Infrastructure Asset Management with Uncertain Data

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## Objectives & background

### Analytics Techniques

<table>
<thead>
<tr>
<th>Business Requirements</th>
<th>STRATEGIC</th>
<th>TACTICAL</th>
<th>OPERATIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>DESCRIPTIVE</strong></td>
<td><strong>PREDICTIVE</strong></td>
<td><strong>PRESCRIPTIVE</strong></td>
</tr>
<tr>
<td>What happened to our assets in the last 10yrs?</td>
<td>What will happen to our assets in the next 25yrs?</td>
<td>What future investments do we need to make on our assets?</td>
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<tr>
<td>What happened to our assets in the last year?</td>
<td>What will happen to our assets in the next year?</td>
<td>What assets do we need to replace or maintain this year?</td>
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<tr>
<td>What is happening to our assets today?</td>
<td>What will happen to our assets tomorrow?</td>
<td>What assets do we need to inspect or maintain tomorrow?</td>
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</tbody>
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Communication Pipe Example

Global Investment £4.42 bn /yr
Are we optimising our investment for communication pipes?

- Less than 80% of assets are mapped*
- Less than 90% of assets have known material or age*

*I’ll set aside the same money as last year & let operations decide

* UK estimate from research
 Approach

1. Build an asset stock

2. Deterioration modelling & whole life cycle analysis

3. Optimise maintenance & investment policies
1a. Asset mapping
1b. Asset age

i. Corporate GIS

ii. UK Gov. Valuation Office Agency postcode age data

iii. Digitised historic map boundaries
1c. Asset material

i. Corporate GIS

ii. Maintenance records

iii. Elicitation

<table>
<thead>
<tr>
<th>Date range</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
<th>Zone 4</th>
<th>Zone 5</th>
<th>Zone 6</th>
<th>Zone 7</th>
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<tbody>
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<td>Pb</td>
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</table>
2. Life cycle model
2. Deterioration modelling & WLC

- New Assets
- Asset failures
- Asset repairs & replacements
2b. Model calibration & verification

- Calibration (10 years)
- Verification (3 years)
- Projection (+25 years)
3. Results – AMP6 Expenditure

8% Cost Saving

2% Performance ↑

Sensitive information removed
Pb comparison

Age at failure:
- <41
- 41-60
- 61-80
- 81-100
- 101-120
- 121-140
- >140

R² = 0.9902

Observed Failure Count vs. Modelled Failure Count graph.
Pb comparison

- Observed Company 1
- Modelled Company 1

Failure Count vs. Pipe Age (Years)