Natural Disaster Risk Reduction Decision Support System

Development & Use Framework

The ability to consider effective risk reduction planning is critical, given the potentially enormous social and economic losses associated with hazard impacts. However, developing and implementing long term risk reduction schemes is often difficult for a variety of reasons, including an investment preference for shorter term benefits, the perceived inaccuracy of risk attributed to disasters due to their relative infrequent occurrence, and budgetary constraints. Therefore, selecting the optimal trade-off between options can be difficult.

Software based decision support systems (DSSs) can assist with overcome these obstacles, because of their analytical capabilities to combine various sources of information (e.g. GIS-based topographic information, population and economic forecasts, and numerical output from simulation models) and support trade-off analysis for portfolios of risk reduction options. The University of Adelaide (Adelaide, Australia) and the Research Institute for Knowledge Systems, RIKS (Maastricht, The Netherlands), with support from the Bushfire & Natural Hazard CRC, BNHCRC, are developing a spatial DSS that integrates various hazard models and calculates risk dynamically using demographic, infrastructure, and environmental data.

A process was developed that enables disaster risk reduction DSSs to be developed iteratively based on interactions between end users, scientists and IT specialists (Figure 1). System end-use is considered explicitly during DSS development, including the generation of exploratory scenarios for policy development and impact assessment. The use process involves interaction between stakeholders, facilitators and modellers, and like the development process, is coordinated by a central architect.

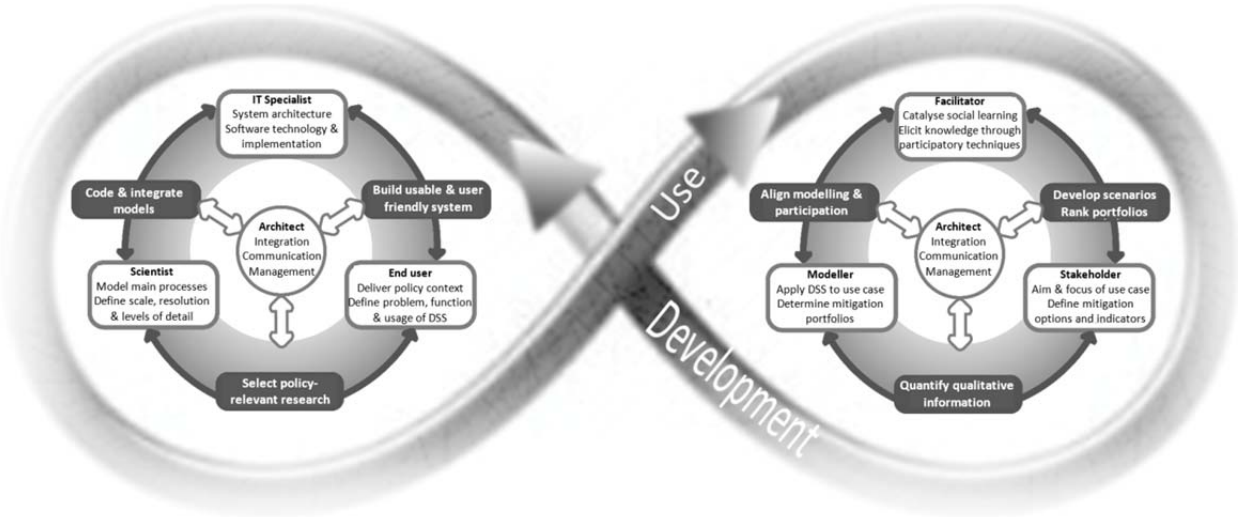

FIGURE 1- THE DEVELOPMENT AND USE OF A DSS ARE SEPARATE PROCESSES, YET INFLUENCE AND SHAPE EACH OTHER

Application of the proposed process, including the iterative application of the development and use cycles, results in:

1. A systematic and transparent approach to evaluating disaster risk reduction options.
2. A framework for making more strategic and less responsive decisions in relation to reducing the impact of disasters and natural hazards, due to the availability of relevant information.
3. The ability to identify the best possible disaster risk reduction options by sifting through, evaluating and ranking a large number of alternatives.
4. A better understanding of the trade-offs between economic, environmental and/or social objectives for various disaster risk reduction options.

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End user engagement during the development and use cycles occurs via a series of four workshops to scope design requirements and develop initial scenarios for policy assessment. The first workshop focusses on discussing the specific spatial area of interest, disasters of relevance to the area, relevant risk reduction options to include, as well as main drivers and uncertainties in future development of the area. This feeds into the system development process in terms of which hazard models to include, along with the identification of drivers and relationships that are relevant to capturing the dynamics of the area. They also allow for initial scenario scoping, highlighting key drivers and uncertainties to be included in the scenario narratives.

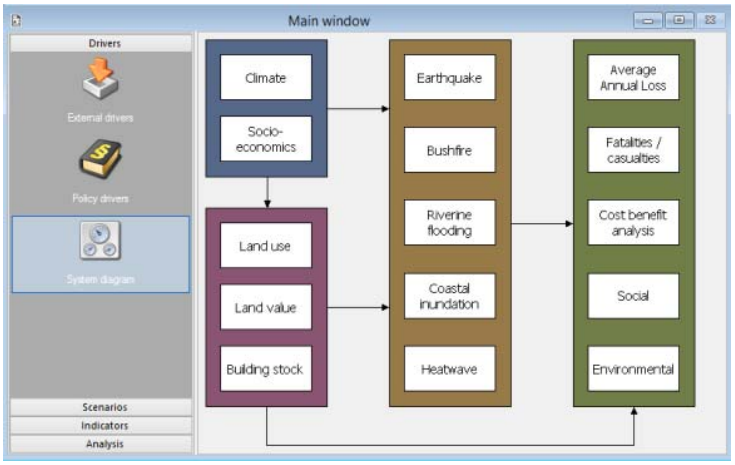

FIGURE 2 THE MODELLER OVERVIEW FOR THE DSS DEVELOPED FOR GREATER ADELAIDE

The second workshop presents the first prototype of the system (Figure 2) and asks for feedback from end-users. Of particular interest is the consideration of risk reduction options and whether they are included appropriately, and whether sufficient indicators for policy assessment are included. Following this, scenarios are developed by exploring future developments impacting on the effectiveness of risk reduction strategies.

The information from the workshop is fed-back to IT-specialists and scientists who update the system. Qualitative, narrative scenarios are also constructed based on the outputs of the second workshop, providing a sketch for the future of the area along with specific information on key factors such as the economy, institutional issues, the environment, and urbanisation. The scenarios are returned to stakeholders to receive comments before being quantified and modelled. The third workshop shows these quantified scenarios for the region (Figure 3), allowing stakeholders, such as policy-makers across government, to consider the implications of decisions, understand the uncertainties involved in policy and regional development and build strategic capacity in dealing with uncertain futures.

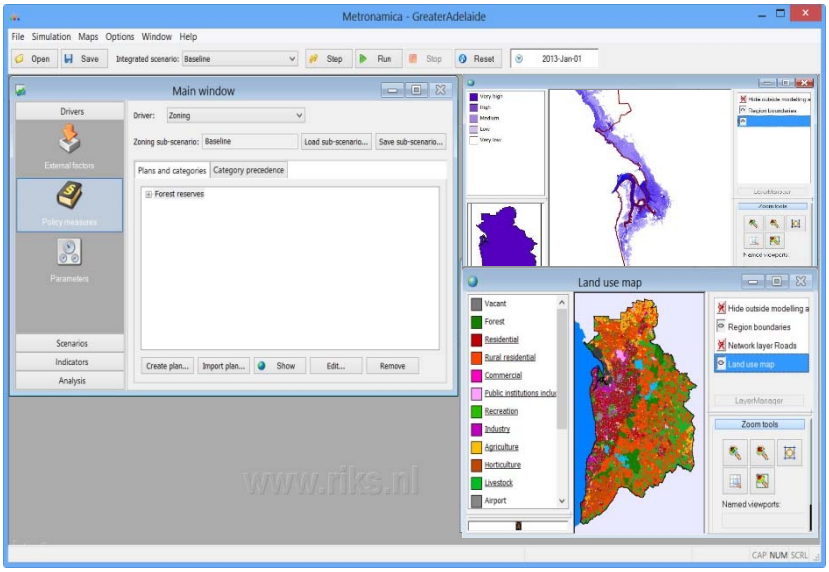

FIGURE 3 THE POLICY OVERVIEW, SHOWING LAND USE AND COASTAL INDUNDATION HAZARD FOR GREATER ADELAIDE

The final workshop focusses on policy development and provides a set of near-to optimal risk reduction policy portfolios for the end-user selected performance metrics. These portfolios can be discussed between modellers and stakeholders to consider the feasibility of implementation. Discussions of the system's integration into decision making frameworks can then be more specifically discussed and considered, as end-users are more aware of purpose and suitability of the system.

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THE UNIVERSITY of ADELAIDE

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