

## THE UNPLANNED MORPHING OF SOCIAL HOUSING IN CAIRO: A POSITIVE OR NEGATIVE PHENOMENA?

Kamal Mahmoud Elgabalawy  
Omar Mohamed Galal

### Abstract

Social housing in Egypt was and still is one of the main concerns of the state. With the unprecedented growth of the informal settlements occurring during the last decades – especially in the Capital and around it – delivering affordable dwellings becomes crucial. Such necessity constantly stimulates the mass production of new developments all over Egypt, however, the developed housing schemes tend to be more concerned with immediate needs without considering the future needs of their residents.

In Cairo many locations exist where the residents have developed interesting solutions to deal with such short comings. In this paper, the morphing process of such developments is documented and classified on a macro scale. The focus of the classification will be the changes executed by the residents. Afterwards, a case study is chosen and analysed on a micro scale.

The micro-analysis of the changes are on the form with respect to additions to building's geometry, changes in skin, ground floor and roofs. The analysis investigates the changes occurring in the buildings' activity or functions as well. In the light of the literature of sustainable and energy efficient urbanism, the development's original and modified states are then qualitatively compared.

The study demonstrates that there are lessons to be learned from the residents' intervention and recommends more flexible designs for housing schemes in the future. Such flexibility should account for and anticipate such changes instead of frustrating them.

### Key Words

Apartment Housing, Urban Morphology, Sustainable Urbanism, Urban Resilience.

### 1. Introduction

Apartment construction has been the answer to most of the governmental housing interventions, especially units targeting the lower income groups. Despite their diverse locations and designs, these projects tended to have four major aspects in common: a) all projects tended to be of relatively small residential units with area starting from 40 m<sup>2</sup>, b) all projects tended to be mainly of single use buildings that are completely dedicated to residences, c) all projects have relatively large spaces between the different buildings in

comparison to traditional urban settlements, and d) all projects tended to be formed by the repetition of specific models at a larger scale.

These four characteristics have constituted the formula. Ironically, however, in the absence of strict control a fifth characteristic became a common feature, dominating and changing the other four: alterations implemented by the residents on their units. The residents' interventions have varied from changes that are as small as opening a window in an entirely solid wall, to changes that are as significant such as the addition of a four floors height extension to the original buildings.

Despite being classified as illegal at worst and informal at best, these interventions have created an interesting morphological phenomenon that is worth of studying. They have not only unique form characteristics, but also make smaller residential units bigger, single purpose buildings turned into mixed uses, spaces between buildings smaller and monotonous urban environments turned to more diverse ones. Ironically, some of these changes may have effectively mitigated some of the typical harmful impacts of the modernist urban forms.

After highlighting the locations of occurrences of these phenomena on the macro scale in Cairo, this paper aims to classify and analyse the continuous morphing process in one of the governmental housing developments in the Mattareya district. The monitoring process is focused on demonstrating the changes occurred on some of the original buildings through three time frames. First is the original building state, second when the intrusions occurred through 2009 and third the intrusions that occurred until 2018.

The classification and analysis process will be focused on discussing and sorting the intrusions and their effect on the form of the urban environment from a morphological point of view and based on Conzen's approach to urban morphology. Such changed urban environments are then discussed and reviewed in the light of literature of sustainable urbanism and compared to their original states. This paper adds to the literature with debates discussing the shortcomings of current housing schemes in Egypt in addition to the observation of a unique morphological urban phenomenon.

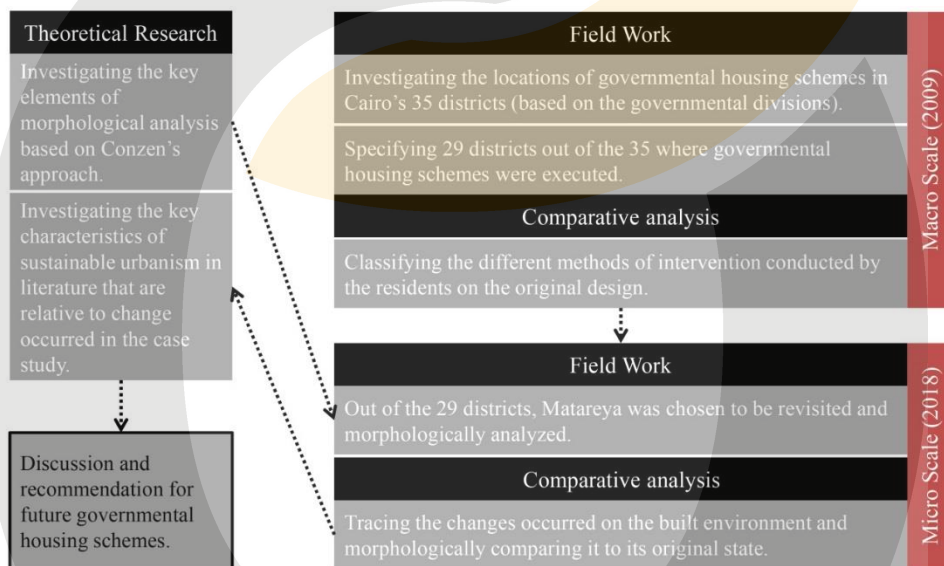
## **2. Methodology**

This work revisits a housing research that was conducted in the interval between 2009 to 2016 (Elgabalawy, 2016). There are some common data between the two points in time but the main difference is that this paper perceives this data from the perspective of urban morphology and not housing. Urban morphology has been defined as a complex field with main focus on the form and development of urban settlements (Moreno & Steadman, 2014). By definition, the main difference between the studies of urban form in comparison to urban morphology is the dimension of time. Time occurs to be

among the necessary principles for any morphological analysis (Moudon, 1997).

More specifically the steps in this work are shown in Fig. 1. First a survey on macro scale was conducted on 2009. The main aim of that step was to highlight how wide spread the phenomena of residents' intervention can be found. Additionally, the manner of intervention is classified into three main categories; 1) changes in building geometry, 2) changes in building skin and 3) changes in building uses. Secondly, a more focused micro-scaled survey on 2018 was conducted on one of the districts that were previously visited. The chosen district was the Mattaria because it included several interventions in addition to its unique steel constructed additions.

According to Conzen – who is acknowledged as one of the pioneers of urban morphology's English school – urban morphology can be broken down into four main elements which are; land uses, building structures, plot pattern, and street pattern (Carmona, 2003). Among these four elements, the first two tend to change easier or faster with time compared to last two. Hence it was buildings' structure and uses that were at issue during the second survey as there was not much change occurring in the street networks and the scheme was not planned to be divided in plots.



**Fig. 1: A Diagram Summarizing the Methodology by which the Research was Conducted (Diagram Developed by the Authors).**

### 3. Field Visits Findings

Cairo's governorate is divided into four sectors and within them thirty seven different administrative districts as shown in Fig. 2. The first phase of the

research was conducted on all these districts, however, only the Eastern Sector will be discussed in detail. The second one was conducted in the Matareya district at the Eastern Cairo Sector.

### 3.1. Macro Scale

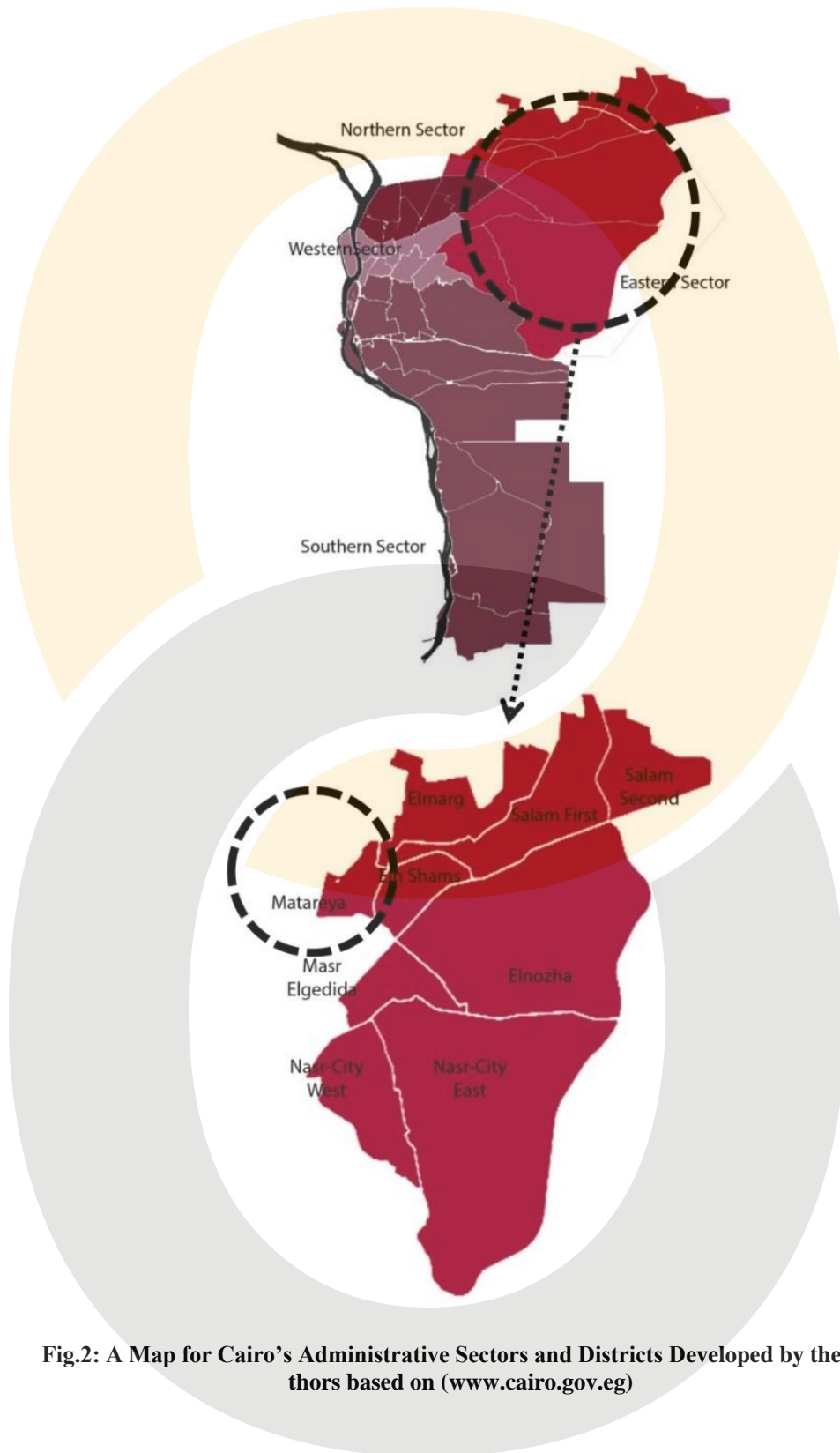
Out of all of the surveyed districts twenty nine included government housing schemes. Perhaps the most surprising result of the survey is that none of the schemes remained in their original state. All housing projects tended to have at least one kind of intervention by the residents. The changes implemented on the level of buildings' geometry were especially common in the older schemes (30 years old or more). These interventions included extensions of concrete/steel blocks (adding one room to the apartment), addition of rooms on the roof, and occasionally adding an entire module adjacent to the existing building. In Misr-El-Qadima Cairo the extensions were so thorough that the original building's façades were completely covered.

The changes implemented on skin tended to occur more intensively. The interventions included windows widened added and removed. Perhaps the most dominant and widespread feature was the change of balconies to be part of the interior rooms of the apartments. Table 1 demonstrates the how the interventions occurred in different districts on the level of buildings' geometry and skin in a more detailed manner. The changes implemented on the buildings' uses were mostly occurring in ground floors and roofs. The ground floors tended to change from residential units to commercial functions, while the additions on the roofs were occasionally used to raise domestic birds.

### 3.2. Micro Scale

The Matareya district governmental housing scheme was chosen for two main reasons: 1) the uniqueness of the nature of the interventions implemented by the residents as per surveyed in 2009, and 2) the significance of the changes implemented on buildings' form and uses since 2009. Both reasons made the study of Matareya district more interesting from a morphological point of view.

The housing scheme is located along the Kablat Street next to the Matareya's district local authority's bureau. The development was planned on an orthogonal grid that is oriented to the north with slight inclination to the east. The typology of the models used in the project is a shallow linear slab as shown in Fig. 3. All the buildings had the same depth but the length varied from one building to another. The dominant use in the scheme was residential but as shown in table 1 and 2, many of these characteristics has changed with time.



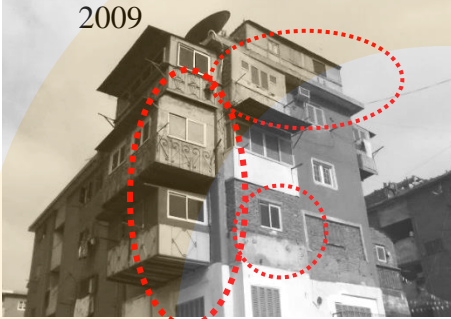
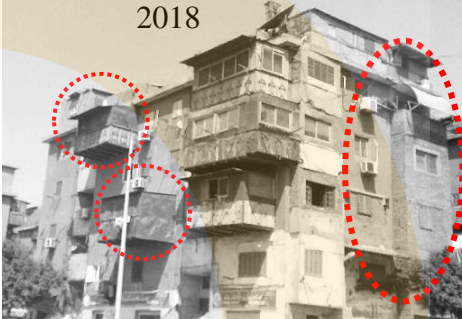


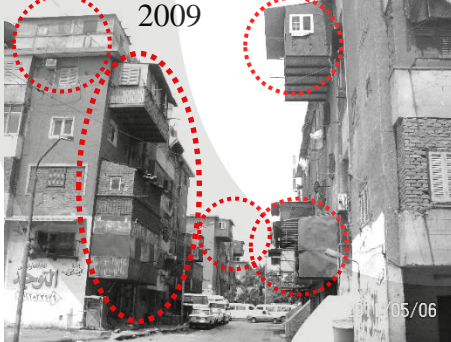

**Fig.2: A Map for Cairo's Administrative Sectors and Districts Developed by the authors based on ([www.cairo.gov.eg](http://www.cairo.gov.eg))**

**Table 1: Comparison between Interventions Conducted by the Residents in Eastern Cairo as per Surveyed by the authors in 2009.**

Typology	Elements	Features Changed	Matareya	Marj	Salam 1	Salam 2	Misr Eljadida	Ain Shams	Nasr-East	Nasr-West	Elnozha	Approximate Rate of Spread	
Changes in Skin	Windows	Windows Addition	√		√	√	√	√	√	√	√	90%	
		Windows Expansion	√	√	√	√		√	√	√	√	90%	
		Windows Removal		√									<30%
Changes in Skin	Balconies	Balconies Closure	√	√	√	√	√	√	√	√	√	90%	
Changes in Geometry	Facades	Blocks Addition (concrete)		√			√	√	√	√		50%	
		Blocks Addition (steel)	√		√	√	√	√				50%	
		Full extension (concrete)					√	√	√			30%	
	Roofs	Concrete Rooms						√					30%
		Steel Rooms	√			√							30%
		Light Wooden Structures	√		√	√		√					50%

**Fig. 3: A Schematic Perspective showing the Original Design of the Matareya Governmental Housing Scheme near the Kablat Street (by the authors).**

Table 2: Comparison between the Stat of the Governmental Housing Scheme in 2009 on the left and 2018 on the right (developed by the authors).

<p>2009</p> 	<p>2018</p> 
<ul style="list-style-type: none"> <li>- Steel protrusions.</li> <li>- Closed balconies.</li> <li>- Light structures at the roof.</li> </ul>	<ul style="list-style-type: none"> <li>- Addition of steel protrusions.</li> <li>- Addition of a full building height reinforced concrete module.</li> </ul>
<p>2009</p> 	<p>2018</p> 
<ul style="list-style-type: none"> <li>- Protrusions of steel blocks.</li> <li>- Change of uses in ground floor.</li> </ul>	<ul style="list-style-type: none"> <li>- Addition of steel protrusions.</li> <li>- Addition of concrete rooms over the roof.</li> </ul>
<p>2009</p> 	<p>2018</p> 
<ul style="list-style-type: none"> <li>- Protrusions of steel blocks.</li> <li>- Light structures over the roof</li> </ul>	<ul style="list-style-type: none"> <li>- Changing uses of ground floor.</li> <li>- Addition of reinforced concrete module.</li> </ul>

### 3.3. Macro Scale

Between the initial construction and 2009 gradual changes started to occur. These included the closure of balconies, adding to the interior space of the residential unit, and the addition of light wooden/steel structures over the roof. Additionally, it witnessed the development of the steel cantilevers that protruded for 2.5 to 3 meters. That technique has perhaps become the most common feature of the Matareya district yet it was not found in the other surveyed locations. Some of the residential units in the ground floor were changed to commercial activities, however, this was not the dominant case in the entire scheme in 2009.

When the site was revisited in 2018 further interventions were obvious. First the number of enclosed balconies and the protruding blocks had increased. Second, instead of the light structures previously monitored over the roof, now rooms with reinforced concrete structure and bricks were added. Third, on the level of buildings' form, at the second survey the addition of entire reinforced concrete modules four to five floors height were noticed. These additions worked as an extension to the original buildings. They have the most significant effect as they increase the buildings' foot print and makes the space between them narrower. And fourth, the ground floor use is seldom residential. Instead, cafés, workshops and shops dominate the uses especially in the more visually accessible areas.

## 4. Review and Discussion

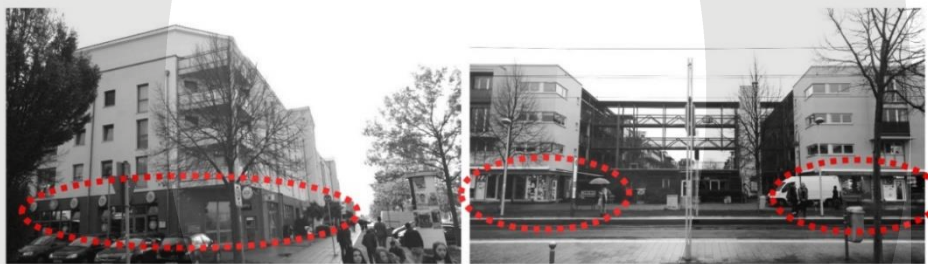
The previous sections have described the original state of the governmental housing schemes at Eastern Cairo sector, the typology and the changes that occurred over time. This was the manner in which they were morphing. This section however, reviews and discusses the possible extent of usefulness or harm resulting from such changes. The scope of the review and discussion will only discuss the changes in land-use and building form and within the light of literature related to sustainable urbanism as per stated at the methodology section.

Most of the governmental housing schemes were designed to be dense which is already one of the characteristics of sustainable urban forms (Newman & Kenworthy, 1989). Higher densities are usually argued for as one of the key elements that are necessary of the residents of the urban environment so that their trips are via walking or public transportation (Newman & Kenworthy, 2013). However, most of the schemes were planned to be single use developments with large scaled areas solely dedicated to residential use. Moreover, most of the apartments in the schemes were of similar areas. Hence, the matter of question would be whether the changes implemented by the residents as illustrated in table 2 are useful or harmful?



On the smallest possible scale, a mix of use can be achieved vertically (different uses in one building) or horizontally (buildings of different uses neighbouring to each other's) (Pahl-Weber, Seelig, & Ohlenburg, 2012). It is recognized in literature for encouragement of walking through decreasing distances between different uses (Rogers, 2008). The positive aspects of mixed-use developments have been argued for qualitatively in different sources since the 60s of the last century (Jacobs, 1961). Alexander (2013) has further highlighted the overlap and the interrelations between systems and activities as one of the major differences between older, naturally-grown cities and artificially planned modern cities. Additionally, Koolhaas has argued that if there are to be new urbanism, it will no longer be about specific definitions or separations of the different entities within the city, but about the 'unnamable hybrids' and intense and diverse built environment (Eigler & Werlemann, 1997).

Yet there were quantitative studies that discussed the significance of land use mix. These illustrated how density might not lead to improved walking (Townshend & Lake, 2009). Based on a small number of interviews and observation, it was noticed that some of United Kingdom's dense urban environments were dominated by the use of personal vehicles. Even though in some studies the coexistence of urban density and mix of uses reinforce walking (Glazier et al., 2014), several empirical studies demonstrate how mixed uses have stronger influence on walking and transit use than density (Ewing & Bartholomew, 2013). Actually, some of the examples of sustainable urban developments like Kronsberg and Vauban in Germany (Fraker, 2013) have the ground floor of apartment blocks dedicated to commercial use especially at main streets as show in Fig.4.



**Fig. 4: Photos for Apartment Blocks with Commercial use at the Ground floor at Kronsberg (on the left) and Vauban (on the right) at Germany. (photos shot and edited by the authors).**

By comparison, different extensions applied on the typical floors and the roof have different effects. With respect to land use, the apartments where the extensions have occurred have increased in area. That in itself can add to the residential units' diversity. This mix of housing units was claimed to be one of the features of more sustainable urban environments (Calthrope & van der Ryn, 1991). It is further argued that different housing sizes leads to mix of residents as families tend to live in bigger units while senior citizens and

young people tend to live in smaller ones (Farr, 2008). Such diversity in residents may contribute positively to the livelihood of the urban environment as each group have different time schedule from the other.

Another effect of the expansions and addition is narrowing the space between the apartment blocks. In the context of hotter and dryer climates, urban forms resilience increases to higher temperatures in summer when the buildings are closer in order to utilize mutual shading (Pizzaro, 2009). On the other hand, allowing free flow of air via widening streets may contribute positively to the climate through ventilation. However, it will also be offset by excessive solar radiation in addition to windblown dust (Ko, 2013). Narrowing spaces between buildings by increasing the streets' canyons height to width ratio is, among other strategies, sometimes used to deliberately design cooler urban environments (Littlefair, 2000). Furthermore, being shaded is among the key elements that increase the livelihood of public spaces (Abd El-Moneim & Galal, 2017).

Regarding the use of light roof structures to raise domestic birds there is a positive aspect for that as well. Food production within the urban environment is well perceived and is considered as one of the elements that increase the resilience of the urban environment. During the World War II, in Britain, 10% of the residents' needs for vegetables were grown in private and allotment gardens (Vale & Vale, 2010). Although it was a different method of urban agriculture, both methods adapts the concept of local production of food at times of crises –either due to war or economic conditions– making it accessible to the more vulnerable groups. The addition of the light structures on the roof also reduces the direct solar radiation on the last floor's apartments which may improve their indoor air temperature hot summers.

Hence, some of the morphing phenomena occurring at governmental apartment housing in Cairo have some positive aspects. This does not necessary mean that the matter should be left as is. For it also has some possibly negative impacts. If this process continued without any sort of control it might lead to substantial threats as well. Perhaps the most obvious would be that the extensions in form of cantilevers or additions to the roof were not designed by professional engineers. Hence, these extensions could threaten the safety of the building and the residents with in it. Also, there are no fire protection measures for light weight wooden structures used for raising domestic birds. Hence they are vulnerable to fires.

If the extensions continue at the same rate, overcrowding and urban environments that are too dense and poorly ventilated becomes inevitable. If such poor ventilation was coupled with pollution from ground floor workshops (in case they produced any sort of fumes or air pollutants) the quality of air in these urban canyons degrades. Vegetation and green spaces are important for having role to play in mitigating urban heat island effect. Shading and cooling urban spaces, even provide habitats for birds and empower bio-diversity.

On the social level the interventions can have several negative implications on the residents. Some kinds of workshops can produce higher levels of noise. Moreover, the researchers did not ask questions to determine if the communities' residents are actually the owners of the workshops. Hence, that can mean an exaggeration in estimating the positive impacts of the changes in land use. In the future, perhaps more empirical research needs to be done. This can be through additional surveys, questionnaires or even via various simulation methods to determine gains and losses from the changes occurring in urban form. Simulation programs now can guide urban planning/design to solutions that are more climate sensitive and energy efficient on multiple scales (Galal, 2017). If properly quantified, the lessons learned from this morphing process can lead to conscious and planned interventions to improve other governmental housing schemes in the future.

## 5. Conclusion

In Cairo, a natural morphing process has been occurring in governmental housing schemes. This study has monitored that phenomenon on the macro scale of the Eastern Cairo sector at 2009 and the micro scale of the Matareya district in 2018. In both time frames, significant morphological evolution was found on the level of land use and building forms. Interventions varying from skin changes, additions of steel protrusions, rooms over the roof and full height additional reinforce concrete modules, to changes in the functions in the ground floor.

In the light of the literature on sustainable urbanism, the morphing process was discussed. The interventions conducted by the resident have led to creating an urban settlement that enjoys a mix of use and housing styles and a more compact and dense built environment. Consequently, they are expected to make destinations within a walking distance from the residents, make the built environment more sensitive to the hot arid climatic conditions and generally empower the resilience of the community. However, if the morphing process is left without control, it can lead to more hazardous outcomes.

All in all, this phenomenon is worth studying for it can inspire solutions that dramatically increase the adaptability of planned governmental schemes. Furthermore, many lessons should be learned from the morphing process of the older schemes, especially when the government is currently constructing hundreds of thousands of apartments housing annually.

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