

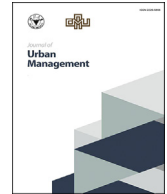
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Research Article

Mitigation of urban voids in traditional neighborhoods: The case of the Al-Najada zone in Doha, Qatar



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ABSTRACT

Urban voids and leftover spaces challenge the urban development of cities and result in land vacancy and other spatial planning issues. Such spaces have great potential for innovative intervention through piece-by-piece sustainable urban design and small-scale actions to foster livability and sustainability. This paper analyzes urban voids in the Al-Najada zone in Doha, Qatar. The zone has a valuable cultural and historical background. The paper uses the case study method to analyze the urban voids and develop re-planning scenarios through visual schematic design and photomontage. The paper demonstrates the application of sustainable and social principles to rejuvenate old areas by creating functions for urban voids.

1. Introduction

Urban design is a multidisciplinary field that draws together livability enhancement, community creation, equality promotion, and opportunity expansion in addition to fostering sustainability (Brown, Dixon, & Gillham, 2014; Downton, 2009). The concept of sustainable urbanism arose as a response to the current climatic change debate that considers both the environmental and contemporary urban design realities such as population growth, urban sprawl, and the over-dependence on the automobile as a major transportation system (Mazzeo, James, Young, & Farrell, 2017). In this regard, urban voids are one of the most widespread urban challenges in today's cities, where some spaces within neighborhoods and districts are left vacant due to planning issues and other reasons (Gobster, Hadavi, Rigolon, & Stewart, 2020). We refer to such spaces as urban voids (Jeong-Lee, Hwang, & Dongha-Lee, 2015; Kim, Newman, & Jiang, 2020; Rathi & Kushwah, 2017; Hashem, Wahba, & Nasr-Eldin, 2022). Urban voids should be mitigated through innovative interventions such as piece-by-piece urban design and other comprehensive design techniques based on the theoretical application of sustainable urbanism.

In this study, urban voids branch into three levels based on the size and the location of the leftover space within the urban area. The first type of urban void exists in a plot and is relatively easy to use for development or modification (Fig. 1). Accordingly, the plot is a basic urban unit and includes spaces such as pilotis and rooftops in addition to spaces in-between, around, and underneath the buildings (Azhar & Gjerde, 2016; Lee, Hwang, & Lee, 2015). For instance, pilotis are structural supports that lift a building above ground level and

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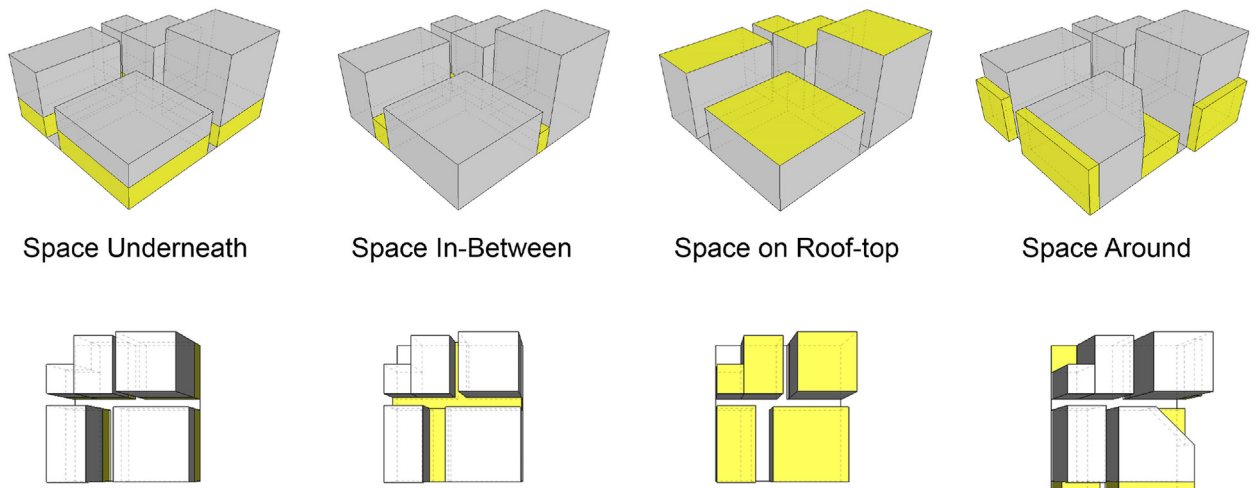


Fig. 1. Urban voids in a plot. After (Azhar & Gjerde, 2016). Graphics by the Authors.

result in vacant space below, refining the connectivity of the building with the surrounding land uses (Corbusier, 1986). Spaces beneath pilotis can be used for parking, entry point to a building, garden, or other public uses. Similarly, rooftops are discontinuous or temporal leftover spaces with diverse physical characteristics that lack integration with the overall building (Azhar & Gjerde, 2016). There is currently a growing interest in urban design to utilize rooftops effectively as they have been ignored and left unattended in most contemporary schemes (Saha & Eckelman, 2017).

The second level of classification considers voids in an urban block level. Urban blocks are the components of the street, plot, buildings, and public open spaces. They are the essential forms of urban tissue and the defining elements of the city layout (Oikonomou, 2015). Examples of urban voids existing in blocks include in-between spaces and setbacks commonly located on low-rise residential developments.

The third level of classification considers urban voids existing in a community (Lee et al., 2015; Hashem et al., 2022). These urban voids consider how residents and pedestrians participate in creating livable communal spaces by enhancing the quality of life and utilizing pedestrian pathways, landscape features, fixtures, public areas, and other strategies for sociocultural enhancement.

While the difference between voids in the plot and block levels seems quite obvious due to the differences in the physical limits that define each level, community voids relate to livability and social aspects of the urban space considering the human behavior and social interactions in these voids (Lee et al., 2015; Kim et al., 2020; Rathi & Kushwah, 2017; Hashem et al., 2022).

This paper contributes by demonstrating the design for urban voids in the Al-Najada zone in the traditional core area of Doha to enhance urban livability and sustainable tourism. Three selected sites of urban voids in the Al-Najada zone are classified, examined, and investigated to apply revitalization strategies. Finally, the paper presents visual schematic outcomes through computer-aided graphical software and photomontage and some guidelines to regenerate urban voids to increase social integration and livability on the traditional neighborhood scale.

The rest of the paper is organized as follows. The relevant literature on urban voids, sustainable planning, sustainable tourism, and methods used to mitigate urban voids are given in Section 2. Urbanism in Doha, Qatar, is also reviewed in this section. The research method used in this paper is given in Section 3, followed by the discussion of the site used for analysis in Section 4. The implication of the proposed urban design is given in Section 5. Finally, conclusions and discussions are given in Section 6.

2. Literature review

This section focuses on the concept of sustainable urbanism, smart growth, and general aspects of urban voids. The section presents urban void types and their characteristics and highlights the main challenges in urban void planning. It also provides a summary of the principal parameters used in the planning of urban voids.

2.1. Sustainable urbanism

Sustainable urbanism covers fifteen core principles that unite under the common mission of mitigating present-day urban challenges (Lehmann, 2010). One of the main principles highlights the practice of retrofitting using (1) urban infill through integrated land use; (2) sustainability through density; (3) compactness of buildings and public spaces through vertical rather than horizontal development, and; (4) effective transport systems and transit-oriented developments that are promised to be the future of land-use planning in eco-cities (Cervero, 2009; Knowles & Ferbrache, 2019; Lehmann, 2010; Loo & Comtois, 2015; Pojani & Stead, 2018).

2.2. Urban climate and design movements

Cities steadily have higher temperatures compared to other urban areas due to greater heat retention by buildings, urban materials such as concrete and asphalt, along with other human-induced activities. Therefore, strategies for urban climate adjustment must consider urban green infrastructure due to its various positive externalities on the community and local ecosystems (Steiner, 2018).

Studies show that building cooler cities is possible through green infrastructure. Techniques of green infrastructures on an urban scale include (1) green open spaces and public parks; (2) shading trees and tree canopies; (3) green roofs; and (4) vertical greening systems and bio-facades (Clark, 2019; Elsadek, Liu, & Lian, 2019; Shafique, Luo, & Zuo, 2020).

Other studies present smart growth to target the challenge of urban climate. Smart growth refers to a theory used in urban and transportation planning by focusing on creating walkable, bicycle-friendly, and transit-oriented land use and is particularly used in the UK, Europe, and North America. Therefore, smart growth helps to reduce the dependence on car-based urbanism, promote a healthy lifestyle, limit urban sprawl, and utilize efficient alternatives to public transportation systems (Artmann, Kohler, Meinel, Gan, & Ioja, 2019; Riggs & Chamberlain, 2018). Urban sprawl is created due to unplanned and aesthetically displeasing areas and affects social cohesion, human health, and environmental quality. Therefore, smart growth impacts the creation of housing opportunities, walkable neighborhoods, and preserving open space and natural beauty (Knaap & Talen, 2005).

Urban planners consider the differences in local conditions from one place to another and do not strictly implement the same principles of smart growth and new urbanism in all places (Wey & Hsu, 2014). Nevertheless, smart growth might be controversial. For example, increasing the density in urban cities is a solution to reduce the dependence on automobiles. Still, it might create problems in limited air circulation, increased domestic waste production, and urban heat islands.

2.2.1. A conceptual exploration of urban voids

In the urban design literature, studies classify urban voids into various categories. Accordingly, categories of urban voids include planning voids, functional voids, and geographical voids (Rathi & Kushwah, 2017). The planning voids relate to inefficient planning processes, which means that the planning has been performed without understanding the city's fabric. Functional voids consider the dead vacant spaces in the cities when these spaces are not used as intended. In most cases, functional voids occupy precious land and are aesthetically unpleasing. The geographical voids are created when the city's natural features, such as streams, rivers, or valleys, are overlooked by urban planners and designers and create geographical voids (Rathi & Kushwah, 2017).

Other studies group urban voids into reserve spaces, remnant spaces, and defunct spaces (Patel, Bhatt, & Shah, 2019). Reserve spaces are intentionally left undeveloped to create a buffer zone for infrastructures like roads, rail, power plants, or transmission lines. Remnant spaces are created due to infrastructure or by-law requirements, such as spaces under the overhead rail line or flyovers, or service lanes on highways. Defunct spaces are underutilized spaces, for example, parking spaces, urban parks, or abandoned industrial areas (Patel et al., 2019).

In discussing urban voids, property formation, and land ownership can also be considered to understand the core concept of the utilities envisaged by the owners. Accordingly, understanding the structure of traditional neighborhoods is a requirement for urban regeneration to optimize real property value and encourage land acquisition (Goncalves & del, 2013). This approach gives rise to the noticeable trend in urban development known as the Iconic District Concept, mostly seen in the emerging cities of the Middle East including Doha (Goncalves & del, 2013; Law & Underwood, 2012).

2.2.2. Urban voids mitigation as a piece-by-piece urbanism

Piece-by-piece urban design is an incremental precinct or neighborhood-based development process. It counts on the perceptions of the public interest, and it is focused on urban renewal (Lang, 2005). A common approach to piece-by-piece urbanism includes mixed-use and diverse development to foster public communication and social interaction paired with the possibility of the addition of new services and infrastructure.

A major limitation to piece-by-piece urbanism is the role of public-private partnerships (PPP) in assuring that public policies are well implemented, especially in privately-owned lands and projects (Inam, 2016). Another challenge is the interpretations and tools available to the urban designer, zoning restrictions, building heights, and setback requirements.

Practically, some studies consider human behavior analysis and the contemplation of user performance as necessary to consider for user-centric innovation and participatory urban void utilization design (Douglas, Reardon, & Täger, 2018; Ferguson & Candy, 2014). These designs should include shared areas, urban pockets, sociable plazas, and green urban zones to meet the functional requirement of the public.

2.3. Urbanism considerations in Doha, Qatar

The characteristics of urbanism in the State of Qatar include its rapid urban growth aided by high revenues from the active industries in the oil and gas sector, along with the flow of megaprojects (AL-Mohannadi, Asmaa, & Furlan, 2018; Salama & Wiedmann, 2016; Wiedmann, Salama, & Mirincheva, 2014). Qatar aims for sustainable development as defined in its strategic vision and development framework (General Secretariat for Development Planning (GSDP), 2008). The Qatar National Development Framework (QNDF) strategy places greater importance on the built environment as a driver of change to fulfill the anticipated vision of sustainable development on the urban scale and emphasizes the importance of proper urban planning to avoid the extension of poor community facilities (Al-Harami & Furlan, 2020; Furlan, Petruccioli, Major, et al., 2019).

The Al-Najada zone, which is the focused urban area in this paper, is one of the older localities in Doha. Such older localities can foster a strong sense of the place by providing links to the past and the valuable cultural way of life (AL-Mohannadi, AL-Malki, & Furlan, 2019; Furlan, Eissa, Awwad, & Awwaad, 2015; Shurbaju, 2018). The local owners in the area have mostly moved out to better homes and facilities, and most of the buildings are rental facilities for low-income workers. The courtyard houses in these areas were developed for specific cultural uses by the original inhabitants but are unpreserved at present (AL-Mohannadi, Asmaa, Furlan, & Major, 2019, 2020). Urban renewal activities in some parts of Al-Najada were undertaken to revive the living heritage and the development of the adjacent areas. For example, the revived Souq Waqif (old bazaar) located adjacent to the Al-Najada zone provides a strategic strength as the old bazaar with retail shops and dining and leisure facilities represents an attachment to Qatari heritage and has become a landmark for tourists and visitors (Furlan & AL-Mohannadi, 2020; Furlan, AL-Mohannadi, Major, & Paquet, 2022; Khan, Major, Tannous, & Paquet, 2021; Tannous, Furlan, & Major, 2020). This makes the revived areas of Al-Najada more livable and attached to the heritage.

Therefore, further rejuvenation of the Al-Najada zone will bring back its historical significance and preserve its identity and antiquities. This means future urban planning for void mitigation in the Al-Najada zone should focus on conservation and renovation (AL-Mohannadi, Furlan, & Major, 2020; Furlan, Petruccioli, & Jamaledin, 2019). The mitigation may focus on one or more of the following actions: restoration of areas and facilities; reconstruction of old buildings; demolition of temporary installations (like advertisement boards and fences); provision of shady open spaces; and providing parking areas. It should be noted that when old structures are demolished for restoration and conservation, the long-standing heritage of those areas may be lost (AL-Mohannadi, Asmaa, Furlan, & Major, 2020; Eddisford & Roberts, 2014).

2.4. Void mitigation challenges

Urban voids mitigation in traditional zones is subject to challenges like loss of livable spaces, loss of connectivity between void networks, isolated application of conservation strategies, and a lack of coherence in the void mitigation strategies (García & Esmeralda, 2017). Table 1 lists some of the challenges in the literature that are important to consider when developing Doha's urban void mitigation.

3. Research design

This paper employs a case study research methodology to provide a schematic design application and a policy framework to mitigate urban voids. The case study methodology is useful to understand the processes and outcomes that reshape cities and their sociocultural dynamics, which aligns with the scope of this paper. In architecture and urban design, case study research is widely utilized as qualitative, action, and mission-oriented research to improve existing situations (Boyko, Cooper, Davey, & Wootton, 2006; Groat & Wang, 2002). The method targets a specific context and develops intensive knowledge based on a practical problem-solving process.

Table 1
Challenges to addressing urban voids in urban planning and design.

Challenge to address urban voids	Description	Reference
Lack of public spaces	Previously, public spaces were an important part of the public realm in old cities. Currently, there is a lack of planning for public spaces.	Rathi and Kushwah (2017)
Lack of public participation	There is a lack of public participation from the people's side as well as the governmental side. This is critical since not all cities can be treated the same way. Some techniques and methods fit somewhere and do not fit others.	
Poor design of public spaces	There is a gap between people's needs and design in the public spaces present in the city. Poorly designed public spaces will end up as a design intervention that does not fit within the location.	
Financial support for vacant lands	Financial struggles can hinder community engagement with vacant land reuse. Financial information about the availability of loans, grants, and other potential sources of money should be available to the residents. Most cities lack adequate economic incentives to support vacant land reuse and remove (or maintain and improve) abandoned buildings.	Kim et al. (2020)
Understanding the problems and potential value of vacant urban land	Most urban residents do not even know how many vacant properties are in their municipalities. Besides, they might not know which vacant properties have contamination issues that would potentially affect people's health.	
Practical information about the redevelopment process for vacant land	It is very important to provide practical information about redevelopment. Residents would like to know how they can reuse vacant land, but they often lack the technical and practical knowledge or financial means to redevelop it. Therefore, municipalities should provide vacant land classifications and tax policy investment incentives for vacant land reuse.	
The protection of the historic and local cultural identity of the city	The approaches for urban voids should consider a management plan for the heritage resources. Moreover, emphasis should be placed on integrating the cultural and economic sectors in urban heritage management.	Shurbaju (2018)
Encouraging social interactions and liveability	Based on planning and design guidelines, there are several suggestions to improve Al-Najada's social sustainability. Among them is the need to diversify the uses in the zone; the need for multi-modal transportation options; the need to incorporate artistic and visual features into the site. Other recommendations include the encouragement of social activity, community involvement, and cross-neighborhood accessibility.	Eissa, Awwad, Awwaad, and Furlan (2015)

Furthermore, when a case study is supplemented with field studies, it can help to improve the design due to the clear perspectives observed during the field studies (Amedeo, Golledge, & Stimson, 2009).

It is important to note that this study adds to prior academic and research endeavors by the authors and others, and uses data collected in reports done for fieldwork and training exercises. These reports are published articles or unpublished working papers, spanning topics such as spatial practices and morphological analysis (AL-Mohannadi, Asmaa, et al., 2019); state of community reports; and historic conservation and preservation. Data on urban voids were collected through site visits, site analysis, photographic documentation, and maps and aerial images. Methods of analysis included visual mapping, analytical diagrams, simulative images, and census data.

The overall research framework used in this paper is given in Fig. 2. The framework is inductive in its formulation. It starts with a theoretical examination and hypothesizes that a certain urban trend is worth investigating in a definite context, namely urban voids. GIS can be used as the first line of information for this study to understand the characteristics of the urban void. Then, the applicable criteria for planning are obtained from the literature review to be verified and used in the case study. The characteristics of the case study are discussed next, followed by the design application. This type of research may enhance the existing body of knowledge, especially in the fields of architecture and urban design (Groat & Wang, 2002).

3.1. Strategies for the design application

In general, urban void mitigation strategies should lead to an integrated urban design methodology that includes the following sub-strategies (Fig. 3). The research team developed these concepts as strategies based on climatic emergencies and resilient urban planning and design.

- a. Regeneration and beautification of deteriorated urban spaces by integrating low and high technologies: low-level technology includes plantation and landscaping solutions to spread the green cover and improve the microclimate; whereas high-level technologies include applied systems that support sustainability best practices. An example of the current effort in Doha is the ongoing beautification program implemented by the Public Works Authority, which aims to expand Qatar’s green cover by 240% in two years (QT-Online, 2019).
- b. Integration of urban renewal and infill: it aims to incorporate better land-use planning, promote a compact community, and bring people back to the Al-Najada zone, especially the original inhabitants. Lehmann (2010) mentions that a common strategy for integrated urban infill is the adaptive reuse of existing buildings and revitalizing of underutilized land for community benefits (Lehmann, 2010).

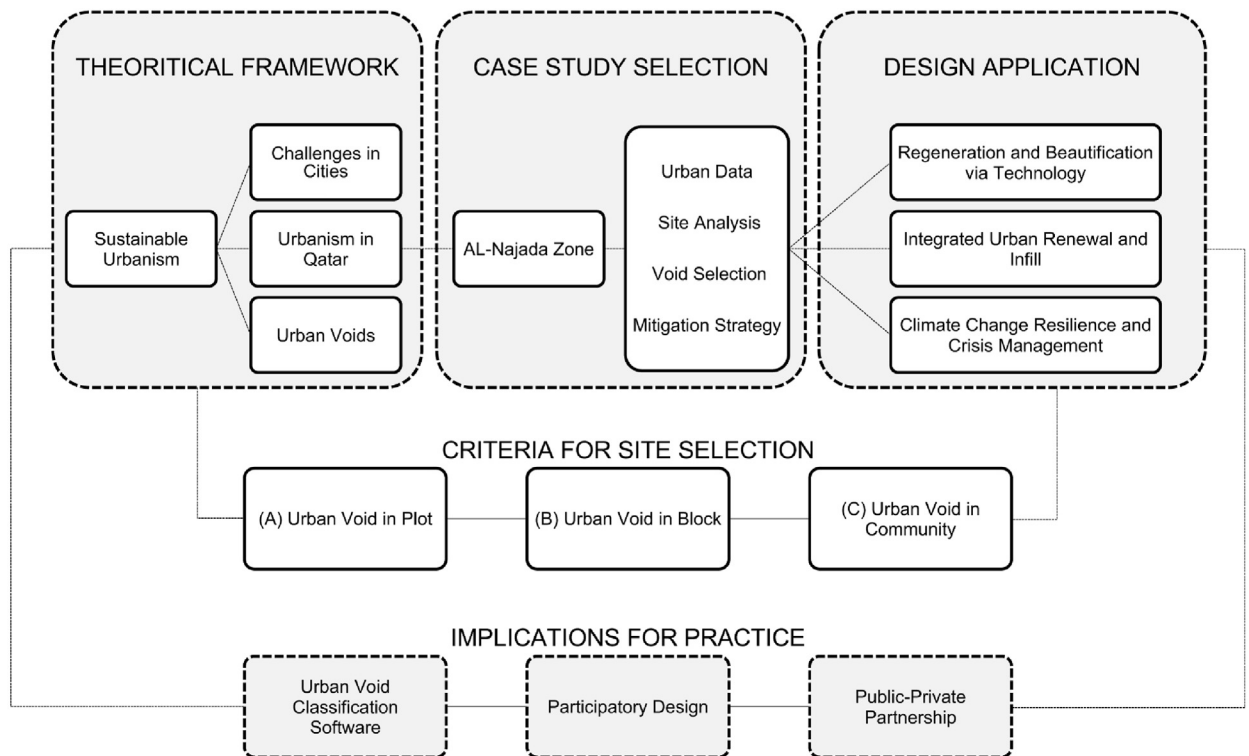


Fig. 2. Methodological framework of the paper. Graphics by the Authors.

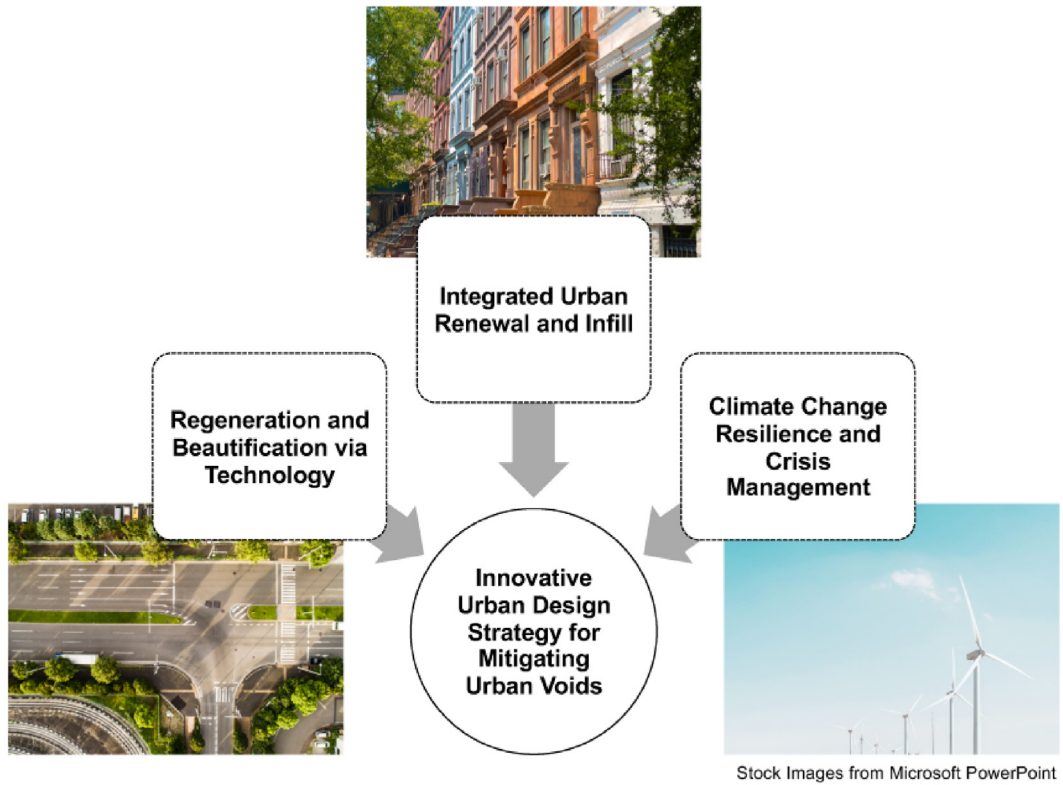


Fig. 3. Urban void mitigation strategies as an integrated urban design system. Graphics by the Authors.

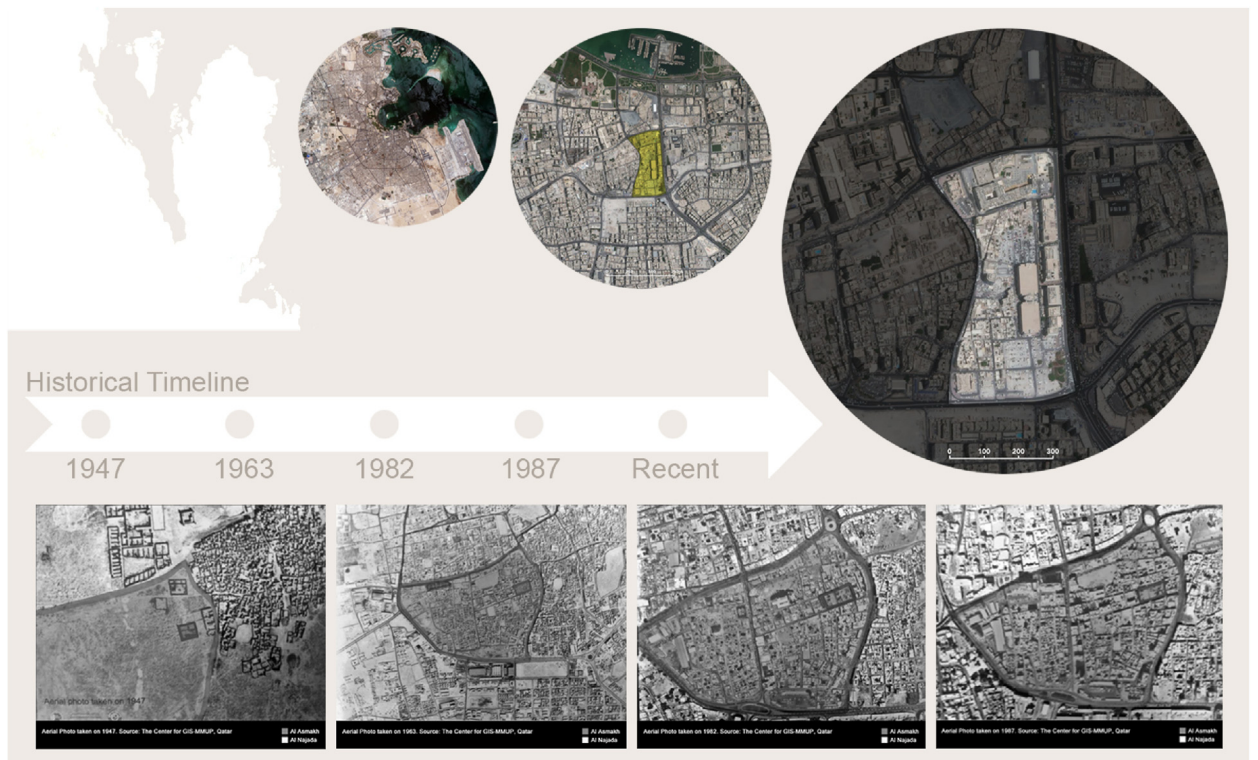


Fig. 4. Location and historical timeline of Al-Najada, Doha. After (MME (Cartographer), 2020). Graphics by the Authors.

- c. Climate changes resilience and crisis management through design: the sub-strategy incorporates resilient tactics to reduce carbon emissions; enhance macro-mobility; design adaptable spaces and structures to drastic climatic events and other emergencies; as well as establish effective emergency plans and evaluation procedures.

4. Site findings

Al-Najada zone (Fig. 4) is significant in its historical and socio-cultural attributes, along with being one of the old remains of the traditional core of Doha. Its current land use consists of low-to-medium rise mixed-use buildings, apartments, and retail shops bordering the zone, while the core of the zone contains traditional residential neighborhoods with Qatari architecture (AL-Mohannadi, Asmaa, et al., 2019; Eddisford & Roberts, 2014; Furlan et al., 2015). Due to urban transformation through history, the existing traditional buildings in the zone require preservation and restoration.

In addition to its degraded urban situation, the social and demographical condition of the Al-Najada zone presents a challenge to its sustainable urban development (AL-Mohannadi, Asmaa, et al., 2019; Salama, Azzali, & Wiedmann, 2017). The buildings vacated by the



Fig. 5. Selected urban voids in Al-Najada. Graphics by the Authors.

owners, who shifted to other localities due to their increased living standards or family composition, are currently occupied by migrant communities of different ethnological backgrounds. The zone has multiple layers of urban voids such as useless, underused, abandoned, and in-between spaces.

The study area has the basic infrastructure to support utilities and public facilities, notwithstanding its old building establishments. With the limited existence of residential units, most facilities serve as mosques, commercial quarters, retail shops, and other public uses. The residential options include apartment buildings and temporary settlements in the traditional residential core.

4.1. Urban voids selection and needs assessment

For urban void needs assessment, it is recommended to use triangulation of quantitative, qualitative, and observations or anecdotal tools to achieve an objective process (Steiner, Butler, & American Planning Association, 2012). The most valid tools used in the study are anecdotal, which is mostly dependent on observations and visual data.

As an initial step of the needs assessment process, the research team gathered the information through field trips to study the site conditions and choose proper locations within the zone to analyze and observe possible fit of built environment enhancement options. The urban voids are selected based on access to the site, availability of the information, and the suitability of the selected site for mitigation and improvement. The selected sites are used for the demonstration of design.

Defining the neighborhood and its boundary is important in needs assessment (Steiner et al., 2012). Three sites were selected due to the access provided to the researchers. Nevertheless, as the buildings are similar in architecture, the alteration proposed here could be easily adapted in other void areas aided by using GIS-based data. The data from GIS will give the first line of information that can be used for the visualization and classification of voids, which is further discussed in the implications for practice (Section 5).

In selecting the voids, each void space was studied in terms of its scale, distinctive space dynamics, and hierarchy of function. We selected the urban plot on a rooftop of a traditional residential building, namely a courtyard house. Alternatively, the urban block is a semi-public space represented by the setbacks and parking spaces around a mosque that evokes a special approach to designing for a socio-religious function. The urban void on the community scale involves a large scattered parking area, centralizing the entire traditional core of the Al-Najada zone, and has a potential for community development by design. The map (Fig. 5) illustrates the three selected sites of urban voids considering the plot, block, and community scales.

4.1.1. Urban void in a plot: needs assessment

Based on the existing condition, the selected site for the urban void in a plot is the rooftop of a courtyard house, which has a two-story colonnade and an upper roof space that are common architectural features of old houses in Doha (AL-Mohannadi et al., 2020;



Fig. 6. Urban void in a plot. Graphics by the Authors.

AL-Mohannadi, Furlan, & Grosvald, 2022; Eddisford & Roberts, 2014; Jaidah & Bourennane, 2009; Sayigh & Marafia, 1998). In the past and as an ideal condition, the rooftop was an active alternative living space during mild weather conditions. However, the rooftop is now left unpreserved and in bad condition. Nevertheless, the rooftop does have the original traces of architecture, which can be used for immediate preservation. A renovation and conservation plan can support the renovation of the courtyard while maintaining its unique architectural character, thus, reviving the concept of livable rooftop space in the dwellings (Fig. 6).

4.1.2. Urban void in a block: needs assessment

Urban voids in a block scale consist of spaces between buildings or setback spaces, characterized by their placement intermittently in low-rise residential areas. Hence, the voided setback area surrounding the main mosque- the Rowdah Bint Jassim AL-Thani Mosque – and bordering the zone from the north represent an urban void situation at the block level.

It also suggests that the block's void spaces might be further developed to make it livable and socially integrated with the neighboring blocks because it is spatially distinctive as an entry point and forms an edge to the entire zone (Fig. 7).

Based on the existing condition, migrant laborers use the setbacks as temporary gathering places. They tend to congregate in small groups around the street signs and gates. During the weekends, the mosque setbacks become bustling areas for migrant laborers with noticeably high pedestrian traffic (AL-Mohannadi, Asmaa, et al., 2019; Furlan et al., 2015).

4.1.3. Urban void in a community: needs assessment

Another gap in the zone is currently used as a distributed parking area. It represents an open area that morphologically balances the surrounding compact traditional districts, but the current activity is not suitable for the anticipated public use. The void lacks basic infrastructure such as street paving and is left to its natural surface with no safety considerations. Such urban emptiness presents a challenge to comprehensive sustainable urbanism in the study area (Fig. 8).

4.2. Data analysis: design application

The mitigation of three selected voids is discussed below as design applications following the integrated urban design methodologies and sub-strategies presented previously in this paper (Section 3.1)(Fig. 3). In addition, the concepts used for the design are also discussed.



Fig. 7. Urban void in a block. Graphics by the Authors.



Fig. 8. Urban void in a community. Graphics by the Authors.

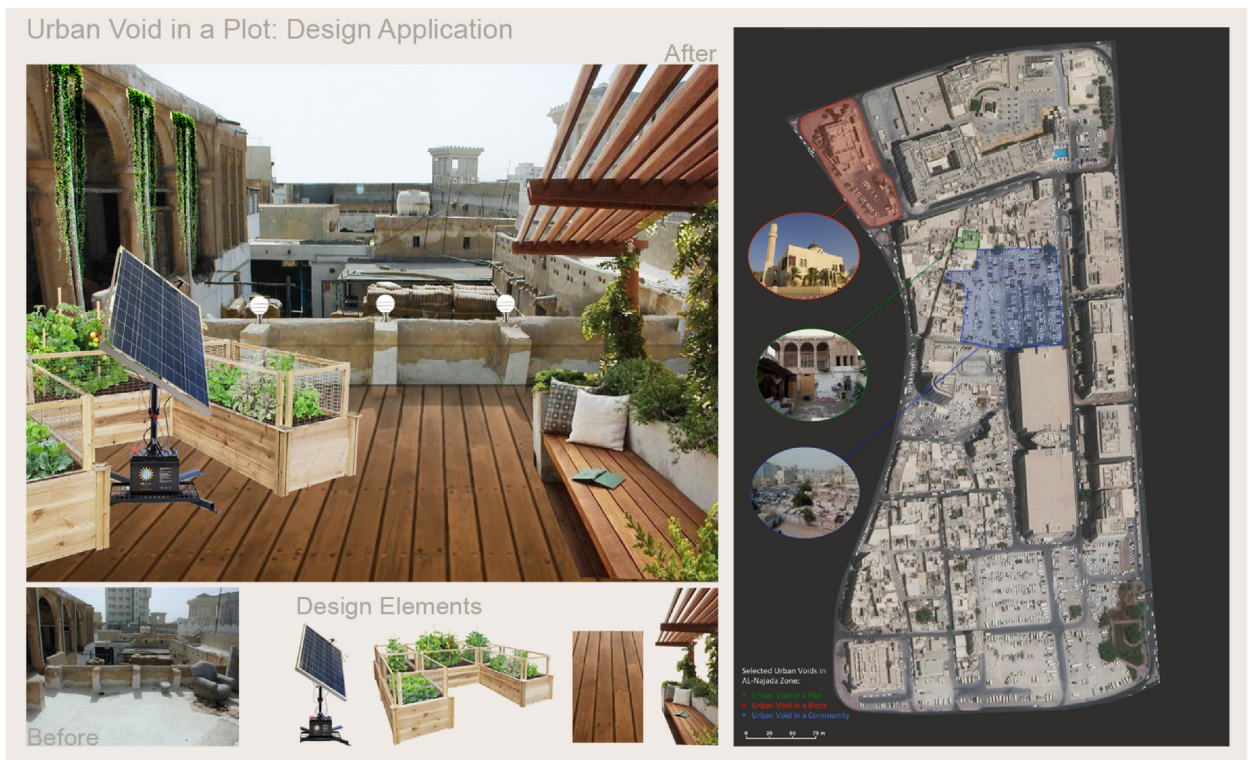


Fig. 9. Photomontage/concept of the rooftop's regeneration and beautification. Graphics by the Authors.

4.2.1. Urban void in a plot: design application

This design application, mentioned below, focuses on fulfilling the three urban design strategies to mitigate urban voids, bearing in mind the socio-cultural vision of rooftops in traditional Qatari houses.

- (1) Regeneration and beautification via technology: According to research on green urbanism and urban farming, residential rooftops can integrate vertical farming, permaculture gardening, and portable residential greenhouses to become productive gardens capable of generating vegetables (Grichting, Awwaad, AL-Mohannadi, & Eribi, 2016; Grichting Solder, 2013). Therefore, if regenerated through the greenery, the rooftop would also add a beautification value to the general skyline of the Al-Najada zone. The research team rendered various options for greening the courtyard rooftop. The photomontage of the selected concept is presented in Fig. 9. The design application for beautifying the courtyard involves renovation and vegetation of native species to become a sustainable green roof in a residential plot. The rooftop shall integrate high-tech climatic moderation techniques, utilize the recycled water used within the household and use solar panels to provide electricity for running the rooftop systems (Fig. 9).
- (2) Integrated urban renewal and infill: Although urban renewal is applicable in the wider urban context rather than in the scale of a residential unit, the essence of the theory could be applied in terms of slum reduction into space creation (Roberts, 2000). Relocation of accumulated items on the rooftop and preserving traditional architectural features are key to renewing the space. Thus, the renewal of the rooftop is strategized in limiting the option of demolition or destruction.
- (3) Climate change resilience and crisis management: The rooftop shall foresee resiliency to climatic conditions as a design approach. It should be durable to excessive sun radiation and wind flow, which are typical climatic conditions in Qatar. Integrating strategies such as capturing wind flow to create a pleasant microclimate through the breeze, climatic moderation techniques such as solar panels and canopies, and eco-lighting to store daylight for night use, in addition to reducing the land surface temperature (LST), are important for climate change resiliency of the rooftop (Fig. 10). In terms of crisis management, the rooftop shall have direct access to lower levels through safety stairs to ensure a safe evacuation plan and provide shelter during rare drastic climatic events such as floods and heavy rainfall that might disturb the lower levels of the courtyard house.

4.2.2. Urban void in a block: design application

The setbacks and empty triangles around the central mosque block bordering the zone from the northwest have good possibilities for integrated urban void strategies that can elevate social life and revamp street furniture to create liveable spaces. The approach focuses on the existing socio-cultural dynamics of the site as a part of a religious establishment, responding to the need for an integration of form and function.

- (1) Regeneration and beautification via technology: The regeneration strategy focuses on the provision of adequate street furniture and proper seating areas in addition to the use of solar power to provide multi-purpose stations for mobile charging and internet connection. It is important to mention that besides the mosque, there is a new project under development of Al-Najada Souq and Hotel, which is designed as a mixed-use facility (Bureau-ad.com, 2020; G1architecture.com, 2013). The design scheme has remodeled the mosque and its parking area as an active public area, giving the block a regenerative character to transfer it into a green public space (Fig. 11).

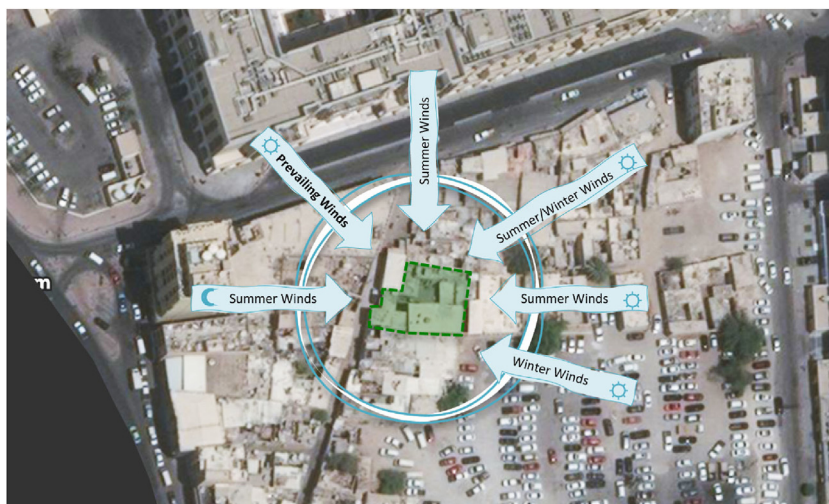


Fig. 10. Sustainable strategy for comfortable climates by winds. Graphics by the Authors.



Fig. 11. Urban regeneration of the mosque setbacks and parking area by GI Architecture. Source (G1architecture.com, 2013).

- (2) Integrated urban renewal and infill: The strategy is to revive the Islamic Friday market to encourage the social engagement of Muslims in the mosque while supporting a specialized economic activity and inspiring cultural visits by tourists approaching Souq Waqif and the nearby attractions. Renewing the landscape around the mosque with gardens and water features is an urban renewal and a beautification tactic (Fig. 12).
- (3) Climate change resilience and crisis management: Triangular-shaped setbacks could serve as safety gathering points during disasters, equipped with portable signage systems to direct the crowd in case of evacuation or emergency procedures. Besides, the void spaces could be utilized as donation centers, retaining the community value of the mosque. Portable tents and safety equipment storage could also be installed temporarily when there is a need for crisis management (Fig. 12).

4.2.3. Urban void in a community: design application

The core of the Al-Najada zone presents an opportunity for planned community development through open spaces and parks in replacement of the existing large and dispersed parking area. It has good potential for integrated urban void initiatives that can improve social life and radically transform livable environments.

- (1) Regeneration and beautification via technology: Due to the urgent need and noticeable lack of parking spaces, extra parking could be developed as an underground structure. Such underground parking was also developed for visitors to Souq Waqif and the surrounding area. Therefore, the new development from the government could be focused on developing more underground parking, which will also create more visits to the place and make it more livable. The current parking could still be utilized as an open public park with greeneries. Establishing such a green area and park in the area would create a unified space for the entire community that supports a healthy lifestyle and fosters the creation of a cooler microclimate. Such parks and green areas incorporate the latest technologies in design and services, especially sustainable building materials, landscape fixtures, and community facilities (Walliss & Rahmann, 2016). The objective is not to convert the void into a grass cover but to align landscape design innovatively with the surrounding context. The increased space in the parking area (underground and overground) makes the area valuable and beautiful with urban farming, native vegetation, softscape design, and hardscape elements (Fig. 13).
- (2) Integrated urban renewal and infill: The existing large parking space (Fig. 8) could serve as a square with multiple public facilities and retail activities such as outdoor picnic areas; portable cafes in containers; open prayer areas during special religious events, and Eid festival; and a pleasant gathering area equipped with proper landscape and lighting. This way, the investments in the urban renewal approach would support economic activity and create space for attraction and support small-to-medium businesses and entrepreneurship (Fig. 14).
- (3) Climate change resilience and crisis management: As a resilient strategy, the void could serve as a gathering area for seasonal events and festivals such as farmer markets, a venue for events, or a place for gathering or developing facilities for crisis events such as the temporary testing center for a pandemic situation, or temporary warehouses to cater to the need for storage to meet the needs of the crisis (Fig. 14).

4.3. Urban voids design impact assessment

The design applications for the urban voids at different scales have potential benefits and consequences in the long and short terms. The benefit of scaling the voids into plot, block, and community levels allows flexibility of application, and reduction of costs and time for implementation. It also increases the chances for growing community support as the changes occur. The long-term goal is to redesign the area to rejuvenate the lost cultural heritage and social activities of the community fabric in the setting of a traditional neighborhood.

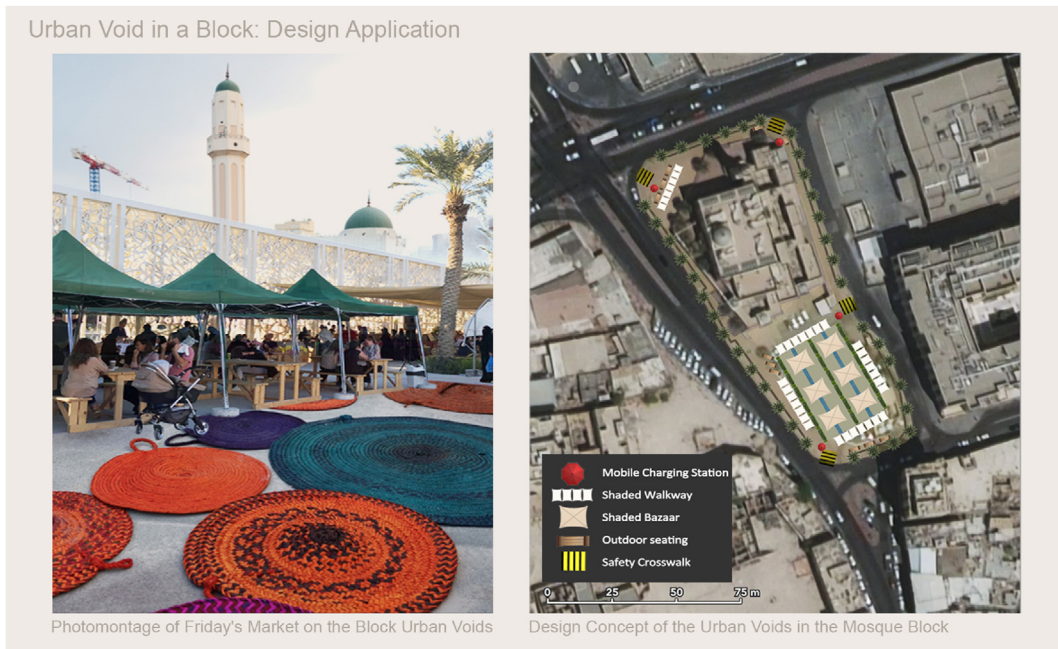


Fig. 12. Design application for the urban void in a block. Graphics by the Authors.

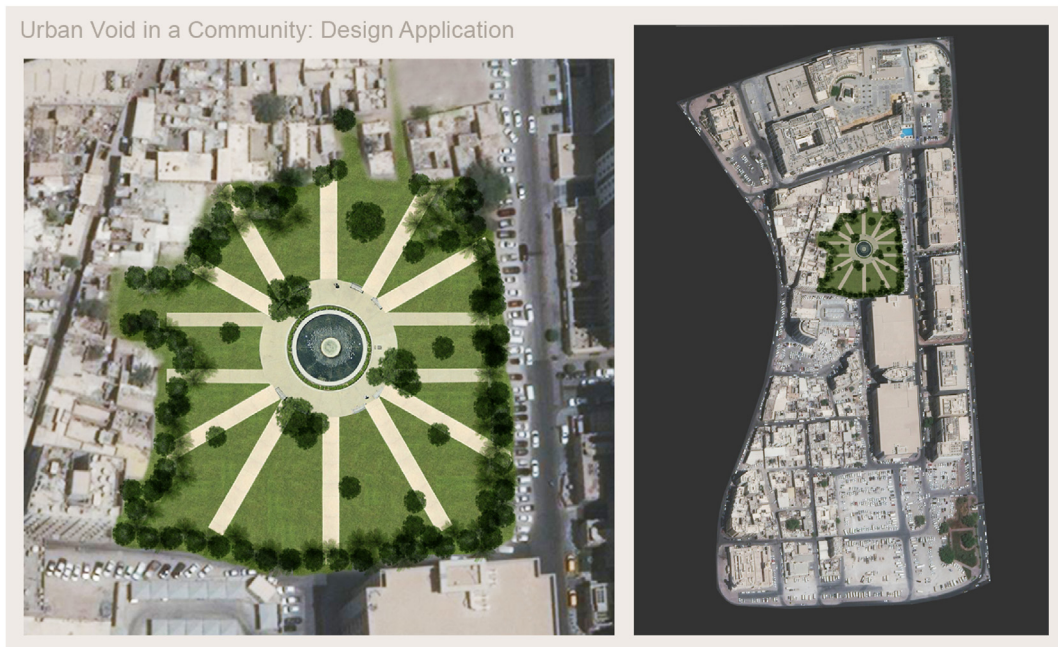


Fig. 13. Design application for Al-Najada central park. Graphics by the Authors.

5. Implications for practice

The study considers some implications for the practice of urban void mitigation in traditional neighborhoods. Our study shows that the identification and classification of the urban void are easier with GIS-based data on the area. With GIS, the first line of information can be visualized during the desk study and they can be classified into different types of areas. Qatar has a very strong GIS unit, and Qatar's Planning and Statistical Authority (PSA) has provided a very high-resolution GIS map in its government platform for public consumption (Planning and Statistics Authority (PSA), 2021). Therefore, the data obtained from GIS can be used for a detailed analysis



Fig. 14. Design applications for the community void within Al-Najada central park. Graphics by the Authors.

of the area and stored in a standard format for further analysis (Sileryte, Cavic, & Beirao, 2017). The analyzed map becomes the primer for the field visit, where it can be verified for area features, and measurements. The data collected from the site visit can be easily assimilated into the GIS platform to develop various scenarios. This helps the architecture, planners, and community leaders to play an important role in the participatory design process. Participatory tools during the planning and design process include community design meetings and design charrettes.

As urban design is a holistic process and there are many stakeholders involved, other considerations could be to develop a private-public partnership (PPP) in such developments. Developing social value in urban voids can be the agenda of the public sector stakeholders while creating an image (brand) or monetary value can be the private sector's agenda. The involvement of ministerial entities and bodies, research centers, and higher education institutes represents the public sector. However, architects, construction companies, and large business houses represent the private sector. The public sector can provide temporary ownership and the requirements for the utilization of the voids. The private sector can develop and utilize them based on government requirements. Such an approach will reduce government investment requirements and supports the re-planning of voids for the intended use.

6. Conclusions and future research

The paper discusses the importance of urban voids in community rejuvenation and social integration. Urban voids are generated through the planning and design practice, the location, or abandonment of use. Redesigning and redeveloping urban voids can revive the social life of declining neighborhoods.

The paper provides different approaches to mitigate urban voids to utilize them for social and economic activities so that the voids become a place for rejuvenation. Meanwhile, it confronts the available body of knowledge in insisting on the necessity for urban void mitigation. The challenges of urban void mitigation involve consideration for public spaces and participation (Kim et al., 2020; Rathi & Kushwah, 2017) and a need to optimize urban regeneration by combining design with real property value and market dynamics (Goncalves & del, 2013; Kim et al., 2020). Other challenges specific to the context of Al-Najada comprise the need to protect and conserve the historical identity and cultural heritage of the site (AL-Mohannadi et al., 2020; Boussaa, 2021; Shurbaju, 2018) and the need to encourage social interaction and livability (Eissa et al., 2015; Nafi, Alattar, Furlan, Nafi, & Alattar, 2015).

The examples given in the paper promote urban designers and architects to rethink city morphology and respond to sociocultural and local contexts inclusively. The study also supports applying piece-by-piece urban design and small-scale actions to help positively mitigate degraded urban spaces based on the vision of sustainable urbanism. The paper, to our knowledge, is the first of its kind dealing with urban voids in Qatar.

The paper focuses on three urban voids for remodeling using three main strategies: regeneration and beautification using available technology; integrated urban renewal and refill, and climate change resilience and crisis management. The designs for the three urban voids are presented with visual schematic designs and photomontages using data from site visits and site analysis. The proposed

solutions are based on the contemporary designs used in Doha and surrounding areas using customer-centric innovative development (Pokharel & Ayari, 2020; Selden & MacMillan, 2006) that is important in developing a new service (service area in this case).

The research team focused only on three areas; therefore, more areas can be considered in the future as an advancement of the current research. This approach can help incorporate some unique features in the voids, such as on the rooftops, and analyze the integrated effect of void mitigation in other urban areas with similar cultural heritage.

7. Limitations

Critically, the current study has the following limitations:

- 1) There might be a theoretical debate about whether to consider spaces such as rooftops or setbacks as urban voids due to property formation and land ownership. Yet, this current study looks into these voids based on clear criteria. The criteria include the void's size, location, as well as suitability for rejuvenation.
- 2) The design proposals are preliminary applications of the mitigation strategies to ease the illustration of ideas and to visualize the intended outcomes, yet these might be subject to further development.
- 3) The research presented here is based on the team's visit and discussions with some people occupying the area. The research team could not reach the original inhabitants as the tenants were unaware of the location and the research time constraints. Therefore, the research can also be extended by involving house owners and the current inhabitants to assess their needs for the use of voids. This type of design is called participatory design, where the research team and the community become an integral part of the identification, evaluation, alternative designs, scenario analysis, and decision making (Douglas et al., 2018; Ferguson & Candy, 2014; Kosk, 2016). The participatory approach was not fully possible as it was difficult to trace the area's occupants in the given time.

Declaration of competing interest

All authors below mentioned have participated in (a) conception and design, or analysis and interpretation of the data; (b) drafting the article or revising it critically for important intellectual content, and (c) approval of the final version.

This manuscript has not been submitted to, nor is under review at, another journal or other publishing venue.

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