Local Roads Network Condition Monitoring :
A new approach

How can Local Authorities make better use of asset survey data without increasing their investment in survey technology?

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Condition monitoring of the local road network

It is stated clearly in the Code of Practice for Well Managed Highway Infrastructure[1] *that the establishment of an effective regime of inspection, survey and recording is the most crucial component of highway infrastructure maintenance.* These inspections provide the data on which local road Asset Managers rely to make robust maintenance decisions. However, Local Authorities have many options available to them when designing inspection regimes.

Whilst traditional network visual inspections, such as CVI undertaken on foot or from moving vehicles, gave way to routine SCANNER surveys in the 2000s, newer survey technologies are now becoming available. These draw on the growth in the availability of connected low cost sensor systems, which could provide network level information of great value to asset managers.

However, the question always remains over the selection of the right data for each asset management activity. For example, whilst condition indices provided by network level surveys are powerful tools to support network level decisions, detailed local information on the appearance of defects, provided by walked inspections, video or other data, can assist in treatment prioritisation, selection and design. There is unlikely to be a single inspection tool that will meet all asset management needs.

[1]http://www.ukroadsliaisongroup.org/en/codes/

Well Managed Highway Infrastructure also advises that inspection regimes should be consistent. This is important to provide asset managers with confidence in the data they are using to make decisions. Confidence in the consistency can be provided through nationally recognised independent technical approvals processes – like the Highway Inspector Competence Framework[2]. However, it is difficult for approvals regimes to keep pace with the march of technology. Providers of new survey technologies might find it challenging to show that the consistency and objectivity of their data has been independently assured.

So, how can Asset Managers select the right inspection regime, be confident in their data, and get the best value from their inspections?

[2] http://www.ukroadsliaisongroup.org/en/codes/highway-inspector-competence-framework.cfm

The Surface Condition Assessment for the National NEtwork of Roads (SCANNER) survey provides data on the visual condition of the surface of local roads.

The surveys, which are centrally mandated, provide an objective assessment of condition. The primary output of the surveys — the Road Condition Indicator (RCI) — can be used to underpin decisions on local highways maintenance.

ROAD CONDITION INDICATOR (RCI)

GREEN = road section is in good condition.

AMBER = road section is not in perfect condition but would still offer a good driving surface.

RED = road section is likely to be in poor condition and will probably need maintenance within the next year or so.

Policy changes on the horizon?

In 2018 the Transport Select Committee began an investigation into the funding and maintenance of local roads. The collection and use of condition data formed a core part of the review, and sought suggestions and recommendations into –

- How data is collected; what new methods or emerging technologies might do a better job of surveys?

- What types of data are collected and why?

- How to get the best value out of condition data?

The Committee found that there was no consistent approach across the country, but some shining examples of good practice. Contributors noted the need for a consistent methodology to compare roads and effectively benchmark them. Doing this would improve fair allocation of resources at a national level. It would also allow the performance of Local Authorities to be measured against meaningful KPIs for the good management of their allotted maintenance budget.

The Department for Transport has recently responded to the recommendations of the Committee[3] and propose to undertake a review of local highways practice, and in particular the technology and data that is required to understand the condition of highways and the wider road infrastructure. However, CIHT has already been gathering feedback[4]. They questioned whether Local Highway Authorities have enough information on the condition of highway assets for the benefit of all users. Of 150 Local Authorities who responded to a survey:

- >9 out 10 said there should be a standard approach to collect condition data

- 96% said there should be a standard approach to calculate backlog

It is clear that there is a need to update our approach to how road condition should/could be measured and managed.

[3]https://publications.parliament.uk/pa/cm201920/cmselect/cmtrans/138/13802.htm

[4]https://www.ciht.org.uk/news/ciht-improving-local-roads-an-update

Innovation as a force for change

New technology providers, of which there are plenty in the market, are also lobbying for a change in the approach to data collection. It is becoming apparent that current network surveys are relatively expensive methods, if their full capability is not wholly exploited.

However, the UK remains relatively advanced in its implementation of routine objective condition surveys on Local Authority roads. Whilst parts of Europe have adopted automated visual condition surveys on strategic roads, the situation on local roads is less developed. In Europe, local municipalities that have relied on subjective data are now considering how objective measures could benefit their asset management processes.

For current network surveys, like SCANNER, the vehicular platform that carries the technology has not altered much since it was introduced in 2000, but the monitoring technology itself has been updated and remains at the leading edge. However, there has been very little change to the survey specification to reflect this march in technology. There is now a disconnect between the capability of the tools and systems used in the survey, and the base requirements on which the data and Indicators are predicated. The survey might be capable of delivering greater value than is currently being exploited.

However, alternative survey technologies have also been evolving rapidly. New systems can, for example, provide high resolution image data covering the whole carriageway, or measure sub-surface structure and structural condition. In addition, the RCMG Visual Survey Sub Group is exploring enhancements to traditional visual inspections (CVI) to improve how visual condition is reported. These new approaches all have strong potential to support improved decision making.

New systems could provide data to support all aspects of monitoring — potential which has been recognised by the Road Condition Management Group.

The 10th Report[5]– "Local roads funding and maintenance: Filling the Gap " produced by the Transport Select Committee tends towards a view that SCANNER technology may be becoming out of date.

[5] https://publications.parliament.uk/pa/cm201719/cmselect/cmtrans/1486/report-files/148602.htm

The Road Condition Management Group (RCMG) provides advice and guidance on collection and management of road condition data in the UK[6], and publishes the standards for network condition data collection. The RCMG has suggested changes to survey specifications to encourage the use of new technology, acquiring more varied and better quality data at a lower cost, while still meeting the need to achieve entirely objective data collection.

[6] http://www.ukroadsliaisongroup.org/en/asset-condition/road-condition-information/index.cfm
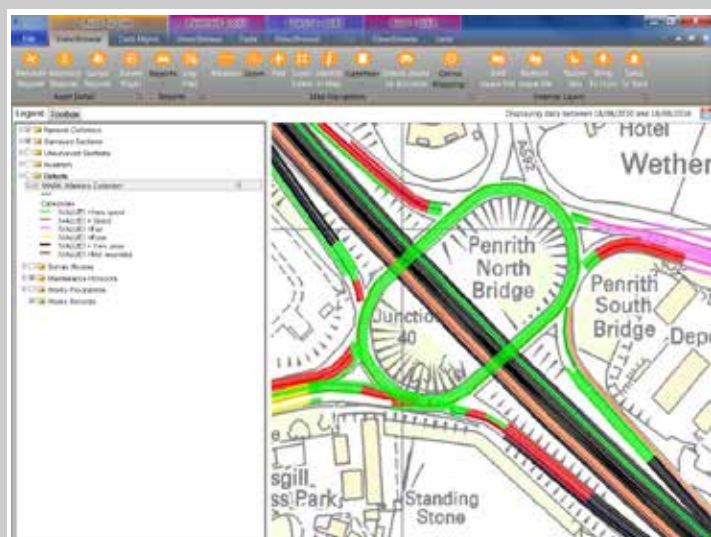
Condition data to improve the user experience

Asset Managers have traditionally been schooled in the delivery of good engineering programmes, and management of maintenance resources. But in 2020, the experience of the tax paying road user has become a high priority, and they are quick to complain about the condition of roads, regardless of who is responsible for their upkeep. Indeed, the Infrastructure Code of Practice recognises that a core objective of maintenance is to address user experience and satisfaction. It is therefore essential, as part of modern public information and customer satisfaction programmes, for Local Authorities to have access to objective measures of ride quality.

Local Highways Authorities will soon / are already required to deliver against a range of customer experience metrics. High resolution data 3D relating to road surface shape can create an accurate assessment of ride quality, or serviceability. Many technologies offer the potential to provide this information, and indicator specifications can be used reflect this through the inclusion of a ride quality component, as is the case for the current RCI.

Serviceability KPIs support satisfied road users

Condition data to make better decisions

New Approaches

On Strategic Roads there is an expectation that updates to the Design Manual for Roads and Bridges (DMRB, due in 2020) will make it a requirement to apply high resolution imagery data in condition assessment, to avoid putting workers on the road unnecessarily.

Its all about having the right data, recognising the value in the data, and where best to apply it. Survey devices can provide far more insight into condition than is available from looking at Indicators alone. Much of this information is available, right now from existing surveys. Asset Managers need only ask for it, access it, and learn how to interpret it.

Visualisation tools are also a gift to time starved managers challenged to justify budget lines. Correctly set up, these tools can provide the evidence, instantly, in a format that will help decision making, without the need for in-depth understanding of the data sources.

Vision for Objective Condition Assessment of Local Roads (VOCAL Roads)

So, returning to our question – how can Asset Managers select the right inspection regime, be confident in their data, and get the best value from their inspections?

It is clear that we could obtain better value from condition surveys by making full use of the data provided. To achieve this, providers will need to make the full dataset generated by modern survey technologies easily accessible and, importantly, easily manipulated by available asset management tools. Authorities also need to have confidence in the quality of the data – which may be demonstrated through successful, real world, application. By working together to optimise their approach, suppliers and consumers of data will see mutual benefit.

To support the achievement of this goal it has been suggested that a community group – called VOCAL roads — is established to bring together best practice and real–world experience of how to make best use of condition data. This suggestion has been welcomed by the RCMG. The group would seek bring together stakeholders to:

- improve understanding of current and new data collection and analysis techniques
- encourage the adoption of new survey technologies
- show the benefits brought by objective, consistent data.

The group could help Local Highways Authorities bridge gaps in knowledge resulting from changes and reductions in resources, and could help Local Highways Authorities better engage with their data, sharing knowledge, experience and lessons learned across the industry. This would help Asset Managers –

- make better decisions
- make roads safer
- save money

A community group like VOCAL roads could also help Asset Managers develop stronger relations with their survey and software providers, helping them create information that is more easily understood by everyone.

This proposal is in its infancy. Over the coming months the group is to seek interest and engagement with Local Highways Authorities to understand whether and how they would like such a group to evolve — including what it could do for them and what they could do to support its aims. Everyone is encouraged to get involved so that the community can get the best from its valuable data asset.

New frontiers:
a collaborative approach
to benefit from new technologies

Many new forms of condition survey are becoming available to Local Authorities. Some of these are becoming widely available and some are not yet developed to the level of routine use. In some cases the new technologies may be considered too expensive, or unavailable to Local Authorities. However, these methods could provide detailed and accurate insights on condition to allow better maintenance planning, deliver evidence to support critical projects, or underpin high profile investment plans.

A community group such as VOCAL Roads could help Local Authorities collaboratively understand the types of technologies that might best serve their particular needs, and help authorities share the cost of developing this understanding. By collectively building use cases adoption of innovation would be de-risked by a bold few, to the benefit of all.

Automated Visual Inspections

Video surveys providing all-round imagery can be applied to measure the condition of many types of asset – including pavements, markings, footways, signs, vehicle restraint systems etc. Linking high resolution imagery with Machine Learning analysis methods, enables the automated extraction and quantification of defects.

Traffic Speed Deflectometer

TRL have been working with Highways England for over ten years to establish the Traffic Speed Deflectometer as a network level structural assessment tool. The device has been successfully introduced for routine use on the strategic road network. This has delivered a reduction in the need for slow speed Deflectograph surveys of pavement structural condition, and there is a vision to ultimately use this technology to remove the need for the Deflectograph.

Condition of Road Markings

Road markings are an important contributor to road safety, providing guidance to drivers and warning of hazards ahead. Until recently, network level measurement of marking visibility has been challenging. However, new technologies are now available that can be combined with existing equipment. Highways England successfully commenced annual network wide surveys of marking condition, using new technologies, in 2018.

Ground Penetrating Radar

Ground Penetrating Radar (GPR) is a versatile non-destructive technique that compliments coring and falling weight deflectometer (FWD) surveys by providing continuous measurements of pavement construction at high detail and coverage. GPR surveys can be conducted at traffic speed from a bespoke versatile collection platform that integrates the GPR data with video imagery, high precision GNSS (global navigation satellite system) equipment and an inertial measurement unit (IMU).