Rialtas na hÉireann
Government of Ireland

Spending Review 2021

The Protection and Renewal of Ireland's Road and Railway Network

Cillian Moran and Tomás Campbell

Strategic Research and Analysis Division, Department of Transport

November 2021

IGEES
Irish Government Economic and Evaluation Service

Contents

List of Figures

List of Tables

Executive Summary

- Land transport investment has fluctuated from €3bn in 2008 to €900m in 2013. In 2021, the allocated funding was €2.5bn.
- Current expenditure has remained relatively stable at around €550m annually from 2000 to 2021, although there has been a marked increase in 2020 and 2021 due to the need for increased Public Service Obligation subvention arising from COVID-19 public health measures. Capital expenditure has varied significantly across the period, with an annual average of €1.7bn.
- Supporting research for the forthcoming National Investment Framework for Transport in Ireland estimates that the level of Exchequer protection and renewal investment required to maintain the land transport network in steady state is €1.3bn. In 2020, €1.29bn was spent on protection and renewal.

National Roads

- Transport Infrastructure Ireland (TII) has overall responsibility for managing the national road network, which accounts for 5% of the total road length in the State but carries 46 percent of all road traffic.
- Protection and renewal is funded by the Department of Transport, with activity delivered by TII, local authorities and through public-private partnerships.
- Overall protection and renewal investment increased from €259m to €491m in 2007-2020.
- Pavement indicators show that the network is highly maintained and has consistently improved in quality in recent years. The total proportion of the network categorised as fair or better increased from 93% in 2014 to 97% in 2020.
- The number of fatal collisions on the network has decreased over time. However, peak hour travel time has increased arising due to increased traffic congestion in recent years.

Regional and Local Roads

- Local authorities are responsible for maintaining the network but receive Department of Transport grants to fund the work, which are intended to supplement realistic contributions from own resources.
- The Department of Transport does not have a direct oversight function for local authority own resource contributions.

- The overall value of Departmental grants fell from €608m in 2007 to €319m in 2015 before increasing to €565m in 2021. Approximately 90 percent of grants go towards protection and renewal.
- The length of network may increase for reasons outside the Department of Transport's control, such as local authorities taking charge of private roads and adding them to the public network, adding to the cost of protection and renewal.
- Local authorities' own resource expenditure categorised under roads is estimated to have increased from €225 million in 2014 to €282 million in 2019, but this is not exclusively used for protection and renewal.
- The average cost of maintenance per kilometre across all local authorities from 2016 to 2019 was €102,000.
- The annual average proportion of network maintained was 5.2% from 2018 to 2020.
- The proportion of local roads reported as having no defects increased from 15% in 2014 to 23% in 2019, while for regional roads the increase was from 24% to 38%.
- Since 2013 there has been a 24.3% decrease in fatal collisions on regional and local roads

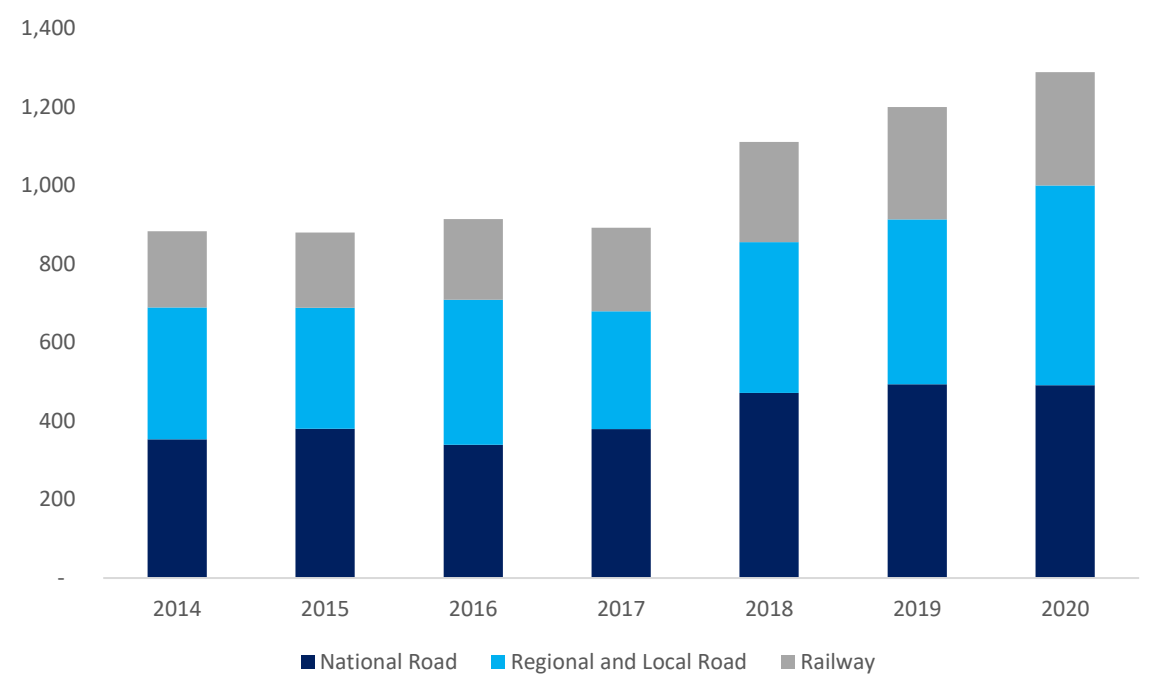
Heavy Rail

- The network comprises approximately 2,000km of operational track, 14 tunnels and over 4,400 bridges, all of which require ongoing maintenance to facilitate rail services.
- Exchequer funding for protection and renewal has been provided through the Infrastructure Manager Multi-Annual Contract (IMMAC) since 2014, which provides five-year funding certainty and establishes key performance indicators.
- Funding requirements for protection and renewal were recently examined as part of the development of the IMMAC 2020 to 2024, which ensures full funding of protection and renewal in the sector in the coming years. The annual Exchequer contribution will average €204m, with total funding, including access charges, increasing from €286m to €301m.
- Under the IMMAC from 2014 to 2018, protection and renewal investment grew from €191m to €248m, an increase of approximately 30%.
- There was a 49 percent increase in protection and renewal investment from 2014 and 2019 and a 33 percent reduction in infrastructure issues.
- Total delay minutes across connecting, commuter, and intercity services grew from 105,000 minutes in 2014 to 142,000 minutes in 2018.
- The performance of Irish Rail's Infrastructure Manager under the current IMMAC will be subject to comprehensive review in 2023 to inform the next iteration of the IMMAC.

Conclusion

- Total investment in protection and renewal in all three sectors increased from €880m in 2014 to c. €1.3bn in 2020—approximately steady state investment estimated by NIFTI.
- This increased investment is consistent with the IMF's PIMA Report recommendations and the NDP 2018-2027 commitment to achieve steady state requirements on most of the network by 2021
- Delivery and oversight of protection and renewal is complex, however, as it is not exclusively funded by the Exchequer and the Department of Transport does not have a direct oversight function for all relevant activities.
- An integrated approach to consistent protection and renewal road data collection, including by local authorities, and establishment of multi-annual funding certainty and targets, such as under the IMMAC structure, could help to improve the delivery and coordination of protection and renewal of the road network and increase transparency

Cumulative Land Transport Protection and Renewal Expenditure 2014 to 2020



1. Introduction

The aim of this paper is to examine the overall expenditure, both current and capital, on maintenance, protection, and renewal of the existing land transport network. It will examine the three main components which comprise land transport in Ireland: national roads, regional and local roads, and the heavy rail network. It will examine expenditure from 2007 to 2020, taking into consideration investment levels before the financial crisis, during the period of fiscal consolidation, and the more recent recovery in investment. This research will build upon other recent analysis in the sector and seek to contribute to the overall understanding of maintaining Ireland's transport infrastructure, and how this can be done efficiently and effectively.

Section 2 of the paper will set out some overall sectoral context, including overall investment levels and trends in recent years. Section 3 will set out the literature which has informed this review. Sections 4, 5 and 6 will then consider how protection and renewal is delivered and recent trends in expenditure, outputs and outcomes for the national road network, regional and local roads network and heavy rail network respectively. Section 7 will then draw this analysis together to arrive at an overall picture of protection and renewal expenditure in recent years, set out emerging conclusions and identify areas for potential further research.

1.1 Methodology

The paper draws on desk-based quantitative and process analysis using a range Department of Transport administrative data and information. It also utilises data from a wide range of sources, including Transport Infrastructure Ireland, the National Transport Authority, the Central Statistics Office, Local Authorities, the Departments of Housing, Local Government and Heritage, the Department of Public Expenditure and Reform, Irish Rail, and the Commission for Railway Regulation. The research employs a variety of analytical techniques, such as trend analyses and international benchmarking. Following the analytical approach taken by value for money and policy reviews, each sector will be examined in terms of its trends regarding inputs, outputs and outcomes.

1.2 Quality Assurance

As part of the quality assurance process feedback was sought on the analysis format (structure), clarity (quality of writing), accuracy (reliability of data), robustness (methodological rigour), and consistency (between evidence and conclusions). Further detail on the quality assurance process is set out in Appendix 1. It is important to note that involvement in the Quality Assurance process does not imply agreement with the findings of the analysis.

2. Background and Context

The land transport network is a vital piece of public infrastructure. To ensure that it fulfils its function of safely and efficiently moving people and goods around the country, ongoing protection and renewal of existing assets is required. Given the extent of the network, protection and renewal can be a challenging and expensive. However, it is essential to ensuring the full value of past investment is realised. The following section presents a high-level overview of the land transport sector, the overall funding context from 2010 to 2020, and estimated protection and renewal requirements.

2.1 Overview of the Land Transport Network

The road and rail networks are the State's widest and most expansive infrastructure, extending to approximately 100,000km of road network and 2,000km of operational railway track. Despite the relatively small land area of State, Ireland's population density is low, with widely dispersed settlement patterns, and its road network is one of the longest per capita in Europe.[1,2] These transport networks are vitally important to provide economic and social links, facilitate the movement of people and goods, and provide access to employment, education, and services. However, with the population projected to grow by 1 million in the next two decades, increased travel demand will lead to increased degradation of the network if investment does not keep pace. Adequate protection and renewal investment is required to guarantee the transport network is suitably maintained and of a consistently high standard to ensure safety and connectivity.

Protection and renewal refers to maintaining the physical infrastructure of the transport network in a safe and adequate condition.[3] It encompasses the maintenance of existing transport infrastructure and assets, such as roads, rail, buses and supporting technologies, but excludes upgrades to the network which deliver improved performance. Having a robust estimate of the required annual protection and renewal investment is essential for developing a long-term plan for transport investment. If the necessary protection and renewal investment is not delivered, the network will deteriorate and certain assets will have to be prioritised for protection.

The heavy rail network is currently around 2,000km in length. Since 2007 it has catered for over 560 million passenger journeys and the volume of freight that moves on the network is equivalent to approximately 9,000 road freight journeys annually. Irish Rail is responsible for the delivery of rail services and the provision of rail infrastructure in Ireland, and these two core tasks are overseen by two functionally separate arms in line with EU requirements. The Railway Undertaking arm of Irish rail

[1] National Investment Framework for Transport in Ireland, Background Paper 12: Rural and Regional Accessibility
[2] Transport Trends 2020: An overview of Ireland's Transport Sector.
[3] National Investment Framework for Transport in Ireland, Background Paper 6: Protection and Renewal

delivers heavy rail services while the Infrastructure Manager is responsible for the protection and renewal of the network itself.

The Dublin Transport Authority Act (2008) (as amended) establishes the regulatory framework for the provision of rail services in Ireland. The National Transport Authority (NTA) awards contracts to Irish Rail to provide services under the Public Service Obligation (PSO) and provides funding for specialised services of social importance but which may not otherwise by financially viable. On the infrastructure side, since 2014 the Infrastructure Manager Multi-Annual Contract (IMMAC) has established five-year investment envelopes for the heavy rail network and defined a range of performance indicators which the Infrastructure Manager is responsible for delivering. The current IMMAC, which runs from 2020 to 2024, ensures that protection and renewal requirements are fully funded over the coming years.

From 1994 to 2013 there was significant investment of approximately €22bn in the development of the national road network, including the construction of the motorway network. These developments radically changed the characteristics of the road network, rather than simply increasing its length. The importance of the national road network is evident, as national roads accounted for 5 percent of all roads in 2020 but transported almost 46 percent of total road traffic.[4]

Regional and local roads are essential for linking towns and villages with their rural hinterlands and regions. The regional and local road network accounts for approximately 96,000km of roads and 54 percent of all road traffic. Lower population densities in more rural areas mean these roads may not be subject to the same levels of traffic demand as national roads. However, the extent of the network and their remote nature can often leave regional and local roads exposed and unrepaired for years at a time, leading to extensive degradation of the network in certain locations.

2.2 Recent Sectoral Investment

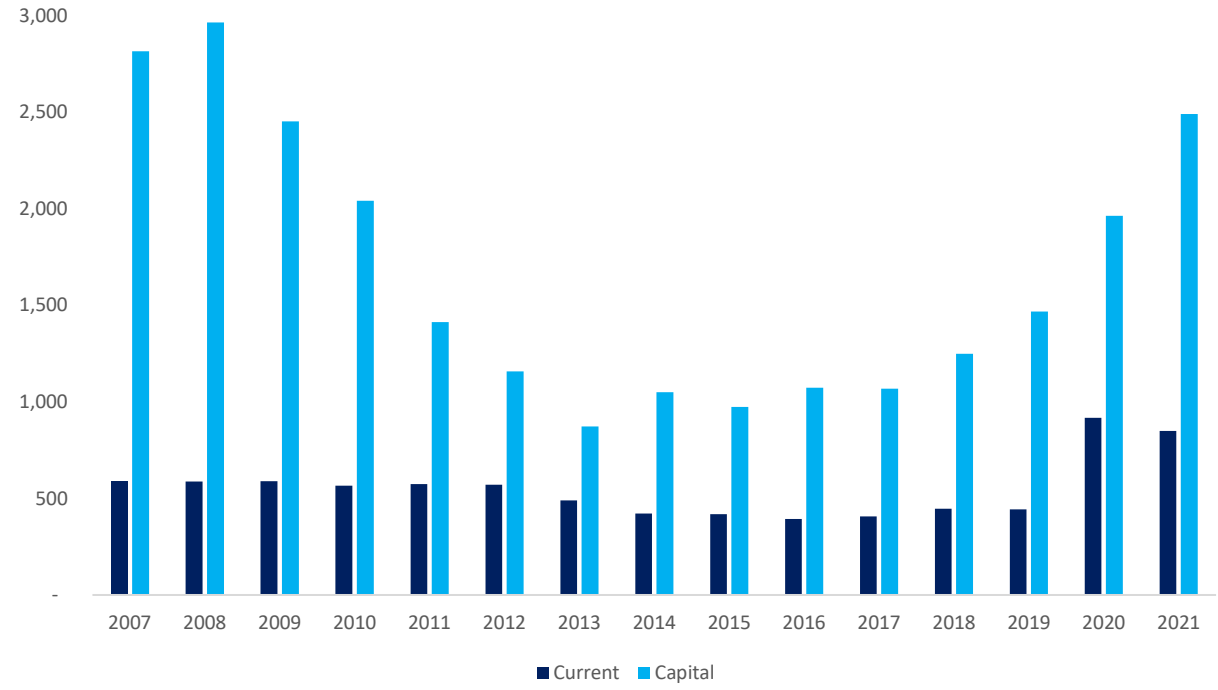
Figure 1 shows total current and capital expenditure on land transport from 2007 to 2021. Current expenditure, which is largely constituted of Public Service Obligation payments to public transport operators, has been relatively steady across the period. There was €587 million in current expenditure in 2007, which fell to €393 million in 2016 before increasing to €917 million in 2020. It should be noted the large increase in current expenditure in 2020 and 2021 compared to earlier years is a result of the COVID-19 pandemic and the increased need for public transport subvention.

Capital expenditure, however, fluctuated significantly with economic cycles, with peak capital expenditure of €2.96 billion in 2008, falling to €873 million in 2013, a reduction of 70 percent in five years. From 2013 to 2018 there were gradual increases amounting to €340 million. Capital investment

[4] Value for Money Review on Current Expenditure on National Road Maintenance (2015)

then increased to €1.96 billion in 2020, with €2.5 billion allocated for 2021. As new transport infrastructure is developed through this increased investment, there will be an increased need for protection and renewal expenditure in the medium and long term.

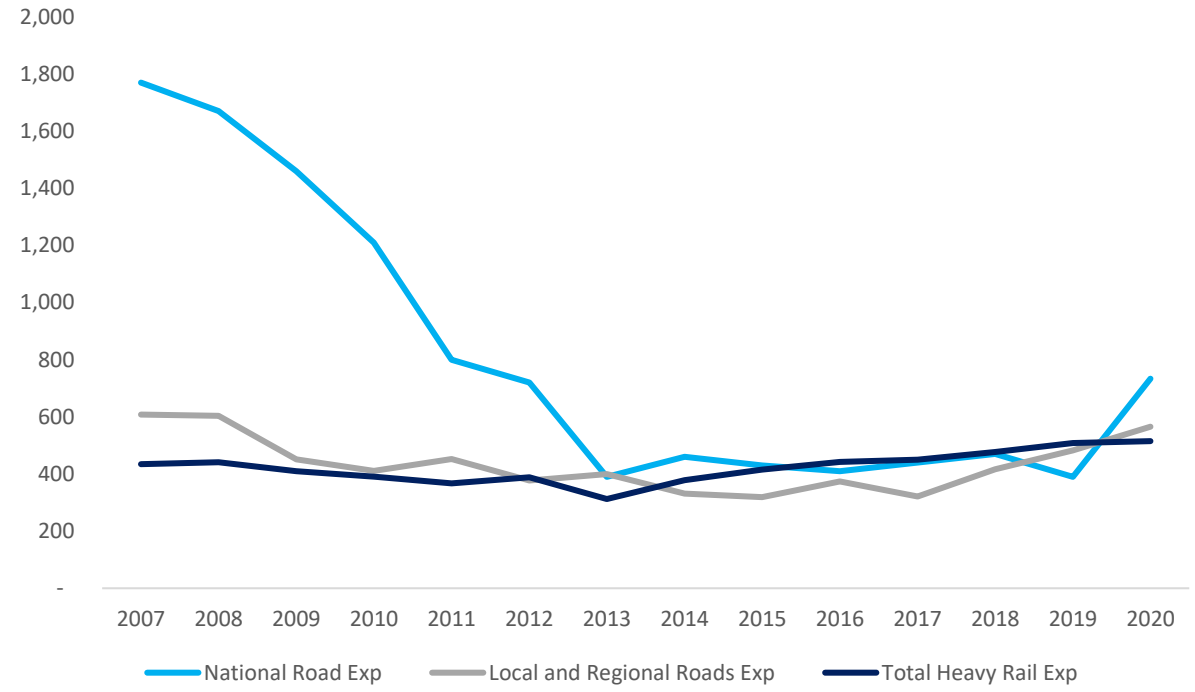
Figure 1: Annual Land Transport Investment, 2007 to 2021



Source: Revised Estimates for the Public Service 2007-2021
Note: Expenditure Figures are measured in €million. Figures for 2021 refer to allocated finances for the year, not expenditure

Figure 2 shows overall expenditure in each of the three main components of the land transport network from 2007 to 2020. Expenditure on national roads decreased substantially from €1.8 billion in 2007, to €390 million in 2013, before increasing to €734 million in 2020. This marks an overall reduction of €1.1 billion in 15 years and a substantial decrease in expenditure for most of the decade. Department of Transport grants for regional and local roads decreased from €608 million in 2007 to €319 million in 2015, before rising to €555 million in 2020. Expenditure on rail decreased from €441 million in 2007 to €312 million in 2013, based on figures from Irish Rail's annual reports, before increasing to €515 million in 2020, with the IMMAC structure in place since 2014. It should be noted, however, that the accounting methodology used in Irish Rail's annual reports differs from the IMMAC, and the rail estimate presented here should therefore be treated as indicative.

Figure 2: Overall Transport Investment by Sector, 2007 to 2020



Source: Department of Transport Payment Booklets 2007-2020, Irish Rail Annual Reports, IMMAC Report, TII Annual Report
Note: Figures are measured in € millions

Overall, the trend in expenditure for the land transport network was reductions in funding from 2007 to 2013, slowly increasing funding from 2014 to 2018, followed by more substantial increases in 2019 and 2020. Since 2007, expenditure on national roads has decreased by 58 percent, and by 14 percent on regional and local roads, while heavy rail expenditure increased by 17 percent, albeit from a lower baseline. Rail had its highest expenditure in 2020 at €515 million, while roads received €1.3 billion in 2020. This means that expenditure on roads was about 2.5 times greater than expenditure on rail in 2020, which marks a significant shift from 2007 when roads investment was around 5.4 times greater than rail. With the 2020 Programme for Government including the commitment of a 2:1 ratio between new investment in public transport and roads, this rebalancing of investment from roads towards public transport is likely to accelerate investment in rail over the coming years.

2.3 Protection and Renewal

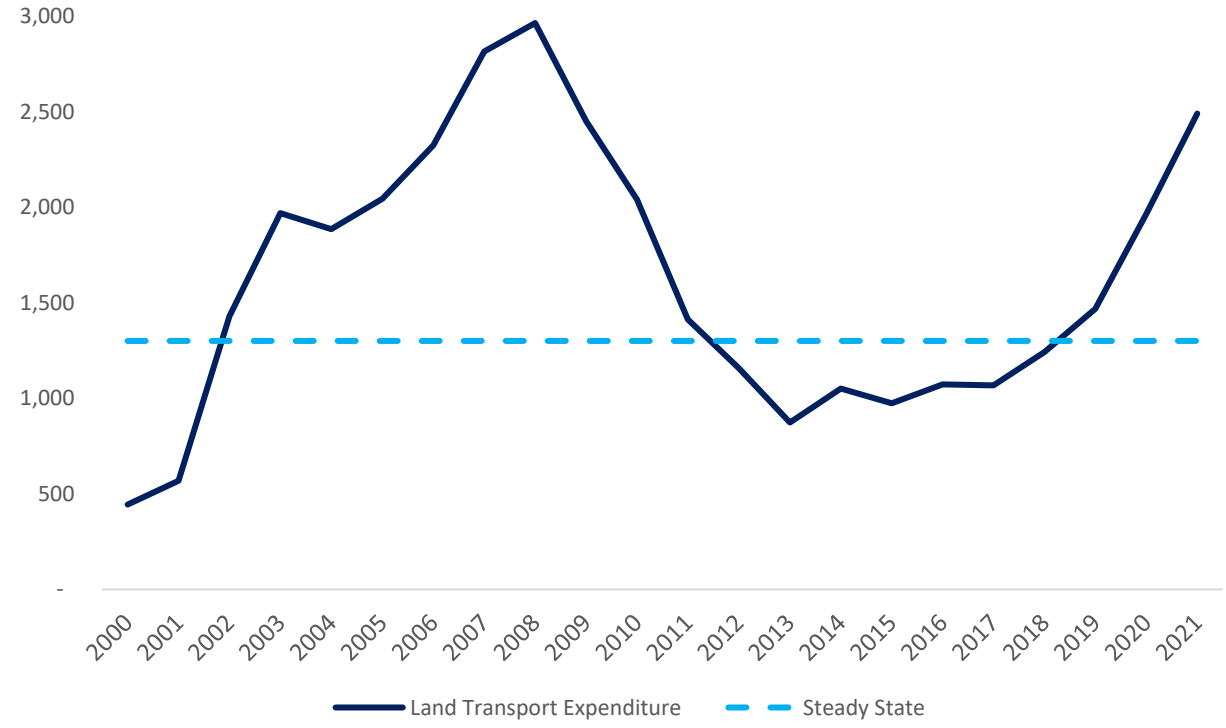
Protection and renewal aims to maintain the physical infrastructure of the transport network in a safe and adequate condition. If protection and renewal investment meets the level of funding required to maintain the network exactly in its current condition, with neither deterioration nor improvement, investment is said to meet 'steady state' requirements. Note, however, that meeting steady state in a given year does not necessarily mean that the network exists in an optimal condition. Where assets are significantly degraded, steady state investment will prevent further degradation but investment above this level is required to rehabilitate the asset. A precise quantification of the value of

outstanding rehabilitation costs arising from accumulated steady state deficits is beyond the scope of this paper.

Transport sector protection and renewal costs do not fall solely on the Exchequer. Local authorities contribute to the upkeep of their regional and local roads from own resources, Transport Infrastructure Ireland (TII) re-invest the revenue raised through tolling operations, and public transport operators re-invest farebox revenue. This final category, which relates to buses and rolling stock, is not considered in this paper. Research conducted to underpin the National Investment Framework for Transport in Ireland (NIFTI), estimates that capital protection and renewal costs across the sector were €1.7bn in 2018, of which €1.3bn was Exchequer-funded via the Department of Transport. Protection and renewal investment funded out of current expenditure, although small relative to capital expenditure, is additional to this estimate.

Protection and renewal represents a significant share of sectoral expenditure and is essential to ensuring that the full value of historic investment is realised. Between 2007 and 2020 almost €30bn was invested by the Exchequer in land transport. Following a period of constrained investment, the National Development Plan (NDP) 2018-2027 committed to achieving 'steady state' investment levels for most of the transport network by 2021.[5]

Figure 3: Land Transport Capital Investment and Estimated Steady State Requirement, 2000 to 2021



Source: Revised Estimates for the Public Service 2000-2021
Note: Figures for 2021 relate to budgetary allocation rather than expenditure. Figures are measured in €million

[5] National Development Plan 2018-2027.

While the NDP funding commitment will ensure that the network does not degrade from its current condition, that does not mean all parts of the network are now in an adequate condition. Figure 3 shows total capital investment in land transport from 2000 to 2021 along with the estimated cost of meeting steady state levels of protection and renewal investment from NIFTI. Due to constrained investment following the financial crisis, steady state levels of investment were not met for a number of years during the 2010s. Furthermore, as the annual allocations were not spent exclusively on protection and renewal, the gap between protection and renewal investment and the steady state requirement is greater than depicted. This underinvestment has resulted in parts of the network degrading and now requiring rehabilitation. Estimating the cost of this rehabilitation work on the different parts of the transport network is outside the scope of this paper, but it is likely to be considerable. Furthermore, as degradation tends to accelerate over time, the cost is likely to exceed the value of the accumulated protection and renewal deficit.

2.4 Conclusion

The land transport network is an extensive piece of vital public infrastructure which requires substantial ongoing investment to ensure it remains in good quality and does not deteriorate over time. While €1.3 billion is the high-level estimate of the required amount of Exchequer capital investment in protection and renewal required to keep the network in a steady state condition, actual investment varied between €2.96 billion and €873 million between 2007 and 2020 and fell short of the steady state requirement in multiple years. Funding has increased in recent years, however, and the NDP commitment to meet steady state investment levels should ensure the network does not degrade from its current condition in the short term. Nevertheless, accumulated deficits have built up over time and mean that costly rehabilitation works are required on certain parts of the network, over and above meeting steady state.

3. Literature Review

This section sets out some key reports published by the Irish Government, as well as reviews and research by international bodies, which examine the area of protection and renewal. It sets out key findings and insights which have helped to underpin, frame and inform this research.

3.1 Why Road Maintenance is Important and How to Get it Done

In a 2005 note, the World Bank reports that despite advanced economies recognising the importance and necessity of maintaining transport infrastructure, most countries allocate insufficient funding to achieve the required maintenance. Postponing maintenance creates additional direct and indirect costs when compared to rectifying a defect promptly. The note cites international estimates that after three years the cost of postponed maintenance increases six-fold when compared to prompt maintenance, rising to an 18-fold increase after five years. This arises through the exacerbation of defects over time, such as the failure to address a minor road defect resulting in nearby land subsidence and causing additional road damage. The World Bank categorises necessary maintenance into three groups:

1. Routine Maintenance to prevent premature deterioration of assets, costing relatively little to implement compared to other types of maintenance.
2. Periodic Maintenance to preserve structural integrity, such as pavement reconstruction over the medium term.
3. Urgent Maintenance which cannot be foreseen, such as in response to a road collapse due to landslides or flooding. This is the most expensive type of maintenance.

The Report includes recommendations to overcome challenges associated with funding maintenance for transport projects. Reliable access to funding is essential, as maintenance budgets are often subject to cutbacks. The report recommends annual ring-fenced funding to guarantee maintenance, which could potentially develop a surplus if issues are dealt with over time that could be used to fund new transport projects. Allowing maintenance activities by the private sector may also help address funding issues. Finally, where funding is short, the maintenance of existing transport networks should take priority to ensure infrastructure is in adequate condition before new transport projects are developed, as this may further inhibit maintenance funding and exacerbate issues on the network.

3.2 Current Expenditure on National Road Maintenance

A Value for Money and Policy Review on 'Current Expenditure on National Road Maintenance' was published in 2015. This review examined the rationale, efficiency, effectiveness, relevance and management of the current expenditure maintenance programme on national roads from 2007 to 2014. The review outlined the importance of national road infrastructure to the State's economic and

social development, with c. 5,300 km of national roads connecting towns and cities and facilitating 46 percent of traffic despite being only 5 percent of the overall road network.

The report distinguishes between current and capital protection and renewal investment on the national road network. The distinction originates from the type of work carried out. Current maintenance relates to any ongoing work carried out to ensure the safety of roads and prevent premature deterioration in the short run. It is utilised to address structural issues before they develop to a substantial level. This includes ordinary maintenance to address pavement defects, winter maintenance, and bridge maintenance. Capital maintenance is aligned to long-term or substantial work to renew road assets or the road network. It tends to arise due to sporadic environmental events such as flooding or landslides which would significantly damage the road network This type of maintenance includes full pavement reconstruction, resurfacing, or overlaying significant sections of the road network. Capital maintenance requires more time for planning and analysis before being conducted and is less readily available to deploy in response to maintenance issues.

The review highlights that some maintenance programmes classified as capital expenditure are essential to the maintenance of the National Road Network and must be completed annually such as pavement renewal or overlays. It documents how this classification results in national road current and capital maintenance being inherently interlinked, as well as asset maintenance and infrastructural management.

3.3 Public Investment Management Assessment Report

In 2017, the International Monetary Fund (IMF) published an assessment of Ireland's public infrastructure investment over two decades. The Public Investment Management Assessment (PIMA) Report found that after the financial crisis, there was insufficient investment to support the ongoing maintenance required by Ireland's transport infrastructure. Investment fell to 1990s levels, which resulted in substantial backlogs of protection and renewal work on transport infrastructure. The report found that funding for new projects was sufficient, but insufficient attention was given to maintaining assets once constructed. This was resulting in premature degradation of infrastructure and increased running costs.

The report outlines improvements in the management of maintenance investment to bring Ireland in line with other advanced economies and achieve better value for money, as well as potentially delivering savings. The report recommends a stronger emphasis on developing urban areas outside Dublin by investing in transport infrastructure at a more regional and local level. The report also highlights limitations on the data kept regarding infrastructure maintenance. Recommendations relevant to protection and renewal are set out in Table 1.

Table 1: PIMA Report Protection and Renewal Recommendations

Phase	Recommendation
Budget Maintenance of Public Assets	Increase the share of the budget directed toward maintenance and rehabilitation expenditure to prevent further degradation of the existing capital stock
Budget Maintenance of Public Assets	Sharpen the focus in the budget process on the level of spending required to maintain infrastructure at steady-state level. Use the recommended government-wide register of nonfinancial infrastructure assets to determine appropriate maintenance levels
Monitoring of Public Assets	Improve asset management and the allocation of maintenance funding by developing a central register of infrastructure assets valued at either book (initially) or (ultimately) market value.
Monitoring Investment Projects	Further develop the Capital Tracker database to provide comprehensive information on: Annual cost profile, implementation of project, clear separation of capital and recurrent costs, data on adjustment of project and implementation of delays and results
Improve links between planning and budgetary decision making	Establish a common analytical framework…on estimating demand pressures and other infrastructural gaps

Source: Public Investment Management Assessment Report Ireland, International Monetary Fund, 2017

3.4 Department of Transport, Tourism and Sport's Value for Money Reviews

Following the publication of the Value for Money and Policy Review (VFM) on Current Expenditure on National Road Maintenance, the Department of Transport, Tourism and Sport published a paper as part of the 2018 Spending Review Paper which revisited several previous Departmental VFMs to assess the progress made in implementing their recommendations. Of the 13 recommendations made in 2015 in respect of current expenditure on national road maintenance, three had been fully implemented and ten were in progress at the end of 2018. Actions in progress included the collection of data on the maintenance of the lighting network, updates to the Eirspan bridge management system, and improved monitoring of Intelligent Transport Systems maintenance.

Updated positions for 2021 on the implementation of the Value for Money recommendations are set out in Appendix 5.

3.5 Review of the Infrastructure Manager Multi-Annual Contract 2014 to 2018

In 2008 the European Commission published a Communication on Multi-Annual Contracts for rail infrastructure quality. This detailed the advantages of introducing an Infrastructure Manager Multi-Annual Contract (IMMAC) framework, and what it can achieve for the maintenance and renewal of national railway infrastructure. Advantages include a long-term financing framework for maintenance and effective cost controls.[6] The aim of the IMMAC was to ensure Member States within the EU provide rail infrastructure at the best value for money, and maintain rail infrastructure in terms of quality, reliability, and flexibility, as well as delivering programmes on a cost-efficient basis.[7]

[6] Review of the Infrastructure Manager Multi-Annual Contract 2014-2018, Department of Transport, Touring and Sport, 2019
[7] Rail Infrastructure Multi-Annual Contracts, European Commission

In 2014 an IMMAC was agreed between the Department of Transport, Tourism and Sport and Irish Rail running from 2014 to 2018. A one-year extension was approved until 2019 and a new IMMAC for was subsequently approved for 2020 to 2024 which sets out a multi-annual funding commitment of €1bn and ensuring that protection and renewal on the heavy rail network is fully funded in the coming years.

In 2019, the Department of Transport conducted a review of the IMMAC from 2014 to 2018 which assessed the performance of the first IMMAC and made several recommendations to inform the current IMMAC from 2020 to 2024. This included fully funding protection and renewal funding to ensure the network was fit for purpose and funding to deliver network enhancements. It also examined the 2016 Rail Review recommendations, multiannual capital allocations under the NDP and NPF, the effectiveness of the IMMAC Key Performance Indicators, and the alignment of Ireland's rail network with Northern Ireland's railway network post Brexit.

Table 2: Recommendations of IMMAC Review

Theme	Recommendation
A Long-Term Financing Framework for Maintenance	IMMAC funding from 2020 to 2024 should provide a 5-year funding framework in line with the requirements identified
Enabling Effective Cost Control	Financial Performance Indicators should be developed to allow for appropriate monitoring of the efficiency and effectiveness of the increased levels of investment planned from 2020 to 2024
Effective Benchmarking and Regulatory Supervision	Annual performance thresholds should be robust and appropriately challenging to allow for effective monitoring of performance.
Improving Performance and Quality Control	The Infrastructure Manager should develop a 5-year outline work programme for 2020 to 2024, with summary expected benefits capable of measurement within the framework of revised KPIs
Securing the Effectiveness of Contractual Arrangements	The IMMAC from 2020 to 2024 be subject to a Value for Money Policy Review starting from 2023

Source: Review of the Infrastructure Manager Multi-Annual Contract 2014-2018, Department of Transport, Tourism and Sport, 2019

3.6 Conclusion

The Irish Government, the Department of Transport, and other international bodies have examined areas related to the protection and renewal of road and rail networks. The reports that have been published outline the importance of protection and renewal, the implications of neglecting investment in maintaining land transport infrastructure, the challenges associated with undertaking this investment, and made recommendations to address the issues which arise. While these vary between the road and rail sectors, Table 3 sets out the high-level, key messages from some of the main reports examined for this research.

Table 3: Summary of Literature Review

Report	Key Message
Why Road Maintenance is Important and How to Get it Done (2005)	Delays to maintenance work increases repairs costs in the long run, with additional indirect costs. Protected funding sources are necessary to guarantee maintenance.
Value for Money Review Current Expenditure on National Roads (2015)	Current and capital expenditure are inherently interlinked. Other key themes and findings included total maintenance expenditure decreasing by 30 percent from 2008-2014, the importance of local authorities in delivering road maintenance, and overall lack of data kept on maintaining the road network to ensure efficient maintenance.
Public Investment Management Assessment (2018)	Insufficient funding is allocated towards ongoing maintenance of transport projects, resulting in a backlog of protection and renewal works which will inhibit Ireland's economic growth in the coming years unless addressed.
Value for Money Review, Spending Review Assessment (2018)	Found there was limited data on maintenance, but when examined on a per Km basis of expenditure, Ireland spends less than other countries on road maintenance.
Infrastructure Manager Multi-Annual Contract Review (2019)	The report sets out the funding requirement for maintenance of the rail network through multi annual budgeting to ensure a steady state level provision of service. It acknowledges the funding gap and aims to address this through the subsequent IMAMC Report that runs from 2020-2024.

4. National Road Network

The National Road Network connects towns, cities, and regions to facilitate the movement of people, goods, and services across the State. It is an essential component of the land transport network to ensure balanced economic and social development. The network is categorised into Primary and Secondary national roads and further divided into motorways, dual-carriageways, and single lane roads. Collectively these comprise 5,306km of roads across the State with an intended lifespan of around 20 to 40 years.[8]

The importance of national roads is evident given that 46 percent of road-based passenger journeys and 93 percent of internal merchandise transport happen on national roads,[9] despite the network comprising only 5 percent of total roads. Given the importance of the national road network, ongoing protection and renewal is essential to ensure the network does not deteriorate or degrade. Protection and renewal of the network can be achieved in several forms, such as routine inspections and maintenance of road assets. It can also involve providing weather and winter maintenance, responding to incidents on the network, repairs to damaged sections of road, and undertaking improvement, rehabilitation and renewal works.[10]

4.1 Delivery of Protection and Renewal

Local authorities had responsibility for the maintenance and upkeep of the national road network until 1993, when this responsibility was transferred to the National Roads Authority. Following the financial crisis, the National Roads Authority was merged with the Railway Procurement Agency in 2015 to establish Transport Infrastructure Ireland (TII), the body now responsible for maintaining the national road protection and renewal. The rationale for this merger was to provide an integrated approach to the future development and operation of the national roads network and light rail infrastructure throughout Ireland.

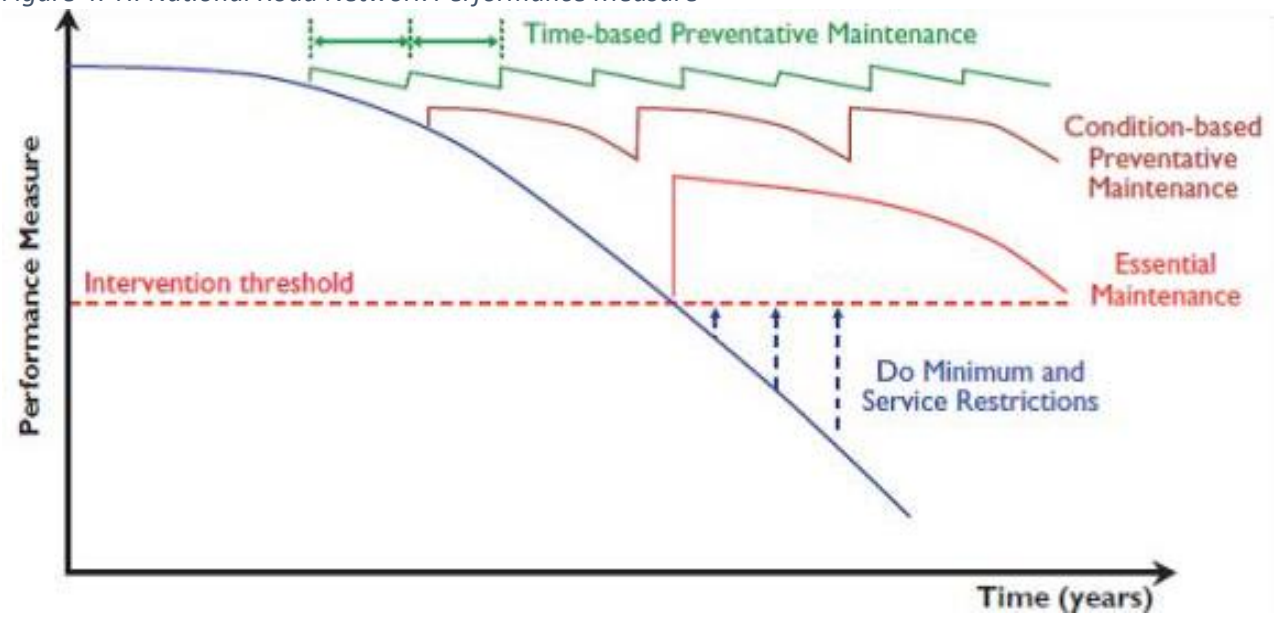
Challenges exist with the national road network, with a large proportion of the network consisting of "legacy" roads that evolved from historic routes, which are often constrained by physical or environmental conditions.[11] The task of protection and renewal is also challenging due to environmental factors, increased traffic loads and the continuous deterioration of road structures.[12]

While TII is responsible for network operations, maintenance and management of National Roads, responsibilities are also delegated to several bodies. Motorways and national primary roads are

[8] https://www.tii.ie/roads-tolling/operations-and-maintenance/Pavements/
[9] https://www.tii.ie/about/about-tii/funding/
[10] https://www.tii.ie/roads-tolling/operations-and-maintenance/road-maintenance/
[11] https://www.tii.ie/roads-tolling/operations-and-maintenance/Pavements/
[12] https://www.tii.ie/roads-tolling/operations-and-maintenance/Pavements/

generally maintained by TII or via PPP agreements, and national secondary roads are generally maintained by local authorities, each with some exceptions. The Department of Transport provides funding to TII on an annual basis, which redistributes funding across local authorities to carry out maintenance on national roads in their jurisdiction.[13] Parts of the network are also managed and maintained by Public Private Partnerships (PPPs), where private companies complete routine maintenance to a defined standard and can charge access for road usage in return.[14] Management and maintenance are also delivered through a range of private third parties, such as Motorway Maintenance and Renewal Contract Operators. These are managed under private contracts or by PPP Concession companies in the case of the tolled motorways, which account for over 35 percent of the motorway network.[15] At the end of a PPP contract, operators must return the national road back to TII in the same condition as when it was provided to operators.

Figure 4: TII National Road Network Performance Measure



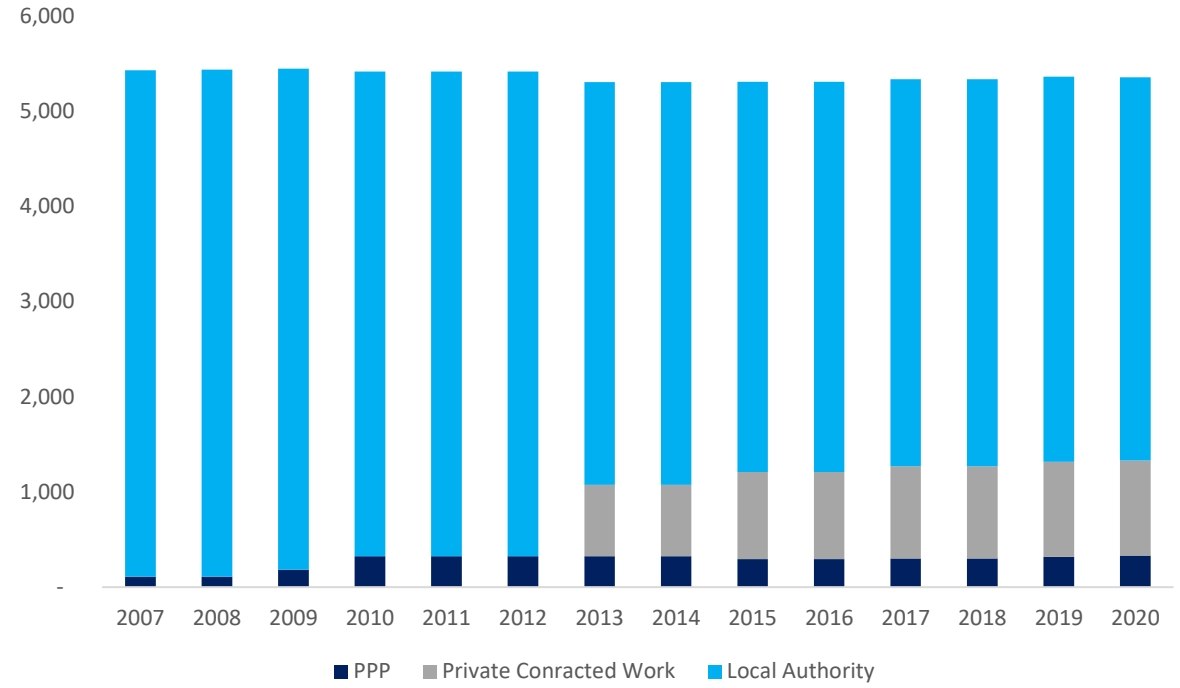
Source: https://www.tii.ie/roads-tolling/operations-and-maintenance/Pavements/

Figure 4 depicts the theory of road network deterioration, degradation and maintenance. Over time, the network will deteriorate for a variety of reasons. Ongoing maintenance can be conducted to maintain the network at a given level. Where this is not completed, the marginal increase in degradation will grow at an exponential rate. At a certain point, the network will pass a necessary intervention threshold that will require essential maintenance to be completed, but this is usually to restore the asset to a substantially reduced standard than what it was designed for. At this stage, the cost of rehabilitating the network to its original state will have increased substantially. As such,

[13] Transport Infrastructure Ireland, Chargeability of Expenditure to National Road Grants, 2020
[14] However, TII do not direct PPP operators to allocate funding in a specific way to achieve this.
[15] Transport Infrastructure Ireland Annual Reports

prompt, regular protection and renewal is more cost-effective in the long run. For this reason, TII conduct an annual survey of the network to assess its quality, deterioration rate, and funding required, and prioritise assets for protectional and renewal.

Figure 5: National Road Length Maintained by Provider 2007 to 2020



Source: Transport Infrastructure Ireland Annual Reports 2014-2020 and National Roads Authority Annual Reports 2007-2013
Note: Figures are measured in Kilometres

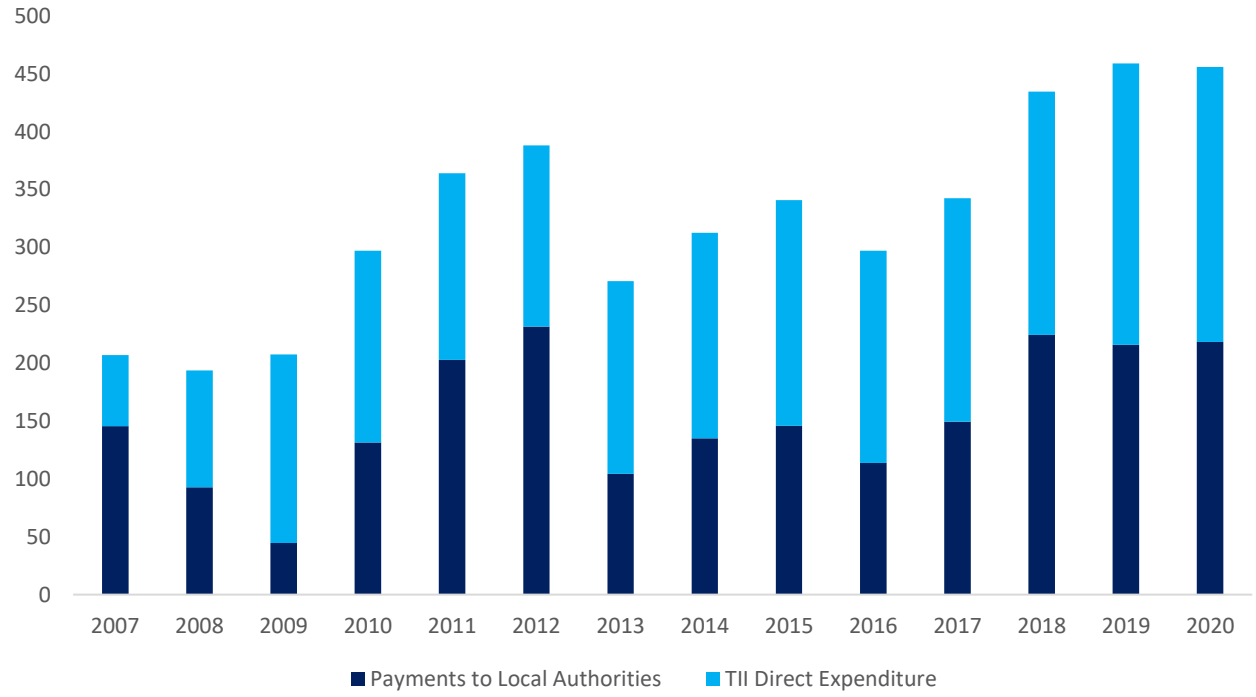
Figure 5 shows where delivery responsibility for the maintenance of the national road network rested each year from 2007 to 2020. National roads are predominantly maintained by local authorities, with 5,320km maintained in 2007. This has decreased over time, however, to 4,023 km by 2020. Private contractors have had a growing role in the maintenance of the network since 2013, with responsibility for maintaining 747km in that year and 998km in 2020. The use of PPPs has also increased over time, with such agreements covering 108km of the network in 2007 and 332km in 2020. The total length of national roads to be maintained fell by 1.4 percent across this period, from 5,428km in 2007 to 5,353km in 2020, indicating that the length of national roads that were incorporated into the regional and local road network slightly outstripped the construction of new national road length.

4.2 Inputs: Expenditure

Capital investment in pavement management and network rehabilitation on the national road network grew from €207m in 2007 to €456m in 2020. Since the creation of TII in 2015, there has been a fairly even split in this investment between local authorities and work overseen by TII directly. In 2020, for example, €218m was paid to local authorities while €238m was administered by TII directly—

47.9 percent and 52.1 percent of the total respectively. Figure 6 shows the trend in this expenditure between 2017 and 2020.

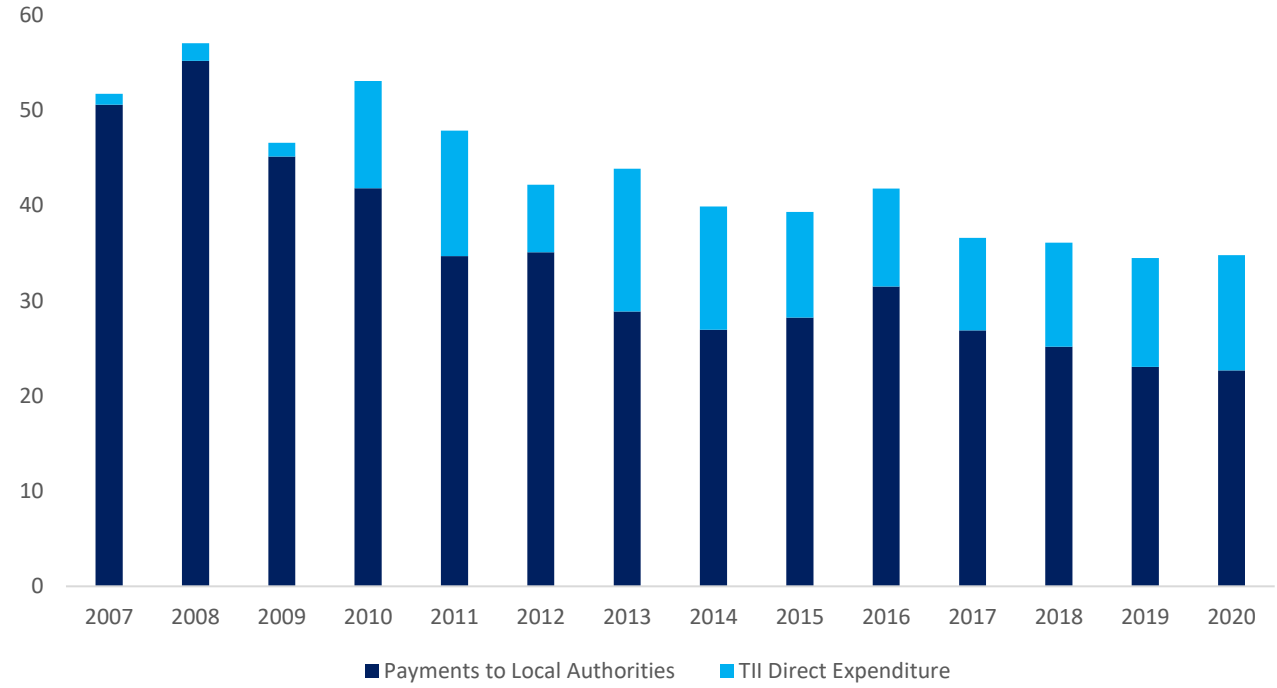
Figure 6: Protection and Renewal Expenditure on National Roads, Capital, 2007 to 2020



Source: Transport Infrastructure Ireland
Note: Figures are measured in millions of euro

In addition to capital investment, a relatively small amount of current expenditure is incurred each year in respect of routine maintainence of the national road network, such as winter maintenance and maintaining route lighting. The amount spent of expenditure in this area has declined over time, from a peak of €57.1m in 2008 to €34.8m in 2020. The deliver of this activity is similarly split between TII and local authorities, but with local authorities responsible for most of expenditure. In 2020, TII paid €22.7m to local authorities in respect of routine maintenance, compared to €12.1m of expenditure it oversaw directly—a split of 65.2 percent to 34.8 percent. Figure 7 shows the trend in this expenditure between 2017 and 2020.

Figure 7: Protection and Renewal Expenditure on National Roads, Current, 2007 to 2020

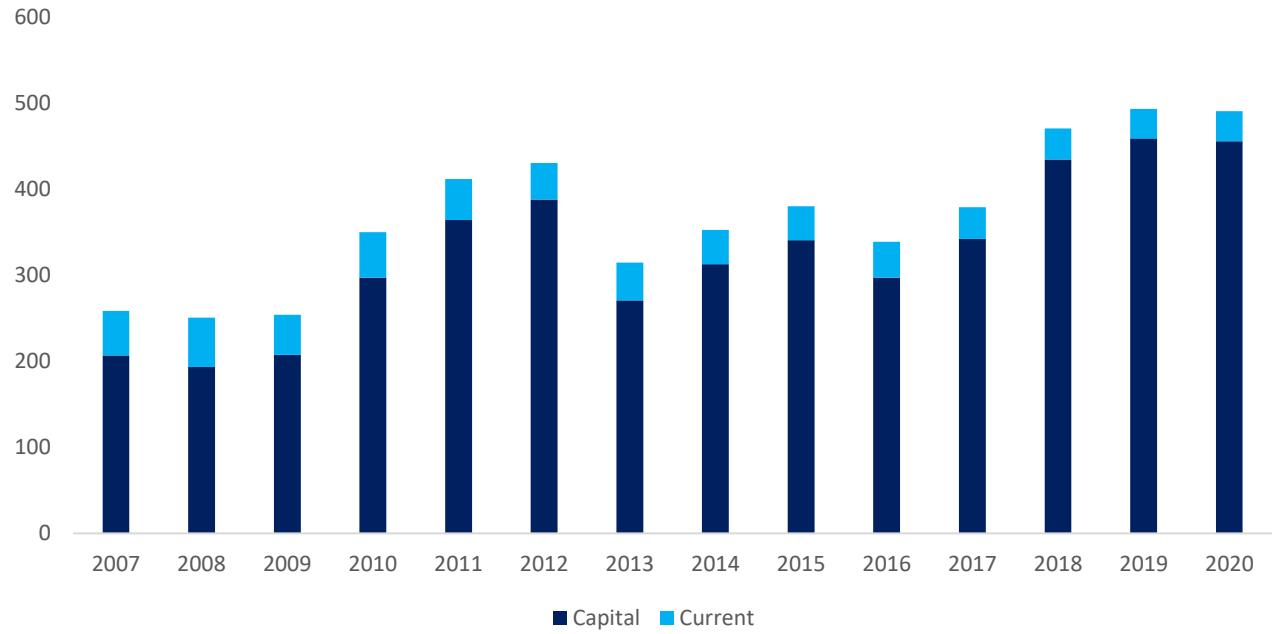


Source: Transport Infrastructure Ireland
Note: Figures are measured in millions of euro

Figure 8 combines capital and current investment to give the overall amount spent on publicly delivered protection and renewal of the national road network. It is important to note, however, that this investment is supplemented by the activities of PPP operators, which must maintain the sections of the network for which they are responsible to a contractually defined standard. TII does not directly quantify the amount that PPP operators spend on this work each year, but it is likely to constitute a considerable portion of the operational, availability and other PPP payments that TII makes each year.

With regard to activity delivered by TII and local authorities, overall protection and renewal investment in 2020 was €491m, a marginal decrease on €493m in 2019. However, this exceeds the earlier peak investment level of €430m in 2012 and is an 89.7 percent increase on the €259m spent in 2007 in nominal terms. The share of investment comprised of current, ordinary maintenance has decreased across the period from 20.0 percent in 2007 to 7.1 percent in 2020 through a combination of increased capital and decreased current allocations. Across the period, a total of close to €5.2bn has been spent on protection and renewal across the two categories.

Figure 8: Protection and Renewal Expenditure on National Roads, Capital and Current, 2007 to 2020



Source: Transport Infrastructure Ireland
Note: Figures are measured in millions of euro

4.3 Outputs: Pavement Quality

TII categorises national roads into the primary and secondary national road network. Drilling down further, Table 4 sets out the national road subnetwork classification on a scale from 0 to 4. This provides information such as the road type, expected volume of traffic and age of the network, which can be used to inform the maintenance needs of the particular sections of the network. TII also assesses pavement conditions annually to determine which sections require protection and renewal work. The type of maintenance needed, and the categorisation of pavement condition is set out in Table 5, where roads are graded from 'Very Poor' to 'Very Good' on a 5-point scale, indicating the extent of maintenance work which must be carried out.

Table 4: Classification of National Road Sub Networks

Sub Network	Classification
0	Motorway and Dual Carriageway sections of the network. High speed, high volumes pavement. Much of this subnetwork is less than 10 years old.
1	Urban Areas. Significant geometric and pavement design has taken place in the construction/rehabilitation of the pavement sections. Typically carry reasonably large volumes of traffic, identified by presence of hard shoulders adjacent to the carriageway
2	Legacy subnetwork. Typically constructed without formal geometric or pavement design. Typically carries traffic volumes less than 10,000 AADT.
3	Legacy subnetwork. Typically constructed without formal geometric or pavement design. Typically carries traffic volumes less than 5,000 AADT.
4	Legacy subnetwork. Typically constructed without formal geometric or pavement design. Typically carries traffic volumes less than 2,000 AADT.

Source: Transport Infrastructure Ireland National Road Indicators Report 2014-2019
Note: AADT refers to Average Annual Daily Traffic

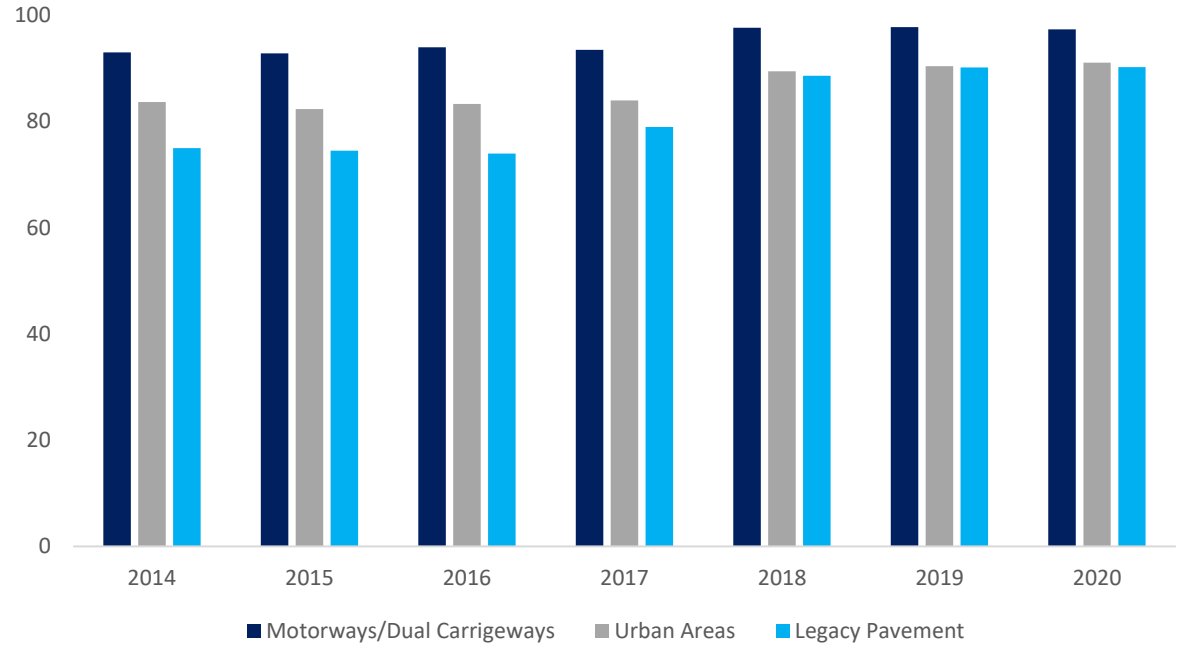
Table 5: National Road Pavement Condition Index

Pavement Condition	Work Type Needed
Very Good	Cyclical maintenance only
Good	Reactive maintenance (typically joint sealing / pothole repairs)
Fair	Preventive intervention and / or resurfacing works
Poor	Structural overlay to restore pavement strength
Very Poor	Pavement reconstruction - end of life treatment

Source: https://www.tii.ie/roads-tolling/operations-and-maintenance/Pavements/

Figure 9 shows the proportion of the different national road subnetwork subcategories with pavement conditions assessed as fair or better from 2014 to 2020, averaged across surface health, surface safety and structural health. This shows the overall condition of the network to be excellent, highly maintained, and consistently improving. The total proportion of motorways and dual carriageways categorised as fair or better increased from 93 percent in 2014 to 97 percent in 2020, averaging 95 percent. Urban Roads exhibited the same trend, with the proportion categorised as fair or better increasing from 84 percent in 2015 to 91 percent in 2020, with a 5-year average of 86 percent. Legacy Pavements experienced the most significant improvement, from 75 percent categorised fair or better in 2015 to 90 percent in 2020, with an average of 82 percent across the period. This shows that ongoing protection and renewal on national roads is substantially improving the quality of the network infrastructure and ensuring it is maintained to a high standard.

Figure 9: National Road Network Classification as Fair or Better, 2014 to 2020

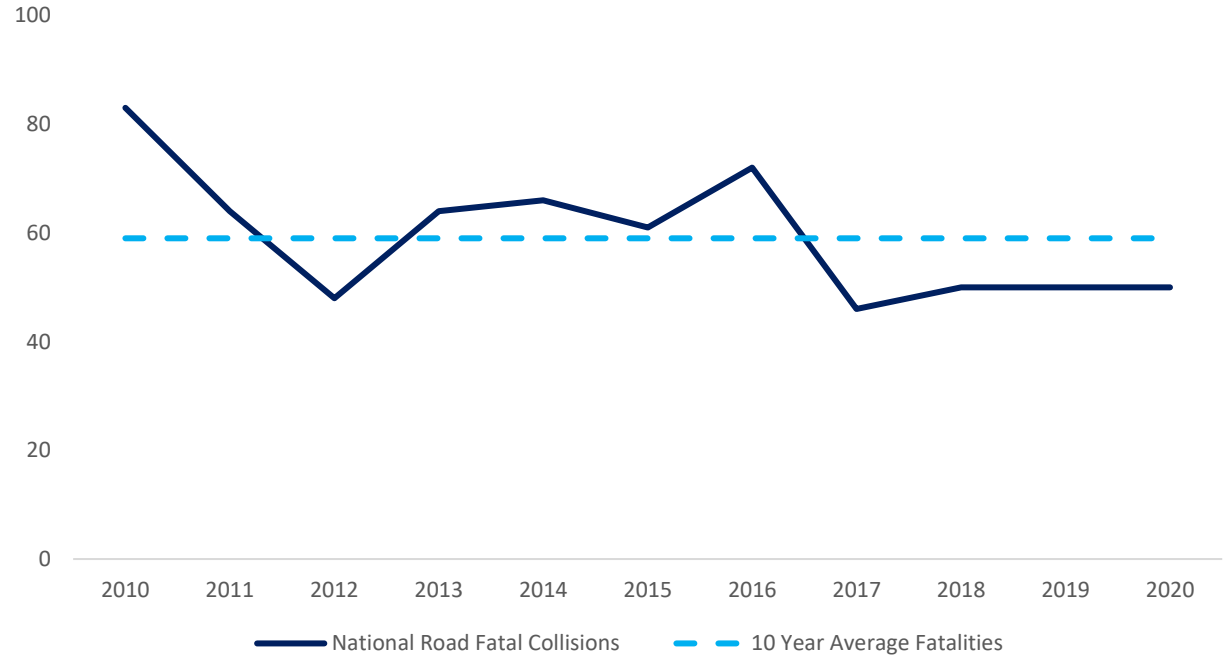


Source: TII National Road Indicators Report 2014-2020
Note: Road Quality measured as a percentage (%). 'Very good' is taken as the ideal scenario or steady state condition of roads.

4.4 Outcomes: Road Safety and Travel Times

Figure 10 shows the annual number of fatal collisions on the national road network from 2010 to 2020.[16] In 2010 there were 83 such collisions on national roads, decreasing to 48 in 2012. This rose to 72 in 2016, before falling to a low of 46 in 2017. It has remained at a similar level in recent years, with 50 fatal collisions in 2020. The annual average across the period is 59 fatal collisions each year. The downward trend may suggest that as national road infrastructure has improved in quality, improvements in road safety have followed and been sustained, although direct attribution is difficult given other factors that may have contributed to reducing collisions such as ongoing public awareness campaigns, improved signage, and appropriate speeds.

Figure 10: Annual Fatal Collisions on National Roads, 2010 - 2020



Source: Transport Infrastructure Ireland National Road Indicators 2014-2020.

National road network traffic performance is monitored using a combination of traffic monitoring units (TMU) and automatic number plate recognition (ANPR) sites managed by TII. These sensors provide information on traffic volumes, speeds and journey times at discrete locations on the network.

To provide an aggregate representation of the performance of the full national road network, TMU and ANPR data, supplemented with available traffic survey data and Google travel time data, are used to update the TII National Transport Model (NTpM) annually. TII publishes information from each update in the annual National Roads Indicators Report.[17] Figure 11 presents NTpM morning (AM) total travel times on national roads on a typical working day between 2014 and 2019, measured in hours.

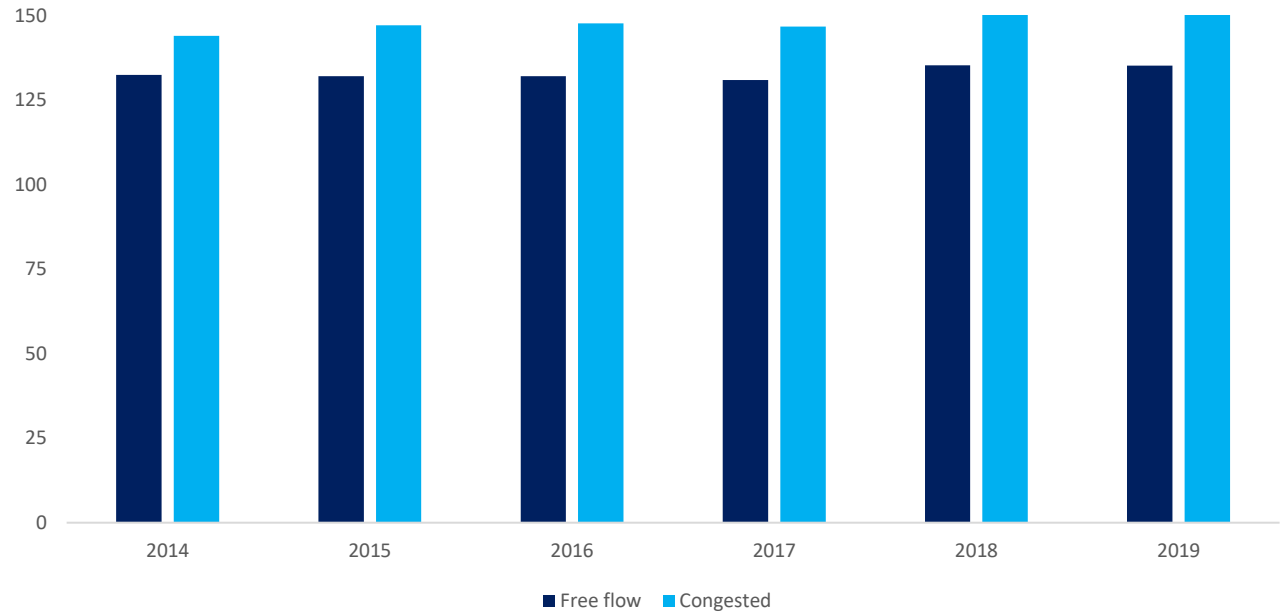
[16] The Road Safety Authority (RSA) define fatal collisions as "where at least one person is killed as a result of the collision and death occurs within 30 days"

[17] https://www.tii.ie/tii-library/strategic-planning/tii-road-network-indicators/TII-National-Roads-Network-Indicators-2020.pdf

This shows two aggregate travel times: travel times at free-flow speeds and under congested conditions.

Total travel times indicate how long it would take a vehicle to travel the entire national road network in AM period free-flow and congested conditions. Free-flow travel times remain relatively static over time, increasing in 2018 due to the opening of the M17/M18 motorway in late 2017. The modelled data shows an increase in congested travel times, however, as use of the network increased due to both population growth and improved economic performance. The difference between the free-flow and congested travel times represents the total delay, or congestion, on the national road network. This congestion occurs on sections of the network where demand exceeds capacity causing levels of service on those sections to decline.[18] Across the period, free-flow traffic travel time increased from 132.5 hours to 135.2, while congested travel time increased from 144 hours in 2014 to 150.4 hours in 2019.

Figure 11: Time to Travel National Road Network, AM, 2014 to 2019



Source: Transport Infrastructure Ireland
Note: Figures are measured in Hours

The population is expected to grow by 1 million people by 2040.[19] With an associated increase in economic activity, the demand to use the national road network will increase significantly over time resulting in increased congestion. Increased traffic will accelerate degradation, which will require the necessary protection and renewal funding to prevent reductions in journey times or levels of service on national roads. Near urban areas, measures to provide alternatives to travel by car and effectively

[18] i.e. traffic conditions move from free-flowing or stable flow to unstable flow and flow breakdown.
[19] Project Ireland 2040 https://www.gov.ie/en/campaigns/09022006-project-ireland-2040/

manage demand on the network can address deterioration in performance. There also remain sections on the interurban network that require investment to upgrade the road standard to facilitate more efficient operation of the network.

4.5 Conclusion

The national road network is an extensive piece of vital public infrastructure, spanning 5,300km and carrying 46 percent of all passenger road journeys within the State. Protection and renewal of the network is overseen by TII and delivered in a variety of ways: by TII directly, by local authorities who receive payments from TII in respect of roads within their jurisdiction, and by PPP operators to contractually defined standards. Broadly speaking, the national primary road network is maintained by TII or through PPP agreements while the national secondary road network is maintained by local authorities.

Protection and renewal work involves a range of activities, such as inspections, maintaining pavements, bridges, drainage, safety barriers, improvement, and rehabilitation of assets. Over time, the network will degrade and deteriorate due to a range of factors, such as increased traffic, the composition of vehicles using the network, and environmental causes such as freezing and flooding. However, if protection and renewal occurs at an early stage, the network can be sustained at a higher quality for reduced cost.

There has been an upward trend in protection and renewal investment over time, albeit it with a period of decline in the mid-2010s following the financial crisis. In 2020, a total of €491m was spent on protection and renewal work overseen by TII directly or delivered by local authorities compared with €259m in 2007, an increase of almost 90 percent in nominal terms. The composition of this expenditure has evolved over time, with the share accounted for by current expenditure steadily declining from 20.0 percent in 2007 to 7.1 percent in 2020. These figures do not reflect protection and renewal activity delivered by PPP operators, which is likely to represent a substantial proportion of the amount TII spends each year on operational and availability payments.

This increase in investment is reflected in pavement quality across the network. From 2014-2020, the proportion of motorways and dual carriageways with pavement quality classed as fair or better grew from 93 percent to 97 percent, while the comparable increase for national roads in urban areas was from 84 percent to 91 percent. The greatest increase was recorded for legacy pavements, with the proportion with fair or better pavement condition growing from 75 percent to 90 percent. While road safety is attributable to more factors than simply pavement quality, such as RSA safety campaigns, fatal collisions on the national roads network have declined as pavement quality has improved. In 2020 there were 50 such collisions, compared with 66 in 2014 and 83 in 2010. On the other hand,

congestion the network has worsened in recent years, with the aggregate length of time it would take to travel the entire length of the network in congested AM conditions growing by 4.4 percent between 2014 and 2019, from 144.0 hours to 150.4 hours. While adequate protection and renewal can contribute to improved journey times, however, this increase is likely to represent capacity issues on parts of the network as travel demand has grown.

5. Regional and Local Road Network

Regional and local roads serve an essential social and economic function across the State. They link communities to services, support rural and regional development, connect local areas and their hinterlands, and feed into the national road network. In total the regional and local road network is approximately 96,000km long, comprising 94 percent of all roads and facilitating an estimated 54 percent of all road traffic in the State.[20] This network of 83,000km local roads and 13,000km regional roads varies from multi-lane urban and interurban arterial roads to single lane roads through remote rural areas.

5.1 Delivery of Protection and Renewal

Regional and local roads are managed and maintained by local authorities. This involves operating, maintaining, and improving the roads in their jurisdiction to ensure they are in adequate condition. Protection and renewal investment includes pavement strengthening, preventative surface dressing, climate adaptation and resilience works, drainage works, bridge rehabilitation and safety works. It is a significant network of national infrastructure for local authorities to manage, in both the short and long term, given its importance in facilitating economic activity and movement of people.

Regional and local roads are funded through a combination of Exchequer sources, such as grants from the Department of Transport or Project Ireland 2040 strategic funds, and non-Exchequer sources, such as local authorities' own resource income. In relation to protection and renewal of the network specifically, as opposed to the development of new or improved infrastructure, Department of Transport grants and local authorities' own resources are the only funding used for this purpose.

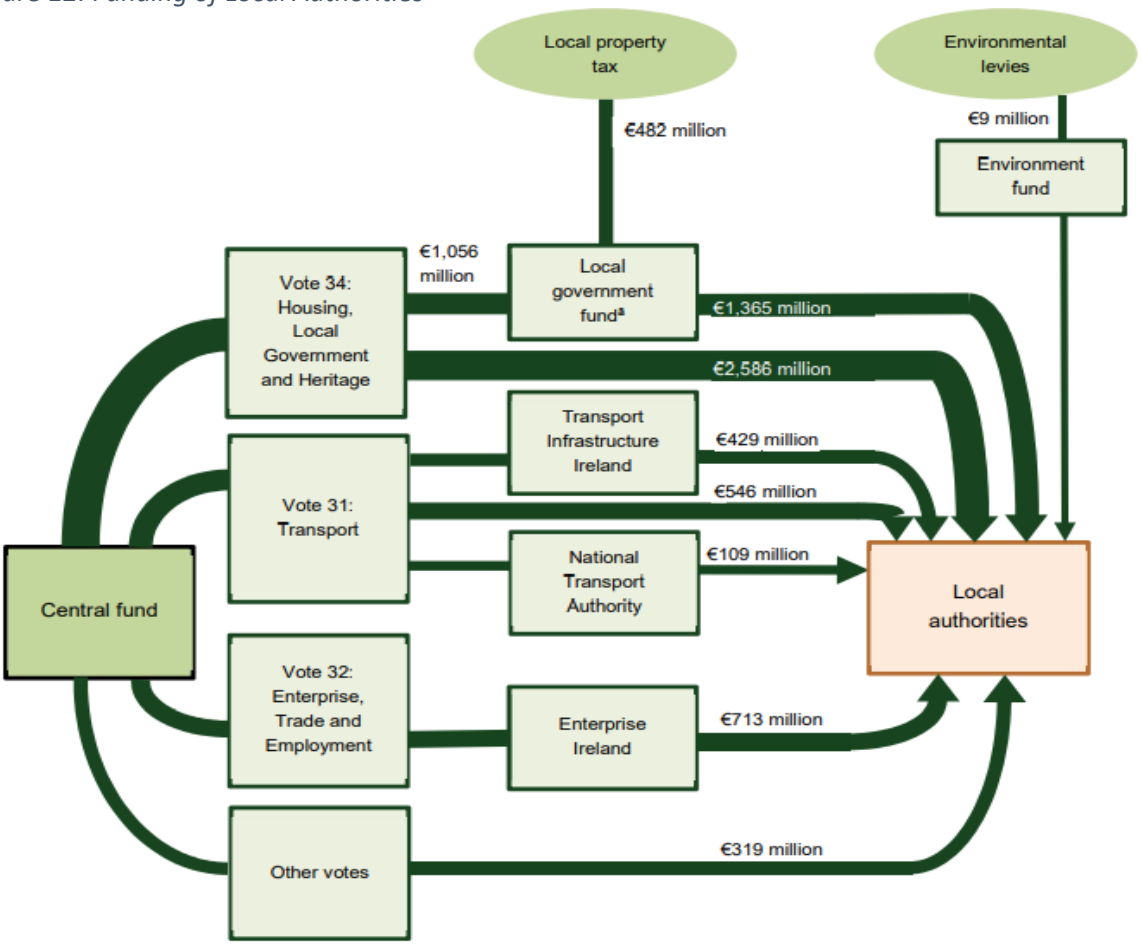
While local authorities invest in protection and renewal from their own resources and high-level figures regarding this are available, the Department of Transport does not hold a detailed breakdown of how precisely this money is spent each year. The figures that are available are somewhat broader than strictly protection and renewal and include associated costs such staffing, offices and other overheads. For this reason, grants allocated to local authorities by the Department of Transport are the primary focus of this section.

Figure 12 shows the various means by which local authorities are funded, although as highlighted only Department of Transport grants and own resources are invested in the protection and renewal of the regional and local road network. It should also be noted that TII's role in the funding of regional and local roads is only as the payment agent for grants using its Payment Reporting System, which it possesses for the purpose of distributing grants to local authorities in respect of national roads. TII

[20] Regional and Local Roads, Department of Transport, Government of Ireland, 2019

does have a consequential role in funding local authorities in respect of national roads, as discussed in the previous section.

Figure 12: Funding of Local Authorities



Source: Reports on the Accounts of the Public Service 2020, Office of the Comptroller and Auditor General

Targeted Department of Transport grants were introduced in the mid-1990s to ensure priority work was addressed in a systematic way by local authorities. They are intended to supplement realistic contributions from each local authorities' own resources.[21] Due to the high level of own resource income generated by the four Dublin local authorities, they do not receive Departmental grants for road maintenance. Grants are allocated each year for specific purposes and the three main categories of grant are: Restoration Improvement, Restoration Maintenance, and Discretionary Grants. These are allocated on a pro-rated basis determined by the length of a local authority's regional and local road network which "is seen as the most equitable basis for allocation grants".[22,23] The Memorandum on Grants for Regional and Local Roads sets out the conditions attached to grants, with local authorities required to prioritise maintenance work based on road condition ratings across the local authority area.

[21] Regional and Local Roads, Department of Transport, Government of Ireland, 2019
[22] Local and regional road network length is revaluated every 6 to 10 years, which can result in changes in road length in jurisdictions.
[23] https://www.gov.ie/en/publication/5cd20d-regional-and-local-roads/

Given the range of funding provided for maintaining the regional and local road network, the Roads Management Office (RMO) was established in 2014 to provide support to local authorities in the efficient management of the network, promote consistency in road investment and maintenance, and improve road asset management.[24] This is done with support from the Local Government Management Agency (LGMA). The RMO estimates the regional and local road network has an asset value in excess of €56bn, with over €6.1bn in Department of Transport grants invested in the maintenance of the network since 2007.[25]

The Department of Transport has sought to improve the management of the regional and local road network by sponsoring and funding the development of the Road Asset Management System, or MapRoad. MapRoad is linked to the grants allocated, and local authorities are required to submit full details of all proposed road pavement works to the Department of Transport using the system. This must set out start and end points for each proposed project, the condition rating for each road section before maintenance, and the proposed maintenance work. Full details of the completed projects must also be submitted to the Department of Transport at the end out the year, including the condition rating of the road following works. This information forms the basis for the National Oversight and Audit Commission (NOAC) performance reports each year.

Local authorities raise income through a variety of mechanisms which can then be allocated for local services, including protection and renewal of the regional and local road network. They charge for services provided locally, such as parking, and levy rates on commercial property, which is the single largest income source for local authorities.[26] They also generate income from setting rates on housing in their area, using Local Property Tax (LPT).[27,28] Of the total amount of LPT collected, local authorities currently retain 80 percent for funding local services, while 20 percent is collected into the Local Government Fund (LGF), which is a central funding source administered by the Department of Local Government. This current model of the LGF is due to be phased out from 2023 and 2024. Where local authorities are in a surplus position the surplus is redistributed to other authorities,[29] while each authority receives funding calculated with reference to their base funding requirement.[30] Local authorities can also borrow funding, but this requires Ministerial sanction.[31]

[24] The Roads Management Office operates as a shared service for local authorities, with several local authorities contributing resources.
[25] http://www.rmo.ie/about-us.html
[26] An Overview of Commercial Rates in Local Authorities, Value for Money Unit, Local Government Audit Service.
[27] Some exemptions to the local property tax exist, such as homes damaged due to pyrite or if owned by a charity or public body.
[28] The local property tax is paid from the Local Government Fund to local authorities
[29] A surplus is considered when a local authority's 80 percent LPT is greater than their base funding requirement
[30] Reports on the Accounts of the Public Service 2019, Officer of the Comptroller and Auditor General
[31] An Overview of Interest Only Loans in Local Authorities, Value for Money Unit, Local Government Audit Service, 2019

5.2 Inputs: Expenditure

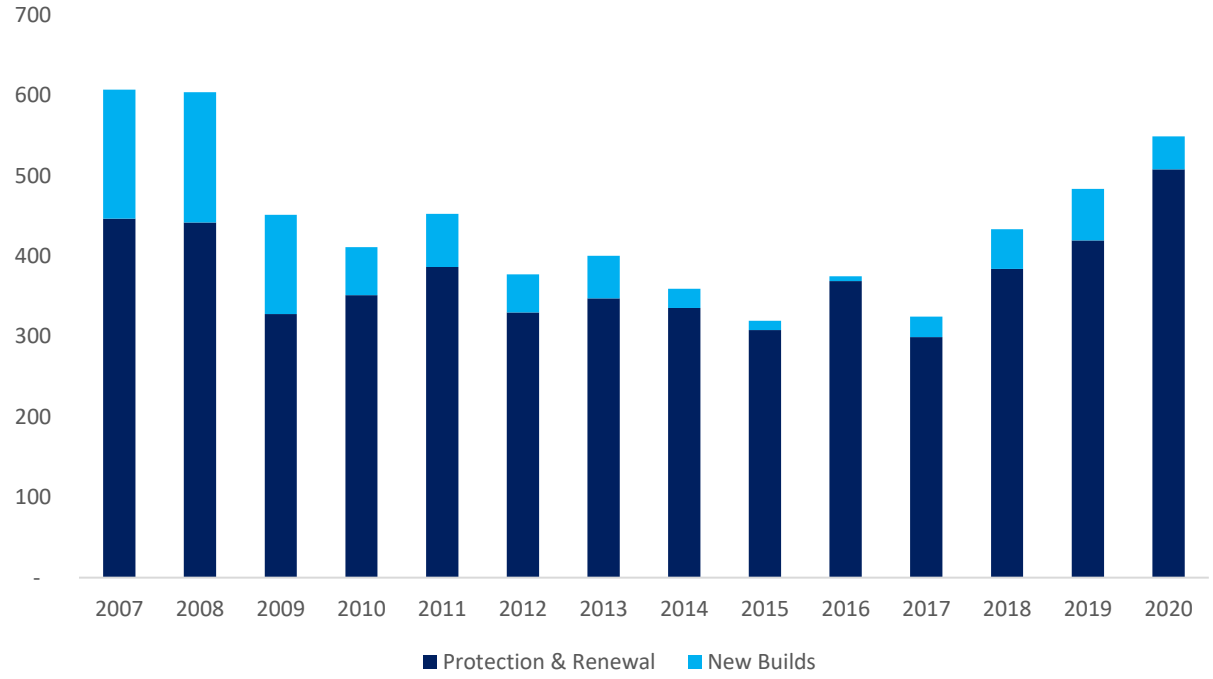
Figure 13 sets out the annual value of grants allocated to local authorities by the Department of Transport in respect of their regional and local roads since 2007. Following a period of decreased investment following the financial crisis, the value of grants allocated has been growing in recent years and in 2020 stood at €549m. While this falls short of the €608m allocated in 2007, 2020 marked a new high for investment in protection and renewal of the network at €508m, or 92.5 percent of the total value of grants allocated. By comparison, 73.5 percent of the overall allocation was earmarked for protection and renewal in 2007. Over time, the split between new investment and protection and renewal has increasingly been rebalanced in favour of protecting and renewing existing assets. On average across the period, approximately 10 percent of investment has been in new projects while 90 percent has been in protecting and renewing the existing network. From 2007 to 2020, the amount allocated to protection and renewal increased by 13.6 percent in nominal terms, while for new projects it fell by 74.5 percent.

Within this overall allocation, the amount of current expenditure has declined in the past decade or so. From 2015 to 2020 the amount of current expenditure within grants allocated on the regional and local road network averaged €45m, compared with a comparable spend of €134m in 2008. The continuing low level of current funding has resulted in essential protection and renewal works which would historically have been funded through current expenditure now being funded from capital expenditure instead.

Despite recent overall funding increases, historic underinvestment has led to a backlog of regional and local road protection and renewal works to be completed. Research undertaken in support of NIFTI estimated the Exchequer share of steady state capital costs on the regional and local road network to be €630m in 2018.[32] However, this was based on the simplifying assumption that the network existed in an adequate condition to start with which, in many locations, is not the case. Based on preliminary findings from ongoing surveying, it is estimated that the backlog of works across the network would cost in excess of €5bn to fully address.

[32] National Investment Framework for Transport in Ireland, Background Paper 6: Protection and Renewal

Figure 13: Department of Transport Regional and Local Roads Grants



Source: Dept of Transport Payment Booklets 2007-2020. Note: 'New Builds' includes Strategic Regional and Local Roads, New Strategic Regional and Local Roads, and Specific Improvement Grant allocations. Figures measured in € million.

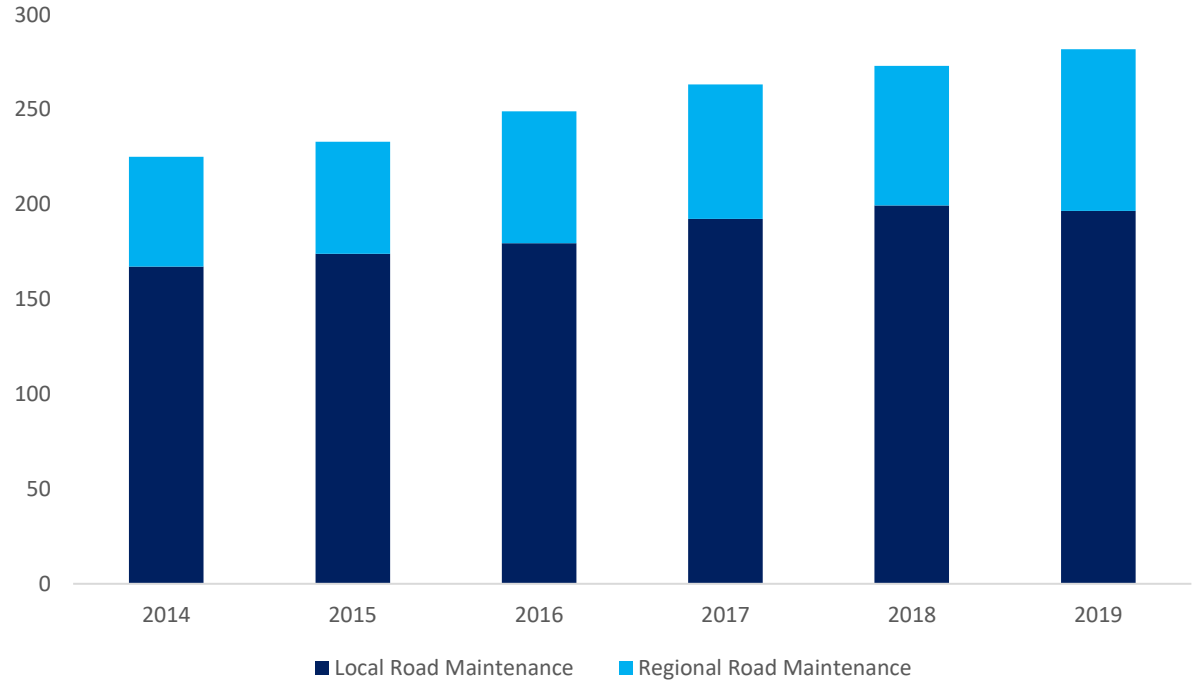
While funding inevitably declined following the financial crisis, the result is that the quality of the network has dropped towards the essential maintenance level. As investment levels recover, there is a need for a period of higher funding than the steady state amount to ensure the network is brought to the time-based preventative maintenance or condition-based preventative maintenance level. Failing this, protection and renewal investment is less effective and maintenance is not operating at an optimal efficiency level.

Furthermore, the length of the network can increase for reasons outside of the Department of Transport's control, such as local authorities taking in charge roads that are not currently part of the network or developing new road infrastructure from sources such as Project Ireland 2040 strategic development funds. This lengthening adds to the cost of protection and renewal and, along with other factors such as inflation and increased need for climate protection measures, means that there has been considerable upward pressure on protection and renewal costs since 2018.

As noted, local authorities are also involved in funding the protection and renewal of their regional and local road network. Figure 14 shows total reported expenditure by local authorities on the maintenance of regional and local roads from 2014 to 2019. However, it should be emphasised that unlike with Departmental grants where robust reporting requirements are attached to funding, the Department of Transport has no oversight of local authority own resource expenditure on roads or the extent to which this funding goes towards the actual protection and renewal of road pavement.

Department of Transport grants do not cover certain costs such as salaries of technical grades, the repair and maintenance of equipment, and the operation and maintenance of offices and depots. Therefore, the high-level figure for local authorities' own resource investment in protection and renewal must fund a range of items in addition to direct pavement maintenance. It should not be interpreted as being entirely additional to the Department's investment in protection and renewal. Furthermore, the amount of own resources dedicated to protection and renewal can vary significantly across authorities.

Figure 14: Reported Local Authority Own Resource Road Maintenance Investment, 2014 to 2019



Source: Local Authority Financial Statements 2014-2020, Department of Housing, Local Government and Heritage.
Note: Figures measured in € million.

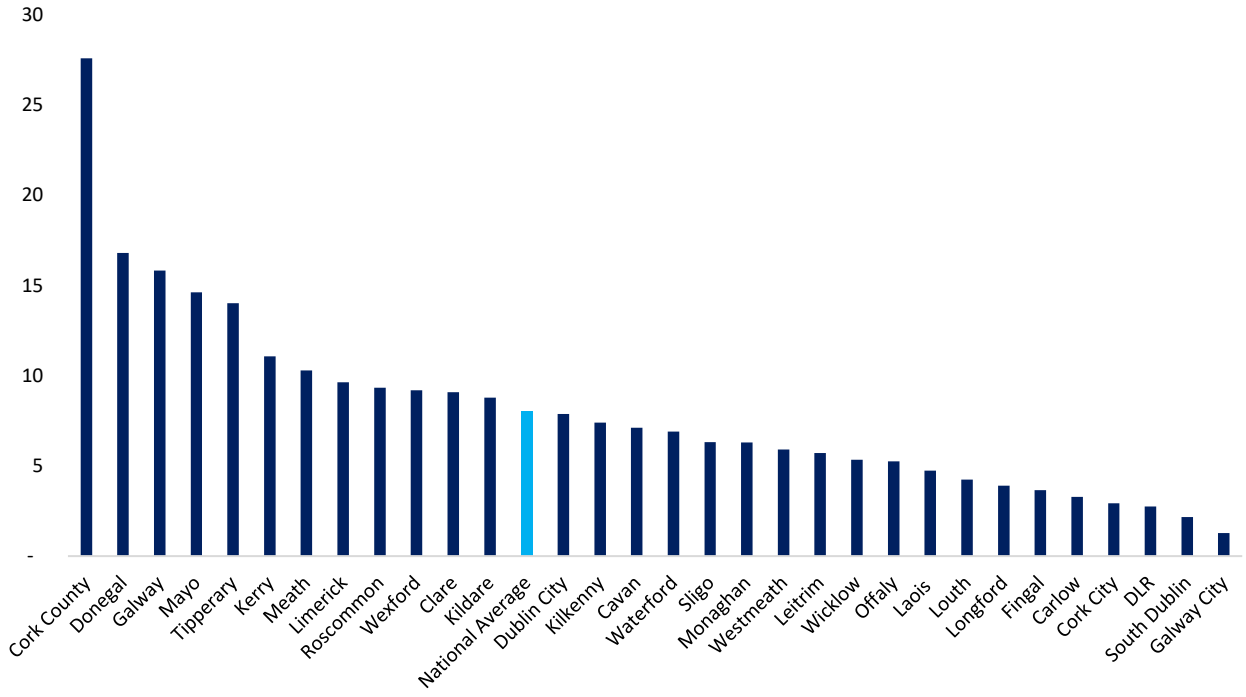
Total local authority own resource expenditure categorised under roads is estimated to have increased from a total of €225 million in 2014 to €282 million in 2019. Within this, expenditure on regional roads increased from €58 million in 2014 to €85 million in 2019, while for local roads the increase was from €167 million to €199 million.

Figure 15 shows average annual expenditure on regional and local road maintenance by local authority from 2016 to 2019 as reported by NOAC. As Departmental grants are allocated each year based on the length of the road network in a county, larger counties with more extensive road networks tend to have the highest levels of expenditure. Local authorities with the lowest expenditure are those with smaller regional and local road networks, and are predominantly urban, city-based councils.

In total, 12 of the 31 local authorities spent more on maintaining regional and local roads than the national average across the period. The local authorities with the highest average annual expenditure

were Cork County (€27.6 million), Donegal (€16.8 million) Galway County (€15.8 million), and Mayo (€14.6 million). The average length of the regional and local road network across these counties is approximately 3,725km. The local authorities that spent least on maintain regional and local roads were Cork City (€2.9 million), Dún Laoghaire-Rathdown (DLR) (€2.8 million), South Dublin (€2.2 million), and Galway City (€1.3 million). The average length of the regional and local road network across these four local authorities is 410km. Extreme caution should be used when interpreting these figures, however, as Departmental grants and own resource expenditure may not simply be additive for the reasons set out above. Furthermore, while local authorities are required to use the MapRoad system (from which NOAC takes its figures) in respect of Departmental grants, the use of the system for own resource investment is inconsistent across the country. Consequently, the figures reported by NOAC may be an undercount in certain cases.

Figure 15: Average Annual Protection and Renewal Expenditure by Local Authority, 2016 to 2019

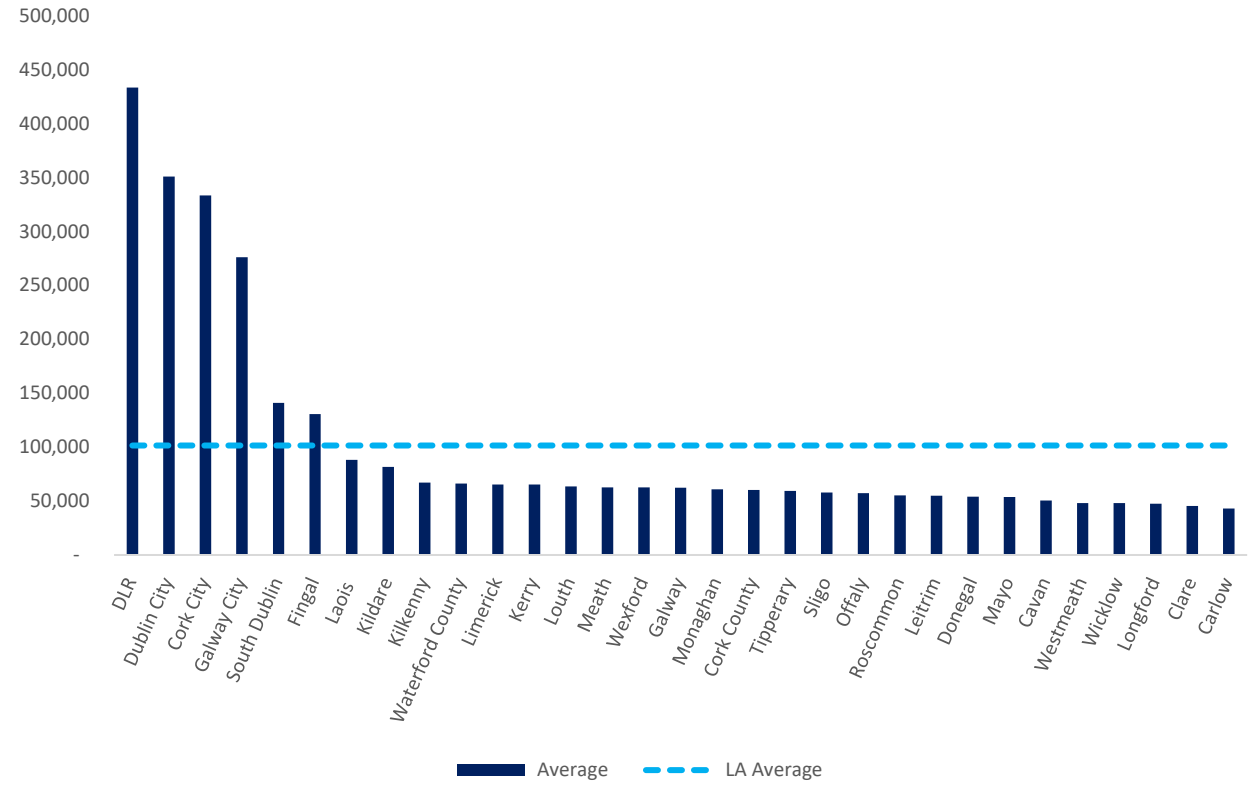


Source: National Oversight and Audit Committee, Local Authority Performance Indicators 2016-2019
Note: Maintenance expenditure is measured in millions of euros.

Average maintenance expenditure per kilometre from 2016 to 2019, across all local authorities, is approximately €102,000 (Figure 16). Of the 31 local authorities, 25 are below this average cost of maintenance, with six spending above the average. However, the six local authorities that spend most per kilometre of maintenance are all city councils in highly urbanised areas, where the cost of protection and renewal is significantly higher given traffic volumes on the network and disruption associated with conducting works. Dún Laoghaire-Rathdown (DLR) had the highest maintenance cost per kilometre at €415,000, followed by Dublin City (€356,000), Cork City (€332,000), Galway City

(€300,000) and South Dublin (€142,000) councils. The local authorities with the lowest cost of maintenance per kilometre were Leitrim (€43,000), Westmeath and Clare (€41,000), Longford (€40,000) and Roscommon (€35,000).

Figure 16: Average Cost of Protection and Renewal per Kilometre by Local Authority, 2015 to 2019

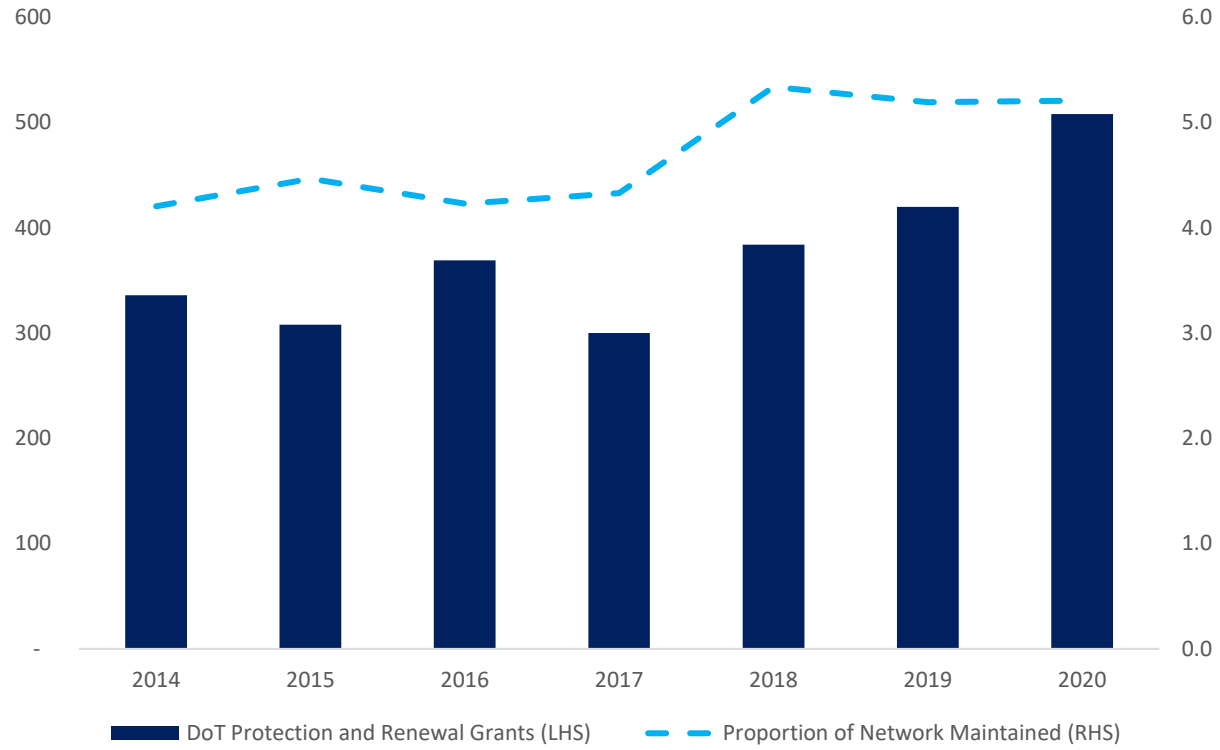


Source: National Oversight and Audit Committee Performance Indicator Reports 2014 to 2019.
Note: Authors' calculations from total regional and local road expenditure and total regional and local road lengths reported as maintained. Maintenance expenditure is measured in euros

5.3 Outputs: Activity and Pavement Quality

Figure 17 shows Departmental grants for protection and renewal of regional and local roads from 2014 to 2020 along with the corresponding proportion of the network maintained each year. As investment has increased in recent years, so too has the proportion of the network maintained each year, with an annual average of around 5.2 percent of the network maintained each year from 2018 to 2020 compared with an average of 4.3 percent from 2014 to 2017. Assuming the same sections of road are not revisited, the increased proportion of the network maintained annually in recent years would see the entire network subject to protection and renewal approximately every 19 years, compared with every 23 years at the 2014 to 2017 level of activity.

Figure 17: Protection and Renewal Investment and Activity, 2014 to 2020



Source: National Oversight and Audit Committee, Department of Transport Payment Booklets 2014-2020.
Note: Expenditure is measured in millions of euros, Maintenance is measured in percentages (%)

Local authorities and the Department of Transport assess the quality of a sample of the regional and local road network annually using the Pavement Service Condition Index (PSCI). Pavement condition is scored on a 10-point scale considering the number of structural defects, where point 1 indicates severe deterioration and point 10 indicates the road is in perfect condition (further detail Appendix 4). This methodology was established in 2014 and indicates the current condition of the road and the associated level protection and renewal work to bring the road up to an adequate state. To ensure an optimal lifespan:

- Rural roads need to be surface dressed every 10 years on average. Urban roads require a more expensive type of surface treatment at a similar interval.
- Roads with a fully designed pavement need to be strengthened/overlaid every 20 years on average. A road with a legacy pavement will have a shorter life.

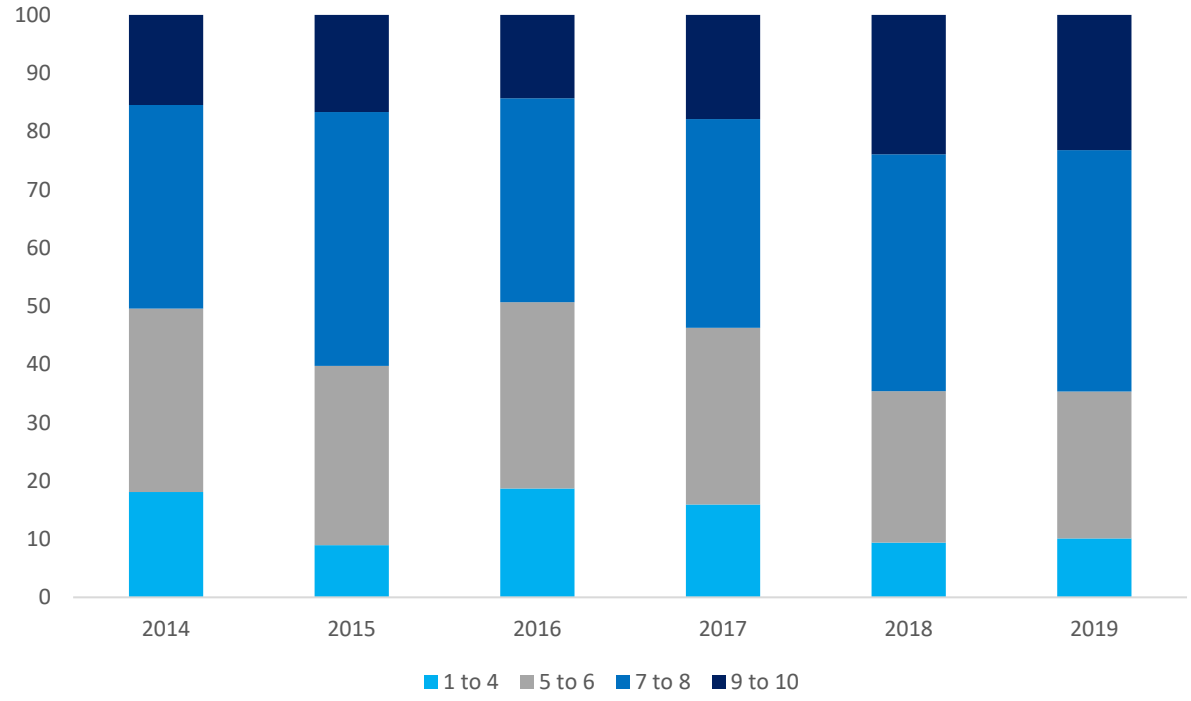
Given this, key metrics for the protection and renewal of the network are the length of pavement resealed each year and the length improved/strengthened. Length of road pavement resealed refers to the length of road pavement surface dressed. This work maintains or restores waterproofing of the pavement surface and provides improved skid resistance to pavements with surface defects present. The purpose of this is to protect the structural integrity of the road. A core aspect of this treatment is

to maintain the asset before it requires improvement. To be most effective, road resealing should ideally be undertaken when the road surface is in quite good condition, i.e., with PSCI rating of 8 or 7.

Length of road strengthened/improved is where more extensive rehabilitation and strengthening works are required (PSCI rating in the range from 1 to 6). Different types of works are required depending on the PSCI rating. Works can include surface restoration to carry out localised repairs such as pothole patching, surface treatment or thin overlay, structural overlay to strengthen the road which can involve excavating and replacing sections of the road pavement, and road reconstruction which requires full depth reconstruction with extensive base repair.

Figure 18 shows the results of PSCI assessments from 2014 to 2019 for local roads.[33] The proportion of local roads with severe structural defects (PSCI of 1 to 4) decreased from 18 percent of the network in 2014 to 10 percent in 2019. Localised distress (PSCI of 7 or 8) increased from 35 percent in 2014 to 41 percent in 2019, while proportion of the network experiencing no defects increased from 15 percent in 2014 to 23 percent in 2019. This suggests the overall condition of the local road network is improving with time. However, this requires ongoing investment to ensure that these improvements are sustained into the long term.

Figure 18: Pavement Service Condition Index, Local Roads, 2014 to 2019

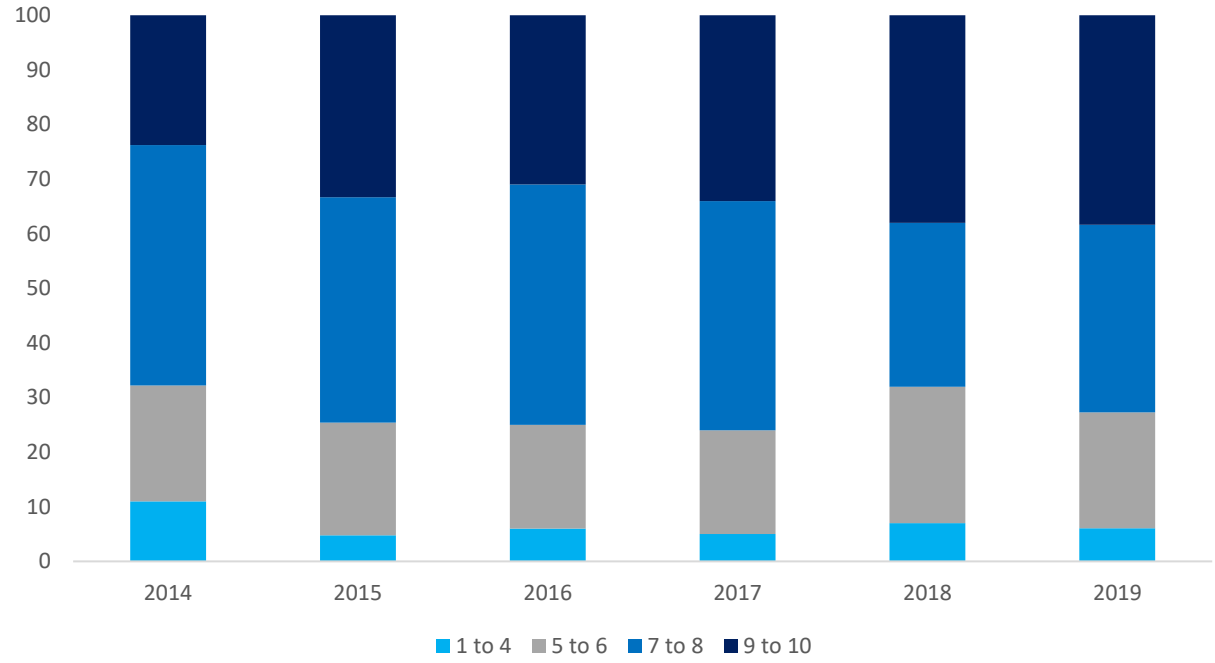


Source: National Oversight and Audit Committee (NOAC), Local Authority Performance Indicators Reports 2014-2019. Note: Discrepancies in total proportion reported are due to some local authorities not fully conducting PSCI in some years. Figures measured as percentages (%).

[33] Years with low responses from local authorities for local roads were adjusted to allow for an overall assessment out of 100 percent

Figure 19 shows the PSCI rating for regional roads from 2014 to 2019.[34] On average, 7 percent of regional roads in were categorized as having severe structural distress (PSCI of 1 to 4) across the period and this remained steady over time. The proportion of regional roads experiencing localised distress (PSCI of 7 or 8) decreased from 44 percent in 2014 to 34 percent in 2019, while the proportion of roads with no defects showed a robust improvement from 24 percent to 38 percent.

Figure 19: Pavement Service Condition Index, Regional Roads, 2014 to 2019



Source: National Oversight and Audit Committee (NOAC), Local Authority Performance Indicators Reports 2014-2019.
Note: Discrepancies in total proportion reported are due to some local authorities not fully conducting PSCI in some years. Figures measured as percentages (%)

Given that PSCI is dependent on local authorities conducting surveys of their roads, the low response rate in some years, such as 2014 (45 percent) and 2015 (63 percent) for regional roads, may reflect initial issues with the self-assessment methodology.[35] In 2014, just 5 of the 31 local authorities completed full surveys, with the remainder completing at least some of the necessary work. Reporting has, however, improved over time. There were full responses from 2016 to 2019, which suggests a more accurate representation of the condition of regional roads.

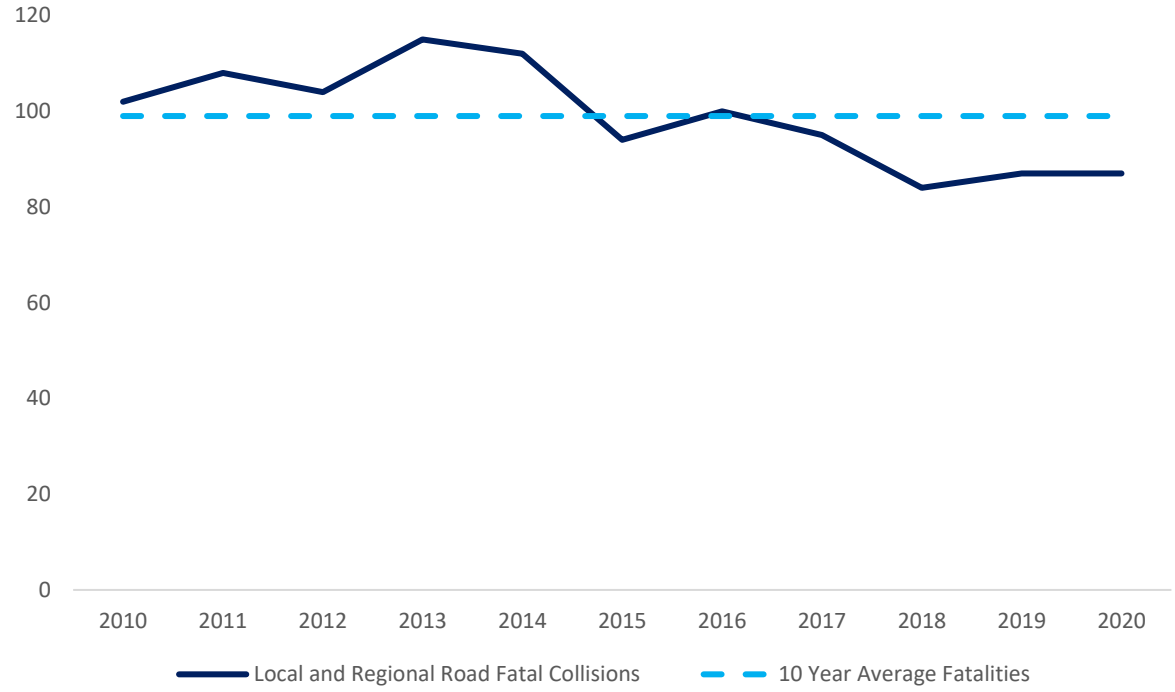
5.4 Outcomes: Road Safety

While the number of collisions is affected by several factors, such as road safety legislation and RSA public awareness campaigns, the condition of the road network is also an important consideration. Figure 20 presents annual statistics on the number of fatal collisions on regional and local roads from 2010 to 2020, and the average number of collisions over the decade.

[34] Years with low responses from local authorities for regional roads were adjusted to allow for an overall assessment out of 100 percent
[35] National Oversight and Audit Commission, Performance Indicators in Local Authorities 2014-2019

There were 102 fatal collisions on regional and local roads in 2010, rising to 115 in 2013. Fatal collisions have slowly decreasing since, to a low of 84 in 2018. There was then a slight increase to 87 fatal collisions in 2019 and 2020. Since 2013, then, there has been a 24.3 percent decrease in fatal collisions on regional and local roads. Across the decade, the average number of fatal road collisions was 99.

Figure 20: Fatal Collisions on Regional and Local Road Network, 2010 to 2020



Source: Transport Infrastructure Ireland National Road Indicators and Road Safety Authority Review of Fatal Collisions Reports 2010-2020.
Note: Regional and local road collisions are estimated as the difference between total accidents and accidents occurring on national roads.

5.5 Conclusion

The regional and local road network comprises approximately 96,000km of roads, 13,000km of which are regional roads and 83,000km of which are local roads. The network constitutes 94 percent of all public roads in the country and carries an estimated 54 percent of road traffic. Local authorities are responsible for managing the regional and local road network in their jurisdictions, conducting protection and renewal work to keep maintain the network's quality. This involves road pavement strengthening, preventative surface dressing, climate adaptation and resilience works, drainage works, bridge rehabilitation and safety works.

Protection and renewal funding is allocated in the form of Department of Transport grants each year, with local authorities receiving funding on a pro-rated basis determined by the length of the regional and local road network in the county. Local authorities are expected to make realistic contributions to protection and renewal out of their own resources also, and in the case of the four Dublin local authorities the level of own resourcing is sufficiently high that no Exchequer grants are allocated. However, while protection and renewal is generally funded from a mix of these two sources, the

Department of Transport does not have oversight of how local authorities spend own resource income and the breakdown of this expenditure between direct maintenance activities and other associated costs.

Following a period of particularly constrained investment following the financial crisis, overall Exchequer funding for protection and renewal works has increased in recent years, with the €508m allocated in 2020 exceeding the pre-crisis peak of €447m in 2007. Within this total, however, current expenditure is still at historically low levels—resulting in the diversion of capital investment—and there is now a much-reduced emphasis on the development of new infrastructure within the sector. The accumulated protection and renewal deficit, unanticipated additions to the network (such as local authorities taking in charge non-public roads), inflation, and increased need for interventions associated with climate change (such as August 2017 flooding in Donegal, which caused an estimated €15m in damage to the road network and led to a further €11m in flood relief schemes) all put upward pressure on the estimated investment necessary to meet steady state requirements.

As investment has increased in recent years, so too has the length of road maintained each year, which has reduced the length of time it will take to protect and renew the entire network from approximately 23 years to 19 years. There has also been robust improvement in pavement quality since 2014, and if recent investment trends are sustained it should see more of the network move out of the level of essential maintenance and towards the time- or condition-based preventative maintenance levels. Increases in the quality of the network also appear to be borne out by improved road safety since 2013, although attributing this improvement to any specific factor is not straightforward.

6. Heavy Rail Network

Irish Rail operates the heavy rail network for passengers and freight services in Ireland. It runs diesel-powered intercity and regional rail passenger services, as well as Dublin Area Rapid Transit (DART) services on electrified track. Across the network there are 147 passenger stations, approximately 2,000km of operational track, 14 tunnels and over 4,400 bridges, all of which require ongoing maintenance to facilitate rail services. In addition, there are approximately 2,500km of closed or abandoned track which may require some maintenance investment to ensure safety, such as the repair of bridges.[36]

Rail infrastructure requiring protection and renewal is defined in national legislation as encompassing, among other things, rail track and track beds, safety, signalling and telecommunication installations, level crossings, civil engineering structures, buildings, and power installations. Since 2014 Exchequer funding for the protection and renewal of the network has been provided through the Infrastructure Manager Multi-Annual Contract (IMMAC), which is a requirement of EU and Irish legislation. Given the introduction of the IMMAC in 2014, and the lack of comparability between how protection and renewal activity is delivered under this structure compared with previously, this section will focus on the period following 2014. Furthermore, it is important to note that the Infrastructure Manager is functionally separate from the Railway Undertaking arm of Irish Rail, which is responsible for the delivery of services and is held to account through the Public Service Obligation structure. This section is focused on the activities and performance of the Infrastructure Manager.

Funding requirements for the protection and renewal of the network were most recently examined as part of the development of the IMMAC 2020 to 2024, which now provides appropriate Exchequer funding for the entire period, which was not the case with IMMAC 2014 to 2018. The IMMAC also sets out a range of key performance indicators in relation to the condition of infrastructure and the performance of services which the Infrastructure Manager is accountable for delivering.

6.1 Delivery of Protection and Renewal

Under EU regulations, Member States must separate the provision of rail infrastructure from the provision of rail services. In Ireland, this has been achieved by implementing a functional separation within Irish Rail between the Railway Undertaking arm, which provides services, and the Infrastructure Manager arm, which maintains the network. The regulations also require that the Infrastructure Manager enter into a contractual agreement with the Minister for Transport, with this agreement lasting for at least five years and setting out, among other things, the capacity allocation and access

[36] Rail Review Report, National Transport Authority, Iarnród Éireann, 2016

charging regime for use of the network. Under normal business conditions, the profit and loss of the Infrastructure Manager must at least balance over a five-year period, i.e., expenditure on the network must not exceed income from access charges and state funding. These regulations and requirements form the basis of the IMMAC structure.

As a general performance standard, the IMMAC requires that the Infrastructure Manager at all times provides railway infrastructure in an efficient, effective and safe manner and by appropriate qualified personnel. Key performance indicators are established annually, taking into account the current state of the network and funding available, and penalties and incentives can be applied depending on performance against these indicators. The objectives of the KPIs and penalties for persistent failure to perform are to ensure that the network meets the expected quality given available funding, and also to provide a mechanism whereby the Minister can attain meaningful recognition of any inconvenience or loss resulting from the Infrastructure Manager failing to deliver on its contractual obligations. Conversely, better than target performance on one KPI can be used to offset penalties in others, encouraging and rewarding improved performance.

The Commission for Railway Regulation (CRR) was established in 2016 with the aim of ensuring national alignment with EU regulations and directives. It is an independent body with a supervisory role, monitoring State-funded expenditure on rail infrastructure, overseeing the track access allocation and pricing regime, and preparing an annual report on the Infrastructure Manager's performance to the Minister for Transport. The CRR also produces a quarterly report on the Infrastructure Manager's performance against the IMMAC KPIs and holds meetings with the Infrastructure Manager and Department of transport to review and discuss performance against the agreed criteria in the previous quarter.

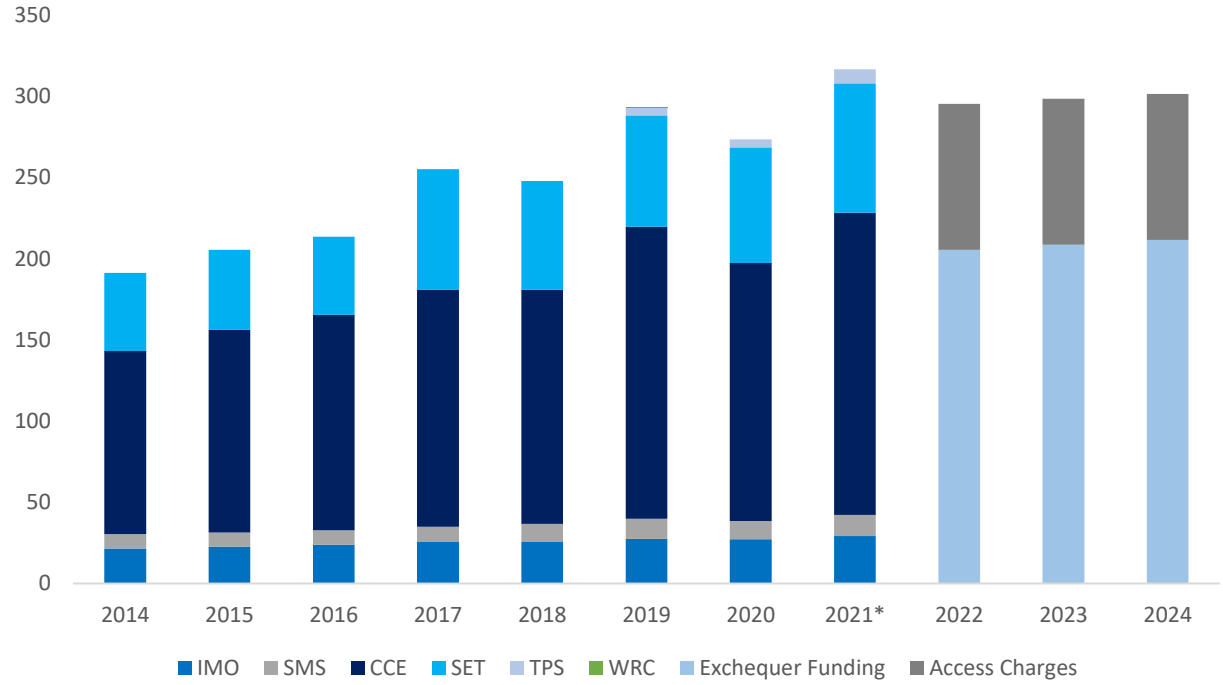
6.2 Inputs: Expenditure

Within the Infrastructure Manager there are four business units with responsibility for distinct elements of protection and renewal activity. Infrastructure Manager Operations (IMO) is responsible for train control operations and is the interface been railway undertakings and the rail network. Safety Management Systems (SMS) manages safety and ensures compliance with relevant national and EU legislation. The Chief Civil Engineering (CCE) department is organised on a regional basis and is responsible for the protection and renewal of civil engineering infrastructure. Finally, the Signalling, Electrical and Telecommunications (SET) department is responsible for the maintenance and renewal of these systems and is also organised on a regional basis.

Figure 21 shows the breakdown of the IMMAC allocation to each of these functional areas from 2014 to 2018. For the period from 2020 onwards, committed investment from Government and forecast

access charges are shown, from which the different business units will be funded. From 2014 to 2018—the first IMMAC period—total protection and renewal investment grew from €191m to €248m, an increase of €57m or 29.5 percent. Civil engineering accounted for the greatest share of this investment, averaging €132m annually across the period. This is followed by signalling, electrical and telecommunications investment, which averaged €57m, and operations, which averaged €24m. Finally, safety management systems averaged €9m in annual investment.

Figure 21: Breakdown of IMMAC Investment, 2014 to 2024



Sources: Review of the Infrastructure Manager Multi-Annual Contract 2014 to 2018; Iarnród Éireann Annual Report 2019
Note: Figures measures in millions of euro. * Figures for 2021 are a Forecast

The investment increase seen over the life of the previous IMMAC has been sustained and built upon as part of the current IMMAC running from 2020 to 2024. Government has committed to fully fund protection and renewal on the rail network for the duration of this contract, with an annual Exchequer contribution averaging €204m. The remainder will be raised by the Infrastructure Manager through access charges, which will average €89m during this period. In combination, this will see protection and renewal investment reach €301m in 2024, an increase of €110m, or 57.6 percent, on 2014 when the IMMAC was introduced.

6.3 Outputs: Asset Maintenance

Derailments, collisions and other infrastructural issues all pose safety dangers. Protection and renewal investment aims to mitigate such incidents and repair damaged assets. Research indicates that the main causes of train derailments are broken rails, welds, and speed changes on the track.[37] [38] They can

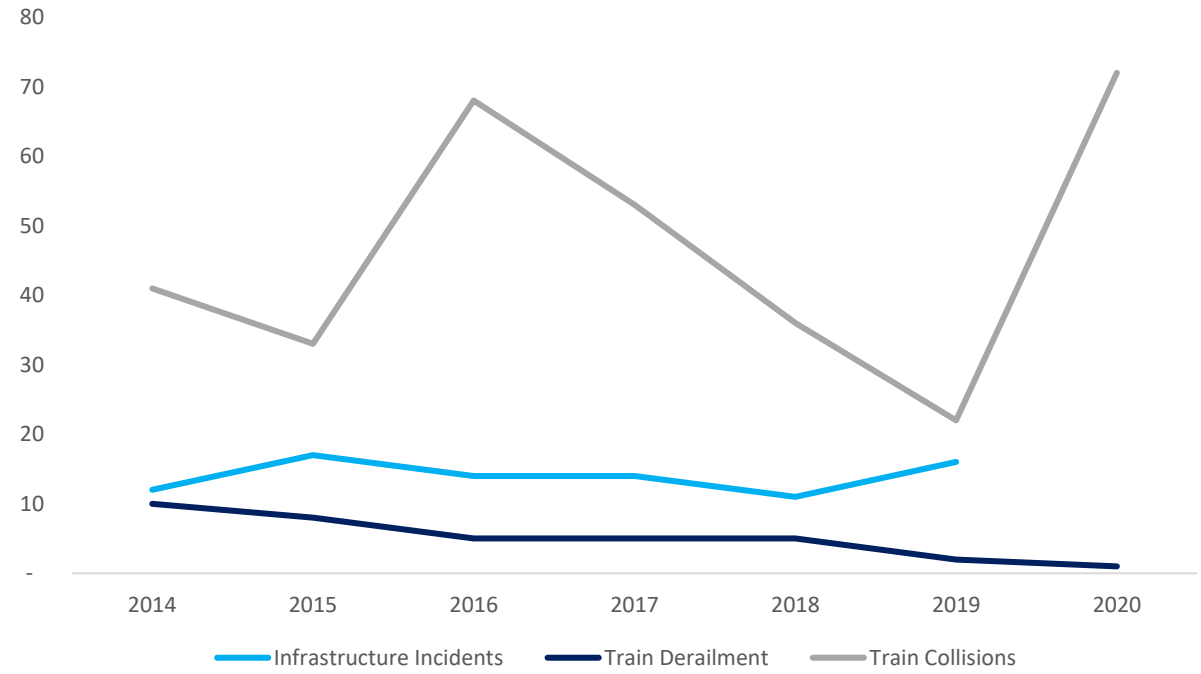
[37] Analysis of Causes of Major Train Derailment and Their Effect on Accident Rates, Liu, Saat and Barkan, 2012
[38] https://www.bst-tsb.gc.ca/eng/stats/rail/2019/sser-ssro-2019.html#4.0

also occur in limited instances due to train speed, geometry of the track, rail head conditions and human error. Asset interfaces, such as level crossings, are also an important safety consideration, with the number of level crossing accidents, near misses requiring emergency braking, and bridge strikes all key indicators. There have been no fatal accidents at any of the 934 crossings across the country since 2010. With regard to collisions, the majority of these involve livestock or other objects on lines.

Figure 22 shows the trend in infrastructure incidents, derailments and collisions between 2014 and 2020. The number of annual collisions varied significantly across the period, recording a low of 22 in 2019 and a high of 72 in 2020. The number of derailments steadily declined from nine in 2014 to one in 2019. The number of other infrastructure incidents was relatively consistent year-on-year, going from 12 in 2014 to 16 in 2019, at an average of 14 annually.

Given that many of the 4,440 bridges on the network are over a hundred years old, they can be vulnerable to damage and collapse if they are impacted by bridge strikes or not properly maintained. Bridges can be broken down into two categories: a road transport bridge above a rail line, and a rail line bridge over a road. A bridge strike refers to a road vehicle striking the parapet or roadside containment of a bridge over a rail line or under a railway bridge. This can result in the misalignment of railway tracks, creating structural weakness to the bridge, or the derailment of trains. As maintenance assessments must be carried out to ensure the track is safe for travel. Such incidents can result in delays and affect the running of services. Due to the single-track nature of most of the network, such delays can have significant knock-on implications for services.

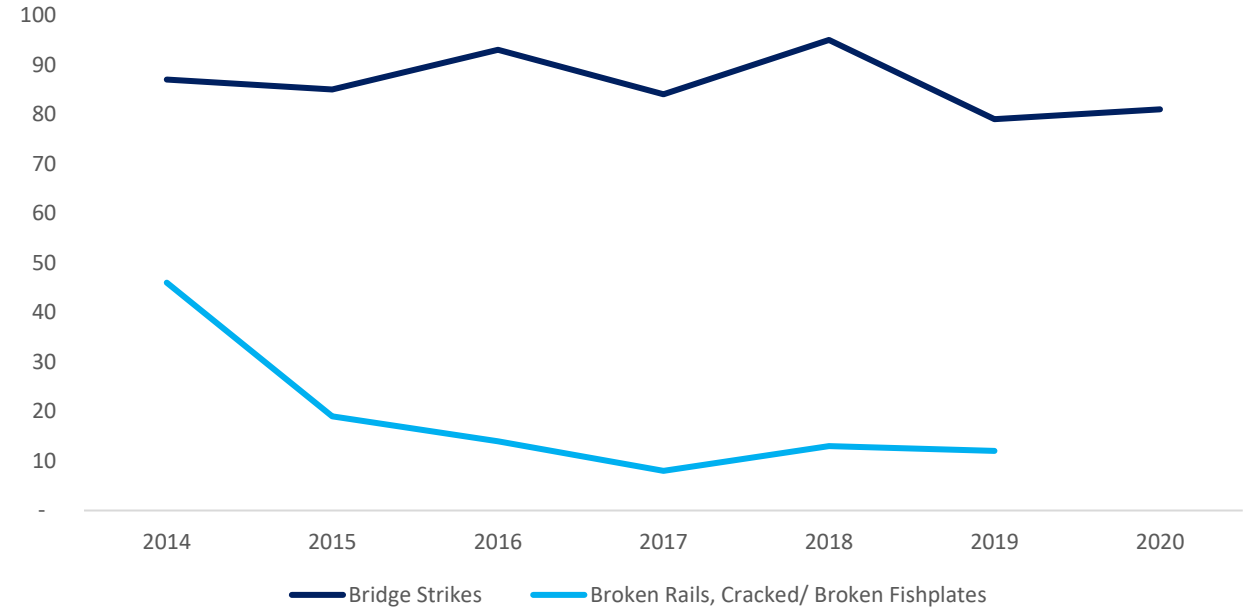
Figure 22: Infrastructure Incidents, Derailments and Collisions, 2014 to 2020



Source: Commission for Railway Regulation Railway Safety Performance Report 2019, Irish Rail Annual Accounts and IMMAC Report 2019

The railway track is visually inspected by personnel once per week, inspected using specialized equipment several times per year, and is subject to ultrasound testing at least once every two years. While broken rails are uncommon, repairing them is an important element of the Infrastructure Manager protection and renewal programme. Should a fishplate become cracked or broken, this can result in the rail line no longer being continuous, potentially leading to derailment.[39] Figure 23 shows between 2014 and 2019 there was a significant decline in the number of track issues identified in the form of broken rails and cracked and broken fishplates. In 2014, 46 issues were identified compared to 12 in 2019, with an annual average across the period of 19. Figure 23 also shows that the total number of bridge strikes decreased slightly from 85 in 2014 to 81 in 2020, at an average of 86 annually.

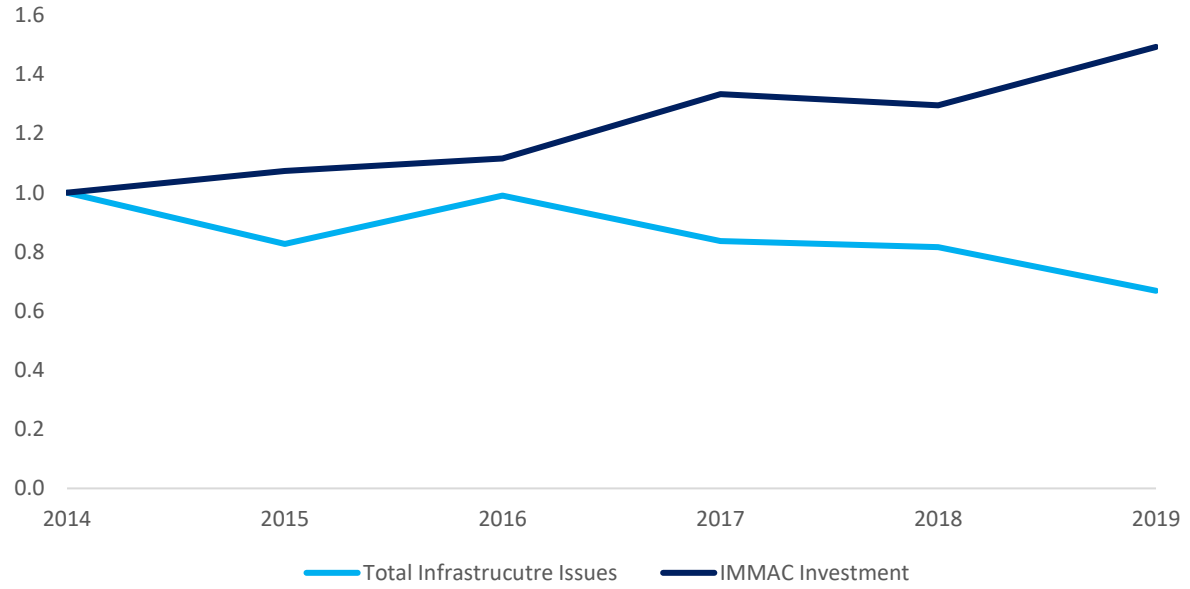
Figure 23: Bridge Strikes and Track Issues, 2014 to 2020



Source: Commission for Railway Regulation Railway Safety Performance Report 2019

[39] A fishplate is a special bolted connection on rail track which joins two pieces of rail track together.

Figure 24: Variation in Investment and Infrastructure Issues, 2014 to 2019



Source: Commission for Railway Regulation Railway Safety Performance Report 2019, Irish Rail Annual Accounts and IMMAC Report 2019
Note: 2014 =1

At an aggregate level, Figure 24 shows that as protection and renewal investment has increased since the introduction of the IMMAC in 2014, the number of infrastructure issues on the rail network has declined. Setting 2014 as the base year, there was a 49 percent increase in protection and renewal investment by 2019 in nominal terms and this corresponded with a 33 percent reduction in infrastructure issues. The negative correlation between the two trends suggests that the increased investment and performance targets set out in the IMMAC are having the desired impact of improving the performance and safety of the network.

6.4 Outcomes: Performance of Services

IMMAC 2020 to 2024 sought to strengthen and improve the performance monitoring system with the introduction of a tiered approach toward performance monitoring with the potential for imposition of penalties if performance against certain key performance indicators is deemed unsatisfactory. Appendix 3 sets out these performance indicators for the 2020 to 2024 IMMAC.

Punctuality is defined as a train arriving within 10 minutes of schedule for intercity and commuter services and within 5 minutes for DART services.[40] The PSO sets a requirement that a minimum of 90 percent of intercity services and 92 percent of DART services must be punctual.[41] While punctuality is not solely related to infrastructure and is affected by several factors more relevant to the Railway Undertaking arm of Irish Rail, such as timetabling, adequate protection and renewal is an important part of ensuring services run to time. NTA figures show that punctuality benchmarks were met for all

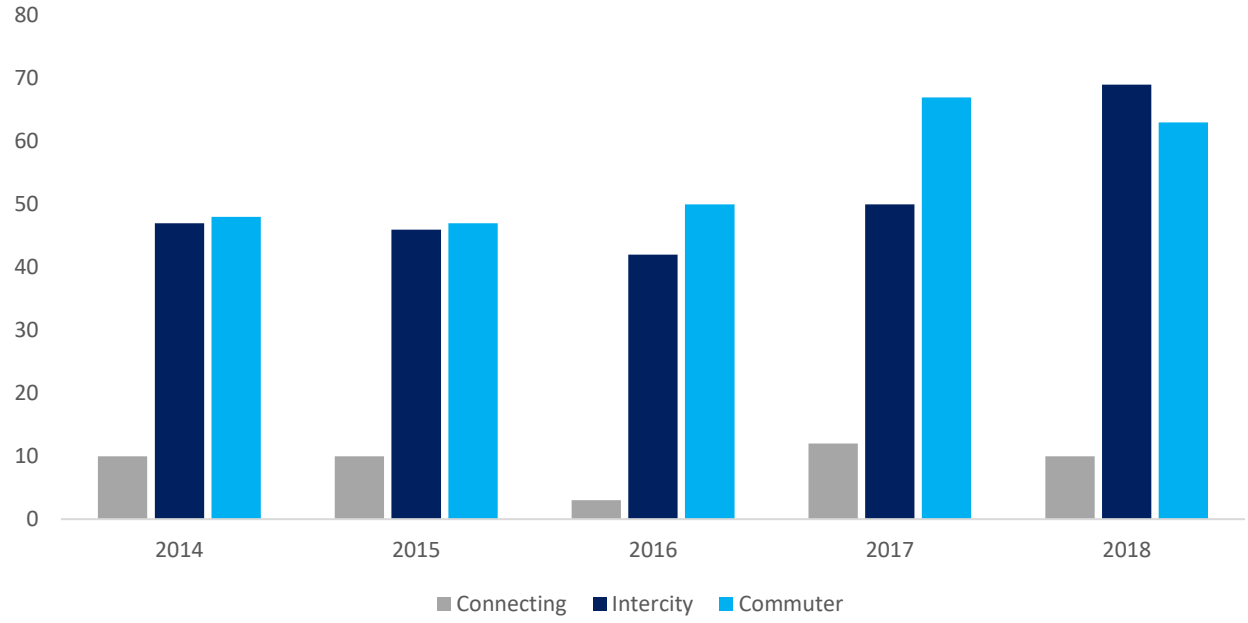
[40] https://www.irishrail.ie/en-ie/about-us/train-punctuality-reliability-performance/2012
[41] Schedule B Performance Obligations Iarnród Éireann 2011, National Transport Authority, 2012

intercity services in 2017 and 2020.[42] The DART fell short of its punctuality target in 2017 with 85 percent of services arriving within 5 minutes of schedule. However, this increased to 92 percent in 2020.

While punctuality refers to the timeliness of a particular train, another performance metric tracked under the IMMAC is aggregate delay across services as a whole. As with punctuality, delays can arise due to issues with the operations arm of Irish Rail or issues relating to infrastructure, such as signalling, power or track faults. However, the Infrastructure Manager is accountable for the latter category of delays through the IMMAC structure.

Figure 25 shows the aggregate delay minutes attributable to infrastructure issues from 2014 to 2018 for connecting, Intercity and Commuter services. The least level of variation across the period is seen for connecting services, which opened and closed the period with 10,000 minutes of annual delay. Within this, however, there was a notable reduction to 3,000 minutes in 2016. For both Intercity and Commuter services, the trend in delay was generally upward across the period. In 2014, Intercity services experienced 47,000 minutes of delay and this grew by 46.8 percent to 69,000 minutes in 2018. Delay on Commuter services grew from 48,000 minutes in 2014 to 67,000 minutes in 2017, then reduced slightly to 63,000 minutes in 2018—a 31.3 percent increase across the period. Total delay minutes across all three types of service grew from 105,000 minutes in 2014 to 142,000 minutes in 2018, an increase of 36.5 percent.

Figure 25: Aggregate Delay Attributable to Infrastructure Issues by Service, 2014 to 2018



Sources: Review of the Infrastructure Manager Multi-Annual Contract 2014 to 2018
Note: Measured in Thousands of Minutes.

[42] Intercity services all terminate in Dublin on one end and include the connections with Belfast, Cork, Galway, Limerick, Sligo and Waterford.

While delay generally increased across the period, it is important to note that the acceptable thresholds for delay for each type of service are set on an annual basis and in only two instances—for connecting services in 2017 and for Intercity services in 2018—were those thresholds breached. Increased delay on Commuter services, which include the DART, are also partially attributable to increased services level for the DART during this period.

6.5 Conclusion

Since the introduction of the IMMAC in 2014, investment in protection and renewal of the rail network has grown considerably, from €191m in 2014 to €291m in 2021. With Government committing to fully funding steady state requirements on the rail network for the duration of the current IMMAC from 2020 to 2024, total investment will reach €301m in 2024. The rail network itself comprises approximately 2,000k of operational track, 4,400 bridges, 147 stations and 14 tunnels, all requiring some degree of ongoing protection and renewal. In addition, a certain amount of basic maintenance must be performed on closed sections of the track to ensure public safety.

As funding has increased with the introduction of the IMMAC, the Infrastructure Manager is now accountable for delivering a range of output and outcome KPIs, and this is overseen by the CRR. Generally speaking, the Infrastructure Manager performed strongly against its targets over the course of the first IMMAC, with infrastructure issues on the network declining by 33 percent between 2014 and 2018, with investment increasing by 49 percent, in nominal terms, during the same period. It is important to note, also, that steady state levels of investment were not being met during the period of the first IMMAC. With regard to services, punctuality targets set by the NTA were generally achieved in 2017 and 2020, which is partly attributable to the quality of infrastructure. In the majority of cases, infrastructure-related delay was within agreed thresholds from 2014 to 2018, although such delays did generally increase. Again, however, service developments such as increasing the frequency of the DART during this period also contributed to this increase.

The performance of the Infrastructure Manager with regard to the current IMMAC from 2020 to 2024 will be subject to comprehensive review in the coming years to inform the next iteration of the IMMAC. It is currently anticipated that this review will commence in late 2023.

7. Conclusion

This paper has examined the expenditure on protecting and renewing Ireland's road and rail network, the processes involved in delivering that work, and the associated outputs and outcomes in terms of infrastructure and transport. It separated out current and capital allocations for protection and renewal across each sector, the associated outcomes over time, and the accumulated deficit in the transport network following the financial crisis.

Table 6 sets out the objectives underpinning this Spending Review, and the associated outcomes that have addressed each objective.

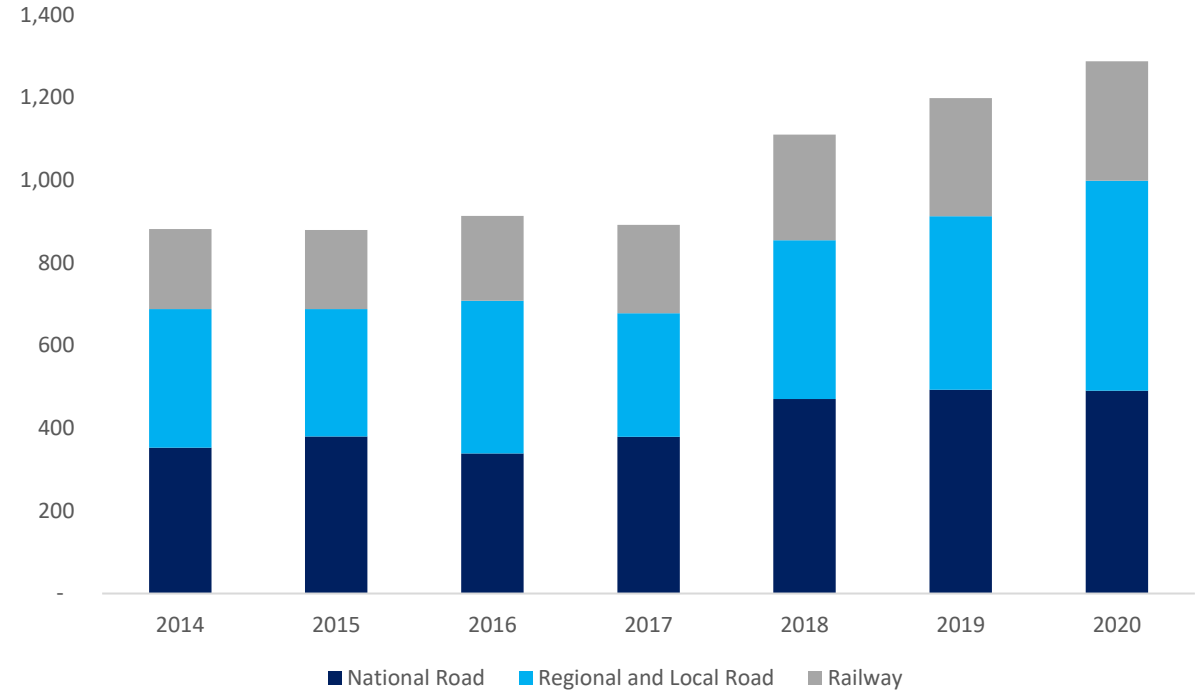
Table 6: Objectives and Outcomes of Spending Review 2021

Objective	Outcome
To examine data on protection and renewal investment and identify trends, for road and rail, from 2007 to 2020	Examined protection and renewal, current and capital expenditure trends across the road network since 2007, and from 2014 for the railway due to changes in funding structure in that sector.
To identify the unit cost of different types of maintenance on different parts of the network	The paper estimated the annual funding dedicated to protection and renewal for the road and rail network on an annual basis
To examine the relationship between initial construction investment and recurrent protection and renewal investment, considering both current and capital maintenance expenditure	Outlined the relationship between current and capital expenditure in each component of the land transport network.
To improve understanding of the costs of degradation and rehabilitation on different parts of the network	The analysis sets out the structure, processes, and costs associated with elements of the road and rail network.
To improve understanding of and quantify pressures in terms of protection and renewal investment, especially climate adaptation	The research sets out the estimated accumulated deficit for the road network, and the investment required to address structural deficits.
To revisit the recommendations of the 2015 VFM and 2018 Spending Review and report on their progress and implementation	Sets out updates from 2018 review of the VFM

Bringing the figures presented in Sections 4, 5 and 6 together, Figure 26 shows that overall investment in protection and renewal in the three sectors was had risen from around €880m in 2014 to approximately €1.3bn in 2020—roughly the same as the 2018 steady state estimate arrived at as part of the NIFTI supporting research. This increased investment is consistent with the NDP commitment to meet steady state requirements on most of the network by 2021. However, there has been upward pressure on protection and renewal requirements since 2018 and it is important to note that, even if

steady state is met today and the network does not deteriorate from its current condition, accumulated deficits over a number of years mean that parts of the network require rehabilitation works to be brought up to an adequate condition. Furthermore, the NIFTI estimate is not completely like-for-like with Figure 26 as NIFTI focused only on capital investment whereas this paper also includes current investment. Current expenditure is, though, a relatively small component of transport protection and renewal investment.

Figure 26: Cumulative Land Transport Protection and Renewal Expenditure 2014 to 2020



Source: Transport Infrastructure Ireland, Department of Transport Payment Booklets 2014-2020, IMMAC Review 2019
Source: Expenditure measured in millions euro. Excludes expenditure on new builds.

This paper has demonstrated the complexity involved in providing protection and renewal, with a range of different bodies involved on the various parts of the network. This is further complicated by the fact that not all protection and renewal is funded directly by the Exchequer. This means the Department of Transport does not have a direct oversight function for certain activity, such as the protection and renewal work carried out by local authorities that is funded out of their own resources. An integrated approach to regular and consistent collection of protection and renewal data across the sector, including by local authorities, and multi-annual targets and funding certain, such as under the IMMAC structure, could help to improve delivery and coordination of protection and renewal of the road network and increase transparency. Future research could consider how the Department of Transport and the Department of Housing, Local Government and Heritage can collaborate more closely in this area.

The rail network has implemented multi-annual budgeting since 2014 with the introduction of the IMMAC structure in accordance with EU regulations. As well as creating funding certainty, the IMMAC sets out a range of performance indicators that the Infrastructure Manager must report on, and its performance is regularly reviewed by the Commission for Railway Regulation. Consistent failure to perform against key performance indicators can result in the imposition of penalties, while better than targeted performance is incentivised. The current IMMAC, running from 2020 to 2024, ensures that protection and renewal of the network will be fully funded in the coming years. It is expected that a comprehensive review of the current IMMAC will commence in 2023 to inform the next multi-annual contract beginning in 2025.

Appendix 1: Quality Assurance Process

Quality Assurance Process

To ensure accuracy and methodological rigour, the authors engaged in the following quality assurance process.

✓ Internal/Departmental

- ✓ Line management
- ✓ Spending Review Sub-group and Steering group
- ✓ Other divisions/sections – Central Votes Section and the Public Service Reform and Delivery Office.
- \- Peer review (IGEES network, seminars, conferences etc.)

✓ External

- \- Other Government Department
- \- Quality Assurance Group (QAG)
- ✓ Peer review (IGEES network, seminars, conferences etc.)
- ✓ Advisory group
- \- External expert(s)
- \- Other (relevant details)

Appendix 2: Bodies Involved in Protection and Renewal

Table 7: Bodies involved in land transport maintenance, monitoring and funding

Road Network	Rail Network
Department of Transport	Iarnrod Eireann
Department of Housing, Local Government and Heritage	Commission for Railway Regulation (CRR)
Local Authorities – 31 City and County Councils	Privately contracted work
Transport Infrastructure Ireland (TII)	
National Transport Authority (NTA)	
Road Management Office (RMO)	
National Oversight and Audit Committee (NOAC)	
Local Government Management Agency (LGMA)	
Public Private Partnerships (PPP)	
Privately contracted work	

Appendix 3: Further Information on Rail

Table 8: IMMAC Performance Indicators 2019-2023

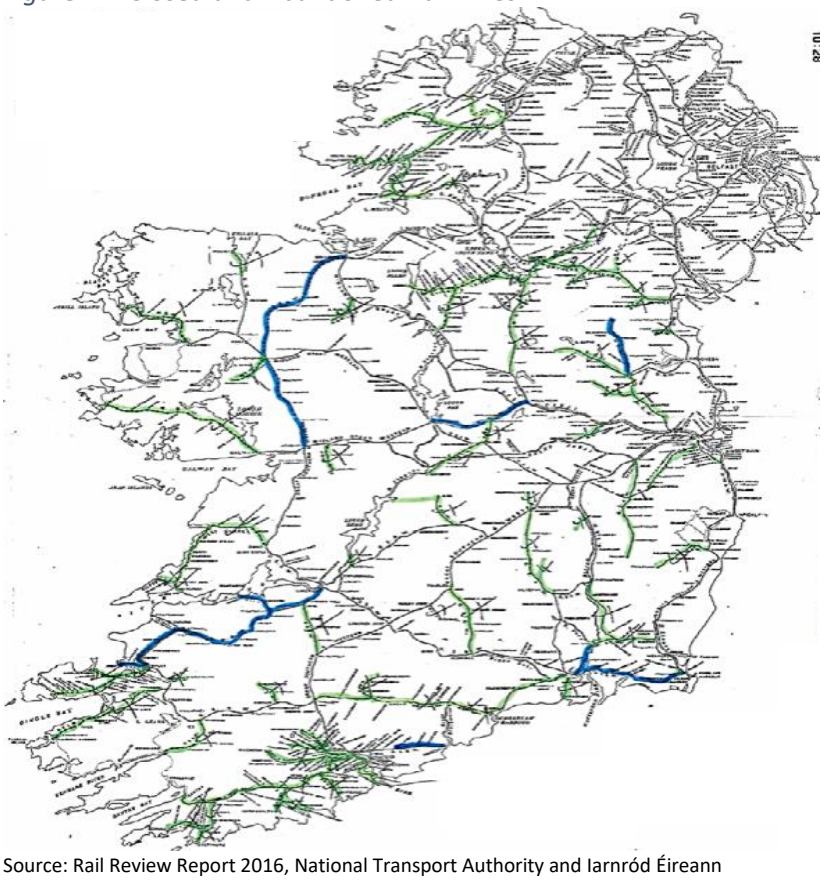
Area	Indicator	Description	Report Frequency
Financial Performance	Spend vs Forecast	• Overall IMMAC • By Department (SMS, IMO, CCE and SET) • By CCE asset category • By SET asset Category	Quarterly
Financial Performance	Spend by network size and activity	• IMMAC spend / main track km • Renewal spend / main track km • IMMAC spend / train km • Renewal spend / train km	Annual
Financial Performance	Cost per track-work activity	• Ballast cleaning: cost per km • Rail Milling: cost per km • Track Relaying: cost per km	Annual
Asset Condition Upgrade	Possession Management	• Actual disruptive possessions taken • List of major disruptive possessions for quarter	Quarterly
Service Delivery – Speed Restrictions	TSRs (Temporary)	• Location / route • Reason / cause • Impact on journey times / speeds • No. of Days TSR limits exceeded by route	Snapshot at end of Quarter
Service Delivery – Speed Restrictions	ESRs (Emergency)	• Total train delay (Minutes) • Cause of incident	Quarterly & YTD
Current Infrastructure and Development	Scale of Network	• Operational main track kms • Number of operational stations • Level crossings by major category • Point Ends by major category • Kms of main track electrified	Annual
Current Infrastructure and Development	Cost of Disused Assets	• Closed lines expenditure • Abandoned lines expenditure	Annual
Asset Condition Upgrades	Possession Management	• Disruptive Possessions planned	Quarterly
Safety Performance	Asset Interface	• Level crossing accidents • Level crossings near misses Category 1 emergency break • Bridge strikes	Quarterly & YTD
Safety Performance	SMS	• No. audits completed against plan • Overdue SMS audit actions • Safety validations	Quarterly & YTD
Safety Performance	Competence Management and Training Days	• Health & safety • Rules and regulations , Other	Quarterly & YTD
Service Punctuality - Performance	Service Punctuality	• Passenger and Freight (Actual Vs Target by route)	Quarterly & YTD
Service Punctuality - Performance	Train Kns Operated	• Passenger services train kms (Actual Vs Target)	Quarterly & YTD
Service Punctuality - Performance	Delay Minutes (Excluding Force Majeure)	• M Delay minute (excluding FM) by route / '000 train kms operated	Quarterly & YTD
Service Delivery – Speed Restrictions	PSRs (Permeant)	• Fastest journey time per route each year • Changes over last timetable	Annual

Table 9: IMMAC Key Performance Indicators 2019-2023

KPI Area	KPI	KPI Description	Report Frequency
Asset Condition Upgrades	Track Upgrades Kms	• Ballast cleaning kms planned v actual • Rail milling shifts planned v actual • Track relaying kms planned v actual	Quarterly
Asset Condition Upgrades	Level Crossing	• Upgrades – improved operational control / technical solutions • Eliminations	Quarterly
Safety Performance	Safety Events	• Train derailments – running • Train collisions – train & buffer – running lines • SPADS with high-risk rating >=20 • SPADS with risk rating 0-19 • Wrong-side failure SET	Quarterly & YTD
Safety Performance	Sperry Train	• Length of track surveyed kms • Confirmed category 1 and 2 defects by route.	Quarterly & YTD
Safety Performance	Rate of Asset Defects	• Structural defects / '000 main track kms • Track defects / '000 main track kms • SET defects / '000 main track kms	Twice Yearly
Service Delivery - Performance	Service Cancellations Attributable to IM, excluding force majeure	• Full cancellations by route – with cause • Partial cancellations by route – with cause • Supplementary note for 'temporary timetable' • Percentage of cancellations attributed to IM	Quarterly & YTD

Source: Infrastructure Manager Multi Annual Contract 2020-2024 Contract, Department of Transport and Irish Rail, 2020.

Figure 27: Closed and Abandoned Rail Lines



Source: Rail Review Report 2016, National Transport Authority and Iarnród Éireann
Note: Blue indicates closed lines. Green indicates abandoned lines

Figure 28: Railway Station Map and Routes

Source: Irish Rail Station Maps, https://www.irishrail.ie/en-ie/travel-information/station-and-route-maps

Appendix 4: Further Information on Roads

Table 10: National Road Current Expenditure Maintenance Subheads

Maintenance Sub Head	Explanation
Ordinary Maintenance	The on-going operational maintenance of the network and includes regular activities such as minor pavement defects (e.g., potholes etc.), drainage works, verge and median cutting, route sweeping, safety barrier repair etc.
Winter Maintenance	Works undertaken during winter months to keep the network working, with activities including route salting and snow/ice clearing.
Route Lighting	Refers to both the energy and maintenance costs for the lighting of the national road network during hours of darkness.
Bridge Maintenance	Minor works undertaken to maintain and clean bridges on national roads.
Intelligent Transport Systems (ITS) Maintenance	Maintenance of the various infrastructural assets such as Variable Message Signs (VMS) and Emergency Roadside Telephones (ERTs).

Source: Value for Money Review on Current Expenditure on National Roads 2015

Table 11: Regional and Local Road State Grants Allocated for Maintenance 2020

State Grant	Description	€ million
Restoration Improvement	Grant for main road strengthening programme and caters for surface restoration, pavement overlay works, complete road rehabilitation works and for drainage works	247
Discretionary Maintenance	Local Authorities have discretion in spending for maintenance works subject to selecting from a list of eligible works, but required to prioritise projects which involve strengthening works, remedying road defects, winter maintenance and drainage works.	85
Restoration Maintenance	The purpose of restoration maintenance is to maintain the asset before it requires improvement. To protect the structural integrity of roads by way of surface dressing through the sealing of the road surface.	42
Strategic Regional/Local Roads	-	27
Supplementary Restoration Maintenance	-	23
Active Travel	Grant for the completion of active travel projects	20
Drainage Programme	Grant is to promote road network resilience	20
Community Involvement Scheme	Facilitates community involvement in the repair and improvement of roads.	15
Specific Improvement	Projects on a case-by-case basis, considering the availability of funding and the outcome of project appraisals.	14
Climate Adaptation/Resilience	Grant to assist the transport network with climate change issues	12
Bridge Rehabilitation	Allows local authorities to undertake bridge rehabilitation works.	12
Former National Roads	Grants to local authorities for the upkeep and maintenance of former national roads reclassified as regional roads	10
Safety Improvement Works	Allows local authorities to undertake safety improvement works.	9
Other	Includes miscellaneous, cycle signs, speed signage, severe weather etc.	14
Total	**Total State Grants from Department of Transport**	**549**

Source: Department of Transport Payments Booklet 2020

Table 12: Regional and Local Road Pavement Survey Condition Index Rating

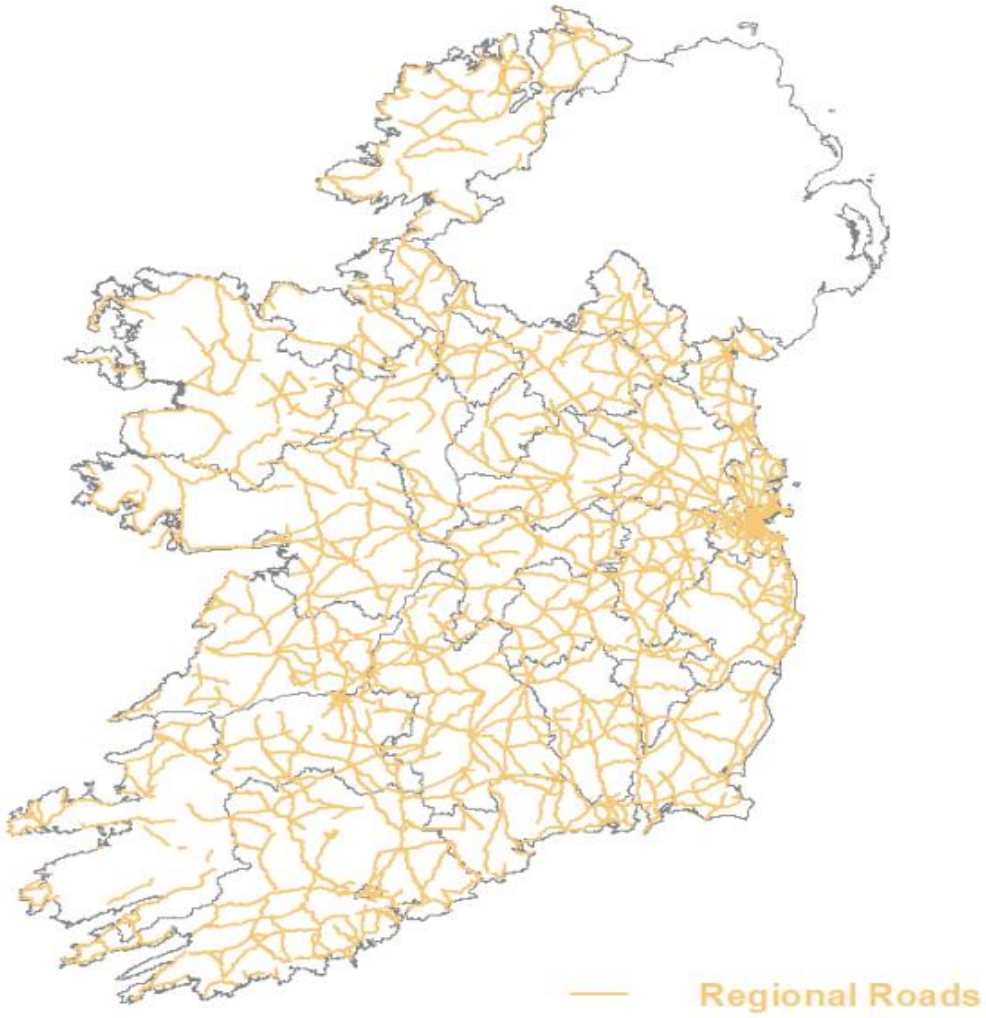
PSCI Rating	Indicator Description	Pavement Treatment	Structural Condition
10	Road surface in perfect condition	Routine Maintenance	Excellent
9	Road surface in very good condition	Routine Maintenance	Very Good
8	Little or no surface defects	Resealing and Restoration of skid resistance	Good
7	Little or no surface defects, old surface with aged appearance	Resealing and Restoration of skid resistance	Good
6	Surface defects may be present, no structural distress	Surface restoration	Fair
5	Surface defects may be present	Surface restoration	Fair
4	Other defects may be present	Structural rehabilitation	Poor
3	Other defects may be present	Structural rehabilitation	Poor
2	Very difficult to drive on	Road reconstruction	Failed Overall
1	Severe deterioration	Road reconstruction	Failed Overall

Source: https://opac.oireachtas.ie/AWData/Library3/Documents%20Laid/pdf/TTSdoclaid070120b_070120_161223.pdf

Figure 29: National Road Network

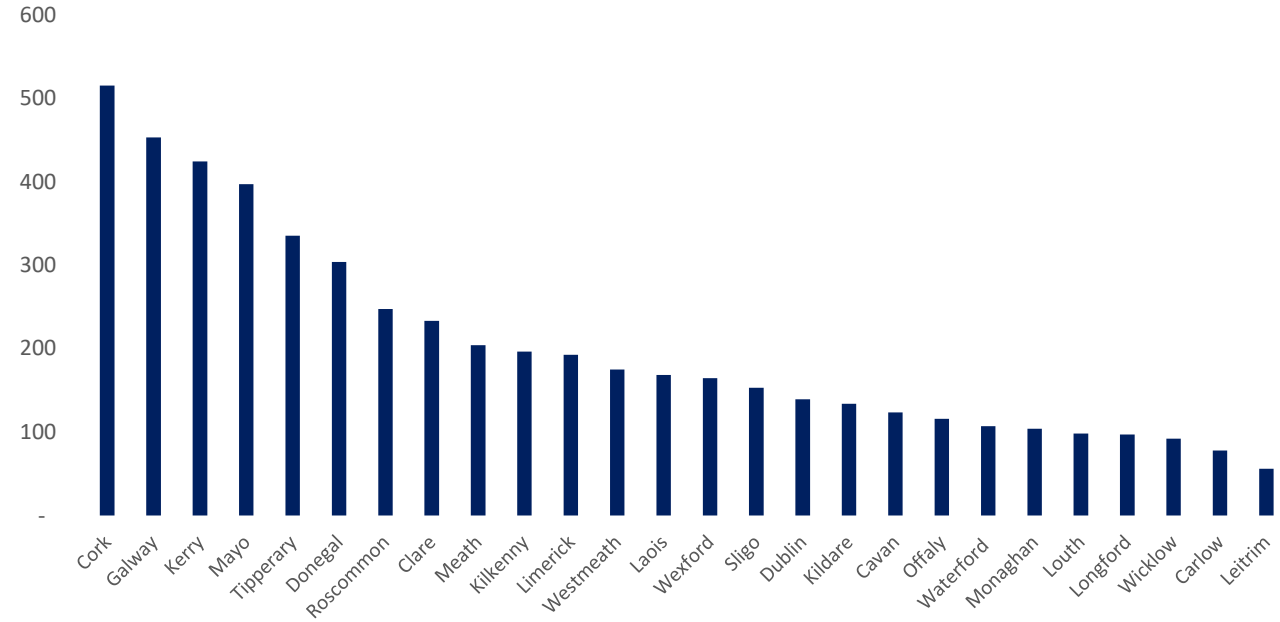
Source: Transport Infrastructure Ireland Annual Reports 2007-2020

Figure 30: Regional Road Network



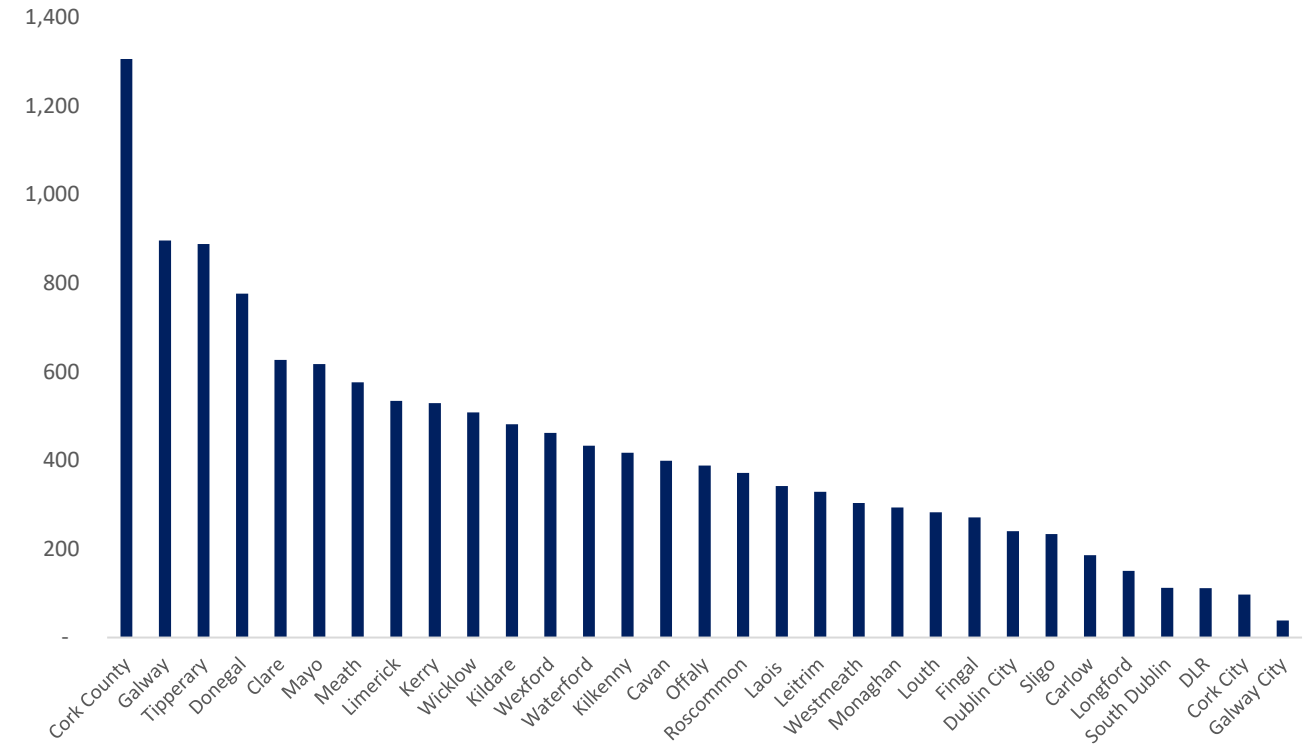
Source: https://opac.oireachtas.ie/AWData/Library3/Documents%20Laid/pdf/TTSdoclaid070120b_070120_161223.pdf

Figure 31: Average Length of National Road by County, 2014 to 2020



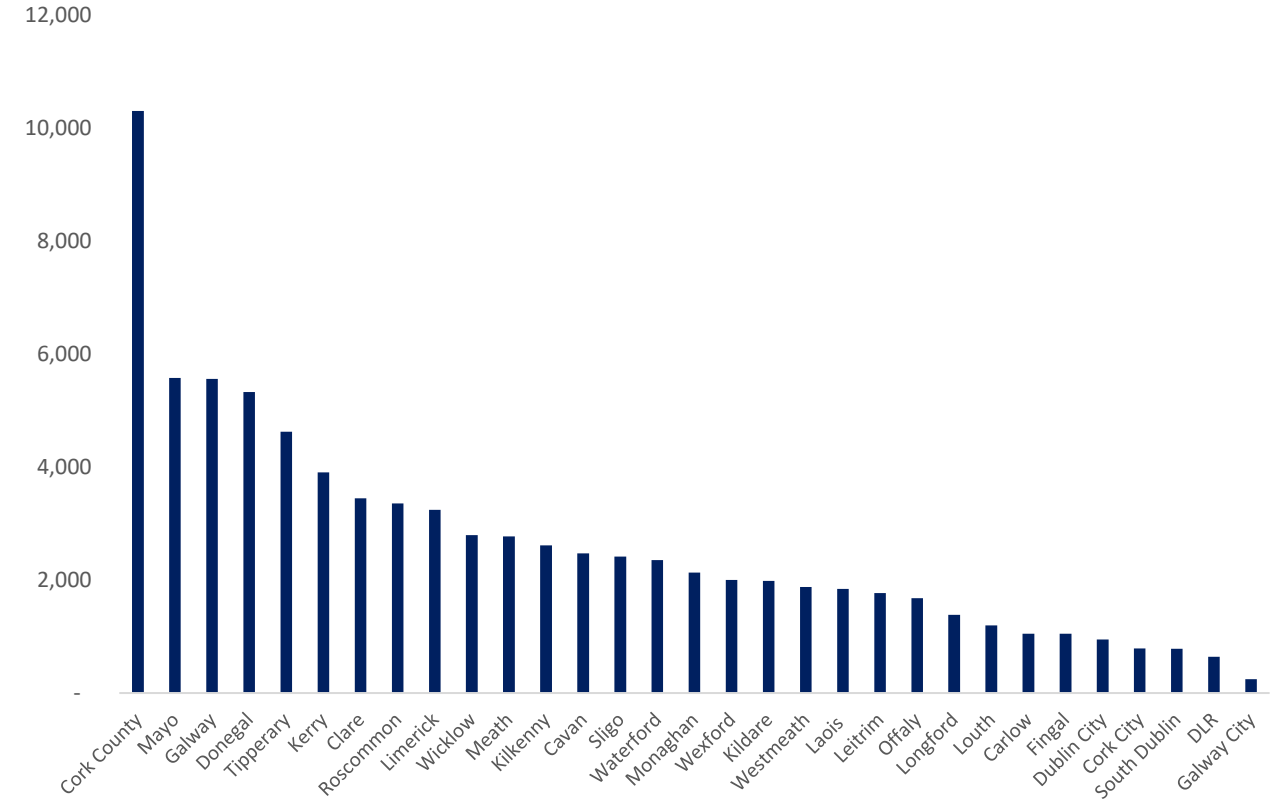
Source: National Audit Oversight Commission Report, Local Authority Services Indicator 2014-2020 Note: Distances are measured in Km

Figure 32: Average Length of Regional Roads by Local Authority, 2015 to 2020



Source: National Audit Oversight Committee, Local Authority Services Indicator Report 2014-2020
Note: Distances are measured in Km

Figure 33 Average Length of Local Roads by Local Authority, 2015 to 2020



Source: National Audit Oversight Committee, Local Authority Services Indicator Report 2014-2020
Note: Distances are measured in Km

Appendix 5: Implementation Update on 2015 VFM

Table 13: 2021 Progress Update on National Roads Maintenance Programme VFM

Recommendation	Target Date	Follow Up Action	Date	Task Status
The TII, in conjunction with relevant stakeholders, such as LA's, the CCMA and the SEAI, should continue to work towards better efficiency for route lighting.	Not Specified	TII have undertaken a number of initiatives: Following the initial pilot scheme on 4 motorway junctions, TII has eliminated excess lighting at a total of more than 50 motorway junctions and is currently monitoring to confirm no adverse safety outcomes. TII completed an energy reduction scheme on town bypasses in the north west of the country in 2020, switching existing lighting to more efficient LED lighting. TII is also working with CCMA on the procurement programme for the replacement of existing public lighting in the South-West Region, covering both national and non-national roads. Further schemes for the Eastern and Northwest areas are in preparation as of October 2021	2021	Ongoing
The TII should continue to work towards achieving asset management best practice in the roads sector such that the network is cost efficient and provides best value for money. In this regard, an assessment of the balance between capital and current funding for national roads should be carried out by TII and DoT by end-2016. In addition, the collection of the data recommended in this report and its use in maintenance and management systems for prioritisation should be pursued.	End 2016	TII has reviewed maintenance expenditure profiles in neighbouring jurisdictions. TII updated its motorway contracts (which were re-tendered in 2019) to allow clearer correlation between outputs and costs for routine maintenance. Cost efficiency on motorway contracts is driven in the first instance by the competitive tender process and by the monitoring and enforcement of Contractor performance. TII has noted that it found it difficult to obtain data from local authorities in relation to maintenance. The shortfall in current funding for national roads has required the funding of some maintenance operations from capital monies and the deferral of certain other activities.	2021	Ongoing
The TII and LAs, in conjunction with all relevant stakeholders, should implement an efficiency programme for national road maintenance which targets improved performance. A feasibility study on this issue should be completed by end-2016 with a programme of efficiency measures to be completed by end- 2017.	End 2016 to End 2017	TII have implemented arrangements whereby those local authorities who use the GeoAPP defects management system and can demonstrate more efficient operations. An increase in current maintenance monies would allow this initiative to be expanded thus contributing to improved maintenance performance. A further technical upgrade of the system is planned for 2022-2023, delivering additional functionality which is expected to enhance the usability and effectiveness of the system.	2021	Ongoing
DoT and the TII should continue to have a close working relationship in the roads sector and will seek to minimise any constraints to delivery at the LA level. This should involve an analysis of how management and/or funding systems could be better aligned by end-2016.	End 2016	Discussions have taken place with City and Country Managers Association (CCMA). However, in recent years difficulty in recruiting engineering staff has become an ongoing issue.	2018	Not Completed

The TII, DoT and LAs, in conjunction with relevant stakeholders such as the CCMA and RMO, should seek to optimise maintenance operations on a regional basis. As such the feasibility of a formal structure of regional maintenance areas should be explored as a priority, so that best practice can be shared and collaboration targeted.	Not Specified	In TII's response to the final draft of the Report, it indicated that whilst acknowledging the optimisation of maintenance by local authorities on a regional basis was one option, other options including outsourced regional contracts was another and that all options ought to be evaluated. This matter will be considered further in conjunction with CCMA and DoT following engagement. As part of current review of winter operations, a regionalised structure has been considered. Solutions to optimise overall winter maintenance efficiency continue to be explored while the sharing of best practice and solutions for other areas of maintenance including the management of road pavements and the recycling of materials has been beneficial and is ongoing.	2021	Ongoing
The TII should, as part of an overall data collection plan, proceed to fully implement an adequate method of data collection on ordinary maintenance works through the GeoAPP system by end-2015 to ensure that the appropriate data is available for the management and evaluation of the ordinary maintenance sub-programme. Data on costs and outputs produced by the system should be broadly comparable across delivery mechanisms.	End 2015	TII is endeavouring to establish what constitutes an appropriate level of data collection. The reality is that local authority resources continue to diminish, and the capacity to provide more detailed data is limited. As part of re-tendering our Motorway Contracts Audit and Administration Service (MCAAS) in 2020 TII has put in place additional resources to monitor performance and better measure outputs.	2021	Ongoing
The TII should, as part of an overall data collection plan, continue to collect data centrally on the delivery of winter maintenance to facilitate evaluation and analysis.	Not Specified	TII is continuing to collect data on winter maintenance activities. There is an ongoing challenge in ensuring that local authorities provide the required input data to the Road Weather Information System.	2021	Ongoing
The TII should, as part of an overall data collection plan, proceed to build and maintain an accurate register of lighting assets on the national road network before end-2016 to facilitate asset management and future sub-programme evaluation.	End 2016	A full inventory of lighting assets has been prepared for the national road network. This forms the basic building block for planning all network lighting efficiency initiatives.	2017	Completed
As part of an overall data collection plan, TII will devise and implement a change to the Eirspan bridge management system by end-2016 such that the system will include details of maintenance works that have been carried out and their cost in a format that will allow all such information to be accessed on a national and regional basis.	End 2016	The necessary upgrade to the Eirspan bridge management software has been undertaken. We are however proceeding with the integration of the bridge management system into a broader asset management system. This work is ongoing.	2016	Action completed but further enhancement ongoing.
The TII will proceed to implement a system to track, monitor and evaluate the level of performance and maintenance carried out in regard to ITS maintenance. This system will be operational by the end of 2015.	End 2015	The system of monitoring ITS maintenance contract activities and performance is in place.	2015	Completed

By end-2015 DoT and TII should consider the implementation, in consultation with relevant national and international stakeholders, of a national road user survey that is completed to assist in the evaluation and management of this and other TII programmes.	End 2015	TII has taken initial steps in this regard through discussions with our marketing department and peer jurisdictions in Europe. TII has undertaken road user surveys in relation to M50 and Dublin Tunnel related traffic management activities.	2018/ 2019	Partly Complete (targeted at M50)
DoT to carry out a Focused Policy Assessment of this programme's efficiency within 3 years following the implementation of an adequate data collection plan by TII. This should incorporate a cost effectiveness analysis of insourced vs. outsourced programme delivery to ascertain if the current mix of delivery mechanisms is in the most efficient. This analysis should also take into account differences in the quality of output.	End 2018	DoT monitored implementation progress for this review as part of the annual Quality Assurance Processes for 2015, 2017 and 2018. Further assessment of national road expenditure and effectiveness of implementing recommendations occurred under the 2018 Spending Review, with the Spending Review 2021 providing the most recent progress update utilising the data collected by TII to assess efficiency.	2018	Completed
The Current Road Maintenance Programme on national roads should continue to be carried out by DoT and TII. The recommendations of this report should be implemented such that efficiency and effectiveness are enhanced.	Ongoing		2018	Ongoing

Source: Department of Transport, Tourism and Sport's Value for Money Review, Spending Review Paper 2018, and TII Updates 2021
Note: Acronyms in recommendations have been updated to reflect new agencies established since 2015. 'TII' has replaced the 'NRA' and 'DoT' has replaced 'DTTaS'.