Identity, place narrative and biophilic urban development: Connecting the past, present and future for sustainable liveable cities

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Urbanisation presents sustainability challenges for the natural environment, resources and ecological systems, whilst high levels of pollution and disconnect from the natural environment can adversely impact the health and wellbeing of urban residents. Rapid urbanisation can also curtail processes of placemaking, including place attachment and place identity, raising questions around the social sustainability and livability of cities into the future. With such concerns in mind, cities are increasingly called upon to develop in ways that are environmentally, socially, and economically sustainable. Biophilic urbanism and biophilic design offer an approach to sustainable urban development. Such approaches propose incorporation of nature and green infrastructure within the city in order to positively affect human health and wellbeing, in addition to benefiting environmental, social and economic sustainability. This paper explores findings from community focus groups exploring perceptions of a proposed biophilic urban development in Wales, UK. Our research explored how community members understood and negotiated possible impacts of the development on the social, environmental and economic landscape of the city by drawing on their own emplaced experiences. Through gaining an understanding of community place identity and narrative as well as distinctive and defining place characteristics, connections and synergies are revealed between place-based attachment and principles of biophilia. This in turn can provide a trajectory of place transformation authentic to both community and place identity and which supports the aims of biophilic design. As a consequence, it is possible for biophilic design to not only be sustained by communities, but to become an integral element of place identity and place attachment, contributing to the sustainability of place through time.

KEYWORDS

biophilic design, community perceptions and expectations, place making, relational approach, urbanization

1. Introduction

Over 50% of the global population live in urban areas such as cities (World Bank, 2022). In the UK the percentage is higher with around 80% of people residing in cities and surrounding suburbs (Edmondson et al., 2020). While urbanisation can hold both socio-cultural and economic benefits for urban populations and national economies, it can also hold unintended consequences, pressuring land availability and natural resources, causing loss of biodiversity and fragmentation of ecological services (Edmondson et al., 2020; Kor et al., 2022; Piracha and Chaudhary, 2022; World Bank, 2022). Energy consumption and associated greenhouse gas emissions from cities hold direct

implications for climate change at global scales (World Bank, 2022). Air pollution (Liang and Gong, 2020) and Urban Heat Island (UHI) effects (Piracha and Chaudhary, 2022) hold implications "for individuals, medical systems, ecosystems health, and economies" (Liang and Gong, 2020, p. 2). Urbanisation can also affect complex and dynamic relational placemaking processes between people and the physical (natural and built) environment (Ghavampour and Vale, 2015; Dameria et al., 2022). These diverse potential outcomes, along with expectations of continued urban growth into the future (United Nations, 2018), highlights the need to critically consider how cities can become decarbonised and sustainable (Ziari et al., 2018; Macke et al., 2019) in ways that can enable the people who live within them to have healthy and well lives.

One approach to addressing some of these issues is through biophilic design, which can offer a "nature-based" solution (Gulsrud et al., 2018, p. 158) to localised and societal scale concerns around climate change and urban sustainability, improving air quality, UHI, biodiversity and ecological systems (Kellert, 2008; Thomson and Newman, 2021). Biophilic design underpinned by Biophilia theory (Wilson, 1984; Kellert and Wilson, 1993) aims to increase human-nature connections in order to benefit human health and wellbeing and overall quality of life in a number of different but interconnected ways (Xue et al., 2019; Wijesooriya and Brambilla, 2020; Dobson et al., 2021; van Vliet and Hammond, 2021; Washbourne, 2022). In doing so, population productivity and prosperity are improved (Bathri and Kasliwal, 2019; Wijesooriya and Brambilla, 2020). Human-nature connections can encourage environmentally conscious attitudes and behaviours (Nisbet et al., 2009; Ziari et al., 2018), and if developed in ways that enable community interaction, can contribute to a sense of community and sense of place (Mell and Whitten, 2021; van Vliet and Hammond, 2021) instilling a sense of attachment and stewardship (Kayihan, 2018). Finally, it is also possible that biophilic design could increase the economic value of land and property (Scott and Lennon, 2016) and encourage economic investment in place (Mell, 2022; Washbourne, 2022). Thus, while biophilic design holds several environmentally and economically beneficial outcomes (Ziari et al., 2018; Bathri and Kasliwal, 2019), its primary focus is on human health and wellbeing. It is in this way that biophilic design differs from other established environmentally sustainable designs, critiqued for focusing heavily on environmental impacts and building performance and less on human-centred outcomes (Wijesooriya and Brambilla, 2020).

While interest in biophilic design is growing, there remain distinct gaps within the literature, notably around the design phases, where "more information is necessary to empower designers," but also post-occupancy evaluation, and the adoption of biophilic design in high-rise buildings (Wijesooriya and Brambilla, 2020, p. 12). Furthermore, while the environmental impacts of biophilic design have received attention, less has been given to the possible social or cultural impacts that may be experienced in place as a result, including for existing communities. A crucial part of the debate around biophilic designs therefore are the perspectives of people from the broader community of place, who may also be affected by the design and who are important in its acceptance and longer-term sustainability. Subsequently, it may be possible for biophilic design to be taken up within processes of place making by communities, contribute positively to place attachment

and identity, as well as achieving positive health and wellbeing, environmental and economic outcomes.

In this paper we draw on findings from three community-based focus groups held to explore perspectives and experiences of the city in question and how the group members perceived a biophilic building development planned for their city centre. We highlight how responses to the development are informed through a relational interplay of past, present and future emplaced experiences, which inform place narratives and identity. Through their discussions, community members forged connections between the ideological underpinnings of the development and the socio-culturally valued and distinctive characteristics of the city. As such, the development was negotiated as a means of both continuing and enhancing the narrative and identity of the city and the community, contributing to a sustainable city now and into the future. Prior to presenting our methodological approach and findings, we first outline relevant concepts and literature in order to situate our study.

2. Conceptual review

In this section we briefly outline the theoretical underpinning of biophilic urbanism and biophilic design, highlighting potential interconnected beneficial outcomes to populations and place. We then make connections between biophilic design and processes of place making, highlighting how both are concerned with affective human encounters with the environment that create emotional attachment. Finally, we suggest that as a form of place transformation, and in line with its theoretical underpinnings, biophilic design must understand existing processes of place making and place narrative in order to incorporate and enhance them in its application. A relational approach that explores the evolution of place narrative through time and which accounts for place aspirations can elucidate both material (natural and built) and socio-cultural characteristics of place. In doing so, biophilic design can not only affect a connection to nature but also to place, becoming incorporated into, and strengthening, place making and place narrative, and thus more likely to be stewarded and sustained by place-making communities through time.

2.1. Addressing biophilic place making development

Growing urbanisation and the associated impacts on natural environments, ecologies, human health and wellbeing, in addition to concerns for climate change mean that cities are called upon to become more sustainable (United Nations, 2015). Sustainable development proposes a holistic approach encompassing environmental, social, and economic dimensions (United Nations, 2015), and there exist a number of conceptualizations that work towards the sustainable development of cities. For example, Smart Cities (Jasanoff, 2015); Smart Sustainable Cities (Macke et al., 2019), Ecological City and Sustainable Urbanism (Washbourne, 2022). Biophilic urbanism offers a conceptualisation and approach to the sustainable development of cities (Ziari et al., 2018), in which nature is systematically incorporated and managed into the

urban environment. Biophilic urbanism strategies may include incorporating the "concept of work-live-play into mixed land use" (Xue et al., 2019, p. 1445), and adapting hard infrastructure such as transport systems, water systems and buildings to include or be constituted by naturally based interventions (Ziari et al., 2018). Indeed, the increased integration of nature, natural forms or green infrastructure into the city means that biophilic urbanism holds many environmental benefits, however, this is not its core focus. Biophilic urbanism is based on Biophilia theory (Wilson, 1984), which proposes humans' affiliation with nature, necessitates a need to connect with "nature on physical, mental and social levels" (Bathri and Kasliwal, 2019, p. 581). Enablement of nature-human connections can hold affective outcomes, positively affecting health and wellbeing (van Vliet and Hammond, 2021). As a nature-based solution holding central focus on principles of health, biophilic design aligns with sustainable development goals and calls to make buildings and the construction sector efficient and resilient (United Nations Environment Programme, 2020). Furthermore, while biophilic urbanism does not directly aim to improve economic sustainability of a city (Ziari et al., 2018; Ateşli and Ayten, 2022), it can be considered an economic investment (Ziari et al., 2018) as improved human health and wellbeing also improves "prosperity, profitability and cultural connections" (Bathri and Kasliwal, 2019, p. 581).

The affective elements of biophilic urbanism are not only derived from physical encounters that affect the sensed experience, but also from emotional reactions to the environment (Richardson and Butler, 2022). Indeed, biophilic urbanism seeks to encourage "an emotional attachment to particular settings and places" (Richardson and Butler, 2022, p. 37). Biophilia, as love of nature and topophilia, as love of place, are closely connected concepts, each emphasising how encounters with nature (biophilia) or physical environment (topophilia) contribute to emotional processes of attachment (Tabb, 2021, p. 4). As topophilia can be considered an expansion of the biophilia process (Tabb, 2021) it may be possible for biophilic design to enable or strengthen "a positive connection between people and the environment" (Kayihan, 2018, p. 12), similar to place-making processes, such as place attachment (Beatley and Newman, 2013). In addition, attachment to nature and place can "encourage an expanded sense of relationship and responsibility for the human and natural communities" (Richardson and Butler, 2022, p. 37). Research exploring the integration of nature and green spaces within the urban environment has demonstrated an increased sense of stewardship (Wijesooriya and Brambilla, 2020) or an increase in pro-environmental perspectives and behaviour (Nisbet et al., 2009; Ziari et al., 2018; Dameria et al., 2022). Further, urban green spaces have been shown to increase a sense of safety and provide opportunities for community interaction, increasing social cohesion and sense of community (Weinstein et al., 2015). Such encounters increase a sense of belonging, contribute to a sense of community and further strengthen emotional attachments to place (Parkhill et al., 2015; Macke et al., 2019). Finally, biophilic urbanism can complement or enhance "distinctive place qualities" (Beatley and Newman, 2013, p. 335), working within existing topography and climates in ways that connect "the culture and ecology of a locality or geographic area" (Kellert, 2008, p. 5) contributing to place identity and place attachment.

As buildings make up a significant proportion of the urban built environment, and are places where people spend around 95% of their time (Wijesooriya and Brambilla, 2020), both their external and internal design are important to the human lived experience. Biophilic design, as a component of biophilic urbanisation (Thomson and Newman, 2021), applies biophilia principles to specific built environment projects, including to buildings. It focusses on the "sensory stimulation" of people as they encounter the built environment, and thus seeks to emphasise and manipulate "natural elements and ecological form and patterns into buildings" (Xue et al., 2019, p. 1445). How such inclusion and manipulation of natural elements are incorporated into a built design can vary, but typically would include multiple direct and indirect opportunities to sense nature through sight, air, smell, touch, or sound (Xue et al., 2019). While "the human dimension" is central to biophilic building designs (Wijesooriya and Brambilla, 2020, p. 3), this can hold a heavy focus on building occupants and not necessarily on the wider place-making community, who may also be affected in different ways by the design. Considering cities as places of high population levels and human activity, and that a biophilic building design may accommodate varied uses, it is likely to affect different communities within and outside of the building (Xue et al., 2019).

A biophilic approach that strengthens community attachment and commitment to place should encompass "local agenda setting, decision-making, and process monitoring with locally adapted indicators," whereby outputs are "responsive and relevant to local needs and aspirations" (Tan et al., 2019, p. 2). Without doing so, attachment to place and place identity may be disrupted, which can cause emotional experiences of "anxiety and loss" (Devine-Wright, 2009, p. 428), gentrification and "spatial exclusion" (Scott and Lennon, 2016, p. 268; Courage, 2021) or weakening a sense of community and place overall (Ghavampour and Vale, 2015). Moreover, past place changes or disruptions will also become a part of the narrative of place, affecting not only how communities understand their identity, but also how they may respond to future place change (Thomas et al., 2022). Thus, biophilic design must remain environmentally and socially nuanced to the place it is within, to positively affect a sense of place and attachment for building occupants and the wider community of place-makers.

2.2. Towards authentic, distinctive and accepted place transformation

As processes of place transformation, it is now established that sustainable urban developments must be "place-based," providing opportunity to incorporate existing place-specific social, environmental, economic and political dynamics and aspirations (Tan et al., 2019, p. 2). Considered as "relational," place-based approaches are usually "qualitative, participatory and situated" (Roberts et al., 2020, p. 4), and involve understanding how place-makers, including communities, experience and make sense of place (Thomas et al., 2022). This can reveal significant material, symbolic and culturally valued elements of place (Roberts et al., 2020), as well as relational interplay with other places and broader societally derived values, priorities, and contexts (Thomas

et al., 2022). When applied in the context of sustainable urban development, place-based approaches offer a means of protecting the integrity of such material, symbolic and culturally valued elements of place, and navigate a pathway of development appropriate to place and acceptable to communities. Thus, biophilic design should be attentive to relationally informed place-narratives, which can reveal socio-culturally valued "distinctive place qualities" (Beatley and Newman, 2013, p. 335).

More recently there have been calls for place-making approaches to be sensitive to existing temporal narratives of place that are revealing of why and what elements of place are socio-culturally significant and how present place identity is understood (Roberts et al., 2020). Informing this are understandings of placemaking as both a spatial and temporal process (Roberts et al., 2020), meaning place can be understood as being made up of both past and present emplaced experiences. Further, how place is understood is not only contingent on the past, but also "where we are going" (Trigg, 2017, p. 128), or how we expect, or want to experience place at future points in time. Such spatio-temporal experiences can be understood individually and collectively as place-narratives (Holland and O'Neill, 1996; Ghavampour and Vale, 2015). Roberts et al. (2020, p. 5) highlight that through understanding people's place-narratives and how these have developed through time, transformation of place can be directed in ways that avoid "sharp breaks" or "incongruity" in the narrative, respecting the "diachronic integrity" of place. Such an approach enables existing sense of place and place identity to transform in ways that are acceptable to communities, through alignment and continuation of place narrative. In this way, transformation of place is not jarring, inauthentic or imposed, but is a continuous evolution of the past into the present and future.

The above temporally sensitive place-based, or relational, approaches attend to socio-cultural, economic, environmental and political contexts and how these inform place making, identity and responses to place change at a local scale. However, they also recognise that as a multi-scalar, nested, and overall relational process, places and the communities within them are in interplay with higher-scale or macro, socio-cultural, environmental, economic and political contexts. For example, the industrial town setting of Thomas et al. (2022) research highlights how sense of place and identity are both localised experiential processes as well as national and international politic-economic processes of investment, disinvestment and most recently socio-political processes of decarbonisation. Such influences both directly and indirectly affect the daily activities of community members in place, as well as how they perceive place and their own identities in relation to broader shifting societal contexts. Thus, current macro-scale societal contexts and concerns around climate change, economic and energy crisis, as well as different policy responses, interplay with both individual and collective worldviews, and socio-cultural norms. This not only influences current place and identity, but also how communities perceive the trajectory of place narrative into the future (Roberts et al., 2020). Attending to this, place-based sustainable urban development can identify and incorporate "common agreed-upon motivational and symbolic values, directed to the common good"

(Horlings, 2015, p. 258). In this way the value and meaning attached to place, informing the sense of place and identity, holds multi-scalar significance and the place is sustained in the longer term.

Overall, understanding how and why certain social, physical and symbolic attributes of place contribute to place attachment (Devine-Wright, 2009) and how people make sense of their identities (Thomas et al., 2022) is important in ensuring that sustainable urban developments positively affect such processes. As communities are active producers of place, place making, including transformation of place, must enable their involvement (Macke et al., 2019; Courage, 2021; Mell, 2022). Relatedly, as place and community are intertwined (Parkhill et al., 2015; Weinstein et al., 2015) sustainable urban development must be attentive to "dynamic human emotions and relationships involved in individual's and group attachment to a specific location or place" (Gulsrud et al., 2018, p. 159). A relational approach that allows and values community participation can identify ways in which place attachment and place identity can evolve with place change, in ways perceived as authentic to both community and place identity (Roberts et al., 2020). Thomas et al. (2022) highlight how scenario-based deliberative workshops that incorporate group mapping activities of place with communities can reveal how place identity is shaped through emplaced temporal experiences, but also how this informs how place is hoped to transform into the future. Such an approach can reveal how sustainable urban developments, including biophilic urbanism approaches, can be carried out in ways that enable continued place-making by communities and as such remain valued, and sustained through time (Dameria et al., 2022). Below we outline our methodology in the exploration of community experiences of place and how this interplays with perceptions of a transformative biophilic design.

3. Materials and methods

The data drawn on in this paper were collected as part of the Living Well in Low Carbon Homes (LWLCH) research project, which explored the lived experience of new and novel low and zero carbon homes, developed in Wales, UK between 2019 and 2022. LWLCH formed a part of the broader Active Building Centre Research Programme (ABC-RP), which aimed to demonstrate how the UK construction and energy sectors may be decarbonised through the deployment of Active Buildings. Active Buildings are conceptualised as being energy efficient in built design, and incorporating energy production, energy storage, and intelligent digital energy management. Active Homes represent a form of Active Building designed and used as dwellings.

LWLCH research involved empirical qualitative enquiry at five Active Home developments across South Wales. Each case site varied in their specific locations, compositions of stakeholders, and their primary ambitions. Consequently, each varied in built design (fabrics, layout, aesthetics), impact on existing environments and communities, and combination of energy systems, specific technologies and energy management arrangements. LWLCH research design comprised three strands of enquiry. The first two strands involved stakeholder interviews and qualitative

FIGURE 1
Mixed use of proposed development. Image used in focus group presentations and reproduced with kind permission from the architects.

longitudinal resident interviews, the findings of which have been discussed previously (O'Sullivan et al., 2022, 2023; see Shirani et al., 2022a,b,c) and are not reported here. Instead, this paper focuses on the third strand, which involved community focus groups at a case site currently under construction. Focus groups were utilised to gain insight into community perspectives and experiences of sustainable and green infrastructure development and climate change. We also explored community perspectives and experiences of place, and how individual and collective future aspirations for the place interplayed with perspectives on climate change and sustainable urban development.

Whilst improving resident health and wellbeing, partly through provision of green spaces to facilitate connection to nature, was an aim of developers across all five sites (Shirani et al., 2022c), the case site we focus on here presented more radical plans for green spaces within the design. Different to our other case sites, which are residential only developments, the case site discussed in the focus groups is a single mixed-use building, located in a city centre in South Wales, UK (Figure 1). The proposed development is split between retail units, commercial office spaces and residential apartments, in addition to a number of outdoor public community spaces. The development is re-purposing and expanding an existing retail building, adding an additional 9 floors and expanding the ground floor footprint. Importantly, the extension of the ground floor will convert what was a rear-car park and loading area, into an outdoor public area (Figure 2). Biophilia has been adopted as a core concept informing the overall design and planned end-use of the development.

Underpinning the building design are ambitions to address social, environmental and economic issues relevant to the city. The development aims to strengthen connections between humans and nature by integrating key aspects concerning biophilic infrastructure, sensorial design and performance (Xue et al., 2019).

FIGURE 2
Proposed outdoor public area. Image used in focus group presentations and reproduced with kind permission from the architects.
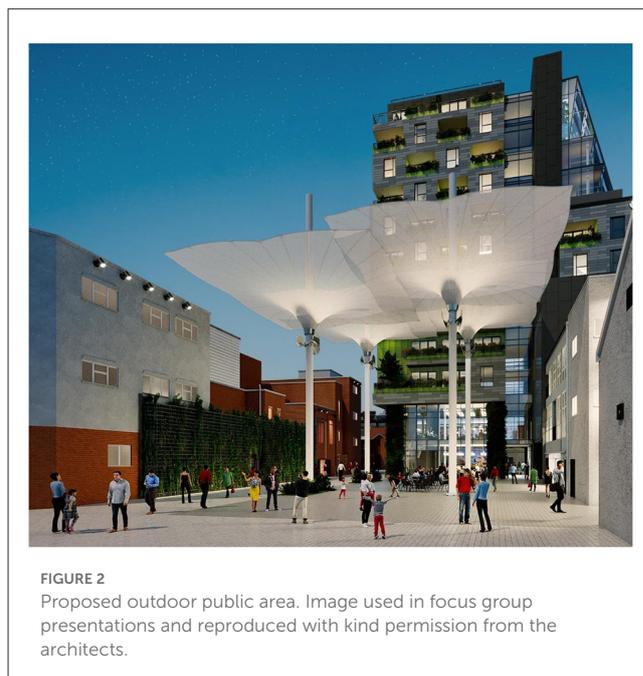
In addition, aims include providing health and wellbeing benefits, encouraging environmentally sensitive behaviours, and being environmentally and social sustainable through time. Importantly, a key ambition for the development is to create a sense of community and place through enabling community interaction (Macke et al., 2019) for those living and working there as well as the wider community (Parkhill et al., 2015). These aims translate into a number of strategies realised through various technical and design interventions (Xue et al., 2019; Wijesooriya

FIGURE 3
Proposed front elevation of the building with green walls and retention of existing mature trees. Image used in focus group presentations and reproduced with kind permission from the architects.

and Brambilla, 2020). Green infrastructure is planned to include green walls, planting on all resident balconies, green public spaces, and a roof-top urban farm (Figures 3, 4). The urban farm will also include further sustainable features, with aquaponic growing, sustainable drainage, and the siting of solar panels. The developers plan to establish the urban farm as a Community Interest Company (CIC), also open to non-residents, assisting community members with funding and governance for several years. Finally, there are plans for visible displays of the building's carbon emissions, energy production and other technical performance, as well as the aquaponic system, in publicly accessible areas of the building.

This development is likely to have multiple direct and indirect impacts to different communities in the city centre. Planned residential and community spaces align with local strategic policies in regenerating the city centre through increased hours of activity. This, in addition to facilitating new residential and community activities *via* the use of green spaces, as well as retail and commercial space, means social landscapes may be impacted. Linked to this, the planned mixed use will potentially impact the existing business community in the city, providing opportunities for increased footfall but also possible competition and disruption. As a new 'high rise' development with distinct green infrastructure features, the building will be juxtaposed by more conventional and in some cases historic buildings, thus will affect the urban landscape. However, the development complements a number of other sustainable urban developments in the wider city, as part of a broader Local Authority led Green Infrastructure Strategy. Other developments include the redesign of a prominent city through-road to include wider pedestrianised and green walkways, new and existing buildings clad with green walls or roof top gardens, and a new music arena with a roof top coastal park. Finally, coupled with its visual impact, the showcase of the development's biophilic design through public and educational spaces is hoped to demonstrate and encourage conversation in the city community around climate change and further localised actions.

3.1. Community focus groups

Facilitated group discussions can take several forms that include focus groups and deliberative workshops. In both instances, group participants are presented with a topic of discussion and, with some assistance from a facilitator or moderator, they discuss and deliberate the topic between themselves. However, focus groups and deliberative workshops differ in two main areas; first in how much information is given to participants about the topic for discussion, before and as deliberations commence, and second in what outcomes are developed.

Focus groups rely on participants discussing and gaining understanding of certain topics by drawing mainly on their own individual knowledge, beliefs and experiences. Deliberative workshops are often used to understand public perceptions of complex, technical or emerging areas of science, technology and policy (Roelich and Litman-Roventa, 2020); areas where existing public knowledge may be limited. For this reason, steps are usually taken to provide participants with balanced information about the topic of deliberation to enable their discussions to not only be informed by their own personal knowledge, but to also be technically informed (Pidgeon, 2021; Thomas et al., 2022). Findings from focus groups are based on the outcomes of their discussions but also analysis of how the groups themselves self-organise, interpret the topic using their own understandings and language, and how they reflect on and reposition individual perspectives in relation to the other group members. This analysis provides insight into how society more broadly may produce and use cultural knowledge, opinions and meanings. For deliberative workshops, while participants may discuss topics in a similarly structured way to a focus group, there can be more emphasis placed upon the group reaching a consensus or a shared conclusion about the topic discussed. Thus, while generally focus groups aim to understand how and why the group may reach certain opinions as a group, a deliberative workshop will be less concerned with this and more focused on reaching "a statement of the group's views" that "stands on its own" (Evans and Kotchetkova, 2009, p. 626). Overall, in planning our focus groups, we borrowed elements present in both focus groups and deliberative workshops. We provided balanced information about less known topic areas to participants that enabled informed discussion to take place, that is open to participant debate and interpretation, focusing on how the group works together to come to shared understanding of the areas of investigation, without steering them towards a consensus or group statement.

Our focus group discussions encompassed topics more familiar to participants (for example the city they carried out activities in) as well as those less familiar or unknown. Participants were presented with information around the application of green infrastructure within urban settings and purported social, environmental and economic benefits for community. In addition, participants were presented with images and descriptions of key biophilic design features planned to be included within the building. These included: possible new sensory experiences; mixed use; community led urban farm; sustainable water and energy management; resident living spaces; health and wellbeing (examples of presentation

FIGURE 4
Aerial image of the proposed development highlighting space for community led urban farm. Visible also are green balconies and green walls. Image used in focus group presentations and reproduced with kind permission from the architects.

slides Figures 5, 6). Thus, to enable informed discussions between participants we provided "supporting balanced information and policy framings" on areas we assumed would be less familiar to participants. This was to enable participant perspectives to emerge that, while technically informed, were based upon their own understanding and interpretation of the information in relation to the group as a whole (Pidgeon, 2021, p. 36; see also Roelich and Litman-Roventa, 2020).

Participants were asked to imagine the city in relation to a not yet realised biophilic design, presented as a form of sustainable urban development with focus on human-nature connections. As such, participants had to "situate themselves in relation to [future] infrastructure change while maintaining a firm grounding in local context" (Cherry et al., 2021, p. 3). To facilitate this, and similar to Cherry et al. (2017) we first asked participants to complete an activity pack prior to attending a focus group. These activities provided further depth to data collected, allowed us to ground the discussions, and encouraged participants to think differently and in advance about elements of their life or other activities in the city. This draws on our previous work, where we have carefully incorporated the use of images to prompt more expanded participant narratives, and to encourage greater temporal reflexivity (Henwood et al., 2018; Henwood and Shirani, 2022). We incorporated participant activity responses into researcher presentations to prompt thought and encourage discussion. During the focus groups, we used a mix of text, photos and videos in researcher presentations to introduce our core topics. By utilising maps and representations of local contexts, we aim to locally situate participants (Roelich and Litman-Roventa, 2020; Cherry et al., 2021), to aid discussion of place-based issues. After each researcher presentation we opened and maintained deliberative space for participant discussion (Pidgeon, 2021). Participants were also able to write questions or comments during the focus groups using the "chat" function available on the digital hosting platform.

These questions and comments were visible to all attendees and enabled further participation in the discussions.

3.2. Sample and recruitment

Three community focus groups were carried out online in March 2022 with each group comprising 5–10 people and lasting for 2.5 h, broadly in line with other focus groups and deliberative workshops investigating public understandings of similar socio-technical areas of investigation (Cherry et al., 2017; Hoolohan et al., 2018; Soland et al., 2018). As the purpose of the focus groups was to gain insight into community responses to a sustainable urban development in their city, we recruited participants from that location. While we placed no sample recruitment quota for socio-demographic categories, each group sample was theoretically informed (Tonkiss, 2018; Macnaghten, 2020). Following Cherry et al. (2021, p. 3), participants were selected and grouped "based on shared proximal interests" that "reflect shared points of experience or ways of relating to life." In this way, it was anticipated that each group would have some shared commonalities around climate change, lived experiences and aspirations for the city, and language. These commonalities allowed "a deeper probing between participants [...] and allowed insight into shared sense-making around novel concepts" (Cherry et al., 2017, p. 39). Table 1 below outlines our three focus groups.

Groups 1 and 3 were recruited *via* a recruitment agency, while group 2 was recruited directly by the research team. Each participant was offered a £75 honorarium as compensation for their time. Due to the COVID-19 pandemic, focus groups were conducted remotely by members of the research team, using video conferencing software. Working as a research team, our iterative qualitative analysis involved several steps. This included
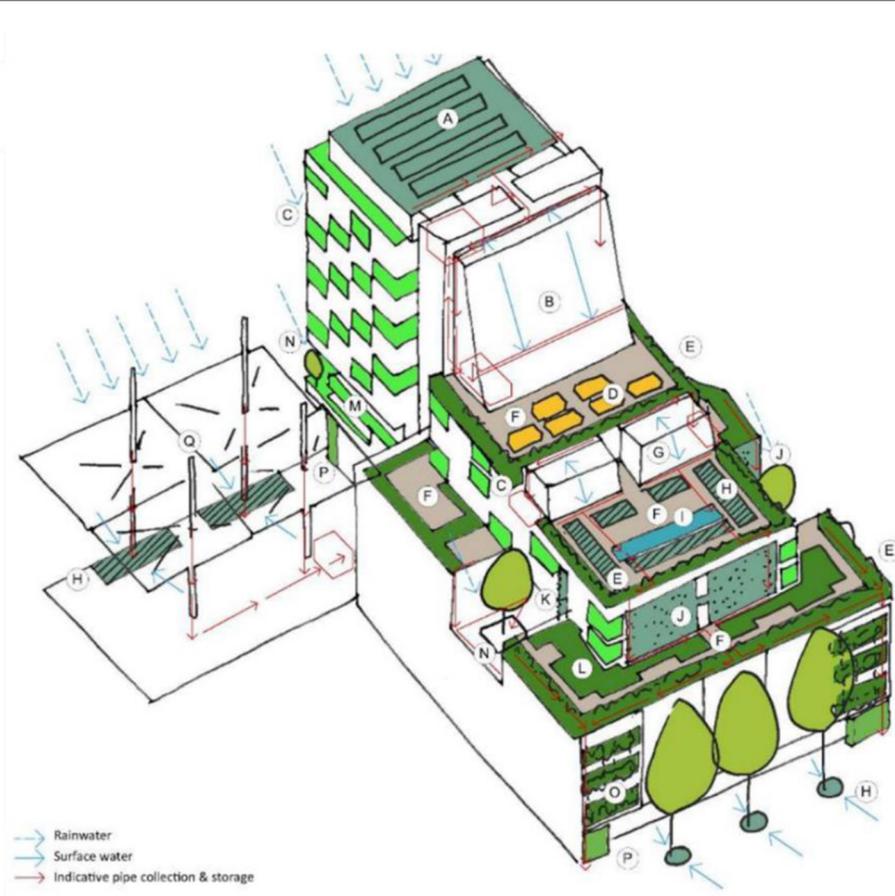
FIGURE 5
Sustainable drainage strategy. Diagram presented to focus group participants with verbal explanation of broader proposed water management for the building. Image reproduced with kind permission from the architects.
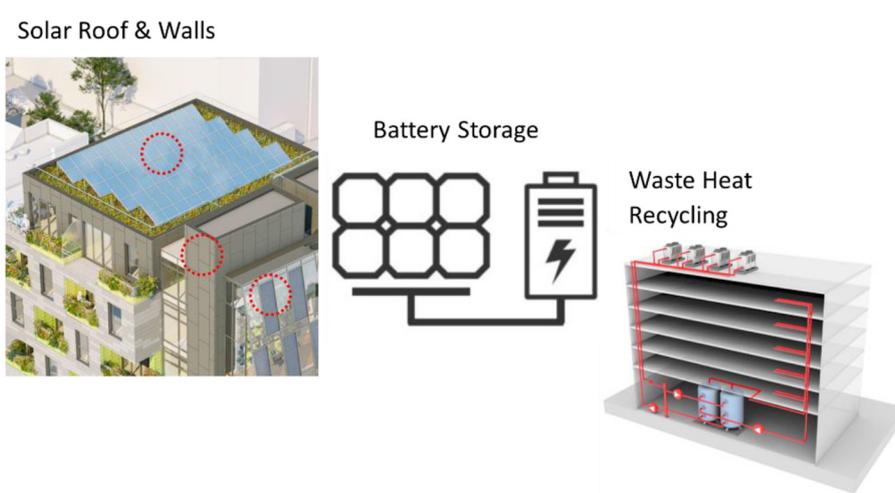

FIGURE 6
Images presented to focus group participants with verbal explanation of broader proposed energy management strategy for the building. Image reproduced with kind permission from the architects.

the creation of focus group summaries after each focus group, which allowed each researcher to reflect on their immediate impressions of the focus group discussions and main issues arising. Focus groups were audio recorded and transcribed verbatim by an external transcription company. Following this, the research team anonymised the transcripts and added in

TABLE 1 Focus group composition.

Group	Number of participants	Group composition/ recruitment criteria
City residents (Group 1)	9	Participants lived within the vicinity of the city centre and included:
		1. People living alone
		2. Retired people
		3. And people living as a couple
		4. Other household compositions were included once compositions 1–3 were represented
Green initiatives (Group 2)	8	Participants were located within the broader county and not restricted to the city centre, and included initiatives towards:
		1. Community gardens/allotments/green spaces
		2. Renewable energy
		3. Environmental issues (biodiversity/climate change/land use)
Local businesses (Group 3)	5	Participants businesses were located within the city centre and were locally owned, including:
		1. Market stall holders
		2. Natural produce growers and sellers e.g., (vegetable, alcohol, honey etc)
		3. Café owners
		4. Building management (commercial space renters)
		5. Other locally owned businesses

the group chat transcripts to form a single document for each focus group. The transcripts were then read and re-read by the research team enabling immersion in the data (Macnaghten, 2020). During this process, notes and memos were made that reflected researcher interpretations of the data, meaning and of connections to the literature and social context (Creswell, 2013; Macnaghten, 2020). From this, key themes emerged between and across each focus group (Macnaghten, 2020). The results presented in the next section represent the findings that emerged from the three focus groups in relation to themes of community experiences of and aspirations for place. We consider how these interplay to inform community perspectives of the proposed development.

4. Results

In following section, we outline findings from the three community focus groups that highlight community responses to the proposed biophilic urban development. Participants have been assigned pseudonyms to maintain anonymity.

4.1. Understanding experiences: Responsive and relevant change

While working or carrying out community activities in the city were broadly discussed favourably by participants across the three groups, living in the city centre was not viewed desirably. Participants drew on their own embodied and sensed experiences (Roberts et al., 2020) of the city centre to highlight how they imagined sensory or social experiences of noise and air pollution (Xue et al., 2019), and anti-social behaviour may impact upon future residents of the proposed development:

> "I do not like going into town, I would rather shop online and then take the kids out to, like, parks or the beach or something. I would rather not, and it's so rough, the area is so rough, it's so full of poverty. [...] I love the whole concept but if it was in, like, a different place I think it would really work." (Natasha, residents group).
>
> "I'm a little bit concerned as a person that used to park behind there and had to walk there in the dark. It's a little bit of a creepy area. [Laughter] ... It does need improvement in that area, but yeah, it's, to me, it's just always been a creepy place where I've dinged my car a lot." (Josie, businesses group).

In all groups, participants spoke about their concerns regarding economic decline in the city centre. These negative experiences of the city meant that for some participants, it was hard to imagine the social landscape of the area changing (Thomas et al., 2022) and that this would affect the quality of life for residents and the success of the development as a new place for community overall. Many spoke of their own experiences of either working or accessing amenities in the city centre and the visual impact of "gaping holes" in the high street, due to disinvestment. Such decline was expressed as being a concern for the economic viability of the city, but also as creating an unpleasant environment for pedestrians. Participants expressed perceptions that this was the result of UK-wide economic downturn and changing customer shopping habits, but that it had been compounded due to COVID-19, and so was not necessarily endemic to their city. Participants expressed that the impact of disinvestment was made more visible due to the large size of the vacant retail units. Drawing on their own place-based knowledge (Horlings, 2015; Thomas et al., 2022) of the commercial landscape participants suggested the proposed biophilic development may offer an opportunity to counteract this issue by making retail spaces in the development smaller so that smaller local businesses could lease them:

> "I think smaller, smaller spaces and smaller businesses and more support would go further than one huge business moving in and then moving out when it doesn't work." (Josie, businesses group).

Connected to discussions around the size of businesses that may occupy the proposed development, was a suggestion that the businesses could also be selected based on possible synergies between their business aims or ideology with those of the biophilic design of the proposed development. As Briony indicates below,

this could increase the impact of the development through reinforcing its symbolism:

> "I was wondering about whether some of the retail units and some of the office spaces particularly, whether actually as a building there would almost be, some values that they would expect those people to be working to. So, whether you would have, I know we have a few shops here where you can, kind of, take your packaging to be refilled and it's, kind of, like, zero plastic shops and things like that, whether, kind of, the whole ethos of the building would, kind of, philtre into all of those elements as well." (Briony, residents group).

The building was also seen as creating broader impact by its potential to revitalise what was currently perceived as an unappealing area. Unlike those who expressed concerns about the location, some participants saw the building as a potential stimulus for urban regeneration efforts. This was partly related to the renovation of an existing building:

> "I think a lot of city centres are suffering from, you know, retail units going, just being abandoned because businesses don't, you know, move online and stuff like that. So there's a lot of that kind of element of it, and I think that's really good to see buildings being repurposed in that way … I walk down [street location of planned development] quite often, and it is very abandoned and rundown and not a very pleasant street to walk down at the moment. But, you know, stuff like this will bring further kind of investment and people wanting to, I guess, you know, invest and regenerate other buildings that are along there that desperately need it as well. So yeah, definitely a really positive step I think for, particularly for that area." (Gavin, green initiative Group).

Across the focus groups, participants viewed favourably the various ambitions for the proposed development to address climate change concerns. Most participants talked positively about the hard infrastructural solutions, such as the inclusion of renewable energy production and strategies for increasing energy and water efficiency (Xue et al., 2019). Furthermore, participants reflected on how the scale and distinctive aesthetic of the development could "start conversations and spark interest" (Mike, green initiatives group) within communities. In this way, and aligned with the literature (c.f. Nisbet et al., 2009; Ziari et al., 2018; Dameria et al., 2022), the proposed development may provide knowledge and inspiration in the ways others could adopt sustainable habits or ways of living:

> "Are you also looking for people to see how it works, are you looking at provoke, discussions about it, you know, people living in the area? Are you looking for people to maybe, you know, look to grow more trees and, and have things growing out in the windows or…? You know looking for people on the, sort of, copy and see what can be done? So, it's, like, a, sort of, static advertisement in effect then, isn't it?" (Patrick, residents group).

The urban farm was also perceived as an opportunity to encourage a wider range of communities to participate in sustainable food growing, or even to think more carefully about where their food is sourced from. This connects with other research findings that establish links between human-nature connections and increased affinity to environmental concerns (Nisbet et al., 2009; Ziari et al., 2018; Dameria et al., 2022). In addition, as membership of the CIC that would manage the farm would be open to both residents of the building and the wider communities in the city, some participants like Susan below, and in line with the literature (c.f. Parkhill et al., 2015; van Vliet and Hammond, 2021) expressed how having such a green space may encourage community interactions:

> "It could be marvellous if it is like a club because then that would create interactions between people." (Susan, green initiatives group).

Across the focus groups, participants identified a tension between the location of the building as being more suitable for younger, professional people, who were expected to lack the spare time to contribute to the upkeep of communal green spaces, and thus, could undermine key aspects of the biophilic design if unmaintained.

> "It wouldn't be so much for families, it'd be more like business people working in the city centre. […] I don't wanna put a label on somebody, but people who, like, business people and younger people who enjoy socialising and stuff like that, are not gonna have the time for the gardening side of it." (Liz, residents group).

The maintenance requirements associated with increased green infrastructure within biophilic design has previously been identified as a "weakness" to the concept (Wijesooriya and Brambilla, 2020, p. 7) and was also raised by participants. If such spaces became neglected, then the development may become an eyesore and possibly symbolic of another failed urban development project instead of a source of pride. Thus, while participants were broadly positive and enthusiastic about many aspects of the proposed development, they drew on past experiences of other urban developments in the city to express caution and some cynicism about the development. Several participants spoke of instances where other urban development projects had been carried out, only to be re-developed a few years later, incurring a perceived waste of public money and unnecessary disruption for local communities. Other participants spoke of how previous urban development plans and architect impressions looked fantastic, only to be scaled back or diminished in their realisation:

> "The whole thing with the building in terms of the green space, and the sort of home farm thing is quite nice, but then, you know, you get a lot of, you look at the original designs for the arena, and that sort of thing, and they were very lavish and very pretty, and, you know, architects do a good job of drawing a pretty plan, and then what you get in reality is kind of two thirds of that. So I'd worry a little bit, like two thirds later, what it would look like." (Ross, businesses group).

Overall, in reflecting and sharing their experiences of the city, participants discussed how the proposed development may interplay with existing social, economic and environmental contexts. In doing so, they identified areas of opportunity, where the proposed development could improve aspects that were of concern. However, past experiences of urban developments in the city that were perceived to be short sighted, or where once realised fell short of what was presented in plans, tempered participants' responses to this proposed development. Participants expressed how for developments to be used and sustained they must meet multiple interconnected outputs that are place-specific and reflective of community needs and wants.

4.2. Strengthening existing narratives

The preceding section highlighted how some participants' encounters in the built areas of the city had been negative, affecting perceptions of decline and feelings of insecurity and fear. In contrast, existing green infrastructure in the city was also talked about as holding multiple benefits in terms of the activities and emotional encounters participants experienced (Weinstein et al., 2015; Dobson et al., 2021; van Vliet and Hammond, 2021). In the first instance, the location of the city in relation to the broader landscape of the county, nestled in the hills and next to the coast was talked about by participants as unique and "defining" features (Thomas et al., 2022, p. 82) or "distinctive" characteristics (Beatley and Newman, 2013, p. 335). Almost all participants spoke favourably about the green infrastructure in the city; particularly proximity to the sea:

> "I've lived in [the city] all my life. I'm directly by the beach, which is brilliant. I've also got kids, so having parks and open spaces around is a big bonus, and I also love the community feel around here too." (Tessa, residents group).

In line with Thomas et al. (2022, p. 87) most participants identified the seafront as a particularly significant and "emotionally salient" place. As Patrick's quote highlights, the seafront was accessed for physical activity as well as for the other positive emotional affects:

> "One of the things I like about the beach, is it's very, very relaxing and calming, and even in the winter, you know, walking the dogs and we walk along the beach it is, it is really, it just, just makes you feel free." (Patrick, residents group).

Being able to access green infrastructure in the city was felt to hold several benefits for residents, as well as visitors to the city. Similar to Roberts et al. (2020) participants spoke of the intrinsic and affective qualities of different green infrastructure and their own embodied and sensed experiences of place. In line with research that has demonstrated the multiple benefits of green infrastructure in urban settings (Gulsrud et al., 2018; Xue et al., 2019), some participants expressed recognition of the inter-connection between green infrastructure, environmental benefits and social benefits:

> "Environmental health is linked closely with human health—one health—we need to increase biodiversity, green infrastructure, have better air quality, less soil pollution, less flooding, prioritise nature in everything we do—food, energy, transport, health, education, culture—so that there is a win-win for nature and humans. We need healthier environments for healthier citizens to thrive in with nature thriving at the same time." [Susan, green initiatives group (activity pack)].

Furthermore, across the focus groups participants made connections between the existing green infrastructure of the city and its surrounds with socio-cultural elements of place, including its heritage, culture and climate. These existing connections between the identity of the city and its green infrastructure were then perceived as being strengthened by the biophilic design of the proposed development (Beatley and Newman, 2013). In this way, the proposed development could be perceived as a continuation of the narrative of place (Roberts et al., 2020). As Briony's quote highlights, participants also recognised that emphasising the connection between "pioneering" sustainable developments and defining characteristics, i.e., the green infrastructure, could strengthen the identity of the city and hold economic benefits, encouraging further investment in the city (Lak et al., 2021). Moreover, new investment could be steered towards developments that would further synergise with the identity of the city, making it more acceptable to communities:

> "In terms of [the city], kind of, like, what is our brand here, like, how do we differentiate ourselves from other cities? And I think we've got lots of outdoor space, we've got the [coastal area], like, we've got that, kind of, outdoors sustainable, kind of. There's a bit of an opportunity there for us potentially, and I think with the [tidal energy project] as well that's gonna really, kind of, put us on the map I think, and, and is this another, kind of, string to that bow of doing something sustainable, kind of [pause], I dunno, maybe being a bit pioneering. It's not necessarily that the developers are from here or that they're local people, but actually is it something that we can get on board with, and there is maybe a bit of a niche for us as a city I think." (Briony, residents group).

The opportunity to strengthen the city's identity through encouraging urban developments that emphasised the ecological assets of the city interplayed with participants' concerns for climate change. In this way, the proposed development was an opportunity to address both their own local concerns for climate change as well as those at a societal level. Here, participants talked about the need to alter how building developments are carried out in order to "build a better" and a "long-term" future. Considering Carys' and Shelly's quotes below, the proposed development was framed as a route into a more sustainable future for the city.

> "Really speaking it's gotta be encouraged because we can't go on building the way we were. We've got to build for a better future and the long-term future, so the more greener than the more environmentally friendly the building can be, the better." (Carys, businesses group).

> "If we don't make changes with regards to new buildings and new developments and things like that, then [the] city centre is always gonna remain the same." (Shelly, residents group).

Finally, a number of participants spoke about how the biophilic design of the proposed development aligned with other ongoing developments that were increasing green infrastructure in the city, which was seen as an improvement:

> "It sets a precedent; this is what we're achieving, this is what we want, investment can make this difference, and it will attract more because [City Centre]... I don't go into the city centre, I don't need to, I don't like it actually, and this is going to make a big change. You know, the green infrastructure improvements as well makes a change already. You know, I'm noticing that when I have gone into the city centre. So absolutely, it puts pride back in the city centre, and we've so needed that for a long time." (Eleanor, Green Initiative Group).

Considered in this context, participants expressed how the development contributed to a new sense of place that encompassed several elements. First, a sense of place that is drawn from actions addressing current local and wider climate change concerns can enable a sense of "collective pride and identity" (Thomas et al., 2022, p. 82), recognising how the place contributes to "the common good" (Horlings, 2015, p. 258). Second, the same actions are enabled by, and can enhance, already present socio-cultural connections between communities and the green infrastructure of the city, key characteristics of place and identity (Thomas et al., 2022). Thus, while the city identity may change, in this way, it remains authentic to the place narrative (Roberts et al., 2020) and protects symbolically valuable resources and landscapes.

Overall, participants expressed enthusiasm at the prospect of a sustainable urban development in their city for several reasons. First, participants expressed that green infrastructure in the city was socio-culturally valued for its emotional affects and as a defining characteristic of the city. As such, the proposed biophilic development was perceived as further strengthening these attributes. Second, participants expressed how the development was pioneering and visionary in many ways, holding direct social and economic benefits for the city while also addressing broader societal concerns for climate change and environmental protection. This was perceived as creating a mechanism for demanding that further city investment reflect such values, accumulating in an improved city-environment (Shirvani Dastgerdi and De Luca, 2019; Winston, 2021), further improving quality of place (Lak et al., 2021). Thus, the proposed development would continue an emerging narrative of a progressive, green city, while also strengthening place identity and contributing to a sense of pride.

5. Discussion: A relational and authentic transformation of place?

As a nature-based approach to sustainable urban development, biophilic design provides an opportunity to address societal concerns for climate change while holding many environmental benefits experienced at the local scale (Kellert, 2008; Gulsrud et al., 2018). Key to biophilic design is the transformation of the built environment to alter human sensed and enacted experiences of place affecting positive emotional responses (Richardson and Butler, 2022), including attachment to nature and place (Kayihan, 2018). For biophilic design to become meaningful and valuable within place and enhance place attachment and identity, it must understand and reflect broader community perspectives. Through exploring community perspectives of place in relation to a proposed city centre biophilic development, we find that it is possible for biophilic design to work within processes of placemaking and contribute positively to place attachment and identity.

We adopted a relational approach within community focus groups, which encompassed the exploration of community experiences of place through time. For some, prior experiences of anti-social behaviour, and sensed experiences of noise or air pollution made it difficult for participants to imagine that the biophilic design could provide a safe and healthy living environment. Conversely, for others, the proposed development was seen as an opportunity to address such issues and improve the social, material and economic environment and thus, the "quality of place" (Shirvani Dastgerdi and De Luca, 2019, p. 2). Participants also identified other opportunities to improve place, highlighting how the development may counteract the decline of the high street. Indeed, the innovative biophilic design and scale of the proposed development was perceived by several participants as an opportunity to distinguish the city from others in the country (Beatley and Newman, 2013; Trigg, 2017; Tabb, 2021), change its reputation and identity (Beatley and Newman, 2013; Lak et al., 2021) and encourage further economic investment (Ghavampour and Vale, 2015; Shirvani Dastgerdi and De Luca, 2019; Washbourne, 2022).

However, this place-based experiential knowledge meant several expressed cynicism over whether the ambitious aims of the development would be realised (Thomas et al., 2022). This was raised in two ways; first, participants spoke of previous experiences of regeneration activities in the city. Several perceived these previous efforts to be ill-considered, unreflective of the needs or desires of the community, and carried out in isolation of other developments, which led to some scepticism of other planned developments. A tension was also identified between the kind of residents that participants expected the building to appeal to (young professionals) compared to those who would have the time to devote to maintaining the green infrastructure (older retirees). Indeed, the maintenance associated with green infrastructure within biophilic design has previously been identified as a weakness, although this was attributed to cost as opposed to community participation (Wijesooriya and Brambilla, 2020). As per Thomas et al. (2022) participants reflected on the identity of place in relation to other places, in which they perceived the city to be politically and economically peripheralized. This affected how they perceived risks associated with the biophilic design; should the development be unsuccessful it presented a reputational risk for the city and its communities. However, some participants saw

the development as potentially transforming and improving the reputation of the city and instilling a sense of pride.

Our approach also revealed how green spaces and infrastructure in the city were valued for their "affective qualities" (Roberts et al., 2020, p. 3). These aspects were considered defining and distinguishing characteristics (Beatley and Newman, 2013) and, similar to Thomas et al. (2022), informed a sense of place and identity, something the community wanted to "make the most of" when considering the future. The proposed biophilic development, while a new form of built-infrastructure, due to the biophilic ideology and increase of nature and green infrastructure in the city, was seen as enhancing and building upon these green characteristics (Beatley and Newman, 2013). In this way it became positioned by participants as diachronically consistent and authentic to the existing place identity (Roberts et al., 2020). In addition, participants spoke of the need for the city to develop sustainably in order to address both current climate change concerns and the needs of future generations. Features of the biophilic design, such as the inclusion of renewable energy production and strategies for increasing energy and water efficiency, were perceived by participants as addressing such concerns. Further, through its prominent and distinct design, and community and educational spaces, most participants expressed how the proposed development could act as an "advertisement" to city communities and visitors. In doing so the biophilic design could increase awareness and knowledge around climate change and sustainable interventions, and possibly influence behavioural change. Interconnected with this were discussions of the future, and how participants wanted the city overall to develop in ways that enabled its longer-term sustainability (Newman et al., 2017). In this way, the proposed development was seen as symbolic of how the city should develop into the future and a means of levering further investment into the city in ways that resonated with the ethos of the development, and place identity.

Overall, place, as a dynamic and relational, physical, symbolic and social construct, means that sustainable urban developments that seek in some way to transform place will be informed by place-making processes (Thomas et al., 2022). A relational approach whereby community participation is sought and valued in sustainable urban development discussions and decision making can allow place attachment and place identity to transform, while remaining authentic to the narrative of place (Roberts et al., 2020). Sustainable urban developments can be positioned as morally good (Courage, 2021), through their overarching ambitions to improve place, and address high-scale societal concerns for climate change. However, without adopting an "enriched sociocultural view that is deeply place-based" (Gulsrud et al., 2018, p. 159) they risk creating a sharp break in the place narrative and thus being perceived as inauthentic, and unrepresentative of the place and communities. In such instances, there can be a "breakdown of well-intentioned schemes" (Roberts et al., 2020, p. 4) as they risk being rejected or underutilised by the community. Being attentive to the dynamics informing individual and collective social and cultural place attachment (Ghavampour and Vale, 2015; Gulsrud et al., 2018), biophilic design as a form of sustainable urban development can enhance and build upon the defining characteristics considered important to place attachment and identity (Beatley and Newman, 2013; Roberts et al., 2020; Thomas et al., 2022). Furthermore, through understanding, respecting and incorporating "local knowledge as a "process, performed in the everyday," sustainable urban developments can be meaningful, accepted and sustained by communities (Nightingale and Cotes in Gulsrud et al., 2018) and result in "genuine formation of the vibrant, liveable places" (Courage, 2021, p. 3).

6. Concluding comments

The sustainable development of cities to address climate change is crucial. As places of concentrated human activity, it is also important that such sustainable development is applied in ways that enables humans to live healthy and well lives. Biophilic urbanism and biophilic design offer an approach to sustainable urban development that foreground establishing human-nature connections for positive affective outcomes to human health and wellbeing. Our research seeks to address the gap in existing literature concerning the design phase and adoption of biophilic design in high-rise buildings (Wijesooriya and Brambilla, 2020, p. 12), and the possible social or cultural impacts that may be experienced in place as a result. As communities are active producers of place, place transformations such as biophilic design, which aim to affect emotional responses of attachment, must be accepted by communities and incorporated within place making processes (Macke et al., 2019; Courage, 2021; Mell, 2022). As such, biophilic design must ensure that socio-cultural, as well as environmental or topographical nuances of place are understood and in different ways addressed within the design. To do so, the sensed and experiential knowledge of place held by wider communities affected in different ways by the design should be understood. By seeking community perspectives at an early phase of the development, we have been able to feedback insights from our focus groups directly to stakeholders and developers, in order for these to inform the unfolding development.

Our research highlights how a relational approach that explores community experiential and sensed experiences, which inform place attachment through time, can elucidate how biophilic design can develop in ways that are acceptable and authentic to place. This involves the elucidation of distinctive and defining characteristics of place, how and why areas within place are valued and used, and understanding sensorial experiences important in the attribution of emotional attachment to place. All of which synergise and can strengthen biophilic designs that aim to affect positive sensory and emotional responses to nature within place. Furthermore, exploring temporal experiences can reveal a narrative of place. This in turn can provide a trajectory of place transformation authentic to both community and place identity and which supports the aims of biophilic design (Roberts et al., 2020). More research is needed to explore the emotional effect of biophilic design on both attachment to nature and to place, how these interplay, and the broader community of people they affect outside of immediate design users. Furthermore, additional research is needed to explore how biophilic design can integrate within place narratives to enhance and improve the trajectory of place and place identity. In doing so it may be possible to strengthen arguments for

increased development of biophilic design and scale up towards biophilic urbanism.

Data availability statement

The data supporting the findings of this study are not publicly available due to containing information that could compromise the privacy of research participants. Requests to access the datasets should be directed to osullivankm1@cardiff.ac.uk.

Ethics statement

The studies involving human participants were reviewed and approved by Cardiff University School of Social Science Research Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

Author contributions

KO'S, FS, RH, NP, and KH contributed to conception and design of the study and contributed to the acquisition of data for the work. KO'S, FS, and RH organised the data for the work. KO'S and FS analysed the data for the work and wrote the first draught of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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