End-to-End Linkage Structure for Infrastructure Network Models



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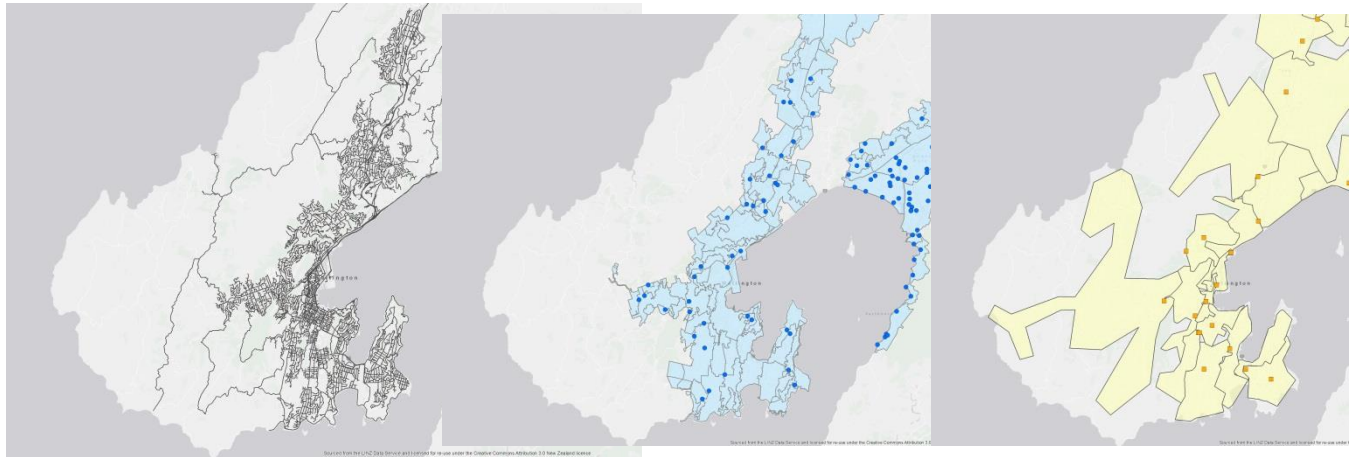
Built Environment Infrastructure

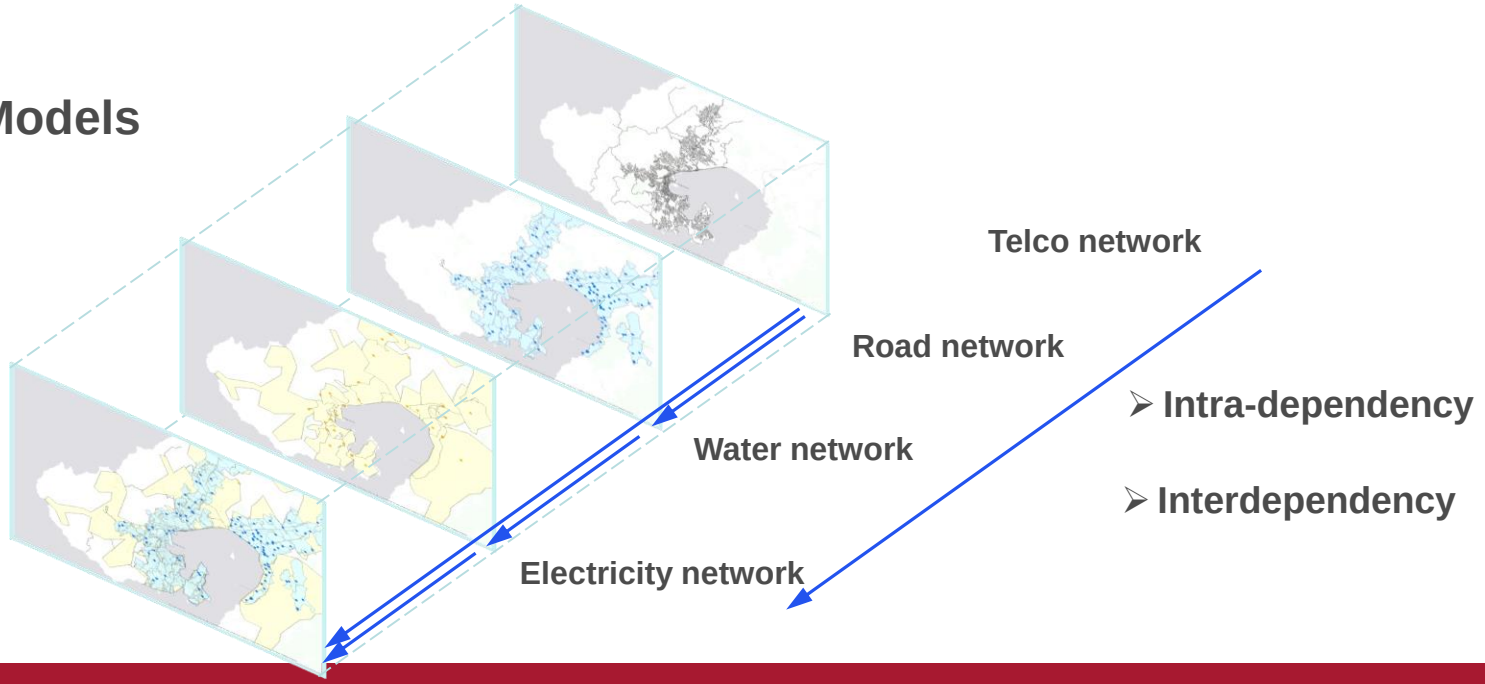


Road network

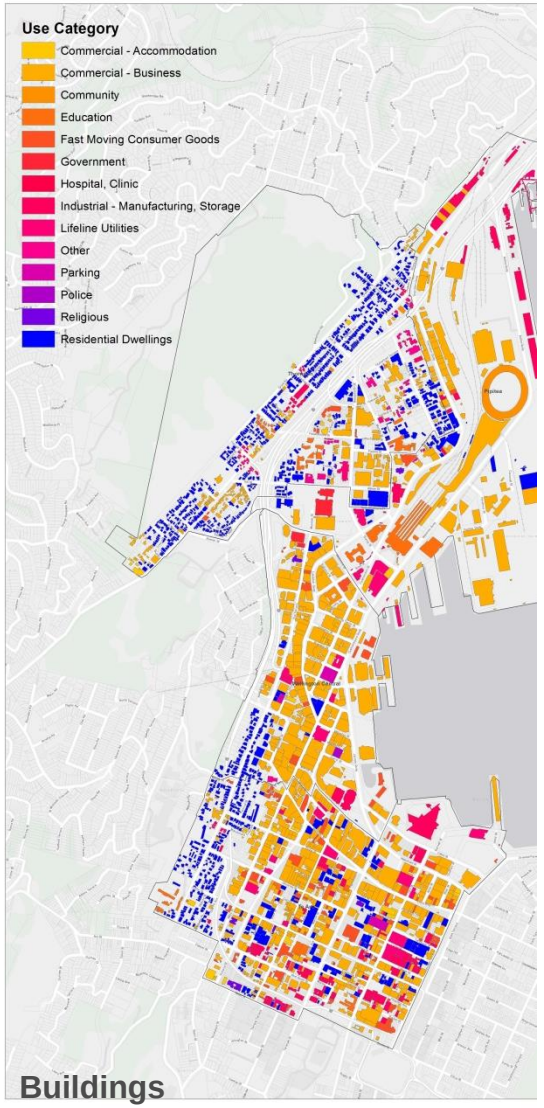
Water network

Electricity network

Network Models

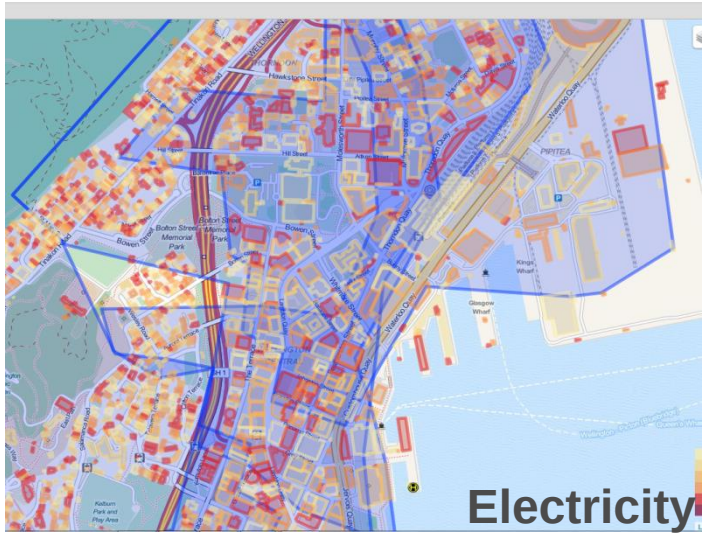


- Intra-dependency
- Interdependency

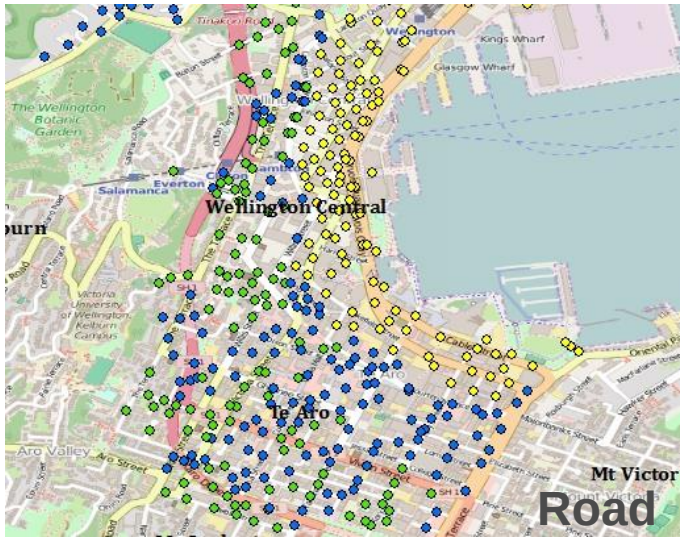


Buildings

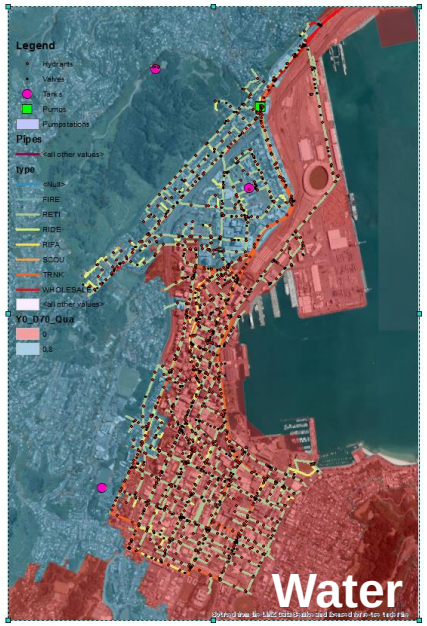
Damage to infrastructure and outage of utilities (individual)



Damage to electricity supply



Damage to road networks

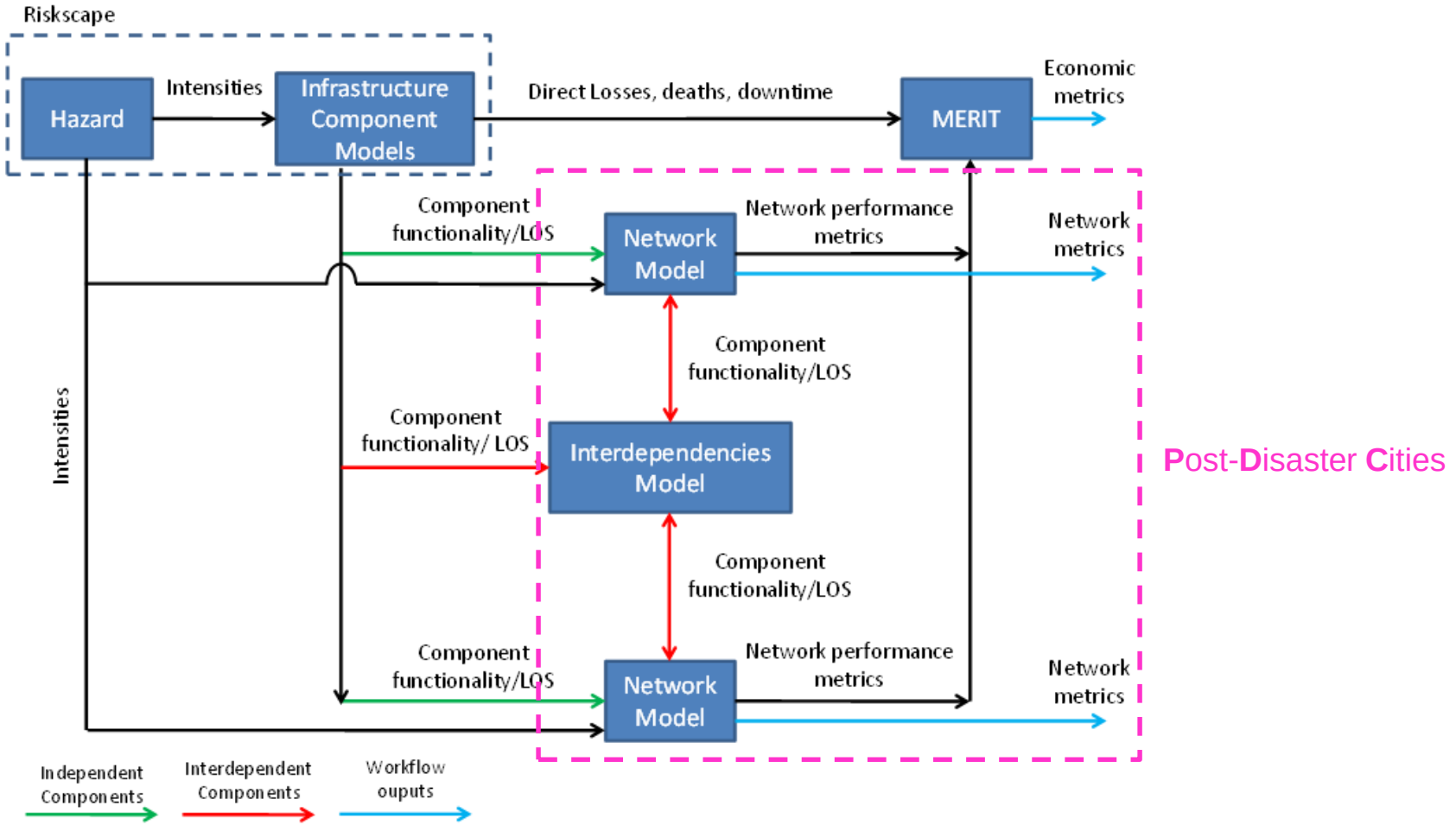


Damage to water networks

Why ‘Linkage Structure’?

- **Infrastructure network impact assessment**

- Models- specific purposes
- Need to be linked to have integrated impact assessment
- Continuity/consistency input-output information flow from one model to the next



Objectives of the study

Information gathering on:

- inflow and outflow parameters between various models used within ‘end to end’ impact assessment of infrastructure networks;
- characteristics of exogenous (independent) parameters into each model and the commonality and their consistency;
- characteristics of the structure, metadata and software platforms used in each model

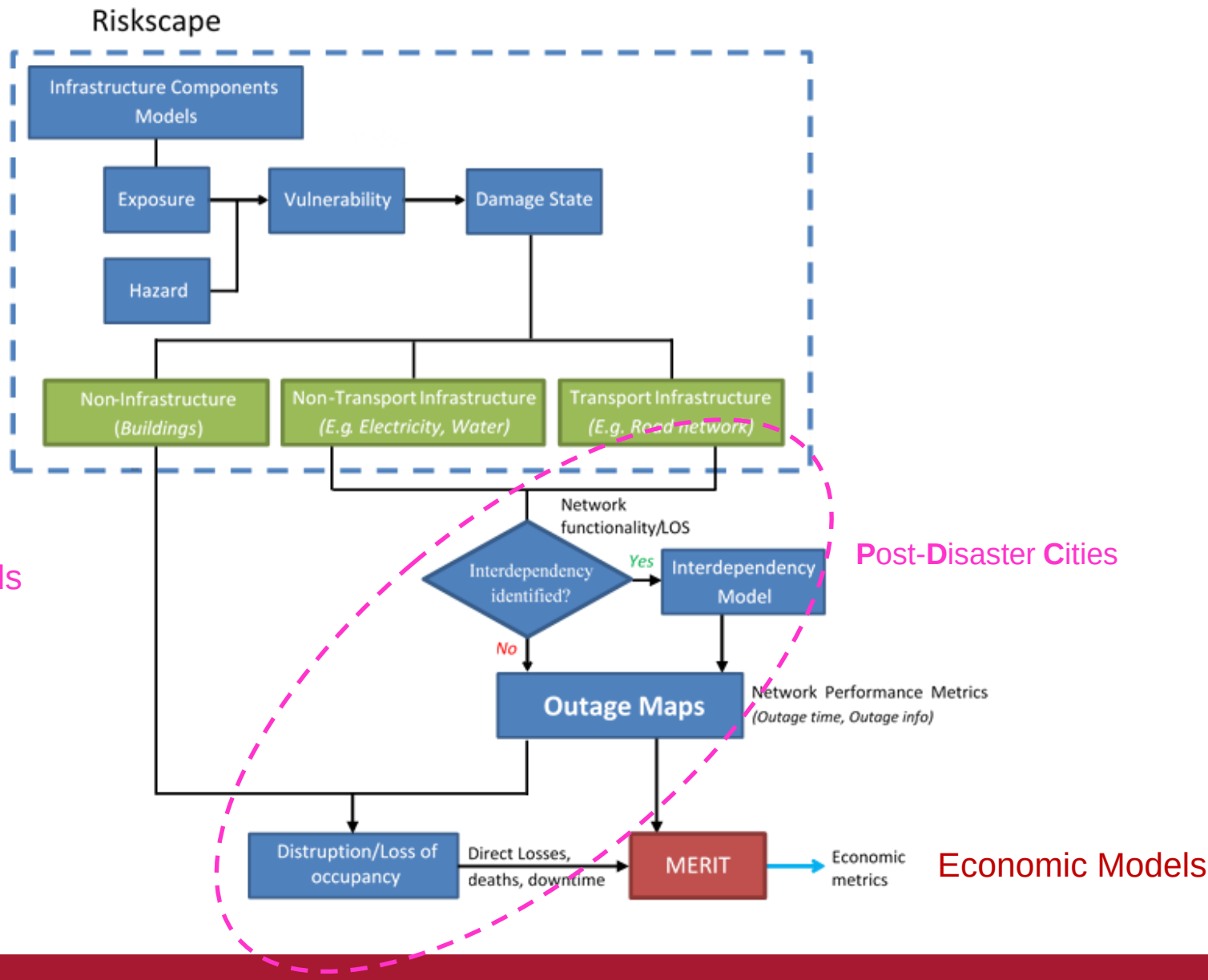
What is expected from the researchers ?

- Objective of research
- Infrastructure models being addressed?
- Brief description on the scope/features of model(s)
- What other models they are capable of linking with? (examples to provide)
- Inflow (input parameters) considered?
- What are their formats? (GIS/CSV/txt etc.)
- What are the output metrics generated?
- What are their format?

Riskscape-PDC-MERIT interface

Damage Models

Outage/Disruption Models



Water Network Model

1.	Name	Water Network Modeling
2.	Organisation	Riskscape
3.	Contact	
4.	Spatial Resolution	Grid of 100x100 m.
5.	Temporal Resolution	
6.	Input data exogenous	Repair Time/Recovery Time (Water infrastructure provider)
7.	Input from other models	GIS files, Damage States
8.	Input parameters	Component name, location, damage state, recovery time
9.	Output Data	$Outage_{it,c}$, Functionality Characteristics

Modeled Components

1. Reservoir
2. Water treatment plant
3. Pump station
4. Bulk water pipeline

Electricity Network Model

1.	Name	Electricity Network Modeling
2.	Organisation	Riskscape
3.	Contact	
4.	Spatial Resolution	Grid of 100x100 m.
5.	Temporal Resolution	
6.	Input data exogenous	Repair Time/Recovery Time
7.	Input from other models	GIS files, Damage State
8.	Input parameters	Component name, location, damage state, recovery time
9.	Output Data	$Outage_{it,c}$, Functionality Characteristics

Modeled Components

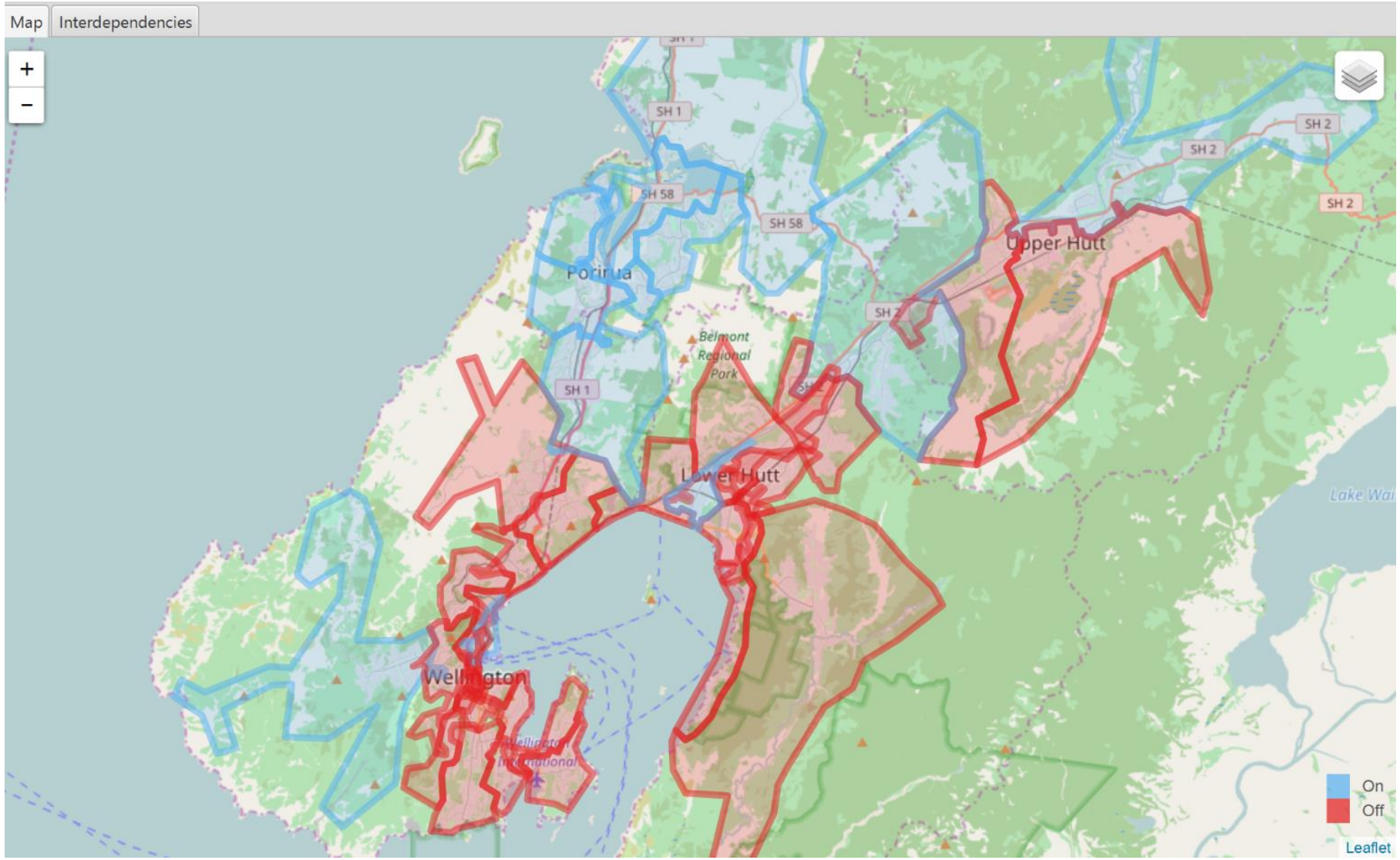
1. Grid Exit Points
2. TP-Circuits (110KV) between GXP-GXP
3. 33KV Transmission lines between Substation-GXP
4. Substations

Electricity Network Model

- Given a particular hazard, the map shows outage of electricity in different regions
- Regions are divided in terms of area covered by a Substation

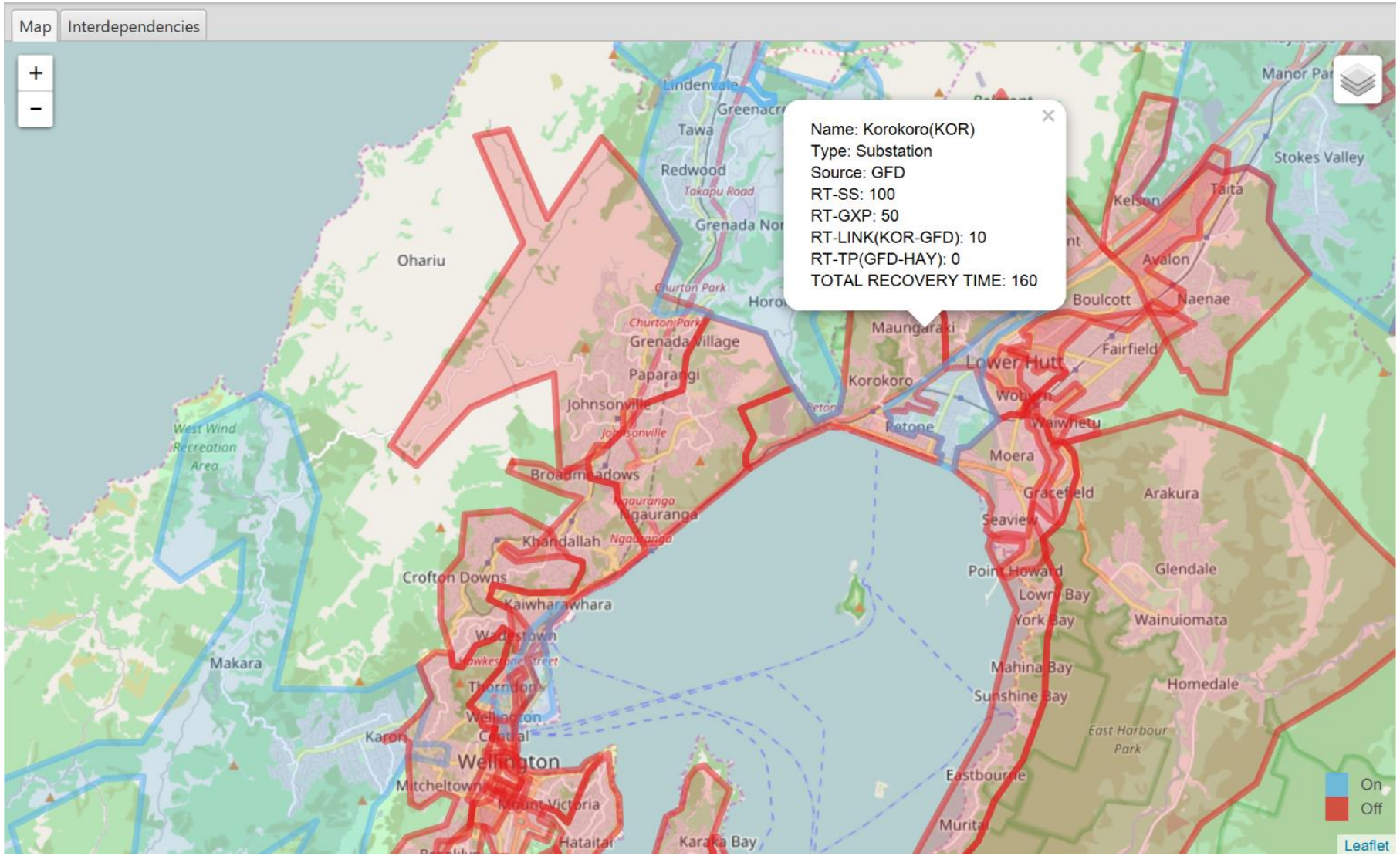
Red Regions → Outage
Blue Regions → no Outage

- Outage considers damage state of all the components



Electricity Network Model

- Each region show the details of each component's recovery time
- Recovery time is computed from the damage state
- Recovery time will be computed through workshops with infrastructure providers



Thank you for your attention!

Questions?

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