



An Roinn Iompair
Department of Transport



CLIMATE ACTION PLAN 2021

ACTION 252 - SCOPING REPORT FOR POTENTIAL INTRODUCTION OF DYNAMIC TRAFFIC MANAGEMENT ON MOTORWAY / NATIONAL ROAD NETWORK

DECEMBER 2022



CLIMATE ACTION PLAN 2021 – ANNEX OF ACTIONS

Action	252	Continue rollout of variable speed limits/dynamic traffic management infrastructure on the M50 Motorway to increase safety and reduce congestion			
Steps Necessary for Delivery	Proposed Output	Timeline	Lead	Key Stakeholders	
High-level scoping for potential introduction on other motorways / national roads	Published Scoping Map	Q2 2022	D/Transport	TII	

Road transport, specifically from operating fossil fuel powered (or internal combustion engine) vehicles has significant negative impacts through the generation of greenhouse gas (GHG) emissions and result in environmental damage/costs and health effects on society. These impacts and costs are imposed on the environment as a whole as opposed to the operator of the vehicle.

The introduction of Variable Speed Limits (VSLs) has been shown to, improve safety and journey times it can also indirectly contribute to reduction in air and noise pollution, and GHG emissions from road transport, particularly those associated from fossil fuel powered vehicles.

Air Quality

The road transport system in Ireland is highly fossil fuel dependent (diesel & petrol), which results in significant emissions of GHGs and air pollutants that are contained in exhaust fumes. Oxides of nitrogen (NOX), Polycyclic Aromatic Hydrocarbons (PAH) and Particulate Matter (PM) are the primary pollutants produced by traffic emissions which negatively impact air quality. The pollutants can have significant health implications and have been linked to the development of respiratory and cardiovascular diseases.

Climate Change

Road transport is one of the principal sectors contributing to increasing GHG emissions, consequently aggravating climate change trends. The burning of fossil fuels from road transport releases carbon dioxide (CO₂) into the atmosphere which contributes to climate change. Consequently, the decarbonisation of the transport sector is a key priority; however, reducing congestion and ensuring road networks are operating efficiently can also help reduce GHG emissions.

Benefits from implementation of VSLs on Air Quality and Climate

As outlined above, road vehicles emit a variety of GHG and air pollutants. Congested, slow moving and stop-start traffic generates substantially higher emissions than smoother moving traffic. Whilst the primary aim of Variable Speed Limits (VSLs) and similar traffic management measures is to limit congestion and increase road user safety the use of such technology also reduces greenhouse and noxious gas emissions through the reduction in stop-start driving.

In terms of fuel consumption and vehicle emissions (which is directly linked to air pollution) the optimum speed to minimise greenhouse and noxious gas emissions is 65 – 75km/hr. Due to the considerable daily variation in speeds at any given location, time, or day it would be difficult to accurately quantify the emission benefits of the M50 VSL scheme. However, in a scenario where VSL reduced the variability in speeds during the 08:00 – 09:00 period to that



experienced during the 07:00 – 08:00 period, it is estimated that the outcome achieved would be 3% reductions in CO₂ and NO_x, 4% reduction in PM and over 7% reduction in VOC.

VSL systems have been employed on UK motorways over many years to control the traffic flow, including on the M25 London Orbital where VSLs have been in operation since 1995. At the early stage of operation, VSLs were triggered by increasing traffic volumes or the detection of incidents and queues. In 2004 monitoring data reported a reduction of emissions along the M25 directly linked to the implementation of the VSL systems. This was attributed to the decrease in stop-start driving and improved compliance with the speed limits. Similar benefits would be anticipated to occur along Ireland’s national road network with the introduction of VSL / dynamic traffic management systems.

VARIABLE SPEED LIMITS



M50 Variable Speed Limit

Variable Speed Limits are intended to improve the operational efficiency of a motorway by smoothing traffic flow (by reducing the amount of stop – start braking and acceleration by drivers), improving journey time reliability and reducing the number of secondary traffic collisions. This is achieved through modification of the speed limit in various sections to limit localised build-up in-vehicle concentration. In this regard, VSL does not seek to increase capacity, manage or redistribute demand but seeks to improve the flow conditions, reduce incidents, reduce emissions and improve the reliability of the motorway by controlling and enforcing speeds. This is achieved through the setting of mandatory speed limits (using illuminated digital signs displayed overhead each lane) that are the most appropriate speed to the prevailing traffic conditions at that time. Using the same overhead illuminated signage, a Lane Control Signalling (Red X) regime is also part of the system. This allows the rapid deployment of lane closures to protect road users and emergency services during an incident



on the route. This signalling provides greater protection to road workers when performing their duties on the motorway. Although Red X is an essential safety feature of the system, it does not contribute to a reduction in emissions.

The expected benefits of introducing VSL, have been identified as outlined below:

Proactive Benefits

- The primary objective of the VSL system is to proactively smooth traffic flow and reduce the prevalence of stop-start driving and unexpected vehicle movements which can cause shockwaves and lead to a breakdown in traffic flow. The main benefits of reducing turbulence in the flow are improved reliability and safety, which is realised through reduced variability in journey times and a reduction in incidents.
- This improved traffic flow behaviour leads to a reduction in injury incidents. In addition, there are currently a significant number of incidents (both injury and non-injury incidents) related carriageway or lane closures on sections of the motorway network. The reduction in incidents (both injury and non-injury incidents) will reduce the number of lane closures and associated delays incurred by motorway users.
- Speed enforcement will result in uniform average speeds across all lanes which will reduce the prevalence of weaving and lead to a better balance of lane usage. This will lead to an improved level of service for users and ensure the road capacity is efficiently utilised during periods of high demand.
- Improved driving behaviours and reduced flow turbulence reduces emissions from road users.

Reactive Benefits

- During incidents or periods of congestion, the system sets signals and message signs to inform and advise drivers to manage incidents and reduce congestion effectively.
- In the event of incidents, it protects road users and emergency workers from secondary incidents

Economic Benefits

The benefits arising post scheme completion will be manifested in five main areas as per below.

- Reduction in incidents and related injuries/casualties.
- Reduction in delays associated with incidents as the number of incidents reduces.
- Level of Service Improvements through improved reliability.
- Reliability Improvements; and
- Environmental Impacts as a result of reduced congestion.

Infrastructure Requirements

Given current technologies available and the make-up of the road fleet, variable speed limit schemes require the installation of a significant amount of civil and electronic infrastructure to allow the display of the appropriate speed to all drivers on the section of the road.

Usually, a VSL scheme consists of the following new components:

- Gantries with associated parking and walkways
- Lane Control Signals to display regulatory speeds and Red X
- Variable Message Signs to provide supporting driver information
- Incident Detection equipment



- CCTV cameras
- Optical Fibre and power cabling
- Associated Ducting and roadside cabinets
- Weather Station / Systems
- Enforcement Cameras
- Provision of safe parking and access facilities for maintenance personnel.

In addition, augmentation of existing infrastructure / services is also required

- Resourcing of Motorway Operations Control Centre – ICT & personnel
- Enhancement of the Network Intelligence and Management System which controls the roadside electronic infrastructure.

Consequently, variable speed limit schemes are costly to implement and are most suitable for use on high volume sections of the motorway network. Given current technologies, variable speed limits are not currently a realistic prospect for single carriageway sections of the network. However, the future adoption of cooperative ITS (C-ITS) technologies should allow a broader adoption of VSL systems with less costly roadside deployment.

The first section of the variable speed limit scheme on the M50 Dublin Ring Road commenced operation in October 2021 and the roll-out on the remaining sections is continuing. It is expected that knowledge gained during this learning phase will inform the roll-out of further VSL schemes on the network. Given their cost, traffic flow levels and operational practicalities, variable speed limits schemes are likely not appropriate on all sections of the motorway and high-speed dual carriageway network.

It should be noted that gantries along the M50 are provided typically at a maximum separation of 1000m in each direction. A number of the key radial/approaches onto the M50 have already been equipped with similarly spaced gantries, with the capability to retrofit equipment to allow for the provision of VSL / LCS capability. There are however further sections of the motorway network where provision of VSL / LCS may be appropriate subject to technical and cost analyses being carried out.

Potential Locations

- M1 southbound J4 Donabate to J1 M50 (7.5km)
- M50 northbound J3 M1 to Dublin Tunnel
- N3 eastbound J4 Clonee to J1 M50
- M4 eastbound J7 Maynooth to J1 M50
- N7 eastbound J4 Rathcoole to J1 M50
- N11 / M11 northbound J8 Kilmacanogue to M50
- N40 eastbound & westbound J1 Poulavone to J11 Dunkettle
- M8 southbound J17 Watergrasshill to J19 Dunkettle
(Note: - Impact of Dunkettle Interchange upgrade works would need to be assessed)
- N25 westbound J4 Carrigtohill to J1 Dunkettle

Over the coming years it is expected that the number of digitally connected vehicles on the network will continue to increase significantly, affording the opportunity to avail of C-ITS technologies and a reduction in the requirement for expensive roadside deployments. This



would allow the adoption of an alternative approach to the development of VSL schemes that would require less civil and electronic infrastructure.

ASSOCIATED POTENTIAL NETWORK ENHANCEMENTS

The continued evolution of ITS / C-ITS technology coupled with knowledge being gathered from the construction and operation of VSL and related schemes may allow the implementation of related dynamic traffic management schemes on other sections of the network. These schemes would use similar Intelligent Transport System technologies as deployed on the M50 to address other operational challenges.



M7 Average Speed Camera

- **Average Speed Management** – Provision of average speed camera infrastructure to promote driver compliance at locations of identified safety issues.
- **Bus Lanes** – Provision of infrastructure required for a VSL scheme would facilitate the use of the hardshoulder to provide dedicated lanes for scheduled high-capacity and high frequency buses at locations of regular slow-moving congestion where the road cross-section allows.
- **Emergency On Network Parking** – Provision of infrastructure to allow parking of port bound HCV traffic on the network in response to congestion or closure of Dublin Port or similar.
- **CCTV** – Wider provision of CCTV would allow monitoring of network and facilitate faster incident responses.
- **Weather** – Provision of location specific weather information (including high winds and hail incidents) to vehicles across the network and where appropriate implement an appropriate traffic management response e.g. reduce speed in hail event.



ONGOING ACTIVITIES

TII currently has ongoing work and design activities in the area VSL or similar dynamic traffic management. These include inter alia: -

- Completing the implementation of the variable speed limit scheme on the M50 Dublin Ring Road and continuing to monitor the outcomes up to and after the system is fully operational,
- Designing dynamic traffic management schemes for key locations on the M1 radial approach to the M50,
- Assessing the impact of the M7 Average Speed Camera trial to determine its impact and suitability for roll out of the technology elsewhere on the network,
- Examining the potential for innovative use of these and other innovative technologies arriving to market to address identified operational or compliance issues on the network,
- Assessing identified potential schemes for suitability for deployment of the technology,
- Carrying out appropriate cost benefit analyses.

SUMMARY

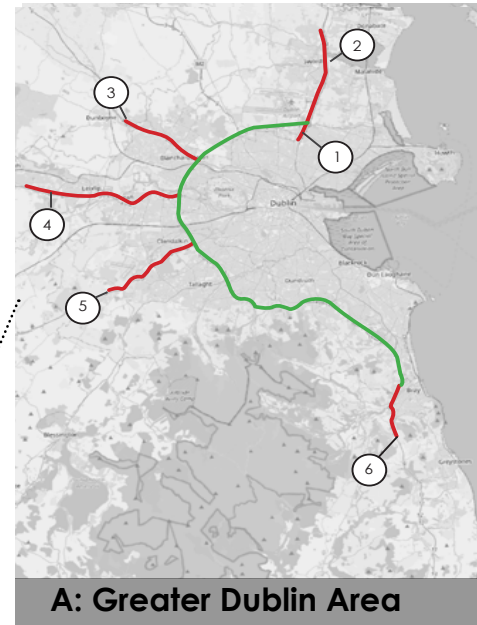
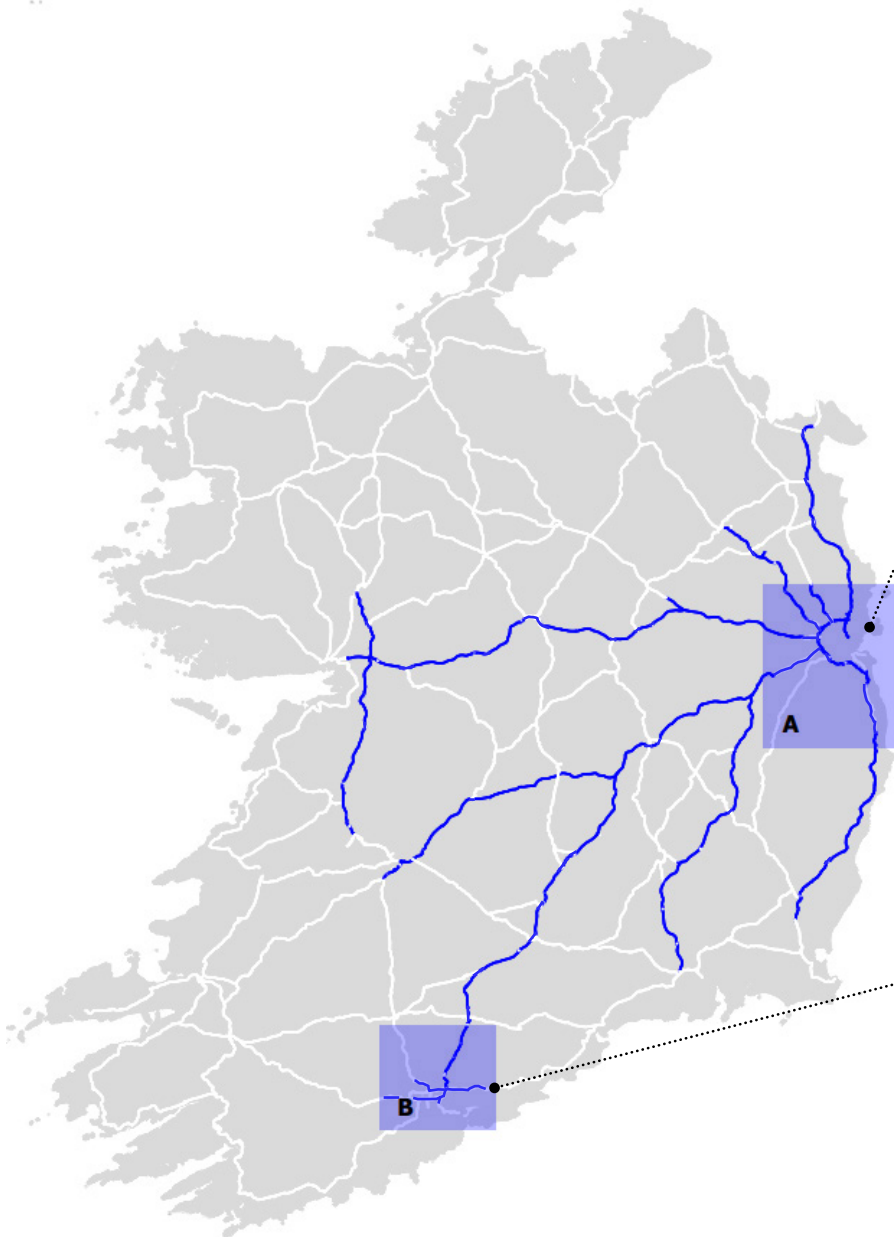
This report provides an overview of the variable speed limit technology scheme being implemented on the M50 Dublin Ring Road and identifies the potential for technology of this kind to be implemented on other sections of the network to achieve safety and climate action benefits. The deployment of the technology is expensive, but it has the potential to contribute positively to overall carbon reduction targets, in tandem with other carbon reduction initiatives.

Climate Action Plan 2021

Action 252: Potential Locations for Variable Speed Limits



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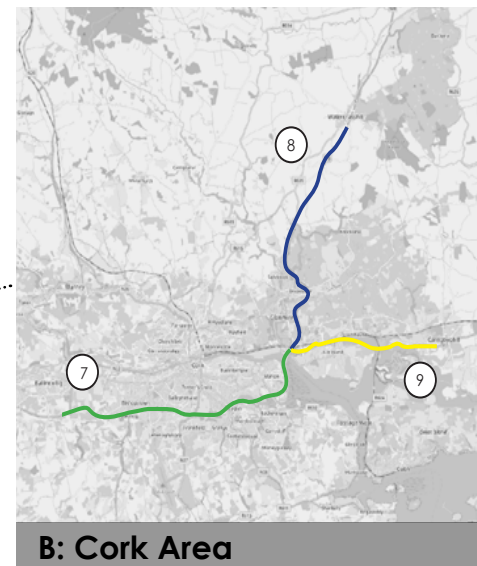


Legend

M50 Variable Speed Limit Scheme

Potential VSL Areas (Greater Dublin Area)

- ① M50 Northbound J3 M1 to Tunnel
- ② M1 Southbound J4 Donabate to M50 J3
- ③ N3 Eastbound J4 Clonee to M50 J6
- ④ N4 Eastbound J7 Maynooth to M50 J7
- ⑤ N7 Eastbound J4 Rathcoole to M50 J9
- ⑥ M11 northbound J8 Kilmacanogue to M50



Legend

Potential VSL Areas (Cork Area)

- ⑦ N40 J1 Poulavone to J11 Dunkettle
- ⑧ M8 Southbound J17 Watergrasshill to J19 Dunkettle
- ⑨ N25 Westbound J4 Carrigtohill to J1 Dunkettle

Note: This map to be read in conjunction with the Scoping Report for Potential Introduction of Dynamic Traffic Management on Motorway / National Road Network