



Northern Ireland Audit Office

Structural Maintenance of the Road Network



REPORT BY THE COMPTROLLER AND AUDITOR GENERAL
26 March 2019



Northern Ireland Audit Office

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Published 26 March 2019

This report has been prepared under Article 8 of the Audit (Northern Ireland) Order 1987 for presentation to the Northern Ireland Assembly in accordance with Article 11 of the Order.

K J Donnelly
Comptroller and Auditor General

Northern Ireland Audit Office
26 March 2019

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For further information about the Northern Ireland Audit Office please contact:

Northern Ireland Audit Office
106 University Street
BELFAST
BT7 1EU

Tel: 028 9025 1100
email: info@niauditoffice.gov.uk
website: www.niauditoffice.gov.uk

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Key Terms and Abbreviations

Classification of roads	Roads are classified by type e.g. Motorway or B class.
DBFO	A private sector party is awarded a contract to design, build, finance and operate a capital project in return for regular payments, typically over 25 to 30 years.
HGV	Heavy Goods Vehicle
ITS	Invest To Save
Local road network	All roads, regardless of geographical location, that do not form part of the trunk road network.
PPP	Public Private Partnership – a long-term contractual arrangement between a public body and the private sector to deliver a new asset, via a project such as a DBFO .
Preventative maintenance	Pre-planned maintenance, such as resurfacing, which properly preserves the asset.
Reactive maintenance	Unplanned maintenance that can often consist of short-term repair work such as patching.
Rural roads	All major and minor roads with a speed limit of more than 40mph.
Trunk roads	Major strategic roads other than motorways. These are dual carriageways and other 'A' class roads that carry relatively high levels of traffic and interconnect large urban areas and or motorways.
Structural maintenance	Activities that maintain and preserve the surface and structure of roads and footpaths. These include reconstruction, overlay, resurfacing, surface dressing and patching.
Trunk road network	Part of the road network that comprises key transport corridors (motorways and dual carriageways), link corridors (dual carriageways and other 'A' roads) and other trunk roads ('A' Roads). It forms part of the wider strategic transport network, which includes railways, airports and seaports.
UKPMS	United Kingdom Pavement Management System. Provides a framework for the systematic collection of data with the decision-making processes necessary to optimise resources for the maintenance and renewal of pavements, including the generation of programmes of works and corresponding budgets.
Urban roads	All major and minor roads with a speed limit of 40mph or less.
Utility trench	Trench dug to lay utility lines such as communications, electricity, gas, water supply pipes and sewer pipes.
VKT	Vehicle Kilometres Travelled

Key Facts

25,714 km

the total route length of the road network

78%

the percentage of rural roads

22%

the percentage of urban roads

£1.2 billion

the current estimated amount of expenditure required to clear the backlog of structural maintenance

£143 million

the annual funding required to maintain the road network in a steady and sustainable state

£92 million

the average annual funding spent on structural maintenance allocated over the past five years

£51 million

the average additional funding required each year to maintain the road network in a steady and sustainable state

Executive Summary

Introduction

1. Northern Ireland's road network is of significant strategic, economic and social importance. There is a very strong, positive correlation between a country's ability to grow its economy and the quality of its road network. Economic growth both results in and is driven by more commuters, freight and tourists moving around the road network.
2. To realise its potential contribution, the roads and pavements making up the network need to be improved and properly maintained and this requires significant, regular funding. This report focuses on the structural maintenance of the existing road network.
3. In 1992 and in 2000 we examined the condition of the network; the adequacy of funding to maintain it; whether maintenance practices provided value for money; and performance in meeting key targets. We reported that, for many years, funding for road maintenance was below the level required to maintain the network in a satisfactory condition.
4. As a result of funding constraints, resources have been focused on the motorways and other roads making up the trunk road network. While this has resulted in relatively good standards of maintenance on these roads, our previous reports noted indications of significant deterioration in the condition of the rest of the network. These findings were supported in 2009 by the independent Snaith report¹. We also reported that as a direct consequence of underfunding, maintenance practices did not always provide good value for money. Had more funds been available, better economic solutions could have been adopted.
5. This report follows up our previous work in this area and focuses on the structural maintenance of the road network today. We examine whether the key issues identified in our earlier studies remain. We also look at emerging issues. The report does not examine new or upgraded roads, which have seen significant investment and delivery in recent years.

Key Findings

6. The Department for Infrastructure (the Department) has responsibility for the road network. Since our last review in 2000 it has made significant operational efficiencies, particularly in relation to the delivery of day to day structural maintenance. However, these efficiencies have been outweighed by long-term financial pressures, which affect the structural maintenance of the road network and have led to further deterioration in its overall condition. Whilst the condition of roads making up the trunk road network is still relatively good, the other roads making up the local road network continue to deteriorate at a faster rate, as less money is made available to maintain them to the same standard.

1 'A Review of the Structural Maintenance Funding Requirements for the Roads Service', M.S. Snaith, September 2009.

7. Since 2012, when the responsibility for the network transferred from a government agency to a Department, there has been very little published information on the physical condition of the network. In the absence of official condition information, public perceptions, based on media reports, public commentary and personal experiences, often reflect a network that is in poor condition.
8. Whilst the overall level of funding has improved, it is still less than required to maintain network condition in a satisfactory, steady state. As a result, the Department's estimated amount of investment required to clear the overall structural maintenance backlog has increased from £168 million (at today's value) in 1998, to £1.2 billion².
9. There is no certainty at the beginning of each financial year about how much will be available to spend on structural maintenance and, in recent years, the opening budget has varied considerably. Consequently, there has been reliance on additional in-year funding. This prevents the Department from carrying out all planned maintenance work that is required on the network, which can lead to delays, as well as less economic and sub-standard temporary repairs, until more money becomes available. These funding issues are not conducive to medium or long-term strategic planning and as a result, there is no published strategy in place to deal with structural maintenance, nor the growing maintenance backlog.
10. The level and uncertainty of funding continues to impact on the deterioration of the network's condition and in particular the condition of the local road network.

Value for Money conclusion

11. Due to a shortfall in meeting the Department's funding requirement and the uncertainty of in-year funding allocations, spending on structural maintenance does not always provide value for money. Over time, these funding pressures have constrained spending on good, value for money preventative maintenance, contributing to a higher proportion of expenditure on reactive maintenance, which does not always provide value for money. More recently, funding pressures have led to lower priority defects being no longer recorded or repaired, allowing further damage to occur and accelerating the rate of network deterioration. This is likely to lead to higher costs in the future, which could have been avoided.
12. Uncertainty over funding levels also inhibits strategic planning and the development of more effective commercial relationships with private contractors. Publishing a structural maintenance strategy along with regular performance information and road condition data, would help the public and key stakeholders better understand the network's condition and support the Department in maintaining it to a satisfactory condition.

2 The Department's estimates of £168 million and £1.2 billion have been calculated in different ways and whilst each is the best assessment of the backlog pertaining at that time, they are not directly comparable.

Executive Summary

13. However, without more funding certainty, it is unlikely that the Department will be able to deliver improved performance and value for money.

Recommendations

Recommendation 1

The Department needs to work with the Department of Finance to secure long-term funding options, such as ring-fenced funding, to increase budget certainty and promote better value for money.

Recommendation 2

The Department should develop a strategy to communicate, consult and engage with all stakeholders regarding the condition of the road network. This should be developed with inputs from local government councils and partners in other public bodies.

Recommendation 3

The Department should publish a strategy for maintaining the road network to a satisfactory state. The strategy could form part of a wider roads investment strategy, which takes account of the needs of the existing network when considering the affordability of large-scale road infrastructure and other transport investments.

Recommendation 4

The Department should publish information regarding the condition of the road network on a regular basis. This should include meaningful performance indicators and standards, providing all elected representatives and road users with valuable information to support independent monitoring and inform decision-making.

Recommendation 5

In light of the latest condition data for the trunk road network, which indicates that it is in better condition than previously thought, the Department should reconsider how funding is allocated for structural maintenance to ensure fair coverage for all sections of the network including rural roads.

Part One: Introduction



Part One:

Introduction

Overview of the road network

The road network is of significant economic and social importance and whilst the number of vehicles using our roads is growing significantly, the total distance travelled is not

- 1.1 Northern Ireland (NI) is more dependent on road-based transport for industry, commerce and social purposes than any other region within the United Kingdom (UK). Almost all freight is transported by road, compared with approximately 76 per cent in Great Britain³ (GB), and public transport relies heavily on the road network (the network). These dependencies reflect the modest scale of the rail network (with little prospect of significant expansion) and the absence of a water based transport system.
- 1.2 Despite this dependency, NI has a similar number of cars per 1,000 people as other European Union (EU) countries⁴. The number of vehicles registered has increased by almost 62 per cent between 2000 and 2018⁵ and there are increasing demands on parts of the urban network from enhanced priority measures for buses, private taxis and cyclists. In 2016, 84 per cent of the working population travelled to work in a car or van⁶. This compares to 80 per cent in Wales; 71 per cent in Scotland; 67 per cent in England⁷; and 66 per cent in the Republic of Ireland (RoI)⁸.
- 1.3 Despite increasing car ownership, statistics indicate that the total distance travelled by all vehicles, between 2008 and 2014, has remained consistent. This contrasts with the rest of the UK and the RoI, which are experiencing much higher growth rates. The distance travelled by goods vehicles has marginally declined in this period whilst bus and coach services are increasing. Statistics also show that, since 2006, the estimated total fuel consumed by NI's registered vehicles has fallen by 7 per cent.⁹
- 1.4 Set against a backdrop of stricter European environmental legislation and policies, it has been no longer sustainable for governments to simply 'predict and provide', with competing strategic transport priorities to encourage car users to use other forms of transport. However, transport alternatives in NI are more limited than the rest of the UK and for some citizens in rural areas, there is no current practical alternative to using a vehicle. Until very recently, major projects to encourage citizens to switch from cars to public transport in urban areas had limited successes.

3 Domestic Road Freight Statistics, United Kingdom 2016 – Department of Transport, July 2017.

4 Northern Ireland's motorisation rate (numbers of cars per 1,000 people) is similar to European Union average (492 versus an EU average of 494 in 2015) - European Manufacturers Automobile Association PARC statistics and Northern Ireland Transport statistics.

5 At 30 June 2018, 1,179,000 vehicles were licensed in NI, of which 86% were Private Light Goods vehicles. At 31st December 2000 730,730 vehicles were licensed in NI, of which 84% were Private Light Goods vehicles.

6 Northern Ireland Transport Statistics 2016-2017

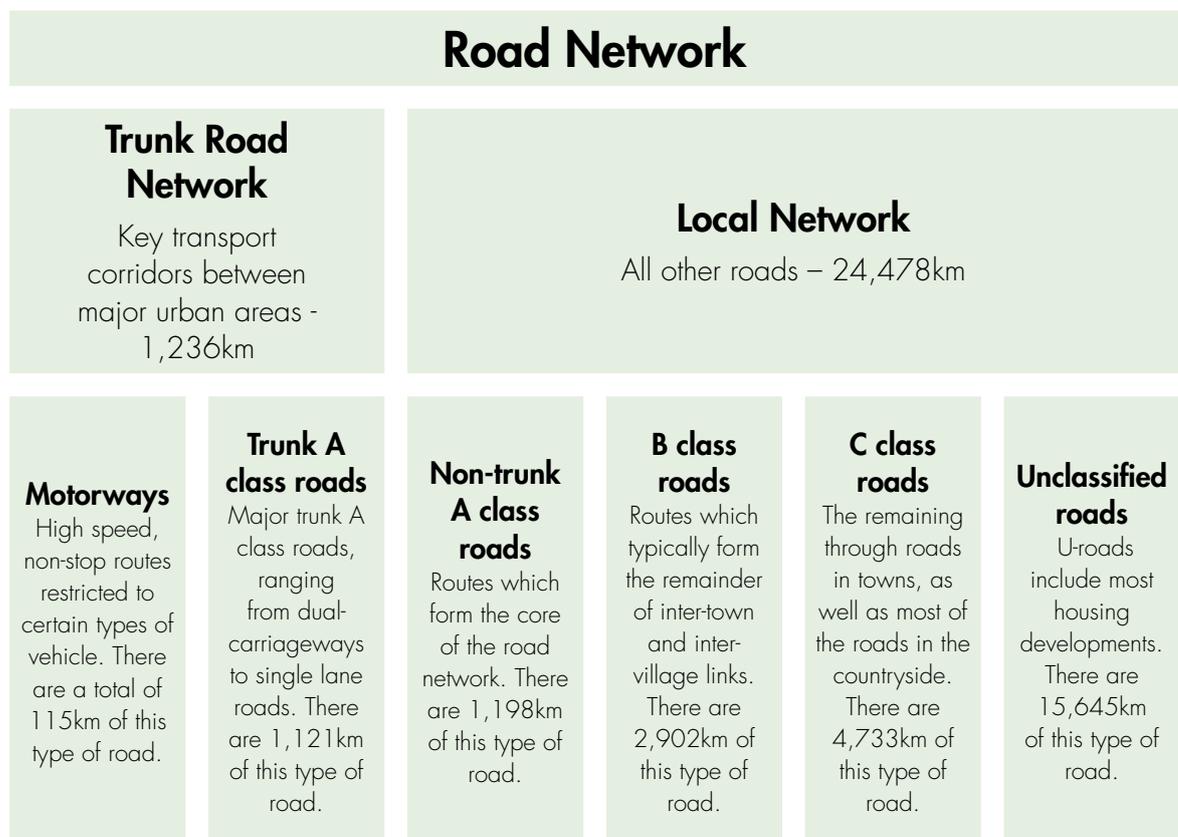
7 Transport Statistics Great Britain 2016

8 Commuting in Ireland, Census 2016

9 'Sub national transport fuel consumption 2005-2015', Department for Business, Energy and Industrial Strategy, June 2017.

- 1.5 The network therefore remains of significant economic and social importance and with an estimated value of £26 billion is NI's most valuable capital asset. It comprises almost 26,000km of different types of public road (**Figure 1**), 10,000km of footways, 5,900 bridges, 283,000 streetlights and 34 Park and Ride/Share car parks.

Figure 1. Hierarchy of the road network



Source: Northern Ireland Audit Office

Maintaining the structure of the road network is vital to Northern Ireland's economy and the social wellbeing of citizens and communities

- 1.6 Maintaining the existing network so that it is safe, serviceable and reliable, is vital. Recent studies in Scotland addressed an evidence gap on the value of the trunk road network to society and the economy and how the wider transport network supported growth sectors. Conducting similar studies in NI may help demonstrate to elected representatives and other stakeholders¹⁰ the contribution of well-maintained roads to our economy.
- 1.7 Unlike the rest of the UK, responsibility for the entire network is a function of central government, under the Department for Infrastructure (the Department). This should present NI with greater strategic and operational control advantage than the other regions, enabling the Department to

¹⁰ Stakeholders include motoring groups, freight and haulier representatives, businesses, councils, environmental groups, professional engineering and transport associations and academics.

Part One: Introduction

leverage better value for money. However, there are a number of key inhibitors to achieving this:

- A network which, for decades, has received sub-optimal investment and maintenance.
- A long network relative to the size of the population (road density, measured by kilometre of road per 1,000 inhabitants is more than double the UK average).
- A relatively large and growing rural population (approximately 36 per cent¹¹ compared to the UK average of 17 per cent¹²).
- Reducing overall public financial resources, which has significantly affected staffing levels within the Department.
- Uncertainty around in year funding and future funding.
- Increasing winter rainfall which, combined with cold temperatures, accelerates the structural deterioration of roads.

1.8 There are two main classifications of network maintenance; ‘Structural Maintenance’ and ‘Routine Maintenance’. This report focuses on the former, which include activities that maintain and preserve the surface and structure of roads and footpaths¹³. It is a long-term commitment, requiring a continuous programme of maintenance to minimise deterioration. Insufficient maintenance leads to roads or footpaths not lasting as long as expected due to damage to their underlying structure. At some point, maintenance and repair becomes uneconomic and full replacement is required.

Roads need to be maintained and repaired for a number of reasons

1.9 The structural maintenance programme comprises a mixture of proactive planned activities, such as resurfacing and surface dressing, as well as unplanned reactive activities such as patching. Whilst the latter is less efficient and sometimes may provide poor value for money, it is essential in order to maintain as safe a network as resources permit and protect the Department against public liability claims. **Appendix 1** describes the main structural maintenance activities.

1.10 In time, roads become more brittle and cracks can occur on the surface, typically within ten to twenty years. Water ingress, along with repetitive ‘freeze-thaw’ cycles, can lead to rapid deterioration in the surface, with expanding and deepening cracks leading to potholes and other defects. Other contributing factors that lead to structural maintenance treatments include utility trenches and poor underlying ground conditions. Utility trenches, for example, introduce joints, which can weaken the road surface, even when reinstated properly. These are the most

11 Northern Ireland estimated population statistics 2017, Northern Ireland Statistical Research Agency.

12 The World Bank Statistics 2017.

13 Maintenance of streetlights, bridges and park and ride/share car parks are outside the scope of this report.

common causes of surface failure, however early identification and treatment (patching and resealing) of the defects can extend road surface life for a modest cost.

- 1.11 High levels of traffic increase wear and tear on roads, slowly polishing the surface, which decreases the amount of grip and resistance to skidding. If the surface has some undetected or untreated defects, high levels of traffic can accelerate deterioration.
- 1.12 The major cause of wear and tear is the damage done to road foundations and pavements by heavy goods vehicle (HGV) traffic. Smaller and lighter vehicles do negligible damage to road foundations, but HGVs cause much more damage because the damaging power rises exponentially as weight increases. Designed and built to a higher specification, motorways and trunk roads are structurally more resistant to these types of wear and tear. However, smaller and older roads are more prone to structural failure arising from the weight or volume of modern HGVs.
- 1.13 The use of 'sat-navs' in GB has seen an increase in the number of HGVs using local roads to avoid journey delays caused by heavy traffic build-ups on trunk roads. However, the Department does not have any evidence to suggest this is a particular problem in NI. In England, some roads have weight restrictions placed upon them and the UK Government is looking into the potential benefits of an HGV charge system based on mass and distance, a system that has proved beneficial to networks in countries such as Switzerland, Germany and New Zealand, by encouraging transport companies to become more efficient.
- 1.14 In 2014, a UK wide fixed levy was placed on all HGVs with a maximum design weight of 12 tonnes or more. Prior to its introduction, non-UK registered HGVs were able to use UK roads without contributing to their upkeep. However, as with all vehicle excise duties, income received is not specifically linked to the upkeep of road networks.

Long-term funding constraints have prevented the Department from taking effective action to address persistent issues which inhibit effective and economic network maintenance

- 1.15 With ongoing network deterioration, this report comes at an opportune time for the Department and its responsibility for maintaining the road network. The report examines the condition of the network; the key inhibitors that continue to impact upon its condition; and the Department's ability to meet its legislative responsibilities. The same persistent issues over the past three decades are impairing the upkeep of the network. Despite efficiency savings¹⁴ over the years, long-term funding constraints and unpredictable funding are preventing the Department from taking effective strategic and operational action to address these issues.

14 Efficiency savings have arisen from improved technology and maintenance techniques, outsourcing and staff reductions.

Part One: Introduction

- 1.16 This report provides a strategic overview of the more significant structural maintenance issues facing the network. The intention in producing this report is to support the Department in its drive to continue to meet its legislative responsibilities and its performance. At the heart of this is identifying and overcoming the key obstacles to providing a sustainable road network.

Structure

- 1.17 We have focused our commentary on the key issues affecting structural maintenance of the road network. Some of the issues identified provide a context for the consideration of why the Department is inhibited from addressing them effectively, and what could be done to help remedy this. Consequently, the report is structured in the following way:

Part Two provides an overview of how structural maintenance is strategically managed and how the absence of certainty over funding inhibits better value for money. It also considers historical and current levels of structural maintenance funding, in-year timing of funding and the reliance on supplementary funding.

Part Three provides an overview and a limited assessment of the current condition of the road network, in the absence of published information by the Department.

Methodology

- 1.18 Our investigation has used a combination of quantitative and qualitative methods to gather evidence. Our assessment of the condition of the network and how it is maintained and funded, was informed by discussions with key staff at the Department, local councils and with other independent third party experts within the industry. We have reviewed documents from a range of sources and analysed published and unpublished performance data held by the Department.
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Part Two: Strategic planning and funding of structural road maintenance



Part Two: Strategic planning and funding of structural road maintenance

Without more certainty around future funding levels, the Department is inhibited from managing its structural maintenance programme effectively or efficiently

- 2.1 Good strategic planning of structural maintenance requires robust asset management activities as well as accurate predictions about traffic volumes and growth, up-to-date condition data for all road classes and predictable budgets. Ongoing annual budget constraints and the lack of certainty around funding levels are discussed later in this section and are issues that have historically created barriers to long term planning. **Part Three** of this report identifies constraints around the structural condition of the local network and data collected to predict traffic volumes and growth.
- 2.2 In line with other UK regions, the Department has begun to implement and utilise a fully functioning Pavement Management System to support its asset management activities. Based on a UK standard framework, the system combines data collection with decision-making processes. Once fully implemented it will support and enhance the Department's asset management activities, in particular the assessment of road network condition, planning of investment and strategic prioritisation of structural maintenance of the network.
- 2.3 The Department has a high-level five-year 'Asset Management Plan 2017-22', which includes specific plans for Water, Rail and Roads infrastructure. The Roads Infrastructure Plan (the Plan) applies asset management principles such as the 'whole life costing' approach¹⁵ and includes network valuation and condition assessment strategies. However, a recent review of this Plan by an independent consultant¹⁶ identified that it lacked the detail necessary to provide the basis for robust asset management, recommending the development of a 'Highways' Asset Management Plan' in line with other UK regions.
- 2.4 When the Plan was first introduced in 1998 it was anticipated that higher initial levels of investment in the network would realise benefits over its whole life cycle. Had higher levels of investment been made, these benefits would have included:
- a reduction in unplanned reactive work, such as patching, leading to overall costs of 10 per cent (or less) of the total structural maintenance budget;
 - the potential of reducing road traffic accidents through higher skid resistance;
 - fewer public liability claims;
 - less traffic delays due to unplanned maintenance;

15 Whole-life costing calculates both the initial construction cost of construction and future maintenance needs, their cost and the consequential costs to road users.

16 Review of the Structural Maintenance Funding Requirements For the Department for Infrastructure (Roads) – Jim Barton, BSc(Hons), CEng, MICE,FCIHT, 2018.

- lower vehicle operating costs due to smoother surfaces; and
- less adverse environmental impacts.

- 2.5 Successful delivery and outcomes from the Plan are highly dependent upon adequate funding. Increased funding was allocated between 2000 and 2005, however, this still fell short of what was required to deliver the Plan (and has consistently fallen short since). As a result, many of the expected benefits have yet to be realised, twenty years after its implementation.
- 2.6 Underfunding is the largest challenge facing the Department, however, its impact is compounded by the lack of certainty over in year funding and future funding. Without certainty, the Department is inhibited from strategically managing its structural maintenance programme effectively or efficiently. For example, over reliance on temporary patching or surface dressing and delays in road-resurfacing projects until funding becomes available, can lead to additional costs. This also affects negatively on contractors, creating uncertainty in the industry and inhibiting development of longer term and more effective, commercial relationships.
- 2.7 The issue of longer term funding certainty has been addressed in England for its strategic road network. In an attempt to drive value for money for its highway and transportation industry Highways England was established, along with the implementation of a Roads Investment Strategy. This established a five-year cycle of ring fenced funding and included a maintenance strategy that set out plans for increased annual structural maintenance spending of almost 40 per cent, across the entire road network.

Recommendation 1

The Department needs to work with the Department of Finance to secure long-term funding options, such as ring-fenced funding, to increase budget certainty and promote better value for money.

There is limited Department led direct engagement with road users

- 2.8 Whilst Departmental Officers meet and discuss network related matters with councils, there is limited direct engagement with road users. A noteworthy exception to this is the provision of a good practice Public Information Portal¹⁷ allowing members of the public to report road related faults, such as potholes or other defects, directly to the Department for action.
- 2.9 In GB, engagement with road users forms an important part of maintenance management and strategic planning. For example, satisfaction surveys are conducted at local government level and published each year. Whilst some surveys were conducted in NI before 2012, the Department has not carried out any recent surveys.

¹⁷ This is a web-based system that can be found on the 'Travel, transport and roads' section of the NI Direct website. It also enables reporting of other faults such as street lighting, spillages and gully blockages. The system also allows the person who reported a fault to track its progress.

Part Two: Strategic planning and funding of structural road maintenance

- 2.10 Consultation in GB led to stakeholders expressing concern about the accuracy of published road condition data, particularly about how well the data reflects the underlying structural condition of roads. User satisfaction information indicates a view that conflicts with the condition data. Surveys, media reports and public commentary indicate poor experiences of road condition and a belief that it is deteriorating. This has led in recent years to additional funding for local road networks.
- 2.11 Media reports, public commentary on social media and lobbying to and by local elected representatives reflects a similar opinion in NI. The absence of direct engagement or consultation by the Department, for example, through formal published surveys, inhibits a fuller and more realistic understanding of the needs of users. User engagement can enrich the understanding of network condition and the needs of all stakeholders, to support strategic planning as well as the Department's annual budget proposals.

Recommendation 2

The Department should develop a strategy to communicate, consult and engage with all stakeholders regarding the condition of the road network. This should be developed with inputs from local government councils and partners in other public bodies.

A roads strategy is required if the Department is to be more transparent and accountable for its future goals and commitments regarding the road network

- 2.12 Roads investment features as a key part of the overarching '*Investment Strategy for Northern Ireland 2011-2021*'. However, NI does not have a published strategy dedicated to roads investment. In relation to structural maintenance, the Investment Strategy states that, "*Going forward we will focus our structural maintenance investment on maintaining the condition of the motorway and trunk road network.*" Condition data indicates that this is being achieved, however this has been at the expense of the local road network as discussed further in **Part Three**.
- 2.13 A published roads investment strategy would enable the Department to be more transparent and accountable for its future goals and commitments regarding the road network. It would also help to articulate its long-term funding needs. It should include structural maintenance investment of existing roads and how the annually increasing maintenance backlog can be addressed. The strategy would also need to demonstrate affordability, deliverability and value for money, all of which would require certainty of funding.
-

Recommendation 3

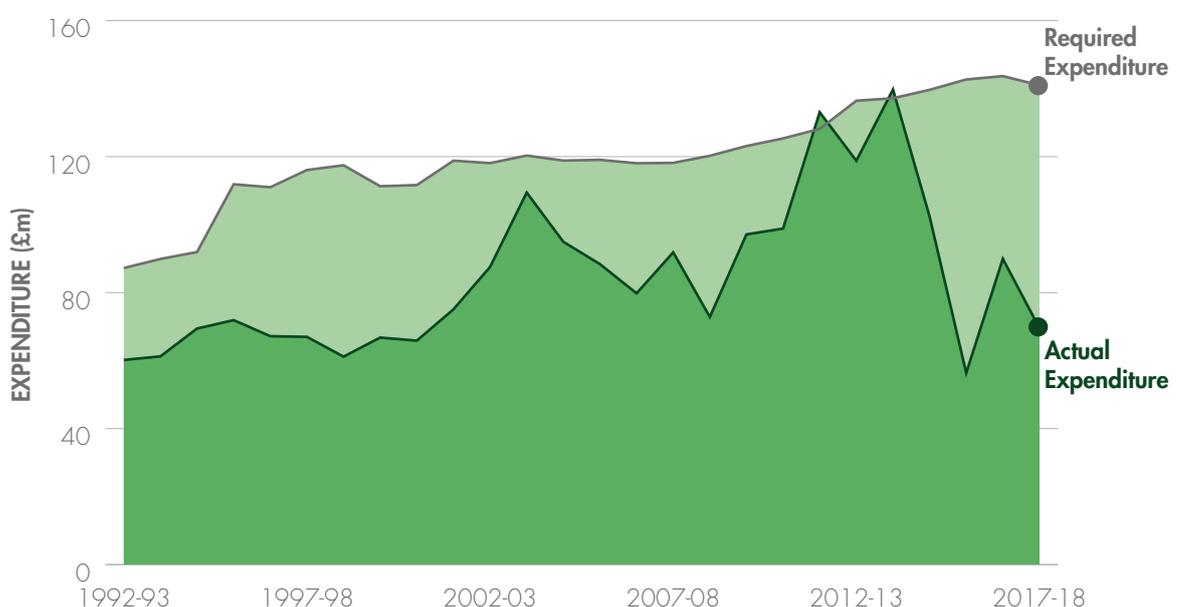
The Department should publish a strategy for maintaining the road network to a satisfactory state. The strategy could form part of a wider roads investment strategy, which takes account of the needs of the existing network when considering the affordability of large-scale road infrastructure and other transport investments.

Lack of certainty of funding inhibits the Department's ability to deliver a long-term, value for money structural maintenance service

- 2.14 There is a strong, evidence-based link between funding and the condition of the network. Until our last report in 2000, overall spending on structural maintenance, in real terms, had been in decline since 1975. Since then the general trend has reversed and more money, in real terms, has been available to maintain the network. However, the amounts received each year are consistently less than what is required to maintain a steady state, resulting in an estimated backlog of work, which the Department estimates could cost £1.2 billion of additional funding over and above annual allocations. In addition, for the past fifteen years, annual budgets have been inconsistent (see **Figure 2**). Changing budgets from one year to the next creates uncertainty and makes it difficult for the Department to plan its activities effectively and economically.

Figure 2. Structural maintenance expenditure versus requirements

With the exception of two years, structural maintenance expenditure has been consistently lower than required



Source: Department for Infrastructure data (inflated to 2018 values)

Part Two: Strategic planning and funding of structural road maintenance

- 2.15 This issue is not unique to NI and also exists in GB and the RoI. However, NI's position is historically unique due to the reliance placed on the network as a mode of transport and its length relative to the size of the population. Whilst total spend on the roads network per head of the population over the past five years compares favourably to the rest of the UK, spend per mile of road is the lowest in the UK. Comparators for structural maintenance spend are not readily available.
- 2.16 Each year the Department bids to the Department of Finance, as part of the Budget and in-year monitoring process, for funding to maintain the network in a steady state. To determine the optimal structural maintenance budget, the Department has regard to network condition based on whole-life costing and the cost and quantity of materials needed for road and footway surfaces to extend their life. This forms the basis of its 'Structural Maintenance Funding Plan'. This excludes funding to clear the maintenance backlog and is based on the longest possible life of the surface materials, which in practice may not last that long. The Department is also contractually committed to paying for two major road infrastructure Public Private Partnerships¹⁸ (PPPs), which cost on average around £47 million each year. These contracts also include the maintenance of the motorway network.
- 2.17 The structural maintenance budget, which must be spent within the financial year, has a capital element and a revenue element. The capital element funds proactive planned maintenance services, such as reconstruction, resurfacing and surface dressing. This maintenance should have a life of many years. It factors in the age and condition of a road and, using up-to-date risk based prioritisation techniques, generally provides good value for money. An exception to this is surface dressing which, if used incorrectly as a substitute for resurfacing, can provide poor value for money as it provides no increase to structural strength.
- 2.18 The revenue element funds reactive and emergency maintenance services such as patching. Whilst necessary, much of this type of maintenance is temporary in nature, does not always provide good value for money and has been described as 'papering over the cracks'.

Targeting the limited funds available for reactive maintenance is a short-term solution, but is unlikely to deliver value for money over the long-term

- 2.19 The 2009 Snaith report identified a link between reactive maintenance expenditure and planned preventative maintenance. As the demand for reactive maintenance increases, less funding is available for preventative maintenance. At that time, the level of reactive maintenance was reported as being 30 per cent of the overall structural maintenance budget; the ideal percentage on a well-maintained road should be 10 per cent.

¹⁸ The Public Private Partnerships are two long-term cooperative arrangements between the Department and the private sector. The private sector designed, built, and operate sections of Motorway and Trunk 'A' roads using private finance. They also provide structural and routine maintenance services for 90 per cent of Motorways.

- 2.20 From 2008-09 until 2014-15, the annual amounts spent on reactive maintenance (see **Figure 3**) remained relatively consistent. However, as a result of the introduction of reduced service levels in 2014-15 (see **paragraph 3.31**), reactive maintenance expenditure decreased to below 30 per cent of the overall budget because of less patching on the local network. From 2011-12 to 2014-15, supplementary 'Invest to Save' capital funding (see **paragraphs 2.25 and 2.26**), which cannot be spent on reactive maintenance, further reduced the percentage to levels below 20 per cent.
- 2.21 The demand for reactive maintenance generally increases as overall network conditions deteriorate. Reducing network deterioration can only be achieved through sustained high levels of preventative maintenance. With limited funding available, the Department is unable to undertake all patching demands and, through a risk-based approach, has reduced the extent of patching service it provides. Whilst this reduces the overall expenditure on patching and gives the appearance of improved value for money in the short term, it increases the need for reactive maintenance and preventative maintenance in the future. This is not sustainable and does not promote value for money over the long-term.

The Department relies heavily on additional funding received from in-year monitoring rounds which indicates that its baseline budget allocation has not been sufficient to deliver its services

- 2.22 A 2014 study of in-year monitoring rounds¹⁹ by the Northern Ireland Assembly found the Department for Regional Development (responsible for the network until May 2016) submitted the highest number and value of bids for additional in-year funding. It concluded that the Department's baseline budget was being set too low, an area that may benefit from further scrutiny by the Assembly.
- 2.23 Since 2010, the opening budget allocation for each financial year has ranged between approximately £20 million (in 2014-15) and £70 million (see **Figure 4**). This equated to approximately 22 per cent and 79 per cent respectively of the amounts actually received in those years, but more crucially only between 14 per cent and 50 per cent of what the Department stated it required to maintain the network properly.
- 2.24 Additional funding is not guaranteed. Underfunding at the beginning of each financial year, heavy reliance on additional funds and the late in-year timing of the receipt of these funds impacts negatively on the Department's ability to plan structural maintenance in a way that delivers value for money for a number of reasons:
- Management in the Department are more cautious about conducting more expensive resurfacing or surface dressing work. This constrains the Department from planning and delivering a more substantive in-year programme of proactive maintenance.

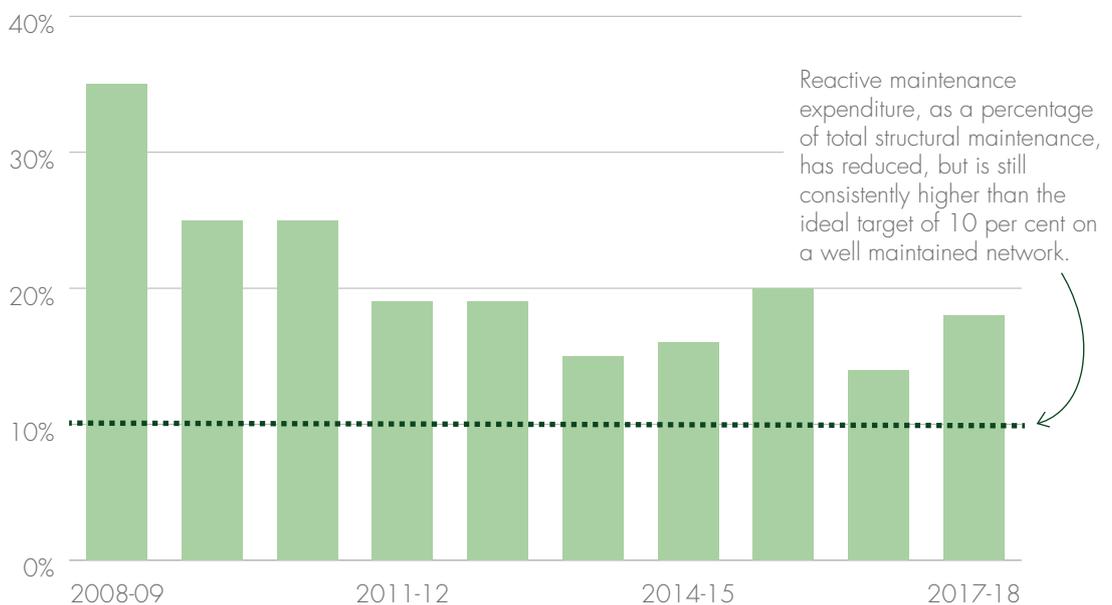
¹⁹ Monitoring rounds form part of the annual budgeting process, whereby surplus funds from central government bodies can be reallocated to other bodies in need.

Part Two: Strategic planning and funding of structural road maintenance

- There is more frequent use of reactive maintenance, such as patching, on areas of roads where resurfacing or surface dressing would provide a longer lasting value for money solution.

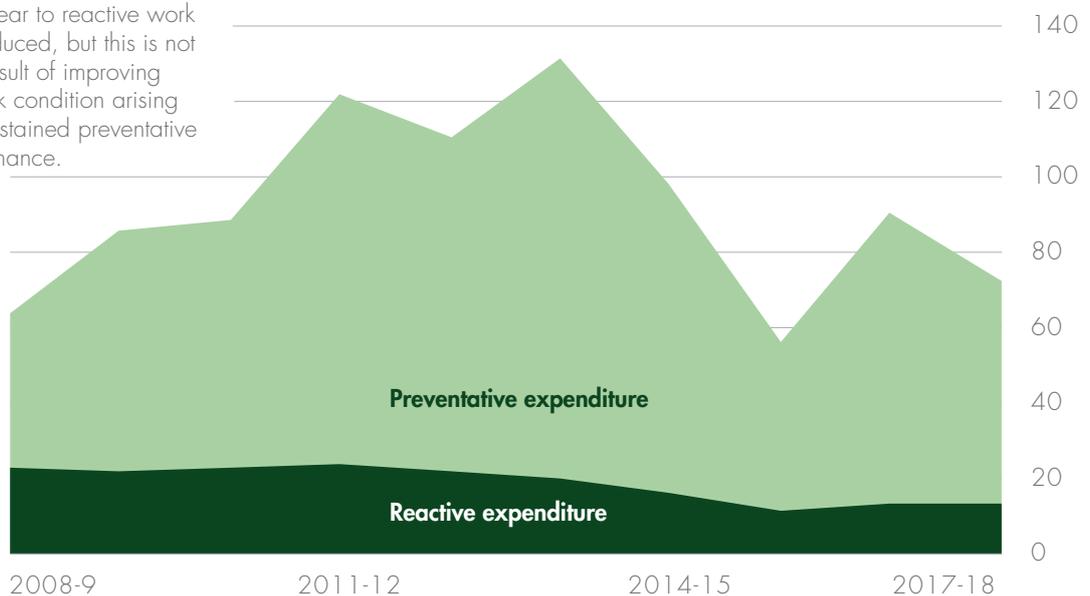
Figure 3. Reactive and Preventative expenditure

Reactive maintenance expenditure as a percentage of total structural maintenance expenditure



The funding committed each year to reactive work has reduced, but this is not as a result of improving network condition arising from sustained preventative maintenance.

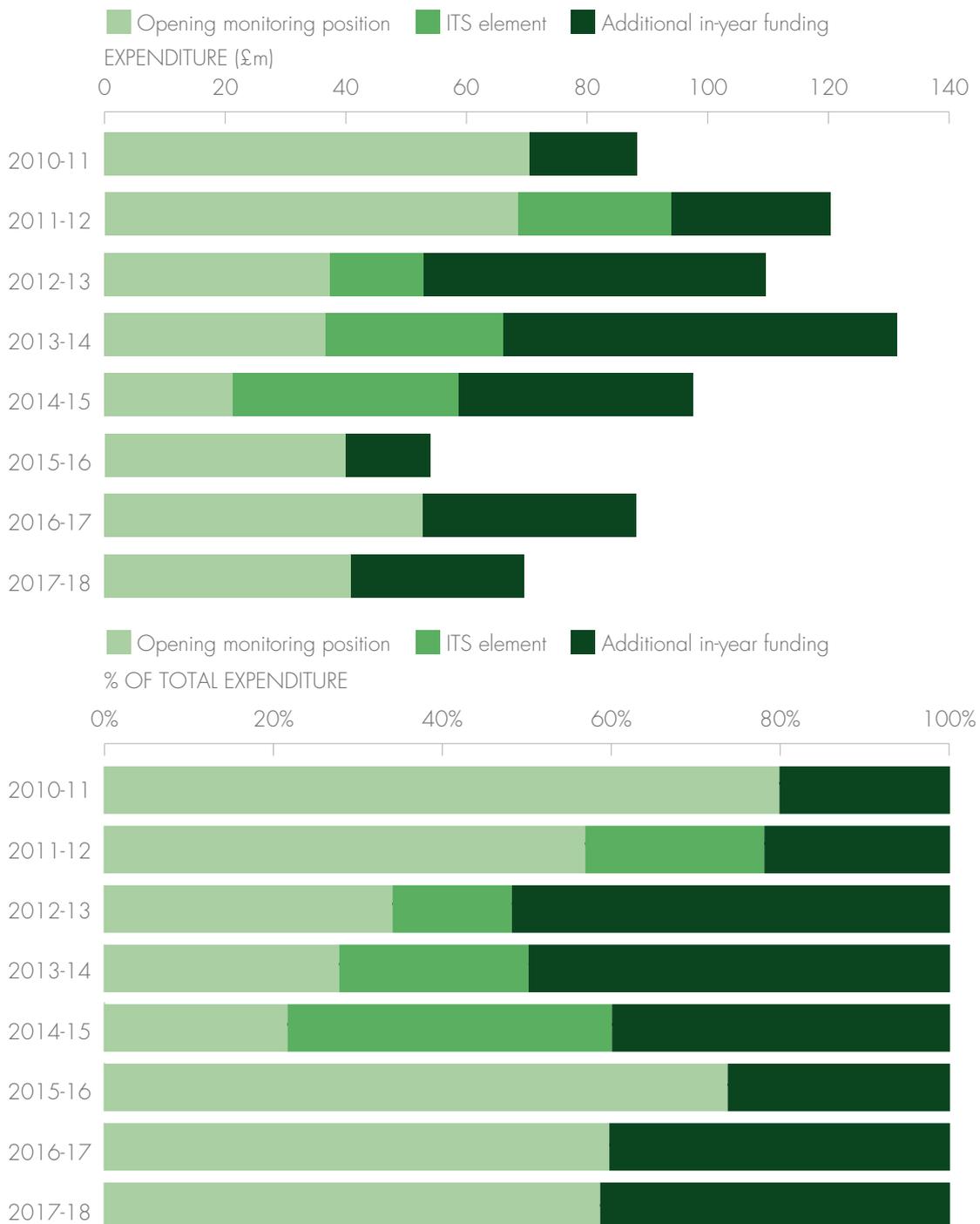
TOTAL STRUCTURAL MAINTENANCE EXPENDITURE (£m)



Source: Department for Infrastructure data

Figure 4. Reliance on in-year resource allocations

Structural maintenance funding has relied heavily on in-year, Invest to Save funding and other supplementary funds



Source: Department for Infrastructure data

Part Two:

Strategic planning and funding of structural road maintenance

- The quality of repairs diminishes as more short-term temporary repairs are carried out, until more funding is available to conduct the work to a proper standard, which will last longer. Temporary repair costs can have greater overhead costs such as site set-up and traffic management.
- Funding received late in the year leads to an increase in the amount of work carried out at the end of a financial year. The additional time pressure to complete this work increases the risk to quality and cost.
- Contractors incur additional costs associated with an insecure programme of work both in year and from one year to the next, which may be being passed to the public sector.
- Contractors are less likely to make long-term investments in staff, training and machinery.
- Structural maintenance work delayed to the autumn and winter months can impact on repair quality, with cooler temperatures and weather disruptions being less than ideal for laying bitumen or asphalt. There are also fewer daylight hours to carry out maintenance work and additional costs associated with working over weekends or into the evenings.

In recent years the Department has also heavily relied on additional capital funding to supplement its mainstream budget

- 2.25 Following the publication of the Snaith report in 2009, the network benefited further when, between 2011 and 2015, additional capital funding of £108 million was received from the 'Invest to Save' funding initiative. This provided an element of capital ring-fenced funding, averaging 20 per cent of the overall structural maintenance budget. The objective was that high levels of sustained capital investment in structural maintenance over a number of years should see a reduction in the funding required for patching.
- 2.26 However, the sustained additional investment was short-lived and in the final year of 'Invest to Save' the mainstream capital budget was significantly cut. In 2016-17, an additional £15 million was allocated to improve rural roads (the First Steps Stimulus Package²⁰) and, most recently, another £15 million in the 2018-19 budget (the Road Recovery Fund). The use of 'Invest to Save' to supplement departmental budgets received criticism from the Assembly's Public Accounts Committee, who found that *"the amount of funding allocated seemed purely to be an attempt to offset budget cuts in mainstream funding."*²¹.

20 The 'First Steps Stimulus' package is borrowed from the UK Treasury and will need to be repaid by the Department in the future.

21 Public Accounts Committee Report on Invest to Save funding in Northern Ireland, March 2016

- 2.27 Supplementary capital funding has resulted in some improvements in the condition of the network, particularly when it is spent on value for money, planned maintenance work, such as resurfacing. However, its future availability is not guaranteed and this was evident in 2015-16 after the 'Invest to Save' funding ended and spending on structural maintenance fell to £54 million.
- 2.28 The National Audit Office (NAO) found that changes to road maintenance budgets in-year do not promote value for money²². NAO also found that stop/start funding makes long-term planning more difficult for highways authorities and contractors and cited unpredictable income as a disincentive to invest in improving efficiency. Infrastructure UK has reported that certainty of funding is associated with cost savings of 10 to 20 per cent for routine maintenance²³.
- 2.29 As most structural maintenance is contracted out to the private sector, reliance on additional in-year funding, the planning cycle for maintenance and having to spend money within the financial year are claimed to be having a negative impact on the economy, jobs and safety. The Quarry Products Association Northern Ireland published that every £1 underspent on maintenance costs the economy £1.26. It also estimates that 650 private sector jobs have been lost in recent years due to the lack of funding and that every £1 million spent on resurfacing roads sustains 13 highly skilled jobs²⁴.
- 2.30 Competing government priorities to protect, in particular, health and education, as well as inflationary and other pressures, create an environment where short and medium term options are very limited. Long term funding would provide more certainty to help ensure that structural maintenance of the entire road network meets reasonable service levels on a sustainable basis. It is important that the Department ensures that all relevant data, information, scenarios and consequences are presented to the Department of Finance and elected representatives, so that informed decisions can be made in relation to the funding of structural maintenance.

22 *Maintaining Strategic Infrastructure: Roads*, the National Audit Office, June 2014

23 *A fresh start for the Strategic Road Network: Managing our roads better to drive economic growth, boost innovation and give road users more for their money*, Alan Cook, November 2011

24 <http://www.northernbuilder.co.uk/qpanimla/> - by contrast the Scottish government has cited that for every £1 reduction in road maintenance, there is a cost of £1.50 to the wider economy. (http://www.racfoundation.org/assets/rac_foundation/content/downloadables/economics_of_road_maintenance-an_racf_view-june_2013.pdf)

Part Three:

The condition of the network



Part Three:

The condition of the network

The Department monitors the physical condition of the network along with traffic volumes and flows to inform structural maintenance demands

- 3.1 Roads are prioritised for the scheduling of planned structural maintenance using a hierarchical, risk-based approach, to manage limited resources. The exceptions to this are road defects that may pose a risk to public safety, in which case maintenance is carried out regardless of road type. The collection and analysis of data to establish a detailed picture of the current condition of the network, is essential to allocate limited resources to areas of greatest need and set priorities for structural maintenance.
 - 3.2 Understanding the demands that traffic volumes have on the network is also critical. Road classification, as well as the volume, type and frequency of traffic using it, determine the importance any road has in the overall network. The collection and analysis of data over time is essential for measuring current demand and forecasting the future potential utilisation of roads across the network. Together with road condition data, this informs current and potential future structural maintenance demands.
 - 3.3 The Department monitors the condition of the network using a variety of survey and inspection methods. These measure some or all of the following: structural strength; surface condition; skidding resistance; and ride quality (see **Figure 5**). They identify defects, both in the surface and within the road structure, which inform a programme of work for a particular structural maintenance activity, such as patching or resurfacing. They also identify defects likely to pose a risk to public safety. Rectification of these is required within short time scales to reduce the risk of public liability claims. **Appendix 2** sets out the types of survey and inspection methods.
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Figure 5. Survey and inspection by road type

Road Type	Description	Type of survey and inspection
Motorway	High-speed, non-stop routes restricted to certain types of vehicle.	Safety, surface and structure
A Class	Separated into trunk and non-trunk roads. Along with motorways, A Class trunk roads are the key transport corridors between major urban areas. They can range from dual-carriageways to single lane roads. Non-trunk A Class roads form the core of the rest of the road network.	Safety, surface and structure
B Class and C Class	B Class roads form the remaining inter-town and inter-village link roads. C Class roads tend to be the roads running through towns, as well as most country roads.	Safety and surface only
Unclassified	All other roads that are not classified and can be urban or rural. Unclassified private lanes are not maintained by the Department.	Safety and surface only

Financial pressures are preventing the Department from collecting all the data it requires to predict road usage growth, to assist with long term structural maintenance planning

- 3.4 In 2000, we recommended that projected traffic growth rates specific to NI be established²⁵. Between 2008 and 2014, Vehicle Kilometres Travelled (VKT) surveys set out the estimated number of kilometres travelled across the network each year by all forms of transport. However, due to financial pressures these surveys were discontinued.

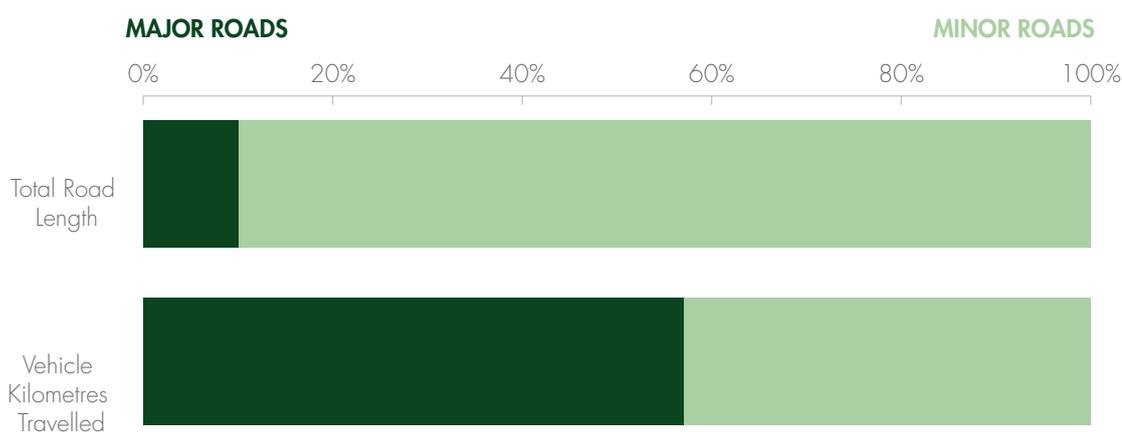
25 Previously GB data was used and applied to the Northern Ireland network.

Part Three: The condition of the network

- 3.5 The statistics in the surveys indicated a modest increase in the distance travelled by all types of vehicle, from 19.5 billion kilometres in 2008 to 19.8 billion kilometres in 2014. The increase was the net effect of a larger increase in kilometres travelled on minor roads²⁶ and a smaller decrease on major roads²⁷. However, as shown in **Figure 6**, major roads only represent 10 per cent of the entire network but account for 57 per cent of all distance travelled. This means that major roads are subject to much more traffic and, consequently, more wear and tear than minor roads. However, they have been designed, constructed and maintained to accommodate this.

Figure 6. Road type usage

Despite only accounting for 10 per cent of the road network in Northern Ireland, the majority of vehicle kilometres travelled in Northern Ireland occur on major roads



Source: "Annual road traffic estimates: vehicle kilometres travelled in Northern Ireland 2014", Department for Infrastructure, June 2016.

- 3.6 A change in the type of data now collected and the absence of current published estimates of VKT, means that it is not possible to be certain whether there are still increasing demands on minor roads. There is a risk that collecting less data leads to less accurate estimates regarding traffic usage of the road network. As well as acting as an inhibitor to long term strategic planning (**paragraph 2.1**), it may also pose an increased public safety risk, particularly relating to faster rural minor roads, as the vast majority of these roads were not designed or constructed to modern standards and historically receive the least maintenance.

26 Minor roads include 'B' (under 10,000 vehicles per day) and 'C' classified roads and unclassified roads.

27 Major roads include motorways and all class 'A' roads and B roads with flows of greater than 10,000 vehicles per day. These roads usually have high traffic flows and are often the main arteries to major destinations.

- 3.7 The Department told us that current data indicates traffic volume rates increasing by an overall one per cent annually across the entire network. This is significantly less than the estimated growth rates in GB and the Rol.

There is limited transparency of the road network's current physical condition and formal targets are restricted to the trunk road network

- 3.8 The Department has one condition-based objective within its current Corporate Plan relating to network maintenance²⁸. This is to invest in the motorway and trunk road network so that at least 85 per cent is in satisfactory structural condition, that is, a residual life of greater than five years. The target in the Department's annual Business Plans have fluctuated over the years (ranging between 65 per cent and 85 per cent) as a result of fluctuating budgets. The motorway and trunk network accounts for approximately 5 per cent of the entire network, but facilitates almost 40 per cent²⁹ of total kilometres travelled. There is no published objective for the remaining 95 per cent of the road network, which facilitates 60 per cent of total kilometres travelled.
- 3.9 Following a recommendation from our report in 2000, information on network condition was published. However, this ceased in 2012. A general picture of road condition 2002 – 2009 was published in the independent Snaith report³⁰, however this was not widely available to the general public. Since 2012, there has been no published information regarding the physical condition of the network. By contrast, England, Scotland and Wales publish condition surveys on an annual basis.
- 3.10 There is still a misconception among the public that local councils are responsible for the road network, reflected by a significant number of phone calls received by councils regarding road related issues. In addition, local elected representatives receive regular complaints relating to road conditions. Whilst council officers and elected representatives are unable to resolve these issues, the Department encourages councils to inform it of road maintenance matters brought to their attention, and meets with council officers and elected representatives informally on a regular basis. In addition, Senior Roads Managers attend formal meetings twice yearly with elected representatives, where any road maintenance issues can be raised and addressed.
- 3.11 The Department presents an annual report for each council³¹, informing councillors and the public about work carried out in each council area. The content of the reports varies, but always includes information on the location and amount spent during the year on resurfacing and surface dressing, as well as footway and drainage maintenance. It also includes proposed

28 The Department also has performance targets relating to repairing or making safe network defects

29 Calculated from "Annual road traffic estimates: vehicle kilometres travelled in Northern Ireland 2014", Department of Infrastructure June 2016

30 'A Review of the Structural Maintenance Funding Requirements for the Roads Service', M.S. Snaith, September 2009.

31 These reports are available on the Department's website.

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work for the following year. However, the reports do not include information relating to road condition or the extent of any reactive maintenance work carried out during the year, such as the repair of network defects.

- 3.12 These reports could provide an opportunity for the Department to communicate to locally elected representatives and other stakeholders, the condition of the network within each council area, rather than just a summary of major work completed. Local authorities in GB already have detailed insight into local road conditions, as they are responsible for their own local networks.

Recommendation 4

The Department should publish information regarding the condition of the road network on a regular basis. This should include meaningful performance indicators and standards, providing all elected representatives and road users with valuable information to support independent monitoring and inform decision-making.

A growing maintenance backlog of £1.2 billion exists as a result of long-term underfunding

- 3.13 Despite repeatedly bidding for more resources since the 1980's, annual funding for structural maintenance has consistently fallen short of what the Department considers necessary to maintain the network to a satisfactory standard.
- 3.14 Our previous review noted a considerable structural maintenance backlog relating to the network and reported that continued underfunding was likely to hasten the deterioration of its condition. The backlog is the estimated amount of money required to rectify all outstanding structural maintenance issues and bring the entire network into a fit for purpose state. In 1999, the estimated maintenance backlog was approximately £168 million (2018 value).
- 3.15 The 2009 Snaith report highlighted a direct link between the level of structural maintenance funding and the condition of the overall network. It identified that the network was continuing to deteriorate and that the maintenance backlog had risen to £889 million (2018 value). The report estimated that £108 million (£143 million in 2018 value) was required annually to maintain the network in a steady state. Additional funding over and above this amount was required to reduce the backlog. The NI Executive recognised and accepted the findings of this report and for several years the Department was allocated additional funding, although this still fell short of the annual requirement.
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- 3.16 The Department's current estimation of the backlog is £1.2 billion.³² Approximately £165 million relates to the trunk road network deficiencies (excluding PPP elements), with the rest relating to the local network. An increase over time of the maintenance backlog indicates overall deterioration in the network's condition. Whilst structural maintenance spending has increased in real terms, slowing the pace of deterioration in recent years, the annual allocations have varied widely (**Part Two**) and are still less than required to maintain the network in a steady state.

While data indicates a marginal overall improvement in the condition of the trunk road network, by contrast the growing backlog of maintenance indicates that the overall condition is deteriorating

- 3.17 As a direct result of structural maintenance funding falling consistently below the level required to maintain the network in a satisfactory condition, the Department has continued to focus its resources on the trunk road network, that is, Motorways and Trunk 'A' class roads. This is subject to ensuring essential provision for safety across all roads. Historically this approach has promoted efficiencies and resulted in relatively good standards of maintenance. However, attempting to maintain these standards continues to be at the expense of deterioration in the condition of the rest of the network.
- 3.18 In 2018, the Department introduced new software to store and process data collected by the Deflectograph surveys (**Appendix 2**). Updated traffic flow and road construction data were also used. The outcome indicated that performance results from previous years underestimated the condition of the trunk road network and that it may be in better overall condition than was previously thought. However, this is only one measure of assessing road condition and is supplemented by information from SCANNER data, Course Visual Inspection (CVI) surveys and professional engineering judgement on network condition (**Appendix 2**). Despite results indicating better overall conditions, the growing backlog of maintenance work required on the trunk road network (**paragraph 3.16**) indicates an overall decline in the condition of the trunk road network.
- 3.19 In 2006 and 2007, the Department awarded two PPP contracts for the 'Design, Build, Finance and Operate' (DBFO) of small sections of motorway and Trunk 'A' roads (**paragraph 2.16**). As part of this agreement, the Department also transferred the responsibility for maintenance of 90 per cent of all motorways, along with the new sections of Trunk 'A' roads (less than one per cent of all Trunk 'A' roads), to the private sector. The average annual cost of the two contracts is approximately £47 million. This includes life cycle replacement, day-to-day operational maintenance and management, finance charges and loan repayments. Due to the way in which these contracts are structured, the Department cannot readily identify the cost of maintaining motorways. While value for money was tested as part of the Outline Business Case and at the contract award stage using the appropriate Treasury guidance, it is not possible for us to determine if a value for money maintenance service is being provided.

32 The Department's estimates of £168m (1998) and £1.2billion (2018) have been calculated in different ways and whilst each is the best assessment of the backlog pertaining at that time, they are not directly comparable.

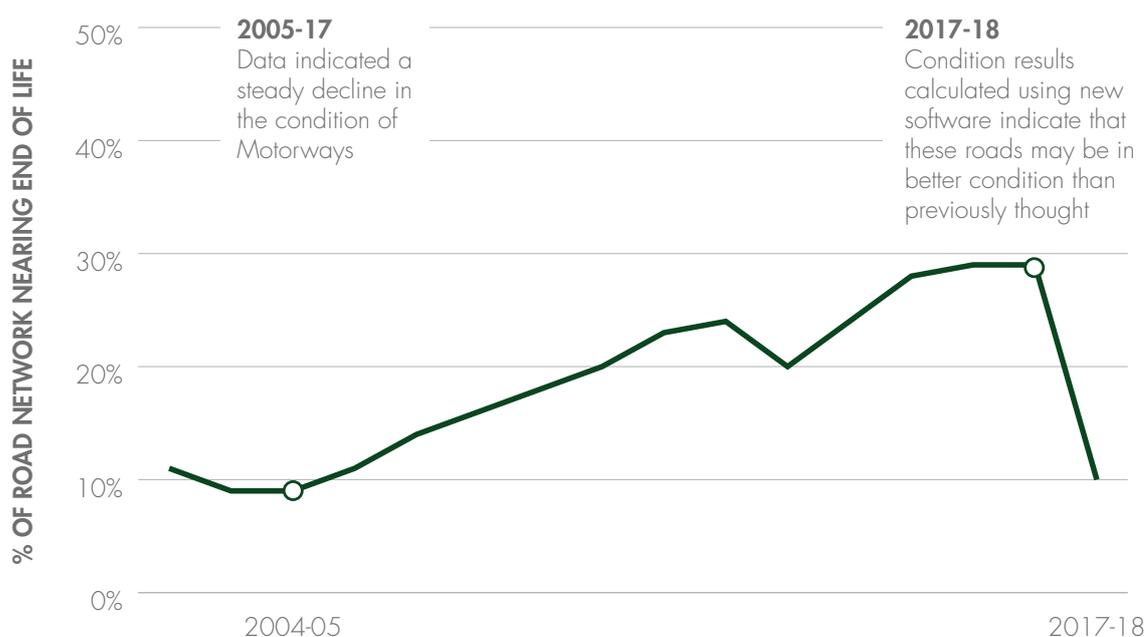
Part Three: The condition of the network

- 3.20 A key feature of the agreements is the transfer of maintenance risk of the motorways to the private sector, which is reflected over the thirty-year period of each contract. Until 2018, the Department's performance data indicated a steady decline in motorway condition, peaking at almost 30 per cent of motorway length nearing the end of economic life (see **Figure 7**). Results from the most recent performance data indicates that only 10 per cent of Motorway length is nearing the end of economic life.

Figure 7. Residual life of Motorways

Until 2017-18 data indicated a steady increase in the proportion of road length nearing the end of economic life

% of road length with less than five years life remaining



Source: Department for Infrastructure data

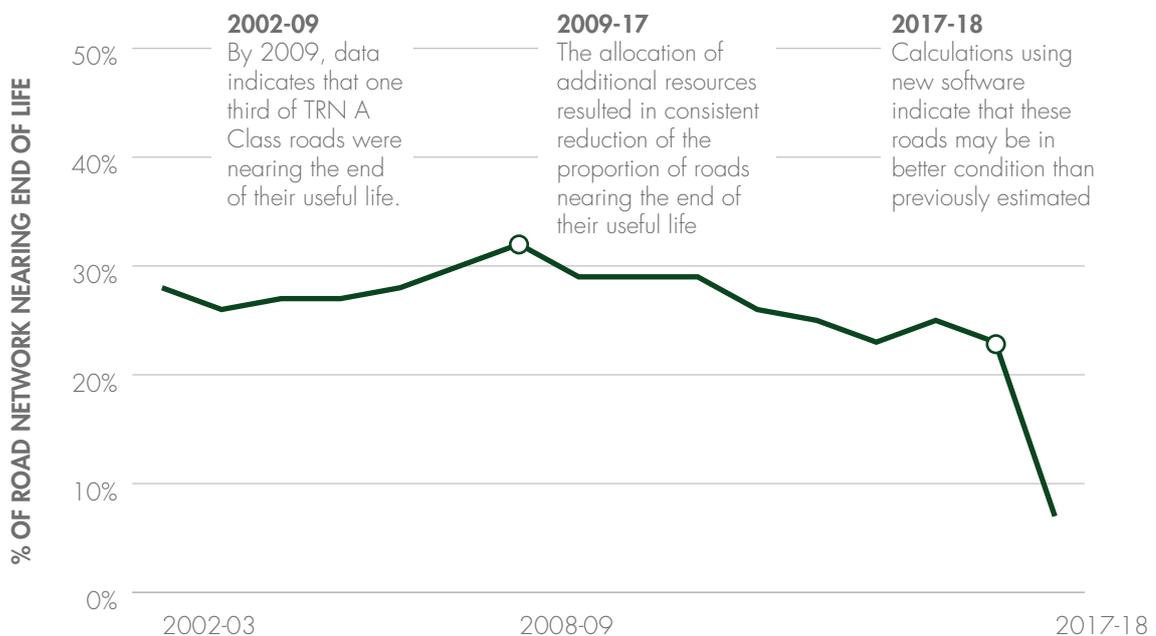
- 3.21 The improved 2017-18 performance result is not an indication of actual physical improvement in motorway condition, but that these roads may now last longer than previously thought. The Department has explained that the approach on both contracts is to manage them in accordance with economic decisions that will ensure that the minimum contractual hand-back requirements are delivered as cost effectively as possible. The requirements include a stipulation that 85 per cent of all maintained pavements must have a residual life of greater than ten years. When the contracts end, the maintenance risk will be transferred back to the Department.

- 3.22 We understand that the Department will identify and manage any potential risks in advance of the end of the contracts. As part of this process, it should be able to determine if the private sector has adequately maintained these roads to an affordable, satisfactory and sustainable “steady state” and whether the maintenance aspect of the contracts has provided the public with value for money.
- 3.23 Between 1995 and 2000, the percentage of the rest of the trunk road network with a residual life of less than five years averaged almost 20 per cent³³. By 2009, nearly one third of trunk ‘A’ class roads were nearing the end of their useful life. However, additional funding available between 2009 and 2015 (**Part 2**) halted and, to a small degree, reversed the decline in the condition of the ‘A’ class trunk roads (**Figure 8**). The latest data indicates that less than seven per cent of the trunk road network had a residual life of less than five years, significantly better than previously estimated. As with motorways, this is not as a result of any recent physical improvement, but that these roads may now last longer than previously thought.

Figure 8. Residual life of Trunk ‘A’ Class Roads

Since 2009 data indicates an overall reduction in the proportion of roads nearing the end of their economic life

% of roads with less than five years life remaining



Source: Department for Infrastructure data

- 3.24 Whether the reduction in the proportion of these roads nearing their economic life can be maintained, will depend on future levels of funding. However, going forward, the latest condition results may have an impact on the Department’s estimated £165 million backlog of

Part Three: The condition of the network

maintenance work required on the trunk road network (excluding PPP elements) (**paragraph 3.16**). It could also have a significant impact on decision making regarding maintenance investment in the rest of the network, in particular rural roads.

Recommendation 5

In light of the latest condition data for the trunk road network, which indicates that it is in better condition than previously thought, the Department should reconsider how funding is allocated for structural maintenance to ensure fair coverage for all sections of the network including rural roads.

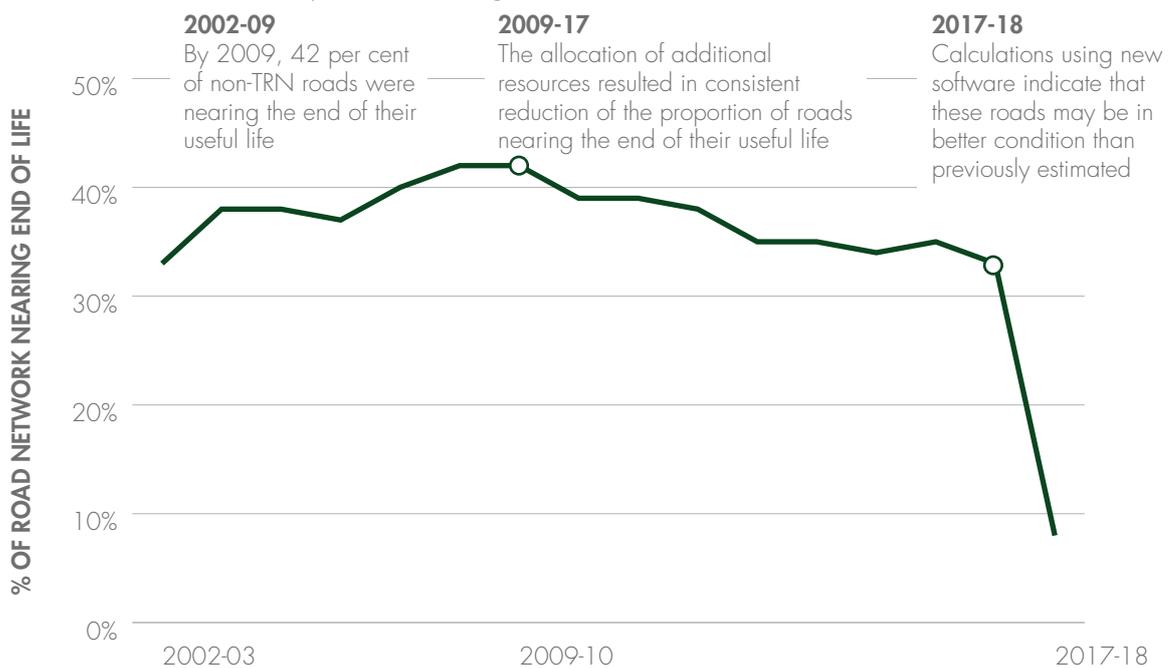
Prioritisation of the trunk road network has resulted in the rest of the road network deteriorating at a faster rate

- 3.25 In our last review, we were unable to determine the condition of the rest of the road network as condition data was unavailable until 2002. This prevents us from determining the extent to which roads have deteriorated since then. The balance of other evidence at that time, from inspections and surveys, the number of public liability claims, the number of defects detected, the level of patching and results of public opinion surveys, suggested the condition of local roads was deteriorating.
- 3.26 Between 2002 and 2009, non-trunk 'A' road condition data indicated increased deterioration to a point where 42 per cent of these roads were approaching the end of their useful life (see **Figure 9**). Additional investment halted and started to reverse the deterioration. However, until the improved 2017-18 measure, data indicated that, on average, 35 per cent of these roads had an estimated residual life of less than five years.
- 3.27 Whilst the condition of the trunk road network and non-trunk 'A' class roads is assessed from data relating to the condition of both the surface and the underlying structure, the 'B' class, 'C' class and Unclassified roads within the local network are assessed based on surface condition only. The Department told us that the cost of assessing the entire network to the same levels as the trunk network and non-trunk 'A' class roads is neither practical nor financially viable.
- 3.28 From 2002 until 2016, the surface condition of 'B' class and 'C' class roads (30 per cent of the entire network length) was measured and monitored from CVI surveys (**Appendix 2**). In addition, from 2006 the surface condition was measured by SCANNER surveys (**Appendix 2**) on a sample basis, with full coverage achieved between 2012-2015. SCANNER surveys, which are now routinely undertaken, can provide a more consistent and objective assessment of surface condition over the longer term. Recent data indicates that the percentage of roads requiring either immediate attention, or attention in the near future, to their surface, is reducing.
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Figure 9. Residual life of non-trunk 'A' Class Roads

Since 2009 there has been a consistent reduction in the proportion of roads nearing the end of their economic life

% of roads with less than five years life remaining



Source: Department for Infrastructure data

Whilst the SCANNER survey does not provide an actual measure of underlying strength, a number of surface parameters are measured that characterise the condition of the road surface and which can be an indicator of the condition of the lower road layers.

- 3.29 Since 2002, the surface condition of Unclassified roads has been measured and monitored from CVI surveys³⁴. Although the available CVI data indicates that the surface of these roads has remained in a steady state, the significantly reduced frequency of data collection since 2015 is unlikely to provide an accurate overall measure of unclassified road conditions. It has been reported³⁵ that this apparent condition was being held at these levels by reactive patching and localised surface dressing, a situation that can only be sustained for a limited period. As with the 'B' and 'C' class roads, current measurements do not provide an absolute measure of the underlying structural condition of these roads.
- 3.30 Whilst these condition datasets show some recent improvements to road surfaces, the current barriers to measuring the underlying structural integrity of 'B', 'C' and Unclassified roads, together with the balance of overall evidence³⁶, indicates that the local network continues to deteriorate. Between 2009 and 2015, the increased spending also benefited the local

34 From 2001-2015 CVI covered 25 per cent of unclassified roads each year. Since 2016 only 10 per cent is covered on an annual basis due to funding constraints and the impact of VES.

35 'A Review of the Structural Maintenance Funding Requirements for the Roads Service', M.S. Snaith, September 2009.

36 For example, increasing number of defects and public liability claims and the increasing maintenance backlog.

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network, and the limited data reaffirms the linkage between structural road maintenance expenditure and road condition. However, as set out in **Part Two** this increased level of investment has been inconsistent and between 2016 and 2018 there was a significant reduction in structural maintenance investment. There is concern that a downward trend in the deterioration may once again come into focus.

Financial pressures have led to interim changes to the Department's 'Roads Maintenance Standards for Safety' and the introduction of a limited service

- 3.31 Financial pressures experienced by the Department have been significant in relation to its ability to deliver a value for money structural maintenance programme and, in particular, those elements of the programme that rely on revenue funding. This led to several interim changes to the Department's 'Roads Maintenance Standards for Safety' (RMSS) policy document and the introduction of a limited service. In relation to strategic maintenance, this document determines the frequency of safety inspections and policy in relation to the repair of road defects.
- 3.32 The Department described its first changes in April 2015³⁷ as '*significant and unprecedented*' and this also impacted across its wider suite of routine maintenance services to the network.³⁸ The impact of these actions on the delivery of the structural maintenance work programme initially affected the repair of its lowest priority network defects. Repair services were withdrawn from low trafficked rural roads (46 per cent of the network), except for emergencies, with only the most serious defects repaired in other areas. It also led to a permanent reduction in the frequency of safety inspections on low and medium traffic urban and rural roads and reduced the frequency of inspections of some footways.
- 3.33 While the Department recognised that this limited service provides a balance of financial risk versus public safety and acceptability, it also recognises there could be a number of serious consequences, which could increase with time. These include concerns that the condition of footways, bitmac roads³⁹ and cycle ways could deteriorate, and that the risk of public liability claims could rise due to a breach of statutory duty. However, all of the actions made at the time were necessary to mitigate financial pressures. At the time of this report's publication, a limited service was still in place.
- 3.34 The Department attributed its decision to introduce a second interim change to its RMSS to reduced staffing levels (arising from the Northern Ireland Civil Service Voluntary Exit Scheme). We previously reported that best practice indicates that early departure schemes should be driven by the long-term needs of the organisation and workforce plans, rather than purely immediate budgetary considerations. This was not feasible within NI when blunt in-year

37 Director of Engineering Memorandum 155/15 - Road Maintenance Standards for Safety – Skeleton Service.

38 The 'skeleton service' (which was later renamed 'limited service') also impacted significantly on routine maintenance service provision e.g. street lighting repair, road sign and markings maintenance, gully cleaning and grass cutting.

39 Approximately 83 per cent of roads are bitmac, with the rest being constructed from the more durable and sustainable asphalt. Asphalt repairs are funded through the capital budget, which has not been affected to the same extent as the revenue budget.

adjustments in headcount and pay bill were essential to balance budgets⁴⁰. The reduction in frequency of safety inspections is an example of what can happen when immediate budgetary considerations precede the long-term needs of the Department.

Financial pressures inhibit the Department's performance in identifying and repairing network defects, preventing it from putting all local user and community requirements above its own requirements

- 3.35 Reduced funding and the limited service have led to a significant reduction in the number of defects (for example, potholes) recorded and approved for repair. In addition, the percentage of defects repaired after approval has reduced. Whilst this negatively affects all classifications of defect, it has particularly impacted on minor defects on the local road network, as more serious defects on the trunk road network are prioritised.
- 3.36 **Appendix 3** shows the link between the overall amount of reactive funding spent and the Department's ability to repair each category of defect. Reactive spending, which is linked to overall resource availability, has fallen since 2014-15, and with major and medium defects prioritised, the number of minor defects repaired has reduced. Minor defects left unrepaired are at a high risk of further deterioration, costing more to repair in the future. There is a risk that the increase in the number of medium and major defects recorded in 2017-18 is the beginning of an increasing trend principally caused by the decision to not repair minor defects sooner.
- 3.37 Whilst the Department's risk based approach follows the current UK code of practice⁴¹ (which enables timely identification of safety related defects on its strategic roads and those with high volumes of traffic), resourcing pressures inhibit this from application to the rest of the network. Under the limited service provisions, not all road users receive the same level of service, particularly those who frequently use rural roads. The Department has mitigated some of the additional safety risk with the Public Information Portal (see **paragraph 2.8**), which allows road users to report road defects. However, many obvious visual defects, along with other less obvious defects which can only be identified by trained and experienced inspectors (often with specialised equipment), may go unreported.

Long-term deterioration of the road network increases the risk to public safety

- 3.38 The Department is obliged to repair any road defects likely to pose a risk to public safety. It has to be able to provide evidence that the road or footpath had been inspected at reasonable intervals and that reasonable action was taken to address any defects arising, to successfully defend any claims for compensation for injury or loss. Some road and pavement defects can,

40 Northern Ireland Public Sector Voluntary Exit Schemes, Northern Ireland Audit Office, October 2016.

41 'Well-Managed Highway Infrastructure: A Code of Practice', October 2016.

Part Three: The condition of the network

if undetected or not repaired promptly, increase the risk of damage to a vehicle or injury to people⁴². This is particularly the case on roads with higher traffic volumes and speed limits, which increases the subsequent rate of deterioration and degradation.

- 3.39 In 2009 the UK Roads Board⁴³ set out that *“claim opportunities occur because roads and footways have deteriorated due to the historic lack of investment and subsequent maintenance backlog. Effective planned maintenance budget allocations can reduce maintenance-based claims to negligible levels”*⁴⁴. The total financial cost (including compensation, any associated legal costs or costs associated with obtaining specialist advice) of claims resulting from damage to vehicles has averaged £240,000 over the past five years.
- 3.40 The costs in relation to personal injuries are significantly greater, averaging nearly £4 million⁴⁵ over the same period (**Figure 10**). The average cost of a successful claim for damage to a vehicle has reduced in recent years. However, following a steady state, the average cost of a successful personal injury claim decreased in 2017-18. Whilst the cost and frequency of these claims are less than at the time of our last review, they are paid from the Department’s budget and in 2015-16 accounted for approximately eight per cent of structural maintenance expenditure.
- 3.41 The recent increasing trend in the number of successful claims (**Figure 11**) peaked in 2016-17 at 1,461⁴⁶. This followed a spike in the number of vehicle damage claims received in 2015-16, demonstrating that there is a time lag in concluding successful claims. In 2017-18, 3,934 vehicle damage claims were received and the Department expects another significant peak in the number of successful vehicle damage claims in 2018-19.
- 3.42 The increasing number of vehicles and traffic growth cannot totally account for total claims received in 2017-18 and is, in our view, an indication that the surface condition of the road network is deteriorating. Regardless of how well maintained the network is, the risk of damage or injury will always be present. However, the longer a defect goes undetected and/or unrepaired, the greater the risk of damage and injury. In addition, the greater the number of undetected and/or unrepaired defects, the greater the risk of damage and injury. Having a well-maintained network reduces this risk.

42 Vehicle damage includes damage to cycles, motorcycles, cars, lorries, mini-buses, coaches etc. Personal injury includes claims from pedestrians, cyclists and vehicle occupants for injuries sustained on the network.

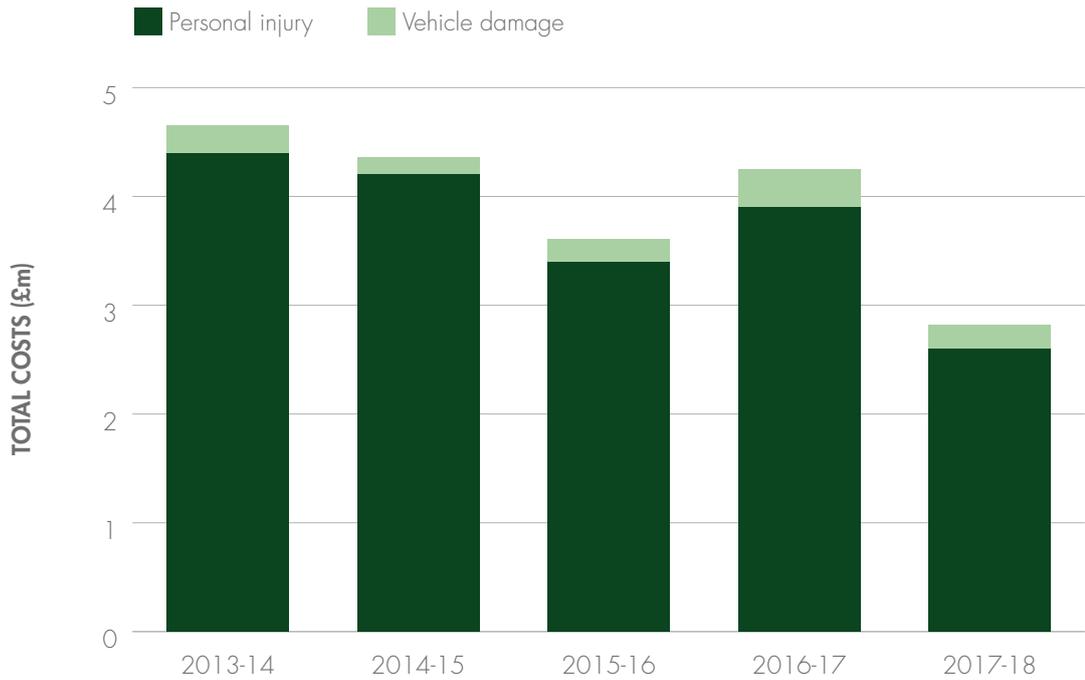
43 The UK Roads Board is part of the UK Roads Liaison Group which brings together national and local government from across the UK to consider roads infrastructure, asset management, engineering and operational matters. The Department is a participating member of this group.

44 Highway Risk and Liability Claims, Second Edition 2009, UK Roads Board.

45 Includes compensation payments, legal and counsel fees.

46 There is a time delay between when claims are made and when successful claims are paid, therefore claims concluded in a financial year do not necessarily relate to claims received in that year.

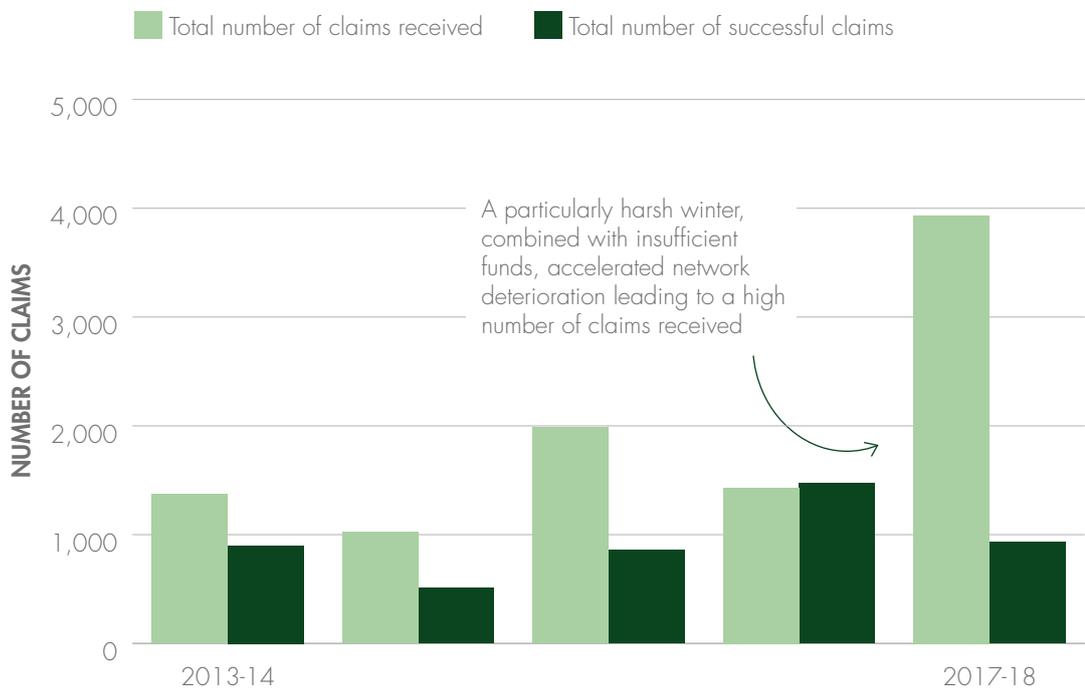
Figure 10. Damages resulting from road and pavement defects



Source: Department for Infrastructure data

Figure 11. Number of claims for damage to a vehicle

There is an increasing trend in the number of successful claims



Source: Department for Infrastructure data

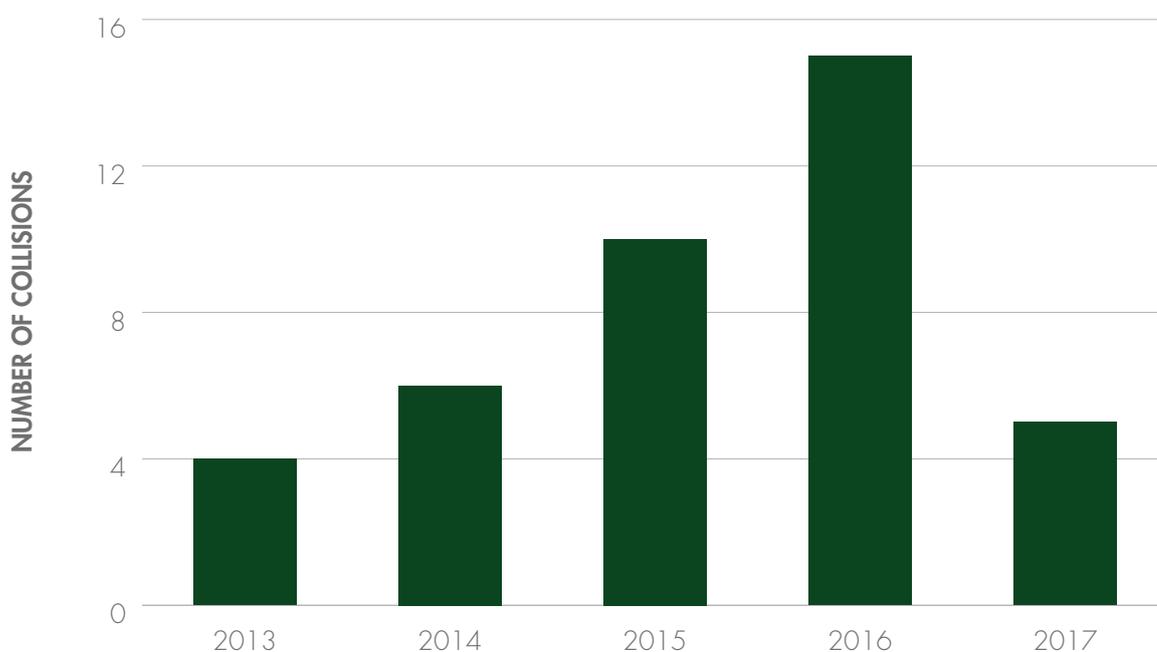
Part Three: The condition of the network

Up until the most recent year there was an increasing trend in the number of collisions attributed to a road surface in need of repair

- 3.43 The Police Service of Northern Ireland (PSNI) produces regular statistics on injuries resulting from road traffic collisions that have been brought to their attention. As in other UK regions, collisions resulting in no injuries do not form part of the statistics.
- 3.44 Our review of PSNI statistics indicates that the number of recorded collisions whose principal cause was attributed to a physical road condition is very small. Most noteworthy, however, are those collisions attributed to a road surface in need of repair, which increased year on year from 4 in 2013 to 15⁴⁷ in 2016, before decreasing to 5 in 2017 (**Figure 12**). It is too early to determine whether the decrease in 2017 is a reversal of this recent trend. Whilst small in number, the impact on the individuals and families involved in such collisions can be significant, as can the direct and indirect socio-economic costs of such collisions.

Figure 12. Road collisions where a road surface needing repair was a principal cause

Whilst small in number, the impact of collisions on the individuals and families involved can be significant



Source: PSNI statistics

47 None of these accidents has resulted in a fatality and the majority relate to slight, rather than serious, injury.

Appendix 1: Structural Maintenance Activities *(paragraph 1.9)*

Structural Maintenance Activity	Description	Reasons Used	Cost
Resurfacing	The machine laying of a new surface layer of bitmac or asphalt. It is normally superimposed on the existing surface, but it is sometimes necessary to remove the existing surface. If a section of road requires strengthening, thicker layers are applied.	<ul style="list-style-type: none"> • Restore riding quality of the road. • Restore skidding resistance. • Prevent water ingress. • Renew wearing course where the existing surface has oxidised. • Strengthen the load carry capacity • Restore longitudinal profile and so reduce the dynamic load on the road where settlement or subsidence has taken place. 	Costs range from approximately £22/sqm for non-Trunk A,B,C & U to approximately £27/sqm for Trunk roads
Reconstruction	The complete replacement of the surface and lower layers of the road.	Carried out at the end of the service life of the road	Estimated ⁴⁸ to be £80 - £90/sqm
Surface dressing	The application of one or more alternating layers of bitumen and stone chippings to the surface of a road. There is no increase in structural strength but will significantly increase its durability and service life	<ul style="list-style-type: none"> • Improve the surface texture and skid resistance • Seals the surface against water penetration. • Stop the existing surface disintegrating and extends the life of the road • Provides cost effective and durable method of road surfacing, with minimum on site time and reduced delays and safety risks, compared to alternates. 	Actual treatment costs are approximately £2.06/sqm; the unit rate for the dressing aspect is about £1.20/sqm

48 In most cases reconstruction relates to pockets/areas within a scheme and this makes unit costs difficult to extract.

Structural Maintenance Activity	Description	Reasons Used	Cost
Patching	Repair of a small area of pavement (such as a pothole or crack).		Costs are approximately £18/sqm (based on a 70mm depth as this is the most commonly used repair depth)
Structural drainage	Repair of drainage systems adjacent to roads.		The Department does not hold information in a format that could be linked to expenditure and that would facilitate a cost per sqm.

Appendix 2: Survey and inspection types *(paragraphs 3.3, 3.18 and 3.28)*

The survey and inspection types currently conducted by the Department comprise:

Structural survey and inspections

Deflectograph: Survey carried out by a machine on a slow moving vehicle to determine the residual life of the pavement. This particular survey is confined to the Motorway, Trunk and A class network on a three-year cycle.

Surface survey and inspections

SCANNER: Surveys carried out by a vehicle travelling at normal traffic speed and using computer-imaging techniques to record surface defects. These are performed on Trunk, A, B and C class roads and the data is analysed to current UKPMS Rules and Parameters. Coverage on Trunk and A class roads is on a two-year cycle, whilst B and C class is a four-year cycle. A small sample survey has also been carried out on the U Class network as a first step for inclusion in the network's asset valuation. These surveys are carried out by independent contractors.

Course Visual Inspection (CVI): Surveys carried out to national UKPMS standards by in-house teams from a slow moving vehicle, which records defects in the road surface. This survey is now confined to the unclassified road network and was previously undertaken over a four-year cycle. However, constrained in-house survey teams have meant that this has now reduced to ten-year cycle.

SCRIM: Survey carried out by a machine on a vehicle and used to ascertain the skid resistance of the underlying pavement in wet conditions. This particular survey is confined to the motorway and trunk network on an annual survey. The non-trunk A class network is surveyed on a three-year cycle.

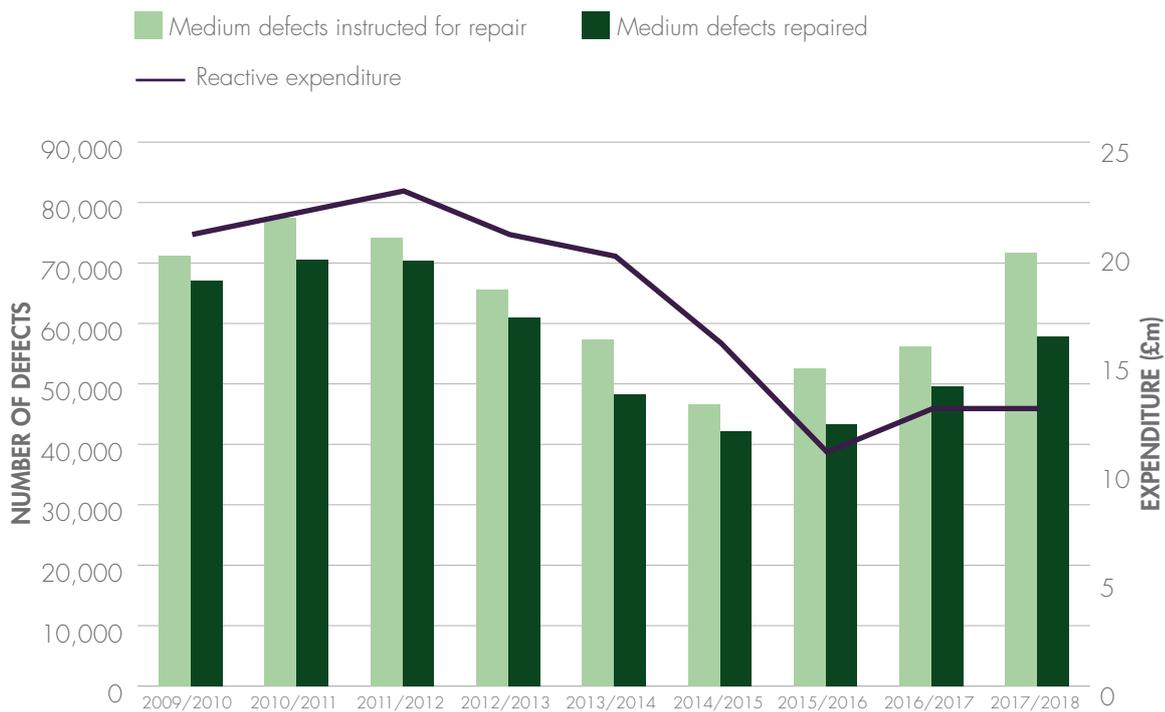
Safety Inspections: Under Article 8 of the Roads (Northern Ireland) Order 1993, the Department has a duty to maintain public roads. The detection of defects which affect public safety, is given a high priority by the Department, which currently visually inspects every road at least once every 26 weeks. The outcome of these inspections will usually generate maintenance tasks, such as patching.

Appendix 3: Defect performance versus reactive expenditure *(paragraph 3.36)*

Major defects instructed for repair



Medium defects instructed for repair



Source: Department for Infrastructure data

Minor defects instructed for repair



Source: Department for Infrastructure data

NIAO Reports 2018 and 2019

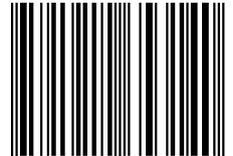
Title	Date Published
2018	
Continuous improvement arrangements in policing	27 February 2018
Type 2 Diabetes Prevention and Care	06 March 2018
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2019	
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Published and printed by CDS

CDS 210769

ISBN 978-1-912653-14-0



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