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Sustainable Mobility Policy Review

Background Paper 4 Congestion



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Context and questions for consideration

This background paper is one of a number of papers that have been prepared by the Department of Transport, Tourism and Sport to inform a public consultation on Ireland's sustainable mobility policy. The review work arises from a commitment in the *Programme for a Partnership Government*¹ to review public transport policy "to ensure services are sustainable into the future and are meeting the needs of a modern economy". The public consultation is designed to give stakeholders, interested parties and the general public the opportunity to reflect on the information and analysis in the papers, to share their views, and to contribute to the development of a Sustainable Mobility Policy Statement.

Sustainable Mobility can be described as linking people and places in a sustainable way by supporting:

- comfortable and affordable journeys to and from work, home, school, college, shops and leisure;
- travelling by cleaner and greener transport; and
- a shift away from the private car to greater use of active travel (walking and cycling) and public transport (e.g. bus, rail, tram).

All elements of sustainable mobility (public transport, cycling, walking) are being considered in the policy review. Each background paper includes a number of questions to generate ideas about the extent to which the present approach to sustainable mobility is working well, the areas which are not, and future priorities.

This background paper sets out trends in Irish traffic congestion, policy interventions to date, other potential interventions and international examples to address traffic congestion. The questions below are included as a guide. Participants in the public consultation are not confined to answering the suggested questions and are invited to offer any other contribution they wish to make. It is recommended that submissions are confined to circa 2,500 words or less.

- 4.1 What are the opportunities and challenges around reducing traffic congestion in our cities and other urban areas and how can sustainable mobility respond to these?
- 4.2 Should additional demand management measures be considered, alongside supply focused measures, to address urban congestion – for example congestion charging/road pricing?
- 4.3 Are there international best practice examples to address traffic congestion that could be applied in an Irish context?

1 Structure of the paper

- Section 2:** **Traffic congestion and Ireland** defines road-based traffic congestion and its causes and identifies the economic, environmental and social causes of congestion. It then focuses on trends in transport demand in Ireland. In order to visualise the nature of congestion in Ireland, the Section includes a number of maps looking at the performance of a sample of key roadways in the Greater Dublin Area (GDA), Cork and Galway.
- Section 3:** **Existing policy approach** sets out the existing policy approach in Ireland to tackle congestion at national, regional, metropolitan and local level. It identifies the stakeholders who have a role in the alleviation of congestion and the current institutional arrangements in place. The relevant strategies both nationally and regionally are also outlined along with the existing targets and expected results of these strategies.
- Section 4:** **Interventions** looks at the aim of policy interventions to address congestion including decoupling the growth of private car use from future growth in travel demand. It lists common demand and supply focused policy interventions to reduce traffic congestion and these interventions are expanded on in Sections 5 and 6. The Section also considers road capacity and induced demand. Finally it sets out the interaction between interventions to alleviate congestion and other Government policy areas.
- Section 5:** **Supply-focused interventions** describes supply focused policy options to alleviate congestion particularly investment in sustainable mobility capacity. This includes development of sustainable mobility infrastructure (public transport, active travel) and provision of additional public transport services. The Section also looks at a number of supply-focused road measures including road space reallocation and road space widening.
- Section 6:** **Demand-focused interventions** describes policy options to alleviate congestion by focusing on how and when travellers make journeys. The Section looks at demand focused measures such as fiscal measures, parking policies, traffic management, mobility management, technology and mobility as a service/shared mobility.

2 Traffic congestion and Ireland

2.1 Introduction

This Section defines road-based traffic congestion and its causes and identifies the economic, environmental and social causes of congestion. It then focuses on trends in transport demand in Ireland. In order to visualise the nature of congestion in Ireland, this Section includes a number of maps looking at the performance of a sample of key roadways in the Greater Dublin Area (GDA), Cork and Galway.

2.2 What is road-based traffic congestion?

Road-based traffic congestion is a condition on transport networks that occurs as use increases. It is characterised by lower travel speeds, an increased frequency of delays, longer trip times, increased traffic jams, and a reduction in reliability of travel times. While congestion is a possibility for any mode of transportation, this paper focuses on motorised vehicle congestion on public roads.

Congestion is a function of travel demand and supply. Travel demand and supply can be considered, in this case, to be made up of a combination of road space supply/demand and sustainable mobility supply/demand. A certain amount of congestion is not necessarily bad as it is a sign of economic and social activity. ‘Aggravated congestion’, however, is defined as congestion levels above those which would be expected on a properly functioning road. It occurs when the number of vehicles on a part of the network is higher than the number which is economically desirable.

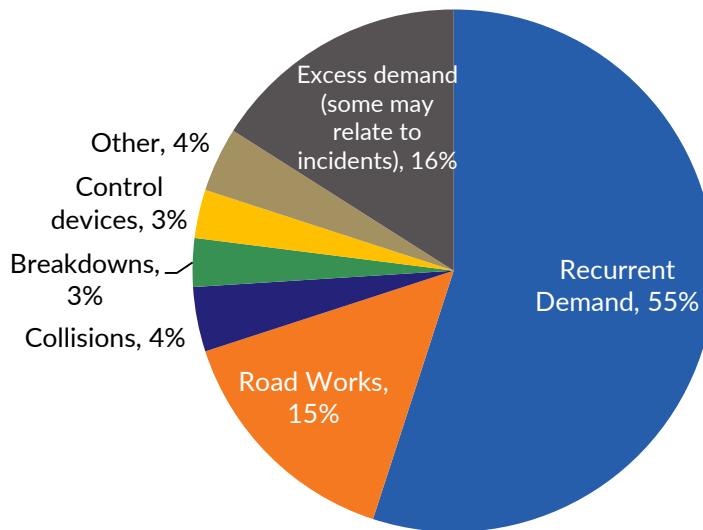
Congestion is caused by a situation where road space supply is not sufficient to adequately cope with road space demand. This supply and demand imbalance generally takes three forms:

- **Recurrent Demand Imbalance:** This refers to a situation where demand and supply are relatively consistent, with demand consistently being greater than supply. This is a broad network issue and suggests that there is a need to invest in long-term programmes to reduce demand or increase supply. Traffic jams which happen in the same part of a city every day during the morning peak time are examples of this kind of congestion.
- **Temporary Excess Demand:** This refers to a situation where the need to use particular routes is temporarily increased beyond normal levels, to an extent which causes aggravated congestion. An example is when traffic jams happen on routes near a concert or sporting event. Another might be a case where a route to a beach becomes congested on a sunny day.
- **Temporary Supply Decreases:** This refers to a situation where particular routes, or some capacity on those routes, is closed off for a short period of time, forcing traffic onto other routes, and therefore causing aggravated congestion. The most common examples of this are road-works, breakdowns and accidents.

Figure 2.1 based on a 2017 report by Transport for London on understanding and managing congestion², outlines the causes of congestion across London in 2015. This shows that 55%

related to recurrent demand, 16% was accredited to excess demand, while 22% was related to supply decreases such as road-works, collisions, and breakdowns. A further 3% related to control devices, usually traffic calming measures, traffic lights, etc. It is likely that these control devices are in locations where safety is being prioritised over stable flow of traffic. The ‘Other’ section is a combination of various unclassifiable causes.

Figure 2.1: Causes of congestion across London, 2015



Source: Transport for London

There is no similar study available for Irish cities or for the GDA but it can be assumed that the ranking of congestion causes would be similar in an Irish setting – most congestion being caused by overall network imbalances, and just under a third of congestion being caused by a combination of road capacity supply issues such as road-works, accidents and breakdowns and occasional non-pattern increases in demand to travel to a specific place. As such, the most common drivers of congestion are, arguably, overall travel demand and supply.

Travel demand, in general, is pro-cyclical – it correlates closely with economic performance and population growth. As population and economic performance grow, more journeys are created – mostly movement between work places and residential areas and movement to obtain or provide goods and services.

2.3 Why must we tackle congestion, and why now?

Traffic congestion is a major issue in Ireland’s cities and other urban areas and creates a range of economic, environmental and social costs. The focus of transport policy is primarily on the sustainable and efficient movement of the transport network’s users and, as a result, ensuring that congestion does not reach unacceptable levels is of key importance. Associated costs of congestion include lost time, increased vehicle operating costs, emissions and other environmental impacts such as air quality and pollution. Congestion is closely related to increased private car usage and causes increased time on the road for these cars. The combination of more cars

spending more time on the road leads to a significant growth in aggregate emissions from private cars.

In addition, aggravated congestion leads to costs to the wider economy by increasing the costs of doing business and a resulting reduction in the relative attractiveness of an area as an option to locate a business. Longer and more unpredictable journey times mean that people spend more time travelling and less time in the places they are trying to get to. This can increase levels of personal stress for commuters and impact negatively on health and quality of life. Congestion also causes issues for place-making in urban areas. Urban roads filled with cars create pressures to increase road space, and reduce the flexibility of planners to create more public spaces for other use.

The 2017 Department of Transport, Tourism and Sport's (DTTAS) *Costs of Congestion, An Analysis of the Greater Dublin Area*³ report provides an important landmark in putting a cost on congestion at present, and into the future. It identified annual costs of €358 million in the GDA in 2012 and forecast annual costs of €2.08 billion per year in 2033, in the absence of intervention. These costs are based on time lost through increased journey times. At a pivotal point for Ireland's growth, rising aggregate delays for commuters and other road users can only negatively affect competitiveness.

Congestion significantly impacts quality of life, community spaces, the ability to engage economically, and the health of the air and climate. It is increasing, and increasing faster than forecasted to. It is necessary to take decisive action to reverse this trend.

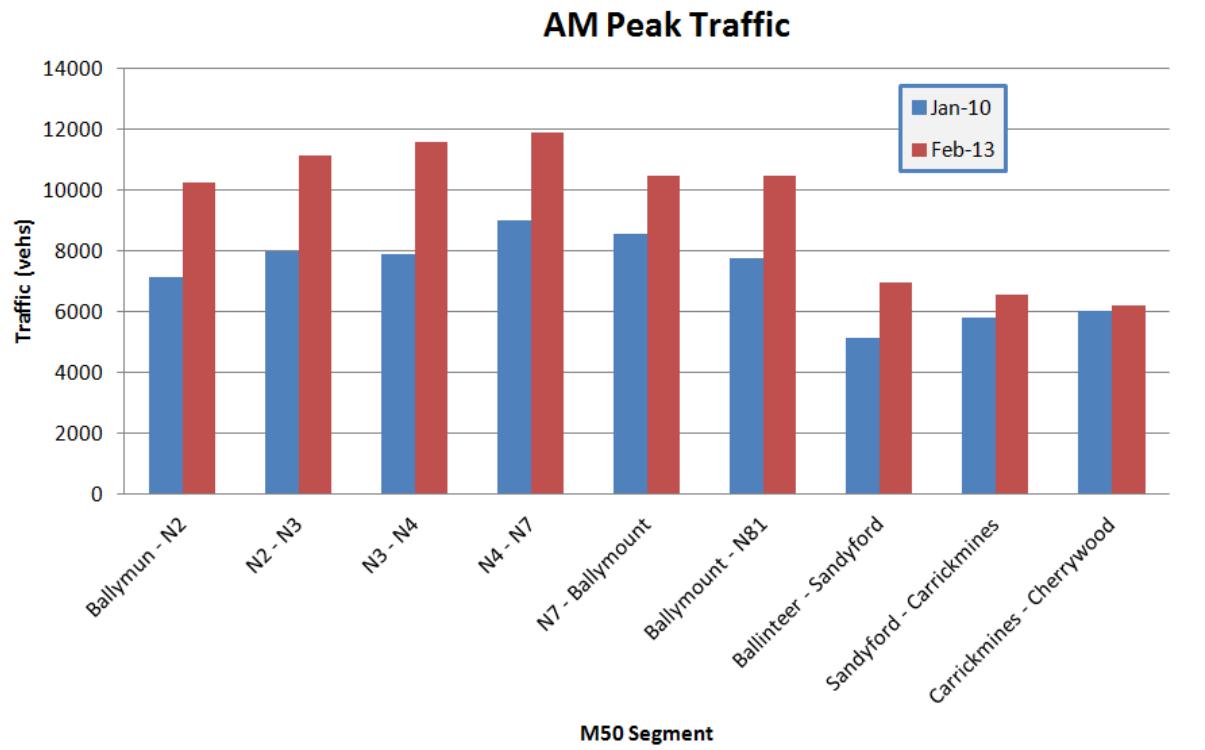
2.4 Transport demand

The advent of Ireland's economic downturn in 2008 impacted significantly on transport demand across the country. Largely reflecting the growth in unemployment, aggregate transport demand in the GDA, in particular, fell between 2008 and 2012. However, after that period of reduced transport usage, transport activity and demand has been steadily growing again, and is expected to expand further in future years in line with forecasted economic growth rates. Public transport usage and private car usage have risen in parallel with each other, to support this rising demand. While this rise in economic activity is positive for almost all areas of the economy, it places a great deal of pressure on the transport network. In addition, the planning and development of new housing over the last few decades has led to dispersed population settlements and urban sprawl in the cities. This has contributed to congestion problems.

Journeys times are getting longer, peak travel periods are starting earlier and ending later, while time spent commuting each day is growing. From 2014, for the first time since the completion of the M50 upgrade, users of the motorway began to experience a pattern of increasing journey times during peak hours as the volume of traffic in some of the motorway lanes approached the capacity of those lanes. Aggravated congestion in certain sections of the M50 during peak hours is now a daily event.

Transport Infrastructure Ireland (TII) has operational responsibility for the M50 and, in 2014, in conjunction with the four Dublin local authorities, published the *M50 Demand Management Report*⁴. This report looked at trends on the M50 including a comparison of weekday average morning peak hour traffic flows for January 2010 and February 2013, as shown in Figure 2.2.

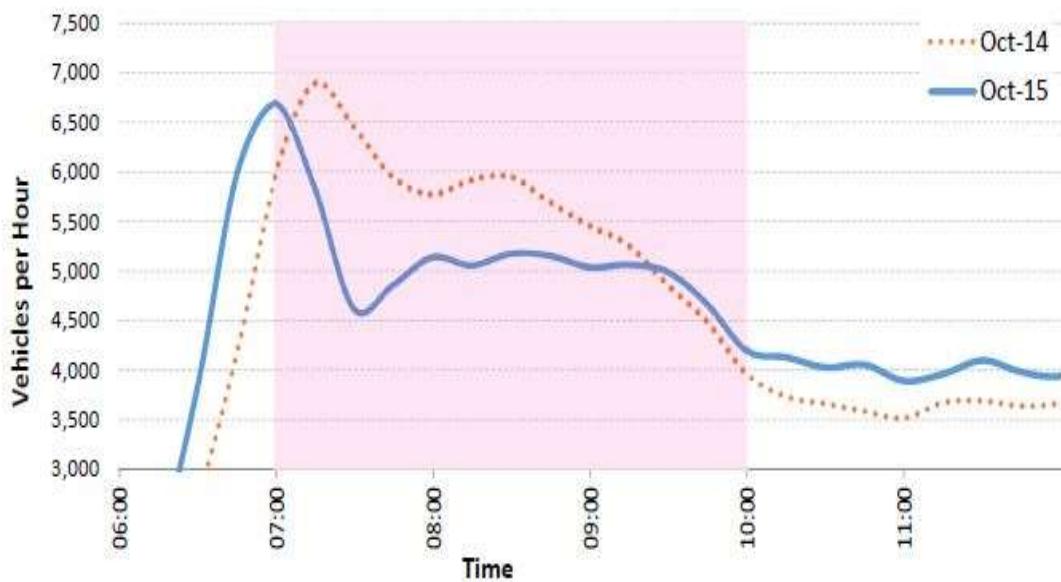
Figure 2.2: M50 AM Peak Traffic



Source: M50 Demand Management Report

Figure 2.3 from TII shows the impact of congestion on traffic throughput on the N4 to N7 southbound section of the motorway and that morning congestion is suppressing peak traffic throughput on this section. The morning peak throughput in 2015 was below 2014 levels, in spite of higher demand. The graph shows that fewer cars are travelling during the traditional “peak”, which may be due to congestion on the roads. However, this is probably not due to shifts of modes but to drivers choosing to start journeys outside of traditional peak hours. This may seem like an example of market conditions leading to an efficient distribution of road capacity. However, the impact is that commuters are choosing to alter their schedules to allow them to continue to drive their cars but avoid congestion instead of choosing to adapt to other modes.

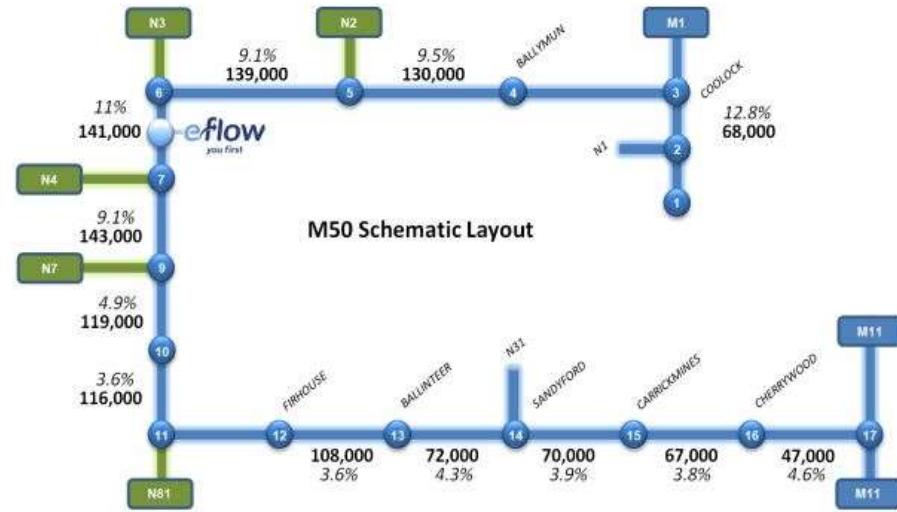
Figure 2.3: M50 AM traffic throughput (southbound, N4-N7 section)



Source: Transport Infrastructure Ireland

TII also modelled expected growth in traffic volumes on the M50 in 2023 as part of the *M50 Demand Management Report*. In the model, Annual Average Daily Traffic (AADT) figures were outlined which showed the forecasted average daily number of vehicles at each junction on the M50 in 2023. These forecasts were modelled in 2014 from a 2011 baseline. However, in TII's *National Roads Network Indicators 2017*⁵, the **actual** AADT performance of the M50 showed that, on every stretch of the motorway, the 2017 figures were higher than the 2023 predicted volumes. The forecast and actual volumes are shown in Figure 2.4 and Figure 2.5. This highlights the rapid rise in travel demand, and the importance of reviewing modelling data regularly, especially when underlying expectations change. The percentages shown in Figures 2.4 and 2.5 represent the number of heavy goods vehicles (HGVs) as a percentage of the total number of vehicles. For example in Figure 2.5, there is an AADT of 22,000 vehicles between junctions 1 and 2 (the port tunnel) of which 41% are HGVs.

Figure 2.4: Forecasted annual average daily traffic in 2023 (published 2014)



Source: M50 Demand Management Report

Figure 2.5: Actual annual average daily traffic in 2017



Source: National Roads Network Indicators 2017

The National Transport Authority (NTA) and Dublin City Council (DCC) publish an annual *Canal Cordon Report*⁶ which looks at trends in vehicles and people travelling into Dublin city centre in the morning peak period. The 2018 report shows a reduction in the number of cars entering the city every morning from over 59,000 in 2008 to over 48,000 in 2018. However, the total number of journeys has grown from over 181,000 journeys in 2010 to almost 214,000 journeys in 2018. In 2015, the NTA and DCC published the *Dublin City Centre Transport Study*⁷. This study estimated that by 2023, the transport network of Dublin city will be required to cater for approximately 40,000 additional journeys each morning, an increase of almost 20% on 2015 levels. The study considered that it is not possible to cater for this increase by private vehicles alone, as if even 20%

of these additional trips were made by car it would represent an increase of 8,500 cars on the road during the morning peak. This would effectively return the traffic volumes and congestion in the city to levels last seen in the early 2000s.

In relation to the travel demand in the other cities, the 2016 *Galway Transport Strategy*⁸ showed that Galway city experiences peak hour congestion and journey time unreliability for all motorised transport. The 2013 Cork City Centre Movement Strategy identified that 66% of city centre traffic is through-traffic with destinations outside the city centre⁹. TII in consultation with Cork City Council, Cork County Council and various other stakeholders published the *N40 Demand Management Report*¹⁰ in 2017. The analysis in that report, as shown in Table 2.1, noted considerable growth in traffic flows observed along the N40 corridor over the years 2013 to 2016.

The draft *Cork Metropolitan Area Transport Strategy*¹¹, which was published in May 2019 for public consultation, noted traffic congestion and delays at key locations on the national road network during peak periods, such as the Dunkettle Interchange (junction of the N8, M8, N25 and N40) and on sections on the N40.

Table 2.1: Rising traffic volumes on N40 corridor

Location	2013 AADT	2016 AADT	% Change
N25 at Little Island	48,800	53,200	+9.0%
N40 at Jack Lynch Tunnel	59,100	65,000	+10.0%
N40 between N28 & Mahon	58,500	69,500	+18.8%
N40 between N27 and N28	76,700	84,400	+10.0%
N40 between N22 and N71	33,300	39,800	+19.5%
N22 at Ovens	18,800	20,900	+11.2%

Assuming that economic growth will remain a priority aim of Government and that, in general, the current economic performance will continue, it is reasonable to assume consistently rising travel demand across the country, particularly in the cities and in the GDA. The DTTAS 2015 'Strategic Framework for Investment in Land Transport'¹² advised that, based on conservative population and employment growth scenarios, commuting trips nationally are expected to rise by 35% over current levels by 2040.

Road space supply increased significantly in Ireland in the latter parts of the 20th century and the early parts of the 21st with large public investment in expanding and upgrading the road network nationally. However, urban road space is unlikely to increase dramatically, particularly in the GDA, in the coming years. Space to expand roads is becoming scarcer, and competition for that space is high. Without intervention, rising demand to use private cars, coupled with largely static road space supply will exacerbate the congestion issues that are evident today.

2.5 Visualising congestion in Irish cities

In order to visualise the nature of congestion in Ireland, this paper looks at the performance of a sample of key roadways in the GDA, Cork and Galway. This is not to suggest that congestion does not happen in any other locations. Congestion also occurs in the other cities, as well as other urban areas throughout the country.

Map 2.1, Map 2.2 and Map 2.3, provided by TII, demonstrate congestion through showing Level Of Service on national roads. Level of Service (LOS) is a quality measure used to describe operational conditions within a traffic stream. In general, LOS is a measure of a combination of service indicators such as speed, travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience. Six LOS are defined from A to F, with LOS A representing fully stable flow operations and LOS F representing complete breakdown in vehicular flow. A brief definition of each LOS is as follows:

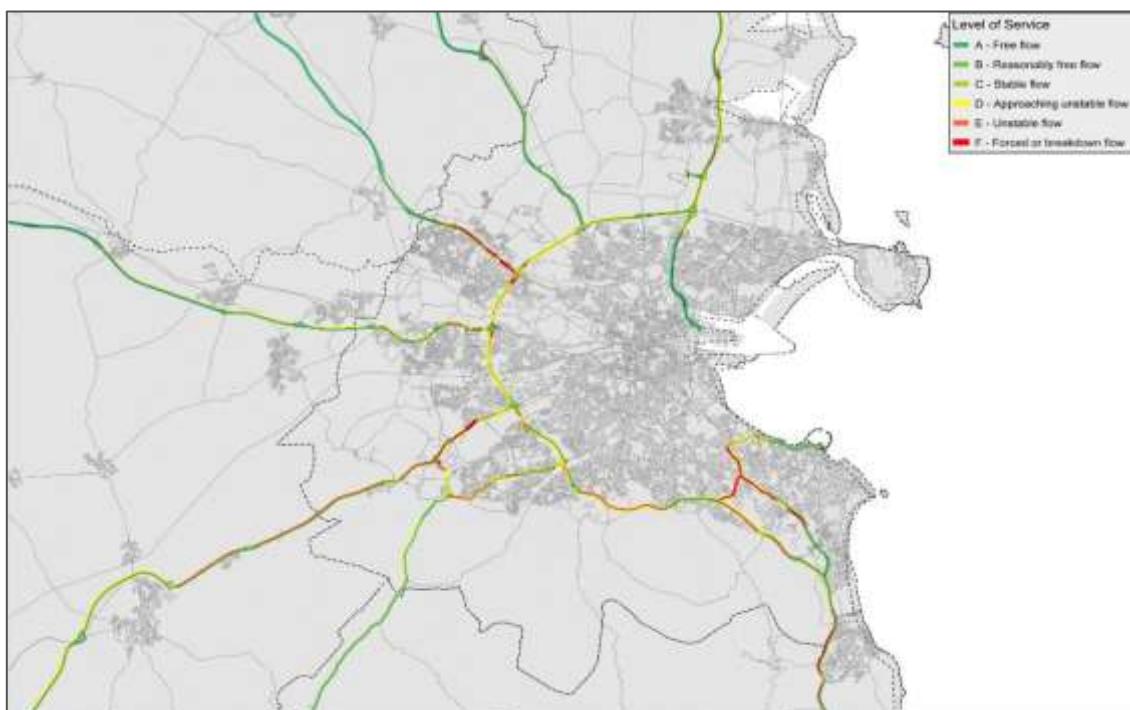
- **LOS A** – describes stable flow operations. Stable flow speeds prevail. Vehicles are almost completely unimpeded in their ability to manoeuvre within the traffic stream. The effects of incidents or point breakdowns are easily absorbed at this level.
- **LOS B** – represents reasonably stable flow, and stable flow speeds are maintained. The ability to manoeuvre within the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high. The effects of minor incidents and point breakdowns are still easily absorbed.
- **LOS C** – provides for flow with speeds at or near the stable flow speeds of the motorway. Freedom to manoeuvre within the traffic stream is noticeably restricted, and lane changes require more care and vigilance on the part of the driver. Minor incidents may still be absorbed, but the local deterioration in service will be substantial. Queues may be expected to form behind any significant blockage.
- **LOS D** – is the level at which speeds begin to decline slightly with increasing flows and density begins to increase somewhat more quickly. Freedom to manoeuvre within the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort levels. Even minor incidents can be expected to create queuing, because the traffic stream has little space to absorb disruptions.
- **LOS E** – describes operation at capacity. Operations at this level are volatile, because there are virtually no usable gaps in the traffic stream. Vehicles are closely spaced leaving little room to manoeuvre within the traffic stream at speeds that still exceed 80 km/h. Any disruption of the traffic stream, such as vehicles entering from a ramp or a vehicle changing lanes, can establish a disruption wave that propagates throughout the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate even the most minor disruption, and any incident can be expected to produce a serious breakdown with extensive queuing. Manoeuvrability within the traffic stream is extremely limited.

- **LOS F** – describes breakdowns in vehicular flow. Such conditions generally exist within queues forming behind breakdown points.

It is important to note that the LOS definition is not necessarily related to traffic flow. It also refers to the ability to manoeuvre within a traffic stream. This is particularly prevalent between LOS E and LOS F where it is more likely at LOS F that there will be a lower overall traffic volume than LOS E due to a bottle-neck resulting from a breakdown.

Map 2.1 for the GDA shows unstable flow or forced or breakdown flow at many points of the M11 and N7, on the N81 leading through Tallaght and Firhouse, in areas around Lucan on the M4, from Mulhuddart into the Dublin city centre on the N2, at points on the M1 such as Swords and Balbriggan, and between junctions 12 and 13 on the M50 itself. Most of the M50 itself shows signs of approaching unstable flow.

Map 2.1: Greater Dublin Area - Radials into M50 and on the M50



Source: TII

The Galway map (Map 2.2) shows unstable flow or forced or breakdown flow into the city centre from Galway Technology Park (N6), Two Mile Ditch (N83), Ballindooley (N84), and Oranswell (N59). All travel into the city centre via national road would pass through these areas. A number of points on these same roads further from the city are also approaching unstable flow.

Map 2.2: Galway - national roads approaching the city centre



Source: TII

The Cork map (Map 2.3) shows unstable flow or forced or breakdown flow at multiple points leading in to the city centre, from Monees (N28), the Cork Airport Business Park (N27), from Spur Hill (N71), from Blackpool Shopping Centre (N20), from the Tivoli Docks (N8) and along the R641, which leads past Cork University Hospital. Levels approaching unstable flow can be seen at multiple points along these roads. All travel into the city centre via national road would pass through these areas.

Map 2.3: Cork national roads approaching the city centre



Source: TII

Section 2 key points

- Traffic congestion is a major issue in Ireland's cities and other urban areas.
- The primary focus of transport policy is on the sustainable and efficient movement of the network's users and ensuring that congestion does not reach unacceptable levels.
- Associated costs of congestion include lost time, increased vehicle operating costs and environmental impacts such as emissions, air quality and pollution.
- Wider costs to the economy include increased costs of doing business and a resulting reduction in the attractiveness of areas to locate businesses.
- The annual cost of time lost due to aggravated congestion in the Greater Dublin Area is forecasted to rise from the current estimated cost of €358 million to over €2 billion in 2033, in the absence of interventions.
- Congestion can increase levels of personal stress for commuters and impact negatively on health and quality of life.
- The historic planning and development of new housing has led to dispersed population settlements and urban sprawl in cities which has contributed to congestion problems.
- Transport demand has been growing steadily in recent years and is expected to grow further in the future in line with forecasted economic growth rates.
- Public transport usage and private car usage have risen in parallel with each other and this is placing a great deal of pressure on the transport network.
- In Dublin, daily aggravated congestion in certain sections of the M50 motorway during peak hours is increasing and traffic volumes on the motorway are now higher than forecasted.
- Traffic and congestion levels are also growing on radial routes approaching Dublin city, inside the M50.
- There are similar traffic and congestion patterns in other cities, regions and towns.
- By 2040, commuting trips nationally are expected to rise by 35% over current levels.
- Without intervention, rising demand to use private cars, coupled with largely static road space supply will exacerbate the congestion issues that are evident today,

3 Existing policy approach

3.1 Introduction

This Section sets out the existing policy approach in Ireland to tackle congestion at national, regional, metropolitan and local level. It identifies the stakeholders who have a role in the alleviation of congestion and the current institutional arrangements in place. The relevant strategies both nationally and regionally are also outlined along with the existing targets and expected results of these strategies.

3.2 Institutional arrangements

There are a number of stakeholders with different roles and responsibilities in relation to alleviation of congestion at national, regional, metropolitan and local level. These are:

- Department of Transport, Tourism and Sport
- National Transport Authority
- Transport Infrastructure Ireland
- Regional Assemblies
- Local Authorities
- An Garda Síochána

An inter-agency approach has been adopted by stakeholders on a number of congestion related issues. Examples of this inter-agency approach are outlined later in this Section.

	Institutional arrangements in Ireland	Scope
Stakeholders	Department of Transport, Tourism and Sport (DTTAS)	National
	National Transport Authority (NTA)	Regional (GDA)
	Transport Infrastructure Ireland (TII)	National
	Regional Assemblies	Regional
	Local Authorities	Local
	An Garda Síochána	National
Strategies	Smarter Travel - A New Transport Policy for Ireland 2009-2020	National
	Strategic Investment Framework for Land Transport (2015)	National
	NTA Transport Strategy for the Greater Dublin Area 2016-2035	Regional
	Galway Transport Strategy	Metropolitan
	Draft Cork Metropolitan Area Transport Strategy	Metropolitan
Target	Reduce the share of people commuting by private car (nationally) from 65% to 45% by 2020 (Smarter Travel)	National

The institutional arrangements in Ireland are similar to those in other countries whereby transport agencies work with local authorities to tackle congestion issues and within a broad policy and statutory framework set at Government level. In most countries, the police also play a role in road safety and traffic management issues. Similar to the institutional arrangements in Ireland for the GDA, a number of other countries have developed regional/city transport strategies. While these strategies cover a range of transport policy issues, addressing urban congestion is a common theme across the strategies. Examples include the *Mayor of London's Transport Strategy (2018)*¹³,

Stockholm's Urban Mobility Strategy (2012)¹⁴ and the Helsinki Region Transport System Plan (2015)¹⁵. Each of these strategies identify targets to increase the mode share for public transport trips over the lifetime of the strategy – e.g. a target of 80% sustainable mode share for trips by 2041 (London); public transport's shares of motorised transport journeys during peak hours to be 80% by 2030 (Stockholm); and public transport mode share trips to increase by 6% (Helsinki).

Targets are useful to support the setting and reaching of public policy goals and – provided they are credible - they also have a symbolic function, in that they signal commitment to a goal. The DTTAS *Common Appraisal Framework for Transport Projects and Programmes¹⁶* states that objectives should be SMART (specific, measurable, accurate, realistic and timely). For example, a commitment to improving something may be a positive step, but the success of policies aimed at, say, a 20% improvement, can be monitored and evaluated. An ability to show that the improvement of around 20% happened shows that the policy or strategy was justified and engenders trust in future plans and investments. Working towards targets also allows policy makers to judge medium-term progress of strategies, and to re-strategise where necessary.

3.2.1 Department of Transport, Tourism and Sport (DTTAS)

The Department of Transport, Tourism and Sport (DTTAS) is responsible for the development of land transport policy and legislation. Ireland's land transport system comprises the road, rail, cycling and walking networks, together with bus, rail and taxi services. The DTTAS' high-level goal for land transport, as set out in its *Statement of Strategy 2016-2019¹⁷*, is “*to best serve the needs of society and the economy through safe, sustainable and competitive transport networks and services*”. The two existing national policies relevant to the alleviation of congestion are *Smarter Travel: A Sustainable Transport Future 2009-2020¹⁸* and the *2015 Strategic Investment Framework for Land Transport (SIFLT)*. Further details on these two policies are outlined in Section 3.3.

The DTTAS has a number of agencies under its remit in the land transport sector. Those with roles around the alleviation of congestion are the National Transport Authority and Transport Infrastructure Ireland.

3.2.2 National Transport Authority (NTA)

The NTA was established as a non-commercial State body under the *Dublin Transport Authority Act 2008¹⁹*, as amended. Its purpose is to bring a more focussed and integrated approach to the planning and delivery of transport infrastructure and services both on a national basis generally and especially in the GDA where the NTA has a more detailed remit. The legislation sets out the functions of the NTA in the GDA which includes the following functions particularly relevant to the alleviation of congestion:

- undertake strategic planning of transport;
- promote the development of an integrated, accessible public transport network;
- promote increased recourse to cycling and walking as a means of transport;
- secure the:
 - provision of public transport infrastructure,
 - effective management of traffic,
 - effective management of transport demand;

The NTA also has responsibility for the preparation of:

- a strategic transport plan for the GDA for a period of between 12 and 20 years;
- a six-year integrated implementation plan;
- a traffic management plan;
- traffic management guidelines.

Under the Act, the NTA also has responsibility for implementation of demand management measures in the GDA. Demand management measures have been defined as measures which promote a reduction in the total amount of travel or reduced growth in the total amount of travel and include measures to:

- reduce the need to travel;
- reduce the use of mechanically-propelled vehicles and particularly private cars;
- increase travel by public transport, bicycle or on foot as an alternative to the private car;
- encourage travel at less congested periods other than by means of a congestion charge;
- reduce trip length.

The present *Transport Strategy for the Greater Dublin Area 2016-2035*²⁰, which the NTA drew up in fulfilment of its statutory responsibility, provides a framework for the planning and delivery of transport infrastructure and services in the GDA over the next two decades. The 20-year strategy will be supported and given effect over the course of its lifetime through a sequence of 6-year implementation plans – these succeeding the NTA's present *Integrated Implementation Plan 2013-2018*²¹ – and these shorter term implementation plans will set out the investment priorities and proposals for the relevant period.

3.2.3 Transport Infrastructure Ireland (TII)

TII is a non-commercial State body and was established through a merger of the National Roads Authority and the Railway Procurement Agency under the *Roads Act 2015*²². TII has statutory responsibility to secure the provision of a safe and efficient network of national roads. For this purpose, it has overall responsibility for planning and supervision of construction and maintenance works on these roads in conjunction with the relevant local authorities.

TII has operational responsibility for the M50 and along with a number of other stakeholders is continuing to implement a number of measures to manage demand and optimise operational efficiency on the M50. The specific measures introduced are referred to in Section 6 of this paper.

3.2.4 Local authorities

Local authorities are the road authorities for their respective administrative areas and the improvement and maintenance of regional and local roads is the statutory responsibility of each local authority. Local authorities are also statutorily responsible for traffic management within their areas of responsibility. This can cover a wide range of measures some of which include bus priority improvements, junction upgrades, speed management, traffic-calming, safety measures and parking management.

3.2.5 An Garda Síochána

An Garda Síochána has responsibility for the enforcement of road traffic law. The Gardaí work closely with the Road Safety Authority and local authorities in addressing all road incidents. Improving road safety and significantly reducing the incidence of fatal and serious injury on Irish roads is the main responsibility of an Garda Síochána's Roads Policing Unit.

Examples of inter-agency coordination and cooperation on congestion related issues

- 2014: TII in conjunction with the four Dublin local authorities published the **M50 Demand Management Study** which examined a range of short-term and longer-term measures to “manage demand and optimise operational efficiency on the M50”.
- 2015: TII initiated the **Interagency Incident Coordination Group** which includes the principal stakeholders involved in the management of the M50 and its approach roads. The members include An Garda Síochána, the Dublin Fire Brigade, the four Dublin local authorities, the Motorway Traffic Control Centre and TII.
- 2015: Dublin City Council and the NTA jointly published the **Dublin City Centre Transport Study** which sets out the various measures proposed for Dublin's city centre to ensure the efficient functioning of transport in the area.
- 2017: TII in consultation with Cork City Council, Cork County Council and various other stakeholders published the **N40 Demand Management Study** which identified a number of indicative scheme-specific demand management measures that “demonstrated the need for demand management on the N40, provided a rigorous assessment of potential demand management interventions specifically for the N40 and demonstrated the feasibility of the demand management measures.”
- 2018: The NTA, in conjunction with the four Dublin local authorities, established a **Traffic Coordination Group** to ensure that adequate arrangements are in place to effectively manage traffic in the region in a coordinated manner.

3.3 National policy

The DTTAS' *Smarter Travel: A Sustainable Transport Future* set out national transport policy for 2009-2020. One of the key goals of the strategy was to “improve economic competitiveness through maximising the efficiency of the transport system and alleviating congestion and infrastructural bottlenecks”. The Policy contained 49 actions, including a number of congestion alleviation measures. Some of these individual actions are referred to later in Sections 5 and 6. In the context of its work in reviewing sustainable mobility policy, DTTAS has undertaken a review of the implementation status of each of the 49 actions that were put forward in the 2009 documents. This review is being published alongside the background papers for public consultation.

Smarter Travel included a target that work-related commuting by car would be reduced from a current modal share of 65% to 45% in 2020. Based on Census 2016 results, it is unlikely that this target will be met on a national level. Census 2016 found that, in the State overall, 61.4% of

working commuters drove to work in 2016. However, just under half of Dublin city and suburbs workers commuted by car, which was the lowest across the State. The highest car use was in rural areas, where 76% of commuters used the car to get to work.

In 2015, DTTAS published the *Strategic Investment Framework for Land Transport (SIFLT)* which identified three key priorities for future investment in land transport. One of these priorities was to address urban congestion and to improve the efficiency and sustainability of the urban transport systems. The *SIFLT* considered that this must be guided by demand/capacity assessments and recognise the role of urban centres as key drivers of economic activity, nationally and regionally. The framework identified the following measures:

- improved and expanded public transport capacity;
- improved and expanded walking and cycling infrastructure;
- the use of Intelligent Transport Systems to improve efficiency and sustainability and to increase the capacity of existing urban transport systems.

The *Framework* noted that investments to improve the quality and time competitiveness of alternatives to the car often play an important role as a driver of modal shift and should be supported. It recognised that demand management measures may also prove necessary to, *inter alia*, maximise the value of transport infrastructure. To receive investment, the *SIFLT* considered that projects must be implemented in conjunction with supportive spatial planning policies.

The *SIFLT* identified ten actions for land transport across the following areas:

- incorporating *SIFLT* transport priorities in investment plans;
- integrating land use and transport planning;
- identifying a Strategic Road Network;
- developing a new Rail Policy;
- maintaining a key role for careful project appraisal;
- applying *SIFLT* research in future transport policy development.

Transport policy, including policies to address congestion, is closely linked with land use planning policy and *Background Paper 6 – Land Use Planning and Transport Planning* considers this alignment in more detail. *Project Ireland 2040 (National Planning Framework and National Development Plan 2018-2027)*²³ is the Government's high-level strategic plan for shaping the future growth and development of the country out to 2040. *The National Planning Framework (NPF)* recognises that previous dispersed and fragmented housing development has compounded issues such as congestion and has increased commuting times. It commits to expand attractive sustainable mobility alternatives to car transport to reduce congestion.

Alongside the policy review of sustainable mobility, DTTAS is carrying out a further piece of analysis – the *Planning, Land Use and Transport Outlook* (or *PLUTO*) 2040 study. *PLUTO* 2040 will take the objectives of *Project Ireland 2040* (as set out in the *NPF* and the *NDP*) and the priorities set out in the *SIFLT*, and develop high-level objectives for investment in Ireland's roads and public transport infrastructure on the basis of them. One of the key challenges *PLUTO* 2040 will set out to address is the fact Ireland's transport system faces a number of, at times competing policy and

investment priorities (such as expanding transport infrastructure while keeping the existing infrastructure in good condition). The purpose of *PLUTO 2040* is to develop a transport investment framework which delivers a land transport network that meets the travel needs of the population in the coming decades and which supports the National Strategic Outcomes of *Project Ireland 2040*.

3.4 Regional and metropolitan policy

3.4.1 Regional Spatial and Economic Strategies/Metropolitan Area Strategic Plans

At a regional level, Ireland is divided into the following three regional assembly areas:

- Eastern and Midland;
- Southern; and
- Northern and Western.

The regional assemblies are tasked to coordinate, promote and support the strategic planning and sustainable development of the regions. The primary vehicle for this is the preparation and implementation of Regional Spatial and Economic Strategies (RSES) for a period of between 12 and 20 years. The RSESs will provide regional level strategic planning and economic policy in support of the implementation of the *NPF*. For each of the three regions, the Regional Assemblies are required to prepare their own RSES in accordance with the framework set by the *NPF*. The RSESs should address a range of economic and spatial elements including the promotion of sustainable transportation strategies in urban and rural areas.

The five cities each involve more than one local authority area, with the metropolitan area of Dublin covering all or part of the area of seven local authority areas. While the three RSESs will be developed to coordinate local authority plans at a strategic and regional assembly level, the span of each regional assembly is too broad to be able to sufficiently focus on city and metropolitan issues. So, in tandem with and as part of the RSES process, five separate coordinated Metropolitan Area Strategic Plans (MASPs) will be prepared for the Cork, Dublin, Galway, Limerick and Waterford Metropolitan Areas.

There is a statutory requirement for the Eastern and Midland Region RSES to be consistent with the National Transport Authority's (NTA) *Transport Strategy for the Greater Dublin Area (GDA)*.

3.4.2 NTA Transport Strategy for the GDA

The NTA's *Transport Strategy for the Greater Dublin Area 2016-2035* is the primary strategy document which is intended to deal with managing transport demand in the GDA. The overall aim of the strategy is to “contribute to the economic, social and cultural progress of the Greater Dublin Area by providing for the efficient, effective and sustainable movement of people and goods.” The *Strategy* identified the following patterns and trends for the region:

- Suburbanisation and spread of population, employment and other land uses has continued;
- Mode share of car use continues to increase;
- Car ownership – a key determinant of car use – is likely to increase further, up to saturation levels;
- Cycling has increased significantly in numbers and in mode share;
- Recovery is occurring in public transport use, but not in its mode share;

- Encouraging non-car use for trips to education is a significant challenge;
- There is no spare capacity on the M50 motorway;
- Protecting and enhancing access to the ports and Dublin Airport is a strategic priority; and
- Current economic growth will mean that within the next few years, overall levels of travel demand are likely to exceed the travel demand experienced in 2006 and 2007.

Addressing urban congestion is a priority of the *Strategy* and it proposed to achieve this through the following:

- The provision of alternative sustainable mobility infrastructure (heavy and light rail; bus; cycling; walking);
- Maintain, renew, manage and operate the road network infrastructure and undertake a limited number of new projects on the road network;
- The introduction of complementary demand management measures; and
- Develop a network of park and ride facilities.

Proposed investments in sustainable mobility infrastructure and the roads network over the short to medium term will be addressed further in Section 5 which looks at the focus of congestion alleviating policy to date. The NTA Strategy considers that increased public transport provision, coupled with enhanced cycling and walking facilities in urban areas, will provide the means to cater for much of the projected increased travel demand in the GDA. However, the *Strategy* also considers that, without complementary demand management measures, the full benefits of the strategy will not be achieved. Over the period to 2035, the *Strategy* proposes to implement the demand management measures set out below.

Demand Management measures proposed in GDA Transport Strategy

- Encourage **land use policies** which support the provision of development in locations and at densities which enable the efficient provision of public transport services;
- Set **maximum parking standards for all new developments**, with the level of parking provision applied being based on the level of public transport accessibility;
- **Reduce the availability of workplace parking in urban centres** to discourage car commuting, where alternative transport options are available;
- Implement **demand management measures on the M50 motorway** to ensure that it retains sufficient capacity to fulfil its strategic functions;
- Implement, at the appropriate time, **demand management measures to address congestion issues on the radial national routes approaching the M50 motorway**, to ensure that these routes retain sufficient capacity to fulfil their strategic functions;
- Secure the **introduction or expansion of on-street parking controls, and charging structures**, that seek to reduce commuter parking and which contribute to greater parking turnover for non-commuting purposes;
- Introduce **parking charges at out-of-town retail centres**, to reduce the congestion potential at these locations; and

Demand Management measures proposed in GDA Transport Strategy

- Support and facilitate the implementation and expansion of:
 - **Workplace Travel Plans** for all large employers;
 - **Tailored travel planning information provision** for residential and commercial/retail areas;
 - **Travel Plans for schools, colleges and all education campuses; and**
 - **Car club schemes, car-pooling and car sharing.**

The GDA Strategy does not have a defined target for travel mode share but does include modelling work on the forecasted mode share for commuting trips in 2035 based on 'with Strategy' interventions and 'without Strategy' (Figure 3.1). It predicts that full implementation of the Strategy will result in 45% of work commutes in the GDA undertaken by car by 2035. This is not cited as a target of the Strategy, but is an expected result. The modelling is based on 2011 travel mode shares (which may be outdated, as evidenced by the rapid rise of GDA traffic in recent years). A point to note is that the total number of car journeys is forecast to increase under the Strategy. It may be appropriate to remodel for up to date expectations, in line with population growth forecast in *Project Ireland 2040*, and to set a number of mode share targets and milestones to drive delivery performance.

Figure 3.1: Projected AM commute mode shares in the GDA in 2035



Source: NTA Transport Strategy for the Greater Dublin Area 2016-2035

While the NTA's statutory responsibility for transport planning applies only to the GDA, the Authority has worked on an administrative, non-statutory basis to assist several local authorities in other cities in preparing transport related strategies. *Project Ireland 2040* commits to extend the NTA's statutory responsibility for transport planning beyond the GDA to cover all of Ireland's

cities. An example of the existing cooperation is the *Galway Transport Strategy* and the draft *Cork Metropolitan Area Transport Strategy*. A key issue identified in both *Strategies* is urban congestion.

3.4.3 Galway Transport Strategy

The 2016 *Galway Transport Strategy* was developed on a joint basis by the NTA and Galway City and County Councils as an integrated transport plan. The *Strategy* sets out an overall framework for the development of transport infrastructure and services in Galway City and its environs over a 20-year period. Key issues identified in the *Strategy* include:

- An over-reliance on private car travel;
- Significant peak-hour congestion and journey time unreliability;
- Significant dispersed traffic movements to, through and around the city centre area;
- Constraints to national, regional and local transport movements, all of which funnel through Galway City, including all movement to and from Connemara;
- Limited bridge crossings on the River Corrib;
- Key junctions operating over-capacity;
- An inappropriate mix of transport modes within the city centre due to limited road space;
- A public transport service and network in need of enhanced capacity and additional priority;
- A limited, discontinuous cycle network;
- Restricted footpaths, poor accessibility for disabled/mobility impaired people; and
- Associated safety issues due to poor walking and cycling infrastructure.

The *Strategy* identified key transport infrastructure projects and service changes to address the existing transportation issues and provides a framework for their phased implementation, subject to funding. The infrastructural projects include:

- An enhanced city traffic network;
- An improved bus network with a minimum frequency of 15 minutes or better at peak time and improved residential and commercial access in a 10 minute walk (BusConnects);
- Improved bus priority measures;
- New Park and Ride services; and
- Improved walking and cycling routes.

The *Strategy* proposes a number of other measures to support the infrastructural proposals. These include:

- **Smarter Mobility** – Smarter Mobility and Intelligent Transport Systems (ITS) will be incorporated into the *Strategy* measures to support infrastructural proposals. This includes expanding the existing City Urban Traffic Control network, using ITS to manage parking efficiently, improving wayfinding around the city, upgrading street lighting and improving and upgrading junctions.
- **Land Use Integration** – The *Strategy* recognises that integrating land use with transport demand is a fundamental requirement for creating a sustainable city.
- **Behavioural Change** – Alternatives to the private car will be promoted for the workforce and for students to raise awareness of the travel choices available and to underpin a shift

to sustainable modes of transport. It is intended to continue the development of mobility management plans at major employment and educational institutions.

- **Demand Management** – The *Strategy* recognises that in order to shift the focus within the city centre to walking, cycling and public transport, demand management measures are needed to enhance the function of the city for these users. This may include measures such as managing and controlling the availability and cost of parking, restricting traffic flow from certain streets, reducing speed limits, providing additional pedestrian crossings at key locations and having a reduced emphasis on facilitating through traffic.

3.4.4 Cork Metropolitan Area Transport Strategy

A draft *Cork Metropolitan Area Transport Strategy* was published in May 2019 for public consultation. The draft strategy was developed by Cork City Council and Cork County Council, in partnership with the NTA. Submissions received under the public consultation will be reviewed and incorporated, where relevant, in the final *Strategy* which will be published by end 2019.

The *Strategy* will provide a framework for the planning and delivery of transport infrastructure and services across the Cork Metropolitan Area, for the period up to 2040. The draft *Strategy* covers proposals relating to all modes of transport including:

- Improvements to Cork's bus infrastructure through BusConnects Cork which will introduce a revised, more extensive and higher capacity bus system;
- Enhancements to the commuter rail service, including additional stations;
- A light rail transit corridor to reflect the more ambitious growth targets of *Project Ireland 2040*;
- A number of bus and rail-based park and ride sites;
- Cycling and walking infrastructure; and
- Improvements to the road network.

3.4.5 Limerick and Waterford Transport Strategies

Work is underway on the development of the *Limerick Shannon Metropolitan Area Transport Strategy* and work will begin by end 2019 on the development of the *Waterford Metropolitan Area Transport Strategy*.

Section 3 key points

- A number of stakeholders have different roles and responsibilities for congestion alleviation at national, regional and local level (DTTAS, NTA, TII, local authorities, Gardaí). An inter-agency coordinated approach has been adopted, similar to other countries.
- Internationally, addressing urban congestion is a common theme of metropolitan transport strategies along with targets to increase the mode share for public transport trips.
- It is unlikely that Ireland's *Smarter Travel Policy* target to reduce work-related commuting by car to 45% in 2020 will be achieved at a national level.

Section 3 key points

- The *SIFT* recommended investment in viable alternatives to the private car as a driver of modal shift. It recognised that demand management measures may also be necessary to maximise the value of transport infrastructure and that projects must be implemented in conjunction with supportive spatial planning policies.
- The NTA's *Transport Strategy for the GDA 2016-2035* considers that increased integrated sustainable mobility provision will cater for much of the projected increased travel demand in the region. It considers that this investment must be complemented by demand management measures to achieve the full benefits of the strategy.
- A key priority in the GDA is to manage the use of the M50 to protect its national function. TII, along with other stakeholders is continuing to implement measures to manage demand and optimise operational efficiency on the M50. There is similar cooperation outside the GDA, e.g. in relation to the N40.
- The *GDA Transport Strategy* predicts that its full implementation will result in 45% of GDA work commutes undertaken by car by 2035. This expected outcome may need to be updated given the rapid rise of traffic in the region in recent years and forecast population growth.
- Outside of the GDA, the NTA is working administratively with the local authorities in the other cities to prepare transport strategies. *Project Ireland 2040* commits to extend the NTA's statutory remit for transport planning in the GDA to the other cities.
- Both the *Galway Transport Strategy* and the draft *Cork Metropolitan Area Transport Strategy* identify urban congestion as a key issue.
- *Project Ireland 2040* recognises the link between transport and land use planning policies and that previous dispersed housing development has compounded congestion issues. It commits to expand attractive sustainable mobility alternatives to car transport over the period 2018 to 2027.
- The DTTAS forthcoming study - *PLUTO 2040* – will take the objectives of *Project Ireland 2040* and the priorities set out in the 2015 *Strategic Investment Framework for Land Transport* and develop high-level objectives for investment in Ireland's roads and public transport infrastructure on the basis of them.

4 Interventions

4.1 Introduction

This Section looks at the aim of policy interventions to address congestion including decoupling the growth of private car use from future growth in travel demand. It lists common demand and supply focused policy interventions to reduce traffic congestion and these interventions are expanded on in Sections 5 and 6. The Section also considers road capacity and induced demand. Finally it sets out the interaction between interventions to alleviate congestion and other Government policy areas.

4.2 Aim of interventions

In trying to relieve aggravated congestion, a key aim is to reach a point of market equilibrium between travel demand and supply. Ideally, this would include creating the conditions for future supply and demand to move in tandem, so that market equilibrium becomes the norm.

Dependency on private car is a significant factor contributing to aggravated congestion levels in the cities and other urban areas. Private car is the highest mode choice for travel in Ireland with 74% of all journeys being taken by car²⁴. Roads which are primarily used by private cars are more likely to be at or over-capacity than roads dominated by public transport. In a network with high dependency on private cars, travellers are less flexible to change when additional temporary demand is applied, or when supply of space is temporarily reduced.

Congestion need not be the natural result of rising travel demand, if more efficient transport methods are adopted. While approaches to ensure that temporary network imbalances are managed efficiently are key to traffic management, it is clear that decoupling rising private car usage from rising travel demand is a priority for reducing the likelihood of aggravated congestion. Given that private car usage is already such that demand is greater than supply in some locations, in order to alleviate congestion, an objective is to reduce private car usage from current levels, not to simply hold it static.

The competing demands for road space must also be considered. As more public transport is added to roads, it inevitably reduces the available road-space for private car usage. In such a scenario, the already excessive car traffic will have less space to use, which may then further exacerbate the issue for the private car user. It should be borne in mind that a scenario where more public transport is developed, and more commuters use this public transport, but private car users still experience congestion (due to reduced supply of space for private cars to drive on), is possible.

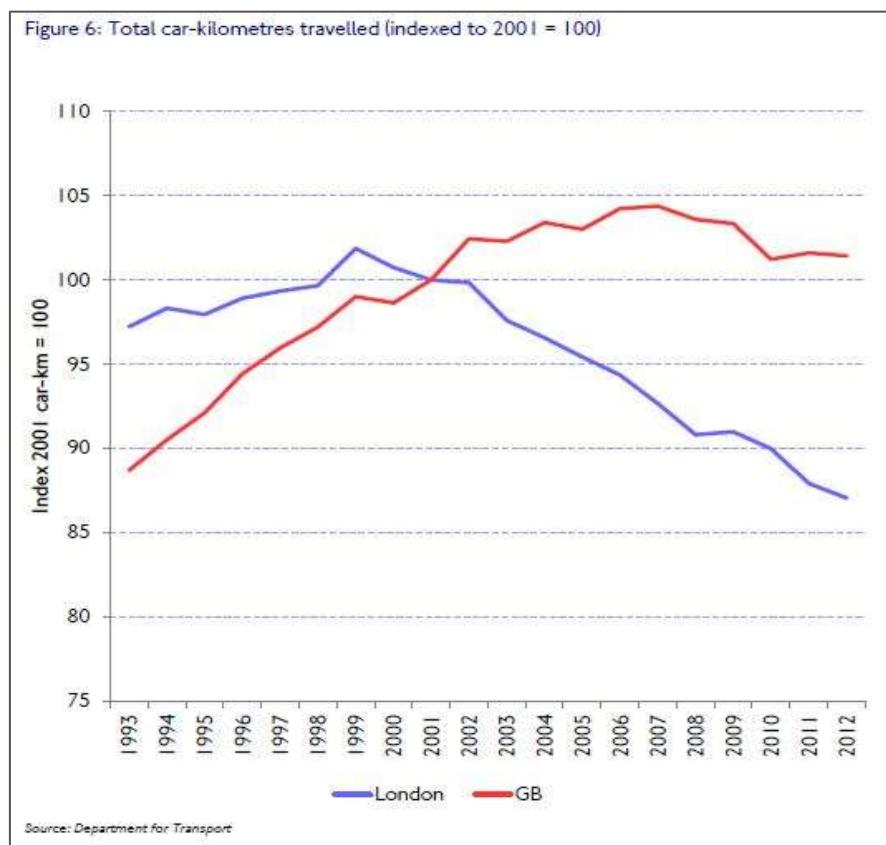
As some volume of private car traffic in and near cities will always be necessary, the role of transport policy is to facilitate that access for the journeys that require it, while developing a sustainable mobility network which should cater for most journeys. Reaching a point where this balance is possible, without aggravated congestion being a common issue, is a major task. In theory, reaching a situation where congestion is relatively negligible in the cities, for both private and public transport users, it would be necessary to:

- Reduce private car transport usage from the current levels, despite growing travel demand;
- Reduce car transport to a level where demand for space for private car driving is less than the future supply, given the likelihood that future supply will be lower than current supply; and
- Increase public transport capacity to carry all current public transport passengers; plus the new commuters that need to be accommodated as population increases in the coming years; plus the commuters who shift mode away from private car usage.

In summary, an overarching policy goal is to decouple the growth of private car use from future growth in travel demand and drive a major modal shift to sustainable mobility so that private car use demand falls significantly below current use. While there are obvious differences between a city such as London and cities in Ireland, London's experience from the mid-90s to the end of the first decade of the twenty first century is an example of decoupling travel demand and private car travel. In this period, the population and travel demand in London grew, but car usage fell.

Decoupling travel demand and private car travel – the London experience

The graph below from the UK Department for Transport shows that total car kilometres travelled in London fell by around 11% from 1993 to 2012, and around 14% from a peak in the period in 1999. Car kilometres outside London grew aggressively from 1993 to 2003 and had returned to just below 2003 figures by 2012, after even busier periods.



Decoupling travel demand and private car travel – the London experience

Between 2000 and 2015, the London population rose by 1.7 million people (24.3% rise) and total daily trips rose from 22.7 million to 26.7 million (17.6% rise). However, the total quantity of unsustainable trips per day fell from 10.67 million (47% mode share of 22.7 million trips) to 9.61 million (36% mode share of 26.7 million trips).

The Transport for London (TfL) *Drivers of Demand for Travel in London* report²⁵ looked at the factors contributing to a mode shift away from car travel. This included a number of economic, social and demographic factors such as population changes, the performance of London's economy, changing attitudes to car ownership/use, evolving working arrangements and change in personal preferences as a consequence of a change in demographics.

It also identified the following key factors which were under the control of transport policy makers:

- the capacity of public transport grew;
- road space was reallocated towards public transport usage (and away from private car usage);
- public transport fares remained relatively stable (while motoring costs rose);
- passengers became more satisfied with the quality of service on public transport.

The impact of the London Congestion Charge from 2003 was not included in the review.

4.3 Intervention options

Strategies for congestion alleviation are generally made up of a combination of interventions that affect the nature of travel demand and supply.

- **Demand-focused interventions** focus on changing how and when travellers make journeys. This can also be considered as working to actively reduce demand for unsustainable transport, while also working to actively increase demand for sustainable mobility.
- **Supply-focused interventions** focus on supply of capacity for both sustainable and unsustainable travel methods, usually focusing on changes to the capacity of transport options.

A number of common policy interventions to reducing road-based traffic congestion are outlined in Table 4.1. These measures will be considered in more detail in Sections 5 and 6.

While demand-focused interventions play a part in most international strategies to address congestion, this is generally with an understanding that there needs to be sufficient supply in order to support these measures. Demand-focused interventions are unlikely to work if there is no viable alternative for private car users.

Table 4.1: Congestion alleviation measures/interventions

Supply focused
Investment in sustainable mobility capacity
Development of public transport infrastructure
Provision of additional public transport services
Provision of additional active travel facilities
Road measures
Road space reallocation
Road space widening
Building of new roads
Demand focused
Private car demand reduction
Road pricing/congestion charging
Other fiscal measures (tax increases/incentives)
Parking policies
Traffic Management
Bus priority improvements
Junction upgrades
Speed management
Traffic calming
Safety measures
Traffic signal enhancements
Mobility Management
Workplace/school travel plans
Personal travel planning
Technology
Intelligent Transport Systems (ITS) for the road network
Public transport technology
Land use and transport planning integration
High density development
Development along public transport routes
Mobility as a Service/Shared mobility
Car/bicycle sharing, car clubs, ride sharing, app-enabled on-demand transport services

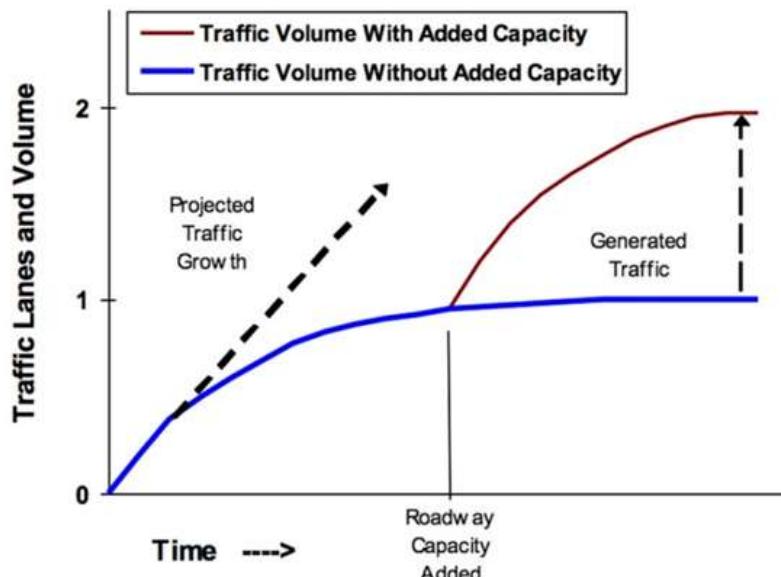
4.4 Road building and induced demand

While all the measures identified in Table 4.1 are evident in multiple jurisdictions, and are suited to different contexts, it is worth noting why the response to congested roads and over-demand for private car travel is not to simply build more space for cars to drive on. International policy has, in general, avoided building additional road capacity to address congestion caused by the private car, where other options exist. There are a number of reasons for this:

- The high financial and environmental cost of road-building;
- Sustainable mobility infrastructure is usually more efficient from a land allocation point-of-view than roads built for car usage (and land is scarce);
- Additional road capacity which is built for private cars may simply become full and congested itself. This relates to the concept of induced demand.

The concept of induced demand, or latent demand, is the phenomenon that after supply increases, more of a good is consumed. In this case, at least theoretically, measures that increase people's ability to drive may increase overall demand to drive. As such, increasing road capacity, while also costly, runs the risk of increasing the proportion of transport demand which is made up by private car movements – i.e. encouraging the pursuit of the least efficient way to travel (Figure 4.1). Measures such as demand management, road pricing, better integration of public transport planning with urban planning, and improved public transport do not run the risk of increasing demand for private car travel and are more likely to reduce it.

Figure 4.1: How road capacity expansion generates traffic



Source: Victoria Transport Policy Institute

4.5 Travel demand interventions

It is assumed that overall travel demand (in terms of daily journeys) will grow in Ireland in the coming years. This is due to recent growth in travel demand in line with improved economic performance, and the expectation that population and jobs in Ireland will continue to grow as identified in *Project Ireland 2040*.

As discussed earlier, travel demand is pro-cyclical. Assuming that expectations of population growth are accurate, travel demand growth is almost inevitable. A scenario where population and employment grows but the number of people working, shopping and otherwise engaging in the economy from their homes grows, to an extent that travel demand does not grow, is theoretically possible, but unlikely. Overall travel demand (in terms of aggregate kilometres travelled) may not increase in line with increased population and employment. This is highly dependent on a reversal of historic trends for urban sprawl in Irish development.

However, it is motorised transport demand, and not travel demand, that most affects congestion. Demand for public and private motorised transport does not have a 1:1 relationship with increased travel demand. This is because people may choose to engage in active travel (walking and cycling). Due to the space-efficiency of active travel, an important measure of success in terms of anti-congestion policy is the size of the ratio of non-motorised travel to overall travel demand.

There are two clear options to improve this ratio. Firstly to invest in encouraging active travel through infrastructure, training, behaviour change schemes, etc. Secondly, in ensuring that more people live close enough to their travel locations to be easily able to walk or cycle or to connect to public transport (through dense urban planning). While these specific topics are touched upon briefly in this paper, they are explored in much greater depth in other background papers prepared – *Background Paper 2: Active Travel* and *Background Paper 6: Land Use Planning and Transport Planning*.

4.6 Interaction with other Government policy

Interventions to alleviate congestion can impact on other Government policy areas and vice versa. For example, such interventions can impact environmental policy by lowering transport emission levels and improving air quality and road safety policy through improved efficiency and safety of incident responses. They can also positively impact health and well-being as increased use of active travel modes increases physical activity levels and reduced journey times can lower stress levels and improve quality of life. Tax policy can be impacted by reduced revenue from vehicle and fuel taxes/duties caused by reduced private car use. However, demand-focused interventions, such as congestion charging or tolls can increase tax revenues.

Similarly, recent Government policy around spatial planning can help towards reducing congestion levels. One of the key priorities of *Project Ireland 2040* and the *National Planning Framework* is compact growth which aims to achieve effective density and consolidation rather than further sprawl of urban development. Achieving this can reduce the need to travel long distance and make sustainable mobility more attractive and easier to supply.

Other government areas impacted by policy measures to alleviate congestion include:

Environment/climate change

- Reduced transport emission levels
- Improved air quality
- Reduced noise
- Protection of natural habitats

Road safety

- Improved efficiency and safety of incident responses

Health and wellbeing

- Increased physical activity levels (through more active travel)
- Lowered stress and fatigue (from reduction in time and length of travel)
- Improved quality of life (from reduced journey times)
- Improved health (from reduction in pollution)

Tax

- Increased tax revenue through collection of congestion charges or road tolls
- Reduced revenue relating to vehicle and fuel taxes/duties caused by reduction in private car use.

Section 4 key points

- A key aim of policy interventions to address congestion is to achieve market equilibrium between travel demand and supply.
- Private car use forms the majority of travel demand in Ireland and this is a significant contributor to over capacity on roads and congestion.
- It is assumed that overall travel demand will continue to grow in Ireland in the coming years.
- A policy goal is to decouple the growth of private car use from future growth in travel demand and drive a major modal shift to sustainable mobility so that private car use demand falls significantly below current use.
- A combination of demand-focused and supply focused interventions is usually applied to address congestion rather than a single intervention.
- Demand-focused interventions focus on changing how and when travellers make journeys.
- Supply-focused interventions usually focus on changes to the capacity of transport options.
- While demand-focused interventions play a part in most international strategies to address congestion, this is generally with an understanding that there needs to be sufficient supply in order to support these measures. Demand-focused interventions are unlikely to work if there is no viable alternative for private car users.

Section 4 key points

- International policies generally avoid building additional road capacity to address congestion caused by private car as it does not result in lasting congestion relief.
- Policy interventions to alleviate congestion can impact on other Government policy areas such as environmental, road, safety, health and tax policies. Similarly spatial planning policies can relieve congestion by reducing the need to travel long distances and making sustainable mobility more attractive.

5 Supply-focused interventions

5.1 Introduction

This Section focuses on supply-focused interventions to alleviate congestion particularly through investment in sustainable mobility capacity. This includes development of sustainable mobility infrastructure (public transport, active travel) and provision of additional public transport services. The Section also looks at a number of supply-focused road measures including road space reallocation and road space widening.

Section 4 identified the need to invest in increasing supply as the first part of an overall congestion alleviation strategy and this has been the policy focus to date in Ireland. Increasing supply in the network is being done through a programme of investment in public transport and infrastructure for active travel, an ongoing process of reallocating road space to more efficient modes, and a small amount of road space investment.

5.2 Investment in sustainable mobility capacity

Measures
Development of public transport infrastructure
Provision of additional public transport services
Provision of additional active travel facilities

5.2.1 Development of public transport infrastructure/provision of additional services

In Ireland, short, medium and long-term investments in sustainable mobility infrastructure are planned to play a major part in relieving congestion. One of the priorities of sustainable mobility investment in recent years under the Government's previous Capital Plan '*Building on Recovery: Infrastructure and Capital Investment 2016-2021*'²⁶ was to address urban congestion. Notable projects delivered include:

- Luas Cross City,
- Reopening of the Phoenix Park Tunnel to passenger trains,
- Substantial replacement of bus fleet,
- Sustainable mobility projects in the five cities (Cork, Dublin, Galway, Limerick, Waterford) including junction upgrades; bus and pedestrian infrastructure; traffic management measures; and improvements to rail and bus station facilities,
- Integration projects to increase public transport use and improve customer experiences through the use of responsive and passenger-friendly smarter technologies, and
- Accessibility upgrades and retro-fit of existing public transport infrastructure throughout the country.

The National Development Plan (NDP) 2018-2027 was published alongside the *National Planning Framework* as part of *Project Ireland 2040*. The NDP sets out a 10-year infrastructure programme to underpin implementation of the NPF. Investment in sustainable mobility will be accelerated over the next decade under the NDP to support the development of an integrated sustainable

mobility system. The public transport programmes and underlying public transport projects proposed for delivery in the cities during the period 2018 to 2027 are as follows:

- Continued investment in bus and train fleets, as well as infrastructure, to maintain safety and service levels including further expansion where required.
- Delivery of the full BusConnects programme for all of Ireland's cities.
- Transition to low emission buses.
- Construction of MetroLink.
- Delivery of priority elements of the DART Expansion Programme.
- Park-and-Ride Programme at strategic rail, Luas and bus locations.
- Complete construction of the National Train Control Centre.
- Supporting programmes of rail and bus station improvement/development, traffic management investment, passenger information programmes, accessibility enhancements and similar.
- Undertake appraisal, planning and design for Luas network expansion.

A common supply measure used internationally is the development of park and ride facilities beside public transport. These are usually located at the edge of cities to allow private car users to transfer to public transport for onward travel to the city centre and reduce congestion levels in the city. Some international cities where park and ride has been successfully implemented and which are similar in nature to the GDA are Auckland, Portland (Oregon), Vancouver, Perth, Adelaide and Edinburgh²⁷.

The *National Development Plan* commits to the development of strategic bus and rail based park and ride facilities. This follows on from commitments in the *Smarter Travel* policy and the NTA's *GDA Transport Strategy*. The *GDA Strategy* commits to provide park and ride facilities at the edge of major and intermediate urban centres to '*facilitate those living beyond the local walking catchment of rail, or feasible alternative public transport services, to access destinations through the public transport network.*' The recently published *Climate Action Plan*²⁸ (Action 89) commits to the establishment of a Park and Ride Development Office within the NTA and the development of a 5-year strategy and implementation plan with specific timelines

The recent and planned infrastructural investments will be complemented by service improvements. This includes expanded bus services under the BusConnects programmes, expanded and more frequent DART and commuter rail services and improved Luas services through expansion and timetabling. .

5.2.2 Provision of additional active travel facilities

The *NDP* commits to the delivery of comprehensive cycling and walking networks for the cities. A significant increase in multi-annual funding up to 2023 has been provided to deliver cycling and walking infrastructure in Cork, Galway, the GDA, Limerick and Waterford over this period. This programme will provide active travel routes to help alleviate congestion by providing viable alternatives and connectivity with existing public transport infrastructure. Over this same period, investment is being made in sustainable urban mobility projects which includes projects that will provide either direct or indirect improvements for urban cycling. In addition, the planned

investment in new bus corridors under the BusConnects programme in Dublin includes over 200km of designated segregated cycle lanes. As previously mentioned, a separate Background Paper focuses on active travel.

5.3 Road measures

Measures
Road space reallocation
Road space widening
Building of new roads

5.3.1 Road space reallocation

Road space reallocation involves shifting road space currently devoted to private car use or parking to serve other modes, such as pavements, bike lanes, bus lanes and rail lines. In some cases it involves reducing total road rights of way in order to make land available for other uses. It is a method of prioritising more efficient modes. International research suggests that this does not reduce travel demand, but that travellers respond by shifting when and how they travel, and their destinations²⁹. In other words, road space reallocation usually increases supply for sustainable mobility while reducing space for unsustainable transport. As the supply trade moves away from a less efficient method and towards a more efficient method, road space reallocation is, generally, a process that increases overall travel supply.

Road space reallocation has a variety of equity impacts. It increases safety and accessibility for some types of travel, but can reduce speeds for others. It gives priority to efficient modes, which increases horizontal equity: travellers that impose less congestion on others bear less congestion delay. Current road design and management practices result in public transport and ride-share passengers being delayed by traffic congestion equally with single occupant private car passengers, although they require less road space per passenger-mile and so impose less congestion on other road users.

The process of shifting road space usage from prioritising unsustainable methods to prioritising sustainable means is a widely followed international format. For example, since the publication of the 1998 UK Government Transport White Paper *A new deal for Transport: Better for everyone*³⁰, there has been a major programme of reallocation of space in the UK since the turn of the millennium. The 2017 report for Transport for London on “*Understanding and Managing Congestion*” states that bus lane kilometres in the London network grew from 162 kilometres to 281 kilometres between 2000 and 2014.

Road space reallocation – the Irish experience

Allocation of greater space to, and increasing prioritisation of, public transport, cycling and walking is a key theme of the *Smarter Travel* policy.

- Action 12 committed to the implementation of more radical bus priority and traffic management measures to improve the punctuality and reliability of bus services, and to support more efficient use of bus fleets. The action notes that this may involve making some urban streets car-free, creating tram-like priorities in others, and making greater use of roads/hard shoulders by buses.
- Action 23 committed to improved road priority for walking and cycling access to key public transport interchanges, ports and airports.

The *Design Manual for Urban Roads and Streets (DMURS)*³¹ was jointly published by DTTAS and the then Department of the Environment, Community and Local Government in 2013. The manual emphasises the role of streets as social places where people should want to live and spend. DMURS does not envisage the total exclusion of the car but rather it is about achieving a better balance in how urban roads and streets are designed and used.

The NTA and Dublin City Council, in collaboration with Dublin Bus and TII, have been progressively implementing measures set out in the 2015 *Dublin City Centre Transport Study* to enable the continued development and growth of the city. The recommendations from the study focus heavily on road space reallocation. The proposals in the *Study* have been partially delivered upon to date. Plans for a civic plaza and the removal of private cars from Westmoreland Street, D'Olier Street, and College Green were rejected by An Bord Pleanála in October 2018. Since the publication of the *Study*, works to develop the Luas Cross City have seen significant sections of city centre road space developed into priority space for public transport, cycling/walking.

The NTA's *Transport Strategy for the GDA 2016-2035* builds upon the *Dublin City Centre Transport Study* and the *Smarter Travel* commitments in planning increased space on Dublin streets for more sustainable mobility. The 2016 *Galway Transport Strategy* commits to the reallocation of road space to public transport in the city centre which will be accompanied by an associated improvement in the public realm. The draft *Cork Metropolitan Area Transport Strategy* envisages further 'walkability' improvements over the lifetime of the *Strategy*. These include further re-allocation of road space in favour of pedestrians in the city and town centres. It is also proposed to review the road network within Cork city with the aim of prioritising road space for public transport, walking and cycling provision.

The BusConnects programme for the cities includes the development of quality bus corridors and new or improved cycle lanes.

5.3.2 Road space widening/building of new roads/improvements to junctions

Increased supply on the roads networks involves some approaches to increase overall network capacity, and other approaches to reduce incident-related congestion. Earlier in this paper, it was noted that incident-related congestion was a much smaller issue than congestion due to overall network supply. However, it was also noted that significant growth in the volume of the road network will not be possible in congested areas, and may not be the most efficient and effective option. As such, while some capacity increases are to be made to the overall road network, the priority is measures to improve the efficient operation of the roads.

Under the *National Development Plan*, a number of road schemes have been identified where relieving congestion is an objective. These schemes are highlighted in Table 5.1 below.

Table 5.1: Road development under NDP 2018-2027

Scheme	Status
National Routes	
N6 Galway City Ring Road	Planning / Design / Construction
N7 Naas to Newbridge bypass widening, Osberstown Interchange and Sallins Bypass	Planning / Design / Construction
N8/N25 Dunkettle Interchange	Planning / Design / Construction
N20 Cork to Limerick Road (Cork North Ring Road)	Planning / Design / Construction
M28 Cork to Ringaskiddy Road	Planning / Design / Construction
M4 Leixlip to Maynooth	Pre-Appraisal / Early Planning
N11 from Junction 4 M50 to Kilmacanogue	Pre-Appraisal / Early Planning
N25 Carrigtwohill to Midleton	Pre-Appraisal / Early Planning
N3 Clonee to M50	Pre-Appraisal / Early Planning
M50 Dublin Port South Access Road	Pre-Appraisal / Early Planning
Regional and Local Routes	
The Sallins Bypass	Planning / Design / Construction
Carrigaline Western Distributor Road	Pre-Appraisal / Early Planning

Section 5 key points

- The supply-focuses interventions in Ireland are focusing on investment in sustainable mobility infrastructure, reallocating road space to more efficient modes, and some further road space investment.
- The *National Development Plan (NDP) 2018-2027* commits to further and accelerated investment in sustainable mobility to increase capacity and relieve congestion.
- This includes the major public transport projects of MetroLink, DART Expansion and BusConnects which will be supported by new park and ride facilities and active travel infrastructure. These infrastructural investments will be complemented by public transport service improvements.
- Road space reallocation policies have been applied in Ireland in recent years to shift road space for private car use or parking to serve other more efficient modes of transport. This policy is also widely applied internationally.
- Recent national, regional and metropolitan transport strategies and policies have committed to road space reallocation measures including proposals for bus, cycling and walking priority systems and car traffic restrictions in urban streets. The planned BusConnects programmes for the cities will provide significantly enhanced quality bus corridors and improved segregated cycle lanes.
- The *NDP* identifies a number of interurban, national and regional road schemes where relieving congestion is an objective.

6 Demand-focused interventions

6.1 Introduction

This Section considers demand focused interventions to alleviate congestion. Section 4.3 listed the following demand-focused congestion alleviation approaches:

Demand focused
Private car demand reduction
Road pricing/congestion charging
Other fiscal measures (tax increases/incentives)
Parking policies
Traffic Management
Bus priority improvements
Junction upgrades
Speed management
Traffic calming
Safety measures
Traffic signal enhancements
Mobility Management
Workplace/school travel plans
Personal travel planning
Technology
Intelligent Transport Systems (ITS) for the road network
Public transport technology
Land use and transport planning integration
High density development
Development along public transport routes
Mobility as a Service/Shared mobility
Car/bicycle sharing, car clubs, ride sharing, app-enabled on-demand transport services

The measures under private car demand reduction, traffic management, mobility management, Intelligent Transport Systems and shared mobility will be considered in this Section. Dense urban planning is a highly effective congestion relieving policy as it reduces the likelihood that people need to use motorised transport to travel. However, this concept has already been well-developed as part of *Project Ireland 2040* (and the *National Planning Framework* contained therein) and in another background paper (*Background Paper 6: Land Use Planning and Transport Planning*).

Practices such as e-working or e-shopping can also impact the level of transport demand and traffic congestion. *Future Jobs Ireland 2019* was launched by the Government in March 2019 and

sets out a framework of ambitions for Ireland's future economic agenda³². Ambition 4.2 seeks to foster participation in the labour force through flexible working solutions.

Once significant sustainable mobility supply increases have come online, international best practice indicates that policy focus should pivot to opportunities to influence the nature of travel demand – to reduce usage of private car travel and increase usage of sustainable options. It should be noted that it is not a guarantee that motorists will shift modes to sustainable mobility just because capacity increases, even if journeys have become more difficult due to congestion.

For a start, people's commuting patterns are quite habitual and habits can be very entrenched. There is, at least at the early points of a change, a possible perceived sacrifice in leaving a car at home and opting to use sustainable mobility instead. Secondly, the challenge of relieving congestion could be considered as a collective action problem. Though mass modal shift should bear benefits to all, it is possible that individuals may perceive the benefits as being able to occur without their individual contribution. If enough commuters view sustainable mobility investment as an opportunity to remove *other people's* cars from the roads in order to reduce *their own* travel time, this could limit the impact of capacity increases.

Action 81 of the *Climate Action Plan* commits to examining a range of demand management measures in all of the cities as a means to reduce transport emissions. DTTAS, in collaboration with the local authorities, will commission a study by end 2019 to:

- Consider key demand management drivers in an Irish context (e.g. congestion, air quality, climate considerations);
- Review international best practices on measures such as urban congestion charging, low emission zones and parking pricing policies; and
- Recommend the most appropriate responses for Cork, Dublin, Galway, Limerick and Waterford taking into account overall transport strategies in each case.

6.2 Private car demand reduction

Measures
Road pricing/congestion charging
Other fiscal measures
Parking policies

6.2.1 Road pricing/congestion charging

Congestion charging/road pricing has long been advocated by transport economists and traffic planners as an efficient means to reduce road congestion through demand reduction. Singapore (1998), Rome (2001), Durham (2002), London (2003), Stockholm (2006), Valletta (2007), Milan (2012) and Gothenburg (2013) have all introduced different forms of charging or permit systems to combat congestion and/or environmental problems, and many other cities are considering it. New York, Manchester, Copenhagen and Edinburgh have all recently tried to introduce congestion charges.

Increasing the cost to drive in certain places at certain times should decrease the number of drivers choosing to drive there and then. The size of the decrease depends on the ease of adaptation, among other things – in other words, how good the alternatives are. Alternatives may be other time periods, modes, routes, destinations etc.

While congestion charges generates additional revenue there can be significant set-up and annual running costs to process charges, payments, handle enquiries and for an enforcement system. For example, the London Congestion Charge generated revenue of GBP 230 million in 2017/2018 and incurred annual running costs of GBP 74 million for the same period³³. Costs of around GBP 162 million were incurred in setting up the congestion changing scheme³⁴.

It is important to note that not all congestion charges operate in terms of charging people a standard fee to enter a city centre area. Singapore is a notable example of an alternative method. While Singapore operates a cordoned area, charges are calculated based on the distances travelled within the city centre area instead of a single charge for entry.

A 2018 discussion paper for the International Transport Forum (ITF) summarised research on the long-term effects of congestion charging in Stockholm and Gothenburg³⁵. There are lessons for the GDA relating to Stockholm's congestion charge as the population in Stockholm at the point of the beginning of the trial is comparable to Dublin. The case study below gives an overview of the Stockholm congestion system.

Congestion charges – Stockholm

The Stockholm congestion charge system was introduced in 2006 and designed as a toll cordon around the inner city. Charges are time-dependent and are higher at morning and evening peak times. Vehicles are charged when crossing the cordon in both directions.

From 2006-2015, the charges ranged from between €1 and €2 per trip and in 2016, the charges increased to €1.1 to €3.5 per trip. This increased the charge by 75% at peak times and 10% in off-peak times. The system was also extended significantly in 2016 to include all car traffic between the north and south of the city.

When the charges were introduced in 2006, the traffic across the cordon was reduced by approximately 20% with commuters diverting to public transport (approximately 50% of drivers were commuters).

The investment cost for the system was approximately €200 million. This included the initial cost for planning and commissioning of the system (including system development and staff training) and operating costs during the first year. The annual operating costs were €22 million in the second year of its operation reducing to €10.3 million in 2016. The 2016 operating costs represent 7% of the annual revenue for 2016 (€140 million).

Congestion charges – Stockholm

By comparison, the annual operating costs (GBP 90.1 million in 2015/2016) for the London congestion charging system represent 35% of the annual revenue (GBP 186.7 million). The ITF discussion paper considers that a key difference between the Swedish system and the London system is that the payments of the latter are partly manual while the payments of the Swedish system are fully automated.

In 2004, over 45% of the citizens of Stockholm stated that they would vote in favour of congestion charges in a referendum. This support fell to below 40% just before the introduction of the system in 2006. Once the charges were introduced, support increased again and in a referendum in 2006, 53% of citizens voted to keep the charges. Up until 2013, support for the charges gradually increased to over 70%. Following the changes to the system in 2016, support dropped to 60%.

6.2.2 Road pricing – the Irish experience

Ireland has not introduced charging as a method to reduce congestion. However, the option has been put forward in a number of relevant policies and strategies.

- *Smarter Travel* (Action 11) commits to ‘consider the application of fiscal measures aimed at reducing car use and achieving a shift to alternative modes of transport.
- *The Transport Strategy for the GDA* notes the need for multi-point tolling as a complementary measure to expanding network capacity as a response to rising transport demand.
- *The M50 Demand Management Study* (2014) recommends the introduction of variable distance based tolling which would result in more than 80% of users being subjected to tolling (currently 39% pay a toll)¹.
- *The Strategic Investment Framework for Land Transport* (2015) highlighted a potential role for demand management, particularly road user charging but was not prescriptive regarding a specific timeline for the introduction of such charging. The report is also clear that the scope for additional transport charges is currently limited by the existing burden of transport taxation and levels of household expenditure on transport.
- *The N40 Demand Management Study* (2017) indicates that the introduction of multi point tolling will help manage the future demand on the N40.

Ireland does have a relationship with road-pricing of sorts. There are eleven roads which are tolled for drivers to use. These tolls are primarily used as a way to recoup the costs of the infrastructure rather than as a fiscal measure to encourage a policy. The exception to this is the Dublin Tunnel. The purpose of the tunnel is to provide a dedicated route for Heavy Goods Vehicles (HGVs) between Dublin Port and the greater road network as well as dramatically reducing the number of HGVs in Dublin city. In order to manage demand through the tunnel and give priority to HGVs, there is no toll for commercial vehicles with a gross vehicle weight over 3,500kg, for buses with

¹This policy approach is regularly referred to as ‘multi-point tolling’

25 or more seats or for exemption card holders. For all other vehicles, the toll is €10 at peak times and peak directions or €3 at off-peak times and directions.

Over the period 2006 to 2018, the volume of light goods vehicles crossing into Dublin city centre reduced by 50%. The majority of that decrease, 70%, occurred in the period 2006-2007, and coincided with the opening of the Dublin Port Tunnel in 2006 and the implementation of the HGV Management Strategy³⁶ in 2007. Between 2017 and 2018, however, there was an increase of 13% in the number of goods vehicles entering the city in the morning peakⁱⁱ.

6.2.3 Other fiscal measures

There are a range of other fiscal options available when it comes to reducing congestion. This can include increasing tax on fuel/vehicles as a method to encourage drivers to drive less and car-pool more. A 2018 briefing by the European Environment Agency demonstrates a clear relationship between the nature of taxes and the decisions that drivers make about acquiring vehicles³⁷. However, a danger here, and in the case of the congestion charges, is that these additional costs impact the less wealthy disproportionately. As already outlined, it is recognised that the scope for additional fiscal measures for transport is limited by the existing burden of transport taxation and levels of household expenditure on transport.

Existing tax policy incentives such as the Travel Pass (Txsaver) and Cycle to Work Schemes for employees aim to encourage modal shift from private car use to more sustainable forms of transport. Under the Tx saver scheme, employees can purchase seasonal public transport tickets from their gross salary, which provides income tax and PRSI savings. The Cycle to Work Scheme allows employers to pay for bicycles and bicycle equipment for their employees and the employee pays back through a salary sacrifice arrangement of up to 12 months. The employee is not liable for tax, PRSI or the Universal Social Charge on their repayments. The 2017 National Mitigation Plan³⁸ committed to considering the potential expansion of these schemes as part of a sectoral approach to decarbonising transport and reducing emissions. However, the Plan acknowledges that any expansion of these schemes would incur costs in terms of revenue to the State foregone.

A fiscal measure applied in Ireland, along with many other countries, is public transport fare subsidies. Free travel passes are also provided to persons resident in Ireland who are over 66 and persons in receipt of certain social welfare payments. There are also reduced fares for children. As part of the BusConnects programme of investment in subsidised bus services, the NTA proposes to introduce simplified fare structures within the major urban centres.

6.2.4 Parking policies

Excessive parking supply can contribute to increased demand for car travel and result in congestion. However, when parking supply is restricted, poor management can increase local congestion due to increased search time. Parking pricing and parking controls are complementary

ⁱⁱ Canal Cordon Report 2018

and are usually implemented together to avoid local congestion – i.e. parking space provision is reduced and is priced to ensure availability at that supply level.

Compared to other transport policies aimed at managing car use, manipulating parking cost or supply presents three clear advantages:

- Parking management does not usually require large investments, such as complicated equipment, new roads or extra public transport supply, and it can be realised in a relatively short time;
- Some kind of parking management can already be found in almost all larger towns and cities in Europe. This makes the public acceptability of parking management much greater than new ways to manage car use, for example a congestion charging scheme. Parking control is common in Irish cities and towns and in the case of Dublin varies by area in response to demand.
- Many congested urban arterials have on-street parking lanes. In such situations, reducing parking spaces can allow for reallocation of that space to use for transport or civic space – i.e. the ‘reward’ for the policy is not just decreased congestion, but also increased public space.

International examples illustrate that there are a number of parking-related policy measures that can be adopted:

- Reducing or removing minimum standards for number of parking spaces needed in new residential and office developments and move towards maximum numbers;
- Make more parking community-owned, instead of being “owned” by one development (so as to better distribute currently available parking);
- Make parking pricing more demand responsive – e.g. raise prices in the busiest areas;
- Reduce the supply of on-street parking.

Parking management – Zurich

In 1996, Zurich introduced a parking supply cap which aimed to achieve a balance between the demands for more pedestrianisation and the interests of business to provide enough parking spaces³⁹. Since then, any new off-street parking spaces in the city have to be balanced by taking away on-street parking spaces.

Between 1996 and 2013, about 800 on-street parking spaces were removed and upgraded to more urban, liveable and high quality street space. This was balanced by the creation of about 800 publicly accessible off-street parking spaces. There has been no negative impact on business in the city.

Zurich has also introduced parking maximums, creating ceilings for the amount of parking in new developments which varies depending on size. Hospitals, care homes, schools, hotels, sports facilities, manufacturing, and storage areas are evaluated on a case-by-case basis.

Parking management – Nottingham

The workplace parking levy was introduced in Nottingham in 2012 covering employers who provide 11 or more liable parking places⁴⁰. The charge commenced at GBP 288 per space and now stands at GBP 415 per space for 2019. With over 25,000 parking places liable for the levy, the scheme has generated over £44m in revenues since the scheme commenced.

Levies are not applied to spaces available for customers, occasional business visitors, business fleet vehicles (not used for commuting) and discounts of 100% are applicable to drivers with disabled passenger badges, for emergency service vehicles and at qualifying NHS premises.

Revenues are ring-fenced by law to spend on transport initiatives, and proceeds have contributed to the financing of the city's tram network, electric link bus network and redevelopment of the city's railway station. Grants are available to businesses to encourage reduction in workplace parking through initiatives such as a cycling grant for showers and cycle facilities.

At a national level, the need to reduce parking spaces is noted in *Smarter Travel*. It is alluded to in Action 1 of the policy and explicitly in Action 8.

- Action 1 commits to ensuring that '*Government Investment in new public facilities such as schools, community/health centres and sports/amenity facilities as far as is practicable, takes account of the need to give priority to walking, cycling and public transport as the primary means of accessing (the) facilities*'.
- Action 8 specifically calls on the DTTAS to '*seek a plan from the Office of Public Works to reduce car-parking spaces at Government offices where alternative travel options are possible, and require all other public sector organisations to do likewise as part of their workplace travel plans*'.

The Office of Public Works no longer provides "stand-alone" car parking spaces for Government Departments and Offices (i.e. spaces which are not provided by a landlord as part of the building itself).

Parking restriction is also noted as a means of supporting sustainable mobility demand growth in the *Transport Strategy for the GDA*. Some of the specific parking-related issues which are identified in the strategy are:

- The need for enforcement of laws relating to parking on footpaths and cycle lanes;
- Set maximum parking standards for all new developments, with the level of parking provision applied being based on the level of public transport accessibility;
- Reduce the availability of workplace parking in urban centres to discourage car commuting, where alternative transport options are available;
- Secure the introduction or expansion of on-street parking controls, and charging structures, that seek to reduce commuter parking and which contribute to greater parking turnover for non-commuting purposes;

- Introduce parking charges at out-of-town retail centres, to reduce the congestion potential at these locations.

The 2017 *National Mitigation Plan* includes a long term measure to develop a National Policy on Parking. More recently, the *National Planning Framework* notes that there should generally be no car parking requirement for new development in or near the centres of the five cities, and a significantly reduced requirement in the inner suburbs of all five. This has been expanded in the Regional Spatial and Economic Strategies (RSES) for the Eastern and Midland Region and the draft RSES for the Southern Region. The RSESs include guiding principles/Regional Policy Objectives for the integration of land use and transport planning. These state that all non-residential development proposals should be subject to maximum parking standards; and in locations where the highest intensity of development occurs, an approach that caps car parking on an area-wide basis should be applied.

The *Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities*⁴¹ were published by the Department of Housing, Planning and Local Government (DHPLG) in 2018. In relation to car parking provision in larger scale and higher density developments, comprising wholly of apartments in more central locations that are well served by public transport, the *Guidelines* state that “*the default policy is for car parking provision to be minimised, substantially reduced or wholly eliminated in certain circumstances*”. It also states that this policy “*would be particularly applicable in highly accessible areas such as in or adjoining city cores or at a confluence of public transport systems such rail and bus stations located in close proximity.*”

6.3 Traffic management

Measures
Bus priority improvements
Junction upgrades
Speed management
Traffic calming
Safety measures
Traffic signal enhancements

As outlined earlier in the paper, local authorities are statutorily responsible for traffic management within their areas of responsibility and there is close engagement between the local authorities and the NTA on traffic management measures. The NTA provides capital funding to local authorities for sustainable urban transport projects in the cities which includes traffic management measures. This can include bus priority improvements, junction upgrades, speed management, traffic calming, safety measures and traffic signal enhancements.

As also outlined, the relevant stakeholders are working together to effectively manage the road network. In Dublin, this includes the establishment of an inter-agency Traffic Coordination Group in 2018. This group has identified congestion points on key routes and are working through a programme of bus priority traffic signal enhancements to resolve this.

6.4 Mobility management

Measures
Workplace/school travel plans
Personal travel planning

Mobility management is a concept to promote sustainable mobility and manage the demand for car use by changing travellers' attitudes and behaviourⁱⁱⁱ. Mobility management usually focuses on "soft" measures like information and communication, organising services and coordinating activities of different partners. These are intended to complement and enhance the effectiveness of "hard" measures within urban transport (e.g., adding more capacity through building infrastructure, buying more fleet, etc.). Mobility management measures (in comparison to "hard" measures) do not necessarily require large financial investments and may have a high benefit-cost ratio. In Ireland and the United Kingdom, mobility management often takes the form of 'travel planning' and is regularly discussed under this heading. Travel planning can happen through an organisation, or directly to the individual.

6.4.1 Workplace/school travel plans

A common mobility management measure is to target behaviour change within discrete units such as large companies or educational institutions rather than attempting to drive behaviour change across a country as a whole. Table 6.1 includes an outline of corporate mobility management initiatives in a number of other European countries⁴² and in Washington, under the Commute Trip Reduction initiative⁴³. Some of these initiatives are mandatory under legislation while others are voluntary.

ⁱⁱⁱ Definition provided by the European Platform on Mobility Management

Table 6.1: International approaches to corporate mobility management

Country	Details
Austria	<p>The Klimaaktiv Mobil Programme is Austria's climate protection initiative in transport and supports mobility management measures contributing to greenhouse gas mitigation. The scope of the programme is very broad and provides a national framework to motivate and support specific target groups to develop and implement measures to reduce CO₂ emissions from related transport activities. Specific initiatives for businesses and schools include:</p> <ul style="list-style-type: none"> - Consulting programme offers free-of-charge expert advice on green mobility management to target groups including businesses and schools. - Funding bonus for corporate mobility projects e.g. public transport passes for employees. <p>As of end 2017, green mobility projects were implemented by approximately 9,000 businesses and 400 schools.</p>
France	<p>A number of corporate mobility management measures have been implemented in France over the last two decades:</p> <p>1996: Sustainable urban transport plans became mandatory for urban areas with more than 100,000 inhabitants, including promoting mobility management with employers.</p> <p>2000: The concept of voluntary 'workplace travel plans' was developed.</p> <p>2016: A bike kilometric allowance scheme was introduced for companies following a pilot scheme in 18 companies in 2014/2015. Under this voluntary scheme an allowance is provided for employees who commute by bicycle up to a maximum of €200 per year for each employee.</p> <p>2018: Workplace travel plans are mandatory for companies with more than 100 employees. In addition, companies must fund 50% of their employees' commuting fares.</p> <p>By 2010, nearly 1,500 workplace plans had been set up covering 4 million employees.</p>

Country	Details
Italy	<p>In 1998, legislation introduced the position of mobility manager for companies in Italy (both public and private) with more than 300 employees. The mobility manager is responsible for:</p> <ul style="list-style-type: none"> - Optimising systematic home-work trips of employees; - Introducing new forms of environmentally sustainable mobility to address the issues of air pollution and traffic congestion. <p>Companies are required to adopt home-to work mobility plans. Each municipality must put in place a support structure for the coordination of the company mobility managers. Examples of measures implemented by company mobility managers include:</p> <ul style="list-style-type: none"> ▪ Promoting cycling - e.g. providing free bikes to employees or incentivising the purchase of bikes. ▪ Putting in place infrastructural projects to promote sustainable travel. This includes special parking lots or outdoor bicycle racks and changing rooms for cyclists. ▪ Encouraging public transport use – e.g. by making agreements with public transport companies which allows employees to buy lower priced passes, receive contributions from the employer or obtain the payment in instalments of the passes in the payrolls. ▪ Setting up company shuttles and employee collection services, car-pooling, bike sharing, increased tele-working, agreements with crèches close to company offices.
Washington State (USA)	<p>The 2006 Commute Trip Reduction Efficiency Act requires local governments in urban areas with traffic congestion to develop programmes that reduce drive-alone trips and vehicle miles. It includes targeting workplaces with 100 or more full-time employees in the most congested areas of the state. Employers develop and manage their own programmes based on locally adopted goals for reducing vehicles trips and miles travelled.</p> <p>The State's Department of Transportation provides technical assistance to employers to get their programmes up and running. Over 1,050 workplaces and 530,000 commuters participate in the CTR programme and employers regularly report on their programmes.</p>

A number of European countries take a similar approach to Ireland when it comes to mobility management where the primary focus is on promoting a range of tools for creating behaviour change. In many cases, a national office with responsibility for mobility management offers some kind of consultancy service to companies or schools, similar to what the NTA provides through the Smarter Travel programmes and their contribution to the Green Schools programme.

Organisation level mobility management in Ireland

Mobility management is a key element of the *Smarter Travel* policy. Actions 7, 8 and 9 commit to:

- Ensuring that every school and college in Ireland has a travel plan to encourage students to take alternatives to car and that local authorities identify and implement safe walking and cycling routes to and from schools and other educational institutions.
- Establishing an advisory group of stakeholders to achieve better cooperation in delivering school and college plans.
- Working towards a requirement on organisations with over 100 staff to develop and implement workplace travel plans.
- Providing support and guidance for the development of workplace travel plans.
- Implementing a programme to promote Personalised Travel Plans, aimed at citizens in areas served by public transport.

The *Transport Strategy for the GDA* commits to supporting and facilitating the implementation and expansion of:

- Workplace Travel Plans for all large employers;
- Tailored travel planning information provision for residential and commercial/retail areas;
- Travel Plans for schools, colleges and all education campuses.

In terms of implementing these measures, the NTA provides free resources online to support local authorities, organisations and third level institutions to create and implement travel plans. Schemes exist, under the banners *Smarter Travel Workplaces*⁴⁴ and *Smarter Travel Campus* to facilitate the development of these plans. Organisations of more than 250 people can avail of the 'Smarter Travel Workplaces Partner Package', which provides for active support in development and implementation of travel plans by Smarter Travel, a subcontractor of the NTA. Over 130 workplaces and campuses nationwide have engaged with these services.

The NTA also supports the 'Travel' module of An Taisce's *Green-Schools* programme⁴⁵. The aim of this module is to encourage schools to promote sustainable modes of transport to and from school. *Green-Schools* Travel encourages pupils and parents to walk, cycle, 'Park n Stride', use public transport or car pool instead of using the private car on the school run.

There are currently no mechanisms to ensure that travel plans are implemented and there is no obligation on any organisation in Ireland to have a travel plan. This includes government departments, other public sector organisations, schools, etc.

6.4.2 Personal Travel Planning

Personal Travel Planning (PTP) encourages people to make more sustainable travel choices and seeks to enable more journeys to be made on foot, bike, bus, train or in shared cars, through the provision of information, incentives and motivation directly to individuals. The greatest successes in terms of Personal Travel Planning are likely to be delivered where there are/is:

- Plentiful and diverse local facilities (shops, employment centres, leisure facilities etc.);
- Good community networks;
- High levels of accessibility (by all sustainable mobility modes);
- Excess capacity on the public transport system;
- A stable (non-transient) population;
- Local recognition of congestion-related problems; and
- Recent investments in the local sustainable mobility network.

PTP usually involves some combination of:

- One-to-one conversations between individuals and trained field officers;
- The provision of information on how to travel sustainably (for example, maps or guides about the local bus network, walking and cycling routes);
- The offer of gifts and incentives to encourage the use of sustainable modes (for example, pedometers, water bottles, free bus tickets).

In many ways, PTP can be seen as the provision of the 'push' that is needed to get those who could potentially shift to sustainable mobility to make that step, through campaigns which target a community with shared needs. This is generally done through making it easier to find information on services or providing incentives to shift modes.

Campaigns promoting one way to travel over another, which sell an economic benefit to the traveller, can be more likely to be successful when people have not yet formed travel habits. This argument holds for recent movers to an area, students moving out of home for their studies, or people who have recently begun commuting to a new area (for example, if a new industrial estate were to open, with jobs in a number of organisations coming online at the same time).

This is not to say that PTP campaigns do not work when focused on people who have already formed habits. It is just more difficult. This is where the idea of utilising the energy around a new service, or a recently changed or expanded service, becomes particularly useful. If habits are formed within one scenario, it can be difficult to break them unless the scenario changes. A commuter who has always driven because they find it easier than taking the bus may be more likely to be swayed if they hear that there are now more buses, better buses, faster buses, etc., than previously.

Personal Travel Planning – the Irish experience

PTP was delivered in Midleton during July 2010 with *Smarter Travel* funding from DTTAS. The scope of the PTP was scaled to reflect available funding. The aim of the PTP was to achieve a 10% reduction in car trips to work⁴⁶. Approximately 500 houses were targeted to get involved in the project which resulted in 273 residents participating in a pre-advice survey and receiving travel advice and a starter kit. The starter kit included:

- bus/train timetables;
- local area and public transport maps;
- local walking and cycling routes;
- information on active travel, eco-driving, car sharing, road safety and the bike to work scheme;
- branded materials such as pens, arm bands, high visibility vests, water bottles and a pedometer;
- incentives to promote smarter travel were also provided including a free return bus ticket to Cork city and free parking for a week at Midleton train station.

A monitoring survey was carried out after three months to evaluate the success of the Midleton PTP. This survey was completed by 120 of the original 273 residents. Results from the monitoring survey show that 12% of participants changed their mode of commuting travel.

It is difficult to draw a line between some elements of mobility management and practices that might otherwise be described as marketing or PR for public transport services or operators. In reality, there is a major overlap in the two, and the existence of broader marketing campaigns to promote services is sometimes seen as an important underlying support for mobility management programmes. The key message for both marketers and transport-policy makers is to focus, where possible, on demographics which are well-primed to break old habits and adopt new ones, and to focus on providing the information needed to encourage and facilitate that move.

6.5 Technology

Measures
Intelligent Transport Systems (ITS) for the road network
Public transport technology

New technologies and innovation can present opportunities for better and enhanced services and reduce traffic congestion. Intelligent Transport Systems (ITS) comprise the application of information technology and communications to provide information for travellers enabling them to make informed travel choices. ITS assists in the management of transport infrastructure by allowing for the communication of information on transport network performance in real time. The use of ITS as a measure to address congestion has been identified in a number of national and regional strategies including the *SIFLT*, the NTA's *Transport Strategy for the GDA*, the *Galway Transport Strategy* and the draft *Cork Metropolitan Area Transport Strategy*.

6.5.1 ITS for the road network

There are a number of ITS measures that can be introduced on the road network (interurban/motorways) to control travel demand in response to issues so as to allow for better overall network performance and transport demand management. This can include variable speed limits, variable message signs, incident detection systems and ramp metering.

Traffic incidents and turbulence within the traffic scheme can aggravate congestion levels. Turbulence can be caused by vehicles breaking, vehicles weaving between lanes, merging/diverging traffic and incidents upstream in the road network. Conversely, turbulence can be a root cause of incidents. Managing the effects of both turbulence and incidents is a key element in the overall management of congestion.

The M50 Demand Management Study (2014) recommended a number of programmes to address these issues. These included:

- Intelligent Transport Systems/Traffic Control – Variable Speed Limits and lane control signals along with enhanced incident detection;
- Information – Internet and roadside Variable Message Signs to advise other drivers where accidents are;
- Network Control – Management of Intelligent Transport Systems/Traffic Control measures from a dedicated single control centre.

Since the report, there has already been an introduction of incident support unit vehicles and tow away vehicles, a new system of Emergency Diversion Route signage, and changes to the lane marking layout at junction merge points. TII has also commenced a project titled '*enhancing Motorway Operation Services (eMOS)*' which will include Variable Speed Limits (VSL) and Lane Control Signalling.

The Variable Speed Limit regime on the M50 will improve the operational efficiency of the motorway by smoothing traffic flow, improving journey time reliability and reducing the number of traffic collisions. Lane Control Signalling will also be installed as part of the project which will allow the closing off of lanes. DTTAS is progressing the legislative arrangements that will provide TII with the necessary powers to regulate and operate VSL on motorways.

TII is extending the Motorway Traffic Control Centre at Dublin Tunnel to cater for the additional workload from the introduction of VSL and is currently procuring the management systems and hardware for the operation and roll-out of VSL for the M50. It is expected that these works which TII is undertaking will be completed in late 2019 or early 2020.

6.5.2 Public transport technology

Public transport technology solutions such as integrated ticketing and smartcard technology offers a convenient way to pay public transport fares and can be successful in increasing modal shift from private car and reducing urban congestion. The Transport for Ireland Leap Card offers unique smart ticketing opportunities including fare capping (daily and weekly), discounting for through journeys by card and instant automatic top-up of the purse value on the card. Fare

capping is where a customer can use their Leap card for as many services as they like either daily or weekly and they will be assured that their costs will be fixed or ‘capped’ at attractive rates. Mobile top-up was introduced in 2016 and has proven popular with over 20% of all top-ups taking place on mobile phones.

In the coming years, the NTA will commence the implementation of an account-based solution involving acceptance of contactless bank cards, bar codes and mobile tickets.

The NTA has implemented a comprehensive suite of well recognised Real Time Passenger Information (RTPI) systems based on Automatic Vehicle Location (AVL) data provided by transport operators. The central systems receives data from all Dublin Bus, Go-Ahead and Bus Éireann vehicles and rail and Luas services which is subsequently processed to provide frequent and accurate predictions directly to customers in the following forms:

- Over 700 on-street signs at bus stops and in key locations;
- Through a mobile App available to almost all mobile smart phone platforms;
- Online through the NTA’s customer facing website – www.transportforireland.ie
- In key transport hubs, including Dublin Airport, on modern flat screen displays along with other pertinent local public transport information; and
- Using mobile SMS messaging.

The NTA is working with the private bus sector to develop means by which data from their services can be displayed on the RTPI system with an initial objective of displaying scheduled times for private operators. Currently scheduled data is displayed for some private operators. It is intended to continue the roll-out to other locations for RTPI displays and to assess arrangements for wider provision of arrival time information.

The NTA has developed a web-based public transport National Journey Planner to enable advance planning on any public transport journey on the island of Ireland, from door to door, incorporating walking. The Journey Planner also displays fares options and real time information to web and app users. A separate App has been developed specifically for cycling journey planning. The Planners are available:

- Through a mobile App – Real Time Ireland (Apple iPhones and Google Android devices);
- Online through the transport for Ireland website.

6.6 Mobility as a Service/Shared mobility

The current model of private transport involving privately owned motor vehicles and driven by individuals is being challenged by technological developments. The introduction of several innovations in the provision of transport as a service, including app-enabled on-demand transport services, car- and bicycle-sharing, and ride-sharing platforms, has already made an impact on transport systems and promises to grow in importance as the enabling technology advances.

The provision of mobility as a service (MaaS) could have a sizeable effect on both public and private transport, particularly in urban areas. It can help to reduce congestion and address constraints in transport capacity, while providing better value for the end-user.

There are a number of commitments in existing policies and strategies around shared mobility. The *Smarter Travel* policy included the following commitments:

- Establish a car-sharing website which will help employers to encourage such initiatives in the workforce;
- Extend the car-sharing site;
- Support private and public sector initiatives to establish car club schemes in Ireland; and
- Legislate to enable on-road parking spaces to be designated for car clubs through appropriate signage.

The *Transport Strategy for the GDA* also commits to support and facilitate the implementation and expansion of car-club schemes, car-pooling and car-sharing. The *National Planning Framework* references car-pooling and car-sharing as examples to help increase the efficiency of land use.

Some progress has been made on the above commitments. The NTA has published information to assist individuals and organisations with an interest in developing car-sharing arrangements and directly promotes the development of car-sharing arrangements through its Smarter Travel Workplaces and Smarter Travel Campus Programmes. Car-sharing is an arrangement involving a driver plus passenger(s) sharing a journey by private car. It can also be referred to as lift-sharing and car-pooling and is a common initiative when considering organisational travel planning and Personal Travel Planning. Car-sharing is different to commercial car-clubs where cars are rented for a short period of time, often by the hour. In Ireland, car club type sharing schemes are in place in Dublin (GoCar and Yuko) with parking support from Dublin City Council.

Shared mobility measures operating in Ireland also include public bike schemes, which operate in Cork, Dublin, Limerick and Galway, and private bike schemes and stationless schemes, e.g. the BleeperBike scheme, which is available in Dublin and Sligo.

A report published by the International Transport Forum in 2018 examined how new shared mobility services could change mobility in the GDA⁴⁷. The report looked at simulations of 11 different shared transport scenarios. It considered that shared, on-demand mobility services could provide significant benefits to the GDA by reducing emissions, congestion and the need for parking space.

The interest in shared mobility as a congestion alleviation policy relates mostly to its role in breaking habits around car ownership and car dependency. It breaks with the tradition of cars being something a person needs to own in order to use, and creates an image of a car as a vehicle for occasional use, complementing the use of public transport for regular commutes.

Section 6 key points

- When sufficient increases in the supply and capacity of sustainable mobility options have been put in place, international best practice indicates that the policy focus should move to demand management measures.
- This includes fiscal measures such as road pricing/congestion charging, increases in fuel/vehicle taxes and/or tax incentives such as the Travel Pass and Cycle to Work Schemes.
- Over the past 20 years, a number of international cities have introduced forms of congestion charging. In Stockholm, which is similar in population size to Dublin, there was approximately a 20% drop in private cars driving into the city centre after the introduction of the charge.
- While congestion charging and other fiscal measures can discourage private car use in city centres and raise revenue for reinvestment by the State, there can be significant administration, set-up and enforcement costs involved. Tax-focused schemes can also impact the less wealthy disproportionately.
- The introduction of road use charging as a policy measure to alleviate congestion has been put forward in a number of recent national policies and strategies. While there is road tolling in place on a number of roads, this is primarily used as a way to recoup the costs of the infrastructure rather than as a fiscal measure to address congestion.
- The exception is the Dublin Tunnel which is intended to provide a dedicated route for Heavy Goods Vehicles in the city and charges a toll for certain other private vehicles, which is higher at peak times.
- The number of goods vehicles travelling into Dublin city centre in the morning peak has remained relatively static over recent years, but has recently shown an increase of 13% between 2017 and 2018. Over the longer period from 2006 to 2018, the number of goods vehicles travelling into the city has decreased by almost half at 50%.
- Parking policies are another form of demand management which do not usually require large investment. Such measures can already be found in almost all larger towns and cities in Europe, including Ireland.
- The *Smarter Travel* policy and NTA Transport Strategy for the GDA make a number of parking policy commitments. These include:
 - Reducing parking spaces in new public facilities/public sector organisations;
 - Enforcing laws for parking on footpaths/cycle lanes;
 - Maximum parking standards for new developments;
 - Reducing workplace parking in urban centres;
 - On-street parking controls; and
 - Parking charges at out-of-town retail centres.
- The National Planning Framework notes that there should generally be no car parking requirement for new development in or near the centres of the five cities, and a significantly reduced requirement in the inner suburbs of all five.

Section 6 key points

- Mobility management interventions usually focus on "soft" measures like information and communication, organising services and coordinating activities of different partners. These are intended to complement "hard" measures within urban transport such as adding more capacity through building infrastructure and buying more fleet.
- In Ireland, mobility management often takes the form of 'travel planning' and is a key element of the *Smarter Travel* policy and the NTA *Transport Strategy for the GDA* which includes commitments in relation to school/college, workplace and personal travel plans.
- A number of European countries take a similar approach to Ireland on mobility management where the primary focus is on promoting a range of tools to create behaviour change. In many cases, a national office offers consultancy services to companies or schools, similar to what the NTA provides through the Smarter Travel and Green Schools programmes.
- Intelligent Transport Systems (ITS) use information technology to provide real time information for travellers enabling them to make informed travel choices.
- Common ITS measures include road network measures to control travel demand in response to issues e.g. variable speed limits, variable message signs, incident detection systems, and ramp metering.
- Public transport technology solutions such as integrated ticketing and smartcard technology offers a convenient way to pay public transport fares and can be successful in increasing modal shift from private car and reducing urban congestion.
- Mobility as a Service (MaaS) is a recent transport development that involves a shift in thinking about transport means. The introduction of several innovations in the provision of transport as a service, including app-enabled on-demand transport services, car- and bicycle-sharing, and ride-sharing platforms could have a sizeable effect on both public and private transport, particularly in urban areas.
- A 2018 report by the International Transport Forum considered that shared, on-demand mobility services could provide significant benefits to the GDA by reducing emissions, congestion and the need for parking space.

7 Concluding points

Traffic congestion is a major issue in Ireland's cities and other urban areas. The primary focus of transport policy is on the sustainable and efficient movement of the network's users and ensuring that aggravated congestion does not reach unacceptable levels.

Aggravated congestion is congestion levels above those which would be expected on a properly functioning road and creates a range of economic and social costs. Associated costs include lost time, increased vehicle operating costs and environmental impacts such as emissions, air quality and pollution. It also leads to costs to the wider economy by increasing the costs of doing business and a resulting reduction in the relative attractiveness of an area as an option to locate a business. Congestion can increase levels of personal stress for commuters and impact negatively on health and quality of life. The current cost of time lost due to aggravated congestion is estimated at €358 million per year in the Greater Dublin Area and, without intervention, is forecast to rise to over €2 billion per year in 2033.

Congestion also causes issues for place-making in urban areas. The historic planning and development of new housing has led to dispersed population settlements and urban sprawl in the cities which has contributed to congestion problems.

Transport demand has been growing steadily in recent years and is expected to grow further in the future in line with forecasted economic growth rates. Public transport usage and private car usage have risen in parallel with each other and this is placing a great deal of pressure on the transport network. In Dublin, aggravated congestion in certain sections of the M50 motorway during peak hours is increasing and traffic volumes on the motorway are now higher than forecasted. Traffic and congestion levels are also growing on radial routes approaching Dublin city, inside the M50. Similar traffic and congestion patterns exist in other cities, regions and towns.

By 2040, commuting trips nationally are expected to rise by 35% over current levels. Without intervention, rising demand to use private cars, coupled with largely static road space supply will exacerbate the congestion issues that are evident today.

A number of stakeholders have different roles and responsibilities for congestion alleviation at national, regional and local level (DTTAS, NTA, TII, local authorities, Gardaí). An inter-agency coordinated approach has been adopted, similar to other countries. Internationally, addressing urban congestion is a common theme of metropolitan strategies along with targets to increase the mode share for public transport trips.

Policy interventions to alleviate congestion can impact on other Government policy areas such as environmental, road safety, health and tax policies. Similarly, spatial planning policies can relieve congestion by reducing the need to travel long distances and making sustainable mobility more attractive.

The existing national policy - *Smarter Travel: A Sustainable Transport Future 2009-2020* - included a target that work-related commuting by car would be reduced from a current modal share of 65%

to 45% in 2020. However based on recent trends, it is unlikely that this target will be met on a national level.

Addressing urban congestion is a key priority of the 2015 *Strategic Investment Framework for Land Transport* which recommended investment in viable alternatives to the private car as a driver of modal shift. It recognised that demand management measures may also be necessary to maximise the value of transport infrastructure and considered that projects must be implemented in conjunction with supportive spatial planning policies.

The NTA's *Transport Strategy for the Greater Dublin Area 2016-2035* considers that increased integrated sustainable mobility provision in urban areas will provide the means to cater for much of the projected increased travel demand in the region. It considers that this investment must be complemented by demand management measures to achieve the full benefits of the strategy. A key priority in the GDA is to manage the use of the M50 to protect its national function. TII, who has operational responsibility for the motorway, is continuing to implement various measures with other stakeholders to manage demand and optimise operational efficiency on the motorway. There is also similar cooperation outside of the GDA.

The GDA *Transport Strategy* predicts that its full implementation will result in 45% of work commutes in the region undertaken by car by 2035. This expected outcome may need to be updated given the rapid rise of traffic in the region in recent years and forecast population growth.

While the NTA's statutory responsibility for transport planning currently applies only to the GDA, *Project Ireland 2040* commits to extend this to all of Ireland's cities. The NTA has been working administratively with the local authorities in the other cities to prepare metropolitan transport strategies.

Project Ireland 2040 recognises the link between transport and land use planning policies and that previous dispersed housing development has compounded congestion issues. It commits to expand attractive sustainable mobility alternatives to car transport over the period 2018-2027. The DTTAS forthcoming study - *PLUTO 2040* – will take the objectives of *Project Ireland 2040* and the priorities set out in the 2015 *Strategic Investment Framework for Land Transport* and develop high-level objectives for investment in Ireland's roads and public transport infrastructure on the basis of them.

A key aim of policy interventions to address congestion is to achieve market equilibrium between travel demand and supply. Private car use forms the majority of travel demand in Ireland and this is a significant contributor to over-capacity on roads and congestion. It is assumed that overall travel demand will continue to grow in Ireland in the coming years. A policy goal is to decouple the growth of private car use from future growth in travel demand and drive a major modal shift to sustainable mobility so that private car use demand falls significantly below current use.

A combination of demand-focused and supply-focused interventions is usually applied to address congestion rather than a single intervention. Demand-focused interventions focus on changing

how and when travellers make journeys. Supply-focused interventions usually focus on changes to the capacity of transport options. While demand-focused interventions play a part in most international strategies to address congestion, this is generally with an understanding that there needs to be sufficient supply in order to support these measures. Demand-focused interventions are unlikely to work if there is no viable alternative for private car users. International policies also generally avoid building additional road capacity to address congestion caused by private car if other options exist.

The supply-focused interventions in Ireland are focusing on investment in sustainable mobility infrastructure, reallocating road space to more efficient modes, and some road space investment. The *National Development Plan (NDP) 2018-2027* commits to further and accelerated investment in sustainable mobility to increase capacity and relieve congestion. This includes the major public transport projects of MetroLink, DART Expansion and BusConnects and integrated by new park and ride facilities and active travel infrastructure. These infrastructural investments will be complemented by public transport service improvements.

Road space reallocation policies have been applied in Ireland in recent years to shift road space for private car use or parking to serve other more efficient modes of transport. This policy is also widely applied internationally. Recent national, regional and city transport policies have committed to road space reallocation measures including proposals for bus, cycling and walking priority systems and car traffic restrictions in urban streets. The planned BusConnects programmes for the cities will provide significantly enhanced quality bus corridors and improved segregated cycle lanes.

While it is not proposed to significantly increase the volume of the Irish road network, the NDP identifies a number of road schemes where relieving congestion is an objective. The current priority for the road network is to improve the efficient operation of the roads. The NTA and local authorities are implementing traffic management measures in the cities to address congestion including bus priority improvements, junction upgrades, speed management, traffic calming, and safety measures.

When sufficient increases in the supply and capacity of sustainable mobility options has been put in place, international best practice indicates that the policy focus should move to demand management measures. This includes fiscal measures such as road pricing/congestion charging, increases in fuel/vehicle taxes and/or tax incentives such as the Travel Pass (Taxisaver) and Cycle to Work Schemes.

Over the past 20 years, a number of international cities have introduced forms of congestion charging. In Stockholm, which is similar in population size to Dublin, there was approximately a 20% drop in private cars driving into the city centre after the introduction of the charge. While congestion charging and other fiscal measures can discourage private car use in city centres and raise revenue for reinvestment by the State, there can be significant administration, set-up and enforcement costs involved. Tax-focused schemes can also impact the less wealthy disproportionately.

The introduction of road use charging as a policy measure to alleviate congestion has been put forward in a number of recent national policies and strategies. While there is road tolling in place on a number of roads, these tolls are primarily used as a way to recoup the costs of the infrastructure rather than as a fiscal measure to address congestion. The exception is the tolled Dublin Tunnel which is intended to provide a dedicated route for Heavy Goods Vehicles in the city. The number of goods vehicles travelling into Dublin city centre in the morning peak has remained relatively static over recent years, but has recently shown an increase of 13% between 2017 and 2018. Over the longer period from 2006 to 2018, the number of goods vehicles travelling into the city has decreased by almost half at 50%.

Parking policies are another form of demand management which do not usually require large investment. Such measures can already be found in almost all larger towns and cities in Europe, including Ireland. The *Smarter Travel* policy and the NTA's *Transport Strategy for the GDA* make a number of parking policy commitments. These include reducing parking spaces in new public facilities/public sector organisations, enforcing laws for parking on footpaths/cycle lanes, maximum parking standards for new developments, reducing workplace parking in urban centres, on-street parking controls and parking charges at out-of-town retail centres. More recently, the *National Planning Framework* notes that there should generally be no car parking requirement for new development in or near the centres of the five cities, and a significantly reduced requirement in the inner suburbs of all five.

Mobility management interventions usually focus on "soft" measures like information and communication, organising services and coordinating activities of different partners. These are intended to complement "hard" measures within urban transport such as adding more capacity through building infrastructure and buying more fleet.

In Ireland, mobility management often takes the form of 'travel planning' and is a key element of the *Smarter Travel* policy and the *Transport Strategy for the GDA* which includes commitments in relation to school/college, workplace and personal travel plans. A number of European countries take a similar approach to Ireland on mobility management where the primary focus is on promoting a range of tools to create behaviour change. In many cases, a national office offers consultancy services to companies or schools, similar to what the NTA provides through the Smarter Travel and Green Schools programmes.

Another common demand management measure is Intelligent Transport Systems (ITS) which use information technology to provide real time information for travellers enabling them to make informed travel choices. This includes road network measures to control travel demand in response to issues e.g. variable speed limits, variable message signs, incident detection systems, and ramp metering. Public transport technology solutions such as integrated ticketing and smartcard technology offers a convenient way to pay public transport fares and can be successful in increasing modal shift from private car and reducing urban congestion.

Mobility as a Service (MaaS) is a recent transport development that involves a shift in thinking about transport means. The introduction of several innovations in the provision of transport as a

service, including app-enabled on-demand transport services, car- and bicycle-sharing, and ride-sharing platforms could have a sizeable effect on both public and private transport, particularly in urban areas. A 2018 report by the International Transport Forum considered that shared, on-demand mobility services could provide significant benefits to the GDA by reducing emissions, congestion and the need for parking space.

The policy objective to alleviate congestion is to put in place a combination of measures to reduce current congestion levels in the cities and other urban areas and ensure that future travel demand can be managed and not lead to increased aggravated congestion over the medium and long-term.

Acronyms

AADT	Annual Average Daily Traffic
DCC	Dublin City Council
DMURS	Design Manual for Urban Roads and Streets
DTTAS	Department of Transport, Tourism and Sport
GDA	Greater Dublin Area
HGV	Heavy Goods Vehicle
ITF	International Transport Forum
ITS	Intelligent Transport Systems
LOS	Level of Service
NDP	National Development Plan
NPF	National Planning Framework
NTA	National Transport Authority
PLUTO	Planning, Land Use and Transport Outlook 2040
PTP	Personal Travel Planning
RSES	Regional Spatial and Economic Strategy
SIFLT	Strategic Investment Framework for Land Transport
TfL	Transport for London
TII	Transport Infrastructure Ireland
VSL	Variable Speed Limit

References

- ¹ Government of Ireland, *A Programme for a Partnership Government*, (2016) ([Available Online](#))
- ² Integrated Transport Planning Ltd for Transport for London on behalf of Greater London Authority, *Understanding and Managing Congestion*, (2017) ([Available Online](#))
- ³ Department of Transport, Tourism and Sport, *Costs of Congestion, An Analysis of the Greater Dublin Area*, (2017) ([Available Online](#))
- ⁴ Aecom, *M50 Demand Management Report*, (2014) ([Available Online](#))
- ⁵ Transport Infrastructure Ireland, *National Roads Network Indicators 2017*, (2017) ([Available Online](#))
- ⁶ National Transport Authority, Dublin City Council, *Canal Cordon Report*, (2019) ([Available Online](#))
- ⁷ Dublin City Council, National Transport Authority, *Dublin City Centre Transport Study*, (2015) ([Available Online](#))
- ⁸ Galway City Council, Galway County Council, *Galway Transport Strategy*, (2016) ([Available Online](#))
- ⁹ Cork City Council, *City Centre Movement Strategy*, (2013) ([Available Online](#))
- ¹⁰ Transport Infrastructure Ireland, *N40 Demand Management Study*, (2017) ([Available Online](#))
- ¹¹ NTA, Cork County Council, Cork City Council, TII, Systra, Jacobs, *Cork Metropolitan Area, Draft Transport Strategy*, (2019) ([Available Online](#))
- ¹² Department of Transport, Tourism and Sport, *Strategic Framework for Investment in Land Transport*, (2015) ([Available Online](#))
- ¹³ Mayor of London, *Mayor's Transport Strategy*, (2018) ([Available Online](#))
- ¹⁴ City of Stockholm, *Urban Mobility Strategy*, (2012) ([Available Online](#))
- ¹⁵ Helsinki Region Transport, *Helsinki Region Transport System Plan*, (2015) ([Available Online](#))
- ¹⁶ Department of Transport, Tourism and Sport, *Common Appraisal Framework for Transport Projects and Programmes*, (2016) ([Available Online](#))
- ¹⁷ Department of Transport, Tourism and Sport, *Statement of Strategy 2016-2019*, (2016) ([Available Online](#))
- ¹⁸ Department of Transport, Tourism and Sport, *Smarter Travel: A Sustainable Transport Future 2009-2020*, (2009) ([Available Online](#))
- ¹⁹ Dublin Transport Authority Act 2008 (Consolidated Version) ([Available Online](#))
- ²⁰ National Transport Authority, *Transport Strategy for the Greater Dublin Area 2016-2035*, (2016) ([Available Online](#))
- ²¹ National Transport Authority, *Integrated Implementation Plan 2013-2018*, (2014) ([Available Online](#))
- ²² Roads Act 2015 ([Available Online](#))
- ²³ Government of Ireland, *Project Ireland 2040*, (2018) ([Available Online](#))
- ²⁴ Central Statistics Office, *National Travel Survey 2016* (2016) ([Available Online](#))
- ²⁵ Transport for London, *Drivers of Demand for Travel in London A review of trends in travel demand and their causes*, (2014) ([Available Online](#))
- ²⁶ Government of Ireland, *Building on Recovery: Infrastructure and Capital Investment 2016-2021*, (2015) ([Available Online](#))

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- ²⁷ National Transport Authority, *Draft Transport Strategy for the Greater Dublin Area – Park and Ride Report*, (2015) ([Available Online](#))
- ²⁸ Government of Ireland, *Climate Action Plan 2019*, (2019) ([Available Online](#))
- ²⁹ Cairns, S., Atkins, S., & Goodwin, P. (2002). Disappearing traffic? The story so far. In *Proceedings of the Institution of Civil Engineers-Municipal Engineer*. Thomas Telford Ltd ([Available Online](#))
- ³⁰ UK Government White Paper, *A new deal for Transport: Better for everyone*, (1998) ([Available Online](#))
- ³¹ Department of Transport, Tourism and Sport/Department of the Environment, Community and Local Government, *Design Manual for Urban Roads and Streets*, (2013) ([Available Online](#))
- ³² Government of Ireland, *Future Jobs Ireland 2019: Preparing Now for Tomorrow's Economy*, (2019) ([Available Online](#))
- ³³ Transport for London, *Annual Report 2017/2018*, (2018) ([Available Online](#))
- ³⁴ Transport for London, *Ex-post evaluation of quantified impacts of original scheme*, (2007) ([Available Online](#))
- ³⁵ Börjesson, M. (2018), *Assessing the Net Overall Distributive Effect of a Congestion Charge*, International Transport Forum, *Long-Term Effects of the Swedish Congestion Charges, Discussion Paper*, (2018) ([Available Online](#))
- ³⁶ Dublin City Council, *HGV Management Strategy* (2007) ([Available Online](#))
- ³⁷ European Environment Agency, *Appropriate taxes and incentives do affect purchases of new cars*, (2018) ([Available Online](#))
- ³⁸ Government of Ireland, *National Mitigation Plan*, (2017) ([Available Online](#))
- ³⁹ Eltis, *Catalogue on Case Studies for Parking Management Solutions, Push & Pull*, (2015) ([Available Online](#))
- ⁴⁰ Nottingham City Council, *Workplace Parking Levy* ([Available Online](#))
- ⁴¹ Department of Housing, Planning and Local Government, *Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities*, (2018) ([Available Online](#))
- ⁴² European Platform on Mobility Management, *Mobility Management Strategy Book*, (2018) ([Available Online](#))
- ⁴³ www.wsdot.wa.gov/transit/ctr/home
- ⁴⁴ www.smartertravelworkplaces.ie/
- ⁴⁵ <https://greenschoolsireland.org/>
- ⁴⁶ Irish Transport Research Network, *Personalised Travel Planning in Midleton, Co Cork, Proceedings of the ITRN 2011*, (2011) ([Available Online](#))
- ⁴⁷ International Transport Forum, *Shared Mobility Simulations for Dublin*, (2018), ([Available Online](#))



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