

MODEL TO FORECAST RISK IN VARIATION OF GEOLOGICAL
AND HYDROLOGICAL STRATUM IN THE EXPRESSWAY.

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DECLARATION

I declare that this thesis is an original report of my research, has been written by me, and has not been submitted for any previous degree or any other educational purposes of any private government university or educational institute. The experimental work is almost entirely my own work; the collaborative contributions have been indicated clearly and acknowledged. References have been provided on all supporting works of literature and resources.

Further, I acknowledge the intellectual contribution of my research supervisor, Prof. (Mrs.) Udayangani Kulatunga, for the successful completion of this research dissertation. I confirm that I will not use this dissertation (or a part of it) without the name of my research supervisor as a contributing author unless I have obtained written consent from my supervisor. Also, I hereby grant to the University of Moratuwa the non-exclusive right to reproduce and distribute my dissertation, in whole or in part, in print, electronic, or other medium. I retain the right to use this content in whole or part in future works such as articles or books.

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DEDICATION

I dedicate this thesis to my loving wife Kalani Senarath Parana Yapa and two daughters for their constant love and support. Who's words of encouragement and spent their enjoyable time for me with patiently, giving strength to complete this work. A special feeling of gratitude to my loving parents, Hendric and Lili Samarasinghe who taught me how to explore the light of life to serve the world. I also dedicate this dissertation to my many friends and other family members who have supported me throughout the process. I will always appreciate all they have done.

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ABSTRACT

Model to Forecast Risk in Variation of Geological and Hydrological Stratum in the Expressway.

Expressway construction projects are susceptible to risks stemming from geological and hydrological variations along their routes, necessitating careful budgetary planning. Most of these unforeseen risks are encountered in the below the ground formation of the road base level. Especially in the existing ground geological and hydrological factors are varying along the road trace, causing this risk to become more complex and unforeseen nature. This research endeavors to address these challenges by developing a model for forecasting risks associated with geological and hydrological changes along expressway routes in Sri Lanka. Through a mixed-method approach comprising literature reviews, expert interviews, questionnaire surveys, and case studies, this study systematically investigates the identification, ranking, and analysis of risk factors.

The research identified sixteen main geotechnical and hydrological risk factors through literature review and expert interviews. These factors were subsequently condensed into ten significant risk factors and further analyzed through questionnaire surveys. Expert evaluations were employed to assess the impact and frequency of occurrence of these risk factors, leading to the identification of two primary risk factors with the most severe impact on project cost overruns.

Furthermore, a Risk Forecasting Model was developed based on case study data, allowing for the estimation of risk amounts during the preliminary estimation phase of future expressway projects. The model, validated against survey findings, aims to provide decision-makers with invaluable insights for budgetary allocations and risk management strategies.

The findings of this research underscore the importance of proactive risk assessment and forecasting in expressway construction projects, offering a systematic approach to mitigate financial pressures and ensure project success.

Keywords: Expressway construction projects, Geological risk factors, Hydrological Risk Factors, Forecasting the risk amount, risk, and cost estimation, modeling the risk amount to estimations

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