Department for Transport

Highways Asset Management: Funding and Data Collection Survey

Local authority perspective on data collection and funding highways maintenance

Ipsos MORI

June 2022

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Executive summary

Introduction

In July 2021, the DfT commissioned Ipsos MORI[1], a well-established market research company, to carry out research into how local authorities (LAs) use the '**Potholes Fund**' announced at Budget 2020[2], and how this fits in to their broader approach to highways asset management. It should be noted that in previous years there had been a smaller fund called '**The Pothole Action Fund**'; these terms are interchangeable in this report to maintain a degree of consistency.

Additionally, the research was intended to identify what data is consistently being collected by local authorities and potential areas where the DfT might be able to support more consistent data collection on highways and asset maintenance.

Methodology

This study is based on detailed consultations with fifteen LAs. Selection criteria were intended to ensure regional representation and variation based on geographical and contextual factors such as the type of authority, the overall population size, geographical features (coastal versus inland, rural versus urban etc.) and other relevant features.

The interview data was supplemented by a review of relevant documentation provided by LAs and the DfT, providing detail on the types of data already provided to the DfT as well as LAs' longer-term asset management priorities.

Findings

The main study findings are summarised below in line with each of the primary research questions.

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[1] https://www.ipsos.com/ipsos-mori/en-uk

[2] HM Treasury (2020), Budget 2020, available at: https://www.gov.uk/government/publications/budget-2020-documents/budget-2020

How the Potholes Fund is administered and delivered by local authorities

- LAs view the Potholes Fund as a reallocation of, or replacement for, reduced capital and revenue funding overall.
- Some LAs combine the Potholes Fund with other capital funding in one transport pot for overall highways and asset management; others maintain a degree of separation, creating a planned programme of work across the network targeting pothole repair on prioritised highways.
- Most LAs use a relatively broad interpretation of the scope of the funding, referring to DfT guidance that it should be used "for the treatment and prevention of" potholes. Many therefore feel justified to spend pothole funding on preventative treatments such as resurfacing which help prevent the development of potholes.
- The moniker "Pothole Action Fund" provides pressure to use the funding on reactive repairs, as it creates an expectation from residents and politicians that the funding should be used solely for this purpose.
- With regard to allocation of funding, most LAs accept that they are working within constrained budgets. The focus of funding on reactive repairs and major works has led to concerns about a squeeze on 'regular' maintenance. More consideration of ongoing strategic maintenance accompanied by a longer-term funding strategy would support the transition to an asset management-based approach to highways maintenance.

The range and nature of data generated and held by LAs about road maintenance treatment outputs and outcomes in their area

- In general, LAs are happy with the amount and quality of data they collect, particularly with regard to overall road conditions.
- Significant exceptions include footway data and inventory data (particularly with regard to smaller assets such as signs, lighting, culverts, and gullies), which are not consistently collected due to resource constraints.
- Data on drainage is also a particular concern, given increase in rainfall associated with climate change and increased pressure from new housing developments on (often) Victorian drainage systems.
- LAs are consistently collecting some specific data items which are not currently being shared with the DfT. These include detailed road condition and skid resistance data, data on insurance claims and resident complaints.

The potential for more consistent collection of data on roads maintenance treatments by DfT

- The DfT is viewed as an important agent in improving the overall quality and comparability of highways data, both by providing common data templates and definitions and by pushing local authorities to capture additional data on issues such as long-term sustainability and overall impact.
- Data submitted to DfT is not currently perceived to be particularly onerous to collect. Many LAs expressed willingness to provide additional data (for example, on traffic volume), new datasets (for example, around footways), or more detailed data (with regard to road condition). However, as a variety of different data collection methods and databases are used, this would pose difficulties when considering the creation of a consistent national dataset.
- Several LAs expressed concern regarding comparability of datasets which are not currently collected by the DfT (for example, footway data or stratifications of road condition data). Further guidance on definitions would be welcomed in order to ensure data collected is comparable between different authorities.
- Some LAs expressed a desire for further support from DfT in implementing large scale surveys to map their overall inventory. This could be achieved either through the provision of funding or through the commissioning of a centralised survey.
- The majority of LAs interviewed were happy with the data transfer requirements and formats requested by DfT. Some noted, however, that the data being provided was in effect a simplified version of the data they currently hold, presenting a relatively narrow view of their complete dataset.
- Some LAs suggested that more use could be made of their GIS systems, for example by allowing them to upload data directly to a central platform or through a live data feed via an API created and maintained by DfT. It should be noted, however, that not all LAs are currently taking such sophisticated approaches to data collection and analysis.

1. Introduction

This section provides a brief summary of the research implemented to inform this report. This includes a review of the overarching research questions, the study team's approach to data collection and analysis, a review of the sample of local authorities (LAs) consulted for the study and a description of the main data gaps and limitations.

1.1 Purpose of the research

The aims and objectives of this study are summarised in the table below:

Table 1: Project Aims and Objectives

Overarching question	Sub questions
To understand about how one of DfT's key road maintenance funding streams (the Potholes Fund) is administered and delivered by the funded local authorities	▪ LAs perception of the Fund 'process' and how this varies across types of LAs ▪ How the Pothole Fund sits alongside other road maintenance streams, such as HMB and the Pothole Action Fund ▪ Factors influencing LAs decisions about how road maintenance funding is used/allocated?
To understand the range and nature of data generated / held by LAs about road maintenance treatment outputs and outcomes in their area (those funded by the Pothole Fund alongside other road maintenance funding streams)	▪ Type and availability of LA data sources on spending / treatments / outputs ▪ Type and availability of LA data sources on treatment outcomes ▪ LAs asset management strategies (e.g. whether it is reactive or proactive and the factors driving decision making. For example, minimising carbon emissions and maximising VfM) ▪ How LAs use data to inform their asset management strategy ▪ How LAs use data to understand VfM of their asset management strategy ▪ Range and nature of contextual factors / particular local challenges that influence interpretation of data collected on road maintenance treatments across different LAs
To explore the potential for more consistent collection of data on roads maintenance treatments by DfT	▪ Opportunities to make more / better use of existing LA data sources ▪ Evidence gaps that would require new data collection ▪ Challenges to national data collection and aggregation across different LAs ▪ Contextual information that could usefully be collected to supplement existing DfT treatment data collection

1.2 Approach and methodology

The study was implemented using the following main tasks:

Task One: Inception and Familiarisation

The project began with an initial familiarisation stage, starting with an inception meeting with the Project Steering Group followed by in-depth interviews with Department for Transport (DfT) stakeholders and a review of relevant documentation. This included information on what data the DfT collects from local authorities and how, as well as relevant policy documents. This stage was used to help explore the requirements for the study in more depth and collect more detailed information on the Pothole Action Fund delivery process as well as evidence currently collected on its results.

Task Two: Development of research tools

The information compiled during the familiarisation phase informed the development of two key research tools:

- A semi-structured discussion guide for depth interviews with LAs. This was designed to capture details of how LAs administer the Pothole Action Fund and other capital and revenue funding, to understand their overall approach to highways and asset management including how resources are prioritised, the processes involved, and data collected at the local level.
- To support systematic collection of information on local data availability, delivery of the interview programme was supported by a data collection template. This provided a framework to record the availability (or non-availability) of items of information at the local level, and how information is recorded and/or categorised (to aid an assessment of the level of consistency across LAs where data is captured).

Task Three: Fieldwork

Fifteen depth interviews were carried out with LAs via Microsoft Teams. More information on the authorities consulted and the sampling criteria used is provided in Section 1.3 below.

Task Four: Analysis

The interview data was analysed using the qualitative data analysis package NVIVO. A thematic analysis framework was developed, organised around the key research questions for the project. This framework was used to code interview transcripts, enabling systematic analysis across the 15 cases. The thematic analysis was complemented by an analysis of the data gathered in the data collection template developed as part of Task 2, giving an overview of the data gathered at the local level, issues associated with consistency, and key gaps in information.

Task Five: Reporting

The findings of the project were provided in the form of:

- An interim findings report submitted to DfT to obtain initial feedback on the emerging results and shape the final written report.
- A concise written report summarising the findings and recommendations accompanied by a presentation and discussion of the main findings with key stakeholders within DfT..

1.3 Local authorities consulted

A total sample of 15 LAs were consulted for this study. Selection criteria were intended to ensure regional representation and variation based on geographical and contextual factors such as the type of authority, the overall population size, geographical features (coastal versus inland, rural versus urban etc.) and other relevant features including the existence of ancient road networks, specific topographical features and seasonal spikes in traffic.

Table 2: Overview of sample

No.	Authority type	Population (LGA est. mid-2020)	Region	Urban/ Rural	Coastal/ inland	Other relevant features
1	County	1,199,870	South East	Rural	Inland	
2	Unitary Authority	568,210 (mid-2019)	South West	Rural	Coastal	Seasonal spike in traffic
3	Unitary Authority	138,381	North West	Urban	Coastal	
4	Unitary Authority	396,989	South West	Urban	Coastal	
5	Combined Authority	657,204	East of England	Rural	Inland	
6	County	499,781	North West	Rural	Coastal	
7	Local Authority	190,990 (mid-2019)	North West	Urban	Inland	Part of GMCA
8	County	713,085	East Midlands	Rural	Inland	
9	Local Authority	533,149	North East	Urban	Inland	Part of NECA
10	County	914,039	East of England	Rural	Coastal	Below sea level
11	Unitary Authority	172,748	Yorkshire and the Humber	Rural	Inland	
12	County	563,851	South West	Rural	Coastal	Seasonal spike in traffic

13	Combined Authority	141,285	North East	Urban	Coastal	
14	Unitary Authority	209,397	North West	Urban	Inland	
15	County	1,589,057	South East	Rural	Coastal	Roman roads

1.4 Data gaps and limitations

The research encountered no major unforeseen challenges, although the Covid-19 pandemic meant that all data collection was carried out virtually. In terms of methodological limitations, the following should be noted:

- The research was carried out over the summer period, meaning that interaction with stakeholders within LAs was limited by their availability due to holidays. The sample nonetheless represented a relatively broad spectrum of different authorities and the study was aided by significant cooperation from the DfT.
- The research was commissioned and took place over a very short space of time, meaning there was not time to thoroughly collate and review all the data available. This report therefore represents a snapshot of the information provided by interviewees, supplemented by a rapid review of relevant literature.
- All completed data collection templates have been shared with relevant contacts within the authorities in order to ensure the data collected was as complete and as accurate as possible. Nonetheless there may be some gaps in terms of the data included.

2. Background and context

This section provides an overview of:

- the relevant political and financial context within which LAs in England are operating with regard to highways and asset management; and
- a brief review of the data they are currently providing to the DfT.

2.1 Highways Maintenance in England

The highways network in England is made up of motorways, major ‘A’ roads, classified B and C roads, and unclassified roads (primarily in rural and residential areas)[3]. Responsibility for highways maintenance is described in the 1980 Highways Act[4] (amended most recently in February 2021):

- The DfT is responsible for developing policy and providing the legislative framework for the local roads sector, as well as providing capital funding through various different channels.
- National Highways (established in 2015 and previously called Highways England) is responsible for maintaining the 4,500 mile Strategic Road Network (SRN - including motorways and 18% of all A roads, covering a calculated 2.4% of the total length of road in England and carrying a third of motor traffic vehicle miles).
- Responsibility for maintaining, managing and, where necessary, improving their section of the local highway network (the remaining 184,000 miles of the English road network) sits with 153 LAs across England[5]. Local devolution deals, such as within London and Combined Authorities, may lead to these responsibilities being shared (such as TfL

[3] DfT (2021), Road Lengths in Great Britain 2020, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957882/road-lengths-in-great-britain-2020.pdf

[4] Highways Act 1980 https://www.legislation.gov.uk/ukpga/1980/66

[5] Andrew Haylen (2019), Local roads maintenance in England (House of Commons Library Briefing Paper), available at: https://researchbriefings.files.parliament.uk/documents/CBP-8383/CBP-8383.pdf

maintaining London's 'Red Route' London Road Network[6]). Some have proposals regarding responsibility of maintenance under consideration[7].

The general condition of the road network and estimated cost of repairing defects are a source of ongoing concern. Industry reports, such as the annual 'ALARM' survey from the Asphalt Industry Alliance[8], estimate that approximately 18% of the local road network is in poor condition and, depending on the level and scale of maintenance operations, in need of up to £10 billion over 14 years to bring roads up to an adequate "steady state" condition - that is, preventing any further deterioration of the network based on an assessment of its current condition.

The ALARM survey raises concerns regarding the "up-down" nature of highways funding, which leads to "wasteful patch and mend" repairs rather than more efficient longer-term maintenance[9]. This backlog was highlighted during the Transport Select Committee's 2019 Local roads funding and maintenance: filling the gap report[10]. Public dissatisfaction with the condition of local roads has also increased. For example, in a 2020 survey of UK citizens carried out by the RAC, 52% of respondents stated conditions had worsened in 2020 when compared with the previous 12 months[11].

Principal funding for highways maintenance within LAs is provided in the form of central government grants (capital expenditure) primarily from DfT, although there are LAs who instead have a Private Finance Initiative (PFI) for highways maintenance. This capital funding can be supplemented with additional money from local government revenue and borrowing. The Department for Levelling Up, Housing and Communities (DLUHC) also provide funding for LAs through the Core Spending Power/Revenue Support Grant allocation (revenue expenditure). The structural renewal and upgrade of highway assets, including roads, footways, bridges, drainage, and lighting, is primarily classed as capital expenditure. Routine highways maintenance works including reactive treatments necessary to keep the network in a serviceable condition, such as gulley cleaning, grass cutting, surface dressing and other ongoing repairs and maintenance, are covered by revenue expenditure.

Capital expenditure is allocated using a block funding formula comprising[12]:

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6 https://tfl.gov.uk/corporate/about-tfl/what-we-do

7 https://www.gov.uk/government/consultations/key-route-networks-devolving-more-powers-and-responsibilities-for-locally-important-roads-to-metro-mayors-and-their-combined-authorities

8 Asphalt Industry Alliance (2018), Annual Local Authority Road Maintenance Survey 2021, available at: https://www.asphaltuk.org/wp-content/uploads/ALARM-survey-2021-FINAL.pdf

9 Asphalt Industry Alliance (2018), Annual Local Authority Road Maintenance Survey 2021, available at: https://www.asphaltuk.org/wp-content/uploads/ALARM-survey-2021-FINAL.pdf

10 House of Commons Transport Committee (2019), Local roads funding and maintenance: filling the gap, available at: https://publications.parliament.uk/pa/cm201719/cmselect/cmtrans/1486/1486.pdf

11 RAC (2020), Report on Motoring 2020: Driving through the Pandemic

12 DfT (2020), Roads Funding Information Pack, available at: https://www.gov.uk/government/publications/roads-funding-information-pack/roads-funding-information-pack

- **'Needs based' funding -** primarily Highways Maintenance Block funding (totalling £4.7 billion between 2015/16 and 2020/21), however this was supplemented over the years with additional discrete pots of funding such as the Pothole Action Fund;
- **'Incentive-based' funding -** primarily top-sliced[13] Highways Maintenance Block funding (totalling £578 million between 2016/17 and 2020/21) requiring LAs to submit an annual self-assessment; and
- **'Bid-for' funding -** through the now-defunct £575 million Challenge Fund[14], which supported major maintenance projects (62 in 2020) that could not be funded through the normal needs-based funding pot. This funding had also been top-sliced from the Block funding following a consultation in 2014[15].

In October 2018, the Chancellor announced an additional one-off £420 million for local highways maintenance. This was allocated using the highways maintenance funding formula and was targeted at repairing roads (including potholes), bridges, and other local highway infrastructure. Other "bid-for" funding for local roads, outside the scope of maintenance, announced in the 2018 Budget included:

- the **Local Pinch Point Fund** (£150 million for projects to ease congestion), however this ultimately did not occur, and was later superseded into the Levelling Up Fund at Budget 2020;
- the **National Roads Fund** (whilst the majority of the £28.8 billion was allocated to the strategic road network as part of RIS2, a small proportion was set aside for large local major (LLM) schemes within the local road network); and
- the **Transforming Cities Fund** (£2.5 billion to support connectivity in large English cities).

Central funding is in many instances supplemented by local funding – either from capital reserves, prudential borrowing, income (for example, from council tax), or – in some cases – replaced by retained business rates. Where LAs have opted to retain business rates as part of the Business Rates Retention pilot, their share of needs-based and incentive-based funding has been reduced accordingly, resulting in a net zero gain/loss outcome.

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13 Top-slicing means using a specific part of a sum of money for a specific purpose, in this case for highways and asset maintenance.

14 DfT (2020) Local highways maintenance challenge fund: schemes funded, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/869349/challenge-fund-schemes.csv/preview

15 DfT (2014) Local authority highways maintenance funding: 2015/15 to 2020/21, available at: https://www.gov.uk/government/consultations/local-authority-highways-maintenance-funding-201516-to-202021

2.2 The Pothole Action Fund / Potholes Fund

The Pothole Action Fund was first announced in the 2015 Budget, with funding totalling £296 million over the period 2016/17 to 2020/21. At the time, this was estimated to be enough to repair over 5 million potholes.[16] The Fund was allocated by formula to LAs in England, excluding London, and formed part of the package of capital funding provided by central government.

An additional £500 million was allocated via the rebranded ‘Potholes Fund’ in 2020/21 as part of Budget 2020 – the first of five equal instalments to be distributed between 2020/21 and 2024/25, totalling £2.5 billion. A needs-based formula is used to allocate all capital maintenance funding, including the Potholes Fund and the Pothole Action Fund, taking into consideration data provided by LAs in 2019 based on road length and the number of highway assets (bridges, lighting columns) under LA management.

The average cost of repairing a single pothole has been estimated at approximately £50. The Pothole Fund each year has therefore been promoted as funding to fix the *equivalent* of 10 million potholes[17], however it should be noted that many LAs will typically spend it across the entire highway network and its assets.

2.3 Data available to DfT

The DfT currently collects data from LAs on the length and condition of local A, B, C, and unclassified roads to produce national statistics. The main sources of data are as follows:

- The **Highways Maintenance Capital Funding Self-Assessment Questionnaire**;
- The **Carriageway Works Done Survey** (CWD); and,
- The **Skidding Resistance Survey** (SR).

The Self-Assessment Questionnaire provides data on working practices used to demonstrate what efficiency measures are being pursued by the LA, whilst the Carriageway Works Done Survey provides data on the percentage of highways that should be considered for maintenance.

Data provided by the self-assessment questionnaire is divided into five main sections designed to assess the LA’s progress on maximising return on capital funding allocated by the DfT. These sections cover asset management practices achieving recommendations of the UK Roads Liaison Group (UKRLG), resilience to severe events, customer consultations, data sharing/benchmarking and efficiency savings, and cost-effective operational delivery practices. 2021/22 also saw the trialling of additional sustainability questions to help align LAs when exploring decarbonising their activities and considering biodiversity when carrying out works across the network.

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16 https://www.gov.uk/government/topical-events/budget-2015

17 https://www.gov.uk/government/news/funding-to-fix-equivalent-of-10-million-potholes-allocated-to-local-authorities

The CWD survey provides data on the surface condition for principal and non-principal classified networks covering roads that are in worse condition. These are roads that have been categorised as red under the Road Condition Indicator (RCI), which is the main measure of condition used for the official statistics published annually. It also provides a breakdown of all treatment types (e.g. reconstruction, surface dressing, programmed patching) and the lengths applied across the LA managed ‘A’ road and LA managed minor road networks . The Skidding Resistance survey primarily collects data for LA managed classified ‘A’ roads and motorways. Each survey collects data on the previous two years and is submitted under the Single Data List. The CWD survey also collects data on non-mandatory items including surface condition for unclassified roads as well as data for the amber and green condition categories across both classified principal and non-principal roads. Additional sources of data include:

- the **annual National Highways and Transport Survey** (NHT) measuring public satisfaction; and
- **data on sustainability and climate resilience outcomes**, which is often collected as a requirement of bid-for-funding.

3. Approaches to highways and asset management

In this section we review the approaches taken by the different LAs in our sample to highways and asset management. This includes consideration of how responsibilities are allocated for repair and maintenance of highways and associated assets at local level, approaches to funding, and the strategies applied by LAs to highways and asset management.

3.1 Division of responsibilities within local authorities

All LAs interviewed for this study took broadly similar approaches to highways and asset management, particularly with regard to the activities which were included within the scope of the local asset management plan.[18] In general, these cover:

- **Reactive repairs**, including filling potholes and applying surface dressing;
- **Ongoing maintenance** of specific assets or stretches of road;
- **Strategic improvements** to highways and associated assets;
- **Upkeep of other assets**, including structures (i.e. bridges), lighting, road signs, and drainage/gulleys etc.

Traditionally, responsibility for highways and asset management within LAs has been divided between two teams: an operations or engineering team responsible for ongoing “reactive” maintenance (e.g. repairing potholes, maintaining verges and gullies); and a more forward-looking “strategic” or commissioning team with a responsibility for longer-term maintenance and investment in improvements (e.g. road resurfacing, upgrades to existing assets). If the LA is a county or combined authority, teams can be divided by local

[18] An Asset Management Plan is a strategic document laying out plans for managing an organisation's infrastructure and other assets to deliver an agreed standard of service. In the context of local transport, asset management plans tend to include approaches to managing the condition of highways and other assets over the medium term.

region (i.e. North, South, City) with a varying degree of devolved power depending on the LA. However, many of these separate regional teams have recently been or are in the process of being amalgamated due to constrained local budgets.

Some LAs continue to maintain a divide between “reactive” repairs and patching, and “proactive” strategic maintenance or works in their organisational structure. In other cases these two service areas have been combined into one department with responsibilities shared out more thematically. This change was implemented by some LAs in response to funding cuts and the need for associated efficiency savings. In other cases, however, interviewees explained that this reflected a broader shift in the overall approach to highways and asset management locally. The new, more streamlined teams reflect an attempt to be more joined up in terms of data collection, sharing, and analysis to support a more strategic and targeted approach to highways and asset management. Evidence on the extent to which this streamlining has led to increased cooperation is limited, however some interviewees did mention that the amalgamation of reactive and proactive teams in one common structure allowed them to work more closely with their colleagues (for example, by drawing on the expertise of engineers when deciding which stretches of road to prioritise for resurfacing).

In many cases, separate teams are tasked with the maintenance of structures (i.e. bridges), lighting, road signs, and drainage etc. These teams may sit within the same department as those responsible for highways or may be managed separately. In all cases, however, interviewees reported high levels of co-operation and data sharing between the different teams. This is often facilitated by centralised IT systems, which were able to import data from the individual databases held by the separate teams. In some cases, asset managers maintain their own spreadsheets or access databases which combine information from various internal sources. Additionally, interviewees reported regular consultations with experts in different teams to “sense-check” their data analysis and to identify potential issues which may not be picked up by the asset management software. Finally, interviewees also reported liaising with other local government departments as needed, particularly housing and planning teams (to provide input on expected impacts of proposed housing developments on the local highways network).

There is often a divide in terms of who carries out different types of treatments: reactive repairs such as pothole patching tend to be the responsibility of an internal operations or engineering team, whereas larger-scale and more strategic works such as resurfacing or reconstruction are often contracted out. In some cases, this is to an external contractor and in others to a wholly or partly owned subsidiary, who works solely for, but independently of the LA. Some LAs have a long-term contract with an external contractor, who is responsible for implementing the asset management plan and/or the programme of works. Authorities that have entered a long-term arrangement with the same contractor or are working with a subsidiary company often cite cost and time efficiencies as the main driver for opting for this method of conducting maintenance.

3.2 Availability and distribution of funding

For all LAs interviewed for this report, capital funding from DfT in the form of needs-based grants was reported as their **primary source** of funding. Several LAs reported having bid for funding from the Challenge Fund, Local Pinch Point Fund, LEP Fund, Safer Roads

Fund, and others, with varied success. In many cases, LAs supplement these sources of funding from their own revenue (i.e. council tax and business rates) and capital in the form of cash reserves and prudential borrowing. Another form of revenue funding reported was the Department for Levelling Up, Housing and Communities (DLUHC) revenue support grant, although only a few LAs mentioned receiving this grant in the context of highways maintenance.[19]

Capital and revenue funding are spent in different ways. As a rule of thumb, capital funding is spent on the improvement of assets whilst revenue funding is spent on more day-to-day reactive/maintenance work (e.g. gulley cleaning, patching potholes, grass-cutting, and road marking etc).

All interviewees described being heavily dependent on centralised capital funding. There was a consensus that the money available from central government was not enough to maintain their local highway network in a “steady state”. This issue has become increasingly significant in the last decade, as funding cuts have led to a squeeze on revenue funding in particular. One LA cited a fall in DLUHC revenue funding as responsible for a reduction in the revenue-related activities they are able to fulfil (e.g. grass cutting, tree clearance, drain emptying), contributing to the deterioration of asset condition. Others pointed to a longer-term squeeze both on highways funding and on revenue expenditure more generally.

Interviewees from all LAs reported that current levels of funding would not allow them to meet the significant investment required to solve long-term deterioration of the local highways network. Revenue funding is not ringfenced for highways maintenance and many LAs noted a gradual decline in the amount of revenue available to them as pressure on other services such as social care has increased. The long-term downwards pressure on funding has led to a significant maintenance backlog.

Interviewees reported that returning the highways to a reasonable condition (or, in some cases, maintaining a “steady state” long-term) would require significant additional funds over several years. As a result, many interviewees reported that they were effectively managing a declining asset with much of the network condition remaining unchanged or in a state of “managed deterioration”, causing significant concerns for the future of the network.

[19] The Revenue Support Grant is a central government grant given to local authorities which can be used to finance revenue expenditure on any service. The amount of Revenue Support Grant to be provided to authorities is established through the local government finance settlement. Although all LAs receive the grant, not all LAs necessarily spend the funding on highways and asset maintenance.

Case study: Use of prudential borrowing for highways and asset maintenance

Seven of the LAs interviewed for this study referenced prudential borrowing as a source of income for highways maintenance. In four cases, interviewees explained that borrowing is being used to "plug the gap" between the level of funding received from the DfT and the amount required to keep the highways network in a "steady state". The other three LAs reported using borrowing to invest in more concrete projects to upgrade specific assets or parts of the network. In two cases, money was used to upgrade street lighting (i.e. installing LED lightbulbs in all streetlights). In the third case, a total of £40 million was invested over five years to upgrade deteriorating infrastructure from the 1960s and 70s.An additional £30 million was borrowed to modernise street lighting across the network, including replacing columns and upgrading to LEDs.

Borrowed money is guaranteed for a two to three-year period and this was perceived as an important way to facilitate planning of longer-term maintenance programmes. The amounts of money being borrowed vary somewhat, but in general these amount to approximately £10 million per year (Asset Managers described being guaranteed approximately £30 to £40 million in funding over a three-year period). In some cases, although money was being borrowed in three-year tranches, this was being repeated over a number of funding rounds. One interviewee reported that they were just applying for their third round of money funded through prudential borrowing at the Council level. In other cases, however, the money was viewed as a "one-off" investment.

Interest rates have been low for a number of years, making borrowing a rational option for many LAs in the current climate. However, some interviewees did raise concerns regarding the impact of servicing debt on their ability to maintain spending on highways maintenance in future. One LA mentioned that they are expecting to spend approximately £300,000 over 40 years from their revenue budget to service/repay historic debt. Another LA described having used the Potholes Fund allocation to repay money which had previously been borrowed to fund ongoing highways maintenance.

3.2.2 The Pothole Action Fund / The Potholes Fund

The Potholes Fund forms part of the overall capital funding pot. It is not viewed as "additional" funding per se, but rather as a reallocation of, or replacement for, reduced capital and revenue funding overall. Some LAs combine the Potholes Fund with other capital funding in one transport pot for overall highways and asset management; others maintain a separation, creating a planned programme of work across the network targeting pothole repair on prioritised highways. In one case, the Potholes Fund was used to pay back money which had previously been borrowed to supplement capital grant funding. However, it is more common for debt to be repaid using revenue funding, with one LA stating that they were using cash reserves to service borrowing used to improve the condition of their highway network rather than manage its decline.

In terms of the Fund "process", most LAs do not distinguish between the Potholes Fund and other sources of capital funding available from the DfT. In general, although it is accounted for separately, the Fund is viewed as part of the overall funding package and therefore approached in the same way as other capital funding. Most LAs used a relatively broad interpretation of the scope of the funding, referring to DfT guidance that it should be used “for the treatment and prevention of” potholes. Many therefore felt justified to spend pothole funding on preventative treatments such as resurfacing which help prevent the development of potholes. Some, however, noted that the moniker “Pothole Action Fund” or “Potholes Fund” created an expectation from local residents and politicians that the funding should be used more narrowly for repairing potholes. Interviewees also reported being required (until recently) to publish how the funding is being spent on the LA website. This added to the pressure they felt to use the funding more strictly for repairing rather than preventing potholes.

For those who keep money received through the Potholes Fund separate to other funding sources and spend it on pothole-related issues, the branding of the Fund is viewed as reducing their ability to appropriately allocate spend according to identified needs. LAs also stated that a focus on filling potholes can be unhelpful in terms of ensuring good highway condition overall, as it prevents a more holistic approach to highways and asset management including structures, streetlighting and other elements. Several LAs reported frustration with how the funding was allocated, explaining that historically they had had very little foresight regarding how much money would be allocated via the Pothole Action Fund or when they would be receiving it. Many felt that this had improved in recent years though, with a clearer settlement for the next five years.

The majority of LAs expressed a preference for more freedom to use the money provided via the Pothole Action Fund/Potholes Fud as part of a common funding pot to prioritise and target larger-scale preventative measures such as resurfacing larger sections of road. A few LAs, particularly those with access to greater levels of revenue funding, reported using the Pothole Action Fund strictly for highways improvement programmes rather than ongoing maintenance and one reported using it to commission one-off surveys on asset condition.

3.2.3 Allocation of funding by local authorities

Decision-making processes informing funding allocation appear to be largely similar across the LAs interviewed, with some differences in terms of the particular assets being prioritised based on contextual needs. All LAs use road condition data to determine areas of the network in need of attention and will primarily intervene with treatments to prolong the life of the highway. Some notable exceptions emerged from the interviews:

- one LA is in the process of prioritising residential roads due to a focus on improving strategic roads in recent years;
- in another case, footways are being prioritised in support of a broader active travel agenda.

These instances are exceptions to the more common pattern, however, which is to focus on strategic A roads (sometimes also B and C roads), prioritising roads with high traffic volume. In addition, most LAs mentioned the need to focus resources on drainage systems to ensure they can cope with future demands on the network.

A key objective for all LAs when deciding how to use capital funding is to minimise the impact on revenue budget and ongoing maintenance costs. This means that a scheme or development programme that reduces the need for recurring maintenance practices will be prioritised (e.g. resurfacing a larger section of road rather than patching an individual pothole). Where the opportunity arises, LAs will also try to combine highways improvements schemes with maintenance works to minimise disruption and maximise the benefits of scheduled treatments.

Safety is a major priority for LAs. Funding tends to be allocated to areas of the network where there have been clusters of accidents (identified through insurance claims against the authority) with a focus on improving skid resistance. A Resilient Network has also been identified by several authorities to target roads that are of strategic importance and likely to cause major disruption if allowed to deteriorate further. One LA stated that it is currently developing a new hierarchy to be used alongside the one created by the DfT to improve the prioritisation of highways, with those occupying critical infrastructure (e.g. hospitals, electricity works, crematoriums, treatment plants etc) contributing to higher levels of priority.

LAs with access to both revenue and capital funding described finding it difficult to determine how a treatment or programme of works should be financed, as some routine maintenance works are seen to be improving assets. Some LAs mentioned significant investments from the LA in major efforts to improve the overall condition of the network, or repair certain high profile (and expensive) assets. These major programmes tend to be funded through borrowing or from capital reserves. One example of the use of borrowing to support long-term investment is a scheme to spend £40 million over five years to address ageing highway infrastructure constructed during the 1970s and 1980s. The same LA also used its own funding to replace the majority of their street lighting with LED bulbs in order to reduce operating costs and minimise emissions.

Two LAs interviewed for this study did not supplement their DfT funding with any local funding streams (capital, revenue, or borrowing). This created constraints regarding treatment options, with interviewees reporting that they relied heavily on surface dressing – even when it was not the most sensible option from a strategic perspective. Without additional income, interviewees from these LAs reported that they did not feel able to implement a longer-term strategic approach to asset and highways management. Instead, their role was limited to short term solutions – namely, patching the worst sections of road. Other LAs confirmed that without additional local funding, their options would be similarly limited.

There was a strong consensus amongst interviewees that the timing of funding is important and has implications both for choice of treatment and overall cost. Certain treatments cannot be applied in extreme temperatures, and therefore cannot be used in winter and/or summer months[20] depending on the types of works. Climate change resulting in hotter summers and wetter winters may also shorten the optimal window where effective works can be carried out, adding to the seasonal pressure on maintenance operatives. Key impacts include increased flooding and subsidence (i.e. landslips), as well

[20] Weather conditions: https://trl.co.uk/uploads/trl/documents/RN42.pdf

as increased thermal loadings on roads and control equipment[21]. Further impacts are listed later in this report.

Any funding which must be spent within a short timeframe can also lead to competition between LAs, increasing the cost of materials and labour. Those authorities with multiple contractor agreements operating with differing supply chains felt able to respond more effectively to ad hoc funding announcements compared to neighbouring LAs relying on one organisation to fulfil all of their treatment works.

In general, interviewees reported that short-term funding was more likely to be spent on reactive repairs and longer-term funding more likely to be used for proactive/strategic expenditure. LAs with access to significant levels of local funding were able to use this to balance out peaks and troughs in central funding (usually through borrowing). Two interviewees from different LAs mentioned lobbying elected members for additional funding, either in response to an emergency incident such as major flooding which caused significant damage to whole roads and drainage assets, or to solve an ongoing issue such as subsidence that cannot be financed by existing sources of funding. Most smaller LAs do not have this option and rely on additional capital funding to adapt to major contextual issues.

3.2.4 Consideration of Value for Money

Nearly all LAs interviewed consider Value for Money (VfM) in their asset management plans. This tends to be understood in terms of a trade-off between the cost and expected lifetime of a given treatment (based on modelling or experience). Several LAs also cited the importance of delivering interventions (such as surface dressing) at the right time to prolong the life of the road and avoid the need for more expensive repairs in the short to medium term. In some cases, road defects are clustered and treated together (sometimes overnight) where possible to minimise the disruption and possible economic impact caused by road closures. Innovative technologies are also being trialled by many LAs to improve the efficiency, sustainability, and longevity of treatments while reducing costs.

Several LAs reported using ‘warm mix’ asphalts to reduce resource usage and emissions associated with traditional ‘hot mix’ asphalts. A few cited using Reclamite as an asphalt rejuvenator treatment used to restore chemical elements and strengthen highway surfaces, prolonging the life of the road. Another innovative treatment technology trialled by one LA (JCB PotholePro) is used to increase the speed of pothole repair by completing treatments using a single machine. One LA reported also benefiting from expertise on innovative technologies used to reduce costs through partnerships with private sector organisations.

Not all LAs experienced success trialling innovative treatments, with one stating that cheaper alternative materials such as recycled rubber and plastic waste used as mixer can improve the state of the network faster but do not provide the same longevity as traditional asphalt. This resulted in the LA reverting to tried and tested materials. Two other LAs referenced longer-term issues arising from historic applications of novel resurfacing materials, which did not achieve the promised lifespan. The specific issues identified with

[21] https://nerc.ukri.org/research/partnerships/ride/lwec/report-cards/infrastructure-source02/

this treatment primarily relate to deterioration/breakdown of the road surface, which required significant investment in order to return the road to an acceptable condition.

Case study: Trialling and application of innovative solutions

LAs are open to innovative treatments, with a number of respondents mentioning that they were trialling specific alternatives to traditional surface dressing and/or resurfacing. These commonly included alternatives to traditional asphalt (for example, low temperature asphalts) or new approaches to maintaining the surface condition (through technologies such as Jetpatcher)[22]. Other innovations focused on improving resilience to flooding, ranging from electronic sensors to help detect flooding hotspots to creating systems for residents to report

One LA entered into a 12-year partnership with a contractor and set up an innovation laboratory in order to trial and evaluate innovative treatments across its network. Through this partnership the LA has been able to gain insights on the performance of new product, combining the latest research with the practical experience of the contractor.

Significant results from the laboratory include:

- Improvements to a binder used in surface dressing, making the material more resilient to hot temperatures.
- Successful trials of Reclamite asphalt rejuvenator (a treatment which extends the lifespan of existing roads) in the laboratory led to its successful application on the local highway, reducing the time and cost (versus resurfacing the road)

For LAs with less resources or a lower appetite for risk, regional networks are an important method for disseminating learning with regard to innovative treatments. A number of interviewees mentioned being part of regional networks where the results of trials were discussed and – in some cases - data is shared to enable a better understanding of the improvements associated with innovative treatments.

3.3 Strategic approaches to asset management

The majority of LAs interviewed are using or are in the process of transitioning to a longer-term asset management approach. As part of this approach, a number of interviewees reported having just published or being about to publish their new five- or ten-year strategy. Spending estimations are based on assuming a steady level of financing (i.e. funding available for next year will be the same as this year).

Objectives often include improving infrastructure to support economic development in the region, reducing carbon emissions (often focused on shifting transportation methods) and ensuring value for money from assets by reducing lifetime costs. Strategic management

[22] https://www.jetpatcheruk.com/

documents are often reviewed annually to ensure the LA's programme of works aligns with its long-term asset management strategy. A Highway Infrastructure Asset Management Guidance Document produced by the UK Roads Liaison Group in 2013 informs the approach taken by many of the LAs interviewed and their Highway Infrastructure Asset Management Plan (HIAMP) [23]. This includes fourteen key recommendations on effective asset management principles.

When it comes to deciding which areas of the network to target, most authorities have adopted a prioritisation system based on multiple factors influencing the asset (e.g. road classification, traffic density, speed restrictions, number of accidents, population density) in combination with road condition data. Most LAs reported prioritising A roads and roads rated red and amber, with a particular focus on preventing roads from moving to a red rating. Additionally, as mentioned in Section 3.2.3, one LA is prioritising highways leading to critical infrastructure (such as hospitals and power stations) to ensure the long-term resilience of local infrastructure.

In order to prevent additional roads from deteriorating further and falling into the red category, LAs often divide funding based on treatment types to ensure there is a spread of reactive and preventative treatments taking place across the network. Not all authorities interviewed can afford this approach, with some being restricted to use of reactive treatment options (primarily surface dressing). These LAs struggle to maintain the long-term condition of their highways network, described their approach to asset management as "managed deterioration".

Many LAs reported concerns around the condition of footways in particular. These were viewed as low priority in comparison to other issues such as blocked drains, and in many cases, there is limited data available on their condition. Some LAs do set aside a proportion of their money to maintain footways but this was not the approach of the majority of interviewees. Authorities with a large proportion of urban roads stated that they found them difficult to maintain and were required to divert funds back to road treatments due to greater need. Flagstones used on footways also increase the cost of repair and are more likely to become hazardous to pedestrians when cracked. Several interviewees therefore expressed a preference for tarmac footways and, in at least one case, reported an ongoing programme to replace flagstones with bituminous surfaces. Maintaining cycle lanes was also a particular topic of concern for some interviewees, who expressed concern regarding their long-term upkeep.

LAs cited a strong preference for increased certainty around the level of funding they are expected to receive to support the development of a longer-term highways and asset management plan. LAs claimed this would facilitate long-term partnerships with contractors and enable further preventative treatment schemes to take place over a number of years rather than a large number of short-term reactive repairs on a yearly basis. Some interviewees noted a shift towards this approach in recent years, with one LA borrowing for the purpose of creating long-term funding security to plan a strategic programme of works over a period of 5 years. LAs also reported a need for increased foresight around when funding would be disbursed, citing a minimum 3-month lead-in time to be able to organise the materials and labour needed for works. Most viewed a 5-10-year

[23] UK Roads Liaison Group (2013), Highways Infrastructure Asset Management Guidance Document, available at: https://ukrlg.ciht.org.uk/ukrlg-home/guidance/transport-asset-management-guidance/

funding settlement as optimal to allow for more strategic and less reactive decision making.

3.4 Contextual factors

Each LA faces a range of contextual factors and demands that influence priorities, approaches to asset management and data collection methods. These contextual factors can include local geography (coastal regions, floodplains, soil types, topography), historical context (listed structures, evolved roads), traffic volumes and more. The most common issues mentioned by LAs relate are described in more detail below.

Increased rainfall and extreme temperatures associated with climate change

A common issue faced by all LAs is increased rainfall and extreme temperatures (hot summers and cold winters) contributing to an intensification of deterioration across the network. The extent to which flooding events impact highway condition varies from a gradual increase in pothole formation as reported by one interviewee, to entire sections of road being washed away as experienced by another.

This variation is influenced by a range of factors including:

- road condition (standing water in roads with a cracked surface will lead to significant deterioration); soil type (certain soil types can lead to subsidence/settling);
- the capacity of drains, gullies and culverts to remove floodwater (older drains often do not have the capacity to deal with the increased volume of rainfall in recent years); and
- and the extent of run-off from neighbouring fields (fields with no crop-cover can be expected to have higher levels of run-off than planted fields or meadows).

Almost all LAs reported concerns regarding the ability of drainage systems can to cope with increasing rainfall and future flooding events. This has led to more regular cleaning programmes and interventions to increase drainage capacity.

LAs also reported warmer temperatures contributing to an increase in bitumen oxidisation/melting leading to the breakdown of highway surfaces. Implications for LAs include the need to consider the most suitable time of year for certain treatments to be implemented due to the use of hot material which requires cooler temperatures to set. Two LAs expressed concern over the potential risk of further deterioration to highways where materials used in treatments such as surface dressing fail to set due to high temperatures. Additionally, some traditional treatments may melt in higher temperatures, meaning that LAs are being required to switch to other, more expensive (and often less tried and tested) alternatives.

Case study: Incorporating flood resilience into asset management planning

In response to major flooding events, one rural LA has set up a number of operations to improve local resilience through better cooperation with relevant organisations and the public. The LA is exploring innovative approaches to monitoring the resilience of its network and identifying hotspots. A Highways Infrastructure Resilience Assessment Modelling (HIRAM) tool is being used to identify and prioritise high risk areas of the network in combination with gully sensors that provide alerts when water levels rise indicating a potential blockage. A new system is also being considered to allow members of the public to identify and report on blocked gullies or culverts on their road.

The LA has established a regional partnership between flood risk management authorities, such as drainage boards, councils, and the Environment Agency. The partnership allows the LA to take a holistic approach to flood resilience by carrying out works that meet the needs of a variety of stakeholders in the region.

The partnership provides additional funding for the LA’s highway asset maintenance plan. This means that greater preventative measures can be taken, such as jetting drainage systems to prevent blockages and creating flood relief channels in high-risk areas. This allows the LA to move from reactive treatments towards more proactive prevention and mitigation of local flooding.

The LA is also collaborating with the Famers and Wildlife Action Group (FWAG) to involve local land managers in implementing land management schemes to protect local highways from flooding. This includes providing funding for assets such as diversion ditches, silt traps and crop management schemes. Schemes often involve several small-scale interventions across multiple farms which combine to divert water away from roads in major events.

Increased pressure on drainage systems from new housing developments and other contextual factors

Some LAs in high density urban regions are struggling to cope with the capacity and maintenance costs associated with drainage systems dating back to the Victorian era when the local population was much lower. In many cases, this has been exacerbated by new housing developments which place increased pressure on the drainage network. In order to cope with the increasing demand placed on old drainage and road networks from new housing developments and associated rises in resident numbers, several LAs have begun to work more closely with developers to identify the future risks and requirements of proposed projects.

In some instances, LAs described the use of natural drainage systems in the form of roadside gullies, or ditches, constructed on a yearly basis. This form of drainage tends to be used on highways in rural locations frequented by farming vehicles. As these vehicles have increased in size, they have become wider than the roads they are using and often straddle road edges, destroying gullies in the process. Across the board, drainage is a major concern for LAs and a significant source of expenditure.

Issues associated with underlying geological features or specific historic structures

The underlying geology of highways can impact their structural integrity. Several LAs reported peat expanding during wet weather and contracting in drought conditions leading to the instability and cracking of highways. Authorities in rural areas face this challenge across vast stretches of land, particularly in coastal regions where land has been reclaimed from the sea. Clay is another soil type contributing to the cracking of highways due to contraction during drought seasons, with one LA experiencing cracking beneath road surfaces requiring more expensive treatment. Sandy soil may also contribute to faster deterioration of highways, due to subsidence and settling. LAs with a variety of different soil conditions cited significant cost implications, as different stretches of road must be treated in different ways.

Historic structures, particularly bridges, pose specific problems for many LAs. Often these structures were not designed to withstand the weight of modern vehicles or the volume of traffic they are currently experiencing. Additionally, the specific expertise and materials required to maintain such structures creates additional time and resource costs. Changes in usage of historic roads are also a common cause for concern. Many roads date back hundreds of years, often to Roman times when modern engineering practices were not yet developed.

More recent roads (constructed in the nineteenth and twentieth centuries) were often not built to withstand the volume of traffic and the weight of vehicles in current usage. Many LAs reported issues stemming from increased congestion and a higher incidence of heavy vehicles, particularly buses and delivery vehicles, leading to the failure of roads constructed using micro asphalt. Additionally, roads in one LA surrounding farmland and industrial regions such as ports were failing as a result of farm machinery and heavy goods vehicles placing significant strain on unclassified/evolved roads not designed to withstand significant weight. The expense and complications associated with maintaining historic road networks is placing significant strain on expenditure and leading to a reprioritisation of future works.

Case study: Specific challenges in rural versus urban areas

LAs in rural and urban environments find themselves faced with unique challenges associated with changes to the local environment. For example, LAs from both rural and urban areas cited the condition of their unclassified road networks as a serious concern. In particular, they spoke of issues regarding the increased volume and weight of local traffic as well as difficulties maintaining associated assets. Although the broader societal shifts causing these changes are similar, the way they play out differs significantly.

In high density urban regions, increased congestion and, specifically, a rise in home delivery vehicles accessing residential streets is leading to increased pressure on unclassified residential roads. The condition of unclassified roads does not tend to be monitored and repairs to these areas are not classed as high priority. The increased weight of delivery vehicles (as compared to private cars, bicycles etc.) is leading to significant concerns regarding the structural integrity of the roads and their ability to withstand future traffic volumes.

Furthermore, several LAs are experiencing additional damage to their footways and highways as a result of improvement schemes carried out by utilities companies. One specific example given relates to the installation of fibre optic connectivity across densely populated regions, which is causing significant disruption and ongoing damage to footways, cycle paths and highways. Coordination with utilities companies to minimise damage and disruption was described as difficult due to the multiplicity of stakeholders concerned.

Rural authorities also struggle with increased volume and weight of traffic on unclassified roads. In this case, modern farm vehicles and machinery are often much larger and heavier than the road was originally intended to withstand. This leads to significant damage to the road surface (often exacerbated by the fact that roads have evolved from very old country road networks, which pre-date the use of automobiles) and the destruction of roadside gullies. Soft subsurface soils can also result in major cracking and subsidence as heavy industrial vehicles move in and out or rural areas transporting goods.

4. Data related to highways condition, repairs, and maintenance

In this section we provide an analysis of the main research findings with regard to data collection. This includes a review of the types of data collected by LAs to inform their asset management planning as well as data collected by other teams within the LA with relevance to highways and asset maintenance. The chapter than considers how data is stored, accessed, and shared, before reviewing obstacles identified by LAs with regard to data collection.

Table 3 provides a brief overview of the main types of data collected by different authorities, including information on how the data is collected and the number of LAs who have confirmed that they are collecting this information.

Table 3: Overview of data collected by LAs

Data collected	Data collection technology	No. of LAs collecting	Further info
Data collected to inform asset management planning			
Skid resistance	SCRIM	15	
Road condition (material loss, surface texture, profile, cracking)	SCANNER[24]	14	
Road condition (cracking and rutting)	Coarse Visual Inspection (CVI)	9	Detailed Visual Inspections (DVI) assess further data parameters and are often conducted manually due to restricted machine access
Condition of roads, footway and bridges condition	Engineer/safety inspection	9	Walked or driven depending on road access
Drainage capacity, silt levels	Drainage/gully inspections	7	
Digital video surveys of road condition (material loss, surface texture, profile, cracking)	GAIST	4	Being trialled by some to consider its effectiveness and VfM

[24] All LAs interviews regularly collect data on road conditions, which is transmitted to the DfT as part of the single data list. One of the LAs selected for this sample has stopped using SCANNER to collect the data and replaced it with GAIST. Seven other authorities use GAIST or Vaisala AI to supplement the data collected by SCANNER.

Digital video surveys of road condition (material loss, surface texture, profile, cracking)	Vaisala Road AI	4	
Sub-surface condition data	Deflectograph	2	
Highway condition data	Route Reports	1	Also provides lifecycle modelling
Sub-surface condition data	Ground radar survey	1	
Other data collected related to highways and assets			
Geospatial data on assets (drainage, culverts, signage, grit bins, trees etc)	Manual inspection, GAIST	9	
Footway condition data	Footway Network Survey (FNS)	8	
Traffic volume	Not specified	8	
Resident satisfaction	NHT survey	6	
Resident complaints	Bespoke local authority online portals	4	
Resident satisfaction surveys	Locally administered surveys (usually pre-post works)	2	
Accident data & Insurance claims	Bespoke local authority online portals	1	
Live traffic and footfall volume data	Vivacity (AI)	1	
Public transport journey times	Not specified	1	
Resident views	Focus groups	1	

4.1 Data collected to inform asset maintenance planning

Nearly all LAs interviewed for this study regularly collect data on road condition, skid resistance and ongoing maintenance needs/safety issues when developing their asset management plans and programme of works.

4.1.1 Road condition data

Road condition[25] data is collected on an annual basis. It is commonly measured using SCANNER (Surface Condition Assessment for the National Network of Roads[26]). A range of parameters such as cracking, rutting road texture and profile are recorded by SCANNER at 10-metre sections of road and combined to produce a Road Condition Indicator (RCI). RCI outputs range between 0 - 315 and are converted to a Red, Amber, Green (RAG) rating. A section of road scoring between 0 – 40 is awarded a Green rating indicating that it is in good condition. A score between 40 - 100 is rated Amber and indicates that the segment of road is showing deterioration and warrants investigation for

[25] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/836182/road-conditions-guide.pdf

[26] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/836188/road-conditions-technote.pdf

potential treatment. Road sections scoring 100 or higher are rated Red and are likely to be in a poor condition in need of repair within the following 12 months.

Other technologies are increasingly being adopted, either as an alternative or (in most cases) a supplement to SCANNER. Of these, the best known are GAIST[27] and Vaisala AI[28]. Both technologies use smart phone cameras mounted on cars to collect geospatial video data which allows for detailed analysis of a number of variables including surface condition, defect types, pavement condition and inventory. Both companies offer a broader suite of technologies which work together to facilitate data analysis and longer-term tracking of road conditions. This is broadly in line with the direction of current DfT policy. A review of road condition data and technology is ongoing, with the aim of providing flexibility for LAs to choose whichever surveying technology best supports their asset management strategy[29].

Whilst a number of the LAs interviewed for this study were trialling these technologies or were in touch with the companies to discuss options, only one of the LAs interviewed had adopted AI solutions as a replacement for SCANNER. AI was perceived by most LAs as having useful potential, in terms of providing more accurate and detailed data and allowing for more sophisticated data analysis.[30] However, a number of interviewees remained sceptical as to whether these technologies could deliver on their promise. Most interviewees were content with SCANNER and felt that it broadly met their needs.

A majority of LAs interviewed further sub-divide the RAG rating mentioned above for measuring road condition, usually into five or six bands. These tend to focus on amber ratings, with asset managers further sub-dividing roads classed as amber into an additional two or three categories to help identify which roads are at risk of turning red, and which could potentially be moved into the green category with some targeted investment.

Some asset managers also further sub-divide their green roads, usually into two categories, in order to identify which roads are at risk of turning amber without further intervention. Asset managers are aware that these additional sub-categories are not applied uniformly across different authorities and some expressed an interest in developing a common formula for these more detailed stratifications. One common reference point cited was the Highways Maintenance Efficiency Programme (HMEP). Authorities using GAIST cited the more detailed five-band categorisation it offers as one of the reasons underlying their choice of technology.

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27 https://www.gaist.co.uk/intelligence-for-highways

28 https://www.vaisala.com/en/products/road-ai

29 https://www.gov.uk/government/publications/implementing-a-data-standard-for-road-condition-monitoring/road-condition-data-and-technology-review-position-paper

30 Specific examples given by interviewees include information on the best time to intervene and the best treatment to use, as well as improved information on treatment costs. On their websites, the companies also claim they can support tracking of accelerated road deterioration due to specific weather conditions (e.g. heat, cold and increased rainfall).

Case Study: Data collection on underlying road structure

Some LAs carry out Deflectograph surveys in order to gain a better understanding of underlying structural issues. While the data gathered from these surveys tends not to be directly applicable for developing asset management strategies, it allows LAs to better understand any issues identified in the survey of surface conditions and to select an appropriate solution.

One example given was a stretch of highway between two roundabouts which was showing limited surface damage. Data collected by Deflectograph identified significant structural issues, which required a more significant treatment than might otherwise have been applied. While this was significantly more expensive in the short term, it prevented longer-term deterioration and more significant problems. Deflectograph data was also described as "very useful" in supporting bids for Challenge Funding, as it allowed the relevant authority to put together a stronger data-driven case for the funding requested.

4.1.2 Skid resistance

Skid resistance is measured using a SCRIM (Sideway-force Coefficient Routine Investigation Machine) survey. This is carried out using specialised lorries, which measure the surface friction of a stretch of road under specific conditions (a smooth rubber tyre angled at 20 degrees to the road surface under a known vertical load at a constant speed, with a controlled flow of water applied to the road surface immediately in front of the test wheel).[31] SCRIM surveys are used to identify areas of road at high risk of wet road skidding, based on standards published in the Design Manual for Roads and Bridges. Several asset managers identified SCRIM surveys as their key data point when drawing up their programme of works. They prioritise skid resistance in order to ensure safety across the network, citing skidding as a major contributing factor to road accidents.

While SCRIM was the default choice for measuring skid resistance amongst nearly all LAs interviewed for this study, one interviewee is using an innovative alternative. In this case, the authority is working in partnership with Audi and Daimler to collect skid resistance data through cameras mounted on consumer cars. This authority also uses GAIST to collect condition data, which uses a similar approach.

4.1.3 Manual surveys to collect information on structures and other assets

All LAs interviewed for this study use manual surveys in addition to the automated skid resistance and road condition surveys described above. Manual surveys are carried out by individuals, on foot or in a vehicle, with results recorded manually. Traditionally these are

[31] More information on SCRIM testing conditions is available at http://www.ptsinternational.co.uk/scrim/

carried out using a pen, paper, and clipboard although in many cases surveys are now recorded using tablets. This allows data which is entered to be uploaded automatically, improving efficiency and reducing the risk of data loss and/or transcription errors. Sometimes these surveys are carried out in-house by Council engineers or members of the operations team. Often, they are carried out by specialised sub-contractors as part of a broader range of services.

Manual surveys tend to come in three forms: safety surveys, annual engineers' inspection (AEI) surveys, and coarse/detailed visual inspection (CVI/DVI) surveys). AEI surveys are carried out every year across the network, while CVI/DVI surveys tend to focus on specific areas. Interviewees took different approaches to their CVI surveys. In some cases, they focus on different areas of the network each year, in order to develop a complete set of data over a number of years. In other cases, these surveys are targeted specifically at unclassified roads, which are not usually monitored by the automated methods described above. DVI surveys tend to be commissioned on specific sections of roads identified by the CVI, in order to gain a more detailed understanding of the specific issues and the most appropriate treatment required.

There was consensus amongst interviewees that manual surveys bring a vital "human component" to the decision-making process, with engineers often asked to sense-check proposed asset management strategies and programmes of works based on their detailed understanding of specific stretches of road. Additionally, some interviewees use the surveys as an opportunity either to collect additional inventory data or to implement small repairs on-the-spot as soon as they are identified.

4.2 Other data collected by local transport authorities

In addition to road condition, skid resistance and manual survey data, all LAs collect and hold data on structures, road signs, traffic lights and road marking. In most cases, this data is not collected by the highways team but by separate teams within the authority via manual inspections. Other data sources used to inform asset maintenance include:

- **Insurance claims data** (from claims against the LA);
- **Traffic volume** (usually on a particular stretch of highway);
- **Resident complaints** to the Council;
- **Resident satisfaction surveys** (both national and local surveys);
- **Inventory data** (if available);
- **Public transport data** (in some cases) to understand journey times between two specific points;
- **Footway condition data** (where available); and
- the **priorities of council members** (in their role as representatives of the people).

While several LAs collect similar categories of data, the methods used for data collection often vary. Some LAs commission one-off surveys to analyse specific issues such as highways drainage (including silt build-up and number, position and condition of gullies) and inventory data (for example, the classification, position and condition of different assets such as signs, lighting, road markings, gullies, culverts etc).

These surveys are perceived as very expensive and resource intensive and therefore tend to be commissioned relatively rarely, often using “one off” investments from capital funding. A majority of interviewees expressed interest in a more comprehensive mapping of their inventory but viewed cost as a major obstacle to achieving this. Some view the development of AI solutions (and open source data, such as Google Street View) as a potential method for reducing the costs associated with mapping inventory data going forward.

LAs that were successful in bidding for Challenge Funding cited funding conditions as a driver to collecting additional data (particularly around impacts). Some noted that, while useful, Challenge Funding is still focused on specific works and does not address the underlying issue of ongoing deterioration of the highways network. One LA stated that bid-for-funding often requires applicants to produce a great deal of information over a short space of time, putting a strain on already limited resources.

4.3 Data storage and access

Nearly all LAs interviewed identified at least one (and in many cases more than one) system for data storage. In most cases, authorities purchased “off the peg” systems rather than developing in-house databases. This is not always the case, however. Some LAs mentioned that they were investigating options for developing new systems (including potentially developing their own in-house technologies). Others mentioned having developed their own databases using Microsoft Excel or Access. More detailed information on the different software solutions used by LAs is available in Annex A.

Almost all LAs interviewed use an asset management system or systems to support the development of their asset management strategy, based around scenario planning. The most commonly used include WDM Scheme Manager, Yotta Horizons, and Symology. Separate systems can be used for specific asset types (e.g. highways, footways, lighting etc) or a single system can store an entire inventory. A Geographic Information System (GIS) is often used to layer various sources of data to produce a visual representation of the entire network. A map highlighting red and amber rated sections of road can be identified in GIS, along with other road condition data, scheduled works, inventory etc.

Asset management systems can also analyse condition data to produce a list of potential treatment schemes for deteriorating assets across the network and carry out scenario mapping. Once a number of potential spending scenarios have been developed by the software, these are subject to further sense checks by experts within the LA (usually engineers or members of the operations team) to ensure that the data is perceived to match the reality on the ground and broader priorities. Other LAs utilise private sector expertise by working with contractors to select the most suitable treatment type rather than prescribing a solution. This is usually done in situations where LAs have a long-standing relationship with a contractor, or where the contractor is a partially or wholly owned subsidiary of the authority.

4.4 Data sharing and interoperability

Data collection and storage responsibilities vary depending on the organisational structure of the authority in question (as described in more detail in Section 3.1.1). It is common for the operations team to manage both data collection and storage, as the engineers within these teams tend to have a detailed understanding of the data parameters used by surveying organisations measuring road condition across the network. Those involved in strategic planning have access to data systems and work closely with the operations team to determine which areas of the network require prioritisation. Smaller teams will often share responsibility for data collection and storage, with the team lead possessing greater control over the data systems used. For those LAs with multiple sub-teams, data is often stored in separate databases.

In most cases, data is imported into the relevant asset management software directly from these databases before being analysed. Some LAs are in the process of looking for a more centralised system which could be used to store all the data collected on road condition, as well as the condition of different assets. Many noted, however, that these broader systems do not meet the specific requirements of different teams. Therefore, there is a tendency for specific teams to maintain their own databases which then interact with the centralised system. While interviewees did not view this as a particular problem at local level, the multiplicity of databases in use in different LAs would pose significant difficulties for the creation of a consistent, comparable dataset at national level.

In some cases, asset managers used a more manual approach – inputting data received from different teams into spreadsheets or other tools developed in a more ad-hoc manner to suit their specific needs and approach. A few interviewees reported that, although they used a centralised asset management system in theory, in reality they still carried out analysis using more basic tools such as Excel. The GIS systems described in Section 3.2.3 are also commonly used to combine data in different “layers” in order to build a more detailed map of the local network. There was general consensus among interviewees that relevant data is shared appropriately between teams and no one reported any issues with access to data within their authority.

LAs also reported significant levels of information sharing between employees and contractors. Examples given included technical insight on specific assets, knowledge on the condition of specific stretches of road and expertise on the merits of different treatments. There is less evidence of broader information sharing outside of teams directly working on highways, although some LAs did cite public transport data and insurance data as important/useful data sources which were collected from other departments.

Some LAs also reported sharing data with neighbouring authorities, either through regional networks or as part of a larger combined authority. In most cases, this data sharing is used for benchmarking and learning purposes. In particular, a number of interviewees reported gathering feedback on the experiences of other authorities when considering new and/or innovative treatments.

Additionally, two LAs reported publishing data publicly on the authority's website in the form of an interactive map. The underlying rationale for publishing data was to increase transparency and inform local residents of ongoing/upcoming works, local hotspots and other useful information.

4.5 Obstacles to data collection

There was a consensus amongst LAs interviewed that they had access to the data they needed within their LA. Nonetheless, certain specific issues were identified with regard to both data gaps and data quality. The main obstacles identified with regard to data collection were resource constraints and, in certain cases, a lack of clarity around definitions.

Footway condition data, in particular, was a source of concern for many LAs. While most carried out Footway Network Surveys (FNS), some reported that these were no longer implemented – either because the data was no longer required by DfT or because there is no longer a common set of standards and definitions which apply to footways. With some notable exceptions, most LAs prioritised roads over footways in terms of spending allocations and this prioritisation is to some extent reflected in patchy data collection on footway condition.

Similarly, very few LAs reported collecting data specifically on cycle paths. In some cases, interviewees explained that cycle paths are included within condition data on highways and footways (as they are either on the road or on the pavement). In other cases, cycle path data was described as difficult to collect and lacking a common set of standards and definitions, as with footways. In many cases, responses reflected a view that there was not enough resource available to maintain cycle paths and therefore collecting condition data was not a priority. Drainage data was also a point of concern, with many authorities noting that understanding the location and condition of drains would become increasingly important as the climate gets wetter and increased population density places a strain on existing facilities.

Resource issues particularly apply to big data collection exercises, such as mapping and updating inventory of smaller, less strategically significant items such as signs, markings, lighting, culverts, gullies, drains etc. In many cases, LAs reported that they had an incomplete view of their assets, with some noting that they were still discovering certain assets which they didn't previously know existed. In other cases, interviewees had a broad overall idea of what assets existed but weren't completely sure where they were.

Finally, a number of LAs reported having a complete inventory which had not been updated for many decades and was therefore in need of review. The cost of carrying out a complete inventory was described as very high, and this was the main reason that LAs provided for not having a more comprehensive knowledge of their overall assets. Some interviewees expressed the hope that new technologies – particularly AI and open data software such as Google Street View – might help reduce the costs associated with inventory surveys in future.

Some asset managers also identified a lack of technical capacity as a significant issue in terms of understanding the plethora of different software solutions available and using them in an effective way. Looking forward, IT skills will be increasingly important to supplement the expertise of more operations-focused colleagues. In the words of one interviewee, "*what we could really do with is a Highways IT team*."

5. Evaluation of outcomes and impact

In this section we consider how outcomes and impact are defined and measured, both in terms of improvements to the overall conditions of highways and associated assets and with regard to broader benefits.

5.1 Approaches to assessing improvement in highway condition

The primary indicator used by LAs to assess highway condition outcomes is the road condition data collected through SCANNER (or GAIST/Vaisala AI) and provided to the DfT. Most interviewees explained that they are aiming to maintain their highways network at a "steady state" (i.e. no significant deterioration in the overall condition of the roads), although some explained that their longer-term forecasting predicts deterioration over the next five to six years.

Expectations of improvement in road condition were limited to the two LAs who had invested significant amounts of local funding into major programmes of works in recent years. In general, a lack of deterioration was reported as a very optimistic outlook given budgetary expectations and underlying road conditions. Indeed, in many areas, significant stretches of highways are expected to move from amber to red in the next five to ten years.

Skid resistance data is also a significant outcome indicator for many interviewees, with "success" in this instance defined as ensuring a safe level of skid resistance across the highways network. Accompanying this measure, many LAs track accident data (usually via claims made against the authority, but also published data from the police or national datasets) in order to monitor road safety and identify any potential hotspots. Accident data is often combined with SCRIM data in order to identify areas where poor skid resistance may be impacting overall road safety.

Additionally, some authorities reported tracking the number of potholes identified and reported as a proxy for the overall state of the road. If the number of potholes appearing remains low, the road could be viewed as being kept in a relatively good condition. However, some interviewees did raise a note of concern regarding using potholes as a measure of road condition. This relates primarily to how potholes are defined. One example given was a machine which is used to identify and treat defects, including potholes. In this case, any treatment applied (even if it is a preventative measure) could loosely be defined as treating a pothole. Therefore, data on the number of potholes identified and filled provides misleadingly large numbers as it also includes treatments to prevent potholes which do not yet exist.

Some interviewees also reported benchmarking their overall highways condition against those reported by other (often neighbouring) authorities in order to assess how they are performing. A standard point of reference is the national road condition dataset based on RCI data reported to the DfT. For many, it is important to bear in mind specific contextual differences such as underlying soil conditions, congestion, and particularly costly assets (for example, high profile Victorian bridges which require significant expertise to maintain). Additionally, the different technologies used to collect and report data led to some expressing doubts regarding whether the national road condition dataset is truly comparable.

5.1.1 Measuring outcomes of specific treatments

While interviewees tended to focus on more high-level outcome indicators with regard to the overall condition of their highways network, specific treatments are evaluated using indicators such as lifespan, cost and (in some cases) environmental impact.

Value for money is a key concern for all authorities and is generally measured by taking into account the overall cost of a treatment and its longevity. Additional factors cited were length of road closure, level of disturbance (i.e. consideration of overall traffic volume) and – in one case – impact on the local economy.

While most interviewees did voice concerns about sustainability, these are less rigorously measured when assessing the effectiveness of specific treatments. Some authorities do consider factors affecting the overall carbon footprint of different treatments, taking into account issues such as emissions during production and distance travelled from the source to the point of treatment. There is little evidence, however, of rigorous analysis of the overall carbon footprint of different products. Instead, sustainability is often addressed through the choice of specific approaches deemed to be “more sustainable”, such as recycling of specific materials and the use of low temperature asphalt.

Case Study: Sustainability considerations

The majority of LAs interviewed for this study incorporated some consideration of sustainability into their overall approach to highways and asset management. In two cases, this was part of a broader strategy implemented by the Council which included specific targets and key performance indicators. In general, however, approaches to sustainability tend to be considered at the level of individual treatments. LAs incorporate sustainability considerations in two main ways:

1. Selection of treatments to **extend the lifetime** of highways and assets.
2. Selection of treatments which have a **lower carbon footprint** than traditional options.

New, more sustainable treatments tend to be trialled on a small section of the network before being rolled out more widely. As with other innovative solutions, LAs also relay on feedback from their peers in other authorities when deciding whether or not to implement an alternative treatment which is touted as being more sustainable than the traditional choice. One LA mentioned using a specific "decision impact assessment tool" which provides an assessment of the environmental impacts of the choice of materials used for particular treatments.

Common sustainable options used by a significant proportion of those consulted for this study included application of warm mix asphalt (instead of hot road asphalt) and recycling of materials including rubber, plastic, foam, concrete and asphalt.

5. 2 Broader benefits for local residents and highway users

Assessment of broader benefits was very limited amongst those authorities interviewed for this study. In most cases, this is due to lack of resource and a clear focus on value for money. Nearly all LAs referenced resident satisfaction as their key indicator of broader benefits. A common point of reference is the NHT dataset, with a number of those interviewed also carrying out their own surveys of residents. In general, these are limited to surveys of residents following local works. In some cases, however, interviewees invest in longer-term engagement with residents through focus groups and other consultation activities.

Other specific indicators identified by interviewees include:

- **Improved accessibility for vulnerable residents** (for example, those with physical disabilities);
- **Increased use of specific assets**, such as cycle lanes; and

- **Future flood reduction** (versus a “no change” scenario).

Each of these additional measures was only cited by one respondent and therefore should be seen as the exception, rather than the rule. The underlying rationale given for measuring these broader outcomes was twofold: firstly, it reflects a strong personal belief in prioritising accessibility and sustainability on the part of the interviewees; additionally, for sustainability measures specifically, it was cited as a condition of bid-for funding provided by the DfT.

6. Conclusions and recommendations

In this section we provide over-arching conclusion and recommendations to the DfT, based on the analysis of interview responses and accompanying documentation.

6.1 Conclusions

How the Potholes Fund is administered and delivered by local authorities

- LAs view the Potholes Fund as a reallocation of, or replacement for, reduced capital and revenue funding overall.
- Some LAs combine the Pothole Fund with other capital funding in one transport pot for overall highways and asset management; others maintain a separation, creating a planned programme of work across the network targeting pothole repair on prioritised highways.
- Most LAs use a relatively broad interpretation of the scope of the funding, referring to DfT guidance that it should be used "for the treatment and prevention of" potholes. Many therefore feel justified to spend pothole funding on preventative treatments such as resurfacing which help prevent the development of potholes.
- The moniker "Pothole Action Fund" provides pressure to use the funding on reactive repairs, as it creates an expectation from local residents and politicians that the funding should be used solely for this purpose.
- With regard to allocation of funding, most LAs accept that they are working within constrained budgets. The focus of funding on reactive repairs and major works has led to concerns about a squeeze on 'regular' maintenance. More consideration of ongoing strategic maintenance accompanied by a longer-term funding strategy would support the transition to an asset management-based approach to highways maintenance.

The range and nature of data generated and held by LAs about road maintenance treatment outputs and outcomes in their area

- In general, LAs are happy with the amount and quality of data they collect, particularly with regard to overall road conditions.
- Significant exceptions include footway data and inventory data (particularly with regard to smaller assets such as signs, lighting, culverts and gullies), which are not consistently collected due to resource constraints.
- Data on drainage is also a particular concern, given increase in rainfall associated with climate change and increased pressure from new housing developments on (often) Victorian drainage systems.
- LAs are consistently collecting some specific data items which are not currently being shared with the DfT. These include more detailed road condition and skid resistance data, data on insurance claims and resident complaints.

The potential for more consistent collection of data on roads maintenance treatments by DfT

- The DfT is viewed as an important actor in improving the overall quality and comparability of highways data, both by providing common data templates and definitions and by pushing local authorities to capture additional data on issues such as long-term sustainability and overall impact.
- Data submitted to DfT is not currently perceived to be particularly onerous to collect. Many LAs expressed willingness to provide additional data (for example, on traffic volume), new datasets (for example, around footways) or more detailed data (with regard to road condition). However, as a variety of different data collection methods and databases are used, this would pose difficulties when considering the creation of a consistent national dataset.
- A number of LAs expressed concern regarding comparability of datasets which are not currently collected by the DfT (for example, footway data or stratifications of road condition data). Further guidance on definitions would be welcomed in order to ensure data collected is comparable between different authorities.
- Some LAs expressed a desire for further support from DfT in implementing large scale surveys to map their overall inventory. This could be achieved either through the provision of funding or through the commissioning of a centralised survey.
- The majority of LAs interviewed were happy with the data transfer requirements and formats requested by DfT. Some noted, however, that the data being provided was in

effect a simplified version of the data they currently hold, presenting a relatively narrow view of their complete dataset.

- Some LAs suggested that more use could be made of their GIS systems, for example by allowing them to upload data directly to a central platform or through a live datafeed via an API created and maintained by DfT. It should be noted, however, that not all LAs are currently taking such sophisticated approaches to data collection and analysis.

6.2 Recommendations

- While significant funding is available for both major works and reactive repairs, there is a gap in terms of ensuring longer-term maintenance**. DfT could consider revisiting the KPIs used to measure road condition** to focus more on the priority of maintaining a healthy highways network.
- **DfT could consider creating a longer-term funding plan** to give LAs a clear forward-view of what funding they can expect in the medium to long term. This could be accompanied by considerations around when the funding is delivered, in order to optimise LAs ability to ensure value for money.

Opportunities to make more / better use of existing LA data sources

- **DfT could consider collecting data from LAs** on the following data items:
    - More detailed skid resistance data and road condition data on all road categories;
    - Complaints data;
    - Data on insurance claims.
- **In terms of data transfer, DfT could consider introducing a centralised platform or portal** which could be used to upload data directly from local authority data feeds, to more closely align to the methods used by LAs to collect, store and transfer data.
- **DfT could look to identify pre-existing national datasets and freely available open source data** which could be combined with local authority data to create a more detailed overview of the national highways network.

Evidence gaps that would require new data collection

- **DfT could explore the possibility of commissioning a national survey** to fill the gaps in data currently held by LAs or could provide funding for LAs to implement data collection regarding the following data gaps:
  - Inventory data;
  - Footway condition data;
  - Location and condition of drains, gullies, and culverts.

Contextual information that could usefully be collected to supplement existing DfT treatment data collection

- **DfT could build on its current role as a central point of reference, by standardising the approaches used by LAs with regard to data collection**. A more wide-ranging mapping exercise would help to understand the extent to which LAs are collecting footway, inventory and resident satisfaction data and to identify standard definitions which may be useful in terms of creating a comparable national dataset.
- **DfT could consider which data elements are already being collected** from some LAs though through Challenge Funding and other competitive grants (for example, data regarding sustainability and projections regarding use of specific assets) that could be collected more consistently from all authorities.

Annex A: Overview of IT Solutions used by Local Authorities

Developer	System name	Key features	Purpose	No. of LAs using
WDM	Highway Infrastructure Asset Management System (HIAMS)	- Mapping and storage of condition data - UKPMS accredited annual and gross depreciation reports for carriageways, footways, cycle paths and verges - Develops road condition assessment regime - Identifies potential treatment investigation sites based on a prioritisation ranking - Models maintenance scheme costs - Produces a programme of maintenance schemes	- Storage of all asset and condition data (incl. historic data) - Used to process condition data and produce depreciation calculations - Management and analysis of SCANNER, CVI, FNS data - Management of structures - Combine data to create pothole hotspot report - Used to generate maintenance schemes - Use of GIS function	7

Yotta	Horizons	- Storage of all asset data - Layers data onto Google Maps - Deterioration and lifecycle modelling to predict long term outcomes of funding scenarios	- Scenario planning to determine steady state - Storage of street lighting data	5
Symology	Symology	- Offers several modules that can be combined in its Street Gazetteer system. This system can be used as a register of street names or a map of the entire network - The Asset Register & Networks module stores all asset data. It also provides the option to meet the requirements of specific disciplines such as Highways, UKPMS, Street Lighting and Structures. - Other modules include Street Gazetteer, Asset Valuation, GIS Integration, Street Works Notice Management	- Process road condition data - Manage street works, - Manage gazetteer network	3
Esri	ArcGIS	- Develop interactive maps with data layers on assets and their condition	- Data visualisation and analysis	3
Dude Solutions	Confirm	- Mapping and storage of asset and condition data - Identifies potential treatment investigation sites	- Works ordering and monitoring of condition data	3
Yotta	Alloy	- Storage of all asset data - Layers data onto Google Maps	- Analyse and manage CVI, SCRIM & SCANNER data - Storage of structures data	2
BridgeStation	BridgeStation	- Storage of bridge asset and condition data - Storage of inspection records - GIS mapping	- Bridges & structures management - Storage of highway inspection data	2

		- Calculates Gross and Depreciated Replacement Costs - Prioritises maintenance schemes based on a VfM score - Deterioration and lifecycle modelling in accordance with the Structures Asset Management Planning Toolkit (SAMPT) -		
XAIS	XA	- Mapping and storage of asset and condition data - Develops road condition assessment regime - Identifies potential treatment investigation sites - Models maintenance scheme costs - Produces a programme of maintenance schemes - Models 1-60 years forward works programme	- Aggregate various data sources and create maintenance schedule	2
AMX Solutions Ltd	Asset Management eXpert	- Storage of asset and condition data - Mapping of data using NSG and GIS - Budget Management & Forecast - Lifecycle planning	- Bridges & structures management	2
Kaarbontech	Kaarbontech	- Storage of gully, sewage, grit bin and tree asset data - Uses sensors across network to provide live data (e.g. gully water levels)	- Gully & tree management	1
Gaist	Asset Stream	- Live storage of all asset data able to monitor daily changes to asset condition	- Management and analysis of asset and condition data - Scenario planning	1

		- Deterioration and lifecycle modelling to predict long term outcomes of funding scenarios - Financial measurements of the cost of depreciation (used to calculate Depreciated Replacement Cost - DRC) - Models the gross replacement cost (GRC) of an entire network - Offers a Works Delivery System module used to map and order works and store associated data against assets	- Financial and treatment life cycle modelling	
thinkWhere Ltd	Location Centre GIS	- Develop interactive maps with data layers on assets and their condition	- Storage of accident and minor assets (e.g. litter bins) data	1
GeoPlace	Local Street Gazetteer (LSG)	- Mapping and identification of highways using a Unique Street Reference Number (USRN). - Storage of Associated Street Data (ASD) providing further information on streets to improve streetworks		1

Annex B: Overview of highways data collected by local authorities

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potholes data combin