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Community risk in **GLADSTONE**

a multi-hazard
risk assessment

Cities Project

AGSO – Geoscience Australia



Produced in conjunction with the **Bureau of Meteorology**

And in cooperation with **Queensland Department of Emergency Services,**
Gladstone City Council and **Calliope Shire Council**

MONOGRAPH

Department of Industry, Science and Resources
Minister for Industry, Science and Resources
Senator the Hon. Nick Minchin

Parliamentary Secretary: The Hon. Warren Entsch MP
Secretary: Russell Higgins

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ISBN: 0 642 467102

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EXECUTIVE SUMMARY

Community Risk in Gladstone is the fourth of a series of multi-hazard case studies by the AGSO – Geoscience Australia *Cities Project*. The report considers tropical cyclone, including severe wind and storm tide, and earthquake. It also provides an overview of the risks posed by severe thunderstorm, flood, landslide, heat wave, and bushfire.

The risk assessments in this report focus on building damage. The vast majority of buildings in Gladstone are residential but the major risks facing Gladstone are economic risks that could arise from interruption to the major industry, including the Boyne Smelters, and Queensland Alumina Refinery, and to the facilities of this important regional port.

The study serves as an introduction to the natural hazard risks facing the Gladstone community and as a focus for discussion on those risks. It provides material that may assist decisions on the importance of undertaking further, more rigorous risk assessments and cost/benefit analyses.

We have adopted a systematic approach to the description of the elements at risk in the community and their vulnerability, grouping the various elements into the five themes of setting, shelter, sustenance, security and society. We have developed an overall vulnerability profile of Gladstone that identifies those census collector's districts and suburbs that provide a disproportionate contribution to community risk because of the number and nature of the elements at risk. Of the five census collector's districts that contribute most to overall community vulnerability, two are in Barney Point, one is in Clinton, and two are in South Gladstone.

Our analysis enables us to make the following comments regarding the 'riskiness' of Gladstone.

- **Tropical cyclone severe wind:** The amount of damage estimated to occur as the result of a design level event, a 0.1% annual exceedance probability wind, would equate to total damage to 700 dwellings. Strong winds pose a threat to power reticulation which in turn could pose a very serious threat to industry, especially the aluminium smelter. There are localised areas in which the combination of building age, construction and site conditions could produce high damage levels. The main area of concern lies along the coastal strip in which shielding from the wind and storm tide is likely to be minimal. The neighbourhoods in which the overall wind risk is greatest are located in the following suburbs (in alphabetical order): Barney Point, Boyne Island, New Auckland, Tannum Sands and West Gladstone.
- **Storm tide inundation:** At the 1% annual exceedance probability level, it is *estimated* that 247 buildings or facilities will experience over-floor inundation. The Callemondah area, with its concentration of key transport and logistic facilities on low-lying filled land, together with its high vulnerability index, clearly has the greatest level of risk. Next are the Barney Point port area and the Boyne Island area. These are the two most significant census collector's districts from an economic resources perspective and amongst the most important in Queensland. The viability of Gladstone rests on its port and the port facilities, including the coal loader, the bauxite import and alumina export facilities. These may be made inoperative for a period because of storm tide damage. The residential neighbourhoods that have a high storm tide risk index tend to be in the areas of older residential coastal development, particularly Barney Point and the northern end of Boyne Island. These are neighbourhoods that contain more elderly people and/or people in the lower socio-economic ranges.

- Earthquakes:** Our study area is on the northern margin of the Wide Bay – Burnett earthquake zone, which is the most active earthquake area in Queensland. The earthquake hazard for Gladstone, as read from a national map, is relatively high for an urban centre in Australia, being only marginally lower than that for Newcastle or Adelaide. We have insufficient data at this stage to estimate earthquake risk for the study area. We recommend investigating the feasibility of collecting additional information to produce a reliable, detailed earthquake hazard map, taking site conditions into account, as soft sediments or land fill tend to amplify earthquake shaking. There are localised areas in which the combination of building age, construction and site conditions could produce high damage levels but, fortunately, less than 10% of the structures in the study area are built on soft sediment or land fill. An earthquake risk assessment would enable one to ascertain whether a high magnitude earthquake close to Gladstone would cause damage to the power reticulation network as well as to buildings and other infrastructure. Much of the domestic water reticulation, for example, consists of brittle, and consequently fragile, pipes. Unlike cyclones, there would be no warning of an earthquake by which to shut down plant in a safe and timely manner.
- Floods:** Flood, urban stormwater and flash flooding caused by cyclones, east coast lows or severe storms pose a threat of both fatalities and economic loss in localised areas. There is currently insufficient information available on which to base a risk assessment.
- Severe thunderstorms:** Severe thunderstorms pose a threat of economic loss and fatalities from hail, lightning and wind. We do not have enough information at present to quantify the level of risk. The impact from any one storm will be more localised than that of a tropical cyclone.
- Heatwaves:** In the period between 1803 and 1992 at least 4287 people died in Australia as a direct result of heat waves (Coates, 1996). Given the lack of detailed information about the incidence of heat wave in the Gladstone region, it is not possible to provide a specific risk assessment. The elderly, especially those living alone, are a particularly susceptible group. In the Gladstone study area there were 531 people that were within this group in 1996. They were present in 49 of the 53 census collector’s districts in the study area, with the largest number (38) in a census collector’s district located in South Gladstone.
- Bushfires:** Whilst bushfires in Gladstone have not been as severe as the worst fires in the southern states, serious fires have occurred in the region during most months of the year. Bushfires do destroy property (including urban property) and they do kill people in Queensland. The overall risk of bushfire damage is higher in rural areas, and in urban areas near the interface with the ‘bush’, than in built-up areas further from the vegetation boundary.
- Landslides:** Auckland Hill, one of the lower hills in the study area, was subject to landsliding in the 1960s and in 1988. There are a number of other hills that may also experience slope instability in torrential or prolonged heavy rain, particularly in areas developed with cut and fill without appropriate mitigation measures. We recommend establishing a database of landslides from cuts and natural slopes to aid in risk assessment.

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