

Urban Greening Strategies for Compact Cities, An-Najaf Historical City, Iraq, A Case Study

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ABSTRACT

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Urban greening is a crucial trend for achieving sustainability as it helps enhance the local climate and lower temperatures. So interesting green elements in cities is an urgent necessity, not an option. This study tries to elucidate suitable urban greening solutions in cities compact and limited in space. This study aims to clarify relevant urban greening strategies in densely populated cities with limited space, particularly old historical cities, by employing a methodology that involves formulating effective and suitable indicators to enhance urban greening in such places. The findings of the theoretical framework revealed various approaches to implementing urban greening in densely populated cities. These include the establishment of a network of green spaces, the installation of green roofs, the incorporation of front balconies, the use of temporary vegetation, and the creation of gardens and parks outside the city. These strategies were assessed using descriptive methods. These indicators were implemented in the ancient city located in the Al-Najaf Governorate, which is a historically significant city and a crucial hub. The implementation of these strategies can enhance the local climate of the city and transform its roadways and structures in a sustainable manner.

1. INTRODUCTION

Integrating green spaces into cities, particularly those of historical significance, has a profound influence on cultivating the essence of the location and enhancing the sense of attachment to it. People perceive these spaces as areas for leisure, communal gatherings, and recreational activities for children, ultimately enhancing the residents' quality of life. Green spaces are integral to urban areas due to their role in preserving the environment. The quality and durability of the urban environment. Urban green spaces such as gardens, parks, and green roofs offer benefits to inhabitants by acting as vital components in urban environments. They absorb pollutants, release oxygen, maintain clean air, water, and soil, and contribute to ecological balance. The city aids in the recovery from physical and emotional stress, enhances social security, and promotes increased social engagement. It also provides a stunning visual display [1, 2]. Variations in land utilization and development approaches have resulted in the formation of green areas with distinct geometric, distributional, and compositional characteristics. Consequently, the compact city encounters significant physical and institutional barriers as a result of its limited size, which restricts the availability and quality of ample vegetation. The presence of plentiful plant elements and green areas is a defining characteristic of cities that prioritize comfort. Effective planning and management ensure the creation of a conducive and secure habitat for both humans and wildlife [3]. Without these natural spaces, there is no linked and connected

life in society. Due to the lack of green spaces in Iraqi cities, particularly in ancient historical cities, there is an urgent need to develop solutions for urban greening to address this deficit [4].

It has become necessary for there to be diligent efforts to improve the reality of green spaces in these cities. Therefore, from the above, the research attempts to find a solution to the research problem represented by the lack of knowledge about urban greening strategies appropriate for compact, limited-area cities, especially historical ones, to achieve the goal of the research. The objective is to identify suitable strategies and policies for implementing urban greening initiatives in old historical compact cities to address the lack of green spaces and vegetation. This includes developing strategies and policies that are specifically tailored to the environmental conditions of old Iraqi cities, with a particular focus on the ancient city of Najaf. The aim is to emphasize the significance of urban greening in achieving urban sustainability.

2. URBAN GREENING AND ITS IMPORTANCE

Smaniotto Costa et al. [5] defined urban greening as the sum of green spaces that together create the urban green fabric or system. It is situated inside intricate social-ecological systems comprising various locations such as public lands and private residential, commercial, and industrial areas [6]. Urban greening can manifest as projects or programs promoting more environmentally friendly urban living [7]. The European

Landscape Convention (ELC) defines a landscape as an area that is formed by the combined influence of natural and human elements [8, 9]. Urban greening goals include enhancing the climate adaption strategy by creating green urban spaces to mitigate the direct and indirect impacts on human health caused by climate change and temperature fluctuations [10]. Urban greening is crucial for acquiring benefits and significant social capital. Green spaces serve as social hubs, facilitating communication among individuals, especially in metropolitan areas where social connections within neighborhoods are less strong than in rural communities like villages. Hence, these interactions foster a sense of patriotism and safety, while also offering social assistance. Several studies have shown that the most efficient method for reducing stress is through visual exposure to nature [11, 12], Urban greening enhances residents' well-being and mental comfort by creating green spaces within and around buildings, as well as near health and educational facilities. These areas serve as spaces for relaxation and social interaction, fostering community cohesion [13]. The research aims to address the lack of knowledge regarding suitable urban greening strategies for compact, limited-area cities, particularly historical ones, to identify appropriate urban greening strategies for such cities [14].

3. COMPACT CITIES

The concept of compact cities appeared in 1973, as it contains many spatial advantages such as reducing the use of cars, achieving a better quality of life for residents, and forming a clear identity for the city. This concept developed for social, economic, and climatic reasons [15], it is considered a type of architecture as it achieves an interconnected relationship between the elements of the city to reach social and psychological factors interconnected with human life [16].

Historical compact cities attempted to incorporate green spaces into their urban designs through the establishment of a network of green corridors. They also engaged with the local community by encouraging individuals to utilize the roofs of their homes for gardening purposes. This approach not only enhances the visual appeal of the city but also contributes to improved environmental services [17]. The concept of the compact city is closely linked to urban ecology, emphasizing the need to protect the city's environment from pollution [18]. The compact city is characterized by a set of characteristics, including preserving the city's countryside and containing dense population centers, as the urban areas are interconnected to enable a walk of 10-15 minutes.

The compact and dense urban fabric has benefits, including reducing pollution and also reducing heating costs, for urban greening such as green spaces and others in the city have a role in reducing global warming and improving the local climate to obtain a sustainable environmental city.

The city's elements are interconnected with each other, such as streets, green spaces, and public spaces [18], the compact city supports pedestrian-friendly environments by emphasizing a network of public and green spaces and also emphasizes public transportation, efficient use of energy, and avoidance of noise and pollutants [19], improving economic aspects by reducing transportation expenses, reducing the consumption of natural resources and preserving nature [20]. Urban areas, particularly historical ones, face a scarcity of land for green spaces. However, this challenge has been addressed

through the implementation of advanced technologies, urban agriculture, and community participation in urban gardening. Urban greening plays a crucial role in enhancing quality of life and promoting sustainability across social, economic, environmental, and institutional dimensions [21].

4. INNOVATIVE EFFORTS IN IMPLEMENTING URBAN GREENING TACTICS IN COMPACT CITIES

4.1 Malmö compact city

A paper on Swedish cities achieved an urban greening strategy to achieve a green urban structure in a compact city, as it used the space factor as a tool for city planning, as models were chosen to obtain a variety of green spaces. These models explained how greening is created in compact cities and what are the motivations behind these methods or strategies [21].

Green roofs: were implemented to maximize land area using the green space factor, which involved incorporating plants on roofs and walls of buildings to offset the lack of greenery in the city [22].

The front gardens: were designed according to comprehensive plans to establish the positioning of residential structures and to a certain extent the quantity of open space. They are created as little gardens located in front of the building intended for entrance or aesthetic appeal [23].

Green balconies: the same method was used as the front gardens, but they do not face the street, but they contributed to providing a green view inside and outside the building. Figure 1 shows the greening on the wires.



Figure 1. The idea of greening on wires [24]

Temporary greening (vegetative cover): the idea of temporary greening came about green spaces that need greening quickly and for a limited period only, as flowers and plants are placed in pots or containers, such as the need to rearrange a specific place [21].

4.2 City of Ljubljana, incorporated Slovenia

The compact city of Ljubljana, Slovenia, won the European Green Capital Award in 2016, as it is considered one of the leading examples of greening compact cities, as its residential areas are located in a semicircle of 300 m of green spaces, meaning that it is located in a green oasis, in addition to providing each individual in the city with 560 m² of green space. Sustainable thinking, urban planning, landscape architecture support and finally growing environmental awareness have transformed the city from its socialist past into

a sustainable compact city [25]. Figure 2 shows the city of Bjlubljana.



Figure 2. The landscape in the city of Bjlubljana

The city implemented plans to increase the rate of greening by creating four recreational parks, with the first one being near the city center. Endangered species are protected within the area, which is also a popular destination for relaxation and trekking. The second park is 135 square kilometers, and the third park is notable for the area's few natural forests, along with the fourth park known for its abundant biological diversity and unique species, serves as a sanctuary for various living animals [26]. Also, among the policies followed is the concept of nature being part of history. During World War II there was a road surrounded by barbed wire all over the city dating back to the Italian occupation 27. But the city soon turned this road, called the Road of Remembrance and Companionship, into a tree-lined road with more than 7,000 trees along 34 kilometers. It is a popular route for running and walking, but it is also a memorial to the suffering of the citizens of Ljubljana during World War II [25]. Figure 3 shows the pedestrian road in Ljubljana and Table 1 shows the Urban greening strategies for compact cities extracted from the theoretical framework and pioneering experiments:



Figure 3. The pedestrian road in Ljubljana / previous source

Table 1. Urban greening strategies in compact cities

	Main Indices	Secondary Indices
Inside the city	- Interconnection of city elements (streets, spaces, and green public spaces)	- The presence of a network of green spaces
	- Green roofs of various types	- Green roofs - The front gardens - Green balconies - Greening on the wires - Temporary greening - Green corridors or lines on the sides of roads and waterways
Outside the city	- Greening city boundaries	- Providing gardens and parks outside the city

5. RESEARCH METHODOLOGY

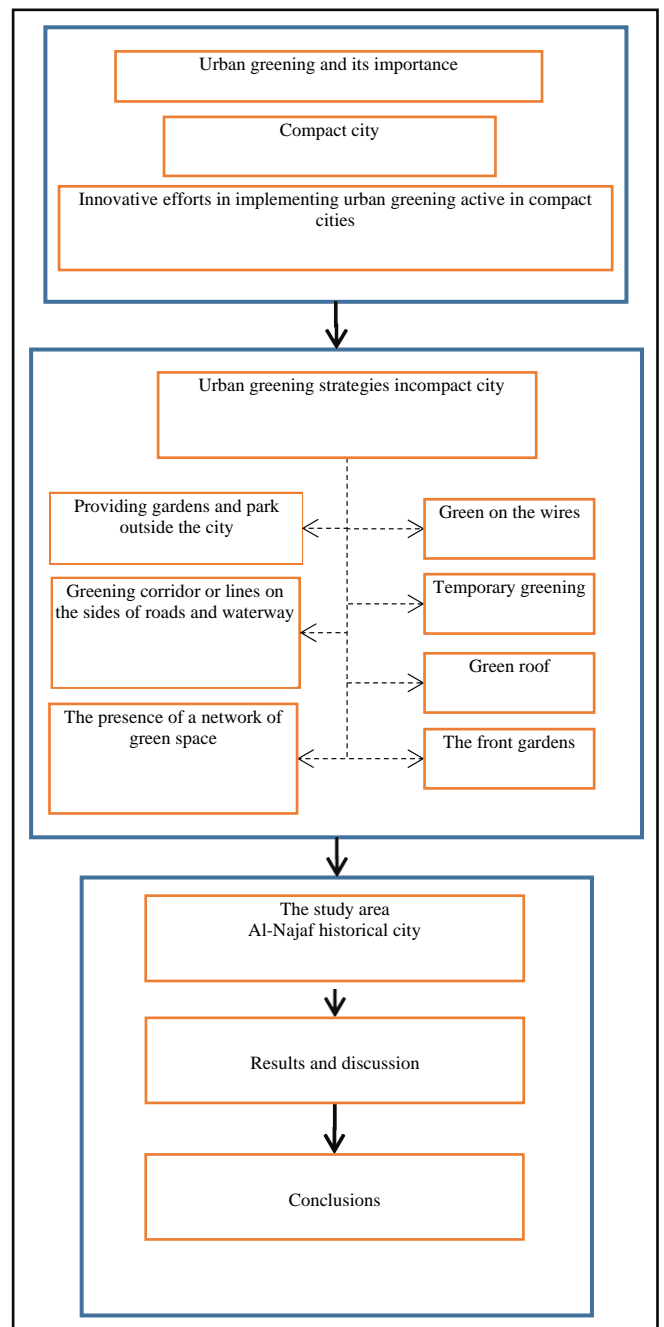


Figure 4. Illustrates the research approach

The research employed a well-defined and precise methodology that primarily draws upon existing literature to identify the gap in knowledge. Subsequently, researchers relied on innovative experiments that implemented urban greening in densely populated areas. Following this, indications or efficient strategies for urban greening in compact cities were derived. The study area's indicators were measured using descriptive measurement methods. Data was collected through a field survey of the study area, with assistance from the Najaf Municipality Directorate, affiliated with the city of Najaf. Additionally, maps issued by the General Directorate of Urban Planning, affiliated with the Ministry of Municipalities and Public Works, were utilized (Figure 4).

6. CASE STUDY

6.1 Location of An-Najaf historical city

An-Najaf historical city is located on the outskirts of the western plateau of Iraq, southwest of the capital, Baghdad. It is 162 km away. The city is 22 meters above sea level. It is located at a longitude of 44 degrees and 19 minutes, and a latitude of 10 degrees and 29 minutes. It is bordered to the north and northeast by the city of Karbala, which is about 20 km away from it, to the south and west by the Bahr Al-Najaf depression, and Abu Sakhir, which is about 10 km away from it, and to the west and east by the city of Kufa, which is about 12 km away from it [28, 29]. Figure 5 shows the location of Najaf Governorate in relation to Iraq.

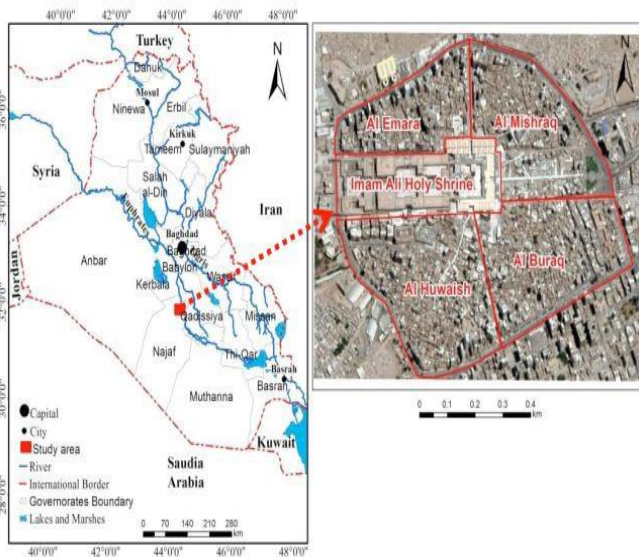


Figure 5. Map of the location of the study area and its neighborhoods [30]

The ancient city is situated in the sacred city of Najaf, serving as the primary urban hub and the historical bedrock of the city. The southwest side of the area has a view of low plains, while the northern and northwest sides have a view of the world's largest cemetery. It moves downward from the east, heading towards the city of Kufa [31]. Figure 6 shows the limits of the study area.

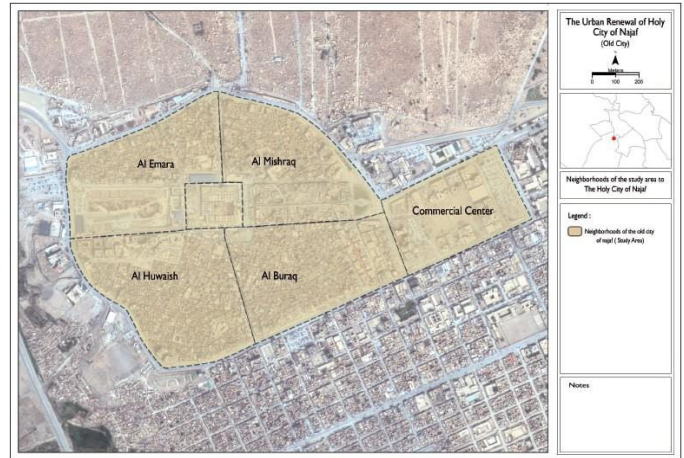


Figure 6. Map of the boundaries of the old city (study area)
Source: Ministry of Municipalities and Public Works / General Directorate of Urban Planning 2016

7. RESULTS AND DISCUSSION

The study area was characterized by narrow and winding streets, as well as houses closely packed together. Therefore, it is considered one of the compact planning models to cope with the hot, dry climate. Figure 7 shows one of the alleys of the historical city.

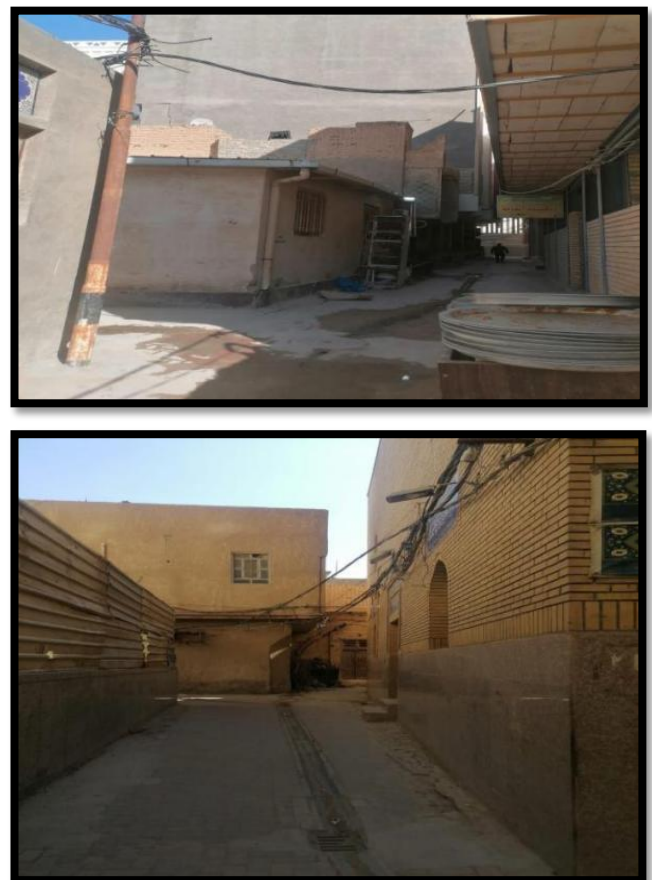


Figure 7. The compact housing and winding roads of the study area
Source: Researcher

We notice through this the lack of green elements inside or outside the urban fabric, as there is one green square (Al-Midan Square) prepared by the cadres of the municipality of Najaf Al-Ashraf (researchers). As for the percentage of green spaces in the four shops of the study area, we note that it reaches 8521 square meters in the locality of Al-Buraq, which is a high percentage. By 1% of the total land area compared to the other three localities, it reached 568 square meters in Al-Huwaish locality, and less than that in Al-Amara locality, which was 964 square meters. Finally, Al-Huwaish locality reached 711 square meters in green area, according to data from the General Directorate of Urban Planning, according to the field survey h of the Ministry of Municipalities in 2016, Figure 8 shows the reality of the green spaces of the study area.

Through a field survey, using geographic information systems (GIS) and relying on data from the Urban Planning Directorate, the following was noted:

- The study area lacks a network of green areas, specifically urban nodes or clearings, which are devoid of vegetation and afforestation in general. The absence of vegetation in the area is due to the local authorities' lack of interest in implementing urban greening initiatives in the old city. Consequently, the area was primarily seen as a transit point rather than a gathering spot for inhabitants. Furthermore, there was a general lack of enthusiasm for urban greening within the old city. Implementing an environmentally friendly policy that is suitable for those specific locations.

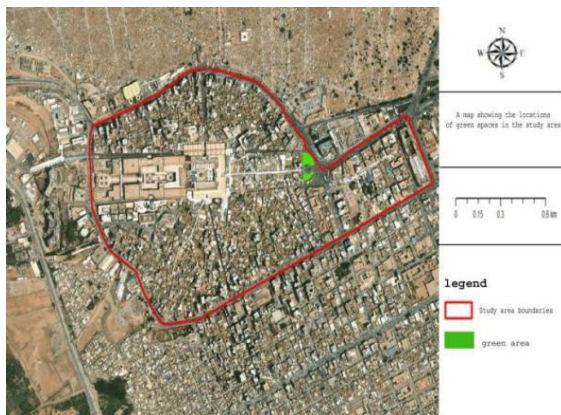


Figure 8. Map of the reality of the green spaces of the study area

Source: Researchers

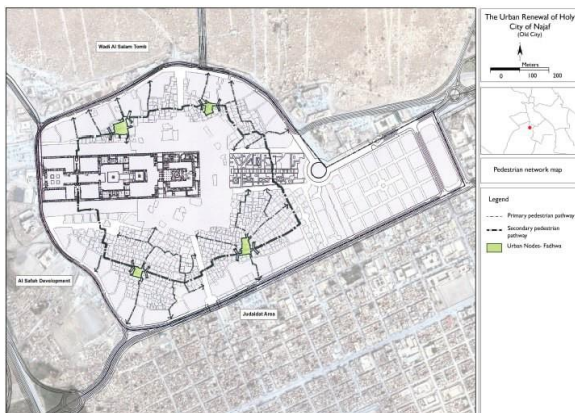


Figure 9. Map of the pedestrian network and urban nodes in the study area

Source: Ministry of Municipalities and Public Works / General Directorate of Urban Planning 2016

The absence of any form of greening within the urban fabric of the old city (green roofs, front balconies, temporary vegetation, greening on wires).

The study area overlooks the foothill area, as it consists of agricultural areas and orchards within the Bahr Al-Najaf depression. It is considered a distinctive tourist destination that serves the residents of the old city in particular and a destination for tourists and visitors in general from various Iraqi cities. The Bahr Al-Najaf depression can be a tourist and entertainment support for the study area, as it was the preparation of detailed plans by the Ministry of Municipalities and Public Works, in cooperation with the relevant departments, regarding the development of the foothills area within the urban renewal project for the old city center, as shown in Figure 9.

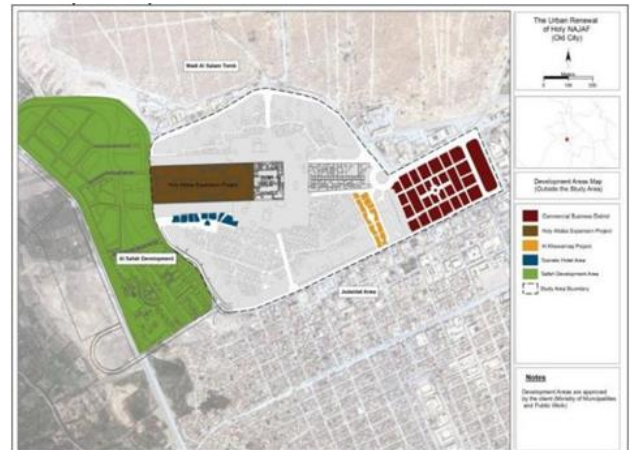


Figure 10. The approved development areas in the study area

Upon analyzing the previous findings, it was determined that the local authorities' disinterest in urban greening can be attributed to the city's limited size and limitations as well as the absence of a research highlighting the significance of urban greening for these cities. Consequently, it was determined that the application of urban greening solutions can enable the implementation of a holistic strategy for the study area. For the study area, it is advisable to carefully select suitable locations for each strategy. However, the most effective initial step to implement is to establish temporary vegetation cover. This can be achieved by distributing containers throughout the corridors, alleys, streets, squares, and public spaces. This approach not only enhances the visual appeal but also contributes to temperature reduction. Secondly, it is crucial to execute a plan aimed at establishing gardens and parks on the outskirts of the urban area. These methods are currently being implemented in the study region by the competent authorities and municipalities (Figure 10). They are specifically focused on creating sustainable pedestrian paths. Thirdly, the implementation of strategies such as green roofs, green balconies, and front gardens. The implementation of it relies on assessing the state of the buildings. If the buildings in the study area are in good structural condition and not in a state of disrepair, it is feasible to utilize them, particularly considering that certain buildings have undergone structural enhancements in their upper sections. The addition of a cleansed higher shrine, together with an extension of the existing shrine, has created a perfect location to implement these techniques. The third priority is establishing a network of green areas, which may encounter challenges due to the city's small size, restricted territory, and high residential density.

8. CONCLUSIONS

The research paper attempted to clarify the gaps in the study area to address them in a way that is compatible with the nature of that area and to be an example and guide for decision-makers, urban planners, and designers, to address the lack of vegetation cover for the various compact historical cities in the Iraqi governorates. Green spaces and greening within the urban fabric of compact cities were highlighted because of their role in achieving social, economic, and environmental well-being, and thus they achieve the dimensions of sustainability. The study area requires great efforts to improve the reality of vegetation cover, and this is what is being worked on in reality. It is necessary to pay attention to roads and waterways, which are the only outlets for that region, and to work to increase trees and provide pedestrian roads that achieve a healthy, sustainable environment. Given the importance of urban greening as one of the basic pillars of sustainability and environmental preservation, and the necessity of preserving and sustaining compact historical cities, the research recommends the possibility of adopting a number of directions for future studies, and one of the directions that could be adopted is to study the relationship between urban greening and the social motivation of residents of historical compact cities, as well as the economic feasibility of urban greening in historic compact cities. Urban greening can be studied to stimulate community participation of residents in historical cities.

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