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Social Streets: An Appraisal Tool for Social Housing Projects in Egypt

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ABSTRACT

Urban form is defined as the physical composition and arrangement of elements that form urban areas, which have been affected by many driving forces and unseen factors. In general, urban spaces are formed as a reaction to the composition of buildings and the rest of urban form elements. Conventional urban design processes recommended isolated buildings, sited in landscape without offering integration to streets and other public spaces, which resulted in un-integrated spaces and streets without a real understanding of human behavior. Therefore, the term Social Streets describes the type of street that promotes socialization among neighbors on the same street to build relationships, exchange needs, and knowledge, and receive help from closer social interaction. Many researchers have studied the public realm and spaces of social housing projects in Egyptian new cities, as well as the opportunities for place-making and their impact on the social and psychology of users, raising the gap in studying the role of planned streets in achieving sociality and social integration in the public realm. The research is based on creating a quantitative description of street systems in housing projects by applying the route structure analysis method using Arc GIS to the street network, which will result in reading the degree of connectivity for streets and studying building facades relationships to streets, which can provide a more understanding of the relationship between buildings and streets, that will reflect the degree of liveliness and sociability of the urban streets.

Keywords: Social streets – public realm – street network – connectivity- route structure analysis

الشوارع الاجتماعية: كأداة تقييم لمشروعات الإسكان الاجتماعي في مصر

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الملخص

يُعرّف التشكيل العمراني بأنه التركيب المادي للعناصر التي تشكل المناطق العمرانية، والتي تتأثر بالعديد من القوى الدافعة وغير المرئية. وبشكل عام فإن الفراغات العمرانية تتشكل كرد فعل على تكوين المباني وبقية عناصر التشكيل العمراني. معظم عمليات التصميم العمراني الحالية قد أدت إلى تشكيل المباني بمعزل عن باقي عناصر التشكيل الأخرى دون توفير التكامل مع الشوارع والفراغات العمرانية، مما أدى إلى تكوين مساحات وشوارع غير متكاملة قد لا تتناسب في أحيان كثيرة سلوك المستخدمين. ولذلك فإن مصطلح الشوارع الاجتماعية يصف الشوارع التي تعزز التنشئة الاجتماعية بين الجيران في نفس الشارع لبناء العلاقات وتبادل الاحتياجات والمعرفة. قام العديد من الباحثين بدراسة الفراغات والساحات العامة بمشروعات الإسكان الاجتماعي بالمدن المصرية الجديدة، وكذلك فرص صناعة المكان وتأثيرها على الحالة الاجتماعية والنفسية للمستخدمين، مما يعكس الفجوة العلمية في دراسة دور الشوارع في تحقيق الاندماج الاجتماعي في الفراغات العامة. يعتمد البحث على الوصف الكمي لأنظمة الشوارع في مشروعات الإسكان الاجتماعي من خلال تطبيق أسلوب تحليل هيكل شبكة الشوارع باستخدام Arc GIS ، مما سيؤدي إلى قراءة درجة ارتباط الشوارع بمداخل المباني ، والتي يمكن أن يوفر فهمًا أكبر للعلاقة بين المباني والشوارع، مما يعكس درجة الحيوية والتواصل الاجتماعي في الشوارع الحضرية.

الكلمات الدالة: الشوارع الاجتماعية- الفراغات العامة- شبكة الشوارع- الاتصالية- تحليل هيكل الشوارع.

INTRODUCTION

1. THE SOCIAL HOUSING IN EGYPT

Egypt has extensive experience with social housing projects; the National Housing Project for example is regarded as one of the most important projects for limited income, supplied 500,000 of housing units over six years to resolve Egypt's housing crisis through the provision of adequate and proper housing.

The morphology of housing projects and its urban spaces are facing many challenges that affect the sustainability and vitality of the urban environment in general. Many researchers believed that the extensive production of urban spaces in housing projects led to lack of distinctiveness and uniformity which led to (non-inhabited) public spaces, so affected the behavior of the inhabitants and their social and economic characteristics, (Ismail, 2018) and (Nasr et al., 2020) criticized these projects from different point of views such as the planning processes, implementation, management, or even the quality of resulted urban image. However, the quality of life in housing projects have been evaluated through the concept of **Distinctiveness** by (Hamed & A.Elaziz, 2017), There study revealed that the level of income of housing projects, are inversely proportional to the emergence of **social spaces,** as low income housing project has more existence of social spaces, in contrary to the existence of **open green spaces** in higher income housing projects

2. URBAN FORM AND CONVENTIONAL URBAN DESIGN

Urban form is defined as the characteristics of the physical composition and arrangements of elements that form urban areas, which have been affected by many driving forces and unseen factors. Aspects of urban form vary according to the levels of study and level of resolution (Marshall, 2004) and (Dempsey et al., 2010). Urban form Elements of neighborhood-district scale, urban form elements can include five main elements according to (Dempsey et al., 2010), Building types, Land use, Urban layout, Density and Transport infrastructure

In general, urban spaces are formed as a reaction to the composition of buildings and the rest of the elements of the urban form. Many urbanists studied the effect of the elements on creating good urban environments for spaces to achieve their functional or even aesthetic goals. Conventional urban design processes recommended isolated buildings, sited in landscape without offering integration to streets and other public spaces, which resulted in un-integrated urban spaces without a real understanding of human behavior. Authors like (Trancik, 1986) described it as ill-planned and ill-shaped public spaces. The characteristics of the urban environment and the urban context in which the system of public spaces is formed, affect the value of spaces and their variations, as well as their function, which in turn affect the value, conviviality and sociality of spaces and streets for users (Gehl, 2011) and (Introini et al., 2021)

3. STREET CONNECTIVITY AND VIBRANT URBAN ENVIRONMENT

The connectivity of urban streets is one of the most important criteria that contribute significantly to raising their urban quality in general. It guarantees exposure to users, as Gil pointed out (Gehl, 2011), it provides greater opportunities for communication between residents, and stimulates opportunities for social activities and meeting

opportunities in outdoor spaces. (Feliciotti et al., 2016) , (Mecredy et al., 2011) and (Bentley et al., 1985)

Both internal and external connectivity have a significant impact on people's mobility as well as the location and intensity of activities, leading to a vibrant and well-used locale. Increased connectivity increases the interaction and exchange between different components of the urban fabric according to (Feliciotti et al., 2016)

4. THE SOCIAL URBAN SPACES

And through previous studies, the social interactions of users and residents are not influenced by the connection between the spaces only, but were greatly affected by the morphology of the spaces themselves and their urban composition as mentioned by (Gill) and others, but what the research is concerned with is The effect of the morphology aspect of the urban spaces and their exposure to the street network.

Thus, the impact of the morphology of urban spaces at the micro level on social interactions or social sustainability was linked to two basic factors, (Greaney, 2015) which are the degree of looseness and the degree of openness.

The concept of 'looseness' described as a relative and often transitory character of space that contrasts with the city's 'tight spaces' where design and regulation aim to pre-determine proper activities (Franck & Stevens, 2007) the loose spaces often encourage appropriations and social interaction, it depends on two characteristics (ringy spaces and appropriation) (Greaney, 2015) and (Stevens, 2007). These two characteristics were mainly associated with (street corners) as places that stimulate the social interactions of the people, as mentioned by William Whyte (H.whyte, 2001).

As for the degree of openness, it was greatly affected by the physical characteristics of spaces and their relationship to the built environment of spaces (Greaney, 2015), The concept of openness in urban spaces can describe the opportunities to open up the environment to the change rather than stabilize it; this can assist designers to understand the ability of urban spaces to link the outside environments with the inside environments, as well as how the visual form of the open spaces can invite engagement and identification rather than closed urban spaces, the qualities of spaces edges can mainly affect the degree of openness which called by Sennett (**Porosity**) (Sennett, 2020), mentioning that the more **porous** edges of the urban spaces the more social practices can be emerged, which leads to more inevitable urban spaces.

On the other hand, 'public realm' is how city dwellers interact with their surroundings. It encompasses more than just 'public space'; it also includes building facades and everything visible at eye level. Therefore (Karssenberg & Laven, 2016)) and (Van ’t Hoff & Glaser, 2012) argued that **Plinths** are thus an essential component of street design

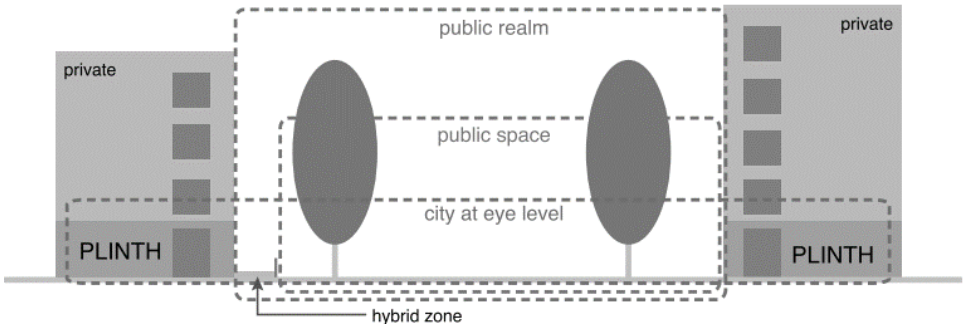

Figure 1 the concept of Plinths, source: (Karssenberg & Laven, 2016)

Hence the porosity of space edges is affected by building **openings** and **entrances**, it allows access to the space leading to more social contact and visual exposure.

5. RESEARCH DESIGN

Since streets play a key role in neighborhoods planning, it should serve as social interaction platforms by creating self-sustaining social places that attract people and transform urban environments into lively public spaces, local streets should ideally constitute a well-connected, efficient network that allows for safe, direct, and accessible access via various modes of transportation ranging from walking to driving.

Also, streets are considered the main space for people's movement, the social environment is meant to be planned as a part of street design, people should move through highly connected and social attractive channels of movement. (Mecredy et al., 2011). Through this concept, the research tried to measure the **connectivity** and the **porosity** of urban street resulted from the production processes of housing projects in Egypt. By comparing various types of housing projects and analyzing its street networks using GIS tool for spatial analysis.

a set of variables can be figured out according to network topological characteristics such as **nodes number,** which can describe the **degree of connectivity** of certain street in comparison to other streets, this variable can be generated from the representation of the street network from center lines which called simple network representation (Marshall, 2004) as showed in Equation 1, and in the following equation:

$$\Delta C = \frac{\sum_{n=1}^{n} \boldsymbol{n}}{\boldsymbol{l}}$$

Equation 1 relative connectivity of street

Where ***n*** is for the nodes of intersection on the streets and ***l*** the total length. By assigning the street type and characteristics to the center lines, a network of routes can be generated from this information, which can help in defining other attributes to the route itself like the degree of depth (Marshall, 2004) figure 2

Another variable will be studied which is the number of entrances alongside street edges figure 2, it can measure the porosity of street edge as mentioned by (Breś & Krośnicka, 2021), the number of building entrances attached to street edge refer to relative porosity of street, which can be calculated by dividing number of entrances ***e*** to street center line total length ***l*** according to the Equation 2

$$\Delta \mathbf{P} = \frac{\sum_{e=1}^{e} \boldsymbol{e}}{\boldsymbol{l}}$$

Equation 2 relative porosity of a street

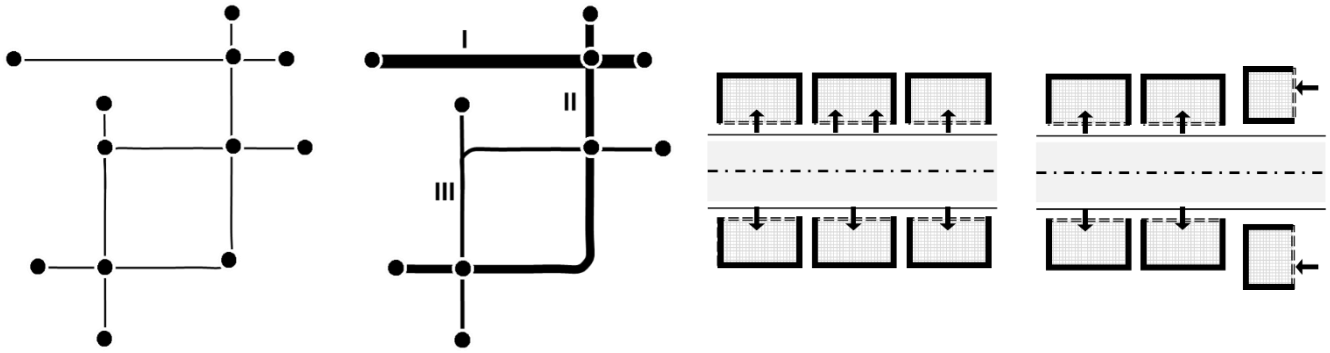

Figure 2 the notion of street connectivity (Left), and the notion of porosity (right) by the author

The two variables of street connectivity and porosity describe each street, each variable can be scaled from high to low values and can be plotted on a bivariate choropleth, The diagram below depicts the two continuous variables, which have been classified into three groups. These groups are made by a geometric interval with three class divides. The figures below depict how the two variables are joined to generate a matrix of nine potential combinations from each class of the variable figures 3& 4.

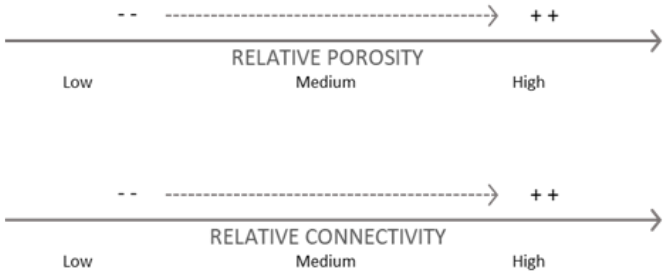

Figure 3 vriable scale for relative porosity (up) and relative connectivity (down). Source: Author

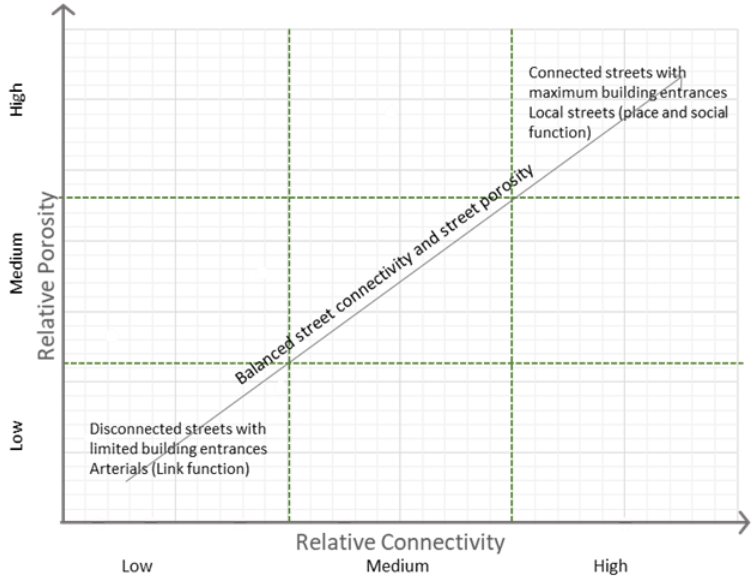

Figure 4 bivariate choropleth diagram for relative porosity and relative connectivity. Source: Author

It is agreed that disconnected streets with limited building entrances can form arterials with Link function, these streets guarantee higher vehicle traffic and higher vehicular speeds, and these streets may function well outside the housing project or even on the peripheries.

On contrary, the other types of streets have higher values of relative connectivity and porosity, which can support (Place function) for streets, these streets can form a network of lively streets and embrace social activities, these streets are neighborhood streets and local streets.

It worth to say that balanced street network should consist of both types of streets, link function and place function streets.

SELECTING CASES

The research will select various types of housing project carried out by NUCA, these project types are **Social housing** (low-income housing with governmental subsidy) areas of 800 Feddan in New October city and **Sakan Masr1** in Capital Grdens city, **Sakan Masr2** (Middle income housing and allowed for mortgages) and **Jannat Masr** (High income housing and allowed for mortgages) under tendering phase in Suez city presented in figure 5.

The projects selected information in the table 1 and it worth mentioning that the projects 3 and 4 are still under tendering phase before construction phase.

Table 1 selected case studies

Area	Type of housing project	Location	Area (Acre)	Number of buildings	Total plot areas (Acre)	% of plot areas	% of roads & spaces areas
1	Social housing 800 faddan	New 6th of October city	191	430	36	19%	74%
2	Sakan Masr 1	Capital Gardens City Sakan Kol El Masreyen	120	179	16	13%	84%
3	Sakan masr 2	Suez City	80.3	123	16	20%	80%
4	Jannat Masr	Suez City	89	126	14	14%	81%

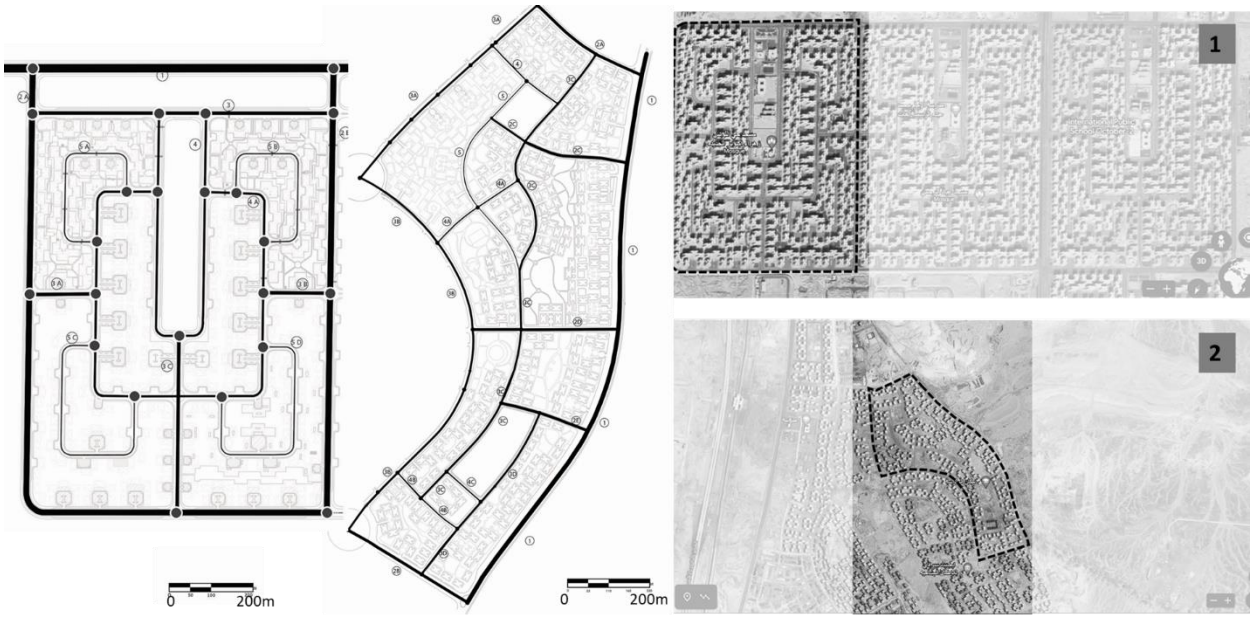

Figure 5 exaples of reading street network for projects
source: google maps and represented by the author

By applying the study to the four projects, a comparative analysis defining the relationship between street connection and porosity for each street in the four projects

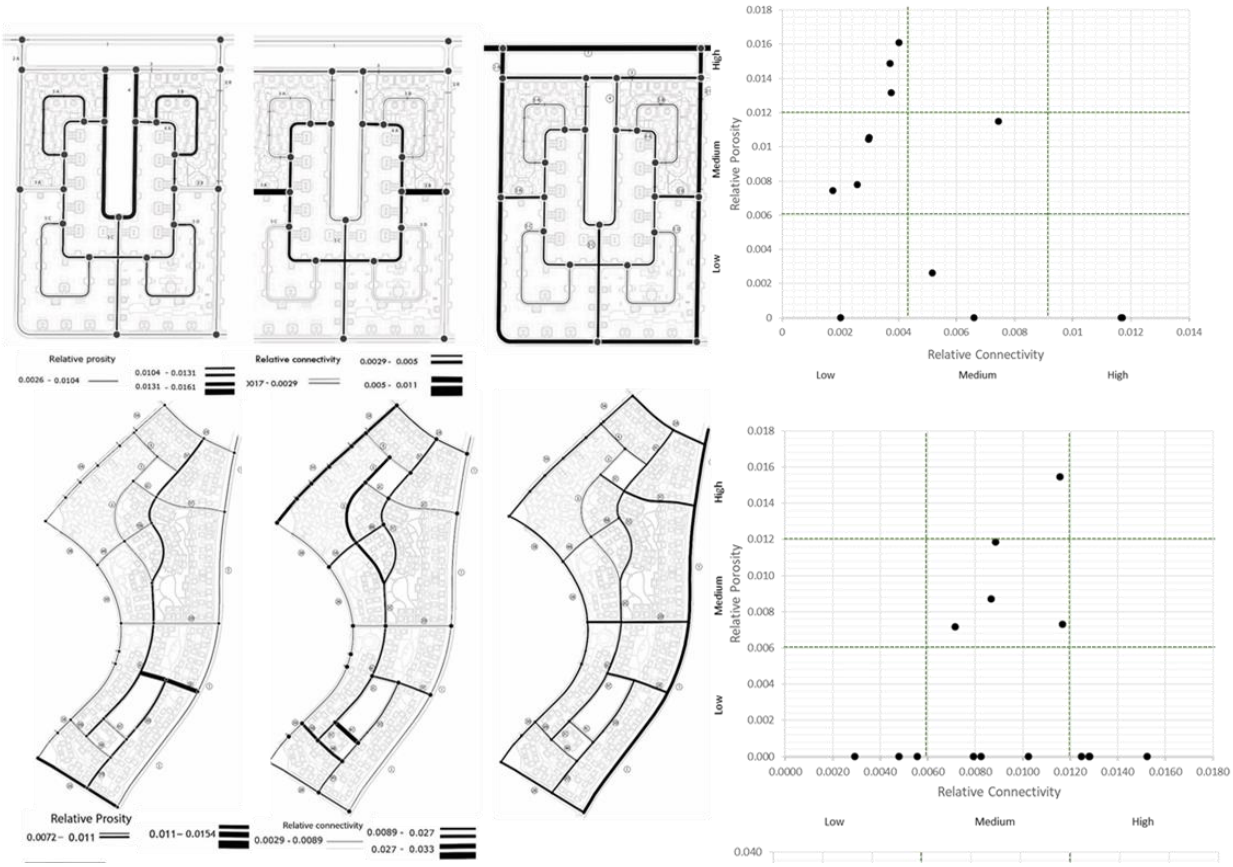

Figure 6 relative porosity and relative connectivity analysisi for Project 1 (up) and P2 (down)
Source: Author

can be performed, in addition to reading the opportunity of creating a balanced structure of street connectivity and porosity in these projects Figure 6 and Figure 7.

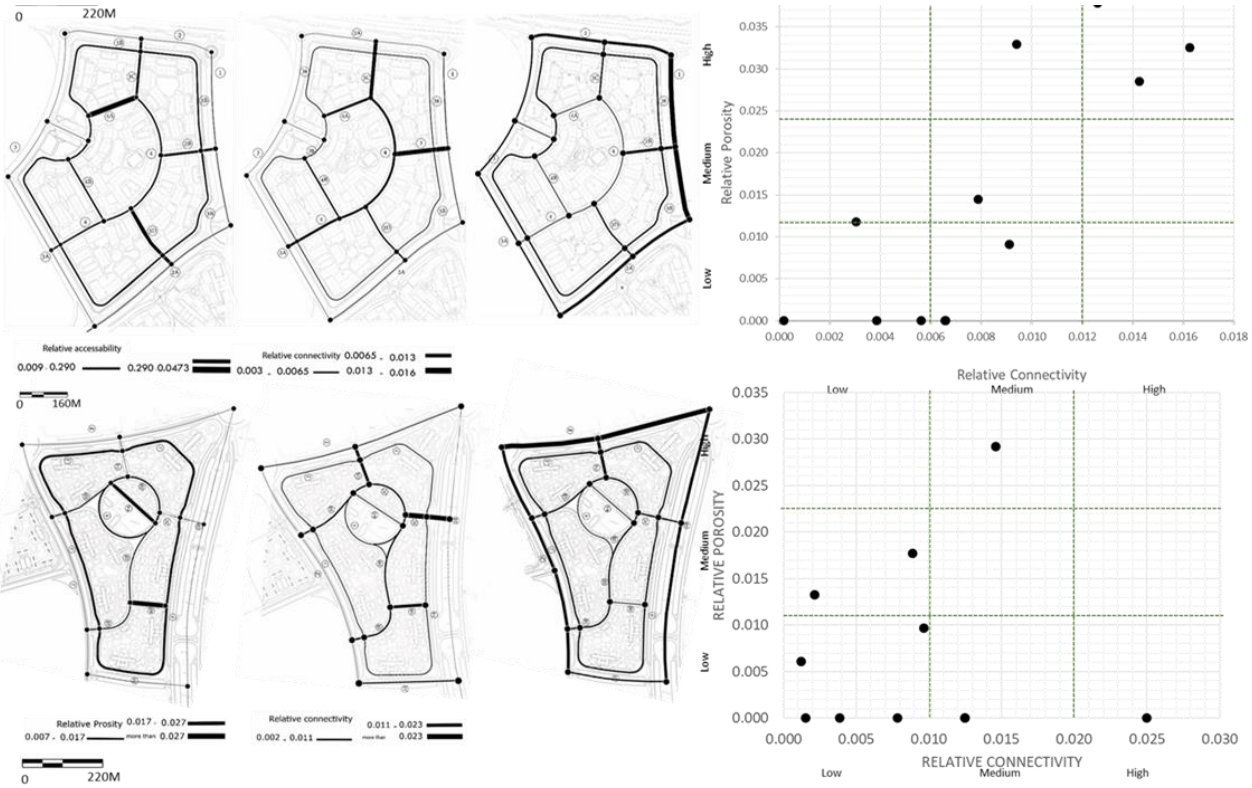

Figure 7 relative porosity and relative connectivity analysisi for Project 3 (up) and P4 (down)

Source: Author

6. RESEARCH RESULTS

The study revealed that most of the streets of housing **project 1** (800 faddan) (low-income housing type) have low relative connectivity and medium to high degree of porosity giving a depiction of un-balanced street function. As a result, there is a relatively limited probability of creating a well-connected social streets network across the project (Figure 8).

In area of **project 2** (Sakan Masr in Capital Gardens city) area (medium income housing) concentrated in relative medium-medium connectivity and porosity values for its streets with no other balanced function for other streets whether were place function streets or link function (Figure 8)

The **project 3** of Jannet masr in Suez City (high income housing), streets are relatively distributed between high- high connectivity &porosity values and low- low values, giving a chance to constitute a structure of balanced network of sociable streets (Figure 9) .

The **project 4** area Sakan masr in Suez City (medium income housing), most of streets are concentrated in low – low connectivity and porosity values, giving a minimum chance to constitute a balanced network of sociable streets (Figure 9)

To study street hierarchy, the degree of depth for studied streets is applied and compared with their connectivity and porosity values, study conclusions can be summarized in the following

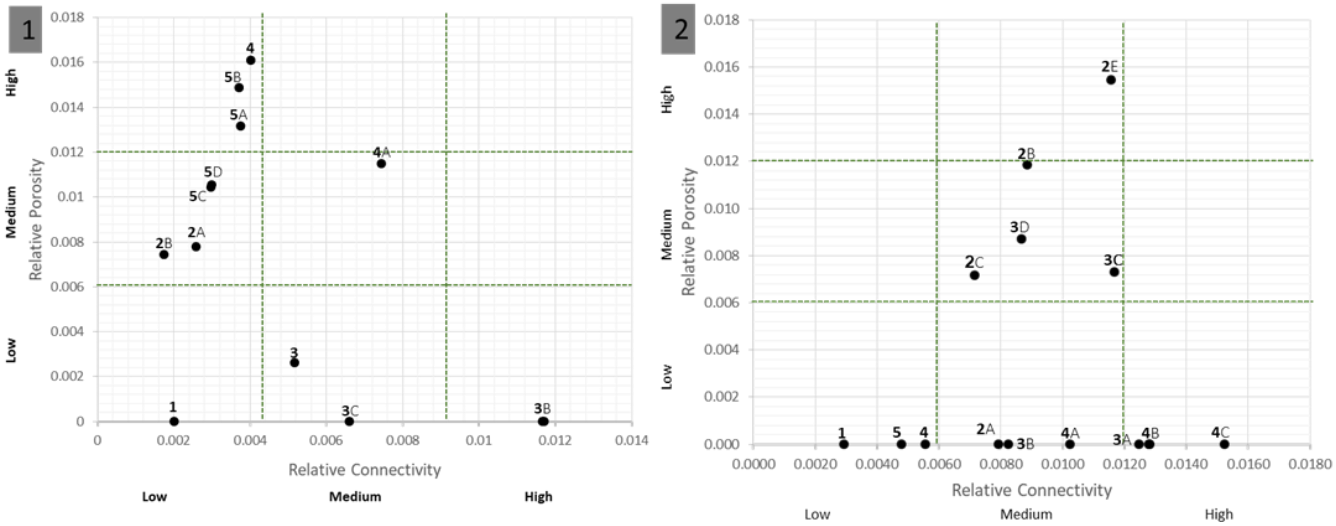

Figure 8 applying street degree of depth to values of porosity and connecivity project 1 (left) and project2 (right)
Source: Author

The first project (800 faddan) (low-income housing type), most of the second-degree & fifth-degree streets have the minimum intersection numbers, with variation between medium and high porosity values (number of building entrances on street edge). Other streets like third degree streets can support access to the other buildings from off-street parking and parking spaces which explains the zero value of the porosity of these streets.

Therefore, a structured social street hierarchy can't be easily experienced, especially in the absence of street levels that contribute to a well-balanced network of social streets as shown in the Table 2. In the **second project** (Sakan Masr in Capital Gardens city), most of the second-degree and third-degree streets have both medium porosity and medium connectivity values. Other streets like third, fourth, fifth-degree streets can support access to the other buildings from off-street parking and parking spaces which explains the zero value of their porosity values.
Notably, the link functions of streets are achieved by 1st ,4th and 5th street degrees of depth, with no sign to achieve place functions with current street network

Source: Author

Table 2 reading street network depth with balanced values of porosity-connectivity project 1 (left) and project 2 (right)

Project 1	Balanced Streets (porosity-connectivity) values		
Street degree of depth	Low – low (link street functions)	medium–medium	High–high (place street functions)
1st	√		
2nd			
3rd			
4th		√	
5th			

Project 2	Balanced Streets (porosity-connectivity) values		
Street degree of Depth	Low – low (link street functions)	medium–medium	High–high (place street functions)
1st	√		
2nd		√√	
3rd		√√	
4th	√		
5th	√		

Source: Author.

The **third project** Jannet masr in Suez City (high-income housing), street degrees of depth noticed to be distributed along the proposed line of balanced network of social streets, which can give basis of a more social and connected street network and more congruent to its structure.

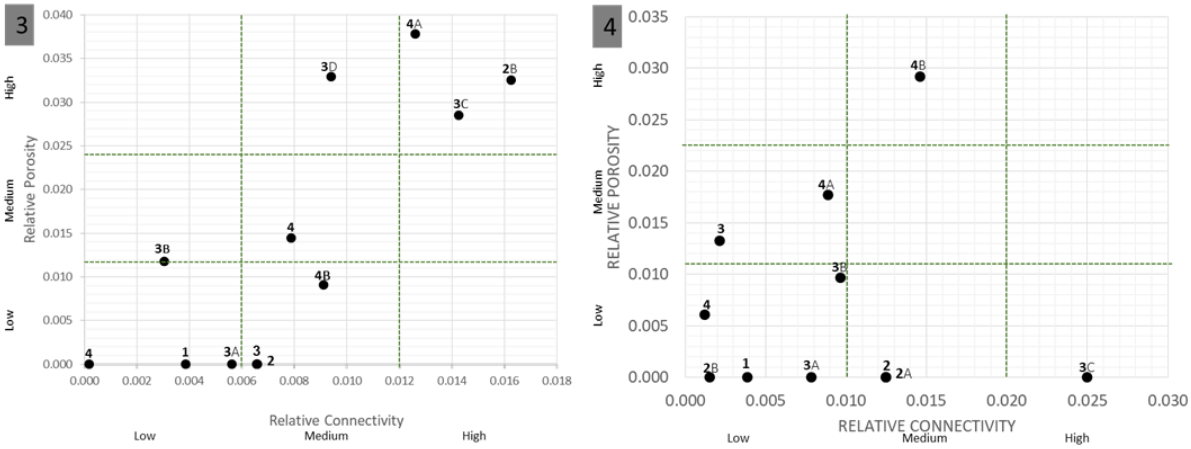

Figure 9 applying street degree of depth to values of porosity and connecivity project 3 (left) and project4 (right)

Source: Author

in the **fourth project**, streets' degrees of depth are mainly located in link function values (low-low porosity connectivity values), although they are the deepest streets in the hierarchy with degrees 3's and 4's, other streets are scattered with no sign of distribution along the balanced values of social streets, which means that street network is lacking the place values that support social functions, this can be concluded from the Table 3

Table 3 reading street network depth with balanced values of porosity-connectivity project 3 (left) and project 4 (right)

Project	Balanced Streets (porosity-connectivity) values		
3	Low – low (link street functions)	medium–medium	High– high (place street functions)
Street degree of Depth 1st	√		
2nd			√
3rd	√	√	√
4th	√		√

Project	Balanced Streets (porosity-connectivity) values		
4	Low – low (link street functions)	medium–medium	High– high (place street functions)
Street degree of Depth 1st	√		
2nd	√		
3rd	√√		
4th	√		

Source: Author

7. RESEARCH CONCLUSION:

The social street network can be used as pro-active model for social housing projects, enhancing the planning and design processes achieving more integrated social projects in Egypt

The presence of building entrances on the street edge can enhance - to some extent- the sense of the urban environment of the street, giving a good chance for proper exposure and making for social interaction, which in return reflects on the identity and the sense

of social streets in social housing projects, results of **Project 3 (Jannet Masr)** can show this potential although it is high income housing type.

Reading the porosity of streets in relation to street connectivity can propose a good framework for a well-balanced social street network structure, which should inherently exist in social housing projects by nature. This is in contrast to the case of **Project 4 (Sakan Masr) and project 1 (800 Feddan Project)**, the balanced social street structures aren't easily found.

Streets networks are basic element s in urban form and the social role they can play in social housing projects is essential, the designing and implementation processes have seemed to be ignoring this role, this can be seen by the distribution of buildings and clusters and their relation the streets, the streets network hierarchy goals are mainly oriented towards mobility functions of cars, neglecting other goals related to access of people and enhancing social life for future inhabitants, Researches are still needed to study the impact of the implemented networks on social behavior.

Egypt has extensive experience in implementing social housing projects in cities and is planning to expand to meet demand; however, more efforts are needed to improve the methodologies of urban design frameworks for the sociability and sustainability of these projects.

There is a significant research gap in studying the social behavior in implemented social housing projects for more evaluation of the frameworks and urban design goals and processes. The goals of sustainability and sociability of these projects should be readdressed to enhance the product and urban-design methodologies.

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