

Toward a Convergent Evidence-Based Urban Design Approach

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ABSTRACT

Urban designers do not typically include research or evidence in practice, though the need for an evidence-based approach is becoming increasingly apparent. The way our built environment is constructed affects our health, well-being, and sense of place, as prior research has uncovered. Historically, urban design practice has negatively affected the well-being of urban residents by reinforcing inequitable social and power structures through the design of public space. Some theorists and designers have proposed evidence-based approaches as a response to these concerns. However, the emerging approaches can be disjointed. Tensions arise when deciding between the many types of evidence urban designers can use, and the different ethics they represent. In this thesis, I analyze three existing approaches to evidence-based urban design, including their benefits and their concerns, and ultimately argue that a convergent method is necessary. The conceptual framework I develop is one that responds to concerns of equity and accountability in the built environment, while also maintaining the significance of good design and acknowledging the inevitable integration of technology into society today.

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GENERAL AUDIENCE ABSTRACT

Urban design is typically an artistic profession, and conducting or referencing research is not necessarily part of an urban designer's day-to-day. However, the need for a research-backed, or evidence-based, approach to public space design is becoming increasingly apparent. Prior researchers have suggested that the way our cities, neighborhoods, parks, roadways and other public spaces are constructed has an effect on our mental and physical health. Historically, these spaces have been designed to reinforce patterns of social inequity, which has negatively affected the well-being of urban residents. Some theorists and designers have proposed evidence-based approaches as a response to these concerns. However, the emerging approaches towards evidence-based urban design sometimes have conflicting physical and social goals. In this thesis, I analyze three existing approaches to evidence-based urban design, including their benefits and their concerns. I ultimately argue that a new method, which converges the existing methods, is necessary. The conceptual framework I develop is one that responds to concerns of equity and accountability in urban space, maintains the significance of artistry and good design, and acknowledges the inevitable integration of technology into society today.

TABLE OF CONTENTS

Introduction	1
Theory Development Approach	2
Critiques of Conventional Urban Design Practice	3
Current Approaches to Evidence-Based Urban Design	5
<i>Smart City Approach</i>	
<i>Justice-Oriented Approach</i>	
<i>Environment and Behavior Studies Approach</i>	
Toward a Convergent Evidence-Based Urban Design Approach	12
<i>Convergence of Evidence Types</i>	
<i>A Convergent Evidence-Based Urban Design Ethic</i>	
Discussion	21

Introduction

Urban design is, without a doubt, a creative profession, drawing from the traditions of artistic disciplines (Van Assche et al., 2016). It is typically practiced as part of the architecture and landscape architecture fields (Forsyth, 2007), but is further distinguished by its emphasis on public space design. Urban designers are thus tasked with constructing the physical features of urban space, which will ultimately become the backdrop to the many social interactions and patterns that occur within the public realm (Carmona, 2014; Lee, 2021; Piazzoni et al., 2022). As researchers uncover more information about the effects of urban environments on both our physical and mental health (Jackson & Ferdman, 2019), as well as the role of urban spaces in proliferating unjust power structures (Boano, 2014), this task becomes increasingly significant.

Theorists such as Debra Flanders Cushing, Evonne Miller (2020), and Matthew Carmona (2014) have proposed evidence-based or research-backed urban design practices as a way to address some of this complexity. However, the potential loss of their artistic liberties, as well as their lack of research training, has historically made urban designers wary of incorporating research or evidence into their practice (Cushing & Miller, 2020). I argue here that, due to the nature of technological change and the pervasiveness of data analytics in our everyday life, urban design can no longer be separated from evidence. As some experts have contended, society is fully entrenched in the world of Big Data and urban analytics (O’Neil, 2016a; Kitchin & Dodge, 2019). Meanwhile, others argue that increasingly complex urban problems are too big to be understood by human intuition alone (Philipsen, 2015; Carmona, 2014). Designers will face choices of how to operate within this space, and how to use the data-driven and analytical tools at their disposal.

The purpose of this thesis is to discuss and further develop the role of evidence in urban design practice as a means to promote equity in the built environment. Current approaches for urban design education and practice generally separate the use of evidence into three distinct categories: (1) using data and technology to optimize urban systems; (2) achieving justice by leveraging local knowledge as evidence; and (3) designing physical spaces based on studies of human perceptions and behaviors. Instead, the future of evidence-based urban design (EBUD) should be more integrative, where data is considered critically alongside local knowledge and design research, with equity and accountability at its center.

In the following thesis, I introduce EBUD as a counterpoint to conventional urban design practice, and discuss the primary ways in which urban designers are using evidence today. I then develop an integrative framework for EBUD, which conceptualizes “evidence” in urban design. Adopting this approach will be a necessary step for furthering urban design practices that promote equity and accountability in public space design.

Theory Development Approach

Like other creative endeavors, the urban design process has historically been somewhat esoteric (Forsyth, 2007), with practitioners relying heavily on their knowledge of beauty and personal preference rather than taking an evidence-based approach (Koskinen & Krogh, 2015; Lak & Aghamolaei, 2022). Therefore, the term “evidence-based urban design” is an uncommon one. However, some architecture, planning and urban design theorists have started to consider the role of research and evidence in urban design practice. Many of these authors seem to be united by goals of challenging and reforming conventional urban design practice. One difficulty with linking this literature together, however, is a lack of consensus on the meaning of evidence (Stanitsa et al., 2022). To begin defining evidence and the role it plays in urban design, I examined three existing frameworks of design research and evidence-based design. The first is Matthew Carmona’s (2014) theoretical primer for urban design research. The second is Kirk Hamilton and David Watkins’s (2009) practice-oriented approach, which can be applied to multiple architectural scales. The third is Azadeh Lak and Reihaneh Aghamolaei’s framework for EBUD in university education.

I analyzed these frameworks in keeping with the Oxford English dictionary’s definition of evidence. That is, “the available body of facts or information indicating whether a belief or proposition is true or valid.” In this case, I consider a “proposition” to be a proposed urban design solution which addresses a problem other than aesthetics or beauty. This investigation uncovered several limitations of conventional urban design evidence types and practices. I broadly distinguished these evidence types as *data-driven*, *testimonial*, and *empirical*. Once they were identified and categorized, I continued to review literature and case studies associated with each evidence type, and began to recognize certain ethics and goals associated with the individual approaches. This allowed me to develop a conceptual framework of EBUD as it exists today, which catalogs the evidence types, motivations, opportunities and challenges of each approach.

This exercise made clear that a new approach to urban design, which makes equity a central concern of the design process, is crucial (Boano et al., 2014; Gehl Institute, 2018; Dewar, 2019; Lowery & Schweitzer, 2019; Goh, 2019; Anguelovski et al., 2022; Piazzoni et al., 2022). I argue that this is achievable through a convergent research approach, which the National Science Foundation defines as a “deep integration across disciplines,” where experts in a diverse range of fields combine their knowledge and practices to address a societal challenge together (NSF, n.d.). I conceptualize this convergent approach to EBUD from both a practical perspective (i.e., evidence types used) and a theoretical perspective (i.e., ethics, goals and orientations) in order to demonstrate *how* designers can remain accountable to urban populations, and *why* they should.

In order to illustrate the possibilities of this convergent approach, I examined New York City's *Streetscapes for Wellness* report. In 2022, New York City's Public Design Commission (PDC), in collaboration with other municipal departments, published a report on designing streetscapes for wellness. In some ways, this report exemplifies the possibilities of a convergent EBUD approach. Like other evidence-based approaches and theories (Chapin & Cooper Marcus, 1993; Hamilton & Watkins, 2009; Carmona, 2014; Gehl Institute, 2018; Piazzoni et al., 2022), it is not a prescriptive set of rules. Instead, is it meant to inspire designers by showcasing built examples of socially-oriented urban design which utilize diverse methods of practice. A fundamental theme of *Designing New York: Streetscapes for Wellness* is re-evaluation and reimagination in regards to both conventional definitions of well-being and conventional methods of urban design. Urban designers, they argue, play a role in cultivating these new definitions and methods (NYC PDC, 2022).

Critiques of Conventional Urban Design Practice

Urban design practice has traditionally prioritized an aesthetic which holds urban public spaces to a standard of beauty and artistry in line with the Modernist Movement of the mid-20th century (Wunderlich, 2014). However, it has been prone to criticisms along multiple dimensions. Carmona (2014) argues that there are two equal but conflicting design strategies within the conventional practice of urban design: the "space-less" and the "place-less" (p. 4). Those who practice the former are critical of urban design's environmentally deterministic origins and would rather focus on socioeconomic and political concerns. Meanwhile, those who practice the latter are aesthetically and functionally inclined but have a tendency to disregard place-based factors. Urban design literature suggests that "place-less" design has drawn more attention from critics, who have accused urban designers of being arrogant (Corner, 1999), "object-driven" (Boano et al., 2014, p. 32), "tool[s] of neoliberalism" (Carmona, 2014, p. 2), and ignorant of larger societal issues (Arabindoo, 2014, p. 52). These commentators view traditional approaches to urban design as top-down processes that focus too heavily on the creation of a physical product while being detached from the intangible aspects of place (Corner, 1999; Carmona, 2014; Wunderlich, 2014). They contend that urban designers have had a tendency to design urban forms separately from their social and political context, and that this has been detrimental to the people who live in cities (Chapin & Cooper Marcus, 1993; Boano et al., 2014).

These perspectives are consistent with the overall trajectory of the profession, too. Over time, architecture and landscape architecture, which tend to encompass urban design practice and education, have generally moved away from "urban research" (Forsyth, 2007, p. 465). This orientation has favored a design- and practice-based approach over an evidence-based approach (Cushing & Miller, 2020), which rarely allows designers to deeply study a place and the way it changes over time (Chapin & Cooper Marcus, 1993). While innovating in design theory and style, they have strayed from linkages to other scientific research, such as sociology, psychology,

public health, and geography. This has resulted in a practice in which it is unusual for designers to consider the validity of research and social theories as they pertain to certain circumstances, communities, and places (Carmona, 2014; Cushing & Miller, 2020; Lak & Aghamolaei, 2022), unless they are looking to justify or validate a design decision they have already made (Kallus, 2001). While there are some academic programs looking to take a more transdisciplinary approach to urban design (CCNY, 2023; The New School, 2023; NYIT, 2023), the conventional methods of the profession largely discount social science research (Wunderlich, 2014). As a result, the design process for the built environment remains “mysterious” (Forsyth, 2007, p. 465), and lacks perspectives from other fields (Arabindoo, 2014; Dewar, 2019; Cushing & Miller, 2020).

This convention in the design fields is partially due to resistance from within these professions (Forsyth, 2007), as educators and practitioners can be wary of using evidence for fear that it will impact the beauty and creativity of their designs (Cushing & Miller, 2020; Emo, 2020). However, it also stems from societal values as a whole. Governments and other funding institutions are often concerned with producing straightforward and tangible results, whereas the outcomes of urban design research are often complex. For instance, funding research for a catch-all weight loss pill sounds more productive on paper than searching for ways in which the built environment could promote more active lifestyles. As a result of this complexity, urban design research is infrequently considered or supported as a tool to address societal problems (Carmona, 2014).

To be sure, relying on intuition, personal preference, and design expertise is enough to produce beautiful designs. However, this also makes it easy to follow design ideologies and practices that prioritize beauty without taking a critical look at their social ramifications (Cushing & Miller, 2020). It is important to consider the present lack of research perspectives in urban design practice as more than just an innocuous ideology when, in fact, it can have real and urgent consequences on everyday life. Iain Borden (2014) reminds us that designers are not solely responsible for the production of urban spaces; the physical forms of cities are also produced by, and reproduce, social and cultural norms, economic interactions, and power dynamics (Hartmann & Jehling, 2019; Piazzoni et al., 2022). One role of the urban designer, regardless of whether or not they actively address this role, is to either confirm or challenge the conventions that these influences create, simply through the process of constructing urban spaces (Chapin & Cooper Marcus, 1993, p. 108).

Urban greening, for instance, exemplifies this role. Adding new green spaces or infrastructure can be associated with the displacement of existing residents, typically from less politically powerful, lower-income and minority communities. This is especially true if it is undertaken without the implementation of policies that protect the right of these residents to remain in their neighborhood (Anguelovski et al., 2022). Even when affordable housing options do remain in

place to allow low- and moderate-income residents to stay, those residents who are not displaced still face repercussions of gentrification, especially through cultural displacement (Anguelovski et al., 2022; Hyra, 2015). This may come in the form of new amenities that do not necessarily appeal to existing residents, which begins to dissolve their place identity and attachment, and can ultimately result in voluntary rather than forced displacement. This type of urban design may have some positive outcomes (e.g., lower crime, higher incomes, higher property values, and more diversity), but these benefits often come at the expense of long-term residents and their attachment to their communities (Hyra, 2015). This is just one example that illustrates how urban designers can become complicit in perpetuating the spatial dynamics that favor those in power (Boano et al., 2014), and risk further excluding groups from public spaces who may already feel unwelcome there (Chapin & Cooper Marcus, 1993).

At the same time, the quality of our physical environment does have an undeniable impact on urban space and those who use it. Like “place-less” design, “space-less” design can also result from a lack of research perspectives; problems addressing human behavior are constantly evolving (Carmona, 2014), and designers can miss out on valuable knowledge by overlooking research on human-environment interactions (Cushing & Miller, 2020). The field of environmental psychology, or environment behavior studies (EBS), responds to this dilemma. Environmental psychologists, for example, can work with architects and designers in order to learn about and address research problems that relate to our physical environments, and to understand how environmental design can improve our quality of life (Churchman, 2002). Debra Flanders Cushing and Evonne Miller (2020), for example, argue that carefully designed spaces can play a significant role in supporting our physical and mental health, as well as making us feel more comfortable in public spaces. As such, urban designers should prioritize designing for well-being, as well as making people feel welcome and ensuring that spaces are appropriate for certain activities (Cushing & Miller, 2020). This is not a simple task, as different people have different understandings of what an accessible and welcoming space is. Nonetheless, the risks of “space-less” design are critical to consider (Gehl Institute, 2018), and urban designers could be better equipped to design public spaces that best serve the people who use them (Cushing & Miller, 2020).

Current Approaches to Evidence-Based Urban Design

In response to these criticisms, and as part of a larger quest to understand cities and address some of their many complex challenges, some urban designers have been inclined to take a more evidence-based approach in recent years (Philipsen, 2015; Lak & Aghamolaei, 2022). While the term “evidence-based design” has not been defined or popularized as well in architecture and urban design as it has for other fields, evidence-based urban design (EBUD) methods do exist and are being used today (Emo, 2020). The use of evidence has emerged in three primary ways as illustrated in **Figure 1**, each responding to different problematic urban design conventions.

One approach, the digital data or *smart city* approach, addresses systemic urban concerns through the use of data (Philipsen, 2015; Lee, 2021), which can be collected and analyzed through means like sensor technology (Lightman, 2019). The other two approaches to EBUD fall under what Carmona (2014) calls the social science approach, in which designers use social scientific data and analysis to address design problems. I conceptualize the first of these so-called social science approaches as a *justice-oriented approach*, because it arose as a direct response to inequities and injustices caused by conventional urban design practices (Hartmann & Jehling, 2019; Lowery & Schweitzer, 2019). The second is the *EBS approach*, which relies on evidence from environmental psychology and behavioral research in order to help designers understand how people feel about and interact with physical spaces. This helps them curate spaces that are functional for a particular feeling, use, or behavior (Churchman, 2002; Cushing & Miller, 2020).

Smart City Approach

The smart city approach rests on the notion that well-planned urbanization can increase economic opportunities and improve standards of living for the average global citizen, all while promoting innovation and development (Jana & Sarkar, 2021). With new technologies in urban data analytics, city governments have the means to unlock potential for cities to improve well-being through optimization (Jana & Sarkar, 2021). In the field of urban design, smart city technologies are being adopted to study public life in ways that have formally been conducted manually (e.g., through observational research) or not studied at all. This is especially true for the study of human behaviors and interactions in the public realm (Lee, 2021, p. 381). Smart cities employ technologies such as sensors, cameras, GPS devices, and digital surveys, which have so far been used to monitor urban information like tree species diversity, air pollution exposure, walkability scores, spatial patterns of movement within cities, and resident perceptions of public spaces (Duarte & deSouza, 2020; Lee, 2021; Subramanian & Jana, 2021).

Of course, this new potential that technology grants designers and planners can also be cause for concern. As Klaus Philipsen (2015) notes, public opinions on data-based approaches to urban design vary from person to person, and can be seen as either exciting or problematic. He even likens the smart city movement to that of urban renewal, arguing that top-down districting by the government has long been the normative design response to a “newly discovered need” (Philipsen, 2015). In modern cities, the so-called “newly discovered need” is for urban systems to intelligently adapt to meet human demands (Lee, 2021), especially as climate change, global population growth, and excessive consumption affect our cities (Kitchin & Dodge, 2019). However, skepticism for the smart city approach arises from the ethical concerns of Big Data (O’Neil, 2016a; Lake, 2017). Recording and managing large amounts of data on human behavior brings data ethics, accuracy, literacy, and security concerns to the forefront of criticisms of the smart city (Lee, 2021).

For example, Sidewalk Labs, Google's urban planning and analytics arm, along with real-estate development company Waterfront Toronto, envisioned a 12-acre smart "micro-city" on Toronto's waterfront in 2017. In their plan, embedded technologies, sensors, and cameras were intended to touch almost every aspect of urban life and governance (Fussell, 2018). However, despite their relatively robust public engagement throughout the planning process (Stein & Fisher, 2019) the smart city design stirred controversy over data privacy and transparency. Both companies intended to allow participating private entities to collect identifiable data on residents and users. To be sure, the resulting backlash from citizen groups and the push to dismantle the project was not because everything about the smart city model was "bad." However, the questions around data privacy and regulation, and the role of corporations in urban design and governance, were not addressed (Fussell, 2018).

Adverse reactions to the smart city approach demonstrate that, just as conventional approaches to urban design are critiqued, urban design within the realm of "urban research" can be critiqued as well. In fact, similar criticisms of "place-lessness" can be leveled at the smart city approach, too. Big Data has given many professionals, including designers, a false sense of objectivity. The use of technology to solve human problems is often considered to be value-free, yet the creators of these softwares have encoded them with their own biases (O'Neil, 2016a, p. 51; Safransky, 2020). The Market Value Analysis (MVA) approach, for example, has been used in at least a dozen U.S. cities. MVA allows governments and private entities to use data-driven algorithms that identify neighborhoods as "better" or "worse" suited for investment and development. In the case of Detroit in the 2010s, this included the identification of neighborhoods that would stop receiving necessary public services, amenities, and capital in the wake of the 2008 financial crisis. These decisions were heavily biased along racial lines, even to the extent of reinforcing historical, racist redlining patterns (Safransky, 2020).

Data-driven methods for urban research have existed since the 1960s and 1970s, but the capabilities of these technologies have drastically increased in recent years, especially through the use of predictive algorithms like MVA. Planners, designers and governments put their trust in these technologies because they provide solutions that are seemingly based in fact, making them difficult for a layperson to refute. In some cases, they are even considered a critical tool in the planning process (Safransky, 2020). However, optimizing urban systems with these new methods necessitates the reduction of human behavior into a predictable set of rules. This analysis involves managing thousands of different pieces of information and categorizing them based on supposedly identical attributes (O'Neil, 2016b; Lake, 2017). These facets of the smart city approach allow certain people or groups to be wrongfully overgeneralized, marginalized, or forgotten in the planning and design process (O'Neil, 2016b; Duarte & deSouza, 2020).

Justice-Oriented Approach

By contrast, other designers and academics have called for more inclusive design processes, with the goal of ensuring equitable outcomes and a dismantling of the top-down legacy of urban design (Carmona, 2014). This justice-oriented approach has been an underlying theme in urban design theory for some time; theorists like Jane Jacobs, Susan Fainstein, Kevin Lynch and Donald Appleyard advocated for justice in urban planning and design beginning in the 1960s, critiquing urban renewal and other technocratic strategies for the social destruction they caused (Hartmann & Jehling, 2019; Lowery & Schweitzer, 2019). Kian Goh (2019) even argues that the concept of justice is part of the foundations of urban design as a profession, though the original visionaries spurred disillusionment and the values have changed over time. Presently, the primary tenets of justice-oriented urban design theory include environmental justice, equity of access, equitable distribution of amenities, livability, providing a plurality of lifestyle choices, and giving communities the power to create economic opportunities for themselves (Boano et al., 2014; Dewar, 2019).

Practitioners who prioritize justice and equity may not necessarily align themselves with EBUD overtly, but their goals and methods are often rooted in social science. For example, they may use both quantitative and qualitative data, such as demographic data and interviews, to inform design (Carmona, 2014). They also strongly emphasize the use of community engagement to gather local knowledge, which is treated as a form of testimonial evidence; it is a means to understand historical patterns of spatial injustice, gauge community well-being, and define appropriate design goals (Gehl Institute, 2018; Lowery & Schweitzer, 2019). In this sense, evidence is used not to produce a single best environment or urban form, but to provide lifestyle choices that respond to the needs of residents as they perceive them (Dewar, 2019).

Even though justice-oriented theories of urban design have existed for decades, actually achieving justice is still difficult in practice (Lowery & Schweitzer, 2019). This concern, in part, speaks to the difficulty of effectively engaging with communities. Some students, for example, have noted that they have not learned the skills necessary to engage with the public, despite learning how important it is to do so (Hes, 2020). Other times, the engagement process simply becomes too complicated as designers try to navigate many conflicting narratives (Lowery & Schweitzer, 2019). However, the larger barrier towards just design is the “somewhat awkward role” of the urban designer; being positioned between the theoretical, research-oriented world and the practical, buildable world can undermine the design justice approach (Goh, 2019, p. 521). Efforts towards just design often respond to the needs of the community through small, temporary interventions, but they do not necessarily question bureaucratic systems or transform power dynamics (Goh, 2019; Piazzoni et al., 2022).

It can be especially difficult for designers to put systemic justice and equity at the center of their process in the context of societies that value market liberalization. In these contexts, urban design - and therefore the urban designer - is typically viewed as a tool to increase the market value of a place. For example, as people become increasingly willing to pay more to live in walkable cities with better public amenities (Lowery & Schweitzer, 2019), new, curated landscapes have become opportunities for developers to cash in on luxury development. Meanwhile, community-centered public spaces in disinvested neighborhoods are deemed valueless and dispensable (Anguelovski et al., 2022). While aforementioned scholars have rightly discussed the urban designer's role in constructing inequitable spaces, this particular barrier illustrates the importance of governance as well. Namely, urban governments will need to support and incentivize design processes that recognize local knowledge, welcome differences of opinion (Lake, 2017), and value equity over profit (Anguelovski et al, 2022).

Environment and Behavior Studies Approach

A third approach, the environment and behavior studies (EBS) approach, has gained prominence in urban theory in recent years. Books such as *Restorative Cities* (Roe & McCay, 2021) and *Creating Great Places* (Cushing & Miller, 2020) bring forth environmental psychology as a research base for urban design and planning. Some theorists have been making connections between the two fields for much longer; take, for example, *Urban Stress*, which drew conclusions between urban conditions, stress, and behavior in 1972. Arza Churchman (2002) argues that a primary difference between the two professions, however, is that urban designers and planners have typically chosen to focus on the advantages of living in cities, while EBS researchers have focused on the disadvantages. Newer EBS theories of urban design seem to reflect a more optimistic approach. For example, the possibilities of urban environments to promote health and well-being, rather than to hinder it, are increasingly studied and supported (Jackson & Ferdman, 2019). A number of evidence types can be used to support EBS research, including demographic data, spatial and geographic data and analysis, behavioral mapping, surveys, interviews, cognitive mapping, and computational models of behaviors (Kallus, 2001; Emo, 2020).

There are two tensions that may arise when marrying EBS and urban design. First, Churchman (2002) discusses the difference in scale between planning work and EBS work. Historically, urban planners and designers have been concerned with macro level, systematic questions while environmental psychologists have been concerned with micro level, individual ones. While EBS researchers focus on individual perceptions, understandings, and relationships between people and their environment, urban designers prefer macro level statistics because they are less complicated and more accessible. Rachel Kallus (2001) agrees that EBS research can be difficult to translate to urban design practice. The findings are usually limited to standalone environments that will not necessarily hold up in a continuous urban fabric. Churchman (2002, p. 191) goes on

to write that environmental psychologists have applied research to “buildings, streets, parks and neighborhoods.” This scale may be considered small in some projects or efforts, but it is certainly within the umbrella of urban design (Lee, 2021).

A second concern with the EBS approach is that environmental psychologists are not necessarily concerned with the economic or political systems of a place, or with practical implementation of theories (Churchman, 2002). This “compartmentalization” between improving the physical environment versus “the social and power relations that happen ‘within’ the environment” may remove EBS design researchers from conversations about justice and equity (Chapin & Cooper Marcus, 1993, p. 107). Of course, this is not antithetical to the conventional methods of urban design, or even the smart city approach, as previously discussed. However, urban planning and design theories are ultimately centered on protecting the public interest (Hamilton & Watkins, 2009; AIA, 2020). Discounting the social or political consequences of design is against this objective.

Figure 1: Current Approaches to Evidence-Based Urban Design

Approach	Problems that the Approach Aims to Solve	Underlying Ethics and Goals	Types of Evidence Used	Challenges and Concerns
Smart City Approach	Complexity and “messiness” of urban design problems (Datta & Odendaal, 2019, p. 392; Jana & Sarkar, 2021)	Efficiency, optimization, and reduction of complexity (Offenhuber, 2019; Jana & Sarkar, 2021) Systemic solutions (Offenhuber, 2019)	Data from urban technologies (e.g. sensors, cameras, GPS); analyses of these data, especially by predictive algorithms (Duarte & deSouza, 2020; Lee, 2021; Subramanian & Jana, 2021)	Privacy, security, and accuracy of data (Philipsen, 2015; Lee, 2021) Algorithmic bias and inequity (Duarte & deSouza, 2020)
Justice-Oriented Approach	“Place-less” design (Carmona, 2014) Reinforcing existing power structures (Boano et al., 2014; Gehl Institute, 2018)	Advancing equity and representation with regards to opportunities, amenities and/or meanings that public spaces provide (Lowery & Schweitzer, 2019)	Social scientific data, such as demographics (Carmona, 2014) Community engagement and local knowledge (Lowery & Schweitzer, 2019)	Often temporary rather than systemic (Piazzoni et al., 2022) Lack of training for conducting community engagement (Lowery & Schweitzer, 2019)
EBS Approach	“Space-less” design (Carmona, 2014) Lack of perspective on how space affects human behaviors (Kallus, 2001)	Understanding how physical environments influence feelings and behaviors (Churchman, 2002; Peponis & Wineman, 2002)	Spatial data and information, observations of people and their behaviors in a space, surveys and interviews (Kallus, 2001; Emo, 2020)	May view social or political problems as outside the scope (Churchman, 2002) Can be too micro-level for urban scale (Churchman, 2002; Kallus, 2001)

Toward a Convergent Evidence-Based Urban Design Approach

Certain concerns about the current, disjointed methods of EBUD (i.e., the use of Big Data, the ability to advance systemic justice, and the validity and generalizability of research) echo the critiques of conventional urban design practice. Namely, conventional urban design methods have historically maintained the status quo of power in urban space (Boano et al., 2014, p. 29; Piazzoni et al., 2022) and created a disconnect between the people who study cities and the people who design them (Carmona, 2014). This problem is likely exacerbated by the lack of diversity within the profession itself. In 2020, Black workers made up just over 5% of the architecture and engineering workforce in the U.S., despite representing over 11% of the total population (Data USA). As the prior section of this paper has illustrated, EBUD methods are susceptible to these same criticisms, despite being born out of efforts to address them. Therefore, I argue that EBUD approaches need convergence - that is, the deliberate and extensive integration of the smart city, justice-oriented, and EBS methods. At a practical level, this will entail the use of evidence types from each approach. However, designers must also find a way to converge the theories, ethics, and orientations of these three approaches.

Convergence of Evidence Types

Fundamentally, the distinguishing characteristic of an evidence-based design from a conventional one is a logical approach supported by research, which is present between the design question and the design solution. EBUD solutions are also measurable, meaning the research-designer should be able to evaluate the design to understand if and how it is addressing a problem (Hamilton & Watkins, 2009; Lak & Aghamolaei, 2022). Some experts in architecture and urban design have already begun to define transdisciplinary and practical approaches for using evidence types from all three outlined approaches. For example, Hamilton and Watkins (2009, p. 9) define evidence-based design as “the thoughtful use of the best available knowledge to improve design decisions.” They go on to outline processes, methods and evidence types for the design of buildings and urban spaces. These include, for instance, literature reviews from multiple disciplines, primary research, public input, and high quality data (Hamilton & Watkins, 2009; Pentecost, 2009). Others introduce the role of “research-designers” and “practitioner-researchers,” in which students and practitioners use a diverse range of evidence to program, design and evaluate their work (Lak & Aghamolaei, 2022, p. 108; Pentecost, 2009, p. 235). These definitions suggest that the term “evidence” in urban design practice casts a wide net, which encourages the use of as much information as is necessary for the designer to make a well-informed decision.

When starting a new project, urban designers have a number of published evidence types at their disposal, or they can generate information themselves (Lak & Aghamolaei, 2022). Some forms, such as “desktop” or archival data, which does not require the designer to physically be in a

place or engage with the public (Gehl, 2018, p. 44), may seem more obvious and accessible. This type of data can be especially accessible considering many localities offer data repositories that are open to the public (Hamilton & Watkins, 2009), and other datasets are available for purchase (Jana & Sarkar, 2021). However, EBUD literature points to many less obvious forms of evidence, too, such as interviews and personal knowledge or experience. Evidence can be compiled, analyzed, and expressed via “words, images, sounds and mappings” (Borden, 2014, p. 16). Finally, local knowledge, which is gathered through a public engagement process, is a significant and necessary part of urban design research (Lak & Aghamolaei, 2022; Gehl Institute, 2018; Hamilton & Watkins, 2009; Cushing & Miller, 2020). **Figure 2** indicates key sources of evidence examined in EBUD literature.

A Convergent Evidence-Based Urban Design Ethic

What is missing from the literature, however, is an approach that encompasses the underlying goals and ethics of all three current approaches. This will be a necessary step for advancing EBUD towards more equitable practices. Take, for example, the tensions between the smart city and justice-oriented approaches; data-centric applications are criticized for their use of exclusionary algorithms and over-simplification of urban problems (O’Neil, 2016a; Lake 2017), which is in contrast to the goals of the justice-oriented approach. However, it is unlikely that we will become less reliant on urban analytics in the future. In fact, it seems that we will only rely on them more (Kitchin & Dodge, 2019), especially as there is potential for urban technologies to spur positive transformations (Jana & Sarkar, 2021). In this case, designers must find a way to utilize, or choose not to utilize, smart city technologies in a way that converges smart city design goals with a justice-oriented agenda.

Considering Ann Forsyth’s (2007, p. 465) characterization of conventional urban design methods as being “mysterious,” one way to conceptualize a convergent orientation for EBUD at a broader level would be through a lens of accountability. Here I use Sue Cavill and M. Sohail’s (2004) definition of accountability, where parties can be considered accountable when they are transparent about, and can justify, their actions and decisions to stakeholders. Some theorists, though discussing design more generally, have already made arguments for the role of accountability in design processes. William Gaver (2014, p. 147), for example, has defined aesthetic accountability as central in the design professions, where design solutions are expected to be engaging, appropriate, and to “work” for the user. In this sense, weight is given to being creative more so than having rigorous scientific methodologies, because design solutions are not necessarily expected to be replicable or generalizable in the way that scientific ones are.

Figure 2: Types of Evidence in Convergent Evidence-based Urban Design

Evidence Type	Definitions, Applications, and/or Considerations	Example Application in New York City’s <i>Streetscapes for Wellness</i> by the Public Design Commission (PDC)
Archival Data	<p>Archival data does not require the designer to be physically present or carry out a public participation process (Gehl Institute, 2018).</p> <p>It includes datasets such as demographics, market values, and birth and death rates, to name a few examples (Gehl Institute, 2018). Newer examples include “emotion extraction” data gleaned from social media; these call to question the possibility of “human sensors” in urban data collection (Jana & Sarkar, 2021, p. 9).</p> <p>Research-designers must ensure that it is complete, accurate, timely, and valid (Pentecost, 2009, p. 239-240). Data is high quality when the methods and tools of research, as well as the design of the study, are transparent and accurate. Where a dataset is used to make a claim, the results of the study are able to draw a cause-and-effect rather than a correlational relationship (Pentecost, 2009).</p>	<p>The report provides examples of large datasets (likely gathered by sensor technology) and how they can be used, such as cyclist counts and crash incidents to help understand the impacts of bike path designs (NYC PDC, 2022).</p>

Evidence Type	Definitions, Applications, and/or Considerations	Example Application in New York City’s <i>Streetscapes for Wellness</i> by the Public Design Commission (PDC)
Primary Sources	<p>Research-designers should be encouraged to conduct research and collect information first-hand (Hamilton & Watkins, 2009).</p> <p>This may include observational data by someone physically present in the space, surveys and questionnaires, interviews, or other empirical research (Gehl Institute, 2018).</p>	<p>The PDC presents a case in which community organizers taught a hands-on course as a means to help predominantly Black and Brown youth understand the implications of urban design decisions, and allow them to better advocate for themselves. The students learned about how urban design can contribute to environmental racism through a community restoration project, in which they undertook first-hand data collection work and connected negative public health indicators to the construction of a nearby highway. In a convergent fashion, they also learned data analysis and digital literacy as part of the program. This project paired digital knowledge with experiential knowledge (NYC PDC, 2022).</p>
Literature Review	<p>Awareness and knowledge of current literature is integral to evidence-based urban design (Lak & Aghamolaei, 2022).</p> <p>Hamilton & Watkins (2009) argue that reading current urban design research, as well as research from other fields that pertain to physical environments, is a base level requirement for collecting evidence. They especially recommend prioritizing peer-reviewed, primary sources in order to preserve the original intent of the literature.</p> <p>Research-designers can review literature with the intent to answer specific questions about a problem, and understand how they may change or expand on those theories in their work (Pentecost, 2009).</p>	<p>The Commission emphasizes the importance of natural elements, like green spaces, because of their positive impacts on physical and mental health. Citing EBS research from <i>The International Journal of Environmental Research and Public Health</i>, the PDC also underscores the importance of park design and access in promoting civic trust and belonging (NYC PDC, 2022).</p>

Evidence Type	Definitions, Applications, and/or Considerations	Example Application in New York City’s <i>Streetscapes for Wellness</i> by the Public Design Commission (PDC)
Public Input	<p>There is a need for those working at the urban scale to disaggregate communities into smaller intersections to understand how people perceive space at an individual level. Churchman (2002) writes that “...people do not perceive, understand, or relate to the environment in the same way, nor do they necessarily do so in the way that the planner does or intends that they should” (p. 198).</p> <p>Representatives of the public must be included as part of an evidence-based design process. They offer qualitative value to the designer to contextualize quantitative evidence (Hamilton & Watkins, 2009).</p> <p>Engagement and dialogue are crucial to building and sustaining a trusting relationship between design actors (local officials, designers, developers, etc.) and a community (Gehl Institute, 2018).</p>	<p>The PDC encourages design methods that involve direct community engagement in pursuit of justice, and highlights projects in which designers interact with the community in creative ways, build genuine relationships, and put community needs first. They also promote the consideration of diverse lifestyle choices and backgrounds in public space design. For example, “Restorative Ground” is a playscape project that prioritizes the experiences of neurodivergent individuals in order to promote more inclusive opportunities for well-being (NYC PDC 2022, p. 60).</p>

On one hand, aesthetic accountability is important to consider. For one, it maintains the role of creativity in an evidence-based design process, which some designers are wary of losing (Cushing & Miller, 2020; Emo, 2020). It shows that EBUD may actually require heightened creativity, as the designer has to synthesize research and use those findings to create a design that works for a given community (Hamilton & Watkins, 2009). In relation to the EBS approach, for example, aesthetic accountability can refer to the capacity of a physical environment to generate or reinforce certain behaviors, or ascribe certain meaning, to a public space (Peponis & Wineman, 2002). This might include, for instance, researching environmental indicators of healthy communities (e.g. tree canopy, vegetation, quality parks) and including or recommending those as part of a holistic design (Gehl Institute, 2018).

On the other hand, Ilpo Koskinen and Peter Krogh (2015) have argued that Gaver's distinction between procedural and aesthetic accountability wrongfully separates design from research, when in fact design affects more than just our physical environments. They go on to define the role of accountability in design research as an interdisciplinary approach to help uncover new information, while simultaneously maintaining the authority of the urban design profession over others (Koskinen & Krogh, 2015). I will refer to this as professional accountability. For example, they might agree with Forsyth (2007) that urban analysis and social research can be opportunities to create new knowledge, innovate within the field, and to address more problems with urban design. These methods can help to inform and support the design process by providing novel information and leaving designers with an expanding set of knowledge and resources at their disposal (Hamilton & Watkins, 2009, p. 26). Urban analytics tools can also open up opportunities to innovate the ways in which urban designers interact with the public (Subramanian & Jana, 2021; Kitchin et al., 2021), and allow designers to more efficiently identify and address urban issues (Jana & Sarkar, 2021), without relegating the design of public spaces entirely to engineers and data scientists.

However, this type of accountability is still not comprehensive. Incorporating new information and new technologies into design practice will be a part of EBUD, but it does not address equity or imply the "deep integration" that a convergent approach would suggest (NSF, n.d.). I argue that EBUD should also incorporate and prioritize accountability to society as a whole, especially given the capacity of urban design to create and perpetuate injustice as previously discussed (Boano et al., 2014; Dewar, 2019; Piazzoni et al., 2022). Social accountability would require the designer to take further steps to ensure equity through transdisciplinary approaches. The ethics and practices of participatory governance, which encourage urban actors to provide just and democratic services (Cavill & Sohail, 2004), can, for example, be translated into a new paradigm of participatory urban computing. This could include co-creation and co-design of new urban technologies, co-collection of data, and the ability for stakeholders to share and visualize that data (Stein & Fisher, 2019).

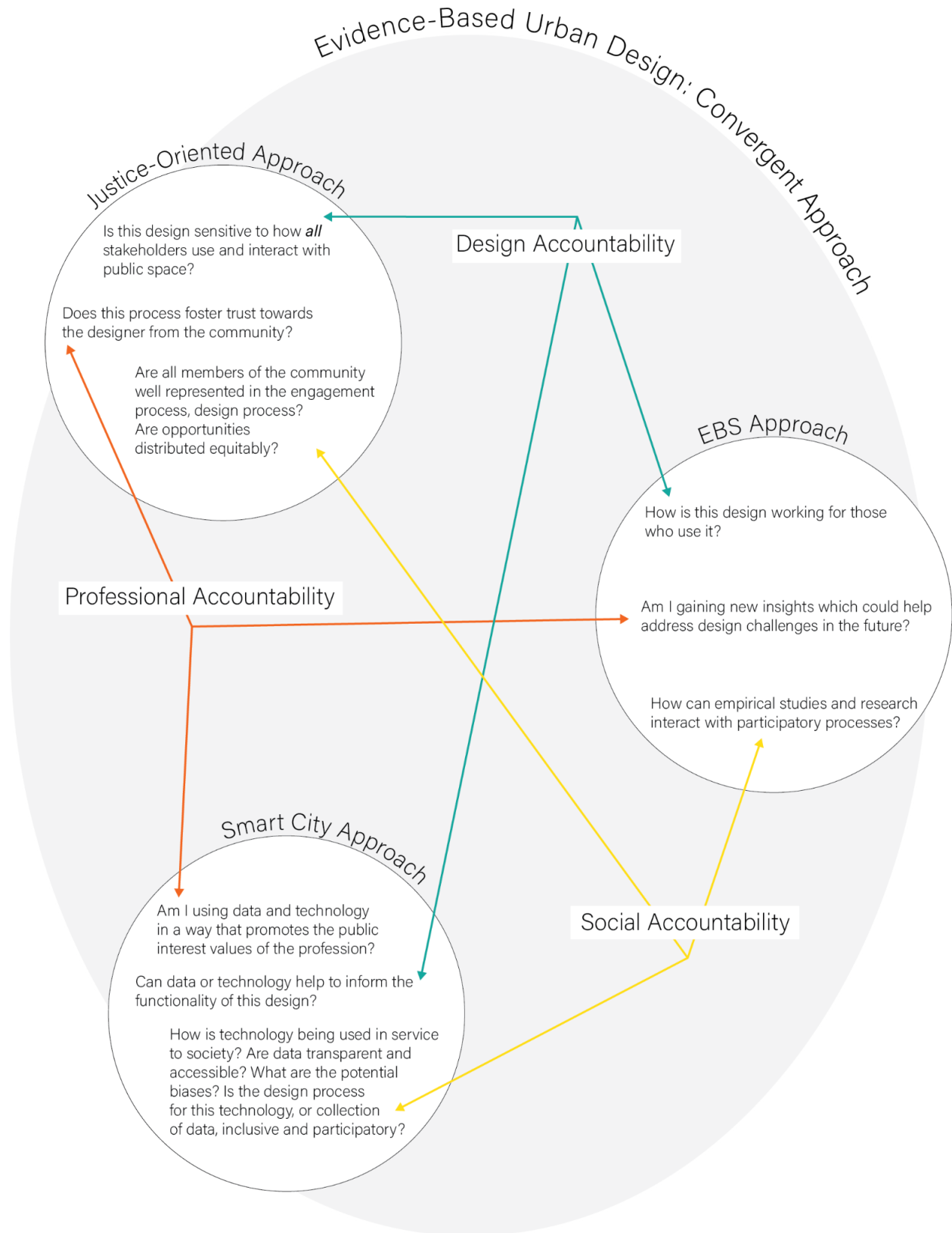
My framework for a convergent EBUD ethic, therefore, is one that integrates the current smart city, justice-oriented and EBS approaches by way of different forms of accountability. I represent this in **Figure 3** as a series of questions that designers may ask themselves throughout the course of the design process. These questions begin to address the ways in which disparate EBUD approaches may be integrated through aesthetic, professional, and social accountability. The framework purposefully prioritizes the process of design, and is antithetical to what Peter Marcuse refers to as “designer planning,” in which designers deprioritize the urban design process in favor of implementing an imaginative vision (Marcuse, 2016). The orientation of this approach towards the design process, as opposed to its outcome, is built on the theory that urban designers should not claim to be the sole arbitrators of what is considered a desirable outcome. Instead, the framework suggests a design process in which there are opportunities to welcome transdisciplinary perspectives, as well as democratic and social interests (Van Assche et al., 2016).

An important note, however, is that this approach does not present an exhaustive list of considerations, nor is it an assurance that design outcomes will be just. It is important to consider that inclusive design processes may not necessarily lead to just outcomes. For example, democratic participation processes may be skewed in favor of whichever demographic group is in power, particularly if minority groups feel intimidated by existing social dynamics. In some cases, opportunities to participate may also be inaccessible to certain people. In other words, unjust social conditions and governance could undermine the efforts of an urban design process completely. Therefore, the underlying social context needs to be inclusive and equitable in order for just urban design outcomes to be possible (Fainstein 2016); EBUD should ultimately be a collaboration between governments, private design firms, non-profits, and communities.

The *Streetscapes for Wellness* report illustrates this possibility well. In addition to the fact that the Public Design Commission is a public entity itself, many of the case studies in the report include direct design contribution and oversight from government agencies, such as the Department of Transportation, as well as public-private partnerships. In most cases, municipal agencies are integral, as they have the ability to designate sites and programs for urban design interventions and studies (NYC PDC, 2022). This is especially significant given that the siting of urban design projects is an important consideration for equity (Dewar, 2019). Meanwhile, public entities have the power to design policies in response to this type of research. Despite the temporary nature of many of the projects exemplified in the report, the Commission contends that its long-term goal is to use these findings to inform policy in the future. Ultimately, the narrative of *Streetscapes for Wellness* provides an optimistic take on the abilities of municipalities to act as catalysts for just design, transitioning short-term design research explorations into long-term, systemic solutions (NYC PDC, 2022).

However, even though there are limitations of urban design as a singular profession, there are opportunities as well, which EBUD will be especially equipped to handle. Just outcomes may begin with policies and processes that are inclusive, but they also hinge on the ability of the urban designer to envision what exactly a just outcome would be and how it would be evaluated (Fainstein & DeFilippis, 2016). Urban design as a profession is centered on the ability to envision design outcomes (Van Assche, 2016). However, EBUD in particular involves an evaluation process, in which research-designers are encouraged to measure a project's success (Lak & Aghamolaei, 2022). Thus, the proposed design process framework in **Figure 3** should be considered as one piece of a convergent EBUD approach, in combination with existing urban design skill sets, broader EBUD definitions, and society as whole.

Figure 3: A Convergent Evidence-Based Urban Design Ethic



Discussion

This research argues that a convergent evidence-based urban design approach has the potential to address complex urban design problems with equity and accountability at the forefront. It defines “evidence” in urban design, and proposes approaches to equitable EBUD practices. However, applying this framework in practice poses some critical barriers. Research in any discipline is influenced by how it is valued in the economy (Carmona, 2014). It may be difficult to operate an EBUD practice while working within a society where profit is the bottom line. It takes time and effort to build trust with communities, and to engage with public agencies and histories; project structures, resources, and timelines do not generally afford this kind of flexibility or timeframes. This can make innovative projects, such as smart city approaches that include community participation, difficult to scale (Offenhuber, 2019). The lack of profitability can be further hampered by the severe time constraints that are typically imposed on designers (Chapin & Cooper Marcus, 1993), or the lack of authority given to urban designers over other professions (e.g. traffic engineers) (Jones, 2014). Meanwhile, societal values are also at play (Carmona, 2014). Participatory governance strategies put some of the accountability workload onto communities as well. Ensuring mutual accountability assumes that stakeholders will readily engage, and that they will impose consequences to the urban designer in the event of wrongdoing (Cavill & Sohail, 2004). It is unclear from this framework what those consequences could be.

On the other hand, there is reason to be hopeful, too. The case studies presented in *Streetscapes for Wellness*, for example, make clear that there are interested parties who are already devoting their talent, time, and funding towards meaningful EBUD strategies. Generating new knowledge via EBUD will position designers to set new baselines and loftier goals for the future of design (Pentecost, 2009), and expand the role of urban design to address injustice in cities. Through EBUD, urban design goals can begin to encompass economic equity, climate resilience, water and food security, and infrastructure degradation (Piazzoni et al, 2022; Forsyth, 2007). Of course, urban design alone does not address larger sociopolitical systems and is not a panacea for all urban problems (Piazzoni et al., 2022). However, the designs of our cities, along with inclusive social structures, do have the capacity to enable equity in urban communities (Gehl Institute, 2018; Piazzoni et al., 2022, p. 1). Through the cooperation of practitioners, municipalities, policymakers, and communities, all with a shared vision of EBUD, urban design can be part of a solution rather than exacerbate existing problems

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