END TO END LINKAGE STRUCTURE FOR INTEGRATED IMPACT ASSESSMENT OF

INFRASTRUCTURE NETWORKS UNDER NATURAL HAZARDS

Syed Yasir Imtiaz¹, SR Uma², Raj Prasanna¹, Garry McDonald³ and Nick Horspool²

¹Joint Centre for Disaster Research (JCDR), Massey University, New Zealand ²GNS Science, New Zealand ³Market Economics, New Zealand





Kia manawaroa – Ngā Ākina o Te Ao Tūroa







This project is FP6 QuakeCoRE funded project with an aim to develop a linkage structure framework to link various models necessary for the estimation of geospatial hazard intensities, infrastructure component performance, network performance, interdependencies, and socio-economic metrics by achieving the following research objectives:

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

DESCRIPTION

Figure 1 provides a schematic representation of the basic interaction and high-level representation of the inflows and outflows between each model. The workflow moves from hazard into infrastructure component models and splits into two paths. First outflow characterising component performance goes into MERIT. Another outflow goes into the network models individually or through the interdependencies model if component interdependencies are identified. In each of the cases, the network metrics are generated which can be utilized by economic assessment tools like MERIT.

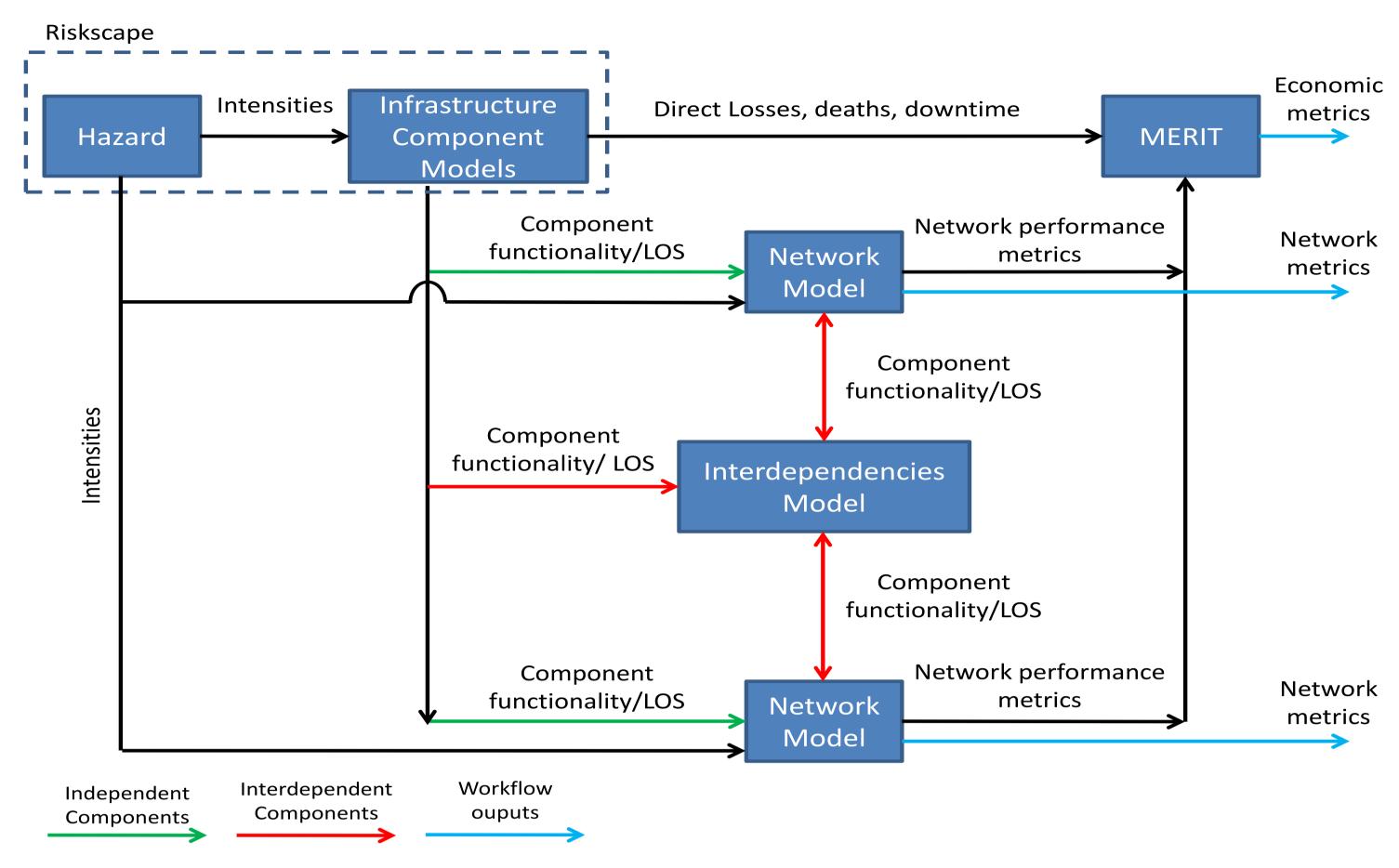


Figure 1. Schematic of module interaction and representative inflows and outflow.

UNDERSTANDING OF INTERLINKAGES BETWEEN MODELS

To understand the inflow and outflow requirements of each model, the information gathering has been done by interacting with model developers to classify the structure, metadata and software platforms used around four main modules of Hazard, Fragility, Damage and Functionality as shown in figure 2. Within each of these modules, relevant questions have been designed to understand work scope and possibilities of any interlinkages between various infrastructure network models.

To understand the interlinkage possibilities between various infrastructure network models, a linkage framework has been designed as shown in figure 3. The initial linkage possibilities identified through interviews from different infrastructure network model developers have been added in the framework and with inclusion of more models, this framework would provide a platform for an integrated impact assessment of infrastructure networks under natural hazards.

• What is the modelled network? • What components are included in the model, and how would their functionality be characterised? What is the Software platform used? Network Model • What information is needed to translate damage/functionality into inputs for your network model? • What information is coming out of your network model? • Have you considered any kind of interdependency model?

Hazard

Are you focusing on specific hazards or

Fragility

Damage



Functionality

hazards in general and what are the secondary perils? **Earthquake** input into your model? What are the intensity parameters? How do you represent flood intensity in terms of inundation depth, duration and velocity?

What is the wind speed or any other indicator?

How do you represent Tsunami intensity in terms of inundation depth, duration and velocity?

Is component fragility incorporated within your network model or is this an How do you define a system for computing fragility and what is the granularity level? What are the parameters used for

Is damage defined within your network model or is this input into your model? the damage Description System or Network What is the damage computation parameter? (Damage ratio/ damage percentage) How are you defining the damage

How the damage reflected in functionality? How do you define Level of Service the level of computing functionality? (Region-wise, Network-wise, Systemwise, Component-wise or End user-wise) How do you define disruption or outage generated from your model?

Figure 2. Schematic of basic modules for information gathering

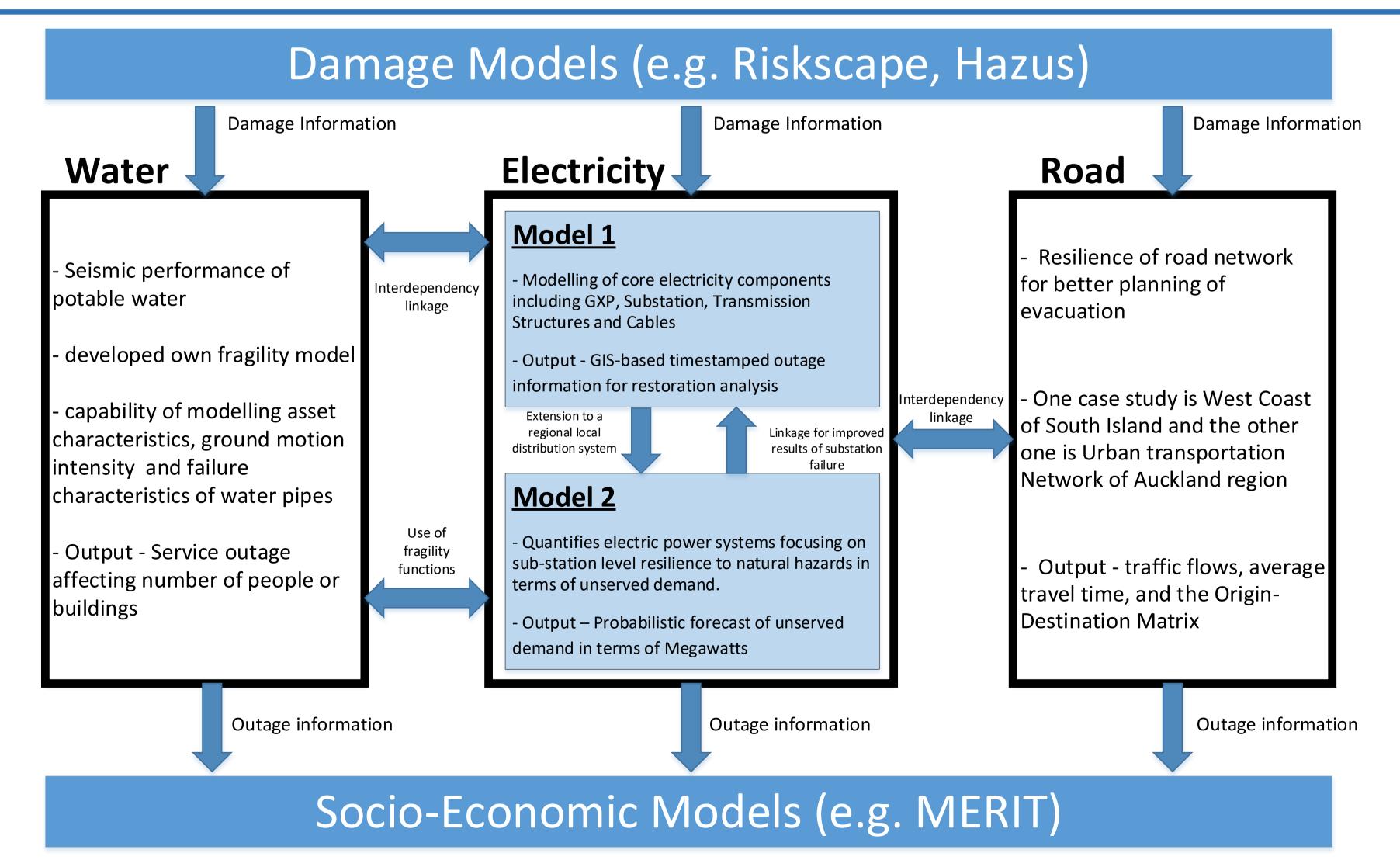


Figure 3. Framework for identification of interlinkages between different models

LINKAGE FRAMEWORK