Climate Change Adaptation Research Grants Program
- Settlements and Infrastructure Projects

Project title:
Reforming Planning Processes Trial: Rockhampton 2050

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Objectives:
To determine and demonstrate/trial how existing urban planning principles and practices could accommodate climate change (CC) and the uncertainty of CC impacts for a "seachange" region. Rockhampton Regional Council (RRC) will form an alliance of neighbouring small regional councils and work with partners to:

- develop and apply spatial information to trial planning approaches in a 'real world' situation involving three levels of government and community engagement. (includes a "brand new town" site evaluation effort.)
- influence other Councils to take action through producing a mechanism and process to enable the mainstreaming of climate change adaptation within local government.
- address a critical gap in knowledge by prioritising the need for (and potential benefits of) further research and reforms in regulatory, capacity-building, and/or other instruments as enablers for the integration of climate change risk assessment into planning.

Project design and methods:
The study will achieve the research objectives through (a) natural hazard modelling methods incorporating climate change uncertainty analysis, (b) innovations in visualisation and engagement/alliance designed for the provision of information and education (including historic events) that help stakeholders 'connect' with the science to support informed choice-making, and (c) case study evaluation methods to evaluate the tools and other methods trialled and recommend opportunities for further improvement and research.

The *tropical cyclone wind* component of the project will create a series of GIS overlays that provide an estimation of the spatial extent of the severe wind hazard assessed due to tropical cyclones in the study area. The wind hazard assessment methodology is similar to that used by Geoscience Australia in undertaking the National Wind Risk Assessment. This methodology utilises the following data inputs in the application of Geoscience Australia's Tropical Cyclone Risk Model; Historical tropical cyclone records, Digital Elevation Model (DEM), land-use classification map and estimates of change in frequency, intensity and tracks of tropical cyclones to 2070 for low-, medium- and high-greenhouse gas emission scenarios. To determine the level of wind hazard, regional scale wind hazard will be combined with local, directionally-dependent wind speed multipliers (evaluated from the DEM and land-use classification map). The wind hazard scenarios will be relevant to the local building standards.

The *storm surge inundation* component will create a series of GIS overlays that provide an estimation of the spatial extent of the hazard assessed due to inundation (combined effects of storm surge, sea-level rise and coastal recession. The inundation assessment methodology is similar to that used by Geoscience Australia in the National Coastal Vulnerability Assessment and utilises the following data inputs in the application of the "bathtub approach" adapted from Eastman (1993). The study will utilise the existing high-resolution LiDAR DEM (horizontal □ 50cm and vertical □ 15cm) recently flown for the study area. Sea-level rise estimates (low, medium and high) for 2070 will be obtained from regional projections used by Queensland State Government, and the storm-surge data (current climate) for 1 in 100, 500 and 1000 events for Yeepon / Emu Bank tide gauges (Harper, 2004). The cyclone modelling will inform future storm surge hazard in the region. The extent of coastal inundation will be determined by combining the potential sea-level rise to 2070 will the maximum

predicted tidal height, and the 1 in 100 (500 & 1000?) year predicted storm surge height. These combined components provide a potential high water level that is projected onto the coastal topography (provided by the LiDAR DEM) to estimate areas that might be inundated under each scenario and storm surge projection.

Coastal Recession will be examined utilising the "Smartline" and the National Coastal Geomorphology datasets. The sections of the coast assessed as potentially unstable and therefore prone to recession due to SLR will be identified. The potential for these sections of shoreline to retreat will be assessed to create a Zone of Potential Instability (ZPI). Historical shoreline analysis will be used to evaluate the validity of the recession buffers applied to create the ZPI's. Using historical aerial photography this analysis will validate these assumptions by identifying any existing erosional trends under know climatic conditions. The combination of the zones of potential instability (ZPI) with the modelled areas of inundation underpins the identification of the areas of the Rockhampton Regional Shire most likely to be affected by the combined hazards of erosion and inundation for the defined 2070 scenarios.

Bushfire hazard is a significant threat to the Rockhampton regional community. Rockhampton was declared a disaster zones following the October 2009 fires where on October 20th about 200 homes at Norman Gardens were placed on high alert because of the Mt Archer bushfires. Current bushfire hazard analysis for the region (June 2008) titled "Bushfire Risk Analysis for the Rockhampton Regional Council" was produced by the Queensland Fire and Rescue Service (QFRS) as a "guide only" for planning purposes. It details LOW, MEDIUM and HIGH risk levels based on fuel/vegetation data only. The classification is based on hazardous vegetation and has been undertaken mainly using remotely sensed imagery. Small areas of vegetation measuring less than 5 hectares in area (which proved problematic in the 2009 Victorian fires) including linking vegetation strips that comply with the requirements of the planning guidelines, are not considered. An assessment of the meteorological risk of extreme fire conditions in conjunction with prolonged periods of reduced rainfall will be considered. Meteorological conditions influence the likelihood of crown fire development within a region and/or the spot fire ignition potential for the region. The influence of climate change on these drivers of fire hazard needs to also be considered. This analysis assessing the Forest Fire Danger Index (FFDI) will be conducted using the Rockhampton Aerodrome Meteorological Office (AMO) data for current climate and a range of models (from IPCC 4th & 5th Assessment Reports) to provide guidance regarding how the hazard with be modified by climate change. The bushfire overlays (both current climate and the range of future climate scenarios; low, medium & high) aim to increase the understanding of, and ability to manage, bushfires in the Rockhampton region in order to reduce the risk to firefighters, the community and the environment through improve planning for both development and emergency services. The project will provide advice to local government and the community and contribute to guidelines on best practices for fire risk management.

Flooding: The Queensland State Government is in the process of revising the State Planning Policy related to flood risk management. As part of this revision a methodology is being proposed to incorporate climate change into the flood risk assessment. This methodology is in the process of being assessed by the Scientific Advisory Group for this study, but once it has been approved it will be the recommended methodology for local councils to assess their flood risk for planning purposes. The application of this methodology will be an important input into this project.

Project Design

The project has clearly stated objectives which address research priorities set out in the S&I NARP as well as the priorities of RRC, and the project has been designed to leverage the best methods and capability in Australia in relation to the research questions. Final development of the project design is proposed after the review of literature for methodology phase scheduled into the timeline (see gantt chart) and though engagement with the Queensland Government's Climate Change Centre for Excellence, Department of Infrastructure and Planning, Local Governments, Fitzroy Basin Association and the Fitzroy River and Coastal Catchments Inc body, and the 'Emergency Management Queensland' State department.