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Productivity Commission
Barriers to Effective Climate Change Adaptation
LB2 Collins Street East
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Victoria

Response to Productivity Commission Issues Paper – October 2011
Barriers to Effective Climate Change Adaptation

Introduction

This response to the call for submissions on *Barriers to Effective Climate Change Adaptation* is made by Edge Environment. Edge Environment is a Sydney based research, consultancy and education business established in 2008. Edge Environment specializes in sustainability strategy development, adaptation to climate change, life-cycle assessment and eco-labeling, with a particular focus on projects related to the built environment – buildings and infrastructure.

Edge Environment staff have led and contributed to several climate change adaptation research projects, including a major cross-disciplinary assessment of the need to adapt buildings to the unavoidable consequences of climate change in New Zealand and Australia respectively.

Recently, the Insurance Council of Australia (ICA) has commissioned Edge Environment, to develop a Resilience Rating Tool (RRT) to measure the resilience of dwellings to extreme meteorological events. The RRT is intended for use by a broad range of stakeholders including, insurers, homeowners, builders, designers and governments to reduce the vulnerability of buildings to extreme meteorological events. The objectives of the Resilience Rating Tool initiative include:

(a) To provide guidance and information concerning resilience to users
(b) To demonstrate leadership toward a more resilient built environment, and
(c) To provide a platform for the further development of tools that contribute to resilience

This submission responds selectively to the questions posed by the Productivity Commission's Issues Paper.

Defining Effective Adaptation to Climate Change

At the scale of a single building, a well-adapted structure can be defined as one that withstands, and can sustain, health, safety and amenity through extreme meteorological events at minimal or negative additional life cycle cost. *Effective* adaptation involves the additional requirement that the changes necessary to make a well-adapted building are done in an efficient manner and minimize unintended consequences. On a macro-scale a well-adapted built environment will depend on a whole system of adapted components and a definition is necessarily more complicated (and perhaps less useful).

Adaptation involves understanding that we are living in a society designed using historical climate variables and coming to terms with how GHG emissions and commensurate climate change may change these variables in the future.

Uncertainty and Adaptation

The built environment, and all it contains, is integral to our survival on the planet: it accommodates and sustains individuals and families, economic activities, education and health services, and is repository of the nation's cultural heritage. The average life expectancy of a house is about 60 - 100 years (some will last significantly longer), so most of the houses standing now – including those currently being built – will be around until the later part of the century to experience the more severe projected consequences from climate change.

Whilst global climate models predict increased frequency and intensity of extreme weather events there is a level of uncertainty concerning these changes at a local level. As stated in the Australian Governments Position Paper on Adapting to Climate Change (2010), uncertainty in climate predictions is not a justification for delaying adaptation initiatives. In most cases, it is necessary to improve the current resilience to extreme weather events based on other factors, including rising population and increased density of the built environment. A degree of uncertainty surrounding these changes means that adaptation policy should take the form of enablement and guidance rather than dictating responses. Policy that enables a variety of solutions will also support initiatives that are tailored to local needs and draw on local capabilities and innovations.

In addition to the requirement for greater resilience, we also need to adapt our built environment to a lower carbon economy. Design for carbon efficiency, both in terms of the carbon that our built environment emits to sustain comfortable living conditions and the carbon embodied in the materials and products from which it is constructed, need to be considered when undertaking adaptation initiatives. Edge Environment's life cycle assessment work reveals that decisions taken with the best of intentions frequently result in perverse outcomes. For example, energy efficient lighting causing a requirement for increased heating loads and a longer heating season in residential buildings. However, international and national work on adaptation has suggested that there are also chances for the two agendas to work in

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harmony. For example, where energy efficiency upgrades are being carried out it may be more economically efficient to simultaneously undertake resilience upgrades.

In order to achieve energy efficiency, lower embodied energy and greater resilience, synergies and potential conflicts between these agendas need to be identified prior to policies being implemented. Tools that assess resilience and energy use should be designed to work together and ratings provided by these tools should be clearly defined and delineated.

Uncertainty is most significant for adaptations that are frequency related and those exposed are usually unaware of their exposure or unwilling to accept and mitigate their exposure. The insurance industry believes that there are a large proportion of Australian households either not insured or underinsured. Government has a duty to inform the public and to regulate minimum standards of protection based on a precautionary approach. Equally, the degree of precaution should not expose the public to unnecessary financial burden.

Adaptation to date

It is Edge Environment's view that, to date, adaptation to climate change in Australia has been slow and that efforts must be made to accelerate this agenda. Where adaptation has occurred it has been from the perspective of an owner protecting themselves from a direct impact on their health, comfort or amenity, e.g. installing air-conditioning in overheating buildings, or selective and reactionary regulation such as design requirements in bush-fire prone regions. Government responses often fall short of regulation, instead relying on guidelines documents, such as the *Department of Local Government and Planning – Repairing your house after flood* and *Hawkesbury-Nepean Floor Plan Management Steering Committee- Reducing vulnerability of buildings to flood damage*.

There are some cases where policy has improved adaptive capacity as an unintended consequence. The energy efficiency provisions for houses introduced into the Building Code, which establish a higher level of energy efficiency incidentally, also improve resilience against overheating. Houses with good solar design features such as properly shaded north- and west-facing windows, minimal west-facing windows, or provision for effective ventilation should be the least affected. Houses without such features, or poor solar design, could suffer from severely overheated conditions.

There is a need for more decisive leadership that will result in tangible changes to policy and regulation, and will, in turn, have a physical effect on the houses we live in and rely on for health, safety and amenity. We believe that there is a role for regulation in delivering more resilient built environments, potentially at a National level through the Building Code of Australia, and that to date this leadership has been lacking. Without decisive leadership and the delivery of clear policy and tools to address adaptation, the different levels of government in Australia are likely to develop their own uncoordinated responses, as seen in Australia's regulations for energy efficient homes. This lack of coordination has resulted in a slower progress to energy efficiency in the new residential building stock. There is an opportunity to avoid a similar situation with the resilience agenda.

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Edge Environment also believe that there is a role for voluntary adoption of best practice through green building and green infrastructure rating tools as well as making resilience data available to the public, akin to the development of policy for mandatory disclosure of energy efficiency performance. In Europe, Asia, US and Australia there is evidence that voluntary sustainability certification schemes create market movement, build capacity and capability of industry to respond and, through economies of scale, reduce the costs of mitigation technologies. We expect the same to be true for resilience tools and improvements in building resilience. The Australia Green Infrastructure Council Rating Scheme and the Green Building Council of Australia's Communities Tool are examples of rating tools that are already incorporating resilience components.

Barriers to Adaptation

In the context of the built environment there are four significant barriers to climate change adaptation;

1. Access to information – limited information is available on how to effectively adapt to climate change. Improved information would include detailed climate modeling, construction material resilience testing standards and tools that centralize information and are easily accessible.
2. Harmonization of terminology and methodology – there are no clear standards for assessing resilience and a common language for discussing the resilience of buildings is lacking. Definitions of hazards and sub-hazards would assist discussion of adaptive requirements. Agreed methodology for testing materials and assessing improvements to buildings would enable better decision making around resilience of buildings.
3. Alignment of overlapping initiatives – various projects have touched on resilience in the built environment but are not coordinated under a clear approach to adaptation to climate change. Alignment needs to occur across the different levels of governments and between industry initiatives.
4. Attitudinal – various organizations have identified an attitude amongst building owners – especially residential building owners – that they will not be affected by extreme weather events despite those events occurring in their area in the past.

A Selection of Relevant Projects and Research dealing with Adaptation

The Insurance Council of Australia (ICA) Resilience Rating Tool project is an attempt to deal with some of these barriers by increasing access to information, standardising methodology and aligning similar initiatives wherever possible. The ICA is investing this tool in order to measure the resilience of homes, and deliver a rating that can potentially inform insurance premiums.

Through work that Edge Environment is conducting in the adaptation space it is apparent that there are numerous guidelines concerning resilience and in some cases these are inconsistent, noticeably in the language describing adaptation issues. For example, differences in hazard definitions, differences in nomenclature of building components and discrepancies in resilience requirements.

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A recent study[1] of the need to adapt the New Zealand building stock to the unavoidable impacts of climate change, which was co-authored by Edge Environment, estimated the total cost of adaptation to $2.3 billion. This represents about 1.3% of the value of the New Zealand housing stock. The economic benefits of the adaptation were estimated to be approximately $4.1 billion. The most cost effective adaptation options identified were increased insulation levels in new or recently built houses and relocation of vulnerable coastal properties at risk from inundation and coastal erosion. General adaptation measures with low or negative return include planned adaptation to wind and driving rain. The key issues identified in the study are listed in the box on the following page.

UK work on adaptation to climate change dating back to the 1990's differentiated types of risk from climate change between:

- Changes that would progressively affect the built environment and for which there was time for regulation, policy market based mechanisms to keep pace with the change – e.g. prevalence of termite damage or changes to aquifers; and
- Changes that were threshold limited or where the influence was more on frequency of the event rather than severity – e.g. severe weather events – typhoon, inundation etc. This latter type of risk was considered more urgent for intervention.

Effective adaptation needs to adequately address both physical impacts from climate change effects, and stakeholders' norms and tolerance of conditions and risk.

[1] J. Bengtsson, R. Hargreaves and I.C. Page, 2007, Assessment of the Need to Adapt Buildings in New Zealand to the Impacts of Climate Change, Study report 179, BRANZ Ltd.

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Figure 1. Taken from *J. Bengtsson, R. Hargreaves and I.C. Page, 2007, Figure Assessment of the Need to Adapt Buildings in New Zealand to the Impacts of Climate Change, Study report 179, BRANZ*.

Housing Adaptation

Climate change is only one among a range of major future changes within the housing sector, be they political, social, cultural or economic. Key housing adaptations relating to climate and social changes identified are:

- *Climate change is only recently on the housing market radar:* Literature and expert sources suggest climate changes are given less importance and urgency in the public domain than many social changes, such as increases in crime, obesity and uses for technology. For the householders, fear of intruders (burglars, home invasion, peeping toms) is much greater, more immediate, and has more social and housing impacts (including choice of neighbourhood and demand for security features) than fear of climate change
- *Sector dynamics limit adaptation:* Housing as a business sector, as a householder investment, and as a key site for private consumption is highly vulnerable to external influences – such as global economic factors, the cost of capital, tax on capital gains, insurance sector policy in relation to housing, and local authority regulation. This means the sector's ability to develop a self-determined, coherent response to the social impacts of climate change may be limited.
- *Climate change promotes sector growth – and social tensions:* External pressures could have a much greater effect on New Zealand society and its housing sector than anticipated local changes. The relatively benign impacts of climate change in New Zealand are likely to be a key driver of immigration with increasing ethnic diversity, and increasing social tensions. Climate and social adaptations is expected to co-evolve.
- *An ageing population highlights key social impacts:* An aging population increasingly remaining in their own homes could result in increase in age-related vulnerabilities within housing. Research indicates other groups may be equally or more vulnerable – such as children, low income households, people with health problems or disabilities, and Maori or Pacific Island communities. Combinations of these variables with older age result in higher vulnerabilities.
- *Key forms of resilience are psychological toughness and community cohesion*: Evidence available suggests older people, while physically more vulnerable, and may also be psychologically stronger and more able to cope with crises. In addition, lower income neighbourhoods, immigrant groups, and church communities, for example, may have levels of social cohesion that make them more resilient and speed their recovery.
- *Social conflicts is projected to be a major impact:* Climate change's social impacts is expected to include significant social disruption and conflict over changing patterns in the value of land in coastal areas, especially where wealthy enclaves suffer significant loss in value.
- *Key climate change hazards are the extremes of rainfall and heat:* The key climate change hazards emerging from this study are wet weather extremes (rain, wind, floods, erosion, landslips) and heat extremes (heat, water shortages/ drought). In this respect, it is worth pursuing flooding/ erosion/ landslips as a key part of a strategy for communicating the need for concern over climate change, and for appropriate housing adaptations. The storms/ flooding issues are a powerful way of engaging communities in the problems and challenges posed by climate change.
- *Social impacts result from climate and social interactions:* In combination, house/ household resilience and preparedness (including housing adaptations) reduce social impacts, while hazards and house/ household vulnerabilities increase them. The interaction between these elements is an indicator of the relative social impact.

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Adaptation and Policy Instruments

As mentioned earlier in this response, the key to effective adaptation will lie with a more coordinated and thorough government response to adaptation issues. For the built environment this is likely to take the form of improvements to the Building Code of Australia to incorporate resilience concerns. A possible way of achieving this might be to establish a set of archetypes for each state/territory/climate zone that represent the optimum design for energy efficiency and resilience in that region, and that these be used as a basis for regulation and reference for the development of industry responses to energy efficiency and resilience. Such archetypes could also be used as educational resources that help to disseminate information around the adaptation agenda.

Such improvements may be similar to improvement to the BCA made in the wake of Cyclone Tracy or recent updates to include energy efficiency requirements.

Examples of coordinated approaches to adaptation in the built environment can be found in the United State Federal Emergency Management Agency's flood zone requirements. The National Flood Insurance Program (NFIP) was given the objective of protecting buildings that are constructed in special flood hazard areas. Under NFIP new construction, post-disaster rebuild and large alterations in these zones are subject to building design criteria. The regulation requires the use of flood resistant construction material and sets minimum heights for the lowest floor in a building.

The New Zealand Building Code also addresses resilience in a systematic way under a 'durability clause'. This clause sets default lifetimes for building elements depending on the importance of their function and the ease of replacement. The New Zealand Department of Building and Housing sees this clause as a form of consumer protection where consumers are unlikely to have the knowledge to weigh the relative benefits of construction styles and materials.

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