



orrb

Safety and Future Transport

Dr Charles Karl, National Discipline Leader – Transport Systems
FG-AI4AD Workshop, 2 December 2020

ARRB's experience in CAV projects

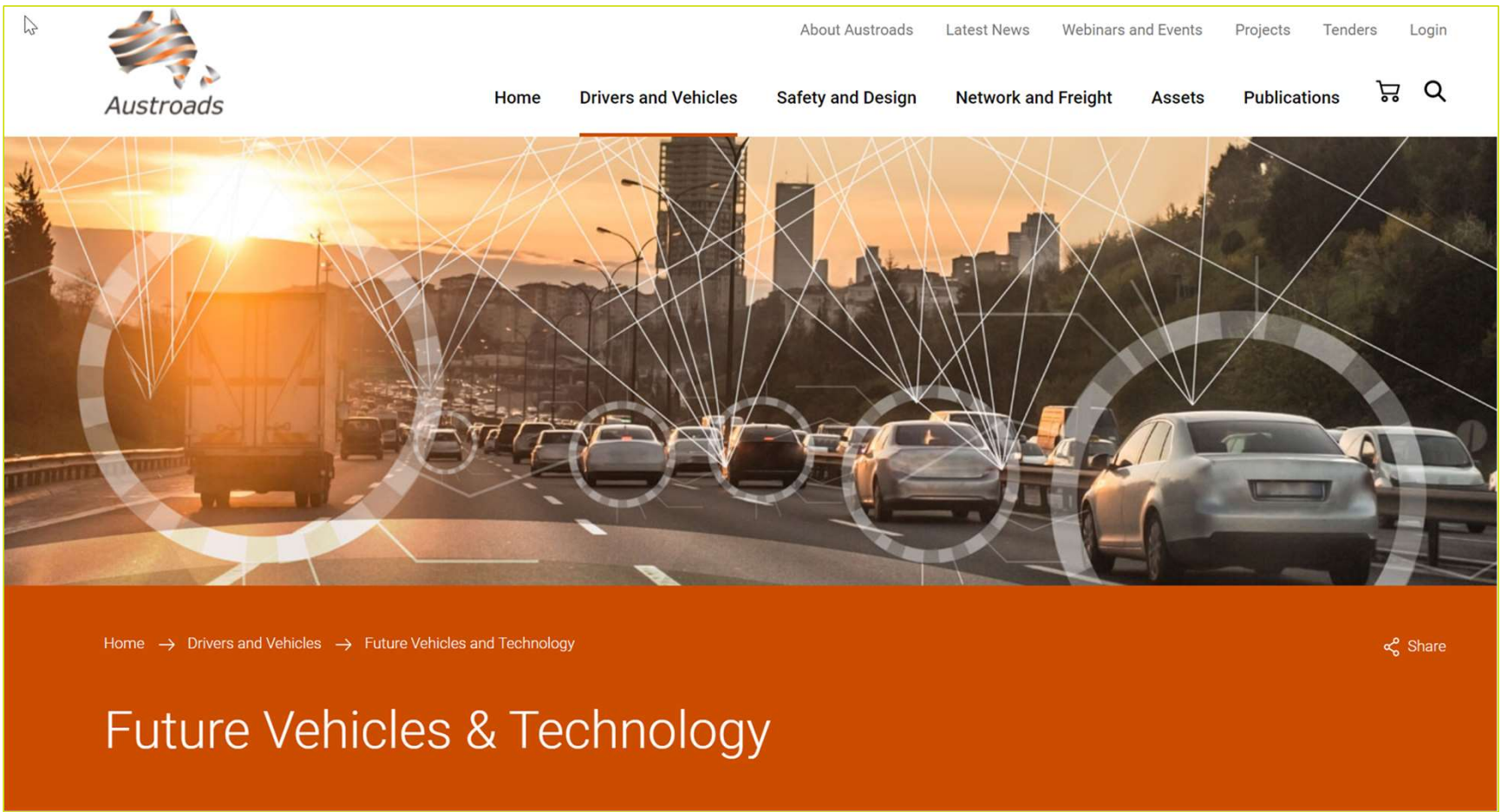
Translating research into reality (www.arrb.com.au)



Projects

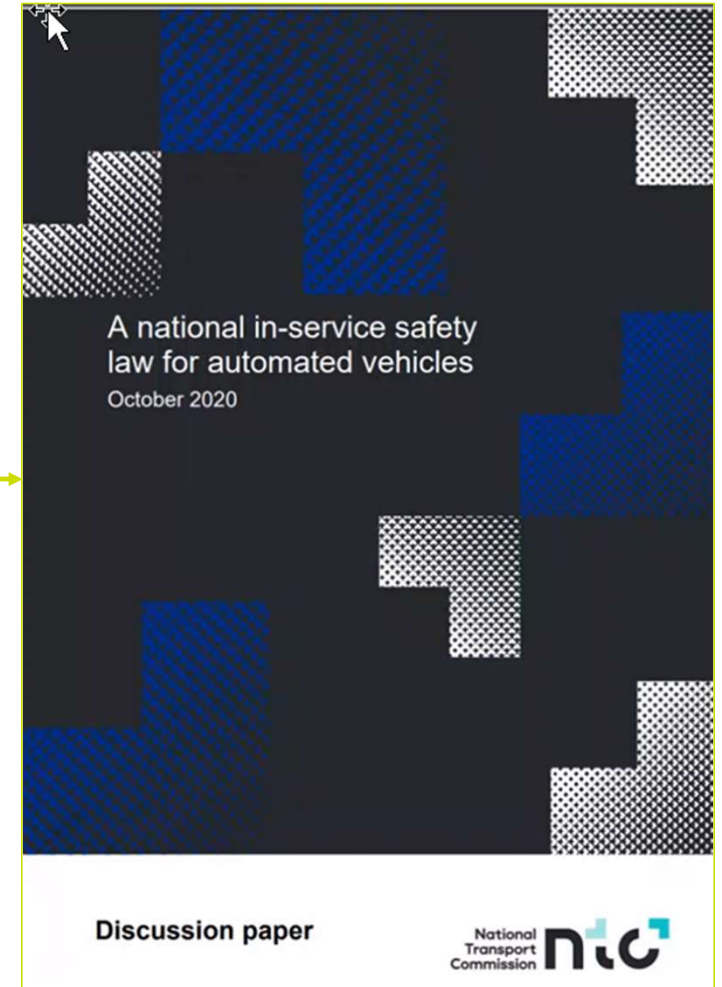
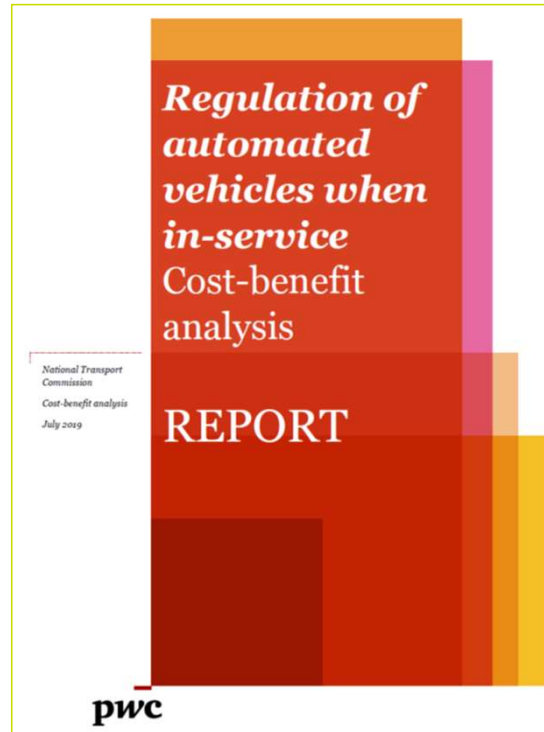
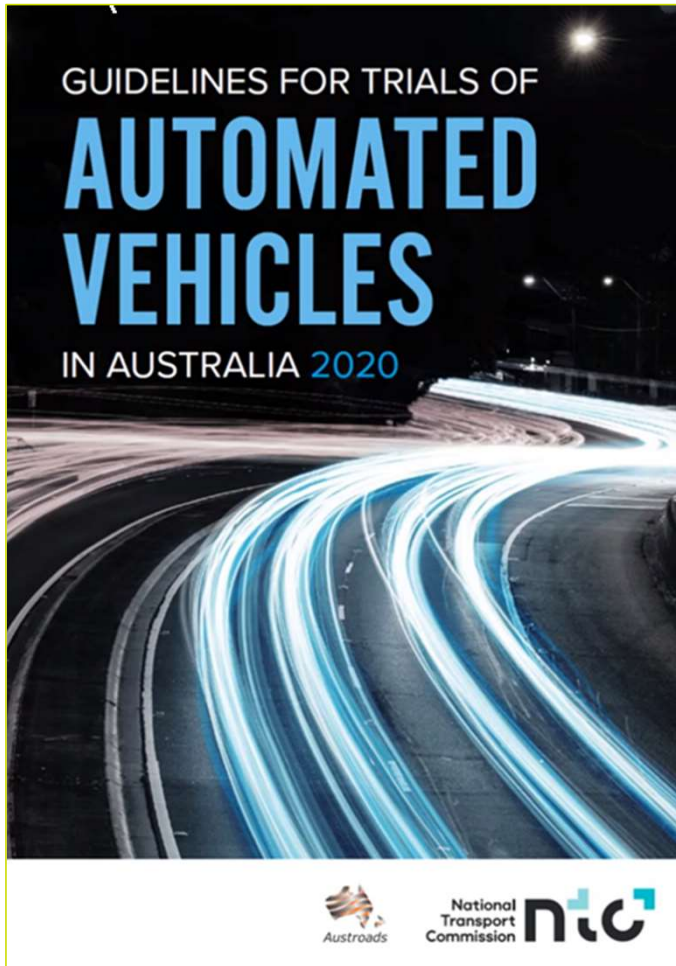
1. Road Operations with Electric Vehicles
2. Road audit on infrastructure to support automated vehicles on rural and metro roads
3. National report of connected and automated vehicles
4. EastLink motorway operational deployment of semi-automated vehicles
5. Yarra Trams priority

Austrroads (www.austrroads.com.au)



<https://austrroads.com.au/drivers-and-vehicles/future-vehicles-and-technology/trials>

National Transport Commission (www.ntc.gov.au)



<https://www.ntc.gov.au/transport-reform/automated-vehicle-program>

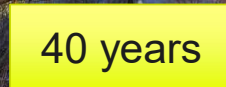
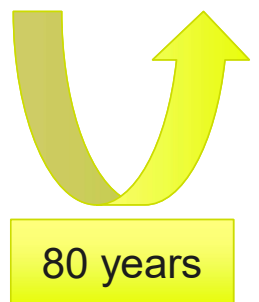
Transport and Mobility



Beijing early 1900



Beijing rush hour 1979



Beijing, 26 Jan 2019

Safety in Future Transport

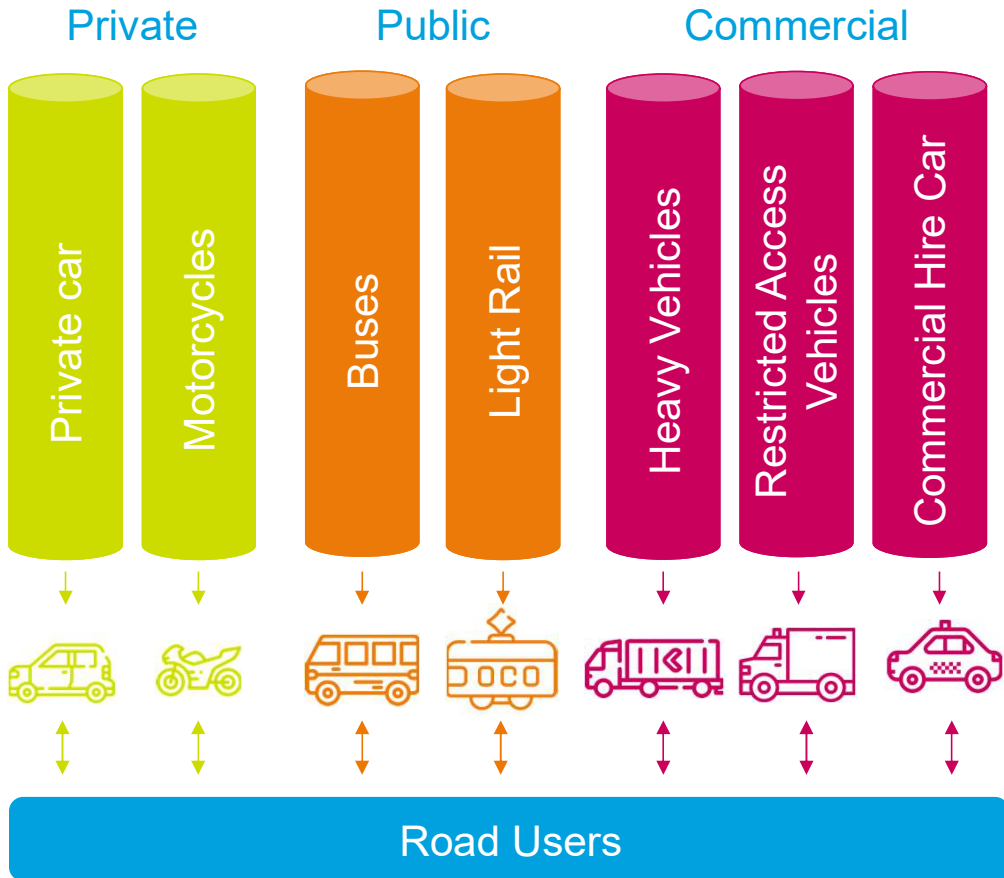


Transport System

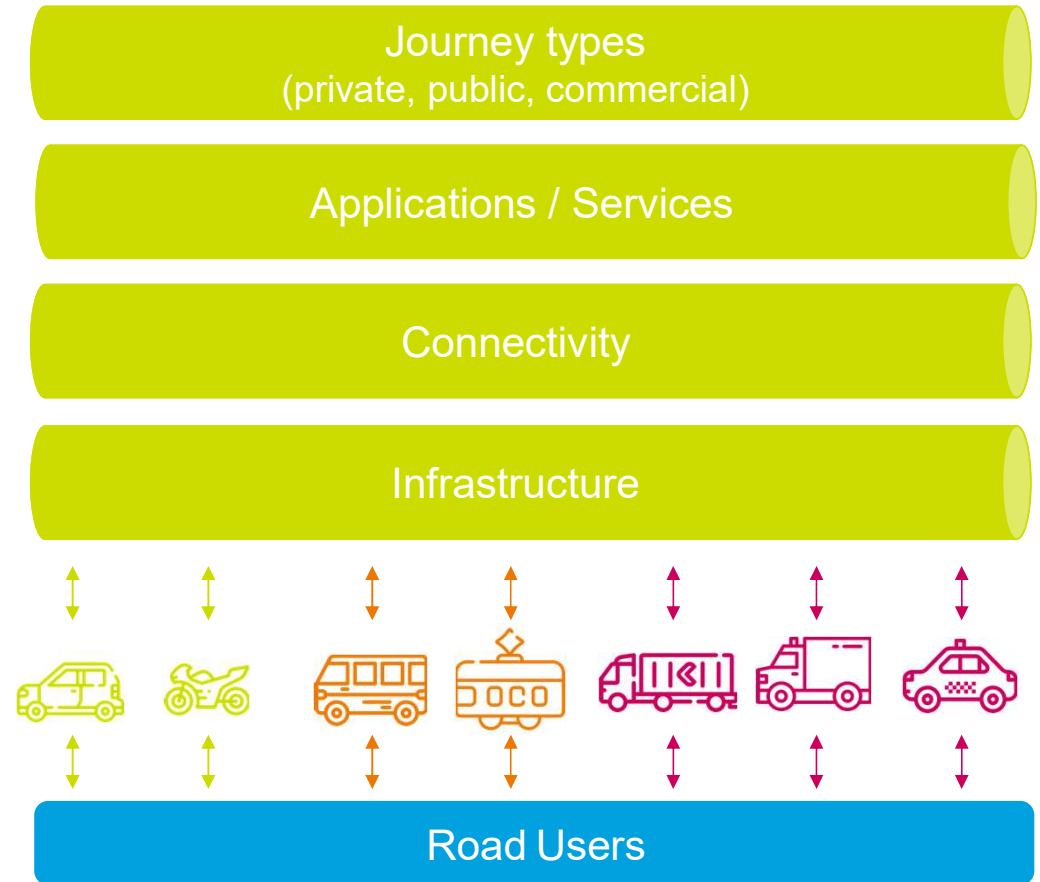
1. Vehicles / Technology
2. Infrastructure
3. People
4. Regulatory Frameworks and Operational Frameworks

Next Generation Transport

Physical Infrastructure



Digital Infrastructure



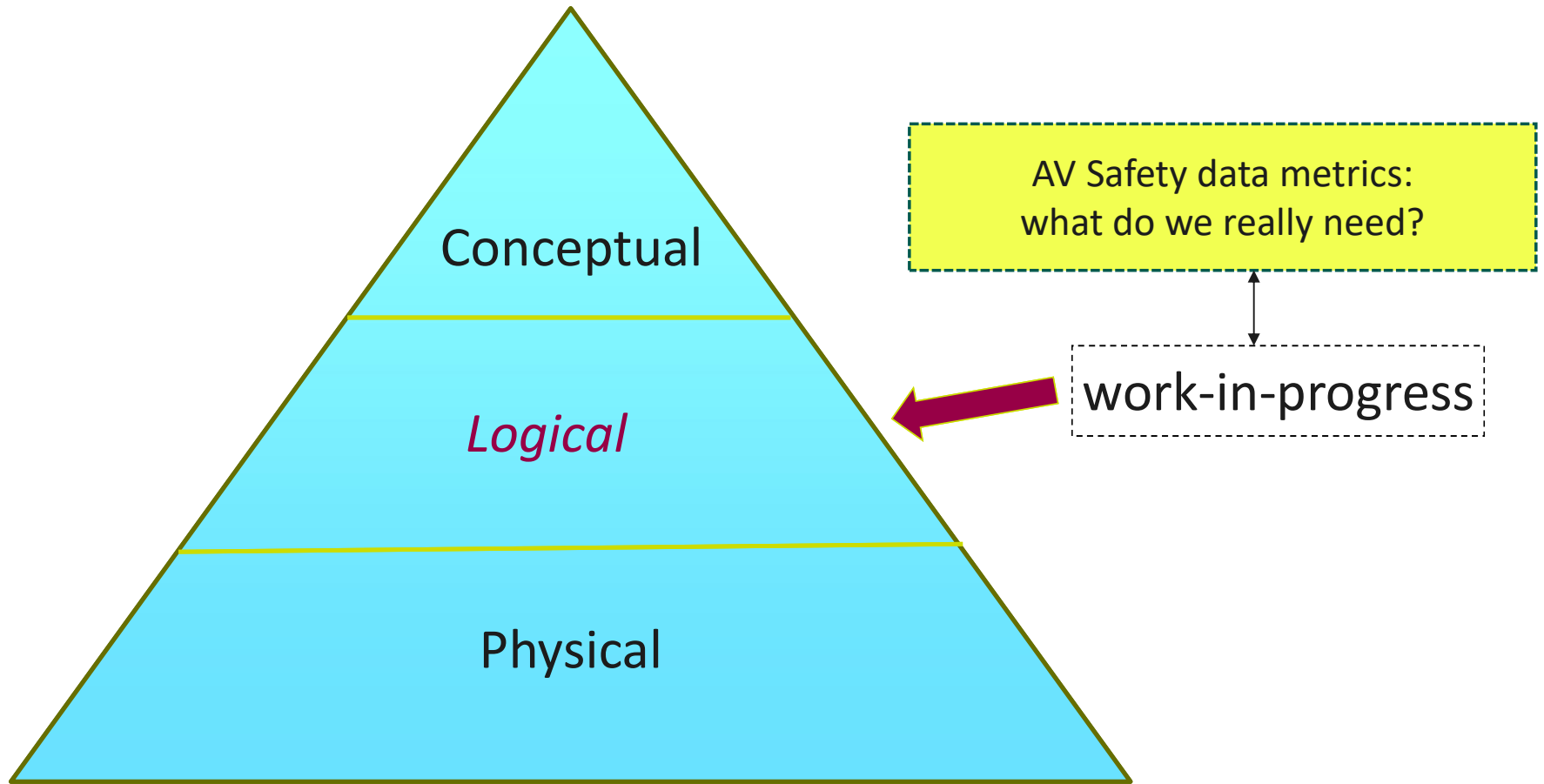
Transport System – Concept of Operations

Time horizon	Regulatory framework	Period
Today	Road Rules, Driver licensing, Vehicle registration	1920s to date (100 years)
Transition Period	Eco-system which includes AV systems safely interoperating within today's transport network environment	2015 onwards (over the next 10 to 30 or 40 years?)
Future	Fully Connected and Automated Vehicles	2050+

Key Question:

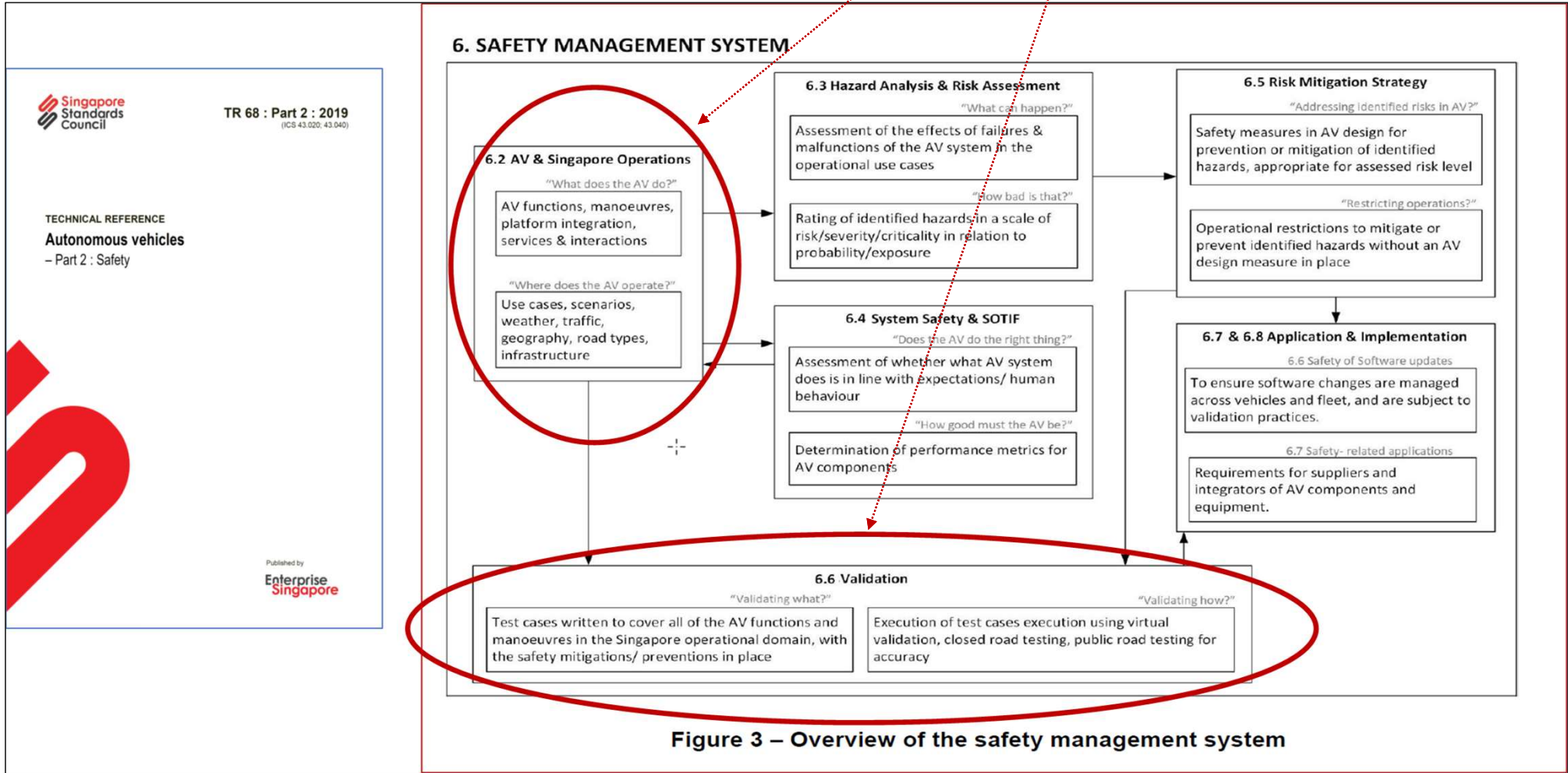
Can we use our existing regulatory and operational frameworks or will that require changes?

Transport System Architecture



Singapore example

Use cases



TR 68 : Part 2 : 2019
(ICS 43.020; 43.040)

TECHNICAL REFERENCE
Autonomous vehicles
– Part 2 : Safety

Published by
Enterprise Singapore

What is a Safety Management Plan?

- A safety management plan must be provided as part of the application for a trial
- Trialling organisations must develop a safety management plan outlining all key relevant safety risks for the trial and how they will be mitigated or eliminated.



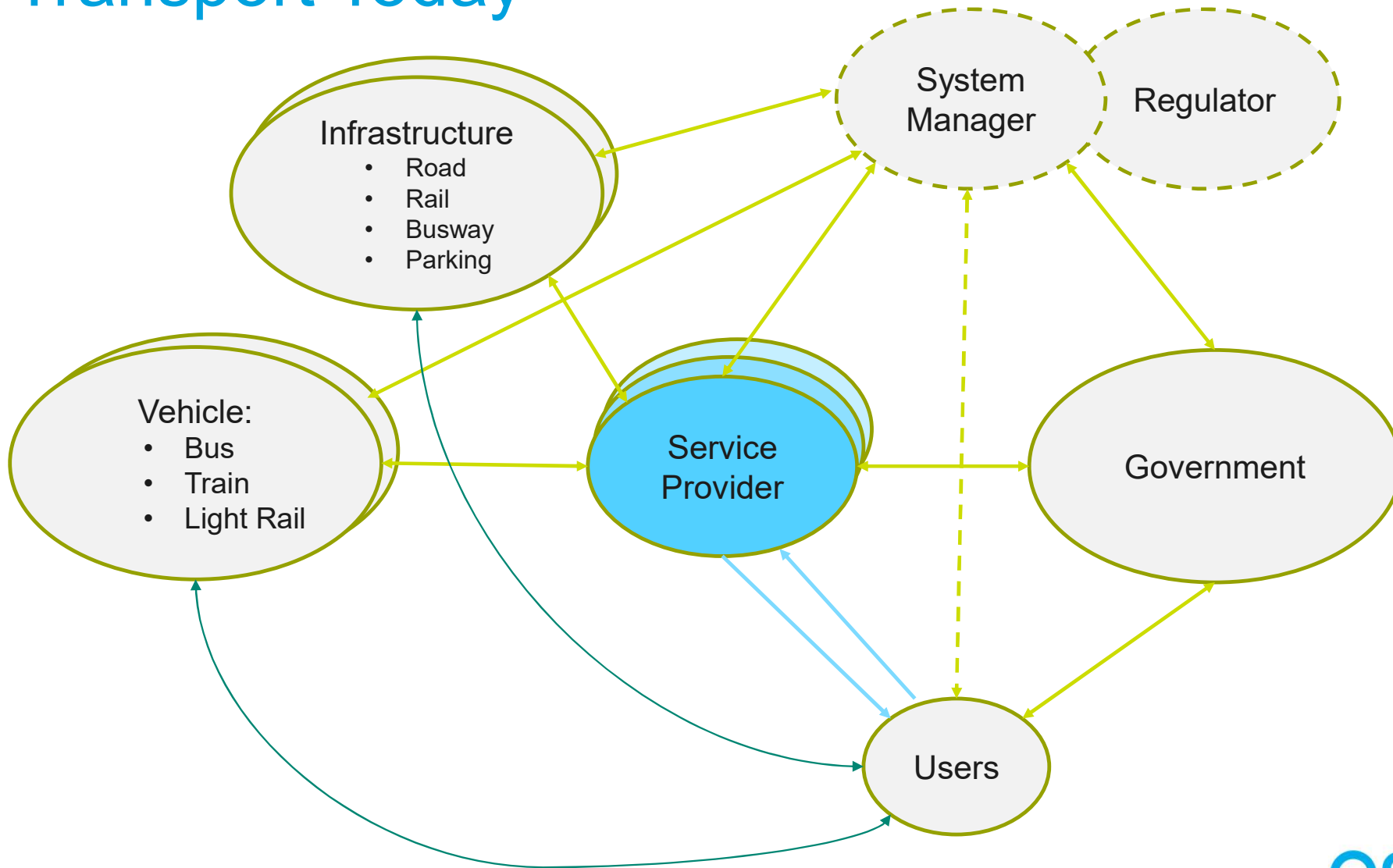
Source: Guidelines for Trials of Automated Vehicles in Australia, Austroads, NTC 2017

Outline of a Safety Management Plan

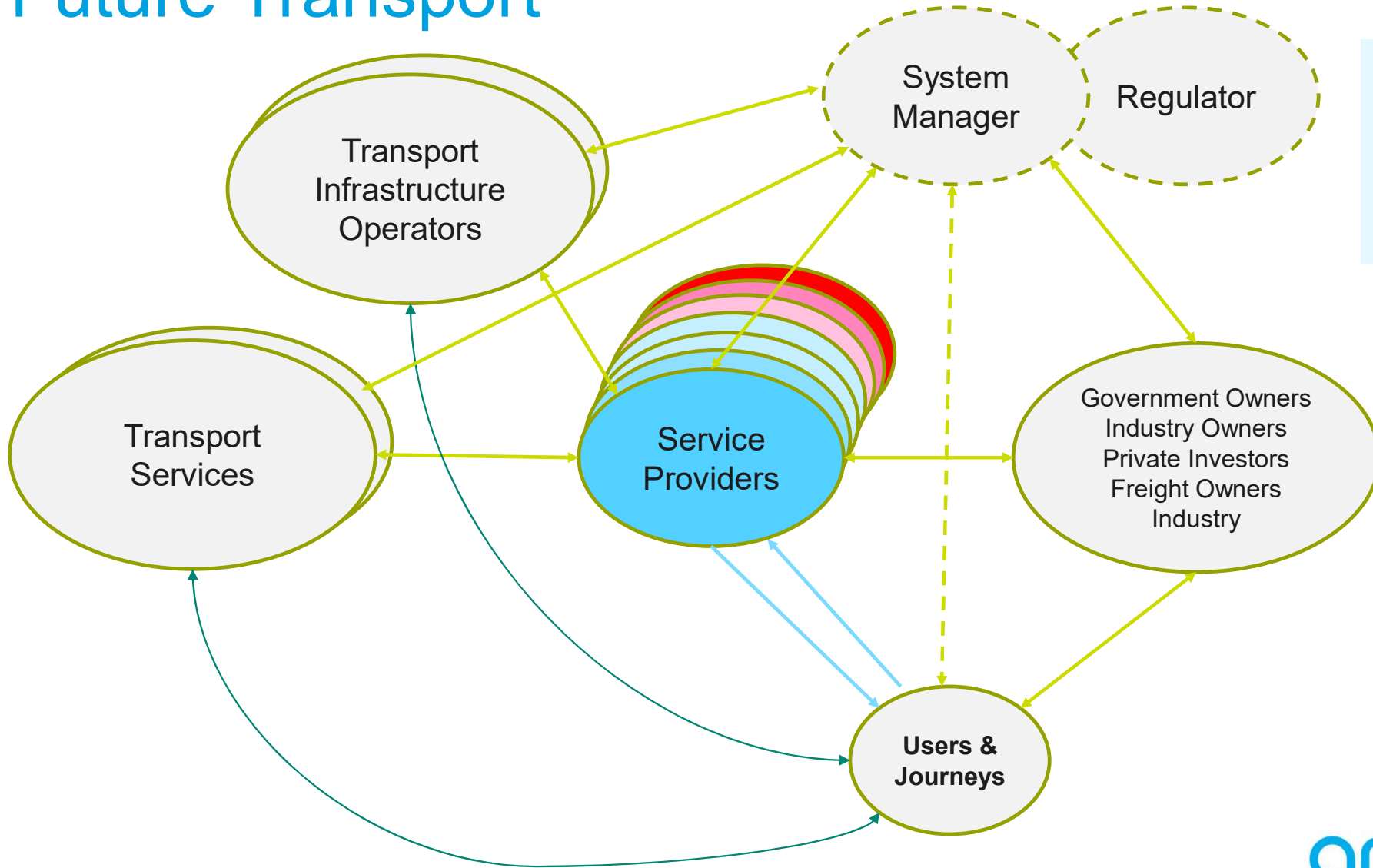
1	Scope of Project		Description
1.1	Project Objectives and Outcomes	<input type="checkbox"/>	Listing of objectives and desired project outcomes
1.2	Project Partners	<input type="checkbox"/>	Listing and details of project partners
1.3	Project Scope	<input type="checkbox"/>	Details of project scope
2	Vehicle / Technology		
2.1	The Vehicle	<input type="checkbox"/>	Details of the Autonomous Ground Vehicle (AGV)
2.2	The Technology	<input type="checkbox"/>	Details of the autonomous technology
2.3	The System (infrastructure, driver, operator)	<input type="checkbox"/>	Details of the autonomous system and interfaces
2.4	Use Cases	<input type="checkbox"/>	Details of the Use Case and Scenarios
3	Safety		
3.1	Safety Risk Checklist	<input type="checkbox"/>	Details of risks and control measures
3.2	Traffic Management Plan	<input type="checkbox"/>	Details of the traffic management plan, treatments
3.3	Incident Management Plan	<input type="checkbox"/>	Details of the incident management plan

4	Approvals and Compliance		
4.1	Approval from Agencies	<input type="checkbox"/>	Approval documentation
4.2	Compliance with Guidelines	<input type="checkbox"/>	Compliance acknowledgements
4.3	Insurance	<input type="checkbox"/>	Insurance details
5	Other relevant information		
5.1	Operators details	<input type="checkbox"/>	List of approved operators
5.2	Emergency contacts	<input type="checkbox"/>	List of emergency contacts
5.3	Vehicle identifier	<input type="checkbox"/>	Details of vehicle
5.4	Incident reporting sheet	<input type="checkbox"/>	Details of incident reporting form
5.4	Insurance certificate of currency	<input type="checkbox"/>	Insurance certificate
6	Appendices		
6.1	Training manuals	<input type="checkbox"/>	Details of training manuals
6.2	Risk Register	<input type="checkbox"/>	Risk register details
6.3	Operating manuals	<input type="checkbox"/>	Details of operating manuals
6.4	Service / maintenance manuals	<input type="checkbox"/>	Details of other manuals

Transport Today



Future Transport



Some examples of Australian work:
(i) General Safety Duty - ADSE – Automated Driving System Entity
(ii) 'First Supply' AV Regulator
(iii) "In-Service" AV Regulator

<https://www.ntc.gov.au/transport-reform/ntc-projects/in-service-safety-AVs>

Where to from here?

- Not one size fits all
- Ecosystem – Prescriptive as well as Safety Management Systems co-exist
- Starting on our journey
- Logical architecture development is only just beginning
 - We have yet to scale the trials and future concepts of operations
 - Regulatory frameworks
 - Operational frameworks
 - Roles and responsibilities
 - Actors who will perform those roles are unclear
- 80% design of a logical architecture is the easy bit
- Remaining 20% of logical architecture will take 80% of our effort (i.e., next 10-20 years)
- Then we will flip to CAVs

The image features a blue background with a pattern of white dots that form a grid and several curved lines. In the top left, the letters 'arrb' are written in a white, lowercase, sans-serif font. Below this, a large, light blue, rounded rectangular shape contains the text 'SHAPING OUR TRANSPORT FUTURE' in a blue, uppercase, sans-serif font.

arrb

SHAPING
OUR
TRANSPORT
FUTURE

Dr Charles A Karl
ARRB Group, Australia
charles.karl@arrb.com.au
+61 467 412 246