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RAPID METHODS OF LANDSLIDE HAZARD MAPPING: FIJI CASE STUDY

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CONTENTS

Summary

Figures

Tables

Summary

A landslide hazard probability map can help planners (1) prepare for, and/or mitigate against, the effects of landsliding on communities and infrastructure, and (2) avoid or minimise the risks associated with new developments. The aims of the project were to establish, by means of studies in a few test areas, a generic method by which remote sensing and data analysis using a geographic information system (GIS) could provide a provisional landslide hazard zonation map. The provision of basic hazard information is an underpinning theme of the UN's International Decade for Natural Disaster Reduction (IDNDR). It is an essential requirement for disaster preparedness and mitigation planning. This report forms part of BGS project 92/7 (R5554) 'Rapid assessment of landslip hazards' carried out under the ODA/BGS Technology Development and Research Programme as part of the British Government's provision of aid to developing countries. It provides a detailed technical account of work undertaken in a test area in Viti Levu in collaboration with Fiji Mineral Resources Department. The study represents a demonstration of a methodology that is applicable to many developing countries.

The underlying principle is that relationships between past landsliding events, interpreted from remote sensing, and factors such as the geology, relief, soils etc provide the basis for modelling where future landslides are most likely to occur. This is achieved using a GIS by 'weighting' each class of each variable (e.g. each lithology 'class' of the variable 'geology') according to the proportion of landslides occurring within it compared to the regional average. Combinations of variables, produced by summing the weights in individual classes, provide 'models' of landslide probability. The approach is empirical but has the advantage of potentially being able to provide regional scale hazard maps over large areas quickly and cheaply; this is unlikely to be achieved using conventional ground-based geotechnical methods.

In Fiji, landslides are usually triggered by intense rain storms commonly associated with tropical cyclones. However, the regional distribution of landslides has not been mapped nor is it known how far geology and landscape influence the location and severity of landsliding events. The report discusses the remote sensing and GIS methodology, and describes the results of the pilot study over an area of 713 km² in south east Viti Levu. The landslide model uses geology, elevation, slope angle, slope aspect, soil type, and forest cover as inputs. The resulting provisional landslide hazard zonation map, divided into high, medium and low zones of landslide hazard probability, suggests that whilst rainfall is the immediate cause, others controls do exert a significant influence. It is recommended that consideration be given in Fiji to implementing the techniques as part of a national strategic plan for landslide hazard zonation mapping.