

Crowding Perception Assessment in Nasr City & Masr el Gdeeda: A Comparative Analysis

Mai Hossam El-Didy^{1*}

, Ghada Farouk Hassan², Samy Afifi³ and Ayat Ismail⁴

^{1,2,3} *Urban Design and Planning Department, Faculty of Engineering, Ain Shams University, Cairo, Egypt.*

⁴ *Architectural Engineering and Environmental Design Department, Arab Academy for Science Technology and Maritime Transport, Cairo, Egypt.*

Abstract

The challenge of crowding in urbanised areas poses a significant hurdle for institutions, local authorities, and urban planners. Aligned with Sustainable Development Goals (SDGs), the methodologies employed by cities in developing or redeveloping their environments profoundly influence residents' lives, overall city livability, and the quality of life. Additionally, the subjective and physical nature of crowding and density presents a challenge for planners in understanding how to enhance the experiences and perceptions of users. Therefore, this paper aims to provide insights for planners by clarifying various terminologies that may cause conflicts and compiling physical planning variables impacting crowding perception. Additionally, it assesses the effectiveness of redevelopment interventions undertaken by Egyptian institutions. Through a comparative analysis between Nasr City and Masr el Gdeeda neighbourhoods, this paper evaluates the physical characteristics of the built environment and their anticipated impact on crowding perception. It also scrutinises the approaches adopted by institutional authorities in redeveloping these two cases. The findings offer planners guidance on the necessary physical interventions to enhance user experiences and provide recommendations for institutional authorities to bridge the gap between intentions and practices.

Keywords: *Crowding perception assessment, Reformation project, Nasr City, Masr el Gdeeda, Cairo, Egypt.*

1. Introduction

In alignment with the Sustainable Development Goals (SDGs), local governments that prioritise the public's needs in urban development exemplify their commitment to citizens' well-being by delivering public goods, infrastructure, services, and spaces [1]. In this context, cities face the challenge of enhancing the quality of life and the user experience, considering the increasing rate of rapid urbanisation and the associated issues of overcrowding [2]. Planners and decision-makers must address these urban challenges as a means of improving urban livability and the overall quality of life for residents.

The blend of various academic viewpoints adds complexity to the tasks of urban planners, who are grappling with persistent urban issues brought about by high population densities in cities [3]. One of these challenges is crowding, which has profound effects on the mental and physical well-being of residents, the overall quality of life, and the livability of urban areas. The complexity arises from the differentiation between "crowding," a cognitive-perceptual phenomenon, "population density," a quantifiable physical measure [4], and the term "perceived density" which has emerged within discussions surrounding crowding in academic

* Corresponding author

literature. This paper offers distinctive understanding of these three concepts to enhance comprehension of the crowding issue.

Previous studies have identified various factors influencing users' perceptions of crowding within their living environments, categorizing them into psychological, planning, and organizational approaches [3]. This paper specifically focuses on planning approaches to investigate the efficacy of variables in Nasr City and Masr el Gdeeda neighbourhoods which are characterized by high crowding perceptions. The examination aims to explore the impact of these planning variables on perceived densities, consequently influencing crowding perceptions. Additionally, the paper evaluates the role played by the government and local authorities in addressing this issue within their national plans among the two cases. This comprehensive analysis seeks to enhance the understanding of the crowding problem and its relationship with built environment characteristics while shedding light on gaps in the methodologies employed by Egyptian planning frameworks. Through a comparative analysis of both cases, the paper provides valuable insights for planners and decision-makers, elucidating the reasons behind heightened crowding perceptions in such contexts and offering knowledge to guide the redevelopment of urban environments with optimal interventions to enhance users' experiences. Furthermore, the paper aims to furnish institutional authorities with guidelines to formulate more effective plans.

2. Methodology

This paper employs a mixed-methods approach to provide a comprehensive exploration of crowding perception's significance in shaping users' experiences within urban environments. It begins by offering an overview of the importance of crowding perception and elucidating the relationships between various terminologies, providing clear definitions and identifying their interconnections. Subsequently, the study focuses on the planning physical variables that have the potential to influence the experience of crowding in diverse urban contexts. Following this, a survey is conducted to gauge people's perceptions of crowding in two selected case studies. Participants are tasked with evaluating their level of crowdedness. In the next phase, a comparative analysis is undertaken between the two cases, highlighting the physical characteristics of the built environment based on the extracted physical variables. This analysis draws upon self-observations, maps, statistical data from previous studies, photographs, and historical images from Google Earth. The analysis will also assess the methodologies adopted by institutional authorities to redevelop both cases.

3. Results and Discussion

3.1 Crowding perception importance for sustainable communities

Although perceived as a somewhat elusive phenomenon within the realm of urban planning, the matter of stress induced by crowding in urban environments has garnered substantial attention in the fields of urban geography and environmental psychology. With the persistent growth of urbanisation, the issues associated with overcrowding remain salient in urban areas [5], thereby impacting both the quality of life and the overall livability of cities [6].

3.2 Crowding perception relation to density and perceived density

The misconception between density and crowding is prevalent, with crowding negatively impacting density's public image [7]. Density is stigmatised, linked to negative aspects in various civilizations, creating emotional associations but lacking direct correlation with the psychological experience of crowding [8, 9, 10]. High density is acknowledged as perception-dependent, influenced by individual judgments [11]. A new term, perceived density, which is defined as an individual's estimation of people in an area and spatial organisation, plays a crucial role in crowding discussions [12, 13, 14]. Understanding perceived density becomes pivotal, emphasising its significance over real density for enhancing user experiences in high-density environments.

3.3 Physical planning environmental factors

Previous studies have identified various factors influencing users' perceptions of crowding within their living environments, categorised into psychological, planning, and organisational approaches [3]. This paper's focus centers on the planning physical variables inherent in the built environment, particularly those that pertain to the realm of planning and urban design. These variables can influence crowding perceptions independently of neighbourhood densities.

The ensuing section will delve into the literature surrounding variables that can impact crowding perceptions from a planning perspective. This examination will illuminate approaches and interventions that planners and decision-makers should consider to enhance perceptions and user experiences.

The analysis of human population crowding is a complex subject. It is evident that there is a limited correlation between physical measures of population density and an individual's subjective perception of crowding [4]. However, this section will draw insights on how crowding perceptions can stem from negative perceptions of the built environment, such as tall buildings and complex circulation networks [6]. The development of superblocks and architecture that lacks street engagement impacts crowding perception and consequently user experiences [15]. To alleviate this, it is suggested that a mix of regular housing and unique structures, along with abundant short blocks and smaller plots, can create open-sky views and rejuvenate underutilised street space. Enhancing job-housing balance and street vibrancy can minimise commuting and non-work motorised traffic, reducing reliance on vehicles [16]. As per Jacobs (1961), "in the absence of city diversity, people in large settlements are probably better off in cars than on foot." Establishing inviting local streets with a more equitable distribution of jobs and housing has the potential to decrease both commuter and non-work motorised traffic, encourage diversity, and diminish dependence on vehicles [17].

As stated by Churchman [18], reallocating space from cars to other uses has the potential to enhance the benefits of high density and mitigate its drawbacks. This approach provides individuals with the ability to influence their surroundings and adapt to evolving circumstances. The ongoing conflict among drivers, cyclists, and pedestrians in urban areas has prompted suggestions such as behavioural zoning by Gifford as a strategy to alleviate crowding [19].

Urban open spaces, whether well-maintained gathering spots or natural landscapes, offer respite from crowded areas and relate to perceived density and human needs. Natural environments positively affect psychological well-being by reducing stress and promoting attention restoration [20]. Allocating space for walking and cycling separate from traffic lanes can also mitigate crowding perceptions [19]. The proximity to amenities such as parks and open spaces has a positive influence on crowding perception, whereas proximity to main roads, industrial areas, and commercial establishments may have a negative impact. The surrounding land uses are a crucial factor in shaping neighbourhood crowding dynamics [21]. Street patterns can greatly influence urban navigation, traffic congestion, and parking availability [22]. Strategic street design, such as traffic calming and pedestrianisation, contributes to alleviating crowdedness in high-density areas [6]. City roadways should not merely accommodate cars but should be designed as a green grid, creating an interconnected and evenly distributed open and green system for increased contact with nature. Wen emphasises the preference for low- to medium-rise housing to frame streets as viewing corridors, preventing high-rise buildings from obstructing significant views and landmarks [6].

3.4 Overview on case studies

Nasr City and Masr el Gdeeda, two neighbourhoods undergoing substantial modifications in recent years, exhibit distinct urban fabrics and street patterns. Despite sharing similar densities, ranging from 5.83 to 75 people per feddan [23], the selection of both cases for analysis aims to unveil the relationship between urban fabric, physical characteristics, and the perception of crowding in the built environment. To gauge the level of perceived crowdedness, a questionnaire was administered, yielding 90 responses. Surprisingly, 70 percent of participants perceived Nasr City as highly crowded, whereas Masr el Gdeeda received 42 votes, despite their comparable densities. This suggests that additional physical characteristics may influence crowding perceptions. Subsequently, the following section will delve into a comparative analysis of the status of each case.

3.5 Analysis and observations

3.5.1 Layout design

In the case of Nasr City, originally it was designed to accommodate medium- to high-rise buildings; later on, violations in height took place, as shown in Figure 1. The height violations of residential buildings and the excess concentration of uses at some locations caused traffic jams, parking problems for the users, and security problems [24]. The high-rise buildings, as mentioned, could not lead to a feeling of crowdedness if surrounded by public plazas and green areas, which is not the case in Nasr City. The planning of Nasr City depends on a grid pattern, which causes societal consequences [25], where allocating buildings in a way that doesn't offer public spaces in-between. Therefore, instead, vacant lands or lost spaces that could be found between buildings could be converted into gathering areas or small parks to be accessed by the residents of the district. In other areas where a mix of high and medium-rise buildings exists, the presence of superblocks and long blocks may contribute to an elevated sense of crowding.

On the contrary, in Masr el Gdeeda, the heights originally varied between low and medium-rise buildings. Despite some violations, the urban fabric on main roads has been largely preserved.

The design of sidewalks incorporates arched features, creating spaces for leisure, shopping, and gathering for users. In terms of block length, it appears to be shorter than the blocks in Nasr City. This shorter block length provides smaller plots, allowing for a mix of regular and unique structures, opening up sky views, and revitalising underutilised street areas [3]. Figure 2 illustrates the contrast between the long-length blocks in Nasr City and the shorter-length blocks in Masr el Gdeeda.

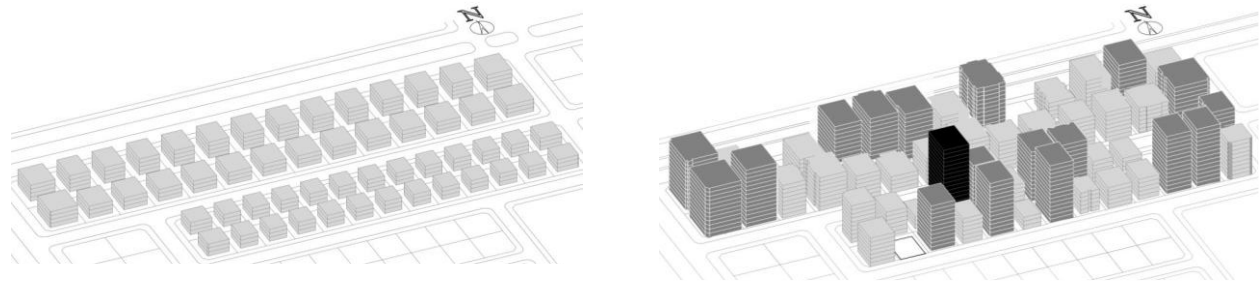


Figure 1. Sample of Height Violations in Nasr City. Source: [26]



Figure 2. Block Length in Nasr City and Masr el Gdeeda. Source: Google earth

3.5.2 Open spaces and green areas

The reformation of the road networks in "Nasr City" has led to a depletion of greenery, resulting in heightened air pollution and a subsequent deterioration of Nasr City's environmental image among its inhabitants [27]. In 2006, East Nasr City allocated its highest per capita green space at 4.89 m², but this figure declined to 1.69 m² by 2020. Moreover, between 2017 and 2020, East Nasr City witnessed a reduction of 311,283 m² in green spaces, equating to a 25% decrease in per capita green space allocation. The diminishing green spaces pose substantial negative repercussions for the district and the overall well-being of its residents [28].

Concerning Masr el Gdeeda, the reformation project consumed much of the green spaces that used to occupy the street medians. As a result, it lost an area of 90 feddans of green spaces, according to the Heliopolis Heritage Foundation [28]. In Heliopolis, the per capita allocation of green spaces decreased from its peak in 2006 (6.38 m²) to 3.52 m² in 2020. The Heliopolis Heritage Initiative documented the loss of green spaces, estimating approximately 390,000 m² lost between various streets and squares in the district [28]. Official data from CCBA presents a slightly lower value for lost green spaces, totaling 272,274 m² between 2017 and 2020, still constituting a significant loss that led to around a two-fifths reduction in the per capita green space allocation.

This decline in green spaces has had broader implications for the quality of life in the Heliopolis district. The environmental and visual quality have deteriorated, exacerbated by interruptions to visual continuity caused by bridges. The quality of sidewalks has also decreased, and pedestrian safety while crossing roads has been compromised [29]. The district witnessed a notable increase in traffic accidents following these developments. Furthermore, the loss of shade on sidewalks, resulting from the cutting and uprooting of trees, has adversely affected walkability, which is a crucial factor for pedestrian-friendly environments [30].

A study was conducted in 2023 to evaluate users' satisfaction and experiences following the implementation of the reformation project in Nasr City (Figure 3). The findings indicated a decrease in the sense of security and reduced accessibility to open and green spaces [31]. This eventually affects the user experience as well as the crowding perception. The comprehensive changes occurring in both neighbourhoods are influencing the user experience and, consequently, the overall quality of life, thereby affecting their perception of crowding.

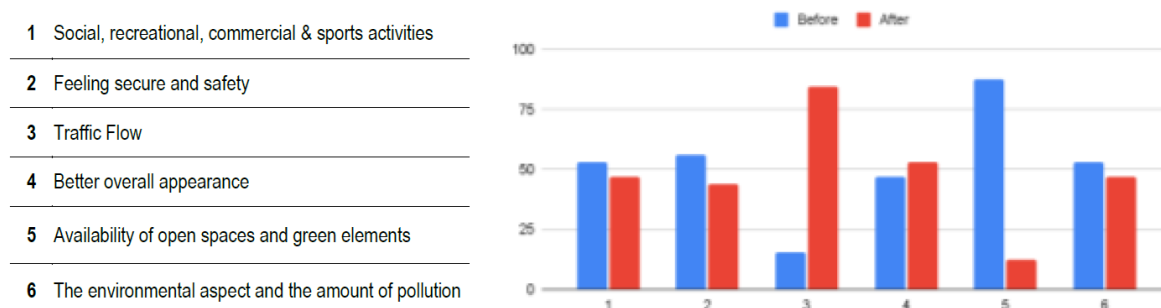


Figure 3. Residents' Satisfaction With Urban QoL Dimensions Before & After the Reformation Project in Nasr City. Source: [31]

The following photos illustrate the reduction of green areas in favour of expanding the width of streets in Masr el Gdeeda (Figure 4).



Figure 4. Sample of the Magnificent Changes in Street Image Due to the Erosion of Greenery in Masr el Gdeeda. Source: [32]

3.5.3 Streets

In an effort to alleviate the persistent traffic congestion in Nasr City, the government initiated a road network reformation project in East Cairo in 2019 [28]. The primary objective of this undertaking was to enhance resident transportation and decrease reliance on private vehicles [31]. As of now, these initiatives have successfully halved travel times and reduced fuel consumption by 20% for vehicles traversing the area. Nonetheless, several challenges have emerged, including a notable increase in vehicle accidents. Furthermore, the modifications led to the erosion of greenery, contributing to elevated air pollution and a subsequent decline in Nasr City's environmental standing among its residents, consequently influencing crowding perceptions. Additionally, the construction of bridges to replace roundabouts and intersections on main roads, the widening of main roads through the removal of green median strips, commercial facilities encroaching upon public parks either partially or entirely, and the establishment of substantial pillars to support the monorail lane [31]. These dramatic changes affected the users' experiences and perceptions.

To facilitate the creation of additional lanes, the projects undertaken in Masr el Gdeeda extensively utilised the green spaces that previously adorned the street medians. This transformation resulted in the loss of approximately 90 feddans of green areas, as reported by the Heliopolis Heritage Foundation [28]. Furthermore, to accommodate these expansions, the remaining tracks of the Heliopolis tramway were dismantled. While the widened streets may

have alleviated congestion in the short term, they concurrently gave rise to increased traffic and higher rates of speeding. The immediate aftermath of the opening of these bridges witnessed a significant surge in traffic accidents and road fatalities. Notably, these projects underscored a prioritisation of the car in urban planning and design, neglecting the potential adverse effects on individuals dependent on alternative modes of transportation, such as active travel (walking and cycling). Furthermore, the removal of trees has resulted in a loss of shade, potentially influencing individuals to opt for walking over commuting, particularly for short-distance trips like grocery shopping, particularly in the summer months [30].

Road encroachments in both cases result in a lack of pedestrianisation on the streets, significantly impacting users' experiences. Moreover, the absence of traffic calming measures, such as bumps, curbs, chicanes, angled parking, wider sidewalks, bike lanes, and green entry features, all contribute to the amplification of crowding perception. Significantly, as an alternative to addressing traffic issues, a technical resolution could be implemented through smart procedures. This includes reorganising land use, rearranging the movement patterns of public facilities and mobility, and implementing an effective traffic light system. These measures provide a simpler alternative compared to sacrificing green areas or altering the urban nature of any developed district. These procedures have the potential to influence users' experiences and shape their perceptions of crowding within their environments.

The varying building heights in Nasr City, especially between local and main roads, hinder streets from being recognised as viewing corridors due to the presence of high-rise structures. This obstruction negatively impacts crowding perception as it prevents clear vision. In contrast, the low- to medium-rise buildings along main roads in Masr el Gdeeda allow streets to be considered viewing corridors. According to Wen, the preference for low- to medium-rise housing aids in framing streets as viewing corridors, preventing high-rise buildings from blocking significant views and landmarks. This strategy is intended to keep the city skyline as unobstructed as possible, reducing the sense of crowding [33]. The encroachment of greenery and trees makes it challenging to consider streets in both cases as green grids.

Figure 5 and Figure 6 illustrates the profound transformations following the addition of bridges in two zones in Nasr City and Masr El Gdeeda.

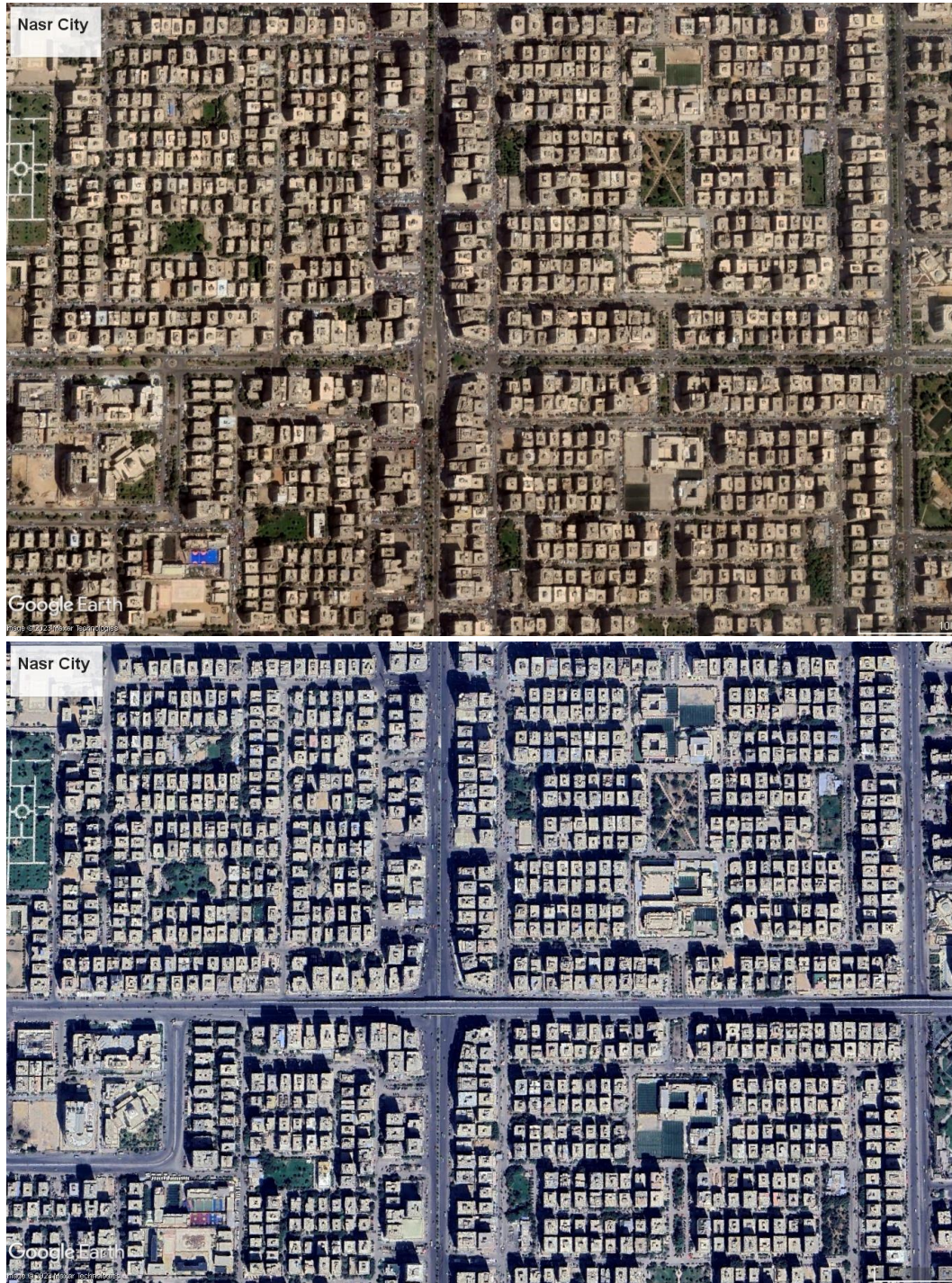


Figure 5. Sample of the Transformation of Main Roads After Adding Bridges, Nasr City. Source: Author based on Google earth

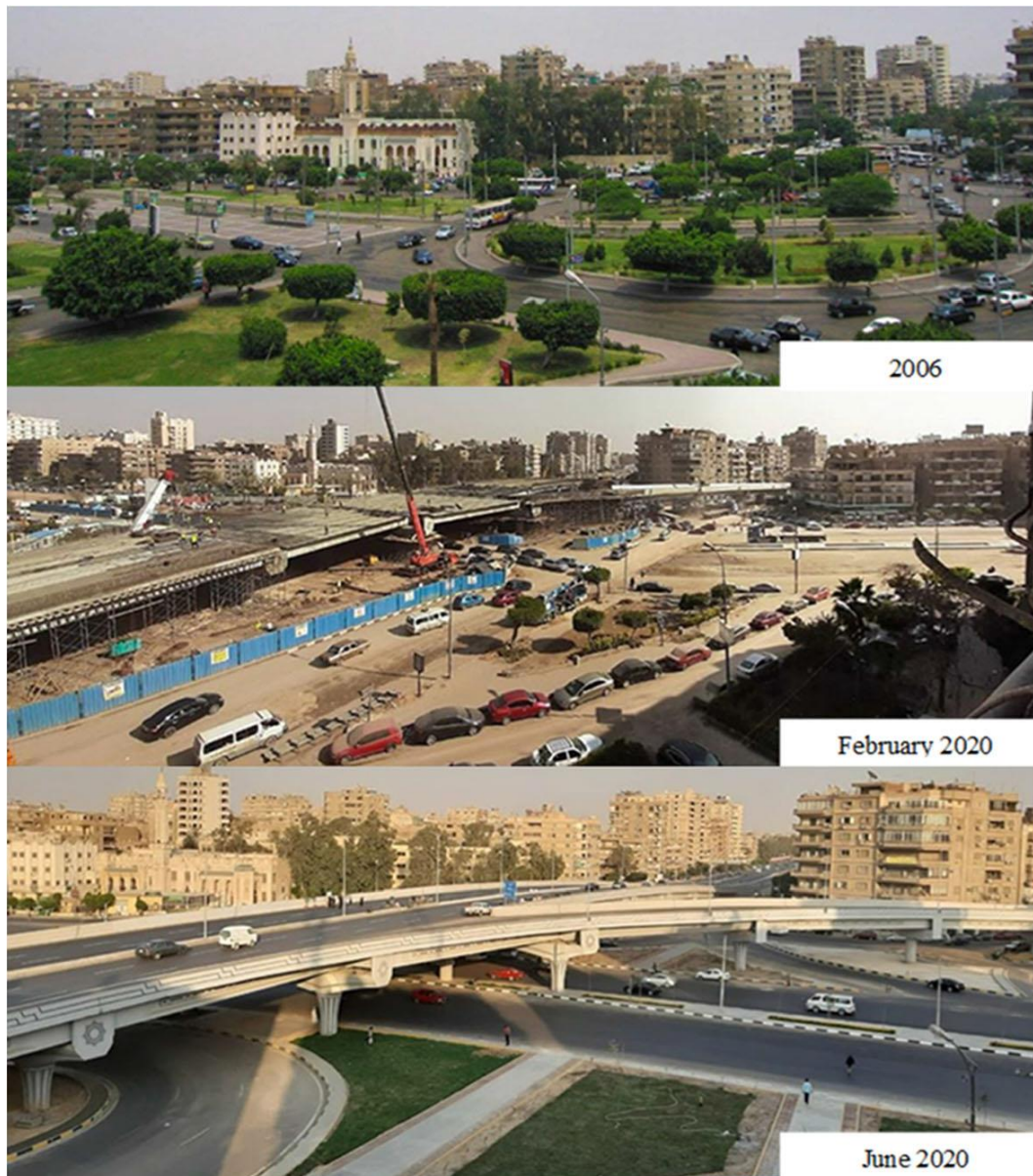


Figure 6. Sample of the Transformation of Main Roads After Adding Bridges, Masr el Gdeeda.
Source: [34]

4. Conclusion

An assessment of the physical environmental factors in both cases indicates that the redevelopment actions contradict the principles outlined by theorists and scholars, revealing a clear inconsistency between the government's intentions and the actual implementation. The national plans in Egypt seem to demonstrate a gap in addressing the necessary scale of interventions required to achieve tangible impacts on users' perceptions of their environment. The approval of height violations and prioritisation of projects to widen roads or construct vehicle bridges over protecting green spaces reflect a disregard for users' experiences. Losing green spaces to prioritise vehicular usage within urban contexts contradicts SDG goals, Egypt Vision 2030, and the fundamental pillars of the Urban Strategic Plan 2052. The shift from

"green to grey" represents opposing approaches to sustainable urban development. While such infrastructure developments may enhance aspects like vehicular movement, they negatively impact the city's image, livability, and users' crowding perceptions.

In the context of the redevelopment process, the Ministry of Environment, during an official public dialogue session with the Heliopolis Heritage Initiative, acknowledged the absence of proactive environmental, social, or urban studies announced to the public community before the initiation of implementation actions. This lack of information regarding impact assessments poses a challenge for calculating or measuring the predicted consequences for living conditions. Furthermore, the exclusion of public participation from the state's urban and physical planning process has resulted in imposing material changes on people's lives that may prove difficult to rectify. Consequently, it is imperative for all plans to undergo public scrutiny and approval. Notably, the consolidated building law No. 119/2008 has mandated the necessity of public participation and outlined the procedures for conducting public consultations.

Frameworks in the Egyptian context should be formulated to closely align with micro-scale and bottom-up methodologies, aiming to bridge the gap between institutional stakeholders and local communities. This approach seeks to enhance the effectiveness of urban planning initiatives and their impact on users' experiences and their perceptions of crowding within their living environments.

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