

## Chapter 10

# Environment and Transport



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## Introduction

Our transport system is highly fossil fuel dependent, which results in significant emissions of greenhouse gases (GHGs) and air pollutants that are contained in exhaust fumes. Overall, 19.5% (11.3 Mt CO<sub>2</sub>eq) of Ireland's GHG emissions are from the transport sector, and this proportion is expected to increase substantially by 2020. The national climate policy goal (DECLG, 2014) is to reduce overall emissions of carbon dioxide (CO<sub>2</sub>) by at least 80% of 1990 levels by 2050. Ireland also has various targets in the transport sector that it has to achieve, including an obligation to deliver 10% of transport energy from renewable sources by 2020. These stringent goals will require a major transformation in how our transport network is operated and managed.

A recent report by the European Environment Agency (EEA, 2015) has highlighted that a modal shift away from road transport and a switch to alternative fuels are among the key future challenges to be overcome if Europe is to achieve its decarbonisation targets. In Ireland, there is an urgent need for better urban and spatial planning, as well as a major investment programme to encourage much more fuel-efficient transport, a switch to cleaner and alternative fuels, a rapid increase in the electrification of our car stock and a very significant shift from private car to public transport. Without these measures, Ireland will fall well short of meeting its various targets in the transport sector, and of ultimately reducing its emissions of CO<sub>2</sub> by at least 80% by 2050.



## Current Trends

### Transport Emissions

Transport is a significant contributor to Ireland's greenhouse gas emissions.

Transport was responsible for 19.5% of Ireland's total GHG emissions in 2014 (EPA, 2016a). Transport emissions grew considerably between 1990 and 2007. By 2007, emissions were up to 180% higher than in 1990. However, the economic downturn meant that emissions from transport decreased by 25% from 2007 to 2012. Changes to emissions-based motor and vehicle registration taxes also had an influence on this reduction, as did EU emissions limits. For people with options for commuting, other than by car, the introduction of carbon taxes also had some effect though in the short-term at least fuel consumption remains relatively static.

Since 2012, with a resumption of economic growth, transport emissions have started to rise again (Figure 10.1). GHG emissions, including CO<sub>2</sub>, are projected to increase by at least a further 10% by 2020 (EPA, 2016b). This increase could be even higher, as it is based on an assumption that there will be 50,000 electric vehicles on the road and that the 10% renewable fuel use target

has been met. There are currently only around 1,700 electric vehicles on the road, highlighting the scale of the challenges to be addressed in the transport sector.

### Air Pollution and Transport

Air pollutants released from transport are a key public health issue.

The impact of air pollution arising from transport emissions on the environment and health is covered in Chapter 2 of this report. The transport sector accounted for 12% of all air pollutant emissions in 2015 and is one of the largest contributors to particulate matter pollution in cities (Figure 10.2). The diesel car fleet is a key source of this particulate pollution. The predominant message is that there are significant human health impacts from particulate matter (PM) and nitrogen oxides (NO<sub>x</sub>) emissions, which include cardiovascular disease, lung disease and heart attacks (EPA, 2015), and this points to a clear need to reduce transport-related pollution emissions. The recent controversy over the misrepresentation of NO<sub>x</sub> concentrations in car emissions serves to underline the importance of industry integrity and transparency, as well as the need for independent validation of standards necessary to ensure protection of public health.

Figure 10.1 Transport Greenhouse Gas Emissions, 1990-2014 (Source: EPA)

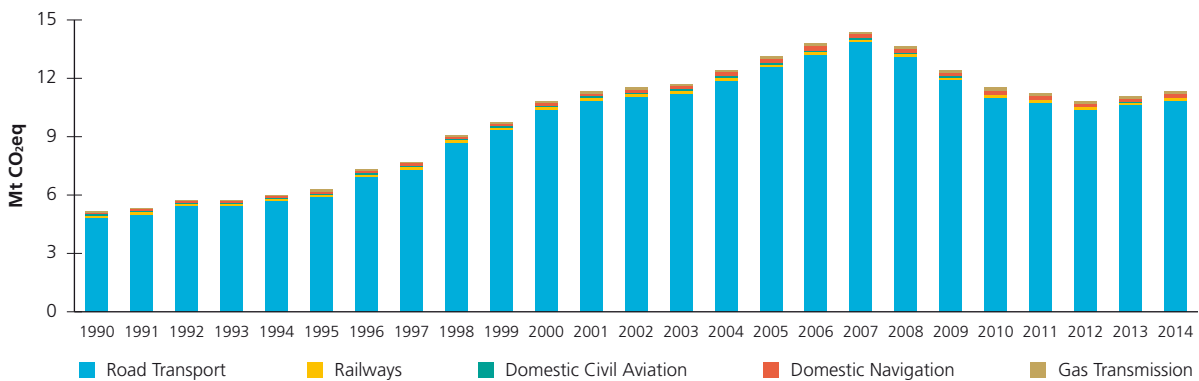
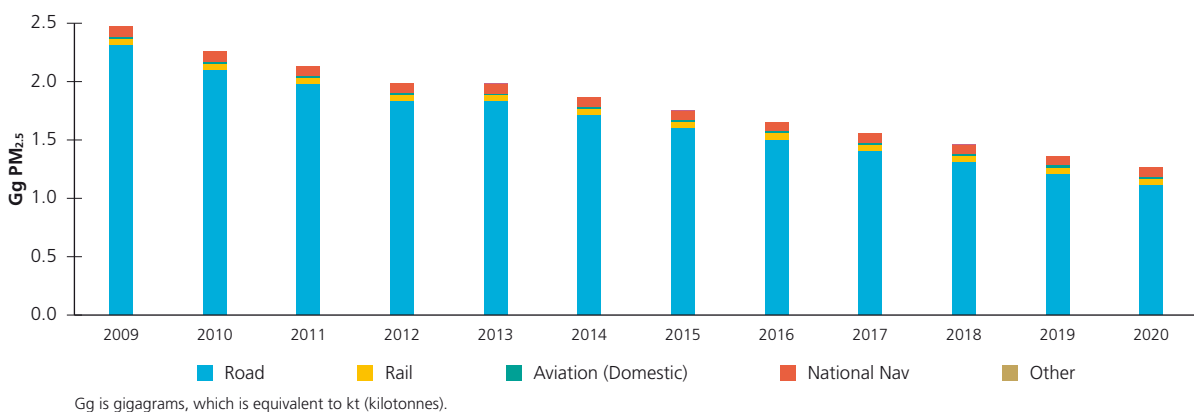


Figure 10.2 Particulate Matter (PM<sub>2.5</sub>) Inventories and Projections by Transport Type, 2009-2020 (Source: EPA)

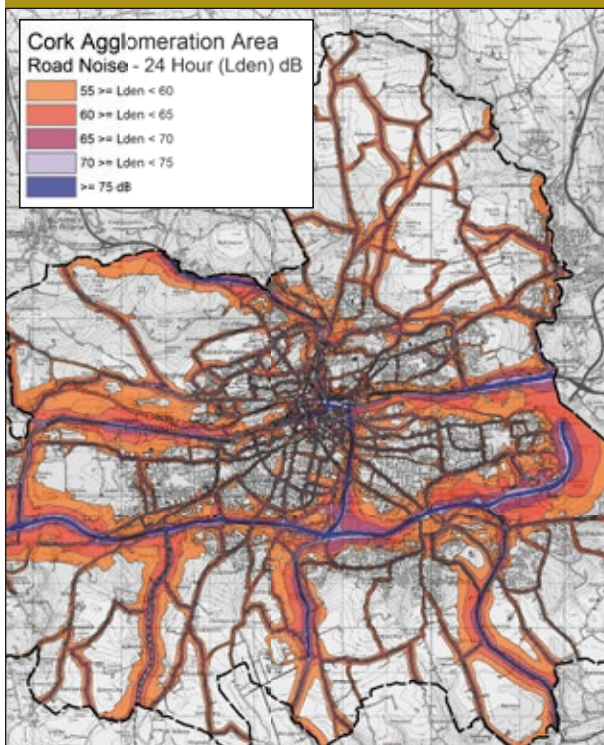


### Other Environmental Pressures

Noise pollution is an important health concern affecting quality of life and wellbeing, and road transport is one of the main sources of environmental noise pollution in Europe, as outlined in Chapter 8 of this report. An example of transport noise mapping in cities is shown in Figure 10.3. Land use planning to safeguard the protection of quiet areas not yet affected by noise can bring significant environmental health benefits. Other environmental aspects include the significant impacts from large transport infrastructural developments on both the human and natural environment, such as on air quality, climate, land and soil.



**Figure 10.3** Environmental Noise Map of Cork City (Source: Cork City Council)



### Passenger Road Transport

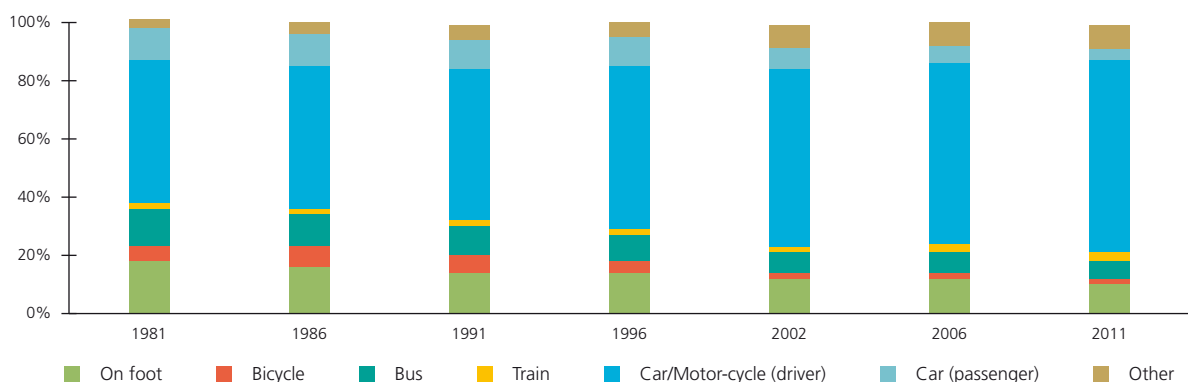
The car is still the dominant choice.

The private car remains the dominant mode of transport in Ireland, accounting, on average, for 74% of all journeys (Figure 10.4) and 79% of all journeys outside Dublin (CSO, 2015). The dependency on car transport outside Dublin can be partially explained by the low-density, dispersed nature of the rural population, making it very difficult to effectively operate a public transport service in rural Ireland. This high dependency has a very significant environmental impact in terms of both GHG and air pollutant emissions.

The total number of licensed vehicles on Irish roads exceeded 2.5 million for the first time in 2014 (DTTAS, 2015a), which included over 1.9 million private cars. While private car ownership levels in Ireland are still below the EU average, the challenge for policymakers is to try to develop a sustainable transport model that can meet the Department of Transport, Tourism and Sport's (DTTAS) sustainable transport vision of:

- maximising efficiency and alleviating congestion;
- minimising the impacts of air pollutants and GHG emissions; and
- reducing overall travel demand and commuting distances by private car.

**Figure 10.4** Travel to Work by Mode (Source: CSO)



## Road Freight

Road freight is projected to increase again as the economy grows.

There was significant growth in the number of heavy goods vehicles (HGVs) from 1990 onwards. The estimated energy demand of Irish road freight between 1990 and 2007 increased by 239% (SEAI, 2014a). However, the estimated final energy demand of HGVs was down 49% in the period 2007 to 2013, and HGVs have become much more fuel efficient due to more stringent EU standards. Nevertheless, the energy demand from HGVs has now started to increase again which clearly indicates that economic activity is a significant factor when it comes to road freight based emissions.



## Rail and Bus

The challenge is to increase passenger numbers to reduce car dependency.

Rail freight traffic declined by 83% over the period 1990 – 2014, from 589 million tonne-kilometre (tkm) in 1990 to 100 million tkm in 2014, although since 2012 it has been increasing. While the demand for rail freight has declined over the period, combined rail and road freight has increased significantly which indicates a very significant modal shift to road freight. The CO<sub>2</sub> emissions profile for rail freight could be up to 90% less than that for road freight with the new longer trains under trial, while any CO<sub>2</sub> emissions from electric trains would be minimal (Irish Rail, 2016).

The total number of heavy rail passengers dropped from 44.7 million in 2008 to 36.7 million in 2013 in line with economic and transport demand decline. Recent years have seen a renewed growth in rail passengers. Meanwhile, the Luas has experienced consistent passenger growth since 2009, with provisional figures indicating that 34.6 million passengers used this service in 2015, which is 9.2 million higher than in 2009. Bus vehicle kilometres increased by 39% from 1998 to 2008, before falling back by 10% from 2008 to 2012. The total kilometres operated remained constant between 2013 and 2014 at 163.6 million vehicle

km, with a small decline in both Dublin Bus and Bus Éireann public service obligation (PSO) services balanced by a small increase in other services (DTTAS, 2015b).

## Cycling

**Cycling in cities has recorded steady growth.**

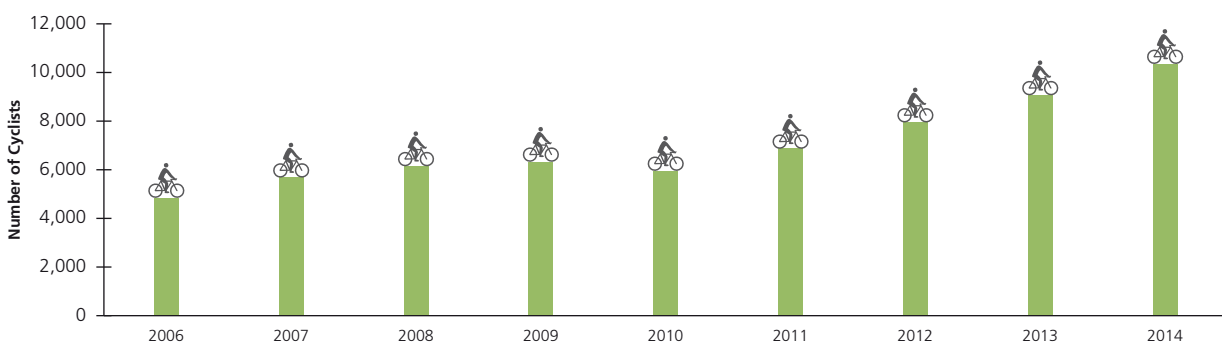
The number of journeys on the Dublin Bikes scheme, which began operations in Dublin in 2009, increased from 1.2 million in 2010 to 4.1 million in 2015. There are now similar schemes in operation in Cork, Limerick and Galway. The number of journeys in 2015 was 289,426 in Cork, 40,118 in Limerick and 19,934 in Galway. Cycling to work in Dublin has seen steady growth since 2006 based on counters placed along the canals (Figure 10.5).

## Aviation

**Air transport passenger numbers are increasing.**

Following a substantial drop in numbers from 2009 to 2011, the number of passengers handled by Irish airports has rebounded again to reach 26.5 million in 2014, with the upward trend likely to continue for some time to come. The energy demand of aviation is estimated based on the sales of jet kerosene. Between 1990 and 2007, estimated aviation energy demand grew by 179%, from

Figure 10.5 Cyclists Crossing the Canal Cordon in the Morning (a.m.) Peak (Source: DTA)



375 kilo-tonnes of oil equivalent (ktoe) to 1045 ktoe (1 toe is the amount of energy released by burning 1 tonne of crude oil). This was followed by a decline of 44% up to 2012, while 2013 saw an increase of 3.4% to 607 ktoe, and this upward trend is continuing.

## Marine and Navigation

Tonnages handled by Irish ports, while increasing in 2014, were still 12% below 2007 levels. The number of vessels handled was 24% lower in 2014, suggesting a move towards fewer larger vessels. This transport sector involving Ireland's cargo ships and tankers is simply known as "navigation". Navigation energy demand is estimated based on sales of marine diesel. For the period 1990 to 2013, the estimated energy demand increased from a low base in the early 1990s of approximately 7 ktoe to a peak of 81 ktoe in 2008, declining to 57 ktoe in 2013. The trend for energy demand in this mode is currently poorly understood.

## What's Being Done

### Energy Efficiency

Initiatives to increase energy efficiency in the transport sector are in progress.

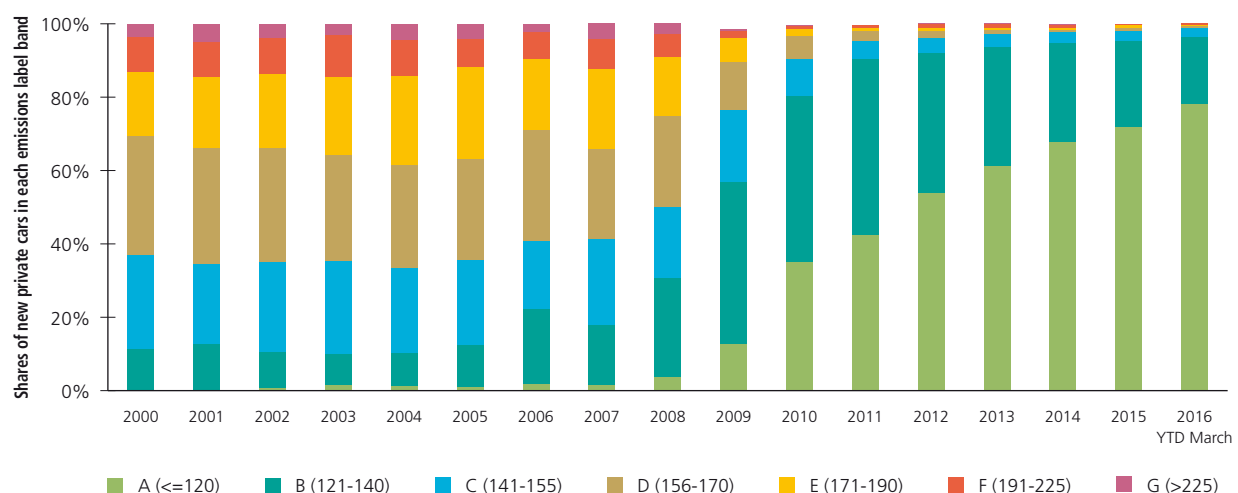
Ireland's third National Energy Efficiency Action Plan (NEEAP) was launched by the Department of Communications, Energy and Natural Resources (DCENR) in 2014. The NEEAP sets out a suite of policies and measures to deliver savings resulting from energy efficiency. The transport sector accounts for 14% of the total energy efficiency savings identified. The majority of the energy savings (66%) are expected to come from the EU regulations on improved fuel economy of new private cars, but this assumes that the energy efficiency figures supplied by the various vehicle manufacturers can be validated.

According to research by the International Council on Clean Transportation (ICCT), real-world emissions of CO<sub>2</sub> are up to 40% higher than emissions measured in the testing lab, with the largest discrepancy observed in hybrid cars (EEA, 2016).

The charging system for Vehicle Registration Tax (VRT) and motor tax for private vehicles continues to promote the purchase of energy-efficient vehicles. In 2013, 61% of new purchases were in Band A (1–120 g/km) and 32% were in Band B (121–140 g/km), while cars with CO<sub>2</sub> emissions of 140 g/km or higher accounted for just 7% of new car purchases (Figure 10.6). Whilst a successful policy from the perspective of CO<sub>2</sub>, this tax transfer did lead to higher environmental NO<sub>x</sub> and particulate emissions as consumers migrated to low-CO<sub>2</sub> diesel cars. A significant portion of the Irish passenger car (PC) fleet still uses older exhaust emission reduction technologies, such as Euro II (1997-2001) and III (2002-2005), but this is changing as newer technologies such as Euro IV and V become more dominant (EPA-UNFCCC, 2016). The potential impacts, particularly the effects of NO<sub>x</sub> emissions resulting from continued dieselisation (increase in relative numbers of diesel vehicles) on ambient pollutant levels and therefore human health, are becoming more clearly understood and must also be factored into policy development in this area. The environmental efficiency of such a taxation measure is therefore questionable.

Initiatives are under way to modernise the public transport fleet by introducing reduced emission vehicles. There is a commitment to establish a Green Bus Fund to cover the differential between the cost of a conventional diesel bus and the cost of an alternative fuelled equivalent. This, and other transport measures, are included in the White Paper on Energy Policy *Ireland's Transition to a Low Carbon Energy Future 2015-2030*, which was published in 2015 (DCENR, 2015).

Figure 10.6 Share of New Cars by Emission Band (Source: SEAI 2014a Energy in Transport)



## Alternative Fuels

### Promoting the use of alternative fuels including electricity is a key policy objective.

The use of alternative fuels, including electricity, forms a significant part of government policy to reduce transport emissions. Under the EU's Renewable Energy Directive (2009/28/EC), Ireland is obliged to deliver 10% of transport energy by renewable sources by 2020 – this is called the RES-T (renewable energy in transport) target. The Biofuels Obligation Scheme, which places an obligation on suppliers of transport fuels to ensure that 6% (by volume) of petrol and diesel is produced from renewable sources, e.g. ethanol and biodiesel, is set to increase this obligation to 8% from 2017 (NORA, 2016). In practice, the consumption of biofuel is predominantly achieved by the blending of liquid biofuels with petrol and diesel. Biodiesel is the dominant biofuel (72%), with the rest being bioethanol.

To promote renewable electricity in transport, a grant support scheme for electric vehicles (EVs) enables purchasers of such vehicles to receive up to €5,000 off the cost price, and EVs are also treated favourably under the motor tax system, qualifying for VRT relief of up to €5,000. In addition, a tax incentive for companies paying corporation tax allows companies to write off 100% of the purchase value of qualifying energy-efficient equipment against their profit in the year of purchase. In 2014, the Electricity Supply Board (ESB) successfully completed the installation of electric vehicle fast chargers across the country, with a fast charger located every 60 km along Ireland's main roads (ESB, 2016).

### Electric Vehicles: Case Study of the Aran Islands Electric Vehicle project

Twenty-four households on the Aran Islands have participated in a pilot project to demonstrate the smart grid technologies needed to transfer and store wind energy in EVs. Each household was fitted with an innovative smart charger unit that could be accessed remotely to allow matching of available wind power with vehicle-charging requirements. It was found that EVs have reduced reliance on imported energy for transport by 68%, and analysis shows that this could be cut further by replacing heating systems with heat pumps powered by wind or wave energy (SEAI, 2015).

## Planning for Sustainable Transport

### Land use planning should be consistent with spatial planning objectives.

The National Transport Authority (NTA) is responsible for ensuring that integration of land use and transport planning in the Greater Dublin Area is consistent with spatial planning objectives. The Transport Strategy for the

Greater Dublin Area 2016-2035 has now been approved by the DTTAS and sets out the principles for land use and transport integration (NTA, 2016).

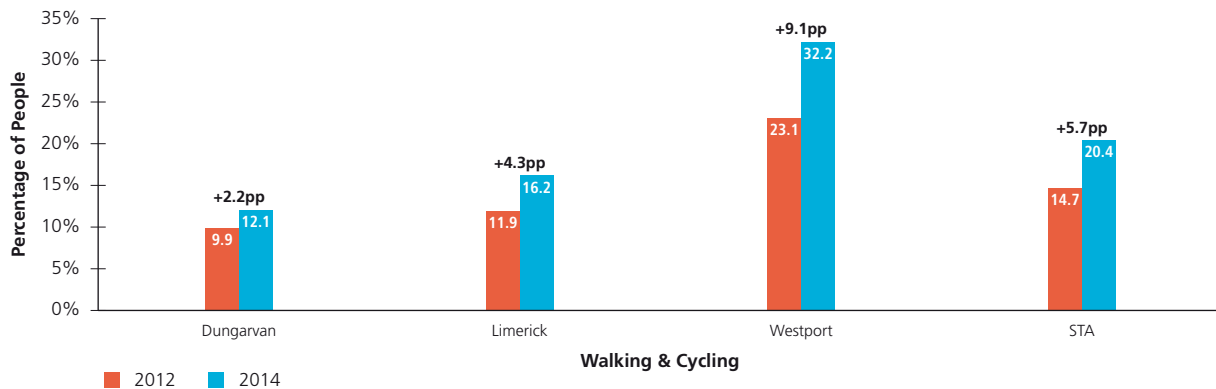
The DTTAS funds the NTA to administer a range of behavioural change programmes. These include the Smarter Travel Workplaces, Smarter Travel Campuses and Green Schools Travel programmes, which are designed to raise awareness around more sustainable travel options and to encourage a shift away from the car to more sustainable modes of transport. The Dublin Bikes scheme has been a great success, and the scheme has been rolled out to the regional cities of Cork, Galway and Limerick, while taxation incentives, such as the Bike to Work scheme, have also been very successful.

### Smarter Travel Areas: Case Study of Smarter Travel Areas – Limerick, Dungarvan, Westport

Under the Smarter Travel Areas (STA) programme, three areas (Limerick City, Dungarvan and Westport) have officially become Ireland's Smarter Travel Demonstration Areas 2012-2016. They represent a city area, a medium-sized town and a small town. The three areas will see a combined investment of €23 million in order to encourage a behavioural switch to more sustainable forms of transport such as cycling, walking and public transport. This investment in Smarter Travel Areas is intended to reduce congestion and pollution, improve road safety, create local employment opportunities, and improve people's health and fitness, as well as enhancing local townscapes and streetscapes. A 2016 interim report evaluated the modal shift seen so far in these areas when compared with Dublin, with increased uptake in both walking and cycling, particularly in Westport (Figure 10.7).



Figure 10.7 Modal Shift for Walking and Cycling (Source: AECOM, 2016)



## Outlook

### Transport and Planning

**Planning and public transport policy needs to be integrated.**

Sustainable transport policies aimed at reducing travel can only be delivered if there are complementary spatial policies locating future developments closer to employment centres and the services that support them, including education, retail and leisure opportunities. In terms of making public transport more attractive and accessible, some good progress has been made in recent years through tax saver schemes, integrated ticketing, use of smart technologies, journey planners and real-time passenger information, but much more needs to be done. The forthcoming National Planning Framework (NPF) is a 20 year strategy for the spatial development of Ireland that will promote a better quality of life for all, with sustainable economic growth and an environment of the highest quality as key underlying principles (DECLG, 2015).

The DTTAS is currently developing a National Intelligent Transport Systems (bio) Strategy, which is due for completion in 2017. Among the key advantages of intelligent transport systems (ITS) is their ability to maximise the potential of infrastructural and consumable resources including fuel. The strategy aims to develop a two-channel approach based on (1) research and development in ITS and (2) the co-ordinated delivery of ITS in Ireland in the medium term. This two-pronged approach will lead to commercial opportunities and, through shared services, a more co-ordinated delivery of ITS (ITS-Ireland, 2014).

### Greening Transport Survey

**Incentivise commuters to use public transport.**

According to the preliminary findings of a recent survey (Greening Transport, 2016a) of commuters in the Greater Dublin Area, time considerations are the main factor

influencing transport mode when travelling to and from work or education. The costs and health benefits associated with public transport, cycling, walking are also important considerations for commuters.

Interestingly, the average monthly costs of car ownership, including carbon emissions-based motor tax, did not prove to be an important factor influencing respondents' decision to own or use a car. Increasing the efficiency of bus services could be achieved by improving bus priority on certain roads, reducing bus stops situated at bottlenecks by directing attention to orbital routes or routes which have greater bus segregation from other traffic, and reducing the number of stops at close proximity to each other. Stop times could be reduced by increasing electronic ticketing. Fast, clean, convenient and affordable public transport needs to be part of any sustainable transport strategy that successfully reduces private car use in urban areas. The Greening Transport project, currently in its first phase, aims to look at the emissions reduction potential of behaviour change in the transport sector (Greening Transport, 2016b).

### The 2030 Rail Network Strategy

**Progressing the strategy for Ireland's rail network will reduce the use of fossil fuels.**

The focus of the 2030 Rail Network Strategy is on the future development requirements of the Iarnród Éireann InterCity Network and the regional services. The Energy White paper supports the introduction of a suite of initiatives to improve the energy efficiency of the rail network, for example further rail electrification will be a priority in future capital plans, as it substantially reduces the use of fossil fuels. The recently published Capital Plan 2016-2021 also provides for further such public investment in the Greater Dublin Area (DPER, 2015).



## Rail Freight

The potential for rail freight was also considered in this rail network strategy, but it is limited in Ireland as the small scale of the Irish market is insufficient to justify large scale capital expenditure. Some ways to increase rail freight include carbon or tax credits for shippers to incentivise rail rather than road use, the reduction of the track access charges to make rail more competitive with road freight, and the promotion of rail freight to shippers and to freight forwarders.

## Road Freight

### Alternatives to oil as transport fuel are available.

The introduction of the Euro class standards for exhaust emission reduction technologies have had a significant impact on reducing atmospheric emissions such as NO<sub>x</sub> and particulates, meanwhile the Alternative Fuels Infrastructure Directive (2014/94/EU) outlines the various fuel options that could provide alternatives to oil in road and maritime transport. In relation to liquefied natural gas (LNG), there are currently no facilities in Ireland, so consideration will need to be given to the level of infrastructure such as developing fuelling stations and incentives needed to support this fuel.

Currently, natural gas offers certain benefits in terms of emissions reductions and air quality, and the technology is mature. Natural gas vehicles (NGVs) have several benefits over conventional diesel vehicles, including a 10-20% reduction in CO<sub>2</sub> emissions and 70%, 80% and 99% reductions in nitrogen oxide, sulphur dioxide and particulate emissions,



respectively. They can also deliver fuel savings, reduce noise emissions, and operate on natural gas or biogas. Natural gas vehicles fuelled by compressed natural gas (CNG) are particularly suited for heavy road freight. The Alternative Fuels Infrastructure Directive requires the provision of a sufficient number of publicly accessible CNG refuelling points to be built by 2025. The target number of refuelling points will be included in a National Policy Framework on Alternative Fuels Infrastructure for Transport, due for publication in late 2016.

Another benefit of supporting CNG-fuelled vehicles is the creation of a market for biomethane as a transport fuel. Biogas can be upgraded to biomethane with a methane content of 96%, and biomethane can be used in gas vehicles as a fuel without modification of the engine. According to the recent SEAI report *Ireland's Energy Targets – Progress, Ambition and Impacts* (SEAI, 2016), the use of biofuels added to traditional transport fuels needs to treble in the next 5 years if renewable targets are to be met. The development of the current gas infrastructure to better enable the production of biomethane from a range of sources, including from farm waste, is addressed in the Bioenergy Strategy (DCENR, 2014).

## Reducing Vehicle Emissions

### More energy-efficient vehicles are needed.

According to SEAI (2016), new electric vehicle registrations need to grow from less than 1% of new car sales to 20% within the next 5 years, i.e. annual sales of EVs need to reach 50,000 by 2020 in order to contribute to meeting binding EU energy targets. This level of growth is highly questionable. It requires a very significant shift in incentives, education and public attitude as there are over 200,000 commercial vans in Ireland (under 3 tonnes), a shift to electric vans (e-vans) could have a significant impact. At present, electric cars account for only 1.3% of new car sales in the EU, but this figure rises to 12% in the Netherlands and to 8% in Denmark (EEA, 2016).

In Ireland, increasing sales of car models emitting less than 100 g CO<sub>2</sub>/km would result in a significant reduction in transport carbon emissions (more stringent requirements for average CO<sub>2</sub> emissions for new cars, 95 g CO<sub>2</sub>/km, will take effect from 2021 under new EU legislation). There are now more than 300 models of petrol and diesel cars emitting less than 100 g CO<sub>2</sub>/km and they attract no price premium. These figures do not include hybrid or electric cars, which could result in further reductions. Measures to support such a transition need to be considered in the National Mitigation Plan (NMP) currently under development. A transport sectoral plan needs to outline how Ireland is going to reduce its CO<sub>2</sub> and air pollutant emissions while trying to minimise the costs. Bringing the sectoral plans together into the NMP will require the proposed measures to be complementary across all sectors.

## Demand Reduction Measures

### Incentives encourage more sustainable car use.

Financial incentives such as subsidies or preferential tax treatments (e.g. free parking in the city centre, free tolls, and lower fuel or registration taxes) play a major role in the consumer's choice of the type of car bought. Past studies have shown that fuel taxes, where they are high, have restrained growth in fuel demand over the long term (Stern, 2007) by leading to the purchase of more fuel-efficient vehicles. The implementation of various "demand management" measures, as set out in the *Transport Strategy for the Greater Dublin Area 2016-2035*, should help to accommodate future travel growth in a managed and balanced way, while some behavioural change programmes are also highlighted in this report (NTA, 2016).

In addressing the need to reduce emissions from transport, a range of approaches to demand management and mode shift will need to be considered, such as measures to target those drivers who use their car for non-essential journeys, and to reward those people who switch to public transport or actively car pool using the national car-sharing website. The intention of any such measures should be to reward good behaviour as well as to ensure that sustainable transport modes will become the cultural norm. We also need to look at technological advances and approaches successfully delivered elsewhere, e.g. innovative taxation systems, and to implement those aspects that would best suit the Irish situation.

## Cycling and Walking Initiatives

### A new plan looks to expand the existing cycle network.

The NTA has published a Greater Dublin Area Cycle Network Plan, which sets out a 10-year strategy for the counties of Dublin, Kildare, Meath and Wicklow. The cycle network outlined in the plan will treble the existing network in urban areas from 500 km to 1485 km in length, and will provide over 1300 km of new connections between towns in the rural areas of the Greater Dublin Area (NTA, 2014).

The proposed National Galway to Dublin cycleway will be Ireland's first dedicated inter-city route for cyclists and walkers, who will be able to travel between Galway and Dublin without using roads, while the Wild Atlantic Way which includes driving, cycling and walking routes has already been a huge success for both locals and visitors alike (GDC, 2015). In addition, the Active Travel Towns programmes were established to secure increased walking and cycling mode share in large population and employment centres.

## Conclusions and Future Challenges

### Key High-level Messages



In Ireland, it is anticipated that reductions in GHG emissions from transport will come mainly from fuel efficiency gains and, to a lesser extent, from the use of alternative fuels. There is a very significant challenge to develop suitable alternative fuels that meet the currently available vehicle technology in the short term.

In relation to road freight transport, the conversion from diesel to cleaner NGVs is a policy option that should be progressed with the installation of sufficient infrastructure and refuelling points. Other measures may include incentives for lower emitting vehicles through the tax system, grants for purchase of cleaner vehicles, scrappage schemes for older vehicles as well as policy options to maximise zero-emissions vehicle sales in 2035. These measures will need to be driven as part of the National Mitigation Plan and when implemented will play a key role in reducing CO<sub>2</sub> emissions. An integrated strategy, tackling GHG and air pollutant emissions together, needs to be pursued to ensure that the public health co-benefits are realised.

A genuine change in the image of public transport and cycling in the Greater Dublin Area (as well as other large urban areas in Ireland) is required if the behavioural

change needed to move away from individual car usage is to be achieved. This change can be realised through a combination of public awareness campaigns and significantly more funding being assigned to projects like walkability audits, plans to expand and declutter footpaths, priority routes and schemes for traffic management of public transport, especially at junctions, greater segregation of cyclists from mainstream traffic and safe cycling infrastructure (e.g. bicycle parking, early starts at traffic lights and safe road surfaces) (Greening Transport, 2016b).

This awareness campaign should occur in line with “green city” measures that act as a barrier to car use in large urban areas, for example greater pedestrianisation of streets, congestion charging, creation of more park and ride facilities; and movement of car parks away from city centre areas, as set out in the in the *Greater Dublin Transport Strategy 2016-2035*. These measures should be put in place to encourage sustainable transport use in order to ease traffic congestion and ultimately result in a reduction in emissions. However, viable alternatives to the private car need to be available for these measures to be effective.

The main initiatives and legislative requirements are outlined in the Energy White paper, the Biofuels Obligation scheme, the National Mitigation Plan, the Draft Transport Strategy, and the Dublin Area Cycle Network. The relevant authorities will be responsible for ensuring the effective implementation of these policies. Going forward, it will be necessary for periodic reports to be prepared and published to outline how the environmental and sustainability actions incorporated into these projects are progressing, and to assess whether they are contributing to significant and verifiable reductions in our emissions of CO<sub>2</sub> and air pollutants.

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