

Nigel J. Smith BSc, MSc, PhD, CEng, FICE, FCIHT, FAPM, FHEA is Professor of Project & Transport Infrastructure Management, Institute for Resilient Infrastructure, School of Civil Engineering, University of Leeds. After working with contractors and the Department of Transport, he returned to academia he has researched and published widely in the field of transport infrastructure. He is author or co-author of a number of key reports on transport infrastructure for the Organisation for European Co-operation and Development, for the European Parliament and for the UK National Audit Office.

Team Members: Associate Professor K Moodley and Lecturer D Dawson,

Institute for Resilient Infrastructure
School of Civil Engineering
University of Leeds
LEEDS, LS2 9JT.

This written evidence is supplementary to the evidence related to highway maintenance management presented to the Welsh Assembly Public Accounts Committee, PAC, Inquiry into Value for Money in Motorway and Trunk Road Investment in 2015. This evidence relates specifically to the main parts of the first and third bullet points in the Terms of Reference, namely:

- The extent to which the current approach to the funding and delivery of maintenance programmes is effective and provides value for money
- Whether Wales is adopting a sustainable approach to the maintenance of its road network.

In addition the importance of increasing the resilience of the carriageway will be emphasised to demonstrate the importance of improving the resistance and reliability of highways in relation to value for money and sustainability.

The PAC evidence, (1), identified a number of key issues. Firstly that road carriageways maintained in good condition will not be adversely affected by winter

weather or normal traffic loadings. Secondly that although pot holes in major roads or those posing a serious threat to road safety will need to be repaired, widespread "pothole" repairs are not cost effective. Finally a sustainable and resilient maintenance strategy based on asset management principles should be adopted. The concept that in future the inclusion of energy audit/ decarbonisation/ green behaviour as integral aspects of any maintenance policy remains valid.

The evidence will first update the current position relating to highway maintenance in England and in Scotland. The situation in Wales will then be considered in terms of Asset management, sustainability and resilience. Unfortunately the timing of Inquiry does not permit the effects of the most recent, harsher winter to be fully addressed.

Background in England

Highways England is performing well by world standards, (2). The Strategic Road Network, SRN is managed on Whole Life Asset Management, WLAM, principles. Local Authorities assist in the maintenance management acting as agents. Investment has been in terms of addressing the lack of data and of staff with the correct skills and competencies to implement these approaches.

The Highways Maintenance Efficiency Programme, HMEP, (3), continues to receive support from the Department of Transport. HMEP is concerned with facilitating the change to highways services, so that greater savings and efficiencies can be achieved and the demand for improved highway services can be met. HMEP seeks to connect the networks across the highways sector and provides tools and resources to help managers transform the delivery of highways through greater efficiencies. The activities have moved towards building best practice. The key principles from the programme include the following.

- Prevention is better than cure. This includes the development and embedding of Asset Management into the structure of decision making for repairs and maintenance. The key objective is to reduce the level of reactive maintenance; for example filling potholes.
- Organisations need to make correct and informed choices. These have to be about creating solutions for permanent repairs.
- There should be knowledge sharing between stakeholders. Competency should be developed at both managerial and technical levels.
- The public should be engaged. Customer satisfaction should be monitored, performance benchmarked and success or failure communicated transparently.

Looking to the future the HMEP makes a number of broader recommendations:

- Permanent repairs should be first choice.

- Define potholes and develop a risk based response.
- Co-ordinate street works and highways openings with utility companies, (4)
- Public/User satisfaction with highways should be monitored.
- Develop competent people. Understanding of skills and competency is relevant to future efficiency and productivity of repairs and maintenance.
- Create an environment for new material and technology to be developed and applied.

Background in Scotland

The single authority in Scotland has ensured the sharing of information and a common approach to highway maintenance based on asset management principles. Transport Scotland has developed its Road Asset Management Programme over the last decade to the production of a road asset management plan for trunk road in 2016, (5). By embedding the practice of asset management in its decision making Transport Scotland is now in a position to plan and identify works, manage risks, establish value for money and more importantly establish the short term, (1-3 years), and the long term, (up to 20 years), maintenance needs of the network. This has enabled Transport Scotland to develop more accurate spending plans of road management and investment. As part of embedding best practice Transport Scotland is currently in process of seeking ISO 55000 Asset Management accreditation, (6). The approach adopted by Transport for Scotland is seen as an exemplar by the World Bank.

As part of their ongoing development of roads asset management Transport Scotland has also investigated the impact on economic, environmental and social conditions related to road maintenance spend, (7). This allowed the modelling of impacts of various road maintenance spend scenarios which revealed that as carriageways deteriorate, vehicles incur more costs through higher fuel consumption, the journey times are longer, particularly on high speed roads, and emissions are higher.

Reductions in road spending also had wide impacts, (8). Remote communities had weaker communication and transport links. Pedestrians and mobility-impaired people were impacted by deteriorating footpaths. Cyclists were exposed to more physical risks. Communities in general felt less secure as the quality of the roads deteriorated. These studies had a major impact on the development of the road asset management plan in Scotland.

Welsh Trunk Road Network

The trunk road network in Wales comprises 1,576km of trunk road and 133km of motorway with an asset value of around £13.5bn. The total road network which includes all Class A, B and C roads is 34,489km. Highway maintenance is influenced by the traffic, the weather and the maintenance regime.

Routine maintenance is intended to keep highway infrastructure safe, serviceable and reliable. The key to providing value for money is performing timely and appropriate maintenance interventions which will limit the adverse effects on road users; prevent further deterioration; and minimise whole-life costs. Typical UK winter weather will not cause problems for a pavement in good condition and prevention is the best cure for serious deterioration. Nevertheless over time the condition of the pavement starts to deteriorate and its condition will worsen. Timely routine maintenance interventions are very cost effective and return the pavement to its original condition or better. Road pavements in poor condition can develop “potholes”. This is usually dealt with quickly and effectively should it occur on the motorway and trunk road network but on minor roads is a significant and sensitive issue for all road users. Patching these pot holes offers a short term fix but it does not improve the overall pavement condition, the repairs often deteriorate very quickly and the cost is estimated to be around 20 times the cost of routine maintenance, (9).

Maintenance trends in Wales: How can delivery & performance be improved?

There is evidence to indicate that carriageway maintenance management is a worsening problem in England, Scotland and Wales but no evidence to show Wales is not obtaining equivalent value for money from the maintenance and management of the motorway and trunk road network in Wales. Welsh funding on the carriageway has increased to £5.1m but there is still a significant shortfall, (10).

Transport network resilience has been acknowledged as a key area of attention across UK, particularly regarding the effects of climate change, extreme weather, and winter weather (11, 12 and 13). The term resilience includes more detailed components: resistance, for example physical protection from hazards; reliability, for example maintaining operations during and after hazards; redundancy, for example available back up to support systems and services; and, response and recovery, for example, organizational ability to achieve recovery. Currently, there is no public policy response to resilience outlined for Wales’ transport network.

Flooding from rivers, coasts, and surface water drainage and extreme winter weather are the major challenges for asset management and maintenance of the carriageway. Climate change will affect maintenance costs through increased erosion of the carriageway surface, and damage to the structural layers of roads eventually causing failure. Socio-economic impacts will be incurred through increased closure of roads due to flooding and remedial repairs. In terms of general flood risk, Wales has ~930km of its road network at risk from river or coastal flooding, (14). This includes 15% of “A” roads, 10% of “B” roads, and 20% of its Motorways but this excludes surface water flooding. Heavier precipitation events are predicted across the UK, (15), and in Wales, it is predicted that mean winter precipitation, during the 2020s, could increase by ~8%. One study suggests that a 1% increase in precipitation results in an approximately 1% impact on the design life for a carriageway with low traffic levels, (16).

Recognising this, there has been specific, HMEP, guidance on the management of highway drainage assets to help quantify the condition of assets, prioritize

maintenance, and assess the ability of assets to deal with present and future flood risks, resilience, (10). Precipitation changes could also affect groundwater flood risk causing problems in low lying areas close to the water table. Prolonged saturation of parts of the road network lead to the carriageway structure becoming less resistant to traffic loading, due to a weakening of the load bearing capacity, particularly in winter with additional frost-thaw action. If this is compounded with surface water on the road, the hydraulic pressure caused by vehicles forces water into cracks or weaknesses and accelerates the process of structural deterioration, and increases the potential for pothole formation (10).

From the Welsh Assembly' transport statistics (2003-2017) relating to winter service costs, which include gritting and other related costs, it was shown that in some years the annual maintenance expenditure was double that of other years. It would appear that winter service costs which are significantly higher than average coincide with winters that are significantly colder or wetter than average. In terms of the effects of the roads, the number of Motorways requiring close monitoring of structural conditions has been gradually increasing since 1995, "A" Roads do not show any direct trends, and the number of Local Authority road networks needing further investigation has reduced

Asset Management Maintenance Recommendations

It is impractical and financially unrealistic to create a completely resilient road network in the short term. Therefore a prioritisation of asset management based maintenance investment and intervention must be made to ensure resistance and reliability are controlled. Increasing sustainability and resilience should be a vital part of highway maintenance asset management programmes, good practice towards this includes:

- Establishing a policy response to transport network resilience and climate change based on up to date and accurate condition data
- Examining and applying recommendations from HMEP to make appropriate and timely maintenance interventions
- Strategically maintaining roads and drainage assets to a good standard;
- Monitoring maintenance trends across the entire network
- Development of a set of key performance indicators
- Developing a strategic asset management approach for Wales

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