

# Autonomous Vehicles – Developments in Singapore

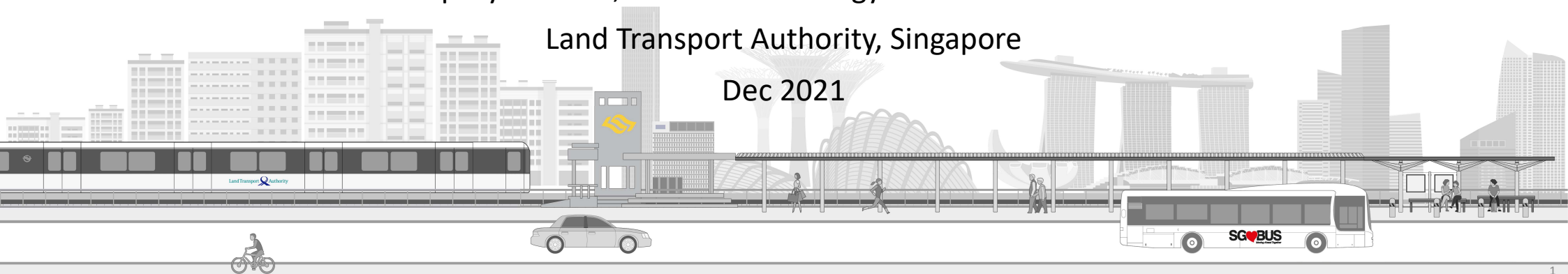
## 12<sup>th</sup> Public and Private Joint Forum in Asian Region

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# Singapore's Urban Mobility Challenges



Growing and Ageing Population

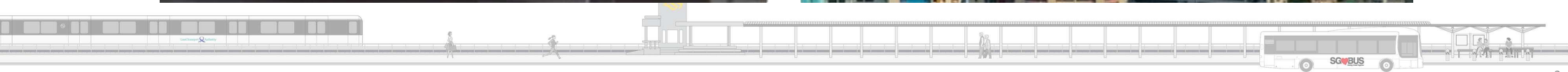


Changing Travel Demands

Constraints in manpower



Limited Land area



# Why Autonomous Vehicles (AVs)?



## Reduce traffic congestion and land take

By optimising traffic flows and reducing demand for car ownership through more convenient and comfortable public transport, especially at first/last mile.



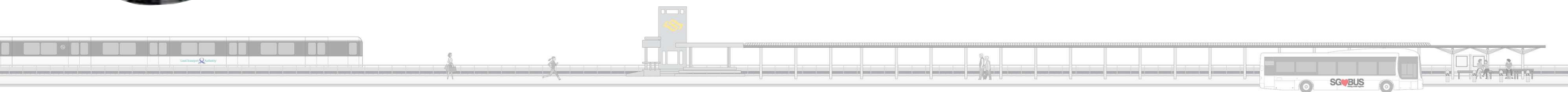
## Reduce reliance on manpower

Reducing operating cost; allowing job up-skilling and redesign to address other demands.



## Improved road safety

By eliminating human-related error. Reduced economic losses from deaths, injuries and traffic jams that may arise from accidents.





# Vision for AVs



## 1 Fixed Route & Scheduled Services

Mass transport for intra- and inter-town travel on a fixed route and scheduled basis



## 2 Point-to-Point Mobility-on-Demand

Shared services dynamically routed in real-time in response to demand, for point-to-point, first-and-last-mile journeys



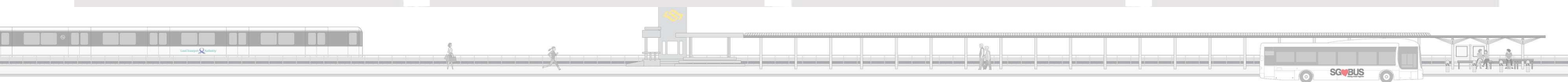
## 3 Freight

Carriage of goods during off-peak hours

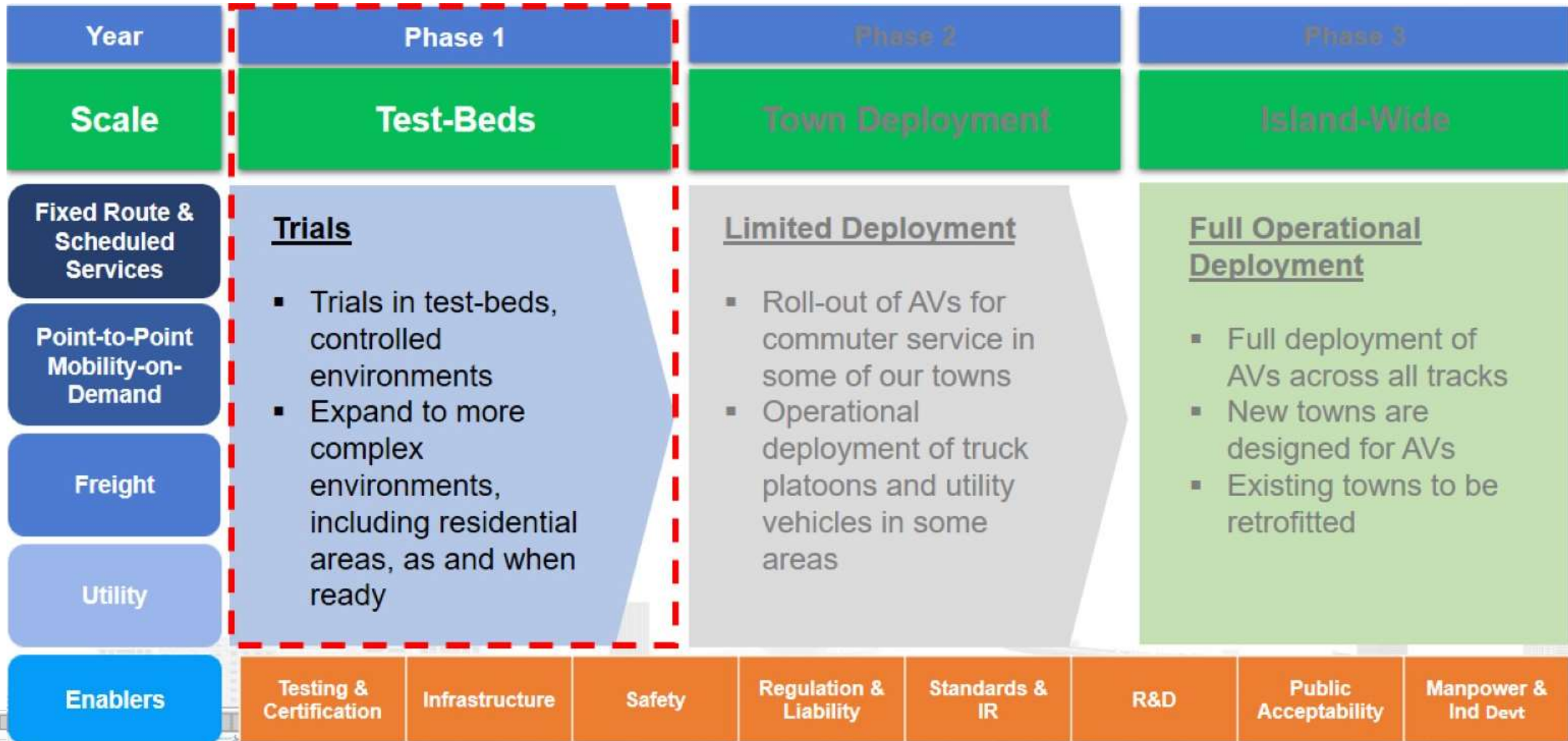


## 4 Utility

Utility operations during off-peak hours (e.g. for road sweeping)



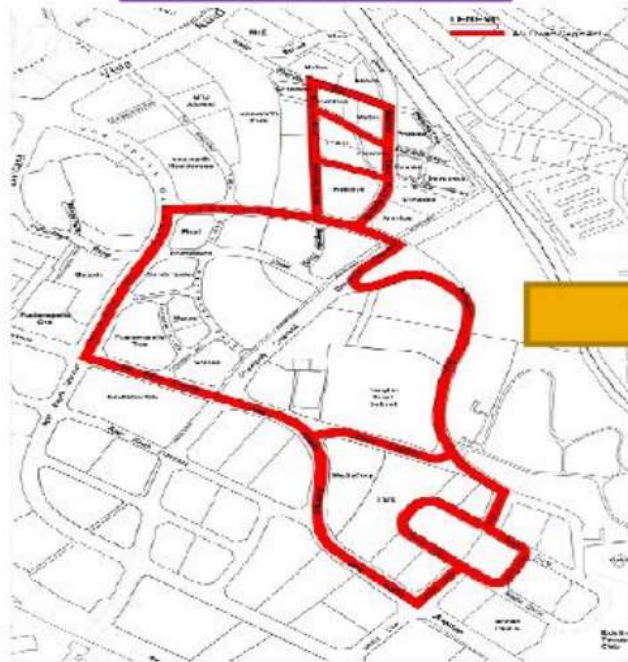
# Roadmap for Deployment of AVs – Phase 1





# Evolution of Singapore's AV Test Bed

January 2015



In collaboration with JTC, announced 6km of demarcated one-north roads

September 2016

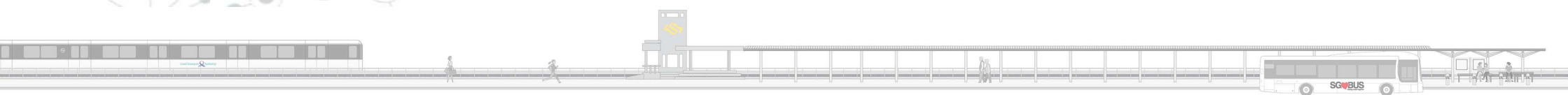


Doubled the length of roads from 6km to 12km

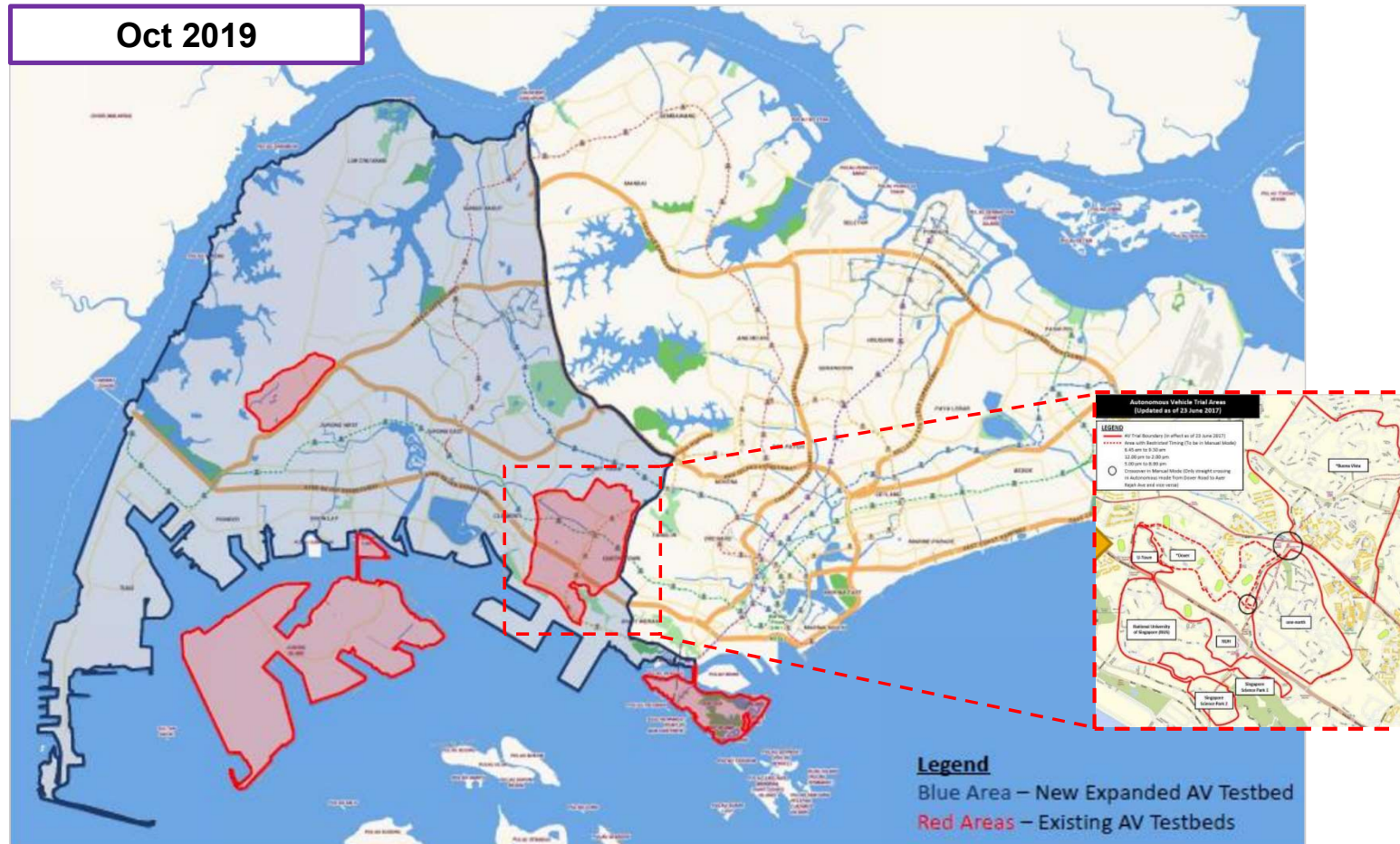
June 2017



Announced expansion of trial areas to include NUS, Singapore Science Park 1 and 2

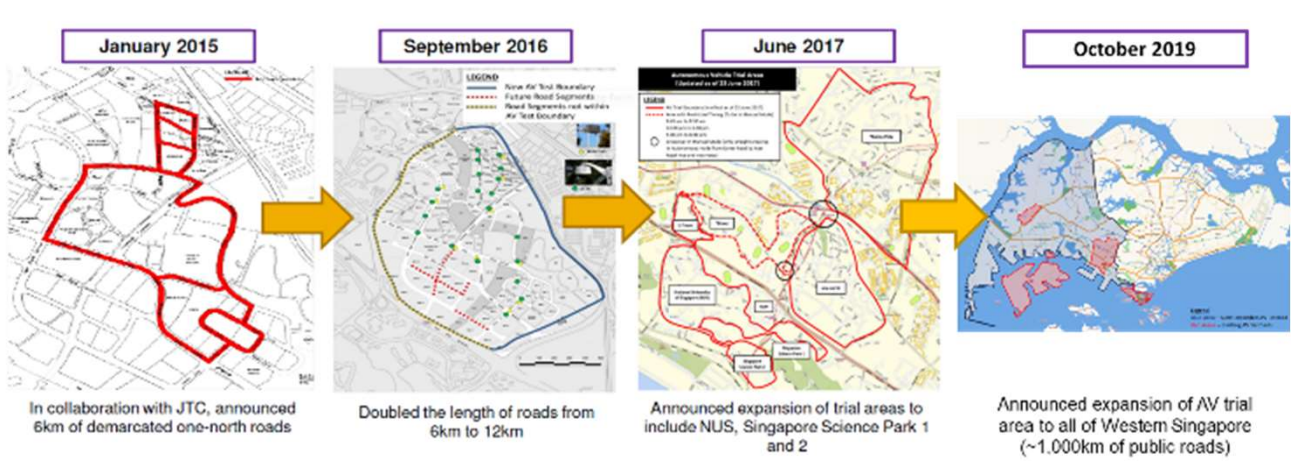


# Further Expansion of Singapore's AV Test Bed





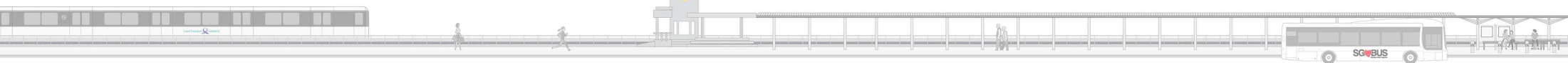
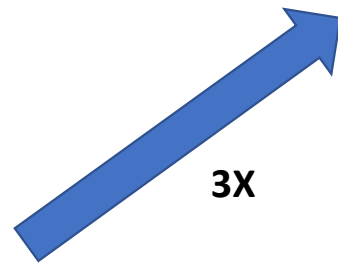
# A Growing AV Trial Community



**2021 – 30+ AVs granted Authorisations/Waiver of Registration (WOR) and Exemption Orders to trial on roads and paths at 10+ different locations**



**2017 - 4 AVs granted Authorisation to conduct trials on roads in the one-north test bed**





# Examples of AV Trial Platforms



nuTonomy's MOD trials in one-north



Delphi's MOD trials in one-north



EasyMile's FSS trials in NUS campus



NTU/Enway/SembWaste/Wong Fong AESV trials in NTU campus



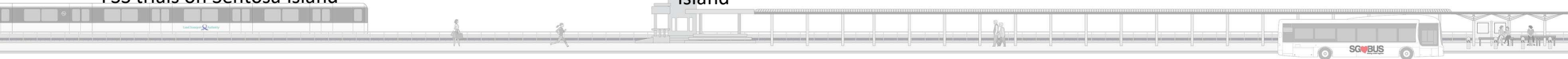
ST Engineering Autonomous Solution's FSS trials on Sentosa Island



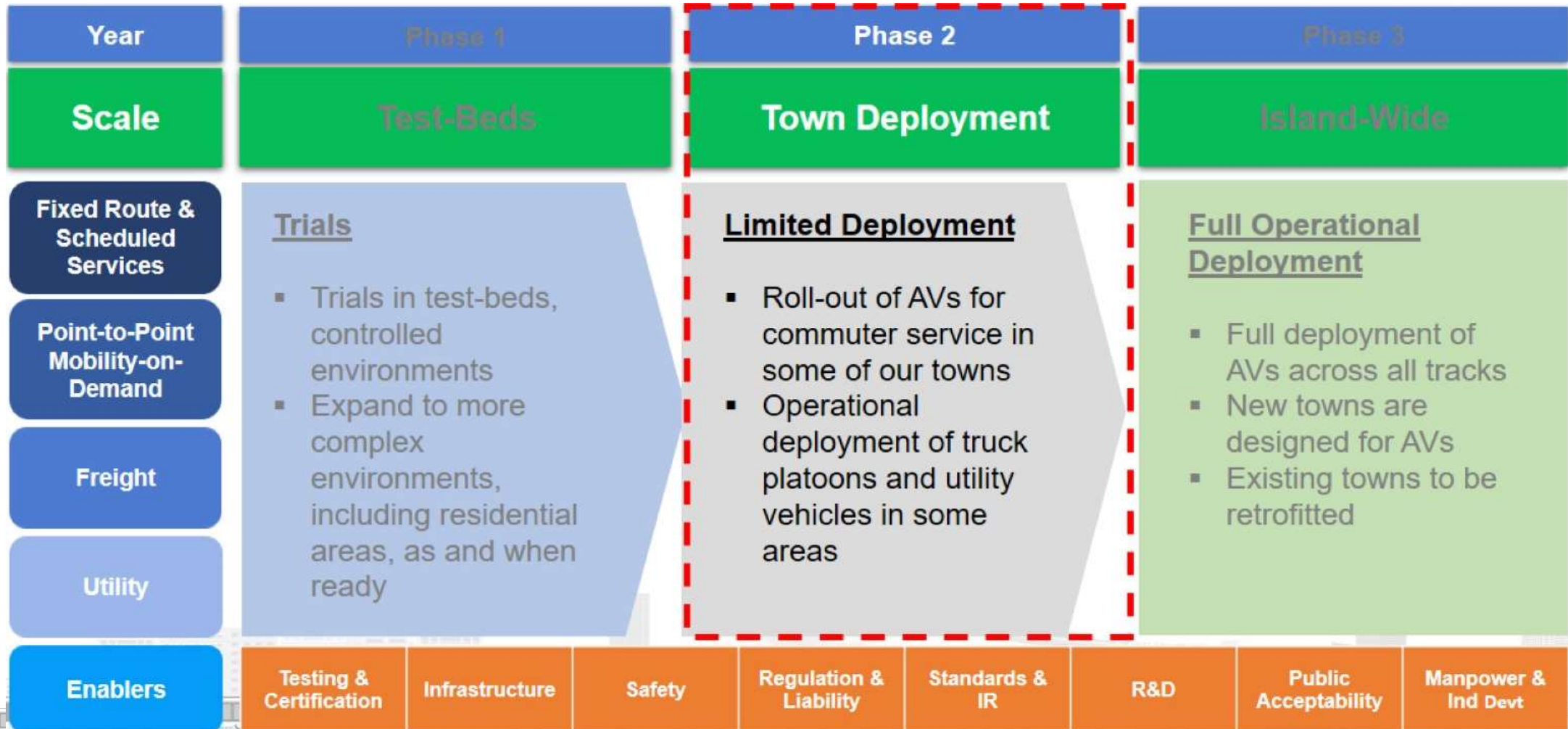
ST Engineering Autonomous Solution's FSS trials on Jurong Island



NTU's FSS trials in NTU campus



# Roadmap for Deployment of AVs – Phase 2





# Pilot Deployment of AVs

- Pilot deployment of autonomous public transport services in 3 new towns: Punggol, Tengah and Jurong Innovation District (JID)
- Pilot services to provide fixed route/scheduled bus and shared/on-demand shuttle services within these new towns
- Collaborate with industry to (i) develop autonomous public transport solutions for Singapore; and (ii) field-test solutions at fleet and town scale
- Received keen interest from more than 20 companies worldwide and locally



**Punggol** - brown-field site with good mix of residential and commercial/industrial areas



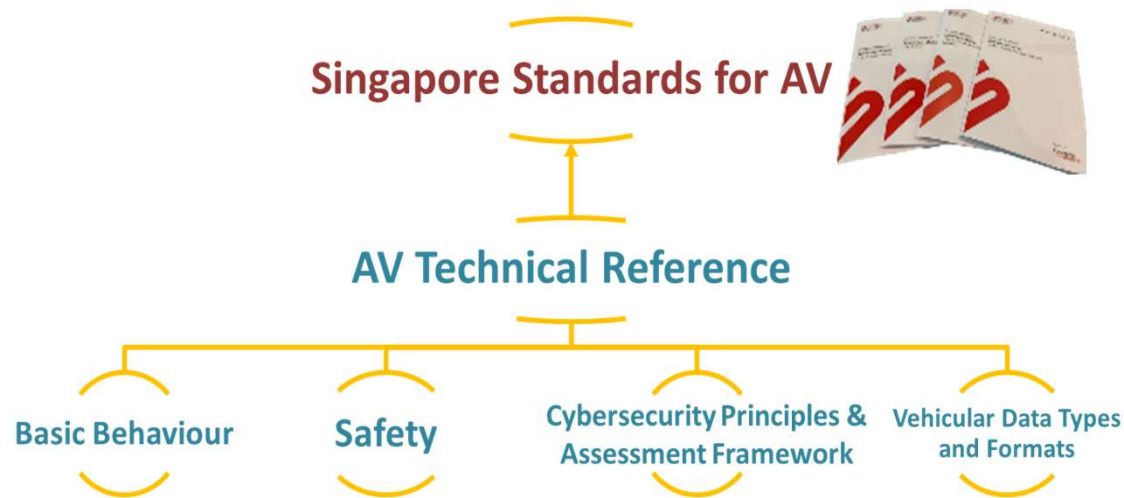
**Tengah** - green-field residential area



**Jurong Innovation District** - largely green-field commercial/light industrial site



# Guiding AV Developments – Technical Reference 68



- An industry-led effort with four working groups comprising AV industry reps, research institutions, IHLs and government agencies
- Standards covering four key areas of AV deployment: (1) vehicle behaviour, (2) safety, (3) cybersecurity and (4) data formats
- Aims to promote the safe deployment of AVs in Singapore





# Thank You

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