Infrastructure Reliability & Vulnerability:

Simulation Modelling of Infrastructure Interdependence

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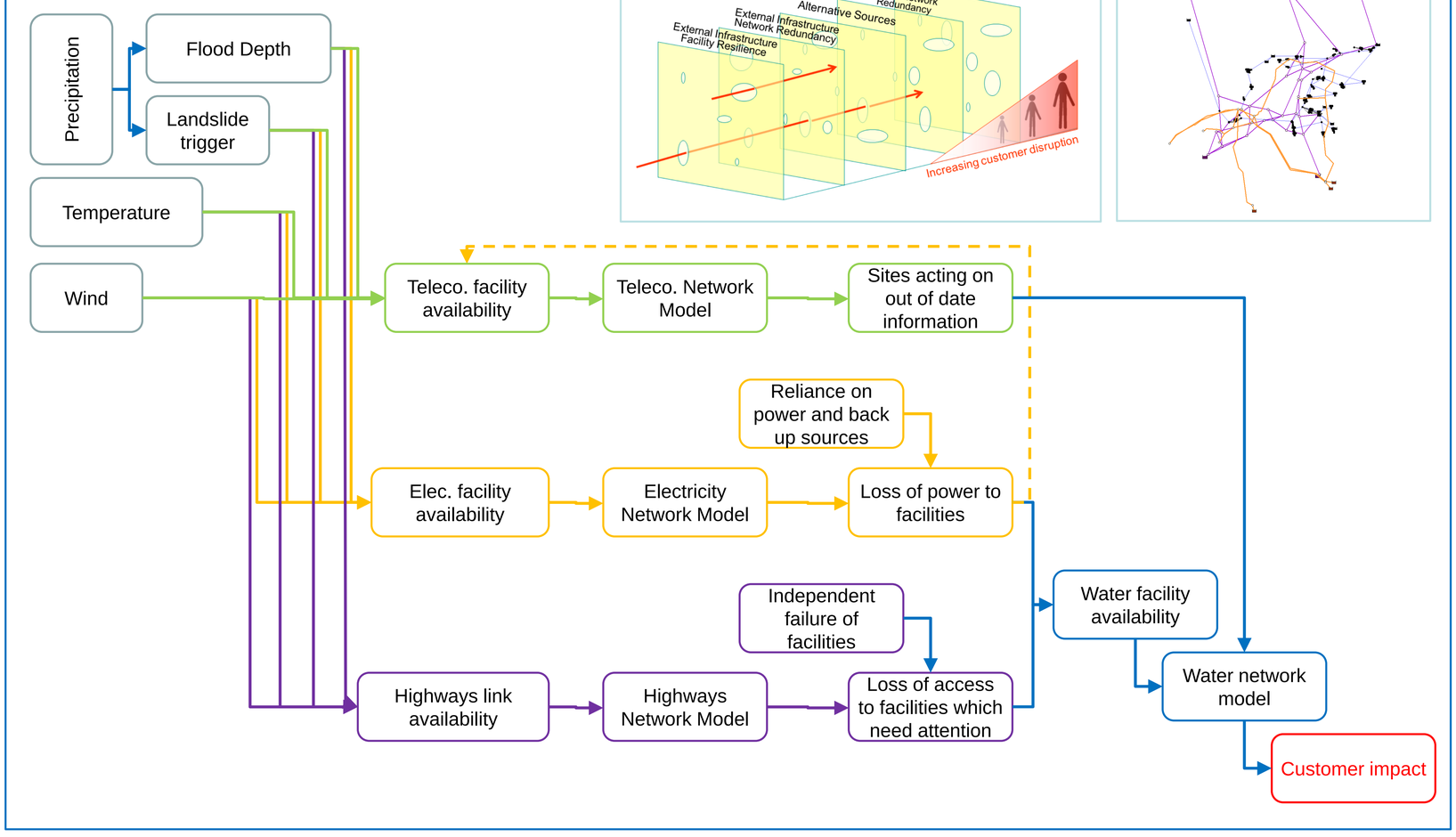
Conclusions

1. Simulation modelling produces detailed and extensive information.
2. It provides fully quantitative likelihood and consequence estimates.
3. The case study makes many assumptions. Resolving these knowledge gaps will help to realise the method's potential.
4. Practical application of the method is limited by the overwhelming volume of results produced.
5. Alternatives such as scenario modelling and more generic risk analyses may be more valuable

Method

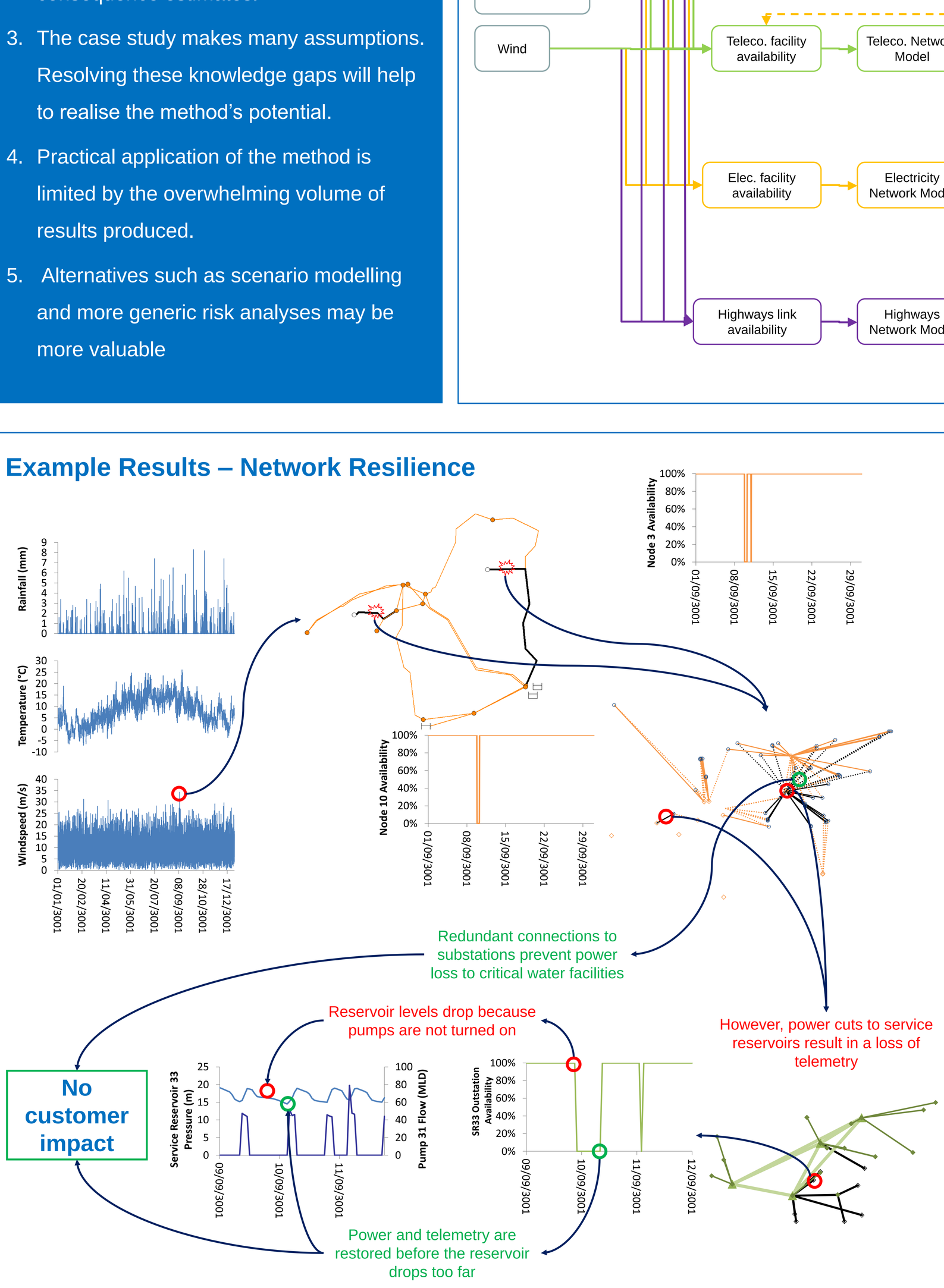


Swiss Cheese Model

(Reason 1990)

Superimposed Networks

Example Results – Network Resilience



Strengths

1. The model runs relatively quickly – the analysis of the highways and telemetry networks and water facility availability takes under 10 minutes.
2. The method is easily adaptable, e.g. the weather inputs could be replaced with climate change predictions.
3. There is a clear logical flow through the model from quantitative hazard values through to customer impact.

Weaknesses

1. There is little data to support the fragility curves which define the vulnerability of facilities. Consequently many are rough estimates.
2. The method involves moving between Microsoft Excel and EPANET making it unwieldy.
3. By only running over a 30yr period the model misses the truly extreme events which are the main concern.

Improvements

1. A full log has been kept of the assumptions and estimate being made to allowing the collection of data in the future to be prioritised.
2. Alternative methods are being considered which focus on extreme scenarios, thereby capturing the risk of very rare events.

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