Acknowledgements
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Project Motivation
The operation of telecommunication networks is critical during business as usual times, and becomes most vital in post-disaster scenarios, when the services are most needed for restoring other critical lifelines, due to inherent interdependencies, and for supporting emergency and relief management tasks. In spite of the recognized critical importance, the assessment of the seismic performance for the telecommunication infrastructure appears to be underrepresented in the literature.

The FP7 QuakeCoRE project “Performance of the Telecommunication Network during the Canterbury Earthquake Sequence” will provide a critical contribution to bridge this gap.

Thanks to an unprecedented collaboration between national and international researchers and highly experienced asset managers from Chorus, data and evidences on the physical and functional performance of the telecommunication network after the Canterbury Earthquakes 2010-2011 have been collected and collated. The data will be processed and interpreted aiming to reveal fragilities and resilience of the telecommunication networks to seismic events.

Telecommunication Infrastructure
The telecommunication infrastructure comprises two main networks including the landline and broadband data service network, and the wireless cellular service network, that are linked together by means of data interoperability and transmission exchanges. Each network is made of different components including among others, underground cables, access pits, roadside cabinets, overhead lines and poles, cellular towers, exchange facilities.

Earthquake-induced Physical and Functional Impacts: Examples

Examples of Physical Impacts on Components
- Damage mechanisms of aerial cables: pulling, tripping, being broken, bending, toppling; sinking; tearing, shearing; liquefaction in ducts; manholes, vaults, manhole; conduit crushing into pieces; conduit tearing, bending; conduit breaking; c) conduit/ manhole.
- Damage due to conduit/ manhole: a) conduit tearing, bending; conduit breaking; b) conduit crushing into pieces.
- Cables severed due to collapse, liquefaction in ducts, manholes, vaults, manhole; conduit tearing, bending; conduit breaking; c) conduit/ manhole.
- Cable cut due to lateral ground spreading.
- Liquefaction in ducts: a) liquefaction in ducts; b) liquefaction in vaults/marshals; c) liquefaction in manhole.
- Damage due to conduit/ manhole: a) conduit tearing, bending; conduit breaking; b) conduit crushing into pieces; conduit/ manhole.
- Techniques of damage to reduce at bridge link: a) in tunnel; b) in conduit/ vaults; c) in conduit/ manholes.

Achieved Outcomes

Definition of Taxonomies and Data Collection
Identification of vulnerable components and critical components to system functionality. Proposal of an ad-hoc taxonomy.

Data collection: components’ location and characteristics; location and description of earthquake-induced faults and repair activities

<table>
<thead>
<tr>
<th>Components</th>
<th>Data Collection Progress</th>
<th>Data Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange Buildings</td>
<td>-</td>
<td>GIS location of buildings. Site inspection observations from the Canterbury Earthquakes</td>
</tr>
<tr>
<td>Buried Cables</td>
<td>-</td>
<td>GIS layout of Copper and Fibre networks. Cable faults from the Canterbury Earthquakes (fault type, cable type, location, cost, etc.)</td>
</tr>
<tr>
<td>Roadside Cabinets</td>
<td>-</td>
<td>GIS locations of cabinets</td>
</tr>
<tr>
<td>Access pits to buried cables</td>
<td>-</td>
<td>Manholes and Ducts investigation observations from the Canterbury Earthquakes (Material, Size, Damage type, Damage cost, status, Inspection observations, etc.)</td>
</tr>
</tbody>
</table>

Data Processing
- GIS overlays have been developed for Exchanges & Cabinets, Buried Fibre network and Buried Copper network.

Next Steps and Expected Outcomes
- Fragility curves/indexes for cables and above-ground components
- Identifications of functional impacts, interdependencies
- Identifications of resilient element and strategies

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