

MEASURING SOCIAL, ENVIRONMENTAL AND ECONOMIC CONSEQUENCES OF ROAD STRUCTURE FAILURE DUE TO NATURAL DISASTERS



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ROAD INFRASTRUCTURE PLAYS AN IMPORTANT ROLE AFTER A DISASTER AND IS A VITAL FACTOR INFLUENCING RECOVERY AND RECONSTRUCTION ACTIVITIES. THIS PROJECT AIMS TO DEVELOP A FRAMEWORK TO MEASURE SOCIAL, ENVIRONMENTAL AND ECONOMIC CONSEQUENCES OF DISASTER RELATED ROAD FAILURE, WHICH WILL HELP TO UNDERSTAND THE WIDER IMPACTS OF ROAD FAILURE IN A POST-DISASTER CONTEXT.

INTRODUCTION

The aim of this research is to study current methods used to measure social, environmental and economic (SEE) impacts of road network failure due to natural disasters and to build a methodologically sound framework that can be used to assess impacts of road failure in natural disaster scenarios. This project brings together the two broad areas of research relating to road structure failure and disaster impact assessment with the intention of understanding the impacts due to road failure caused by natural disasters.

RESEARCH QUESTIONS

- ▶ What are the techniques and the limitations of the methods used currently to measure SEE impacts of disaster related road failure?
- ▶ How can the methods used currently be modified and improved to suit the assessment of impacts of road structure failure?
- ▶ How can the SEE impacts be integrated into a tool to assist in public policy and disaster related infrastructure decision making?
- ▶ How can the developed model be interpreted and validated using a case study / previous research in the field of road failure?
- ▶ How can the identified SEE impacts of disaster induced road failure be reduced?

LITERATURE REVIEW

Disaster impacts have been typically classified into four areas; direct / indirect, based on the temporal and spatial scale; and as tangible / intangible, based on the availability of a market for the type of impact.

A comprehensive literature review was conducted focusing on these four classifications in the areas of impacts assessment of road failure, natural disaster impact assessment and multi criteria integration techniques, covering over 300 journal articles published in the last 3 decades. The review exemplified that most of the research focusses on tangible (economic) impact assessment of disasters and those that looked at road failure were mainly pre-disaster impact prediction studies.

Summary of methodologies used to measure impacts

Impact type	Methodology
Damage to infrastructure	Primary data analysis Cost modelling
Transport impacts	Network analysis Transport modelling
Business impacts	Primary data analysis Input-Output analysis CGE analysis
Loss of life	Statistical analysis Value of statistical life
Community accessibility	Statistical analysis Accessibility index
Environmental	Carbon footprint Embodied energy Sediment run-off

Summary of integration techniques

Impacts considered	Methodology
Total economic	Total monetary impact Cost benefit analysis System risk curve
Socio-economic	Severity assessment tool Cost benefit analysis Life cycle cost
Environmental economic	Multi criteria analysis
Social environmental and economic	Monetary conversion Multi criteria analysis

RESEARCH METHODOLOGY

SEE impact assessment techniques and integration techniques would be analyzed based on their appropriateness and resource intensiveness in order to build a framework that could be used to measure SEE impacts of post-disaster road failure. A recent case study from regional Queensland will be used to validate the model, while a sensitivity analysis will be conducted to understand the significant factors affecting the SEE impacts in a post-disaster context. The results will be used to provide recommendations on how the identified SEE impacts could be reduced thus providing valuable information to road and disaster management authorities.

