

6 Conclusions

Since their inception, GIS have evolved and are still evolving from simple graphical tools towards being fully developed ‘intelligent’ systems. A GIS is currently being used by *eriss* as a central management tool to coordinate the storage, manipulation and retrieval of information generated by an investigation into the geomorphological impacts of the ERA Jabiluka Mine, Northern Territory, Australia. Data useful to the project are disparate in terms of location, format and the original context in which it was collected. GISs have the unique ability to store, manage and manipulate these highly variable datasets, providing an environment that eliminates problems such as absence of metadata and multiple copies of the same datasets spread through an organisation.

However, although the range of functionality offered by GIS is continually expanding, GIS still lack the full functionality of environmental modelling and statistical data analysis packages commonly used in geomorphological analyses. A GIS centred approach to data management, therefore, retains the data storage, manipulation and retrieval powers of GIS whilst maintaining a degree of flexibility that allows the full use of functionality contained within other software packages. Developing a GIS through which all facets of the geomorphologic impact assessment processes are linked allows a more holistic analysis and explanation of both geomorphic baseline studies and modelling outcomes. Implementation of this approach also allows the simplification of data maintenance, revision and update as well as facilitating availability and access for users.

Soil erosion hazard models form an important first step in investigating erosion patterns within a catchment. GIS-based erosion hazard models allow the user to rapidly investigate the impact of different land use and soil conservation scenarios on a erosion patterns within a catchment. This study has included the evaluation of a relatively simple, GIS-based rapid erosion risk assessment method using recently acquired data for the Ngarradj catchment. Input data required by the rapid erosion assessment approach can be derived from widely available land unit and elevation datasets. The use of the AUSLIG 1:250 000 relief and hydrology dataset, as opposed to land units elevation data, as an elevation data source was found to greatly improve the validity of the rapid erosion assessment approach. The rapid erosion assessment method represents an effective means for quickly acquiring and evaluating existing data to assist in the planning and implementation of more detailed monitoring and modelling programs.

A preliminary evaluation of integrated hydrology/landform evolution modelling techniques and GIS for assessing the possible impacts of mining on the Ngarradj catchment has been conducted. Hydrology and sediment transport parameters were derived from field data collected within the Ngarradj catchment. The derived hydrology parameters were used in the DistFW hydrology model to predict annual hydrographs in order to determine long-term hydrology parameters required by the SIBERIA landform evolution model. The predicted annual hydrographs were also used with the sediment transport parameters to derive annual sediment loss values for SIBERIA. This preliminary assessment of landform evolution in the Ngarradj catchment demonstrates the complex process associated with the parameterisation of the SIBERIA model.

Initial attempts to link the hydrology and landform evolution models with GIS have indicated that the parameter derivation and modelling process can be simplified by the integration of these technologies. Linking these models with GIS provides significant advantages as the GIS assists in the derivation, storage, manipulation, processing and visualisation of geo-referenced

data at a catchment wide scale. Through the rapid production of modified input scenarios, it is anticipated that linking the landform evolution model with GIS will provide a valuable tool for assessing the possible impacts of mining impact on catchment sedimentary and hydrological processes.

The quantification of changes in basin morphology over time represents a significant challenge when conducting an analysis of landuse impact on landform evolution. A suite of geomorphic statistics have been adapted for implementation within a GIS. The hypsometric curve, width function and cumulative area diagram have been shown in this report to be suitable for quantifying landform evolution and therefore can be used to assess the impact of various landuse scenarios on landform evolution. The area-slope relationship, however, was not found to be a sensitive statistic to landform evolution in the Ngarradj catchment. This has been attributed to the complex geomorphology of the Ngarradj catchment.

Additional research is required to develop a more fully integrated GIS and landform evolution modelling approach that is beneficial for the pro-active management of mining and more wide ranging catchment management scenarios. The incorporation of spatial variability in input parameter values in the SIBERIA modelling process will be further facilitated through linking the model with a GIS. Application of the integrated system to investigate the impact of the ERA Jabiluka Mine on landform evolution in the Ngarradj catchment will provide valuable information for the long-term management of the mine as well providing feed-back on the efficacy and user-friendliness of the system. However, the propagation of error and uncertainty through the modelling process must also be investigated in order to provide estimates of model output reliability.

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