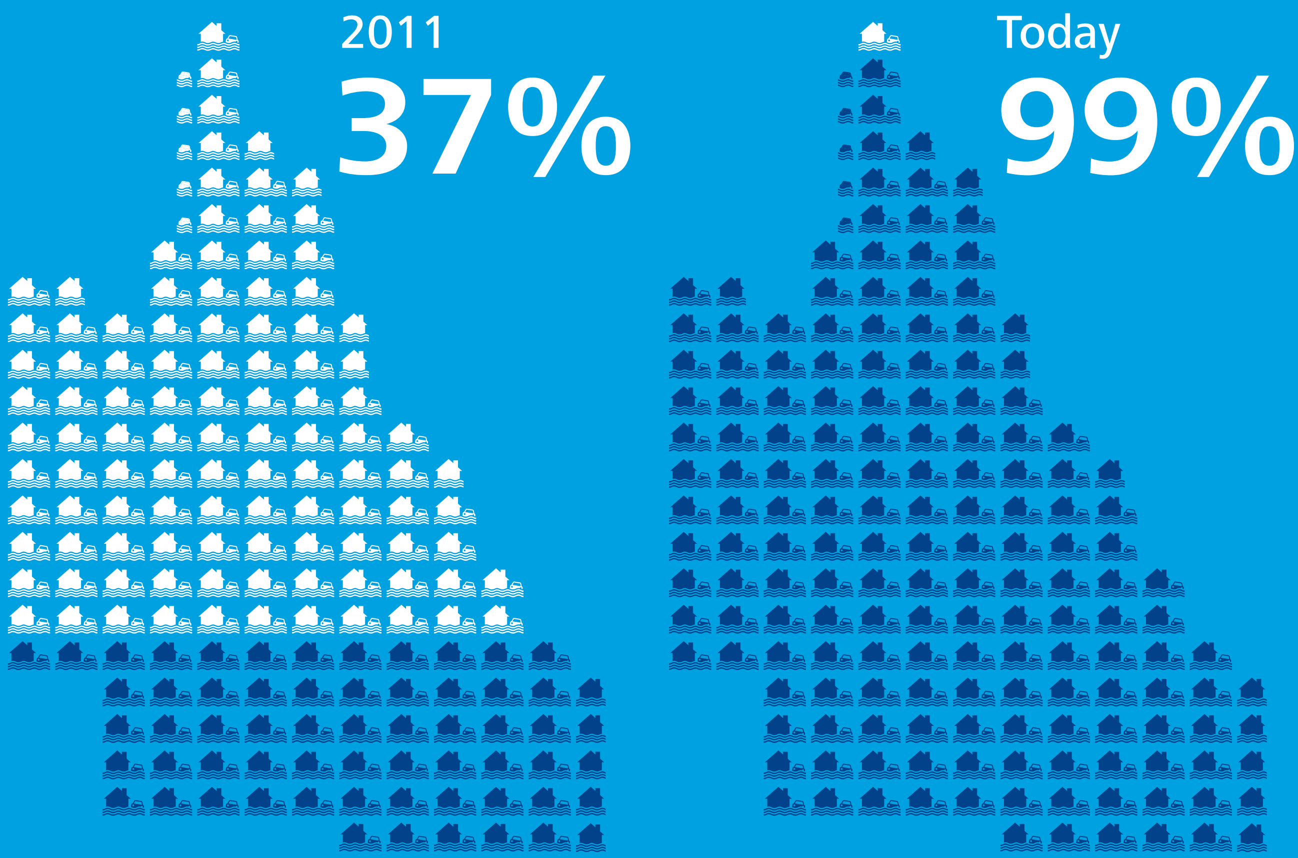
It can be done... Baseline floodplain maps in Queensland



3. Natural disaster data

Key points

The key categories of data inputs used in natural disaster research include:

- **Foundational data:** Base layers of locational information relevant to all hazards, including exposure data and fundamental geographic data. Used for a broad range of purposes, including but not limited to analysis of natural disasters
- **Hazard data:** Hazard specific information on the risks of different disaster types, providing contextual data about the history of events and the risk profile for Australian locations
- **Impact data:** Data on the potential and actual impacts associated with natural disasters, including information on historical costs and damage, and the current and predicted future value at risk.

Gaps exist across all three categories of data.

Significant barriers exist to the better provision, sharing and quality of natural disaster data sets.

There are two key elements to natural disaster information: underlying data inputs and the findings of research activities. This chapter focuses on the first element, setting out a high level summary of the current data holdings relevant to natural disaster risk and exposure in Australia.

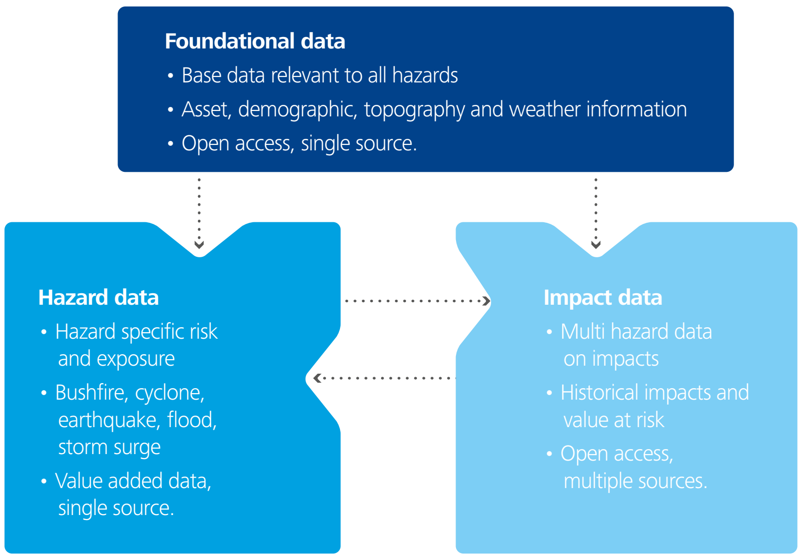
A summary of the key data sets and their custodians broken down by category is provided in tables in Section 3.1. Best practice data management is then explored using Australian Government principles for open data and examples of successful data sharing. This is followed by an analysis of the major barriers to the effective provision of data.

The models used to assess risk are only as good as the data used in their development. It is therefore vital that accurate data is open, transparent and available to end users. Importantly, improved collection and sharing of data will better inform research and decision-making around resilience options.

3.1 Current data holdings

To fully assess the risks associated with natural disasters, a comprehensive spectrum of data inputs from multiple disciplines is required. This encompasses foundational data, hazard data and impact data. Where such data is open, accurate and available, it provides a critical platform for evidence-based research activities and decisions that build resilience across Australian communities. Figure 3.1 outlines the main categories of data sets relevant to bushfires, flooding, earthquakes, cyclones and storm surges.

Figure 3.1: Data categories



Source: Deloitte Access Economics (2014)

Foundational data

Foundational data, which can be used across multiple hazards, forms the base for further peril analysis. Foundational data is also essential as an input to ensure effective decision-making for land planning, building codes and mitigation investment.

As this data can be used for a wide range of purposes, by many users, it should be made open access from a single source.

Table 3.1: Foundational data summary

Category	Data requirements	Data custodian/s
Assets	Location of housing	Australian Bureau of Statistics (ABS), Australia Post, Public Sector Mapping Agencies (PSMA), local governments, private firms
	Location of other infrastructure	ABS, local governments, private firms
	Asset construction data	ABS, local governments, private firms
Demographics	Local population, socio-economic status data	ABS
Topography and geological	Bathymetry	Geoscience Australia
	Elevation data	State governments, local governments, private firms
	Land surface	Terrestrial Ecosystem Research Network (TERN), Geoscience Australia
	Geological	Geoscience Australia
	Vegetation	TERN
Weather	Humidity	Bureau of Meteorology (BoM)
	Rainfall	BoM
	Temperature	BoM
	Satellite and radar data	BoM
	Tide gauge	BoM, local governments
	Wind speeds	BoM, Cyclone Testing Station

Source: Deloitte Access Economics (2014)

Hazard data

Hazard data is specific to a hazard type and relates to risk and exposure. This type of data is generally value-added in nature, providing another layer of information on top of foundational data.

Depending on the circumstances, this data may or may not be made freely available. For example, some data developed by private organisations may be a source of revenue or a competitive advantage and they may be unwilling to share it.

Table 3.2: Hazard data summary

Category	Data requirements	Data custodian/s
Bushfire	Mapping of fire breaks	Emergency services, state governments, local governments, private firms
	Mapping of control burns	Emergency services, state governments, local governments, private firms
	Hazard zones	BoM, local governments, local fire authorities
Cyclone	Historical cyclone tracks and characteristics	BoM
	Wind hazard maps	Australian Building Codes Board
Earthquake	Historical earthquake characteristics	Geoscience Australia
	Interruption contingencies	Private firms, researchers
	Seismic characteristics	Geoscience Australia
	Event shake maps	Geoscience Australia
	Hazard maps	Geoscience Australia
Flood	Mapping of levees / retention basins	Local governments, private firms, researchers
	Mapping of water depth and velocity	Local governments, private firms, researchers
	Hazard flood maps	Local governments, Geoscience Australia, state governments, Insurance Council of Australia (ICA)
Storm surge	Mapping of water depth and velocity	Local governments, BoM, private firms, researchers
	Storm tide analyses	BoM, private firms, researchers
	Hazard maps	Local governments, private firms, researchers

Source: Deloitte Access Economics (2014)

Impact data

Impact data measures the potential and actual impacts associated with a disaster. This includes the costs of damage to assets, emergency response, and human costs in the form of fatalities, injury and longer term social and psychological impacts.

Generally, impact data should be made open to facilitate multiple uses. However in some instances where private organisations have spent considerable resources developing value at risk models, commercial considerations may impede open access.

Table 3.3: Impact data summary

Category	Data requirements	Data custodian/s
Economic costs	Insured losses	Industry bodies, re-insurers and insurers
	Residential, commercial and industrial buildings damaged and destroyed	Emergency Management Australia (EMA), ICA
	Motor vehicles, water vessels, trains and aircraft damage	EMA, ICA
	Farms, crops and livestock damaged and destroyed	EMA, ICA
	Infrastructure damage	EMA, local governments
	Fatalities and injuries	EMA
	Post-disaster health data	Department of Health, Health Insurance Commission, Department of Human Services (DHS)
	Number of people evacuated	EMA
	Number of displaced	EMA
	Social and psychological impacts	Research organisations, state community service agencies
	Impact on employment / livelihoods	Centrelink, DHS
	Impact on public lands	State public land management agencies/departments, research organisations
	Impact on essential services	Private firms, state infrastructure departments, research organisations
	Government relief payments / financial assistance	Commonwealth budget papers, Department of Finance, DHS, EMA
	Costs of response and recovery programs	Commonwealth budget papers, Department of Finance, DHS, EMA, state budget papers, state community service agencies
	Total economic cost	Bureau of Infrastructure, Transport and Regional Economics
Risk models	Value at risk	Local councils, insurance companies, ABS
	Probability or frequency of losses occuring	State governments, local councils, specific researchers, insurance companies, private firms

Source: Deloitte Access Economics (2014)

3.2 Best practice data management

A co-ordinated approach to improved data dissemination and access has multiple benefits for multiple users. In order to achieve better outcomes, best practice principles need to be followed.

As noted in Chapter 2, in 2011 the Office of the Australian Information Commissioner (OAIC) developed a set of principles, listed here, on open public sector information. According to the OAIC, the principles rest on the democratic premise that public sector information is a national resource that should be available for community access and use.

1. Open access to information – a default position
2. Engaging the community
3. Effective information governance
4. Robust information asset management
5. Discoverable and useable information
6. Clear reuse rights
7. Appropriate charging for access
8. Transparent enquiry and complaints process

The principles form the basis of best practice data management. There is a strong case for foundational data, in particular, to adhere to these principles. As foundational data informs research, modelling and decision-making it is important that accurate data is widely available. By providing open access to foundational data through a national platform based on the OAIC principles, decision-making by end users of the data will be improved.

There is also an argument that any data that underpins where a house is built and how it is built (e.g. planning and building codes) should be open access. If not, it may lead to inconsistent or incorrect views of risk and mixed messages to the community, poor decisions around resilience and unnecessary duplication.

Table 3.4 outlines some of the potential benefits of moving towards best practice.

Table 3.4: Benefits of better data

Benefits	Application
Reduced search costs	Researchers can access data without having to devote time and resources to searching for and collating data
Improved research outcomes	Improved research outputs
Better decision-making	Better land planning decisions
	Better emergency response decisions
	Better building decisions
Informed communities	Individuals and homeowners can assess hazard risk easily through central online platforms
Reduced duplication	Transparency and access to available data will reduce the need for re-production
Effective mitigation	Improved building standards
	Informed mitigation investment
Accurate pricing of risk	Consistent insurance pricing
	Availability of mortgages

Source: Deloitte Access Economics (2014)

A current example of best practice data management in the Australian research community is the Terrestrial Ecosystem Research Network (TERN) as outlined in Box 5. TERN demonstrates what can be achieved with adequate infrastructure investment, a concerted effort across organisations and flexible licensing arrangements.

The Bureau of Meteorology is also very well regarded amongst the research community. Some issues exist such as the sparse nature of the wind measuring networks and the time taken to make historical river flow information available, however the overall availability and quality of data is high. Compared to equivalent agencies globally, the Bureau is considered one of the leaders in data provision.

3.3 Gaps in data

Gaps exist across all three types of data. Gaps may occur both where data is non-existent and where it is inaccessible to end users. While this review is not exhaustive, specific examples have been provided to demonstrate areas where gaps can be filled and improvements made.

Elevation data: LiDAR

Elevation data provides information on the land surface such as the bare earth digital elevation models (DEMs) and other land surface objects such as vegetation and buildings often referred to as a land surface model. This data is used across a wide range of perils such as flood, wind and bushfire and can be used for addressing issues relating to urban planning, infrastructure design, water security, environmental management and climate change.

Most elevation data is captured via remote sensing equipment on air craft, satellites or other space craft such as the Shuttle Radar Topography Mission (SRTM). The coverage, accuracy, resolution and costs of different methods vary significantly. Light Detection and Ranging (LiDAR) is typically the most accurate and expensive while coarser national or global scale methods such as SRTM may be freely available. Appropriate quality of data is required to understand the natural hazard risk in some areas. Figure 3.2 illustrates that to understand the flood risk in this geographic area, more accurate methods such as LiDAR would be necessary. Flood modelling undertaken using the SRTM data would produce a significantly different and inaccurate outcome as the watercourse features are not properly defined.

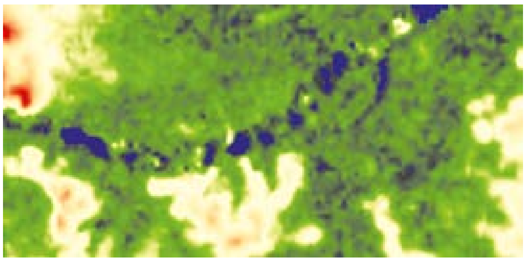
Box 5: Terrestrial Ecosystem Research Network (TERN) – connecting ecosystem scientists

TERN provides the infrastructure to enable the sharing and storage of ecosystem data across disciplines. TERN was created through a $20m grant as part of the National Collaborative Research Infrastructure Strategy in 2009 and $4.1 million from the Queensland State Government. An additional $25.6 million was provided through the Super Science Initiative in 2011.

The TERN Data Discovery Platform delivers open access to Australia's ecosystem data. Researchers in the natural disaster area can access vegetation data through the platform for bushfire modelling. A flexible licensing arrangement allows data sharing by a range of research organisations to make data as openly accessible as possible. TERN's philosophy is 'collect data once – make it discoverable – use it many times'.

Source: TERN (2014)

Figure 3.2: Differences in accuracy of elevation data

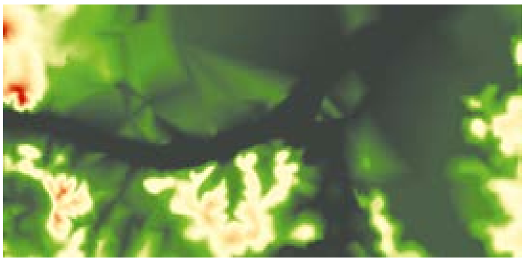


SRTM

Cost: Free

Coverage: Global

Quality: Poor in many areas – cannot be used in some areas



Contour

Cost: Low – moderate

Coverage: Many areas

Quality: Medium

LiDAR

Cost: High

Coverage: Limited

Quality: High

Source: Insurance Australia Group (2014)

There are gaps, however, in the coverage of LiDAR data available in Australia. In areas that are covered, the data may be held by different custodians in different formats with different licensing arrangements. Differences in the quality, and thus the accuracy of elevation data is another important issue, relevant to all types of natural disasters in Australia.

Geoscience Australia holds approximately 200,000km^2 of LiDAR data predominantly over and around built-up and coastal areas. The largest strip of contiguous LiDAR data extends along the coastline from north Queensland around the south-east to Adelaide. Other data sets represent the coastal regions of Tasmania (northern and south east coasts), Darwin, Kakadu and the Perth region south to Busselton.

New data set acquisitions exceeding 50,000km^2 are currently underway along floodplains of the Darling River, to be completed in 2014. Co-ordination of LiDAR acquisition exists through the Intergovernmental Committee on Surveying and Mapping through the Elevation and Depth Working Group currently chaired by Geoscience Australia with representation from all states and territories.

Currently the only LiDAR surveys that are licensed for non-government (Creative Commons) use are the most recent acquisitions over the Darling River floodplains. All other projects have been licensed for internal government use only and are available to all levels of government. Therefore there is very limited LiDAR data currently available to the general public through Geoscience Australia over the populated parts of Australia.

Since the inception of the National Elevation Data Framework, new LiDAR acquired by government (mostly states) has shifted significantly towards state ownership. The culture of suppliers retaining intellectual property is now largely a relic of the earlier acquisitions.

Although all states are moving to open data, or already have open data policies in place, most have exemptions in place for imagery and LiDAR until they can resolve issues around stewardship and custodianship relating, for example, to management of large data volumes and maintaining data currency. Therefore for the more recent acquisitions, the key barriers for open access to high resolution elevation data across Australia are the lack of a robust governance framework and a national investment plan.

Flood hazard information

While good coverage of flood modelling data is available across Queensland (see Box 7), there are significant gaps in the coverage across other states and territories. There are national and state guidelines for best practice preparation of flood hazard information, however these are often applied inconsistently as floodplain management entities and local councils are often small organisations with limited budgets and technical expertise.

Where inadequate flood mapping exists, incorrect land planning decisions may result. It is important to have a detailed understanding of the flood hazard of a local area in order to allocate land safely to avoid devastation. The inability to accurately model flood hazard and risk also impacts the ability of all levels of government to make mitigation investment decisions.

Even where quality flood related data exists, it may not be accessible. For example, an environmental services firm undertook a pilot investigation for a major insurer in 2013 to determine how easy it was to gather flood related data, as well as useability of format for 20 local government areas in NSW. The investigation found significant differences among the councils as to the availability of flood studies and data. And of those that were available some flood studies were considered to be out of date.

Differences in the availability and quality of flood risk information can lead to data disparity or inequality amongst local councils. This can result in some communities unable to make informed decisions while others are able to implement effective, preventative measures to increase resilience.

A lack of access to flood hazard mapping may also affect insurance and mortgage availability, create inconsistent and inaccurate views of risk and cause unnecessary duplication of data capture and analysis. Smaller insurers with limited risk measurement capabilities may choose not to offer insurance or mortgages in areas where flood modelling is unavailable. Larger insurers and banks need to factor in the additional costs in forming a view of risk in order to provide these financial products.

An important additional benefit to the availability of flood hazard maps is that they enable communities to be informed about the hazard of flood posed to their families and homes. An interactive flood check map covering all floodplains in Queensland is now available online.

Wind observations

Measurements of the wind speeds of tropical cyclones that cross Australia's coastline are often inaccurate as a result of issues with the distribution and quality of wind sensors within the automatic weather station network predominately operated by the Bureau of Meteorology. In fact, it is estimated that the peak gusts generated by tropical cyclones are captured by these wind stations in less than 2% of cases (Harper et al, 2008).

These inaccuracies in the severity of cyclone wind speeds and gaps in the capture of data lead to greater uncertainty around the risks borne by coastal communities and the extent of resilience investments required to minimise cyclone impacts. This data is also a very important input into the development of building codes which can significantly enhance the resilience of new housing stock.

An initiative from the Cyclone Testing Station (CTS), at James Cook University in Townsville is trying to address this issue but it requires a significant boost in funding to be sustainable. The station has developed mobile towers with wind sensors which it can deploy into the predicted path of an approaching tropical cyclone. This initiative demonstrated its value in 2014 for Tropical Cyclone Ita when three mobile towers where set up in Cooktown in the main populated areas impacted by the cyclone.* This enabled the CTS to know more precisely the wind speeds and loads that caused failure to these buildings so that building performance can be accurately assessed. This real time transmitted data also informs emergency services, local councils and the community.

Coastal bathymetry

There is limited risk information and research on storm surge activity around Australia. To date, progress has been made through the storm tide mapping in local council areas in Queensland and Western Australia, however there are known issues with quality of these outputs for decision-making. For example, Geoscience Australia has stated that a recent storm surge and inundation modelling study undertaken in Busselton for Planning WA, "is not suited to inform day to day planning determinations", due to the modelling process and the data underpinning the project (Planning WA, 2014).

Coastal bathymetry data is essential for accurate modelling of storm surge inundation. The availability of this data is sparse and often out-dated and may also be in different formats depending on why it was collected. This has a direct flow-on effect on the quality of storm surge mapping.

Social and psychological impacts

There is a lack of available data on the social and psychological impacts of natural disasters. Information regarding the effects on a community after the response and recovery phase is sparse. Social and psychological research is largely ignored on natural disaster research agendas.

Some researchers are seeking to address the limited amount of data by conducting surveys for individual research projects in particular areas however there is no broad collection of data. Information on business disruption, employment and availability of essential services are important to understand the long-term impacts on a community.

Economic impacts

The empirical information on the past or future economic impacts of natural disasters in Australia is unavailable, fragmented or out of date. This is one of the key inputs for prioritisation of research and data activities.

'Building our Nation's Resilience to Natural Disasters' provided overall estimates on the total economic costs of natural disasters in Australia and the forecast growth rate of these costs. As the focus of the paper was to provide a high level view on the budgetary impact of building Australia's resilience, more granular economic cost data was not included in the analysis.

The most recent available source of detailed estimates on economic impacts is the *'Economic Costs of Natural Disasters in Australia'* report developed by the Bureau of Transport Economics in 2001, which is based on historical events only. It does not provide information on potential impacts that are possible but have not occurred. While the information in this report is currently being updated, there is no holistic collation of economic impact data available for users to make economic impact or cost estimates.

3.4 Barriers to efficient, open, transparent and available data

Significant barriers exist to the better provision, sharing and quality of natural disaster data. The removal or reduction of these barriers would help Australia to move closer to optimal decision-making. While the list here is not exhaustive, it covers the key obstacles to a more transparent and open data environment.

* Refer to image of SWIRLNet anemometer mobile tower p.31

Reluctance to share data

Local councils are custodians of a large amount of data used in land planning and emergency response planning. A key barrier regarding the willingness of local councils to share the data is the threat of legal action from citizens due to a potential fall in land and property prices. Even if it is known there will be no legal ramifications, the legal costs involved in defending the release of data can be a deterrent for councils.

The inconsistency among councils in providing flood information is a common area of frustration raised by stakeholders. A submission by the Floodplain Management Association (FMA) summarises the issue well:

"There is variance between how freely Councils share flood databases. Many place all flood studies and maps on their public websites, and make the above data sets available to consultants, the insurance industry and government agencies. Others are more reticent to allow public access, citing misuse / misinterpretation, and instead rely on systems such as s149 property certificates to inform property owners of flood risk on request. Local politics often plays a part, with community members often raising concerns that the publishing of flood data may affect land values and insurance premiums (although these concerns are usually unfounded)." (FMA, 2014)

With gaps existing in flood data due to the variability of sharing arrangements, researchers and users of flood mapping information are required to either source their own information from private organisations or use incomplete data sets. This creates unnecessary costs and can directly impact the quality of research outputs. Inconsistent views of risk, mixed messages to the community, poor decisions around resilience and unnecessary duplication may also result.

This is just one example of a reluctance to share data. Another example is when a researcher has spent considerable resources developing a data set to create original research outputs which can generate future research grants. Where commercial advantages arise from investing in better quality data to accurately model risk, private firms may be unwilling to release information to competitors.

Restrictive licensing arrangements

In some circumstances, councils will receive subsidised elevation data whereby private contractors retain the intellectual property rights of the data. Given the limited financial resources available to some councils, there may be little incentive to pay the additional cost for full rights to the data. This unco-ordinated approach to elevation data creates considerable search costs for the end users and limits accessibility. Box 6 illustrates how limited licensing arrangements can lead to excessive costs in obtaining data.

Another example of licensing arrangements inhibiting usage is the Geoscience Australia LiDAR data holdings. The restrictions imposed on Geoscience Australia's use of LiDAR data mean that the vast majority of the data is only available for internal government use. This is due to the intellectual property ownership resting with the original suppliers, or contracted acquisition companies. A key barrier to opening up access to the data holdings is the cost of implementing new intellectual property arrangements for approximately 200 previous LiDAR acquisitions so their intellectual property is vested in the Commonwealth and Creative Commons licensing can be applied. As noted earlier, the key barriers for open access to high resolution elevation data across Australia are the lack of a robust governance framework and a national investment plan. To complicate this further, end users requiring data now may not be able to access it via other private firms. This is because of the lack of commerciality in building and maintaining such data sets due to government potentially agreeing to release this data in the future.

Cost of collection

The cost of collecting data consistently across regions is in some instances, a primary reason for the piecemeal approach to data collection.

A key barrier to the wide collection of bathymetry data used to model storm surge risk is the substantial costs involved. The Queensland Government has estimated that gathering bathymetric LiDAR data across the entire Queensland coast would cost more than $70 million (Queensland Government, 2013). The implication of not collecting this data is that the awareness of the risk as well as the ability to forecast storm surge is impaired.

Box 6: Restrictive flood map licensing inhibiting decision-making

In late 2012 a company specialising in extreme weather risk analysis, Climate Risk, contacted a local council to request flood and coastal inundation maps. The data was needed as part of a national project to help identify risks to water utility assets from extreme weather and to assess the most cost effective solutions.

Climate Risk knew that high quality flood modelling had been commissioned by the council and had been paid for using a $325,000 grant from the State Government. A PDF of the flood maps could be seen on the internet.

Climate Risk needed to check the hazards for nearly 100,000 water assets from large machinery down to individual sections of pipe. Because the task was too big to do manually, they had developed a software system to check the digital version of the flood maps for the depth and probability of a flood at each asset location and then calculate the annual financial risk.

Climate Risk asked for the original digital version of the files. They were initially directed to use the PDF files on the internet but they explained these were low resolution and did not contain the information within the council's digital flood files. Unfortunately, the council refused to provide a digital copy.

Climate Risk appealed the decision under freedom of information laws. This went to an internal appeal within the council, but the independent assessor confirmed the refusal of access. Their reasoning was based on a clause in the act that allowed the council to refuse to provide information, including digital documents, if the information was available for a fee.

The fee was $2,000 per 'tile' of data, with 150 tiles to cover the required area. The irony is that Climate Risk would have to pay the council $300,000 for a project designed to help protect the water services of residents who had already paid for as tax payers. Furthermore, the data license was for single use, which could be interpreted as requiring multiple such payments.

Climate Risk refused to pay the fees and the request for data was not pursued. But two major consequences flow from the obstruction of access to publicly funded hazard information.

Firstly, prudent risk reduction decisions cannot be made by asset managers. If an asset was found to be at risk, asset managers could take preventative action as part of routine asset upgrades. For example, a machine that is found to be at risk of flooding can be moved or raised to higher ground. This is much cheaper than replacing damaged equipment when an unanticipated flood occurs.

Secondly, there are consequences for the community. No flooding risks can be identified, so the actions to protect water supplies and public health are severely hindered.

Source: Climate Risk, 2014

Land based LiDAR data is one of the more expensive methods of collecting elevation data, compared to methods such as Shuttle Radar Topography Mission (SRTM). However, the bulk purchase of data can have a significant effect on the overall price paid.

The barrier of cost could potentially be reduced through a co-ordinated effort at a state or national level. During consultations, Queensland was put forth as a state that used a well-regarded private firm for the wide collection of LiDAR data and achieved significant cost efficiencies.

While the cost of collecting data is a key barrier, it must be noted that as technology improves it is anticipated that the price of data collection will fall. As an example, satellite derived bathymetry is much cheaper than bathymetric LiDAR, however it is still in the experimental stage. Once improved, this method may enable co-ordinated, consistent data collection at a reasonable cost.

Lack of co-ordination and standardisation

In many cases, data is held in different formats and is subject to different methodologies. Inconsistent assumptions, data management and approaches present big challenges to end users who rely on broad data coverage and need to integrate multiple sources. The co-ordination and standardisation of data collection, storage and provision can help alleviate these problems.

In consultations with stakeholders, it was noted that LiDAR information is being collected multiple times through various levels of government and private firms. Across the state and territory governments, agencies have different data standards, cost structures and licence terms.

There could be significant benefits from the national co-ordination of LiDAR data. A national approach to collecting and disseminating LiDAR data would avoid the current duplication that exists by providing a central source for use in land planning, emergency services, property development and other end users.

There may be a need for additional flyovers for specific purposes but there are known advantages in having a base availability.

Accurate information on building attributes is required to assess asset exposure to particular perils. This includes geocoded address data to identify the position of an asset in relation to a peril and details on the construction materials and building design. The main index for geographic co-ordinates of a property is the Geocoded National Address File (G-NAF) data set from the Public Sector Mapping Agency (PSMA). However, in this data set the location of a particular property is mapped in different ways across the states, depending on the methodology used. Victoria and ACT assign the property to the midpoint of the front boundary of the block, whereas all other states use the centre of the block.

In the absence of a consistent standard for geographical positioning of an asset or parcel of land, use of different information can lead to substantial differences in the outcome of risk modelling, research and policy decisions related to natural disasters. This is particularly the case for large or sloping properties. Similarly, differences in information around the floor height of a building or its construction material can greatly vary its assessed vulnerability.

Box 7: Queensland flood mapping – from poor coverage to complete coverage

Queensland provides an example of what can potentially be achieved through a concerted effort. Following the 2010/2011 floods, the Queensland Floods Commission of Inquiry found there was an inadequate level of flood mapping in Queensland, given that maps were included in only 37% of Queensland's planning schemes. Of those planning schemes with maps, only 23.6% were completed in accordance with state planning policy (2012:62). The inquiry recommended that:

"A recent flood study should be available for use in floodplain management for every urban area in Queensland. Where no recent study exists, one should be initiated." (2012:13)

Since the inquiry, 99% of Queensland was assessed for floodplains and 27% of the state was identified as floodplain (QRA, 2012). A partnership between the Queensland Reconstruction Authority and the Department of Environment and Resource Management led to the development of statewide floodplain maps. All main areas now have at least a basic view of the risk and a more consistent form of data, making Queensland the only state with a statewide understanding of its floodplains.

This is not to say that co-ordination is easy. The Australia and New Zealand Land Information Council (ANZLIC) was established in 1986 to co-ordinate the collection and transfer of land-related information between the different levels of government. ANZLIC provide standards and frameworks for data used in natural disaster research such as elevation and geocoding information. Given the existing issues with elevation data, and that ANZLIC has existed since 1986, shows the problems are not easily solved and require concerted effort by many stakeholders. Obstacles around co-ordination can be overcome, as illustrated in Box 7.

Cost of providing accessibility and transparency

A prevalent issue among researchers is that data exists but is not accessible or is too costly to be used broadly. Limited sharing of data can impede research from occurring and lead to inefficiencies due to overlaps in data gathering. Similarly, another major barrier that creates considerable search costs and further duplication is the lack of transparency around what data is available. The costs involved may inhibit the data collector from providing accessibility and transparency.

Some progress has been made in this area. For example, before the 2010/2011 Queensland floods, flood hazard maps were held by many local councils, but were often not accessible to the public. After the floods, the State Government decided to release this information, providing public access to flood maps through an interactive website. This decision was made in recognition of the value of this information for decision-making to reduce community exposure to flood hazards in the future.

Similarly, in response to the findings of the 2011 National Disaster Insurance Review, the Australian Government committed $12m over four years for Geoscience Australia to develop a national flood risk information platform. The platform aims to provide a public access point for flood risk information. While it is still in progress, it is important that, when complete, the information is up-to-date, thorough and the underlying data is made available for the benefit of all users. The Productivity Commission has recommended the platform be expanded over time to encompass other natural hazards (PC, 2012).

3.5 Conclusions

This chapter has provided a high level summary of the current data holdings relevant to natural disaster risk and exposure in Australia and has highlighted best practice and key barriers. It is clear that a more co-ordinated approach to natural disaster data would not only reduce administrative costs but also support the quality of research activities and decision-making around resilience investments for the benefit of Australian communities. It would also have the added benefit of reducing the unnecessary duplication of data capture and analysis and ensuring assessments of risk were accurate.

While key areas for improvements in data are outlined, a detailed analysis of the cost-effectiveness of resolving gaps or improving access is necessary to ensure the best use of limited resources. It needs to be clear that the benefits of better data provision outweigh the costs.

It is also important to recognise that awareness of these issues is not new. For example, Webb has highlighted that one of the strategies to assist with the adaptation process should involve better co-ordination of key data inputs, as described in a recent paper:

"There needs to be a more systematic identification and coverage of, provenance over, and access to, key adaptation-related data sets and data bases, especially those that are identified as high priority for national support. This includes the next wave of climate and socio-economic information and scenarios; hazard, exposure and impact data; and risk, vulnerability and adaptation options information" (Webb 2013:3)

Collaborative efforts between government agencies to improve the transparency and availability of data is an important first step. There is also potential for greater business involvement in the sharing of data as part of a nationwide strategic shift to greater data co-ordination.