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Barriers and Facilitators: valuation processes in a state of climate change

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ABSTRACT

The repercussions of climate change will have significant ramifications for property and property values, particularly where repeated events will see value eroded, and in some areas destroyed. Recent events, notably extreme flooding in New Zealand and Australia in 2022-2023, highlighted the realities of climate change impacts on the built environment and society. Emissions mitigation goals and the implementation of commitments are infiltrating the property space, as is legislation that will drive emission policies for property. Both the physical climate risks and transition risks will have significant implications for valuation practice and property values. This paper will present research into the current barriers and facilitators in regard to valuers knowledge development, data collection, and valuation practice.

The paper presents research conducted in 2021-2022, that comprised semi-structured interviews with 30 Australia valuers. Participants were from a broad range of specialisations, and included a mix of government, rural, and industry valuers.

Perceived impacts from climate change risks varied depending on the different property markets, however, the barriers highlighted were often common across asset classes. In particular, the common response to the effect of climate risks, was that value impacts will be demonstrated in the evidence; which aligns with the comparative principle of market value. However, if information asymmetry occurs (which is likely and identified as a key barrier), there is probable potential for markets to be mispricing properties. Valuers saw a range of barriers in the comparability of evidence, information availability, implicit and explicit understanding of cost and value ramifications, the valuation approaches and the potential liability valuers may be held accountable.

This research does not provide a solution, rather it explores the current barriers inhibiting valuation practice, and in doing so seeks to enable valuers by providing direction as to the changes necessary in practice.

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INTRODUCTION

It is (generally) accepted as fact, that our climate is changing, and not for the better (IPCC, 2023). The imperative to limit emissions to minimise the worst climate change implications, was (again) noted by the Intergovernmental Panel on Climate Change in its most recent report (IPCC, 2023). However, action to minimise emissions is occurring slowly, and not at the rate required to limit global warming to 1.5°C (IPCC, 2023). Such recognition is not limited to the scientific community. This fact is accepted by Courts and Tribunals. For example, in 2022 Chief Justice Allsop of the Federal Court of Australia observed at the commencement of the Full Court's judgement that "[t]he threat of climate change and global warming was not and is not in dispute between the parties..." (Sharma, 2022 [1]). Decades before that decision, the New Zealand Planning Tribunal observed that while "[t]here [was] not [then] a consensus amongst the world's scientists on the exact nature, scale and timing of the global change problem. Nevertheless, there is a general view that the signs are pointing towards global climate change as being a very serious problem for human kind." (Electricity Corp NZ, 1990, p. 158). Whilst businesses, raw materials industries and manufacturing have been the focus for emissions reductions, the built environment has been recently identified as a key opportunity to harness greater levels of carbon emission mitigation; as the built environment produces 37% of global carbon emissions (UN Environment Program, 2022). This brings into focus the need for greater policy, regulation, and action in the built environment, both to reduce emissions, and for adaptation action to deal with existing and foreshadowed climate change impacts. Government based policy and regulations for buildings are developing, mostly focused on emissions reductions, and at the local level, in some cases, starting to consider future climate change risks. This is aligning with market led changes through the increase in Climate Risk Reporting currently being driven by financial disclosure requirements (Craddock et al., 2023).

Property is faced with a raft of climate related risks (Warren-Myers and Hurlimann, 2022). These include physical risks, and the extenuating implications these risks have on operation, income, and long-term values. It also includes emissions and transition risks, which may have ramifications for property operations, income, ownership, and investment. Consequently, valuers need to be aware of not only the physical and transition risks, but also, how the market is responding and pricing these risks in practice.

This research provides insights into the Australian context of the consideration of climate change risks in valuation practice and processes. It identifies the barriers currently present in valuation practice; and the facilitators for engaging valuers to identify, assess and consider the implications of climate change risks in valuation practice.

BACKGROUND

Climate change will affect property in a raft of different ways, and this will also be nuanced to local environments, as will the extent of climate change risks, vulnerability and impact. Warren-Myers and Craddock (2022a) compiled a table of key climate change risks and summarised the risks to property. The implications of these risks and effects on property; in particular, the consideration of how these might affect property risk profiles and value considerations. There are three key areas of 'loss', defined as direct¹, indirect² and consequential³. These losses, then contribute to, and impact the property's market value as displayed in Table 1. The table provides a synopsis of climate change risks (and associated events), potential aspects of losses and implications for properties physically and economically. Further highlighting the breadth of risk and implications for property values, and for valuation practice. Clayton et al. (2021) also explored the literature to examine climate risks and implications for commercial property values.

¹ Direct losses are associated with damage or total loss to tangible assets, in a built environment context this would include losses associated with damage to dwellings, offices, buildings, infrastructure or public facilities, and increased costs related to materials or resources or increased insurance premiums (Warren-Myers and Hurlimann, 2022)

² Indirect losses are associated with a property's operational aspects, this includes as a result of the climate risk/event coming to pass a loss in rent, loss of revenue from business generation (Warren-Myers and Hurlimann, 2022).

³ Consequential losses occur as a result of repercussions of the climate risk event occurring and reoccurring, that then results in increased vacancy, reduction of demand for the space, resulting in reduced competitiveness in the market, and subsequently lower direct investment (Warren-Myers and Hurlimann, 2022d; Bienert 2014 p.9)

Table 1. Climate change risks and implications for real estate

Climate Change and Related Risks	Implications for Real Estate	Direct Costs & Losses	Indirect Costs & Losses	Consequential Costs & Losses	Value Implications
Sea level rise	<ul style="list-style-type: none"> Inundation Increased flooding and damage Ongoing increased costs: damage and preventative Uninsurable Salt intrusion into ground water and coastal wetlands 	Total loss of real estate/property and value associated with land and buildings (permanent inundation); increased flood damage costs over time.	Utility of asset periodically affected or lost entirely, loss of rent/income generated through ownership, lost revenue for businesses, costs associated with jobs or access, subsequent effect on value.	Discounting of property value with reoccurrence of event, lower direct investment, increased vacancy, loss of demand, increased depreciation and obsolescence.	Long-term complete loss of property/significantly discounted value due to damage and prevention costs, increased depreciation and obsolescence, uninsurable status.
Temperature changes	<ul style="list-style-type: none"> Increased number of days with higher temperatures Increased capacity requirements of building cooling systems due to higher average temperature¹ Higher energy demand (peak), potential black outs 	Costs of maintenance and replacement, reduced rent ¹ , retrofitting assets with better thermal qualities (insulation, windows), lower heat generating and energy efficient equipment, and greater capacity air conditioning systems.	May result in periods of rental or income loss due to building being unable to operate in certain conditions.	Reduced rentals, increased vacancy, increased obsolescence and lower market values.	Properties will need to adapt and improve energy efficiency and mechanical ventilation capacity in order to maintain value; failure will result in value discounting by occupiers and investors.
Bushfires	<ul style="list-style-type: none"> Increase in number of days with very high and extreme heat and fire danger Fire damage to property and assets – leading to damages or total loss of property 	<p>Total loss of buildings and fire related damage costs.</p> <p>Increased insurance levies.</p>	Loss of rent/income generated through ownership, lost revenue for businesses, costs associated with jobs or access.	Discounting of property as reoccurrence of event, lower direct investment, increased vacancy, loss of demand, increased obsolescence, insurance premiums increase or uninsurable status.	Increased risk exposure could lead to property being uninsurable, and exposed to total loss or damage costs.
Extreme weather events	<ul style="list-style-type: none"> Increased frequency and severity of storms. Increased intense rain events Cyclone frequency may reduce but increase intensity resulting in more severe damage and loss. Property damage from wind, hail, flood 	Increased damage costs, from hail, wind, flooding. ^{[2] [3]}	Loss of rent/income due to damages, lost revenue for businesses, costs associated with jobs or access.	Discounting of property with reoccurrence of event, lower direct investment, increased vacancy, loss of demand, increased obsolescence, increased insurance costs.	Increased risk exposure could lead to increased annual property damages (direct and indirect), potential for building to be uninsurable, and exposed to long term value discounting.
Regulatory and Adaptation Costs Market Risks Resource Availability Reputation and Competition	<ul style="list-style-type: none"> Increased costs associated with regulatory compliance and management Higher adaption costs to protect buildings and make them more efficient Increased taxes: e.g. GHG emissions; funding adaptation measures Stranding of assets: exposure to vulnerable areas/locations, or changes in legislation 	<p>Increased compliance and management costs for mitigation and adaptation; loss of market share and income; increased construction costs; increased costs associated with taxation like carbon taxation.</p> <p>Increased costs for resources regarding development and operation building materials, energy, water disposal of waste.</p>	Reduction or loss in rental income (rental demand); reputation and brand risk; exposure to declining markets.	Increased obsolescence and reduction in property values if not compliant with regulations and adapting to resource efficiency to mitigate carbon cost implications.	<p>Increased risk exposure could lead to property being uninsurable, and exposed to total loss or damage costs.</p> <p>Declining market values due to exposure to market risks, reduction in demand, and or regulatory requirements that result in stranded assets.</p>

Source: Warren-Myers and Craddock (2022a) Table 1. *Climate change events and effects on property*, adapted from Warren-Myers and Hurlimann (2022) Table 2 *Climate Change risks and how they are translate to loss and value implications for real estate*.

The implications of the broad range of climate change risks (shown in Table 1) has significant implications not only from a valuation perspective, but importantly for the investment, ownership, management, financing and occupation of property. As stakeholders are potentially exposed to climate change risks and the potential financial ramifications; there is an increasing prevalence of climate risk reporting, driven from a voluntary basis, fiduciary duty, or mandated through legislation or regulation (Craddock and Warren-Myers, 2023). The evolution of reporting and the processes required in this, has led to the incorporation of many climate risk reporting aspects into due diligence processes and considerations (Warren-Myers et al. 2021), which are then being utilised in decision-making for acquisition, investment, management and divestment.

The Taskforce for Climate-related Financial Disclosure (TCFD) has helped to catapult climate change risks, particularly financial climate risk, into a more mainstream conversation. The TCFD seeks to have companies, organisations and jurisdictions to take ownership of climate change related risks, so that these can be properly considered. Although, the adoption of climate risk reporting and TCFD has increased since 2019 (McGrath 2021), there are still several barriers and limitations impacting broader adoption, particularly regarding what is reported, to what extent, and how that is used.

The authors note that New Zealand took the lead in introducing mandatory disclosure for the financial sector, through the Financial Sector (Climate-related Disclosures and Other Matters) Amendment Act 2021 and amended the Financial Markets Conduct Act 2013 (FMC Act), the Financial Reporting Act 2013, and the Public Audit Act 2001 (Ministry for the Environment, 2023). The implication being, that approximately 200 large financial institutions are required to make climate-related disclosures (Craddock, Warren-Myers, and Schmidt, 2023).

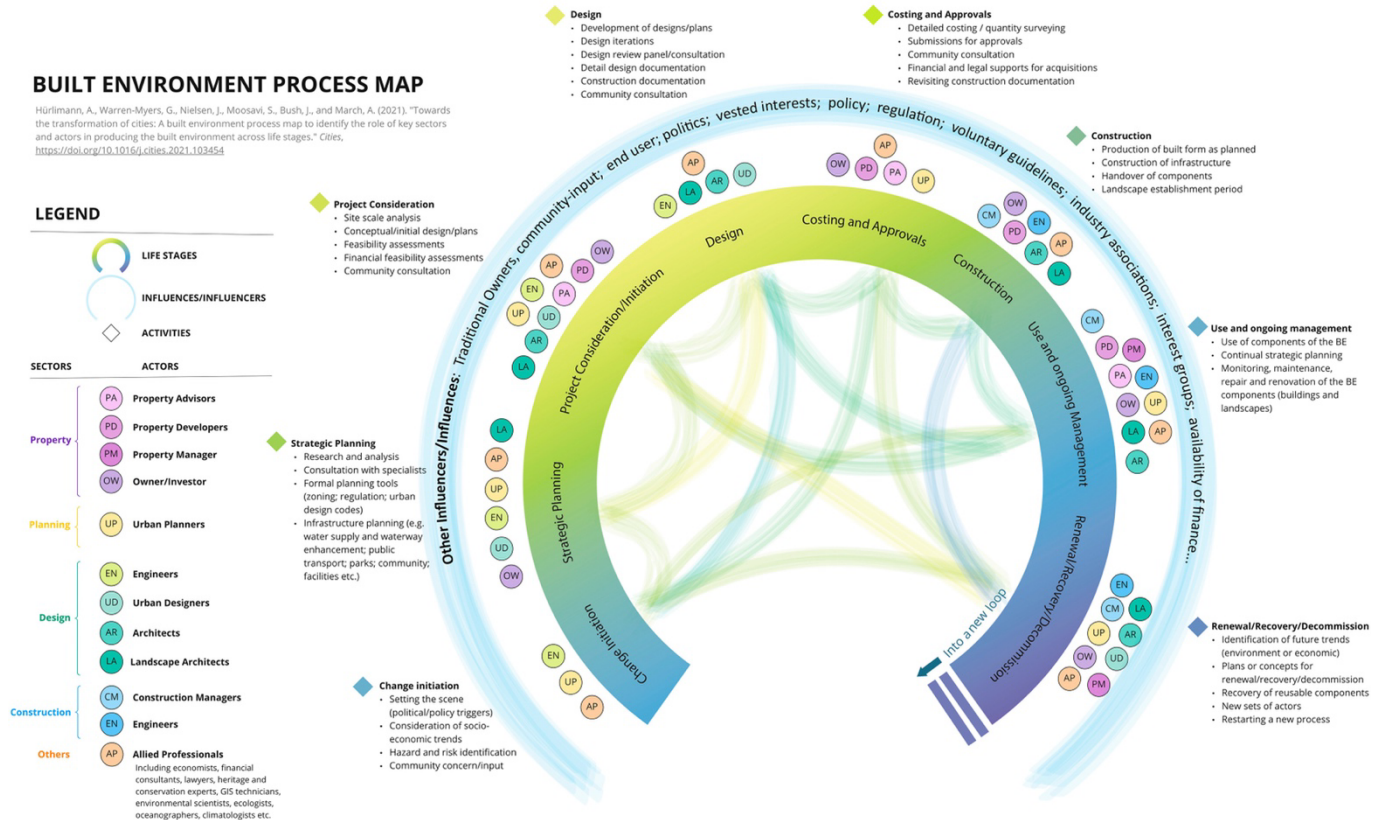
In Australia, the Australian Prudential Regulation Authority (APRA), has led changes to climate risk reporting processes in the banking and finance sector, by releasing the Prudential practice guide (PPG): CPG 229 Climate Financial Risks, November 2021; clarifying the compliance requirements under existing risk management practices, that prudent practices include the disclosure of climate change financial opportunities and risks, and that this is not a new requirement, rather it *'supports compliance with APRA's existing risk management and governance requirements'* (APRA, 2021, pg.5). However, current voluntary climate risk reporting and climate orientated laws are helpful in the fight against climate change, these are not without issues (Kube et al. 2019; Gardiner 2002). As highlighted in the APRA review in 2022, which reported on the voluntary climate risk -self assessment survey, in response to the the CPG229 directive, a range of challenges exist presently, and a key one being the breadth of approaches to reporting and information reported (APRA, 2022). What is clear is that these obligations have both current and future impacts for businesses and organisations, as voluntary reporting requirements are progressively enshrined in law; and these become mandatory, this will lead to changes in business operations, reporting, and consideration of future decision-making (Craddock, Warren-Myers, and Schmidt, 2023). This type of reporting, and the issues considered in that reporting, will become part of the data with which valuers must engage with in the valuation process.

Barriers to climate change in built environments

Climate change and its implications and effects are not just an issue for property stakeholders and valuers. It will affect broad sections of the community and in diverse ways. However, the role of climate change action is not solely required from property stakeholders, it is needed more broadly. One particular group who are key to ensuring the resilience of the built environment are built environment professionals. Hurlimann et al. (2022a) explored the various roles and responsibilities of the built environment professions across the life stages of the built environment, mapping the influence and relationships between life stages and stakeholders, as shown in Figure 1. This understanding is vital to unlocking the opportunities and facilitators to drive greater climate change action across life stages of the development.

Hurlimann et al. (2022b) then explored the international extant academic literature to understand what the key barriers and facilitators to climate change action were for the different sectors of the built environment. Key barriers identified included: risk evaluation, roles and responsibilities, funding and costs, policy and regulations, knowledge, time-frames, clients and community engagement, conflicting priorities and tools. This research also identified that for property professionals, the key barriers highlighted in the literature were: it was not ‘their role’; a perception of high costs; policy and regulation were not clear; lack of knowledge of the scientific information and where to get it; challenges associated with short political time frames; short budget timeframes; the influence of climate change works on amenity and values; and that it was currently considered low priority by developers (Hurlimann et al. 2022b).

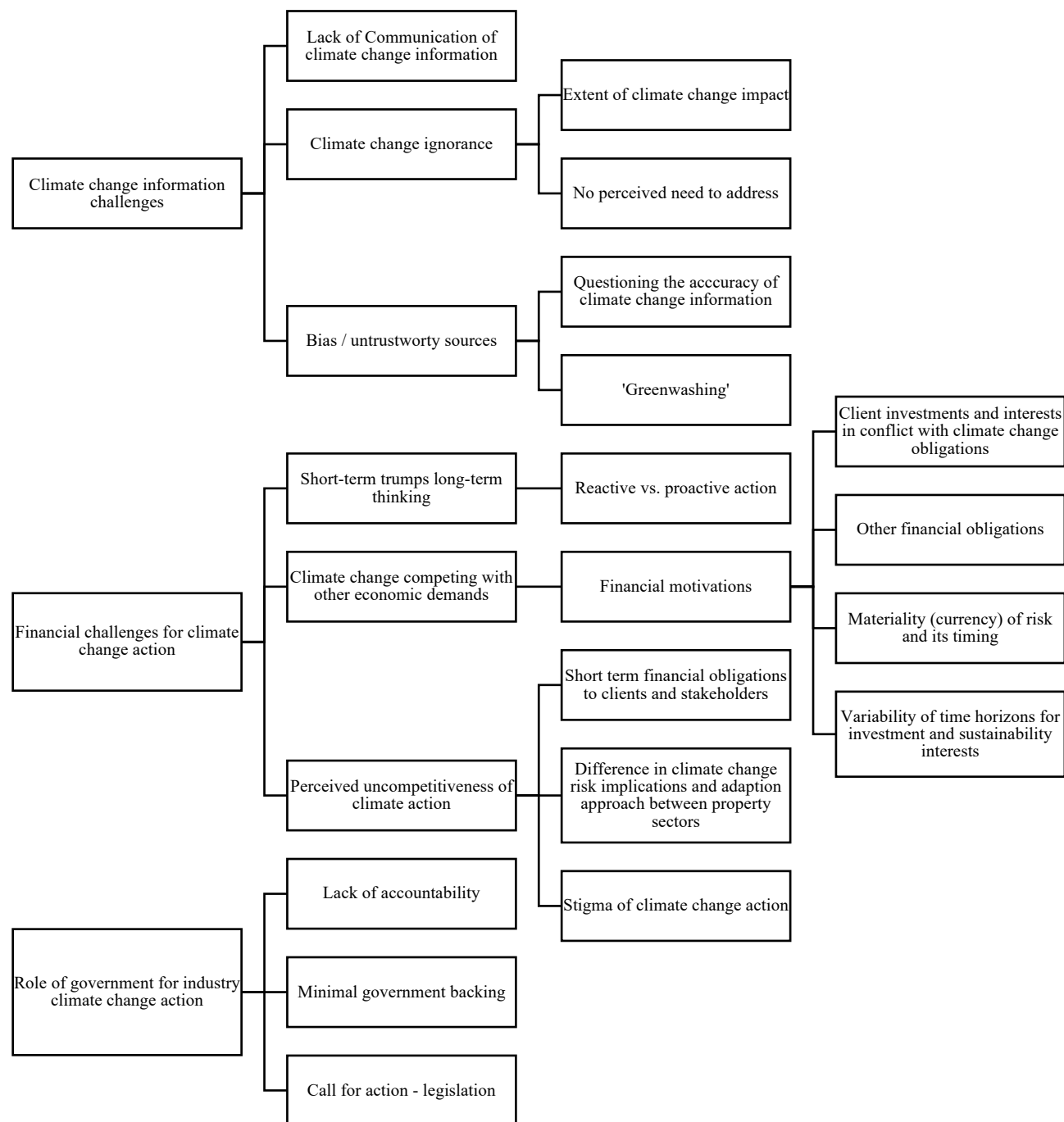
Figure 1. Built environment process map.



Source: Hurlimann et al. (2022a) p. 5

Warren-Myers et al. (2020a) in the Australian context, highlighted the extensive list of barriers for a range of property stakeholders. During 2019, Warren-Myers et al. (2020a) interviewed developers, listed and unlisted real estate investment trusts, superfunds, high net worth individual, advisory and consultancy firms and an industry body, and identified some of the key barriers to climate change action in the property sector, which were broadly classified into climate change information challenges, financial challenges for climate change action and role of government for industry climate change action.

Figure 2. Barriers to climate change action in the Australian property industry as perceived by key stakeholders



Source: Warren-Myers et al. (2020a) Figure 1. Barriers to climate change action in the Australian property industry as perceived by key stakeholders

In a consolidated table by Warren-Myers and Hurlimann (2022), shown in Table 2, they provide a synopsis on research undertaken from examining both the Australian property and construction sectors, from interviews undertaken in 2018 and 2019. This research found that different barriers existed for different climate change risks and transition risks. These were categorised as: information barriers; cost and investment barriers; capacity barriers; and regulatory barriers.

A tension that exists, is the implications of the level of impact of climate change events and the timing of when these risks may have direct implications on property and their values. To date, the value implications and consideration of climate change and transition risks on value are a key gap in research to date. Therefore this research addresses the current knowledge gap, what are the barriers and facilitators for climate change consideration in valuation practice.

Table 2 Barriers to climate change action in the property and construction sectors

Climate Change Risks and Transition Risks	Information Barriers	Cost & Investment Barriers	Capacity Barriers	Regulatory Barriers
Sea level rise	<p>Lack of certainty and nuanced modelling for all locations</p> <p>Lack of understanding of the implications of other measures affected by sea level rise, like storm surge, high tides and waves.</p> <p>Ability to identify if your property is at risk and to what extent that risk is</p>	<p>Damage cost estimates for your property</p> <p>Understanding insurance information and the impact of premiums or un-insurance for at risk properties</p> <p>Loss in property values either completely or incrementally over time.</p>	<p>Identifying valid sources of information</p> <p>Having the personnel who are knowledgeable and able to translate the information into operational practices and decision-making</p>	<p>Lack of federal, state and local government action on a policy and implementation aspect</p> <p>Local government attempts to apply through the planning process has been met with widescale criticism</p>
Temperature changes	<p>Information providing detailed forecasting of future hot temperatures</p> <p>Prediction and estimation of exposure to bushfire risks</p> <p>Impact of future hot days, heat waves and impacts on building HVAC systems, and energy power loads</p>	<p>Retrofitting or constructing additional capacity for building to cope with changing environment.</p> <p>Damage costs associated with heat or fire events</p>	<p>Identifying valid sources of information</p> <p>Having the personnel who are knowledgeable and able to translate the information into operational practices and decision-making</p>	<p>Changes to building codes – increases in costs to build (or rebuild)</p> <p>Understanding where prohibited areas for development</p> <p>Government buy back schemes of risky property</p>
Extreme weather events	<p>Prediction and estimates of severity and likelihood changing and varies by location</p> <p>Insurance coverage unknown and unknown what insurers consider for the property</p>	<p>Damage cost estimates for your property</p> <p>Understanding insurance information and the impact of premiums or un-insurance for at risk properties</p>	<p>Identifying valid sources of information</p> <p>Having the personnel who are knowledgeable and able to translate the information into operational practices and decision-making</p>	<p>Changes to building codes - increases in costs to build (or rebuild)</p>
Regulatory and Adaptation Costs	<p>Lack of information about the costs and cost-benefits of new regulatory requirements, or adaptation costs for assets.</p>	<p>Increased costs associated with regulatory compliance and management.</p> <p>Higher adaption costs to protect buildings and to make more resource efficient.</p> <p>Stranding of assets, either through exposure to vulnerable areas or locations, or through changes in legislation.</p>	<p>Changing regulatory landscape and capacity in-house or for out-sourcing of understanding the implications for the organisation and how to develop new strategies to align</p>	<p>Industry associations resistance and public opinion</p>
Market risk, Reputation and Competition	<p>Understanding the effect of inaction on reputation</p> <p>Competitive risk and information required on cost-benefit of strategies and actions</p>	<p>Increased taxes – in terms of carbon and also funding of adaptation infrastructure.</p> <p>Value lost due to stranding of assets, either through exposure to vulnerable areas or locations, or through changes in legislation.</p>	<p>The need to have the right team for business strategy alignment of CSR strategies, rating systems and disclosure requirements</p> <p>Competitive resilience (Teicher, 2018) identifying the potential to utilise CSR, mitigation and adaptation actions as competitive edge, but resources and costs will be associated.</p>	<p>Stranding of assets, either through exposure to vulnerable areas or locations, or through changes in legislation.</p>
Resource Availability	<p>Information about resource costs and consistency of supply into the future, ie energy costs.</p>	<p>Increased costs for resources, building materials, energy, water; and disposal of waste.</p>	<p>Ability to identify new resources and technologies, this may also require different internal skillsets in procurement.</p>	<p>Lack of support for research and development in new technologies and resources.</p> <p>Threat of regulatory changes may cause further cost implications and security of access.</p>

Source: Table 8.4 Warren-Myers and Hurlimann (2022)

RESEARCH APPROACH

The research investigated current valuation practice in the Australian property industry, exploring valuers current approaches to the identification and consideration of physical risks and climate change risks in valuation practice. Previous research on this topic has been undertaken by the authors involving an online survey and focus groups in Australia (see Warren-Myers and Craddock, 2022b). This research, is a larger project, and was funded by the Australian Property Institute - Australian Property Research and Education Fund (APREF) to investigate climate change and climate-related risks in valuation practice through the project *Valuation @ Risk* (see Warren-Myers and Craddock, 2022a).⁴

This paper progresses that research, by engaging in a discrete component of the large research APREF report by examining the range of barriers and facilitators for valuers in the identification and consideration of climate change risks in valuation practice that emerged in the data collection and analysis of 30 interviews with valuers from across Australia from different specialisations. It answers the research questions:

1. What are the key barriers valuers face in considering the implication of climate change risks in valuation practice?
2. Are there facilitators to enable valuers to engage better with climate change risks in valuation practice?

The research was approved by Ethics committees at the University of Melbourne and Queensland University of Technology. The interviews were conducted in 2021 and 2022. Interviewees included a broad selection of valuers geographically as well as by specialisation. Valuers were located within small firms, national and international firms, and government. Their specialisations included: commercial, residential, agriculture, industrial, infrastructure, and acquisition and compensation. This approach was undertaken on purpose, to expose and identify any nuances that may sit within different professional practice settings.

FINDINGS and DISCUSSION:

Participants were asked a series of questions designed to understand their knowledge of risks generally, and climate change specifically. These were grouped according to: risk assessment in valuation practice (to set a benchmark for later specific climate change related questions); climate change risk assessment in valuation practice; and general knowledge and awareness of past, current, and future disaster events. All participants answered all questions in often a very fulsome manner, which aided with the broader understanding of the issues facing valuers in practice, and issues specific for any specialisation.⁵

Barriers faced by valuers

Valuers' identification of risks was found to be primarily undertaken by engaging with: planning overlays; other town planning information and mappings; specific searches; experts reports; discussions with owners; and physical inspections. This search data was often gathered from a variety of sources, most commonly that of local government authorities and State governments. Independent entities also provided online data and search services. However, there were six key barriers identified by valuers that related to climate change specific risks, these were:

⁴ A copy of the full report is available [from APREF](#). Other contributions to the profession include several articles published in the Australian Property Journal, industry conference presentations, and articles in academic journals. Copies available on request to the authors.

⁵ All participation was undertaken on the basis that it would be anonymous, and all data was anonymised prior to analysis. Therefore, while it is not possible to identify the valuers who so generously gave their time to participant in the interviews, the authors wish to take the time here to acknowledge their invaluable contributions and support of the project. *You know who you are – Thank you!*

1. Information awareness and identification of accurate information;
2. The role of government, regulation and policy (or lack of);
3. Identification of reliable market evidence and information for application in the comparison approach;
4. Limitations of current valuation approaches and the ability to consider climate change risks;
5. The problem of forecasting in valuation practice; and
6. The challenges in identifying a clear relationship between climate change risks and asset lifecycle and the potential impacts, costs and value implications.

These barriers are addressed hereafter in more detail.

Information and Awareness

Commonly raised by valuers was the challenge of accessibility and source of information, particularly in relation to climate change risks, valuers felt there was a lack of awareness of where relevant and accurate information could be sourced. Further, it was clear there was a heavy reliance on information provided by public authorities – i.e. local government (council) or State government agencies. An aspect raised, was that often in terms of planning information, this information was not necessarily comparable across regions or jurisdictions; for example one local council had incorporated sea level rise into their planning scheme, whilst the neighbouring local council hasn't. Further, locating the 'right' information, and what information would also be considered to be engaged with by market participants was also seen as a key barrier.

It was also noted that, while some of this information was freely accessible, often there was a required payment in some form, and almost always came with a disclaimer from the provider about accuracy. It also was noted that private providers often provided the same or different data, again at a cost, and again with the use of disclaimers. Some participants observed that some private entities also may not freely share information they hold even for a fee and yet, for example, the impact will be seen in increased insurance premiums in areas not yet, or not for many years, affected by a climate related event. The lack of information available and accuracy of the data and information that is available, was also identified in the research engaging with professionals in the property industry (Warren-Myers et al. 2020b), construction sector (Hurlimann et al. 2018a) and landscape architecture sector (Moosavi et al, 2023).

The role of self-awareness was noted, in the context of the need for awareness of past events and, where that awareness was not held by the valuer, to undertake the necessary inquiries. However, it also was noted that the valuer's ability to engage with any data was often constrained by the client's instructions, data provided by the client, and the purpose of the report. In this respect, participants also noted that any data tended to be responsive to events, rather than predictive. The availability, currency, accuracy, and accessibility of current data reinforces the need for better clarity and access to information in the valuation process. It also reinforces the need for better transparency from government entities (and other like the Insurance Council of Australia) about the information they hold, and for this to be made available. Otherwise issues associated with information asymmetry will emerge in the market, clouding the real impact of climate risks on decision making, pricing and values.

Role of government

Participants noted a key barrier was the politicised environment at both state and federal level of government, and implications this had for regulation and policy direction, further the ramifications of limited clarity on policy direction and information signalling to the market. Further, the role of local council in future planning and current approvals, and lack of consideration (or not) of climate change risks, which was not consistent across areas, this was also noted by Craddock and Warren-Myers (2022) in their evaluation of flood events and local council policy actions, which were often later withdrawn or removed leading to further development in at risk areas. Further, there was often limitation of the type of public information provided, typically through planning scheme overlays, and these focused on events such as floods and bushfires. Yet, understanding future implications, like sea level rise and potential future flooding was provided on an adhoc

basis, at present. It was also noted that an overreliance on planning schemes to the exclusion of other sources could lead to 'tunnel vision' as this engages only with data that the planning department considers relevant to their role, and not necessarily information that maybe in fact relevant to others in different ways. As state level mapping of sea level rise might be missed due to limited visibility and accessibility to these types of resources. Further, due to the nature of planning requirements and the fact that this engages with historic based information, the data provided is often backwards looking. The role of government and the need for clear and transparent policies to reduce the political circus was also identified by Warren-Myers et al. (2020a) evaluation of perceived barriers by the property industry stakeholders, this was also a prominent barrier identified by Hurlimann et al. (2022b) in their evaluation of built environment sector barriers.

Market evidence and information

It is acknowledged that the role of the valuer is to reflect the market, and any change in the market. Participant discussion regarding 'the market', and the need to reflect the market sentiment regarding climate change risks, was therefore often circular. Sales are influenced by the market, and past events; and the market in turn is then influenced by comparable prices. Participants therefore noted the need for reliable evidence of market impacts and recent sales, and tool and approaches to evaluate whether climate change risks are having any influence on pricing.

Participants also noted that the market was affected by and dependent on purchaser information challenges. This related to issues of the informed (knowledgeable) valuers versus home buyers (often limited knowledge) as to what a property's exposure to risks and its' value impact. Other issues identified related to the loss of market knowledge of past events, even if in the past few years, this was particularly noted in the context of bushfires and floods. Where often initially market transactions were limited or are at a discount due to the event. However, overtime this discounting and slow sales transactions disappeared, which aligns with bush fire and flood event housing studies (Fuerst and Warren-Myers, 2021; Mueller et al. 2009).

Challenging valuation approaches to incorporate climate change risks

Understanding of how climate change risks would affect values was one element and barrier raised by valuers. However, the other key barriers that emerged from discussions with participants were the unpacking of how and what would be affected (from a physical property perspective as well as aspects like cashflow considerations, discount rates, vacancy assumptions etc), and importantly to what extent, and how sensitive in different scenarios. Further, exploration of the impact of say, increased flooding later leading to complete inundation, led to discussions about wasting asset and depreciation considerations, and the limited life of the asset and consequently its ability to maintain an income into perpetuity, and how these should be addressed.

As recognised by the International Valuation Standards IVS400 as regards to Real Property Interests, these are defined by each country's specific laws (IVS400, 20.1). Valuers are required to understand the legal framework that is relevant to the particular interest being valued (IVS400, 20.2). The International Valuation Standards also specifically refers to tenure type. Relevantly, the 'superior interest ... in the land' is one that is held 'in perpetuity'. As the Macquarie dictionary (online) defines the term 'perpetuity'⁶ to mean: "endless or indefinitely long duration or existence". The term 'in perpetuity' therefore means, simply, forever.⁷

In the context of climate change impacts, if the land is positioned such that it is close to the sea, or is in a slip area, or has had some other direct adverse impact already, there is a genuine risk that the land will 'disappear' in the foreseeable (albeit not immediate) future. In those circumstances then, the participants and the authors question whether such land, or any interest in such land, is appropriate to be valued 'in perpetuity' and whether a different approach should be considered in these contexts for clearly at risk properties, not only in valuations required for market value but also importantly for assessment of investment worth.

⁶ Not to be confused with the common law 'rule against perpetuities', which required that a Trust must vest 21 years after a nominated life ended and cannot be held forever.

⁷ As opposed to the use of the words 'defined period' or 'defined term' also used in IVS400.

Future forecasting

Tied to the role of the valuer engaging with comparable data, many participants noted that they lacked a crystal ball to see into the future, and as valuers, there was a focus on not ‘future forecasting’. While understanding, for example, that any property in a coastal or riverine area could be adversely impacted by water at some time in the future, without past evidence to support that impact it was not appropriate to factor this into the valuation. All agreed that it is necessary to avoid long-term forecasts particularly when there is no history, or evidence to refer to as a basis for that forecast. However, this is likely a changing consideration, particularly as climate risk reporting grows in the commercial sector and the due diligence processes begin to better articulate climate change risks in decision-matrices and pricing.

Making the implicit explicit

There were within the interviewees some who self-identified as being ‘climate change deniers’. However, those ‘deniers’ still were very much aware of the need to ensure that all relevant risks – whatever these may be – are identified, and properly considered, within the valuation reports they present. This was of their own understanding, and due to client expectations and direct instructions. As such, relevant matters were made explicit in the reports they prepared for those clients. However, not every client is as informed or directive as to what risks must be included. This is an evolving area, some participants had already been issued with instruction to consider ESG and/or climate change risks, likely a result of banks increasing their consideration of climate risk reporting, and fiduciary requirements for disclosure.

Facilitators

There were three key facilitators identified to assist in enabling valuers to better engage with climate change risks in valuation practice. Firstly, it was found that valuers are well versed in risk identification, analysis and consideration in a valuation practice (Warren-Myers and Craddock, 2023). Just more guidance, education and accurate information (as noted above) is required to enable valuers’ to have greater capacity to identify and consider whether climate risks or transition risks should be reported and considered in valuation practice and its’ effect on market value (if any, which is dependent on the appropriate analysis of comparable evidence).

Secondly, the regulatory environment in Australia is currently in a state of change with the Labour party winning the balance of power at the Federal level in 2022. Which has seen commitments to net zero and layers of action coming through at this level of government. This has also been reflected at state and local government levels as well, for instance the Victorian government released their *Climate Change Strategy*, and the City of Melbourne is in the process of developing and implementing net zero targets and a mapping of climate risks for the municipality. Whilst in New Zealand, the climate disclosures requirements will come into effect in 2023 and in Australia, the APRA disclosure requirements and the position about climate change risks being *should* be part of normal risk disclosure approaches will infiltrate markets and behaviours. So this area is rapidly changing and valuers need to be aware of the changes occurring at these different layers of government and consider the implications for properties and valuation.

Thirdly and finally, there is a rapidly evolving and improving profile of information available that could assist valuers in seeking climate change related information. In particular, valuers and property professionals need to understand what is applicable to them at a higher level and the broader strategies being driven by the government and/or industry, and the emergence of better climate change risk information, which is now being translated down to property specific information. Whilst this is a constantly evolving area of information, Table 3, provides a synopsis of the various climate change risks and where high level and property specific information can be sourced.⁸

⁸ The data this presents is current as at the end of 2022, and is detailed in Warren-Myers and Craddock APREF report.

Table 3. Climate change risk information framework

Climate Change and Physical Risks	High level information	Property specific information
Sea level rise - Inundation - Increased flooding and damage - Ongoing increased costs: damage and preventative - Insurability / Costs of insurance / Uninsurable - Salt intrusion into ground water and coastal wetlands	- IPCC Report (for latest observations regarding heights) – various scenario analysis - OzCoasts Mapping https://ozcoasts.org.au/maps-data/ - Climate Council report - Climate Council risk mapping	- Coastal risks sea level rise mapping - Local council / water authority planning maps - Local council planning information and mapping - Water authority information maps - Historic/previous flood event history - Contact possible insurers - Near map (historic insurance risk) - Victorian Climate Change Risk Management
Temperature changes - Increased number of days with higher temperatures - Increased capacity requirements of building cooling systems due to higher average temperatures - Higher energy demand (peak), potential black outs – need for onsite generation/back up	- IPCC Report (for latest observations regarding temperatures) – various scenario analysis - State of climate reports and outlooks - CSIRO's Australia's changing climate - State forecasts and projection maps (will be likely individualized for each state) - Victoria's Future Climate Tool	- Asset exposure and capability to operate during heat waves - discussion with building/facility manager - Advise commissioning a report regarding building's actual cooling capacity, its' material resilience to extreme heat and modelling its' ability to cope with future heat waves/projected temperatures - Onsite energy generation and consideration of emissions of fossil fuel back up - Suggest consultant commission to assess renewable options and onsite storage.
Bushfires - Increase in number of days with very high and extreme heat and fire danger - Fire damage to property and assets – leading to damages or total loss of property - Increased insurance levies - Insurability / Costs of insurance / Uninsurable	- Climate Council report - State/territory government mapping and reporting of bushfire vulnerability - GeoScience Australia – National Bushfire Mapping - CSIRO Bushfire mapping and forecasting	- Local authority planning maps (bushfire overlays / wildfire overlays) - State and Territory mapping and bushfire analysis (may have individual property based analysis) - Climate Council risk mapping - Near map (bushfire risk and also historic insurance claims information and vulnerability)
Drought - Increase in temperature extremes - Increase in number of days with higher temperatures - Variability in rainfall	- Bureau of Meteorology – Drought Knowledge Centre - Northern Australia Drought Mapping	- State and Territory drought information and mapping – for example NSW – Drought Resources and updates for Farmers
Extreme weather events - Increased frequency and severity of storms. - Increased intense rain events - Cyclone frequency may reduce but increase intensity resulting in more severe damage and loss. - Property damage costs -wind, hail, flood	- Bureau of Meteorology - * Australian Climate and Weather Extremes Monitoring system - * Climate Extremes Mapping - * Climate change trends and extremes - Climate Council report - Victoria's Future Climate Tool	- Bureau of Meteorology – Storms archive - Local government and local authority information, data and mapping - Climate Council risk mapping
Mitigation and Emissions - Assets ability to meet emissions targets – operational (ie Net Zero) - Embodied Energy/Carbon consideration for new builds, retrofits/refurbishments - Asset stranding failure to meet emission targets - Carbon accounting budgets	- Regulation / Legislation - Federal carbon commitments and requirements - National Construction Code - State or Territory carbon and local government commitments and requirements - Industry requirements or reporting requirements (TCFD)	- Individual to the property - Advise commissioning a report regarding building operational and embodied energy requirements current and future – asset stranding potential– mapping against NABERS Energy , NABERS Carbon Neutral , Carbon Risk Real Estate Monitor - Residential property– NatHERS , Green Star Home Standard , Residential Efficiency Scorecard

*Please note: This table is Hyperlink enabled

Source: Warren-Myers and Craddock APREF report, Table 15. Climate change risk information framework.

CONCLUSION

Climate change risks threaten both land and improvements on that land, and in some instances the very existence of that land. Climate change is now a commonly accepted fact. In the context of land erosion and other climate change risks, the reality is that some land may not be here in fact in as little as 15 years' time. This is not a fiction, but a reality we can see for example all too obviously as the sea eats the coastal fringes, and land or houses falls into the sea. As the Victorian Civil and Administrative Tribunal observed in the Gippsland decision *"Put plainly, rising sea levels are to be expected."* (Gippsland, [2008], [48]). It is important therefore that climate change risks should be incorporated into land valuation processes now. If you know land is, or will be, affected by climate change risks, or more importantly, if at a later date a Court or Tribunal finds that you should have known. Then a failure to identify and properly assess such risk now leaves valuers at risk to liability and negligence actions, and this will have flow on implications for professional indemnity insurance and broader valuation industry. As such, the authors suggest valuers need to:

- 1) Recognise any climate change risks, potential timing and possible impacts that are relevant for the property;
- 2) Engage with all available data, from all available sources, in order to identify and properly understand all relevant risks (this maybe nuanced to certain areas and locations);
- 3) Collect and analyse relevant evidence with climate change risks as a consideration (if applicable in the market); and
- 3) Ensure that all current and future potential impacts are properly considered and covered in their valuation process and report (where applicable).

The emerging landscape of climate change risks and transition risks are a significant challenge for both government and industry. There is a need for greater evolution of planning schemes, state and federal tools and modelling to be developed to explore: the identification of climate change risks, their timing and impacts on cities and landscapes. Whilst the industry and the effectiveness of voluntary climate risk reporting, fiduciary responsibility and climate orientated laws (focused at this stage on emissions reductions) will escalate in the level of influence on the decision-making of stakeholders. Although, as climate risk reporting is being adopted by many businesses and industry, the influence and implications for decision-making, investment and divestment, is still yet to be fully realised (Gardiner, 2022; Hurlimann et al., 2018; Kube et al., 2019; Warren-Myers et al., 2021). Mandatory laws, which concurrently impose reporting and compliance obligations on affected entities remain one of the best drivers for climate risk reporting's broad adoption and use (Shakti, 2020); and this will likely lead to greater transparency of risks and how the market prices these risks. However, whether voluntarily adopted, or mandatorily imposed, the impact for stakeholder and market awareness remains the same; related risks must be identified and included in valuation reports, and where relevant in the specific market context, must be considered in the assessment of market values.

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⁹ Should anyone wish to gain access to articles referenced here, that are authored by Georgia Warren-Myers or Lucy Craddock please don't hesitate to contact them at g.warrenmyers@unimelb.edu.au or l.craddock@qut.edu.au

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