Thinking Differently
A Sustainability Assessment Framework for Streetworks

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1st February 2017
Utility Services

• We dig some 4 million holes in UK’s roads each year trying to locate services…

….and we don’t make it easy for ourselves
and the problem is not new...

New York circa 1900
## Utility streetworks and associated costs

<table>
<thead>
<tr>
<th>Issue</th>
<th>Impact</th>
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<tbody>
<tr>
<td>~ £7 billion per annum: cost of utility streetworks to the UK economy</td>
<td>78% of which is indirect costs including social and environmental impacts</td>
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<td>Road occupation due to utility streetworks</td>
<td>Accounted for equivalent of ~ 6.16 million days of work in the UK in 2014-2015</td>
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<td>An estimated 1.37 million streetworks undertaken by utility companies alone</td>
<td>This equates to 2.4 million road openings in the UK in 2014-2015</td>
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- In 2014-2015 alone, utility streetworks in England and Wales have incurred costs of more than £1.5bn.
- The projected cumulative total cost of utility streetworks in the UK from 2013 to 2030 is £319bn.
# Cost of Utility Strikes

<table>
<thead>
<tr>
<th>Labour</th>
<th>Pipe laying</th>
<th>Excavation</th>
<th>Land acquisition</th>
<th>Detour roads</th>
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</thead>
<tbody>
<tr>
<td>Noise</td>
<td>Lost production</td>
<td>Multiplier effects</td>
<td>Environmental costs</td>
<td>Loss of shareholder value</td>
</tr>
<tr>
<td>Material</td>
<td>Earthworks</td>
<td>Dewatering</td>
<td>Permits</td>
<td>Right-of-way</td>
</tr>
<tr>
<td>Traffic delay</td>
<td>Overtime</td>
<td>Lost production</td>
<td>Lost income &amp; taxes</td>
<td>Equipment damage</td>
</tr>
<tr>
<td>Planning</td>
<td>Soil disposal</td>
<td>Mobilisation</td>
<td>Bid documents</td>
<td>Easements</td>
</tr>
<tr>
<td>Legal</td>
<td>Backup systems</td>
<td>3rd party damage to utilities</td>
<td>3rd party damage to property</td>
<td>Restart cost</td>
</tr>
<tr>
<td>Design</td>
<td>Backfill</td>
<td>Demobilisation</td>
<td>Field survey</td>
<td>Equipment</td>
</tr>
<tr>
<td>Insurance premiums</td>
<td>HSE fines</td>
<td>Back office</td>
<td>Programme over-run</td>
<td>Lost sales to utilities</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Direct Costs</th>
<th>Indirect Costs</th>
</tr>
</thead>
</table>
Utility streetworks and associated costs

Utility Strike Cost Ratio = (Indirect cost + Social Costs) / Direct repair costs

From £1ks to £100ks

Example: Assuming you have a strike incident with a direct cost of £1000, that would mean as a rule of thumb that the true cost (direct + indirect + social) is £29000, based on the case study findings.

Generated as part of the iBuild project sponsored by EPSRC
Sustainability

Economic
- Growth
- Revenue

Social
- Charitable Contributions
- Fair Trade
- Employee Welfare

Environment
- Resource Consumption
- Land Use
- Waste Management

Reference: http://www.commons.wikimedia.org
Streetworks Sustainability Assessment Framework

- Quantification of the key impacts/costs using social costing techniques.

  - Delay costs to road users
  - Vehicle operating costs (e.g. fuel consumption)
  - Carbon emissions of queuing vehicles
  - Noise pollution costs
  - Accident costs
  - Accelerated deterioration of road surfaces (decreased road surface value)
Utility streetworks and associated costs

• **Environmental Impact**
  Example: Damages to tree roots (from utilities) and vice versa
Utility streetworks and associated costs

- **Social Impact**
  Examples: Loss of utility provision, traffic delays, losses to local businesses, reduced quality of open space
Questionnaire, to validate the developed indicator sets and to capture expert opinion on their importance and applicability, distributed to a wide group of industry experts including:

- Utility companies
- Local authorities
- Civil Engineering Consultants
- Contractors
- Developers
- Utility Mapping Practitioners
- Academics
- Suppliers

Response rate: ~ 40% - 20/50
Interviews are being arranged as a result of the questionnaire responses.
Example question in the questionnaire:
With regard to utility streetworks projects, specify the importance of the following headline cost / impact categories, where 1 is the most important and 4 is the least important:
Streetworks Sustainability Assessment Framework

• **Why** – to develop a process that enables decision makers to understand sustainability impacts of utilities projects at early stages of project development and inform the impacts of choices in a format that allows the decision maker to choose more sustainable and cost effective processes.

• **What** – a framework that evaluates project information and translates it into environmental, social and economic impacts.

• **How** – by collecting detail information that enables a comprehensive sustainability assessment of the project.
Sustainability assessment tools

- Community impact of working in street (score)
- Negative Brand (score)
- Future Impact (score)
- Compensation to business
- Safety (%)
- Carbon emissions (£)
- Total wasted fuel (£)
- Cost of delays (£)

**Scenario 1**
Hayes, 2012

**Scenario 2**

Halcrow Group Limited, 2008

**SPEAR®**
Arup, 2016
Total Sustainability Cost (TSC) = Direct [economic] + Indirect [economic] + Social + Environmental
Overview of the ATU project

WS1: Management & Impact Dissemination (Overarching)

WS3 - Sensors (Condition Assessment)

WS4a: Geotechnical Infrastructure

WS5: Robotics: In-utility Condition Assessment

WS6: Technology Integration

WS2: Acoustics (Condition Assessment)

W4b: Road Infrastructure

WS5- Part 2: Condition Modellings

WS7: Decision Support System
- Necessary datasets
- Technical Issues (Specification and construction)
- Stakeholder engagement

WS8: Sustainability Cost Modelling
- Sustainability Costing Framework
- Economic, Social and Environmental Parameter Inputs
- Value vs Cost approach
- Future-Proofing Investments

Intelligent and Sustainable Streetworks
From confusion to management for ST and LT