

Building the business case for climate change adaptation

Lessons from
Coastal Australia



Final Report

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The project team would like to thank all organisations who participated in this study. Revealing the features of their business operations will assist the collective understanding and practice of climate change adaptation in businesses and local government.

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1 Executive summary

This study was conducted by Griffith Centre for Sustainable Enterprise at Griffith Business School to explore how coastal organisations used a business case approach to adapt to climate change. Specifically, the study sought to understand the elements and process of mounting a business case in local government and a range of private organisations that resided on the coastline of Australia. The study was commissioned by the National Climate Change Adaptation Research Facility (NCCARF) and the result and findings are expected to be used in the CoastAdapt tool used to inform the actions of public and private sector stakeholders.

Ten in-depth case studies were used to explore the lessons learnt from the business case in each organisation, which included cases from local government (3), property sector (2), financial services (2) and tourism (3). Cases were identified through web-based searches, the Green Cross Australia's Business Adaptation Network and consultation with industry bodies (particularly in an effort to identify cases in the tourism sector). Cases were selected based on a set of criteria developed specifically for this study and finalised in consultation with NCCARF. The criteria for case selection were the product of a synthesis of international best practice of building the business case for adaptation and incorporating sustainability in the private sector.

The literature review identified that whilst a business case for sustainability has become increasingly recognised and applied, the elements that comprise a business case for climate change adaptation is not systematically understood. This is despite a small but growing number of organisations currently mounting such a case.

The research provided a grounded understanding of key elements of a business case for climate change adaptation in coastal areas and the lessons learnt from organisations on how to mount a successful business case for climate change adaptation were synthesised. The key elements and lessons learnt can be considered as critical success factors that can inform future practice of coastal climate change adaptation. The seven key elements include:

1. Mounting a business case for climate change was primarily motivated by risks (and associated economic costs) that have been identified in the present governance systems of the organisation.
2. Integration of the business case for climate change adaptation into overall business decision-frameworks was an important element in mounting a business case. For example, a strong business case for climate change adaptation was associated with the presence of sustainability systems and practices in an organisation.

3. Developing shared value for adaptation with stakeholders and the wider community was an important element for both public and private enterprise.
4. Business cases involved the identification and consideration of adaptation pathways – where future options for action to respond to the climate risks are identified and met through in manageable stages triggered by a change in environmental and social conditions (see Barnett et al. 2014).
5. Use of collaborative approaches, often with external experts and organisations to formulate tools that can assist with obtaining organisational buy-in for the business case. For example visual tools were developed to help communicate the impacts of climate change and make it more relevant and tangible for decision-makers.
6. Planned monitoring of adaptation outcomes will be vital in successfully adapting to future conditions as adjustments may be needed in the future (see no. 4 above).
7. Planning for infrastructure for the short- and long-term helps ensure that adaptation can be supported and implemented now and in the future. In this sense, use of a number of scenarios (mostly current, 2030 and 2070 projections) was widespread among the cases that were examined.

The lessons learnt by coastal organisations in the process of implementing a business case for climate change adaptation include:

1. The use of extreme events as a critical moment to propose the business case.
2. Leadership from within the organisation and external to the organisation is important to progress the business case through the organisation's decision making process.
3. The use of visuals and local context was important to demonstrate the need for adaptation measures.
4. It was important to ensure long term commitment for key positions responsible for climate change adaptation in order to seize opportunities and initiate a proposal. Long term commitment was also important to implement the business case because of the inherent long term nature of climate change.
5. The staged implementation of projects aligned to the business case appeared to lead to greater success.
6. Providing only relevant climate impacts on the business is important and thus, any irrelevant information outside the organisation's scope of operation should not be included.

7. Identifying key climate and weather risks as opportunities for the organisation and demonstrating business relevance will increase the justification of the business case.
8. The linkage of climate change adaptation measures with climate change mitigation appeared to be important for justifying of the business case.
9. Engagement with other organisational commitments (e.g. voluntary environmental or carbon initiatives) and the stakeholders involved with these commitments is important.

This report found important trends in the way business cases for adaptation are prepared in Australia. One of the key findings was that organisations developed their business case in isolation and have little or no knowledge as to how other organisations have approached this issue. Most of the cases were delivered by large-scale organisations that have the capacity (resources in particular) to develop a business case and to plan and implement longer term adaptation strategies. This study will be beneficial to organisations through learning from the experiences of other organisations.

Recommendations from this study include more research focused specifically on the prerequisites and capacity of small and medium-sized businesses to mount a business case for climate change adaptation and the development of a knowledge-sharing platform for Australian businesses and government to coordinate efforts and provide support. Such a platform could be similar to the British UK Climate Impacts Programme (UKCIP) initiative, a multi-disciplinary organisation dedicated to building the capacity of public and private sector organisations for adaptation through knowledge sharing, consultancy and policy-support. Implementing an Australian-style UKCIP would provide materials and tools to help organisations to build the time and resource intensive business case. Thus, enabling organisations to respond and adapt.

2 Introduction

Building a business case for adaptation to climate change is a recent phenomenon. There are several reasons why this is the case. One reason is that most corporate climate action has focused on reducing greenhouse gas emissions internally (see for example Amran et al. 2015; Porter et al. 2014; Adelaide Airport 2016). The focus has been on developing and implementing low-carbon and resource-efficient technologies and services, with incorporation of adaptation measures lagging behind other corporate climate change activity. Arguably, measures to anticipate and adapt to climate impacts must also become a core component of an effective strategy for reducing and managing the risks of climate change.

The rationale for building the business case for adaptation is the need to respond to the risks and opportunities that climate change represents to organisations, but this is not widely recognised in Australia. Failure of climate change adaptation and mitigation has been identified as the top global risk in terms of impact, while it was also among the top five most likely risks (along with risks of extreme events and natural disasters), in the most recent Global Risks Report (World Economic Forum 2016). At the same time, cost-efficient adaptation to climate change was identified as one of 15 top business opportunities by the Global Opportunity Report in 2015 (Global Opportunity Network 2015).

Benefits of taking adaptive action now are difficult to estimate. A study funded by the Australian Business Roundtable for Disaster Resilience and Safer Communities estimated the future costs of natural hazards and benefits of pre-disaster resilience investments based on historical data of economic losses from natural hazards and post-disaster recovery costs (Deloitte Access Economics 2013). The study found that the annual costs of natural disasters will grow by 3.5% per year on average, reaching \$2.3 billion in 2050 (Deloitte Access Economics 2013). This growth in costs is attributed to increased investment and population growth in coastal areas only, as the report did not take into account the potential impacts of climate change in exacerbating extreme weather events (Deloitte Access Economics 2013). The report also finds that adequate preparation, which includes adaptation and pre-disaster preparedness, could reduce costs by 50% (Deloitte Access Economics 2013).

To date, most climate change adaptation by business has been a response to current impacts with only a limited number of organisations using a business case approach regarding present and future impacts of climate change. A business case can be seen as a persuasive argument for change (in products, services, practices, strategies, etc.) within an organisation and may be considered as a decision-support tool. A business case is often communicated to decision-makers in a written report and, if approved, is the precursor to financial commitment and implementation.

A business case for climate change adaptation specifically targets improving the capacity of an organisation to respond to current and predicted impacts of climate change on the organisation and its stakeholders. Increasing recognition by businesses that the Australian economy is being affected by climate change has led to the organisational imperative to mount a business case for adaptation. Although some businesses are implementing their own business case for climate change adaptation, to date, there is no model of how to mount a case and how this is different to other business case approaches. This study sought to fill this gap in knowledge by examining a selection of business cases for climate change adaptation in coastal Australia.

2.1 Aims

The goal of the study was to produce knowledge that will be useful for organisations to produce robust, convincing business cases for climate change adaptation projects, policies and programs, thus enabling these organisations (and the communities in which they operate) to effectively invest in, and adapt to, the consequences of climate change. While tremendous work has already been carried out worldwide to document adaptation cases more generally, there is little literature on how businesses adapt to climate change and make the business cases for adaptation. Studies that describe the processes involved in building a business case for adaptation are rare and this study sought to address this gap in knowledge.

The primary objectives of this study are:

1. To identify and describe exemplary business cases that have been effective in adapting to climate change across business and local government in the coastal zone.
2. To examine and document the critical success factors (including monetary and non-monetary values), and the enabling processes, for coastal organisations to adapt to climate change.
3. To provide appropriate and innovative guidance materials for the CoastAdapt Tool developed by NCCARF.
4. To disseminate the outcomes of the project through industry networks, academic conferences and publications.

2.2 Scope and limitations of the study

The scope of this study was guided by the call for proposals by NCCARF, which sought to collect information that would assist stakeholders with building the business case for climate change adaptation. This study focussed on the practices involved in building the

business case for adaptation in the public and private sectors, and applied this lens to both the literature and case selection. Issues relating to economic valuation techniques, financing and insurance are important elements of adaptation from the business case perspective. However, separate studies were commissioned by NCCARF to explore these issues at length; therefore this report dealt with both topics to a limited extent, and insofar as they help understand how business cases for adaptation were developed.

Case selection was focused on three broad sectors: local government, service industry and tourism. It aimed for Australia-wide coverage, but with a focus on examples from coastal Australia. Cases also had to be either implemented, in the progress of implementation, or significant commitment to pursue the initiative had to be demonstrated (e.g. through financial commitment). Cases were selected based on a set of criteria developed by the research team from the literature on building business cases for environmental sustainability, which covered international examples of business cases in climate change adaptation. The case selection criteria are detailed in Chapter 4. The scope of this study was also limited in time, as it was undertaken between November 2015 and April 2016. The time period limited case selection as examples had to be implemented or near implementation, as described previously.

Limitations were also due to the qualitative approach used. Case study analysis and results should not be used in a similar way to quantitative studies. The generalisability of the analysis of the cases lie in their value of illustrating important defining features of a phenomenon under study and the cases reveal lessons that can be applied to other organisations that have yet to consider such practices. Case studies are valuable in revealing cutting edge practice. The value of the case studies in this study is that they also provide detailed 'real world' insights and lessons learned of the process of a business case for climate change in coastal areas that in many cases are a work in progress.

2.3 Funding, contributors and authorship

The research was funded by NCCARF and the research was made possible through a partnership between Griffith University and Green Cross Australia.

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2.4 Structure of the report

This report has seven chapters. The first chapter is the Executive Summary. Chapter 2 provides the context of the study, its aims and limitations and introduces the topic of business case for climate change adaptation. Chapter 3 provides review of the literature on the business case for adaptation through describing various examples of collection of cases from around the world. This chapter concludes with a summary of features that appear to distinguish adaptation business cases from other, traditional (non-adaptation) business cases. Chapter 4 describes the case study methodology, including how the six criteria for selecting Australian cases were developed and how data collection was carried out through a qualitative research approach. Chapter 5 present each case and analyses the lessons learnt, the methodologies used and key elements for each case. Chapter 6 provides thematic analysis of the key elements organisational learning across the cases examined. Final conclusions and recommendations are provided in Chapter 7.

2.5 An overview of climate change risks and business cases

A total of ten organisations participated in the study are summarised in Table 1. Many of the participating organisations indicated they had mounted a business case for adaptation independently of other organisations; however they expressed curiosity and desire to find out the approaches of other organisations. The strategies are included in Table 1 are the major risks that the business case addresses.

Table 1. Summary of climate risks and adaptation strategies of cases

Organisation	Risks and impacts	Strategy
Melbourne City Council	Increased temperature Urban tree loss Storm water flooding Decreased visual amenity	Urban Forest Strategy
Parramatta City Council	Increased temperature Community affected Flooding impact on assets	Range of planning Initiatives: Parramatta Ways Bring back swimming to the Parramatta River Cool Parramatta
Douglas Shire Council	Increased exposure to storm surge Flooding due to rainfall events Evacuation routes flooding Potable water shortage in dry season Turbidity of flood waters affects wastewater treatment Beach erosion	Range of initiatives: Flood monitoring Water and transport Infrastructure upgrades Coastal management
Lendlease	Increased heat days Air pollution and dust from drought and fire Increased rainfall causing localised flooding	Barangaroo South sought to build the 'greenest global residential, shopping and

	and impacting access and egress Salt water inundation/sea spray Severe storm events	business centre in the world’.
Suncorp	Increased climate risks affecting affordability of insurance/pricing model challenges Increased populations and infrastructure in high-risk areas Feasibility of continuing to underwrite some risks	Protecting the North promotes mitigation activities among homeowners to reduce risk of cyclone damage
Cairns Aquarium	Difficulty sourcing specimens due to reef under stress, continuity of water and power supplies in severe weather events affecting operations, water shortage or drought	New aquarium construction has a clear overall strategy to minimise impacts and protect natural assets
AustralianSuper	Financial risk to value of assets impacted by climate change	Assessment of investments for climate resilience
Stockland	Weather related impacts to physical property, increased demand on air conditioning, bushfires, smoke penetration, water and mosquito borne disease, expectation from community as place of refuge, business disruption	Commercial retrofit for adaptation
Sydney Opera House	Due to its location, the Sydney Opera House could be impacted by sea level rise, while heat waves, strong winds and increased heavy rainfall pose risk to visitors, particularly to outdoor events and retail areas. Warmer winters present an opportunity.	Adaptation through the building renewal scheme, events planning and retail operations
Bedarra Island Resort	The resort was rebuilt after devastation by Cyclone Yasi aiming for long-term sustainability and increased profitability. Main climate change risks remain extreme weather events (cyclones, strong winds) and sea level rise.	Sustainable approach to rebuilding a small-scale luxury resort

3 Literature review: Business cases for climate change adaptation from around the world

Governments that understand and communicate the business case for corporate adaptation and can identify clear roles and responsibilities for the private sector in national adaptation planning and implementation will be able to better leverage private sector resources. (UN Global Compact 2015)

3.1 Introduction

A vast literature exists on climate change adaptation in the public and private sector that includes academic publications, industry and policy reports, websites and databases. These sources provide a host of examples of good adaptation practices in the form of case studies and even include entire databases of cases (most notable of these are the European ClimateAdapt platform and the UN's Private Sector Initiative of adaptation cases). An emerging focus in recent literature attempts to track trends in adaptation approaches, seeking to describe why and how organisations adapt (or not) to the impacts of climate change. They probe at the underlying problems of adaptation by exploring the limits to adaptation (Evans et al. 2016) and lack of implementation (Porter et al. 2014). For the most part, in the private sector, adaptation to climate change is discussed in the realm of corporate strategy. The first section of this chapter describes some recent thinking on how adaptation fits into or materialises as business strategy or organisational strategy in the public sector (Porter et al. 2014). This provides the context for understanding the main focus of this study, applying a business case approach to adaptation. The second section narrows in on literature that primarily concerns the process of building the business case for adaptation, summarising eight studies and reports of experiences of companies within and outside Australia that have formulated a business case for climate change adaptation. The eight documents that were covered include:

- IEMA guidance for building a business case for climate change adaptation (UK)
- UN Global Compact case studies on 'responsible corporate adaptation' (International)
- the business case for adapting buildings to climate change (UK)
- business case for early action for local government (Australia)

- building the case for resilience (Australia)
- roundtable on business case for adaptation – food companies by Oxfam (International).

In addition, the guidelines for building the business case for energy-efficiency by the Office of Environment and Heritage of New South Wales is also described. These documents were identified through Internet searches (Google and Google Scholar) to locate documents with reference to both ‘business case’ and ‘adaptation’ or ‘business case’ and ‘climate change’ more broadly, but only those that addressed adaptation were included. The final section provides some insights into how climate change adaptation is addressed in the business management literature.

3.2 Climate change adaptation in business (or organisational) strategy

Studies have only recently begun to explore how climate change adaptation is incorporated or considered within the framework of corporate business strategy (Amran et al. 2015). Academic discourse on this subject is relatively fresh with the few studies emerging only recently. The literature can be divided into those that draw conclusions from disclosure materials (such as Carbon Disclosure Project data, or Corporate Social Responsibility Reports) and those that derive empirical research from interviews and/or surveys. A third type is literature that presents economic valuation techniques for adaptation that have a much wider application potentially that extend beyond business strategy. Studies in this area seek to assist selection among different adaptation options and this is relevant to both the public and private sectors. Here we provide a summary of a selection of the most literature.

Amran et al. (2015) examined the climate change disclosure practices of firms in Malaysia, Singapore, Philippines, Thailand, and Indonesia. They found that at least 75% of the companies were aware of climate change issues, and 50% of the companies had plans to address climate-change-related issues. Despite widespread awareness of climate change, there was no evidence or indication that the costs, risks or opportunities it represented were incorporation into business strategies. They applied institutional theory (organisations facing the same institutional pressures are more likely to have similar responses) and a resource-based view (which includes tangible and intangible assets, such as financial, technology, organisational learning, innovation and processes, management skills, reputation, and information and knowledge) to explain findings.

Gasbarro and Pinske (2016) and Pinske and Gasbarro (2016) used Carbon Disclosure Project data to investigate the adaptation behaviour of firms in the oil and gas industry. Gasbarro and Pinske (2016) analysed qualitative responses to the 2010 CDP questionnaire of 89

companies. Applying a combination of deductive and inductive approaches they identified ten main interpretations of climate-induced physical changes, which were then assigned an overall (awareness and vulnerability) score from high to low (Gasbarro and Pinske 2016). Based on this methodology, they distinguished four types of adaptation behaviour: pre-emptive, reactive, continuous, and deferred adaptation (Gasbarro and Pinske 2016). Of these, continuous adaptation represents a new category that has not been described before.

Pinske and Gasbarro (2016) also explored Carbon Disclosure Project data from 91 oil and gas companies to determine the level of awareness of the impacts of climate change among firms, interpretations of vulnerability to climate change and response strategy development. They propose a model (based on an attention-based view of the firm developed by Ocasio 1997) that explains awareness of, and perceived vulnerability to, climate change and adoption of routine or non-routine measures to adaptation (Pinske and Gasbarro 2016).

Risk perception and perceived uncertainty of climate stimuli and knowledge of local ecosystem determined when and how firms notice and interpret climate change (Pinske and Gasbarro 2016). Perceived impact and controllability of climate change and past experience determined how firms interpret climate change to assess their vulnerability (Pinske and Gasbarro 2016). They identified the following categories of adaptation measures employed by oil and gas firms: (a) wait-and-see, (b) risk assessment, (c) technical solutions, (d) reduction of exposure through geographical decisions, (e) shift and share risks, (f) disaster relief and business continuity, (g) portfolio diversification, and (h) cooperation (Pinske and Gasbarro 2016 p.19). Pinske and Gasbarro (2016) also found that proximity to the physical impacts of climate did not translate into awareness, but local knowledge reduced high risk perception and the impact of uncertainty. Perceived impact on business and past experience shaped perceptions of vulnerability to climate change, while responses favoured routinized approaches (Pinske and Gasbarro 2016). They noted that oil and gas firms generally believe that they have adequate coping mechanisms, relying primarily on existing risk management systems and insurance (Pinske and Gasbarro 2016). Tendency to opt for a response clearly surfaced in the findings. This has also been observed among financial institutions that were found to place similar faith in their existing (credit) risk assessment practices to deal with environmental risks (Banhalimi-Zakar 2016).

Evans et al. (2016) examine social limits to adaptation based on qualitative data collected from multi-stakeholder workshops and key-informant interviews with representatives of the fisheries and tourism sectors (public and private) in the Great Barrier Reef region. Social limits are relevant to business strategy of adaptation insofar as they both arise and affect organisational and institutional structures such as policy-making and markets, and also perceptions, knowledge and values (Evans et al. 2016). Evans et al. (2016) observe social limits to adaptation; i) when the effort of pursuing a strategy exceeds the benefits of desired adaptation outcomes; ii) when the particular strategy does not address the actual source of

vulnerability, and; iii) the benefits derived from adaptation are undermined by external factors. They find that social limits are highly context specific, but can be reached before thresholds for ecological or technical limits (Evans et al. 2016).

Aldunce et al. (2016) investigated how disaster risk management practitioners in three locations (Charleville, Gold Coast and Brisbane) framed climate change in the context of disaster risk management (i.e. the Natural Disaster Resilience Program of Qld). They interviewed 26 representatives from the public and private sectors and examined relevant documents from in from the: in the context of the (Aldunce et al. 2016). Based on the literature they describe four possible stakeholder responses to climate change uncertainty; i) wait and watch, ii) anticipatory strategy, iii) precautionary principle and iv) resilience (Aldunce et al. 2016). Pairing this with a categorisation of natural disasters as 'routine', 'non-routine' and 'complex' Aldunce et al. (2016) discuss how practitioners perceive disasters in terms of scale, uncertainty and policy and management. They find that climate change is recognised as a complex problem but often proposed policies and solutions are less sophisticated (Aldunce et al. 2016).

Porter et al. (2014) offer a comprehensive review of the attitudes, practices, abilities and limitations of local authorities in Britain in dealing with adaptation to climate change. Their research spans over a decade, consisting of over 180 surveys and more than 20 interviews conducted in 2003 and in 2013. Their results indicate that British local authorities feel more comfortable and confident in using and applying climate data (Porter et al. 2014). Interestingly, Porter et al. (2014) find that expert advice tends to shape assessment of future climate risk, as opposed to recent experiences with extreme weather events. Local authorities were more concerned about issues related to implementation in 2013, particularly funding, costing and matching impacts with costs (Porter et al. 2014). Rebranding adaptation as resilience has been the most successful strategy for action and implementation as it fits with the focus on immediate risks to delivering statutory duties (Porter et al. 2014).

A third group of literature in the realm of climate change adaptation in business strategy is represented by those that report on various economic valuation techniques that can assist with adaptation decisions or adaptation finance. These studies focus on specific instruments, such as cost-benefit analysis, cost-efficiency, multivariate analysis and real options analyses as well as risk finance mechanisms. Linnerooth-Bayer and Hochrainer-Stigler (2015) describe experiences and the potential for various disaster risk financing mechanisms to fund climate change adaptation. While their insights are based on developing country experiences, their conclusions that risk financing can complement and stimulate risk reduction behaviour are likely to have widespread application. Real options analysis is flagged as a potential instrument and applied to climate change adaptation (see for example Linquiti and Vonortas 2012; Hertzler 2007; Nordvik and Liso 2004). Dobs and Chapman (2011) suggest a range of possible insurance and finance mechanisms to fund

coastal retreat in Australia. While the literature is not conclusive in terms of which instrument is or is not suitable to finance adaptation, exploration of the ability of existing and new finance mechanisms is expected to remain a key issue in developing a business case for adaptation.

The above literature reveals that organisations exhibit considerable differences with regard to how they interpret approach and manage adaptation to climate change. Various forces shape current practices in the private and public sector including subjective interpretation, awareness and perceptions of vulnerability. The importance of understanding climate change in the local context appears to be an important capability, while some organisations show a tendency or favour framing adaptation in terms of (disaster) resilience. This leads to the second part of the literature review, which hones in on practices to build the business case for adaptation.

3.3 Studies and reports of business cases of adaptation

The following section summarises eight key documents that directly inform this study. These documents were selected because they provide insight into the operative elements of building the business case by either offering advice or sharing experiences. While a vast number of cases of successful adaptation can be retrieved via the Internet, many of these do not include a discussion about how the business case for taking adaptation action was devised and presented to decision-makers. The following eight documents are unique in the sense that they provide details about the elements of business cases (beyond presenting the adaptation cases) as well as the processes that can help or hinder successful business cases.

3.3.1 IEMA guidance for building a business case for climate change adaptation (UK).

The Institute of Environmental Management and Assessment (IEMA) developed a guide for building a business case for climate change adaptation, targeted at environment and sustainability professionals. Published in 2013 the guide was informed by the experiences of practitioners who have worked on climate change adaptation and resilience initiatives within their organisations.

The methodology involved a workshop with 40 business professionals, to extract the principles of effective action on climate change adaptation, followed by a webinar with 247 participants to present and discuss early findings and a further 15 telephone interviews to explore issues in more detail. Approximately 73% of the participants were from the private sector. A breakdown of the size of companies that webinar participants represented is shown in Figure 1.

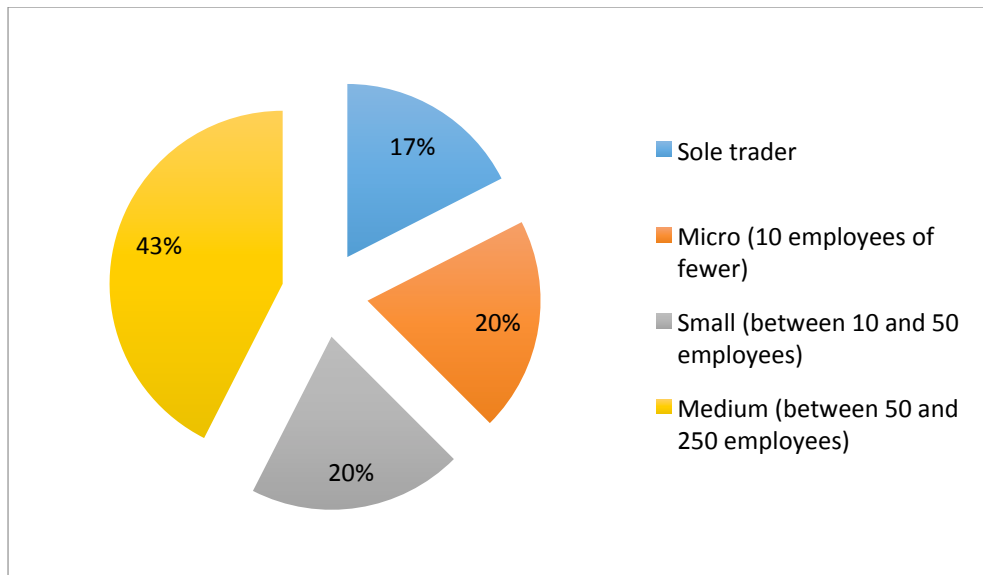


Figure 1. Company size of private business participants of IEMA webinar

Approximately 43% of the participants were working on climate change adaptation internally within their organisations, while 21% were working on adaptation externally, for instance by delivering consultancy services or developing new services and products targeted at building resilience or adaptation.

IEMA used the six generic business areas found in the Business Areas Climate Impact Assessment Tool (BACLIAT - see Box 1) to discuss the risks and opportunities climate change represents. They found that adaptation led to competitive comparative advantage to its competitors (i.e. considering action against climate risks as an opportunity for increased resilience and consequent business advantage).

Based on the experiences of participants, 12 principles and 12 corresponding ‘learning points’ were identified (Table 2).

Box 1. Business Areas Climate Impact Assessment Tool (BACLIAT) (UK)

The Business Areas Climate Impact Assessment Tool (BACLIAT) was developed by UKCIP to assist businesses recognise, assess and respond to climate change (now incorporated into Environment Agency’s Climate Ready Support Service). The tool is essentially a detailed guide on running an in-house workshop. It is generic in nature to allow any business to undertake climate impact assessment and adaptation planning. BACLIAT makes the business case for adaptation along three veins, stating that adaptation can:

- maximise profits
- help manage risks
- present strategic opportunities.

BACLIAT advocates a ‘planned approach’ to adaptation. It reasons that retrofitting is often more expensive than planning, that it takes time to build adaptive capacity and that a risk-based approach can help make good decisions in the face of uncertainty. The BACLIAT workshop involves determining the threats and opportunities presented by climate-related impacts across six generic business areas: market, process, logistics, people, premises and finance. Organisations are to determine these in the scope of a workshop that could be at a company, department or agency level.

Table 2. Principles and learning points for building a business case for adaptation

PRINCIPLES	LEARNING POINTS (FROM PRACTICE)
First understand your business and your context	Understand its purpose, culture and approach to decision making. Know what you are up against. Map key stakeholders and decision making routes. Evaluate and develop your role to the business context (e.g. lead? Inspire? Support? – probably all three at different times)
Engage key internal stakeholders	Communicate with (and seek advice from) a range of critical functions such as finance, marketing, procurement, logistics and operations. Further develop your understanding of the organization and internal decision making, business drivers etc. Build awareness and support. Introduce the business relevance of climate change risks, opportunities and dependencies.
Use business relevant language	In discussions either avoid terms like 'adaptation' or be careful to consistently translate. Use business language - profitability, disruption, staff welfare, client and customer service, liabilities, added value, winning business, loss of reputation, insurance costs, changing asset value, and constraints on future business...
Use direct business experience	Draw on recent experience within the business of extreme weather impacts – use to win interest in early action (this can also help the visualization of future increased risk). Make sure that you present both the worst case scenario and the most likely outcome. Avoid the tendency to present just doom and gloom, and ensure that the work is solutions focused.
Consider wider skill needs	Training may be valuable at early stage and can support internal scoping workshops. External expertise may be needed (e.g. flood risk).
Consider external input	Consider partner opportunities to support (e.g. sector /regional initiatives). Contribution from Advisory committee or stakeholders? Advice / requirements from clients?
Use projections and be transparent (e.g. on scenarios and uncertainty)	Do use formal climate change projections and remember businesses are used to dealing with uncertainty and imperfect information. Be transparent on the status of any projections and information. In addition feel confident to include high emission scenarios if you can justify (i.e. some view as basis for more credible projection given current failure on global emission targets)
Cost / quantify business impacts? (sufficient for decision)	Future climate related business costs are a challenge but some can be estimated - e.g. by assessing impacts of past weather events (£ loss) and projecting forward. Other factors can be quantified (e.g. reputation may consider positive or negative media coverage in column inches). However avoid 'over creative' accounting. The degree of work required for a decision should be considered with a balance of what can and can't be quantified. Clearly state assumptions and dependencies.
Use existing processes (don't reinvent wheel)	Look to use existing business processes where they offer scope for action on climate change adaptation (e.g. procurement, risk management and business continuity, environmental management system, annual business planning etc).
Look for win wins (Trojan horse... piggy back)	Wider agendas offer scope for effective action on climate change adaptation. For example, heating and cooling (staff comfort) requirements in future premises as adaptive considerations within low carbon design and more energy efficient buildings. Adaptation can contribute to other business considerations underway (e.g. flexible and remote working of key personnel, or increased resilience as part of wider procurement and sustainable supply chain initiatives)
Opportunities and Comparative advantage	Investigate with colleagues opportunities for increased business (products and services). Also consider the comparative business advantage from resilience (see section 2.2).
Try things out	Do not under-estimate the importance of making a start. Trialing solutions on site with willing colleagues or business partners can be an important first step (demonstrators)

Source: IEMA (2013)

These principles informed the interview questions of the present study, for example scoping how internal stakeholders were engaged, whether specialist training was undertaken, and how costs and benefits were calculated.

IEMA's (2013) findings revealed that individually developed and implemented business cases for adaptation are rare. Instead, adaptation is more commonly built into other

mainstream environmental management processes, such as Environmental Impact Assessment, Environmental Management Systems or wider strategies, particularly centred on sustainability. Furthermore, experience indicates that often several adaptation business cases are built within an organisation, across a number of areas, each corresponding to a different decision-making point. Corporate reporting, flood risk assessment and environmental impact assessment represented opportunities to incorporate adaptation. Company-specific quantification of the costs and benefits of adaptation was highlighted as important. Normally this was achieved through quantification of adaptation costs and benefits based on various climate scenarios, leveraged against experience and judgement. Specific adaptation cost-benefit estimates were rare. Long-term planning to 2030 and beyond was a significant challenge for businesses, with the notable exceptions of the utility sector, infrastructure companies and some property businesses.

Based on the experience of practitioners, IEMA formulated a three-step approach for businesses to build a business case for adaptation: planning, building, enabling. Planning involves acquiring an understanding of the company's internal processes that help relate adaptation to core business goals and practices. This includes knowing the company's overall approach to business, its central values, core business rationale and approach to change. More specifically, it entails knowing how the company manages risk, what is its decision-making processes and stance on environmental issues. It is also important to reflect on the practitioners' role within the organisation to understand what and how change can be achieved. Planning also involves identifying risks and opportunities presented by climate change, stakeholder mapping, and identification of decision-making capabilities across the organisation. One way to do this is to engage colleagues thereby building internal interest and capacity for adaptation. There are several methods to map stakeholders and IEMA (2013) had no preference for a specific approach. However, they did stress that the approach used should allow practitioners to form an initial judgment about the attitude of stakeholders towards adaptation and internal dependencies. This should lead to an understanding of whether they should be involved in the development of the business case further and if so, how. As a general rule, most large businesses of over 250 employees will benefit from a scoping exercise tailored to their current business model and to planned business directions.

The building phase is targeted toward building awareness of climate dependencies internally and at several levels within an organisation. This could be part of a scoping exercise or formulation of an overall sustainability strategy. Practitioners identified active workshop approaches, as valuable in drawing out critical climate dependencies for the business.

During the enabling phase, adaptation is carried across the organisation along decision-making points, such as those that deal with risk management, supply chain management and environmental management systems.

3.3.2 UN Global Compact case studies on ‘responsible corporate adaptation’

The UN Global Compact project involved documenting 17 examples of ‘responsible corporate adaptation’ from around the world. ‘Responsible corporate adaptation’ involves engaging in activities that are focused on creating shared value and enhancing community livelihoods and are at the interface of business strategy, risk management, sustainable development and community engagement (see Figure 2) (UN Global Compact 2015). Such activities must extend beyond those that are already pursued by companies to preserve business continuity (for example implementing water or energy efficiency) and even strategic shifts within organisations (UN Global Compact 2015).



Figure 2. What is ‘responsible corporate adaptation’? Source: UN Global Compact (2015)

A total of 17 cases were selected out of 25 voluntary submissions from participants of Caring for Climate and UN Global Compact, based on the following criteria:

- relevance of impact on business operations and local communities
- potential for scalability and replicability
- partnerships approach
- innovative dimensions
- geographic and sectoral distribution (UN Global Compact 2015).

Each case study is briefly described in the report and many common features are identified. For instance, most companies drew from their own resources to implement responsible adaptation practices. This was primarily because the business case was strong enough to secure funding internally as part of companies’ own corporate social responsibility programmes, or risk management costs. Several cases were also realised through public financing. For example, government grants supported research, partnerships were forged

with local or regional governments, or joint assistance was granted through government aid. Examples of innovative practices include: Braskem’s ability to join forces with local businesses to build a coalition and pool resources to invest in infrastructure for the benefit to the community; Olam’s effort to fetch a premium for its climate-smart cocoa products, however they found that the market was not willing to pay premium cost; and Tokio Marine’s implementation of the Green Gift Project, which involved generating a revenue stream from its paperless programme and using the funds to invest in mangrove plantations.

The report identified benefits and barriers to implementation of resilient adaptive practices and formulated two lists of recommendations; one for business leaders and one for policy-makers. These are summarised in the tables on the following pages. Four main benefits of implementing adaptation practices were identified that could be useful for companies that aim to build the business case for adaptation. These are described in Table 3.

Table 3. Benefits of responsible corporate adaptation with examples

Benefits of adaptation	Examples
Can improve business operations and competitiveness	Increases efficiency and at the same time reduces operational costs.
	Supports business continuity and risk management for long-term viability.
Can help protect the value chain	Companies in the agriculture sector implemented training programs for local growers on growing alternate crops, implementing more water-efficient farming practices, which reduced stress on the surrounding community.
	Public utility companies implemented adaptation plans, which enabled them to secure resources (electricity or water for instance) for the community into the future.
Can be used to generate new business opportunities	Opportunities were found after risks were identified and appropriate response was implemented. This knowledge was then used to generate new business through developing a new tool or process internally using it in another region or beyond the department or original company.
Is able to strengthen corporate brand	Adaptation measures were used to enhance corporate reputation or safeguarding the ‘social license to operate’. In some instances, early action was not only a co-benefit of adaptation project, but a key driver.

Source: Based on UN Global Compact (2015)

The results showed that community benefits of corporate adaptation materialised through direct investment into suppliers, customers, employees and infrastructure in the community, investment into ecosystem services vital for their business and the economic well-being of the region, and knowledge-sharing of sectoral expertise which raised awareness and supported local resilience efforts. The report also identified several barriers to responsible corporate adaptations (Table 4).

Table 4. Barriers to responsible corporate adaptation and examples

Main barriers to corporate adaptation	Examples
Information gaps and risk uncertainty	Lack of awareness of how climate change will impact organisations.
	Cannot access and/or understand climate data in a meaningful way for organisations.
	Development and implementation of adaptation strategies are risky, considering in uncertainty in the nature, timing and magnitude of impacts.
	Lack of clear guidance for adaptation (while sector-specific guidance on carbon accounting and risk management exist).
	Internal climate champions lack role models and benchmarks to support the business case, identify effective business adaptation actions and delineate a clear path towards success.
Difficulties in integrating long-term forecasts into business planning	Planning horizons of businesses typically do not exceed five years (except infrastructure sector), while climate change is perceived as a long-term risk.
	Adaptation benefits will be realised in 20-30 years.
Lack of incentives to take adaptation action	Measuring and quantifying benefits of adaptation is difficult (particularly return on investment).
	Action to address adaptation by staff is not recognised and supported (e.g. through staff performance management).
	External organisations, such as the insurance industry do not incentivise action to encourage businesses to reduce their exposure or mitigate the risk.
	Lack of incentive for companies to invest in public goods, in infrastructure, such as roads, communications infrastructure or clean water.
	Conflicting incentives to publicise adaptation efforts: on the one hand, adaptation may be a part of standard risk management or planning processes without being explicitly labeled as adaptation, hence the visible level of activity may not fully

	capture the actual level of activity.
Access to financing	Poor access to capital internally for long-term resilience projects. “Some companies report that it is easier for them to send blankets, diapers and water after a catastrophe as part of their corporate social responsibility initiatives than to get their Chief Financial Officers to invest in resilience projects that have an uncertain probability and undetermined internal rate of return ” (UN Global Compact, 2014 p.22)
	Small businesses find it increasingly difficult to get access to capital.
	Public finance is vital, but experience is that it is slow to trickle down .
Policy, regulatory and socio-cultural barriers	Conflicting, inconsistent policies and regulations at local, regional or national level can hamper replication of successful adaptation approaches.
	Lack of guidance showing how the private sector can engage effectively to support public adaptation efforts.
	Beliefs, cultural norms, traditions, institutional inequalities, discrimination and lack of institutional flexibility internally and externally to companies.

Source: (based on UN Global Compact 2015)

Table 4 shows that companies encountered difficulties due to circumstances that were both internal and external to their organisations. Thus, the examples shown in the second column may be particularly valuable in providing ideas to overcome these issues. In response to these barriers, the report makes several recommendations on how to overcome them, specifically targeting business leaders and policy-makers (see Table 5).

Table 5. Summary of recommendations for implementing responsible adaptation practices for business leaders and policy-makers

For business leaders	For policy-makers
<i>Identify critical climate risks and opportunities</i> using traditional techniques such as scenario planning (business ‘war games’) and Monte-Carlo analysis and to monetise losses, ROI. Strategies should reflect the company’s risk tolerance.	Build the foundations for engaging the private sector by a) providing information on the impacts and risks of climate change at the local-scale, b) developing a common language that helps identify opportunities for partnerships and common interests between different stakeholders (consider that many companies will not distinguish between adaptation activities and energy efficiency initiatives) and c) communicate actions regularly and clearly to inform and attract investors.
<i>Identify existing internal strategic frameworks</i> (i.e. core business planning	Facilitate private sector involvement by removing policy barriers to private sector action and developing regulatory

<p>and management) where adaptation goals can be implemented</p>	<p>frameworks to guide and enable responsible corporate adaptation practices, and promote systematic information sharing.</p>
<p><i>Develop strategic partnerships</i> with governments, other companies and NGOs that have similar overall adaptation goals to coordinate adaptation efforts. For example, raising awareness with key stakeholders can build support for action internally and externally. Research institutions can help identify data and information gaps. Working with local partners can help understand community needs and concerns and avoid maladaptive processes.</p>	<p>Align public and private adaptation interests. Local government should outline roles that local businesses could play in addressing community vulnerabilities and needs that are compatible with company’s own corporate adaptation strategies. Such an approach should discourage maladaptive efforts and prevent private companies from contributing to increased vulnerability through precautionary measures that secure scarce resources for themselves. For example, involve private sector stakeholders in the development of adaptation strategies and plans to address pressing climate change adaptation priorities, such as water security, agriculture and disaster risk reduction.</p>
<p><i>Report on progress regularly and publicly and increase transparency to all stakeholders.</i> It is important to mainstream relevant and useful information on climate-related risks, opportunities and initiatives in company annual reports and reporting requirements to shareholders and regulators, alongside other business risks and opportunities. Other forms of reporting include training and educational outreach activities that clearly communicate risk assessment goals, the associated benefits and the resources needed to achieve them.</p>	<p>Leverage private sector resources and market forces. Send clear market signals to help reduce uncertainty and to incentivise private sector investment and engagement. For example, a) provide opportunities for private sector to match public funds for mutually beneficial projects, and research and development of new products and services, b) provide financial incentives to stimulate the uptake of climate-resilient technologies and services, such as subsidies for sustainable agricultural equipment, resilient design competitions, or preferential tariffs for sustainably- sourced products, c) develop strategies to leverage and mobilise private sector expertise and resources in building climate resilience, d) develop sector-specific solutions implement financial and risk reduction incentives and address market failures in building climate resilience. Draw on private sector experience to create new channels for public-private participation and partnerships.</p>

Source: (based on UN Global Compact 2015)

3.3.3 The business case for adapting buildings to climate change: Niche or mainstream? (UK)

This UK report is the product of the British industry-specific initiative called the Design for Future Climate (D4FC) project (Thompson et al. 2014). The project challenged building designers to construct and refurbish buildings to adapt them to future conditions in 2030, 2050 and beyond. It is argued in the report that building designers have a professional duty to understand the potential implications of climate change, discuss them with clients, and act accordingly. It is likely that liabilities for poor designs will ensue.

Fifty projects were selected from over 150 applications, granting £4.2Bn to 240 companies during 2010-2014. Each project was awarded up to £100,000 to cover total costs. Feedback and outcomes from projects were compiled by Innovate UK in the final report.

Experience indicated that even prior experience of severe climate impacts does not motivate clients, indicating an inertia based on thinking in the market that 'lightning won't strike twice'.

The report identified some barriers to the adaptation of the building industry in the UK, including; a) uncertainty about climate change translates to a limited market for adaptive designs, and b) construction clients are reluctant to implement designs, which hinders the building design sector's motivation. Motivation for adaptation in the building sector includes pressure from the insurance industry, investment institutions and other financial stakeholders that have long-term interests in buildings after the construction client has moved on. Opportunities presented by climate change are beginning to be recognised in the industry.

The report identifies several conditions that help building designers mount the business case for adaptation for their clients:

- if costs and benefits over time can be taken into account in establishing initial capital expenditure
- if adaptation gives the client genuine competitive advantages and allows them to exploit new opportunities
- if all of the project's financial stakeholders support it
- the more the client's business processes and decision-making are integrated, and able to respond to new factors, and involve fewer people
- the more enduring the client's stake in the building
- the client's fundamental purpose or core business objectives encourages it to engage with the issue
- the more impact adaptation has on the common good, especially if the adaptation is very visible
- the more vulnerable and likely it is that client's priorities are affected
- the more frequently and seriously the client has experienced the consequences of extreme weather events
- the more certain is the future risk

- the more robust the rationale is and the more convincingly it is communicated
- when the decision-making processes can make sense of underlying uncertainty
- when the technology is tried and tested, and the cost-benefits are pronounced
- the more amenable the client is to innovation and the better the design team is at allaying clients' real or misplaced fears
- the more the client can see that it is part of the building designer's normal service and well established in-house practice.

The report identifies barriers for building designers to engage in adaptive practices, including lack of regulation and standards or consensus, the nature of climate data is presented in an unfamiliar probabilistic format that is not easy to understand and communicate.

The report also identifies the features and capabilities building design firms need to build the business case for adaptation:

- open to innovation: willing trying new things on live projects and committed to voluntary research and development and continuing professional development
- enthusiastic about the subject: knowledgeable about climate change science, clear-sighted about its impact on buildings, and good at communicating the issues
- interdisciplinary: designing from first principles, considering impacts holistically, and having the enthusiasm and skills to work collaboratively with other members of the team
- aspiring to best practice: the opposite of merely delivering regulatory compliance or only doing the minimum that reduced fees permit.

The report concludes that there is a micro-market for adaptation services, suited to only a few types of building design firm.

3.3.4 Roundtable on business case for adaptation – food companies by Oxfam (International)

In 2012, Oxfam invited 14 food companies (including Acclimatise, Café Direct, Marks & Spencer, Starbucks, The Body Shop and Waitrose) to reflect on its publication *Climate Risks and Supply Chain Responsibility* (Thorpe 2012). The discussion centred on building a business case for adaptation in the food industry. Adaptation was seen as relevant to business and can garner support from leadership, as it relates directly to strengthening

producers in the supply chain. There are lots of good examples (pilot projects) but scale must be achieved by improved coordination across industry and government.

Key features of building the business case for adaptation in the food industry included:

- mapping the supply chain to know who producers are and where they are located
- understanding where the company is on the journey
- identification of 'no regrets' and 'low regrets' actions
- increasing information exchange with suppliers
- improved insurance coverage
- investing in or conducting crop research
- incorporating climate change into investment in fixed assets
- tapping into the local knowledge sources
- accommodating growers during extreme weather events by changing purchasing practices and increasing lead-time.

Industry-specific issues and solutions were identified. For instance, the impact of the Global Financial Crisis was a concern, as in many cases demand for sustainable products waned. Smallholders were identified as particularly relevant for adaptation in the food industry because they often have more experience in adapting to changing environmental conditions over time. Specific strategies to assist smallholders included the need for buyers to provide them with a long-term commitment to justify investments for adaptation and taking on additional risks.

3.3.5 Building a business case for energy-efficiency - Office of Environment and Heritage NSW, Australia.

Additional searches of business case processes for climate change more broadly yielded a guideline by the Office of Environment and Heritage (NSW) to Australian businesses on how to build a business case for energy efficiency. Although this example is not aimed at adaptation, but mitigation of climate change, it was deemed relevant for the purposes of this study as it has a domestic context and because it describes a process for business in the broad sense. The Office of Environment and Heritage (NSW) makes the following recommendations for the process:

- Identification of the people in the organisation who can make or break the proposal and the strategies one can use to involve and influence them.

- Select and apply the most effective financial analysis methodologies (including internal rate of return (IRR) and net present value (NPV)) to communicate the value of the projects.
- Quantify and promote the many business benefits that projects can deliver.
- Access innovative energy efficiency financing options to help implement proposals.
- Present a clear and compelling argument for your project in both formal and informal settings.

3.4 Business case for sustainability

The notion of building the business case for sustainability is somewhat better established than the business case for climate change adaptation. Two key works from the realm of corporate sustainability have been consulted to better understand and refine what a business case for adaptation might entail: Schaltegger et al. (2011)'s *Business Cases for Sustainability and the Role of Business Model Innovation Developing a Conceptual Framework*, and the International Finance Corporation's (IFC 2012) *The Business Case for Sustainability*.

Schaltegger et al. (2011 p.8-9) distinguish between the business case for sustainability and the "conventional business case or a business case *of* sustainability" in that the former

- i. aims to realise a "voluntary or mainly voluntary activity with the intention to contribute to the solution of societal or environmental problems" that extend beyond legal requirements
- ii. creates a positive effect on the business, or a "positive economic contribution that can be measured and argued for in a convincing way (e.g. cost savings, the increase of sales or competitiveness, improved profitability, customer retention or reputation etc.)"
- iii. establishes a "clear and convincing argumentation ...that a certain management activity [leads] to ... the intended societal or environmental effects, and the economic effect".

Six drivers of business cases for sustainability are identified in corporate settings and reveal how these manifest in the four pillars of the generic business model (Table 6).

Table 6. Manifestation of the drivers of business case for sustainability in the generic business model

Core drivers of business cases for sustainability	Generic business model pillars			
	Value Proposition (VP)	Customer relationships (CR)	Business infrastructure (BI)	Financial aspects (FA)
Costs and cost reduction	Products and services with lower energy or maintenance costs for customers	Cost-efficient contracting relationships, closed-loop service systems	Costs of new products and services can be lowered through partnerships	Balancing cost reductions for customers and cost structures of new products and services to increase profitability
Sales and profit margin	Environmentally and socially superior products and services require modified or new VPs to turn into sales and profits	Higher customer retention and customer value as a result of sustainability-oriented, service-intensive relationships	New products and services may require strategic partnerships (e.g. co-opetition) to overcome market barriers	New products and services and/or new customer relationships contribute to diversified revenue streams
Risk and risk reduction	Lowering societal risks through products and services can create value to certain customer segments	Service-relationships reducing sustainability risks for customers result in higher customer loyalty	Resources, activities, and partnerships set up in order to minimize internal and external risks	Improved risk and credit rating resulting from lowered sustainability risks
Reputation and brand value	Sustainability as distinctive element of good corporate reputation	Sustainability as marketing feature of the brand increasing customer loyalty	Strategic partnerships with sustainability leaders can increase reputation and brand value	Sustainability performance leading to a good rating and the consideration in sustainability indices and funds
Attractiveness as employer	A companies' offerings and VPs allowing for personal identification to attract employees	Better customer service as a result of higher employee motivation	Attractiveness as principal can enhance the quality of activities, resources, and partnerships	Reduced costs for HR acquisition, less fluctuation costs and lower compensation costs
Innovative capabilities	Unfolding the full sustainability-potential of innovations enables modified or new VPs	Innovative products and services creating solutions to sustainability problems, improving customer retention	To allow for innovations to unfold may require new activities, resources, and partnerships	Higher innovation potential and expectations for profitable innovations leading to an increase of shareholder value

Source: Schaltegger et al. (2011 p.17)

The IFC (2012) identifies five different elements of the business case for sustainability, which rest on its Performance Standards:

- i. protecting brand value
- ii. creating innovative solutions
- iii. energy efficiency to reduce costs
- iv. environmental, social and governance increases investments
- v. consideration of wider external impacts to stakeholders and the community.

3.5 Private sector adaptation in the business and management literature

Linnenluecke et al. (2013) reviewed 38 articles in the business and management academic literature that addressed adaptation to climate change from an initial dataset of over 300 publications on climate change (including mitigation) with the aim to describe trends and identify gaps. They found that most papers were conceptual rather than empirical in nature. Most studies focused on adaptation at the 'firm' or 'industry' level while only two examined it at the level of decision-making (Linnenluecke et al. 2013). Studies at the industry-level focused on certain select sectors, such as tourism, agriculture, electricity and insurance (Linnenluecke et al. 2013). Overwhelmingly, climate change adaptation was interpreted and managed through traditional firm adaptation responses, such as the implementation of cost savings, superior production processes or lobbying. Little is known about the strategic relevance of adaptation and the implication of risk-reduction strategies and changes in patterns of resource allocation (e.g., diversification, relocation, internationalisation) for competition and the bottom-line. There is also little discussion of the types of adaptation capabilities that firms can and need to develop. This led the authors to conclude that the "business and management literature offers very few insights on climate change adaptation; there is also surprisingly little cross- disciplinary work integrating findings from the natural sciences into business thinking" (Linnenluecke et al. 2013 p.410). They highlighted the need to broaden traditional firm adaptation responses, to enable adaptation to the "complex, non-linear and in many cases irreversible" and "uncertain impacts" of climate change (Linnenluecke et al. 2013 p.410).

Busch (2011) aimed to identify the organisational capabilities that are necessary for firms to adapt to disruptions to resource supply, production processes, and product distribution, which are the direct impacts of climate change on companies. With electricity utilities in Austria and Switzerland as case studies, Busch (2011) identified three core capabilities as essential; i) climate knowledge absorption to generate information and internalising capability, ii) climate-related operational flexibility as a short-term adjustment capability, and iii) strategic climate integration as a long-term, innovation-focused capability.

Pauw (2015) examined the motivations for adaptation in the private sector focusing on developing nations and identified primary motives as the need to manage climate risk and harness new markets and opportunities. Climate risk management is understood as mainstreaming adaptation in business practice to protect revenues and to prevent future costs from changing climatic conditions. These costs derive from direct and indirect risks. Direct risks relate to a company's local exposure to climate impacts such as heat stress, water scarcity, and extreme weather events, causing damage for instance to physical assets, production or health. Indirect risks are based on both local and more distant exposure, as

they include the broader effects of climate impacts, such as disruption of infrastructure or supply chains, and impacts on communities or workforce.

The second motivation is new markets and business opportunities (Pauw 2015). New markets are created as a result of climate change (e.g. pest control) and publicly funded adaptation projects such as climate-resilient roads and flood protection barriers require implementation by the (domestic) private sector.

3.6 Summary

The literature revealed that multiple organisations around the world have attempted to collect and document business cases for adaptation. Many of these attempts were aimed at specific sectors (e.g. food companies, or building sector) or regions (UK). In all these documents, business cases featured as a tool or input to decision-making. While the method or elements of developing a business case varied depending on the particular sector or location at hand, there appear to be several common features of a business case and general agreement on how to mount such a case. For instance, business cases are often presented as a (single) document that justifies undertaking a proposed project or activity based on the expected commercial benefit they will deliver. Documents are normally prepared by stakeholders or sponsors of a project, but usually not the project manager and can range in complexity from brief and informal to extensively detailed. Business cases contain similar features, thus, there appears to be a general understanding of the type of information that should be contained in a business case, including:

- background of the project
- expected business benefits
- a discussion of the options considered (with reasons for rejecting or carrying forward each option), including the option of doing nothing and the costs and risks of inactivity
- cost-benefit analysis
- gap analysis (difference between actual and potential performance) and the expected risks
- SWOT analysis or discussion of similar issues referred to as 'situational assessment', 'problem statement' and 'assumptions and constraints'
- an implementation strategy
- project management framework

- final justification for the project.

These are all generic features of business cases. But the literature also revealed some aspects specific to business cases for adaptation, which include an understanding of how climate change impacts organisations. This is more than just an awareness of impacts as it also incorporates an understanding of the risks and opportunities these impacts mean to the organisation overall and to key stakeholders, such as decision-makers (shareholders and Board of Directors), and clients in particular. There is also an emphasis on how to communicate the risks and opportunities effectively, in a meaningful way to stakeholders both internal and external to organisations. A review of the broader, more mature literature on building a business case for sustainability offers valuable lessons and provides a roadmap for achieving the integration (or mainstreaming) of environmental issues into business case development and ultimately business decisions. Armed with these insights, we developed the criteria for inclusion of climate change adaptation business cases in this study and this is presented in the following chapter.

4 Case study methodology

The research methodology of the case study analysis comprised three key components: (1) desktop review of scholarly and non-scholarly literature on the topic of a business case for climate change adaptation for the purpose of understanding the features of a business case for climate change adaptation in coastal areas; (2) the development of criteria for case selection of organisations that have used a business case approach to climate change adaptation in coastal areas in Australia; 3) case study analysis of organisations operating or working with businesses operating in coastal areas to develop a grounded understanding of critical success factors of a business case for climate change adaptation. Specifically, the success factors will be analysed as key elements of the business case and a synthesis of the lessons learnt from organisations on how to mount a successful business case for climate change adaptation. The key elements and lessons learnt about the process of building a business case for climate change adaptation can inform future practice.

4.1 Literature review method

The first component was the desktop review of the scholarly and non-scholarly literature. This was conducted to ascertain the features of a standard business case, the features of a business case for sustainability and importantly, literature on the business case for climate change adaptation. The literature review involved an Internet search for evidence of business cases of adaptation in Australia and internationally in the grey literature (using Google search engine) and in the academic literature (using Google Scholar search engine) using search terms such as 'business case and adaptation', 'business case and climate change', 'business case and disaster resilience'. The search was extended to cover 'business cases for sustainability' to inform the development of the criteria for case selection. A literature review report and selection criteria document were compiled and circulated to members of the research team.

4.2 Developing the criteria for business case selection

The literature review was used by the research team to inform the criteria by which organisations would be chosen. An inception workshop was held in November with members of the research team and Mara Bun, the founder of the Business Adaptation Network at Green Cross Australia, to develop the criteria for case study selection. It was decided that organisations needed to have all of the criteria in the framework to be included as a business case for climate change adaptation. Also, the issues of how these features became enacted in the process of building a business case were discussed and this enabled the formulation of the interview questions. The questions targeted the various issues identified in the features and processes surrounding building a business case for climate change adaptation in coastal areas of Australia. The other purpose of the meeting was to

ensure the project planning aligned with the NCCARF objectives for the CoastAdapt Tool). The criteria that were developed and used to select cases for this study is presented in the bottom row of Table 7.

Table 7. Criteria used to select business cases for adaptation

Source	The key elements of a business case for CC adaptation (This can also be used to select cases for exemplary business cases for climate change)						
IEMA^A Business Case for Climate Change	Changing markets	Business logistics	Business premises	People	Business planning	Company finances	Monitoring
IFC (2012)^B Business case for sustainability	Protecting brand value	Creating innovative solutions	Energy efficiency to reduce costs	ESG increases investment	External impacts – stakeholders/communities		
Schaltegger et al (2011)^C Business case for sustainability	Strategic objectives and measures and business model towards a triple bottom line	Create a positive business effect	Voluntary or mainly voluntary activity with the intention to contribute to the solution of societal or environmental problems.	Certain management activity has led or will lead to both, the intended societal or environmental effects, and the economic effect	Intentional management within the company		
Elements identified by the Research Team	Vision included in strategy documents	Risk incorporated into planning	Return on investments.	Opportunity costing	Collaboration with stakeholders	Organisational commitment to research	
Proposed criteria for adaptation business case selection	<i>Integrated framework - with other elements of business planning</i>	<i>Aims to reduce identifiable impacts on clients/members/constituents</i>	<i>Identifiable adaptation pathways including return on investment, opportunity costs</i>	<i>Increases value to externals – communities, stakeholders.</i>	<i>Infrastructure - present/future planning</i>	<i>Collaborative approach to share costs/resources/information</i>	<i>Monitoring of business case framework within the organisation</i>

^A IEMA (2014)

^B IFC (2012)

^C Schaltegger et al (2011)

It should be noted here that financial or economic justification was deemed not always important in business case approach to climate change adaptation and thus, it was not

included as a separate criteria for selection of cases, although the 'Identifiable adaptation pathways' criteria did probe at the method used to justify selection of an adaptation option.

4.3 Identification of possible cases, interviews and analysis

The case study methodology was used in order to analyse the wide range of cases in the study. Yin (2013) and Flyvbjerg (2006) outline the method and benefits of case study methodology. The important aspect of the case study methodology relevant to the present study is that exemplary cases can illustrate important defining features of a phenomenon under study and reveal lessons that can be applied to other organisations (after the consideration of context). Case studies offer a window into innovation on a given topic as opposed to standard quantitative approaches which tend to survey larger samples sizes and look for generalisability in the results. Case studies analysis was conducted to determine how organisations developed a business case for climate adaptation in coastal environments. The outputs of the analysis consisted of lessons learnt in the process of mounting a business case and the key elements of the business case for climate change adaptation.

4.3.1 Identification of possible cases

In an effort to identify potential business cases for adaptation, the public profiles (websites) of one hundred and twenty local government and business organisations were identified. The aim was to identify organisations that had either implemented the business case for adaptation or made a significant commitment (such as financial commitment) towards implementation and were located along the coastline of Australia. Organisations needed to have all of the criteria identified for a business case for climate change adaptation, as developed from the literature review and expert review stages.

A total of 23 organisations were contacted to determine their suitability for the study. Of these organisations, 17 were asked to participate. A further six organisations, mainly industry bodies and government authorities, were contacted in an effort to assist with identifying potential organisations, particularly in the tourism sector. A total of ten cases were included as cases in the study. Case study participants were determined through using expert knowledge of the project team. Also the project officers who worked on this report conducted detailed website searches for business cases in Australia. Cases that did not meet the criteria were not included because they were not exemplar cases.

The study was conducted over a six-month timeframe from November 2015 to April 2016. Organisations were contacted during the months of January to April. The study utilised the extensive network of organisational contacts offered by Mara Bun, from Green Cross Australia. The study would not have been possible in the given timeframe if it were not for

the relationships developed through the Business Adaptation Network facilitated by Green Cross.

4.3.2 Interviews

Interviews were conducted with all ten organisations and targeted the individuals responsible for planning and implementing a business case for climate change adaptation. In three of the ten organisations interviews were conducted with two individuals who were responsible for climate change adaptation. Participation was voluntary and participants were not paid. The ethical clearance of the study was granted by Griffith University (GU Human Research Ethics reference number 2015/871).

Interviews were conducted over the telephone, recorded and transcribed by a professional transcription service. On average interviews lasted 50 minutes. Interviews were semi-structured and consisted of 16 questions (see Appendix 1) that probed at the following issues: T

- risks and opportunities that climate change presented to the organisation or project
- features of the business case for climate change adaptation
- methods used to ultimately make the business case, such as risk assessment, cost-benefit analysis, SWOT analysis, etc.
- methods used to involve internal and external stakeholders in preparing the business case (e.g. stakeholder mapping, internal workshops, integrated into other stakeholder engagement process)
- level of integration of adaptation, such as the organisation's vision or overall strategy
- approach used to garner support from internal and external stakeholders;
- benefits of adaptation to the community
- monitoring and assessment of the organisation's or project's success
- nature and extent of collaboration with other organisations
- organisational learning.

4.3.3 Case analysis

Each case provides a narrative of how the organisation has mounted a business case for climate change adaptation in coastal areas. Headings within each case in section 6 help provide structure to the narrative. At the end of each case, the lessons learnt regarding the process of mounting a business case and key elements of a business case for adaptation is summarised. Further analysis of the themes across cases is presented. This draft report will be circulated to case study participants (interviewees) for verification of the analysis and their feedback will be incorporated into the final published report.

5 Business cases for adaptation: Ten exemplars from coastal Australia

The list of organisations that satisfied the criteria for selection is shown in Table 8. All cases chosen for this study can be considered exemplary cases because they all addressed the criteria, although to various extent. It should be noted that comparisons between organisations cannot be made but rather the evaluation presented here identifies that some features are more important for a particular business case. The table does not evaluate the success of a business case. Most organisations in this project had developed their own approach to developing a business case within their own organisational framework. All the cases not only fulfilled the criteria but they also exhibited a general consensus about the 2030 and 2070 climate change scenarios.

Table 8: Selected business cases based on the criteria

Business case elements	Presence/importance of element									
	Melbourne City Council	Parramatta City Council	Douglas Shire Council	Lendlease	Suncorp	Cairns Aquarium	AustralianSuper	Stockland	Sydney Opera House	Bedarra Island Resort
Aims to reduce identifiable (economic) impacts	***	**	***	***	**	***	**	***	***	***
Identification of adaptation pathways (options)	*	*	**	**	**	**	**	**	**	**
Integration into overall business decision-frameworks	***	***	***	***	***	***	***	***	***	***
Use of collaborative approaches	**	***	**	**	***	*	*	**	*	*
Planned monitoring of adaptation outcomes	***	**	**	***	**	**	**	***	*	**
Developed shared value with stakeholders including the wider community	**	***	**	**	***	**	*	***	N/A	*
Planning for infrastructure for the short- and long-term	***	*	***	***	**	***	**	***	***	***

* Prevalence of the criterion in the business case

The implication arising from the process of selecting cases is that organisations attempting to develop a business case for climate change adaptation need to understand the context in which the case is mounted and ensure that certain features are given more emphasis in the development of a case. Critical success factors arising from the analysis of the cases will shed light on the process in mounting a business case in an organisation.

The case studies of the organisation are presented in the following ten sections. The information presented is predominantly from the interviews, although some information was also collected from company websites of Lendlease (Barangaroo South) and Green Cross Australia (Stockland case). Company websites of the Cairns Aquarium, Bedarra Island Resort, Sydney Opera House, Parramatta initiatives, Melbourne Urban Forest Strategy, Douglas Shire Council were also checked for triangulation and were often the source of the images. However, written materials offered limited insight into key processes involved in building the business case for adaptation, such as those related to gaining the support of decision-makers, timing and collaborations and partnerships.

At the beginning of each case, there is a summary of lessons learnt and key elements of a business case. Each case will be presented in terms of:

- key elements and lessons learnt summary
- overview
- climate change risks
- adaptation features
- methodology used
- monitoring and assessment
- stakeholder involvement
- wider community benefits and collaboration
- progress on integration of adaptation
- key elements of the business case for adaptation
- organisational Learning
- key quotes
- images

5.1 Melbourne City Council - Urban Forest Strategy

5.1.1 Lessons learnt and key elements summary

Key elements of the case	Lessons learnt
Climate change risk integrated into standard risk management procedures	Transparency in the process of developing a business case was important
Health values important for the business case development	Collaboration with researchers important part of the process
Multiple values of stakeholder important in justification	Gaining a social license for the case was important
Potential asset loss (valued at billions of dollars)	Data and visualisation were important to achieve buy in for both internal and external stakeholders.
Impact already occurring,	
Data was import to build case and support	
Long and short term planning	

Overview

Melbourne City Council is the local government responsible for the city centre and inner suburbs of Victoria's capital city. It has an area of 37.6km², with a resident population of around 122,000 (as of 2014), however, more than 805,000 people use the city on an average day (Melbourne City Council 2016). The Urban Forest Strategy is one of the programs employed to meet the City's goal of managing climate change impacts on the municipality.

The Strategy was catalysed back in 2011 when the City suffered through 13 years of drought. The City responded by significantly reducing potable water use (by up to 90%) which meant the City did not irrigate its urban landscape. However, there was a certain element of maladaptation to these actions which were purely based on water conservation and did not consider broader ecosystem impacts. This brought about an unprecedented and

severe decline in the tree stock throughout Melbourne. In 2011, the City conducted a health assessment of all the trees, found that of its 77,000 trees 39% would be lost within 20 years.

Climate change risks

Melbourne had implemented its first Climate Change Strategy in 2009, which outlined all the risks the City faced from the potential impacts of climate change. Climate change risks were assessed based on the likelihood of occurrence and possible consequences. Socio-economic considerations were included in the risk assessment, including significant increases in the resident and visiting populations. Key climate change risks to Melbourne include:

- drought, due to reduced overall rainfall
- more intense rainfall, at the same time, which makes the City more susceptible to flash-flooding
- more extreme temperatures and more frequent heat waves (the City experienced the hottest day ever on record at over 47°C in 2009, while research revealed that more lives were lost due to heat waves than the Black Saturday bushfires)
- sea level rise.

In hot weather, Melbourne's CBD can be as much as 7°C hotter than other suburbs. In addition to the significant issues of heat stress and possible death in extreme temperatures, heat waves can result in increased anti-social behaviour and violence, power blackouts (if demand outstrips supply), and public transport interruptions as train tracks are affected by extreme heat and power outages.

The risks were integrated into the internal risk management system, and allocated across the organisation to respective work areas which had to integrate into their business plans and report on progress on a continuous basis. This effectively matched risks with work areas within the organisation.

Adaptation features

Learning from its experience, the City now applies an ecosystem or nature-based approach to climate adaptation. The key programs have been the Urban Forest Adaptation and Urban Landscape Adaptation Program, with a 50 million dollar investment over five years. The Urban Forest Strategy has been developed to address this through green infrastructure and water efficiency initiatives. One main target was not only to replace the canopy that was lost during the drought but increases the coverage by 40% across the City by 2040. This is expected to cool summertime temperatures in the City by up to 4°C by 2030 or 2040.

The City is also working to develop a storm water harvesting system, as future rainfall was found to be able to meet the needs of the City into 2050. With the right design, the system will also be able to mitigate the impacts of flash-flooding.

Methodology used

An Integrated Climate Adaptation Model was built with the University of Melbourne which is a hydrological, GIS-based tool that helps decide where to locate interventions within the City to maximise benefits.

The City also developed its own approach valuing the trees with Victoria University in the absence of a standard method of calculating the return on investment or cost-benefit analysis of green infrastructure.

A series of maps were developed, including a:

- useful life expectancy map of each of the 77,000 trees
- species distribution map, which revealed dominant mono-cultures within the urban forest that increased vulnerability and highlighted the need for diversification
- heat map which was overlaid with an analysis of communities vulnerable to heat
- drought impact map.

Monitoring and assessment

Monitored and assessed is carried out annually and extend to canopy mapping. Heat mapping, monitoring of the effectiveness of operations such as larger infrastructure like the storm water harvesting systems is continuous, as is the health assessments for the urban forest itself.

Stakeholder involvement

Transparency and collaboration were paramount features of the adaptation strategy. Planning and implementing the strategy involved collaborative design with the community. Three-hour workshops were run with the community on Saturdays where data (maps), options and plans were discussed. The same data that was used to garner support internally was also released to the community through the Melbourne Urban Forest Visual. This is an open-ended platform to download so any member of the community can access it and interact with the data as well. The City is lucky in that it has very active community support.

Wider community benefits and collaboration

Mainly through maximizing ecosystem services, such as increasing the health and well-being of the general community, making the City cooler and less vulnerable to events like extreme rain. In addition, there are other benefits such as reduction in air pollution, reduction in sun exposure, carbon emissions, and increasing biodiversity.

The City developed a handbook for how to develop an urban forest with the 2020 Vision for Australia. The handbook outlines the steps to building a business case and the benefits that can be achieved from taking a nature-based adaptation approach.

Progress on integration of adaptation

Since implementing its first Climate Change Strategy in 2009, the City has acquired more knowledge regarding the risks posed by climate change and what it needs to do. Building up organisational knowledge of climate change over time about future impacts and what adaptation or resilience or mitigation is needed. Adaptation is integrated into most if not all areas of operation and it is also recognised as an opportunity. For example engineering designs to build new footpaths involves looking at opportunities for permeable paving, maximising the provision of green space or space for tree-planting. Interventions in vulnerable areas will look at whether to apply standard or a more adapted intervention. Adaptation is almost regarded as business-as-usual, but it is recognised that as knowledge grows, the City may have to do more, or change its approach.

Key elements of the business case for adaptation

The Council did not have a standard approach to building the business case. As a local government, the approach was values-based where the key drivers were the health of its community. The evidence that the forest that was in the severe state of decline, and there was no other choice but to respond. The urban forest was valued as an asset that was worth a billion dollars. By failing to irrigate it during the drought, the life of the asset was reduced. The decision to act and what to do was based on a combination of priorities for the City at the time, the urgency of the response, and also what the community and the City valued. It was not simply a matter of which option will give the best return-on-investment.

Data was crucial to garnering support for the adaptation strategy, as was being transparent. Various timeframes are applied to the City to adapt to climate change. Short-term approaches are plans while medium- or long-term approaches are strategies. The Urban Forest Strategy takes an approach to 2030, the Future of Melbourne Plan takes a 10-year time horizon, from 2016 to 2026. The original Climate Change Strategy outlined risks for until the end of the century, but in terms focusing on and responding to climate change a medium-term horizon is to 2030.

Organisational learning

Organisational learning was noted in the process of implementing a business case for climate change adaptation. The following points are important learnings that were gained from implementing a business case for climate change adaptation.

- For Melbourne City Council it was vital to understand the organisation, its priorities and those of the community. The most effective approach was the one that has a social license. A city is for people, so it comes down to what do the people need and want. Some areas and actions were more obvious than others.
- Being informed of the risks relevant to an organisation is important. It is useful to collaborate with researchers, sharing some of their thinking and their advice to understand the relevant issues better.
- Adaptation is not a clinical exercise of figuring out what makes sense, what the best option is.

5.1.2 Key quotes

“...for adaptation practitioners, we often start out wanting to accomplish as much as we can, and you're basically you're working in a city, you're looking at massive change in the way things operate to be adaptive”

“We needed to re-evaluate our adaptation approach and become a little bit more holistic in our perspective of understanding the systems, the interactions with the systems.”

“We have grown organisational knowledge and over the years to the point at which it's being ... it's almost a business-as-usual practice”

“The community was actually invited in to develop some of the adaptation written responses and approaches with the council. So it wasn't a set of officers making all of the decisions, but it was more of a collaborative effort with the community”

“You can't adapt a city without a social license”

Images

1. Melbourne's Urban Forest Visual



Useful lifetime expectancy

Many of Melbourne's trees are approaching the end of their useful life due to a combination of age and the combined stresses of extended drought, extreme heat and water restrictions. The useful life of a tree is an estimate of how long a tree is likely to remain in the landscape based on health, amenity and risk.

Healthy trees are thriving and have a life expectancy exceeding 20 years.

At risk trees may be stressed due to drought or other environmental factors but cultural treatments (e.g., irrigation, mulching etc.) can be used to restore trees to health.

Trees that are **declining** have reached a point where treatments may prolong life but will not restore the health of the trees, and **dying** trees require removal from the landscape.

Source: <http://melbourneurbanforestvisual.com.au>

2. Melbourne's Urban Forests in the future

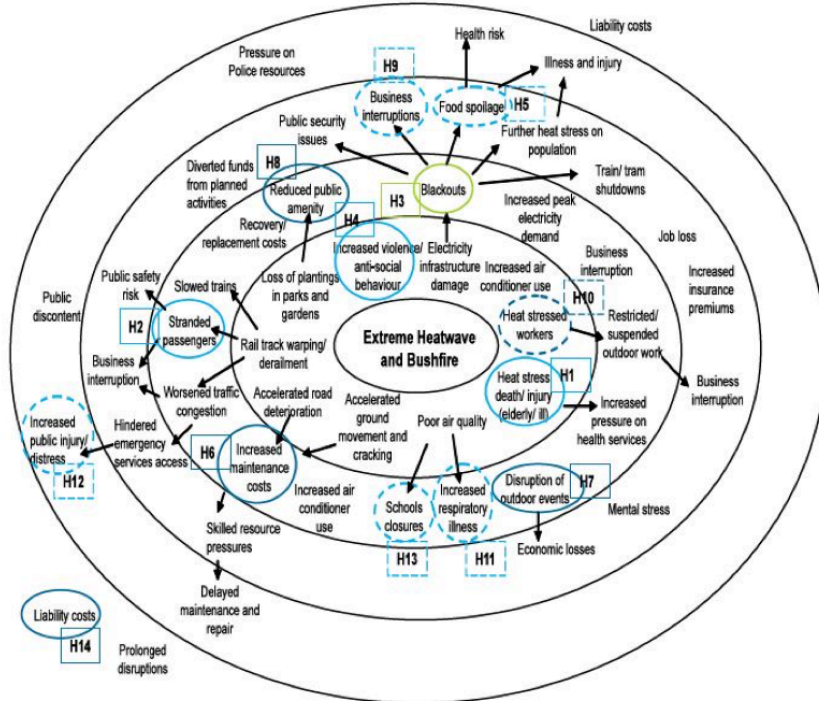


Source: www.melbourne.vic.gov.au

3. Cascading consequences of extreme heatwave and bushfire

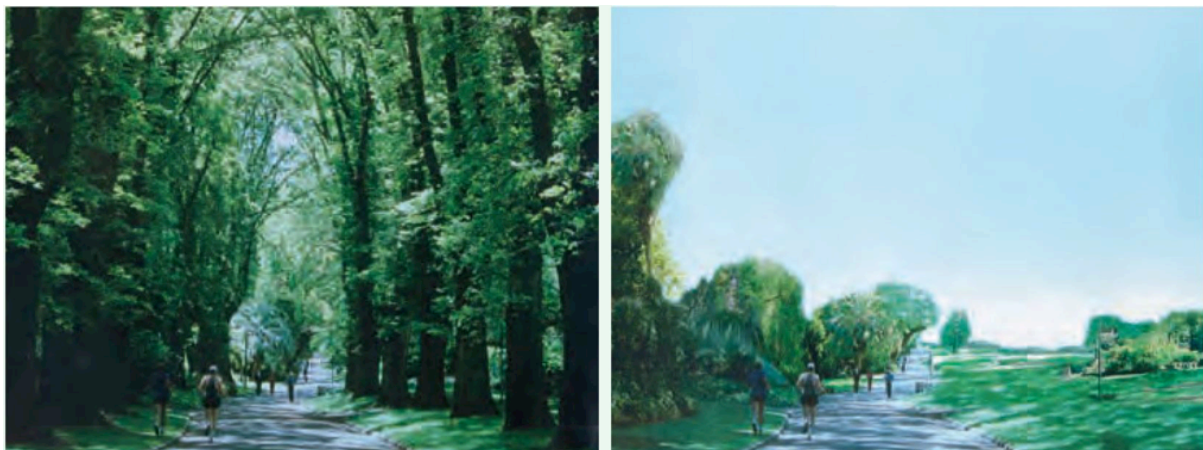
Legend

- Critical
- Non critical
- Municipal
- Council
- Municipal and Council



Source: MCC Climate Change Adaptation Strategy

4. Fitzroy Gardens, showing existing conditions (left) and conditions if elms were lost (right)



Source: MCC Urban Forest Strategy.

5.2 Parramatta City Council: Parramatta Ways, Cool Parramatta, Bring back swimming to the Parramatta River

5.2.1 Lessons learnt and key elements summary

Key elements of the case	Lessons learnt
Impacts identified as already occurring and future risks consequences recognised as high	
Reframing the climate change risks to highlight multiple benefits and turning (climate) risks into a positive message	Reframing the climate change risks to highlight multiple benefits and turning (climate) risks into a positive message;
Connecting the risks to localised context/places through visuals (maps) was important for leadership buy in (council and others).	Even with wicked problems it is important to start to mount the case despite lack of knowledge and potential solutions
Timing the plans and initiatives with extreme hot days increased buy in of the business case.	Sell the business case to various stakeholders internally and externally is important for empowerment and long term commitment to the plan.
Leadership is needed to ensure follow through of business case to action	Waiting for the right time to launch the case, is important as is taking the time to find advocates for projects.
	Ability to transfer ownership or commitment and action to other staff to ensure its future;

Overview

The City of Parramatta, approximately 25km west of Sydney's city centre, is a secondary or satellite CBD for the NSW capital. It has a culturally diverse population of over 170,000 that has significant variability in the socio-economic characteristics of its area of approximately 61 km². The City makes a significant contribution to the economy, in terms of GDP. The Council's most recent rebranding is about 'building Australia's next great city', by transforming and increasing its status in terms of national ranking. Parramatta City Council undertook a climate change risk assessment and prepared an adaptation strategy in 2011. It

is now involved in a range of initiatives in co-operation with state and local government organisations. Those featured in this case study involve staff in the Environmental Outcomes team of the City Strategy department.

Climate change risks

Climate change is just one of many issues that the Council faces. It represents a risk insofar as it puts building and supporting community or civic outcomes or objectives of that community at risks, which are the fundamental issues for the Council. It is important to consider climate change risks in terms of priorities, urgency and whether there is actual evidence that those risks will occur. To date, climate change risks have been dealt with in a reactionary way, as the risks are only recognised when they become real.

Of the 48 identified risks for Parramatta, the highest priority risks are:

- increased premature deaths from extreme heat waves
- increased lifecycle costs to public and private assets
- more rapid degradation of habitat and possible local extinction of threatened species
- more frequent storm water, river and tidal flooding
- increased cost of insurance related to the impact of these extreme weather events.

Parramatta, being in the western part of Sydney, can be 5 to 10°C hotter than the eastern part of Sydney.

Climate change is also recognised as an opportunity as it is sounder to invest now for the future.

Adaptation features

Instead of an overarching adaptation program, Parramatta's approach is to pick and choose areas where adaptation measures can be progressed on a more incremental scale, leading to large-scale changes. Three such initiatives are discussed:

- Parramatta Ways
- Bring back swimming to the Parramatta River
- Cool Parramatta

'Parramatta Ways' is an urban walkability strategy that extends to approximately 390 km of road networks connected to the Sydney Green Grid. This \$300 million project aims at preserving and enhancing the network of green and open natural spaces. It will address an

existing shortfall of open space provision, including catering for the forecast future needs of a growing population, providing a range of environmental, social and economic benefits.

'Bring back swimming to the Parramatta River' is run by the Parramatta River Catchment Group, a partnership of 13 councils and state agencies. The Group was very much focused on catchment management and environmental outcomes, but this has lost its mass appeal to the community and decision-makers. So the Group's mission and goals were redrawn to feature swimming. This was an opportunistic strategy in the sense that the quality of the water was good enough to swim in, but this was not known or publicised. Water quality has improved since the lake was closed for swimming to the public in the 1940-50s as technology improved and wastewater treatment was implemented. It was recognised that if the water is clean, people can swim in it and this has mainstream community and decision-maker appeal. The lake has been open for swimming for the last two years and attracted approximately 21,000 people.

The 'Cool Parramatta' is an urban heat project that consists of a website designed to educate and inform the community about the effects of heat, heat exposure and what to do to keep cool. It includes a high resolution thermal map and turning the negative issue of heat and risk into something positive message or slogan was very important. The campaign has attracted interest from other Councils and may well become a platform to launch similar websites for other cities.

Methodology used

Most of the strategies started with a series of informal workshop with councillors. Attendance was voluntary at these events (no minutes are taken) but they need prior approval to run. About 50% of councillors attended these workshops. The first workshop discussed ideas, the second aimed to agree on priorities, the third was about planning and implementation and is more formal. External specialists were sometimes involved, such as a sustainability media communication specialist for the Bring back swimming project to manage the branding and the media around the initiative.

With respect to the Parramatta Ways initiative, Council first identified the key success factors to encourage walking, such as the need for more shade in the streets, which lead to the ultimate goal to plant more trees. Co-benefits were also identified, such as addressing the issue of transportation and promoting healthy living through active transport. Council has engaged an economist to undertake a cost benefit analysis identify the return on investment and other economic assessments.

For the Cool Parramatta campaign, initially, Council provided a lot of "groundwork" and proposed ideas to other areas (e.g. libraries). In the future, they will organise a workshop with various staff in preparation for next summer, such as letting the staff involved in the previous years come up with ideas. Already, staff members have approached the team with

their own ideas so this “transfer of ownership” or “commitment” to initiatives has begun. The economic appraisal was not carried out for the Cool Parramatta campaign partly because it was tied to funding, and also because figures for losses to business from heat in Melbourne were used to make the case to Council.

For the Bring back swimming to Lake Parramatta project, risk assessment around safety, water quality was conducted and the Council’s legal team was also involved. An internal committee has been set up to deal with issues that arise during the routine monitoring and all decisions are documented. In terms of economic assessment, the initiative is not ready yet. Various solutions and models from a technical perspective need to be carried out, as well as understanding the community drivers and willingness to pay and issues around land use and development.

Monitoring and assessment

Monitoring is against the success factors identified in Council’s 25-year Community Strategic Plans. These include, for example, improvement in water quality of the river, an increase in canopy cover, implementation of plans to manage risks related to urban heat. Reporting on progress occurs at least every four years, corresponding to council elections. This may well take the form of an infographic report card, rather than an extensive report.

Water quality of the Parramatta River is monitored regularly and the information is available on the website. Another way to measure success is through the amount of investment in projects which stems from buy-in through partnerships (e.g. Sydney Council has assigned a full-time officer for 12 months for technical work around modelling water quality).

Stakeholder involvement

Internal ‘corridor conversations’ have been beneficial. Council engaged with other areas, such as its libraries through the Cool Parramatta campaign, which centred around providing bubblers or water to the community on hot days.

Wider community benefits and collaboration

An example of Council’s collaborative approach is its involvement in the Parramatta River Catchment Group, which includes 13 councils, as well as state agencies, such as the Environment Protection Authority (EPA). The partnership allows regulators such as environmental health officers to work with the EPA in a more coordinated way in investigating pollution, spills, and quality of the river overall. Collaboration is through sub-groups that focus on specific issues. For example, a sub-group for engineers will target the management of storm water runoff, reducing pollutant runoff from roads and managing storm water infrastructure. Another sub-group is formed for media staff from all the

councils and state agencies to coordinate messages about the river to the local community through social media. Externally, Beach Watch is also involved.

The Council has research collaboration on the Parramatta Ways project with the UNSW on indicators.

Progress on integration of adaptation

Council's actual support for individual adaptation initiatives has been better than what has been documented in its strategies. Environment is one of six objectives of Council's 25-year Community Strategic Plans and within that there are three sub-priorities: i) the natural environment such as waterways and bushland and greening, ii) the built environment and iii) risks and resilience which is framed around environmental risk and building resilience and heat stress, flooding and food security more recently. Climate change as a term was left out of the strategy. Improvements to council internal management were needed in terms of attention to internal risk management, as Council's focus has been external. Managing heat stress on council employees is a case in point.

Key elements of the business case for adaptation

Several key success factors for mounting a business case were identified.

- Finding the multiple functions and multiple (core) benefits of initiative, which also provided Council staff an opportunity consider how to sell projects in multiple ways.
- Reframing the issue to highlight multiple benefits (above) and turning (climate) risks into a positive message.
- Ability to appeal the case to councillors in a simple, direct and personal way that allowed them to connect to the issue (such as heat in Parramatta and, in this case, it was important to develop localised information in the form of thermal maps for Parramatta).
- Timing is critical in terms of reaching out to the community when it matters most, so people can relate to the issue and recognise the right time to take a business case to decision-makers. Cool Parramatta media messages were sent out and activities were run on very hot days because this is the time the issue is most relevant to people.
- Ability to transfer ownership or commitment and action to other staff to ensure its future.
- Successful leadership needs to have an element of authenticity.

Organisational learning

Organisational learning was noted in the process of implementing a business case for climate change adaptation. The following points are important learnings that were gained from implementing a business case for climate change adaptation.

- The kind of business case that needs to be developed will be different depending on a number of factors. It may be simple if there is already commitment or buy-in from decision-makers but if the scale and complexity of the initiative are significant, there may be a need for a more comprehensive and resource intensive process.
- Waiting for the right time to launch the case was important. Also, it takes time to find advocates for projects.
- Being open to new ideas and open to different points of view helps sell the business case to multiple audiences.
- Involving various groups internally and externally and empowering them to take the project into new directions can help ensure projects have commitment and become viable in the long term.
- For wicked problems, it is still important to start somewhere, despite the problem appearing huge and the solutions unknown.

5.2.2 Key quotes

“From a council point of view, if you sort of go back to the fundamental role of local government and that is to build and support community or civic outcomes then anything that puts those outcomes or those objectives of that community at risk”

“I think on the opportunity side is that- and there is a lot of evidence I think that ...the cost of doing things upfront means that you can avoid a bigger cost down the track.”

“There never is one business case, it’s just a business case at the time based on who you need to convince and responding to the organisational needs, whether it’s in the corporate plan or whether it’s in response to a councillor or a director or the CEO”

“we don't like to do these big programs but we pick and choose these areas where we think that we can progress an adaptation measure”

“Obviously the key to selling the business case sometimes and I think in many times, in my experience it's about how it's sold”

“...heat stress is a huge risk and extreme weather is a risk but if we could actually flip that and try to tackle it in very positive way, I think that it makes it safer for us to get buy-in into the work that we're proposing to do”

“each and every council will have a slightly different objective or view of the world and understanding of what’s important to them...what you have to do is to take the recipe but always I think you need to customise it to your own taste buds if that makes sense, to your own council, to your own organization and to the time that you are doing it”

“It’s not just knowing what the right option is, it’s also that’s it at the right time to do that option”

Images

1. Swimming in Lake Parramatta in the 1930s (above) and since reopening in 2015 (below)



Source: www.dailytelegraph.com.au and www.parracity.nsw.gov.au

2. Advocacy to bringing back swimming to the Parramatta River, pictured former Mayor of Parramatta, Councillor Scott Lloyd



Source: <http://www.lgfocus.com.au/editions/2015-03/bringing-swimming-back-to-the-river.php>

5.3 Douglas Shire Council: Adaptation challenges and experiences

5.3.1 Lessons learnt and key elements summary

Key elements of the case	Lessons learnt
Disaster management - Council applied a 'risk-versus-cost' approach and centred on safety and property.	The complexity of climate change issues means it is difficult to engage decision makers.
Defining the consequences to decision makers (councilors and the community) of the business as usual path was critical in a business case.	Learning from extreme events (flooding and cyclones) means a business case is easier to mount.
The council has identified the need to integrate climate change adaptation across its planning and operations.	Climate change adaptation needs to be supported by qualified staff in designated positions in the council.
Evaluating assets and infrastructure effected by climate change underpin disaster preparedness.	Linking with external agencies (state and federal) important in supporting climate change adaptation measures.

Overview

Douglas Shire covers an area of almost 2,500 km in the Wet Tropics of Northern Queensland, bordered by the Great Barrier Reef Marine Park and the Coral Sea along the east. It includes communities such as Port Douglas, Mossman, Daintree and Cape Tribulation. About 85% of the Shire is a national park, therefore, tourism is of primary importance to its economy. Agriculture, particularly sugar cane farming, is also an important industry. Douglas Shire Council is a relatively new council that used to be a part of the Cairns Regional Council until its separation two years ago. The Council continues to establish its scope, including the condition of its assets and funding strategies, disaster management and plans, including how it will respond to climate change.

Climate change risks

Climate change is a central issue for Douglas Shire Council that is seen as relevant to nearly all facets of its operations. Climate change poses numerous risks to Council and its approximately 12,500 inhabitants, which is largely due to its low-lying coastal location:

- Rising sea levels mean increased exposure to storm surges during cyclone events and low-lying land may be flooded.
- Flooding due to heavy rainfall is already a problem, which is (and will be) exacerbated by tides even more. The time periods that certain areas are cut-off is expected to increase.
- Evacuation routes (to Council's cyclone emergency shelter) may be flooded.
- Potable water shortages during the dry season, as the Council does not have dams and the dry season coincides with high demand from increased tourism to the area. For this reason, in the last two years, the Council had to introduce water restrictions for the first time in its history.
- Wastewater treatment plant is unable to handle turbidity of flood waters and has to be shut down during heavy rain.
- Beach erosion.

Adaptation features

Adaptation efforts are currently focused on disaster management, addressing water scarcity issues, beach protection, and planning. The Council recognises that its community tends to take the risk to live in areas that are compromised because that's where they like to live. Thus, Council's role is to mitigate the risk for the community, being prepared, educating residents and being able to make right decisions when necessary.

Tropical Cyclone Ida, which swept across the Shire in 2014 highlighted the need for better information and monitoring of rivers for instance. Some specific adaptation actions that have been planned or implemented include:

- a camera on the Mossman river that allows flows to be monitored from the local disaster coordination centre
- an automatic river gauge system at Daintree village to monitor flows through the Bureau of Meteorology site (previously this monitoring was done manually)
- construction of a \$40 million reservoir for Port Douglas
- water restrictions during dry season when necessary
- spending over a million dollars to build or improve causeways (in Degarra and Mowbray area) by raising and rebuilding them in concrete (previously it was constructed of gravel, which was washed away several times a year)

- improving drainage in areas of Port Douglas that already go under salt water in spring tides will be needed
- extensive upgrades to the Mossman wastewater treatment plant are required
- to stop coastal erosion at Newell Beach, five geo-fabric bag groynes were placed on the beach
- development of Coastal Management Plans for the entire Shire and flood maps that take future climate conditions into consideration.

Methodology used

Different methods were used for the different issues Council had to address. For disaster management, Council applied a 'risk-versus-cost' approach. The cost of building better infrastructure was weighted against various risks, such as the risk of not being able to get all the people across the evacuation routes when needed, residents being cut-off from essential services, food and water. With respect to upgrading causeways, at-risk population and businesses were identified. One business identified was a quarry— given that materials from the quarry would be required in the event of a natural disaster. Also considered was the cost to businesses due to not being able to operate in an event. A key consideration was to ensure that remote areas were not cut-off for more than the critical three day period, which is when residents would start to run out of drinking water and food. In this case, the cost of helicopter rescue was also incorporated into the business case.

A long-term planning approach was applied to address water security, extending to over a 50-year timeframe. Council officers carried out an all-encompassing risk assessment of the water supply, including existing wastewater plants, looking at the hazards and the possibilities. Various options and their consequences were ranked, with the inability to supply water to the population deemed as catastrophic. It also had an element of economic need, as it is required to support the tourism industry. An external economist was engaged to complete a cost-benefit-analysis that related the infrastructure to continued business growth and also the ability to provide future jobs in the tourism sector.

The beach nourishment project at Newell Beach was based on the premise of the value of the beach. A coastal engineer was engaged to help select a viable option. Limiting the impact of the chosen option on the beach was important for tourism, which was why the sand-coloured geo-fabric sand-bags were implemented.

Although flood maps have been completed, they will need to be upgraded to account for a rise in sea levels.

Monitoring and assessment

In terms of beach nourishment: monitoring of the whole beach profile will consist of measuring beach levels at various points along the beach over in time and inspecting the sandbags and deterioration, etc.

In terms of disaster management: monitoring is a bit more difficult because no two disasters are the same in terms of intensity and frequency. Council conducts exercises to test parts of its disaster management system regularly. Assessment of new causeways is through visual inspection, community feedback but since they were raised, none of the communities have been cut off this year. Measurements along evacuation routes are made during weather events to help with future planning.

Stakeholder involvement and collaboration

Council has organised workshops on disaster management and concept planning for walking strategy, photo-exhibitions, and video recordings of residents who were involved in events. With regard to water security infrastructure, various tourism bodies were consulted locally and more widely (such as Tourism Tropical North Queensland), as well as some of the larger investors in the region (such as Fullshare who own the Sheraton Mirage in Port Douglas, and the two local Chambers of Commerce).

Wider community stakeholder engagement has not been carried out in other areas but is planned. Problems were raised such as difficulties in reaching the populations with information and getting feedback, despite using modern popular technological means (such as Facebook).

Council cooperates with a wide range of organisations on adaptation, some examples are:

- State government
- Council engineers and planners have participated with other regional councils in a coastal hazards workshop and through the Far North Queensland Regional Organization of Councils
- not-for-profit organisations such as the Douglas Shire Sustainability Group, Tangaroa Blue
- Federal government through being a member of Reef Guardian Councils
- Local Marine Advisory Committee
- research organisations such as NCCARF, research facilities in the Daintree.

Wider community benefits and collaboration

Community benefits are an important consideration of local councils, it is their focus and primary purpose. Douglas Shire Council, has focussed on reducing the community exposure to during extreme events through mitigation, ensuring continual business operations. Most of the efforts have been on delivering hard infrastructure solutions and softer measures primarily through education.

Progress on integration of adaptation

Adaptation is recognised as a central issue for the Council. Due to the location and physical characteristics of its area and its reliance on tourism, climate change is a key challenge. While the Council is still in the process of establishing its approach to governance, adaptation is expected to be integrated into nearly all of the Council's' scope, including its Corporate Plan. In addition, the Council is currently hiring a Sustainability Officer whose role will also include identifying adaptation options and making recommendations.

Key elements of the business case for adaptation

Business cases for each of the different adaptation projects required a different approach or set of arguments, but they did contain some similar elements. Disaster management is all about lives and property. For the disaster management scenario, the case was centred on mitigation of risks. A study of evacuation routes and some mitigation work was undertaken, which still needs to extend to the drainage issues and foreshore areas. Data collection, and understanding what information is still required, such as additional flood maps, and work that need to be done. Several options were recognised and strategies to handle residual risks are devised. For example, Council already knows that the emergency shelter cannot accommodate all the population (it has a capacity of 800), so it is developing an educational program based on community connectedness. While the Council has not solved all its problems related to climate change adaptation, the Council consider that it is still 'learning'.

Organisational learning

Organisational learning was noted in the process of implementing a business case for climate change adaptation. The following points are important learnings that were gained from implementing a business case for climate change adaptation.

- There is no one-size-fits-all business case for a business case for climate change adaptation but the ability to sell strategies is probably the key to all of them.
- A useful tactic that helps justifies a business case is the ability to defining the consequences to councillors and the community what will happen if one continues down the same pattern in 30 years and to contrast what will happen if you undertake adaptation measures.

- There are different drivers for different issues and being able to identify these is important.
- People are sometimes resistant if they do not understand the issues especially if the problem (such as climate change) is complex.
- Understanding that some people will be willing to accept certain risks associated with their daily life is important to consider in mounting a business case
- Extreme weather events are important events for an organisation to learn from. It is also important to evaluate the implementation of projects to help the organisation learn.

5.3.2 Key quotes

“I think the business case probably needs to be developed around the objective. I don't know that there's a “one-size-fits-all”.

“I think for a shire on the coast, a low lying shire on the coast like Douglas Shire, certainly adaptation strategies and incorporation into general planning, corporate strategy for the organization will touch on nearly every level”

“...while we probably haven't solved the problem totally, I think we'll be in a much better place in 15 years' time because we've taken some measures now”

Images

1. Flooding in Douglas Shire



Source: douglas.qld.gov.au

2. Cyclone Shelter



Source: portdougss.eq.edu.au

3. Damage from Cyclone Ita in early 2014



Source: <http://douglas.qld.gov.au/?s=cyclone+ita&x=0&y=0>

4. Cyclone Damage to the Daintree Ferry



Source: <http://douglas.qld.gov.au/?s=cyclone+ita&x=0&y=0>

5.4 Lendlease: Barangaroo South Project

5.4.1 Lessons learnt and key elements summary

Key elements of the case	Lessons learnt
Local and state government planning regulations guided adaptation measures	Coastal constraints and adaptation issues need to be acknowledged at the outset of the project.
Life cycle costing was used in relation to infrastructure (energy efficiency options)	Consultation about adaptation and sustainability plans to stakeholders from inception
Time frame for adaptation - 2030 and 2070	Use of method of business case for adaptation (and sustainability/design planning) from Barangaroo used in other projects
Comprehensive risk analysis for project including climate change adaptation	Competent staff needed to enact business case and planning.
Case for adaptation made through comprehensive sustainability plan for project	

Overview

Lendlease is a publicly listed property development company, founded in the early 1950s. It is the developer for the \$6 billion Barangaroo South project, on behalf of the NSW Government. Located on the site of a former container port on the western edge of Sydney's CBD, according to Lendlease, the 7.5 hectare development will be 'the greenest global residential, shopping and business centre in the world'. The development aims to be a carbon neutral, water positive, zero waste precinct. It is scheduled for completion in 2020. Lendlease has had sustainability focus since its inception for over 50 years. The project aims to be world best in its approach to sustainability, which is one of the 12 elements drafted in in the Sustainability Strategy drafted in the very early days of planning in 2008.

Climate change risks

Lendlease has completed a risk analysis of climate change impacts for the Barangaroo South development. They identified 18 risks and eight of those were assessed as extreme and high priority risks identified as:

- increased number of heat days impact external activities and stakeholders

- increased air pollution and dust from drought and fires
- increase rainfall impacts access and egress
- increase rainfall causes localised flooding
- decreases in annual rainfall will affect potable water availability
- increase in sea level causes permanent inundation
- increase in salt water inundation/sea spray cause property damage
- increase in severe storm events causes wind damage.

Of these highest risk items were applied to level ground plane and storm water infrastructure (Lendlease 2015).

Adaptation features

In addressing the above concerns, Lendlease has incorporated a range of built environment initiatives and community resilience initiatives into the design of the project. These include: increasing the road height to reduce storm water ingress; upgrading storm water infrastructure upgrades, allowance for sea level rise in the setting of tail water height; incorporation of photovoltaic cells; and external shading and light coloured materials to reduce the urban heat island effect. Lendlease believes these design aspects will give the project a marketable point of differentiation and provide a degree of future-proofing for investors.

Climate change represents an opportunity for market differentiation and future-proofing for investors. As investors are increasingly becoming aware of climate adaptation risks, Lendlease sees its ability to stay ahead of the market and attract the best capital as key to its success.

Methodology used

Lendlease developed a risk assessment model that is applied in-house to identify climate change risks across a number of areas from financial risk to occupational health and safety impacts and impacts on maintenance of the assets. The risk assessment process assesses the likelihood of occurrence at three time frames: currently, 2030, and 2070. Risks are given a consequence rating and together with likelihood, this allows the identification of high level risks of new and existing assets, which are mitigated through collaboration with the design teams, or property managers and owners.

Lendlease undertook significant due diligence investigations into proposed design solutions for Barangaroo South, which were benchmarked against other developments globally. Lendlease believes they achieved world's best practice.

Cost benefit analysis was not carried out for fundamental risks, such as ensuring that the site is not flooded, the development is not at risk of sea level ingress or storm surge events. Life cycle costing was used in relation to infrastructure such as carbon efficiency and energy efficiency options, where different infrastructure solutions to reduce energy-use and to improve the resilience of (e.g. back-up generators) were assessed through life cycle costing.

Monitoring and assessment

Lendlease conducts a systematic review of the climate change adaptation resilience for its owned and managed assets on at least a three yearly cycle. Given that Lendlease owns some of the assets in Barangaroo South, climate change resilience will be subject to periodic review as well. If there are reasons are found which warrant more frequent assessment or monitoring, there is the capacity to do so.

In addition, an overall Sustainability Report is published for the development that will cover climate change adaptation, among other sustainability issues, which will be provided to government partners.

Stakeholder involvement

Internally, consultations are held with the development team on a regular basis around issues of cost benefit analysis of carbon management, overarching infrastructure costs and climate-proofing, mitigating carbon tax in the overall infrastructure budget through project control group meetings and design review meetings. Lendlease communicated its approach to adaptation and climate change more broadly through the planning application processes through various community consultations. They published a *Climate Change Adaptation and Community Resilience Report* for the project (Lendlease 2015). The largest external consultations were conducted with investors and our tenants on climate change adaptation planning, implementation of the community resilience plan through the business continuity planning teams. This also involved each of the incoming tenants and the strata managers for the residential buildings. Broader consultation was around the more comprehensive Sustainability Plan to road-test it before submitting the bid for the development but climate change adaptation community resilience and broader consultation was not involved in developing the business case *per se*.

Wider community benefits and collaboration

The development aims to be a carbon neutral, water positive, zero waste precinct so the wider community benefit will be that it will not contribute to climate change and its overall

sustainability. Considerable work was done to ensure the site and its surroundings (roads, neighbouring streets) will not be flooded during heavy rainfall.

Progress on integration of adaptation

Adaptation is part of Lendlease's overall sustainability framework which is integrated through the corporate sustainability team and pushed out to every project and business unit. One of the sustainability aspirations of Lendlease is to consider climate change adaptation resilience across the entire business, not just in new builds but also on existing assets that the company owns and manages.

Key elements of the business case for adaptation

Government policy and planning risk were key elements that encompassed obtaining planning approval for the site master plan. The master plan takes into account sea level rise and flooding risks among other things. Minimising resource consumption such as water and electricity was a central theme in designing the infrastructure. Technologies that would allow for managing resources more efficiently and effectively were investigated and implemented.

Ongoing operating cost management introduced various efficiencies, which enabled the development to minimise resource consumption during operation.

Issues that were part of the ground plan and the storm waters were integrated from the very early planning stages and communicated as part of the planning application processes through various community consultations.

Organisational learning

Organisational learning was noted in the process of implementing a business case for climate change adaptation. The following points are important learnings that were gained from implementing a business case for climate change adaptation.

- Adaptation issues should be a priority right at the start because one cannot work those issues into the development retrospectively.
- It is equally important to ensure a firm understand of the existing environmental constraints. Analysing the existing environment, the infrastructure in place, engaging and good competent consultants or staff to undertake due diligence design and modelling to ensure the most cost effective design solutions are identified. This was certainly important from an initial capital cost and on-going operational point of view for infrastructure.

5.4.2 Key quotes

“The risk assessment methodology [we] developed is now being rolled out on other urban regeneration projects [because it] helps us assess infrastructure costs and build those into original commercial assessment of the developments so that these contribute to up-front costs rather than trying to retrospectively build business cases after we've won the development rights for a project.”

“The opportunity for us is really market differentiation and future proofing for our investors ...the investment team and building investors are increasingly becoming aware of climate adaptation risks and our ability to stay ahead of the market ...has been enhanced by our ability to have thought about these things up front and build the strategies into the beginnings of the project.”

Images

1. Artist's impression of the completed project



Source: <http://www.lendlease.com/Australia/Projects/barangaroo-south.aspx#>

5.5 Suncorp: ‘Protecting the North’ and experiences with flood insurance

5.5.1 Lessons learnt and key elements summary

Key elements of the case	Lessons learnt
Recognising risk within the community gives a competitive advantage to climate change adaptation measure justified.	Disasters identify impacts, not on balance sheet of risk (e.g. mental health)
An external investigation of insurance industry facilitates business case approach to climate change adaptation.	Engage stakeholder early in the process of developing product changes to incorporate extra risks
Cost benefit for flood project aids in decision making regarding minimising risks	Understand wider social consequences of disasters to position business case
Hazard exposure vulnerability analysis used to justify business case for new insurance product	

Overview

Suncorp, one of Australia’s leading insurance providers, has a strong presence in North Queensland, where many properties are subject to risk from cyclone and storm damage. In order to address the issue of insurance affordability into the future, Suncorp has developed a package of initiatives known as ‘Protecting the North’ which aims to promote mitigation activities to reduce the risk of cyclone damage to property. Ultimately, insurance provides a way for businesses and communities to manage their risk financially.

Climate change risks

Given the nature of general insurance, underwriting the risk of damage caused by natural disasters such as flooding, cyclones, bushfires, hail, etc. is core to its business. Currently, the industry is not seeing a significant impact from climate change in terms of increase in natural disasters, but what it is seeing is the impact of more communities moving to, and assets built in, high-risk areas. With larger communities and additional infrastructure, the effect in the insurance industry is substantial as they ultimately take a lot of the financial pressure from events in these areas.

Insurers have a vital role in providing a price signal within the market which can encourage people to take measures toward increasing the resilience of their properties. At the

moment, home insurance premiums are the most direct way that many people understand the risks they are at from natural hazards, such as cyclone or floods. Some insurance companies, including Suncorp, have started to offer individual pricing to encourage the community to undertake adaptation measures.

For the insurance industry, climate change represents the following issues:

- affordability of insurance for consumers and for businesses if effected due to increasing risks
- how can the industry continue to underwrite risks
- how should pricing models change
- general moral issues around the risks and adapting the broader business to manage them.

In addition, from events such as the 2011 floods in Queensland there resulted a high degree of dissatisfaction with the industry. It was under a lot of pressure and scrutiny regarding the price and affordability of premiums. There were several government inquiries (10-12) over the past six years. The inquiries revealed that the underlying risks that communities are exposed to were more of a problem than insurance affordability.

In the past five years the focus has been on adaptation or mitigation within the community.

Climate change projections for increased frequency and intensity of extreme weather events require that the risks are constantly monitored and assessed by the insurance business. What is currently being observed at Suncorp is the exponential growth of communities in high risk areas. As more people move to live along the coastline, they move into areas affected by natural perils that have always been there.

Adaptation features

Suncorp's adaptation to climate change risks is highlighted through two cases:

- the new 'Protecting the North' initiative
- flood insurance and responses to floods in Roma (Queensland).

There is significant cyclone risk in northern Australia. In Queensland alone over the last seven years, for every \$1 that the insurance industry collected through premiums, it paid out a \$1.44 million/billion?. This was a key driver for the company to find a solution. The 'Protecting the North' program includes recognition of cyclone mitigation work on existing properties – a premium reduction may be available to certain insurance customers located in areas of northern Australia most likely to experience cyclones. As part of this program,

Suncorp worked with various partners to understand what features of properties make them more resilient to cyclones and termed this 'cyclone resilience benefit'. Depending on the location of the properties, households can obtain up to 20% benefit on their premiums if they make their homes more resilient. Suncorp recognises homeowners who had done resilience work previously.

In response to the 2011 floods, which created a need and appetite in the market for flood insurance, Suncorp (and other insurers) introduced flood insurance as a new product. Suncorp also underwrote substantial flood risk in Queensland, due to a large amount of pressure from the government. Suncorp deemed properties in the town of Roma uninsurable because it flooded three times in two years (2010-2011) and the company paid out over \$100 million. Suncorp conducted studies and modelling which found that construction of a levee to protect the town (in 2010) would have cost approximately \$11 million. In contrast, the state government had spent \$11 million only on helicopter rescue missions for just one flood. This presented a very strong business case for the government to fund the levee, which they did. Suncorp guaranteed that will sell policies again in Roma once the levee was built and will reassess the risk immediately to offer discounts on premiums.

Methodology used

Suncorp has engaged a consultant to carry out modelling. With 'Protecting the North', Suncorp started with the basic risk equation (hazard-exposure-vulnerability) to determine its approach. In northern Queensland, the hazard is the cyclone and the exposure is the companies and properties exposed to cyclones that the company insures. Vulnerability relates to the physical characteristics of the properties and was the only element of the risk equation that Suncorp could address. The company set-up a pilot study with James Cook University to get a deeper understanding of the resilience of properties and the drivers of cyclone damage. (Previously their knowledge was limited to knowing that properties built before 1980 were more vulnerable than those built after.) The study enabled the company to recognise as stronger the houses that had roof replacements, cyclone shutters and a range of other options. They engaged an external consultancy to carry out the cost-benefit analysis of the different options to retrofit homes. This allowed them to demonstrate that households could benefit from retrofitting their properties from just one cyclone alone. The El Niño cycle is important for budgeting and forecasting over the short and medium term. Suncorp considers weather patterns in relation to the southern oscillation index (which indicates the development and intensity of El Niño or La Niña events in the Pacific Ocean).

Monitoring and assessment

Reviews are conducted on a quarterly basis that includes a measure the satisfaction of the customers. But the ultimate test is when people make a claim. Ultimately, the success of

'Protecting the North' will be judged by the measurable reduction in the risks faced by communities in northern Australia and raising risk awareness in the community. Reduced premiums will reflect low claims levels in those areas. As with any insurance product, the success will also be reflected by the amount of interest or business generated by the product, measured through the return on investment.

Stakeholder involvement

Stakeholder involvement has been extensive over the last five years. Suncorp saw a lot of interest from external stakeholders including the wider community, about the price of their insurance and the risk reflected in that price. In relation to floods, Suncorp worked closely with local government such as Roma and the Local Government Association of Queensland. Protecting the North initiative includes a large amount of public outreach to highlight the product solutions areas where more work needs to be done to reduce risks.

Over the last five years, the company ran meetings and internal workshops and published the findings of its consultants' reports and many of its recommendations on broader policy solutions, information from the Cyclone Testing Station. Suncorp has spoken directly with governments and the media on many occasions.

Wider community benefits and collaboration

Sending a clear price signal of the risks is important for the wider community. The insurance industry can encourage resilience and adaptation and can also highlight where there are issues. For example, identify areas where homes perhaps should not be built.

Suncorp worked with Red Cross to better understand the pressures on communities after natural disasters, such as the 2011 floods in Brisbane. These costs that are not accounted for on balance sheets but are very real to the community such as emotional stress that can ultimately destroy people's lives.

Through the 'Protecting the North' initiative, Suncorp has worked with economists and consultancies, the Cyclone Testing Station at James Cook University, some local governments and state governments, particularly Queensland and not-for profit organisations such as Green Cross Australia. The company also works with reinsurers.

Progress on integration of adaptation

Extreme weather events represent a specific type of risk that is fundamental to Suncorp's business on a day to day operational basis now and into the future. So in that sense, it is not part of the company's vision or strategy, but it is its business. Suncorp will need to respond to climate change in the way it offers its products, where it sells them, how it deals with the nature of that risk in its books from both the reinsurance perspective and from a business continuity perspective. The insurance industry is evolving rapidly in terms of responding to

climate change addressing both adaptation and a mitigation and Suncorp is on that journey alongside others. One limitation is that pricing is on an annual basis, which is how insurance currently works. But the industry is thinking more broadly about best how to invest its funds and recognising resilience within the community both in the sense of business continuity and product range. Climate change is also dealt at the strategic level, by the company's strategic innovation area which specifically considers risks on the five to ten-year horizon.

Key elements of the business case for adaptation

Responding to climate change and adapting products to better recognise risk within the community is recognised as giving Suncorp a type of competitive advantage. Pricing risk is inherent to the business of insurance and in this way. The extensive investigations into the insurance industry externally, over the past five or six years, were also important factors.

Information was key importance in addressing the problems of flood insurance in Roma. The cost-benefit for the construction of the levee was a clear case.

Natural disasters have been the game changer and catalyst for change and action. While the insurance industry has a "pretty good understanding of what the cost will look like", this does not necessarily extend to the human costs, which are apparent when disaster hits and insurers "turn up on the ground and start helping people rebuild their homes". At that point, it becomes evident that there is a range of risks and damages that are not "carried on anyone's balance sheet", for instance, mental health issues.

Organisational learning

Organisational learning was noted in the process of implementing a business case for climate change adaptation. The following points are important learnings that were gained from implementing a business case for climate change adaptation.

- The need to engage a broad range of stakeholders early on internally and externally is paramount. Engaging in conversations about concerns and opportunities that are as open and transparent as possible.
- There is an inherent need to build a solid case for any product change, which may be easier in the insurance industry than elsewhere, given that it prices risk directly.
- Creating and recognising shared value delivered to the customer, to the broader community, and any other stakeholders and the business need to be aligned and that has driven success for Suncorp.

5.5.2 Key quotes

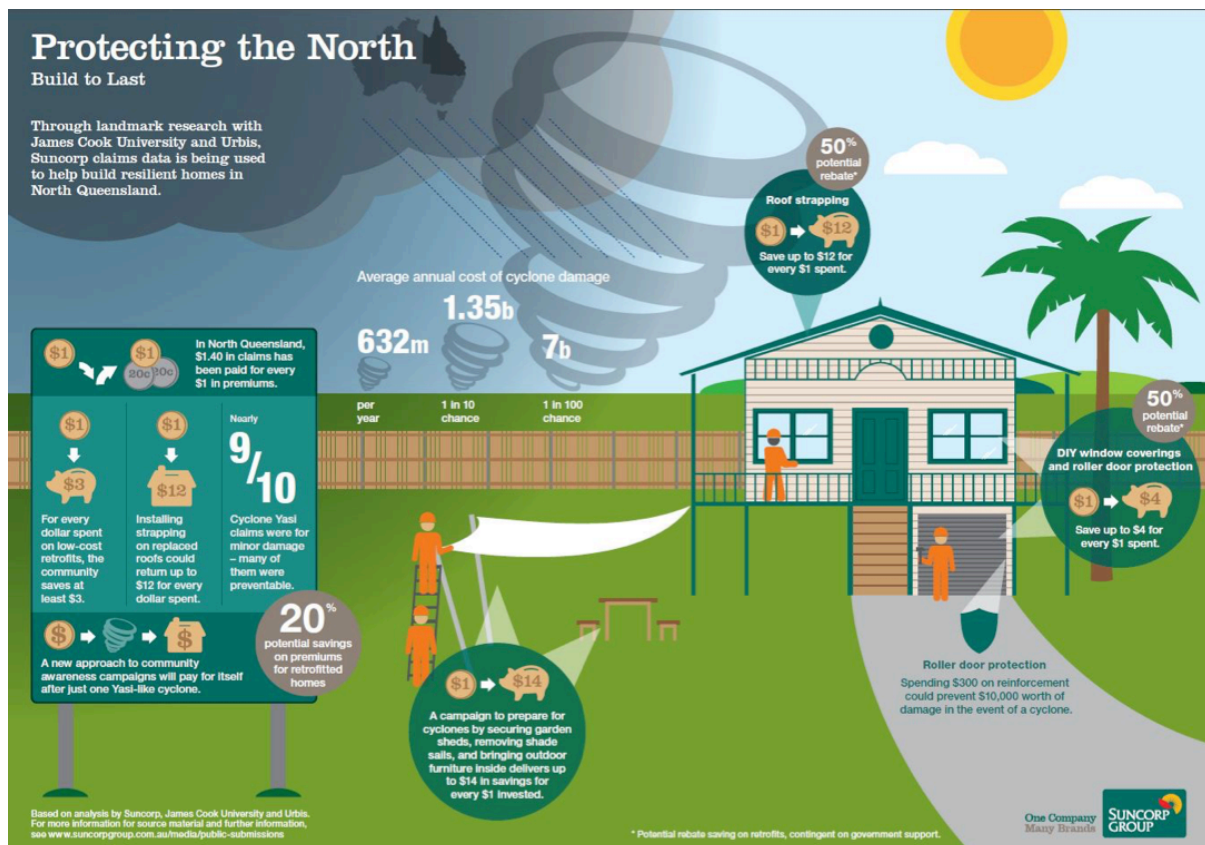
“After the 2011 floods, in particular, I think the industry more broadly realised that the nature of insurance would be changing after that”

“I think Suncorp, we are the must have Queensland insurer, so it wouldn't have been right for our customers to pull out of the market”

“...there is a large benefit to the economy through further investment in making the community more adaptive to or more resilient to natural disasters. Largely because it removes a disruption from the economy, and it's a more effective way of spending resources than rebuilding the same things over and over again ultimately, to a similar standard. That's how we think about it on a policy level, and that's certainly something we continue to advocate”

Images

1. Infographic of how the Protecting the North strategy can be applied



Source: <http://www.suncorp.com.au/insurance/protectingthenorth>

2. Roma flooded streetscape



Source:www.abc.net.au/news/2011-04-20/roma-mops-up-after-another-flood/2606946

5.6 Cairns Aquarium: Building a new state-of-the-art aquarium

5.6.1 Lessons learnt and key elements summary

Key elements of the case	Lessons learnt
A risk register included the impacts of climate change on operational components of the business.	Government is not leading so organisations need to lead in the area of climate change adaptation (and mitigation).
Climate change mitigation and adaptation are a core principle of the development.	It is easier to address climate change if it is an objective from the start.
Corporate social responsibility motivated the business case and organisational response.	
The mission of the organisation is strongly linked to climate change and thus becomes an imperative for organisation change and a business case for climate change adaptation.	

Overview

Scheduled to open April 2017, the Cairns Aquarium is a \$50m, 7500m², three level gateway tourism attraction currently under construction in the heart of Cairns. When complete, it will have more than 5 million litres of salt, fresh and brackish water displays, featuring the species and habitats of North Queensland in almost 70 exhibits. The Cairns Aquarium will also have dedicated Research and Development programs for reproductive biotechnology development of Northern Australia fisheries and crustacean species and will work with leading Universities, TAFEs and industry partners. The building has been designed using green principles including natural light, passive (cooling) ventilation, and with a white façade to minimise heat absorption. The Aquarium has been undergoing the design and engineering and approvals stages for almost five years and is six months into its sixteen month construction phase.

Climate change risks

The Cairns Aquarium is facing risks from climate change even in the development stage, which can be summarised as:

- difficulty with obtaining the required licenses and permits to collect specimens
- difficulty sourcing specimens, both due to the stress caused by coral bleaching of the Great Barrier Reef and the listing of several species as protected under the EPBC Act 1999

- severe weather events such as cyclones pose risks to the Aquarium’s operation, particularly with respect to continuity of power and water supply
- water shortages or droughts can also affect the water supply and cost of water.

Adaptation features

Addressing the effects of climate change both from a mitigation and an adaptation perspective has been a core consideration of the business from its earliest stages of development. No expense has been spared in adopting the most resource efficient technologies including:

- Water recovery – “Closed cycle” life support system (LSS) which purifies and recycles 99% of water with only 1% waste. The Cairns Aquarium will have 5.5 million litres of fresh, brackish and salt water that will be filtered through custom designed water purification plant and equipment.
- Variable speed and energy efficient pumps and motors.
- LED lighting throughout.
- Reflective (white) surfaces and tinted glass on the exterior of the building, reducing the amount of air conditioning and related energy consumption (80% solar reflectant) .
- 400kW generator capable of operating the Aquarium in the event of power failure during a cyclone.
- Extra on-site water storage (50,000 litre freshwater, 170,000 litre saltwater) to maintain aquatic systems if the local water supply is interrupted or compromised as in extreme weather events where the water supply is not suitable for the aquarium exhibits.
- A percentage of the profits will be spent on purchasing agricultural land in tropical North Queensland to convert it from sugarcane to reforested rain forest. This will be a major ecological platform for the business to reduce the regions sediment run-off into the Reef as well as to plant more trees as the business’s own strategy to proactively enable carbon sequestration and create wildlife corridors and habitat.
- The project also involves developing a range of “Reef and Rainforest-friendly” personal use items such as shampoos, conditioners, soaps, dish washing detergents, laundry detergent, etc., that will be free of sulphates, phosphates, parabens and other harmful environmental chemicals. These will be tested and certified by an independent facility such as CSIRO. The public will be able to purchase these in the

Cairns Aquarium gift store as well as online and can continue making positive environmental product choices even after their Aquarium visit.

The Cairns Aquarium has purposely chosen to house and display species endemic to the area which will reduce the need for heating or cooling of the water. The Aquarium has the potential to implement at least a 250 kW voltaic system, which would provide at least 25%, possibly even 30% of its energy from renewable sources. However, the project cannot currently fund the \$100,000 connection fee to the state government for commercial scale solar.

Climate change also represents opportunities from the operational side of the business, by exploring renewable energy technologies and supporting technologies from the perspective of educating the public. The public will want to see some of the creatures that are endangered or impacted by climate change. Some people may be even more interested to see healthy corals because they may not have that opportunity to visit the reef itself.

Methodology used

A risk register was developed through peer review that considered all the risks, including those related to the impacts of climate change on the various operational components of the project. Risk mitigation was developed to respond to the risks. There were no traditional methods employed for the business case because climate change mitigation and adaptation have been a core principle of the development.

Monitoring and assessment

Efficiency of the internal systems will be monitored regularly. All of the systems will be computerised and fully automated providing the ability to monitor energy efficiency, water quality, etc. within the project. Feedback will also be monitored via websites, letters and emails.

Stakeholder involvement

Internal workshops and discussions, meetings, architectural and engineering plans, round table discussions with the principles of a company and the team of consultants and contractors. Determining the Australian standards and research with all the right firms were also important. The strategy around climate change has been raised and discussed with stakeholders, lenders, and financiers, in business documents and will be part of a longer term strategy rolled out to the public and staff once the Aquarium opens in April next year.

Wider community benefits and collaboration

This project is significant in terms of its size and scope, as it is one of the largest private infrastructure projects in the Cairns region. As such, it will be a very far reaching impact on

the broader community. The project strives to be a role model for addressing climate change and educating the community around climate mitigation, technologies and human behaviour.

The Cairns Aquarium is partnering with an Australian bank on using part of the profits to buy land for nature conservation. While the project collaborates with all levels of government, consultants, and research organisations, currently there are no other collaborations on climate change.

Progress on integration of adaptation

Adaptation and mitigating impacts of the project were a corporate philosophy from the start. Currently, this is drafted into the company's Business Plan and the financial document, the Corporate Investment Guide. Addressing climate change has always been an aim when the business model was developed. It continues to play a major role as the model is implemented and the Aquarium is commercialised. Currently, those measures that were determined throughout the development and pre-commercialization stages are implemented.

Key elements of the business case for adaptation

The business case stems from the recognition that every organization must do what they can to mitigate their impact on climate change. This is a corporate social responsibility imperative. Furthermore, any business that features Australian wildlife and biodiversity has a responsibility to demonstrate what it is doing as a business to help protect that biodiversity. The actual branding in regards to climate change adaptation of the Aquarium has not happened publicly yet. Some of the principles come from Canada and the Director's experiences with and involvement in Canadian government programs that support and encourage action on climate change. The lack of activity by the Australian government also prompted the organisation to do as much as it can.

Organisational learning

Organisational learning was noted in the process of implementing a business case for climate change adaptation. The following points are important learnings that were gained from implementing a business case for climate change adaptation.

- There are a wide variety of technologies available but government support, at all levels is lacking.
- Addressing climate change is up to the public and business and greater leadership is needed in this area.

5.6.2 Key quotes

“All Australians, whether it be the public, the corporate sector or Government must recognise that we are all responsible in ensuring the health of this planet and to prevent any further damaging effects, such as rising temperatures and climate change. There can be no acceptable excuse for not taking urgent action. We need courageous leaders at all levels of government to rise up and make climate change the single most important policy issue of our time. Clear messaging is required that educates and informs people of the need and methodologies to reduce energy, water and other resource use, to reduce the amount of waste sent to landfill and into our lakes and oceans as well as developing robust platforms for creating healthy habitats through reforestation and ecosystem protection. Of equal imperative is to transition to a limited fossil fuel based economy with electricity being generated from clean energy sources such as wind, tidal, and solar”.

Images

1. Artist’s image of the new Cairns Aquarium



Source: Peddle Thorp

2. Back of house – kilometres of pipes, sand filters, water purification plant and high pressure pumps.



Source: <http://www.cairnsaquarium.com.au/>

5.7 AustralianSuper: Assessment of investments for climate resilience

5.7.1 Lessons learnt and key elements summary

Key elements of the case	Lessons learnt
Framework for assessing the infrastructure assets, and developing possible adaptation options developed by the external consultant.	Buy-in from senior management is key and makes progressing the business case a lot easier.
Stage approach of business case assessment in relation to the assessment of climate change risks for assets.	This project increased the focus on climate change adaptation within the organisation.
2030 and 2070 considered as a timeframe of analysis of risks.	
Climate change risks incorporated into standard risk assessment and management of assets	

Overview

One of the leading industry superannuation funds in the country, AustralianSuper has approximately 2.1 million members. The fund offers a range of investment options and direct share investment options to its members, including a ‘socially aware’ fund. AustralianSuper is a responsible investor and environmental, social and governance issues are considered in investments. It is a member of the Investor Group on Climate Change, which aims to ensure that risks and opportunities associated with climate change are incorporated into investment decisions.

Climate change risks

AustralianSuper considers the science of climate change seriously including the lock-in effect of variable conditions. Climate change has the potential to impact the some of its investment portfolio and is regarded as a financial risk. However, it will impact different assets differently. As an example, impact on equities and bonds will be different to impacts on property and infrastructure portfolios.

As a member organization, members write and ask about what the Fund is doing on climate change and express concerns about how climate change may impact their retirement. The company follows up on these inquiries and responds to its members.

A major project undertaken by the fund in 2014 looked at the larger size infrastructure assets (seaports, toll roads, airports) that they invested in around Australia and to assess the potential physical impact risks from climate change, and how that could potentially affect the value of those assets. AustralianSuper have commissioned this project to:

- Identify and assess the risks that a changing climate may pose to current and future developments for the asset.
- Determine the adaptation planning themes and approaches that may be adopted and implemented by the Asset so as to manage the risks that may arise in association with a changing climate.
- Understand current best practices with regards to asset management and maintenance thereby improving the quality of the Asset ongoing monitoring and mitigating risks to the asset.

Policy impact on assets was not considered given the policy uncertainty on climate change in Australia.

Adaptation features

The business case was structured around the risks of the potential physical impact of climate change and how this could lead to changes in valuations of the investments. With unlisted assets such as property and infrastructure the management of those assets will be asked specifically about how they are adapting to climate change, what scenario planning they are doing, etc. Some property and infrastructure fund managers do consider climate change impacts. AustralianSuper also engages with ASX companies to seek information on how they are approach and deal with climate change.

The catalyst to consider climate change was a study that the Fund participated in by Mercer, a leading institutional investor advisor, in 2011. It featured assessing more climate change risks across all asset classes.

Methodology used

Engineering company GHD was contracted to assist with the project. AustralianSuper articulated its need to know the potential physical impact risks to select assets to 2030 and 2070. 2030 was chosen as “it’s not that far away”, while 2070 was far out in advance but at that point, AustralianSuper could still be holding those assets or considering selling these assets. GHD developed a climate change risk assessment method based on guidance from the Australian Greenhouse office Guidelines for Climate Change Risk Management, ISO risk management and the AS5334 Australian Standard for Climate change adaptation for settlements and infrastructure risk based approach. GHG identified risks and also suggested adaptation actions.

Monitoring and assessment

Asset management were given 12 months to think about the report and implement it. A meeting will be held around the middle of 2016 to find out exactly what has happened. Monitoring is planned annually targeting the underlying assets to find out what measures have been implemented.

Stakeholder involvement

Internal buy-in was sought from the external Infrastructure Fund Manager

Wider community benefits and collaboration

All of the assets assessed relate to essential services. This means that the wider community impact of any closures, such as an airport runway or seaport flooding, would be major. The impact would affect the financial value of the asset for the investors: which is regarded as a very important.

Progress on integration of adaptation

Adaptation of climate change does not feature in the organisation's overall strategy or vision. Climate change adaptation is applicable to being a responsible investor, which involves finding out all the long term issues that will impact the company, such as climate change.

Key elements of the business case for adaptation

Engineering firm GHD was engaged to develop the framework for assessing the infrastructure assets, and developing possible adaptation options for the asset. These assets included airports, toll roads, and seaports which are partly owned by the Fund (e.g. 5% of an airport). For this reason, it is important to proceed with caution and tact. Organisational buy-in was also sought and achieved by bringing top managers on board. AustralianSuper's decision to hold the asset or when to sell the asset will take this information into account.

Organisational learning

Organisational learning was noted in the process of implementing a business case for climate change adaptation. The following points are important learnings that were gained from implementing a business case for climate change adaptation.

- Buy-in from senior management is key and makes it easier to progress the business case.
- This project actually helped justify the need to focus on climate change adaptation as an investment organisation.

5.7.2 Key quotes

“It was a pilot study... I think we were the first investors in the world to do this kind of thing”

Images

1. Brisbane Airport – one of the infrastructure holdings of AustralianSuper



Source: www.bne.com.au/corporate/bne-major-projects/airfield-apron-projects

2. Perth Airport – one of the infrastructure holdings of AustralianSuper.



Source: www.seeperthairporttransform.com.au/project/future-project/

5.8 Stockland: Commercial retrofit for adaptation

5.8.1 Lessons learnt and key elements summary

Key elements of the case	Lessons learnt
Climate change adaptation is considered as part of the overall risk management process - not treated as a separate activity with a cost attached to it.	A business case for climate change can be incorporated into normal business operations because of progressive management processes.
Climate adaptation linked to other existing sustainability processes in the organisation.	
Monitoring of projects	
Systematic incorporation of adaptation measures through portfolio of assets	

Overview

Stockland is Australia's largest diversified property group, involved in the development and management of commercial property including shopping centres, as well as residential communities and retirement villages. Their portfolio includes 41 retail properties with a combined value of \$5.2 billion. Over the past three years, Stockland has undergone a restructure which has seen a resetting of its purpose and values, including a focus on their commitments around energy, climate change, natural resources, water, materials and community development.

Climate change risks

Stockland conducts climate vulnerability and resilience assessments which focus on the vulnerability of the asset to climate and its ability to endure severe weather impacts and operate without disruption. Potential impacts that have been identified for their commercial properties include:

- increased demand on HVAC systems
- reduced integrity of roofing structures
- overloading of storm water systems
- deterioration of building materials
- reduced availability of potable water

- local flooding, saltwater intrusion
- wind and hail damage
- water and mosquito borne disease
- bushfires, smoke penetration
- increased landscape maintenance
- expectation of community as a place of refuge
- business disruption to our customers and possible rent losses (Johnson 2013).

Adaptation features

Examples of the actions being undertaken at Stockland properties, and the related benefits, are presented in table 9.

Table 9. Stockland example adaptation actions

Proposed Actions	Benefits
<ul style="list-style-type: none"> ● Continue installing roof fastening systems in vulnerable regions ● Maintenance of roof storm water drainage systems ● Protection of air cooled HVAC equipment against hail damage ● Model performance of existing HVAC systems to increase in extreme heat days ● Embed extreme event responses into emergency procedures ● Raise awareness with stakeholders on responses for extreme events ● Include dialogue with local authorities around the use of centres for refuge ● Provide facility for ‘plug in’ emergency power supplies ● Provide shelter for carpark, outdoor dining areas, atriums, walkways ● Specify heat reflective and thermally insulating roof coatings ● Design for increased heat days over 35 degrees in developments ● Design for increased rain events above 150mm in developments 	<ul style="list-style-type: none"> ● Reduced operating and maintenance costs ● Operational issues are addressed as climate adaptation responses ● Actions can be prioritised, investigated and rolled into asset plans over time ● Greater emergency preparedness and amenity where centres are used for refuge ● New shopping centres can be future proofed through climate resilient design ● Potential insurance premium reductions ● Reduced risk of business interruption for retailers and rental abatement ● Improved indoor environment and comfort for retailers and shoppers ● Added community value as a safe and secure place of refuge during extreme events

(Source: Adapted from Johnson 2013)

Methodology used

In 2011, in collaboration with Manidis Roberts, Stockland developed their own risk-based methodology to assess the vulnerability and resilience of their assets to climate change. The method has a particular focus on location, design, structure, operation and maintenance, utilities and services and stakeholders. These attributes are assessed and given a resilience score based on vulnerability in three areas: climate effects (exposure); property elements (sensitivity and adaptive capacity); and climate risks (potential impacts), to give a total resilience score out of nine. Resilience Action Plans are developed for assets with a high score, which is representative of low resilience. The plans include implementing operational responses, maintenance regimes, and business continuity plans, with the aim to improve the resilience score of the asset.

While the initial focus has been on the commercial property assets of the group, similar assessment processes have been developed for the residential and retirement living assets.

For assets in development, future climate scenarios are considered to see how the designs respond to increased rain, cyclone and heat events.

In addition to the risk matrix process, Stockland has been developing an 'opportunities matrix' to assess the value of discretionary initiatives such as adding shade sails to carparks. Traditionally these options would not have received high priority in a 'likelihood/consequence' assessment, but through viewing them as opportunities, they are able to be prioritised because of their ability to improve the amenity to customers and resilience of the asset.

Monitoring and assessment

The climate adaptation (resilience) Action Plans are reviewed to track progress and implementation of actions, again using the assessment methodology for transparency and consistency. For the most vulnerable properties in the North Queensland a regional target has been set to achieve an average resilience score of 5.5 (on a scale of 1-9) by 2017, down from the currently average of 5.9. This improved score places these assets in the middle to lower range of 'moderate' resilience down from the upper moderate range. This then places the assets into a similar resilience range as assets in non-cyclone affected regions.

Stakeholder involvement

Across the organisation there is a strong commitment to sustainability, so engagement with internal stakeholders such as development and project managers on sustainability issues is business as usual. Externally, working with teams of consultants and designers, the policy and vision is set for the project for what Stockland wants to achieve and resilience attributes

are included in the brief so the design helps achieve those outcomes. Stockland is also active in sharing their knowledge, experience and observations with industry and the community.

Wider community benefits and collaboration

Being able to keep shopping centres trading is regarded as a benefit to the wider community because it assists with bouncing back after a weather related event more quickly. The ability to resume normal functions and normal business more quickly are seen as important to the community. Stockland is also aware that shopping centres function as community facilities - for example, providing a place of respite in hot weather, especially in areas with a lower socio-economic demographic that may not have access to air-conditioning at home. Beyond shopping centres, Stockland is also building residential communities with more natural landscaping, parks and recreation facilities. This not only reduces the urban heat island effect but provides facilities for the community to use and enjoy.

Progress on integration of adaptation

Climate change adaptation is at an advanced stage of integration in Stockland's business processes, in particular, its risk management processes. It is one of Stockland's key risk focus areas and part of the overall business strategy, and visible in terms of public commitments and targets. An example is the company's series of nineteen 'Disclosed Management Approach' documents, of which 'Climate Resilience' is one.

Key elements of the business case for adaptation

Stockland's focus on climate change adaptation originally stemmed from commitments in the area of energy management, emissions reductions and the environmental impact of the organisation. Climate change adaptation is considered as part of the overall risk management process, which means it is not treated as a separate activity with a cost attached to it. Business continuity, through avoiding inconvenience, damage, and business interruption were regarded as opportunities from adaptation. This has led the company to create a portfolio of assets that are more resilient to the impacts of climate change in the long-term.

Organisational learning

Organisational learning was noted in the process of implementing a business case for climate change adaptation. The following points are important learnings that were gained from implementing a business case for climate change adaptation:

- A business case for climate change can be incorporated into normal business operations because of progressive management processes.

- Adaptation strategies are often identified as risk management strategies, looking through a different lens that considers future climate scenarios.
- A business case was relatively easy to implement because creating a portfolio of assets that were more resilient to the impacts of climate change provides benefits for retailers because it enabled less business disruption.

5.8.2 Key quotes

“Really climate adaptation and risk management sit hand-in-hand with each other and, in many cases, they overlap each other. Sometimes, what you're observing in good risk management practice is often observed in climate adaptation as well. That's a good thing and important for people to understand the relationships.”

Images



Examples of adaptation actions in Stockland retail centres Source: Johnson, 2013



Shade structures added to the carpark for customer comfort. Source: Johnson, 2013

5.9 Sydney Opera House

5.9.1 Lessons learnt and key elements summary

Key elements of the case	Lessons learnt
Realising the social value of the place and collaboration with stakeholders	Need to have right methodology, such as risk assessments to cost risks is important,
Expansion of existing risk management procedures to include climate change risks	Envisaging some of the outcomes of adaptation and communicating this through stakeholder engagement leads to increased success of implementation
Scaling up adaptation over time is important and linking to other initiatives.	Envisaging some of the outcomes and communicating this through stakeholder engagement.
Alignment with external objectives - alignment with UNESCO World Heritage requirements is key consideration	Leadership and upper management buy in for success

Overview

The Sydney Opera House is an internationally recognised Australian icon located on the banks of Sydney Harbour. In 2007 it became a UNESCO's World Heritage Listed buildings as it is regarded as one of the masterpieces of 20th Century architecture. The Opera House is a government organisation. It has an Environmental Sustainability Plan and Environmental Sustainability Policy and publishes an Environmental Sustainability Report annually that covers the Opera House and its Precinct. The organisation has started its quest to implement adaptation into its broader approach on environmental sustainability.

Climate change risks

Climate change risks have been identified on the basis of the Metropolitan Sydney Climate Change Snapshot published by the Office of Environment and Heritage. Risks to the building itself include:

- impacts from sea level rise through inundation and increased hydrostatic pressure which could result in leaks into underground areas, and potential water ingress
- more severe storms with high winds which could damage to the building
- intense rainfall may also result in storm-water run-off that may result in flooding
- decreased annual rainfall may increase the cost of water adding to operational costs.

In terms of events, potential climate-related risks include:

- high wind damage to temporary infrastructures
- heat waves and high temperatures may leading to heat stress on visitors
- intense storms can increase the incidence of flooding and storm water run-off
- increased intense rainfall and lightening could result in cancellation or postponement of outdoor events.

Adaptation features

Adaptation of the Opera House building itself and its operations is addressed separately. The Opera House building has a periodic ten-year renewal program which sets out necessary upgrades, among other tasks. The program has a sustainability framework that incorporates the impacts of climate change and sea level rise into the design. The organisation is aware that some risks may change and that this needs to be monitored and practices will need to be adjusted.

The service and retail areas that include tours around the building and (temporary) food and beverage stalls are flexible and is more easily adaptable to climate change than the building itself. Learning from experience is an important part of the process. An example is how the design of a 'pop-up' bar reflected light, exacerbating high temperatures for staff and visitors. The organisation is also looking into enhancing its communications plans to ensure program changes can be communicated effectively (in the event of extreme heat, for example) and also creating temporary shade and shelter structures and providing visitors with access to water. Another part of its adaptation strategy is scheduling events in the cooler parts of the day, in the evening or earlier in the morning during summer months.

Climate change also presents some opportunities for the Opera House, particularly in enhancing outdoor events during colder months. Milder weather in winter has resulted in increased participation at winter festivals (such as the event Vivid Light,). Milder winters are providing opportunities to organise more outdoor events, and facilitate outdoor food and beverage retail.

In the long term, use of the jetty on the eastern side of the precinct for regular ferry service is being considered taking into consideration the expected sea level rise. Adaptation to climate change is currently considered in the investment of the renewal modifications of the precinct and embedding it in the broader investment processes is seen as a responsible "use of taxpayers' money".

Methodology used

The building renewal program assumes a 90cm sea level rise, which is the same height used in the Barangaroo development that is very close in proximity (about 300m). Any issues related to building management, including adaptation is carried out via the New South Wales Government's procurement or treasury gateway process, which involves mounting a business case. In a way, this dictates how adaptation can materialise in the business case and it is mostly perceived as a component that strengthens the proposed (renewal) works.

In terms of operations, the organisation has completed an internal event risk assessment that extended to adaptation to climate change. This process revealed that the organisation already has processes in place to address all of the climate-related risks. The risk assessment draws on the experience of managers who have worked for the organisation for 20 years. The issue is that some impacts would occur more frequently and intensify overtime and the organisation has to be prepared to deal with these scenarios. It is not likely that any specific climate change adaptation measures are proposed as stand-alone initiatives in the immediate short-term of five years.

In terms of garnering support for adaptation, the ability to pinpoint government policy that provides guidance such as UNESCO and the State government has been helpful, as was the targeted risk assessment carried out on events. Any effort that helps make climate change real by clearly communicating likely impacts and also by feeling the impacts of climate change makes it easier to garner support.

Monitoring and assessment

The Opera House has a wind monitoring station on site that is used regularly to ensure safety, particularly in relation to temporary structures. There are no other measures or success factors associated with adaptation. This is one area that has not yet been addressed.

Stakeholder involvement

The actual planning of climate change adaptation is a relatively new effort that has been mainly internal so far. This involved attending and organising workshops and gathering information from specific stakeholders to develop an understanding of the risks and potential adaptation measures. Community consultation over mitigation efforts has been carried out. As a national landmark, the Opera House has to ensure it communicates and engages stakeholders over adaptation in a manner that is sensitive to how the building is portrayed in the media for example.

Wider community benefits and collaboration

Public demonstration of robust adaptation to climate change would send a strong message to Australia and the rest of the world. It would mean that Australia cares about this issue.

For example, when the Opera House had the red, white and blue colours on the sails in response to terrorist activity in Paris, this was seen as a message that Australia stands up to terrorism.

The Opera House is also cultural and community-meeting place that has to be safe and comfortable and available to the community in all seasons. It also has a communication value as a place of discussion and “where we can engage and inspire audiences through ideas... [that] “has big community and broader education and communication benefit”.

Discussions about adaptation have occurred with Barangaroo (Lendlease) Sydney Water, the City of Sydney. Staff have attended the Environmental Institute of Australia and New Zealand’s training course and the Green Building Council of Australia’s master class. The organisation has participated in Green Cross Australia’s ‘Witness King Tides’ photo collection that documents king tides in June and December. The initiative serves to create awareness of the impacts of sea level rise.

Progress on integration of adaptation

The organisation has started to recognise the various risks of climate change and is documenting its learning experiences. Long-term commitment to adapt to climate change is demonstrated by its inclusion in the building renewal program and the overall enterprise strategy which has a sustainability focus that recognises that current operators are caretakers of a significant, iconic building protecting it for the next 250 years. UNESCO’s World Heritage policies also provide framework and requirements.

Key elements of the business case for adaptation

For a government organisation, such as the Sydney Opera House, government-led information is a solid starting point. This can be aligned with the organisation’s environmental strategy and baseline data to assess progress against and demonstrate how this adds value to the business. In the case of the Opera House, alignment with UNESCO World Heritage requirements is key consideration. Having the right methodology, such as risk assessments to cost risks is important, as well as envisaging some of the outcomes and communicating this through stakeholder engagement.

Organisational learning

Initially it is helpful not to perceive and treat climate change adaptation as something completely foreign to the organisation or necessarily over complicated, but recognising that it represents an increase of risk are already present. The Opera House applied an approach that internally aligns and embeds adaptation within other business processes. It was also important to “start small” (such as the events risk assessment) to address any resistance

within the organisation and set achievable targets if it is a complex organisation. Engaging management and leadership is also crucial.

5.9.2 Key quotes

“...if the opera house was publicly demonstrating climate change it would send a strong message to Australia...What the opera house does actually matters because it represents Australia at some level... For us to be publicly demonstrating a robust adaptation plan would be a great show of leadership for the rest of the community. We're not there yet, but I think there's value beyond ourselves to doing that, for us and other icons as well.”

“Adaptation would always be as a component to strengthen the business case”

Images

1. The Sydney Opera House



Source: www.opera.org

2. Sydney Opera House sails close up



Source: http://www.sydneyoperahouse.com/about/media/photo_gallery.aspx

5.10 Bedarra Island Resort

5.10.1 Lessons learnt and key elements summary

Key elements of the case	Lessons learnt
Major disaster helped switch to alternative pathway	Applying an integrated approach to sustainability and adaptation creates opportunities.
Small business decision making with less hierarchy to screen initiatives	Uncertainty about outcomes when developing new adaptation processes should not stifle innovation and commitment.
Sustainability processes part of adaptation business case	

Overview

Bedarra Island is situated approximately 10 km from Mission Beach in Tropical North Queensland (approx. 140 km south of Cairns). Bedarra Island Resort is a family-owned business that consists of eight luxury villas located on 45 hectares of land. The resort is closed from mid-January to the end of March, coinciding with the wet season. The resort does not seek eco-certification of any sort and does not cater for children.

Bedarra Island was badly damaged by the last two cyclones that hit the area; the last of these was Tropical Cyclone Yasi in 2011. The subsequent rebuild (including change of ownership) provided an opportunity to rethink the design and the implementation of numerous sustainability measures to benefit the business. The business case for sustainability centres around reducing operational costs through a reduction in diesel consumption and labour costs required to maintain past infrastructure. The observed flow-on effects are that guests enjoy staying at a resort that is operating sustainably.

Climate change risks

The risks posed by extreme weather events are very real and current for the resort. The island location also requires an element of self-sufficiency in terms of power, drinking water and waste. Securing the operation of infrastructure is a key concern. There are two main risks from climate change:

- extreme weather events, primarily cyclones which can damage the resort and cause injury (i.e. safety concerns)
- sea level rise, which could endanger infrastructure in low-lying areas.

Climate change can also present some opportunities, primarily through the extension of the seasons, but such opportunities are not considered currently.

Adaptation features

Adaptation to climate change is integrated into the overall sustainability efforts of the resort. The primary motive for pursuing sustainability was always financial, with the goal to reduce operational costs and increase profitability.

Prior to rebuilding in 2011, the management undertook a sustainability assessment to assist in devising an attainable long-term operational strategy. The result was a fundamental change to the key operational elements of the resort in terms of power, water resource and waste management as well as a reduction in the number of villas (from the initial 16 to eight). The sustainability measures also present an advantage by attracting guests seeking sustainable tourism experiences. The resort is now run entirely on renewable energy (off-grid hybrid solar system with a battery bank and a back-up generator), which include individual solar hot water systems in all villas. This reduced diesel consumption from the initial 300 000L/year to 7000L/year. A tangible benefit for guests is the elimination of the incessant hum and smell of diesel engines operating constantly throughout the day and night.

The switch to renewable energy necessitated the replacement of the old diesel-powered reverse osmosis desalination technology, the substitution of electrical fittings and various appliances with low power alternatives. Currently rainwater storage tanks with about 650,000 litres of capacity and several freshwater springs provide fresh water. Water reticulation infrastructure has been replaced to reduce the risk of any potential water leaks.

A new bio-cycle septic system has been installed on the island to replace the 25 year old diesel-powered sewerage treatment plant, with all treated effluent being dispersed underground through sand beds to irrigate, without any risk of contact with the ocean or fringing reefs. Waste reduction is achieved by selecting suppliers that do not use excessive packaging. Organic waste and most cardboard is composted and used in the vegetable gardens. Aluminium waste is selected and transported to the mainland for recycling. A glass crushing machine is used to reduce all glass to sand that is used as aggregate in concreting and landscaping throughout the resort. Another measure adopted at the resort is revegetation with native species to help stabilise the fore dune.

Guest surveys indicate that for about 60% of visitors, the sustainability aspect of the resort had no impact on their destination selection; about 30% indicated that it had some impact and for 10%, it was the key reason for staying at the resort.

Methodology used

Climate change is not addressed through a formalized risk assessment, but is part of a holistic approach to sustainability. The approach to planning for sustainability was described as “a very back to front way” because it was not driven by maximum visitor numbers. However, pursuit of sustainability was described as making “complete sense in hindsight”.

Out of the initial 16 villas, management selected to reopen the eight that were furthest from the sea, partly because of the concern over sea level rise and also to reduce the possibility of damage from waves during cyclones.

A risk assessment was conducted to determine if and how the switch to renewable energy could be realised on the island. Downsizing from diesel dictated possible options for water and waste management. The “biggest drawback” associated with renewable energy was the need to reduce the size of the cold room and “getting rid of” air-conditioners in all the villas. A feasibility analysis was carried out to assess the costs of additional rainwater tanks and harnessing supply from the freshwater spring. Compared to the desalination machine run by the diesel-powered generator, the significant investment in additional tanks was quickly realised.

Monitoring and assessment

Adaptation to climate change is embedded into overall operational procedures as it is recognised as important for business resilience or continuation. Its success, as with all sustainability measures is “ultimately that they work” and evidence indicates that this is the case. Monitoring involves implementing preventative measures around the resort to decrease possible hazard in the event of strong winds. Measurements for all the windows are stored in a database to facilitate quick replacement when needed. Full emergency cyclone response procedures are in place.

Feedback from guests also confirms their satisfaction with the way the resort is operating. Importantly, experience shows that the resort is “far exceeding” the initially expected internal rate of return associated with the investment.

Stakeholder involvement

As a small, family business, the management investigated options and carried out the research. External advice was sought regarding design of the systems such as the size of the solar system and back-up was required to sustain the resort guests and staff.

Wider community benefits and collaboration

For guests, the main advantages are that there are no smells of diesel fumes and noise from the generator. While guests do not primarily choose Bedarra Island Resort for its sustainability achievements, guest briefings appear to raise awareness about sustainability

among visitors. In this sense, the resort appears to play a role in educating the public about how sustainability measures can operate effectively.

For the wider community and the environment, a benefit is that large amount of diesel is no longer transported through the Great Barrier Reef Marine Park, posing a risk of spillage during transfer. An additional benefit has been the ability to use local contractors to install the new infrastructure.

Progress on integration of adaptation

Reducing the impact on the environment is the overarching strategy of Bedarra Island Resort. Key elements of this include moving toward renewable energy when technology is available. In terms of adaptation, the decision was made not to investment significant amount of funds in low-lying parts of the island.

Key elements of the business case for adaptation

Switching to renewable energy dictated the type of infrastructure that could be implemented and halved overall maximum visitor numbers but it also materialised into substantial cost savings. For example, now it takes one person an hour each day to check all of the infrastructure servicing the resort ; whereas before four to five employees were engaged in operation and maintenance. An additional advantage that was not identified in earlier feasibility studies was that the new technology made the resort exempt from environmental reporting and compliance obligations. While visitor numbers have decreased overall turnover, cost reductions actually increased the profitability of the business.

As a small, family-owned business, any operational decision, including the sustainability approach and selection of alternatives was achieved through consensus over roundtable discussions.

Management has taken care in marketing sustainability initiatives as they did not want this to compromise the Bedarra Island Resort brand. As a luxury resort that relies on repeat visitors, management wanted to avoid any perception that sustainability measures would “reduce or erode the luxurious experience they have on the island”.

Organisational learning

The evidence shows that operating sustainably and switching to renewable energy from diesel makes sound business sense. Applying an integrated approach worked because switching the power source determined the technology and the capacity of the water and waste infrastructure. While it may be difficult to make such a change in an existing resort it is surprising why more operators do not take advantage of this opportunity: “knowing what I know now, I would say step into the abyss, completely changing your operation. Probably the sooner you do it the better.”

5.10.2 Key quotes

“...it's sometimes hard to change how an operation is running. If it had been an operating resort, it would have been a very difficult decision to make... It was a much easier decision for us because it was not operating at the time.”

“...having reduced visitor numbers has decreased the overall turnover [but] it has actually, increased the profitability of the operation compared to how it was previously operating. Now these are really strong business cases for certainly what we've done.”

“You can almost see it on the back of an envelope that the benefits were going to be substantial.”

“I guess we have a fantastic sustainability story to tell, but yet we don't want to risk our luxury brand, which is primarily what we are.”

Images

1. Bedarra Island Resort – Beach House



Source: <https://www.bedarra.com.au/gallery>

2. Bedarra Island Resort- Solar panels



Source: <https://www.bedarra.com.au/gallery>

3. Bedarra Island resort – Front beach



6 A guide to developing a business cases for adaptation

This study identified ten exemplary business cases on the topic of the climate change adaptation in coastal areas. Analysis of the business cases revealed the critical success factors for success (including monetary and non-monetary values) in terms of the elements of the business case and the process of building such a case. These are discussed in the next sections.

6.1 Elements of a business case for climate change adaptation

The analysis revealed that the following elements were present across the cases. The analysis identified the following key elements of a business case for climate change adaptation.

1. Using evidence to support that climate change is impacting the organisation, project or initiative.
2. Framing climate change as a risk and also recognising it as an opportunity.
3. Ability to incorporate climate change risks and/or the opportunities it represents into the organisation's existing processes (such as standard risk management practices) thus allowing it to be part of the 'normal business operations'.
4. Linking the business case for climate change adaptation to sustainability planning.
5. Strategically aligning adaptation objectives with the mission and objectives of the organisation.
6. Collaboration and partnership with a range of organisations, including researchers, public sector (several levels of government) by the private sector to identify strategic shared benefits.
7. Monitoring individual initiatives in terms of the benefits to stakeholders and to minimise risk.
8. Long term time frame for return on investments measured by strategic shared benefits.

All organisations either assumed climate change was already occurring or that the business case identified presently occurring risk factors within the case. This is a fundamental element of a business case for climate change adaptation. Whilst it is difficult to attribute each disaster or extreme event with changing climate, the presence of such events coupled with data on changing climate presents conceptual and tangible evidence of the risks. The nature of extreme weather events such as cyclones in the northern half of Australia and the

movement of these events (and associated risks) further south made a business case more feasible in the relevant cases.

Mounting a business case for climate change was primarily motivated by the understanding of present risks for the organisations. Important to all cases was the incorporation of climate change risk into existing risk management practices and thus climate change becomes part of the normal system of governance of the organisation. There is a greater tendency in the private sector to interpret adaptation as a risk and manage it by incorporating it into their risk management processes.

Linkage of the business case for climate change adaptation to sustainability planning was also a way of justifying the business case for climate change. All organisation exhibited this feature of governance and some organisation realised they needed to strengthen this relationship to ensure improved climate change adaptation.

Strategic alignment of business case objectives with the mission and objectives of the organisation was seen to be a key element of the business cases. The integration of the business case for climate change adaptation into overall business decision-making frameworks was an important element in mounting a business case. Developing a shared value with stakeholders including the wider community was an important element for both local government and private enterprise. Considering the impacts beyond the organisation and the reciprocal relations with stakeholders were important in the case studies presented.

Identification of strategic benefits to the organisation and stakeholders was an important element. In some cases, lifecycle analysis and cost benefit analysis was used. However, it appeared to be more important for the organisation and its stakeholders to identify strategic benefits that result from the implementation of the business case. This was particularly so for coastal council than for private enterprise.

The long term time frame of the business case was also a key element. The return on investment was difficult to measure and as a result of this, the strategic benefits became more important in the justification of the business case.

The planned monitoring of adaptation outcomes was important in risk management and also demonstrating benefits to the organisation and stakeholders.

6.2 How to mount a business case for adaptation

Features of exemplary case studies provide invaluable lessons for practitioners who seek to endeavour to build a business for adaptation. This study identified important lessons that can be passed onto other organisations in order to successfully mount a business case for coastal climate change adaptation. Communicating and sharing the knowledge with other coastal organisations is important because this project found that a business case was often

done by an organisation's in-house experts in isolation from other organisations. Thus, it is important for organisations to gain external knowledge on process and formulation of a business case and to provide guidance on strategies and plans.

The following features were seen to be important in the process implementing a business case for climate change adaptation.

1. Use extreme events as a critical moment to propose the business case. These moments can shift the thinking and direction of the organisation on climate change and in many cases, these critical moments were extreme weather events (e.g. floods, heat waves, cyclones, storm surges). This is needed in order to seize on opportunities to create momentum and mount a case in the first place as quite often external events (e.g. disasters and economic changes) allow for certain elements of a business case to become more relevant in the decision making process of the business case. This was also seen to be a continuous process to elevate the business case towards policy adoption and implementation as opposed to a one –off process.
2. Leadership involved within the organisation and external to the organisation is important for progressing the business case through the decision making process in an organisation.
3. The use of visuals and local context was important to demonstrate the need for adaptation measures. This point is also emphasized by the literature on climate change communication (e.g. CRED 2009).
4. It was important to ensure there is long term staffing for key positions in order to wait for possible delays in initiation or delivery of the proposal. It was also important to have a continuing climate change planner position in an organisation because of the long time frames for the implementation of measures. Most of the participants who championed adaptation business cases had several years of experience in the organisation, so they possessed a more sophisticated knowledge of the organisation, internal systems, and the key risks for the organisation and decision-making processes. Coupled with critical moments was the presence of strategic actions of personnel in an organisation to implement the adaptation plan.
5. The staged implementation of projects within the business case appeared to lead to greater success.
6. Providing only relevant climate impacts on the business is important and thus, any irrelevant information such as impacts on regions where the organisation

does not operate, or processes/products are not part of the business should not be included.

7. Identifying key climate and weather risks as opportunities for the organisation identifying business relevance will increase the justification of the business case. The use of positive framing of key impacts of climate change on the organisation is important in implementing a successful business case for climate change adaptation. Quite often climate change is framed as a non-specific threat in the future. The cases in this study, however, address the risks that are currently experienced by the organisation.
8. The linkage of climate change adaptation measures with climate change mitigation appeared to be important in the justification of the business case. An emphasis on the risks to the organisation of not mitigating for climate change was linked to the risks of not adapting to climate change.
9. Engagement with other organisational commitments (e.g. voluntary environmental or carbon initiatives) and the stakeholders involved with these commitments is important.

6.3 Limitations

The study was limited in time and the number of cases presented here reflects the timeframe of the study. More exemplary cases are likely to exist in coastal Australia. More time searching for cases may have revealed a larger number of climate change adaptation business cases. A small number of organisations which had used a strong climate change adaptation business case in their organisation declined to participate.

As mentioned previously in this report standard generalisations should not be made from these findings. However, the applicability of the key findings and success factors for other organisations can be best judged by the individual who is located within those organisations as their understanding of the context will determine the applicability of many of the factors identified.

7 Conclusions and recommendations

Organisations in Australia face numerous risks from climate change and many recognise the need to adapt their practices and strategies. Some organisations have already developed ways in which adaptation to climate change can be presented as a reasonable and viable business case. The cases studied in detail reveal that in some instances, businesses, governments and the community already feel the negative effects of climate change (such as flooding, cyclones, heat waves and other extreme weather events). Extreme weather events have been key drivers for these organisations to position the business case approach as a way to address climate change adaptation in coastal areas. While some of the cases also identified the ensuing risk posed by rising sea levels, only a few have addressed its effect in a business case approach, most likely because it represents a long term risk that is outside the organisations' planning timeframes. This means that many successful adaptation business cases were reactive in a sense, rather than proactive, which is surprising given the evidence (see e.g. Deloitte Economics 2013; Global Opportunity Network 2015) that adaptation, resilience or pre-disaster preparedness is far more cost-effective than funding recovery efforts. This needs to be calculated and communicated more effectively to Australian business and local governments.

There is also the tendency to view climate change as a source of risk and to argue the business case for adaptation along the principles of risk management. While this appears to be a sound and effective approach now, it has limitations and there remains a need to determine and demonstrate how climate change can materialise (or be mainstreamed) as an opportunity for organisations.

Based on the findings, the following recommendations are provided with the aim to a) empower a wider range of organisations to build the business case for adaptation and b) facilitate organisations in taking the next step in recognising adaptation as a business opportunity:

- Establishing an entity such as the knowledge-sharing network UKCIP operating in the UK, which aims to cross-pollinate ideas and practices between science, policy-makers and practitioners. This is a research, consultancy and networking organisation that builds partnership specifically in the area of adaptation. It has developed a range of tools, guidance documents and organises events on various platforms.
- Reframing the communication of climate change impacts (both current and future) as risk and opportunity for business. This could be a staged process, whereby priorities are set up, such as in terms of location-exposure to extreme weather events (such as along the coast of Northern Australia or heat wave prone suburbs or cities) or sector-specific (such as property/building sector, infrastructure, tourism,

etc.). One example is the 'Investing through an adaptation lens' by the Investors Group on Climate Change (Rissik and Smith 2015).

- Enhance focus on framing climate change adaptation as a business opportunity, which is undoubtedly a great challenge, but is necessary to increase the adaptation aims of organisations. This involves research to determine what these opportunities are (e.g. new products and services) and what assistance organisations need to identify and implement them.
- Research is needed into the responses of organisations that have experienced major climatic/weather events to determine how a business case approach may be useful to shift not only business initiatives addressing climate change but a shift in business models to be responsive to climate change.
- Support (through funding or research) is needed to determine how organisations can gain a return on operational costs of adaptation over time. This is particularly important for local government. This is a fundamental issue of monitoring and assessment by the researchers despite limited documentation in the case studies presented in this project. The use of cost benefit analyses in business case proposals in local government warrants further investigation because of the multiple benefits to many stakeholders and the longer timeframes which any return on investment may be scaled.
- More research is needed that captures small business capacity to develop a business case for climate change adaptation. Most of the cases were large-scale organisations and as such the conclusions relate to organisations that have the capacity to plan and implement longer term adaptation strategies.

8 References

- Adelaide Airport. (2016). An investment for the future – A Solar photovoltaic (PV) case study, Airport Environmental Strategy, Adelaide Airport.
- Aldunce, P., Handmer, J., Beilin, R., Howden, M. (2016) Is climate change framed as 'business as usual' or as a challenging issue? The practitioners' dilemma, *Environment and Planning C: Government and Policy* doi: 0263774X15614734.
- Amran, A., Keat S. O., Wong, C. Y., Hashim, F. (2015) Business strategy for climate change: an ASEAN perspective, *Corporate Social Responsibility and Environmental Management*. doi: [10.1002/csr.1371](https://doi.org/10.1002/csr.1371)
- Barnett, J., Graham, S., Mortreux, C., Fincher, R.E., Waters, E., Hurlimann, A. (2014) A local coastal adaptation pathway, *Nature Climate Change* **4** pp. 1103–1108.
- Busch, T. (2011) Organisational adaptation to disruptions in the natural environment: The case of climate change, in *Scandinavian Journal of Management* **27** pp. 389-404.
- CRED (Centre for Research on Environmental. Decisions) (2009) *The Psychology of Climate Change Communication*, last accessed June 30, 2016 at http://guide.cred.columbia.edu/pdfs/CREDguide_full-res.pdf. r
- Deloitte Access Economics (2013) *Building our Nation's Resilience to Natural Disasters – White Paper*, Accessed February 18th, 2016 at <http://australianbusinessroundtable.com.au/white-paper>.
- Dobes, L., and Chapman, B. (2011) *Financing adaptation to climate-induced retreat from coastal inundation and erosion*, Centre for Climate Economics and Policy, Crawford School of Public Policy, Working Paper 1113.
- Evans L.S., Hicks C.C., Adger W.N., Barnett J, Perry A.L., Fidelman P., Tobin, R. (2016) Structural and Psycho-Social Limits to Climate Change Adaptation in the Great Barrier Reef Region, *PLoS ONE* 11(3): e0150575. doi:10.1371/journal.pone.0150575.
- Flyvbjerg, B. (2006) Five misunderstandings about case-study research. *Qualitative inquiry*, 12(2), 219-245.
- Gasbarro, F., Pinkse, J. (2015) Corporate adaptation behaviour to deal with climate change: the influence of firm-specific interpretations of physical climate impacts, *Corporate Social Responsibility and Environmental Management*, 23:179–192.
- Global Opportunity Network (2015) *Global Opportunity Report*, 1st edition, Accessed February 12, 2016 at <http://globalopportunitynetwork.org/the-2015-global-opportunity-report.pdf>.
- Hertzler, G. (2007) Adapting to climate change and managing climate risks by using real options, *Australian Journal of Agricultural Research* 58: 985-992.
- IEMA (Institute of Environmental Management and Assessment) (2013) *Climate change adaptation – Building the business cases – Guidance for environment and sustainability practitioners*. Last accessed June 26, 2016 at http://climatesouthwest.brightcraft.co.uk/library/Tools/iema_guidance_report_v51.pdf.

- IFC (International Finance Corporation) (2012) *The Business Case for Sustainability*, Accessed May 2nd, 2016 at <http://www.ifc.org/wps/wcm/connect/9519a5004c1bc60eb534bd79803d5464/Business%2BCase%2Bfor%2BSustainability.pdf?MOD=AJPERES>.
- Inglis, J., Whittaker, S., Dimitriadis, A. and Pillora, S. (2014) *Climate Adaptation Manual for Local Government – Embedding resilience to climate change*, Australian Centre of Excellence for Local Government, University of Technology, Sydney.
- Johnson, G. (2013) *Assessing Climate Change Vulnerability and Resilience in a Commercial Property Portfolio*, Local Government Planners Forum, Accessed January 15th, 2016 at <http://www.planning.org.au/documents/item/5567>.
- Lendlease (2015) *Climate Change Adaptation and Community Resilience -Barangaroo South*, last accessed June 29, 2016 at <https://www.barangaroosouth.com.au/about/sustainability>.
- Linnenleucke, M.K., Griffiths, A. and Winn, M.I. (2013) Firm and industry adaptation to climate change: a review of climate adaptation studies in the business and management field, in *WIREs Clim Change*, 4:397–416.
- Linnerooth-Bayer, J. and Hochrainer-Stigler, S. (2015) Financial instruments for disaster risk management and climate change adaptation, *Climatic Change*, 133:85–100.
- Linquiti, P. and N. Vonortas (2012) The value of flexibility in adapting to climate change: A real options analysis of investments in coastal defence, *Climate Change Economics* 3(2) 1-33.
- Nordvik, V. and Liso, K. R. (2004) A primer on the building economics of climate change, *Construction Management and Economics*, 22 pp. 765-775.
- Ocasio, W. (1997). Towards an attention-based view of the firm. *Strategic Management Journal*, 18(S1), 187-206.
- OEH (Office of Environment and Heritage, NSW) (2016) *Building a business case*, Accessed January 6th, 2016 at <http://www.environment.nsw.gov.au/business/business-case-training.htm>.
- Pinkse, J, and Gasbarro, F. (2016) Managing Physical Impacts of Climate Change An Attentional Perspective on Corporate Adaptation, *Business & Society* DOI: 0007650316648688.
- Porter, J.J., Demeritt, D., Dessai, S. (2015) The right stuff? Informing adaptation to climate change in British local government, *Global Environmental Change* 35: 411-422.
- Rissik, D. and Smith T. (2015) *Investing through an adaptation lens*, last accessed June 29, 2016 at http://www.igcc.org.au/resources/Documents/IGCC_Adaptation_Guidance_web_Full_FINAL.pdf.
- W. P. Pauw (2015) Not a panacea: private-sector engagement in adaptation and adaptation finance in developing countries, in *Climate Policy*, 15:5.
- Schaltegger, S., Ludeke-Freund, F. and Hansen, E.G. (2011) *Business Cases for Sustainability and the Role of Business Model Innovation Developing a Conceptual Framework*, Centre for Sustainability Management (CSM), Leuphana University, Lüneburg, Germany, pp.1-25.

Thompson, M., Cooper, I. and Gething, B. (2014) *The business case for adapting buildings to climate change: Niche or mainstream? Executive Summary*, Accessed December 12th, 2015 at <https://www.gov.uk/government/publications/the-business-case-for-adapting-buildings-to-climate-change>.

Thorpe, J. (2012) *Climate change and supply chains – is there a ‘business case’ for adaptation?* Accessed December 8th, 2015, at <http://policy-practice.oxfam.org.uk/blog/2012/08/the-business-case-for-climate-change-adaptation>.

UK Environment Agency (2012) *Climate Ready BACLIAT: Business Impacts Assessment Tool*. Accessed November 15th, 2015 at <http://climateuk.net/resource/bacliat>.

UN Global Compact (2015) *The Business Case for responsible corporate adaptation: Strengthening Private Resilience*, Accessed January 14th, 2016 at <http://caringforclimate.org/workstreams/climate-adaption/>.

World Economic Forum (2016) *Global Risks Report*, 11th edition, accessed February 12, 2016 at http://www3.weforum.org/docs/GRR/WEF_GRR16.pdf.

Yin, R. (2013) *Case study research: Design and methods*. Sage publications, London.

