Logistics and Supply Chain Management PhD Scholarship

Project title: Decision support for emergency fuel supply in New Zealand

Supervisory team: Cécile L'Hermitte, Nadia Trent, Carol Stewart

Adviser: Richard Mowll

Description

The aim of this PhD project is to develop a decision support tool that enables emergency management practitioners to simulate post-disaster fuel supply disruptions and evaluate possible interventions. The tool will support planning for the supply of diesel fuel to critical customers, including emergency services, healthcare providers, lifeline utilities, food distribution networks and other essential services.

The research will first develop a national fuel supply model representing the movement of diesel fuel through New Zealand's supply chain, from import terminals and bulk storage facilities to regional distribution points and retailers. The model will integrate fuel demand profiles, inventory levels, storage and transport capacity, as well as supply chain constraints. It will also represent dependencies on other critical infrastructure (e.g. electricity) that may affect fuel distribution following a major natural hazard event.

The national model will be used to examine how disruptions to fuel infrastructure, transport networks and supporting services can affect diesel availability across regions. It will identify regional operational constraints and areas vulnerable to prolonged fuel shortages. Its outputs will provide the system-level context for a detailed regional case study.

Developed in collaboration with stakeholder partners, the regional case study will examine how diesel fuel supply can be maintained when a major event isolates a New Zealand regional area. It will map regional diesel stocks, fuel supply chain nodes, critical service demand, available storage and transport assets and their capacity, as well as dependencies across fuel, transport, electricity and telecommunications systems.

Simulation experiments will assess disruption scenarios of varying severity and duration. These may include damage to transport infrastructure, loss of electricity and telecommunications, depletion of local stocks and competing demands among critical services. The research will evaluate possible interventions, such as demand prioritisation, prepositioning, the use of coastal shipping and support from commercial operators and the New Zealand Defence Force.

The interventions will be compared using performance measures including met/unmet critical demand, intervention cost and operational feasibility. The case study will identify combinations of interventions with particular attention given to trade-offs between service level and cost.

The key output of this research will be a practical decision support tool that allows emergency management agencies and fuel sector stakeholders to explore disruption scenarios, test contingency plans and compare strategies for sustaining essential services in the aftermath of a major natural hazard event.

Research programme

This project is funded by the Next Generation Risk Assessment theme of the Natural Hazards and Resilience Platform (https://resilienceplatform.nz/). This is a multi-institutional, collaborative research programme with a mission to accelerate resilience to natural hazards in New Zealand.

Funding details

The project will be funded by a 3.5-year scholarship at the University of Waikato. This includes NZ$35,000 per year tax-free stipend and payment of university fees. The project will also include support for research travel.

Eligibility

The scholarship supports study towards a PhD in Supply Chain Management. Applicants should have a master's degree in supply chain management, operations management, operations research, transport engineering or a related discipline. Previous experience in network analysis, optimisation modelling and simulation is required, along with strong analytical and coding skills. As the project involves close collaboration with emergency management practitioners, infrastructure organisations, commercial stakeholders and government agencies, the successful candidate will also need strong communication and interpersonal skills. Experience with GIS, advanced statistics skills and knowledge of fuel supply chains, freight resilience and/or emergency management would be beneficial but are not essential.

The scholarship is open to domestic and international candidates. The successful candidate will be enrolled full-time at the University of Waikato and reside in New Zealand for the entire duration of the PhD project. Candidates must meet the PhD eligibility criteria for enrolling at the University of Waikato.

Applications

Interested candidates should apply via email with the subject line "Emergency Fuel Supply – PhD Application" to Cécile L'Hermitte, cecile.lhermitte@waikato.ac.nz. Applications should include:

- ✓ A CV including publication list, if any
- ✓ Transcripts of bachelor's and master's degrees
- ✓ A cover letter (max. 400 words) outlining your motivation and suitability for the project
- ✓ A research proposal (max. 1,000 words) including a brief review of the most relevant literature (5-8 references), the research questions, the qualitative and quantitative methodological approach, and the list of references.

Shortlisted applicants will be invited to an online interview.

Applications will remain open until the position is filled.

The intended start date of the project is March 2027, subject to enrolment constraints.