

Maintaining Scotland's roads

Prepared for the Auditor General for Scotland and the Accounts Commission

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Audit Scotland prepared this report on behalf of the Accounts Commission and the Auditor General for Scotland. The study was managed by John Lincoln under the general direction of David Pia, Director of Performance Audit (Local Government) and Robert Leishman, Portfolio Manager (Enterprise, Transport and Lifelong Learning). The project team also included Gail McGuigan.

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Acknowledgments

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Contents



Part 1. Introduction **Page 2**

There are six categories of roads in Scotland

Responsibility for maintaining the roads is shared between the Executive and councils
Page 3

Main findings
Page 5

Part 2. The condition of Scotland's roads

Consistent information on the condition of all roads is now becoming available
Page 6

Almost 13% of Scotland's roads are in need of repair, and unclassified roads are in the poorest condition

The condition of roads varies by area, in some councils more than 20% of roads are in need of repair
Page 7

The cost of bringing the road network up to standard has been estimated at £1.5 billion, but further work is needed to improve the accuracy of the estimate

Recommendations
Page 9

Part 3. Road maintenance costs **Page 10**

Overall council spend on road maintenance is in line with Executive expectations, but the position varies among councils
Page 12

Constraints on road budgets have resulted in reduced spending on structural maintenance
Page 14

Contracts for maintaining motorways and trunk roads have delivered in line with the contract requirements

Council practices for delivering road maintenance vary
Page 18

There are significant differences in the unit cost of common road maintenance items reported by councils

Councils need to work together to achieve economies of scale

Recommendations
Page 21

Part 4. Improving the management of road maintenance

Structural maintenance is essential to achieve best value for roads expenditure
Page 23

Some councils' strategies for structural maintenance do not meet Best Value standards
Page 25

Councils and the Scottish Executive need to take measures to reduce the impact of road maintenance on road users and the environment

Recommendations
Page 28

Part 5. Summary of recommendations **Page 30**

Appendix 1. The study advisory group
Page 31

Appendix 2. Description of common maintenance tasks
Page 32

Appendix 3. Methods of assessing road condition
Page 34

Appendix 4. Common road defects
Page 35

Appendix 5. Variation in the condition of roads among councils
Page 36

Appendix 6. Cost of common road maintenance tasks
Page 39

Part 1. Introduction



Scotland's roads are important for economic prosperity and for the quality of life of its population.

1. Scotland's roads are important for economic prosperity and for the quality of life of its population. The length of the road network in Scotland increased by 5% between 1993 and 2003, with the length of the motorway network growing by 32%, and the demands on the road network are increasing. The volume of traffic on Scotland's roads in 2003 was 1% higher than in the previous year, and 18% more than in 1993. In 2003, over 2.3 million motor vehicles were licensed in Scotland, 2% more than the previous year and 27% more than in 1993.

2. Road maintenance covers all work on roads other than major new-build or reconstruction work. It is described in detail in [Appendix 2](#) and includes routine, structural, and winter maintenance, traffic management of road works, maintenance of bridges and structures, and lighting maintenance.

3. All roads need regular structural maintenance, for example, resurfacing or surface dressing, to ensure that their surfaces are sealed properly to prevent water penetration and to maintain skid resistance. Modern roads are able to meet the demands of current traffic flows and vehicle weights, and are designed to have a life of 20-30 years before they require major reconstruction. However, many minor and local roads were not built to modern standards and evolved from cart tracks and drove roads. Bad weather and heavy traffic can cause these roads to fail very rapidly.

4. This study looks at the steps taken by the Scottish Executive and councils to monitor the condition of the road network and to manage structural maintenance. The study was undertaken as a single exercise covering both trunk roads and council

maintained roads. There were three main strands in the research:

- Structured interviews with senior managers and practitioners in six councils (Clackmannanshire, East Ayrshire, City of Edinburgh, Glasgow City, Highland, and Perth & Kinross), the Scottish Executive and other stakeholders.
- Questionnaires were used to gather information from all 32 councils on the cost of road maintenance services and other issues relating to road maintenance.
- Desk research and data analysis drew on existing data sources to collect information on road maintenance. The study team obtained information on the performance of the trunk road contracts from reports by the Performance Audit Group (PAG). The Society of Chief Officers of Transportation in Scotland (SCOTS), and the Scottish Executive supplied information on road conditions.

There are six categories of roads in Scotland

5. The road network in Scotland is made up of six categories of roads:

- Motorways and trunk roads – Scotland's strategic road network catering for through traffic.
- A roads – major roads which deliver the basic road links to certain areas or communities.
- B roads – which serve a local purpose and connect to strategic routes.

- C roads – mainly rural interconnecting roads.
- Unclassified roads – mainly local access roads.
- Private roads.

6. [Exhibit 1 \(overleaf\)](#) shows the extent of each category of road and the number of vehicles carried. Trunk roads and motorways, which carry intense traffic volumes, comprise a relatively small proportion (6%) of total road length but carry over a third of the traffic, including 61% of heavy goods vehicle (HGV) mileage. Conversely, unclassified roads, which comprise almost half of the total road length, carry only a fifth of the traffic.

Responsibility for maintaining the roads is shared between the Executive and councils

7. The Scottish Executive maintains the 3,500 kilometre network of motorways and trunk roads. The 32 Scottish councils are responsible for the maintenance of 51,000 kilometres of other public roads (categories A, B, C and unclassified).

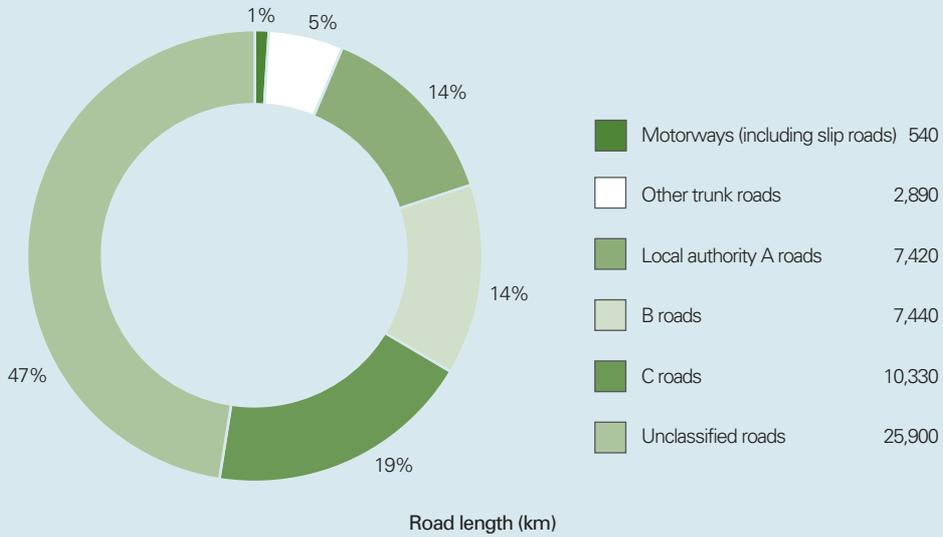
8. Trunk road maintenance is planned by the Executive but the work is undertaken under contract. In February 2001, the Scottish Executive entered into contracts with two operating companies (BEAR Scotland Ltd and Amey Highways Ltd) for the management and maintenance of the trunk roads in Scotland. These contracts cover four geographical areas, with BEAR for the North-East and North-West and with Amey for the South-East and South-West. The performance of the contractors is monitored by the PAG¹ on behalf

¹ The Scottish Executive appointed the consultants Halcrow, working in association with PricewaterhouseCoopers (Halcrow/PwC), as the Performance Audit Group (PAG) for the existing contracts.

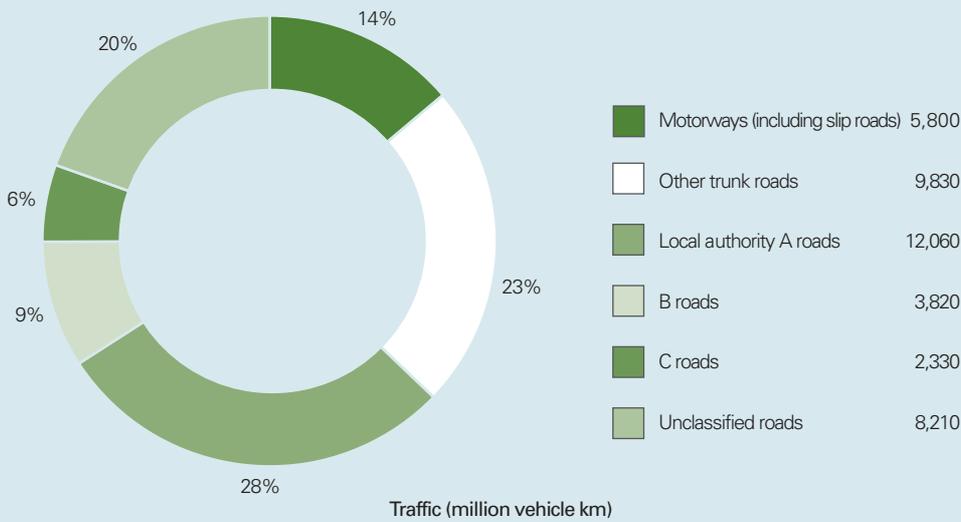
Exhibit 1

The road network 2003

Motorways and trunk roads make up only 6% of the road length but carry over a third of the traffic.



Motorways (including slip roads)	540
Other trunk roads	2,890
Local authority A roads	7,420
B roads	7,440
C roads	10,330
Unclassified roads	25,900



Motorways (including slip roads)	5,800
Other trunk roads	9,830
Local authority A roads	12,060
B roads	3,820
C roads	2,330
Unclassified roads	8,210

Source: Scottish Transport statistics 2004, Scottish Executive

of the Scottish Executive. All structural maintenance schemes valued at over £150,000 are put out to tender under contracts between the Scottish Executive Enterprise, Transport and Lifelong Learning Department and works contractors.

9. Councils use a mixture of their own trading operations (formerly the Direct Labour Organisation – DLOs) and private contractors to maintain the network. Tayside Contracts provides services for Angus, Dundee and Perth & Kinross councils, while roads maintenance for North Lanarkshire is contracted out to the private sector. Councils' roads trading operations tend to undertake routine, cyclic and winter maintenance for councils, while larger structural maintenance contracts are subject to competitive tender.

10. Overall, some £404 million was spent in Scotland on road maintenance in 2002/03 (including lighting maintenance). The Scottish Executive spent around £127 million on trunk road maintenance via the trunk road operating companies; all trunk road maintenance expenditure is funded via revenue. Scottish councils spent some £277 million of revenue expenditure on maintenance, of which £101 million (37%) was estimated to be on structural maintenance. In addition, councils spent a further £44 million of capital expenditure on structural maintenance.

11. Road maintenance has to be managed in the context of wider transportation strategies. These have to balance a range of demands and public expectations – improving public transport provision, improving safety, as well as meeting public expectations that the road network will be kept open during the winter and in extreme weather conditions throughout the rest of the year.

Main findings

- The first repeatable survey of Scottish road conditions suggests that 13% of Scotland's roads should be considered for repair now and 31% require further investigation ([Part 2 page 6](#)).
- Councils may have a maintenance backlog of £1.7 billion, including £900 million for road repairs, but the method of calculating this figure needs to be refined. The Executive has a trunk road maintenance backlog of £232 million ([Part 2 page 6](#)).
- Spending on council-maintained roads fell sharply during the mid-1990s and revenue expenditure is still below the 1994/95 level; spending on trunk roads also fell but has recovered ([Part 3 page 10](#)).
- The trunk road operating companies have completed three years of contracts with good performance. Councils should establish a long-term strategy for road maintenance in the overall context of their transportation and asset management strategies. They need to work together to achieve economies of scale and improve their information through better use of IT ([Part 4 page 23](#)).

Part 2. The condition of Scotland's roads



Until recently, no systematic survey had been undertaken on the condition of roads in Scotland. However, the recent Scottish Road Maintenance Condition Survey (SRMCS) suggests that 13% of Scotland's roads should be considered for repair now and 31% require further investigation. Twenty-seven councils are likely to have a road maintenance backlog. The SRMCS information should make it possible for councils to make better use of road maintenance resources.

12. In this section we look at the condition of the road network in Scotland:

- How road condition is assessed.
- The results of road condition surveys, including a comparison of road conditions among councils.
- The amount of work required to bring roads up to an acceptable condition.

Consistent information on the condition of all roads is now becoming available

13. The SRMCS provided the first consistent information on the condition of Scotland's roads in 2002/03. Prior to that date, councils and the Executive used a variety of techniques (described in [Appendix 3](#)) to measure road condition, depending on the type of road and the nature of the defects being examined (described in [Appendix 4](#)).

14. The survey is carried out by independent consultants on behalf of SCOTS, with the backing of the Scottish Executive and the Department for Transport. The survey methodology was chosen because it:

- provides consistent information over time
- is safer for survey staff
- minimises disruption to road users
- has a low operating cost.

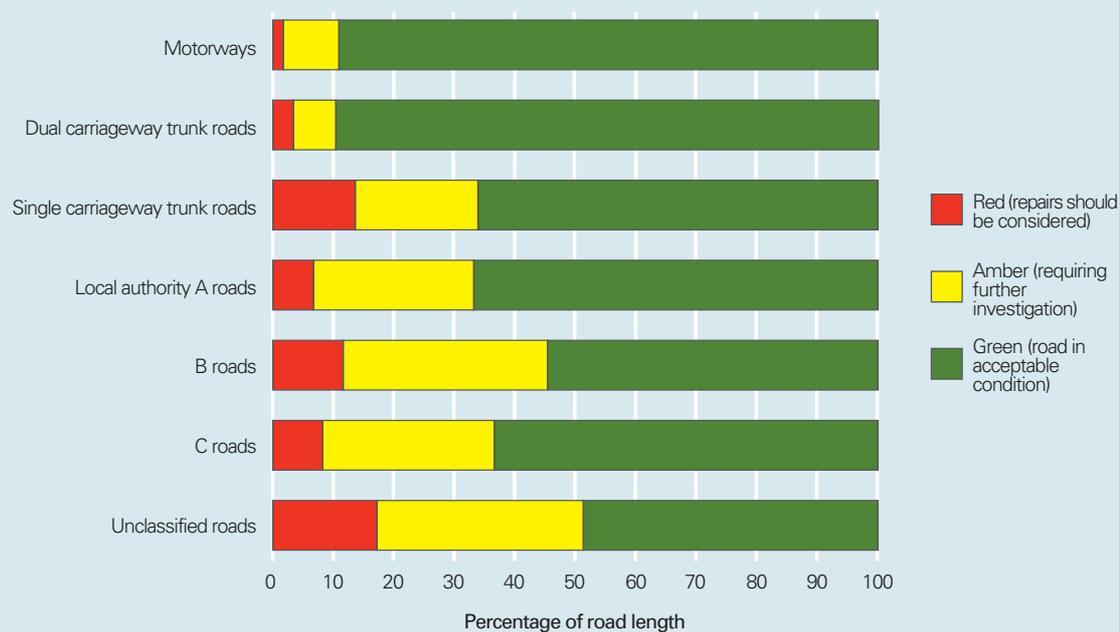
15. The SRMCS uses a standard technique which measures rutting, surface texture, longitudinal profile (bumpiness) and cracking. In addition to the SRMCS, the condition of motorways and trunk roads is monitored by annual structural maintenance surveys, which are undertaken for the Scottish Executive by independent specialist contractors. Over time, the SRMCS will provide a complete picture of the condition of all Scotland's roads. It will enable both trends in the condition of roads to be analysed and examination of the link between road condition and expenditure on the roads by councils and the Scottish Executive.

16. In year one (2002/03), the SRMCS surveyed most of the council 'A' class road network, plus a sample of other roads. In year two (2003/04), the survey assessed the entire council A roads network, 50% of B roads and 20% of the remaining roads. The aim is to survey the entire network by 2007. The SRMCS project will develop as new technology becomes available; its methodology is now being rolled out across the UK and will ultimately facilitate UK-wide comparisons.

Exhibit 2

The condition of Scotland's roads by road classification in 2003/04

Higher classes of road tend to be in a better condition.



Source: Scottish Executive, Scottish Road Maintenance Condition Survey (SRMCS)

17. The results of the survey are used to classify the road network into one of three measures:

- **Green** – roads considered to be in an acceptable condition.
- **Amber** – roads considered to require further investigation to establish if treatment is required.
- **Red** – roads considered to have deteriorated to a point at which repairs to prolong future life should be considered.

Almost 13% of Scotland's roads are in need of repair, and unclassified roads are in the poorest condition

18. Exhibit 2 shows the condition of the Scottish road network as measured by the SRMCS and the Scottish Executive as at March 2004. This shows that around 7,100 kilometres (13%) of Scotland's road network is in the red category and should be considered for repair. In addition, a further 17,000 kilometres (31%) of roads require further investigation to establish if repairs are required.

19. The proportion of roads requiring repairs varies according to the class of the road, with higher classes of road tending to have less need for urgent repair. Almost 90% of motorways and trunk road dual carriageways are in acceptable condition (a green rating), compared to around two-thirds of A roads, 55% of B roads and 49% of local roads. Of the 7,100 kilometres of roads requiring repair, 4,500 kilometres (63%) are unclassified roads. This distribution is in line with priorities. Trunk roads and A and B class roads carry higher volumes of traffic travelling at higher speeds and are therefore maintained to a higher standard to allow the safe movement of traffic.

20. Because this is the first time that condition data is available for the whole of the road network, it is not yet possible to say authoritatively whether road conditions are improving or worsening. Comparison of the condition of A roads in years one and two of the SRMCS indicated a small increase in the proportion of roads in an acceptable condition.

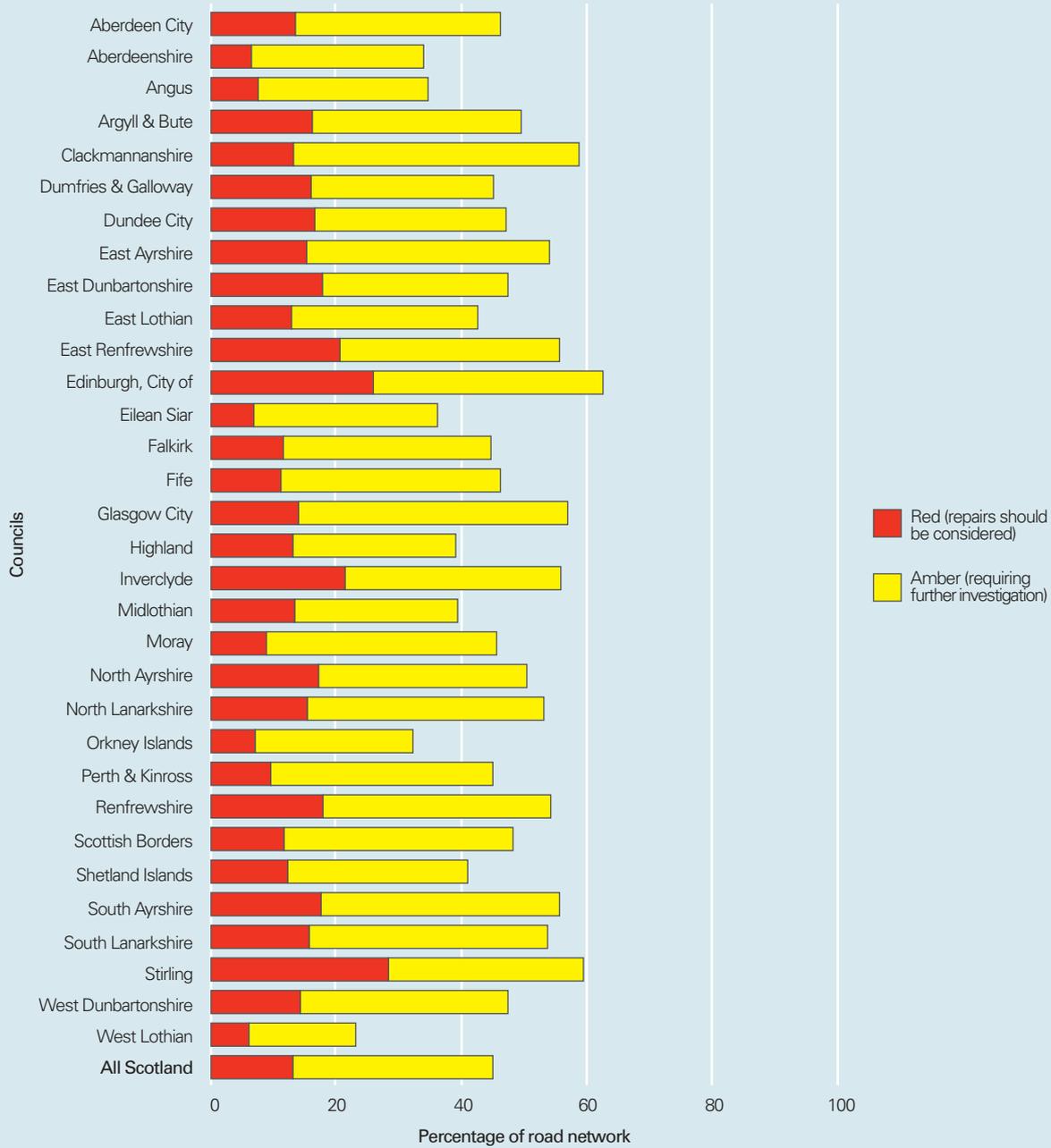
The condition of roads varies by council area; in some councils more than 20% of roads are in need of repair

21. Exhibit 3 (overleaf) shows the condition of the road network for each Scottish council. In the majority of councils, between 10% and 20% of roads require repair, with a further 30-40% requiring further investigation. In four councils, East Renfrewshire, City of Edinburgh, Inverclyde and Stirling, more than 20% of the road network has deteriorated to a point at which repairs to prolong future life should be considered. More detailed information on the condition of A, B and C class and unclassified roads combined is included in Appendix 5. Five councils (Argyll & Bute, East Dunbartonshire, City of Edinburgh, Glasgow City and North Ayrshire) have more than 10% of their A road network requiring repair.

Exhibit 3

Road condition in each council in 2003/04

In many councils, between 10% and 20% of the road network is in need of repair, but in some the proportion is higher.



Source: Scottish Road Maintenance Condition Survey (SRMCS)

The cost of bringing the road network up to standard has been estimated at £1.7 billion, but further work is needed to improve the accuracy of the estimate

22. Several different methods have been used to calculate the size of the road maintenance backlog. These include:

- the cost of improving the condition of the roads network to a 'steady state' where a fixed percentage of the network (around 8%) requires maintenance each year
- applying an average unit cost to the length of the road network needing repair
- the expenditure required to bring the network to a condition where the maintenance cost can then be minimised over the long term
- the cost of bringing the network to the standard expected by road users.

23. The maintenance backlog also includes items other than the road itself, including: footways, street lighting, drainage, bridges and traffic signals. The simplest method of taking into account these items is by multiplying the road maintenance backlog by a factor representing the relative weight of these items compared to that of the road pavement.

24. Different methods of calculating the backlog can lead to widely differing results. This means it is important that the methodology adopted is widely accepted and provides a consistent measure of the backlog. Using the 'steady state' method outlined above, SCOTS provided evidence to the Scottish Parliament's Local Government and Transport Committee that the first estimate of the backlog of structural

maintenance emerging from SCRMS information was a requirement for repair work of £1.5 billion, including £900 million for road repairs.² The Executive, using more detailed information than that available from the SRMCS, has calculated that the structural maintenance backlog for trunk roads is around £100 million, with a further £72 million required for routine repairs and £60 million for bridges.

25. The structural maintenance backlog is less of a problem in some areas than in others. For the trunk roads managed by the Scottish Executive and for roads maintained by five councils (Aberdeenshire, Angus, Eilean Siar, Orkney Islands and West Lothian), the proportion of the road network requiring repair appears to fall below the 8% threshold. The majority of the maintenance backlog is therefore likely to be found mainly in the remaining 27 councils.

26. The methodology used to produce the estimate is still a matter of debate among roads engineers, and SCOTS is actively pursuing a more robust basis for assessing the cost. The UK Roads Board³ is developing a methodology to use road condition data to calculate the road maintenance backlog for the UK as a whole, which it hopes will be adopted across the whole of the UK. The results of the improved methodology will also benefit from the additional information available from progress with the SRMCS, both in terms of greater coverage of the road network and developments in the technology, for example, to allow it to measure edge deterioration in rural roads.

Recommendations

Councils should use the information from the SCRMS to calculate the size of the structural maintenance backlog in their area using a common accepted methodology.

Councils and the Scottish Executive should monitor and report publicly on the condition of their road network and their road maintenance backlog on an annual basis.

² Evidence to the Scottish Parliament, Local Government and Transport Committee, 16 March 2004.

³ The UK Roads Board was set up in 2001 to bring together representatives of local and central government from all parts of the UK, to contribute to the formulation of roads policy in the UK, taking into account differing needs in the four UK countries, where appropriate.

Part 3. Road maintenance costs

The annual council spend on road maintenance fell sharply during the mid-1990s, despite an increase in traffic flow and network length. Maintenance expenditure has recovered slightly since 1997/98, but revenue expenditure is still below the 1994/95 level. Councils' budget-setting procedures have meant that the biggest impact of these reductions has been on the structural maintenance budget.

Evidence from England, where road condition data has been collected over a considerable period, indicates that reductions in road maintenance expenditure lead to a deterioration in road condition over the long term. This evidence, together with the evidence from the SRMCS, suggests that the reduction in maintenance expenditure during the late 1990s has contributed to a structural maintenance backlog.

27. This section looks at:

- trends in road maintenance expenditure
- changes in the amount of money allocated to roads through the Grant Aided Expenditure (GAE) system
- how councils set their road maintenance budgets
- council spend on road maintenance, particularly on structural maintenance
- the use of capital expenditure to fund structural maintenance
- the mechanisms that councils and the Scottish Executive use to control maintenance costs.

Scottish Executive spend on trunk roads has increased in line with traffic growth, but council spend has not

28. Trunk road maintenance expenditure fell during the mid-1990s

but recovered, and has broadly kept pace with traffic flows and the length of the trunk road network ([Exhibit 4](#)).

29. In 2001/02 trunk road maintenance expenditure in England was more than double that in Scotland at £110,000 per kilometre compared to £40,000 per kilometre, expenditure in Wales was 50% higher at £60,000 per kilometre:⁴ this difference may reflect higher traffic flows in England and Wales.

30. [Exhibit 5](#) shows the trend in councils' road maintenance expenditure, traffic flows and road length over the period from 1994 to 2003. The annual spend by councils on road maintenance fell sharply during the mid-1990s, despite an increase in traffic flow and network length. Expenditure has recovered slightly since 1997/98, but revenue expenditure is still below the 1994/95 level. The reduction in revenue expenditure on road maintenance was partially offset during the late 1990s by a significant increase in councils' capital expenditure on

Exhibit 4

Trends in trunk road maintenance expenditure in Scotland

Expenditure on trunk road maintenance fell during the mid-1990s, but has recovered.



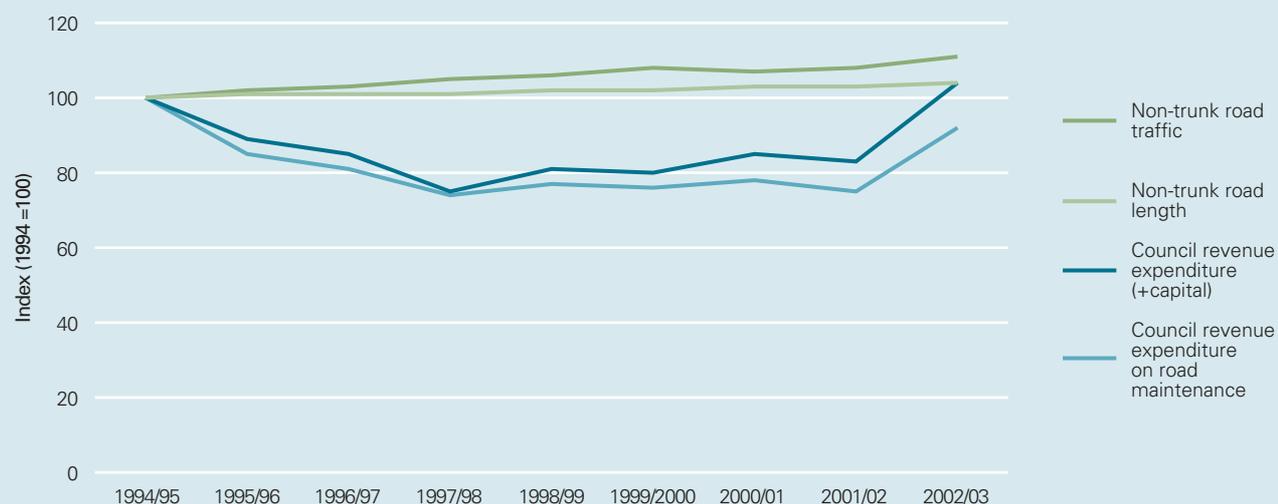
Note: Expenditure adjusted for inflation, 1994/95 = 100, trunk road expenditure excludes design, build, finance, operate payments.

Source: Scottish Transport statistics 2003, UK Treasury

Exhibit 5

Trends in council road maintenance expenditure in Scotland

Council expenditure on road maintenance has declined relative to traffic flows and the length of the road maintained.



Note: Expenditure adjusted for inflation, 1994/95 = 100.

Source: Scottish Transport statistics 2003, UK Treasury. Audit Scotland survey of councils

Exhibit 6

Comparison of road maintenance GAE with overall council GAE over time

The road maintenance GAE has fallen behind the overall amount allocated to councils.



Source: Scottish Executive

structural maintenance. Expenditure increased in 2002/03, partly due to an additional £20 million provided by the Scottish Executive in February 2002 to tackle urgent repairs.

31. Council expenditure on road maintenance was over 50% higher in England than in Scotland, at £10,300 per kilometre compared to £6,500 per kilometre in Scotland; expenditure in Wales at £7,000 per kilometre is slightly higher than in Scotland. This can partly be explained by higher traffic flows south of the border; in addition, the adoption of a ten-year transport plan linked to maintenance funding has led to significant increases in maintenance funding in England.

32. Expenditure on road maintenance varied among Scottish councils, ranging from around £2,000 per kilometre to around £10,000 per kilometre. Urban councils spent about three times more on road maintenance than rural councils; this can partly be explained by higher traffic flows and increased utility works in urban areas leading to a greater requirement for maintenance. However, care must be taken in

comparing spending among councils because of the varying cost drivers for road maintenance:

- Traffic (particularly HGVs).
- The structure and build quality of roads.
- Utility damage.
- Past spend on structural maintenance over a 10-20 year period.

33. Differences in these factors will lead to a variation in spending levels, but detailed information about them is not readily available (paragraphs 75-76) and so it is difficult to draw conclusions about the efficiency of councils' road maintenance performance from the data on spending.

Overall council spend on road maintenance is in line with Executive expectations, but the position varies among councils

34. Councils' revenue expenditure, including roads expenditure, is met by external support from central

government and through locally raised council tax and charges. The system used by the Scottish Executive to distribute resources among councils is known as the Grant Aided Expenditure (GAE) system. The aim of the GAE system is to distribute a fixed sum of money among councils using a hypothetical indication of how much each council should spend on a range of services. A number of indicators are used to divide the GAE for each service among councils, such as population and road lane length.

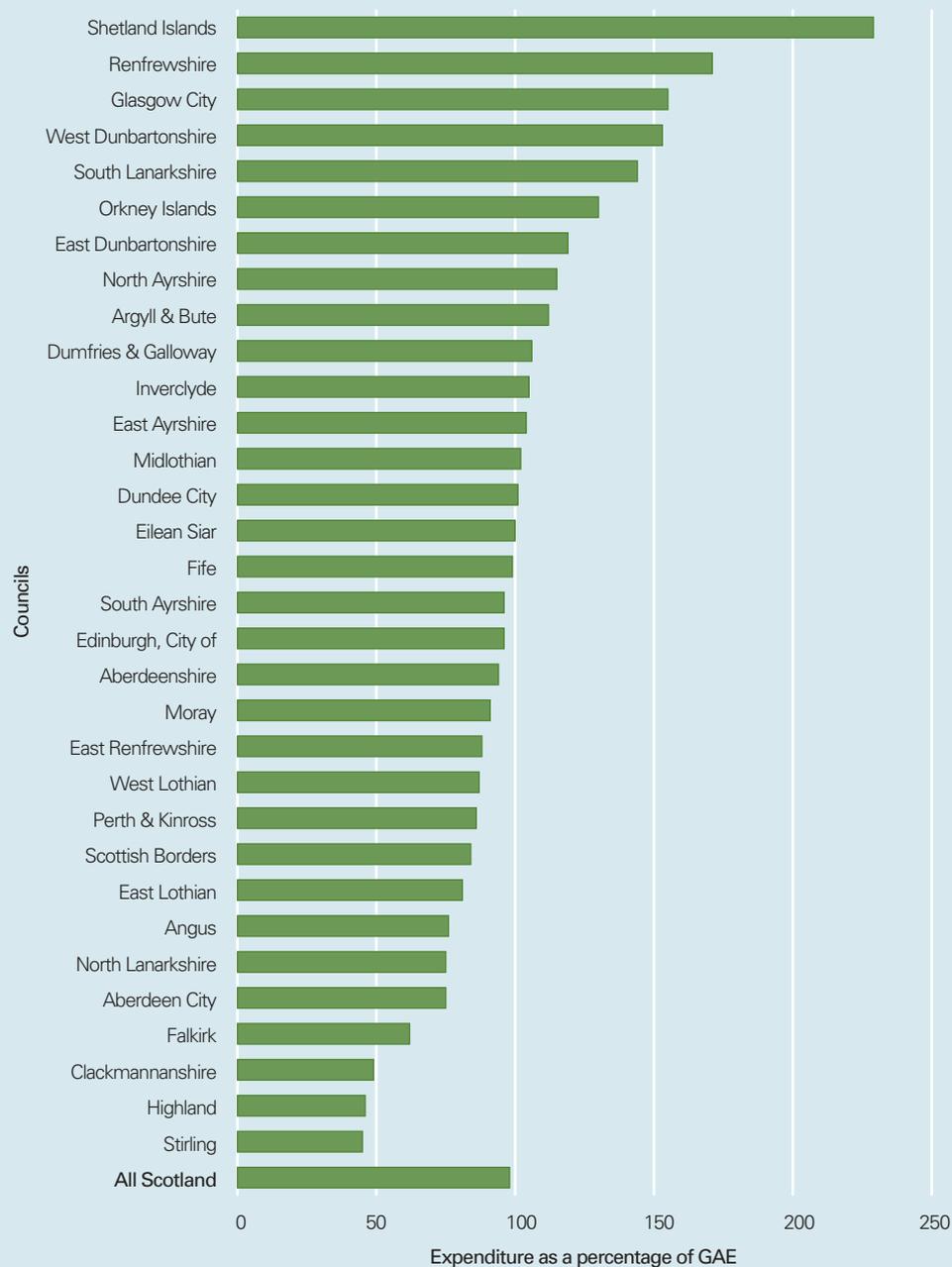
35. The indicative proportion of GAE allocated to road maintenance has fallen over time compared to overall council GAE (Exhibit 6). Part of the increase in overall council GAE is due to councils taking on new responsibilities, but the allocation of notional expenditure to roads maintenance has fallen in both relative and real terms (Exhibit 5 page 11) over the past ten years.

36. Councils themselves decide on the actual level of resource to be applied to road maintenance. Overall, expenditure was close to the indicative level, but the position varied across councils (Exhibit 7). Fifteen councils

Exhibit 7

Comparison of road maintenance expenditure (excluding winter and lighting maintenance) against GAE 2001/02

Overall spend is in line with GAE; about half of councils spend below GAE, with some spending much less.

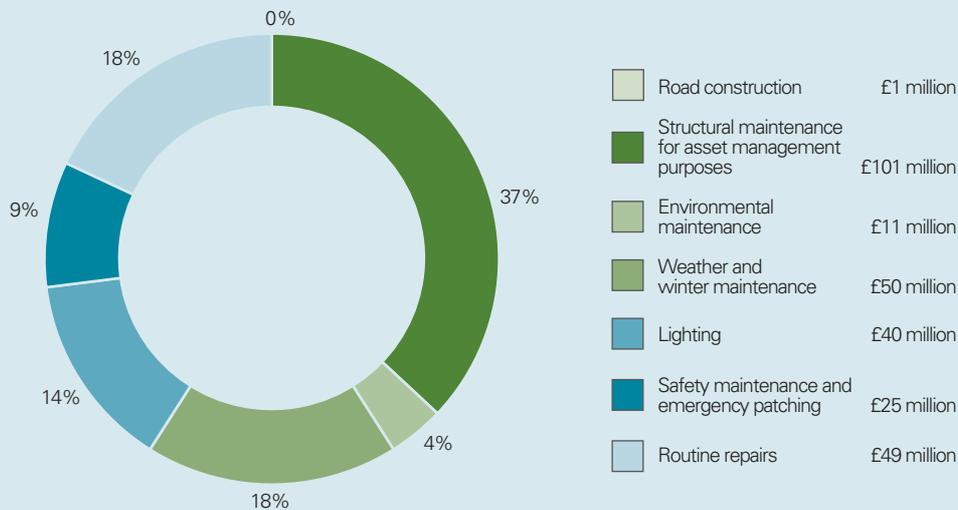


Source: Grant Aided Expenditure 2001/02, Green Book, Scottish Transport statistics 2003, Scottish Executive

Exhibit 8

Breakdown of road maintenance revenue expenditure in Scottish councils 2002/03

37% of councils' road maintenance revenue budget is spent on structural maintenance.



Source: Audit Scotland survey of councils

spend above their GAE for road maintenance. Some (Glasgow City, Renfrewshire and Shetland Islands) spend significantly more than GAE, while others (Falkirk, Clackmannanshire, Highland and Stirling) spent significantly less. There was no correlation between spend relative to GAE and the proportion of roads classified as requiring repair in the SRMCS, even when capital expenditure on structural maintenance was taken into account.

Constraints on road budgets have resulted in reduced spending on structural maintenance

37. Road maintenance expenditure by councils has fallen over the past ten years, and councils' budget-setting mechanisms have tended to mean that the majority of budget reductions in road maintenance have fallen on the structural maintenance budget.

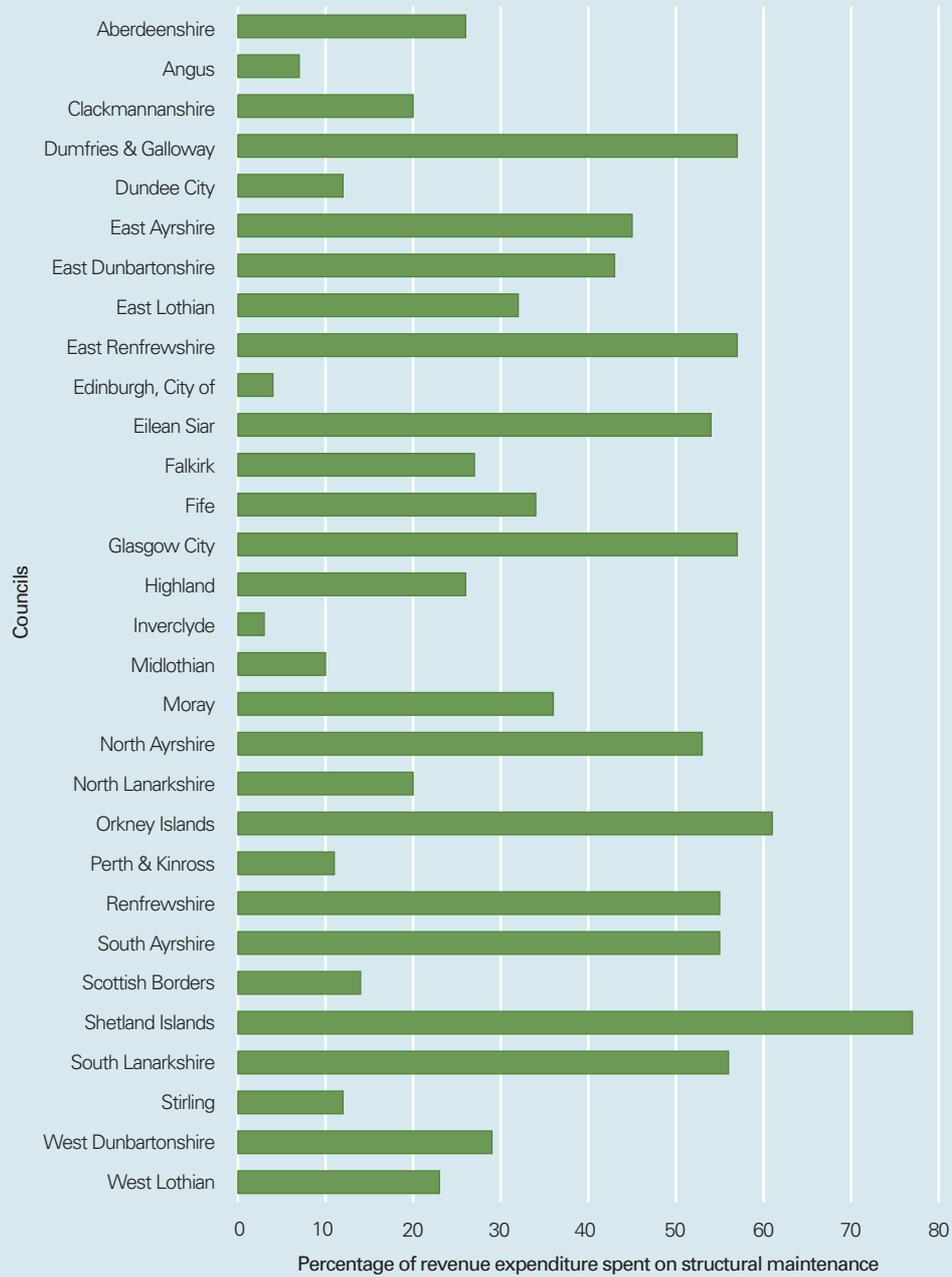
38. Road maintenance budgets cover all work on roads other than major new-build or reconstruction, which are normally funded from capital budgets. Activities covered by revenue spend are described in detail in [Appendix 2](#), and include:

- **routine maintenance** – much of which is carried out on a cyclical basis, and comprises:
 - safety maintenance, including pothole repair and patching to maintain safety for vehicles and pedestrians
 - environmental maintenance, including landscape maintenance and grass-cutting to maintain sight lines
 - gully emptying and drains maintenance to prevent flooding
 - repair and maintenance of safety fences
 - maintenance of road markings, signs and electrical equipment
 - **structural maintenance** – the replacement of major elements of the road to prevent the need for expensive reconstruction of the whole road, for example, through surface dressing or resurfacing
 - **winter maintenance** – salting, gritting and snow removal to ensure that the network remains open and safe throughout the winter. Safety is paramount and there is an expectation from road users that roads will be kept free of ice
 - **traffic management of road works** – ensuring that delays during roadworks are kept to a minimum
 - **maintenance of bridges and structures** – including waterway crossings, railway bridges, pedestrian and agricultural underpasses, gantries, retaining walls, and culverts carrying streams
 - **lighting maintenance** – ensuring illumination levels do not fall below a safe minimum and that lighting columns are in a safe condition.
- 39.** Structural maintenance is the largest element councils' £277 million of revenue expenditure at 37% ([Exhibit 8](#)), although the level of spend varies from 4% to over 70% among councils ([Exhibit 9](#)). Some of the councils with a low percentage of revenue expenditure on structural maintenance had significant capital expenditure in 2002/03 (see paragraph 44). The Scottish Executive

Exhibit 9

The percentage of councils' road maintenance revenue expenditure spent on structural maintenance 2002/03

The percentage of councils' road maintenance revenue budget devoted to structural maintenance varies from almost zero to over 70%.



Note: Aberdeen City and Argyll & Bute were unable to provide a breakdown of revenue expenditure.

Source: Audit Scotland survey of councils

spends about half (48%) of trunk road expenditure on structural maintenance, a similar proportion to England and Wales (50%). The remaining expenditure covers routine maintenance, emergency repairs, lighting maintenance and winter maintenance.

40. In the councils visited, road maintenance budgets were incrementally based on the previous year's budget, with adjustments to meet service pressures. There was little evidence of robust budget-setting mechanisms for structural maintenance, such as a zero-based budgeting approach that considers the balance of expenditure between structural maintenance and routine, winter and emergency maintenance and street lighting.

41. The proportion of the budget allocated to structural maintenance was usually the amount available after expenditure on other maintenance activities had been determined. Many of the other maintenance activities attract higher priority, either because they are a statutory duty imposed on the council for example, road safety and lighting, or because they are matters of immediate public importance, such as making roads passable in winter or during emergency repairs. The problem with this approach is that, in times of financial constraints, the budget for structural maintenance tends to be squeezed when savings are required, particularly where the roads budget can be seen to be above GAE. [Exhibit 10](#) shows the typical budget-setting process found in the councils we visited.

42. When the structural maintenance budget has been finalised, councils' roads engineers put together a shortlist of potential structural maintenance schemes to be put to council members for consideration. This shortlist is usually drawn from a longer list of potential maintenance schemes. The selected schemes are usually those where the roads are in the poorest condition

(a practice known as 'worst first'). There was little evidence of the use of option appraisal (paragraphs 47-50) or asset management systems (paragraphs 72-73), which would prioritise schemes so as to minimise the cost of structural maintenance in the long term.

43. It is difficult to link expenditure data to road condition in Scotland as condition data has only recently been made available, but evidence from England, where condition data has been available for some time, indicates that reductions in road maintenance expenditure lead to a deterioration in road condition over the long term.

Councils need to use option appraisal to help to set capital and revenue budgets for road maintenance

44. Councils should normally fund road maintenance from revenue expenditure as it maintains the asset value rather than creating an asset. However, in some circumstances major structural maintenance projects can be justifiably funded from capital expenditure as they increase the value of the road asset and reduce long-term maintenance expenditure. In some councils, there has been a considerable increase in capital expenditure on road maintenance. Scottish councils' capital expenditure on structural maintenance has risen from £7 million in 1993/94 to £19 million in 1998/99 and £44 million in 2002/03, and 19 councils reported increases in capital expenditure of 20% or more between 1998/99 and 2002/03. Councils with significant capital investment in structural maintenance included Inverclyde, the City of Edinburgh, Falkirk, Perth & Kinross and East Lothian.

45. [Exhibit 11](#) shows a breakdown of councils' capital expenditure on roads maintenance in 2002/03; 47% of all capital expenditure on roads in that year was on structural maintenance projects.

46. From 1 April 2004, the Prudential Code for capital finance allows councils to determine their capital spending and borrowing requirements. It is founded on the key principles of prudence, affordability and sustainability. Under CIPFA guidance on the Prudential Code, councils must have explicit regard to:

- option appraisal
- asset management planning
- strategic planning for the authority
- achievability of the forward plan.

47. All councils need an objective assessment of the structural maintenance requirements of their network and the level and balance of funding that best meets their needs. Any capital expenditure on roads should be based on an effective option appraisal process and asset management planning. To achieve value for money, the expected savings in routine and emergency maintenance arising from structural maintenance capital schemes should outweigh the interest charges on the capital borrowed.

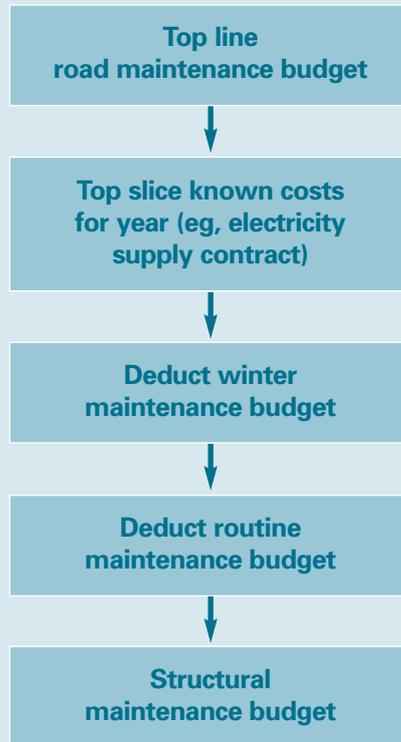
48. The advantage of using option appraisal to decide on an appropriate strategy for financing road maintenance is that:

- it helps to ensure that all aspects of a problem are given due consideration
- the advantages and disadvantages of alternatives, particularly funding strategies, are systematically reviewed against pre-agreed criteria
- discussions with stakeholders during the process help to ensure the acceptability of the option(s) finally chosen.

Exhibit 10

Typical budget-setting process for road maintenance

Reductions in road maintenance expenditure tend to fall disproportionately on structural maintenance.

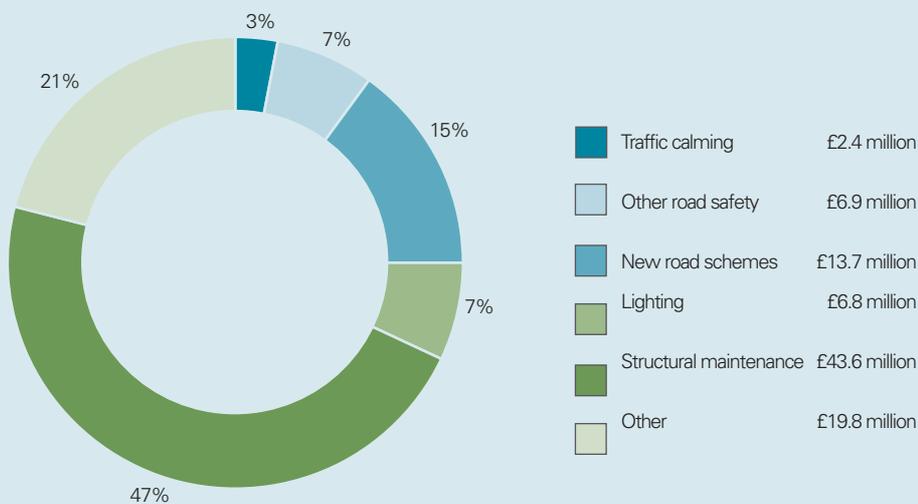


Source: Audit Scotland fieldwork

Exhibit 11

Breakdown of capital expenditure on roads in Scottish councils 2002/03

Almost half of roads' capital expenditure is spent on structural maintenance.



Source: Audit Scotland survey of councils

49. Although option appraisal was mentioned in eight of the 14 Best Value reviews of road maintenance provided by councils, in all except one case (Glasgow City Council) they related to options for service provision, for example, outsourcing all or part of the road maintenance activities, rather than the options for dealing with the maintenance backlog. Councils need to consider a range of options, taking account of current road maintenance capacity within the council and contractors as well as the long-term budget requirements of the council where a road maintenance backlog needs to be tackled.

50. It is also important that the option appraisal process fits within councils' wider policy frameworks, in particular, within councils' transportation strategies, and where capital expenditure is involved, within the councils' overall capital expenditure strategy. [Exhibit 12](#) illustrates some of the financial and non-financial criteria which councils could use in an option appraisal process and the constraints which may apply.

Contracts for maintaining motorways and trunk roads have delivered in line with the contract requirements

51. Motorway and trunk road maintenance is planned by the Executive and the work is undertaken under contract by two operating companies (BEAR Scotland Ltd and Amey Highways Ltd). The performance of the contractors is monitored by the PAG⁵ on behalf of the Scottish Executive.

52. It is important to ensure that the £120 million paid out annually under the contracts delivers value for money. The Scottish Executive attracted much criticism in 2001 when it let new contracts for trunk road maintenance to private sector companies as a replacement for local authorities.

The Auditor General reported on the competition process in November 2001, and recommended that performance of the operating companies should be rigorously assessed by the PAG. The PAG has produced three annual reports describing its detailed work and we are satisfied that the assessment process is working well. The PAG report concluded that BEAR and Amey had broadly met their contractual requirements over the year and their performance has continued to improve. However, some problems still exist which required attention.

53. For the year 2003/04 the PAG concluded:

- the Operating Contractors (OCs) had completed the third year of the contracts with good performance throughout their operations, but there were a few aspects of performance where they had still not reached the standard of service required by the contracts, in particular:
 - the largest area of concern on BEAR and Amey's performance was in the application of some of their management systems. Although these do not have a direct effect on the quality of road maintenance, they are important tools, allowing the OCs to organise their operations effectively
 - Amey failed to implement a fully functional routine maintenance management system
- the OCs broadly met their winter maintenance obligations
- there had been a general improvement in OCs' financial management over the year

- performance in keeping the network available has been excellent.

Council practices for delivering road maintenance vary

54. Across Scotland, around 50% of council maintenance revenue expenditure is subject to competitive tender, with councils' roads trading operations winning about half of the work. In the councils visited, structural maintenance projects were put out to tender while routine and winter maintenance work was undertaken in-house. There is considerable variation among councils in the proportion of road maintenance work subject to competitive tender, from 10% to over 90% among councils ([Exhibit 13 page 20](#)).

55. All six of the councils visited had mechanisms in place for ensuring that their in-house roads trading operations were providing value for money. In addition to putting a proportion of work out to competitive tender, these included benchmarking mechanisms to demonstrate that the bill of quantities used to cost 'in-house' work was competitive. For example, East Ayrshire uses a benchmarking database set up by a group of councils (including all the Ayrshire councils, East Renfrewshire, Inverclyde and Dumfries & Galloway) to set the rates that the council trading operation is expected to work to. The database is updated every six months using information from tendering exercises. Although each council will use the database in its own way, working together allows each council to ensure that its trading operation remains competitive.

56. An efficient council trading operation provides a benchmark against which it can be judged whether tenders from private contractors are competitive. Several road maintenance

⁵ After competition, the Scottish Executive appointed consultants Halcrow in association with PricewaterhouseCoopers (Halcrow/PwC) to exercise the Performance Audit Group (PAG) role for the existing contracts.

Exhibit 12

Factors councils could use to assess options for financing structural maintenance and dealing with the road maintenance backlog

Option appraisal should include assessment of costs and quality.

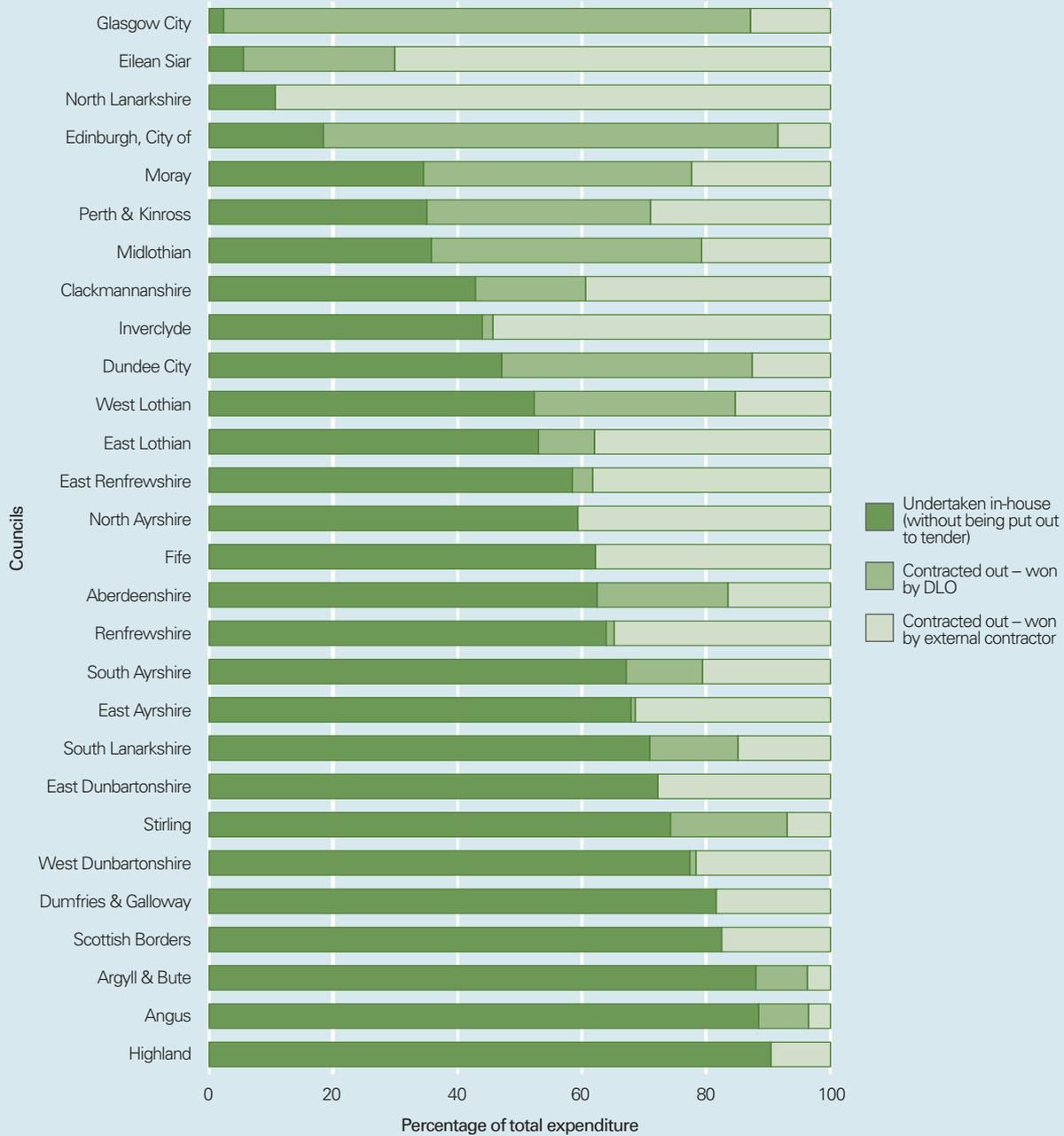
Financial criteria	Non-financial criteria	Constraints	Sources of information on service quality
Staffing costs	Traffic congestion	Planning constraints	Feedback from residents
Equipment costs	The current and forecast traffic use	Financial constraints eg, Prudential Code, affordability	Focus groups
Support costs	Road safety	Compliance with legislation	Best Value Code of Practice
Transport costs	Transportation policies	Health & safety considerations	Consumer surveys
Effect on local economy	Availability of public transport	Environmental considerations	
Available sources of finance	Duties placed on councils	Availability of contractors	
Requirements for expenditure on other roads assets, such as lighting and bridges	Weather	Capital programmes of utilities eg, Scottish Water	

Source: Audit Scotland

Exhibit 13

Percentage of council road maintenance expenditure subject to competitive tender 2002/03

There is considerable variation in the percentage of road maintenance revenue expenditure subject to competitive tender.



Note: Aberdeen City, Falkirk, Orkney Islands and Shetland Islands were unable to provide this information.

Source: Audit Scotland survey of councils

managers said that the presence of the trading operation in the contracting process ensured that there was strong competition among contractors and that, without councils' trading operations in the bidding process, contractors' prices would be likely to rise.

57. Practices adopted for monitoring the performance of council contractors varied. Some councils have similar standards to those used for trunk roads in areas such as winter maintenance. Inspection of work undertaken by the councils' roads trading operations, contractors, or the utility companies could be improved in some councils. Staff in some of the councils visited reported that they were unable to inspect all work undertaken by contractors working on behalf of utility and cable companies, and that, because of this, some reinstatements were failing, requiring additional work at a later date.

There are significant differences in the unit cost of common road maintenance items reported by councils

58. There was considerable variation among councils in the unit cost of common road maintenance items, such as the cost of resurfacing B roads, gully emptying and replacing road markings ([Exhibit 14 overleaf](#) and [Appendix 6 page 39](#)). Some of these differences may be caused by variation in costing methodologies. This variation was not related to the use of competitive tendering or whether the council was predominantly urban or rural in nature. SCOTS has recognised the need to investigate this variation further, as accurate costing is required to provide a reliable estimate of the road maintenance backlog.

Councils need to work together to achieve economies of scale

59. At local government reorganisation, the 12 regional and Island council roads and transportation departments were redistributed between the 32 new unitary councils. Almost all of the regional road maintenance DLOs were split up (except where the new unitary council was based on a former region), with only one regional DLO (Tayside Contracts) continuing.

60. As a result of this, and the loss of the trunk roads contracts, many councils' roads trading operations are not large enough to make economical use of specialist equipment or undertake large or specialist road maintenance contracts. For example, Tayside Contracts is the only trading operation to have won significant trunk road maintenance work when it has been put out to tender. In addition, councils' roads trading operations (formerly DLOs) are sometimes unable to compete for contracts for structural maintenance work put out to tender by their own council, although some overcome this by bidding for contracts and subcontracting part of the work to the private sector.

61. In addition, the lack of economies of scale also affect the 'client' side, including:

- being unable to afford the overheads associated with purchasing and maintaining IT systems, such as asset management systems, which can help deliver better value for money
- being unable to recruit specialised staff eg, Geographical Information Systems (GIS) specialists
- some specialised staff being under utilised eg, bridges engineers.

62. Some of these difficulties could be overcome by entering into consortia arrangements with other councils,

or partnership arrangements with the private sector. Although three-quarters of councils have entered into partnership arrangements with the private sector or other councils, for example, for recycling road waste, there is scope for smaller councils to work together to make better use of scarce staff and resources.

63. With the necessary political support, effective road maintenance partnerships could be established in a number of ways – for example, in the short term, by establishing consortium arrangements between councils and, in the longer term, by establishing joint boards or committees, for example, using the Tayside Contracts model. There are many potential benefits, including improved staff flexibility, a better skill mix, and economies of scale, and larger services would have the potential to develop the capacity to undertake larger structural maintenance contracts.

Recommendations

Councils should review their budget-setting process for road maintenance to ensure that an appropriate and cost-effective balance of expenditure between routine, winter and structural maintenance is achieved.

Councils should review their capital expenditure on structural maintenance to ensure that it achieves value for money and meets the key principles of the Prudential Code. In particular, councils should conduct an option appraisal for procuring and financial road maintenance services.

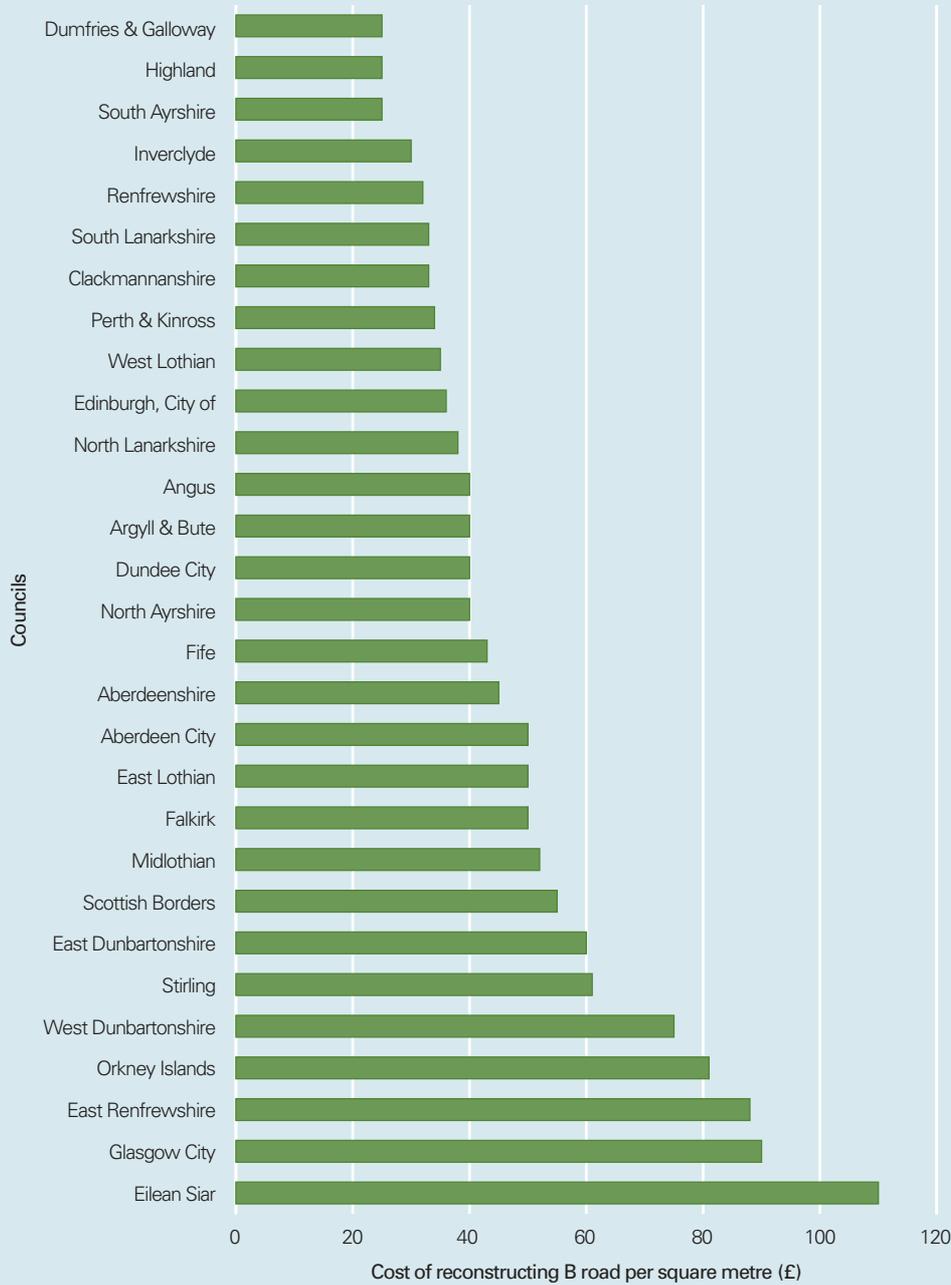
Councils whose unit costs are above average should examine whether cost savings are possible.

Councils should consider whether their road maintenance service could be improved by entering into consortia arrangements to achieve economies of scale in road maintenance.

Exhibit 14

Variation in the cost of B road construction among councils (2002/03)

There is considerable variation in the cost of reconstruction among councils.



Note: some councils could not provide this information because they had not undertaken this type of work recently

Source: Audit Scotland survey of councils

Part 4. Improving the management of road maintenance

Many councils are likely to have a backlog of road maintenance that, if it is not tackled over a reasonable timescale, will have a significant impact on users of the road network and on council finances. Difficult decisions will need to be made, requiring consultation with a range of stakeholders.

64. The previous sections have shown that there is significant scope for improvement in the condition of some of Scotland's roads and that reductions in overall spending on road maintenance have had the greatest impact on councils' spend on structural maintenance. In this section we examine the management of structural maintenance in terms of:

- why structural maintenance is important
- tackling the road maintenance backlog

- improving information and planning to support structural maintenance
- performance monitoring
- maintaining the trunk road network
- the impact of road maintenance on road users and the environment.

Structural maintenance is essential to achieve best value for roads expenditure

65. Roads require regular structural maintenance to ensure that they achieve their design life and to minimise the need for major reconstruction. Roads will deteriorate to the point where they are unsafe and require reconstruction if roads authorities do not maintain them regularly ([Exhibit 15 overleaf](#)).

66. The frequency with which structural maintenance is required depends on a number of factors, including the type of construction, traffic flow and weather conditions. Because the wear and tear

on road pavements is proportional to the 4th power of the axle load,⁶ the majority of structural damage to roads is caused by HGVs. The damage caused by one 11.5 tonne HGV axle is equivalent to that caused by between 100,000 and 500,000 cars. If maintenance is delayed, additional deterioration occurs and the cost of maintenance, when it is carried out, will be considerably higher. Delays in maintenance may lead to the failure of the road, necessitating major reconstruction at considerably greater expense.

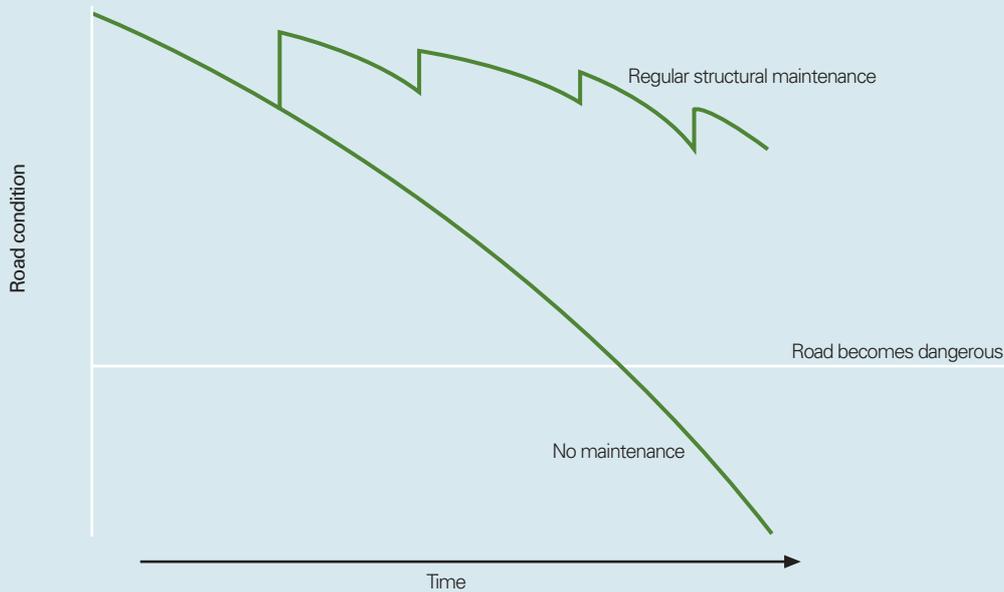
67. The following example from Glasgow City Council ([Exhibit 16 overleaf](#)) examines the effect of different levels of funding on their road maintenance backlog. It shows that additional spending on structural maintenance now can lead to future savings. The Scottish Executive has made similar calculations for the trunk road network; if spending on structural maintenance continues at its present level, the backlog will rise from the current level of £100 million to around £300 million in five years' time and £500 million in ten years' time.

⁶ Lord Whitty, answer to parliamentary question, Hansard, 27 September 2000, Column WA 166.

Exhibit 15

The effect of a lack of maintenance on road condition – an illustrative example

If roads are not maintained, their condition will deteriorate and become unsafe.



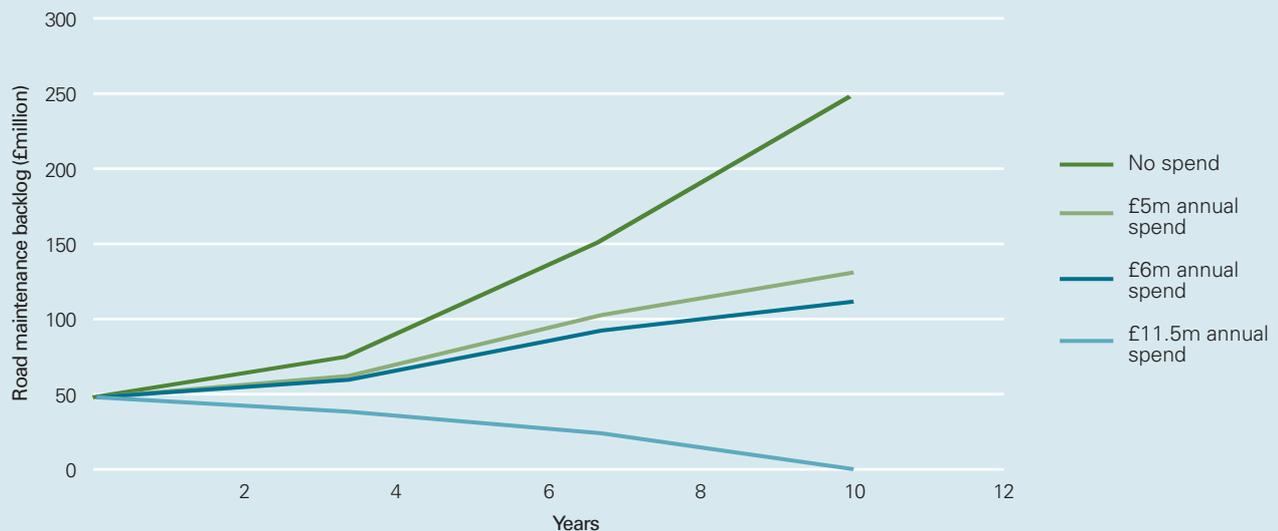
Note: With regular structural maintenance, the road condition improves but it doesn't get back to the position it was before (each point on the graph above will be lower than the previous one).

Source: Audit Scotland

Exhibit 16

Effect on overall maintenance costs of differing maintenance strategies in Glasgow City Council

Increasing maintenance expenditure can lead to long-term savings.



Note: Glasgow City Council's Best Value review identified the effect of differing funding levels on its road maintenance backlog. Glasgow calculated the effects of no funding of road maintenance and funding at various levels of up to £11.5 million per year on the backlog (which was calculated to eliminate the backlog over ten years).

With no spending on road maintenance, Glasgow's backlog will rise from around £50 million to £250 million in ten years' time. With spending of £5 million per year, the backlog will increase to £131million in ten years' time. However, the backlog could be removed by additional spending of £11.5 million per year for ten years. The level of savings will vary according to the level of investment, however, removing the structural maintenance backlog over ten years could result in considerable savings.

Source: Glasgow City Council

Some councils' strategies for structural maintenance do not meet Best Value standards

68. All councils in Scotland have a duty of Best Value,⁷ and the legislation requires them to have regard to accepted guides or codes of practice, which are generally accepted within Scotland as constituting proper arrangements for securing Best Value. The accepted code of practice for road maintenance is *Delivering Best Value in Highway Maintenance – Code of Practice for Maintenance Management* (the Code). The Institution of Highways and Transportation published the Code in 2001. It is endorsed by all the main UK public bodies involved in road maintenance, including the Scottish Executive, COSLA and SCOTS. Changes in management practice and local government legislation eg, Best Value, mean that the current Code needs updating; it is being revised with a view to reissuing it in June 2005.

69. The Code provides guidance to councils on how to develop and review road maintenance policies. The key components required to develop a road maintenance strategy include:

- a comprehensive asset management system for inspecting, recording, analysing, prioritising and programming maintenance works
- a detailed inventory of all relevant components of the road asset, including a defined hierarchy for all of the network, including footways and cycleways
- arrangements to finance, procure and deliver maintenance works, in accordance with the principles of sustainability and Best Value.

70. All 32 councils have a transport strategy, but several do not cover road maintenance in any detail. Only a few councils, notably Argyll & Bute, Fife, Glasgow City and Scottish Borders, included significant sections on road maintenance issues within their transport strategies:

- The Executive and 23 councils comply with Best Value guidance by producing road maintenance strategies. In addition:
 - only 16 councils have set criteria for allocating resources to road maintenance
 - only 17 set standards for road maintenance.

The Executive is developing asset management systems, but some councils have much to do

71. If councils and the Executive are to minimise the costs of structural maintenance in the long term while keeping roads in acceptable condition, they need to develop asset management strategies for roads. Asset management is a systematic process of maintaining, upgrading, and operating physical assets cost-effectively to minimise the whole life cost of the asset while meeting the needs of users. The major factors that need to be considered when adopting asset management for road maintenance include:

- understanding the road assets involved, including how they will deteriorate over time given traffic flows, weather, and preventative maintenance arrangements

- the information needed to manage road assets, including:
 - the asset inventory
 - what is spent on the asset
 - the work undertaken on the road network
 - the road network condition
 - the work planned on the network
- customers' expectations, including predictions of future demand, asset availability and congestion
- the legal and safety requirements, for example, the safety inspection provision required, road safety defects accident reduction
- financial performance and service costs
- environmental impact.

72. A road asset management system uses information from the roads inventory, best maintenance practice and computer software tools to help engineers manage road assets effectively and minimise the overall cost of road maintenance over time. The asset management system stores this information in an organised way. Data can be retrieved as individual road records or combined into reports showing the range of conditions for a group of roads or the whole road network. The system also contains information on the optimal treatments for particular road surfaces.

73. The Executive is introducing an asset management system for motorways and trunk roads, and much of the information required is being collected by the operating companies as part of the trunk road contracts. While many councils have yet to develop basic inventory and information systems necessary to support an asset management system, the recent *Framework for Highway Asset Management*⁸ provides guidance for councils on producing a roads asset management plan.

Councils need to develop effective inventories to support asset management and deliver Best Value

74. Inventories can provide essential information to allow councils to:

- develop effective maintenance strategies
- produce realistic maintenance budgets
- assist operational management eg, for putting maintenance work out to tender
- calculate unit costs for benchmarking purposes.

75. Audit Scotland collected information from councils on a number of basic inventory items required to support a road maintenance management system. [Exhibit 17](#) shows the number of councils holding basic inventory information, whether the information is held on an IT system and whether the council has information on the work undertaken on each item. One of the benefits of the SRMCS has been that all councils now have an up-to-date register of all of their complete road hierarchy – essential for developing a road maintenance strategy. However, information on a number of other

items is limited; for example 18 councils have basic information on safety fencing in their area, but only 11 know the condition of the fencing and only six have an electronic database of work carried out on the safety fencing.

76. Many councils have not yet developed up-to-date electronic inventories of the number and condition of roads assets to support the allocation of maintenance expenditure. The Scottish Executive has good inventory information on the number and condition of almost all trunk road assets and is currently implementing a comprehensive asset management system. Although some councils have good inventory information, information on the condition of items is less comprehensive and information on the maintenance carried out on these items is limited.

The Executive has effective performance monitoring arrangements, but councils' arrangements need to be improved

77. The PAG assists the Scottish Executive by monitoring the financial and technical performance of the maintenance contractors and advises and reports to the Executive as required. This is an important function because the operating company is responsible for collecting and maintaining all relevant information about the network and identifying and initiating all relevant work. The role of the PAG is to scrutinise the performance of the OCs; they ask questions such as: Have the contractors done what they are being paid for? How well have they done it? And, are they delivering value for money?

78. The PAG publishes detailed annual reports commenting on all aspects of the performance of the trunk road operating companies, covering:

- customer service
- value for money
- effective management
- financial performance.

79. The report also includes an appendix detailing the condition of each route and the work undertaken each year.

80. Despite it being a recommendation in the code of practice, many councils have yet to establish a similar framework of performance indicators and outcome targets. These can be used to measure the performance of the road maintenance service, support the pursuit of continuous improvement, and facilitate public performance reporting. All of the councils visited monitored their expenditure against budget, and the financial performance of their trading operations on a regular (usually monthly) basis. Monitoring of other aspects of performance was more variable. Some councils, for example, Glasgow City, had made significant investment in IT. This enabled both monitoring of progress made by their trading operations in undertaking works orders in measuring aspects of performance other than financial performance, for example, whether works orders were completed on time and within budget. However, in other councils, systems were less sophisticated, relying on incompatible computer systems or paper-based systems, which made it difficult to monitor whether work was progressing well. Councils need to

⁸ Framework for Highway Asset Management, County Surveyors Society in conjunction with UK Roads Board, CIPFA, SCOTS, Department for Transport, Highways Agency and others, April 2004.

Exhibit 17

Number of councils holding inventory information on basic items

Although there is good inventory information on some items, many councils do not have data on the condition of a number of common items required for asset management.

Inventory item	Number of councils knowing the number and location of each item	Number of councils knowing the condition of each item	Number of councils with an electronic database of all work carried out on the item, including the location of the work, where appropriate
Road length for each road classification	32	21	13
Bridges and structures	31	5	24
Traffic signals	31	30	25
Street lighting columns and lanterns	31	20	27
Illuminated signs, bollards, pedestrian bollards	24	10	24
Length of carriageway channels to be swept	20	10	3
Gullies	23	13	7
Grass verges (length)	20	9	6
Safety fencing	18	11	6
Pedestrian precincts by area	15	17	10
Footways by length and width	13	30	7
Council-maintained trees	14	20	3
Non-skid surfaces	14	9	5
Retaining walls	13	7	7
Drainage ditches	4	5	3
Council-maintained hedges and boundary fences	7	13	4
Yellow lines (statutory)	25	7	7
Centre lines, edge markings, junction markings	6	11	5

Source: Audit Scotland survey of councils

develop a similar system of performance indicators, based on outcomes, for performance management purposes in their road maintenance plan or asset management plans.

Councils and the Executive need to take measures to reduce the impact of road maintenance on road users and the environment

81. One of the key aims of the Scottish Executive's transportation policy is to provide a safe, reliable and sustainable transport system. Road maintenance strategies can provide an important contribution to sustainability, by helping to:

- reduce light pollution and traffic noise
- reduce landfill and waste of materials by retaining and reusing materials and ensuring that depots and materials storage areas are operated to the highest environmental standards
- encourage nature conservation and biodiversity in verges and hedgerows while dealing with noxious weeds.

82. The trunk roads contract requires the OCs to remove injurious weeds and to deal with other types of weeds to prevent them from adversely affecting the performance of the trunk road. However, the PAG observed that there was a continuing weed problem across much of the network, particularly with injurious weeds such as ragwort. There is evidence that councils could do more to reduce road noise; 14 councils do not use low-noise running surfaces where it might be appropriate. Although all the councils visited tried to maximise

the reuse of road waste, only 13 councils have a policy on the recycling or reuse of materials used in road maintenance.

83. It is also important that councils take into account the views of road users and the wider community in the development of their road maintenance strategies and policies. Councils need to involve the public in setting service standards. However, only nine councils take account of the views of road users when developing performance measures. Almost all councils publish service standards for road maintenance activities, examples include published response standards for lighting faults and winter maintenance plans. Two-thirds of councils analysed the complaints made by road users.

84. Exhibit 18 provides a checklist that highlights the key messages for a road maintenance service. It should be helpful in assisting councillors and senior managers to achieve Best Value in road maintenance services.

Recommendations

All councils should review their performance against the Code of Practice for maintenance management in *Delivering Best Value in Highway Maintenance – Code of Practice for Maintenance Management*, and take action to ensure they are complying fully with the Code.

Councils should collect better inventory information about the assets they are managing, including roads, bridges and street lighting.

Councils should ensure that they have up-to-date IT systems and asset management systems,

and take into account the recommendations and good practice contained in the *Framework for Highway Asset Management*, in particular:

- up-to-date information on the condition of the assets they are managing including roads, bridges and street lighting
- asset management systems linked to GIS and financial systems
- pavement management systems to minimise whole life costs of road maintenance
- electronic recording of safety inspections.

Councils should develop:

- a framework of performance indicators and outcome targets against which to measure the performance of the road maintenance system
- road maintenance strategies in the context of their transportation and roads asset management strategies. Councils should take into account the views of road users and the wider community in the development of road maintenance strategies.

Councils and the Scottish Executive should ensure that their road maintenance activities contribute to the environment and to sustainability.

Exhibit 18

Achieving a Best Value road maintenance service – a checklist

Key issues	Key questions	Councillors	Senior Managers
1. Setting clear policies and objectives for road maintenance	<ul style="list-style-type: none"> Is the council committed to meeting the requirements of the Best Value Code of Practice for Maintenance Management? Is road maintenance a clear component of the council's transport strategy? Does the council have a road maintenance strategy and published policies for road maintenance, which support the council's corporate objectives? 		
2. Making sure the work of road maintenance is properly planned	<ul style="list-style-type: none"> Has the council conducted an option appraisal for ensuring that the road maintenance backlog is being tackled effectively? Does road maintenance ensure that all planned work reflects the results of a systematic option appraisal? Is the work of the road maintenance service planned to minimise long-term costs? 		
3. Resourcing and financial management	<ul style="list-style-type: none"> Does the council ensure that road maintenance has the resources to meet its policy objectives? Is adequate priority given to structural maintenance within the budget-setting process? Is funding for maintenance linked to the condition of road assets? 		
4. Adequate information	<ul style="list-style-type: none"> Does the road maintenance service have adequate electronic inventories to support road maintenance? Are electronic inventories linked to geographical information systems? Is there an adequate asset management system for the road network? 		
5. Procurement and service delivery	<ul style="list-style-type: none"> Has the council considered partnerships or joint working with other councils or the private sector to achieve economies of scale in road maintenance? Are councils' roads trading operations and private contractors subject to sufficient competition? Are unit costs benchmarked against other councils and the private sector? 		
6. Accounting for performance	<ul style="list-style-type: none"> Does the road maintenance service prepare annual performance plans, setting out its achievements and targets? Does the council publish this information in its annual public performance report? Does the road maintenance service maintain an effective performance management framework to continuously review and improve its performance? 		

Part 5. Summary of recommendations

Part 2. The condition of Scotland's roads

Councils should use the information from the Scottish road maintenance condition survey to calculate the size of the structural maintenance backlog in their area using a common accepted methodology.

Councils and the Scottish Executive should monitor and report publicly on the condition of their road network and their road maintenance backlog on an annual basis.

Part 3. Road maintenance costs

Councils should review their budget-setting process for road maintenance to ensure that an appropriate and cost-effective balance of expenditure between routine, winter emergency and structural maintenance is achieved.

Councils should review their capital expenditure on structural maintenance to ensure that it achieves value for money and meets the key principles of the Prudential Code. In particular, councils should conduct an option appraisal for procuring and financing road maintenance services.

Councils whose unit costs are above average should examine whether cost savings are possible.

Councils should consider whether their road maintenance service could be improved by entering into consortia arrangements to achieve economies of scale in road maintenance.

Part 4. Improving the management of road maintenance

All councils should review their performance against the Code of Practice for maintenance management in *Delivering Best Value in Highway Maintenance – Code of Practice for Maintenance Management* and take action to ensure they are complying fully with the Code.

Councils should collect better inventory information about the assets they are managing, including roads, bridges and street lighting.

Councils should ensure that they have up-to-date IT systems and asset management systems, and take into account the recommendations and good practice contained in the *Framework for Highway Asset Management*, in particular:

- up-to-date information on the condition of the assets they are managing including roads, bridges and street lighting

- asset management systems linked to GIS and financial systems
- pavement management systems to minimise whole life costs of road maintenance
- electronic recording of safety inspections.

Councils should develop:

- a framework of performance indicators and outcome targets against which to measure the performance of the road maintenance system.
- road maintenance strategies in the context of their transportation and roads asset management strategies. Councils should take into account the views of road users and the wider community in the development of road maintenance strategies.

Councils and the Scottish Executive should ensure that their road maintenance activities contribute to the environment and to sustainability.

Appendix 1. The study advisory group

Jim Valentine	Head of Roads Planning and Transportation, Perth & Kinross Council
Alan Malcolm	Senior Depute Director, Land Services, Glasgow City Council
Richard Evans	Roads and Community Works Manager, Highland Council
Bob McLellan	Head of Transportation Services, Fife Council
Ken Russell	Head of Maintenance Policy and Finance Branch, Trunk Road Network Management Division, Scottish Executive Enterprise, Transport and Lifelong learning Department

Appendix 2. Description of common maintenance tasks

Routine maintenance

85. The activities required on cyclic and routine maintenance works are generally of a low technical nature. The types of activities to be carried out include:

- repair of potholes and patching to maintain safe passage for vehicles and pedestrians
- landscape maintenance and general grass-cutting, including maintenance of sight lines
- gully emptying and maintenance of drains to prevent flooding
- maintenance of road markings, signs and electrical equipment to assist road safety and control traffic flow, cleaning of signs
- repair and maintenance of safety fences
- removal of obstructions and spillage.

Structural maintenance

86. In contrast to the primarily short-term objectives of routine maintenance, structural maintenance of the carriageway is designed to replace major life-expired elements of the road and to ensure that the design life is achieved or extended. The timely replacement of wearing courses or application of overlays can prevent the need for expensive reconstruction of the whole road. Councils and trunk road operating companies must develop and implement structural maintenance rolling programmes to enable such works to be properly programmed to support budgetary planning. They must also prepare detailed annual programmes, based upon visual and manual pavement assessments and a range of survey data and analysis.

Emergencies

87. By their very nature, emergencies can generate a wide range of reactions which cannot be predetermined. Typical activities necessary to keep the road safe and open to traffic include:

- assistance to emergency services dealing with major accidents and incidents, and the erection and maintenance of diversion signing
- treatment of spillages and clearing of lost loads of any nature, and removal and disposal of animal carcasses and other obstructions
- repair of impact or vandal damage to structures and other street furniture
- rectification of major failure of equipment
- emergencies caused by severe weather, for example, landslips caused by heavy rain.

Winter maintenance

88. Winter maintenance should ensure that the road network remains open and safe throughout the winter season or when winter conditions exist. Safety is paramount and there is an increasing expectation by road users that roads will be ice-free at all times. The Scottish Executive and individual councils have laid down winter maintenance standards for parts of the road network for which they are responsible. These commonly include:

- the provision of depots and specialist winter maintenance vehicles, plant and equipment and the provision of staff trained and certified to both operate the fleets, and ensure that preventative measures are undertaken cost-effectively and responsively to requirements dictated by changes in weather conditions
- procuring supplies of de-icing material – primarily rock salt – and sites for stockpiling in environmentally acceptable conditions, and ensuring that accurate records of salt use are kept
- obtaining specialist weather forecasting services and hardware and software for use in interpreting the information available
- establishing a reliable communication system and, where appropriate, links with emergency services, adjacent units, local authorities and other operators of adjoining roads
- developing the culture of customer care and following detailed written procedures.

Traffic management and management of roadworks

89. Delays due to roadworks are frustrating for drivers and wasteful of resources. Councils and operating companies need to adopt proactive traffic management to ensure that delays during roadworks are kept to a minimum and lanes are always kept open to road users.

Maintenance of bridges and structures

90. The road network contains bridges and other structures, including major waterway crossings, railway bridges, pedestrian and agricultural underpasses, gantries, retaining walls and culverts stream-carrying. Councils and operating companies must undertake an inspection regime which includes general, principal and special inspections to ensure that every structure is visited and all visible elements of a structure are scrutinised in accordance with specified requirements. Following inspections, they must ensure that, where necessary, appropriate remedial action is taken.

Maintenance of electrical and communication installations

91. The road network has lighting, primarily located in urban areas and at roundabouts, but also in rural surroundings as an accident-reduction measure. Inspection and maintenance regimes are required to ensure that overall illumination levels do not fall below a safe minimum.

Appendix 3. Methods of assessing road condition

92. Councils and the Scottish Executive use a variety of techniques to measure road conditions, depending on the type of road and the nature of the defects being examined. Commonly used techniques include:

- **falling weight deflectometer** – this gives detailed information on the road structure, useful for planning major road maintenance schemes
- **deflectograph** – a machine-based survey which provides information about the structural, surface and safety condition of the road surface, and a measure of the residual life remaining in a carriageway. Road condition is measured by a slow-moving vehicle that tests the structural strength by pushing a weight onto the road and measuring how much it deflects
- **visual inspections** – require a roads engineer to visually assess the road and record any defect. However, there are issues of consistency with this methodology, which has led to it being superseded by TRACS - type surveys ([see opposite](#)) for many applications
- **safety inspections** of roads and footways by trained inspectors to find visual defects for safety reasons eg, potholes
- **sideway-force coefficient routine investigation machine surveys (SCRIM)** – is used as a screening tool to measure the skid resistance of the surface of a road section
- **TRACS type surveys** – the key advantage of TRACS is that they minimise disruption to road users and reduce operating costs by collecting road condition data automatically using an especially equipped vehicle travelling at traffic speed. TRACS - type surveys can measure:
 - longitudinal profile and transverse profiles (evenness)
 - rutting (derived from the transverse profile)
 - whole carriageway cracking
 - wheel track cracking
 - transverse cracking
 - road texture (used as a proxy for skid resistance)
- TRACS do not, at present, measure edge deterioration. Although TRACS do not directly measure the structural integrity of the roads structure, poor profile correlates with poor structural strength.

Appendix 4. Common road defects

Pothole

Potholes are usually caused by water entering a cracked road surface. Potholes must be repaired quickly because they are a safety hazard and lead to further road damage.



Large depressions

Large depressions occur in the pavement surface when the filling underneath the road has been inadequately compacted.



Failure of road, requiring reconstruction

If the defects mentioned above are not repaired within a reasonable period, a combination of water penetration, traffic and freezing weather can cause the road to fail. The road will then require costly reconstruction.



Edge deterioration

Worn road shoulders caused by inadequate strength at the edge of the road, or entry of water through the road shoulder, lead to breaking of the road edge.



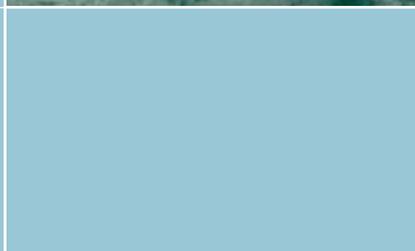
Cracking

Cracks may be across the road (transverse cracking) or in the direction of the road (longitudinal cracking). Cracks allow moisture to seep into the underlying road base material and reduce support for the overlying pavement. Traffic passing over the saturated area will cause it to sink and form a pothole. In freezing conditions, the water will freeze and expand causing further damage. Cracks require sealing to prevent surface water penetration.



Poor road texture, leading to reduced skid resistance

Vehicles scour and wear the road surface leading to reduced skid resistance; exposed stones may become polished, causing slippery conditions when wet. Surplus binder on the surface may cause a 'fatty' or 'slick' surface which becomes soft in hot weather (bleeding) and slippery in wet or frosty weather.



Rutting

Rutting usually takes the form of depressions in the form of wheel tracks. It can indicate the onset of structural deterioration of the road. Rutting also causes hazardous driving conditions because it affects vehicle handling and because surface water remains in the ruts in wet conditions, leading to reduced skid resistance and excess spray.



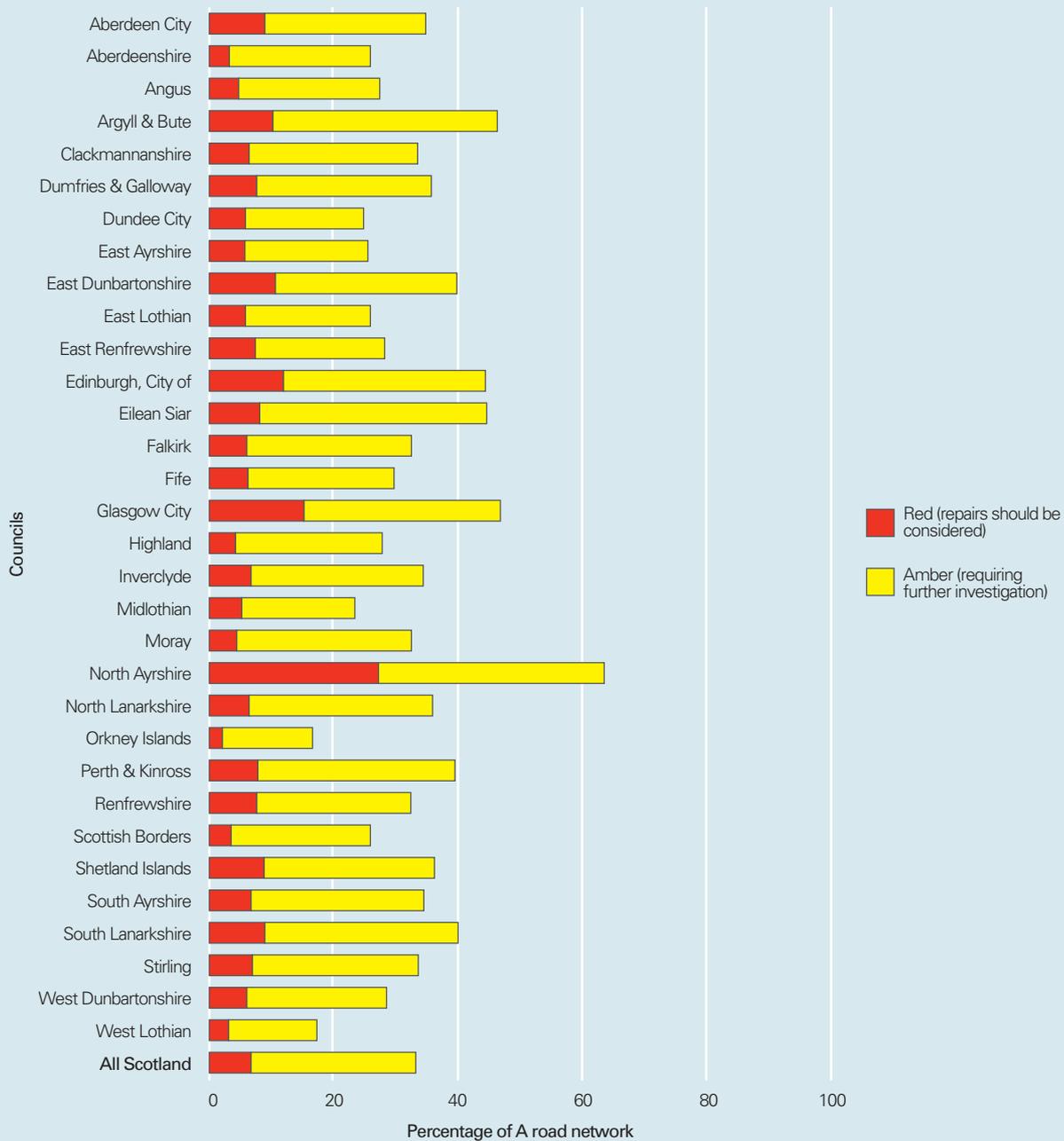
Appendix 5. Variation in the condition of roads among councils

Appendix 5 shows the variation among councils in the condition of A-class, B-class and for C-class and unclassified roads combined. The condition information for C-class and unclassified roads has been combined and is presented on an unnamed basis. This is because only 20% of each council's roads were measured and therefore the information may not present a true picture at an individual council level.

Road condition in each council

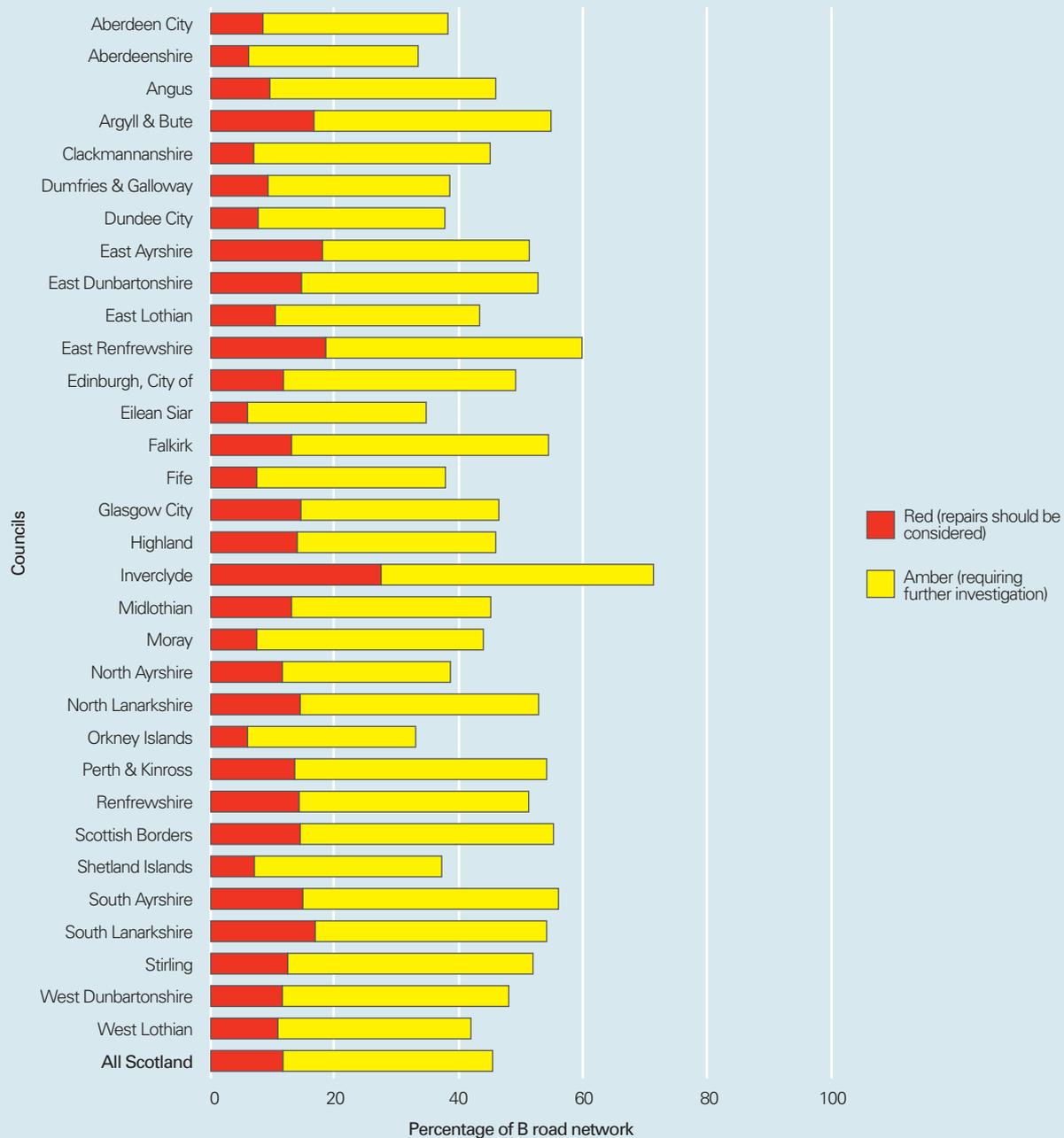
A-class Roads

In the majority of councils, between 5 and 10% of the A road network is in need of repair, but in some councils, the proportion is higher.



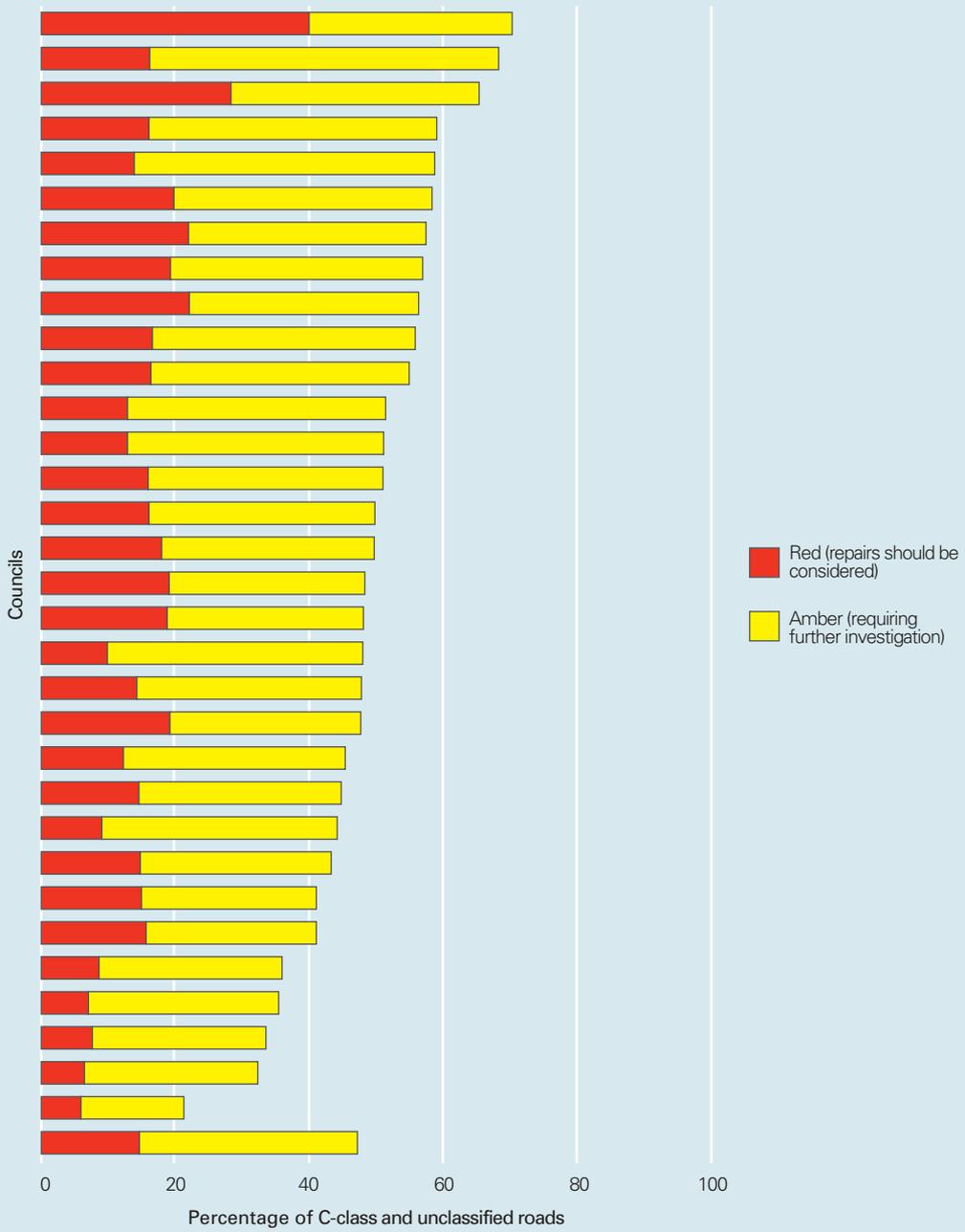
Source: SRMCS 2003/04

B-class Roads



Source: SRMCS 2003/04

C-class and unclassified roads

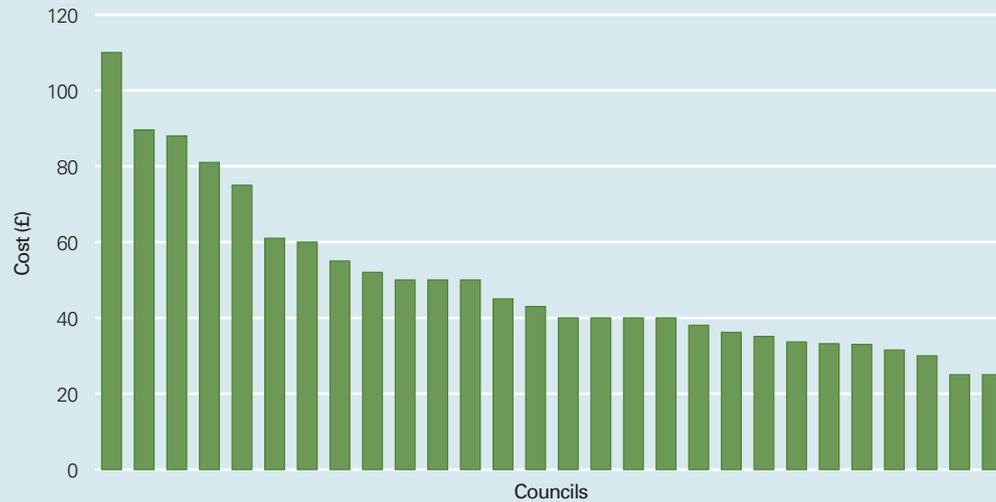


Source: SRMCS 2003/04

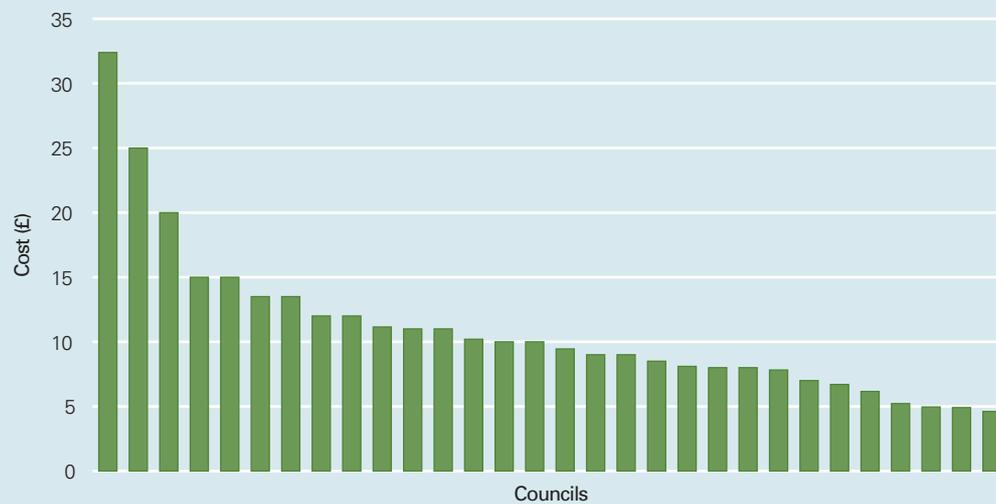
Appendix 6. Cost of common road maintenance tasks

There is a wide variation in the cost of common road maintenance items among councils

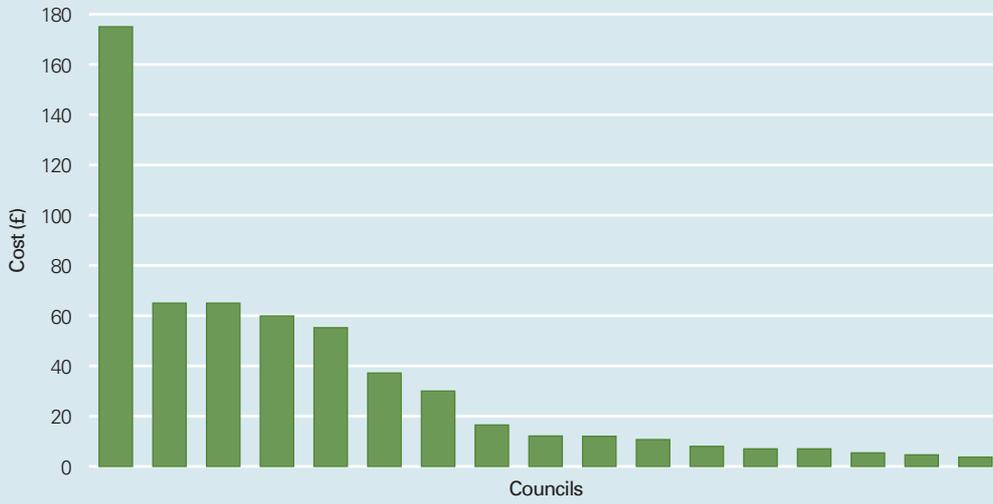
Cost of reconstructing B road (per square metre).



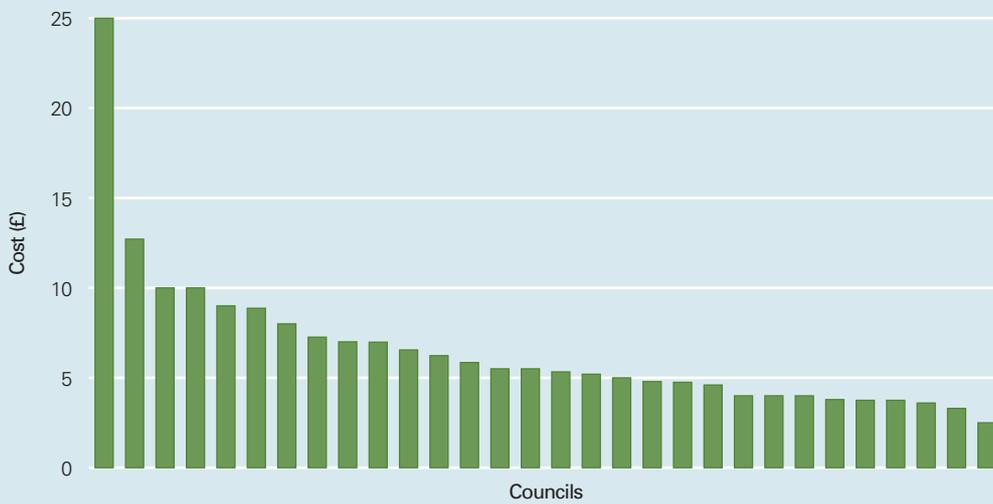
Cost of resurfacing B road (per square metre) plane/remove 40mm and replace with DBM.



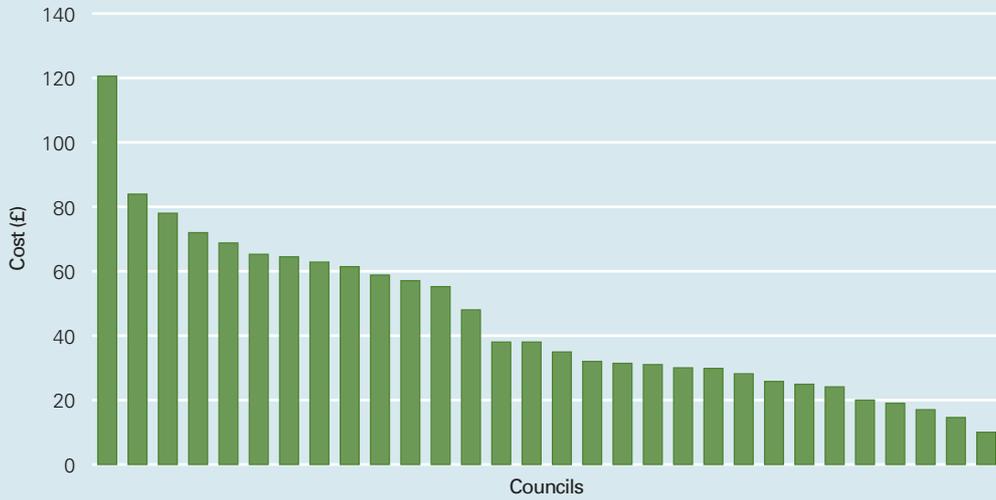
Cost of mechanical sweeping (per km channel swept).



Cost per gully emptied (include disposal of waste).



Street lighting maintenance cost (per lantern per year).



Street lighting energy cost (per lantern per year).



Source: Audit Scotland survey of councils

Maintaining Scotland's roads



Audit Scotland
110 George Street
Edinburgh EH2 4LH

Telephone
0131 477 1234
Fax
0131 477 4567