Research title: Sustainability Costing Model of Utility Streetworks in Urban Environments

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Background

Utility services are an essential part of well-functioning urban environments and as ever more people live in cities (estimated to reach 60-70% of the world's population by 2050), such services will become ever more important (Sterling et al., 2012). However, Utility Streetworks maintenance and upgrade operations, even at present levels, are costly, with direct construction costs estimated at £1.5 billion per year in the UK (of which ~ £150 million is associated with third party damages) (McMahon et al., 2005). By comparison, indirect costs (including social and environmental impacts) have been estimated at £5.5 billion per year (McMahon et al., 2005). It is now well established that the true total cost of any activity can only be measured by considering all aspects encapsulated by the three 'pillars of sustainability', i.e. taking account of social and environmental impacts along with economic (both direct and indirect) costs (Hunt et al., 2014) . However, if the potential benefits of reducing the impact of Utility Streeworks is to be realised (inter)nationally, the costs and non-costed impacts across all three 'pillars of sustainability' have to be determined (i.e. quantified where possible, and qualitatively where not). Only then, for example, can the potentially very considerable savings in social costs (e.g. traffic delays, losses to local business) for one particular option be assessed against any additional direct economic cost of construction. A key challenge in determining the true total cost of Streetworks is how social and environmental aspects are assessed. Estimates of these costs are often driven by a subset of stakeholders (whose agendas vary), while certain social and environmental impacts are simply not possible to cost with any reliability given the qualitative nature of the impact being assessed, e.g. social amenity, visual intrusion or loss of space.

Research Aim

Due to the nature of Streetworks projects and the very large number of Streetworks carried out annually in many countries, a robust and comprehensive as well as simple and easy to use assessment tool is required to be able to evaluate the economic [direct and indirect] as well as the social and environmental impacts of Streetworks using considerations of value. The purpose here is to move away from simple, narrow, often misleading assessments deriving from a single monetary measure.

The aim of this research project is thus to develop a sustainability costing model and evaluation methodology for Utility Streetworks that will allow alternative intervention approaches to be assessed by comparing the true total (i.e. economic, social and environmental) cost / impact. It will thus provide a basis on which to support investment decisions for Streetworks projects which itself provides the final piece of the jigsaw in informing engineers of the likely outcomes of their actions.

Connection to Affiliated Research

This PhD research project stands alongside the *Assessing The Underworld (ATU) - An Integrated Performance Model of City Infrastructures*, which is an EPSRC-funded multi-disciplinary research project that aims to prove the concept of a single integrated assessment framework for Streetworks with which to evaluate the condition of subsurface utility and surface transport infrastructures. The research will build on previous resilience and sustainability projects, including the *'Designing Resilient Cities'* research, and link closely with ongoing affiliated research including *'Liveable Cities: Transforming the Engineering of Cities for Societal and Planetary Wellbeing'* and *'i-BUILD: Infrastructure BUsiness models, valuation and Innovation for Local Delivery'.*

The main purpose is to advance sustainable Streetworks and infrastructure resilience, and to use the outcomes of the work in conjunction with the *Assessing The Underworld (ATU)* Decision Support System (DSS) to support intelligent and sustainable Streetworks.

References

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