

National Roads 2040

Final Strategy

April 2023



TII

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Project Ireland 2040
Building Ireland's Future

Foreword

National Roads 2040 (NR2040) is TII's strategy to enable Project Ireland 2040, responding to evolving national policy and aligning to the Department of Transport's National Investment Framework for Transport in Ireland (NIFTI). The National Roads network is essential for all sectors of society and communities, serving public transport, freight and personal travel. The network facilitates access to a wide range of destinations including health, education, employment, tourism and services. NR2040 builds on the importance of the network to local communities across Ireland, improving connectivity and accessibility to support sustainable economic growth.

NR2040 addresses the needs of current and future users across Ireland ensuring a connected and efficient transport system. It expresses TII's understanding of and response to environmental challenges such as the impact of climate change and biodiversity loss.

TII's vision for the strategy is that National Roads support an evolving transport system which has safety, innovation and accessibility at its core. The strategy includes over thirty commitments to address issues such as population growth, decarbonisation, climate adaptation, safety and congestion. TII aims to support the way people and goods move along the National Roads network, supporting the economic growth of Ireland in a sustainable manner.

Through the development of the NR2040 vision, TII has set several objectives which will be closely monitored over the coming years. Of utmost importance is to continue to deliver a safe and efficient transport network for people and goods. TII also understands that the Roads network needs to be tailored for different users in different localities. With European and national transport policy focussing on sustainability, TII will work to ensure that the National Roads network is a key public asset that is environmentally, economically, and socially sustainable.

National Roads are essential to the delivery of Project Ireland 2040's National Strategic Outcomes, particularly of enhanced regional accessibility, strengthened rural economies and communities and sustainable mobility.

NIFTI directs TII's investment in National Roads. One of NIFTI's Investment Priorities is 'Decarbonisation', reflecting the Government's Climate Action Plan, which sets a 51 percent reduction in overall greenhouse gas emissions by 2030 and setting Ireland on a path to reach net-zero emissions by no later than 2050.

In developing the NR2040 strategy TII recognises that the customer of the future may have different expectations of the National Roads network and different travel behaviours. Vehicles will increasingly be electrically powered, more short distance journeys may be undertaken by public transport, cycling and walking. National Roads will need to cater for all users and facilitate more sustainable travel.

Changing travel patterns, demographics and new technologies make it hard to forecast future travel demands on National Roads. NR2040 is not a 'predict and provide' exercise, but a proactive policy-led strategy to maintain and develop a network that creates opportunities for the country, supporting economic growth whilst supporting our important goals around carbon reduction.

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1. Introduction

Transport Infrastructure Ireland's (TII) primary functions are to: operate, maintain and extend the life of national roads and light railway infrastructure. These functions will ensure the safety and efficiency of our transport networks, ensure appropriate management of environmental resources and contribute to the transition to a low-carbon and climate resilient society. TII must deliver national road, light railway, metro and Active Travel infrastructure, contributing to compact growth, sustainable mobility, enhanced regional accessibility and the transition to a low-carbon future. TII must operate TII's light rail, tolling and traffic control systems and contribute to the electrification and digitalisation of transport, benefiting our customers and contributing to sustainable mobility and de-carbonisation of transport.

1.1. Purpose of National Roads 2040

National Roads 2040 (NR2040) is TII's long-term strategy for planning, operating, and maintaining the National Roads network. NR2040 has been developed to support the delivery of Project Ireland 2040 objectives and to align with the Department of Transport's (DoT) National Investment Framework for Transport in Ireland (NIFTI, December 2021). NR2040 also aligns with commitments in wider policy including the Climate Action Plan and the DoT's National Sustainable Mobility policy.

TII conducted analysis to understand differing functions of the national roads network and to identify how to realise policy ambitions included in Project Ireland 2020 National Planning Framework (NPF) and NIFTI. With NR2040, TII identifies key issues facing the current and future national road network.

The provision of network improvements is still a key responsibility for TII. The management and operation of the National Roads network is expected to require greater resources into the future. The focus in the NR2040 strategy is on maintaining a functional, well-performing and evolving National Roads network, guiding the full range of TII's National Roads activities over a 20-year period. Through the strategy, TII provides a framework for outlining priorities for future investment across National Roads, in the face of fiscal, social, and environmental change. NR2040 is a means to communicate TII's strategic perspective; providing guidance to sponsoring agencies and local authorities, as to types of investments and areas where these will be made.

1.2. Scope and Role of National Roads

The National Roads network consists of almost 5,300 km of roads: National Primary roads (including motorways) and National Secondary roads. The network forms vital transport infrastructure for all sectors of society. The network facilitates movement of people and goods and a wide range of trip purposes including health, education, employment, tourism and access to key services.

1.3. NR2040 Report Structure

Chapter 2 – Policy Context reviews the government policies and plans that influence NR2040

Chapter 3 – Long Term Strategic Issues for National Roads is a brief evidence-based review of baseline and projected future trends identifying key strategic issues facing the National Roads network

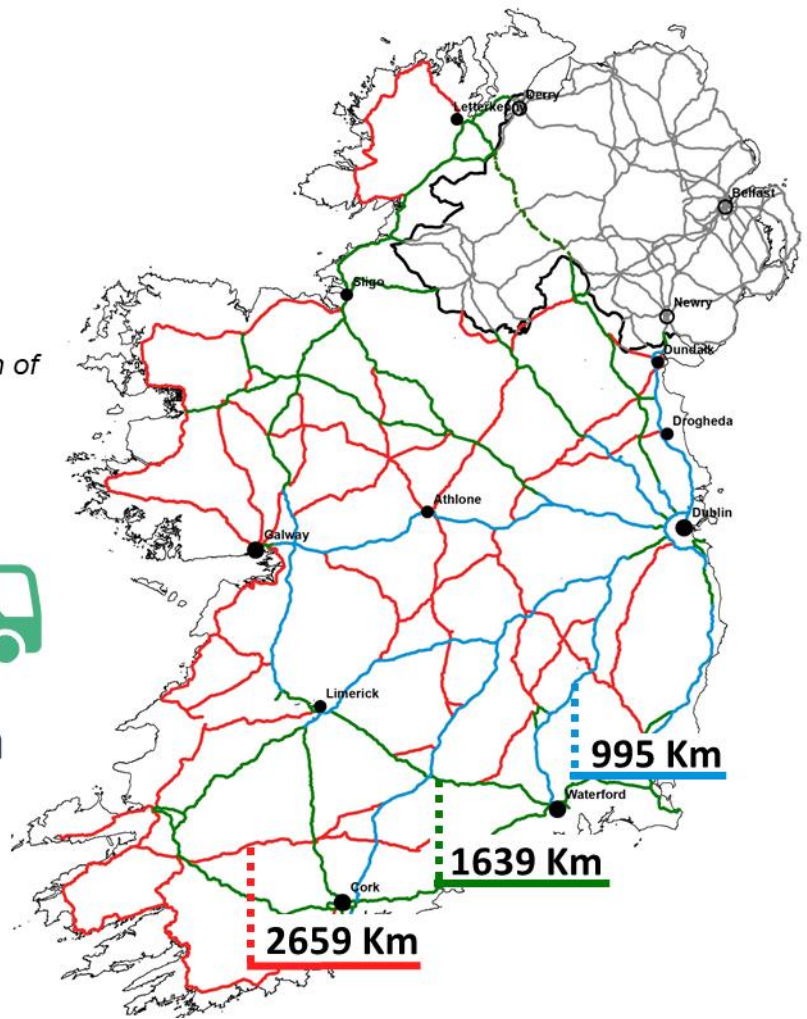
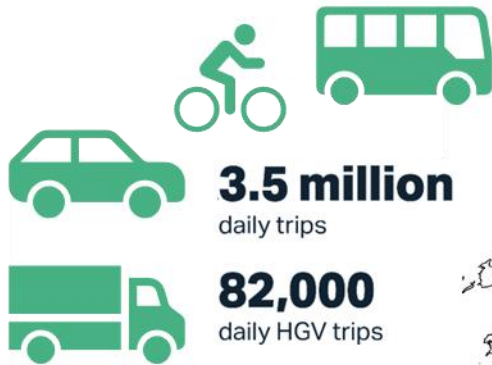
Chapter 4 – NR2040 Vision and Key Objectives is a statement of TII's goals in the development of this strategy, considering national policy context and strategic issues

Chapter 5 – National Roads Investment Priorities and Portfolios presents TII's priority investment themes

Chapter 6 – Implementation summarizes guidance to sponsoring agencies in developing projects/ interventions that align with NR2040

TII has responsibility to secure the provision of a safe and efficient network of national roads... and in doing so must consider the needs of all users

-Roads Act 1993



Role of National Roads

Connecting people and places and help develop communities

Permitting efficient movement of goods and services, and enabling economic activity

Providing opportunities to access jobs, education, leisure, and services, on foot, by bicycle, by car and public transport

2. Policy Context

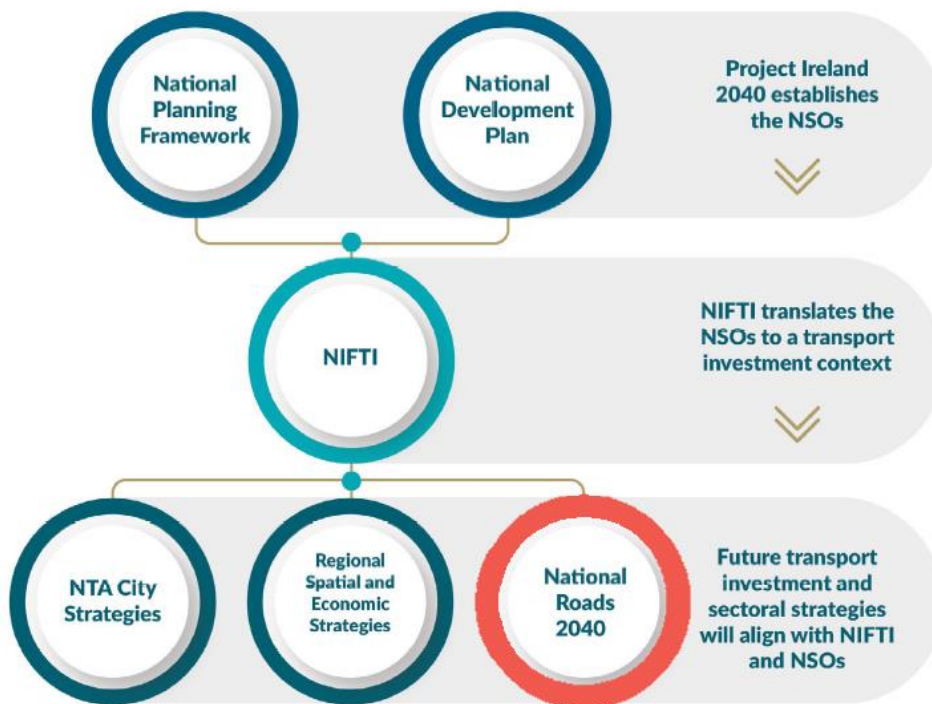
NR2040 is TII’s response to ensure the strategic alignment of the National Roads network to recently published Governmental policies, plans and planning/investment frameworks.



NR2040 was prepared in succession to NIFTI to ensure alignment between the departmental investment framework and the operational and functional needs of National Roads. Collaboration has taken place between DoT and TII, ensuring a common understanding of the network function, current and future users’ and infrastructure requirements on the network, to enable *Project Ireland 2040*.

Figure 2-1. presents where NR2040 sits in the strategy and plan hierarchy of Project Ireland 2040.

Figure 2-1 Project Ireland 2040 Hierarchy of Strategies and Plans, as shown in NIFTI



2.1. Project Ireland 2040

Project Ireland 2040 includes the National Planning Framework, which sets out the overarching spatial strategy for the next twenty years, along with the National Development Plan, which sets out the investment strategy and budget for the period 2021-2030.

2.1.1. National Planning Framework

Project Ireland 2040: National Planning Framework (NPF), is the government's long term spatial strategy for accommodating population growth as well as responding to the need to rapidly decarbonise various sectors across Ireland. The NPF vision is encapsulated in the National Strategic Outcomes (NSOs) representing a shared set of goals, which include compact growth, enhanced regional accessibility, access to services and opportunities, strong rural communities, sustainable mobility, and the transition to a low carbon and climate resilient society, among others.

Within the NPF, there are various actions directly related to National Roads, set out under several of the NSOs, particularly: NSO1 Compact Growth; NSO2 Enhanced Regional Accessibility; NSO3 Strengthened Rural Economics and Communities; NSO4 Sustainable Mobility; and NSO6 High-Quality International Connectivity.

The NSO's mentioned above emphasise the National Roads network's strategic role in providing regional and international accessibility for all road users, including public transport and active travel modes. The NSOs also outline the importance of ensuring safety and a high level of service. A high-quality level of service is to be achieved through the upgrade of existing corridors and effective traffic management. Detailed review in Appendix A.

Figure 2-2 National Planning Framework NSOs



2.1.2. National Development Plan 2021-2030

Project Ireland 2040: National Development Plan (NDP) 2021-2030, published in October 2021, is the Government's overarching ten-year investment strategy and budget. The NDP gives an overview of the transport strategy and subsequent strategic investment priorities across each of the ten NPF NSOs with reference to Ireland's climate action goals.

NDP actions for National Roads fall particularly under: NSO1 Compact Growth; NSO2 Enhanced Regional Accessibility; NSO6 High-Quality International Connectivity; and NSO8 Transition to a Climate-Neutral and Climate-Resilient Society, as set out in Appendix A.

As part of NSO2, Enhanced Regional Accessibility, the NDP identified several National Roads' schemes 'currently under construction' and several to 'start construction' in the near future. It also includes 31 National Roads' schemes that are 'subject to further approval'.

The NDP further highlights the role of National Roads in delivering NSO8, Transition to a Climate-Neutral and Climate-Resilient Society, by enabling significant transition from private internal combustion engine vehicles to electric vehicles. NSO8 also refers to encouraging modal shift from the car to public and active travel modes. In addition, preventative measures to ensure climate resilience of the road network are required, to ensure safety and availability over time.

A mid-term review of NDP (2021-2030) will be undertaken in 2025, to allow the Government to take stock of progress in terms of delivery of the planned projects and programmes. The review will also consider and potentially reaffirm the investment priorities of the Government.

2.2. Climate Action Plan 2023

The Climate Action Plan 2023 (CAP), published in December 2022, is the second annual update to Ireland's Climate Action Plan. CAP2023 sets out a roadmap of actions in various sectors, including transport to reduce greenhouse gas emissions by 51 percent by 2030 (relative to 2018 levels) and reach net zero emissions no later than 2050. The accompanying Annex of actions will be published later in 2023. The 2023 plan is the first to be prepared under the Climate Action and Low

Carbon Development (Amendment) Act 2021, following the introduction of economy-wide carbon budgets and sectoral emissions ceilings approved by Government in 2022.

The Government recognises that there are transformational and unprecedented systems and behavioural change required to deliver transport sector emissions reductions. Transport is identified in the CAP as a sector required to reduce emissions by 50 percent by 2030. The CAP supports policies to transform how society travels and to reduce transport emissions by adopting the Avoid-Shift-Improve approach. This approach involves reducing or avoiding the need to travel (e.g., through land-use planning) and where travel is still required, shifting to sustainable modes of travel, and improving the energy efficiency of vehicles (e.g., by using clean fuels).

CAP 2023 specifies numerous measures and actions required to support the Avoid Shift Improve approach. These range from developing updated standards, support for active travel projects, delivering greenway schemes, working collaboratively with stakeholders and engaging the public on climate action and sustainable mobility.

Some of the actions relevant to road transport include:

- Change the way road space is used (i.e., reallocation of road space to sustainable modes)
- Reduce demand/the total distance driven across all car journeys by 20 percent
- Increase walking, cycling and public transport to account for 50 percent of all journeys
- Support for nearly 1 in 3 private vehicles to be electric vehicles by 2030
- Increase the walking and cycling network
- Increase rural transport bus services

NR2040 has been developed in alignment with CAP.

2.3. National Investment Framework for Transport in Ireland

The National Investment Framework for Transport in Ireland (NIFTI), published in Dec 2021, is the DoT's framework for prioritising future investment in the land transport network to support the delivery of the NPF NSOs. NIFTI also ensures alignment with the Climate Action Plan 2021 by incorporating measures set out within the action plan for land transport.

2.3.1. NIFTI Investment Priorities

NIFTI translates the ten NPF NSOs to a land transport specific context, developing four Investment Priorities that will ensure that the transport sector plays its part in delivering the NPF. NIFTI also considers and incorporates the requirements of the Climate Action Plan with respect to transport.

Future transport projects must align with one or more of NIFTI's four Investment Priorities: Decarbonisation; Protection and Renewal; Mobility of People and Goods in Urban Areas; Enhanced Regional and Rural Connectivity; and set out how potential negative impacts against them will be mitigated, to be considered for funding.

As the NSOs are embedded in NIFTI, future investment in the National Roads Network must be in accordance with these priorities which will support the delivery of the NPF over the coming decades to 2040.

Figure 2-3 NIFTI Investment Priorities



2.3.2. NIFTI Modal and Intervention Hierarchies

A well-managed National Roads network (now and into the future) will support the achievement of various Project Ireland 2040 NSOs: for example, enhancing regional accessibility by reducing congestion on National Roads, allowing people and goods to move freely between the five cities and five regional centres in Ireland (as defined in the NPF)¹. NIFTI also establishes Modal and Intervention Hierarchies to further guide transport investment; and ensure appropriate transport solutions are developed.

NIFTI Modal Hierarchy:

- 1) Active Travel
- 2) Public Transport
- 3) Private Vehicles

NIFTI Intervention Hierarchy:

- 1) Maintain
- 2) Optimise
- 3) Improve
- 4) New

The Modal and Intervention Hierarchies are also incorporated within NR2040. Future investment on National Roads will be developed in accordance with the Hierarchies.

2.4. National Sustainable Mobility Policy

The DOT's National Sustainable Mobility policy, published in April 2022, sets out a strategic framework to 2030 for active travel and public transport. The policy aims to support Ireland's overall requirement to achieve a 51 percent reduction in carbon emissions by the end of this decade. The policy targets at least 500,000 additional daily active travel and public transport journeys and a 10 percent reduction in kilometres driven by fossil fuelled cars by 2030, in line with targets for transport set out in the Climate Action Plan 2021. For TII, actions relating to National Roads focus on improving road safety and provision of infrastructure to support sustainable mobility. These are also set out in Appendix A.

2.5. Trans-European Transport Network (TEN-T)

The TEN-T policy, based on Regulation (EU) No 1315/2013, supports provision of quality transport infrastructure across the European Union. TEN-T dedicates financial support towards the realisation of important transport infrastructure across all transport modes and supports the application of innovation, new technologies and digital solutions. The objective is to improve the use of infrastructure, reduce the environmental impact of transport, enhance energy efficiency, and increase safety whilst implementing and developing a Europe-wide transport network.

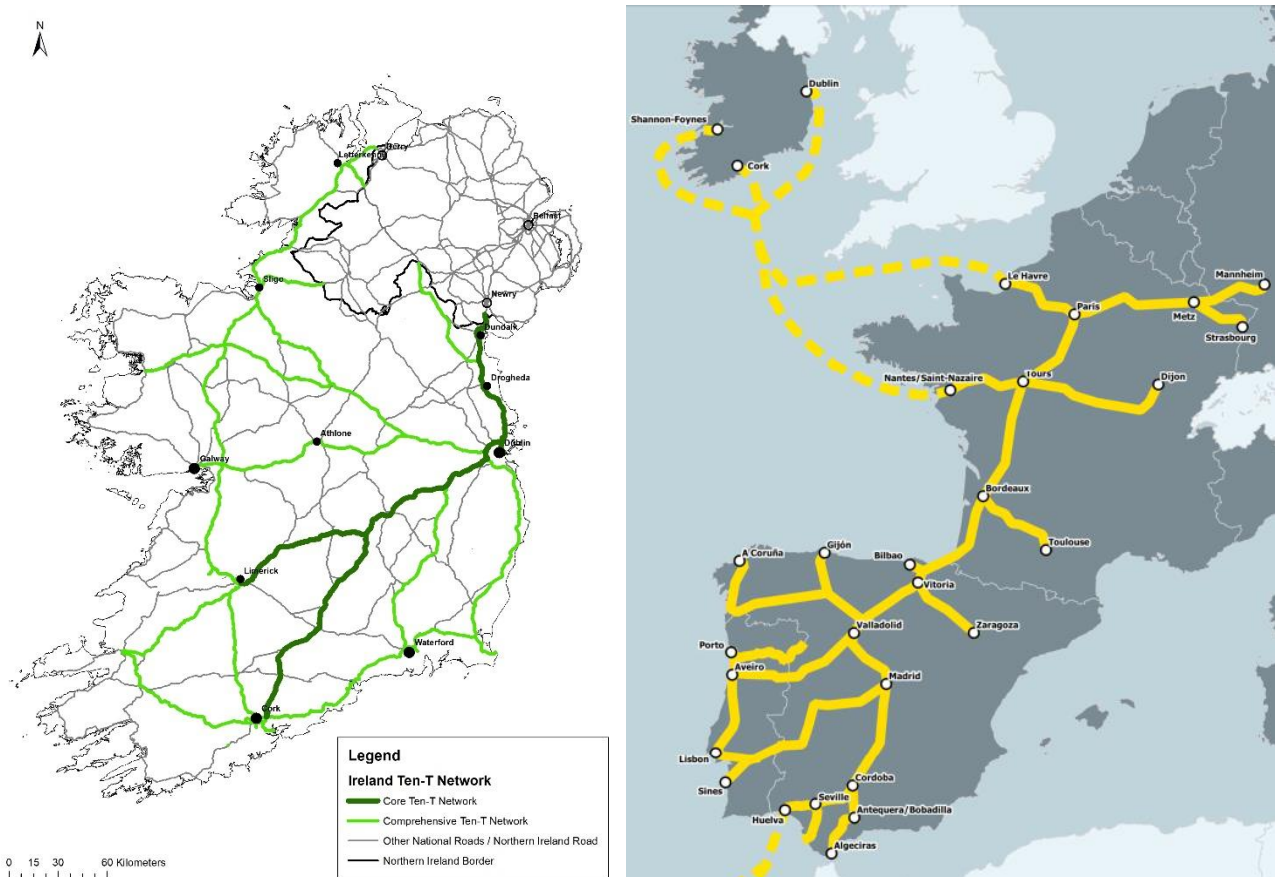
The TEN-T network comprises two 'layers':

- 1) **Comprehensive Network**- covers all European regions and is to be completed by 2050.
- 2) **Core Network**- subset of the comprehensive network, to be completed by 2030. Represented by nine Core Network Corridors, identified as strategically most important missing connections.

Part of Ireland's National Roads network comprises the Ten-T network.

Figure 2-2 – Ireland's TEN-T network and TEN-T Atlantic corridor between Ireland and mainland Europe

¹ Cities – Dublin, Cork, Limerick, Galway and Waterford. Regional Centres – Athlone, Drogheda, Dundalk, Letterkenny and Sligo.



Ten-T policy provides both opportunities for funding alongside obligation to comply and align with EU policy standards and requirements such as: National Roads' connectivity to ports that act as a gateway to other EU member states, for the movement of both people and goods and innovative solutions for leveraging existing capacity prior to investment in new infrastructure.

2.6. TII Climate Adaptation Strategy

TII's Climate Adaptation Strategy, published in December 2022, outlines TII's approach to adapting to climate change and extreme weather events, including flooding, increased risk of landslides, pavement degradation and possible storm damage that will affect the National Roads network and light rail networks. The Strategy builds upon the previous climate adaptation strategy published by TII in 2017. The strategy also responds to the Climate Action Plan 2021 (CAP21) Action 297, "Improve climate resilience and adapt to climate change on the Light rail and National Road Network".

The Strategy outlines seven climate adaptation strategic objectives, which adhere to the six guiding principles from TII's *Sustainability Implementation Plan – Our Future*. The climate adaptation objectives highlight the need to:

1. Reduce the frequency of network disruptions during climate-related incidents
2. Quickly recuperate from any climate-related incidents
3. Ensure organisations responding to climate-related incidents are robust, adaptable, and equitable
4. Improve the climate resilience of lifeline roads thereby providing more accessible communities
5. Participate in the broader adaptation initiatives across Ireland through partnerships and extensive research
6. Incorporate climate adaptation within TII's procedures, policies, and practises to provide a secure and robust network
7. Employ low-carbon methods throughout TII's designs, procedures, and standards in response to climate adaptation as well as considering more extensive societal and environmental benefits

It is important that Ireland's light rail and National Roads networks are resilient to extreme weather conditions. To address this, NR2040 provides a framework for transport investment on the National Roads network which will include climate change adaptation measures to be developed, prioritised, and implemented. Chapter 5 of NR2040 addresses network resilience and climate adaptation as well as the importance of continually maintaining and renewing National Roads infrastructure.

2.7. Redesigning Ireland's Transport for Net Zero: Towards Systems that Work for People and the Planet

'Redesigning Ireland's Transport for Net Zero: Towards Systems that Work for People and the Planet' was published by the Organisation for Economic Co-operation and Development (OECD) in October 2022. The report highlights the issue of increasing car use and associated emissions due to transport and land use planning role in the car dependent transport system. The OECD notes three main unsustainable dynamics contributing to car dependency that include:

1. Induced car demand
2. Urban sprawl
3. The sustainable modes low-attractiveness trap

Decarbonising the transport system through private vehicle fleet electrification alone, will not achieve the changes in behaviour, emission reductions and general well-being improvements that are required in Ireland. Relying heavily on private vehicles will not address the issues of accessibility, urban congestion, and other negative impacts such as road fatalities. With a need for change, the OECD makes the following recommendations:

- Prioritise policies with high potential of reshaping the car-dependent system
- Redefine the electrification strategy to support the transition towards a sustainable transport system
- Encourage a systemic approach to policy decision-making across government departments

The NR2040 strategy has been developed in accordance with the OECD recommendations and recognises the issues of increasing car use and emissions. TII widely supports mitigation measures that should be put in place to reduce emissions and improve the well-being of Irish citizens. The OECD recommendations broadly align to the NR2040 investment priorities and commitments.

2.8. National Ports Policy

The National Ports Policy, published in 2013² by the Department of Transport, Tourism and Sport, establishes a broad set of principles to serve as the foundation for a policy framework that enables the port sector to grow in a sustainable way. The policies' primary objective is to promote a competitive and effective market for maritime transport services. The framework supports future decisions on port restructuring, designed in light of the economic issues that Ireland was facing at the time.

To ensure that the ports sector continues to expand sustainably, the connection between the port sector and the planning and development system is crucial.

Integration between planning and policy for ports with the transport system should be of high priority. TII recognises the potential for greater alignment between planning and policy for ports with that of the National Roads network and will collaborate with the DoT and Irish Maritime Development Office in the development of the next National Ports Policy.

² Currently undergoing update

3. Long Term Strategic Issues for National Roads

To ensure that the future needs of the National Roads network and its customers are met, the context of how the network is used may change over the coming decades and must be understood. The following issues presented in Figure 3-1 have been considered by TII in developing a strategy for National Roads.

The mitigation measures that address these issues are elaborated through TII's investment priorities in Chapter 5 and commitments in Chapter 6. Appendix B summarises the assessment of alternatives where three main scenarios ('Do nothing', 'Predict and Provide', and 'Policy-Led') were considered during the development of the NR2040 Strategy.

Figure 3-1 NR2040 12 long term planning issues

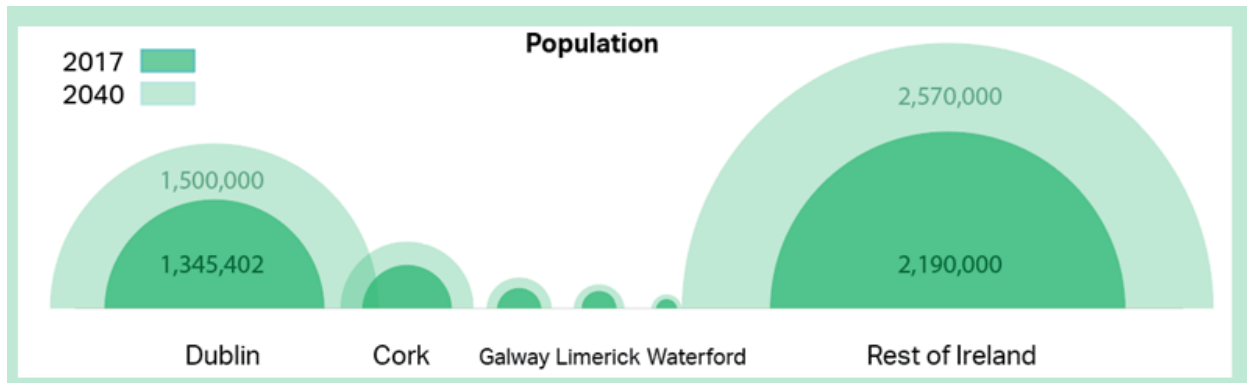


3.1. Future Demographic Growth Trends

Demographic growth poses a challenge to maintaining and improving levels of service in road transport

According to Project Ireland 2040, Ireland’s population is expected to increase by up to 1.1 million people by the year 2040, increasing the population of Ireland upwards to approximately 5.9 million. It is anticipated that half of the future population and jobs growth will be focused on the five cities (Dublin, Cork, Galway, Limerick, and Waterford) and their suburbs. Additionally, it is expected that there will be a significant population increase in Ireland’s towns and some rural areas.

Figure 3-2 NPF target growth 2040- a target of half (50 percent) of future population and employment growth will be focused in the existing five cities and their suburbs



TII analysis shows that this targeted population increase has the potential, if current travel behaviour continues, to increase the number of trips travelled on the national road network by 2.7 million per day. This represents a 20 percent increase in trips per day by 2040 above baseline figures of 13.4 million trips per day. This is in addition to an increase in the number of journeys made on Ireland’s local and regional roads.

If current development patterns and associated travel behaviour continues, demographic growth will not only increase the demand for travel but may also increase car dependency. Currently 82 percent of Irish households own at least one car, with 41 percent of households owning two or more cars³. Accordingly, 67 percent of trips are made in privately owned cars⁴. These journeys are often facilitated by National Roads.

Demographic and employment growth pose a significant challenge in the effort to maintain and improve the level of service on the National Roads network. Through the implementation of the CAP, and the NR2040 investment priorities and mitigation measures, inter-urban demand for private vehicle trips can be mitigated.

3.2. Road Transport Decarbonisation

Adherence to Ireland’s decarbonisation goals poses a significant challenge for the road transport sector, including the National Roads network

Ireland’s Climate Action Plan has set an overall Greenhouse Gas (GHG) emissions reduction target of 51 percent by 2030, compared with 2018, and climate neutrality by 2050. In July 2022, the Government announced sectoral emissions ceilings where the overall target of 51 percent reduction by 2030 can only be met depending on the success of each sector of the Irish economy (electricity, transport, buildings,

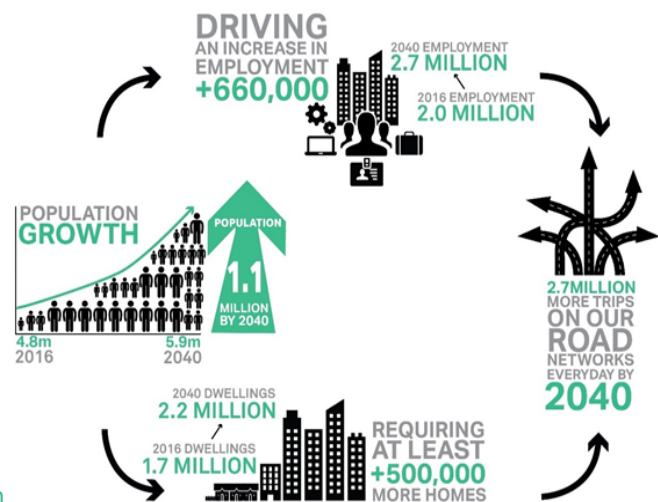


Figure 3-3 Population growth will increase demand on the National Roads network

³ Census, 2016, Central Statistics Office

⁴ Source: TII analysis of CSO, 2020; Central Statistics Office, ‘National Travel Survey 2019’

industry, and agriculture) meeting their individual ceiling targets. The transport sector's ceiling for GHG emissions till 2030 was set to 6 Mega tonne CO₂ equivalent⁵.

The transport sector must play a significant role in this reduction, with a specific 42 percent-51 percent target reduction by 2030. In 2020, road transport GHG emissions made up 94 percent of transport emissions in Ireland⁶. Lockdown measures in response to the COVID-19 pandemic in 2020 resulted in a 16 percent decrease in transport emissions, compared to 2019⁷. TII traffic counts show that 2021 travel trends largely returned to 2019 pre-Covid levels⁸. Emissions from the sector are estimated to reduce to 39 percent below 2018 levels by 2030 if additional measures in plans and policies are implemented, including significant EV share by 2030 and measures to support more sustainable transport⁹.

The NIFTI priorities around facilitating mobility of people and goods in urban areas and enhancing regional and rural connectivity must be achieved while minimising or reducing carbon emissions. A wide array of factors must be considered and understood when planning for a low carbon transport system. While TII has a limited role in delivering behavioural change, the provision of high quality multi modal infrastructure has an important role in enabling and encouraging a modal shift to support a reduction in carbon emissions. The provision of multi-modal infrastructure in combination with improved public transport services will increase transport options on our road network, improving the mobility of people in urban areas and enhancing regional and rural connectivity in alignment with carbon reduction targets.

In an urban context, congestion causes inefficient vehicle engine performance and results in significantly elevated levels of vehicle emissions. This is a particular issue where heavy vehicles make up a sizable proportion of traffic. In an inter-urban travel context, where free-flow conditions contribute to more efficient engine performance, the key driver for carbon emissions is the length of the trip.

A shift to electric technology in the car fleet is a significant step towards decarbonisation of the road transport sector. This must be supported with provision of charging infrastructure along the National Roads network. The emissions from commercial and heavy vehicles must also be mitigated.

TII analysis finds that across the National and Regional Roads network a significant proportion of personal trips are short in nature, typically less than 15 minutes duration¹⁰. These shorter trips are associated with colder engines, which leads to higher emissions. Interventions promoting a shift to low carbon options for these trips, using for example active travel along or adjacent to the National Roads network, would support efforts to reduce both congestion and emissions.

3.3. Climate Adaptation and Resilience

The road network, and the people who rely on it, are vulnerable to a range of possible climate change effects.

Ireland's climate is changing, and the indications are that further and more profound changes are likely. Major recent weather events in Ireland include Storm Ophelia (2017), which caused major power outages, lifted roofs and coastal flooding; Storm Emma (2018), which brought sub-zero temperatures and heavy snow showers that caused disruption and closure of transport systems including roadblocks; as well as heatwaves and drought (2018).

The road network, and the people who rely on it, are vulnerable to a range of possible climate change effects, including strong winds, landslides, changing rainfall patterns and extreme weather events leading to flooding and variable temperatures. In the longer-term sea level rising may also pose a threat. These may cause a range of debilitating impacts on the National Roads network, ranging from reduced performance- such as slower journey times, lower visibility and poor driving conditions; to damaged infrastructure and heightened user risk, causing disruption or closure of sections of the National Roads network. Closure of important transport links bring risks to people and businesses, especially in areas of low resilience where National Roads provide sole transport infrastructure for people and goods and in essence function as regional lifelines.

Adaptation to the impacts of climate change requires action to both manage the risks and to prepare mitigation and resilience plans to reduce vulnerabilities. Climate change mitigation has become an essential component of long term, strategic economic planning. An integrated approach involving stakeholders is essential. TII must prepare strategies for various climatic events that will impact the National Roads network.

⁵ Source: Department of the Taoiseach, 2022; gov.ie, 'Government announces sectoral emissions ceilings, setting Ireland on a pathway to turn the tide on climate change'

⁶ EPA Provisional Greenhouse Gas Emissions for Ireland, 2020 (October 2021)

⁷ EPA Provisional Greenhouse Gas Emissions for Ireland, 2020 (October 2021)

⁸ TII National Roads Network Indicators, 2021

⁹ EPA Ireland's Greenhouse Gas Emissions Projections, 2021-2040 (June 2022)

¹⁰ TII National Roads Network Indicators (2012-2021)

3.4. Sustainability

Striking the appropriate balance between investment in transport and sustainability impacts requires a continued effort.

Sustainable development is “development that meets the needs of the present without comprising the ability of future generations to meet their own needs” (Brundtland Commission).

Transport infrastructure can bring about social and economic benefits, such as enhanced mobility, access to markets and social participation. However, the development and management of transport infrastructure must avoid, reduce and mitigate adverse environmental impacts, such as harmful emissions from transport (GHGs, air quality and noise impacts), and direct and indirect impacts to biodiversity and/or habitats as well as to neighbouring properties and communities adjoining the National Roads network. Striking an appropriate balance between maximising the benefits arising from investment in transport infrastructure and reducing potential negative environmental, social and/or economic impacts requires continued effort as the asset changes and adapts to new futures.

This might mean that some projects may be more expensive up front but will likely have more benefits over the long-term particularly regarding emissions and social impacts.

TII Sustainability Implementation Plan

Through [TII’s Sustainability Implementation Plan](#), a roadmap has been developed to apply the sustainability principles in developing and operating the National Roads network. We recognise that 'sustainability' is complex and far reaching but we are committed to integrating it into everything we do.

TII’s sustainability statement and implementation plan lay out six core principles and two overarching principles. The six principles are set out below; these broadly align with the UN Sustainable Development Goals and have been developed to reflect TII’s organisational ambitions.

Table 3-1 TII Sustainability principles

| Description | | Corresponding Sustainable Development Goals | | | | | |
|-------------|--|---|--|--|--|--|--|
| 1 | Provide effective, efficient, and equitable mobility | | | | | | |
| 2 | Enable safe and resilient networks and services | | | | | | |
| 3 | Collaborate for a holistic approach | | | | | | |
| 4 | Deliver end-to-end improvements | | | | | | |
| 5 | Transition to net zero | | | | | | |
| 6 | Create total value for society | | | | | | |

TII recognises that to truly deliver on sustainability it requires all of society to get involved, and as such the six principles are tied together with two overarching principles:

- Leadership, Collaboration and Partnership; and
- Working together and enabling people

These overarching principles ensure connectivity across the six core principles and are supported in NR2040 commitments.

Air Quality

The transport system in Ireland is highly fossil fuel dependent (diesel & petrol), which results in significant emissions of GHGs and air pollutants (that are contained in exhaust fumes) to the environment. The Environmental Protection Agency (EPA) 'An Integrated Assessment Report - 2020'¹¹ predicts that the transport sector will continue to dominate in emissions of NOx for the 2020 and 2030 period meaning transport will continue to be one of the most significant contributors to air pollution in Ireland. The composition of the Irish vehicle fleet plays a significant role in local ambient air pollution levels. The number of Irish vehicles on the roads has grown consistently in line with population growth and economic growth contributing to a rise in NOx emissions. Implementing measures identified in NR2040, as well as the Government's Climate Action Plan, is likely to result in more concerted efforts to address air quality issues across Ireland including those from the transport sector.

Noise

According to the World Health Organisation (WHO), noise is the second greatest environmental cause of health problems, after air quality. Environmental noise from major infrastructure including roads, railways and airports is governed by the Environmental Noise Directive 2002/42/EC. The Directive relates to the assessment and management of environmental noise and is the key EU instrument to identify noise pollution levels and to trigger the necessary action both at Member State and at EU level. In Ireland, the Directive is transposed into Irish Law by the European Communities (Environmental Noise) Regulations 2018 (S.I. No. 549 of 2018). Under the regulations, TII is responsible for the development of strategic noise mapping for all National Roads carrying more than 3 million vehicles a year and for major railways which carry more than 30,000 passengers per year. Local Authorities are responsible for preparing the Noise Action Plan. CAP includes targets to reduce the total vehicle kilometres of travel by 20 percent by 2030 which will also influence reductions in noise from road transport.

3.5. Road Safety

Road Safety is at the heart of every aspect of management of the National Roads network, on the way towards achieving Vision Zero.

Ireland's new Government Road Safety Strategy (2021-2030) '*Our Journey towards Vision Zero*' has set an ambitious target for Ireland to reduce road traffic fatalities and serious injuries by 50 percent by 2030. Longer term the strategy aims to eradicate road traffic deaths and serious injuries by 2050. In 2021, there were 58 fatalities on National Roads¹², representing a declining trend but still an area for continuous improvement.

An upturn in active travel modes and specifically in cycling, both for commuting and leisure, emphasises the need for a greater focus on prioritising the safety of vulnerable road users. Better cycling and walking provision are an important consideration for investment in the National Roads network and prioritisation of vulnerable road users aligns with the modal hierarchy set out in NIFTI.

TII's statutory remit includes the provision of a safe and efficient National Roads network. The Vision Zero long-term goal and the Safe Systems approach must inform TII investment decisions.

Safe Systems approach

Places primary responsibility for road safety on system designers. Four principles identified are:

¹¹ EPA (2020) <https://www.epa.ie/our-services/monitoring--assessment/assessment/irelands-environment/state-of-environment-report/>

¹² TII-National-Roads-Network-Indicators-2021

1. Human life and health are paramount and take priority over mobility
2. Providers & regulators share responsibility
3. Road traffic systems should take account of human fallibility and resultant harm
4. Providers and regulators must do their duty to support safe travel of all citizens

3.6. Movement of People

The operation, maintenance, renewal, and development of National Roads must focus on the movement of people, rather than vehicles.

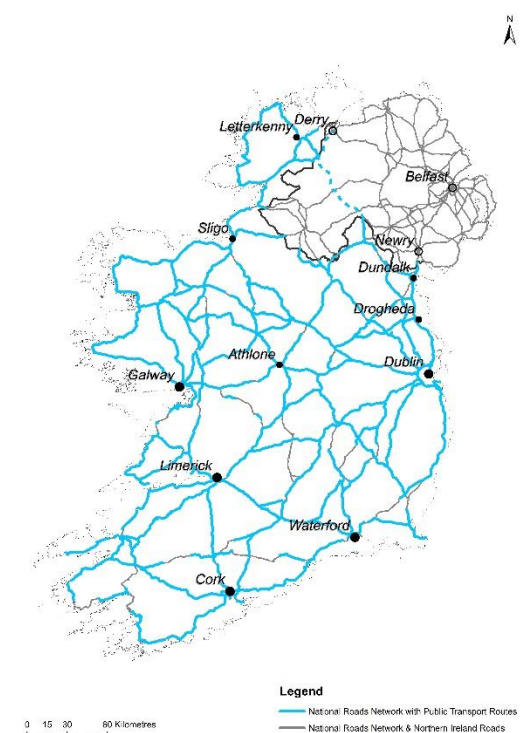
Project Ireland 2040's NSO4 relates to Sustainable Mobility, which supports social and economic activity, and the role of National Roads in a sustainable transport system is a key consideration.

What constitutes efficient mobility differs between urban; rural; and inter-urban contexts as well as between users within each context: female/ male; elderly/ young; trip purpose to work or for errands; etc. Availability of active travel infrastructure and public transport services will enable road users to choose the most convenient and efficient transport modes and routes for them.

Nationally, bus (and coach) journeys increased by 60 percent from 2013 to 2019 (141 mil. trips to 226 mil.), accounting for 82 percent of total public transport vehicle-km (2019)¹³. Figure 3-4 illustrates public transport services facilitated across the National Roads network¹⁴, not accounting for service frequency which may vary across the network and time of day. Infrequent services, particularly during commuter periods, does not enable many road users to switch to an alternative mode from the car. Population growth, along with national decarbonisation targets, drives the need for more efficient use of road-space. Re-allocation of road space is to be investigated to promote and enable a sustainable modal-shift while minimising environmental impact.

In line with the 1993 Roads Act (as amended), the needs of all road users must be considered. Public transport operators and customers will seek more capacity as well as increased speed and frequencies for reduced travel time and journey time reliability in years ahead. It is the role of the National Roads network to accommodate this. In relation to active travel, where national roads are too dangerous for active travel, meaningful interventions should be considered in cooperation with relevant stakeholders and partner agencies.

Figure 3-4 Bus Service Routes Operating on National Roads (2022)



¹³ Source: NTA - Commercial Bus Services in Ireland - Statistical Bulletin: 01 / 2021

¹⁴ Source: General Transit Feed Specification data (https://www.transportforireland.ie/transitData/PT_Data.html)

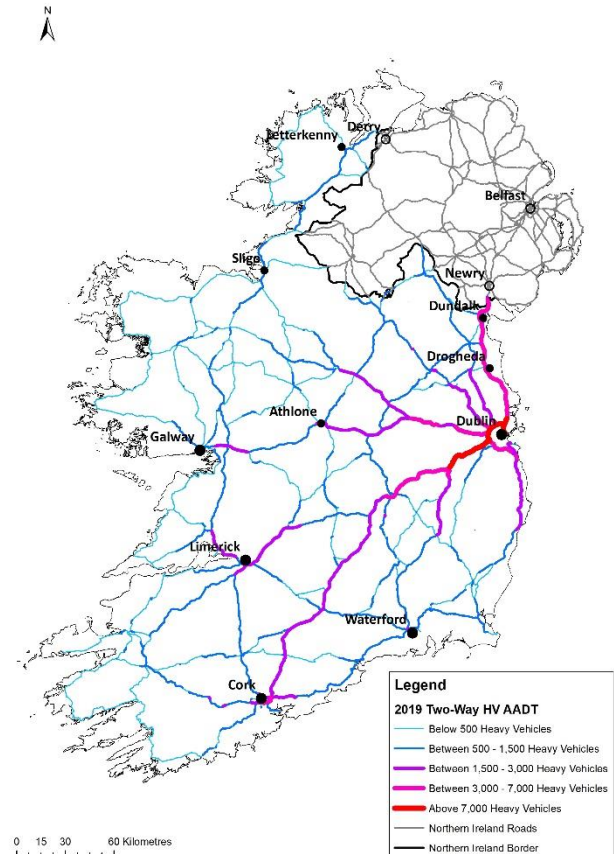
3.7. Movement of Goods and Services

On National Roads a balance must be found between the movement of people and the movement of goods.

Ireland's economy is heavily dependent on the efficient movement of goods, both domestically as well as into and out of the country, and is therefore dependent on efficient domestic and international transport networks. Freight dependent industries need high-quality transport connections to ensure certainty of arrival of incoming goods and outward shipping of products. Producers and retailers need efficient distribution systems for timely access to their markets and customers.

Currently, the vast majority of internal trade freight in Ireland is carried on the road network¹⁵, in a variety of vehicles, from Heavy Goods Vehicles (HGVs) to smaller vans. TII estimates that in the region of 80-90 percent of all freight transport occurs on National Roads¹⁶. The movement of goods takes place throughout the entire country, and intensifies on National Primary roads, notably on the east coast, M50, and around Cork and Limerick, as illustrated in Figure 3.5. Along the M50, for example, goods vehicles (HGV/LGV) represent 25 percent of all vehicles and take up 33 percent of the available road space.

Figure 3-5 – National weekday HGV movements, 2019



There is often limited flexibility in mode or time of travel associated with freight transport given its role in the movement of essential goods for society. The importance of facilitating efficient freight transport for society was highlighted during the COVID pandemic where, despite restrictions to movement of people, demand for goods movement remained constant – only 4 percent less in 2020 than 2019¹⁷.

Transport emissions reduction from goods vehicles represent a significant challenge as, reflective of their size/engine types, they generate 5 to 6 times higher emissions than cars. In 2020, goods vehicles represented nearly 40 percent of the total CO₂e emissions on National Roads¹⁸. While the car fleet is transitioning towards EV/LEVs there are currently no scaled alternatives for HGVs, though the Alternative Fuels Infrastructure Regulation is expected to place an emphasis on provision of electric vehicle charging for HGVs. The progression of technology and traffic management measures is therefore necessary.

Integration of road and rail freight is supported by TII and is important for reducing freight related congestion and emissions on the National Roads network. Iarnród Éireann has developed its strategy *Rail Freight 2040*, which envisions rail playing a key role in enhancing regional connectivity and supporting economic growth whilst meeting climate change objectives.

National Roads can be essential arteries for economic activity across the country, their role in this regard must be acknowledged and protected. National Roads infrastructure should be fit for purpose for the transport of heavy vehicles, noting the high levels of wear and degradation of the carriageway under heavy loading. While the freight sector has proven to be historically resilient, capacity re-allocation or freight specific transport management schemes would need to be considered at the appropriate tier of the NIFTI Modal and Intervention Hierarchies. In December 2022, the DoT published 'Ireland's Road Haulage Strategy 2022–2031'. When implementing NR2040, TII will work closely with the DoT to take account of the needs of the Haulage and Road Freight sector.

¹⁵ Central Statistics Office, Road Freight Transport Survey Quarter 4 and Year 2020.

¹⁶ Vehicle kilometres estimate based on CSO national freight travel estimates and TII's network of roadside traffic counters.

¹⁷ TII Road Traffic Counts

¹⁸ Source: TII Emissions Model

3.8. Urban Congestion

We cannot build our way out of urban congestion challenges - the management of National Roads must balance increasing mobility demands and finite road space

Congestion has a significant impact on the well-being of people in our cities and urban communities. It detrimentally affects local, national, and international accessibility. Land use patterns and a shortage of meaningful alternatives, including public transport and high-quality cycling and walking facilities, have led to an over-reliance on car use, thus leading to congestion.

Congestion is especially evident on national roads in the approaches to and in the environs of urban centres leading towards and around urban centres during peak periods. Thus, not only does congestion adversely affect personal travel experience, but it also hinders the use of the road as a well-functioning public asset.

The economic cost of congestion is evident, as analysis for the Greater Dublin Area estimates- the cost of time lost due to aggravated congestion was €358 million in 2012. This is forecasted to rise to €2.08 billion per year in 2033¹⁹. The economic cost of congestion is especially relevant in respect to the transport of goods, which rely on the National Roads network for efficient access to ports and airports.

Congestion also leads to increased carbon emissions and reductions in air quality, resulting from stop-start traffic conditions. However, this may be mitigated over time, thanks to car fleet electrification policies.

Managing congestion on the urban sections of the National Roads network will allow TII to optimise the use of assets under its remit. However, we cannot build our way out of urban congestion challenges. The management of National Roads must balance increasing mobility demands and finite road space. A collaboration of stakeholders, sectors and interventions is necessary. Ongoing monitoring and demand analysis will enable identification of necessary interventions, such as road space repurposing. Where the National Roads network cannot safely accommodate all road users, including active travel modes, adjacent alternative solutions should be explored.

3.9. Technological Change

The management and operation of National Roads must evolve to support and manage the uptake in developing technologies to the benefit of customers.

The transport options available for customers will expand as technology develops. Aspects where technological change is likely to include: connected vehicles, dynamic traffic management, advanced intelligent transport systems (ITS), electrification of vehicles and potentially energy generating capacity within the road network, advanced payment systems, improved customer information, enforcement measures, Mobility as a Service (MaaS). These technological changes may transform the way National Roads are used and operated.

TII has deployed proven road technologies and Intelligent Transport Systems (ITS) on key sections of the National Roads network. TII is currently in the latter phases of implementing Variable Speed Limits on the M50 as part of its Dynamic Traffic Management Project and has commenced a Co-operative ITS pilot project on the M50 and M1 in Dublin. TII is committed to the facilitation of Connected Driving on National Roads in collaboration with key stakeholders.

It is from this base that the technological future of the National Roads network will evolve.

3.10. Asset Management and Operations

The National Roads network is a valued state asset that requires extensive investment for ongoing management and operations.

Past capital investment in National Roads, including motorways and dual carriageways, has delivered a valuable state asset. The management and operation of this asset represents TII's main expenditure item and will increase as the network, particularly the motorway sections, approaches an age where it requires major renewal investment. Overall ageing of the asset coupled with climate change will affect network resilience and put a further strain on the budget for the ongoing maintenance and operations of the National Roads network. If investment in protection and renewal is deferred, there will be a greater overall cost incurred as the asset deteriorates further.

¹⁹ THE COSTS OF CONGESTION - An Analysis of the Greater Dublin Area, EFEU Research Report (July 2017)

Meanwhile, new categories of expenditure are expected over time with technology playing a greater role in the management of the asset and demand for the same. Protection and Renewal is one of NIFTI's Investment Priorities and requires prioritisation by TII. It must also be noted that public-private partnership (PPP) contracts for the motorway network will begin to expire in the 2030s which will require decisions on how the transition will be managed and what the replacement model might be.

TII's Project BRUCE (Better Road User Charging Evaluation) will help inform a future direction for road user charging, operation and maintenance. It will consider whether the existing PPP road tolls should be removed, retained or replaced with a new user charging model.

3.11. Integrated Mobility

Integrated mobility is key to an inclusive, well connected, and sustainable transport system and must be facilitated through the National Roads network.

The most effective provision of sustainable mobility is through an efficient and well-integrated transport system, where each mode of transport has its own role to play, but also complements and provides resilience for the other modes within that system. The context for Ireland's transport system changes between rural and urban areas. Where there are high levels of trip demand, the case for the provision of public transport alternatives to car travel increases. Where there is dispersed population in rural areas it may not be sustainable to provide bus services that fully meet the mobility needs of all users.

The goal for transport agencies is to enhance accessibility and opportunities for interchange to enable trip-makers to choose the most efficient and convenient combination of modes. However, transport agencies must also ensure efficient provision of transport services and infrastructure, as well as enabling and encouraging travel choices that are socially and environmentally sustainable.

3.12. Customer Experience

TII recognises the need for a customer-centric approach when planning for the National Roads network

A diverse range of customers use the National Roads in different ways and for different reasons. These include regular users of National Roads, and includes those who do not directly use it but benefit from it, e.g., a household receiving deliveries. It is important to understand evolving customer needs and acquire better insight into the wide spectrum of customer expectations, mode preferences and purposes.

TII continues to seek a better understanding of customer expectations depending on location, mode preference and travel purposes.

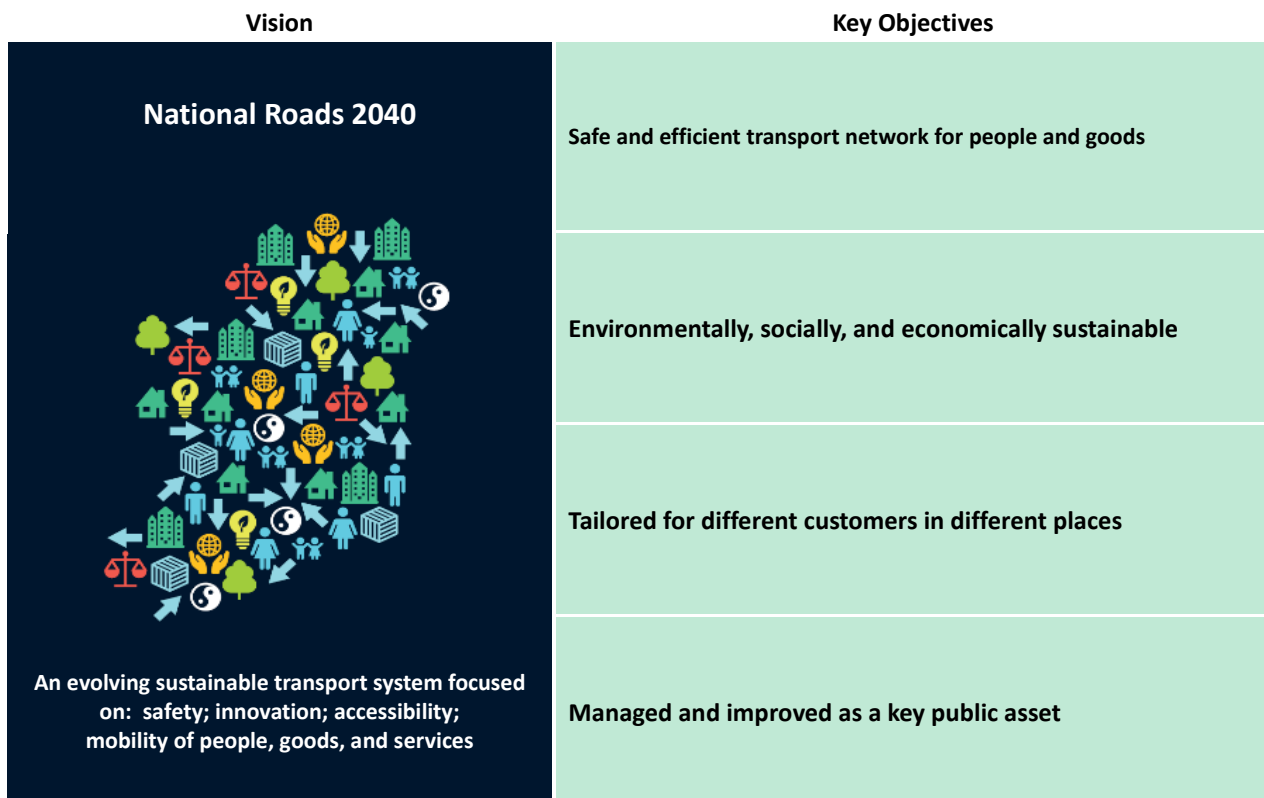
One area of research targeted by TII has been that of gender and transport. Designing sustainable transport infrastructure becomes synonymous with designing inclusive, safe, equitable and high-quality experiences that consider all users. Doing so requires an integrated approach, including several physical, social, and policy interventions across public and private bodies. For National Roads, this can take the form of improved lighting for transport facilities on the network or improved public transport service frequency on National Road routes.

New initiatives will survey users periodically to help understand issues and develop customer orientated solutions, to meet existing and future needs.

4. NR2040 Vision and Key Objectives

NR2040 sets out TII's long-term strategy for the maintenance, development, and management of Ireland's National Roads network. NR2040 is fully aligned with NIFTI and Project Ireland 2040 and focuses on strategic issues for National Roads identified by TII.

Our vision is for the National Roads network to be **"An evolving sustainable transport system focused on: safety; innovation; accessibility; mobility of people, goods, and services"**



NR2040 sets out a strong commitment to provide a National Roads network that is:

- **A network facilitating the safe and efficient movement of people, goods and services**
TII sees road safety as an integral part of every aspect of maintenance, development, and management of the National Roads network, in line with Ireland's long-term goal of achieving Vision Zero by 2050. As the main conduit for economic productivity and social connectivity the National Roads network must be maintained and managed to cater for the efficient transport of people, goods and services.
- **Environmentally, socially, and economically sustainable**
 - I. **Environmental** – Environmental sustainability is the bedrock for social and economic sustainability in Ireland, avoiding and where unavoidable mitigating environmental impacts including climate change, air quality and noise as well as biodiversity impacts of National Roads.
 - II. **Social** – Integrated land use and transport network to connect communities, ensuring that our infrastructure supports safety and inclusivity and enables sustainable mobility and healthier transport choices. TII strives to enhance both urban and rural accessibility, supporting transport options for all sectors of society, particularly in hard-to-reach areas.
 - III. **Economic** – TII will continue to support the economy through the provision and management of infrastructure along the National Roads network that enables the efficient and sustainable movement of people, goods and services.
- **Tailored for different customers in different places**

National Roads must cater for all road users. Planning for the network must consider the unique needs of different customers and provide a network that allows more people to travel conveniently using public transport and active travel modes, for some or all of their trips, while also recognising that some of these options will not be suitable or available for everyone everywhere. The network must also be maintained for personal travel, especially in rural areas where communities are highly dependent on them for basic accessibility to jobs and services.

- **Managed and improved as a key public asset**

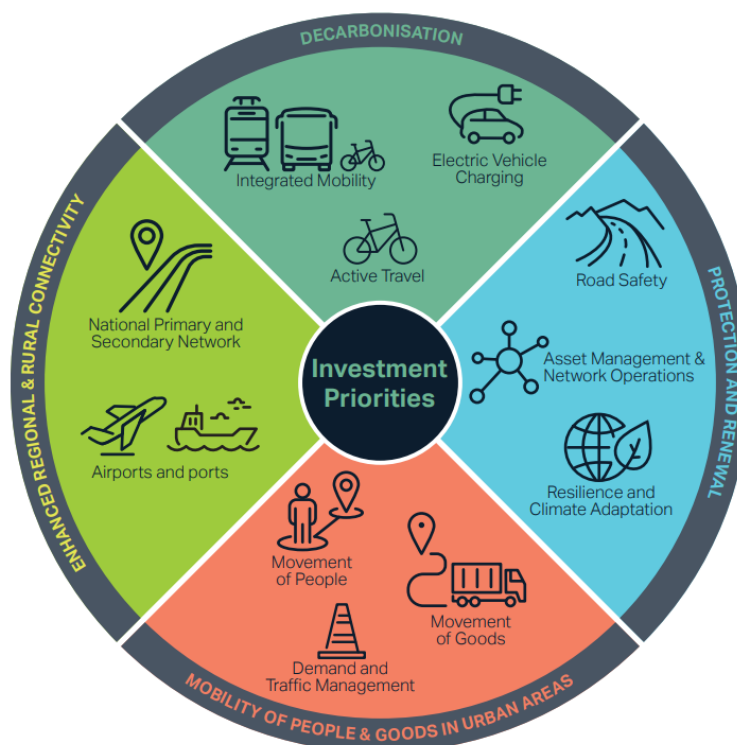
The National Roads network is a key national asset that has received significant investment over the years, primarily related to the maintenance, the improvement and expansion of the network. In light of national targets associated with supporting decarbonisation and climate action, TII stewardship will evolve to manage, improve and enhance the National Roads network in line with these ambitions and as a key public asset.

5. National Roads Investment Priorities and Portfolios

TII has assessed the need for the National Roads network to align with relevant National Strategic Outcomes and has also identified several strategic issues for the network. These considerations have influenced the NR2040 Investment Priorities.

The NR2040 Investment Priorities align with the four NIFTI Investment Priorities and are presented in Figure 5-1.

Figure 5-1 NR2040 Investment Priorities and Portfolios



5.1. Decarbonisation

Decarbonisation Investment Priority is the National Roads network's greatest challenge. It encompasses three investment portfolio themes: Integrated Mobility; Electric Vehicle Charging; and Active Travel.

5.1.1. Integrated Mobility

An integrated multi-modal trip could encompass one from a rural area of low population density to a busy urban centre. It could ideally be composed of multiple parts whereby a trip-maker switches mode from car to public transport at the earliest opportunity and completes the final portion of the trip through walking or cycling. Car dependency is reduced but an acceptable level of personal mobility is retained.

Establishing linkages between National Roads and transport hubs is vital e.g., heavy and light rail stations, bus stations and stops, greenways and National and County Cycle Networks.

TII will contribute to integrated mobility by investing in measures such as Park and Ride, Park and Share and bus prioritisation, where appropriate along National Roads. Improving connections to major public transport hubs, e.g., active travel infrastructure within close proximity of rail stations, could also form part of this portfolio of investment.

TII will ensure that the potential for induced travel demand will be estimated for all major projects such that the need for any future investments in the road network will align with decarbonisation objectives.

Project showcase - Park and Share Facility (M1)

TII and Louth County Council opened, in October 2021, Ireland's first purpose-built Park and Share Facility on the Motorway Network, off junction 16 (formally the N52 Junction).

The 226 Parking Bay Facility represents an investment in the order of €1 million and will significantly improve safety at the junctions off the M1 Motorway, in particular the N33, N53 and R215 where there is an existing safety issue of parking in the verge.

The project incorporates: Wiring for Electric Vehicles (EV); Flood Lighting CCTV Cameras; Turnaround area to facilitate pick up and drop offs; Pedestrian footpaths; Safe access off the R215; Closing of existing hard shoulders on the N33, N53 and R215 to prevent future on road parking; VMS Signage directing drivers to the Park and Share.



In addition to safe parking, the facility will have the added benefit of incentivising more car sharing as well as access to bus services which in turn will reduce the environmental impact of commuting in individual cars.

5.1.2. Electric Vehicle Charging

The National Development Plan (2021-2030) Strategic Investment Priority for Transport includes the target of nearly one million electric vehicles on the road by 2030 with additional charging infrastructure to cater for growth. The Climate Action Plan requires a significant increase in the proportion of Electric Vehicles (EVs) in the car fleet to transition away from internal combustion engines. It is also likely that the sale of new vehicles with internal combustion engines will be banned during the 2030s, with the European Parliament having voted to mandate that all new car and van sales should be zero emissions from 2035. To achieve the required uptake, barriers must be addressed, particularly in the areas of range anxiety and the widespread availability of charging infrastructure.

TII will work with the Department of Transport's Zero Emissions Vehicles office to support the delivery of the national EV charging infrastructure in line with its EV Charging Infrastructure strategy, currently under development.

5.1.3. Active Travel

TII is committed to delivering improved active travel provision in all its projects, such as improving the safety of the National Roads network for active travel users and reducing the severance caused by some National Roads in urban areas. TII will collaborate with stakeholders to progress the National Cycle Network plan to cater for more active trips and expand the Greenway network nationwide, on behalf of the Department of Transport. Provision of safe, high quality active travel infrastructure will encourage modal shift and may result in reductions in carbon emissions.

Project showcase – TII Road Emissions Model

TII has developed and maintains a Road Emissions Model (REM) and can quantify and visualise the greenhouse gas emissions (CO₂ and CO₂e) of the National Roads network's vehicle users in the existing situation and the future.

TII REM was developed for strategic analysis to understand the contributions of the different parts of the vehicle fleet, where the National Roads network is operating efficiently or inefficiently (i.e., uncongested or congested conditions), what emissions may be associated with TII scheme programmes and how road interventions may affect emissions. The tool therefore can be used both to inform policy and test policy proposals to help reduce greenhouse gas emissions.

The TII REM Tool has been designed to work with the TII National Transport Model (NTpM) providing TII with integrated economic, safety and emissions outcomes to facilitate informed decision making.

The TII REM Tool works with the TII National Transport Model (NTpM). This facilitates informed decision making and allows TII understand economic, safety and emissions outcomes associated with possible National Road interventions facilitate informed decision making.

When planning future infrastructure, climate modelling may have to be performed for a range of future transport scenarios to take account of potential behavioural change and different future profiles of the national vehicle fleet. This will provide information on how future transport infrastructure will perform under a range of potential future emission scenarios and support the consideration of whether an investment aligns with Ireland's national decarbonisation targets.

5.2. Protection and Renewal

The protection and renewal of the National Roads network is where TII incurs its greatest proportion of expenditure. Protection and Renewal encompasses three investment portfolio themes: Road Safety; Asset Management & Network Operations; Resilience & Climate Adaptation.

5.2.1. Road Safety

Road safety is and will continue to be an integral part of every aspect of TII's work, particularly along the National Roads network. TII will deliver on its actions in the Road Safety Strategy (2021-2030) and collaborate with partners to deliver on supporting actions. In line with the European Union Road Infrastructure Safety Management (RISM) directive, TII will target investment on sections of the National Roads network with the highest risk of fatal or serious injury. In line with NIFTI, TII will meet asset protection and renewal requirements to help to ensure the safety of users on the network. TII's road safety programme will focus on achieving safe roadsides and a safe environment for vulnerable road users in line with the safe systems approach.

Project showcase- Speed-over-distance cameras on the M7, Tipperary Co.

TII began operation of new speed safety cameras along M7 in Co. Tipperary in April 2022, between Junction 26 - Nenagh (West) and Junction 27 - Birdhill, a section of road which is subject to sudden changes in weather.

Speed-over-distance cameras record vehicles at two distinct points at a set distance apart and note the exact time a vehicle passes each camera. The operation allows An Garda Síochána to accurately calculate the speed of the vehicle. The current section is covered in both directions.

TII analysis indicated speeding in this area was a cause for concern, and safety risks were compounded during rain or hail showers, increasing the potential of serious incidents. It is hoped that the introduction of the new camera system will lead to a reduction in the number of motorists violating speed limits, thus improving road safety.

5.2.2. Asset Management & Network Operations

A key priority for TII is to maintain the existing National Roads network to a robust and safe standard. Essential maintenance at the optimal time will reduce safety risks and the overall cost. A significant percentage of National Roads annual expenditure will relate to the maintenance, protection, and renewal of existing National Roads.

Strategies to prioritise protection and renewal were successfully implemented for the existing motorway network, while parts of the network such as the National Secondary roads require further investment. TII will use asset management principles to manage national roads' assets safely, sustainably, efficiently, and effectively over their useful life.

TII is investing in increased development and deployment of smart infrastructure, to improve road capacity, safety, efficiency, and performance. Emerging and mature technologies include C-ITS, variable speed limits, connected maintenance sensors, and weigh-in-motion technology. Integration of transport and smart infrastructure will also require telecommunication improvements to gain benefits from digitalisation and support decarbonisation.

**Project showcase -
Dynamic Traffic Management
Enhancing Motorway Operation Services**

**Project showcase - C-ITS
Cooperative Intelligent Transport Systems pilot**



The Dynamic Traffic Management programme consists of four key strands:

1. M50 Traffic Flow Optimisation (MTFO): The optimisation of traffic flow on the M50 and approaches through the deployment of Intelligent Transportation Systems (ITS) technology, including variable speed limits, lane control signals, variable message signs and CCTV coverage.
2. The expansion of the existing Dublin Tunnel Control Building to provide a new, state of the art motorway operations control centre (MOCC), in which TII manages the motorway network
3. The implementation of a Network Intelligence and Management System (NIMS), an overarching, adaptive system that receives and processes information from multiple roadside traffic monitoring devices and allows TII to manage all ITS systems operating on the motorway network.
4. A national Cooperative Intelligent Transportation System (C-ITS) pilot project, implemented as part of Ireland's participation in the C-Roads platform, a joint initiative of EU member states and road operators to ensure harmonisation and interoperability of C-ITS services across the EU.

C-ITS is a means for road users and operators to share information and coordinate their actions. It will enable drivers to make more informed decisions (i.e., speed, headway, and lane positions) about their journey.

The pilot project deployed, illustrated in Figure 5-2, trials and evaluates C-ITS services, encompassing a group of technologies and applications that allow effective data exchange through wireless communication technologies, very often between vehicles (vehicle-to-vehicle or 'V2V') or between vehicles and infrastructure (vehicle-to-infrastructure or 'V2I').

The pilot is deployed across five sections, as shown below, and on-road trials are due to commence in 2023. The pilot trials the delivery of messages directly to drivers in their vehicles about conditions on the road ahead, including congestion, road works, slow or stationary vehicles, as well as advisory information such as dynamic speed limit information and weather condition warnings.

The evaluation and assessment phase of the pilot will report on the technical performance of the technology, the impact of C-ITS on road safety and efficiency, and user acceptance of the technology. These findings will be used to inform the development of specifications, as well as the future implementation of C-ITS in Ireland.

Figure 5—2 Ireland's C-ITS Pilot



5.2.3. Resilience & Climate Adaptation

There is a need to ensure the road network is resilient to the effects of climate change, identified as a strategic issue for the National Road network and therefore a new portfolio theme in TII's scope of work.

TII is updating its '*Strategy for Adapting to Climate Change on Ireland's Light Rail and National Road Network*'²⁰. The strategy is examining the impacts of climatic events on surface, groundwater resources and environmental measures as an integral part of the climate adaptation strategy.

TII is continually maintaining and renewing road pavements and road assets such as signage, crash barriers and noise barriers. Adaptation to climate change is included in drainage designs by strengthening bridges and raising of roads, allowing for future increases in rainfall intensities and volumes, preventing roads becoming impassable after heavy rainfall.

National Roads Operational Continuity during Storm Emma (2018)

Storm Emma struck Ireland in February 2018, bringing up to 690 mm of snow to parts of the country.

TII was represented on the National Emergency Coordination Group (NECG) given that National Roads are critical national infrastructure.

In its response to the emergency TII maintained full staffing levels for 24 hours a day between the 26th of February and the 4th of March, and provided food, sleeping and welfare facilities in local hotels and maintenance depots for operatives.

Maintenance of continued road operations on routes to hospitals, emergency services' stations was prioritised, with the entire network ready for morning travel on Monday 5th March 2018.



National Motorway covered in snow

5.3. Mobility of People & Goods in Urban Areas

The National Road network must facilitate both the movement of people and the movement of goods.

Project Ireland 2040's NSO4 relates to Sustainable Mobility, and the role of National Roads in a sustainable transport system is a key consideration. An essential function towards delivering this NSO is to connect people and places across the country, by various modes, on National Roads.

The National Roads network should also be fit for the transport of heavy vehicles, noting the high levels of wear and degradation of the carriageway under heavy loading; emissions originating from freight movement; and unique travel patterns.

5.3.1. Movement of People

The National Roads network should cater for the needs of all road users, including cyclists and pedestrians. Where sections of the network present a hostile or dangerous environment for cyclists and pedestrians, TII will work to provide segregated active travel facilities adjacent to National Roads. TII will identify and address severance associated with busy urban National Roads through provision of safe crossing infrastructure for cyclists and pedestrians.

An increase in the strategic provision of park and ride and park and share facilities at transport interchanges can be an effective means of expanding the catchment area of certain public transport services. Interventions of this nature present opportunities for more efficient use of road space and reduced environmental costs.

The delivery of prioritised bus lanes on busy national radial routes approaching urban centres may enhance the people carrying capacity of these roads and provide journey time reliability and service quality for passengers.

²⁰https://www.tii.ie/technical-services/environment/changing-climate/1_PSF-ENW-0003-01-StrategyForAdaptingToClimateChange_Final_December_2017_Print_Version.pdf

Project showcase – Segregated cycling/walking facility on N56, Dungloe to Glenties, Co. Donegal

TII has invested in the realignment and construction of 27km of National Secondary Road, N56 from Dungloe to Glenties Co. Donegal, including introduction of a segregated cycling/walking facility.

The project was progressed in five sections and fully open to the public in 2022, providing improved regional accessibility and safety for all road users.



5.3.2. Movement of Goods

The National Roads network plays an important role in the carriage of goods and services in urban areas, in particular to and from airports and ports. The Department of Transport is currently developing its ten-year strategy for the haulage sector; TII will implement actions arising for the National Roads network.

As outlined in NIFTI, a key issue for freight is congestion on the land transport network adjacent to strategic links such as the M50 and Dublin tunnel. TII will work with the Department of Transport and partner agencies to explore traffic and demand management measures to improve the journey time reliability required for the efficient movement of imports and exports.

Iarnród Éireann has identified potential routes suitable to rail, within an intermodal freight and logistics future, that will be developed over the life of *Rail Freight 2040*. TII is supportive of freight movement via other modes.

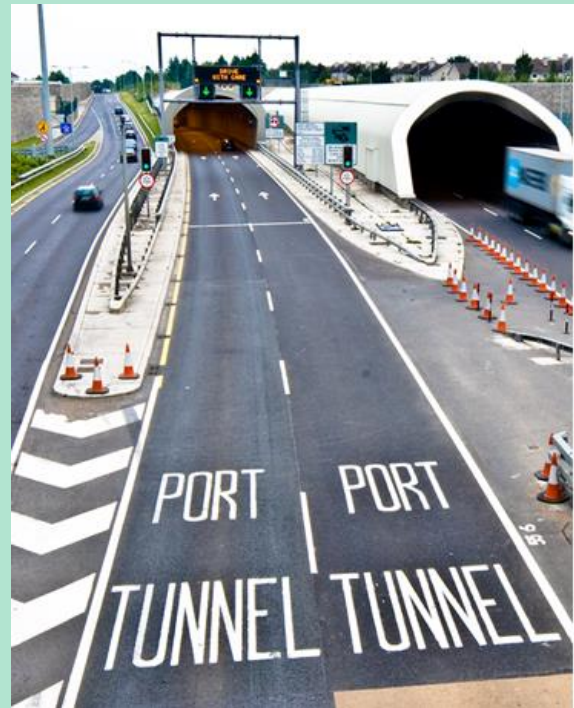
Project showcase- Dublin Tunnel

M50, M1 and Dublin Tunnel represent the most important elements of the national network for the domestic movement of goods.

Dublin Tunnel is a twin bore tunnel of 4.5 km, part of the M50 motorway and completes the northern part of the C-Ring around Dublin city. It opened to traffic in December 2006 including a dedicated route for Heavy Goods Vehicles between Dublin Port, located in the heart of the city, and the greater road network offering a high-quality link of just six minutes from the Port to the M50.

TII analysis shows that HGVs represented in the region of 49 percent of traffic in the Dublin Tunnel in 2020.

Dublin Tunnel also benefits the city of Dublin and its residents, workers and visitors by dramatically reducing the number of HGVs passing through city streets. As a result, urban congestion is reduced while air quality and road safety are improved.



5.3.3. Demand and Traffic Management

TII will support travel demand management measures for National Roads in the five cities (Dublin, Cork, Galway, Limerick, and Waterford) and implement other government policy on demand management on national roads. It will explore the potential of demand management measures, including road-user charging. TII will expand traffic management measures in congested sections of national roads to ensure optimal vehicle flow to minimise carbon emissions, particularly from freight.

Project showcase- M50 Demand Management Study (DMS)

The M50 is the **single most important** element of the road transport network in Ireland for the movement of people and goods.

TII prepared the M50 Demand Management Study (DMS) in 2014 to set out a plan for the management of increasing demand through fiscal policy, intelligent transport systems/traffic control, information, smarter travel and network control measures. Elements of this Study have subsequently been delivered including an Incident Management System, junction layout improvements and Variable Speed Limits on the M50.

In 2021 TII, in recognising continued growth (and associated emissions) on the M50, commissioned further work to gain a thorough understanding of the M50 users and customers including extensive customer engagement



5.4. Enhanced Regional and Rural Connectivity

The enhanced regional and rural connectivity investment priority encapsulates the social and economic importance of the National Roads network, in supporting and balancing the regional cities, key settlements, and rural areas' prosperity and growth, towards achieving Project Ireland 2040 goals.

5.4.1. National Primary Network

The NPF, under NSO2, highlights the need to improve accessibility to the South, North-West and North-East;²¹ and identifies sections of the National Roads network that are prioritised for improvement.

5.4.1.1. Inter Urban Connectivity

The NPF, under NSO2, aims to reduce journey times between the five cities (Dublin, Cork, Galway, Limerick, and Waterford) and five centres of scale, Sligo, Letterkenny, Dundalk, Drogheda and Athlone. The NPF set a target for an average inter-urban speed of 90kph. Most of the inter-urban road travel on the existing motorway and dual carriageway network currently achieves or exceeds this target. On the existing motorway and dual carriageway network, the focus of investment will be on protection, renewal along with the provision of enhanced facilities for public transport on the approaches to cities.

TII analysis, using its National Transport Model²², has identified National Roads corridors where this target is not currently achieved and where additional interventions would support the achievement of an average inter-urban speed of approximately 90 kph, between the five cities and five centres of scale. These corridors are mainly National Primary roads as shown in Figure 5-2.

Targeted interventions along sections of these corridors may include road upgrades, enhancements and/or town bypasses. Any interventions proposed must be developed in accordance with NIFTI's Investment Priorities and its Modal and Intervention Hierarchies.

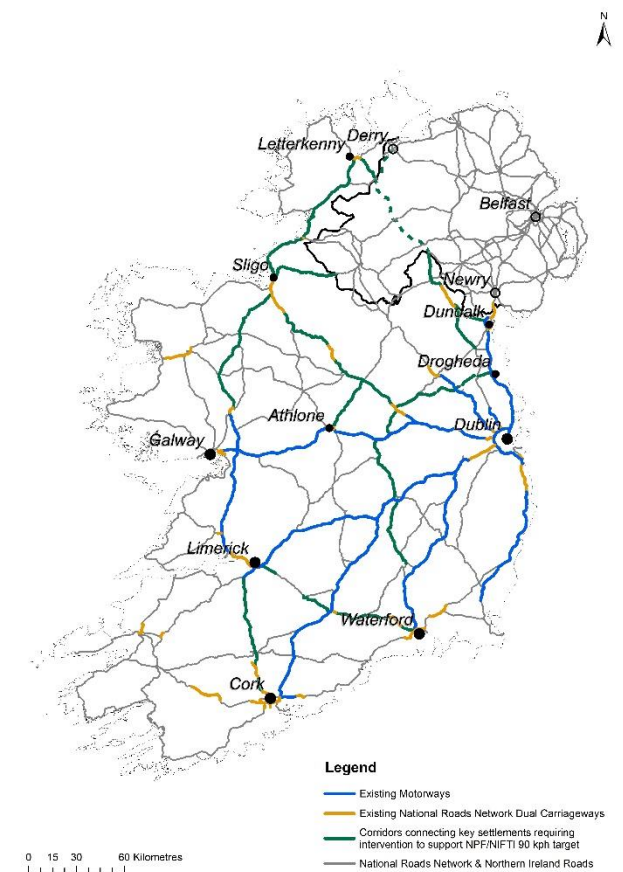


Figure 5—2 Interurban Connectivity

Improved road sections where significant infrastructure upgrades have taken place in recent times are shown in magenta/blue, while those in green are corridors where interventions would support the 90kph NPF target

²¹ National Investment Framework for Transport in Ireland (December 2021), p. 38.

²² <https://www.tii.ie/tii-library/strategic-planning/>

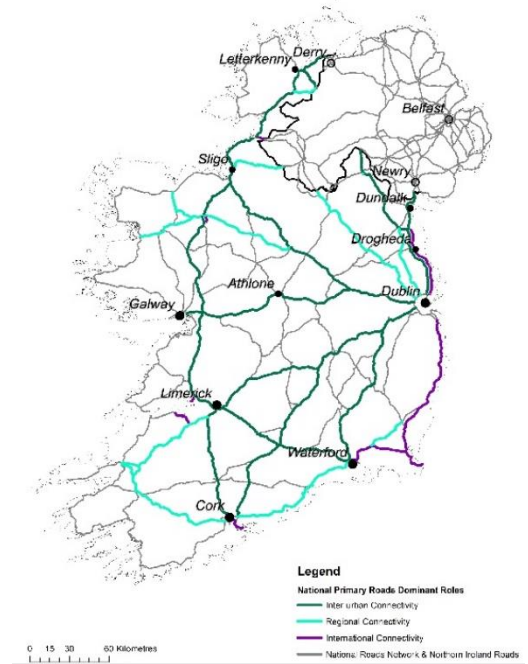
5.4.1.2. Regional Connectivity

Both the NPF and NIFTI indicate the importance of maintaining and improving accessibility to and between the more peripheral areas of the state, for instance, the South and Northwest. The provision of a safe, efficient and reliable network under this classification is a priority; ensuring that the South, Northwest and Northeast regions, as defined by the NPF, have a high degree of accessibility to Dublin and other urban centres.

Any interventions brought forward will be developed in accordance with the NIFTI Investment Priorities and the Modal and Intervention Hierarchies. For example, provision of town bypasses on corridors shown in Figure 5.3., may remove traffic from towns and thus support the Government's 'Town Centre First' policy.

5.4.1.3. International Connectivity

The NPF under NSO6 recognises that National Roads are an important element in ensuring high quality international connectivity to ports and airports. High quality international connectivity is particularly important for business and freight travel. Strengthening access routes to Ireland's ports through investment to upgrade and enhance the road and rail transport network to improve journey times remains a government priority in the NDP.



Two National Road schemes, currently in planning, will improve access to the Tier 1 ports of Ringaskiddy and Shannon-Foynes. The construction of these links will complete the core Trans European Transport Network (TEN- T) road network in Ireland and are to be completed by 2030 in line with EU TEN-T regulations.

Aside from these projects, priority on the corridors shown in Figure 5.3 will be to maintain route quality, efficient operation and to manage congestion in the vicinity of Tier 1 and Tier 2 ports and airports, including the Dublin tunnel. It should be noted that all roads serve multiple functions.

Figure 5-3 Dominant function of National Primary Roads

5.4.2. National Secondary Network

The National Secondary Network must respond to a wide variety of needs, as it performs different functions in different locations. Certain National Secondary Roads provide inter-urban connectivity to the five cities and five regional centres, as shown in Figure 5-4. Other Secondary Roads form key transport links for surrounding areas and have an important function for the community.

Based on detailed analysis, conducted by TII, the National Secondary Road network has been categorised into three functions: Lifeline, Arterial and Collector, to guide investment.

5.4.2.1. Lifeline Roads

Lifeline National Secondary roads carry limited traffic flows but form key transport links for the surrounding communities. They are primarily located in rural settings and in areas of complex topography with very few alternative routes. This type of road serves a lifeline function for its individual transport users. Availability and climate resilience are priorities for lifeline roads.

5.4.2.2. Arterial Roads

Arterial National Secondary roads cater for high travel demand and are in close proximity to large urban centres. Arterial National Secondary Roads corridors have a similar role to certain National Primary corridors in terms of moving people and freight. Arterial roads are subject to increased demand for movement of people and goods and will likely require interventions.

5.4.2.3. Collector Roads

Collector National Secondary roads cater for travel needs across much of the state. Collectors have some level of redundancy, meaning closures are only an inconvenience because alternative routes are available. Safety and route consistency is a priority for these roads.

Any interventions for National Secondary roads will be selected through application of the NIFTI Modal and Intervention Hierarchies.

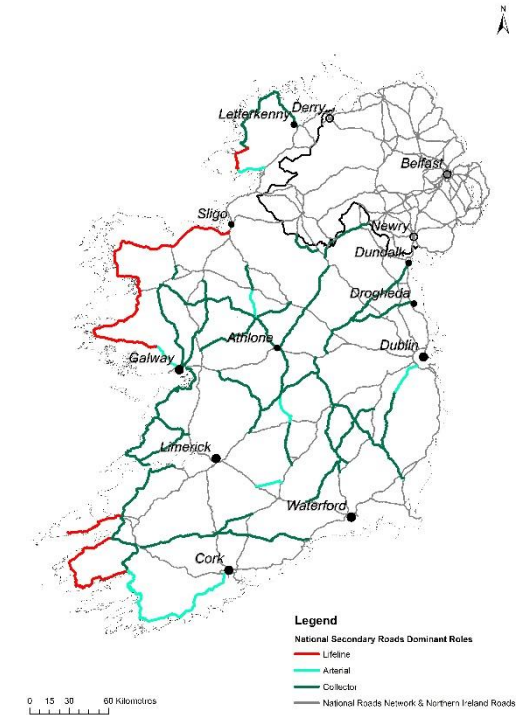


Figure 5.4 Dominant function of National Secondary Roads

6. Implementation

NR2040 is TII's strategy for the National Roads network, identifying the function and investment priorities for different parts of the National Roads network for the purpose of:

- Enabling Project Ireland 2040 (National Planning Framework and NDPs)
- Supporting the realisation of several National Strategic Objectives (NSOs)
- Aligning with NIFTI and other Government policy

This implementation chapter provides NR2040's summary guidance to Sponsoring Agencies and Local Authorities. It outlines:

- TII commitments to addressing strategic issues
- Provides a means of filtering future interventions
- Defines TII investment portfolios
- Concludes with TII's commitment to collaboration, recognised throughout the strategy as a necessary means for the successful implementation of identified interventions and achievement of national targets

6.1. NR2040 Commitments

The NR2040 Investment Priorities are reinforced by a series of TII commitments, further addressing the strategic issues facing the National Roads network in the coming years. Policy obligations, including NPF, NIFTI, the Road Safety Strategy, and internal TII analysis and plans inform these commitments.

The commitments outlined in Table 6-1 will influence the scope of projects on the National Roads network developed by Local Authorities or other Agencies.

Table 6-1 NR2040 Commitments

| Addressing Issues | NR2040 Commitments |
|---|--|
| Future Demographic Growth Trends | <ul style="list-style-type: none"> • TII will continue to analyse possible growth in travel demand, reflecting Project Ireland 2040 population targets. • TII will continue to develop and plan for multiple future demand scenarios that factor in possible behavioural and technological change. • TII will ensure that the potential for induced travel demand will be estimated for all major projects. • TII will implement government policy on demand management. NIFTI sets out the importance of the provision of alternative transport options, such as cycle infrastructure and public transport services before demand-side measures are implemented. TII will ensure that any future implementation of demand management proposals on the National Roads network aligns with the National Sustainability Mobility Policy as well as NIFTI Modal and Intervention Hierarchies. • TII will explore the potential of road-user charging measures through the Better Road User Charging Evaluation (BRUCE) study |
| Decarbonisation | <ul style="list-style-type: none"> • To reduce emissions, TII will prioritise traffic management investment in freight corridors and where congestion results in high levels of GHG emissions. • National Road projects will be appraised in the context of compliance with Ireland's climate change targets, in line with each of the Governments Climate Action Plans, NIFTI and in accordance with the Department of Transport's Common Appraisal Framework. Predicted changes and/or targets associated with the levels of usage of each mode (e.g., bicycle, car, public transport, truck, van) will inform this. |

| | |
|--|---|
| | <ul style="list-style-type: none"> TII will continue to develop and enhance its Road Emissions Model to explore the emissions impact of changes in transport demand, supply of transport networks/services and changes in vehicle fleet technology. TII will reduce its emissions and environmental impacts from maintenance and operations of existing National Road infrastructure. TII will reduce carbon emissions associated with the development, construction and operation of new infrastructure. TII will support the Department of Transport and its Zero Emissions Vehicle Ireland (ZEVl) Office to increase the provision of electric vehicle charging infrastructure nationwide. TII will continue to participate in wider efforts to decarbonise road transport through the provision of appropriate infrastructure, technology, and support of policy aimed at changing behaviours. |
| Climate Adaption & Resilience | <ul style="list-style-type: none"> TII will enhance the resilience of National Roads, in particular sections of the rural National Secondary Roads network, that provide lifeline links to individuals and communities. TII will implement its Climate Adaptation Strategy (2022). |
| Sustainability | <ul style="list-style-type: none"> TII will work with government agencies and stakeholders to support each Climate Action Plan and government's national climate objective to "<i>transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy by 2050.</i>" TII will incorporate economic, social and environmental sustainability objectives and goals in all decisions, policies, projects and processes. TII will promote inter-modal solutions that maximise overall transport efficiency in terms of infrastructure and resource use. For example, facilitating safe active travel along national road corridors that connect with rail and bus stations. In line with its legislative remit, TII will minimise the impact of road infrastructure on the environment and support the development and maintenance of ecological corridors along National Roads. In line with NIFTI, TII will prioritise online improvements and avoid delivering high levels of excess capacity. In line with its legislative remit, TII will work with relevant bodies to support measures to reduce air quality and noise impacts from road transport. TII will continue to support TII's Sustainability Implementation Plan (and subsequent revisions) to integrate all aspects of sustainability into TII's core activities. |
| Road safety | <ul style="list-style-type: none"> TII will deliver on its actions in the Government's Road Safety Strategy 2021-2030 'Our Journey towards Vision Zero' and collaborate with partners to deliver on supporting actions. TII will prioritise delivery of high quality, suitable infrastructure to create forgiving roadsides, self-explaining roads and a safe environment for vulnerable road users. In line with NIFTI, TII will meet asset protection and renewal requirements to help to ensure the safety of the network. In line with the European Union's Road Infrastructure Safety Management (RISM) Directive, TII will target investment on sections of national roads with the highest risk of fatal or serious injury. |
| Movement of People | <ul style="list-style-type: none"> TII will support Connecting Ireland and prioritisation measures such as dedicated bus lanes where such prioritisation results in greater transport efficiency. TII will consider the needs of all road users for all projects. On urban dual carriageways and motorways approaching cities, TII will work with partner agencies to enable public transport and safe high-quality active travel alternatives for car users. TII will continue to support reductions in car dependency and levels of car usage nationally while recognising the important role that private mobility plays for many road users. TII recognises that busy urban motorways, ring roads and town bypasses can be hostile environments for pedestrians and cyclists wishing to cross. TII will identify and remedy severance impacts from National Roads. Where bypasses are built, urban realm improvements will be required in the bypassed town to enable more sustainable mobility. |
| Movement of Goods & Services | <ul style="list-style-type: none"> In line with the NPF and NIFTI, TII will work to achieve average inter-urban speeds of 90km/h on National Road corridors between Ireland's five cities (Dublin, Cork, Galway, Limerick, and Waterford) and five regional centres (Letterkenny, Drogheda, Dundalk, Sligo and Athlone). In some instances, this will mean the development of new infrastructure or upgrading of existing infrastructure to deliver on this NPF and NIFTI inter-urban accessibility objective. |

| | |
|-------------------------|---|
| | <ul style="list-style-type: none"> • TII will work towards improving regional and rural accessibility in line with the NPF and NIFTI objectives. • In partnership with other agencies, TII will work to protect access to ports and airports and improve access where required. • TII will provide/ consider prioritisation measures such as dedicated freight lanes where such prioritisation results in greater transport efficiency. • TII supports the development of rail freight and multi-modal freight distribution centres on or near National Roads. • TII recognises the need to provide quality services and secure parking areas for HGV drivers as required by both the TEN-T Regulation and ITS Directive. An update to TII's Service Area Policy, which outlines the current requirement for motorway service area on the motorway and dual carriageway network, will be published in 2023 |
| Urban Congestion | <ul style="list-style-type: none"> • TII will promote traffic management interventions that help optimise traffic movement on urban National Roads. • TII will support the use of public transport on or adjacent to urban National Roads. • TII will support the provision of segregated or offline active travel infrastructure adjacent to national roads. |

6.2. NR2040 Implementation Structure

The NR2040 implementation structure consists of several portfolios under the four NIFTI Investment Priorities, plus a portfolio of non-infrastructure programmes. This assists in categorising TII expenditure against Government priorities.

The **Decarbonisation** Investment Priority is the National Roads network's greatest challenge. The Investment Priority incorporates Integrated Mobility programme, including major projects such as: core bus corridors, bus and passenger facilities, Park & Ride and Park & Share; as well as an Active Travel programme, which includes the National Cycle Network (NCN); and Electric Vehicle Charging infrastructure development.

The **Protection and Renewal** Investment Priority represents the largest area of expenditure on National Roads. It will continue to deliver Safety and Minor Works portfolios in addition to Network Resilience and Asset Management of infrastructure, including pavements; structures; motorways and tunnels; signs and lines; as well as Network Operations of motorways and tunnel operations; PPP; control centres and ITS; winter operations.

Movement of People and Goods in Urban Areas will include programmes and projects encompassing traffic and demand management measures; technology solutions; and infrastructure interventions in and around cities and towns.

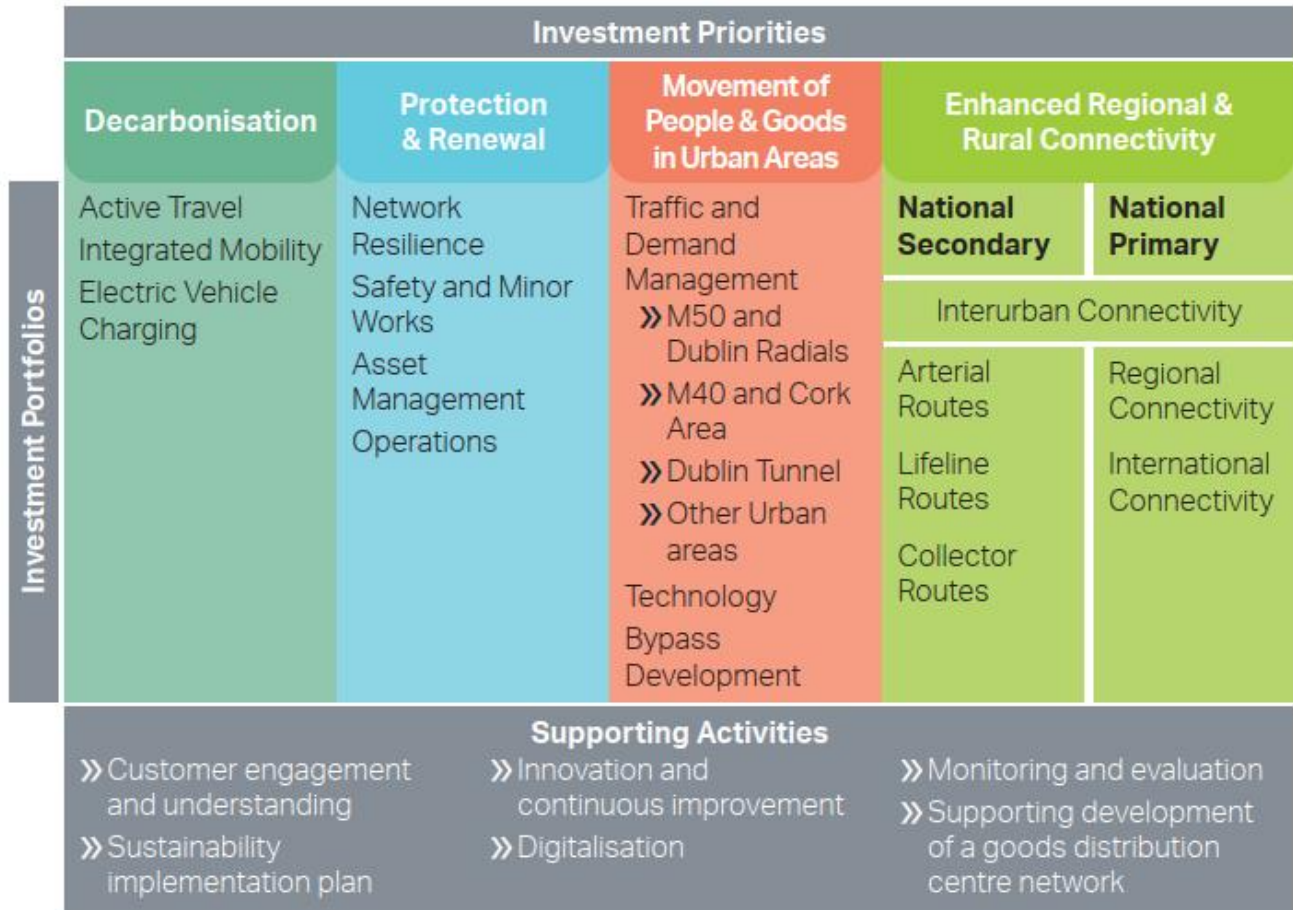
The **Enhanced Regional and Rural Connectivity** Investment Priority focuses on enhancing Interurban Connectivity, Regional Connectivity and International Connectivity. Within this portfolio, there are sub-portfolios for National Primary and National Secondary roads.

Finally, TII recognises necessary supporting activities for investment that will address the changes to processes, technologies, and organisational needs. It will respond to NIFTI's request for long term planning and evolution of practices in the care and development of road infrastructure. These include, for example:

- **Customer engagement and understanding**- developing and delivering practices and processes to improve TII's engagement with, and understanding of, all road customers
- **Sustainability implementation plan**- integrating sustainable practices and processes into every aspect of National Roads development and management, and ensuring sustainability is the bedrock of all decision-making, as articulated in TII's *Sustainability Implementation Plan*. The implementation plan requires new ways of thinking; reviewing all corporate policies, standards and specifications; engaging with the wider supply chain and construction industry; and extensive collaboration
- **Innovation and continuous improvement**- TII 's track record is one of continuous improvement, for example effective implementation of the motorways programme and innovation; early adopters of free flow tolling – M50 and interoperable tolling. TII's continuous improvement must be maintained in the new policy context of decarbonisation, multi-modality and technological change
- **Digitalisation**- including embedding a 'digital-by-design' philosophy; continued development and maintenance of a digital twin of the National Roads network; C-ITS integration; and delivery of digital platforms

- **Monitoring and evaluation**- of investment programmes and projects is a key requirement of the Public Spending Code for capital and operating expenditure. NR2040 and its supporting environmental assessments provides the framework for monitoring and evaluation activity
- **Supporting development of a goods distribution centre network**- on or near National Roads (developed by third parties) to play a significant part in the creation of a more efficient, lower emission, haulage industry.

Figure 6-1 NR2040 Implementation Structure



6.3. Project Development Process

TII, through NR2040, will align with the NIFTI Intervention Hierarchy and seek to address transport challenges through the use of existing road space before considering provision of new infrastructure.

NR2040 is a policy led strategy, not a “predict and provide” (demand-led) strategy

When developing a project on National Roads, the relevant Local Authority, third party and / or TII department will need to show that the proposed investment aligns with NIFTI, as set out in the DoT Common Appraisal Framework (CAF) and/or associated appraisal guidance documents as published by DoT, and address how to work towards achieving the NIFTI Investment Priorities.

NR2040 provides interpretation and further detail to streamline the project development process, by indicating:

1. How the project objectives align with NIFTI investment priorities (reviewed in chapter 2)
2. Specific strategic issue(s) facing National Roads that the project resolves (reviewed in chapter 3)
3. How the project objectives align with NR2040 Vision and Objectives (reviewed in chapter 4)
4. How the project aligns with NR2040 Investment Priorities and the spatial context through guidance on the types of intervention for different regions and types of National Roads (reviewed in chapter 5)
5. How the project aligns to one or more of TII’s commitments (reviewed in section 6.1)

6. Identification of the NR2040 portfolio and programme that would accommodate the project (reviewed in section 6.2)

This process is consistent with existing TII Project Appraisal Guidelines (PAG), DoT CAF and DoT NIFTI investment priorities and hierarchies. It also aligns with the DEPR's Public Spending Code (PSC) requirements to demonstrate the strategic rationale for significant, publicly funded investments.

Intervention types and examples are presented in Table 6-2.

Table 6-2 – National Roads Intervention types and examples

| Intervention | Description | Example |
|---|---|---|
| Priority of public transport, walking, cycling and goods | Enable a sustainable transport system through coordination with partner organisations. Reduce the reliance on private vehicles by coordinating access and priority on National Roads for public transport, goods vehicles, walking and cycling. | <ul style="list-style-type: none"> ○ National Cycling Network active mode collaboration and interchange ○ Building pedestrian and cycle bridges to reduce severance |
| New transport and road technologies | Integrate new road technologies and provide for vehicle innovation. Incentivise and promote quicker, easier and lower-carbon travel alternatives to fossil-fuelled vehicles. | <ul style="list-style-type: none"> ○ Smart motorways ○ C-ITS ○ Modern asset management systems |
| Demand management | Prioritise and incentivise use of the network. Restrict use of the network by time, location, trip purpose, vehicle type or other criteria necessary to balance the needs of the community, environment and economy. | <ul style="list-style-type: none"> ○ HOV, bus and cycle lanes ○ Ramp metering ○ Tolling |
| Resilience and capacity via local reconstruction | Improve resilience or capacity through localised reconstruction, notably on National Secondary Roads | <ul style="list-style-type: none"> ○ Junction improvements ○ Short road segment improvements |
| Road construction | Where no feasible alternative exists to serve the required function, deliver new road infrastructure with sustainable procurement and circular economy practices. | <ul style="list-style-type: none"> ○ Town bypasses ○ Build new to reduce net carbon ○ Build better (new multi-modal links) |

6.4. Environmental Assessments

As part of the preparation of NR2040 a number of environmental assessments have been undertaken in tandem with the development of the Strategy. Assessments include a Strategic Environmental Assessment (SEA), an Appropriate Assessment (AA) and a Strategic Flood Risk Assessment (SFRA). The assessments identify at a strategic level potential effects on the environment as a result of the strategy commitments / actions and these assessments have helped inform the high-level of protection of the environment with a view to promoting sustainable development.

NR2040 sits within the overall hierarchy of policy documents. Any future projects requiring planning consent arising from NR2040 are subject to the relevant project level assessment and the requirements of environmental directives including but not limited to: SEA Directive (2001/42/EC), EIA Directive (2011/92/EU as amended by 2014/52/EU) and Habitats Directive 92/43/EEC, Water Framework Directive (2000/60/EC) and Floods Directive (2007/60/EC) and associated national legislation, as appropriate. This strategy should be read in conjunction with the following environmental assessment reports: SEA Statement, Natura Impact Statement and SFRA and the mitigation included within them. A summary of how the SEA process, including consultation from environmental authorities, has influenced the strategy is included in the SEA Statement published in conjunction to the Strategy.

6.5. Collaboration

National Roads have a multi-modal integrated future that must be delivered by TII in collaboration with other government agencies and transport stakeholders. Early collaboration with third parties is vital to deliver on current and future policy.

Some of TII's key collaborators are: Local Authorities; Department of Transport; Road Safety Authority; National Transport Authority; Department of the Environment, Climate and Communications and other government departments (e.g. Department of Housing, Local Government and Heritage).

Considering the new types of projects envisioned, TII recognises the need for a wide variety of skills and multi-disciplinary teams to ensure successful development and achievement of goals and objectives. A strong supply chain of land use and transport planners, engineers, contractors, technical advisors, public communication and engagement specialists, suppliers and operators is of vital importance, with an increasing emphasis on technology suppliers.

In addition, it is important that future transport investment is coordinated and integrated with other sectors, including land-use planning and policy to support compact sustainable development of our cities and towns, and supports regional and rural development. Cooperation with state agencies will continue to allow National Roads to be used for services of national importance, such as access to international ports.

The success of both 'Movement of People and Goods in Urban Areas' and 'Decarbonisation' portfolios is particularly dependent on a strong collaboration with a range of stakeholders.

7. Monitoring Framework

Monitoring of NR2040 will be led by TII and undertaken through three different aspects:

- **Project-level assessments and appraisals** – through existing methods of monitoring carried out by TII where the development, and appraisal process aligns with the TII PAG, DoT CAF, and DoT NIFTI investment priorities and hierarchies. Project-level assessments should highlight existing issues and those that may arise in the future as well as their underlying causes. This may include existing or potential future problems regarding safety, travel time, travel time reliability, accessibility and social inclusion, severance, connectivity, employment, and socio-economic factors. This will ensure that programmes and projects entering the implementation portfolios are aligned with NR2040. TII in its role of approving authority must ensure compliance with the PSC's requirements on monitoring during delivery and evaluation post-delivery.
- **Annual National Roads Indicators reports** – Yearly key performance indicators and updates on the use of the National Roads network will be compiled and reported. Indicators include information on the road network, economy, road condition, safety, accessibility, and the environment.
- **Environmental monitoring of the Strategy** – The SEA directive requires the monitoring of the likely significant environmental effects of the implementation of plans or programmes. The SEA Monitoring programme developed for NR2040 is presented in the SEA Statement. The monitoring programme identifies targets and indicators, the source of information (including the lead agency or any stakeholders involved in data collection). The frequency of monitoring is also identified.

Appendix A National Policy Actions for National Roads

Note: Any reference to individual projects is for illustrative purposes only, as excerpted from the NPF. All projects are subject to planning approval and compliance with all other applicable environmental law, regulatory and public expenditure requirements for the project concerned, including compliance with the CAF and PSC.

Table 7-1 National Planning Framework actions for National Roads (Excerpts from the NPF)

| NSO | National Roads action |
|---|---|
| NSO1 Compact Growth²³ | Improving accessibility to and between centres of mass and scale and allowing better integration with their surrounding areas. |
| NSO2 Enhanced Regional Accessibility²⁴ | <ol style="list-style-type: none"> 1) Inter-Urban Roads: <ol style="list-style-type: none"> a) Maintaining the strategic capacity and safety of National Roads including planning for future capacity enhancements b) Improving average journey times targeting an average inter-urban speed of 90kph c) Enabling more effective traffic management within and around cities and re-allocation of inner-city road-space in favour of bus-based public transport services and walking/cycling facilities d) Advancing orbital traffic management solutions 2) Accessibility to the North-West: <ol style="list-style-type: none"> a) Upgrading northern sections of the N4 and N5 routes and sections of the N3/M3 National Primary route 3) Public Transport: <ol style="list-style-type: none"> a) Strengthening public transport connectivity between cities and large growth towns in Ireland and Northern Ireland with improved services and reliable journey times |
| NSO3 Strengthened Rural Economies and Communities²⁵ | Invest in and maintain regional and local roads and strategic road improvement projects in rural areas to ensure access to critical services such as education, healthcare, and employment. |
| NSO4 Sustainable Mobility²⁶ | Expand attractive public transport alternatives to car transport to reduce congestion and emissions and enable the transport sector to cater for the demands associated with longer term population and employment growth in a sustainable manner. |
| NSO6 High Quality International Connectivity²⁷ | <p>National roads serve this NSO under the following criteria:</p> <ol style="list-style-type: none"> 1) Airports: <ol style="list-style-type: none"> a) Enhancing land-side access, particularly in public transport terms 2) Ports: <ol style="list-style-type: none"> b) Improve land transport connections to the major ports, including facilitating the growth of Dublin Port through greater efficiency, limited expansion into Dublin Harbour and improved road access, particularly to/from the Southern port area i) |

²³ Project Ireland 2040: National Planning Framework (February 2018), p. 139.

²⁴ Project Ireland 2040: National Planning Framework (February 2018), p. 140.

²⁵ Project Ireland 2040: National Planning Framework (February 2018), p. 141.

²⁶ Project Ireland 2040: National Planning Framework (February 2018), p. 142.

²⁷ Project Ireland 2040: National Planning Framework (February 2018), p. 145.

Table 7-2 National Development Plan actions for National Roads (Excerpts from the NDP (2021-2030))

| NSO | National Roads action |
|---|--|
| NSO1 Compact Growth | Improving accessibility to and between centres of mass and scale, and allowing better integration with their surrounding areas |
| NSO2 Enhanced Regional Accessibility | <p>Investment will continue in new inter-urban roads, having regard to the potential for carrying public transport services and better integrating public transport and active travel networks on the approaches to urban areas. A key priority will be to maintain the existing national road network to a robust and safe standard and a significant percentage of National Roads expenditure over the course of this NDP will relate to maintenance works, in order to protect and renew existing assets.²⁸</p> <p>The feasibility of bypasses will be considered for towns and villages throughout the country that are experiencing major congestion issues. While regional connectivity remains a NSO which the Government is committed to, there will be an increased focus on the delivery of infrastructure which facilitates compact growth in our towns and cities. This will allow for more compact urban and rural communities supported by jobs, houses and services by facilitating public transport and active travel options.²⁹</p> |
| NSO6 High Quality International Connectivity | Strengthening access routes to Ireland's ports through investment to upgrade and enhance the road and rail transport network to improve journey times is and remains a government priority. ³⁰ |
| NSO8 Transition to a Climate-Neutral and Climate-Resilient Society | <p>The main actions are as follows:</p> <ol style="list-style-type: none"> 1) Transitioning the passenger car fleet to electricity and providing additional charging infrastructure. 2) Encouraging a significant modal shift through greater levels of investment and further development of meaningful alternatives to private car uses under the following three major environmentally sustainable mobility schemes: <ol style="list-style-type: none"> a) Additional cycling and walking infrastructure which will provide additional sustainable mobility options to complement increased capacity and faster, higher quality public transport in our main cities b) Travel demand management measures in the five cities c) Pilot initiatives for low emitting technologies in the transport sector. There is also the need to make the road network more resilient to the effects of climate change. This would include the following measures which would be undertaken under national, regional and local programmes: <ol style="list-style-type: none"> i) Improved drainage schemes ii) Strengthened road pavements and bridges which can resist the effects of increased rainfall and the effects of scour damage iii) Raising of roads in certain instances in order to prevent roads becoming impassable after heavy rainfall. |

Table 7-3 National Sustainable Mobility Policy actions for TII³¹

National Sustainable Mobility Policy actions related to national Roads, where TII is owner (Excerpts from National Sustainable Mobility Policy: Action Plan)

²⁸ National Development Plan 2021-2030 (October, 2021), p.61.

²⁹ National Development Plan 2021-2030 (October, 2021), p.65.

³⁰ National Development Plan 2021-2030 (October, 2021), p.108.

³¹ National Sustainable Mobility Policy: Action Plan 2022-2025 (April, 2022)

| Goal | Actions |
|---|---|
| Goal 1: Improve mobility safety | Continue to protect and renew road infrastructure for all road users including sustainable mobility users |
| | Expand speed management measures on National Roads at schools and high-risk locations |
| Goal 3: Expand availability of sustainable mobility in metropolitan areas | Increase provision of Park and Ride and Park and Share at transport interchanges |
| | Develop and implement an active travel infrastructure programme for regional growth centres and key towns outside of the Greater Dublin Area. (Complements CAP Action 233, RSS Action 5, 40) |
| | Develop and publish a strategic national cycle network. (Complements CAP Action 232, RSS Action 39) |
| Goal 4: Expand availability of sustainable mobility in regional and rural areas | Deliver public transport corridors providing prioritised bus lanes on national radial routes to the M50. (CAP Action 261) |
| Goal 5: Encourage people to choose sustainable mobility over the private car | Explore potential of road-user charging measures through the Better Road User Charging Evaluation (BRUCE) study (CAP Action 259) |
| Goal 7: Design infrastructure according to Universal Design Principles and Hierarchy of Road Users Model | Update national standards and project management guidelines to facilitate all road users on the national road network including the delivery of public transport facilities. |
| | Deliver an average of 60 road safety improvement schemes and fund an average of four minor realignment schemes on National Roads per year, to create forgiving roadsides, self-explaining roads, and a safe environment for vulnerable road users |

Appendix B Assessment of Alternatives Summary

Three main alternatives were considered during the development of the NR2040 to comply with the SEA Directive Article 5, which requires the SEA process to identify, describe and evaluate 'reasonable alternatives' of attaining the objectives of the NR2040 strategy. These are presented at length in Chapter 7 of the SEA Environmental Report and summarised in this section.

The alternatives include:

- Alternative 1: Do Nothing scenario
- Alternative 2: Predict and Provide scenario
- Alternative 3: Policy-Led scenario

Alternative 1, a 'Do Nothing' scenario is the baseline or current situation, referencing 2018, when NR2040 development was initiated, as the 'base year'. This approach does not involve any additional investment or changes to the National Roads network. Furthermore, the 'Do Nothing' scenario does not include current emission reduction targets and assumes that economic growth will continue in accordance with normal cycles. For example, it does not consider potential recession or inflation of energy / fuel prices.

Considering these omissions, transport planning was guided predominantly by the 2015 Strategic Investment Framework for Land Transport (SIFLT) which recognised three, hierarchical, priorities:

1. Achieve steady state maintenance
2. Address urban congestion
3. Maximise the value of existing land transport networks

The 'Do Nothing' approach was discounted as it fails to address new policy framework, does not provide TII with a long-term vision and identified to likely have a negative effect, directly or indirectly, on Environmental Protection Objectives (EPO).

Alternative 2, a 'Predict and Provide' scenario involves forecasting future travel demand and providing the required infrastructure and services to meet this demand. In essence, it would be an improved version of the SIFLT based on similar principles. Opportunities for sustainable travel, protection and renewal portfolios would also be included as part of this approach.

This scenario assumes land use development and travel patterns develop according to the NPF and seeks to provide for the predicted travel needs resulting thereof. This scenario would likely result in provision of more road capacity, i.e., construction of roads, in a 'predict and provide' manner that would not be consistent with the NIFTI approach involving investment decision-making based on use of NIFTI intervention and modal hierarchies.

The 'Predict and Provide' approach was discounted based on the shifting policy, probable substantial negative environmental effects over a range of EPOs as well as poor resource efficiency, due to the expected development of more roads.

Alternative 3, a 'Policy Led (Decide & Provide)' scenario includes a strategic vision for the National Roads network that recognises the continuously changing environment and takes policy change into account while also contributing to policy development at national, regional, and local levels (including sectors of the Irish economy).

The 'Policy Led' approach supports the NPF NSOs and consequently NIFTI. It guarantees alignment between government policies and the operational and functional requirements of National Roads. This approach sets a standard where TII will 'provide' for National Roads investments adhering to the national policy requirements to support population growth and the economy. It supports the internationally recognised 'Avoid, Shift and Improve' policy approach and promotes sustainable mobility to reduce negative effects on the EPO's.

Integration of multiple modes will limit growth in vehicle kilometres. Bus and truck priority will be deployed where it can provide for more efficient movement of people and goods. Provision of walking and cycling infrastructure, in particular where it addresses severance, will reduce unnecessary car travel. All investments will be carried out in line with NIFTI modal

hierarchy. In addition, this approach prioritises utilisation of existing assets, in line with NIFTI intervention hierarchy, prior to the development of new roads.

The 'Policy Led' approach was selected to move forward with in the development of NR2040 as it is aligned with current and emerging international and national policy in terms of supporting an integrated transportation network that will result in fewer negative effects on the EPO's when compared with the other alternatives.

Appendix C Response to Public Consultation

Comments for Draft NR2040

Draft NR2040 Public Consultation

A public consultation for the Draft NR2040 strategy, and accompanying environmental reports, was launched for a period of ten weeks, from the 5th August till the 14th October 2022. The public consultation included a dedicated website (nr2040.consultation.ai), which visualised key components of the strategy and hosted links to the PDF versions of all Draft NR2040 documents. In addition, the website hosted a link to a feedback survey.

The public consultation website and survey were published through several media channels:

1. Single public notice in a national newspaper on the day of the consultation launch, as required for SEA consultation
2. Bi-weekly Tweets through the @TIItrafficeer feed
3. Direct notice for Local Authorities Engineers via email, along with designed flyer at the beginning of consultation period
4. Second correspondence from TII to Local Authority offices in end of September

The following section summarises key comments collected in response to the Draft NR2040 strategy and the way they are addressed in the Final NR2040 strategy.

Section 4.2 of the SEA Statement summarises key comments collected in response to the NR2040 Environmental Reports.

Comments on Draft NR2040 Strategy

Overall, 65 submissions were collected in response to the NR2040 public consultation, from the general public and organisations at both a regional and a national level.

Comments were tagged by key themes:

1. **Infrastructure improvement** – subdivided into Active travel, Integrated transport, and Safety
2. **Regional connectivity** – subdivided into General, Figure 5.1 'Interurban Connectivity', Figure 5.2 'Dominant function of National Primary Roads, and Figure 5.3 'Dominant function of National Secondary Roads'
3. **Sustainability**
4. **Engagement with policies**
5. **Further engagement**
6. **Mobility of People and Goods in Urban Areas**

Additional comments were tagged as:

7. **Other**

Table- 1 presents key stakeholder comments, grouped by the key themes identified above, alongside TII's response describing how the comment has affected the update of the Final NR2040 strategy.

Table-1 Key Stakeholder Comments from Public Consultation on Draft NR2040, September-October 2022

| Theme | | Comment | TII Response |
|----------------------------|---------------|--|--|
| Infrastructure Improvement | Active Travel | Suggest highlighting proposed NCN and its relationship with NRN. | <p>NR2040 addresses the NCN in Section 6.2 Implementation Structure <i>“The Decarbonisation Investment Priority ... incorporates Integrated Mobility programme, including major projects such as... an Active Travel programme, which includes the National Cycle Network (NCN).”</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | | Request for increased active travel modes through the implementation and improvement of cyclist and pedestrian infrastructure. | <p>NR2040 addresses active travel modes in Section 6.1 Commitments, in relation to (1) Sustainability, (2) Movement of People, and (3) Urban Congestion:</p> <ol style="list-style-type: none"> 1. <i>“TII will promote inter-modal solutions that maximise overall transport efficiency in terms of infrastructure and resource use. For example, facilitating safe active travel along national road corridors that connect with rail and bus stations.”</i> 2. <i>“TII will consider the needs of all road users for all projects. On urban dual carriageways and motorways approaching cities, TII will work with partner agencies to enable public transport and high-quality active travel alternatives for car users.”</i> 3. <i>“TII will support the provision of segregated or offline active travel infrastructure adjacent to national roads.”</i> <p>As well as within Section 6.2 NR2040 Implementation Structure <i>“The Decarbonisation Investment Priority ... incorporates Integrated Mobility programme, including major projects such as... an Active Travel programme”</i> One of the four investment priorities of NIFTI and NR2040 is Decarbonisation.</p> |

| Theme | Comment | TII Response |
|-------|--|---|
| | | <p><i>“It encompasses three investment portfolio themes: Integrated Mobility; Electric Vehicle Charging; and Active Travel.”</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Consider reprioritisation of road space in urban areas to support the implementation of Active Travel measures.</p> | <p>NR2040 addresses active travel, across the entire National Roads network, rural and urban, in:</p> <p>Section 5.1.3, as one of the Investment Portfolios under Decarbonisation <i>“TII is committed to delivering improved active travel provision in all its projects...”</i></p> <p>As well as in Section 6.1 Commitments, in relation to Sustainability (1), Movement of People (2), and Urban Congestion (3):</p> |
| | <p>Request improvement of active travel modes in rural areas, as well as urban areas.</p> | <ol style="list-style-type: none"> 1. <i>“TII will promote inter-modal solutions that maximise overall transport efficiency in terms of infrastructure and resource use. For example, facilitating high-quality active travel along national road corridors that connect with rail and bus stations.”</i> 2. <i>“TII will consider the needs of all road users for all projects. On urban dual carriageways and motorways approaching cities, TII will work with partner agencies to enable public transport and high-quality active travel alternatives for car users.”</i> 3. <i>“TII will support the provision of segregated or offline active travel infrastructure adjacent to national roads.”</i> <p>And in Section 6.2 Implementation Structure under the Decarbonisation Investment Priority which includes <i>“an Active Travel programme”</i>.</p> |

| Theme | | Comment | TII Response |
|-------|--|---|--|
| | | Request reduction of urban congestion and on street parking. | <p>No amendment has been made to the strategy in this respect at this time.</p> <p>NR2040 addresses urban congestion in the Demand and Traffic Management Portfolio under the Movement of People and Goods in Urban Areas Investment Priority, Section 5.3.2 <i>“TII will support travel demand management measures for National Roads in the five cities... TII will expand traffic management measures in congested sections of national roads to ensure optimal vehicle flow to minimise carbon emissions...”</i></p> <p>TII remit is limited to the National Roads only and does not generally include on-street parking.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | | Request consideration of new approach to the design and / or management of some urban national roads. | <p>NR2040 is TII’s long-term strategy for planning, operating, and maintaining the National Roads network. Design guidelines are out of scope for the strategy.</p> <p>Design guidelines are developed in the Design Manual for Urban Roads and Streets (DMURS, 2019) and in TII’s Design DN-GEO-03084 Treatment of transition zones to towns and villages on national roads (2021) DN-GEO-03084 (tiipublications.ie)</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |

| Theme | Comment | TII Response |
|----------------------|---|--|
| | <p>Request to re-evaluate pedestrian phase timing and duration on junction crossing national roads.</p> <p>Request provision of safe crossing points for cyclists / pedestrians across the National Road Network.</p> <p>Request development of improved pedestrian and cycle crossing along National Roads to combat existing severance and enable better integration [specific project request]</p> | <p>NR2040 addresses vulnerable road users' safety in Section 5.1.3 Active Travel <i>"TII is committed to delivering improved active travel provision in all its projects, such as improving the safety of National Roads for active travel users and reducing the severance caused by some National Roads in urban areas.</i> As well as within Chapter 6. Implementation Section 6.1 NR2040 Commitments, in relation to the movement of people, <i>"TII recognises that busy urban motorways, ring roads and town bypasses can be hostile environments for pedestrians and cyclists wishing to cross. TII will identify and remedy severance impacts from National Roads."</i></p> <p>Specific investments are not within the NR2040's scope and should be developed at a project level through existing processes, outlined in Section 6.3 Project Development Process.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| Integrated Transport | <p>Suggest highlighting the role which the national road network can play in achieving greater inter-modality at key locations (e.g., strategic Park and Ride facilities), facilitating the use of sustainable modes of transport within urban areas.</p> | <p>NR2040 addresses integrated mobility Section 5.1.1 Integrated Mobility <i>"TII will contribute to integrated mobility by investing in measures such as Park and Ride / Share and bus prioritisation, where appropriate along National Roads."</i> As well as within Section 6.2 Implementation Structure, in relation to Decarbonisation, which <i>"incorporates Integrated Mobility programme, including major projects such as: core bus corridors, bus and passenger facilities, Park & Ride and Park & Share"</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |

| Theme | Comment | TII Response |
|-------|--|--|
| | <p>Request implementation and improvement of the public transport network infrastructure.</p> | <p>NR2040 addresses integrated mobility in Section 5.1.1 Integrated Mobility <i>“TII will contribute to integrated mobility by investing in measures such as Park and Ride / Share and bus prioritisation, where appropriate along National Roads.”</i> As well as within Section 6.1 Commitments, in relation to (1) Future Demographic Growth Trends, and (2) Movement of People: 1. <i>“TII will ensure that any future implementation of demand management proposals on the National Roads network aligns with the National Sustainability Mobility Policy as well as NIFTI Modal and Intervention Hierarchies.”</i> 2. <i>“On urban dual carriageways and motorways approaching cities, TII will work with partner agencies to enable public transport and high-quality active travel alternatives for car users.”</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Request increasing Park and Ride facilities.</p> | <p>NR2040 addresses Park and Ride facilities in Section 5.1.1 Integrated Mobility <i>“TII will contribute to integrated mobility by investing in measures such as Park and Ride / Share and bus prioritisation, where appropriate along National Roads.”</i></p> |
| | <p>Support of EV charging infrastructure at Park & Ride locations served by the National Roads network</p> | <p>NR2040 addresses EV charging infrastructure at Park and Ride locations in Section 5.1.2 Electric Vehicle Charging <i>“TII will work with the Department of Transport’s Zero Emissions Vehicles office to support the delivery of the national EV charging infrastructure in line with its EV Charging Infrastructure strategy, currently under development.”</i></p> <p>Specific investments are out of scope for the strategy and should be developed at a project level through existing</p> |

| Theme | | Comment | TII Response |
|-------|----------------------|---|--|
| | | | <p>processes, outlined in Section 6.3 Project Development Process.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | | <p>In reference to the Rail Freight 2040 strategy, there are no proposed rail links to Rosslare Port.</p> | <p>NR2040 is TII’s long-term strategy for planning, operating, and maintaining the National Roads network, under the remit of TII.</p> <p>The Rail Freight 2040 strategy is under the remit of Iarnród Éireann and as such out of scope for the current strategy.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Safety</p> | <p>Need for safer and more accessible roads by increasing signage, speed cameras, safety training / road education, road maintenance / upgrades, better adaption to extreme weather conditions caused by climate change, lower traffic speeds (including speed limits).</p> | <p>NR2040 addresses (1) Road Safety, (2) Asset Management & Network Operations and (3) Resilience & Climate Adaptation in Chapter 5. Investment Priorities and Portfolios, as three portfolios under the Protection and Renewal Investment Priority:</p> <ol style="list-style-type: none"> 1. <i>“TII will deliver on its actions in the Road Safety Strategy (2021-2030) and collaborate with partners to deliver on supporting actions... TII will target investment on sections of national roads with the highest risk of fatal or serious injury...TII’s road safety programme will focus on achieving safe roadsides and a safe environment for vulnerable road users in line with the safe systems approach.”</i> 2. <i>“A key priority for TII is to maintain the existing National Roads network to a robust and safe standard”</i> 3. <i>“There is need to ensure the road network is resilient to the effects of climate change...TII is continually maintaining and renewing road pavements and road assets such as signage, crash barriers and noise barriers. Adaptation to climate change is included in drainage designs by strengthening bridges and raising of roads...”</i> |

| Theme | | Comment | TII Response |
|-------------------------------------|-----------------------|--|---|
| | | | <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | | <p>Traffic noise can be a serious environmental and health issue for residents that are adjacent to high-speed roads. It is considered that the strategy should be supportive of measures to reduce the noise impact of existing roads on residential communities, particularly in the context of larger towns and cities.</p> | <p>NR2040 addresses road related noise in Section 5.2.3 Resilience and Climate Adaptation <i>“TII is continually maintaining and renewing road pavements and road assets such as signage, crash barriers and noise barriers”</i> and in Section 6.1 Commitments, in relation to Sustainability <i>“In line with its legislative remit, TII will work with relevant bodies to support measures to reduce air quality and noise impacts from road transport.”</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | | <p>Request more investment in effective traffic calming on national roads in smaller towns and villages that have not been bypassed.</p> | <p>NR2040 is TII’s long-term strategy for planning, operating, and maintaining the National Roads network. In Section 6.1 Commitments, in relation to the movement of people, <i>“TII recognises that busy urban motorways, ring roads and town bypasses can be hostile environments for pedestrians and cyclists wishing to cross. TII will identify and remedy severance impacts from National Roads”.</i></p> <p>Specific investments are not within NR2040’s scope and should be developed at a project level through existing processes, outlined in Section 6.3 Project Development Process.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| <p>Regional Connectivity</p> | <p>General</p> | <p>Consider the upgrade of national roads in the [specific Region] as a priority.</p> | <p>NR2040 does not suggest prioritisation of interventions or corridors, apart from NIFTI’s Investment Priorities and its Modal and Intervention Hierarchies.</p> |

| Theme | Comment | TII Response |
|-------|--|---|
| | <p>Request recognition of the strategic importance of [specific Region].</p> <p>There is a need for positive discrimination when considering investment decisions relating to [specific Region].</p> | <p>Enhanced Regional and Rural Connectivity is one of NR2040's four Investment Priorities, as developed in Section 5.4 <i>"The enhanced regional and rural connectivity investment priority encapsulates the social and economic importance of the National Roads network, in supporting and balancing the regional cities, key settlements, and rural areas' prosperity and growth, towards achieving Project Ireland 2040 goals"</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Request continued investment in the national road network between [specific areas] to maximise economic benefits.</p> | <p>NR2040 is TII's long-term strategy for planning, operating, and maintaining the National Roads network.</p> <p>Specific investments are not within NR2040's scope and should be developed at a project level through existing processes, outlined in Section 6.3 Project Development Process.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Consider the re-classification of strategic regional roads as national routes.</p> | <p>TII analysis for NR2040 could inform decisions regarding reclassification from Regional to National and vice versa. Roads reclassification is a matter for the Minister, as laid out in the Roads Act, 1993 (as amended), Part II³², and is not within TII's remit.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Request consideration of how potential new links on the NRN be accommodated and implications on investment priorities.</p> | <p>TII's investment priorities as developed through NR2040 will remain relevant for links that may be defined as part of the National Roads network in the future.</p> |

³² The Government of Ireland, Roads Act, 1993 (as amended)

| Theme | Comment | TII Response |
|-------|---|---|
| | Suggested that NR2040 should consider how potential new links on the National Roads network would be accommodated and how these would affect TII's investment priorities. Potential new links could include [specific corridors]. | No amendment has been made to the strategy in this respect at this time. |
| | Ambiguity as to the meaning of section 5.4 - Does a corridor where interventions support the NPF/NIFTI 90kph average inter-urban speed target have a higher ranking than Lifeline/Arterial Roads. | NR2040 does not suggest a ranking of interventions, apart from NIFTI's Investment Priorities and its Modal and Intervention Hierarchies. No amendment has been made to the strategy in this respect at this time. |
| | Requests to include [specific corridors] in Figure 5.1 as corridors where interventions support NPF/ NIFTI 90kph target | Analysis has been re-examined and no amendment has been made to the identified corridors in Figure 5.1 at this time. |
| | Request more detailed information (with regular updates) regarding current average speeds on national roads be made available. | TII's National Roads Indicators report provides annual updates on the performance and use of the National Roads network. No amendment has been made to the strategy in this respect at this time. |
| | Figure 5.2 Dominant Function of National Primary Roads Request [specific routes] be identified as an 'International Connectivity' route or as a 'Regional Connectivity' route. | The strategy has been updated to represent Ireland West International Airport (Knock Airport) for international connectivity in Figure 5.2 No further amendment has been made to the identified corridors in Figure 5.2 at this time. |
| | Figure 5.3 Dominant Function of National Secondary Roads Requests for [specific] amendments to Figure 5.3 | The strategy has been updated to represent sections of the N56 as Collector and Arterial Routes, instead of Lifeline Routes. No further amendments have been made to the identified corridors in Figure 5.3 at this time. |

| Theme | Comment | TII Response |
|-----------------------|--|---|
| | Consider applying a separate funding mechanism to life-line routes, given their key strategic importance. | <p>NR2040 has established a separate funding mechanism for National Secondary roads, elaborated in Section 6.2 NR2040 Implementation Structure and illustrated in Figure 6.1.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| Sustainability | Need to reduce vehicle use. | <p>NR2040 supports a shift to more sustainable modes of transport including public transport and active travel modes and promotes decarbonisation as one of the investment priorities.</p> |
| | Promote zero emission / alternative fuel vehicles. | <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | Request quantitative terms of how NR2040 will contribute to the decarbonisation of the transport sector. | <p>TII's National Roads Indicators report provides annual updates on the performance and use of the National Roads network including Emissions.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | Suggested that NR2040 takes account of upcoming and future requirements in relation to a net zero-carbon transport future in developing infrastructure projects. | <p>NR2040 is in line with the National Policies, reviewed in Chapter 2 Policy Context, and sets Decarbonisation as an Investment Priority, in Section 5.1, and includes TII's commitment, in Section 6.1, to appraise all National Road projects <i>"in the context of compliance with Ireland's climate change targets, in line with the Governments Climate Action Plan, NIFTI and in accordance with the Department of Transport's Common Appraisal Framework."</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | Consider recognising to a greater extent, the impacts of transport on air quality and noise, as well as clarifying TII's role in environmental noise management. | <p>The strategy has been updated in Section 3.4 to provide further detail on the impacts of transport on air quality and noise.</p> |

| Theme | Comment | TII Response |
|---------------------------------|---|--|
| | | <p>TII's legislative remit is set down in the Roads Act 1993 (as amended), referenced in Section 1.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Consider including a target for reducing the population exposed to environmental noise from national roads in the strategy commitments and outlining specific environmental objectives covering environmental noise, noise action plans, mitigations, and support for Local Authorities.</p> | <p>NR2040 is a high-level strategy. The commitments will influence projects on an ongoing basis. Continued noise monitoring and environmental impact assessments are an integral part of the project development and appraisal process and will inform impacts including those related to noise.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Consider reviewing the effects of climate adaptation and resilience to a greater extent.</p> | <p>NR2040 addresses climate adaptation and resilience in Section 3.3. In addition, TII's Climate Adaptation Strategy 2022 includes further detail on the matter.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| Engagement with policies | <p>Supportive of National Roads 2040, in providing a clear context for the national road network as it relates to key areas of Government policy, including the National Planning Framework, the National Development Plan and the Climate Action Plan</p> | <p>-</p> |
| | <p>Consider highlighting the potential for greater alignment between National Road Network planning and National Ports Policy.</p> | <p>The strategy has been updated to include review of the 'National Ports Policy' in Section 2.9 and mentions that <i>'Integration between planning and policy for ports with that of the transport system should be of high priority. TII recognises the potential for greater alignment between planning and policy for Ports with that of the National Roads network.'</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |

| Theme | Comment | TII Response |
|-------|---|---|
| | <p>Consider engaging with and responding to the 2022 OECD report entitled <i>Redesigning Ireland's Transport for Net Zero: Towards Systems that Work for People and the Planet</i>.</p> | <p>The strategy has been updated to include review of the OECD report 'Redesigning Ireland's Transport for Net Zero: Towards Systems that Work for People and the Planet' in Section 2.8 and mentions that <i>'The NR2040 strategy has been developed in accordance with the OECD recommendations presented above and recognises the issues of increasing car use and emissions. TII widely supports the mitigations measures that should be put in place to reduce these emissions and improve the well-being of Irish citizens, which have been broadly responded to and recognised by the NR2040 investment priorities and commitments.'</i></p> |
| | <p>Request clarity on how the NR2040 and its investment priorities will align with the aim of the Government's Climate Action Plan.</p> | <p>Decarbonisation is one of NR2040's four investment priorities, elaborated in Section 5.1. It encompasses three investment portfolio themes: Integrated Mobility; Electric Vehicle Charging; and Active Travel. These are meant to promote reduction of road transport emissions and promote achievement of Climate Action Goals.</p> <p>In addition, Section 6.1 Commitments, details seven TII commitments for addressing the strategic long-term issue of Decarbonisation, including <i>'National Road projects will be appraised in the context of compliance with Ireland's climate change targets, in line with the Government's Climate Action Plan, NIFTI and in accordance with the Department of Transport's Common Appraisal Framework. Predicted changes and/or targets associated with the levels of usage of each mode (e.g., bicycle, car, public transport, truck, van) will inform this.'</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Consider the National Policy Objectives (NPOs) as well as the National Strategic Outcomes (NSOs).</p> | <p>NIFTI translated the National Planning Framework (project Ireland 2040), including its National Policy Objectives (NPOs), to a transport investment context and NR2040 in turn further</p> |

| Theme | Comment | TII Response |
|-------|--|--|
| | | <p>develops NIFTI in the context of the National Roads network, as illustrated in Figure 2.1.</p> <p>NR2040 aligns with NPO2c where any interventions to improve regional connectivity will be developed in accordance with the NIFTI Investment Priorities and the Modal and Intervention Hierarchies.</p> <p>NPO2c states: “Accessibility from the north-west of Ireland and between centres of scale separate from Dublin will be significantly improved, focused on cities and larger regionally distributed centres and on key east-west and north-south routes.” No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Suggest regarding to the Avoid-Shift-Improve framework in the Final Strategy.</p> | <p>The strategy has been updated in Section 2.2 with the review of the Climate Action Plan 2023 which, amongst others, refers to the Avoid-Shift-Improve framework. Additionally, the strategy was amended to incorporate Appendix B Assessment of Alternatives Summary, including reference to the Avoid-Shift-Improve framework.</p> <p>In Chapter 7 of the SEA environmental report, the Avoid-Shift-Improve framework is addressed.</p> |
| | <p>The balance of priorities between achieving NIFTI Intervention Hierarchy and the NDP commitments and NSO of regional and rural connectivity is unclear.</p> | <p>NIFTI translated the Project Ireland 2040 NSOs to a transport investment context and NR2040 in turn further develops NIFTI in the context of the National Roads network, as illustrated in Figure 2.1.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |

| Theme | Comment | TII Response |
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| | <p>Current form of strategy is not consistent with the Regional Spatial and Economic Strategy (RSES) for the [specific region].</p> | <p>NR2040 is consistent with NIFTI, developing it in the context of the National Roads network, as illustrated in Figure 2.1. NIFTI Chapter 1 Overview, Section 1.4 Strategic Investment Framework for Land Transport outlines that:³³ <i>“Future transport investment projects and programmes as identified in investment strategies – whether they are developed by the NTA in the case of public transport, TII in the case of the National Roads network, or Local Authorities in the case of regional and local roads and other projects of a local nature – will have to demonstrate their fit with NIFTI and, by extension, with the NPF and NSOs.”</i></p> <p>NR2040 addresses the importance of regional accessibility, as highlighted by the NPF, in Section 5.4.1.2 Regional Connectivity <i>“Both the NPF and NIFTI indicate the importance of maintaining and improving accessibility to and between the more peripheral areas of the state...Any interventions brought forward will be developed in accordance with the NIFTI Investment Priorities and the Modal and Intervention Hierarchies.”</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Consider amending the Strategy to clearly reflect the regional accessibility ambitions of the National Planning Framework, and the RSES for the [specific region].</p> | |
| | <p>Development plans should be consistent with RPOs and RSES.</p> | |

³³ Government of Ireland, National Investment Framework for Transport in Ireland (2021)

| Theme | Comment | TII Response |
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| | | No amendment has been made to the strategy in this respect at this time. |
| | Consider addressing commitments in the NPF and the Regional Strategies. | The strategy has been updated to include in Section 6.5 Collaboration, <i>“It is important that future transport investment is coordinated and integrated with other sectors including land-use planning to avoid the case of urban sprawl and promote NSOs such as compact urban growth.”</i> |
| | Consider aligning the strategy implementation, monitoring and reporting with the environmental monitoring required under the SEA legislation, and as set out in the SEA ER. | The strategy has been updated to include Section 7 Monitoring Framework, including reference to the SEA Environmental Monitoring. |
| Further Engagement | Request further engagement to clarify comments submitted and understand TII’s intentions regarding its priorities and funding of interventions before NR2040 is finalised. | The Draft NR2040 strategy was presented to Local Authorities in the TII Conference in Sligo in October 2022, with an invitation for open discussion. |
| | Request for further training for local authorities to become familiar with the content of the strategy and to translate its objectives into specific plans. | NR2040 provides guidance as to the Project Development Process in Section 6.3. The Draft NR2040 strategy was also presented to Local Authorities in the TII Conference in Sligo in October 2022. The slide deck presented was provided to all participants and will also be hosted on the nr2040.consultation.ai website alongside the Final Strategy and accompanying environmental reports. |
| Mobility of People and Goods in Urban Areas | Consider placing a critical emphasis on the need to safeguard the primary functions of the national road network in catering for strategic movement, through the protection and optimisation of existing assets. This is of particular importance in relation to the movement of freight and access to international gateways. | Two of the four investment priorities of NIFTI and NR2040 are Protection & Renewal and the Movement of People and Goods in Urban Areas. NR2040 addresses freight movement in Section 5.3.2 Movement of Goods <i>“TII will work with the Department of Transport and partner agencies to explore traffic and demand management measures</i> |

| Theme | Comment | TII Response |
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| | | <p><i>to improve the journey time reliability required for the efficient movement of imports and exports.”</i></p> <p>As well as within Section 6.1 NR2040 Commitments, in relation to the Movement of Goods & Services <i>“TII will provide/consider prioritisation measures such as dedicated freight lanes where such prioritisation results in greater transport efficiency.”</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Consider highlighting the important role of the national road network in the provision of bus-based public transport services, both within urban areas and for inter-urban movements, through the application of appropriate design interventions, traffic management and demand management measures.</p> | <p>One of the four investment priorities of NIFTI and NR2040 is the Movement of People and Goods in Urban Areas.</p> <p>TII recognises the importance of the National Roads network in catering for public transport and in Section 6.1 commits to future actions to support the movement of people including <i>‘Connecting Ireland and prioritisation measures such as dedicated bus lanes where such prioritisation results in greater transport efficiency.’</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Urban Traffic Demand Measures should also consider rationalising tolling arrangements.</p> | <p>The strategy has been updated to include a reference to TII’s BRUCE project in Chapter 3. Long Term Strategic Issues for National Roads- Section 3.10 Asset Management and Operations</p> |
| | <p>Consider improving road access to [specific] ports</p> | <p>NR2040 addresses International Connectivity in Section 5.4.1.3 International Connectivity and identifies National Primary Roads with an International Connectivity predominant function as illustrated in Figure 5.2.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |

| Theme | Comment | TII Response |
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| | <p>Supportive of measures that will improve visitor access to the county through Cork, Shannon, and Kerry Regional airports via national roads.</p> <p>Consider optimised vehicle flow on sections of the National Roads network [specific section mentioned] for the benefit of all users.</p> | <p>-</p> <p>NR2040 addresses optimised vehicle flow in Section 5.3.3 Demand and Traffic Management <i>“TII will support travel demand management measures for National Roads... and implement other government policy on demand management on national roads... TII will expand traffic management measures in congested sections of national roads to ensure optimal vehicle flow to minimise carbon emissions, particularly from freight.”</i></p> <p>As well as within Section 6.1 NR2040 Commitments in relation to Urban Congestion <i>“TII will promote traffic management interventions that help optimise traffic movement on urban National Roads.</i> No amendment has been made to the strategy in this respect at this time.</p> |
| Other | <p>Consider applying a weighting to the investment priorities, that will compensate for infrastructural deficiencies.</p> <p>Consider including a clear acknowledgement of the pronounced and widening gap in the key indicators of economic performance and prosperity and outline how enhanced Road connectivity is one key factor towards addressing the pronounced legacy of under investment in multiple modes across [specific region].</p> | <p>NR2040 does not suggest a weighting of investment priorities, apart from NIFTI’s Investment Priorities and its Modal and Intervention Hierarchies.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> <p>Project Ireland 2040 provides the National Planning Framework (NPF) for enhancing regional development. The NPF provides three Regional Assemblies to <i>“co-ordinate, promote and support the strategic planning and sustainable development of the regions.”</i></p> <p>Whilst Project Ireland 2040 provides the framework for regional development, NR2040 will support Project Ireland 2040 in a transport context.</p> |

| Theme | Comment | TII Response |
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| | | <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Consider amending the Strategy to reflect the All-Island Dimension of Planning and Road Infrastructure</p> | <p>TII considers the NR2040 maps to represent the All-Island dimension of planning and road infrastructure as presented in the Draft Strategy published for public consultation.</p> <p>No amendment has been made to the maps in this respect at this time.</p> |
| | <p>Consider codifying the commitments made in the Strategy, which will help assess the commitments against the Strategic Environmental Objectives of the SEA.</p> | <p>NR2040 is a high-level strategy. The commitments will influence projects on an ongoing basis.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Consider providing more focus on the <i>Integrated Mobility, Electric Vehicle Charging</i> and <i>Active Travel</i> goals (part of the Decarbonisation Investment Priority) for counties of a rural and peninsular nature.</p> | <p>Section 5.1. Decarbonisation encompasses three investment portfolio themes: Integrated Mobility; Electric Vehicle Charging; and Active Travel.</p> <p>For Integrated Mobility, <i>“TII will contribute to integrated mobility by investing in measures such as Park and Ride, Park and Share and bus prioritisation, where appropriate along National Roads.” As well as “Improving connections to major public transport hubs”.</i></p> <p>TII is committed in supporting the Department for Transport and will <i>“support the delivery of the national EV charging infrastructure in line with its EV Charging Infrastructure strategy, currently under development.”</i></p> <p>TII will continue to deliver active travel projects, such as improving the safety of National Roads for active travel users and reducing the severance caused by some National Roads in urban areas.</p> |

| Theme | Comment | TII Response |
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| | | <p>TII are currently developing Greenway schemes in rural areas. Section 5.1.3 Active Travel of the NR2040 addresses the NCN and Greenway network <i>“TII will collaborate with other stakeholders to implement the National Cycle Network plan to cater for more active trips and expand the Greenway network nationwide, on behalf of the Department of Transport.”</i> No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Consider the rapid evolving nature of EVs as a strategic issue and driver-assist technology, have the potential to impact on the operating capacity of national roads. Therefore, consider potential long-term implications for traffic on the national road networks from evolving vehicle design (including the design of road infrastructure both urban and inter-urban).</p> | <p>NR2040 has and will continue to consider technological change as set out in Section 3.9 <i>“TII is committed to the facilitation of Connected Driving on National Roads in collaboration with key stakeholders.”</i></p> <p>As well as within Section 5.1.2 Electric Vehicle Charging <i>“TII will work with the Department of Transport’s Zero Emissions Vehicles office to support the delivery of the national EV charging infrastructure in line with its EV Charging Infrastructure strategy, currently under development.”</i></p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Consider whether and how the interface of the national road network with relevant regional and local roads could be better be addressed at a strategic level to 2040 to help achieve the vision and objectives of TII for the national road network.</p> | <p>TII is cognisant that the National Road Network is not considered in isolation to local and regional solutions. TII supports holistic regional transport solutions and will continue to work in partnership with local authorities and the NTA to develop improvements at a local and regional level.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |
| | <p>Provide more emphasis on the implications of the development of multimodal autonomous freight movement.</p> | <p>NR2040 has considered multimodal freight in Section 3.7</p> |

| Theme | Comment | TII Response |
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| | | <p><i>“Integration of road and rail freight is supported by TII and is important for reducing freight related congestion and emissions on National Roads.”</i></p> <p>Moving forward, TII will continue to work with the Department of Transport to consider opportunities for utilising the rail network for freight movements.</p> <p>NR2040 also considers Technological Change in Section 3.9 <i>“TII is committed to the facilitation of Connected Driving on National Roads in collaboration with key stakeholders.”</i></p> <p>As part of NR2040, the development of autonomous vehicles will be monitored on a regular basis. The potential implications of autonomous freight movements will be considered in terms of possible interventions required on the National Road network.</p> <p>No amendment has been made to the strategy in this respect at this time.</p> |

Glossary

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|--------------|---|---------------|---|
| AA | Appropriate Assessment | MaaS | Mobility as a service |
| CCTV | Closed circuit television | NDP | <i>National Development Plan 2021-2030</i> |
| COVID | Coronavirus | NIFTI | National Investment Framework for Transport in Ireland |
| CSO | Central Statistics Office | NPF | National Planning Framework |
| C-ITS | Co-operative intelligent transport system | NPO | National Policy Objective |
| DoT | Department of Transport | NSO | National Strategic Outcomes (of <i>Project Ireland 2040</i>) |
| eMOS | Enhancing motorway operation services | NR2040 | National Roads 2040 |
| EU | European Union | NTpM | TII's National Transport Model |
| EV | Electric vehicle | PPP | Public-private partnership |
| EPA | Environmental Protection Agency | REM | Road Emissions Model |
| EPO | Environmental Protection Objectives | RSA | Road Safety Authority |
| GHG | Greenhouse gas | SEA | Strategic environmental assessment |
| HGV | Heavy goods vehicle | SFRA | Strategic Flood Risk Assessment |
| HOV | High occupancy vehicle | SILFT | Strategic Investment Framework for Land Transport |
| ITS | Intelligent transport system | TEN-T | Trans-European Transport Network |
| km | Kilometres | TII | Transport Infrastructure Ireland |
| km/h | Kilometres per hour | VMS | Variable message sign |
| LEV | Low-emitting vehicles | V/C | Volume / capacity |
| LGV | Light goods vehicle | UN | United Nations |
| | | VMS | Variable message sign |

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