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High-Resolution Monitoring of Weather Impacts on Infrastructure Networks

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The impacts of weather and climate on infrastructure are numerous. From a business perspective, the largest opportunities exist in the prediction of smaller impacts where preventative action can be taken by operators / end-users to reduce the severity of the weather event, for example, winter road maintenance, railway buckling, leaves-on-the-line, wind impacts on power cabling etc. Advances in modelling mean that these impacts can now be predicted at a high resolution (e.g. route based forecasting for
winter road maintenance) so that mitigation activities can be actioned at vulnerable sections of the infrastructure network.

However, whilst high-resolution models have been in operational use for the last decade, in an environment of increasing litigation, practitioners remain nervous about making decisions solely based on model output. This means that the verification of forecasts is now needed on a scale previously not required, and it is only with this step that end-users will be responsive to using methods which will save money without compromising safety on the network (e.g. selective salting for winter road maintenance where only the coldest sections of road are treated or localised rail speed restrictions in hot weather as opposed to the blanket restrictions currently used).

Hence, there is a clear and pressing need for high-resolution infrastructure monitoring, but existing techniques are simply not capable of producing this solution. Point measurements using traditional sensors are too expensive to install in the numbers required and therefore lack the spatial resolution. Mobile measurements provide an alternative, but these lack the temporal resolution to provide the full picture. Therefore, it is proposed that the emerging Internet of Things could be transformative in this sector, providing the enabling technology to saturate our infrastructure networks with low-cost sensors. In doing so, it will not only provide unprecedented monitoring of weather impacts on infrastructure networks, but would also open the door to a new generation of nowcasting products harnessing the benefits of high resolution observations. These two developments combined will enabling the targeting of costly mitigation efforts more effectively than ever before.