



# ASSESSING CLIMATE CHANGE RISKS AND OPPORTUNITIES FOR INVESTORS

Property and Construction Sector

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Climate Change

# ASSESSING CLIMATE CHANGE RISKS AND OPPORTUNITIES FOR INVESTORS

## Property and Construction Sector

### Introduction

The property and construction sector is already financially vulnerable to extreme weather events such as cyclones, bushfires, high temperatures, hailstorms and flooding. Climate change is forecast to further increase the exposure of this sector to climate, energy and carbon price risks. Many adaptation measures and opportunities to mitigate energy cost and carbon risks are open to property and construction companies.

### Purpose

This guide provides information to help investors assess and integrate climate risk and opportunity in the property and construction sector into investment analysis.

### How to use this guide

*Identify the risk factors:* Recognise key climate change, energy and carbon risks faced now by investors in the property and construction sector in Australia.

*(Table 1 and Table 2 provide a checklist of issues for investors)*

*Identify how risks will increase:* Unmitigated climate change will increase risks related to weather, energy cost and carbon. Increasing risks are explained.

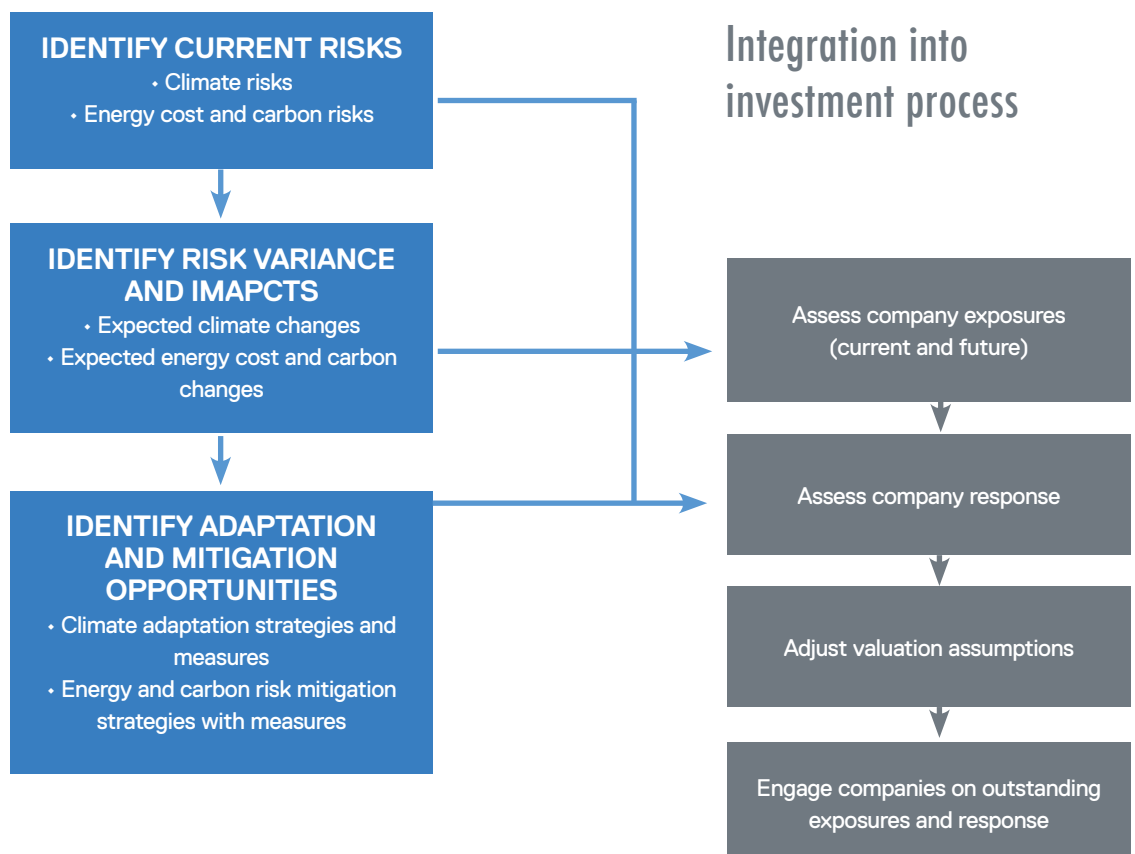
*Identify the adaptation strategies and mitigation measures:* The most cost effective measures companies can take to mitigate energy costs and carbon risks (reduce exposure) and adapt to physical risks (to build resilience for climate changes which can no longer be avoided) are then

described based on observations of leading practices.

*Assess materiality:* Not all climate change risks affect all sectors equally. Tables identifying risks, adaptation strategies and mitigation measures in this guide include the most significant issues for the property and construction sector.

*Integrate the information into investment processes:* The diagram below indicates how investors can integrate the information in this guide into investment practices.

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# SUMMARY OF CLIMATE RISK IN THE PROPERTY AND CONSTRUCTION SECTOR

## Climate related risks









The property and construction sector is a capital intensive sector with many long life fixed assets, supply chain and water requirements to enable operations. The property and construction sector in Australia and globally has always been vulnerable to extreme weather and flooding.<sup>2</sup> Examples of existing vulnerabilities include:

Hailstorms	Over the last decade, hailstorms have caused property damage worth billions in Sydney, Perth, Melbourne, Canberra and Brisbane. Recent Perth and Melbourne hailstorms each caused over a billion dollars damage. The 1999 Sydney hailstorm caused \$1.7 billion in insured damages, equivalent today to \$3.3 billion, affecting 10,000s of buildings. <sup>3</sup>
Rainfall events and flooding	Floods in Brisbane, Victoria and Tasmania in 2010-11 were calculated to have caused damage worth \$5.6 billion largely to property, infrastructure and lost economic activity. <sup>4</sup>
Rainfall delaying construction	By March 2012, the Australian Industry Group-Housing Industry Association's Performance of Construction Index had fallen to 35.6 (anything below 50 is a contraction) due to rain delays caused by the more extreme La Niña cycle bringing consistent rain to the east coast of Australia from the Spring of 2010 through to 2012. <sup>5</sup> This added significantly to construction costs. <sup>6</sup>
Cyclones	Cyclone Yasi in 2011 was estimated to have caused over \$3.5 billion in damage and lost business in Queensland. <sup>7</sup> Modeling suggests if a cyclone directly hits Cairns, losses could be in the order of \$1.5-\$4 billion and up to \$8 billion for a Category 5 cyclone. <sup>8</sup>
Bushfires and electricity supply disruptions	The January 2007 Victorian bushfire disabled the key NSW-Victoria electricity transmission line, reducing Victoria's electricity supply by a third, cutting electricity to 200,000 homes and commercial properties.
Higher temperatures	Australia's average daily maximum temperatures have warmed by about 0.8°C since 1910. The frequency of days above 30°C is rising and record hot days now outnumber extremely cold days by more than two-to-one. This is a factor in air-conditioning consumption doubling in the last decade, driving investment in electricity supply infrastructure and almost doubling electricity costs for the property and construction industry.
Storm surges combining with sea level rises	An estimated \$159 billion worth of Australian buildings are vulnerable to sea level rise and storm surge. This includes up to up to more than 8,000 commercial, 6,000 industrial and 274,000 residential buildings around the country. In cases where losses could be attributed to insufficient planning, lawsuits could be brought with potential for financial and reputational losses.

# Climate change risks, forecast change, potential impacts and adaptation strategies

The probability of these risks occurring and negatively impacting on the cash flows of property and construction companies will increase with climate change over the coming decades. The many adaptation strategies open to companies summarised in Table 1 are described in further detail below in Table 6.

**Table 1: Climate change risks, forecast change, potential impacts and adaptation strategies**

<p><b>MORE INTENSE CYCLONES - FLOODING</b></p> 	<p><b>FORECAST CHANGE</b></p> <p>Cyclone Intensity</p> <p>+ 60% by 2030 +140% by 2070</p>	<p><b>IMPACTS</b></p> <p><b>Construction</b></p> <p>Delays to construction and even risk to meeting completion targets. Damage to cranes Increased construction costs associated with additional site flood mitigation measures Increased insurance costs</p> <p><b>Property Assets</b></p> <p>Damage to property and assets Business interruption to customers Increased insurance costs</p> <p><b>SAMPLE ADAPTION STRATEGIES</b></p> <p><b>Construction</b></p> <p>Increase design and construction standards Ensure cranes are secured or temporarily taken down Flood defense measures Effective stormwater management Pumping equipment and backup generators</p> <p><b>Property Assets</b></p> <p>Proactively check and fix leaking roofs Retrofit to improve resilience to cyclones and hailstorms where appropriate Effective stormwater management strategies</p>	
<p><b>MORE FREQUENT HAILSTORMS - FLOODING</b></p> 	<p><b>FORECAST CHANGE</b></p> <p>Hailstorms in the Sydney basin have occurred approximately once every 5-8 years over the last few decades. Modelling predicts about a further +20% increase in frequency by 2050*</p>	<p><b>IMPACTS</b></p> <p><b>Construction</b></p> <p>Delays to construction and even risk to meeting completion targets. Damage to cranes Increased construction costs associated with additional site flood mitigation measures Increased insurance costs</p> <p><b>Property Assets</b></p> <p>Damage to property and assets Business interruption to customers Increased insurance costs</p> <p><b>SAMPLE ADAPTION STRATEGIES</b></p> <p><b>Construction</b></p> <p>Increase design and construction standards Ensure cranes are secured or temporarily taken down Flood defense measures Effective stormwater management Pumping equipment and backup generators</p> <p><b>Property Assets</b></p> <p>Proactively check and fix leaking roofs Retrofit to improve resilience to cyclones and hailstorms where appropriate Effective stormwater management strategies</p>	
<p><b>MORE INTENSE EXTREME RAIN-FALL EVENTS</b></p> 	<p><b>FORECAST CHANGE</b></p> <p>Despite overall decreases in rainfall (see below), rainfall events will become more intense creating a greater risk of flooding.</p>	<p><b>IMPACTS</b></p> <p><b>Construction</b></p> <p>Delays to construction and even risk to meeting completion targets. Damage to cranes Increased construction costs associated with additional site flood mitigation measures Increased insurance costs</p> <p><b>Property Assets</b></p> <p>Damage to property and assets Business interruption to customers Increased insurance costs</p> <p><b>SAMPLE ADAPTION STRATEGIES</b></p> <p><b>Construction</b></p> <p>Increase design and construction standards Ensure cranes are secured or temporarily taken down Flood defense measures Effective stormwater management Pumping equipment and backup generators</p> <p><b>Property Assets</b></p> <p>Proactively check and fix leaking roofs Retrofit to improve resilience to cyclones and hailstorms where appropriate Effective stormwater management strategies</p>	
<p><b>REDUCED WATER AVAILABILITY</b></p> 	<p><b>FORECAST CHANGE</b></p> <p>(%) 2030 2050 2070 North: -10 to +5 -20 to +10 -30 to +20 South: -10 to 0 -20 to 0 -30 to +5 No. of months in drought by 2070 South WA : +80% Eastern Australia : +40%</p>	<p><b>IMPACTS</b></p> <p><b>Construction</b></p> <p>Inadequate water to service developments damages feasibility of any proposed projects Increase in water prices and costs Water restrictions for landscape watering In droughts, higher electricity costs due to insufficient water for power stations</p>	<p><b>SAMPLE ADAPTION STRATEGIES</b></p> <p><b>Construction</b></p> <p>Design and build water efficient buildings Landscape with drought tolerant plants</p> <p><b>Property Assets</b></p> <p>Improve efficiency of water usage Develop alternative water supplies Use recycled water</p>
<p><b>AVERAGE HIGHER TEMPERATURES</b></p> 	<p><b>FORECAST CHANGE</b></p> <p>0.1 - 1.5°C by 2020 0.3 - 4.0°C by 2030 0.4 - 8.0°C by 2080</p>	<p><b>IMPACTS</b></p> <p><b>Construction and Property Assets</b></p> <p>Higher summer electricity demand, "peak-time" costs, consumption Greater risk of blackouts, construction interruptions and business interruption to customers Productivity loss from heat related fatigue and higher risk of accidents</p> <p><b>SAMPLE ADAPTION STRATEGIES</b></p> <p><b>Construction</b></p> <p>Invest in energy efficiency opportunities (Figure 5)</p> <p><b>Property Assets</b></p> <p>Retrofit existing assets with Improved building "thermal" envelope – insulation, double glazed/low-e windows. Energy efficient lighting and office equipment Cool roofs Energy efficient air-conditioning Solar powered air-conditioning</p>	
<p><b>MORE DAYS OVER 35°C (North Australia)</b></p> 	<p><b>FORECAST CHANGE</b></p> <p>7 - 11 days per annum by 2000 69 days per annum by 2030 308 days per annum by 2070</p>	<p><b>IMPACTS</b></p> <p><b>Construction</b></p> <p>Potential building restrictions in prone regions Difficulties in gaining insurance Damage to construction equipment</p> <p><b>Property Assets</b></p> <p>Damage to property and assets Business interruption to customers Electricity supply disruption Increased insurance costs</p> <p><b>SAMPLE ADAPTION STRATEGIES</b></p> <p><b>Construction</b></p> <p>Future construction in low bushfire risk regions Best practice bushfire building codes Build appropriate fire breaks Reduce bushfire fuel loads around construction site Work with Rural Fire Service</p> <p><b>Property Assets</b></p> <p>Retrofit to improve resilience to bushfires Review current fire breaks Reduce bushfire loads around property</p>	
<p><b>HIGHER RISK OF BUSHFIRES</b></p> 	<p><b>FORECAST CHANGE</b></p> <p>Days with very high and extreme Forest Fire Danger Index (FFDI) ratings: 4 - 25% by 2020 15 - 70% by 2050</p>	<p><b>IMPACTS</b></p> <p><b>Construction</b></p> <p>Potential building restrictions in prone regions Difficulties in gaining insurance Damage to construction equipment</p> <p><b>Property Assets</b></p> <p>Damage to property and assets Business interruption to customers Electricity supply disruption Increased insurance costs</p> <p><b>SAMPLE ADAPTION STRATEGIES</b></p> <p><b>Construction</b></p> <p>Future construction in low bushfire risk regions Best practice bushfire building codes Build appropriate fire breaks Reduce bushfire fuel loads around construction site Work with Rural Fire Service</p> <p><b>Property Assets</b></p> <p>Retrofit to improve resilience to bushfires Review current fire breaks Reduce bushfire loads around property</p>	
<p><b>SEA LEVEL RISES</b></p> 	<p><b>FORECAST CHANGE</b></p> <p>10 to 40cm by 2050 18 to 79cm by 2100<sup>24</sup></p>	<p><b>IMPACTS</b></p> <p><b>Construction</b></p> <p>Restrictions on building approval for building projects on land one metre or less above sea level Increased costs and delays to construction</p> <p><b>Property Assets</b></p> <p>Flooding and damage to property Increased costs from need to invest in flood prevention Business interruption to customers Reduced land value</p>	<p><b>SAMPLE ADAPTION STRATEGIES</b></p> <p><b>Construction</b></p> <p>No new buildings on land at least one metre or less above sea level Design and build so building materials can be recovered and reused upon dismantling Temporary builds that can be dismantled</p> <p><b>Property Assets</b></p> <p>Planned retreat for existing stock built below 1.5-2 metres above sea level Invest in flood prevention infrastructure</p>

## Energy costs and carbon risks





As well as climate change related risks, property companies with energy inefficient building stock are exposed to the following risks:

<p>Rising electricity and water prices</p>	<p>The average Australian national electricity price is predicted to jump by 37% by 2013/2014<sup>13</sup> mostly due to investment in electricity infrastructure but also partly due to the carbon price. Electricity and water prices are forecast to continue to rise, with implications for property companies regarding energy and water efficiency opportunities. The difference now in energy and water costs of 'green' market property leaders to 'laggards' is between 30%-50%.</p>
<p>Losing premium tenants (and price premium)</p>	<p>Evidence shows highly energy efficient office space attracts a price premium compared to less efficient space. The IPD Green Property Index shows assets with a Green Star or NABERS Energy rating rating outperformed non-rated assets due to tenancy stability and higher capital values over two years.<sup>14</sup> Premium tenants (such as government departments) paying premium rents expect commercial and office properties to be resilient to extreme weather events and, increasingly, are negotiating Green Leases with property companies or their managers as a rental condition. This improves tenants' potential to reduce energy usage and offers significant benefits to property companies as, for instance, energy efficient lighting in tenant stores reduces significantly the overall air-conditioning load in indoor shopping centres and malls.</p>
<p>Increasing vacancy rates Losing property value</p>	<p>Under the Building Energy Efficiency Disclosure Act 2010, sellers or lessors of office space exceeding a net lettable area of 2,000 square metres must obtain and disclose an up-to-date energy efficiency rating.<sup>15</sup> Since enactment, anecdotal evidence suggests commercial property with energy inefficient ratings of 1-2 stars (out of 5) are increasingly difficult to lease. Energy efficient 'green' buildings secure tenants more quickly and enjoy lower tenant turnover. A 2008 BCI Australia Green Building Market Report found energy efficient property owners are rewarded with decreased vacancy periods and a subsequent increase in occupancy ratios. Another recent report<sup>16</sup> has further evidence of energy efficient buildings achieving higher asset values through securing higher rents, lower lease-up costs, higher occupancy levels., lower operating costs and improved indoor air quality.</p>
<p>Rising material costs</p>	<p>The carbon price in Australia, while secondary to extensive upgrading of electricity infrastructure, has increased electricity prices as manufacturers 'pass through' additional costs. These factors could also drive a cost increase in construction material inputs with high embodied energy (e.g. steel, glass, cement, aluminium).</p>
<p>Rising compliance requirements</p>	<p>According to the IPCC and numerous other studies, the built environment offers both the most cost effective and the greatest quantity of greenhouse gas emission reduction potential. In response, numerous localities in Australia and internationally are moving to more stringent low carbon building regulations and policies. For instance, California and half of the EU have net zero energy/net zero carbon new building targets for 2016-2030. In Australia, the ACT Government has targeted a 40% greenhouse gas reduction and a 90% renewable energy goal by 2020. ACT greenhouse gas emissions are dominated by the commercial and residential building sector. This will likely see much higher standards for green buildings and retrofitting of existing buildings being effected in the ACT and in other areas of Australia. The Department of Climate Change and Energy Efficiency has published a range of reports scoping the cost benefits of Australia following such targets for the residential and commercial building sectors. These reports find it is technically and economically feasible for the Australian building sector to adopt similar targets to those of leading policies in the EU.</p>



Table 2 provides a list of energy cost and carbon risks, potential impacts and mitigation strategies for investors to discuss with companies.

**Table 2: Energy and carbon cost risks, forecast change, potential impacts and mitigation strategies**

<p><b>UNCERTAINTY REGARDING CLIMATE CHANGE POLICY AND THE PRICE ON CARBON</b></p> 	<p><b>FORECAST CHANGE</b></p> <ul style="list-style-type: none"> <li>2012-2015: \$23/tonne then \$24.15 then \$25.40</li> <li>2015 onwards: global market or implicit prices, likely to rise</li> </ul>	<p><b>SAMPLE MITIGATION STRATEGIES</b></p> <p><b>Construction</b> Adopt energy efficient construction practices (Figure 5)</p> <p><b>Construction and Property Asset Management</b> Build new property and retrofit existing property assets to be energy efficient with</p> <ul style="list-style-type: none"> <li>improved “thermal” building envelope</li> <li>energy efficient lighting</li> <li>improved employee access to daylight – workstations on external walls rather than offices</li> <li>energy efficient office equipment, IT, and servers</li> <li>installing energy efficient HVAC systems</li> <li>waste heat recovery and cogen</li> <li>cool roofs</li> <li>power factor correction</li> <li>low embodied energy materials</li> <li>Building (energy) Management Systems</li> <li>Green Leases with tenants</li> </ul>
<p><b>GREATER EXPOSURE TO RISING ENERGY COSTS</b></p> 	<p><b>FORECAST CHANGE</b></p> <p>Electricity prices increased four times the rate of inflation over the last 5 years. The average national electricity price is predicted to jump by 37% by 2013/2014<sup>17</sup></p> <p>Domestic gas prices are expected to rise significantly due to greater international demand and exposure to the higher international gas price.</p>	
<p><b>LOSING PREMIUM TENANTS (AND PRICE PREMIUM) AND HIGHER VACANCY RATES</b></p> 	<p><b>FORECAST CHANGE</b></p> <p>Commercial building disclosure laws now require sellers or lessors of office space with a net lettable area of 2,000 square metres or more to obtain and disclose an up-to-date energy efficiency rating.<sup>18</sup></p>	
<p><b>HIGHER COMPLIANCE COSTS DUE TO LOW CARBON BUILDING POLICY REFORMS</b></p> 	<p><b>FORECAST CHANGE</b></p> <p>Half of the EU and California, USA has net zero energy/net zero carbon new building targets by 2016-2030. This is indicative of a global trend to higher building standards (see Figure 3)</p>	

# Analysis of the climate change risks

Property losses from recent extreme weather events, plus the latest climate science (Table 1), fuel a growing recognition that current regulatory frameworks are insufficient to protect company assets and operations from more intense extreme weather events, bushfires, changes in water availability and forecast sea level rises due to climate change. The Insurance Council of Australia argues 'it is choosing to accept the construction of damage-prone property in hazard prone areas that is driving economic losses from extreme weather events...factors that are entirely within the government's powers to change through regulation and building practice improvement.'<sup>19</sup>

Another concern long term, is that much current practice simply meets standards based on historic, not future, climate. New construction compliant with the current Building Codes of Australia has been assessed as 'likely to be reasonably adequate' only under 'low emission scenarios'. The current rate of greenhouse gas emissions growth is consistent with the highest IPCC emission scenarios, meaning new buildings built to earlier standards are vulnerable to climate impacts, as are BCA-compliant buildings under current higher emission scenarios.<sup>20</sup>

Hence, leading property and construction companies are mitigating climate change related risks through adaptation strategies, beyond compliance, to reduce negative shocks to cash flows, asset performance

and business continuity.

Climate change creates new risks for property such as increased flooding from storm surges combining with sea level rise over time. An estimated \$113 – \$160 billion worth of property is vulnerable, including between 5,800 and 8,600 commercial buildings, between 3,700 and 6,200 industrial buildings and between 187,000 and 274,000 residential buildings. Additionally, coastal property owners of insured buildings may lose millions of dollars, as whilst the value of coastal buildings may have some insured protection, the loss of land value is not insured against inundation or severe erosion (or the threat of inundation) so owners will not be compensated by insurance.

### Rising insurance costs are increasing insurance premiums.

The total estimated cost to property and infrastructure from major floods, tropical cyclones and severe storms between 1967 and 1999 in Australia was \$28.6 billion.<sup>21</sup> Since 2000, insurance costs from extreme weather events have risen in Australia (Figure 1).

Since insurance payouts are rising faster than CPI due to extreme weather events, the insurance industry has repeatedly stated it has no choice but to raise insurance premiums above CPI.<sup>23</sup> This is leading to appreciable increases in insurance costs for the construction and property industries.

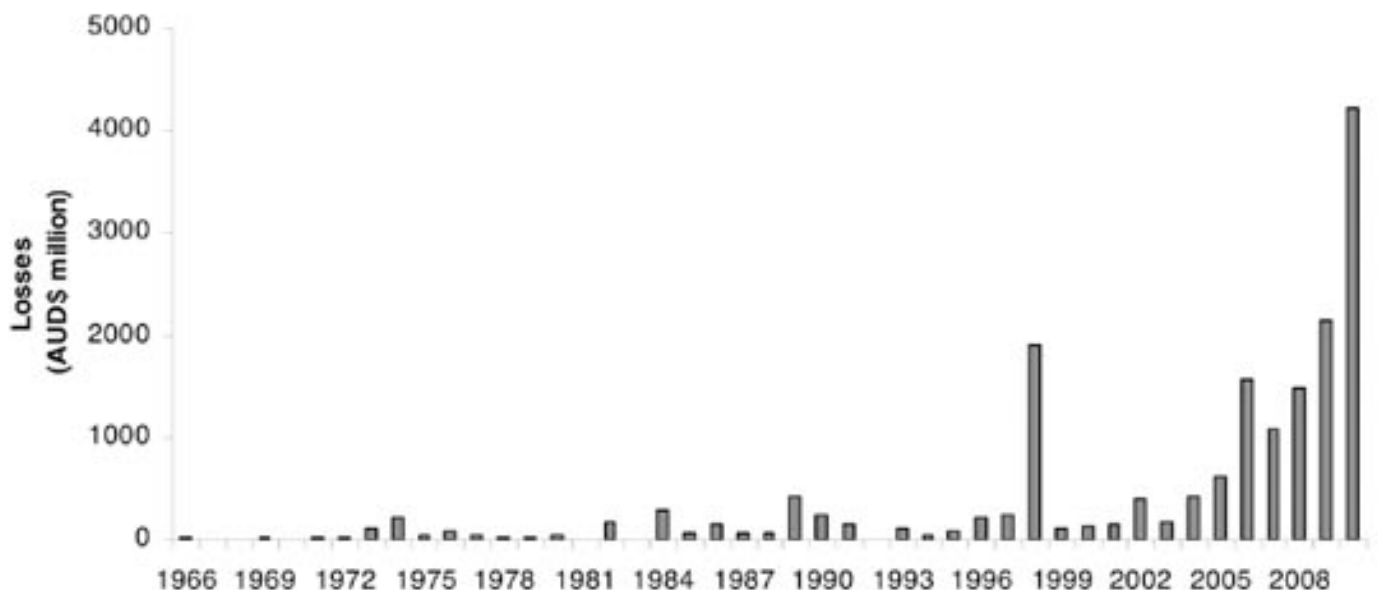
Insurance costs in Australia could rise much more if the global re-insurance industry decides Australia is too costly to re-insure at current rates. Natural catastrophes caused \$US160 billion worth of damage in 2012. The world's leading reinsurer, Munich Re, estimates close to 16% of similar costs in the last few years are from Australia and New Zealand. Hence, Australian re-insurance rates could rise, leading to higher insurance premiums.<sup>24</sup> Some insurance companies have also begun to refuse to insure for flood, long term sea level rises and other climate change related events for extremely vulnerable regions of Australia.

Extreme weather events have not only led to delays in construction, property damage, operational and rebuilding costs, but are also the major cause of insurers starting to refuse to insure extremely vulnerable regions of Australia and increasing their insurance premiums over the last few years.<sup>25</sup> Climate change is forecast to increase the intensity and/or frequency of extreme weather events and thus further increase the property and construction sector's exposure to a wide range of risks (see Table 1 and Table 5). It is important for the property and construction industries to understand the likely scale and speed of such forecast changes.

### More frequent and intense hailstorms.

Hailstorms historically have caused the most financial damage to property.<sup>26</sup> Most of Australia's capital cities have been hit

Figure 1: Insurance losses due to extreme weather events



(Source: Insurance Council of Australia<sup>22</sup>)



by severe hailstorms in the last five years including Brisbane, Sydney, Melbourne, Perth and Canberra. Sydney's geography and climate make it particularly vulnerable to severe convective storms, which produce hail. It has experienced seven major hailstorms in the last 20 years or so (Table 3). This is a noticeable increase on the previous one hundred years. Modeling estimates a further 20% increase in frequency by 2050 for the Sydney region.<sup>27</sup>

**More intense and less predictable rainfall events.** More intense and frequent flooding can cause costly delays to construction, as well as damage property assets through

- increased rain and moisture penetration
- increased ground and foundation movement
- degradation and failure of pipe and waterway structures.

The wetter conditions experienced in Australia in the last two years are consistent with scientists' knowledge and understanding of anthropogenic (human induced) climate change. Some insurance companies no longer offer flood protection property insurance policies to new clients for properties in particularly flood prone areas of Australia.

Australia's climate is significantly affected by the La Niña/El Niño oscillation in the Pacific Ocean. The El Niño oscillation brings drier drought conditions to Australia whilst La Niña brings higher rainfall events. The oscillation between these two cycles underpins why Australia has always been the land "of droughts and flooding rains." The latest climate science suggests it is highly likely this oscillation between drought and flood will become more extreme and intense, so when a long dry period of the El Niño cycle transitions into a La Niña cycle, rain is more likely to fall as heavy downpours than as extended drizzle. Warmer climates also enable more intense rainfall events as warmer atmospheres can hold more water vapour.

**Table 3: Insurance losses from hail events in Sydney**

Region	Date	Cost (billion AU\$)
WESTERN SYDNEY	November 1976	0.73
WESTERN SYDNEY	October 1986	0.71
SOUTH WESTERN SYDNEY	March 1990	1.47
TURRAMURRA	January 1991	0.58
EASTERN SUBURBS	April 1999	3.3
BLACKTOWN	December 2007	0.41
GIRRAWEE & TOONGABBIE	February 1992	0.45

(Source, Jeary, A, 2009)<sup>28</sup>

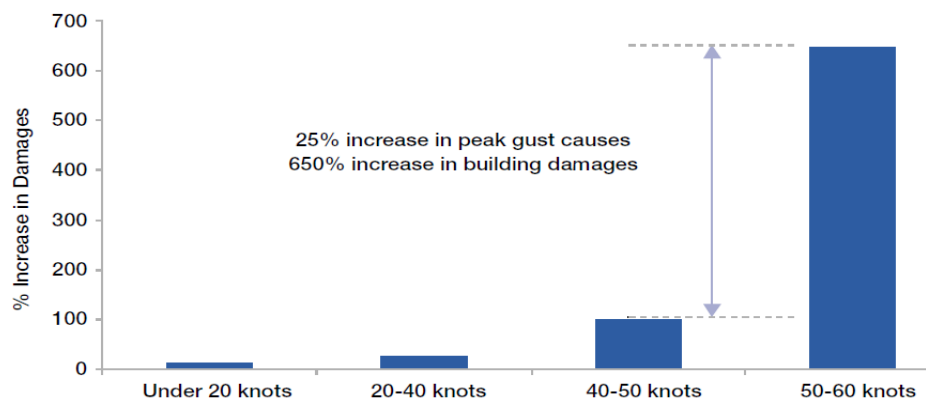
**Cyclones are forecast to become more intense.** Climate change modeling predicts an increase in the intensity of cyclones of 60 percent by 2030 and 140 per cent by 2070.<sup>29</sup> Projections also indicate how tropical cyclones are moving southward as sea surface temperatures increase. CSIRO noted there has been a statistically significant increase in the cost of property damage due to severe cyclonic storms in Australia between 1967 and 1999. This is partly due to the relationship between wind speeds and risk of damage to buildings being nonlinear as shown in Figure 2. Stronger winds and rain generate higher mechanical stresses on buildings. Excess stress can make structural components fail, leading to building collapse. Strong winds can also uplift surface components (such as roofs) into airstreams, potentially leading to personal injury and property damage.<sup>30</sup>

**Higher average temperatures and more frequent days of 35+ degrees Celsius.**

Global average temperatures have already risen by 0.8°C in the last hundred years due to human induced climate change. As the average temperature increases, the distribution of the range of temperatures shifts to include a greater likelihood of more extreme hot temperatures and less extreme cool temperatures. The number of record hot days across Australia has doubled since 1960.<sup>31</sup> Increased extreme temperature events are likely to result in higher energy consumption and hence higher property costs, primarily through increased heating or cooling. Requiring HVAC systems to operate at higher loads will have significant financial implications, including:

- increased electricity consumption and associated energy fees

**Figure 2: IAG building claims versus peak gust speed showing disproportionate increases in claims cost from small increases in peak gust speed**



Source: IAG (2003)<sup>32</sup>



- increased run hours to maintain comfort conditions resulting in higher maintenance costs, reduced equipment lifetimes and requisite additional capital expenditure on plant
- increased summer cooling loads on buildings which could result in higher water and energy demand/costs
- increased energy consumption could result in a lower NABERS rating, therefore affecting demand and market valuation of property assets.

### Higher risks of more intense bushfires.

Climatic conditions influence the risk of bushfires. Between 1973 and 2010, 16 of 38 Australian weather stations recorded a significant increase in the Forest Fire Danger Index (FFDI); no weather station recorded a significant decrease.<sup>33</sup> Looking ahead, in western and south-eastern Australia, the anticipated higher temperatures and lower average rainfall are expected to increase the number of 'very high' and 'extreme' FFDI days by 4 to 25 per cent by 2020 and 15 to 70 per cent by 2050.<sup>34</sup> Furthermore, opportunities for fuel reduction burning

(as a preventative measure) are becoming rarer because fire seasons are becoming longer.<sup>35</sup> Overall, these emerging conditions mean vulnerability to fire is increasing. This will greatly increase the risk of more intense bushfires occurring, leading to a serious threat to rural and peri-urban property in Australia (Table 4).

**Sea level rises.** The IPCC warns how a one centimetre rise in sea level erodes beaches about one metre horizontally.<sup>37</sup> Yet, depending on the geomorphology, the distance of inland coastal flooding can be between 50 to 200 times the sea level rise.<sup>38</sup> An estimated \$159 billion worth of Australian buildings, including more than 8,000 commercial, 6,000 industrial and 274,000 residential buildings, are vulnerable to sea level rise and storm surge. Locations lower than one metre above sea level and thus vulnerable to sea level rises this century include Broome, Perth and its surroundings, Mandurah and its surroundings, Busselton, parts of most capital cities and, in particular, the Gold Coast, which has many canal estate developments.

## Climate change impacts

Having understood the likely risks from climate change, the next step for investors is to assess the potential impact on property and construction companies. Table 5 provides an overview of in-house risk analysis by many leading property and construction companies, as reported through their Carbon Disclosure Project reports from 2012. Investors can use this overview as an analytical checklist to help enable a rapid assessment of the risk exposure for a particular property and/or construction company's assets and benchmark the company's awareness of its climate change related risks.

To conclude, the risks to construction and property companies in Australia from unmitigated climate change are extensive. Experience shows many of these risks and their potential costs can be ameliorated through appropriate and cost effective adaptation and mitigation strategies, outlined below.

**Table 4: Per cent changes in the number of days with 'very high', 'extreme', 'very extreme', and 'catastrophic' fire days due to weather in 2020 and 2050, compared to 1990**



Source: Lucas, C.Hennessy, K., Mills, G. and Bathols, J. (2007) citation 36



**Table 5: Analysis of climate change risks and potential impacts**

<p><b>HIGHER AVERAGE TEMPERATURES AND MORE INTENSE HEATWAVES</b></p> 	<p><b>INCREASED ENERGY, WATER COSTS TO CONSTRUCTION AND PROPERTY ASSETS</b></p> <ul style="list-style-type: none"> <li>Increased air-conditioning energy and water consumption and related costs</li> <li>Increased energy and water consumption could result in property assets achieving a lower green building rating, negatively affecting rental demand and market valuation</li> <li>Reduced indoor air quality and tenant productivity</li> </ul>	<p><b>COMPANIES REPORTING RISK</b></p> <p>Mirvac<sup>®</sup>, Stockland<sup>®</sup>, LendLease<sup>®</sup>, Leighton<sup>®</sup>, Spotless Group<sup>®</sup>, Westfield<sup>®</sup>, Colonial First State<sup>®</sup>, Charter Hall<sup>®</sup>, BWP<sup>®</sup>, Commonwealth Property Office Fund<sup>®</sup>, Investa<sup>®</sup>, GPT<sup>®</sup>, Global Switch<sup>®</sup>, Ausenco<sup>®</sup>, Australand<sup>®</sup></p>	<p><b>MORE INTENSE RAINFALL EVENTS - FLOODING</b></p> 	<p><b>INCREASED COSTS FROM CONSTRUCTION DELAYS, PROPERTY ASSET DAMAGE AND HIGHER FLOOD INSURANCE COSTS.</b></p> <p>Increased risk of delays to construction as well as damage to property assets through</p> <ul style="list-style-type: none"> <li>increased rain and moisture penetration</li> <li>increased ground and foundation movement</li> <li>degradation and failure of pipe and waterway structures.</li> </ul>	<p><b>COMPANIES REPORTING RISK</b></p> <p>Mirvac, Stockland, LendLease, Spotless Group, Downer EDI, UGL, Colonial First State, Charter Hall, BWP, Commonwealth Property Office Fund, DEXUS, Goodman<sup>®</sup></p>
<p><b>MORE INTENSE CYCLONES AND HAILSTORMS. MORE INTENSE HEATWAVES - BUSHFIRES</b></p> 	<p><b>INCREASED COSTS AND DISRUPTION TO CONSTRUCTION AND PROPERTY OPERATIONS</b></p> <ul style="list-style-type: none"> <li>delay to construction and damage to construction sites and property, which increases the costs of maintenance, repair and replacement. These events damage residential, as well as retail and other commercial property</li> <li>disruption to electricity services, delay to supply chains of critical materials, increased insurance premiums</li> </ul>	<p><b>COMPANIES REPORTING RISK</b></p> <p>Mirvac, Stockland, LendLease, Leighton (storms), Colonial First State, BWP (storms), GPT, Australand (storms)</p>	<p><b>MORE INTENSE CYCLONES</b></p> 	<p><b>INCREASED CONSTRUCTION AND PROPERTY ASSET DAMAGE AND DISRUPTION PROPERTY OPERATIONS</b></p> <p>Winds can uplift surface components—such as roofs, patios, verandas, and garage doors—or even whole buildings from their foundations. Rain often penetrates buildings and damages contents. Flying debris from buildings, trees, power lines and other loose items can break windows, roofs and walls. Cyclones can also disable parts of the electricity network.</p>	<p><b>COMPANIES REPORTING RISK</b></p> <p>Mirvac, Stockland, LendLease, Spotless Group, Downer EDI,<sup>®</sup> UGL, Colonial First State, BWP, DEXUS, Goodman</p>
<p><b>MORE INTENSE HAILSTORMS</b></p> 	<p><b>INCREASED CONSTRUCTION AND PROPERTY ASSET DAMAGE AND DISRUPTION TO OPERATIONS</b></p> <p>Hailstorms cause impact damage to buildings and construction equipment as well as resulting in flooding of construction sites. Particularly vulnerable parts of buildings are roofs, skylights, and antennas. If hailstones or melt water penetrate the building—through cracks, leaks, or holes—then contents can also be damaged. Insurance costs of these damages are high, and delays in finalising property claims can be long due to the large number of claims.</p>	<p><b>COMPANIES REPORTING RISK</b></p> <p>Mirvac, Stockland, LendLease, Commonwealth Property Office Fund, Goodman</p>	<p><b>MORE HEATWAVES - BUSHFIRES</b></p> 	<p><b>CONSTRUCTION DELAYS, INCREASED PROPERTY ASSET DAMAGE AND DISRUPTION TO ESSENTIAL SERVICES</b></p> <p>Bushfires do most of their damage to houses and other buildings. Bushfires can also damage or destroy essential services infrastructure, such as electricity power lines, electricity substations, mobile phone towers, water reservoirs and water treatment plants. This can add to construction delays and property management costs.</p>	<p><b>COMPANIES REPORTING RISK</b></p> <p>Mirvac, Stockland, LendLease, Downer EDI, Goodman</p>
<p><b>REDUCED WATER AVAILABILITY</b></p> 	<p><b>WATER SCARCITY</b></p> <p>In many parts of Australia, there will be reduced amounts of water available for construction and operational property activities from changes to water availability due to climate change. For construction, inadequate water to service developments makes any proposed projects unfeasible. For construction and property assets, reduced water availability is likely to lead to water restrictions, higher water prices and energy prices eg in the 2007 drought, insufficient water availability for Victoria's power stations resulted in electricity prices increasing.</p>	<p><b>COMPANIES REPORTING RISK</b></p> <p>Mirvac, Stockland, LendLease, Leighton, Downer EDI, Colonial First State, BWP, Commonwealth Property Office Fund, Investa</p>	<p><b>SEA LEVEL RISE AND STORM SURGE - COASTAL INUNDATION</b></p> 	<p><b>INCREASED COASTAL PROPERTY ASSET DAMAGE</b></p> <p>The combination of sea level rises, storm surges and high tide can lead to inundation and flooding. These events cause water damage to buildings and their contents, including contamination up to levels that make buildings uninhabitable. Persistent moisture can damage or destroy foundations, leading to structural collapse. These events also cause coastal erosion and increase the volume of sea spray on coastal property, which puts coastal property at even higher risk of damage and low market value<sup>®</sup>.</p>	<p><b>COMPANIES REPORTING RISK</b></p> <p>Mirvac, Stockland, LendLease, Leighton, Spotless Group, Charter Hall</p>
<p><b>MORE INTENSE EXTREME WEATHER EVENTS</b></p> 	<p><b>HIGHER INSURANCE PREMIUMS</b></p> <p>Greater intensity and damage from extreme weather events has led to an exponential increase in weather related insurance and re-insurance costs over the last 50 years. Unmitigated climate change will contribute to continuing this trend, leading to ongoing increases in insurance costs.</p>		<p><b>COMPANIES REPORTING RISK</b></p> <p>Colonial First State, GPT</p>		

\* Companies listed are a sample of those reporting through CDP their recognition of these risks. (Source: Smith, M. Stasinopoulos, P, 2013)

To conclude, the risks to construction and property companies in Australia from unmitigated climate change are extensive. Experience shows many of these risks and their potential costs can be ameliorated through appropriate and cost effective adaptation and mitigation strategies, outlined below.



# ANALYSIS OF CLIMATE CHANGE ADAPTATION OPPORTUNITIES TO ADDRESS CLIMATE RISKS

Leading construction and property companies, such as Mirvac and Stockland<sup>58</sup>, are going beyond compliance to adequately protect and adapt their assets, operations and supply chains to reduce risk exposure to floods, storm surges, drought and bushfires.

There is a growing recognition of how inadequate current regulatory frameworks and government standards are to protect company assets and operations from more intense extreme weather events. The property and construction sector is regulated principally by planning policies set by state and local governments and the national Building Code of Australia (BCA). Many of these regulations were developed decades ago with, at best, outdated consideration to climate change risks,<sup>59</sup> so new construction compliant with the current BCA has been assessed as 'likely to be reasonably adequate' only under 'low emission scenarios'. Buildings built to earlier standards are likely vulnerable to climate impacts, as are BCA-compliant buildings under higher emission scenarios.<sup>60</sup>

State governments and local councils also differ considerably in their approach to climate change risk for new and existing construction and property projects, ranging from no consideration to detailed prescriptions. Even after the Black Saturday bushfires, there is no consistent approach to bushfire risk reduction in building codes across Australia. Australia lacks a cohesive national coastal planning framework. Victoria's Coastal Climate Change Advisory Committee has warned 'strategic planning as currently undertaken...is unlikely to be effective in driving the significant planning needed for climate change responses', due to a lack of agency integration, but also a 'lack of sense of priority across state and within local Government areas'.<sup>61</sup> These are symptomatic of no national policy framework for climate change adaptation. In *Barriers to Effective Climate Change Adaptation* the Productivity Commission wrote of the need for such a national climate change adaptation policy:

'Addressing climate change risks for existing areas of human settlement requires consideration of whether, how and when governments should 'protect' cities or towns, or relocate communities from high-

hazard risk areas.' However, 'currently, there is no well-established policy response to this issue.'<sup>62</sup>

The lack of policy reform creates risk, but buildings, settlements and infrastructure – the property and construction sector – will benefit most from an early proactive approach to climate change adaptation.<sup>63</sup> Australia's property and infrastructure, worth over \$5 trillion and with long design lives, will reap compelling longer term financial benefits and cost savings from:

- a consideration of climate change in planning and management decisions to reduce risks and liabilities
- higher future asset values due to lower ongoing operational costs
- avoided locked-in obsolescence
- lower repair and maintenance expenses, with a reduced need for retrofits
- minimised investment in high risk areas
- lower insurance premiums due to a reduced chance of damage to premises from climate change impacts
- decreased energy costs for assets that have been adapted to long-term temperature changes.


Numerous studies show an overwhelming cost benefit from proactive climate change adaptation measures for this sector, some predicting a mean benefit to cost ratio of 60 to 1.<sup>64</sup> Economic analysis finds many adaptation solutions are 'no regrets' measures with net benefits even in the absence of climate changes<sup>65</sup>. Taking early action can help to reduce risk, decrease implementation costs (by incorporating action as part of a planned building or retrofit schedule rather than on an ad hoc basis) and minimise damage. Hence, climate change adaptation is a wise investment because:

- it is generally less expensive to increase resilience prior to an event than to recover after one (whether repair or *replacement*); and
- mechanisms to increase resilience tend to be more cost effectively implemented early (through planning,

design, or policy) than through subsequent retrofit.

To prevent costly damage and reduce long term operational and insurance costs, major companies such as Mirvac, Stockland, GPT and DEXUS have examined their exposure to climate risk and developed strategies to minimise their vulnerability. For instance, Stockland has examined the climate risk profile of each asset within its property portfolio, assessing each one on its location and design, structure, operation and maintenance, utilities and services and stakeholders. This enables new commercial property to be built and operated to appropriate standards; it also allows existing assets to be made more climate-resilient by improving their operation and maintenance regimes. There are numerous options available to construction and property companies to adapt to climate change, a sample of which is listed in Table 6 below.

**Table 6: Climate change adaptation strategies**

<p><b>MORE INTENSE EXTREME WEATHER EVENTS</b></p> 	<p><b>AVOID NEW ACQUISITIONS IN HIGH CLIMATE RISK LOCATIONS</b></p> <p>Where high impact weather events are forecast to increase and where adaptation/resilience strategies will fail to protect future asset values due to broader supply chain effects, tenants/ local businesses retreating or surrounding infrastructure constraints</p>	<p><b>COMPANIES ADAPTING*</b></p> <p>LendLease<sup>66</sup> report they have a procedure to address this Mirvac<sup>67</sup> report they are reviewing their purchase process</p>	<p><b>HIGHER AVERAGE TEMPERATURES AND MORE HEATWAVES</b></p> 	<p><b>REDUCE RISKS OF HIGHER ENERGY AND WATER COSTS</b></p> <p><b>Construction:</b> Invest in energy efficiency opportunities (Figure 5) <b>Construction and Property:</b> Design and build, or retrofit, energy efficient 5+ star buildings by:</p> <ul style="list-style-type: none"> <li>• <b>Improving the 'thermal' building envelope</b> with improved building insulation, high performance window glazing, external window shading, proper window coverings and natural ventilation</li> <li>• <b>Painting roofs 'reflective white'</b> can reduce air-conditioning loads by as much as 20%<sup>68</sup></li> <li>• <b>Reducing internal heat generation</b> by retrofitting with the latest energy efficient lighting and equipment</li> </ul>	<p><b>COMPANIES REPORTING RISK</b></p> <p>Mirvac<sup>71</sup>, Leighton<sup>72</sup>, Westfield<sup>73</sup>, Colonial First State<sup>74</sup>, Commonwealth Property Office Fund<sup>75</sup>, Investa<sup>76</sup>, GPT<sup>77</sup>, Global Switch<sup>78</sup>, Ausenco<sup>79</sup>, Australand<sup>80</sup>, LendLease<sup>81</sup></p>
<p><b>MORE INTENSE RAINFALL EVENTS - FLOODING</b></p> 	<p><b>REDUCE RISKS OF INCREASED COSTS FROM CONSTRUCTION DELAYS AND PROPERTY DAMAGE</b></p> <p>Companies can reduce construction delays by having</p> <ul style="list-style-type: none"> <li>• effective stormwater management strategies</li> <li>• weatherproofing buildings as quickly as possible</li> <li>• exploring opportunities to manufacture and build as much as possible offsite in warehouses.</li> </ul>	<p><b>COMPANIES ADAPTING*</b></p> <p>Leighton (storms), Spotless Group<sup>82</sup>, Downer EDI<sup>83</sup>, Colonial First State, Commonwealth Property Office Fund, DEXUS, GPT, Australand (storms)</p>	<p><b>MORE INTENSE CYCLONES</b></p> 	<p><b>RISKS OF CONSTRUCTION DELAYS AND DAMAGE TO CONSTRUCTION SITES, ASSETS AND PROPERTY</b></p> <ul style="list-style-type: none"> <li>• For construction sites, develop and implement a cyclone management plan. Ensure cranes are secured or removed temporarily in the event of a cyclone</li> <li>• For construction and property companies, risks of damage to a property can be significantly reduced if new or existing property assets secure roofs, protect windows and seal all openings<sup>89</sup></li> </ul>	<p><b>COMPANIES REPORTING RISK</b></p> <p>Downer EDI, UGL, Colonial First State, DEXUS, GPT</p>
<p><b>MORE INTENSE HAILSTORMS</b></p> 	<ul style="list-style-type: none"> <li>• For construction sites, develop and implement a hailstorm management plan to ensure any vulnerable materials, such as panes of glass, are under protected cover</li> <li>• For construction and property companies, risks of damage to a property can be significantly reduced if new or existing property assets optimise roof pitch, protect windows and use resilient roof materials<sup>90</sup></li> </ul>	<p><b>COMPANIES ADAPTING*</b></p> <p>Office Fund, GPT</p>	<p><b>MORE INTENSE BUSHFIRES</b></p> 	<p><b>CONSTRUCTION</b></p> <p>Companies should work with planning authorities to review and avoid future construction in high bushfire risk regions. Companies can use best practice bushfire building codes,<sup>91</sup> build appropriate fire breaks, reduce bushfire fuel loads around construction sites and work with rural fire service</p>	<p><b>COMPANIES REPORTING RISK</b></p> <p>Downer EDI</p>
<p><b>REDUCED WATER AVAILABILITY</b></p> 	<p><b>CONSTRUCTION AND PROPERTY</b></p> <p><b>Design, build and retrofit property assets to be water efficient</b> and ensure landscaping is done with drought tolerant plants. This further helps to secure high green building ratings. Numerous profitable ways to reduce water consumption in new and existing buildings include reducing water leakage, water efficient amenities and dry/wet hybrid cooling systems. Commercial properties tend to have large roof spaces to harvest significant amounts of water in rainwater tanks to then use, at no cost, to further reduce dependence on mains water.</p>	<p><b>COMPANIES ADAPTING*</b></p> <p>Leighton, Downer EDI, Colonial First State, Commonwealth Property Office Fund, Investa</p>	<p><b>SEA LEVEL RISE AND STORM SURGE - COASTAL INUNDATION</b></p> 	<p><b>CONSTRUCT NEW PROPERTIES WELL ABOVE SEA LEVEL AND DEVELOP A PLAN TO ADAPT TO RISKS FROM SEA LEVEL RISES FOR EXISTING PROPERTY PORTFOLIOS</b></p> <p><b>Construction</b> Only build new buildings on land at least several metres above sea level</p> <p><b>Property</b> Review current building stock and develop a planned retreat for buildings below one metre above sea level. Review and develop a sea level rise adaptation strategy for existing property portfolios</p>	<p><b>COMPANIES REPORTING RISK</b></p> <p>Downer EDI</p>

# ANALYSIS OF CLIMATE CHANGE MITIGATION OPPORTUNITIES TO ADDRESS ENERGY COST & CARBON RISKS







As well as risks of property damage and delays from more intense extreme weather events, there are other risks facing the property and construction sector related to climate change. These risks (outlined in Table 2) include:

**Risk of increasing costs from electricity and carbon prices.** The average Australian national electricity price is predicted to

jump by 37% by 2013/2014<sup>87</sup> mostly due to infrastructure investment and partly due to the carbon price. As electricity and water prices are forecast to continue to rise, property companies cannot afford to ignore energy and water efficiency opportunities to reduce costs. Increasingly property owners and tenants are signing Green Leases so both landlord and tenant can better work together to reduce energy usage. This offers

substantial benefits to property owners; for instance, energy efficient lighting in tenant stores generates much less heat than inefficient lighting, thus reduces discernably the overall air-conditioning load in indoor shopping centres and malls. It has been shown that 'Green Leases' are often critical to attracting and retaining premium tenants who pay premium prices such as government departments.

**Table 7: 'Win-win' benefits of Green Leases for property companies and tenants**

BENEFITS FOR PROPERTY COMPANIES		BENEFITS FOR PROPERTY TENANTS
Significant energy cost savings		Significant energy cost savings
More productive and more profitable tenants, meaning longer-term leasing arrangements. This lowers transaction, administration, legal costs and the 'churn' of renegotiating new leasing contracts if tenants leave		Better relations with landlords resulting in the option of longer term leasing arrangements. This lowers costs associated with relocation
Fewer landlord-tenant disputes		Fewer landlord-tenant disputes
The energy efficiency retrofits, and higher energy star rating, make it easier to attract premium tenants to lease space and pay a premium and improve revenue and cash flow		Improved corporate reputation leads to better staff retention rates and improved employee wellbeing, resulting in improved productivity and reduced absenteeism
Helps to comply with the Building Energy Efficiency Disclosure Act 2010 which requires landlords of office space of 2,000 square metres or more to obtain and disclose a current Building Energy Efficiency Certificate (BEEC)		Improved work environments – safer work environment overall—for example, improved indoor air quality and less exposure to heat stress in bakeries. Increases in productivity from improved indoor environment quality
Green leases encourage a collaborative approach between landlord and tenant. This allows a closer working relationship with tenants in a way that enables better management of the property. It can also reduce maintenance costs and the costs of allowing small faults to become big ones		More productive and more profitable tenants, meaning longer-term leasing arrangements. This lowers transaction, administration, legal costs and the 'churn' of renegotiating new leasing contracts if tenants leave

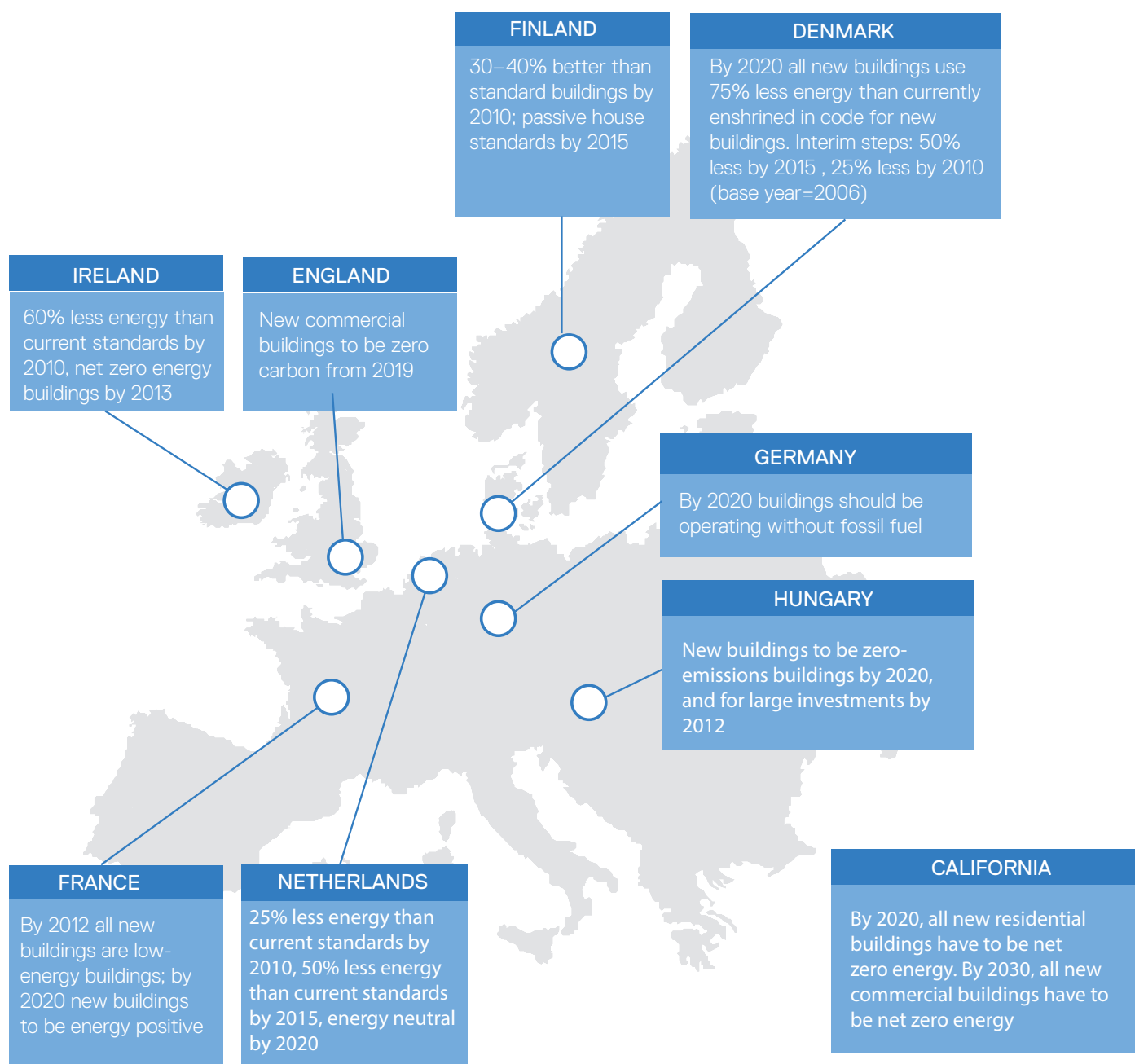
**Risk of losing premium tenants (and price premium).** Increasing evidence both in Australia and overseas shows highly energy efficient office space attracts premium clients (such as government departments) and a price premium compared with less energy efficient space. The IPD Green Property Index shows assets with a NABERS rating outperformed non-rated assets over two years due to tenancy stability and capital values.<sup>88</sup> In addition, as explained above, property owners who enter into Green Lease agreements with their

tenants realise numerous financial benefits for both parties in addition to the energy efficiency savings (Table 7).

**Risk of vacant property.** Commercial building disclosure laws also require sellers or lessors of office space with a net lettable area of 2,000 square metres or more to obtain and disclose an up-to-date energy efficiency rating.<sup>89</sup>

**Likely future regulatory and policy changes.** Numerous localities in Australia and internationally are moving to more stringent low carbon building regulations and policies in response to climate change. For instance, most of the EU has net zero energy/net zero carbon new building targets for 2012-2030 (Table 8).

Figure 3: Low Carbon – Net Zero Energy Targets for a selection of OECD countries.



(Source: European Commission, 2009)<sup>90</sup>



### A climate change mitigation portfolio strategy

The difference in energy and water costs of 'green building' property leaders compared to 'laggards' is now around 30% to 50%. This influences the competitiveness of inefficient assets. An example of a leading approach to improving asset efficiency is from the Investa Property Group.

## Climate change mitigation insulates against rising energy costs and increases revenue

### Construction

**Reducing exposure to energy price rises through cost effective energy efficiency opportunities.** The construction process itself uses energy and thus is exposed to risks of energy price rises from rising electricity, oil, and gas prices. The construction industry can reduce its exposure

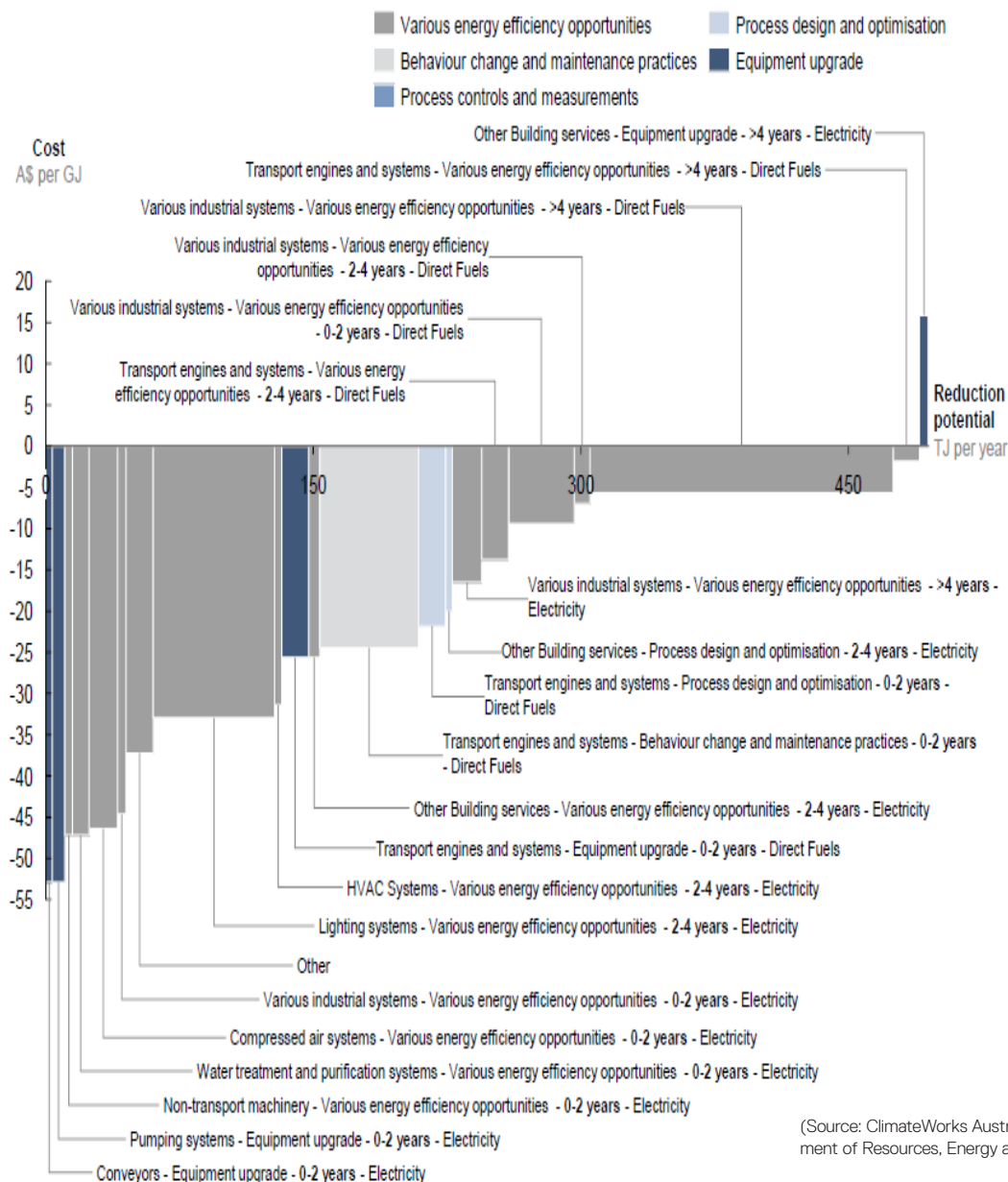
to forecast price rises through investing in energy efficiency opportunities. ClimateWorks Australia has undertaken the first comprehensive review of energy efficiency opportunities in the construction sector as part of their Industrial Energy Efficiency Data Analysis Project. They found numerous energy efficiency opportunities for the sector, over half of which have less than two year returns on investment (Figure 3). These energy efficiency opportunities combined can save the construction sector approximately 5% of their current energy usage (Figure 4).

More detailed analysis of these energy efficiency opportunities in the construction sector is available in the [ClimateWorks Australia study](#). ClimateWorks Australia's analysis of the construction sector considers energy efficiency opportunities using commercially available technologies. It is highly likely that new innovations in, for example, more energy efficient construction crane systems<sup>96</sup>, will continue to improve the energy efficiency opportunities in that area of construction over the next decade, enabling

additional energy savings over time.

**Reducing exposure to higher costs of construction materials under a carbon price – sourcing low embodied energy materials.** The construction of the average commercial property building contains tens of thousands of gigajoules of energy embodied in its construction materials. There are available databases, such as the EcoSpecifier,<sup>98</sup> to assist in selecting new innovative materials with low embodied energies (and low lifecycle carbon cost). An example of Australian innovation on materials include cements with 80% less embodied energy than Portland cements. These are used for concrete slabs in the residential sector in Australia and trials are underway to use them in the commercial building sector.<sup>99</sup> Reusing and recycling building materials, especially façade and structure materials, reduces embodied energy and can also reduce capital costs for new buildings.

Figure 4: Energy efficiency cost curve for Construction, 2010-2011.

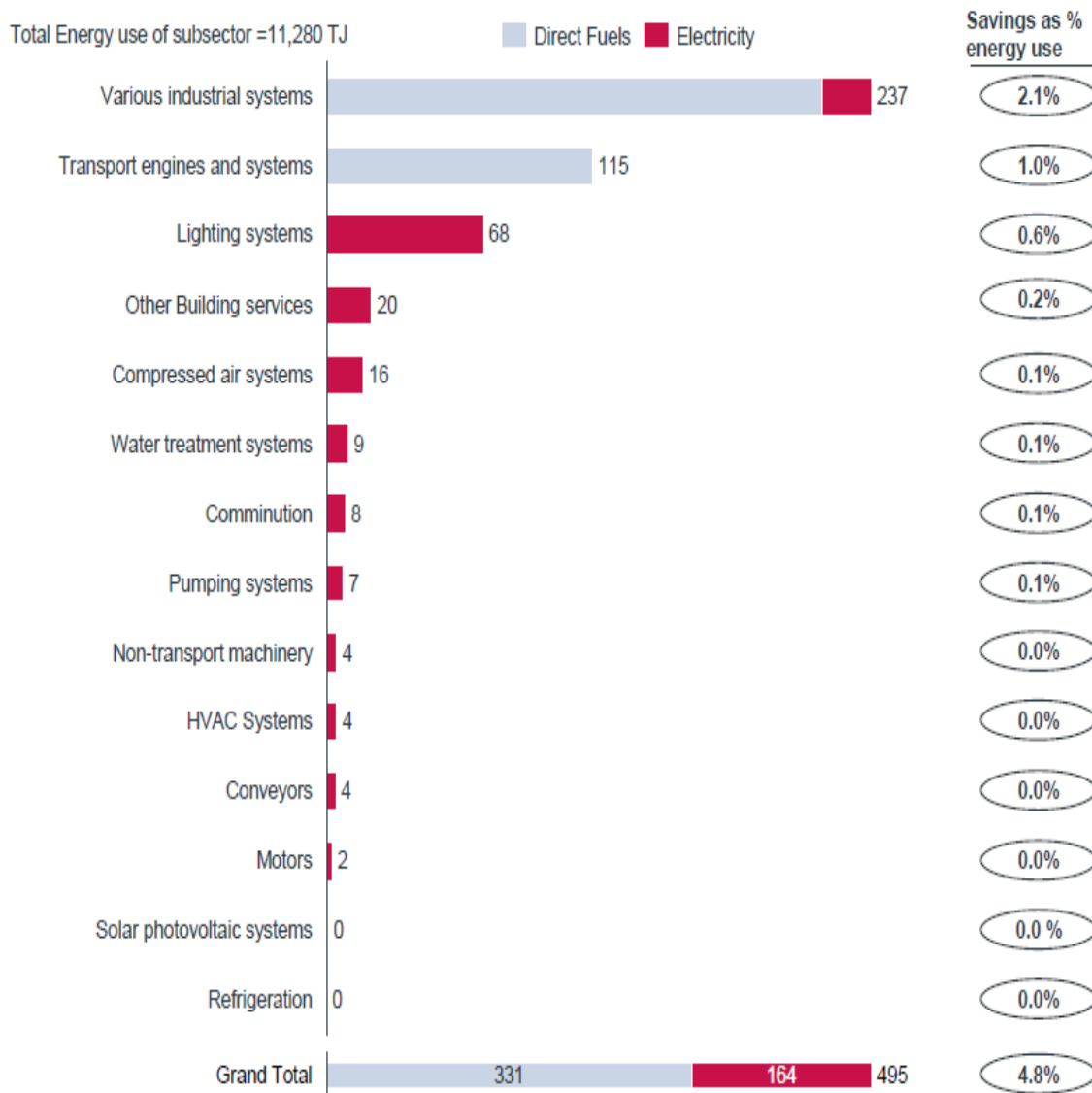


(Source: ClimateWorks Australia and Department of Resources, Energy and Tourism, 2013<sup>95</sup>)





Figure 5: Identified energy savings in Construction by technology and by fuel category, 2010-11



(Source: ClimateWorks Australia and Department of Resources, Energy and Tourism, 2013<sup>94</sup>)

Investa Property Group’s latest building data shows the property group has cut average electricity use by over 30% over the past seven years across its entire property portfolio.<sup>91</sup> For some buildings the cut to electricity usage is higher still. One of the innovative approaches Investa uses to achieve these results is The Pulse Tool, which This tool gives building operators daily weather-normalised feedback on the performance of their buildings. With this information, Investa’s building operators are able to tweak and fine-tune their plant and equipment on a daily basis to immediately save 7% of electricity usage. Craig Roussac, formally General Manager Sustainability, Safety and Environment with Investa for many years, argues “most commercial properties can reduce by half, energy use, once [metering is installed and] data is made available in a clear and usable format, easily understood by property portfolio managers and others who make spending decisions about sustainable building upgrades.”<sup>92</sup>

Investing in such real time energy metering, monitoring and data analysis also provides property companies with new opportunities to improve transparency and reporting to investors. Investa recently shifted to continuous reporting<sup>93</sup> on the environmental performance of buildings in its office portfolio. Investa’s continuous reporting provides:

- quarterly figures of the electricity, gas and water use per square meter of the portfolio, nine months earlier than is typical
- separate Building Scorecards for buildings within Investa’s office portfolio, quarterly, in the public domain
- a window into the day-to-day tuning of buildings for research purposes and sector improvement.<sup>94</sup>



## Property and Construction

Property and construction companies can reduce exposure to higher future energy costs by building new property and retrofitting old assets to be much more energy efficient. Energy efficient buildings have lower operational energy costs, secure tenants more quickly, command higher rents or prices and enjoy lower tenant turnover.<sup>100</sup> Investing in the overall energy efficiency of commercial buildings also improves asset value<sup>101</sup> by costing less to operate and maintain, avoiding future obsolescence and improving the future liquidity of the assets. As Figure 5 shows, virtually all energy efficiency opportunities for old and new residential and commercial properties offer profitable returns on investment. This has been shown by many studies since the mid-1990s.<sup>102</sup>

Analysts should be aware of the profitable and significant energy efficiency opportunities which exist for construction and property companies to ensure new buildings and existing property assets are made to be as energy efficient as possible, as follows:

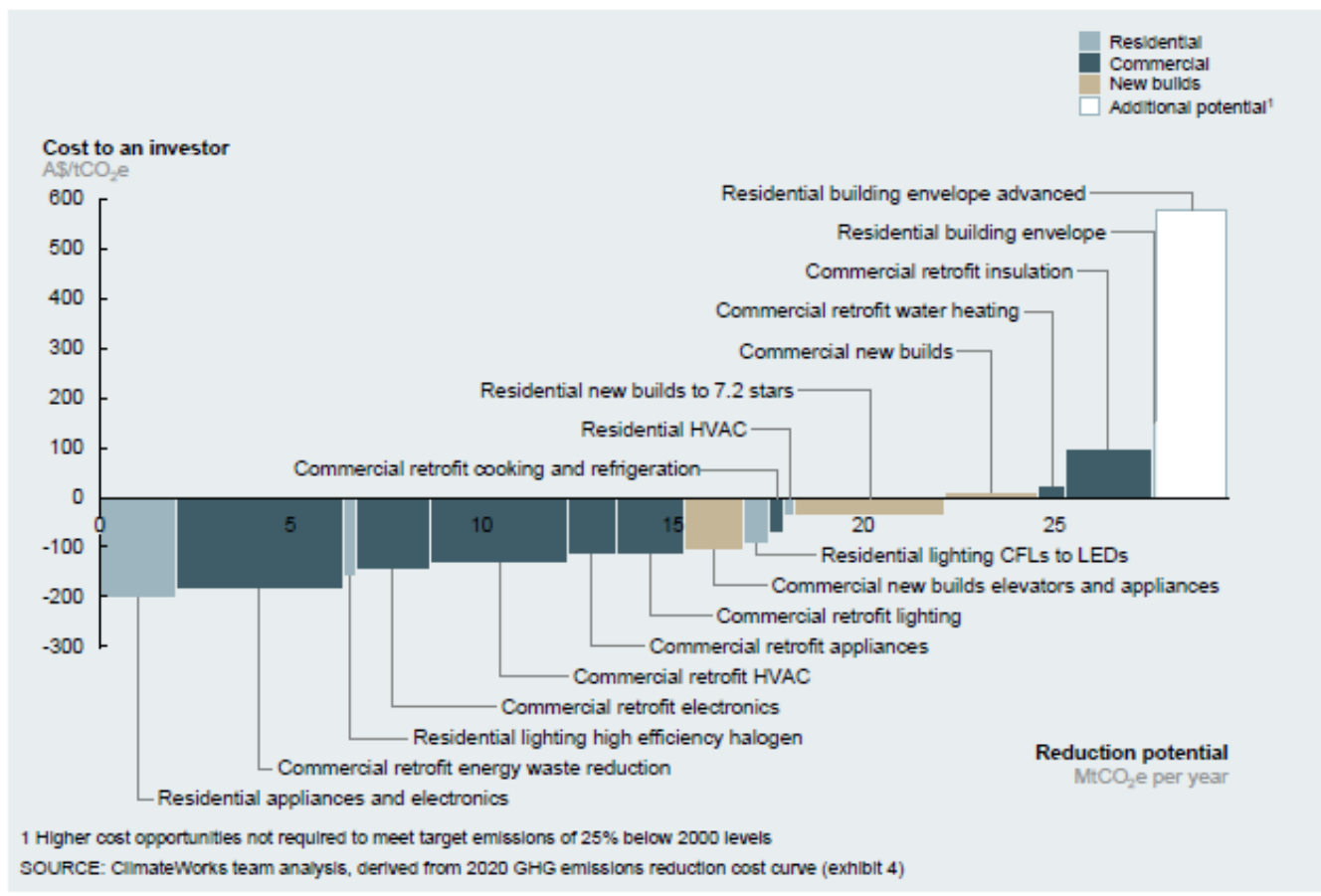
**Reduce lighting energy costs by up to 80%.** Lighting (including indoor, outdoor, security, signs and displays) can account for up to 30% of the electricity use and energy costs in commercial property.<sup>104</sup> These energy costs can be reduced by as much as 80% through retrofitting new energy efficient lighting, utilising daylighting (e.g. skylights in warehouses) and automatically turning lights off where possible.<sup>105</sup> Energy efficient lighting also produces a lot less waste heat than inefficient incandescent or halogen lighting. This can result in considerable energy savings for property companies managing shopping centres, which have large lighting and summer air-conditioning loads.

**Multiple financial benefits of energy efficient heating, cooling and ventilation systems.** The Bond building in Sydney, owned by DEXUS and developed by Lend Lease<sup>106</sup> in partnership with Deutsche Office Trust<sup>107</sup>, utilised state of the art energy efficient chilled beams combined with passive solar design strategies to materially reduce the amount of space needed between floors for the air-conditioning system. The space savings allowed the inclusion of an extra lettable floor.

**Investing in waste heat recovery from ventilation and air-conditioning systems can reduce heating loads by as much as 60%.** The most effective way of recovering energy from ventilation and air-conditioning systems is to make use of recirculated air. Different types of heat exchanges recover heat from extracted air otherwise lost to the atmosphere and use it to pre-heat (or cool) the incoming fresh air, generating considerable financial savings.

**Reduce office equipment, IT, servers and data centre energy usage up to 70%.** Office equipment, IT, servers and data centres account for between 7% and 20% of commercial buildings electricity use and is one of the fastest growing areas for increased demand for electricity in Australia.<sup>108</sup> A noteworthy component of this growth is computers. A holistic approach to energy efficiency can reduce office equipment energy costs by over 50%. For example, Sustainability Victoria reduced their IT/computer/server energy costs by 68% through (i) using energy efficient computers (ii) implementing automatic overnight shut down of all office equipment (iii) reducing the number of servers needed from 20 to 13 through virtualisation (iv) energy efficient server design.<sup>109</sup>

Figure 6: Commercial and residential buildings GHG emission reduction cost curve.



Source: ClimateWorks Australia and Department of Resources, Energy and Tourism, 2013<sup>103</sup>



**Cool roofs: painting your roof white to increase reflection of summer heat.**

Cool roofs reduce heat transfer into a building by reflecting solar radiation. Less heat transfer into a building means less demand for air conditioning. Numerous studies support the value of this approach. For instance, a joint study by Melbourne University and the City of Melbourne has found painting roofs white can make buildings up to four degrees cooler inside and allow for 10 per cent more working hours within a comfortable temperature range.<sup>110</sup> Importantly, businesses are already implementing this strategy. For example, Melbourne Airport has applied more than 35,000 square metres of an Australian-developed paint called 'SkyCool' to terminal roofs. By painting their rooftops, Melbourne Airport reduced air-conditioning so much they saved more than 40,000 tonnes of CO<sup>2</sup> over an 18 month period. They also found that 16 auxiliary air conditioning units were no longer required and the energy used by their major chilled water system was reduced by 30-40%.<sup>111</sup>

**Power factor correction can save up to 15% of a commercial property's energy usage.**

It is not always the case that the amount of electricity commercial property receives is equivalent to the amount of electricity it uses – in fact many consumers are billed on 'wasted' electricity. *Power factor* is a measure of this inefficiency and a *power factor correction* is the solution used to minimise these inefficiencies. Perfect power factor is 1. Businesses with poor power factor (between 0.5 –0.8) will typically increase their bills by up to 10%. Payback can be as soon as one to three years For example, Ergon Energy worked with DEXUS Property Group which manages Willows Shopping Centre in Townsville to implement a power factor correction from 0.74 to over 0.9. This achieved 14% energy efficiency savings across the entire shopping centre. Ergon Energy paid Willows Shopping Centre \$70,000 for delivering a reduction in demand of about 700 kVA.<sup>112</sup>

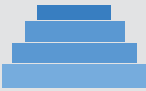



**Commercial property building management systems - often the easiest way to reduce energy costs.**

Building management systems reduce energy consumption by turning off office equipment when they are least likely to be used. Generally, turning off equipment when not required in commercial property can reduce power consumption by at least a quarter compared to leaving equipment on full-time.

**Non-technical factors also reduce energy costs:**

Many non-technical factors can impact on energy performance.<sup>113</sup> The structures of leases, maintenance contracts and management responsibilities can support or block efforts to cut energy waste. Cutting edge energy efficiency efforts incorporate the measures listed below.

**Table 8: Impact of non-technical measures on energy star ratings**

<p><b>MANAGEMENT</b></p> 	<p>1.3 stars</p> <p>0.9 stars</p>	<p>Management is at least partially in- sourced.</p> <p>Building, asset and portfolio managers all feel able to affect efficiency</p>
<p><b>DISCLOSURE</b></p> 	<p>0.5 stars</p>	<p>Their NABERS performance is disclosed to tenants</p>
<p><b>INCENTIVES AND PENALTIES</b></p> 	<p>0.4 stars</p>	<p>They provide efficiency penalties/incentive to maintenance contractors</p>
<p><b>TRAINING AND SKILLS</b></p> 	<p>0.5 stars</p> <p>1.3 stars</p>	<p>There is an efficiency training program</p> <p>The manager reports a higher level of energy efficiency knowledge.</p>



# CONCLUSION

The property and construction sector is a capital intensive industry with long life assets and significant supply chains. Whilst the property and construction sector is vulnerable now to extreme weather events and in the longer term to sea level rises, there is much that can be done to reduce exposure to these risks. The construction and property sector is also vulnerable to rising energy and input costs. These are best addressed by investing in energy efficiency, waste heat recovery, power factor corrections and low embodied energy materials. These strategies reduce the risk of energy price rises. This is because energy efficient 'green' buildings secure tenants more quickly, command higher rents or prices and enjoy lower tenant turnover. Investing in the overall energy efficiency of commercial buildings also improves asset value by costing less to operate and maintain, avoiding future obsolescence and improving the future liquidity of the assets.<sup>114</sup>

As per the diagram in the *How to use this guide* section, investors can use this guide to understand the risks and opportunities faced by property and construction companies. The steps investors may wish to follow to incorporate climate risk and opportunity into investment processes include:

- assess company specific exposures for their severity and timeframe, current and future
- assess the company's response to these exposures and opportunities
- adjust company valuation assumptions based on materiality
- engage the company on outstanding exposures and their response.

In order to perform these steps, investors may gather information on the following issues regarding property and construction company practice:

- How does the company assess the changing risk to their assets from climate change?
- Does the company consider it is exposed to the risks identified in this report?
- What level of exposure does the company consider it faces?
- What are the upstream and downstream risks to company operations from climate and energy cost risks?
- Is the company building resilience into its assets to adapt to climate risks? If so how and when?
- Does the company benchmark its energy performance? If so how?
- Which of the energy risk and carbon mitigation measures has the company already implemented?
- What management systems does the company have in place to address the risks identified?
- What does the company see as the priority energy cost and carbon mitigation opportunities for the future?
- How do the opportunities align with future capital expenditure plans?
- What governance process do you have to make, purchase, development, management and disposal decisions?
- What do you believe are the barriers to implementing adaptation and mitigation measures?
- Does the company have a disaster response plan?
- What is the disaster response plan for business interruption and what does it mean to investability?
- What is the company's preferred channel for reporting progress on these matters to investors?

A discussion with a company incorporating these questions and the analysis in this report should provide the basis for a constructive and relevant dialogue.

Investors should be mindful of existing disclosures by companies on climate risk. A similar, but generic list of questions can be found in the CDP annual questionnaire. Investors should refer to the CDP responses of companies to identify answers already provided. Many companies will have disclosed at least some climate risk and opportunity information. CDP company responses can be found at the following link, or investors can contact IGCC for assistance.

<https://www.cdproject.net/en-US/Results/Pages/responses.aspx>

IGCC will continue its work with members and company engagement partners to support the implementation of this analysis on the property and construction sector in investment processes. Users of this document are encouraged to provide feedback to improve the quality and relevance of the guide for investors.

# KEY RESOURCES

## Climate Change Risk Assessment and Adaptation Strategies

ASBEC Climate Change Task Group (2012) *Preparing for Change: A Climate Change Adaptation Framework For The Built Environment*. Australian Sustainable Built Environment Council. <http://www.asbec.asn.au/files/ASBEC%20Preparing%20for%20Change%20Report%20FINAL.pdf>

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Smith, M et al (2010) *Reducing Risks to the Built Environment – from Cyclones and Hailstorms* in Smith, M et al (2010 *Climate Change Adaptation – Capacity Building Online Textbook* at [http://naturaledgeproject.net/Sustainable\\_Water\\_Solutions\\_Portfolio.aspx#WaterTransformedLecture1\\_2](http://naturaledgeproject.net/Sustainable_Water_Solutions_Portfolio.aspx#WaterTransformedLecture1_2)

Smith, M et al (2010) *Reducing Risks to the Built Environment – from Bushfires* in Smith, M et al (2010 *Climate Change Adaptation – Capacity Building Online Textbook* at [http://naturaledgeproject.net/Sustainable\\_Water\\_Solutions\\_Portfolio.aspx#WaterTransformedLecture1\\_3](http://naturaledgeproject.net/Sustainable_Water_Solutions_Portfolio.aspx#WaterTransformedLecture1_3)

## Climate Change Mitigation

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Smith, M, Andrews, G. (2012) *Lighting – Energy Efficiency Opportunities*. DRET Energy Efficiency Exchange at <http://eex.gov.au/technologies/lighting/>

Smith, M, Andrews, G. (2012) *Heating, Ventilation, Air-Conditioning – Energy Efficiency Opportunities*. DRET Energy Efficiency Exchange at <http://eex.gov.au/technologies/heating-ventilation-and-air-conditioning/>

ClimateWorks Australia and DRET (2013) *Industrial Energy Efficiency Data Analysis - Detailed project results - Other manufacturing, construction and services*. at <http://www.climateworksaustralia.com/publications.html>

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105. Energy Star Office Equipment: [http://www.livingthing.net.au/rc/extpartners/engStar\\_offEquipBrochure.pdf](http://www.livingthing.net.au/rc/extpartners/engStar_offEquipBrochure.pdf)
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