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Sydney Basin Landslide Susceptibility, NSW, Australia

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Abstract
University of Wollongong GIS-based Landslide Inventory has been expanded to facilitate reliable modeling of landslide susceptibility and hazard zonation over the wider Sydney Basin area. Landslide inventory development is underway after designing a state of the art inventory structure following a comprehensive international literature review. The alphanumerical as well as spatial data bases of landslides have been updated after field verification of landslides in Sydney and Newcastle as the stepping stone for the wider Sydney Basin area landslide susceptibility model development. In the lead up to this, landslide susceptibility modeling in two smaller sub-regions of Sydney (Wollongong Local Government Area and the Picton area) has been undertaken by the Landslide Research Team at the University of Wollongong. In tandem with the development of the landslide inventory, new tools and methods have been developed to aid application of Data Mining techniques within a GIS framework to obtain more reliable modeling, analysis and synthesis. The main aim of this paper is to report the latest advances in landslide inventory development, preparation and compilation of data for the modeling work.

Keywords
sydney, nsw, basin, australia, landslide, susceptibility

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Sydney Basin Landslide Susceptibility, NSW, Australia

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Keywords: susceptibility, Landslide Inventory, Hazard, Zonation, Data Mining

1 Introduction

University of Wollongong GIS-based Landslide Inventory has been expanded to facilitate reliable modeling of landslide susceptibility and hazard zonation over the wider Sydney Basin area. Landslide inventory development is underway after designing a state of the art inventory structure following a comprehensive international literature review.

The alphanumerical as well as spatial data bases of landslides have been updated after field verification of landslides in Sydney and Newcastle as the stepping stone for the wider Sydney Basin area landslide susceptibility model development. In the lead up to this, landslide susceptibility modeling in two smaller sub-regions of Sydney (Wollongong Local Government Area and the Picton area) has been undertaken by the Landslide Research Team at the University of Wollongong.

In tandem with the development of the landslide inventory, new tools and methods have been developed to aid application of Data Mining techniques within a GIS framework to obtain more reliable modeling, analysis and synthesis. The main aim of this paper is to report the latest advances in landslide inventory development, preparation and compilation of data for the modeling work.

2 Refined Landslide Inventory structure

Developing a Landslide Inventory is the essential first step towards any landslide zoning program and it is a vital component in modeling of landslide susceptibility, hazard and assessing landslide risk (AGS, 2007; Fell et al., 2008). Both alphanumeric and spatial data of landslides facilitate learning from past events and predicting potential slope failures, which is crucial in managing landslide risk. A landslide inventory is the evidence based data set that is essential for landslide risk management.

In the absence of a universal procedure for building landslide inventories, following a literature review on national and international landslide databases the Landslide Research Team (LRT) at the Faculty of Engineering and Information Sciences at the University of Wollongong has developed a state-of-art landslide inventory structure (Flentje, Stirling, & Palamakumbure, 2012). Moreover, desk identification and engineering geological mapping of landslides are being undertaken within the 31,000km^2 geological extent of the Sydney Basin and the current population of landslides has been grown to almost 2000 from its Illawarra centric coverage of 664 landslides. Database handling techniques available with MS Assess 2007 and ESRI ArcGIS v10 have been incorporated to aid effective storing and manipulation of landslides and to facilitate the expected growth of the landslide inventory over the next 5 to 10 years.

In order to facilitate effective storage of alphanumerical data, the structure of the inventory discussed in (Flentje, et al., 2012) has been iterated several times following discussions with various colleagues. The table tblRecurrenceData and table tblLandslideCost have been incorporated. In the updated landslide structure, the consecutive reactivations of the earlier landslide are not considered as individual landslide events, but as landslide recurrences under the main landslide, hence this information is stored in the table tblRecurrenceData (Landslide recurrence data) with the SRC (Site reference Code) corresponding to the major landslide event in the Parent_LS (Parent landslide) field. This modification was implemented in order to prevent duplication of information stored under Landslide Summary ID which was previously used to denote both first time landslides and recurrences as unique landslide events.

3 Landslide related costs

Estimation of landslide cost is not always straightforward since some losses cannot be measured in terms of physical indicators. In Australia, costs incurred due to landslide disasters are not covered under insurance policies related to natural disasters. Therefore, literature on landslide costs has not been well documented. However, Osuchowski and Roberts (2011), and Tobin (2012) have documented the costs associated with several past landslide hazards in the Wollongong region. Some of this information dated back to 1950. Additional cost components have been introduced

such as expenditure on landslide related research and monitoring to obtain a comprehensive assessment on landslide related costs. A total amount of $280 million AUD in 2013 dollars has been spent over the period 1950 - 2013, mainly by government organisations, within the Wollongong region. On average this represents approximately $4.5 million annual expenditure on landslide related works.

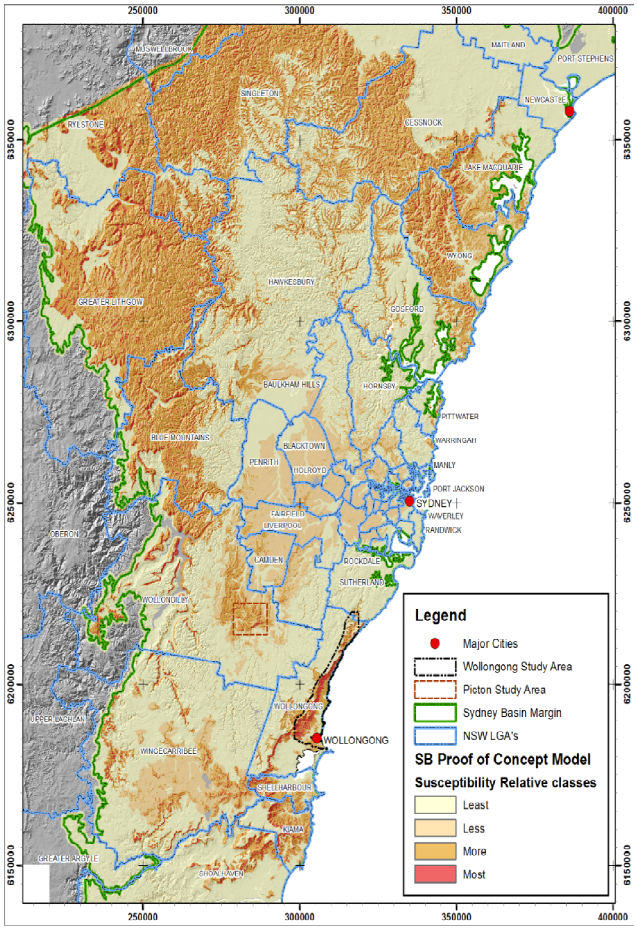

Fig 1. Preliminary landslide susceptibility modeling across the wider Sydney Basin.

4 Data Preparation

The most important spatial data component towards identifying existing landslides and modelling landslide susceptibility is elevation to generate terrain models. This data is fundamental to obtain other parameters crucial in landslide susceptibility modelling such as slope, aspect, wetness index and etc. Light detection and ranging (Lidar) otherwise known as Airborne Laser scan (ALS) data has been obtained from New South Wales government Land and Property Information for various areas within the project study area. Outside of this coverage, the NASA GDEM v2 30m pixel DEM is being employed.

In addition, the highest resolution government Geological Survey digital geology data sets are also being compiled. These range in resolutions from 1:250,000 up to 1:25,000, most commonly available at 1:50,000.

5 Concluding remarks

Development of the Sydney Basin Landslide Inventory over the past few years has contributed significantly towards better landslide susceptibility modeling. Œ:Refined and improved input data in particular with the advent of Airborne Laser Scan and NASA GDEM v2 data combined with advanced computing capabilities is enabling significantly better terrain modeling capacity. With the increased coverage and detail of the landslide inventory, higher resolution DEM and geology information, the regional yet large scale GIS-based Susceptibility modeling outcomes are expected to be suitable for use as Regional Zoning Advisory Level (AGS 2007 Table 1) Susceptibility zoning maps for Local Government Planning applications.

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