Climate Change Adaptation Research Grants Program
- Emergency Management Projects

Project title:
Harnessing private sector logistics for the emergency supply of food and water in flood-prone areas

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Objectives:
Based on the expectation of increased frequency and/or intensity of cyclonic events due to climate change, carry out a nationally-applicable scoping study using the Cairns community to

- Estimate the economic benefits of continuity of supply of water and fresh food to isolated communities.
- Based on the stated alimentary preferences of residents, estimate the additional economic costs of supplying water and food using
  - conventional public sector Emergency Services; and
  - harnessing potential private sector logistical arrangements as an alternative.
- Compare the relative efficiency of public and private sector arrangements, and estimate any additional government subsidies justified by cost-benefit analysis.

Project design and methods
Towns such as Cairns and Ingham were isolated in February 2009 because major roads were closed due to flooding, reportedly resulting in shortages of food, medical supplies and other goods. Disasters that disrupt commercial supply chains ultimately affect both consumers' needs and firms' profits. It is therefore likely that private sector retailers of food, for example, have an incentive to establish contingency arrangements, but the cost of doing so may be prohibitive. On the other hand, supply of necessities by public sector agencies is also expensive. This project is designed to estimate the relative costs of public and private sector provision, and to compare them to the benefits that an isolated community would gain.

Climate change and 'isolation flood' frequencies
Achievement of the research objectives outlined on the first page above depends firstly on estimating the likely climate-induced change over the next 100 years in the frequency of flood events ('isolation floods') that would preclude delivery of fresh food to Cairns residents through everyday commercial supply chains.

Current cyclonic events will be modelled using an extreme value distribution such as the Gumbel to provide a basecase probability density function. Available CSIRO modelling of tropical cyclone activity combined with the six IPCC 2001 Special Report on Emissions Scenarios (SRES) A1F1, A1B, A1T, A2, B1, and B2 will then be applied to the basecase Gumbel to produce six new distributions of projected cyclone activity. Employing Monte Carlo analysis on the assumption of equal probability of occurrence for each of the six new distributions, projections will be generated for each year from 2010 to 2100 of expected frequency (days of cyclone activity) and intensity. Projected frequencies and intensities for each year will indicate the degree of isolation that might be expected in that year. Estimation of costs and benefits will be based only on years where storm intensities are projected to exceed a minimum level that has historically resulted in isolation of the Cairns community due to flooding.

One reason for modelling costs and benefits at different points in time is that it is possible that it may not be cost-beneficial to institute private sector arrangements in the near term, but may become so if the frequency and/or intensity of flood events increases substantially over the course of the century. On the other hand, it may be that public sector arrangements remain preferred throughout. Unless net benefits are estimated for each year over the course of the century, identification of possible switching points will not be possible.

Benefits

A Contingent Valuation Method survey will be conducted to elicit willingness to pay for continuation of supply of water and fresh food. A key aspect of the survey will be to elicit willingness to pay for differences in supply frequency, from 'business as usual' to a delay of up to 10 days before supplies of fresh food and water are resumed.

Estimation of benefits will take into account projected population growth rates for the Cairns region. Depending on advice obtained from Cairns City Council officials, local focus groups, and Emergency Services personnel, estimation of benefits will also be informed by factors such as the likely ability of local residents to continue to cook food and to access retail distribution points. For example, it may be realistic to assume that most residents already have, or would be willing to purchase bottled gas barbecues to ensure an ability to continue to cook food for themselves and/or neighbours. Modelled benefits will only accrue during flood events; non-use values, such as willingness to pay for peace of mind because of the mere existence of arrangements to supply fresh food and water, will not be separately estimated.

Costs

Public sector costs will be modelled as 'business as usual' in terms of the current state of equipment, operational methods, training of personnel, etc., although appropriate adjustments will be made for likely increases in population, road and rail upgrades, a changing climate, etc.

The cost of supplying food and water by a private sector alternative will be estimated in terms of requirements to supplement everyday commercial logistical arrangements. Alternative strategies will be assessed in the light of discussion with major retailers, emergency services personnel and Cairns City Council officials. On the basis of commercial advice, the capital and operational costs of new warehouses, refrigerated containers, upgraded road and rail, specialised vehicles, and wharves (depending on alternative, or mixed strategies involving stockpiling, supply by sea, continued supply by road, etc) will be estimated using input from the CSIRO EpiCast model and related analysis.

Results

As with any cost-benefit analysis, full account will be taken of institutional and cultural factors to ensure a credible and realistic representation of the social benefits and social costs. Desktop research and literature searches (including 'grey' literature) will be complemented by active discussion with key stakeholders to ensure that all relevant factors and information are identified at an early stage.

Following estimation of net benefits for each of the private and public sector alternatives for each year over the century, it will be possible to identify an optimal strategy for the provision of fresh food and water. The methodology, and possibly some of the results are highly likely to be capable of being applied to other coastal communities isolated by cyclonic floods and other natural disasters for Australia as a whole.