

Connected and Autonomous Vehicles (CAV): Implications for road authorities and TII

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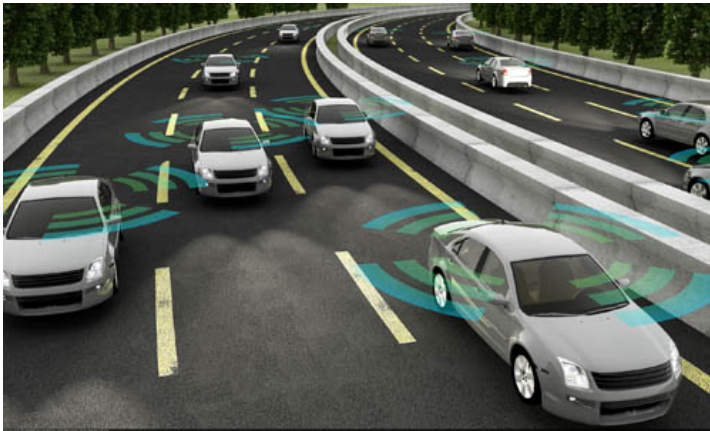
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What are Connected and Autonomous Vehicles (CAVs)?

Connected Vehicles

The connected vehicle concept is about supplying useful information to a driver or a vehicle to help the driver make safer or more informed decisions.

Use of a “connected vehicle” doesn’t imply that the vehicle is making any choices for the driver.



Autonomous Vehicles

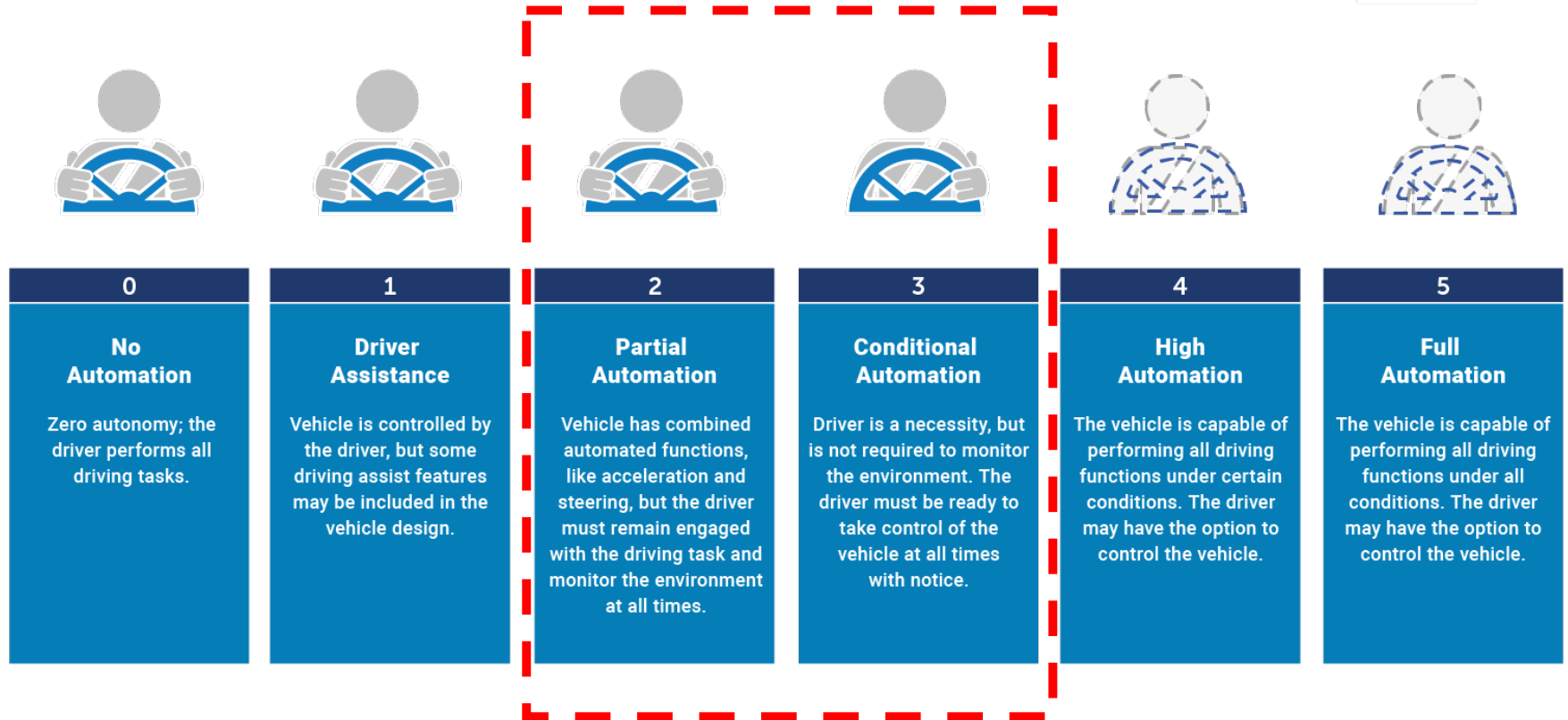
A fully autonomous vehicle does not require a human driver—rather, they are computer-driven.



Automation Levels

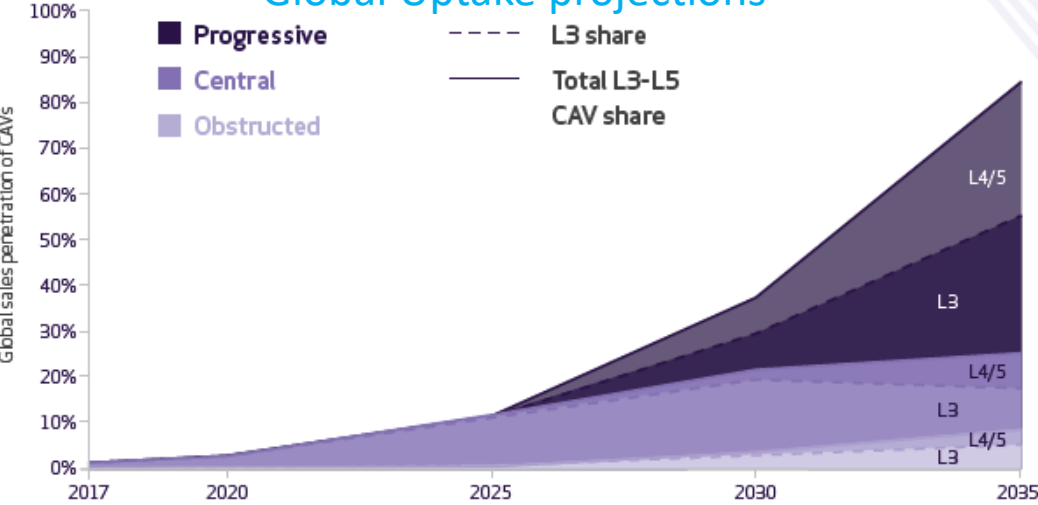
SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) AUTOMATION LEVELS

Full Automation



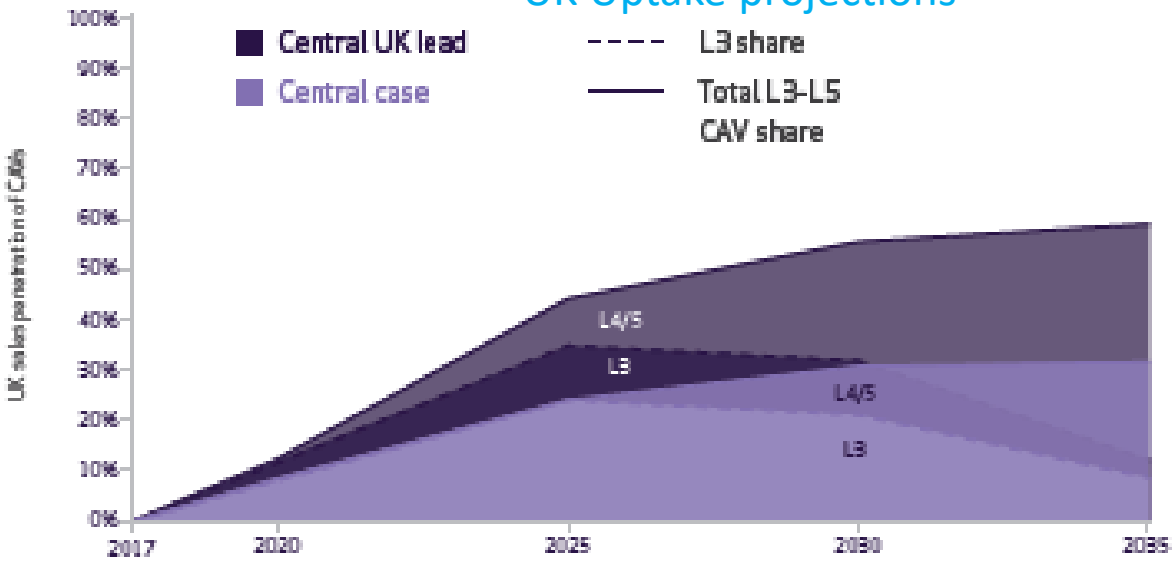
What are the projections for CAVs?

Global Uptake projections



Based on current projections a mixed traffic environment with varying levels of CVs, AVs and CAVs will exist for the foreseeable future

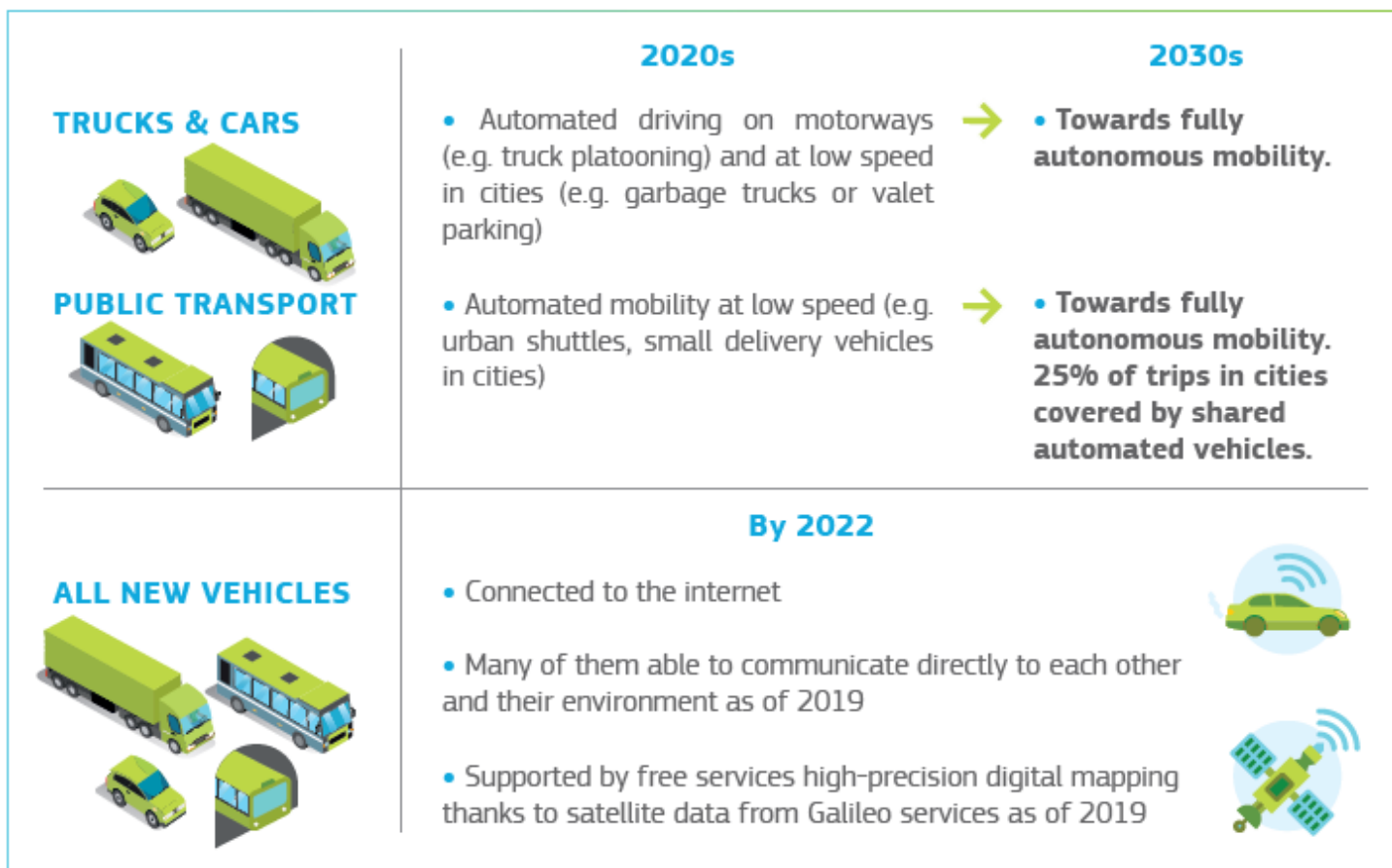
UK Uptake projections



Source: Catapult Market Forecast for CAV (July 2017)

What are the European projections for CAVs?

TIMELINE



•Source: European Commission: Europe on the Move

Some Key Terms around CAVs?

CAV – Connected Autonomous Vehicles

CAD – Connected Autonomous Driving

CCAM – Cooperative, connected and automated mobility

ITS – Intelligent Transport Systems

C-ITS – Cooperative Intelligent Transport Systems (technologies which allow road users and traffic managers to share information and coordinate actions)

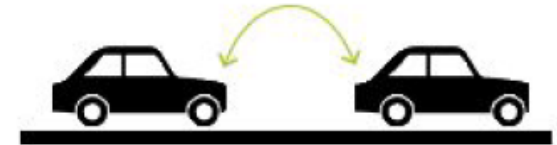
Day 1 Services – ITS services that are expected imminently

Day 1.5 Services – ITS Services that are expected in the short to medium term

V2V – Vehicle to Vehicle Communications

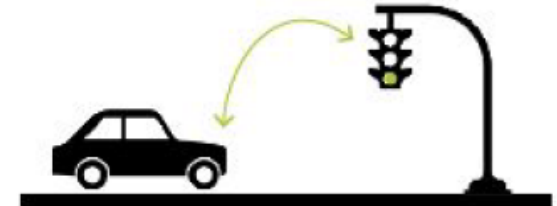
V2I - Vehicle to Infrastructure Communications

V2X – Vehicle to Everything



V2V: Vehicle to Vehicle

Each vehicle is a node with the ability to send and receive critical safety + mobility information to other vehicles.



V2I: Vehicle to Infrastructure

Vehicles are able to send and receive information to surrounding infrastructure such as traffic signals and road sensors.



V2X: Vehicle to Everything

Vehicles can communicate with other vehicles, infrastructure and other users of the public right-of-way for a safer, more efficient transportation network.

Ireland – Government led Activity in this area

Government Interdepartmental Group established

-Regulatory and Technical challenges being examined

Government Roadmap for CAVs under development

-Pillars of focus established and under review

Government Test Guidelines group established

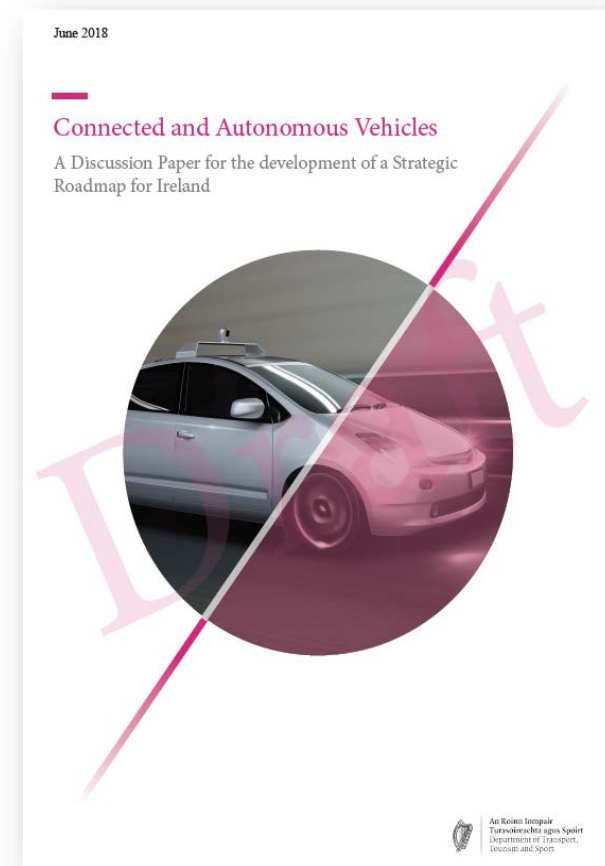
-Preparing guidelines for the Testing of AVs on Irish roads
- Preparing of a Safety Framework for CAV deployment

Government Guidelines on Data & Cybersecurity

- Under development

Customer behaviour research undertaken by RSA

-Less than 40% of people would trust an AV in Ireland at present



Key Areas of Concern for National Road Authorities

CEDR Research:

How will automation change the core businesses of NRAs?

Safety

- How can automation support, within a generation, roads as safe to travel on as railways?
- How can NRAs strive for zero fatalities?
- What new risks will be introduced?

Traffic efficiency

- What will be the impact of CAD on traffic flow?
- How can automation increase lane capacity?
- What traffic management will NRAs need to implement to realise efficiency?

Construction and maintenance

- How can automation support NRAs to reduce maintenance and construction costs by 30%?
- How can sensors from connected vehicles detect potholes, obstructive foliage, ride quality, skid resistance and other indications of road condition?

CEDR overview of national roads authorities' core business



Risks of unintended consequences

- Could automation result in carriageway rutting, reduced capacity? Could structures need strengthening or widening?

Risks & Unknowns relating to CAVs for road authorities

There are 4 areas of consideration around future Transport/Mobility

Physical Infrastructure

- Understanding the investment needs

Digital Infrastructure

- Capturing the vast realms of data and using it to understand how the mobility network

Customer Behaviours

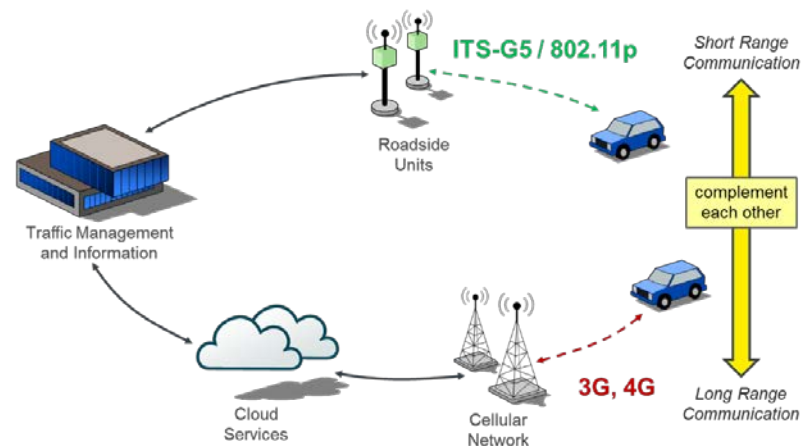
The Vehicle

- New types of vehicles (CAVs etc) are not a silver bullet, connecting them to the system needs of the transport network is.

Unknowns relating to CAVs for road authorities

At present **COMMUNICATIONS** is the largest unknown

- What technology?
- Who provides it?
- What infrastructure is required?
- How is data transferred?

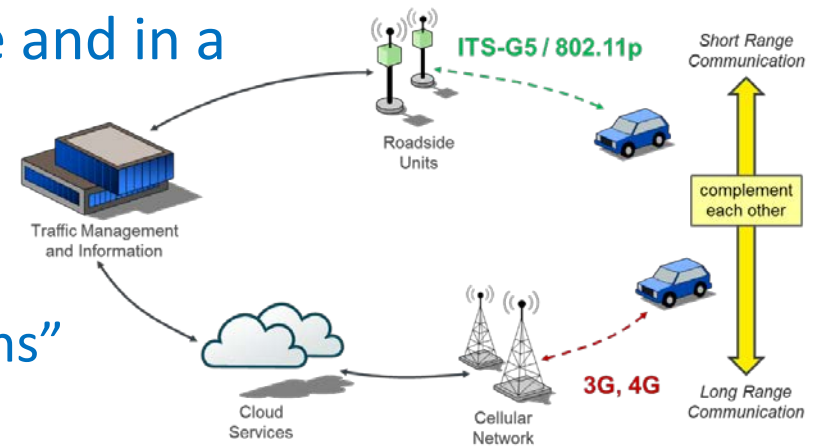


Other unknowns for **PHYSICAL INFRASTRUCTURE** are:

- Impacts on the layout and design of infrastructure e.g. crash barriers, speed signs, VMS on different road types
- Impacts on driver choice and behaviour
- Impacts on travel demand
- Rate of penetration of CAV , implications of mixed fleet

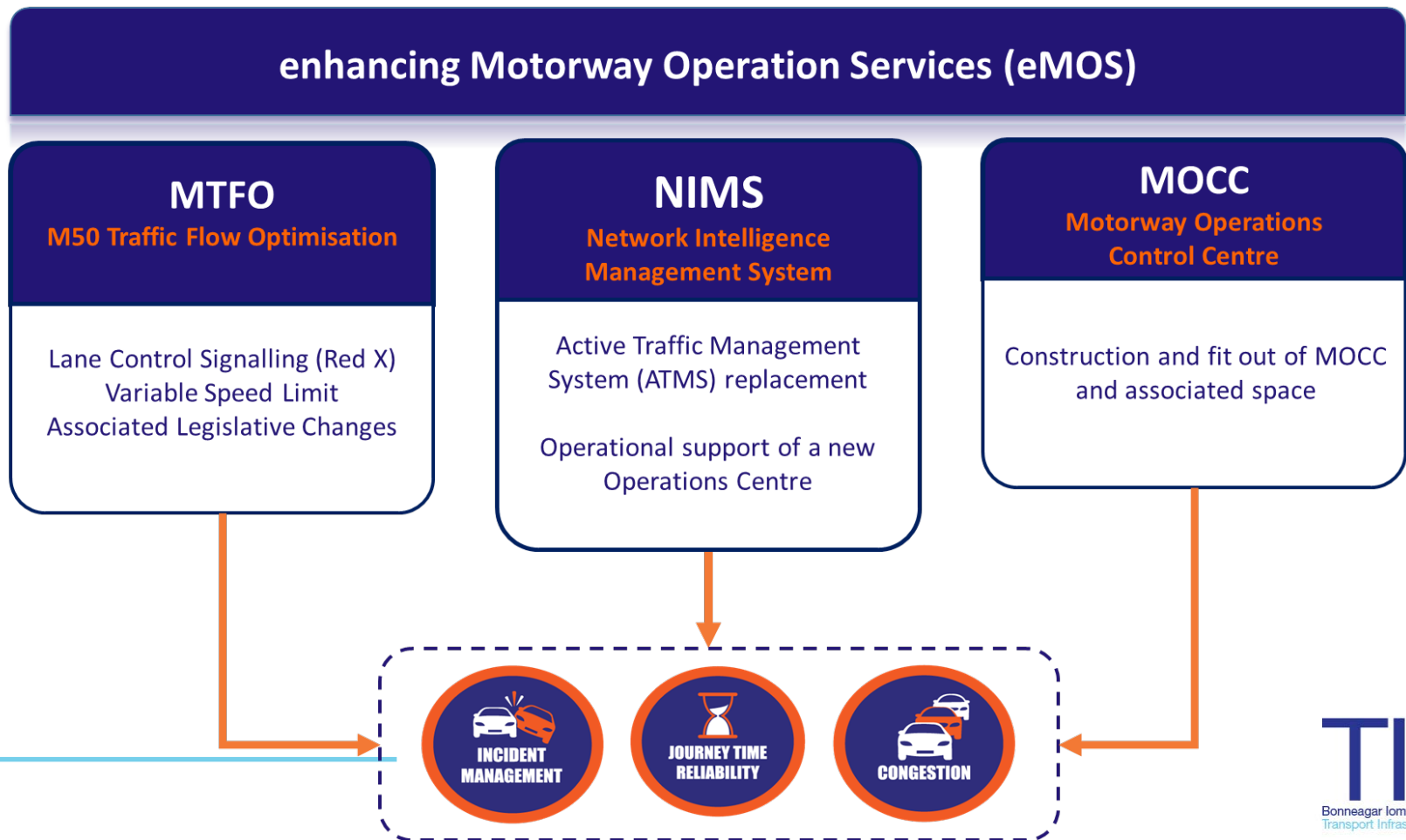
C-ITS “Cooperative Intelligent Transport Systems

- C-ITS is a system by which vehicles and road operator traffic systems exchange and use information in real-time and in a coordinated manner.
- Use of dedicated road-side “beacons” and/ or 3/4/5G data networks to communicate directly with vehicles.
- road operators communicate messages (e.g. “queuing ahead” or “roadworks ahead”) directly to in-vehicle displays instead of by Variable Message Signs.



Readiness for Short Term Expectations

eMOS , the M50 project to provide some Physical and Digital Infrastructure required for connectivity

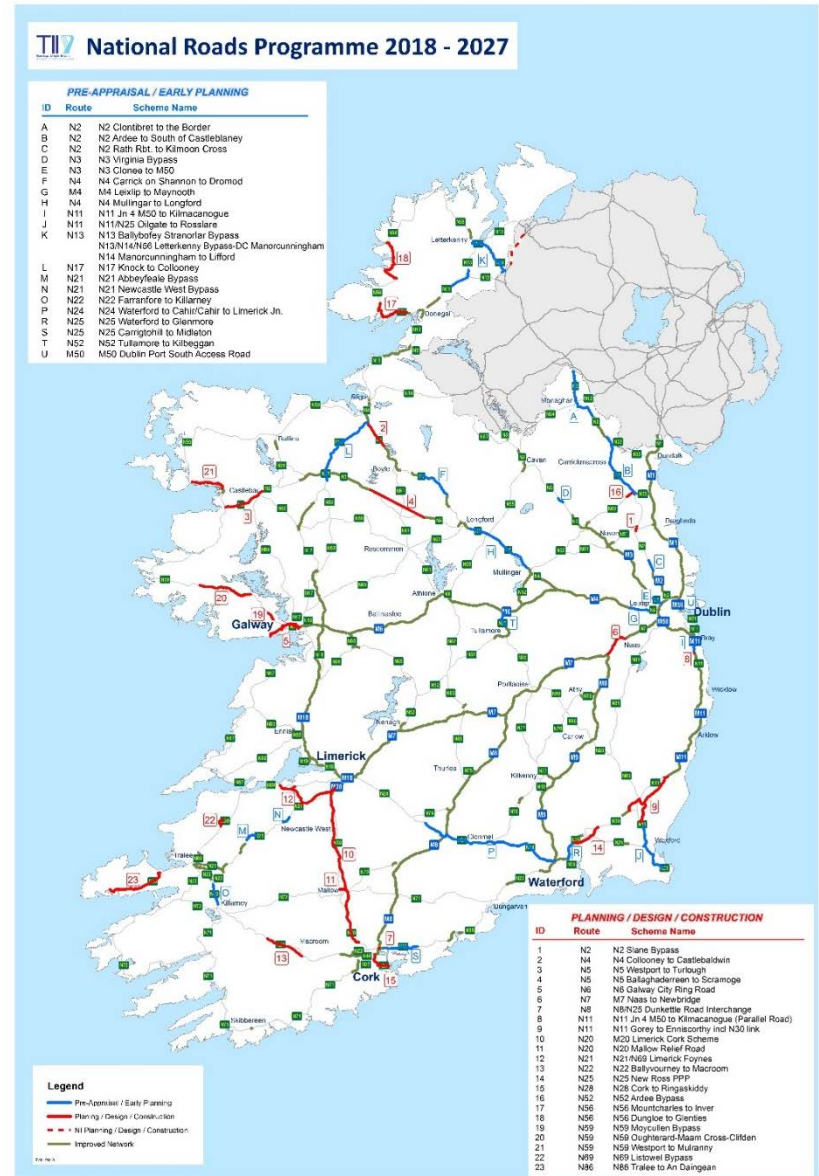


TII responses to supporting CAV deployment

TII Responses to Supporting CAVs on Future Schemes

Project Ireland 2040: National Development Plan has provided a 10 year investment strategy to progress 39 projects through planning, design and construction.

The challenge for TII is to ensure that the projects that are developed over this 10 year period facilitate the rollout of CAD / CAV.



TII responses to supporting CAV deployment

TII's strategy to support CAVs deployment has several strands

1. Develop an new ITS Strategy for TII (C-ITS Strategy)
2. Undertake Standards Work packages to determine physical and communications infrastructure
3. Undertake a C-ITS Pilot on the M50
4. Develop a TII plan for CAV Readiness
5. On-going Research with CEDR and others
6. Facilitate CAV Testing on the National road network
7. Continued and expanded collaboration with stakeholders

Standards Update

TII standards currently make the provision of ducting a mandatory requirement

Use	Road Type			
	Each Verge			One Verge
	Motorway with Lane Control Signals	Motorway	Dual Carriageway	All other roads
TCC Power	2 x 100mm			
TCC Communications	4 x 100mm	4 x 100mm	4 x 100mm	2 x 100mm
Department of Communications	2 x 100mm	2 x 100mm	2 x 100mm	2 x 100mm
Ducting reserved for third parties	2 x 100mm	2 x 100mm	2 x 100mm	2 x 100mm

Table 7-1 Ducting Provision in each verge

- This does not consider the space required for communications masts or equipment, gantries, access for servicing etc
- Other areas for consideration include signage and road markings requirements, security of ducting and communications equipment
- TII Standards Commission will review and update standards accordingly

Thank You

The image features a solid light blue background. In the top right corner, there is a decorative graphic consisting of three parallel, diagonal lines that slope downwards from left to right. The lines are a slightly darker shade of blue than the background.