Geoscience Australia's submission

Productivity Commission inquiry
into
natural disaster funding arrangements

June 2014

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Executive Summary

The cost of natural disasters in Australia is large and projected to increase. The Australian Government bears much of this cost through the support it provides to the jurisdictions in relief and recovery funding following disaster events. There is a need for informed investment decisions to curb these costs through the mitigation of the vulnerability of communities and the promotion of community resilience to natural disasters. An example of effective mitigation is the improved building standards in Darwin following the 1974 Tropical Cyclone Tracy. A simulation of Tracy's impact on Darwin in 2008 by Geoscience Australia (GA) estimated the damage severity in terms of reconstruction cost to be 90% less than that incurred in 1974.

However, evidence indicates that the take-up of options for reducing vulnerability is minimal and, thereby, is limiting potential reductions in the cost of future disasters. Strategies for promoting decisions to invest in mitigation and resilience building rely upon an evidence-base (scientific information) to inform government policy, business, the insurance industry and individual community members. The information can enable cost-effective choices to be made from available options and the development of incentives for these initiatives to be undertaken. GA can assist with this need by providing nationally consistent data for risk assessment, quantitative information on multi-hazard community risk and an understanding of the opportunities for reducing it. This assistance particularly responds to Items 4 and 5 of the Productivity Commission's terms of reference.

The GA submission is primarily focussed on two key areas of the terms of reference, namely:

- "Options to achieve an effective and sustainable balance of natural disaster recovery and mitigation expenditure to build the resilience of communities, including through improved risk assessments." (Item 4)
- "Projected medium and long-term impacts of identified options on the Australian economy and costs for governments as compared to impacts of the current funding arrangements." (Item 5)

Introduction

Background

Australia has been impacted severely by natural disaster events in recent years. These have included the 2009 Victorian bushfires, the floods in Queensland and Victoria in 2011, and Tropical Cyclone Yasi that impacted North Queensland shortly thereafter. Disaster losses in Australia are also rising and will continue to rise into the future according to industry modelling[i]. The Australian Government bears a significant proportion of the cost of natural disasters through the Natural Disaster Relief and Recovery Arrangements (NDRRA)[ii]. Comparatively, Australian Government expenditure on mitigating disaster impacts and costs is small and this is due, in part, to a limited and inconsistent evidence-base for informing expenditure. There is also increased recognition that insurance, businesses and individuals can contribute to disaster resilience and mitigation. However, this also requires an evidence-base to quantify the benefits and costs to prioritise different options[iii].

This submission highlights some of the key information requirements for evidence-based investment in mitigation and the promotion of resilience and recovery. The evidence-base is also required to develop policy that will influence such investment and promote resilience. It further describes existing capability within GA and suggests how this capability can support decision making to curb and potentially reduce the future cost of natural disasters.

Geoscience Australia

GA is a prescribed agency within the Industry Portfolio of the Australian Government. GA is the nation's geoscience agency and custodian of geographic and geological data and knowledge of the nation. We create, maintain and disseminate geo-scientific information and knowledge for the economic, social and environmental benefit of Australia. It produces a range of information products to those involved in managing natural hazard risk in the form of both fundamental data and derived information on risk, resilience and mitigation. GA collaborates with a range of Australian Government agencies and departments, state and local governments along with industry and the broader research community.

The internationally recognised approach[iv] to the assessment of natural hazard risk, its drivers, and the opportunities for reducing this risk requires information on:

- the hazards of interest;
- community exposure (the community assets of value including socio-economic value); and,
- asset vulnerability, or its susceptibility to damage from the hazard.

The combination of these elements indicates the impact of a particular disaster in several ways, including financial cost. To evaluate mitigation or resilience options, information is needed on how these elements may change through mitigation strategies. For over a decade GA has been actively undertaking risk research developing these elements and integrating them with a range of tools.

Within this approach, GA provides fundamental data and has developed information products and models that enable the agency and external users (private and government) to assess quantitatively natural hazard impacts and risk. Examples of fundamental data include:

- Elevation data;
- Satellite imagery;
- Earthquake event catalogues;
- Landslide data; and
- Post disaster survey data on community impact, recovery and resilience.

Examples of derived information and models include:

- Land-cover and land-use data;
- Fire scar mapping;
- Historic flood footprints (water observed from space);
- Catalogued flood studies in the Australian Flood Risk Information Portal;
- Nationally consistent information system of community assets, or exposure (NEXIS);
- Earthquake, cyclone and tsunami hazard models and national hazard data;
- Asset vulnerability models for a wide range of hazards; and
- Impact and risk information derived using integrated earthquake, tsunami and cyclone wind modelling capabilities.

The products the agency produce are typically quantitative, fully discoverable (where possible) and support policy development and the evaluation of mitigation strategy cost-effectiveness. They can also be used to assess resilience measures developed by others.

This submission discusses the key drivers behind increased disaster costs. It also outlines the data and information required to better understand natural hazard risk, and proposes directions for developing an evidence-base that can assist in promoting the up-take of mitigation and resilience building strategies.

Increasing costs of natural disasters

Rising disaster costs in Australia have been linked to a set of drivers associated with the assets at risk and their vulnerability.

Assets at risk, including people, buildings and infrastructure, are expanding both in density and in value in Australia. Most of the exposure in Australia is located in the coastal zone, on coastal flood plains or along river systems. The preference of many Australians to live near the coast has persisted since European settlement, resulting in increasing exposure in some of the most hazardous regions of the country. Furthermore, much of this exposure predates appropriate standards for design and construction. With an annual rate of building replacement of only 2%, no requirements for retrofit, and limited planning requirements for retirement of flood or storm surge prone properties, GA analysis has found that vulnerable older assets presently make up a large proportion of communities and drive most of the community risk. For example, many coastal communities in North Queensland have building stock that comprises 60% legacy buildings that do not meet current wind-loading standards. Finally, investment decisions made by property owners rebuilding after natural disasters are often sub-optimal in reducing asset vulnerability for future disasters.

The rebuilding decisions made for damaged homes after the Brisbane region floods of January 2011 illustrate the need for informed investment in risk reduction. In a 2012 survey of Brisbane and Ipswich households that were impacted by floodwater in 2011, GA found that repairs and reconstruction most commonly did not serve to mitigate risk and the future cost of flood events. Around 60% of the 1174 respondents to the survey indicated that they had rebuilt their homes as they were previously, with no mitigation for future events.

Australian households and businesses are becoming more dependent on sustained delivery of utility services. Communities are also growing and changing in their demographic profile. Populations are aging and many retirees are moving to live in the near-coastal zone. Furthermore, there is a growing expectation that government will provide relief funds following natural disasters.

While by no means an exhaustive list, the above includes some key factors linked to increasing disaster costs. Moreover, these trends are likely to continue driving up future costs unless more effective risk management measures are taken.

Evidence-base for natural disaster mitigation, resilience and recovery initiatives

Mitigation can target any or all of the components of natural hazard risk: hazard, exposure or vulnerability. It serves to reduce the impacts of disasters, improve the resilience of communities to natural disasters and disaster recovery costs for governments. However, the evidence-base needed to evaluate options and to develop effective policy requires an understanding of how the components interact in order to assess the long-term impact on risk and resilience. The following section outlines some essential elements underpinning this understanding.

Consistent and discoverable data

Nationally consistent and fit-for-purpose risk assessment data is essential to provide input into decision making for all levels of governments around disaster mitigation, resilience, response and recovery initiatives. To maximise its impact, and enable the effective sharing of information and knowledge, this data needs to be authoritative, accurate and accessible[v]. Limited accessibility or availability of data can restrict a better understanding of the variable nature of the occurrence and impacts of natural hazards. This understanding is key to assessing a range of risk management options, including urban planning, building standards, and insurance pricing.

For example, elevation data is fundamental to understanding flooding and coastal inundation hazard, but high quality data of suitable resolution is not nationally available. LiDAR is an effective source of high resolution elevation data but, even where it exists, it is often inaccessible. Investment in the National Elevation Data Framework (NEDF), hosted by GA, has supported both coastal LiDAR acquisition programs and access to state owned coastal LiDAR. Furthermore, this project has developed the NEDF Portal, an online discovery and access point for national, regional and high resolution digital elevation data.

Consistent and quantitative exposure, vulnerability and resilience information

National scale information that can be integrated within the risk framework is needed to understand resilience and risk and to prioritise policy or mitigation options for governments, industry and the community. This requires quantitative and consistent information at a national scale that is granular enough to be meaningful to distinguish regional and local variations.

Asset or exposure information is fundamental in the development of risk-assessments. Exposure information must be combined with hazard, vulnerability and resilience information, requiring exposure characteristics that can link to vulnerability and resilience. However, very few data sets exist that allow national scale assessments of risk or resilience. For example, many resilience models have been developed which are social indicators for which the required exposure information is insufficiently available to allow quantification of resilience from national down to local scale. Furthermore, because of the lack of integration of many of the resilience indicators and models, it is difficult to quantify how the risk or resilience would change with various resilience strengthening strategies.

An example of national scale information is the National Exposure Information System (NEXIS). NEXIS was designed to provide nationally consistent exposure information for local, regional or national impact analyses. It currently maintains information about residential, commercial and industrial buildings sourced from publically available fundamental data which includes demographics, property information and economic information. GA is continuing to develop and expand NEXIS to include basic transport and utility infrastructure, as well as leading a research project with the Bushfire and Natural Hazards CRC to develop a broader national exposure modelling framework for future implementation.

Long-term, quantitative risk information

National risk and resilience information enables the evaluation of mitigation options or recovery spending. Such risk information needs to extend beyond the historical record, as many high risk communities have not experienced a major event in their recorded history.

For example, Cairns in North Queensland has escaped a major cyclone wind/storm surge impact to date, although the likelihood of such an event is significant, and the associated consequences very large. Also large earthquakes are infrequent but can cause catastrophic destruction. Sydney is listed as one of the top 20 reinsurance earthquake risks in the world due to its high exposure and vulnerability but has not experienced a damaging earthquake.

Risk models, also called ‘catastrophe models’, which fully quantify the long-term hazard as well as vulnerability and exposure in these locations are extensively used to assess and manage the long-term risk by insurers and industry. The models permit events beyond the historical experience to be understood and considered in mitigation decisions. Such models have not been used to date by governments in Australia.

There is a wide range of options to reduce and manage community risk and promote resilience. Costs and benefits of these options need to be quantified to identify the most cost-effective

mitigation strategies through reduced hazard exposure, reduced vulnerability and the promotion of resilience. Information based on long-term risk models should be discoverable and available to government, industry and private asset owners alike to support better decision making.

Within this context, GA is currently undertaking the National Flood Risk Information Project in partnership with the Attorney-General's Department. A key component of this Project (to be completing in June 2016) is to develop a central access point (the Australian Flood Risk Information Portal) to improve discoverability, accessibility and quality of flood information for Australia and raise community awareness of flood risks. Flood studies, models and maps are critical inputs to land use planning, and emergency management, as well the design of infrastructure such as buildings, roads and bridges. Flood information is also a fundamental requirement to ensure appropriate assessment of flood risk, and the subsequent pricing of flood insurance.

Targeted communication on mitigation

Information on risk and mitigation options needs to be communicated in a range of forms that can influence decision making by stakeholders that range from private individuals to government. When appropriately presented, the information can promote mitigation investment actions that can reduce future disaster impacts.

An example of information on mitigation effectiveness is that derived from an assessment of the results of improved building standards in Darwin following Tropical Cyclone Tracy of 1974. GA simulated Tracy's impact on Darwin as it was in 1974[vi] and on Darwin as it was in 2008. Damage severity in terms of reconstruction cost for the modern Darwin was estimated to be 90% less than that incurred in 1974 due to the reduction in building vulnerability achieved through improved post-Tracy building standards.

Opportunities

As part of the Government's capability, GA seeks to inform the priorities for mitigation and resilience policy and practice, both for government and the private sector. The following section outlines some opportunities that can be leveraged with better coordination and investment.

Consistent and discoverable data

Accessibility of key data

The more data is accessible (open data), the more it can be used, reused, repurposed and built on, in combination with other data for the benefit of everyone[vii]. Data providers, particularly commercial providers, should be strongly encouraged to remove restrictions and not limit either the open release of derived information, or the resolution (or scale) at which it can be provided. This approach would enable more efficient use of available funds and broaden the user-base. In turn, this would support data custodians in achieving better consistency and quality in the data. Open data creates value by enhancing efficiency (i.e. create once and use many times), promotes greater transparency and accountability of decision making, and enhancing community empowerment to make informed decisions.

Better information during the post-disaster and recovery period

Valuable information for informing the development of mitigation and community resilience promotion options can be sourced following disasters. There is an opportunity to improve the availability of impact and recovery information during the post-disaster response and recovery period by coordinated acquisition of satellite and air flown imagery, and systematic field survey activity. Acquisition approaches should encompass a broad range of information requirements and promote alignment of efforts within Whole of Government. The acquisition should also extend through the recovery period, thereby enabling the assessment of community recovery and the

effectiveness of strategies to promote it in a range of settings. This information can inform decision makers in government of effective and relevant mitigation options for communities.

Consistent, quantitative exposure, vulnerability and resilience information

There is a need to integrate current resilience research into the risk modelling framework. This would quantify the current state of Australian communities for all aspects of exposure, and would assist the prioritisation of investment in improved community resilience. This could be done on a regular basis allowing the quantification of trends in resilience for the jurisdictions with primary responsibility for community resilience and for the Australian Government who can support initiatives to improve it.

For example, this would allow examination of the changes to the risk profile of communities in future years where more effective planning instruments are used, either in reducing exposure to extreme hazards, requiring infrastructure upgrade to reduce its vulnerability or requiring building to higher standards than presently required in high hazard areas. This would also require projecting future community exposure in the context of population growth and the planning strategies being considered. This would enable the prioritisation and targeting of mitigation expenditure to build the resilience of communities.

Long-term, quantitative risk information

There is a continuing need to expand the availability of accessible, consistent and up-to-date national information and advice on hazards, risk, and the underlying fundamental data. Such information can underpin national and regional mitigation strategies and enable the prioritisation of options. Furthermore, such information enables the private sector and individuals to identify appropriate risk management practices, ultimately leading to increased resilience of communities, businesses and individuals.

In the near term, there is an opportunity to expand the approach and infrastructure provided by Australian Flood Risk Information Portal to a multi-hazard platform. This would create accessibility for a wide range of data and information to a range of stakeholders in government, private industry and communities for a range of applications and allow these stakeholders to make informed decisions on the effective balance of mitigation and recovery expenditure.

Mitigation options for legacy buildings and infrastructure

Legacy buildings and other infrastructure that fail to meet current design and construction standards are highly susceptible to damage. There is a fundamental need to develop asset type specific information on how this shortfall can be systematically addressed. Current work is underway funded by the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC) to identify mitigation options for residential buildings exposed to flood and wind. It will also develop mitigation strategies for residential and commercial building types for earthquake. There is a need to develop equivalent options for the full range of buildings (commercial, industrial and institutional buildings) and hazard types, including bushfire and storm surge. There is also a need to develop similar information for infrastructure assets, such as roads and electricity supply infrastructure, supplementing the limited work also underway in the BNHCRC and in some universities. In addition, it is essential to appropriately communicate options to building owners and infrastructure managers, and potentially encourage uptake through adaptive insurance premiums or other instruments. The type of information assists all levels of government, industry and the community to make decision on cost-effective strategies for mitigating damage to buildings and in the future infrastructure.

Summary

Evidence suggests that disaster costs will continue to rise. The provision of authoritative information that supports understanding long-term elements of natural hazard impacts and risks of communities enables governments, industry and community to make informed decisions. A comprehensive inventory of fundamental data for Australian natural disasters and the identification of key gaps would be a valuable exercise.

Nationally consistent and fit-for-purpose data is essential to develop evidence-based policy and input into decision making around disaster mitigation, resilience, response and recovery initiatives. There is a continuing need to expand the availability of consistent and up-to-date national information on hazards, and risk. Importantly, the data must be open, that is data are available and accessible, and that everyone is able to use, reuse and redistribute.

National scale information that is integrated with the risk framework will assist in developing and prioritising options to achieve an effective and sustainable balance of natural disaster recovery and mitigation expenditure to build the resilience of communities.

An evidence-base approach should underpin national and regional mitigation strategies and assist the private sector and individuals to identify appropriate risk management practices and quantify the benefits and costs to prioritise different options. This would ultimately contribute to the increased resilience of communities, businesses and individuals. Similarly, national risk and resilience information can contribute to the evaluation of policy design, mitigation options or recovery spending by Australian Government.

Long-term quantitative risk information can assess the impact to communities and enables the evaluation of mitigation options and potential recovery spending. Risk models need to extend beyond the historical records to quantify the long-term hazards as well as the vulnerability and exposures of many high risk communities that have not experienced a major event.

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[i] For example:
Deloitte Access Economics (2013) *Building our nation's resilience to natural disasters*. Report for the Australian Business Roundtable for Disaster Resilience and Safer Communities
Munich Re (2011). *Weather related catastrophes on the rise in Asia-Pacific*. Press release Munich Re 11/1/2011. www.munichre.com

[ii] AGD (2011). National disaster relief and recovery arrangements. Determination 2011, version 1. Attorney General's Department. www.ema.gov.au.

[iii] Mortimer, E., A. Bergin and R. Carter (2011). Sharing risk: financing Australia's disaster resilience. *Australian Strategic Policy Institute Special Report* 37.
Bergin, A. (2011). King-hit: preparing for Australia's disaster futu5re. *Australian Strategic Policy Institute Policy Analysis* 83.

[iv] For example:
United Nations Office for Disaster Risk Reduction, http://www.unisdr.org
World Bank, http://www.worldbank.org/en/news/feature/2013/10/01/south-asia-investing-today-to-increase-resilience-to-tomorrows-hazards

[v] ANZLIC, http://www.anzlic.org.au/sites/default/files/FSDF%20Booklet%20edition%202_web.pdf

[vi] Arthur, C., A. Schofield and B. Cechet (2008). Assessing the impacts of tropical cyclones. *Australian Journal of Emergency Management* 23(4).

[vii] Lateral Economics (2014). Open for Business: How open data can help achieve the G20 growth target.