



## ARCHITECTURAL ENGINEERING

# Crime in relation to urban design. Case study: The Greater Cairo Region



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Received 28 October 2014; revised 2 August 2015; accepted 30 August 2015

Available online 21 October 2015

### KEYWORDS

Crime occurrence;  
Built environment;  
Urban circumstances

**Abstract** Crime is a part of any social system and known to human communities since its origins. It differs from community to another, even within one community it doesn't occur equally in all places and nor by the same way. It is also concentrated in some places more than others, sometimes increases, sometimes decreases, etc. Previous researches have proved that crime rate has significant correlation with different social factors: education levels, poverty rates and lack of social organization, while others have drawn the attention to its relation with the built environment. They proposed that crime occurs in places where both opportunities and criminals are available. The role of this paper is to identify urban circumstances related to crime occurrence within the Greater Cairo Region, and to propose different ways to reduce these crimes. Consecutively, agglomeration's main districts were scrutinized according to social analysis, street-network pattern and land-use.

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## 1. Introduction

This paper evolved from a master thesis “*Crime and urban planning in Egypt*” on the relationship between crime patterns within the Greater Cairo Region and different urban planning

aspects, including both social and physical ones [1]. The objectives were to do the following:

- Increase the awareness of the relationship between urban planning and crime occurrence and how to consider this in planning.
- Investigate urban planning approaches in crime prevention.
- Understand the relationship between crime patterns in Egypt and urban planning aspects.
- Suggest possible urban planning precautions/considerations in order to help in crime prevention commensurate with the Egyptian environment.

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Peer review under responsibility of Ain Shams University.



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The study was bounded in several ways. Firstly, due to the wide scope of the study, it was not possible to conduct the analysis at all of the region's districts; therefore, the main agglomeration districts were selected to be analyzed. Secondly,

the study period has been identified by five-years starting from 2004 till 2008 for the following reasons:

- The large number of urban crimes committed during this period.
- Crime statistics are available starting from 2003 till 2008; statistics before that period are difficult to obtain.
- Last census (2006) took place in the middle of the selected period; therefore, the resulting values can be considered as an average of the five years of the study.
- The proximity between the time of preparing the study, and the study period itself; therefore, a true perception can be given to the region during the study period.

Finally, the research studies crimes are only related to geography and linked to specific physical environment, including the following:

- a. Crimes against persons: homicide and attempted murder, assaults including battery with serious injury or death, kidnapping, sexual harassment and rape.
- b. Crimes against property: robbery, arson, housebreaking, shoplifting, rusting and car theft.

## 2. Crime and the built environment

Earlier crime and crime prevention studies started in 1800s as the industrial revolution changed the urban–rural relationship and reshaped the urban structure; this change ultimately caused many social problems. Early sociologists focused on how these social problems led to crime occurrence. It is worth mentioning that this concept continued until the early 1960s. In 1960s, researchers have drawn the attention to the relation between the built environment and crime. Jane Jacob's book "*The Death and Life of Great American Cities*" [2] was the first influential work to suggest that active street life could cut down opportunities for crime. She focused on the role that "eyes on the street" played in maintaining social control. Jacobs' thesis was simple: people, not police, are the guardians of the public space [3]. Her critique corresponded over the physical design of urban America, which emphasized high rise apartment buildings separated by public space without any specific guardianship. Office areas became vacant after supper, which led to a cessation of informal surveillance and to a reduction in the sense of community among residents. According to Jacobs, city streets were unsafe because they were deserted [2]. She frequently cites New York City's Greenwich Village as an example of a vibrant urban community, and how well-used streets were more likely to be safe from serious crime. She found that natural surveillance was essential for the feeling of safety and that could be achieved by increasing the number of people using a particular area through encouraging a diversity of uses and creating opportunities for positive social interactions [2]. The early 1970s saw a surge of studies depending on the previous work of Jane Jacobs. In 1971, Oscar Newman published a paper "Architectural Design for Crime Prevention", and in 1973 he published a book "Defensible Space, Crime Prevention through Urban Design" [4]. He argued that an area is safer when people feel a sense of ownership and responsibility for that part of a community. Newman

studied crime rates in low-income housing projects in New York City. He observed the development of an eleven story, 2740-unit public housing complex, named "Pruitt-Igoe". The Pruitt-Igoe was supposed to be an ideal housing community for low-income families. The idea was to keep the grounds and the first floor free for community activity. Each building was given communal corridors on every third floor to house a laundry, a communal room and a garbage room. The outside areas of each building were also common areas. According to Newman, because all the grounds and common areas were disassociated from the units, residents could not feel the responsibility toward them and they became unsafe. The corridors, lobbies, elevators and stairs were dangerous places to walk, they became covered with graffiti and littered with garbage and human waste, and women had to get together in groups. The project never achieved more than 60% occupancy. The complex failed miserably and was demolished about 10 years later [4]. However, across the street from Pruitt-Igoe was an older, smaller, row-house complex occupied by an identical population called "Carr Square Village". It remained fully occupied and trouble-free throughout the construction, occupancy, and the decline of Pruitt-Igoe. With the social variables constant in the two developments, Newman began to look into what physical factors were different between the two complexes that would allow one complex to thrive while the other had to be torn down. One of the first things Newman looked at was building type. He noticed that:

- In a single-family housing, everybody feels the responsibility for their place. Residents know who belongs to the area; streets and sidewalks are usually only traveled by neighbors, and therefore identifying strangers is possible.
- In walk-ups the number of people sharing the common areas is limited, only 2 families, giving them a sense of responsibility for their place. It is also easy to identify strangers due to the small number of residents.
- In high-rises, residents do not feel responsible for any of the common areas since they are shared with so many others. They can't identify strangers because of the amount of people that use the space.

Newman studied also the social and physical factors that create high crime rates. He found that the percentage of population receiving welfare is shown to be the most important factor, followed by building height which in turn correlates highly with the number of apartments sharing the entry to a building, as it affects the ability of residents to control their environment. In addition, the size of the housing project and the number of other projects in the area, as the larger low income projects surrounded by other low income projects suffer a higher crime rate than small or isolated projects [4]. Thus, Newman found that the safest neighborhoods have the following attributes:

1. Minimized common areas: the larger the number of people who share a communal space, the more difficult it is for people to identify it or to feel they have a right to control or determine the activity taking place within it.
2. Maximized private ownership: private yards were more defensible because the owners could know whether or not someone belonged to their yards.

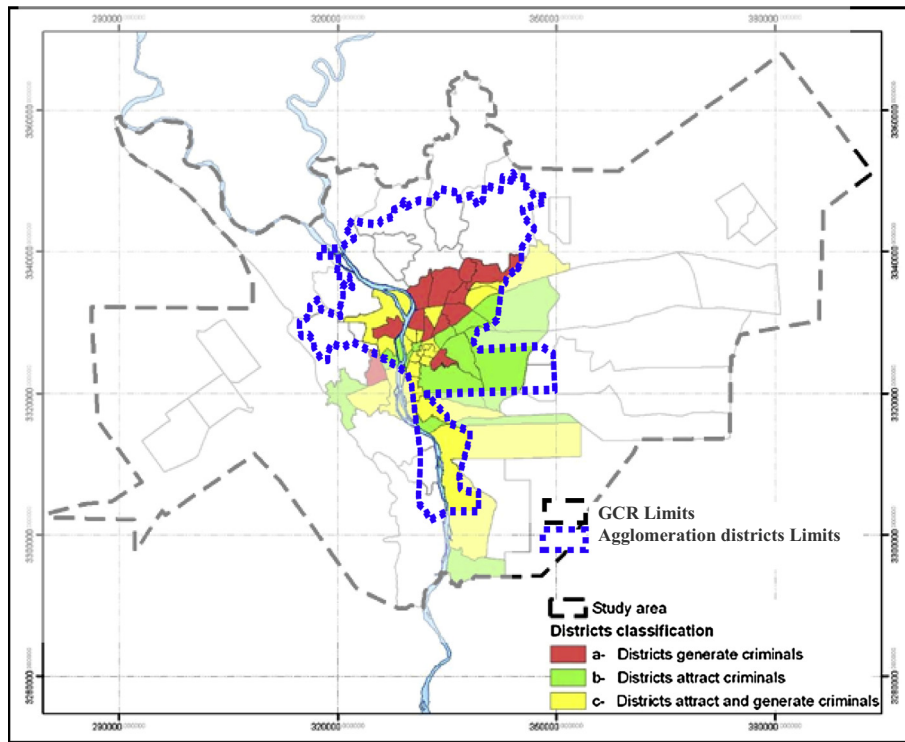


Figure 1 Agglomeration districts classification. Source: The Author.

3. Minimized permeability: the ease of entry to and exit from the neighborhood or housing area.

In 1984, Bill Hillier and Julienne Hanson introduced the concept of “*Social logic of space*” by arguing that there are many physical factors apart from building height that have an effect on encouraging criminal activities. They argued that, on the contrary to Newman, segregation increases the fear of crime. Later, Hillier and his colleagues at the Bartlett School of Architecture and Planning, University College, London, developed the theory of space syntax, based on the concept of social logic of space.

Space syntax has been used in research involving movement analysis in general and its implications include strategic issues such as retail locations, distribution of land uses and locations of crime [5]. According to the theory, a good spatial layout

generates automatic movement which increases the probability of interactions by unplanned encounters. The increased social interactions then increase the risk for a criminal to get caught and hence prevent him from committing the crime [6]. It is worth mentioning that the space syntax technique was used in this research to identify the relationship between street networks and crime rates. The theory of space syntax and drawing methodology will be explained later.

### 3. Methodology

As mentioned before, the main agglomeration’s districts (Fig. 1) were selected for investigation. It is worth mentioning that the methodology used in the analysis depends on the correlation between crime rates of the selected districts and the

Table 1 Correlation between crime and different social factors according to the last census results (2006). Source: The Author.

	Illiteracy rate	Unemployment rate	Internal migration rate	Average family rate	Rate scramble	Population density
Total crimes	$r = -0.4411^*$ $t = -1.9837$	$-0.3559^*$ $-1.7011$	$-0.3349$ $-1.6259$	$-0.7217^{**}$ $-2.7167$	$-0.6478^{**}$ $-2.5477$	$-0.3900^*$ $-1.8184$
Crimes against person	$r = -0.4227^*$ $t = -1.9254$	$-0.4673^*$ $-2.0639$	$-0.2138$ $-1.1415$	$-0.7520^{**}$ $-2.7816$	$-0.6728^{**}$ $-2.6065$	$-0.4784^*$ $-2.0970$
Crime against property	$r = -0.4398^*$ $t = -1.9796$	$-0.3534^*$ $-1.6922$	$-0.3352$ $-1.6268$	$-0.7189^{**}$ $-2.7105$	$-0.6453^{**}$ $-2.5417$	$-0.3877^*$ $-1.8105$
Significant at level	0.000*** 0.01** 0.05*		Critical value	3.551 2.423 1.684		

**Table 2** Social ranks and agglomeration districts classification. *Source:* The Author.

	QISM_ENAME		Illiteracy rate	#	Unemployment rate	#	Internal Migration rate	#	Average Family size	#	Rate scramble	#	Population Density	#	Total ranks	Total crimes
1	Al-Marg	A	22.47	5	10.19	3	13.94	3	4	1	1.14	1	30,260	31	44	563.7
2	Al-Salam	C	20.39	5	9.05	2	13.39	3	3.94	1	1.21	1	17,684	18	30	504.0
3	Ain Shams	C	14.46	3	12.23	3	12.53	3	3.92	1	1.12	1	63,046	64	75	<b>769.1</b>
4	Al-Khsos	A	26.43	6	4.95	1	47.12	10	3.92	1	1.1	1	49,861	50	69	120.9
5	Al Mataria	A	19.29	4	13.69	3	10.94	3	3.93	1	1.18	1	80,077	81	93	411.5
6	Shobra Al Khaima 2nd	A	22.36	5	11.83	3	25.55	6	4	1	1.16	1	44,004	44	60	129.1
7	Shubra Al Khaima 1st	A	24.94	5	11.67	3	24.26	5	4.04	1	1.2	1	32,720	33	48	95.4
8	Al Sahel	A	15.78	4	13.07	3	7.64	2	3.52	1	1.04	1	55,293	56	67	360.9
9	Rod Al-Farag	C	20.68	5	11.31	3	7.94	2	3.4	1	1.05	1	55,966	56	68	967.4
10	Shobra	C	19.26	4	12.44	3	8.43	2	3.4	1	1.05	1	53,123	54	65	<b>1766.1</b>
11	Sharabia	A	27.75	6	14.29	3	8.99	2	3.78	1	1.29	1	58,409	59	72	569.6
12	Al-Zawya Al Hamra	C	23.02	5	14.65	3	11.46	3	3.94	1	1.19	1	63,706	64	77	<b>772.8</b>
13	Al Zaitoun	A	13.4	3	13.2	3	12.3	3	3.69	1	1.07	1	39,275	40	51	525.6
14	Hadayeq Al Qoba	A	18.86	5	13.72	3	11.29	3	3.68	1	1.13	1	73,402	74	87	565.3
15	Nozha	B	4.98	1	8.04	2	15.53	4	3.31	1	0.87	1	2743	3	12	<b>1574.6</b>
16	Masr Al Gadida	B	6.31	2	8.48	2	16.48	4	3.31	1	0.83	1	12,411	13	23	<b>2737.4</b>
17	Al Wayli	B	14.66	3	6.11	2	7.89	2	3.4	1	0.99	1	15,600	16	25	<b>1779.8</b>
18	Al Zaher	C	10.16	3	9.91	2	8.7	2	3.44	1	0.95	1	32,491	33	42	<b>1693.5</b>
19	Bab Al-Shairia	C	24.3	5	7.3	2	4.43	1	3.61	1	1.13	1	55,231	56	66	<b>1852.7</b>
20	Al gammalia	C	27.08	6	7.83	2	3.93	1	3.6	1	1.18	1	24,407	25	36	<b>1541.1</b>
21	Al-Darb Al-Ahmar	C	22.86	5	8.55	2	4.72	1	3.71	1	1.12	1	32,479	33	43	<b>1673.1</b>
22	Al-Mouski	C	27.17	6	8.16	2	6.38	2	3.4	1	1.05	1	27,512	28	40	<b>3543.6</b>
23	Al-Azbakeya	B	14.62	3	7.77	2	6.07	2	3.19	1	0.93	1	19,490	20	29	<b>2796.7</b>
24	Bolaq	C	31.54	7	5.94	2	6.12	2	3.31	1	1.27	1	27,212	28	41	<b>713.9</b>
25–26	Qasr Al-Niel + Zamalik	B	4.39	1	5.76	2	14.63	3	2.42	1	0.56	1	6933	7	15	<b>3131.4</b>
27	Abdin	C	14.47	4	5.94	2	10.41	3	3.13	1	0.92	1	25,018	26	37	<b>1724.2</b>
28	Al-Sayeda Zainab	C	18.37	4	9.33	2	6.72	2	3.47	1	1.08	1	35,839	36	46	<b>2236.7</b>
29	Masr Al-Qadima	C	28.97	6	9.61	2	8.27	2	3.52	1	1.13	1	21,477	22	34	405.7
30	Al-Khalifa	B	22.6	5	6.64	2	9.96	2	3.75	1	1.21	1	6162	7	18	<b>1007.7</b>
31	Monshat Naser	A	47.05	10	4.31	1	11.99	3	3.91	1	1.51	1	47,183	48	64	507.5
32	Madinat Nasr 2nd	B	12.33	3	13.85	3	17.74	4	3.91	1	1.14	1	4387	5	17	<b>1730.8</b>
33	Madinat Nasr 1st	B	6.75	2	9.14	2	21.84	5	3.69	1	1	1	6800	7	18	<b>708.5</b>
34	Al-Basatine	C	21.67	5	11.83	3	10.69	3	3.96	1	1.17	1	27,613	28	41	<b>574.1</b>
35	Al-Maadi	B	7.43	2	10.44	3	13.09	3	3.32	1	0.87	1	3118	4	14	<b>3645.6</b>
36–37	Tora + Helwan	C	20.84	5	13.97	3	13.37	3	3.91	1	1.18	1	4632	5	18	303.9
38	Al tebin	B	25.5	6	18.82	4	16.31	4	4.36	1	1.33	1	2686	3	19	<b>603.8</b>
39	Giza-Qism	C	25.05	6	11.99	3	11.59	3	3.82	1	1.14	1	22,354	23	37	<b>1098.6</b>
40	Al-Omrania	C	14.83	3	11.09	3	25.5	6	3.86	1	1.09	1	41,447	2	16	361.2
41–42	Al-Ahram	B	22.5	5	11.83	3	19.16	4	3.97	1	1.12	1	15,073	16	30	<b>594.2</b>

43	Bolaq Al dakrou	A	18.87	4	12.22	3	13.86	1	1.15	1	61,717	62	74	327.8
44	Dokki	B	6.37	2	6.76	2	22.95	1	0.8	1	18,427	19	30	<b>1843.7</b>
45	Al-Agouza	C	12.32	3	10.77	3	29.23	1	0.91	1	30,380	31	45	<b>1171.2</b>
46	Imbaba-Qism	A	21.73	5	10.07	3	19.34	1	1.19	1	71,490	72	86	338.3
47-48	Al waraq	C	28.84	6	8.78	2	19.18	1	1.17	1	19,921	20	34	309.2

\* The black highlighted cells represent values larger than the region's values as follows:  
 The region's rank = 35. The region's crime rate = 571.58.

\*\* Districts classification key:

a – Districts generating criminals rather than being vulnerable to crimes.

b – Districts attracting criminals rather than generating them.

c – Districts attracting and generating criminals at the same time.

Italic values represent fragmented ranks for each rate.

rates obtained from different factors. Analysis includes the following:

### 3.1. Social analysis

In this part, crime rates were correlated with different social factors including illiteracy rate, unemployment rate, and internal migration studies, and these factors can be considered as an indicator of social deterioration within any society, which is primarily responsible for generating criminals and increasing crime rates.

### 3.2. Street network pattern analysis

Using the “*space syntax*” technique, street network analysis has to follow these steps:

- Taking maps of the selected case studies, drawing the longest and fewest axial lines to obtain the axial map.
- Analyzing the maps using UCL Depthmap software, calculating the Global Integration, Local Integration  $R = 3$ ,  $R = 10$  and Connectivity values.
- Checking the correlations between each of the former values and crime rates.

### 3.3. Land use analysis

In this part, crime rates were correlated with different land uses which can be classified into activity uses (represented by commercial areas), idle uses (represented by cemeteries, deserts and military areas), and a mix of them (represented by industrial areas, in addition to the study of the residential areas themselves, including some of the formal housing areas (the old deteriorated residential areas, public housing and shelter “El-EWAA” housing areas) and the informal housing areas). Based on previous studies, land uses can provide a good opportunity for criminals to commit their crimes by reducing movements and activities or exaggerating them.

## 4. Analysis

### 4.1. Social analysis

The main purpose of this analysis was to identify the relationship between different social factors and crime rate. The methodology used to understand this relation depends on the correlation between the latter and the rate of each of these factors within the studied districts. According to the mentioned methodology, results showed that total crime rate was significantly and negatively correlated with all studied social factors except the internal migration rate, where a negative but not significant correlation exists. This also applied to person and property crimes. So, it can be concluded that districts with high socially deteriorated residents have low crimes rate. **Table 1** shows the correlation and “*t*” values over the agglomeration districts.

This result can be explained in two directions. On the one hand, the increase of socially deteriorated residents within a district is considered as an indicator of the increasing of the

**Table 3** Social characteristics of the selected districts and their crime data during the study period (2004–2008). *Source:* Social characteristics recalculated by the author according to the last census results, Crime data recalculated by the author according to Public Security Bureau's (PSB's) statistics.

District	Illiteracy rate	Unemployment rate	Internal migration rate	Average family size	Rate scramble	Population density	Crime rates	Crime against person	Crime against property
<i>Districts generating criminals</i>									
Mataria	19.29	13.69	10.94	3.93	1.18	80,077	411.50	7.62	403.88
Manshyet Nasser	47.05	4.31	11.99	3.91	1.51	47,183	507.54	7.63	499.90
Bolaq AlDakrou	18.87	12.22	13.86	3.92	1.15	61,717	327.81	7.03	320.79
<i>Districts attracting criminals</i>									
Masr AlGadida	6.31	8.48	16.48	3.31	0.83	12,411	2737.41	26.41	2711.01
Madinat Nasr 2nd	12.33	13.85	17.74	3.91	1.14	4387	1730.84	13.17	1717.67
Dokki	6.37	6.76	22.95	3.23	0.80	18,427	1843.68	23.45	1820.24

district's poverty rate. Since most criminals search for high standards of living areas to commit their crimes, these socially deteriorated districts become less vulnerable to crimes and the adjacent ones with low socially deteriorated residents become more vulnerable to crimes. On the other hand, most of these districts help in creating criminals—due to their bad living conditions—than being places of crimes. Since most criminals leave a buffer around their residence where they might be recognized according to the crime pattern theory [7], they may tend to commit their crimes within the adjacent districts. Thus, these socially deteriorated districts become less vulnerable to crimes. Based on the previous explanation, a conceptualization of “districts attracting criminals” and “districts generating criminals” has been proposed by comparing districts' social conditions with their crime rates through Table 2:

- Ranking values within each of the studied factors in groups, for example:
  - values  $\geq 0$ ,  $< 10$  have rank = 1;
  - values  $\geq 10$ ,  $< 20$  have rank = 2;
  - values  $\geq 20$ ,  $< 30$  have rank = 3, etc.,

Then, summing up the resulted ranks over each district:

- Identifying high socially deteriorated districts by calculating the region's rank; higher rank values are considered an indicator of high socially deteriorated districts.
- Identifying high crime rate districts by calculating the region's crime rate; higher values are considered an indicator of high crime rate districts.

According to that, the main agglomeration's districts were classified according to the following figure into three types:

- Districts generating criminals rather than being vulnerable to crimes, including socially deteriorated districts with low crime rates.
- Districts attracting criminals rather than generating them, including socially developed districts with high crime rates.

- Districts attracting and generating criminals at the same time, including both socially deteriorated districts with high crime rates and socially developed districts with low crime rates. It should be noted that criminals of this type of districts may not be those who commit crimes within. It is possible that these districts attract criminals from outside and expel their criminals outside at the same time, as higher risks of detection and apprehension exist within their residence districts.

## 4.2. Physical analysis

### 4.2.1. Street network

Based on the assumption that criminals always choose places that require the least amount of time and energy to commit their crimes, a sample of the first and second districts types was selected to be analyzed. This involved the selection of districts that are socially and spatially different from each other so that, any relationships between crime and space across the areas are unlikely to be due to social factors. The selected districts include the following: *Al-Mataria*, *Manshyet Nasser* and *Boulaq Al Dakrou* as districts generating criminals, corresponded with *Masr Al Gadida*, *Madinat Nasr 2nd* and *Dokki* as districts attracting criminals. Table 3 indicates social characteristics of the districts being investigated and their crime data. As for the third type, which includes districts attract and generate criminals at the same time, it was difficult to identify whether criminals are insiders or outsiders, especially that most of these districts located within the downtown which attracts people from different areas, whether criminals or not. Thus the third type was ignored.

To identify the relationship between street networks and crime rates, space syntax analysis has been used.

*4.2.1.1. Drawing methodology.* As axial models depend on visibility, therefore, achieving the natural surveillance, some elements have to be taken into account while drawing. Based on surveys done by the author within the selected districts, these elements include the following:



**Figure 2** Example of wide planted middle islands, Khalifa Ma'mon St., Misr Elgadida district. *Source:* The Author.



**Figure 3** Example of narrow middle islands, Sudan St., Dokki District. *Source:* The Author.

1. Middle islands: according to surveys, they can be classified into the following:
- a. Wide planted fenced islands, with low-rise fences, shrubs, and trimmed trees.
  - b. Non-fenced wide planted islands with low-rise shrubs and trimmed trees.
  - c. Narrow islands.

It is notable that most of them are easily passable and don't impede vision; therefore, they can be considered as spaces [Figs. 2 and 3](#).

Nodes and open spaces: most of them are non-fenced containing simple sculptures, fountains, shrubs, seats, etc. [Fig. 4](#) shows examples of nodes and open spaces within the selected districts.



**Figure 4** Examples of nodes and open areas, roxy square-Misr El-Gadida District (Above) and Galaa Square-Dokki district (Below). *Source:* The Author.



**Figure 5** Example of fenced private areas, Madinet Nasr 2nd district. *Source:* The Author.

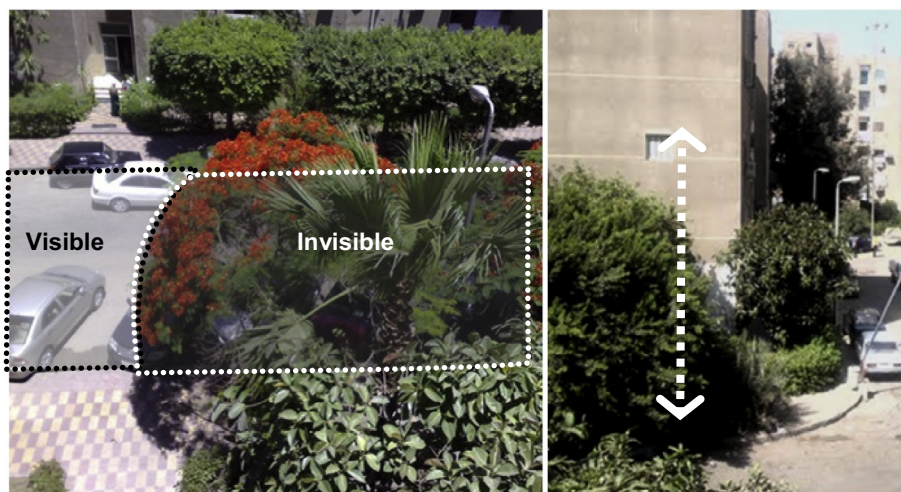
It is notable that those sculptures, fountains, shrubs, seats, etc. don't impede vision, so they were ignored while drawing the axial maps; and considered as spaces.

1. Some private vacancies including the following:
  - a. Fenced areas (such as Military uses, private lands): the majority of these lands have high-rise fences that impede vision, as their main purpose is to secure the space surrounded by; thus, they can be considered as objects. [Fig. 5](#) shows an example of fenced areas within the selected districts.
  - b. Non-fenced areas which can be classified into the following:
    - I. Buildings' intermediate spaces: these spaces – especially within the districts attracting criminals – are usually used as building entrance, garage entrance and in some cases used as storage areas while a small percentage have been used as internal routes or open spaces; therefore, they can be considered as objects.
    - II. Buildings' open spaces: these spaces usually are planted, but the lack of maintenance of these plants makes them grow thicker and impede visibility for residents. Therefore, they can also be considered as objects although, some are passable [Fig. 6](#).

So it can be concluded that, in order to study the effect of natural surveillance and movement on crime, middle islands, nodes and open areas are considered as spaces, while all private vacancies are considered as objects.

*4.2.1.2. Space syntax analysis.* Depending on the selected sample, two questions need to be answered. The first is: "Are there spatial differences between districts generating criminals and those attracting criminals that affect crime rates?" The second is: "Are there particular street patterns attract criminals?" Therefore, there were two primary types of variables used extensively in the analysis: the values obtained through Space Syntax analysis as the independent variable, and crime rates as the dependent variables. The values obtained through space syntax were as follows: Global Integration, Local Integration  $R = 3$ , Local Integration  $R = 10$  and Connectivity. The relationship between each of these values and crime rate was explored to examine their effects on crime occurrence in the selected districts. For the first question which relates to the spatial differences that affect the crime, the correlation between each of values obtained through space syntax and crime rate was calculated. Comparing Districts generating criminals with districts attracting criminals [Table 4](#) shows that:

These results are consistent with Hillier and Sahbaz, 2005. They concluded [\[8\]](#):



**Figure 6** Example of building open spaces that impede visibility, Emtdad Ramsis Buildings-Madinet Nasr 2nd district. *Source:* The Author.



**Table 4** Districts generating criminals and districts attracting criminals. *Source:* Author.

	Districts generating criminals					Districts attracting criminals			
	Global integration	Integration $R = 3$	Integration $R = 10$	Connectivity		Global integration	Integration $R = 3$	Integration $R = 10$	Connectivity
Mataria	1.2140	2.2324	1.3544	4.7314	Masr Al Gadida	1.7721	2.4021	1.7723	5.3157
Manshyet Nasser	0.6157	1.6170	0.9960	3.3198	Madinat Nasr 2nd	0.7874	1.6219	0.9913	3.3833
Bolaq Al Dakrour	1.1348	2.2441	1.3122	4.2582	Dokki	1.4723	2.0799	1.4848	4.5362
Total crimes	$r = -0.8219$	-0.8926	-0.8299	-0.6826	Total crimes	$r = 0.8001$	0.8671*	0.8406	0.8617
	$t = -0.4511$	-0.4716	-0.4535	-0.4057		$t = 4.0034$	6.5271	5.2754	6.2298
Crimes against person	$r = -0.4063$	-0.5285	-0.4192	-0.2036	Crimes against person	$r = 0.9962^{**}$	0.9783**	0.9876**	0.9805**
	$t = -0.2889$	-0.3458	-0.2954	-0.1691		$t = 265.3883$	45.1300	79.6578	50.3207
Crimes against property	$r = -0.8230$	-0.8935	-0.8310	-0.6840	Crimes against property	$r = 0.7950$	0.8629	0.8360	0.8573
	$t = -0.4515$	-0.4719	-0.4538	-0.4062		$t = 3.8785$	6.2935	5.0985	6.0101
Significant at level	0.000***	Critical value		636.619	Significant at level	0.000***	Critical value		636.619
	0.01**			31.821		0.01**			31.821
	0.05*			6.314		0.05*			6.314

The total crime rates were negatively – though not significantly-correlated with all the spatial factors which means that, crime rates decrease with increasing the global integration, local integration  $R = 3$ ,  $R = 10$  and connectivity values, and vice versa. This also applied to both crime against person and crime against property rates

**Integration values:**

Results support that the presence of more people appears to provide higher risks of detection and apprehension to potential criminals. Higher Integration values are usually associated with higher levels of movement at different scales—pedestrian and vehicular. Consequently, more people—and eyes—are present which in turn, spell potential trouble for those attempting to commit any criminal act. These findings agree with Jacob’s thesis through the presence of high density neighborhoods characterized by strong social interactions as mentioned previously

**Connectivity values:**

Results also showed that although higher connectivity values provide more escape routes, lower incidents occurred. This agrees with the rational choice theory where criminals, in general, compare between the risks of being caught – or being recognized by the insiders – and escaping with rewards gained (Felson, M. and Clarke, R.V., 1998); it is obvious that the probability of escaping with rewards is less. This means that either those areas have low standards of living, or high natural surveillance exists, or may be both

The total crime rates were positively and significantly correlated with all the spatial factors which means that, crime rates increase with increasing the global integration, local integration  $R = 3$ ,  $R = 10$  and connectivity values, and vice versa. This also applied to both crime against person and crime against property rates

Results support that the presence of more people appears to provide higher risks of being exposed to crimes. Higher integration values provide overcrowded areas with a larger number of potential targets especially, that most of these spaces are desirable locations for retail and other public services because of their high accessibility. Criminals find it easier to commit their crimes in crowd and escape using crowds to impede victims and blending into them. This doesn’t mean that there are no eyes on streets, but it can be said that crowd, the existence of a larger number of victims, the lack of social interactions between residents, etc., dominate the eyes on street which makes these areas more vulnerable to crimes

Results also showed that higher connectivity values provide more escape routes; therefore, higher crimes occur, so it can be interpreted that criminals find the probability of escaping with rewards is higher than being caught -or being recognized by the insiders. These findings agree partially with Newman’s defensible space theory; both share the idea of minimizing the permeability – including the ease of entry to and exit from the area – to control the numbers of people using the space, while the idea of creating isolated neighborhoods from strangers to achieve territoriality is unacceptable for the studied cases

**Table 5** Correlation values between street patterns and crime rates during the study period (2004–2008). *Source:* Author.

	Masr Al Gadida	Madinat Nasr 2nd	Dokki	Total crimes		Crimes against person		Crimes against property	
				r=	t=	r=	t=	r=	t=
				<i>Global integration</i>					
Grid	1.7139	0.8374	1.5311	0.7346	2.7680	0.9999***	8054.1958	0.7288	2.6877
Radial	2.1342	0.0000	1.9170	0.6584	1.9272	0.9925**	133.1170	0.6520	1.8733
Organic	0.0000	0.7471	1.1290	-0.9041	-0.4748	-0.3888	-0.2800	-0.9077	-0.4758
Curve	1.8699	0.8669	0.0000	0.8342	5.0313	0.2539	0.3403	0.8388	5.2052
<i>Integration R = 3</i>									
Grid	2.3014	1.8379	2.1724	0.7826	3.6005	0.9983**	592.9196	0.7773	3.4909
Radial	3.0891	0.0000	3.0510	0.5946	1.4670	0.9793**	47.2163	0.5878	1.4261
Organic	0.0000	1.4567	1.4480	-0.9953	-0.4988	-0.6769	-0.4037	-0.9961	-0.4990
Curve	2.5091	1.8917	0.0000	0.6127	1.5819	-0.0704	-0.0658	0.6194	1.6272
<i>Integration R = 10</i>									
Grid	1.7142	1.0984	1.5450	0.7804	3.5529	0.9985***	675.1323	0.7750	3.4450
Radial	2.1342	0.0000	1.9196	0.6575	1.9198	0.9924**	130.6467	0.6511	1.8661
Organic	0.0000	0.9151	1.1401	-0.9583	-0.4893	-0.5234	-0.3436	-0.9606	-0.4900
Curve	1.8699	1.0780	0.0000	0.7556	3.0919	0.1263	0.1446	0.7611	3.1866
<i>Connectivity</i>									
Grid	4.2596	3.6316	4.3130	0.5275	1.1164	0.9596*	23.7568	0.5203	1.0845
Radial	12.0000	0.0000	12.4750	0.5584	1.2646	0.9693*	31.5923	0.5514	1.2290
Organic	0.0000	2.8435	2.6050	-0.9996	-0.4999	-0.7271	-0.4210	-0.9998	-0.5000
Curve	7.2857	5.1408	0.0000	0.6531	1.8823	-0.0183	-0.0180	0.6594	1.9364
Significant at level	0.000***	Critical value		636.619					
	0.01**			31.821					
	0.05*			6.314					

“Overall, we can say that urban integration, and the increase in movement and levels of activity that it brings has a double effect; it can produce more natural surveillance and safety in numbers and so reduce crime; and it may mean that potential criminals also use integrated streets, and so make more accessible locations more dangerous. Both effects undoubtedly exist, and a key variable is the degree to which there is a residential culture in more active areas. Where it exists, crime

risk is reduced, where it does not, risk is increased. But these benefits do not seem to pass through the intervening variable of community formation. They seem to be much simpler: effects of the ordinary co-presence of people that everyday movement and activity brings. A residential culture, it might be conjectured, is first a culture of civilized co-presence, and only second, and after due time, a culture of community formation. This, perhaps, is what made historic cities, which always brought heterogeneous population into dense patterns of contact, the civilized places they seemed to be. As both Jane Jacobs and Oscar Newman observed, a society which does not civilize its streets cannot be civilized”.

**Table 6** Correlation between the existence of studied formal housing areas and crimes rate during the study period (2004–2008). *Source:* Author.

		The existence of old deteriorated housing areas	The existence of public housing areas	The existence of shelter housing areas
Total crimes	r=	0.3227**	-0.2229	-0.0915
	t=	3.0882	-1.1813	-0.5431
Crimes against person	r=	0.3225**	-0.1799	-0.2017
	t=	3.0842	-0.9884	-1.0876
Crime against property	r=	0.3216**	-0.2227	-0.0899
	t=	3.0727	-1.1802	-0.5344
Significant at level	0.000***	Critical value		3.551
	0.01**			2.423
	0.05*			1.684

As for the second question, which relates to the various network patterns and their relation to crime, streets within each of the attracting criminals’ districts were classified to include linear, radial, organic and curvilinear patterns. Taking integration and connectivity values into account, results showed that person crimes were positively correlated at (0.01) level with grid and radial patterns, while there is no correlation with property crimes. Table 5 shows correlation results between crimes and network patterns.

4.2.2. Land use

4.2.2.1. Residential areas. 4.2.2.1.1. Formal housing areas. Due to lack of information on old deteriorated, public and shelter housing areas, the methodology used to understand the relationship between those areas and crime rates depends on the correlation between the latter and the existence of those areas – each separately – within each of agglomeration districts. This can be done by giving each of the studied districts the values of



be committed within their industrial and agricultural areas, where significance at level of 0.05 was shown, while property crimes results did not show any significance with the studied uses. This supports space syntax results, as criminals offending within the first type find it easier to commit their crimes in crowd and escape using crowds to impede victims and blending into them, while those offending within the second type find the presence of more people provide higher risks of detection and apprehension and they tend to commit their crimes within segregated areas. As for districts generating and attracting criminals at the same time, most of person crimes are supposed to be committed within their commercial areas and cemeteries, where significance at level of 0.05 was shown, while property crimes results did not show any significance with the studied uses. This confirms that this type of districts contains a mixture of the other two types, as crimes tend to occur in both crowd and deserted areas.

## 5. Conclusion

From the above analysis, it is evident that most criminals search for accessible places, easy to move through and that provide high opportunities for escape to commit their crimes. It is also evident that the agglomeration's districts can be classified as below into three types based on their social characteristics and crime rates:

### 5.1. Districts generating criminals

Analysis showed that the presence of more people in those districts appears to provide higher risks of detection and apprehension to potential criminals; therefore most criminals commit their crimes within segregated areas. Analysis showed that those segregated areas include old deteriorated housing, industrial as well as agricultural areas.

### 5.2. Districts attracting criminals

Analysis showed that the presence of more people in those districts appears to provide higher risks of being exposed to crimes; therefore most criminals commit their crimes within overcrowded areas. Moreover, it showed that those overcrowded areas include commercial areas with grid networks. It is obvious that grid networks provide clearer and more direct and predictable routes and therefore attract more potential offenders, while the existence of commercial uses helps in attracting more potential targets. Since more potential offenders will see more potential targets, more crime opportunities will be provided.

### 5.3. Districts generating and attracting criminals

Results showed that those districts are a mix of the previous two types; therefore incidents occur within both overcrowded and segregated areas almost with the same proportions.

## 6. Recommendations

According to the findings of this research, recommendations – in order to provide a secured environment – have to cover two

different processes: the first is to improve the urban environment, while the second includes the upgrading of population especially in the socially deteriorated districts.

### 6.1. Improving the urban environment

The researcher recommends that this process can be achieved through a set of parties which have to work with each other within the whole system. Those parties include the following:

#### 6.1.1. Legislators

Legislators – represented by the members of the People's Assembly and the Shura Council – need to work in two directions:

- a. The amendment of the existing laws or the enactment of new ones – whether related to the criminals themselves or the urban environment where those crimes were committed – in order to increase the effort of crime.
- b. Allocating more resources of the general budget to deliver public services and utilities to underserved areas especially, street lighting. Here comes the role of local governance as will be shown in the next point.

#### 6.1.2. Local governance

Local governance at different levels (governorates, *markez*, cities, districts and villages) has the responsibility to distribute those resources within their jurisdiction. It is recommended that this distribution covers three basic tasks:

- a. Survey areas suffering from bad living conditions and classify them according to their physical, social, economic conditions, etc.
- b. The establishment and management of all public services\utilities within socially\physically deteriorated areas.
- c. The quick removal of informal housing areas and their replacement with formal ones.

It is notable that the mentioned tasks depend on planners and designers significantly as will be shown in the next point.

#### 6.1.3. Planners and designers

They are the key factors for crime reduction through their cooperation with local governance and legislators. The result of this cooperation appears in identifying different design principles\measures to be adopted in laws or regulations, and therefore secures the urban environment of future projects. It is worth mentioning that analysis of this research has recommended a set of principles\measures which activate the role of both insiders and outsiders in maintaining natural surveillance through the following:

- Mixing of uses in order to pool different groups of people at different times of the day, create opportunities for positive social interactions between insiders and outsiders; taking into account the avoidance of incongruous uses.
- Reducing the grid network patterns in both limited and exaggerated movement areas.

#### 6.1.4. Criminologists

Criminologists have to provide decision makers with a snapshot of criminality and criminal behavior which provide them with an understanding of crime patterns and trends. Without this understanding of both crime patterns and criminal behavior, people who have to make decisions that affect the safety and security of communities will not have access to the vital, synthesized information essential to good planning and strategy.

#### 6.2. Upgrading of population

The researcher recommends that this process can be achieved through organizations within different ministries by strengthening the sense of belonging and citizenship in the community, increasing social interactions among residents at different levels in addition to, building their capacity. This includes the following:

##### 6.2.1. Ministry of education

- a. Strengthening the concepts of belonging and citizenship through the development of education curriculum in schools.
- b. Focusing on the role of the school in the process of education so as not to be restricted to curriculum issues and to be extended to monitor students' behavior in addition to, strengthening the relationship between home and school.
- c. Giving attention to schools' activities – especially in summer – in order to reduce juvenile crimes and delinquency.

##### 6.2.2. National council for youth

- a. Raising youth awareness about citizenship and the legal system through targeted programs.
- b. The establishment of youth centers and sports clubs – in the underserved areas – to highlight the talents of young people and their abilities, in addition to strengthening social relationships among them.
- c. Conducting training courses for youth employment through improving their skills and abilities, such as computer skills.

##### 6.2.3. Ministry of social solidarity

- a. Raising families' awareness about citizenship and the legal system through targeted programs.
- b. Encouragement of volunteer work as a mean of strengthening social relationships within community.
- c. Conducting training courses for employment through improving residents' skills and abilities, such as crafts making and tailoring.

Finally, for both processes, organizations within ministry of interior have to do the following:

- a. Improve law enforcement
- b. Develop new strategies for crime reduction and present them to the legislative authorities.

## 7. Recommendations for further research

This study has opened the door for variety of studies that can investigate crime in the Egyptian environment. For the future, a more detailed study is recommended with precise locations of incidents. Future research may also be conducted in the new urban communities' districts, villages and small towns' districts or even other Egyptian cities and comparison can be made which may strengthen the findings of this study or may contradict it. Also more detailed study can be done by dividing the crime further by types, location and time, which will give a more detailed understanding of the crime patterns.

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