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Strategic urban design for sustainable development: A framework for studio and practice

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Abstract

Urban design seeks to apply the goals of sustainable development in the physical design of cities. It involves complex efforts to explore and address a whole range of urban issues in accordance with the goals of sustainable development. However, it faces challenges to consider the feelings of local communities about unsustainabilities in their environment and to impact the actual urban development. Deploying strategy, which is the science of making the most effective use of a situation to achieve goals, to urban design helps overcome these challenges. This study recommends an interdiscipline of strategic urban design. It proposes a framework of strategic urban design for participative, timely and implementable physical design for sustainable urban development. A cyclic framework of strategic urban design is proposed that comprises four steps: (i) set a goal for urban sustainability, (ii) explore unsustainabilities from citizens' perspective, (iii) explore unsustainabilities that are source of other unsustainabilities, and (iv) design multi-projects to tackle source unsustainabilities. These steps are explained with methods and templates for application in urban design studio and practice.

KEYWORDS
challenges, implementation, participation, practice, strategic, studio, sustainable development, urban design

1 | INTRODUCTION

1.1 | The aim of this study

This study aims to propose an interdisciplinary framework for participative, timely and implementable design of sustainable cities. The introductory section explains the need for this study, and the subsequent sections explain its methods, results and implications for the studio and practice of designing sustainable cities.

1.2 | Urban design for sustainable development

In 1987, the United Nations' *Our Common Future* (WCED, 1987) defined sustainability as 'meeting the needs of the present without compromising the ability of future generations to meet their own needs'. This definition reflected sustainability primarily as an ecological concept (Holden & Linnerud, 2007). However, the term sustainable development is now used with a whole system approach that seeks a balance between economic development and the protection of social and environmental systems (Le Blanc, 2015). Cities are places where

most development occurs, and most people live (United Nations, 2018). Sustainable development largely depends on sustainability of urban development. For example, currently cities account for more than 70% of global carbon dioxide emissions, and cities are failing to provide basic living conditions for 23.5 per cent of the urban population worldwide living in slums (United Nations, 2020).

The '2030 Agenda for Sustainable Development' was adopted in September 2015 with 17 Sustainable Development Goals (SDGs). It assigned a standalone Goal to urban sustainability, that is, SDG11: Make cities and human settlements inclusive, safe, resilient and sustainable (United Nations, 2015). SDG11 has 10 Targets and 15 Indicators that are intended to function as the bases of urban data collection, analysis, and design solutions toward SDG11 (Benedek et al., 2021).

Urban design plays a main role in achieving SDG11, and urban sustainability in general. Urban design gives physical form to the menu of ideas subsumed under the title of sustainable urban development (Carmona, 2021). It reflects sustainability in designing buildings, public spaces, streets, transport, and landscape (Al-Harami & Furlan, 2018; Carmona, 2021; Moudon, 2007). The subject of urban design is physical, but its role in urban sustainability involves much more than simply greening the city or even reducing energy use and carbon emissions by designing the urban form (Larco, 2016). It considers multiple impacts of physical design on the social, economic and environmental sustainability of the built environment (Carmona, 2009). Urban design comprises two broad types: urban design projects, and urban design masterplans.

Urban design projects are concrete design interventions of medium-term for site scales like a plaza, an urban block or a university campus (Oosterlynck et al., 2011). Urban design projects are the basic means of implementing urban design, but they have limitations in multidimensional integration for sustainable urban development (Rowley, 1994). In other words, an urban design project could only focus on a limited number of needs and functions because of its site scale, and because of its particular stakeholders. For instance, design of an urban block may not accommodate solutions for multiple needs of green space, renewable energy transition, housing, employment, etc., altogether in an effective way.

Urban design masterplans are concerned with establishing the integrating fabric of urban areas that are more than simply collections of unrelated projects (Carmona, 2009). Urban design masterplans are prepared with long-term goals for urban scales like an urban district, an entire city or even a city and its surrounding areas (Bell, 2005). They are the main framework of urban design for the pursuit of balanced and sustainable urban development (Rowley, 1994). Urban design masterplanning involves elaborate efforts to explore and address a whole range of urban issues in accordance with the goals of sustainable development (Moughtin & Shirley, 2005). Table 1 presents a studio framework of urban design masterplanning for sustainable development.

1.3 | The need for a new type of urban design for sustainable development

As Table 1 indicates, urban design masterplanning is a coherent framework for physical design of sustainable cities (Cowan, 2002). However, it faces two basic challenges to support sustainability, as follows:

1. **Participation challenge:** although communities are usually engaged in urban design masterplanning in terms of setting a goal for urban sustainability and providing design solutions towards that goal, the technical steps in-between reduce community engagement in identification of sustainability issues and gaps (Dias et al., 2014). Rather than soliciting views about unsustainabilities from people living with poverty, air pollution, accidents, unaffordable housing and alike (Lee & Kim, 2021), designers assimilate and analyse significant levels of data from various databases making it a costly and lengthy process to develop a complete design (Gil & Pinto Duarte, 2008; Madanipour, 2006).
2. **Implementation challenge:** urban design masterplanning identifies development areas and types, environmental improvements, and infrastructure changes (Cowan, 2002; Bell, 2005). However, is common that developments and infrastructure changes do not come forward according to urban design masterplans (Pizarro, 2015), but as Lang (2005) observes, pop up by responses to random social, economic and political opportunities. Toker (2007) notes that weak connection of urban design with local conditions of economic and social systems reduces its impact on the actual urban development. More recently, Greenberg (2019)

TABLE 1 A template of urban design masterplanning for SDG11 (Ziafati Bafarasat, 2022)

Goal (SDG11): Make cities and human settlements inclusive, safe, resilient and sustainable		
Collect data for urban sustainability indicators	**Analyse data to explore unsustainabilities**	**Produce design solutions**
Databases of population, heritage, economy, natural resources, transportation, housing, utilities, public spaces, and so forth, are searched to collect data for Indicators 11.1.1, 11.2.1, 11.3.1, 11.4.1, 11.5.1, 11.5.2, 11.5.3, 11.6.1, 11.6.2, 11.7.1, 11.7.2, and Related Indicators of SDG11. Field study for the indicators is undertaken where databases are inadequate.	Targets 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7 of SDG 11 act as benchmarks in data analysis to explore sustainability issues/gaps or unsustainabilities.	To support the (lagging) Targets, design principles such as compact development, affordable housing, car-free mobility, social inclusion, and so forth, are identified. These principles are translated into codes and maps of development areas and types, environmental improvements, and infrastructure changes.

suggests that with unprecedented dynamics of local conditions in the last two decades, urban design needs to become more like improvisational jazz in its pursuit of sustainable development.

In light of these two challenges of urban design, and in response to a need identified by previous studies (Elmqvist et al., 2019; Larco, 2016; Pizarro, 2015), this study proposes a framework to produce participative, timely and implementable physical designs for sustainable urban development. This framework is labelled 'strategic urban design'.

2 | RESEARCH METHODS

This study needs to answer four questions to meet its aim. They are displayed in Table 2. As shown in the table, each question required its own research method to explore the answer. Overall, this study applied four research methods, including reflection on own work, literature review, desk-based analysis, and practitioners panel as explained in following sections.

2.1 | Reflection on own work

In 2019, following 9 years of research and writing about strategic spatial planning, the researcher started a venture with an urban design corporate and subsequently co-lead an interdisciplinary module of urban design studio. The studio experience was then repeated in another national context as the researcher moved institution in 2021. Engagement with challenges of sustainable city design in studio and practice led the researcher to think about deploying of strategy principles to urban design. The researcher's previous work on the contributions of strategy science to the quest of sustainability by spatial planning made the researcher believe that a new interdiscipline of strategic urban design might achieve similar success.

2.2 | Literature review

A mapping search of the main scholarly search engines of Google Scholar, ScienceDirect, Scopus and PubMed for *strategic urban design* confirmed the researcher's initial assumption that this study would be a first in English to introduce the interdiscipline of strategic urban design and propose its framework. The search for the term strategic urban design was carried out without using inverted commas and other delimiters like AND to allow for broadest search return. The closest records to strategic urban design that the search engines returned related to *urban design strategies*. It is important to distinguish between strategic urban design and urban design strategies like density, transit-oriented development, mixed use of spaces, and participative design (Bohn & Viljoen, 2012; Tiwari et al., 2011). Urban design strategies are particular principles and methods of urban design, but strategic urban design is a type, model or paradigm of urban design.

Strategic urban design is discussed in this study for the first time. This brings forward the question of what are the principles of strategy that might be deployed to urban design? This question needed a literature review to answer. A scoping literature search indicated that most scholarly contents on strategy principles come from two fields: business management and spatial planning. Business management literature on strategy principles was found to be original and elaborate, but not recent. Spatial planning literature on strategy principles is more recent but less elaborate. Contents from both fields along with some other contents (e.g., from public sector management) were included in the literature review, although records that qualified for inclusion in full text qualitative analysis were more from business management literature. Inclusion criteria for full text analysis of records consisted of: (a) direct relevance to the question, (b) analytical answer to the question, and (c) detailed answer to the question.

2.3 | Practitioners feedback panel

After the strategy principles were identified, they were analysed by the researcher for systematic application to urban design. Following two stages of desk-based analysis (Table 2), the researcher produced a framework for strategic urban design. The framework was then presented to a panel of urban design practitioners for their feedbacks. The panel was run online with four participants in addition to the researcher. Panel participants consisted of two designers from the private sector in England, one designer from local government in Germany, and one designer from local government in Turkey. The

TABLE 2 Research aim, questions and methods of the study

Aim: Propose an interdisciplinary framework for participative, timely and implementable design of sustainable cities.

Question	Research method	Result section
1.What type of interdisciplinary design is needed?	Reflection on own work about strategy science and urban design	2.1
2. What are the principles of strategy?	Review of the literature on strategy	3.2
3. Are the principles of strategy relevant to the two challenges of urban design?	Desk-based analysis	3.3
4. What framework could be proposed to deploy strategy principles to urban design for sustainable development?	Desk-based analysis Practitioners feedback panel	4

Source: Author.

number and composition of panel participants was intended to stimulate in-depth feedbacks about the framework and its potential application by practitioners in different sectors and contexts. The panel started with presentation of the proposed framework of strategic urban design by the researcher. Then panel participants provided their feedbacks. The feedbacks helped refine the framework of strategic urban design.

3 | STRATEGY AND ITS PRINCIPLES

Virtually everyone writing about strategy agrees that no consensus on its precise definition exists (Bryson et al., 2018; Chaffee, 1985), but those who refer to strategy generally see it as making the most effective use of a situation to achieve goals (Mintzberg, 1987; Mintzberg & Waters, 1985). This suggests that strategy is a science that makes other sciences work. However, not every model of strategy is helpful to every science. This section reviews the literature on strategy and indicates that from three models of strategy, only one, that is, the Adaptive Model, might be applicable to urban design. The rest of the section will then explore principles of strategy in the Adaptive Model and indicate their potential relevance to addressing the two challenges of sustainable city design.

It is important to note that the literature covered in this section is often from business management. Therefore, the term 'environment' that is used frequently refers to its business meaning in this section. This will be clarified at the beginning of the next sub-section.

3.1 | Three models of strategy

Exploring the literatures of business management and public sector management on strategy indicates that 'organisation' and 'environment' are key terms (Bourgeois III, 1980; Bryson, 2011; Kotha & Nair, 1995). Environment in this sense refers to a set of vague forces 'out there'—in effect, everything that is not organisation (Mintzberg et al., 1998). It includes social, economic, institutional, political, physical and natural surroundings of the organisation. Chaffee (1985) distinguishes three broad models of strategy mainly based on their relationships with the environment (i.e., surroundings). They consist of the 'Linear', 'Adaptive (Emergent)', and 'Interpretive' Models.

The Linear Model of strategy is characterised by producing detailed strategic plans to achieve long-term goals. The environment is seen as a nuisance that needs to be dealt with (Chaffee, 1985). So strategic planning generates future scenarios of the changing environment, weighs their likelihood and defines detailed actions for the scenario chosen as most likely (Chaffee, 1985; Wiltbank et al., 2006). Although Chaffee (1985) includes the Linear Model in strategy categories, it does not align with the strategy notion of 'making the most effective use of a situation' unless the most effective use of a dynamic situation is to explore its future and plan accordingly.

The Linear Model of strategy was applied from business management to spatial planning in the 1970s after the sudden interruption of the economic growth conditions, which had been assumed to be the norm, and the need of spatial planning for new theories and methods (Sartorio, 2005). However, scenario methods further increased the workload of spatial planning increasing the time lag between its studies of the environment and its implementation whereas in many cases the environment changed in non-predictable ways (Balducci, 2010).

Strategy in the Interpretive Model resembles the Linear Model in terms of seeking to deal, but not change, with the changing environment, but it believes that accomplishing this task is not possible by strategic plans (Chaffee, 1985). The Interpretive Model works with language, meanings and norms to gain legitimacy and drive stakeholders in the organisation *and* in the environment to think and to act in ways that are expected to produce favourable results for the organisation (Weick & Daft, 1983). Strategy in the Interpretive Model is a multilevel process grounded in participative making of meanings of propriety, trust and awareness that serve legitimacy for the organisation and its goals (Neilsen & Rao, 1987).

The Interpretive Model of strategy was deployed from business management to spatial planning in the 1990s. It created a view that strategic spatial planning that gives shape to development in an indirect way by giving shape to the minds of those who act on the space (Faludi, 2000). Strategy in the Interpretive Model is difficult to deploy to urban design because physical design is a defining feature of urban design (Jacobs & Appleyard, 1987).

In the Adaptive (Emergent) Model of strategy, the organisation continuously monitors the environment and simultaneously adapts its physical outputs with the opportunities and threats present in the environment (Chaffee, 1985; Guth, 1976; Hofer, 1973). The Adaptive Model relies heavily on an evolutionary biological perspective of organisations (Lovas & Ghoshal, 2000). In this perspective the goal is to support an invisible whole by adaptive actions coming together in an organic process; the organisation and its environment are open to each other; and the environment is more dynamic and less predictable (Chaffee, 1985; Mintzberg & Waters, 1985; Quinn, 1978). The Adaptive Model's focus on continuously adapting physical outputs to the changing environment with an evolutionary system perspective offers good potential for application in urban design.

3.2 | Principles of (adaptive model) strategy

Strategy in the Adaptive Model involves four applied principles of 'citizen science', 'catalysis', 'adaptive cycle', and 'multi-projects' (CCAM) that are explained below.

3.2.1 | Citizen science

In the Adaptive Model of strategy, while it is important for the organisation to remain focused on long-term goals, it is also crucial to address day-to-day problems, needs and judgements of end users of the organisation (Isenberg, 1987). Changing expectations of the users of the organisation outputs drive continuous adaptations of the

organisation and its activities (Chaffee, 1985; Hofer & Schendel, 1978). These changing expectations are usually investigated with a 'citizen science' approach to ensure that the organisation adapts to first-hand user views (Malhotra et al., 2017). Citizen science describes a method of public participation in scientific investigations wherein members of the public provide their real-world sensing as (a) scientific data, and (b) directions for inquiry (Millar & Searcy, 2019; Venkatesh & Velkennedy, 2022).

3.2.2 | Catalysis

The organisation's continuous adaptation to the environment means that activities of the organisation are selective and changing (Porter, 1996). However, strategy in the Adaptive Model does not involve improvising in the selection of activities (Chaffee, 1985). It targets activities that provide multiple benefits from single expenditures (Haeckel, 1999). In other words, strategy in the Adaptive Model acts by 'catalysis' whereby activities (e.g., technological innovation) are selected and implemented in the course of adaptation to the environment which can stimulate positive changes in some non-selected domains (e.g., reduction of production costs and pollution taxes) in the business ecosystem (Mintzberg et al., 2003; Rumelt, 2011).

3.2.3 | Adaptive cycle

In the Adaptive Model, the organisation and the environment constitute an open system, and the environment might bring shocks to the organisation requiring a great deal of adaptation (Chaffee, 1985; Tsao & Ni, 2016). In response, the organisation resolves its entrepreneurial, engineering and administrative problems by cycles of adapting to the environment rather than a one-shot major adaptation to solve problems altogether. This is because: (a) the organisation might not afford wholesale adaptation, and (b) problems keep changing in relation to the environment and in connection with each activity of the organisation to solve them (Miles et al., 1978).

3.2.4 | Multi-projects

The Adaptive Model of strategy provides dynamic, real-time response to issues and opportunities in the environment by changing the organisation's physical outputs. (Chaffee, 1985; Perrott, 2011). This is not possible when the organisation relies on large projects to produce its physical outputs (Hyvari, 2006). Also, single projects do not help much in progress towards the organisation's goal. The Adaptive Model of strategy designs a collection of usually small, technically similar projects that link in terms of a multi-projects system to the organisation's goal (Artto & Dietrich, 2007). Toyota is mentioned as a car manufacturing company that works well because of its effective design of a multi-projects system (Cusumano & Nobeoka, 1998).

3.3 | Potential relevance of the CCAM principles of strategy to sustainable city design

Table 3 indicates the potential relevance of the CCAM principles of strategy to sustainable city design. The next section will utilise this relevance to propose a framework of strategic urban design.

4 | A CYCLIC FRAMEWORK OF STRATEGIC URBAN DESIGN FOR SUSTAINABLE DEVELOPMENT

In this section, a cyclic framework of strategic urban design is proposed. Figure 1 presents an overview of this framework, and the following subsections explain its four steps.

4.1 | Set a goal for urban sustainability

Global goals of urban sustainability like the SDG11 can usually act as a good starting goal for strategic urban design. However, as Figure 1 indicates, the goal of urban sustainability is reviewed in every cycle of strategic urban design which means the goal becomes more embedded in local dynamics in the second cycle of strategic urban design, and more so in the subsequent cycles.

4.2 | Explore unsustainabilities from citizens' perspectives

This step of strategic urban design consists of: (a) organising a workshop of citizen sensing of urban problems, and (b) categorising problems reported by citizens into unsustainabilities. They are explained below.

4.2.1 | Workshop of citizen sensing of problems

Citizen sensing—where people act as sensors of urban problems—is based on citizen science (Coulson et al., 2021). It is possible to explore citizen sensing of urban problems in two broad ways: (a) exploring sensing of individual citizens through an open list questionnaire, a complaint hotline, a mobile app, and so forth, which allows to include many citizens (Peng et al., 2022); and (b) citizen sensing workshop that allows exchange of views between participating citizens but includes a smaller number of citizens (MacPhail and Colla, 2020). Citizen sensing workshop is preferred for application in urban design. In the workshop, a moderator briefs participants about sustainability agendas, and then there is group discussions about urban problems (Figure 2). These help participants notice and report more problems, for example, some environmental issues that they did not use to see as problems before (Gold & Ochu, 2018). A citizen sensing workshop usually consists of 12–24 participants, although sometimes this number can

TABLE 3 Potential relevance of the strategy principles to sustainable city design

Strategy principle	Potential relevance to urban design	Design challenge to be addressed	
		Failing to consider citizens' feelings about unsustainabilities	Limited impact of design on sustainable urban development
Citizen science	Urban unsustainabilities might be identified by citizens	■	■
Catalysis	Design solutions might focus on unsustainabilities that are source of other unsustainabilities (source unsustainabilities)		■
Adaptive cycle	Framework of urban design might become cyclic	■	■
Multi-projects	Urban design solutions might be small projects in multiple locations	■	■

Note: Shaded cells indicate a tick mark function.
Source: Author.

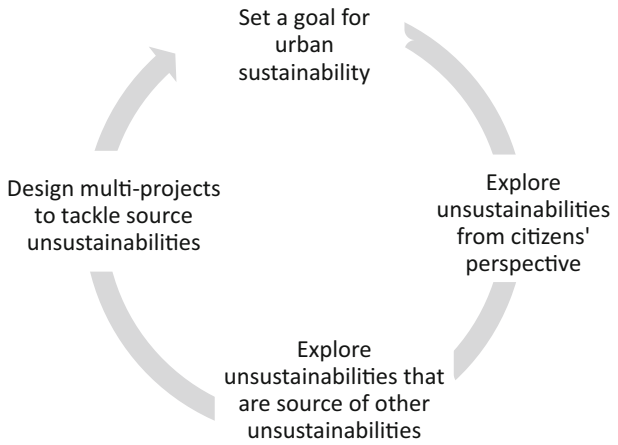

FIGURE 1 A cyclic framework of strategic urban design. *Source*: Author

increase up to 60 (Balestrini et al., 2017). Participating citizens should be a representative sample of different socioeconomic backgrounds and places in the design area (Woods et al., 2018). A template for a workshop of citizen sensing is provided in Figure 2. The workshop will produce in a list of urban problems based on citizen science.

4.2.2 | Categorising problems reported by citizens into unsustainabilities

The list of urban problems that is produced in the workshop of citizen sensing should be thematically categorised into a more manageable list of unsustainabilities. In this categorising it is important to note that unsustainabilities should not be too general for the subsequent analysis of their relationships and design response. Figure 3 indicates an example of categorising 61 urban problems into 27 unsustainabilities that cover urban form, social, economic and environmental dimensions.

4.3 | Explore unsustainabilities that are source of other unsustainabilities

> Despite substantial focus on sustainability issues in both science and politics, humanity remains on largely unsustainable development trajectories. Partly, this is due to the failure of sustainability science to engage with the root causes of unsustainability (Abson et al., 2017, p. 30).

Because it is usually impractical to provide design solutions for all unsustainabilities, a method is introduced in this section to explore unsustainabilities that are source of other unsustainabilities. Providing design solutions for source unsustainabilities could also improve a broad range of other unsustainabilities that are driven by source unsustainabilities (Abson et al., 2017). Figure 4 indicates how 'non-inclusive housing' might act as a source unsustainability by driving a few other unsustainabilities that were mentioned in Figure 3.

The method to explore source unsustainabilities is a cross-impact (interrelationship) matrix. Cross-impact analysis was first developed by Theodore Gordon and Olaf Helmer in 1966 for application in forecasting (Gordon & Hayward, 1968). It is based on experts' analysis of the impact of a variable on all other variables within a system to explore those variables that play a significant role in the future development of the system (Asan & Asan, 2007). Using a matrix for cross-impact analysis helps experts to find the most influential variables and those variables that are impacted by the most other variables (Chao, 2008).

Table 4 displays a cross-impact matrix for an example of six unsustainabilities from Figure 3. The complete example should include the 27 unsustainabilities in the first row and first column. Impact of each unsustainability on other unsustainabilities is indicated vertically by scores from 0 (no known impact) to 3 (strong impact). The last row is the sum of impacts of each unsustainability on other unsustainabilities. Higher impact sums indicate source unsustainabilities.

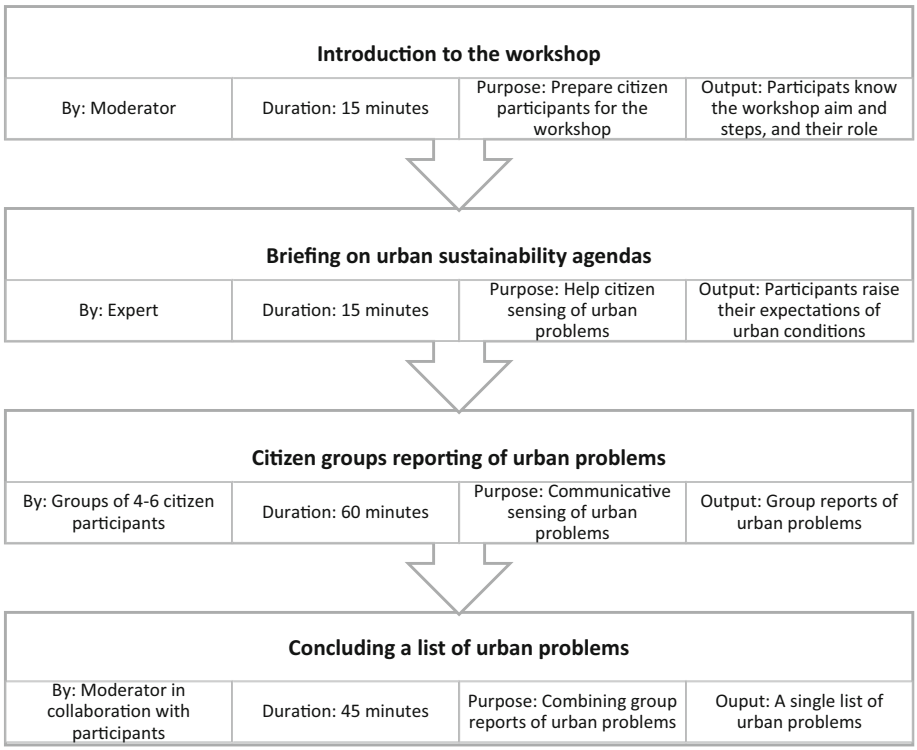

FIGURE 2 Template for a workshop of citizen sensing of urban problems. *Source*: Author, based on: Woods et al. (2018)

The impact scores should be provided by a team of experts with contextual knowledge about the design area. The team could decide together about the scores in a process of group consensus, or it is possible to fill in the matrix cells with averages of scores given by individual experts (Weimer-Jehle, 2006). When scoring is undertaken by individual experts, mistakes of internal inconsistencies among the scores are more likely to occur. However, this might be checked with tests of internal consistency, for example Cronbach's alpha formula, before calculating averages of scores (English & Keeley, 2015).

4.4 | Design multi-projects to tackle source unsustainabilities

It was mentioned earlier that projects are the basic means of implementing urban design, but an urban design project could essentially focus on a limited number of issues in its site scale which confines its multidimensional contribution to sustainable development. Focusing on source unsustainabilities could help projects provide multidimensional contribution to sustainable development. This contribution could be maximised by a set of projects, that is, multi-projects, that focus on source unsustainabilities.

In the fields of construction and project management, multi-projects are a set of similar type, small projects that are implemented simultaneously in different locations to provide timely but systematic answer to issues and needs (Aritua et al., 2009). Multi-projects tend to be smaller than single projects thus shorter in duration (Payne, 1995). They exchange resources, partners and learning between individual project locations, and they can more easily engage stakeholders in each location (Dietrich & Lehtonen, 2005; Rojanamon et al., 2012). Designing of multi-projects comprises two aspects: (a) the scope of multi-projects, and (b) locations and layouts (Aritua et al., 2009; Cortesão et al., 2020). They are discussed below.

4.4.1 | Defining the scope of multi-projects

The scope of multi-projects should be defined in terms of the source unsustainabilities and the mechanisms to tackle the source unsustainabilities. Projects can apply two mechanisms to tackle source unsustainabilities. They comprise: (a) physical outputs like houses or parks; and (b) processes involved in creating physical outputs (Keitsch, 2012).

Multi-projects might be able to tackle a few source unsustainabilities together, particularly when they tackle some source unsustainabilities physically and some others procedurally. In the previous example, the source unsustainability with the highest impact sum is 'non-participative governance', but this is an issue which cannot be addressed physically. It is usually possible to still tackle such a source unsustainability but in terms of processes in creating physical outputs for other source unsustainabilities. As the next source unsustainability is non-inclusive housing (Impact sum = 8), this means multi-projects should provide 'inclusive housing' in a 'participative' mechanism. Inclusive housing is defined as affordable housing in middle class neighbourhoods (Winston, 2022). The next source unsustainability is unemployment which can be tackled by both physical outputs, like providing shops and offices, and implementation processes of multi-projects that support local employment. Table 5 indicates that the scope of a set of multi-projects can cover the three source unsustainabilities together in this example.

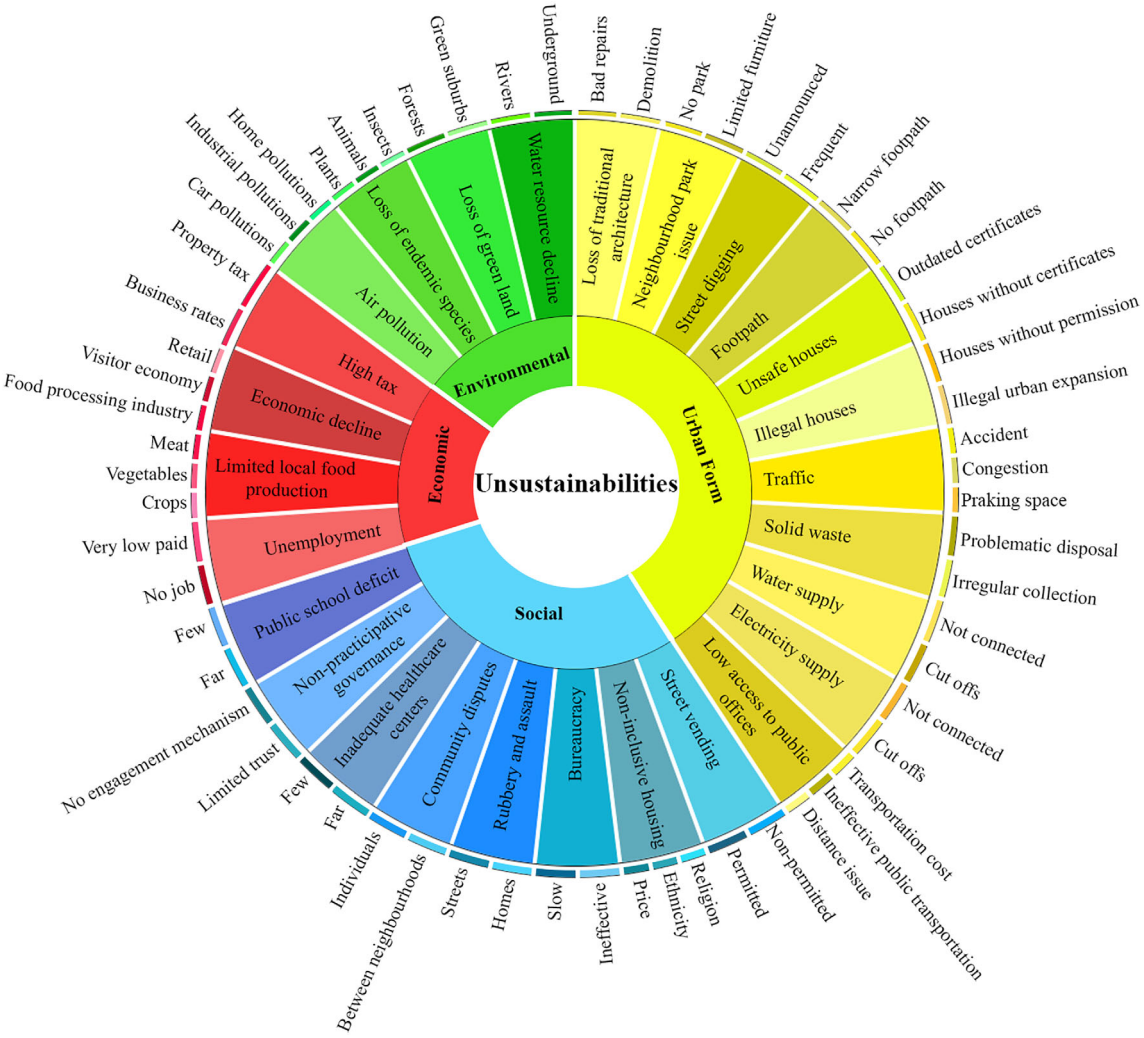

FIGURE 3 Categorising an example of 61 urban problems into 27 unsustainabilities. *Source*: Author

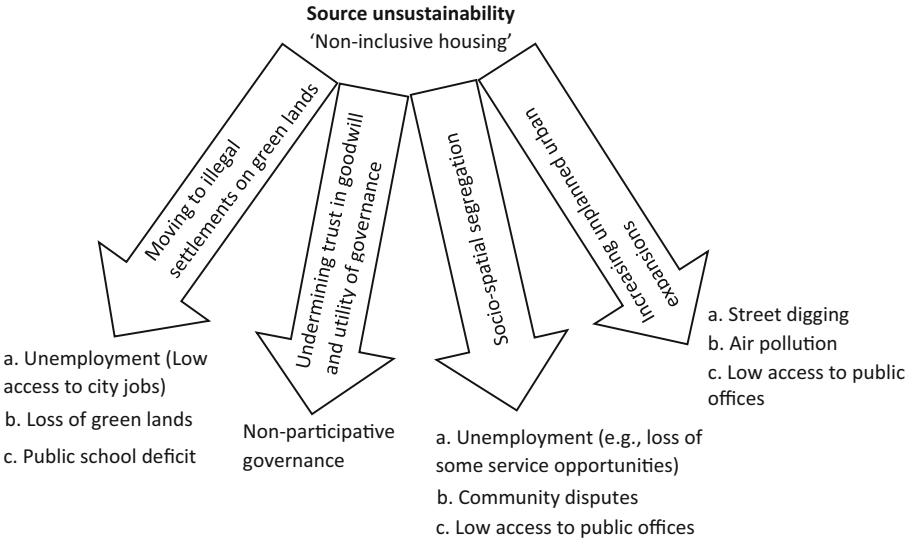

FIGURE 4 An example of source unsustainability. *Source*: Author

TABLE 4 A cross-impact matrix of urban unsustainabilities

Urban unsustainabilities						
0 ≤ impact ≤3	Non-inclusive housing	Loss of green lands	Non-participative governance	Low access to public offices	Unemployment	Street digging
Non-inclusive housing		0	2	0	2.5	0
Loss of green lands	2		2	1.5	1.5	0
Non-participative governance	2	1		0.5	2.5	0.5
Low access to public offices	2	0	1.5		0	0.25
Unemployment	1	0. 5	1	1		0
Street digging	1	0	2	0	0	
Impact sum	8	1.5	8.5	3	6.5	0.75

Source: Author.

TABLE 5 An example of defining the scope of multi-projects

Source unsustainabilities	Scope of multi-projects to tackle source unsustainabilities	
1. Non-participative governance	Participative projects of (…?)* *Physical output is needed for projects in urban design	Participative projects of affordable houses in middle class neighbourhoods. Where consistent, provide shops and offices in these projects, but always ensure local employment is supported in project constructions.
2. Non-inclusive housing	Projects of affordable houses in middle class neighbourhoods	
3. Unemployment	Projects that provide retail/office space and support local employment in project constructions	

Source: Author.

However, it is important to note that the number of source unsustainabilities that multi-projects might tackle is limited by the small size of projects which cannot effectively provide very diverse physical outputs (Dietrich & Lehtonen, 2005; Payne, 1995). This means that adding more source unsustainabilities to the scope of projects depends on the possibility to address them in integration with addressing source unsustainabilities of higher impact.

4.4.2 | Locations and layouts of multi-projects

Locations and layouts of multi-projects are set in accordance with their scope and local economic, social, environmental and urban form considerations (Rondinelli, 2013). Layouts of projects should enable optimum use of the small size of projects to cover their scope. This might be assisted by computational designing of layout prototypes (Miao et al., 2018). Layouts should also integrate landscape impacts of projects with visual qualities of the surrounding environment (Miao et al., 2017). After a set of multi-projects is implemented, strategic urban design begins a new cycle so that the results of the multi-projects are reflected in a new list of unsustainabilities for the subsequent steps.

5 | CONCLUSIONS

Urban design seeks to apply the goals of sustainable development in the physical design of cities. It involves complex efforts to explore and address a whole range of urban issues in accordance with the goals of sustainable development. However, it faces challenges to consider the feelings of local communities about unsustainabilities in their environment and to impact the actual urban development. Deploying strategy, which is the science of making the most effective use of a situation to achieve goals, to urban design helps overcome these challenges. This study recommended an interdiscipline of strategic urban design. It proposed a framework of strategic urban design for participative, timely and implementable physical design for sustainable urban development. A cyclic framework of strategic urban design was proposed that comprises four steps: (i) set a goal for urban sustainability, (ii) explore unsustainabilities from citizens' perspective, (iii) explore unsustainabilities that are source of other unsustainabilities and (iv) design multi-projects to tackle source unsustainabilities.

In this concluding section, contributions and limitations of the study are explained.

5.1 | Contributions

5.1.1 | Contribution to theory

This study is a first reviewed publication in English about a new interdiscipline of strategic urban design and its framework. By systematic exploration of the CCAM strategy principles and linking them clearly to the challenges of urban design for sustainable development, the study sets the foundation for future theoretical developments on this track. In other words, this study provides a first steppingstone for

proliferation of ideas and perspectives about strategic urban design as a main instrument for building sustainable cities.

5.1.2 | Contribution to studio

Application of the framework of strategic urban design in studios can stimulate students' deep understanding of sustainability and out of the box thinking for designing sustainable cities. This essential change in studio pedagogy, which is also emphasised by Qu et al. (2020), is made possible in strategic urban design in two ways: (a) reducing data workload of design by exploring unsustainabilities from citizens' perspectives and (b) increasing analytical workload of design by exploring source unsustainabilities and their design solutions. The reduction in data workload that is an added value of citizen science and engaging with local feelings about unsustainabilities, will also make it possible for each student group in design studios to cover all themes of design. This means that each group of students can provide a complete design for an urban area that is helpful for their systematic learning of sustainable city design.

The framework of strategic urban design aligns studio with the approach of many design schools to sustainable urban design as an interdisciplinary, adaptive and cyclic process (Keitsch, 2012). It helps students to learn to engage with local views and daily issues and connect them with their design responses for sustainable urban development by means of small multi-projects. It integrates project design in the learning package of urban design studio, providing students with the ability to work across design scales from exploring unsustainabilities to designing implementation of their solutions. The framework of strategic urban design educates students to design sustainable cities in the making without resorting to master maps and codes for the entire design area. This is essential to prepare design students to work for urban sustainability in an age of uncertainty and local democracy.

5.1.3 | Contribution to practice

Strategic urban design enables design practitioners to apply their science of urban sustainability in quick fixes needed for urban problems. It will help better connect with the interests of public and private bodies in designing sustainable cities and societies as suggested by Gazvoda (2019). By designing small multi-projects that tackle source unsustainabilities in continuous cycles, strategic urban design can make systematic impact on sustainable urban development with limited resources but with results that start to show in short term. Continuous reflection on local sustainability problems and design responses in short cycles of strategic urban design provides design accountability and increases public support behind the practice.

5.2 | Limitations

This study proposed a new design framework that needs application feedbacks before wide use in studio and practice. Although the framework of strategic urban design was examined by an international panel of design practitioners, further helpful details and methods often emerge in the course of dealing with issues that might arise in applications. In other words, the framework of strategic urban design is still a draft that should further evolve in its applications in studio and practice.

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