CoastAdapt

Snapshot

Using data to assess **coastal hazard in Townsville**

Summary

Townsville City Council gathered and developed data sets that would help them understand which council, community and private properties would be at risk of coastal flooding for a sea-level rise of 0.8 m and storm tide inundation in 2100. Maps were produced to show those areas at risk of flooding in the future. This information, along with stakeholder input and economic modelling, was used to identify, assess and rank adaptation options. The council has used the results to help keep a focus on adaptation through prioritising actions, understanding resource needs and working out the optimum timing of action. The findings of the Coastal Hazard Assessment Strategy (CHAS) have been incorporated in the most recent Townsville City Plan.

Keywords

Flooding, planning, data, coastal hazard

Townsville City Council, a rapidly growing coastal city of approximately 190 000 people in North Queensland, is already exposed to a range of coastal hazards including erosion, storm tide, flooding from the sea and sea-level rise. The council has undertaken a Coastal Hazard Adaptation Strategy (CHAS) to consider the risks of three coastal hazards: coastal erosion, storm tide and sea-level rise. Project partners included the Local Government Association of Queensland, the Queensland State Government and consultants from GHD Pty Ltd and Griffith University.

The project looked at which council, community and private assets would be at risk of flooding through a data gathering and mapping exercise. Observational information on building structures was used to make a first pass assessment of floor heights. This was then combined with digital elevation models and a digital cadastral database to model the extent of inundation using the 'bathtub' approach.

Risk maps were created in the first instance for a sea-level rise of 0.8 m by 2100 (relative to 1990) taking into account erosion prone areas, and to show the possible extent of flooding in a 1 in 100 year storm tide for 2100. A range of other scenarios (more severe events, sea-level rise at years between now and 2100) were also modelled to build a clear picture of changing risk for each locality.

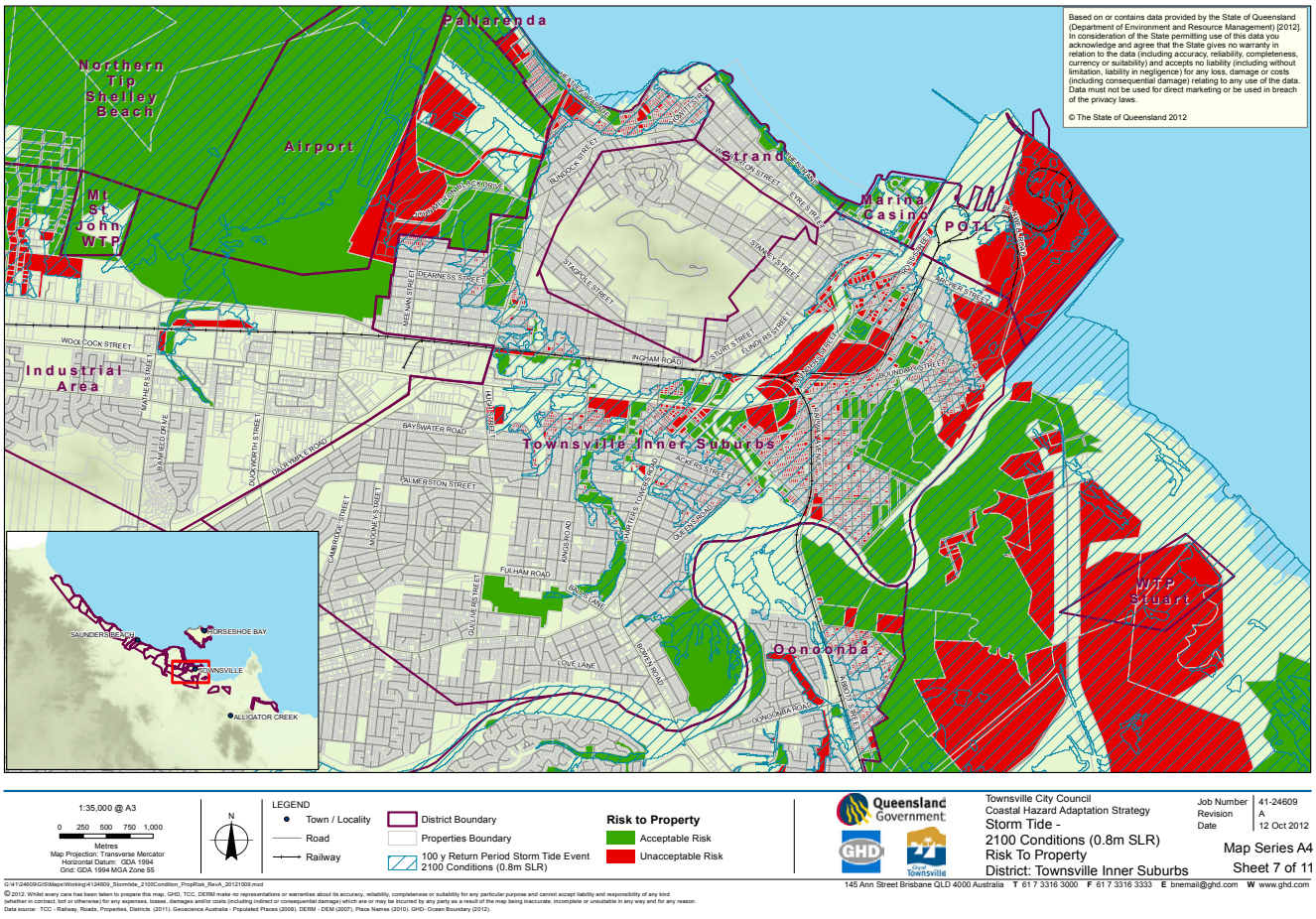

Figure 1: Map of Townsville indicating the level of risk associated with storm tide flooding under 2100 conditions (0.8 SLR). Green = acceptable, Red = unacceptable. Source: GHD 2012 (Townsville CHAS – Appendix A, Part 4). Townsville City Council, © State of Queensland 2012.

The output of the initial data analysis was a series of risk maps (Figure 1) in which each area of flooding was classified as either an 'acceptable risk', a 'tolerable risk' or an 'unacceptable risk'. The level of risk was based on storm tide flooding and permanent inundation of open spaces, buildings and infrastructure and whether communities or individuals would be expected to live with the risk or not using criteria agreed within the Townsville City Council (Table 1).

For each locality with an identified risk, a set of alternative 'accommodate', 'retreat' or 'maintain status quo' adaptation options were considered. These were then assessed and ranked through a process of stakeholder and council executive consultation informed by the risk mapping, some preliminary costings and local knowledge together with multi-criteria analysis (MCA) using agreed decision criteria. A shortlist of options was then subjected to more extensive economic analysis using a benefit-cost analysis framework. This showed the options with a positive net present value (i.e. a cost effective project) and the options without. The analysis was used to estimate the best time to undertake each adaptation option and its economic viability. An example of an assessment of the adaptation options for the inner suburbs of Townsville is shown in Table 2.

The Townsville City Council CHAS project used a very methodical and data-strong approach to, first, identify its hazards and risks and, second, determine 'preferred' adaptation investments and actions. The CHAS proved to be a complex undertaking, and the level of complexity was not fully appreciated at the outset of the project. Significant effort and data were needed to gather the basic information required to understand future risks and impacts, identify appropriate adaptation actions, and cost and assess options. The Council has seen the benefit of the exercise to keep a focus on adaptation through prioritising actions, understanding the resources needed and the timing of action and funding. The findings of the CHAS have been incorporated in the most recent Townsville City Plan.

Table 1: Example of agreed thresholds used to identify areas of risk in Townsville under climate change. This table includes risks associated with storm tide flooding and permanent sea-level rise inundation. Red = a risk unacceptable to community and individuals and where measures must be taken to reduce the risk. Yellow = tolerable risks that society can live with but should be reduced where reasonably practical. Green = acceptable risk that society can live with and do not require risk reduction. Source: GHD 2012 (Townsville CHAS – Appendix A, Part 1).

Hazard	Residential property	Commercial or industrial property	Open space/rural / other
Event: 1 in 100 year	Above floor flooding	Above floor flooding	
Permanent inundation SLR >5% of block			
Permanent inundation SLR <5% of block			

Table 2: Example of adaptation options considered and assessed for Townsville Inner Suburbs. Source: Modified from GHD 2012 (Townsville CHAS).

Strategy	Description	MCA score	Project NPV ($M)	NPV Project minus NPV Maintain Status Quo ($M)	Optimal year to implement	PV Cost of Adaptation investment ($M)
Defend 1	Combine defend, accommodate and retreat actions	72	$724	$1732	2027	$190
Defend 2	Combine defend, accommodate and retreat actions with planning amendments	61	Assessed via MCA only	Assessed via MCA only	Assessed via MCA only	Assessed via MCA only
Defend 3	Combine defend, accommodate and retreat actions with planning amendments	53	Assessed via MCA only	Assessed via MCA only	Assessed via MCA only	Assessed via MCA only
Accommodate 1	Flood proofing, coastal defence, land change and acquisition	31	Assessed via MCA only	Assessed via MCA only	Assessed via MCA only	Assessed via MCA only
Accommodate 2	Similar to Accommodate 1 but defend only against SLR	26	Assessed via MCA only	Assessed via MCA only	Assessed via MCA only	Assessed via MCA only
Retreat	Local infrastructure protection, land use change and acquisition	55	-$215	$792	2027	$1132

Reference

GHD, 2012: Coastal Hazard Adaptation Strategy for Townsville City Council. Report prepared for Townsville City Council. Accessed 15 June 2017. [Available online at https://www.townsville.qld.gov.au/building-planning-and-projects/council-projects/townsville-coastal-hazard-adaptation-strategy].

Further reading

A longer case study: https://www.nccarf.edu.au/localgov/case-study/townsville-coastal-hazard-adaptation-strategy (accessed 15 June 2017).

Townsville City Plan: https://www.townsville.qld.gov.au/building-planning-and-projects/town-planning/city-plan (accessed 15 June 2017).

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