



COMMUNITY RISK IN MACKAY

A MULTI-HAZARD RISK ASSESSMENT

Miriam Middelmann and Ken Granger
(editors)

Cities Project
Australian Geological Survey Organisation

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Executive summary

All Australian urban communities face risks from a range of geohazards. Mitigation of these risks will improve community safety, sustainability and prosperity. However, due to the complexity of comparing the risks from different geohazards, few multi-hazard risk assessments have been attempted. This report is the second of AGSO's Cities Project multi-hazard risk assessments, and it develops further the methodology outlined in the Cairns study (Granger and others, 1999). The research assesses the risk to the Mackay community from severe winds and storm tide from tropical cyclones, flooding of the Pioneer River, and earthquakes. The report will be a valuable resource to those who are responsible for, or interested in, the management of these risks – including concerned citizens, elected officials, professional engineers, planners and emergency managers.

Approach

This study makes extensive use of AGSO's Risk-GIS method, which is a fusion of the decision support capabilities of geographical information systems (GIS) and the philosophy of risk management. The analysis of risk involves assessing the levels of hazard at Mackay, developing an understanding of the vulnerability of the elements that are at risk within the community, and synthesising a range of event scenarios. A comprehensive building database is used to generate damage assessments for the various scenarios. Each suburb is ranked for its contribution to overall community vulnerability and for its exposure to the various hazards. These two rankings determine total risk for each suburb by hazard. Finally, overall community risk from the various hazards is compared.

Results

The Mackay community has a high level of residual risk with regard to flooding of the Pioneer River. The community also has a high level of residual risk from severe wind and storm tide. Mackay has a much lesser, but significant, residual risk with regard to earthquakes.

Mackay has a moderate level of risk from hazard events that occur relatively frequently, that is, those with an average recurrence interval (ARI) of 50 years or less. Events within this range will cause some property loss and put lives at risk. However, the existing warning systems and other mitigation strategies already in place should minimise the potential loss of life and economic impact **provided the population is aware and prepared.**

Riverine flooding, cyclonic wind and storm tide events with an ARI of 100 years or more will inevitably cause significant economic harm and potentially some (possibly significant) loss of life. In these rarer and more extreme events, the loss of critical facilities and the impact on specific community functions such as business activity, especially in Central Mackay, North Mackay, Mackay Harbour, Paget and West Mackay, will add to the magnitude of the risk posed directly by the hazard event itself. These secondary risks are likely to have an effect for a considerable period of time after the initial impact and will significantly increase direct economic and social costs. Consequently, the community will be faced with a long recovery and restoration period. This is especially significant given the Mackay community's heavy reliance on disaster-sensitive industries such as agriculture and tourism.

The older areas (suburbs of South Mackay, Central Mackay, Andergrove, North Mackay, West Mackay, Slade Point and East Mackay) are most vulnerable and most at risk to the impacts of floods, cyclones and earthquakes. The suburbs of Bucasia and Beaconsfield are at significant risk from wind, storm tide and earthquake but not flooding.

Floods in the Pioneer River pose the greatest geohazard risk to Mackay. In the ARI = 100 year scenario (which sets the minimum floor level for new buildings), 18% of all buildings would have overfloor flooding, producing moderate or more severe damage and possibly structural failure. Numerous key facilities would be exposed to inundation. The likelihood of levees being overtopped

and/or breached is high. Evacuations would need to commence well before the water reached the top of the levees in order to minimise the risk to human life and property losses.

Severe wind and storm tide from tropical cyclones pose equal second in there risk to Mackay. Under an event with ARI = 1000 years (the design event for wind), almost 50% of buildings would suffer moderate or more severe damage. Modern design standards for wind-resistant buildings have provided an effective form of mitigation. However, older buildings (which comprise about two-thirds of all buildings in Mackay) are not constructed to these standards and they constitute a major source of residual risk.

As with floods in the Pioneer River, the risk of severe damage to buildings and structural failure from storm tide is high. The potential for loss of life from the rarer, more severe events is high. A storm tide scenario with a 100 year ARI (which sets the minimum floor level for new buildings) indicates that 10% of all buildings would have overfloor flooding, causing moderate or more severe damage and the possibility of structural failure.

Earthquakes also pose a significant risk to Mackay, though this threat is not well recognised. For a 475 year ARI scenario (as specified by the Australian earthquake loadings standard), about 16% of all buildings are expected to sustain damage, although about three-quarters of this damage will be slight. Electric power distribution, medical facilities and commercial businesses are especially at risk from earthquake in Mackay.

The Mackay community appears to accept a moderate level of risk for relatively frequent hazard events (ARI of 50 years or less) due to many factors including familiarity with their occurrence. **Increased community awareness regarding the possible impact of rarer, more severe hazard events could improve the public's understanding of risk, thereby making mitigation strategies easier to implement.**