The Built Environment Policy and Practice Context to Facilitate Climate Change Action - the Role for Planning and Design

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Abstract
Human settlements are key sites in which there is a need for effective climate change action. This paper reports findings in summary of a wider study into the integration of climate change adaptation and mitigation actions across the built environment in Australia. It reports on a process map of the built environment, describes Australian built environment policy; the preparedness of Australian built environment professionals; identifies action across the life cycle of the built environment; and barriers and facilitators experienced by Australia urban designers.

Key words: climate change, built environment, professionals

1 - Introduction

In its 6th Chapter, the Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report, "Cities, settlements and key infrastructure" (2022), states that planning and urban design are essential to climate change action. However, it also highlights that impediments to action must be overcome. With this in mind, finding ways for planning and built environment practitioners to take meaningful action on climate in circumstances where there is a lack of clarity is important. This often takes place within complex urban management processes and systems (IPCC, 2022: 6-90, 6-105).

This paper reports summary findings of a large Australian Research Council funded study into integrating climate change action (adaptation and mitigation) across the built environment. It explored how climate change action could be facilitated from the viewpoint of built environment practitioners in Australia, paying heed to the policy context. The research brought together an interdisciplinary team of built environment researchers, with a range of academic and practice backgrounds. Considerable engagement with practitioners and policy makers was included. Its overall aim is to identify actions in policy and practice that assist to achieve effective and efficient climate change adaptation and mitigation actions in the main sectors of Australia's built environment, including: design (architecture, landscape architecture and urban design); urban planning; construction; and property. Policy is understood in this work to include policies, strategies, regulations, codes and legal Acts (A. Hurlimann et al., 2024; A. Hurlimann & A. March, 2012).

Caused by anthropogenic greenhouse gas (GHG) emissions, climate change is having increasing impacts on systems globally. Considerable international recognition exists of the urgent need for reduced GHG emissions to avoid catastrophic climate change, and adaption

to deal with changes in climate that are unavoidable (IPCC, 2015). This action of climate change mitigation, in addition to climate change adaptation dealing with existing and future impacts has particular importance in cities (Gleeson & Steele, 2010; McGuirk, Dowling, & Bulkeley, 2014). Built environments are where the majority of the world's population live and produce the most GHG emissions. The impacts of climate change such as extreme weather, wildfires, floods, storms and sea level rise are also increasingly felt in cities, including in Australia (BoM & CSIRO, 2020).

Australia is a highly urbanised country and has an urgent need to address climate change. In this paper the manner in which production and modification of the built environment occurs focussed on, including the activities of the design, urban planning, construction and property sectors. Australian governments at federal, state and local levels have developed many policies to address climate change (A. Hurlimann et al., 2024). While action to address climate change has occurred, it appears unlikely to be of a scale extensive enough to deal with the problem. Effective policy that can achieve climate change targets are an essential factor in dealing with this challenge (IPCC, 2022).

Built environments, also known as cities, urban areas, or human settlements are defined variously. For this research we follow the 2016 Australian State of the Environment report definition:

…the human-made surroundings where people gather to live, work and play. It encompasses both the physical structures where people do these activities and the supporting infrastructures, such as transport, water and energy networks. The built environment is a material, spatial and cultural product of human labour and imagination." (Coleman, 2017: 2).

To consider barriers and facilitators of climate change adaptation and mitigation, the paper reports findings relating to: 1) mapping the Built Environment Life Cycle; 2) describing the Australian built environment policy context; 3) assessing the preparedness of Australian built environment professionals, including planners; 4) identifying the mechanisms for influence and action across the life cycle of the built environment; and, 5) the barriers and facilitators experienced by Australia urban designers.

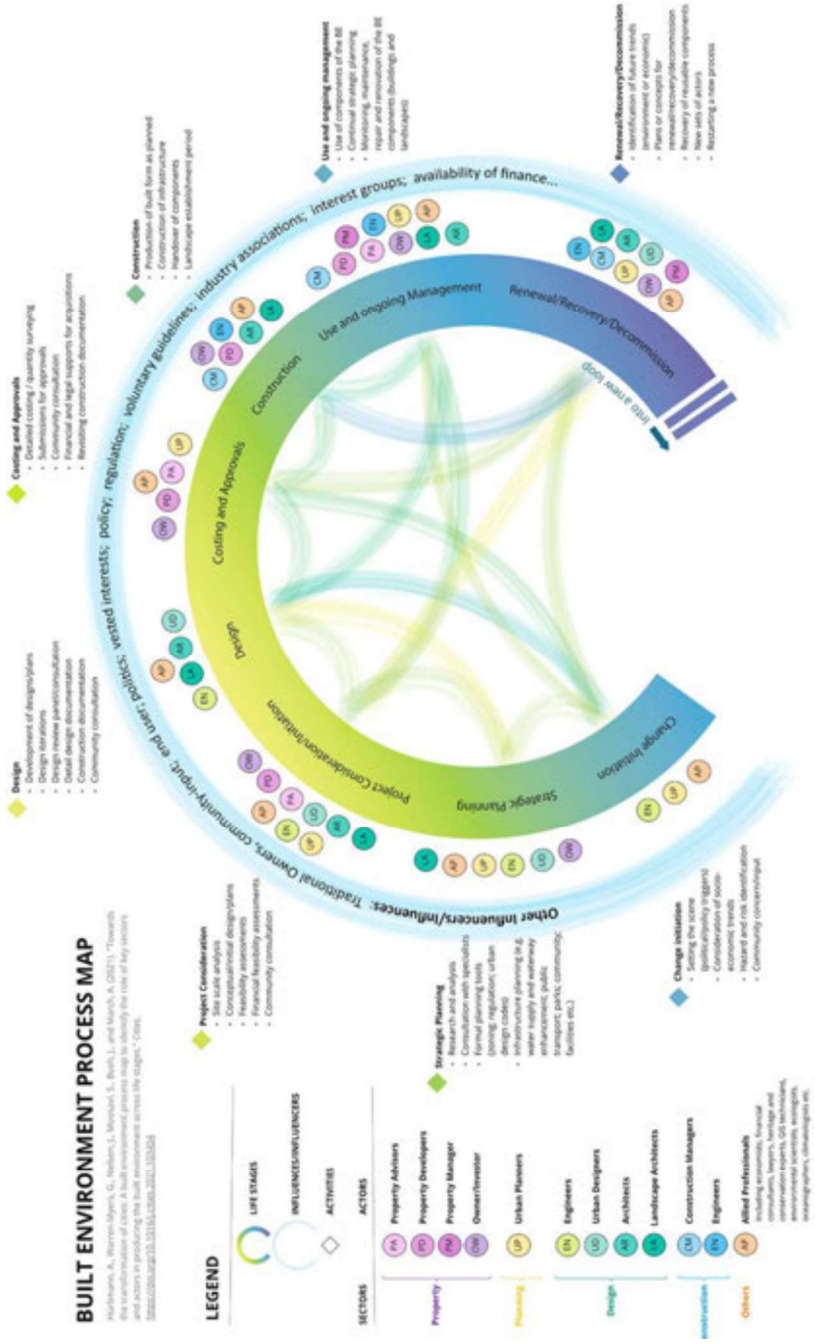
2 - Climate Change and the Built Environment Life Cycle

This section sets out a process map to describe the production of the built environment as a life cycle developed at the beginning of this project (Hurlimann et al 2022). Process mapping allows the development of a model to show "relationships between the activities, people, data and objects involved in the production of a specified output" (Biazzo, 2002: 42). They are recognised for their descriptive value in assisting defining, improving, and re-designing processes (Biazzo, 2002). Biazzo (2002 p.43) sets out four common perspectives represented in process maps: 1) the process or fundamental activities; 2) when and how the elements of the process are carried out; 3) where and by whom they are undertaken; and 4) the structure and relationship between the stakeholders in the process. The process map developed and presented of the built environment in this paper identifies key activities in producing the built environment. At the same time, it identifies the key sectors and actors contributing to the production of the built environment across life stages.

Distinct phases were followed to develop built environment process map (Hürlimann et al., 2022). Drawing on the methods of Sanders, Ross, and Coleman (1999) and Biazzo (2002),

the following actions were taken 1) establishment of temporal via life stages 2) identification of the activities contributing to producing the built environment 3) identifying key sectors' involvement across life stages 4) identification of key actors and professionals across the life stages (Sanders, Ross, & Coleman, 1999). Diagramming was developed to describe the arrangements showing the structure and relationships between stakeholders.

Following internal development, external input from industry professionals assisted to verify and further refine the process map. An expert reference group comprising 18 members met to critique and discuss the preliminary process map was undertaken, including breakout sessions. Outcomes of meeting with the expert reference group led to a number of changes and ongoing iterations of the process map. Further feedback was then sought from the expert reference group for verification, thus finalising the built environment process map. The final built environment life cycle map is shown in Figure 3 below (Hürlimann et al., 2022).


BUILT ENVIRONMENT PROCESS MAP
LEGEND
LIFE STAGES
INFLUENCES/INFLUENCERS
ACTIVITIES
ACTORS
SECTORS
Property
Planning
Design
Construction
Others
Other Influencers/Influences: Traditional Owners, community input, end user, politics; vested interests; policy; regulation; voluntary guidelines; industry associations; interest groups; availability of finance...
Strategic Planning
Project Consideration
Design
Costing and Approvals
Construction
Use and ongoing Management
Renewal/Recovery/Decommission
Change Initiation
into a new loop

The design of the built environment life cycle map highlights the non-linear nature of the ways that the built environment is produced and maintained over time, represented by a horse-shoe shape. This is because the renewal/recovery/decommissioning stage may lead to initiation of a new projects, rather than rather than the same cycle. The diagram sets out eight main stages, demarcated by shifts in actors' involvement, the roles taken on, and their influence. Internal connections between stages represent non-linear and iterative characteristics fundamental to the process. While some projects may follow a linear progression through the stages, more often the processes include numerous feedback loops, short-circuits and iterative modifications.

This process map developed seeks to improve understandings of the ongoing production of the built environment. It addresses gaps in current approaches by describing the extensive range of life stages. It considers diverse built environments sectors and articulates the role of key actors, and the relationship between them, while visualising the process. There are limitations to the process map, particularly regarding its complexity being represented in a simple two-dimensional form and acknowledging the diversity of different and particular context-specific circumstances. Notwithstanding, this representation contributes to understanding how the built environment is produced, as a step to finding ways to make transformative changes in practice to address climate change. This could be applied to contexts ranging from climate change action, sustainability objectives, to the incorporation of improvements to address disability.

3 - Understanding the Built Environment Policy Context

Built environments are important places in which social and economic activities are focused. They are also sources of significant GHG emissions. To transform built environments so that they can facilitate and incorporate appropriate action to address climate change, appropriate policy instruments must exist. Typologies suited to describing and analysing built environment policies in an holistic way are limited.

Based on a wide review of literature we developed (see Table 1) a 'built environment policy framework' consisting of a policy instrument typology (strategies, laws, regulations, guidelines, voluntary instruments and programs) and a built environment policy setting (governance level, sector, property type, life stage, timeframe) (A. Hurlimann et al., 2024).

Policy categories from existing literature:	Regulatory	Regulatory	Informational	Informational	Financial/other incentive	Government provision and direct action
Policy instrument Types and examples	Law • Legislation • Statutes	Regulation • Building regulations/ standards • Codes •Development controls e.g., zoning, overlays,	Strategy • Strategic plans • Spatial plans	Guideline • Policy advice/guidance • Guidelines	Voluntary instrument • Voluntary standards • Awards • Voluntary certifications • Grants and subsidies	Program •Implementation of projects/ programs of action • Professional education •Experimentation

		growth boundaries •Environmental and other impact assessments • Taxes / rebates / buy-backs • Financial levers				
Definition	Rule/s enacted and recognised as requiring or forbidding certain actions. Binding force.	Prescribed rules to guide practice and implement law/s. Can include those with financial implications.	Long term plan or policy which articulates goals and methods of achieving them.	Principle/s guiding or directing action. Can be compulsory or non-compulsory, depending on how it is implemented.	Non-compulsory instruments to guide practice, including fiscal incentives.	Planned activity/ies to assist realisation of goals.

Table 1 - Policy instruments typology with relevance to the production of the built environment
Source: (A. Hurlimann et al., 2024: 5)

The framework was tested in Australia to consider three local municipalities. Policy instruments that influence decision making regarding, and management of, the built environment in Victoria, Australia were identified and analysed using an iterative process. Policy instruments that met the key criteria were selected: influential in explicitly guiding decision-making (of public or private actors) regarding the built environment of the jurisdiction; local, state, national, international and non-government. In assessing relevant local governments, policy emanating from international, national and state levels was included if it met the inclusion criteria.

The first local study area, The City of Melbourne, centres on a high density, globally-connected central business district within greater metropolitan Melbourne in the context of surrounding suburbs. Its population is 154,000 (greater metropolitan Melbourne has a 4.9 million 2021 census population), a land area of 37.33 km^2. The City of Greater Geelong (Geelong) second largest city in Victoria and includes urban settlements, growth areas, regional towns, rural land, and has a coastal location. Its population is 271,000, with a land area of 1252 km. Wellington Shire Council (Wellington) is a regional municipality, including 45,000 persons and an area of 10,811km^2.

Overall, Melbourne had 33 built policy instruments, Geelong 23, and Wellington nine. By a considerable amount (as shown in Figure 1), the dominant policy instrument type was ‘strategy’. Melbourne and Geelong had many biodiversity, environmental, sustainability and climate change strategies, while the more remote regional Wellington municipality had few. Across the all governance levels, with a focus on the City of Melbourne at the local level, the policy instrument type were ranked in order: strategy (44), guideline (30), law (17), regulation (12), voluntary instrument (9), and program (5). State government had the most policy instruments (47), followed by the local government (37), federal government (21), international (7), then non-government (5). State government had more than double the number of laws than the federal level, while local government had more strategies than any other level of government. This may be due to their role in the built environment, which differs in comparison to the federal and local levels, with more responsibility distributed. The mapping identified that strategies were the dominant policy instrument. Fewer policy instruments were found to directly address the built environment’s later life stages, and there were fewer at federal and international levels of governance.

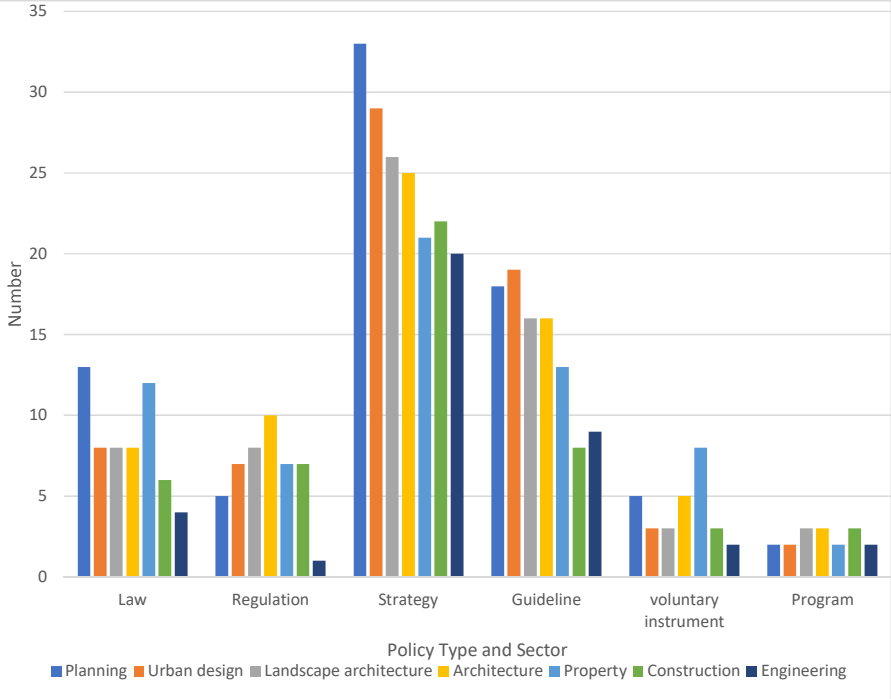


Figure 1 - Victoria's Built Environment Policy Instrument type by built environment sector

Examination of the documents revealed that, according to sector, they were applied across the life cycle of built environment elements revealing distinct, albeit overlapping, stages as shown in Figure 2 below.

Change Initiation
Strategic Planning
Project Consideration and Initiation
Design
Costing and Approvals
Construction
Use and Ongoing Management
Renewal, Recovery, Decommissioning

Figure 2 - Built Environment Life Cyle Application Evident in Policy instruments

Overall, the results show a relative dominance of 'strategy' compared with the limited amount of implementation via 'programs' that guide action and achieve goals. This suggests that there is a need to seek greater diversity of policy instruments at all levels government. Generally, strategies appeared to be non-binding and more easily prepared, without certainty of action. Broadly, there appears to be a need to have more effective policy in the later life stages of the built environment, suggesting that identification of and augmentation of policy gaps in stages such as 'renewal and recovery' would facilitate transition to a more circular economy. It is noted that actions taken by the European Union, specifically, the Circular

Economy Action Plan (European Commission, 2020);(Spani, 2020) recognises the environmental and climate change impact of resource extraction and greater circularity. Federal government in Australia appears to have insufficient policy instruments if it is seeking greater influence to enhance its climate change leadership and to meet international goals (such as the Paris Agreement). There is a general lack of strong 'command and control' policy instruments of regulation and law implemented across the entirety of life stages and governance levels. These will be necessary to allow government to achieve increased uptake of climate change goals. The next stage of the research is to assess the extent to which these policies address climate change and this is currently under peer review.

4 - The Preparedness of Planners and other Built Environment Professions for climate change action

We now turn to considering the preparedness of planners and other built environment professionals to take climate change action, based on a review of literature in English. The research assessed existing scholarship that considered climate change preparedness of professionals within built environment sectors (A. C Hurlimann et al., 2022). The problematizing review was an 'opening up exercise' to enable researchers to rethink existing knowledge in a generative manner (Alvesson & Sandberg, 2020).

Moser and Luers's (2008) framework for climate change preparedness was followed. Accordingly, this examined awareness, analytical capacity, and action of built environment professionals in the context of their sectors (Moser & Luers, 2008). The review assessed reported facilitators and barriers of climate change action. The main data base used was Scopus, in parallel with discipline-specific journals. Scopus is a source-neutral abstract and citation database curated by independent subject experts (Elsevier 2020). The database includes 25,000 titles from over 5000 publishers, the majority being published after 1996. The research reported here (A. C Hurlimann et al., 2022) was guided by the following two questions:

1. What barriers exist to climate change action in and across the built environment sectors: urban planning, property, construction, and design (including urban design, landscape architecture and architecture)?

2. What facilitates action to address climate change in and across these built environment sectors?

Following the screening and selection methods of Moher et al., 175 articles were included in this research (Moher, Liberati, Tetzlaff, Altman, & PRISMA Group*, 2009), with 50% of the articles published in the period between 2017 and 2020. Detailed analysis was undertaken in an excel spreadsheet. The review began with the collection of basic meta-data such as sector of focus; type of research (empirical/non- empirical); details of the method; location of the research; and whether climate change adaptation, mitigation or both, were examined. In terms of overall numbers, papers addressing barriers, facilitators, and climate change awareness were highest in urban planning, property, and construction literature, whilst urban planning also had a strong focus on climate change action as shown in Figure 4 below.

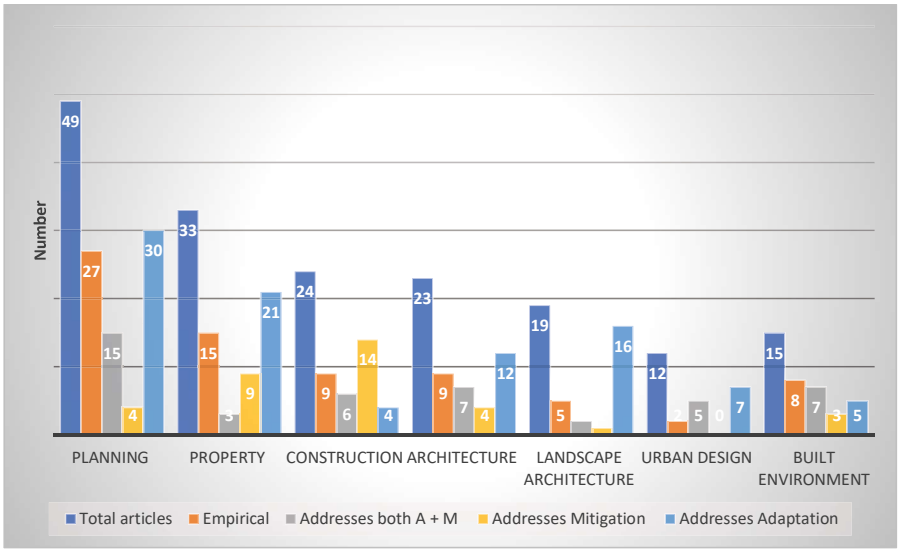


Fig. 4. Literature review results: number of papers that addressed: climate change preparedness (awareness, analytical capacity and action); barriers or facilitators of climate change action - across built environment sectors (note: papers could be in multiple categories). (source: A. C Hurlimann et al., 2022)

Table 2 below shows the key barriers to climate change action identified in literature reviewed across the built environment. The left column shows the broad themes of barriers identified from across the literature, with the right column showing specific barriers. The three major barriers to climate change action identified in the literature are funding and cost, knowledge, and time frames.

Category	**Specific Barriers to Climate Change Action**
Risk Evaluation	First movers' risk Pricing climate change risk into asset values
Roles and Responsibilities	Lack of leadership Not viewed as responsibility among developers
Funding/ Cost	Perceived high cost Lack of resources Budget constraints
Policy/ Regulations	Limited regulations Policy/ regulatory confusion Uncertainty of planning policy
Knowledge	Inconsistent and unclear language Lack of awareness/ belief of CC Lack of knowledge/ scientific information Uncertainty of CC impacts Lack of adequate education
Time Frames	Short political time frames Short budget time frames Short local need time frames Long term adaptation horizon

Clients/ community engagement	Low demand from residential sector Lack of interest from clients Community opposition
Conflicting priorities	Influence of CC works on amenity values Low priority among developers Climate change versus economic growth Environmental performance versus social values
Tools	Lack of domestic tools Lack of tools for performance metrics

Table 2 - Barriers to climate change action across built environment sectors – reported in literature. Source (A. C Hurlimann et al., 2022).

Table 3 shows the primary facilitators of climate change action distilled from literature. The most reported facilitator was financial levers, mainly in the construction, property, and urban planning literature (Gurran, Norman, & Hamin, 2013; Lützkendorf, Fan, & Lorenz, 2011). Improved climate change knowledge, its effects, and practical or viable strategies for action were reported to be important facilitators, across all sectors, but particularly within urban planning. The third highest identified facilitator was disciplinary capacity and skills, identified mainly within the design sub-sectors, as well as the need for more integrated approaches and use of knowledge from related fields such as ecology. “Supporting actors and champions’ beyond the discipline, were also identified as critical, notably in the urban planning literature, which often seeks to achieve integrated and multiscale approaches to taking climate change actions (A. C. Hurlimann & A. P. March, 2012).

Category	Specific Barriers to Climate Change Action
Knowledge	Increased awareness/ education Consideration of long terms CC impacts Access to technical support Place based knowledge Effective communication of risk
Financial Levers	Financial stakeholders Access to international/ national aid Incentives for innovation Customer demand Lower green premiums Value discounts/ Brown discounts
Policy / Regulations	Carbon pricing Performance-based decision making Energy efficiency standards Rating tools
Organisational Governance	In-kind support Organisational values/ strategies Breath of sectoral support
Supporting actors/ champions	Environmental NGOs Frontline practitioners Community Innovators
Political support	Political will and commitment Supportive multi-level political environment
Climate related disasters	Severe weather events
Disciplinary capacity/ skills	Ecological knowledge Integrated and multi-stakeholder processes Visual communication techniques Considering uncertainty and time horizons

Table 3 - Facilitators of climate change action across built environment sectors – reported in literature.

Being able to apply generally agreed upon high-level concepts, evidence and thinking to practical, complex and non-routine problems is the basis for professionals taking action (Webber & Ruge, 2019), and will be critical for climate change action. A starting point for this is the existence of trustworthy sources of fundamental knowledge, such as evidence-based literature suitable for application by built environment professionals, decision makers and educators. This review of literature raises many implications for the built environment professions, and for the achievement of climate change goals in the production and use of built environments. It suggests a need for increased strategic action to locate climate change capacity-building on the agenda of both private and public built environment actors. There may be opportunities to improve preparation for climate action within the professions. This could include professional education; improved climate change accreditation of university education; and membership of professional associations. However, the review has shown that research in some built environment sectors is not well covered (e.g. for urban planning see (Hamin & Marcucci, 2013; Anna C Hurlimann, Moosavi, & Browne, 2021; Preston-Jones, 2020). The review highlights the limited integration of skills and resources across built environment sectors and professionals within them to maximise climate change knowledge capacity and action.

5 - Barriers and Facilitators to Urban Design Climate Change Action

The ability professionals to take climate change action is fundamental to finding ways to transform the built environment via climate change adaptation and mitigation. This final section reports results of an empirical study of the main categories of action which urban designers in Australia are taking to address climate change, and the barriers and enablers that they face in doing this (reported by March et al., In-press). The large Australian Research Council Grant is taking a focused look at practice across each built environment sector, which in addition to urban design are at various stages of publication including urban planning (under review), landscape architecture (Moosavi et al., 2023); architecture (under review) and sustainability (under analysis); in addition to earlier studies focused on the construction (Anna C Hurlimann, Browne, Warren-Myers, & Francis, 2018) and property sectors (Warren-Myers, Hurlimann, & Bush, 2020).

Here we focus on urban design, and begin by considering the practice of urban design itself, we argue that, despite some variations across urban design practices, shared goals and core challenges exist. They are into five categories. The first, Inter-relationships and Integration, acknowledges that urban design action in complex arenas of diverse interests, actors and responsibilities is both a core benefit or, and challenge to, its effectiveness (Elrahman & Moureen, 2021). The second, Scalar Connections seeks to understand that urban design acts at a range of scales: the macro scale, encompassing planning, transportation and infrastructure systems, narrowing down to small -scale matters such as street lights, materials and furnishings (Department of Infrastructure and Transport, 2011). Third, urban design is deployed for increasingly Diverse Aims, while seeking simultaneously seeking integration (Carmona, Heath, Oc, & Tiesdell, 2021: 3). Fourth, Public Values and Regulation via integration of disparate goals is central to effective urban design (Carmona et al., 2021; Moughtin, 2003) often taking the form of state sanctioned intervention (Carmona, 2016). Finally, Urban design's orientation is towards Strategic Public Orientation and Professional Legitimacy, such seeking to further the interests of public, common, or interstices land's "values" that are otherwise afterthoughts (Elrahman & Moureen, 2021).

Urban design practice includes overarching themes seeking to make the links between human settlements, natural systems and environmental sustainability. However, it is also the case that when climate change action is included, even a goal, its manifestation is often contextual or an aside rather than being core. Limited direct urban design scholarship examines barriers and facilitators to climate change mitigation and adaptation.

Hebbert (2009) highlights that while exemplary case studies exist, a lack of substantive knowledge within practice is a barrier to turning existing climate change focused urban design decision-making tools into action (Hebbert, 2009). He suggests that there is tension between public spaces aimed towards resilience and good place-making outcomes. Other state that urban design concepts such as the *compact city* may challenge adaptation efforts, such as in relation to flood control. Others such as (Childers et al., 2015) and (De, Kerselaers, Van, & Rogge, 2017) maintain the potential for urban design to play an important role in helping to develop solutions to climate change adaptation. Urban designs abilities in collaboration and sectoral knowledge integration were seen as potential facilitators of climate action (Childers et al., 2015), as well as using design workshops to develop grounded local climate adaptation needs (Jones et al., 2018). Lenzolzer et al (2020) sought to understand urban climate awareness and the urgency to adapt internationally among citizens, local politicians, urban planners and designers.

Uncommon until the 1980s, urban design is now prominent in Australia. Kozlowski (2006) noted that most major strategic plans in Australia have made some reference to urban design. Almost all design and planning programs in Australian universities now include urban at least some design. Similarly, the majority of large city-based municipalities now employ urban designers. Urban design does not have a dedicated professional body in Australia and it is not included in the Australian census as a job, nor are there statutes governing qualifications, roles and responsibilities. A quasi-accrediting agency for urban design is the Planning Institute of Australia (PIA) which can accredit planning programs with an urban design emphasis (Planning Institute of Australia, 2020: 13, 16, 22). Five currently have an urban design focus (Planning Institute of Australia, 2022). The Australian Institute of Landscape Architecture (AILA)'s recognise urban design projects in its annual awards.

To understand climate change actions taken by Australian urban designers and the barriers and facilitators for climate change action that they face, interviews with 22 urban designers from diverse locations and firm types within Australia were conducted, as reported in March et al In Press. Practitioners from diverse locations, agency and firm types within Australia were identified and interviewed. Semi-structured interviews focused on the participants' practice, organisation, and profession at large, seeking to understand the barriers and facilitators to climate change action in the built environment.

A qualitative thematic analysis was undertaken using a quasi-inductive or abductive approach (Piekkari 2018). Seven key types of climate change action were identified across the practitioners interviewed, as shown in Table 4 below.

Policies and Strategies (establishing, enforcing or following)
Education & research
Project designs & practices
Reducing carbon footprints
Advocating or lobbying
Sustainability measures & ratings
Type of projects & tenders undertaken oriented to climate change action

Table 4 - Type of Climate Action Taken (ranked: highest incidence at top)

While the themes above emerged strongly across the interview subjects, the ways they took these actions were diverse, reflecting the breadth of activity inherent to urban design, the respondents' diverse roles and the need for urban designers to be interdisciplinary. While a relatively small sample, the results indicate that the practices of these Australian urban designers are strongly linked with climate change action. When the results were analysed in terms climate change the five top *facilitators* were found, as shown in Table 5 below.

Culture, values, expertise, or reputation that prioritises sustainability measures & CC action to influence positive outcomes
Government targets, priorities, resources, & regulations
Building, promoting, & refining CC awareness
Design practices & outcomes that improve the ability to produce sustainable built environment outputs or inherent consideration of sustainability and climate change (e.g. passive design)
Accessibility of sustainable materials & practices. May include increasing accessibility through affordability, supply chains, information or resources

Table 5 – Climate Action Facilitators: Experienced or Observed by Respondents

Note: Ranked in order of mentions from most frequent at top, to least at bottom.

It is noteworthy that the theme of *culture, values, expertise, or reputation that prioritized sustainability measures & climate change action to influence positive outcomes* emerged as important. Similarly, most respondents indicated the importance of *government targets, priorities, resources, & regulations* facilitating climate change action in the broader built environment. However, it is important to recognise that only two suggested this was the case within the urban design sector itself, but rather in the wider suite of policies described above in *Understanding the Built Environment Policy Context*. This is likely to be a result of urban design being largely unregulated as a profession in Australia, but rather, being a bridging or facilitating role. The *building, promoting, & refining climate change awareness* and *culture, values, expertise, or reputation* were also reported as important facilitators. In contrast, the five main barriers to climate change action by urban designers interviewed are presented below in Table 6.

Limited influence, reach, or decision-making capabilities
The externality of sustainability leading to a lack of accountability, including the ability to get away with greenwashing, or lack of incentives
Management or structural issues pertaining to things like available resources or power distribution
Competing project deliverables and constraints on budget, time, and resources
Poor government policies & leadership

Table 6 – Barriers to Climate Action Experienced or Observed by Respondents.

Note: Ranked in order of mentions from most frequent at top to least at bottom.

Most respondents indicated that a key barrier across the broader built environment was *limited influence, reach, or decision-making capabilities* and that the *effects of non-sustainability being externalised* and a *lack of accountability (including ability to get away with greenwashing) or lack of incentives to action*. Many also indicated that *poor government policies & leadership* across the built environment was a barrier.

Overall, the results indicate ways that urban designer practitioners, the organisations within which they work, and government agencies, can facilitate greater climate change action. Demonstration of strong leadership, whether at state or local government level, or within the private sector was seen by practitioners to be an important enabler. Establishing key targets and firm regulations assisted in association with financial and other relevant incentives was considered fundamental. The provision of accessible and trusted information for practitioners and decision makers was considered essential and a facilitator of integration in actions across multiple temporal and spatial scales. This aligns with the general understanding expressed amongst urban design practitioners that collective outcomes going beyond single projects or interests are a defining characteristic of the profession. Organisational leadership and culture, allied with a need for government to provide avenues for integration of outcomes was also highlighted.

6 - Conclusions

While there is now widespread recognition internationally that urgent action is needed to reduce GHG emissions to avoid catastrophic climate change, and that adaption is needed to deal with changes in climate that are unavoidable (IPCC 2015; 2018) actual action in the built environment is challenging and complex. This paper set out in summary a number of

findings of a project that considered the integration of climate change adaptation and mitigation action in Australia's built environment. It took the viewpoint of built environment practitioners in Australia, while seeking to understand the complexities of policy.

The paper began with a description of the Built Environment Life Cycle, set out so that diverse built environment sectors could be understood across sectors that are typically understood in isolation, including the articulation of key actors' roles, their relationships, and the potential for key transformative actions to be taken. The paper then presented a framework to describe built environment policy, including policy types and tiers of governance. By application to the Australian case via assessment of three municipalities', it was shown that there is a dominance of 'strategy' compared with the limited amounts of implementation via more direct 'action programs'. Further, it was seen that there was a need for more effective policy that considered the end of life cycle in the built environment, and a need for more instruments of direct regulation and law implemented to encourage meeting of targets.

The paper then reported on the preparedness of Australian built environment professionals, including planners, based on a wide review of literature in English. It showed that there is a strong need for trustworthy, evidence based literature that can be used to take action by practitioners, for improved education and accreditation, and for more strategic, integrated and long term approaches to be developed. Finally, findings of a more detailed study into the perceptions of Australian urban designers were reported. It showed that the main climate change action taken by urban designers are via establishing, enforcing or following clear policies and strategies, by preparing or undertaking education or research, and by direct action via design. It also highlighted the importance of strong leadership at all levels and across public and private sectors in providing opportunities and examples for climate change action – typically in association with strong regulatory and incentives-based contexts.

Overall, this research suggests that climate change action in the built environment requires understanding of the entire built environment life cycle, the various actor's roles in this, and ensuring integration is occurring. For example, it appears that in Australia, there is a need for additional work in the renewal/ recovery/ demolition phase to close the loop. There is for greater leadership across tiers of government and in the private sector, allied with easily access information to aid decisions.

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