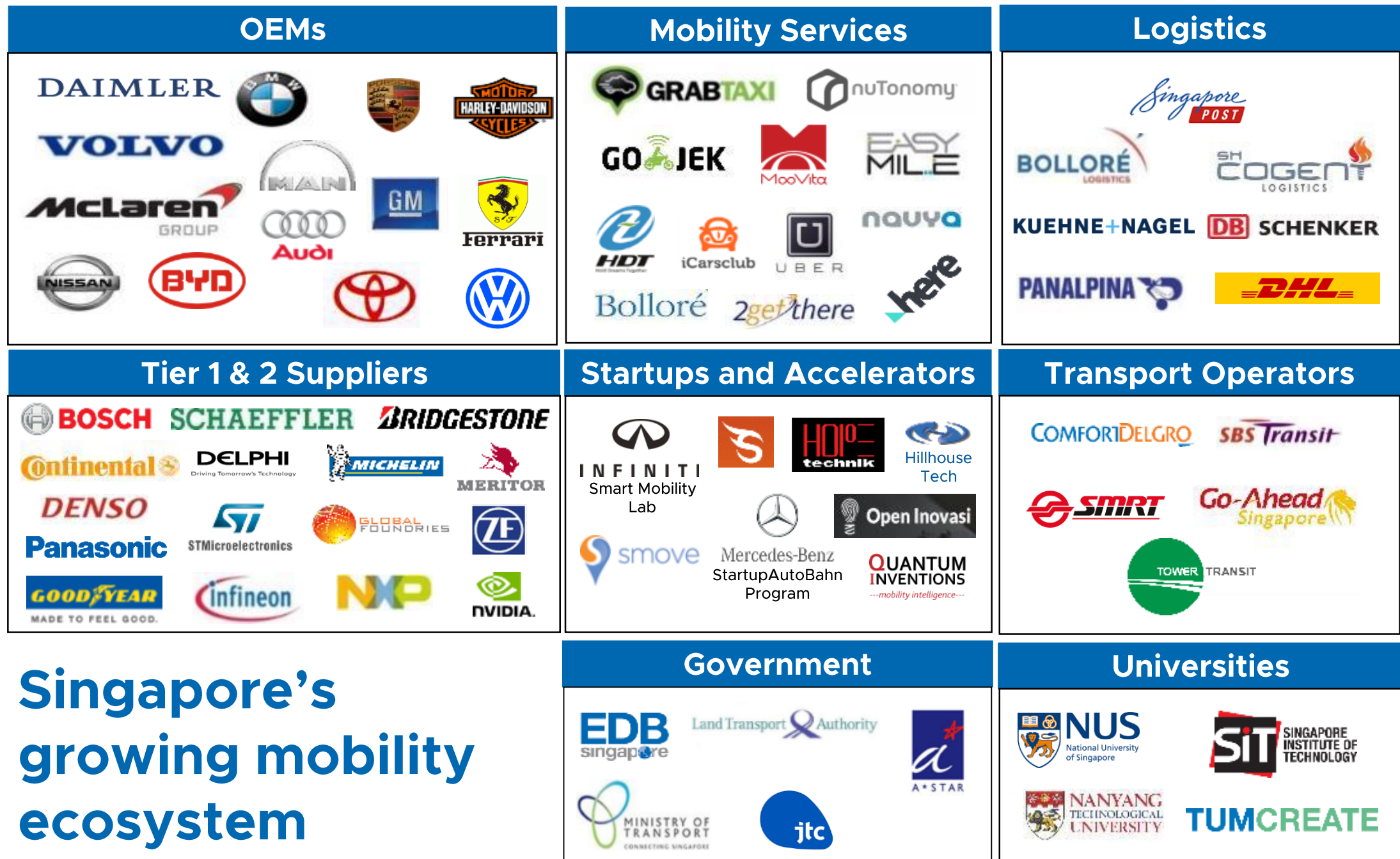
Jurong Innovation District



Punggol Downtown



Singapore's Urban Mobility Sector



Grab is Southeast Asia's #1 ride-hailing app, food delivery service and cashless payment solution all-in-one

Grab's headquarter and largest R&D centre are both in Singapore

The company's US\$100M Data Analytics Centre houses 200 engineers and data scientists here

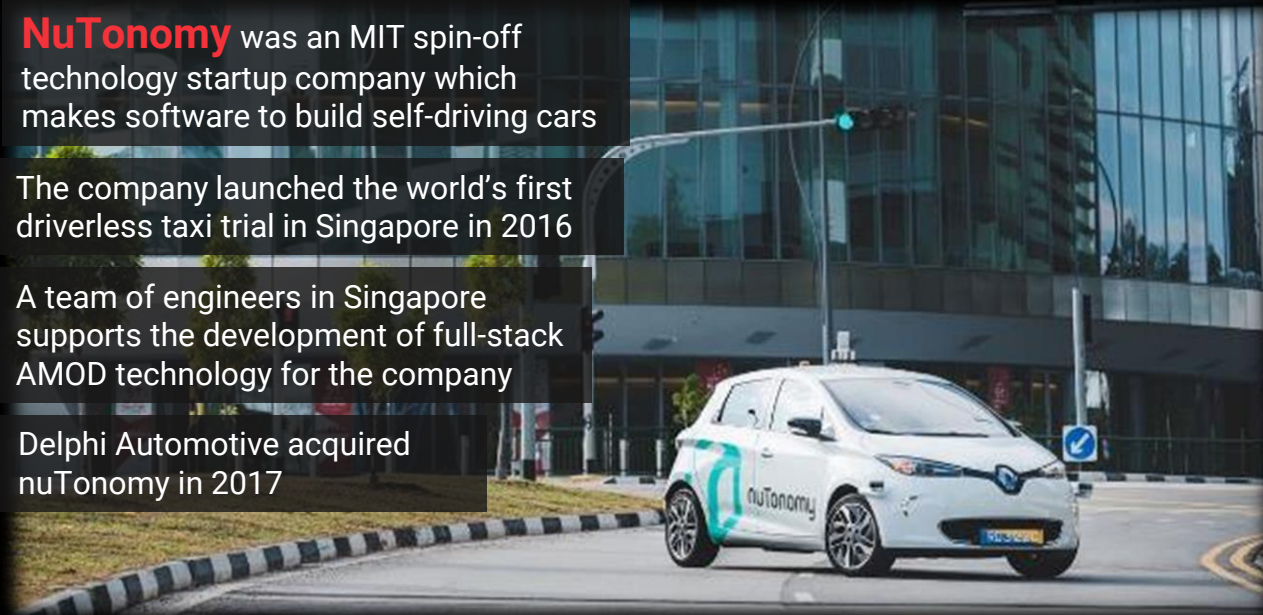


NuTonomy was an MIT spin-off technology startup company which makes software to build self-driving cars

The company launched the world's first driverless taxi trial in Singapore in 2016

A team of engineers in Singapore supports the development of full-stack AMOD technology for the company

Delphi Automotive acquired nuTonomy in 2017



Urban mobility start-ups finding success in Singapore



Automotive giant Continental bought Singapore-based **Quantum Inventions** in July 2017.

The company was founded in 2006 and has 120 staff across Singapore, India, Malaysia and Indonesia.

The company focuses on mobility data services in the consumer, automotive and government sectors.

One of **BMW's** Technology Offices worldwide is located in Singapore

Established a Future Mobility Research Lab with NTU looking at **R&D** in electro-mobility and driver behavior



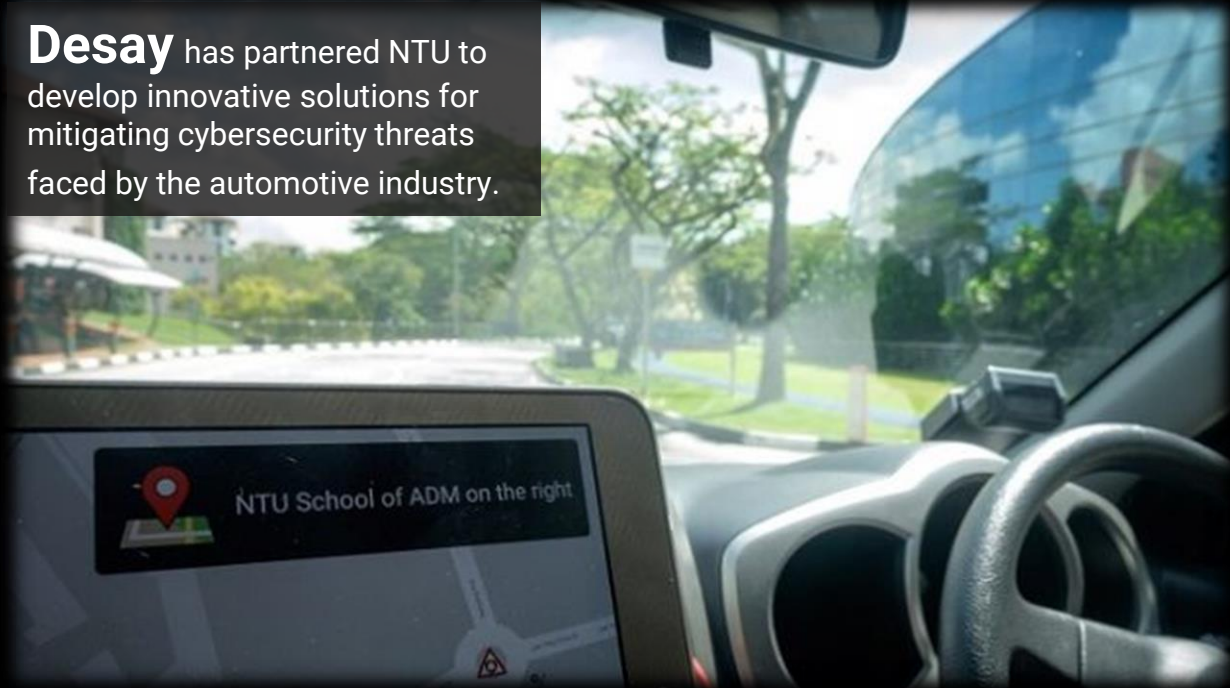
Continental and **EasyMile** have established a joint **R&D** team in Singapore to develop AV technologies, focusing on perception, driving strategies, AI, safety and system integration.



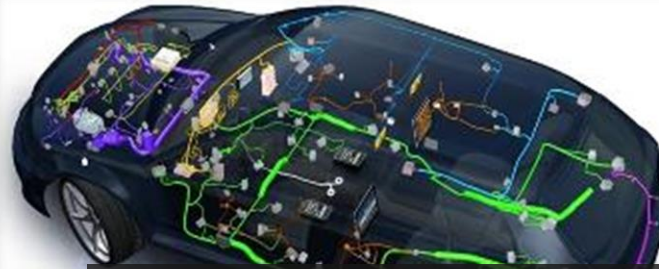
Continental opens third R&D facility, making it one of the largest private **R&D** facilities in Singapore.

Aims to reach more than 2,000 employees in Singapore within the next 5 years

Desay has partnered NTU to develop innovative solutions for mitigating cybersecurity threats faced by the automotive industry.



Singapore is one of the top
Aptiv manufacturing sites
for Active Safety products

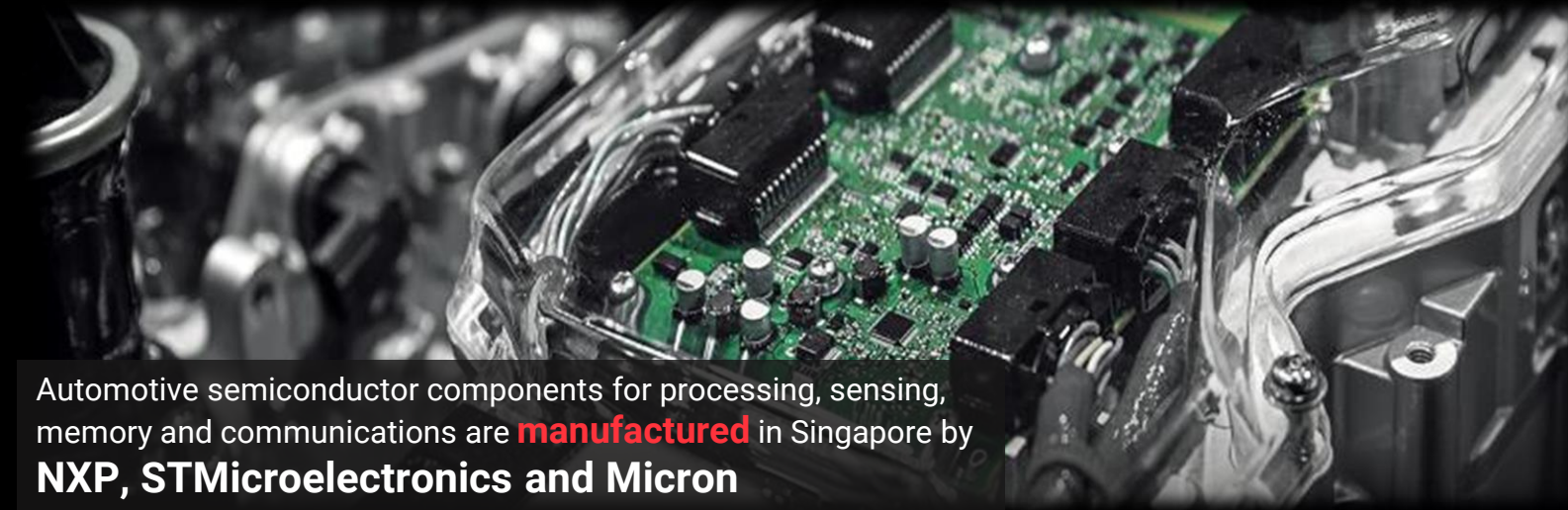


Delphi Technologies manufactures
advanced automotive electronic
components, electronic security products,
power modules, among other products.



Infineon designated
Singapore as their final
global product **test** site.
More than 80% of Infineon's
chips tested in Singapore
are automotive ICs

Automotive semiconductor components for processing, sensing,
memory and communications are **manufactured** in Singapore by
NXP, STMicroelectronics and Micron





Unmanned Aerial Systems in Singapore

Ship to shore trials by Wilhelmsen Ships Service and Airbus



Wilhelmsen piloting delivery of spare parts, documents, water test kits and 3D printed consumables to vessels at anchorage via Airbus Skyways drone instead of small boat

Potential to save up to 90% of delivery costs

One-north: Singapore's first drone estate

200ha business park designated as drone estate for test-bedding innovative unmanned aerial systems

5 projects had been selected to kick off UAS trials at the drone estate.

Singtel

will explore and trial different technologies to enable the use of delivery drones and drone stations

ST Engineering Aerospace

will test drones that can improve the efficiency of work and take over potentially dangerous jobs now done by human

Airbus

will work on Project Skyways which is an aerial unmanned parcel delivery system for use in dense urban environments

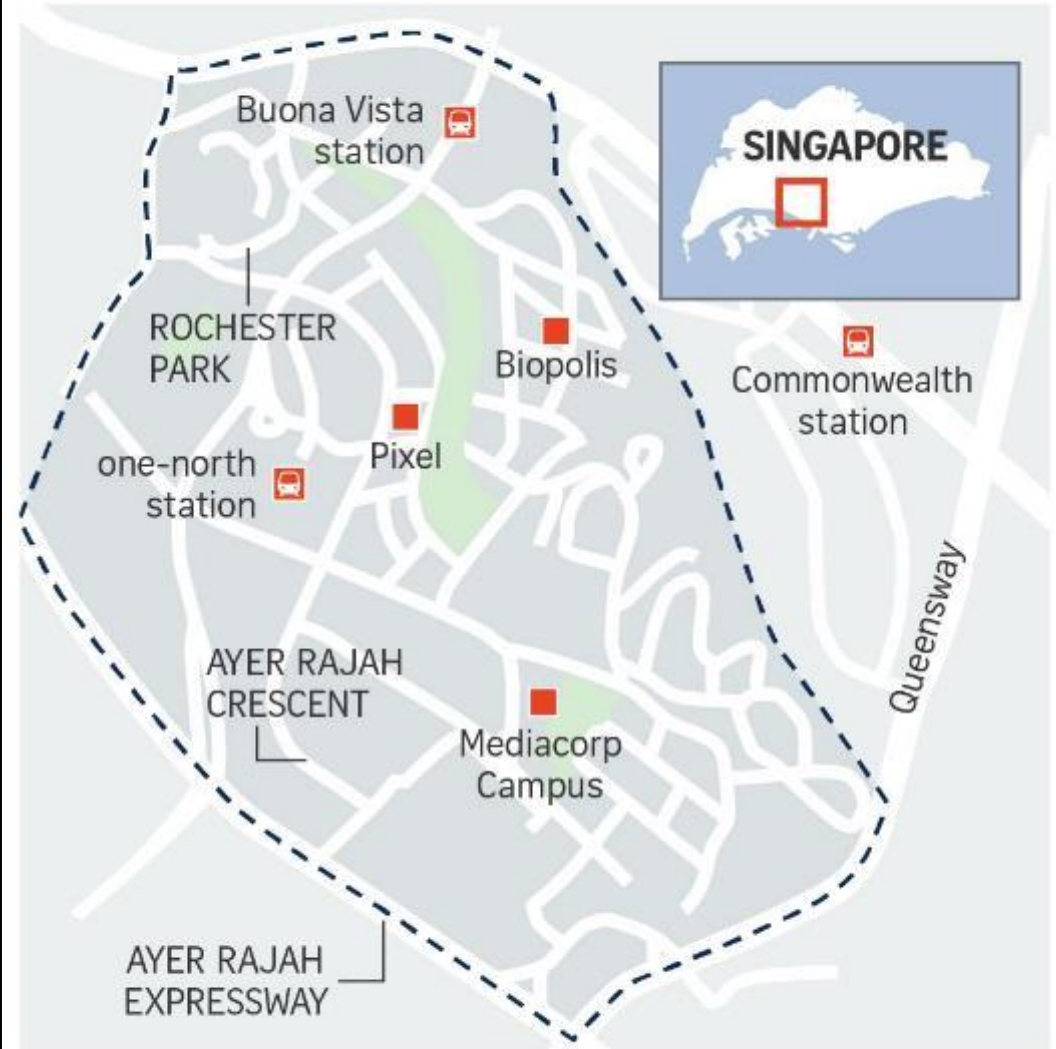
JTC and H3 Dynamics

are collaborating to enhance the quality and productivity of building inspections

Nanyang Technological University

The university's Air Traffic Management Research Institute plans to conduct trials on how to manage multiple drone operations in low-altitude airspace

One-north district



STRAITS TIMES GRAPHICS



Proof of concept flight trial in Singapore

German aviation start-up Volocopter conducted a series of flight trials of its air vehicle in Singapore. Such experimental projects allows CAAS and EDB to deepen our understanding of the technology and guide our policy on facilitating future air taxis operations in this region



Electric Vehicle Developments in Singapore

EV R&D and design activities are emerging in Singapore



Singapore-based startup **Eurosports** developing electric motorbike EST-X to target the SEA market



Singapore-based startup **ShadoEV** developing EV fleet vehicles for utility, passenger and cargo use cases in rugged terrain



Hyundai is establishing a Mobility Global Innovation Center in Singapore (HMGICs) to explore ideas to revolutionize processes encompassing R&D, business and production for future mobility solutions

Rising electrification of passenger and commercial fleets



SE Asia ridehailing giant **Grab** launched 200 EVs in partnership with Hyundai and SP Group



Shell launched SE Asia's first electric vehicle charging service in Singapore in Aug 2019, with expansion plans to the rest of its retail services.



HDT, subsidiary of BYD, is a new taxi fleet operator with a planned fleet of at least 800 taxis by 2022.



LTA to progressively deploy electric buses for passenger services from early 2020, starting with 60 new vehicles.



Potential Impact of COVID-19



Social Distancing

Sanitization & Disinfection



Sustainability



Thank You

