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## Australian urban designers' experience of barriers and enablers to climate change action

Alan March<sup>a</sup>, Anna Hurlimann<sup>a</sup>, Sareh Moosavi<sup>b\*</sup>, Judy Bush<sup>a</sup>, Georgia Warren-Myers<sup>c</sup> and Geoffrey R. Browne<sup>a</sup>

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### ABSTRACT

Urban designers have considerable potential to take important climate change actions in the built environment. Based on interviews with urban designers across Australia, it was found that the main actions taken were: development and use of policies and strategies; education and research; appropriate project designs; reduction of carbon footprints; advocacy and lobbying; the use of sustainability measures and ratings; and taking on projects oriented to climate change action. Key facilitators of these actions that overcame barriers were strong leadership, establishment of targets and measures, effective regulation, financial and other incentives, and access to trustworthy, practical information.

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### KEYWORDS

Urban design; climate change; professionals; barriers; enablers

## Introduction

In the context of climate change, the need for 'cities to mitigate greenhouse gas emissions and respond to the impacts of climate change by adapting' (Landauer, Juhola, and Klein 2019) is widely regarded as a central element in meeting this urgent challenge. Chapter 6 of The Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report, 'Cities, settlements and key infrastructure' (2022), highlights the use of urban design and overcoming impediments to its effectiveness as a key mechanism (6–93). However, the roles and capabilities of urban designers in meeting this challenge remains unclear, particularly in the context of diverse societal, financial, institutional and professional uncertainties (IPCC 2022, 60–90, 6–15).

This paper reports results of a 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 to taking climate change action. The paper first considers the practice of urban design, focusing upon goals and challenges in published literature. Next, relevant literature considering urban design and its role in climate change action is reviewed, and a description of urban design in the Australian setting is provided. These are followed by

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an outline of the research methods, presentation of the results, discussion of the results, and finally conclusions pointing to the significance of this study.

## Urban design: goals and challenges

It is argued that, despite some variations across urban design practices, shared goals and core challenges exist. These are grouped into five categories.

### *Inter-relationships and integration*

Urban design action in the complex arena of multiple interests, agents and responsibilities is held as both a core benefit and challenge to effectiveness (Elrahman and Moureen 2021). Gehl's description of urban design as the management of the spaces between buildings (Gehl [1971] 2011) invokes a focus on interactions between spaces and structures, the blurred functional relationships between private and public land, and attention to the active management of human experience and values (Gehl [1971] 2011). Urban design includes physical *space* within its broader purpose of creating, maintaining and improving *places*, and indeed to overcoming the barriers to understanding and acting on their characteristics (Llewelyn-Davis 2007, 10). A sense of place results when physical forms are mixed with activity and meaning (Carmona 2021, 5; Montgomery 1998). Managing the diversity of practices, interests and institutional contexts is inherent to successful urban design – even while this can also confound its success and easy categorization (Carmona 2021). Indeed, Elrahman and Moureen (2021) suggest that it is due to the challenges of acting across diverse realms and interests, that urban design often falls short of expectations.

### *Scalar connections*

Urban design operates from the macro scale, to encompass planning, transportation and infrastructure systems, down to micro-scale street lighting, materials and furniture (Department of Infrastructure and Transport 2011). When integrated into policy and planning systems, urban design informs land use planning, infrastructure, built form and even determines the socio-demographic mix of places (Department of Infrastructure and Transport 2011). Urban design's origins lie in bridging the spheres of architecture oriented to individual sites and buildings, and wider settlement functions that fall under the remit of 'urban and regional planning' (Carmona 2021). This deliberate 'joining' of scalar connections achieves outcomes encompassing multiple goals, including climate change (Carmona 2021). However, the realities of incomplete powers, information, and clashes of interests continue to challenge the abilities of urban design to achieve these ideals (Sorkin 2013).

### *Diverse goals*

Urban design is deployed for increasingly diverse aims. For example, Water Sensitive Urban Design; 'WSUD' seeks to manage water systems to reduce flooding and improve water quality, contain and use water locally, maintain natural systems and enhance local

aesthetics through implementing nature-based solutions (Moosavi, Browne, and Bush 2021). Likewise, reduction of wildfire impacts on human settlements is being achieved via integrated urban design approaches to building and settlement design (Blanchi et al. 2014; March and Gonzalez-Mathiesen 2020; Ramsay and Rudolph 2003). Many urban morphology approaches have been based on urban design oriented to core organizing principles, such as urban villages (Barton 2000) transit-oriented development (Thomas et al. 2018), walkable neighbourhoods (Newman, Kosonen, and Kenworthy 2016), or 20 minute cities (Mackness, White, and Barrett 2021). An increasing emphasis on integrating landscape approaches and ecological principles into designing urban spaces has resulted in different ‘urban-ism’ discourses including ecological urbanism (Mostafavi and Doherty 2010), landscape (Heins 2015), green (Lehmann 2010), multispecies (Gandy 2023), and biophilic (Tabb 2020). The dynamic and sometimes contrasting multiplicity of aspirations in urban design often leads to fragmentation of actions, driven by diverse exogenous goals. Examination of recent additions to Carmona’s latest edition of *Public Places, Urban Spaces: The Dimensions of Urban Design* acknowledges power as a core driver of change that often overrides initial aspirations (Carmona 2021, 3).

### **Public values and regulation**

Integration of disparate goals is central to effective urban design (Carmona 2021; Moughtin 2003). Urban design can be understood as a kind of project management that draws together diverse actors to achieve common purposes, typically intersecting with governance mechanisms seeking wider public values. When urban design takes the form of state sanctioned intervention, it can require some elements to be regulated and administered bureaucratically (Carmona 2016). While regulating urban design can be important for ensuring minimum standards, it has its downsides. Stifling action, creativity and economic growth (Ellin 2006; Elrahman and Moureen 2021); achieving specific place-based local outcomes versus joined-up overall goals and centralist management (March 2012; Sorkin 2013); the ‘rigidity’ or rules versus changing societal expectations (March 2012); and, focusing on specific outcomes versus causing unintended negative consequences (Elrahman and Moureen 2021; Madanipour 2006a).

### **Strategic public orientation and professional legitimacy**

Generally, design ambition, regulation and investment focusses on individual buildings, landholdings or public infrastructures (such as roads or squares), and so is often oriented to single or a limited number of functions. As a result, public or common land’s ‘values’ can become an afterthought (Gehl [1971] 2011; Gehl et al. 2006; Rouse 1998; Sorkin 2013). It is unfortunately common that *urban* design [due to its focus on interstices] seeks to elevate wider public values that secondary to other, more intentional (or economic) activities (Elrahman and Moureen 2021). This can be as a result of a lack of strategic vision, short termism (Carmona 2021), a lack of urban design literacy (Rouse 1998), or a failure to develop and apply reliable guidelines and controls (Llewelyn-Davis 2007). This is worsened by urban design’s lack of formal status as a profession (Elrahman and Moureen 2021; Floyd 1978; Lang 1994; Madanipour 2006b; Sorkin 2013).

## Urban design & climate change action

Many seminal works and practices of urban design include themes dealing with the links between human settlements, the natural world and environmental or ecological sustainability (see Agyeman et al. 2016; David and Collins 2014; Geddes [1915] 1968; Howard [1898]1998; Lang 1994; McHarg 1969). However, even while texts such as Carmona's (2021) *Public Places, Urban Spaces* mention climate change, it is contextual rather than a core purpose. There is limited direct urban design scholarship examining barriers and facilitators to climate change adaptation and mitigation.

Some contributions include (Hebbert 2009) who 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. He argues there is tension between optimizing public spaces for resilience and good place-making outcomes, whilst others argue that urban design concepts such as the *compact city* may challenge adaptation efforts, especially in relation to flood control. In contrast, both Childers et al. (2015) and De Waegemaeker et al. (2017) highlight the potential for urban design to play an important role in helping to develop solutions to climate change adaptation. In a recent review (Hurlimann et al. 2022), only one empirical study was found that examined how barriers to climate change adaptation explicitly within urban design can be overcome through international design workshops. In it, the authors explored alternative futures and helped to visualize future adaptation challenges {De Waegemaeker, 2017 #1713}. The greater collaboration and integration of sectoral knowledge were viewed as a facilitator of improved climate action (Childers et al. 2015), as well as design workshops targeted towards local climate adaptation needs (Jones et al. 2018). Similarly (Cortêsão et al. 2020), highlight the role of visual guidelines to communicate climate-responsive design. Lenzolzer et al. (2020) sought to understand urban climate awareness and the urgency to adapt internationally among citizens, local politicians, urban planners and designers. There is a greater emphasis on climate change *adaptation* strategies (compared with mitigation) in urban design scholarly literature.

## The urban design profession in Australia

While uncommon until the 1980s, urban design has now become more prominent in Australia, aided by establishment of groups such as the Urban Design Forum in 1986. Kozłowski (2006) noted that by 2006 most major Australian strategic plans and associated documents made some reference to urban design. Currently, almost all design and planning programmes in universities include urban design aspects, including options for Masters programmes in Urban Design. Likewise, most large city-based municipalities now include urban design roles.

The most well-known documents that guide urban designers in Australia pay little substantive attention to climate change. The primary national document, *Creating Places for People: an urban design protocol for Australian cities* sets high level expectations (Department of Infrastructure and Transport 2011). However, it makes only two fleeting references to climate change (Department of Infrastructure and Transport 2011, 9, 11)

Urban design does not have a separate professional body to regulate membership or conduct in Australia, nor is it included in the Australian census; there is no ANZSCO code

for urban designers. It has no statutes governing qualifications, roles and responsibilities. The only quasi-accrediting body is the Planning Institute of Australia (PIA) which may accredit planning programmes that have an urban design emphasis (Planning Institute of Australia 2020, 13, 16, 22). Of 49 planning programmes accredited by PIA, 5 demonstrate an urban design focus (Planning Institute of Australia 2022). Additionally, the Australian Institute of Landscape Architecture (AILA)'s annual awards include a category for recognizing best practice urban design projects.

## Research method

To develop insights into climate change actions taken by Australian urban designers and the barriers and facilitators for climate change action that they face, urban designers from a diversity of locations and firm types within Australia were interviewed. Potential respondents were identified through professional networks including LinkedIn and internet searches. Invitations were extended by email with follow-up messages. The interviews were audio recorded and transcribed by a professional transcription company or via NVIVO, and subsequently reviewed for accuracy and participant de-identification. Respondents were allocated and referred to using a unique number and a code according to type of organization (Pub = public; Pr = private). A total of 21 in-depth interviews were conducted from June to September 2021 inclusive. Interviews ranged from 40 minutes to one hour in length. Due to the varied COVID-19 restrictions across Australia during that time, interviews were mostly via video conference, with some face-to-face meetings. Interviewee characteristics are summarized in Table 1.

## Interview questions

The semi-structured interviews included questions focused on participants' own professional practice, their organization, and the urban design sector overall. The interviews included series of questions about climate change and professional practice and competency. Questions specifically relating to this paper's focus included: background information about the interviewee and their organization; climate change actions they take in their practice, and barriers and facilitators for climate change action that they face. These questions were as follows:

- Could you please tell me about any actions your organization has taken to address climate change?
- What do you think the main barriers are for implementing action to address climate change in your organization/sector/across the built environment?

**Table 1.** Interviewee characteristics.

| Characteristic         | State |     |     |     |    |    |     |    | Firm type    |              | Size of firm |        |       | Gender |        |
|------------------------|-------|-----|-----|-----|----|----|-----|----|--------------|--------------|--------------|--------|-------|--------|--------|
|                        | QLD   | NSW | VIC | TAS | SA | WA | ACT | NT | Public (Pub) | Private (Pr) | Small        | Medium | Large | Male   | Female |
| Number of Interviewees | 3     | 6   | 8   | 0   | 0  | 2  | 1   | 1  | 8            | 13           | 3            | 5      | 9     | 11     | 10     |

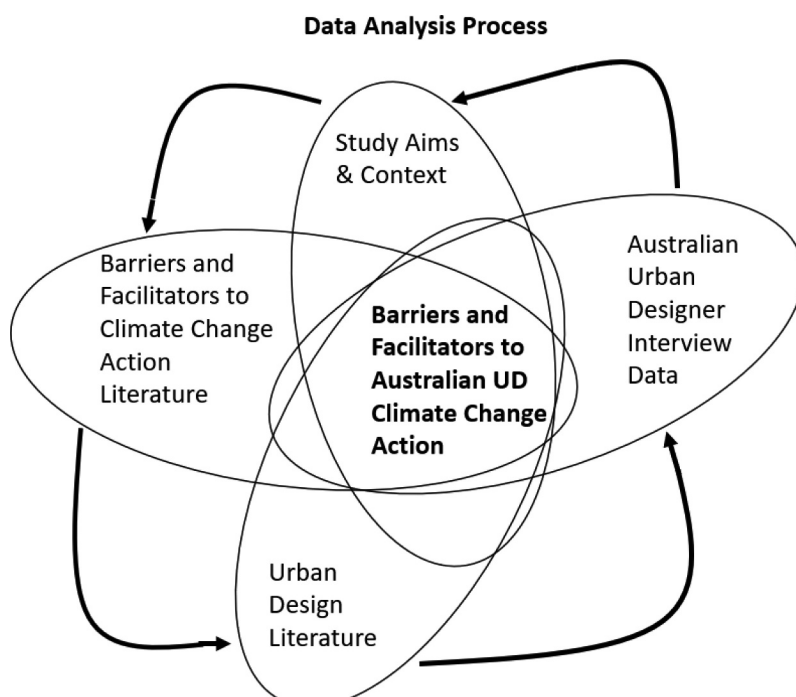
- What are the main facilitators/opportunities for implementing action to address climate change in your organization/sector/across the built environment?

Climate change action was established as both adaptation and mitigation for the purposes of the study and these terms were defined by the interviewer consistently across the interview and in line with the IPCC definitions. Respondents often mentioned barriers and facilitators of climate change action outside the specific questions, hence responses to all questions were considered in the analysis for this paper.

### Coding and analysis

A qualitative thematic analysis research strategy was used, appropriate to the interview data and the exploratory nature of the study, given that limited research has been published in this area (Maxwell 2021). Intentional selection of subjects was deployed, using protocols for data collection via interviews using pre-established, but open-ended questions based on existing literature (Yin 2013). Analysis followed a quasi-inductive or *abductive* approach (Piekkari and Welch 2018) as shown in Figure 1.

A re-iterative open coding and on-coding approach was employed whereby initial coding sought themes without strong predetermination of categories, to reduce bias (Dey 1999). Initially NVIVO software was used to code interviewee responses relating to: climate change actions; barriers to climate change action; and facilitators of climate change action. These were then reviewed and revised



**Figure 1.** Abductive research approach drawing on literature and interview data.

independently by subsequent researchers and iteratively considered. This process abductively compared interview responses and their coding with the previously cited wider literature on barriers and facilitators of climate change action and urban design literature, seeking understanding and description in line with the research aims (Piekkari and Welch 2018, 354). Interview data were generatively considered with reference to the initial framework and literature of the study, the contexts of the interviewees themselves, and the themes that emerged within the wider case itself (Maxwell 2021).

## Results

This section presents the results of the analysis and discusses the bigger picture implications in the paper's following section. The analysis of interview data identified seven main categories of action that the urban designers interviewed took to address climate change. These are presented in Table 2 below with an example quote provided.

As shown in Table 2, diverse actions were undertaken by the respondents, reflecting the general breadth of activity inherent to urban design, the diversity of respondents' roles and the need to work across and with many other disciplines. While representing a relatively small sample and without assessing actual impact, the results indicate that the practices of these Australian urban designers are strongly linked with climate change action. In terms of *facilitators* of climate change action by urban designers, the analysis found 15 categories of results, shown in Table 3.

It is noteworthy that the theme of *culture, values, expertise, or reputation that prioritised sustainability measures and climate change action to influence positive outcomes* emerged as important. Similarly, most respondents indicated the importance of *government targets, priorities, resources, and regulations* facilitating climate change action in the broader built environment, however, it is important to recognize that only two suggested this was the case within the urban design sector itself. 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. The main barriers to climate change action by urban designers interviewed are presented below in Table 4. The analysis found 20 categories of barrier.

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 and leadership* across the built environment was a barrier.

## Identification of cross-cutting themes

Building on the initial results reported above, an iterative, abductive analysis was undertaken. The shared goals and core challenges to effective urban design previously found in

**Table 2.** Type of climate actions taken by respondents or in association with others.

| Type of Climate Action Taken (ranked: highest incidence at top)         | Example Quote                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Policies and Strategies (establishing, enforcing or following)          | <i>"We also have a new ESG policy as UD01 organisation globally. So, that is a statement of intent based on sustainability pillars that we are signing up to as an entity. Obviously, we're a shareholder owned organisation so obviously, you know, there's a need for us to be responsive to market demands there for corporate behaviour and appropriate governance. ... that recent ESG strategy has certainly upped the ante across the company because that's been launched by our global CEO. ... and it's been rolled out by each of the regional CEOs and there's obviously therefore considerable buy-in to that". UD01Pr</i>                                                                                                                                                                                                                                                             |
| Education & research                                                    | <i>".. an important piece of how we address climate change, is helping people understand what needs to shift. So creating design guidance. Then it starts to elevate an awareness of how individual actions on an individual building can contribute to better climate comfort, and by thinking about orientation, by thinking about planting trees, by so that sort of design guidance, which is, I guess, the first one is about physical, tangible outcome and then the second one's actually about the advocacy of elevating and improving awareness. So I think for my organization, it's as a result of kind of involvement on masterplans. You can see opportunities for whole of system thinking. And then the other one is sort of being able to create, contribute to the creation of create design guidance that helps elevate an understanding of people's individual role". UD12Pr</i> |
| Project designs & practices                                             | <i>"it's the sort of day to day practices that are being reinforced within the company as well. And I think that sort of understanding that, it starts with those sort of small actions to how we sit in our workplace environment. So what are the materials we're using? What are the resources we're using? We are changing". (UD8Pr)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Reducing carbon footprints                                              | <i>"Yeah, well, I guess in terms of like streetscape construction, we try to minimize the carbon footprint of how the project is delivered and with that we actually try to dig on our procurement form, we ask the tenderer to actually list what are their ecological environmental methods that they're using and going or going to use in that particular project". (UD03Pub)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Advocating or lobbying                                                  | <i>"I think probably the next step ... might be around starting to be sort of more of an advocate out into the industry. So there's sort of a focus, I think, right now for us to, I guess see where there's opportunity to kind of outsource, open source some of these tools and working with Green Building councils, so we're quite actively involved with the WELL Green Building Council and then across sort of the global organization into the UK Green Building Council, and the other Green Building Councils out there and then working with the Australian Green Building Council now. So I think for us there is sort of a process of peer review and development of those pathways". (UD19Pr)</i>                                                                                                                                                                                    |
| Sustainability measures & ratings                                       | <i>"we're sort of putting together a sustainability and resilience framework in our organization at the moment to sort of try and make sure that there's something that's a bit more of a consistent way of looking at things that we can apply to projects". (UD06Pr)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Type of projects & tenders undertaken oriented to climate change action | <i>"It's certainly when we are choosing the projects we do think about, well actually do the values of the outcome stand up to what we stand for. So I would sort of say that, yes, we do align whatever projects we sort of do take on, it is to make sure that it reinforces a better outcome for the future. So that is sort of something that travels ... , I think is resonated through what we do take on". (UD08Pr)</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

the wider literature were considered in the analysis. This resulted in identification of six key themes regarding barriers and facilitators to Australian urban designers' climate change action:

**Table 3.** Facilitators of climate action experienced or observed by respondents.

---

|                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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                                     |
| Effective feedback loops relating to CC itself or failure to respond to CC that contributes to effecting positive change                                                                    |
| Genuine support for sustainability & CC action, particularly driven by community or grassroots movements                                                                                    |
| Leadership                                                                                                                                                                                  |
| Aligning economic & environmental motivations                                                                                                                                               |
| Long-term approaches & strategies                                                                                                                                                           |
| Interdisciplinary collaboration                                                                                                                                                             |
| Enforced responsibility such as holding BE actors or sectors accountable                                                                                                                    |
| Sense of duty to act on CC, even if in seemingly small ways                                                                                                                                 |
| Biophilia and the innate human proclivity to connect with nature and other living things.                                                                                                   |
| Redistribution of power that encourages or facilitates more diverse & representative actors in CC decision-making                                                                           |

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

**Table 4.** Barriers to climate action experienced or observed by respondents.

---

|                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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                                                                                                                                       |
| Biased, untrustworthy, or limited CC knowledge or information sources                                                                                                       |
| Societal & political values or factors that favour environmentally disadvantageous public, political or economic objectives                                                 |
| Client influences                                                                                                                                                           |
| Balancing profitability or affordability & sustainability                                                                                                                   |
| Apathy                                                                                                                                                                      |
| Unsustainable BE sector & actor practices even if well-intentioned                                                                                                          |
| Misdirected attention or priorities                                                                                                                                         |
| Restricted involvement in BE life stages or activities                                                                                                                      |
| Risk aversion and status quo approaches including lack of innovation or progress; inability or unwillingness to promote or act on CC due to perceived negative consequences |
| Short-termism, including lack of proactivity or urgency to respond to CC                                                                                                    |
| Restricted communication or collaboration between BE actors or sectors                                                                                                      |
| CC adaptation versus mitigation difficulties in implementing adaptation & mitigation strategies                                                                             |
| Unmeasurable environmental impacts or targets                                                                                                                               |
| Urban Sprawl                                                                                                                                                                |
| Discrepancies between BE design, construction, & upkeep, including issues pertaining to realisation or implementation                                                       |

---

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

- (1) Value Alignment, Incentives and Accountability
- (2) Economics and financial
- (3) Information and Feedback Loops
- (4) Influence, Culture and Leadership
- (5) Regulation
- (6) Temporal and Spatial Scales

These themes are taken up in the following discussion section.

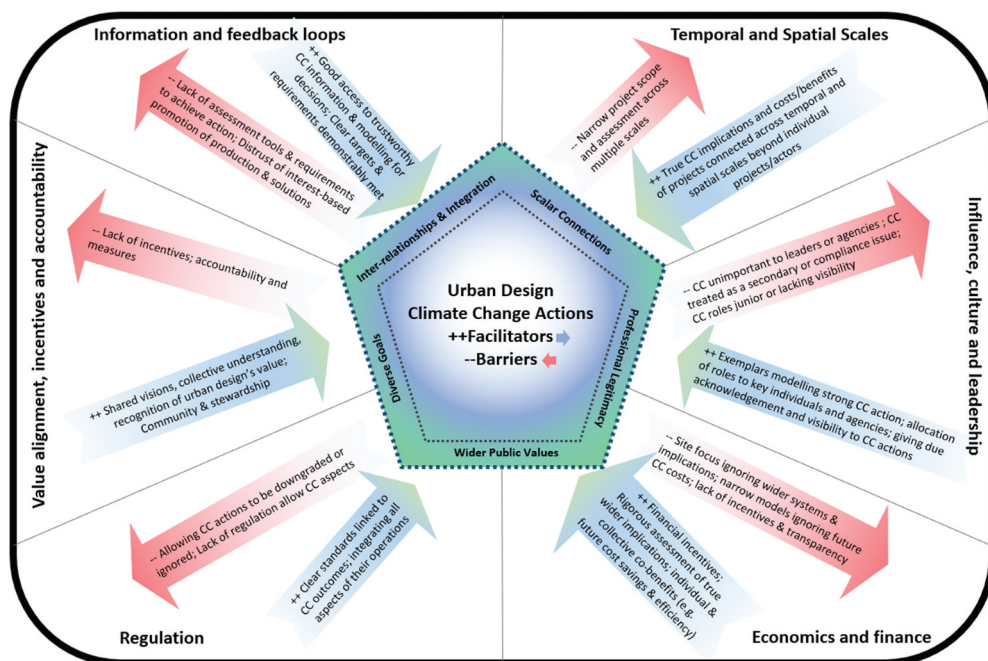
## Discussion

In the context of ongoing urban design practice and the literature, examination of the results leads to a range of wider findings. The themes, and how each was found to be both a facilitator and barrier to climate change action, are summarized in [Figure 2](#) below. The following discussion considers these using selected examples.

### *Value alignment, non-financial incentives and accountability*

Urban design seeks to coordinate, improve, incentivize, restrict or modify built environment actions across public and private space, applying organizing principles and design to achieve a range of collective goals (Carmona 2021). While it is now widely recognized that these collective goals should include action on climate change, this is often challenged by the variety of competing values, incentives and measures of success (Elrahman and Moureen 2021; Rouse 1998; Sorkin 2013). The current study results suggest that many barriers to, and facilitators of, action on climate change exist in this area. Many respondents highlighted the need for alignment of values across the full range of actors and the public.

What it really takes is a shift in mindset from the population at large ... an appreciation for both mitigation and responding to climate change in the built environments ... It's one thing for the government to put in place these requirements for builders, developers, whoever it might be. It's another thing for the communities ... (UD12Pr)



**Figure 2.** Key barriers and facilitators to climate change action identified by Australian urban designers.

Reflecting that urban design action necessarily cuts across many jurisdictions and sectors (Elrahman and Moureen 2021), many respondents stated that significant change cannot occur when values are not deeply adopted and aligned, which is also highlighted by Mintz, Valentino and Wayne (2021):

[I]n Australia, we tend to have a very closed view. . . it's like a don't be positive. Let's just push everything back, [adopt] restrictive solutions, rather than looking for innovation to deal with climate change. (UD14Pr)

When climate change action was successful it was understood to be facilitated by value alignment.

The way I see urban design is that it is very much focused on public interest, and the public interest where we have this stewardship of our cities. And, yes, private landowners and private developers or just the private sector are an absolutely important part of that. But it's got to be for the greater benefit of building a society, not just growth. (UD16Pr)

The prospect of being accountable in some way, whether by sanction or just the potential for scrutiny, can impel decision makers towards common goals (Lapiente and Van de Walle 2020, 464; van Acker and Bouckaert 2018). Some respondents reported a desire for ways to encourage climate change action integrating actions by various actors, and with wider public goals.

I think even before there was an issue of climate emergency action plan, there was already a big push from the community themselves for council to actually do something a bit more. (UD03Pub)

The joining of values with the cooperation and incentivization of private actors with others was also seen as a climate change action facilitation mechanism.

I don't know if there's more incentives for developers to partner with industry in some way or even with community groups or with government to help facilitate an outcome that can result in lots of positives, not just the environmental but social and economic positives. (UD09Pr)

Merit-based funding initiatives such as the Sustainability Infrastructure Fund [government incentive programme for products and infrastructure projects using recycled materials] were expected to 'definitely create a really, really good outcome . . . . Because then we are accountable to deliver it as per what we promised' (UD03Pub). Further, having independent assessments of projects, even if non-binding, was seen as important in terms of accountability.

All the state significant projects have to come to this review [relating to net zero]. So then it's up to a planning authority to say the developer did address this or did not address it. (UD05Pub)

The site-by-site project focus of much urban design can have the tendency to narrow goals. Accordingly, the public or common 'values' which are implications of projects (including climate change adaptation and mitigation) can easily become afterthoughts (Gehl [1971] 2011; Gehl et al. 2006; Rouse 1998; Sorkin 2013).

I think governments and other clients should understand the climate performance of the projects that they're investing in, and I think that the business case for a project should

include much more rigour related to future carbon performance and legacy value generally. (UD01Pr)

The distinctiveness of urban design practice in pursuing wider public values was commonly seen as being secondary to achievement of other more instrumental goals by other agencies or professions (cf. Elrahman and Moureen 2021). Some respondents suggested that stronger policy targets and justifications would assist in maintaining wider collective goals.

I think it would be very helpful to have [green space targets] better set up in policy, because, you've got to justify [it] to development managers or across the business. (UD09Pr)

Respondents identified multiple impediments in line with what was found in the literature including, a lack of long term and overarching vision (Carmona 2021), understanding of urban design amongst related actors (Rouse 1998) and inadequate regulatory guidance (Llewelyn-Davis 2007).

### *Economics and financing*

Seminal studies such as Carmona's (2001) showed the value, including economic, that urban design adds to cities. By way of contrast, however, it is widely recognized that securing finance and economic support for climate change adaptation and mitigation in cities is challenging (Rosenzweig et al. 2018). This is particularly the case in neo-liberal settings where measures of value are primarily directed to financial returns (Joy and Vogel 2021; Perucich 2019). In this current study economic drivers were understood by respondents to be highly influential on urban design climate change action. Facilitation of action via integration of climate change performance into economic measures used to evaluate projects was seen as a potentially powerful but little-used driver for positive change.

Governments and other clients should understand the climate performance of the projects that they're investing in and I think ... that the business case for a project should include much more rigour related to future carbon performance and legacy value generally. (UD01Pr)

The above sentiment runs parallel with a general view that climate change pricing structures are currently inadequate. This includes the underlying measure of carbon pricing: 'what would help us, is if there were a price on carbon, because then there would be an incentive to getting more sustainable buildings' (UD16Pr). Similarly:

The sad fact of it is, is that there needs to be financial incentivization of the developers to push in that direction. (UD11Pr)

A private sector urban designer suggested that: 'if there were a proper pricing of risk related to a lack of climate adaptation, then that would ... generate the momentum for change. At the moment, change still feels like it's an option' (UD01Pr). The need for financial and economic factors to facilitate climate change action driven by the public and consumers was also evident.

It's another thing for the communities to actually be saying, well, wait a minute, we want to know what the energy efficiencies of these dwellings that we're buying, because we

understand its important. But secondly, it has the capacity it to save us money over the long term. (UD11Pr)

Acknowledging the financial interconnectedness of climate change action and other co-benefits and goals via good urban design was also highlighted:

There is a serious business case that isn't just necessarily about asset renewal, it's about the health of people. Because if you spend this much money on this particular thing and in 20 or 30 years time, it's sustaining the health of people and reducing health costs. (UD18Pub)

Despite challenges, respondents highlighted the role of urban design professionals proactively influencing their clients to take a wider view of economics and finance including climate change action. In parallel, there was a belief that there is a need for collective action based on financial mechanisms:

We're really trying to shift it back to the bigger, gold standard in terms of ensuring common outcomes and that this is a different equation or different view taken on the economics of the project. [T]hat requires us to work clients and say, 'is there another way that you could evaluate this or think about this in terms of the economic equation?'. (UD19Pr)

Overall, many urban designers reported being caught between dealing with costly and uncertain potential impacts of climate change, and achieving more tangible and obvious goals such as aesthetics.

### *Information and feedback loops*

Ongoing concerns with a general lack of urban design literacy and knowledge or how these should evolve over time (Carmona 2021) are applicable to the development, dissemination and application of climate change evidence and implementation (Kabisch et al. 2016). Respondents reported an overall lack of usable guidance about climate change they could understand and apply in their work (UD07Pub). The difficulty in applying high level thinking to practice evident: 'I think the understanding we have is actually quite limited ... the connection to what we should be doing as urban designers ... is abstract' (UD11Pr).

The challenge, for a practitioner in urban design is, and ... it is related to it being a bit of a mongrel profession. ... we have to be generalists. And so, on any day, I'm trying to keep on top of things. There's just a lot of complex information we have to get across. So if I'm really honest, I'm engaging on a pretty superficial level. (UD16Pr)

Urban designers are often collaborators, facilitators and synthesizers of others' knowledge and capabilities. It is perhaps unsurprising then that they need trustworthy sources that help them to understand the climate change implications of actions:

... we aren't the technical experts. We're designers. So invariably we're reliant on someone else to give us that information. (UD04Pr)

Another practitioner suggested that:

A barrier or a facilitator, depending on which way you look at it, is that people want to make decisions with confidence. At the moment, I would suspect a lot of people know of climate

change but they don't know with any confidence how to go about doing something about it. (UD01Pr)

The reliance on external information and ongoing feedback during the design process suggests that urban designers need information that is appropriate for the work they are undertaking, coupled with frameworks to guide key decisions.

[T]he flood mitigation consultant actually asked, 'Oh - okay. What should we model it for? Do you want me to design something that can capture extra flooding?' Well, at that point I didn't really know the answer . . . . So we just assumed a certain number. But if we do future-proof it for a 100 year flood, then it will just absorb all the budget. (UD03Pub)

Examples of facilitators of applied urban design knowledge do exist. Local government organizations have taken up important leadership roles in this area and these guidelines are increasingly utilized by practitioners.

My colleagues are doing work with the local government organizations at the coast and the Municipal Association of Victoria, looking at the impact of sea level rise on their assets and local facilities. . . . So there is government information and what you might call standards and measures that are a foundation point. (UD04Pr)

An example is the development of the Green Factor Tool by Melbourne City Council to help designers to better integrate green infrastructure in built assets to achieve higher environmental and social performance.

### *Influence, culture and leadership*

A key benefit of professions is that they apply specialist and intellectual knowledge to problems, providing collective benefits for society (Cribb and Gewirtz 2015; Noordegraaf 2020). However, many urban design practitioners stated that there is a need for additional leadership.

I probably would blame the government. But in the end, Australian citizens are the ones who vote. So they need to stand up and say something, don't they?. (UD14Pub)

The role of government as a client, driving and requiring climate action in contract tenders and design outcomes is significant.

The other key facilitating thing would be state governments taking a leadership and saying they want to get to carbon neutral. Those key statements from state government are really important. (UD16Pr)

Within organizations, including government, many suggested that leaders' influence is significant.

Unless it becomes a core cultural driver within the organization, I don't know how to change that. That comes from the leadership, really . . . If you've got a CEO whose thing is climate change, that will start to permeate through everything. (UD13Pub)

Indeed, some government departments were noted as being leaders in climate change action, and many private practitioners were personally pleased to be engaged by them.

In the public domain, state government have been quite ambitious to set a tree canopy target of 40%, and they've also got targets around deep-soil planting. (UD09Pr)

In parallel, key local governments were also considered influential.

Within Sydney, the City of [withheld] I feel, has leadership in this space. [They] are really proactive, a progressive council. I go to them. They've set a net 2050 zero target ... (UD09Pr)

The role of political leadership was considered important to drive operationalization of climate change action. 'We have a Greens [party] councillor who is very strong on making sure these things do get embedded' (UD13Pub). However, concerns were also raised about the potential for the private sector to seek Environmental, Social and Governmental (ESG) credentials in ways that do not necessarily pay sufficient attention to climate change action.

I've been going to meetings recently where even the big corporate entities are regularly referring to ESG ... it's a real shift in what you might call top end of town (UD04Pr).

In the private sector, particularly large firms, the appointment of leaders into sustainability and climate change roles was considered key to establishing roles and responsibilities.

[I have] been appointed our sustainability leader within the Melbourne studio. I have responsibility that we're actually delivering those outcomes within the projects and pushing them as hard as we can, also upskilling and training staff and working into that business development, project creation space to make sure that we're aligning ourselves to actually deliver those (UD19Pr).

## Regulation

Urban designers seek outcomes within a range of inter-related laws, regulations and policies that span urban planning, building, engineering, environmental, financial, property, financial and other domains (Dovey 2020). Most interviewees suggested that current regulations are inadequate, going so far as to say: 'as soon as the government can come out with the regulations, the better ... I think the regulation [aspect to climate action] would be the biggest one' (UD22Pr). A general lack of regulation was highlighted (UD06Pr), with some urban designers expressing a concern that climate change action was largely voluntary:

I don't feel strongly pressed to have to provide answers or justification around topics of climate change, to be honest. And I think that it would be good if I was forced to do that through that planning framework or government policy. (UD09Pr)

Regarding approval procedures, one respondent identified that new processes are needed (UD01Pr). Despite many leading examples of policy and statements of intent, a need for stronger legal and regulatory structures was expressed:

Legislation is a key thing that we can mandate. These things are important ... again, it comes back to politics, you know, there might not be popular and that might be where the short termism comes in. But legislation is a key tool to fixing a lot of this stuff. (UD13Pub)

Regulation was seen to be a challenge, but also to represent a potential mechanism to bring about the integration of action required to act on climate change:

It's hard because they're cross-sector issues and to develop some sort of policy at a government level ... that's what's really needed for us to be able to ensure that these things are happening .... (UD06Pr)

### *Temporal and spatial scales*

A fundamental of urban design is its ability to meaningfully connect built form and functional outcomes across domains (Abusaada and Elshater 2021; Carmona 2016; Carmona 2021). These include bridging the public and private, achieving desirable individual and public outcomes, connecting aesthetics with functionality, and embedding cores values in outcomes that have implications across multiple spatial and temporal scales (Elrahman and Moureen 2021), including climate change (Naboni et al. 2019). One urban designer succinctly captured an inherent paradox.

For climate change adaptation and mitigation, you have to invest now. But the benefits are collected by someone else later on in the project. There is no incentive to invest. (UD05Pub)

The challenge was understood to be partly political – and thus linked to short-term time frames:

There's no doubt that the politics of the day, and what you might call short term immediate crises such as the pandemic or immediate economic requirements, are obviously affecting the ambitions that we can pursue. .... (UD04Pr)

In contrast, government, acting as an integrating and connecting agent across various boundaries and sectors was understood to have the ability to achieve spatially connected outcomes that would not otherwise be possible.

There are other big projects that are driven by the state. The Western Vic Transmission Network is a massive powerline that goes for 190 kilometres and that's about getting green power ... into the grid and getting it to where it's needed in Melbourne. (UD13Pub)

### **Conclusions**

While the potential for urban design to help deliver climate change adaptation and mitigation solutions is recognized (Childers et al. 2015; De Waegemaeker et al. 2017), there is little research on how urban designers are taking action to address climate change, or the facilitators and barriers to this action. Urban design offers many potential opportunities to deliver more efficient, sustainable, equitable urban places by integrating action across multiple scales, tenure types and modes. It can manage and improve the diverse relationships between the physical, economic, social and environmental systems central to settlements' functions and values. This potential extends also to taking action to adapt to and mitigate climate change (Carmona 2021). The main actions taken by urban designers in this study were: the development and use of policies and strategies; education & research activities; facilitating climate change through project designs & practices; reducing carbon footprints; advocating or lobbying for climate change action; using sustainability measures & ratings to inform their practice; and taking on projects oriented to climate change

action. The climate change work currently undertaken is oriented mainly to adaptation rather than mitigation, there is thus significant opportunity to enhance mitigation actions, given that urban design potentially can reduce greenhouse gas emissions.

The results presented in this paper are significant, given they are the first to comprehensively examine Australian urban design practitioners' climate change actions and their views regarding the barriers and enablers to taking climate change action. Interview data was analysed by integrating theoretical insights from the wider urban design and climate change action literature. The results indicate that the full potential of urban design to act on climate change is not being met, and that many identified short-comings mirror the more general challenges already facing urban design.

The results indicate ways that urban designers, the organizations within which they work, and governments, can facilitate greater climate change action. Six main themes emerged from analysis of barriers and enablers: 1. value alignment; 2. influence, culture and leadership; 3. economics and finance; 4. information; 5. regulation; and, 6. temporal and spatial scales. Key implications emerge from these. Demonstration of strong leadership, whether it was at state or local government level or within the private sector was highlighted by practitioners as a key enabler. The establishment of key targets and strong regulations assisted by financial and other incentives were considered essential. Provision of trustworthy and accessible information for practitioners and decision makers was considered fundamental to integrated action across multiple temporal and spatial scales. This is in keeping with the underlying perception amongst practitioners of urban design's basis in collective outcomes that go beyond single projects or interests. The importance of organizational leadership and culture, allied with a need for government to provide avenues for integration of outcomes was also highlighted.

There appears to be a fundamental need for urban design practitioners to overcome uncertainty about the climate change implications of projects and corresponding actions to be taken – rather than maintaining business as usual approach due to a lack of knowledge. Starting from landscapes and ecosystems, rather than built forms, can provide a basis for ecological literacy and more-than-human considerations in design. This can then form the basis for critical engagement with environmental flows and understandings of metabolic interdependencies, linking in with resource sensitive design and circular economy approaches to address climate change mitigation. Finally, urban design education and practice needs to take on speculative and experimental approaches to the integration of creativity with scientific data-driven approaches.

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