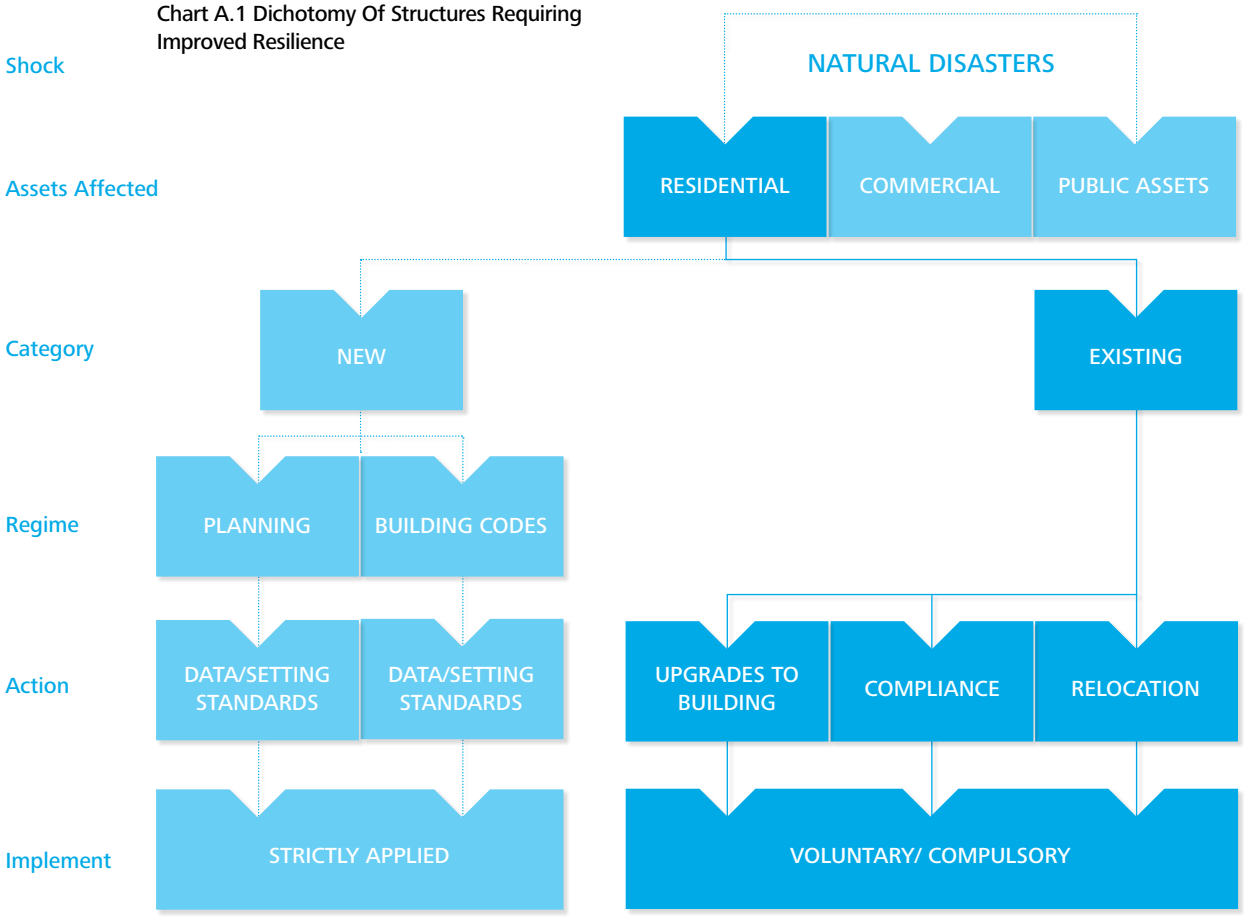
Appendix A: Resilience – the structure of the problem

This section lays out the structure of the problem to clearly point to areas which deserve greater focus of government, business, communities and individuals. The area of disaster resilience is complicated and the structured approach taken below provides an initial focus on 'hard adaptation'[13] activities required and then looks at what is necessary from a 'soft adaptation' perspective in order to better understand the coordination issue that needs to be addressed in developing a more resilient and safer community.

The categories of structures requiring resilience are presented in Chart A.1. We start by looking at the nature of the main assets affected by natural disasters namely: residential housing, commercial buildings and public assets (roads, bridges, parks, schools, etc).

We then take each of these asset classes in turn and consider separately both new and existing assets. This is an important consideration given that the appropriate pre-disaster resilience action and collaboration required are different between new and existing assets and hence impacts on the framing of policy recommendations.

Chart A.1 Dichotomy Of Structures Requiring Improved Resilience



13 'Hard' adaptation measures usually imply the use of specific technologies and actions involving capital goods, such as levees, seawalls and reinforced buildings, whereas 'soft' adaptation measures focus on information, capacity building, policy and strategy development, and institutional arrangements.

In this Appendix we focus on the residential category but the same analysis can be undertaken for commercial and public assets. Thus, the 'Residential housing' category in Chart A.1 is broken down to consider the implications for both new and existing properties and how the pre-disaster resilience activity will vary.

If we look at the existing residential asset category, consultations with industry and peak bodies have suggested that recent activity in improving planning and building codes in relation to disaster resilience is well in hand and is the subject of significant focus and attention.

For example, on 30 January 2013, the Australian Building Codes Board (the Board) announced the decision to introduce new National Construction Code (NCC) provisions to apply in flood hazard areas as designated by state, territory or local governments (Australian Building Codes Board, 2012). The new requirements are designed to ensure the structural integrity of, and survival of utilities in, new residential buildings in designated flood hazard areas in all states and territories of Australia. This requirement found to increase construction costs by $216 million (present value over 10 years) with the benefits of ensuring structural integrity and survival of amenities estimated to be $352 million (present value over 10 years). Therefore, this option was found to have a net benefit to the community and has now been incorporated into the building codes (which are enforceable through the Local Council planning approvals process).

Considering each category in turn, we look to apply a standardised framework for analysis as set out in Chart A.2.

Chart A.2 Framework for analysis

Residential

Key Points

- Critical role for Government is to develop appropriate information that informs high level awareness of risks
- The biggest coordination challenge but arguably the greatest impact is with existing residential buildings (retrofit, compliance and relocation)
- Relocation options will be challenging for Governments but need to be considered in the appropriate circumstances.

Residential – new

Approximately 1.3% of the housing stock is built each year which makes standards for new residential construction a long-term method of introducing disaster resilience. At this rate of construction, a new building standard introduced today will take at most 44 years to cover 50% of the housing stock. While this time horizon might seem exceptionally long, the attractiveness of pursuing resilience in new homes is driven by the fact that it is both technically easier and more economical to improve resilience during the construction of a house as compared to retro-fitting a pre-existing home.

The proposed method of implementing disaster resilience in new homes is therefore through the improvement of Data and Standard Setting. We will analyse this method using the framework in Chart A.2.

- Natural disaster risk needs to be accurately mapped by location. For example, flood risk maps and detailed digital elevation maps needs to be made available that allow for modelling of flood risks in a manner that is specific enough to determine the risk for a given property
- The most effective measures for mitigating the identified risks need to be ascertained. For example, this may involve the CSIRO determining best practices for flood pre-disaster resilience given particular levels of risk. Insurers can also involve themselves at this stage by valuing the reduction in assets at risk brought about by these pre-disaster resilience efforts
- Action on this front can be mandated through the Building Codes and through conditions attached to planning approval. As an example, these standards could be included in the NCC or into the relevant State Development Code
- Payment in this case will fall on the constructing party, either the homeowner or developer.

Residential – existing

In any given year, existing residential buildings make up 98.7% of the housing stock and are thus a prominent target for the implementation of disaster resilience. Unfortunately, it is often technically difficult and very expensive to retro-fit an existing property to be disaster resilient.

However, three possible methods of improving resilience are proposed here:

- Upgrades to buildings
- Compliance
- Relocation.

Upgrades to buildings

One method of improving resilience in the housing stock is to consider specific upgrades to buildings. Again using the framework in Chart A.2:

- Natural disaster risks need to be accurately mapped by location (as for new residential buildings)
- The most effective measures for mitigating the identified risks need to be ascertained, again, through targeted research, including potentially building inspections and home audits, similar to energy efficiency or other 'improvement' processes for homes
- Action on this front can be market-based. Price signals can be communicated either through home valuation or through lowered insurance premiums. For example, the implementation of bush fire resilience upgrades to a home can both increase the value of the property when sold or mortgaged, as well as trigger a reduction in insurance premiums for the residents within it.

Example

A measure to improve cyclone resilience on existing homes by 50% could cost $25,000. There will be benefits for both the individual and government from undertaking this home improvement and so costs should be allocated accordingly.

Local government's role could be the collection and dissemination of risk information and compliance monitoring, working in close collaboration with the relevant state government.

Compliance

As well as upgrades, existing buildings need monitoring over time to ensure compliance with a required upkeep standard. Over time resilience measures may deteriorate (e.g. clearing vegetation around homes in bush fire risk areas) and so the property and surrounding environment must be appropriately maintained to ensure ongoing resilience.

Using the framework set out in Chart A.2:

- Natural disaster risk needs to be mapped by location. For example, in the case of bushfires, the extent of the bush and fire load, as well as local topography needs to be mapped in a manner that allows the determination of risk level in each house
- The most effective measures for mitigating the identified risks need to be ascertained. As an example, vegetation clearance may be determined to be the most appropriate solution to mitigating disaster risk

- Action on this front can be either compulsory or market-based. An on-the-ground compliance officer will be required to ensure that the property remains compliant although the officer could utilise aerial surveillance information to make this task more cost effective. Using the example of bushfires, a possible organisation that can ensure compliance would be the Rural Fire Service in the case of NSW. Incentives in this case can be either market-based (insurance discount) or mandated (legal requirement). The matter however is complicated by the fact that there are reputational costs associated with being the group that polices compliance. Furthermore, there may be a substantial monetary and time cost to checking properties in an area for compliance
- Payment in this case needs to be apportioned between the parties involved. In the example used, there is an immediate burden being placed on the compliance officer.

The appropriate pre-disaster resilience action is different for new and existing assets and hence impacts the framing of policy recommendations

Relocation

A third method of improving resilience is to relocate members of the community out of high-risk areas.

Using the framework set out in Chart A.2:

- Natural disaster risk needs to be accurately mapped by location
- The most effective measures for mitigating the identified risks needs to be ascertained. Critically though, relocation should be seen as a last resort, and only be applied when other methods of promoting resilience are deemed ineffective or inappropriate
- Action on this front can be either market-based or mandated. Market-based solutions would involve the use of voluntary buybacks to remove residents from homes that are most at risk. An extreme alternative would be to use compulsory acquisition laws to mandate the purchase of homes in highest-risk areas. Although extreme, compulsory acquisition has been used in the past in cases such as Sydney Airport where residents were provided with a sliding scale of noise reduction improvements depending on their distance from the flight path. Another example is Christchurch in New Zealand where, following the 2011 earthquake, certain areas have been designated 'red zone' prohibiting rebuilding of homes, with residents offered relocation to new subdivisions under their insurance
- Payment in this case needs to be apportioned between the parties involved. In this case, that would result in some measure of cost being balanced between the government and the residents being relocated. This could take the form of housing subsidies structured as an incentive to encourage residents to relocate.