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A Socio-ecological Approach to Assessing Physical Sctivities in Public Open Spaces of Alexandria City, Egypt

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1 ABSTRACT

Public open spaces are the main attractive areas for people, to practice physical activities, and interact with their surrounding social as well as physical (natural and man-made) environment. Socio-ecological approach is found to be the most applicable approach to examine and measure the various aspects affecting physical activities within public open spaces. The research focused on Alexandria, Egypt, and the study area selected was Pharoas area near old city centre of Alexandria. A field research has been conducted using on-site and online Questionnaire. Statistical analysis was produced to analyse the findings using SPSS statistics software. The results showed that the main factors influencing public open spaces location selection choices were the social environment factors, followed by physical environment factors, then the time taken to reach selected public open space. Physical activities were found to be affected the most by the time spent in the public open space.

Keywords: socio-ecological, physical activities, Alexandria, physical environment, public open spaces

2 INTRODUCTION

The socio-ecological approach is a new concept, area of Study, in Physical Education. (Katzmarzyk ,2008). Physical activity is an issential constituent of health and eudaemonia (Wilk, Piotr, et al,2018). The word ecology evolved from biological sciences and refers to the interrelationships between organisms and their environments. Ecological and socio-ecological models of human behaviour have evolved over a number of decades in the fields of sociology, psychology, education and health and focus on the nature of people's interactions with their environments. (Victorian Curriculum and Assessment Authority ,2014)

"Public open spaces", appear to be key built environment frame work that provide opportunities for a multiple physical activity behaviour, such as refreshment walking and playing sports. A lot of research has examined how different characteristics of public open space, such as access to, size and design features, are related to physical activity collaboration. Are views of 50 quantitative studies (Katzmarzyk, 2008). Recently, growing stress, on the implications between the physical environment and physical activity has existed (Elder et al., 2007).

This paper aims at exploring the "Open Spaces" examining relations between public open space and physical activity using Socio-ecological approach to further understand determinants of physical activity. (Van Hecke et al. ,2016). The concept of socio-Ecological approach state that physical activity has various levels of effectiveness, including demographic, psychosocial, physical environmental, and policy factors. To modify people's behaviour, it is important to interfere with these levels, researchers have progressively used socio-ecological models to promote understanding determinants of physical activity (Elder et al., 2007, Glanz et al., 2008). This concept proposes built environment as the most influential level which ease collaboration in physical activity (Rosenbaum et al, 2011).

Social and Physical characteristics of low-socio-ecological impact/high-walk able areas differ from those of high-socio-ecological impact /high walkable areas, and these interactions should be investigated. Thus, it is crucial to specify if walkability to health attitude. Examining these interactions is related to health and urban environment policy, for the future increasing physical activity initiation, former researches have proved that neighbourhood have significant direct relation with physical activity (Shumaker et al. ,2009). Redevelopment of public open spaces is the act of increasing the value within its neighbourhood. Old city centre extension (Bahary and Pharoas area) contained the most attractive historic building which is Citadel of Qaitbay and the public walking area accessing the citadel. Downtowns present the architectural image and character of the city and its history. Thus, it is important to redevelop it to maintain its heritage. It is mandatory to revive the retail activities for people instead of the enclosed shopping malls. It is also important to decrease the congestion of traffic at peak hours to revive the downtown open public spaces as a focal point that attracts

tourists and enhances the sense of belonging to the residents of the city. (Shafik.S et al. ,2015). Urban population has rapidly increased thus the city of Alexandria has been enlarged and gradually human relations with nature have been damaged. (Nady.R ,2016). For these reasons, people in Alexandria have lost the opportunity to come in contact with nature. Urban open spaces, parks and its effects on people's health have significant need to be improved to develop the city. To achieve sustainability of urban open spaces and their design strategies have an important rule. Its transformation will provide a high quality of living environment presenting the socio-ecological approach to create sustainable open spaces as an integrated part of a sustainable city. Finally, the non-focus on developing Bahary's open spaces in Alexandria has bad impact of losing successful historic public open spaces. (Shafik. S et al. ,2015).

The objectives of this research could be listed in the following:

- Evaluate which factors of socio-ecology will be more useful to increase the public open spaces attractiveness.
- Suggest a number of steps that may lead Alexandria's public open spaces to be sustainable.
- Measure the weights of aspects of socio-ecological open spaces and its relevant indicators using on-site and on-line survey to both Egyptian and foreign visitors of the area as well as using statistical analysis using SPSS application which is used to measure and state relations between socio-ecological domains and determine the significant factors on physical activities in public open spaces. As shown in Fig.1

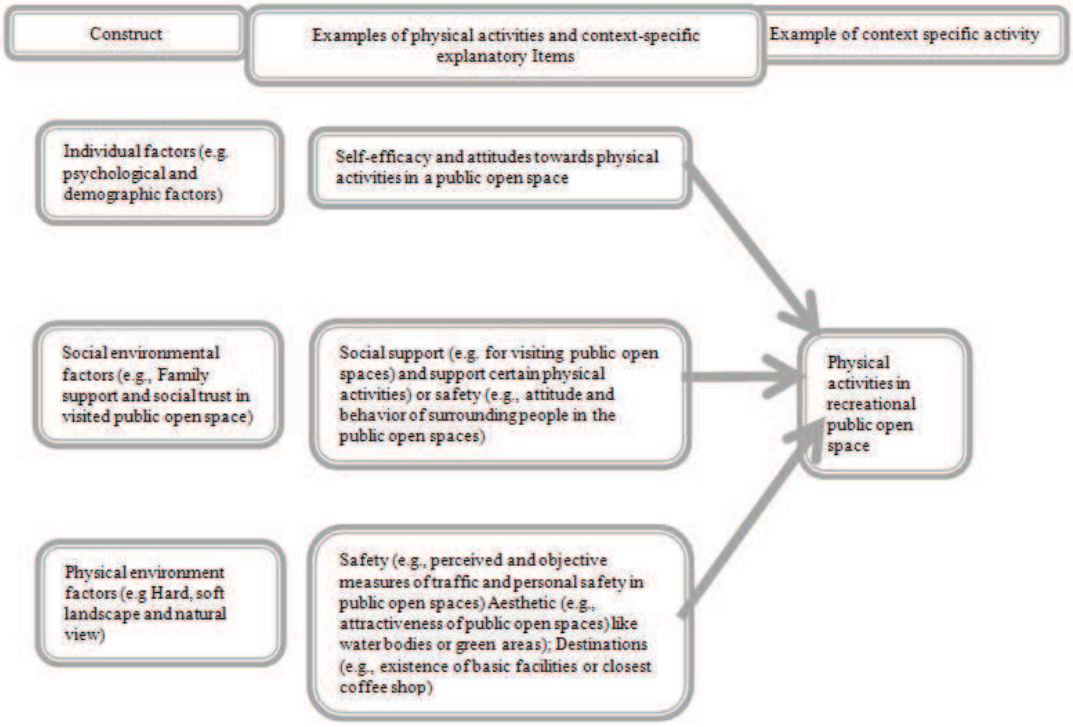

Fig. 1: Structure of socio-ecological theory four domains and how it will effect physical activities in consequence. Source: Researcher, 2017.

3 METHODOLOGY

This study focuses on a number of questions. What are the factors influencing physical activities in public open spaces? How do people choose their free time visiting locations, and what are the factors playing rules in this process? The research relies on a pragmatic approach. It includes both qualitative and quantitative methods. Which are onsite and online survey, observation and statistical analysis. The principle of selecting mixed methods is, on one hand, to respond to the different natures of the research questions. Furthermore, it attempts to introduce a theoretical ground for the assessment of a public open space and to how far it encourages or discourages physical activities bounded by them.

3.1 Theoretical approach

The socio-ecological approach is based on multi-step method. It attempts to assess public open spaces and self-selection factors in a holistic framework, aiming to pinpoint the determinants of physical activity (Van Hecke 2016, Bronfenbrenner ,1994). This concept suggests built environment as the most effective level, as it affluence support to physical activity (Wilk et al., 2018). Fig 2 conceptualizes the four factors of socio-ecological theory that effect individuals' physical activities.

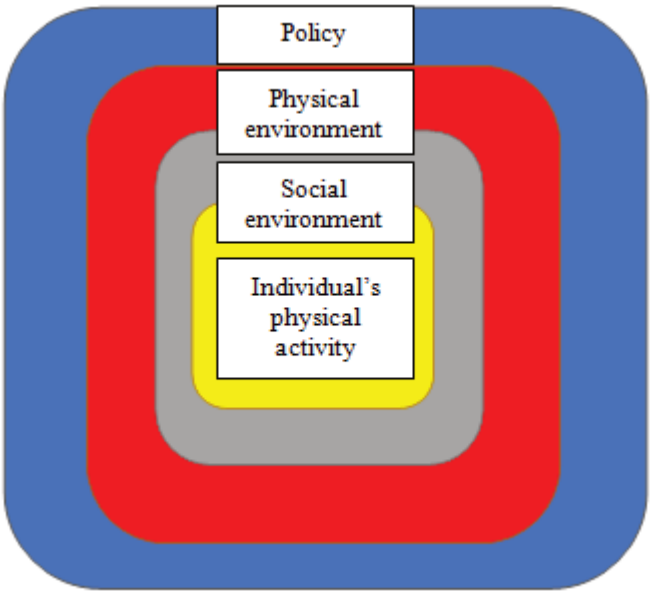

Fig. 2. Relation between the socio-ecological theory four domains. Source: Researcher, 2017.

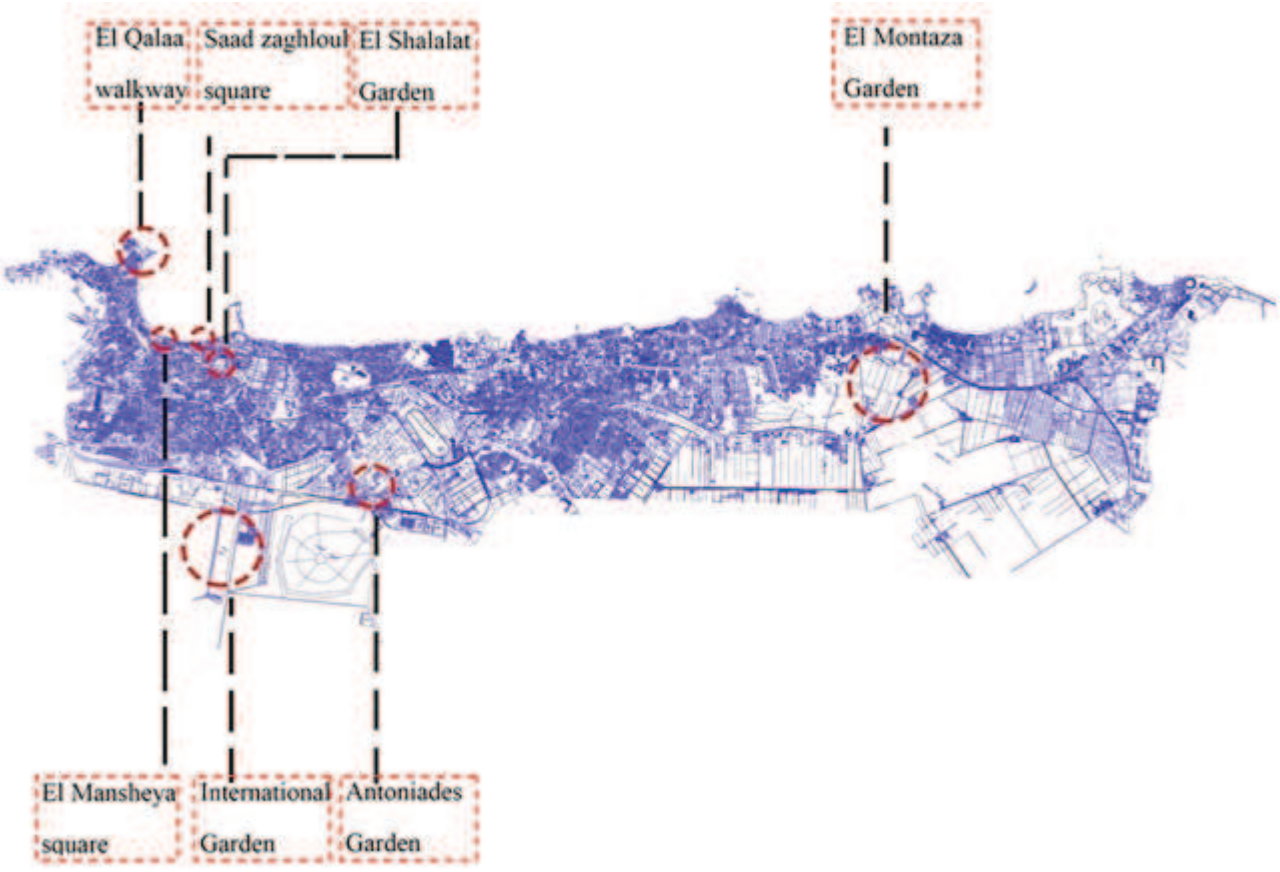

Fig. 3 highlighting locations of public open spaces in Alexandria illustrated by author.

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3.2 Empirical work

After illustrating the different factors related to effect of public open spaces, a knowledge gap appears. First, the factors of more significance Second, the proportion between the four factors domains remains ambiguous, especially in the case of public open spaces in Alexandria. Therefore, an empirical method is needed to identify these two aspects.

The city of Alexandria, Egypt, with 5,217,833 inhabitants in 2018. (CAPMAS, 2018) has been selected as a case study for the research. There are two reasons for selecting Alexandria. First, it represents the second largest urban mass in Egypt. Second, represented by Fig 3; limited recreational public open spaces located within its boundary.

Since the aim of research is studying physical activities in public open spaces as types mentioned in World Health Organization (2015); Table 1 represents why el Qalaa Area is selected highlighting the various physical activities occurring in it regardless its relatively small area comparing to other public open spaces illustrated in Fig 3.

Activities	El Qalaa walkway	El Mansheya square	Saad zaghloul square	El Shalalat Garden	El Montaza Garden	International Garden	Antoniades Garden
Walking	●	●	●	●	●	●	●
Joging	●		●	●	●	●	●
Runing	●		●	●	●	●	●
Horse riding	●						
Cycling	●			●	●		
Crusing	●						
Fishing	●				●		
Ball playing	●		●	●	●	●	●
Relaxing	●	●	●	●	●	●	●

Table 1 compares the various physical activities between P.O.S in Alexandria. Source: Researcher, 2017.

3.2.1 Data collection

Due to the absence of official register or previous studies that tackle measurement of physical activities in public open spaces in Alexandria, primary data became the only way to conduct this research. The data are collected based on a questionnaire in 2017 based on literature review (Veitch, Jenny, et al.,2014, Van Hecke, Linde, et al ,2016, Chan, Pui-shan, et al.,2014) The survey is designed to cover different related factors for public open spaces visiting choices and how it impacts physical activities within it) Qualitative data were described using number and percent. Quantitative data was described using range mean and standard deviation. Significance of the obtained results was judged at the 5% level (Kirkpatrick LA et al. ,2013). Socio-ecological four domains have been studied and categorized into three different sections: individual, social environment and physical environment factors. Individual factors comprised (15 questions); Social environment factors (10 questions), physical environment (6 questions). The first part, individual factors, covers the basic information about the respondent, such as: age, gender, marital status, employment. While the second part, social environment factors, divided into four parts: social context which depends on people's behaviour in public open spaces, Modelling part which addresses the individuals own social network and how active they are; social network part shade the extent of social interaction could be done between visitors. And last part in social factors is social trust and cohesion addressing the mutual trust and willing of plateful between visitors. Part three, physical environment factors which includes man-made and natural environment factors and their importance to visitors in public open spaces. In Fig.4 map illustrates the locations where the author took samples from the Area. The sample taken for the survey varied in the places where people have been asked. But mainly samples were taken from the lower walkway because it is the most crowded and various in its physical activities. People have been asked in front of the aquarium, the castle, the private cafeterias where people gather and along the lower walkway and the promontory. The total area of Pharoas is 18,500 m2. It could be analysed according to design, services and physical activities that take place in the

area. Statistical analysis of the data was fed to the computer and analysed using IBM SPSS software (Kotz S et al. ,2006). The physical activities attract people to visit the whole pharoas area are shown in Fig.3

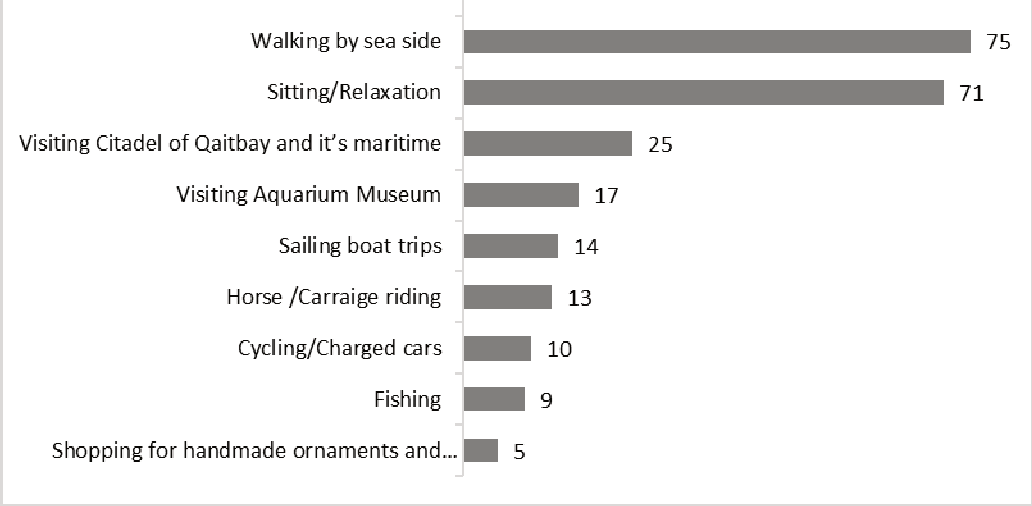

Fig.3 shows the most attractive activities in the area selected by visitors. Source: Researcher , 2017

Design: the design of Soft scape showing a lack in the green elements while the existing green elements in the steps separating the building side walkway from the upper walkway need maintenance and cleaning.

Hard scape like lighting elements, only 44 columns placed on the upper walk while 15 on the building side walkway where 2 columns need fixing and lamps replacing. No lighting in the lower walkway or in the non-designed part except for the 3 columns lighting the façade of the castle and the 4 floor lamps in the same area. Benches were mostly broken or in a bad condition and there were 11 in the whole area. Retail kiosks existed in a hidden location by cars parking in front of it, block its accessibility hide the exhibits inside. The pattern on the sidewalks is interlock which is suitable for walking, but there were some uncovered holes. On the street side basalt pattern is used in some areas forcing drivers to slowdown for pedestrians. The pattern used properly too in the upper walk way where circular patterns used to emphasize the nodes where people gather and rectilinear where people just move or sit. However, patterns need to be cleaned.

Existing buildings like the castle attracted people to the area, the castle is affiliate the Ministry of Tourism. The second place attracting visitors to the place is the aquarium located in the middle of the walkway which is affiliate the ministry of scientific research. the place is less maintained and not attractive to visit more than one or times with family. The last public visit place is the private cafeterias located at the beginning of the walkway where shelters, shadings and proper seating and safe area for kids to play while parents could enjoy the view without any disturbance of other activities or street venders and it is separated by coiled fence and barrels from the public area of walk-way these cafeterias mainly is not entered by public who cannot pay to enjoy that service. Services: There were lack in the basic facilities like bins and water fountains also the parking area is not enough. There were two toilets in a good condition located at the beginning and at the end of the area. Safety: Two small kiosks for police station were located in the middle of the area.

Physical activities: In Fig.5 section A-A also shows that natural environment affected people physical activities in which people gathered in front of the sea in the lower walkway(most crowded by physical activities) to sit and relax, take family cruses, walk, take photos, fish, while their children play around, cycle or motorcycle, ride horses or balloons or flying their kites. Some of the visitors complained their children may fall on the hard pattern while playing or they got hit by one of the motorcycles or horses. The physical environment in the lower walkway gives some privacy and separation from the other parts of the walkway. On the same level there is promontory with area 600m2 shown in Fig.4, it combines relaxing and entering boat cruises and mostly fishing activities as it is surrounded by sea from 3 sides. The upper walkway helped people to walk and enjoy the scene from a higher level. It is mis-used by street venders where they spread their goods with no order. The node in the beginning of upper walkway is full by small bicycles and charged cars to be rented to children. The position of the building side walk way where car parkings and small area of sidewalks prevented people from walking easily.It is mainly used by the clubs' visitors. People tend to walk in the middle of the street instead of walking on the sidewalks. The undersigned part of the walkway stretches along 1,172 m2 area. Considered the most unsafe part because of the absence of lighting elements

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at night. And the broken benches and unsafe floor patterns. This part lacks any shadings to shelters. People use the castle openings to be sheltered. Bad smell existed because people through rubbish and it is not collected.

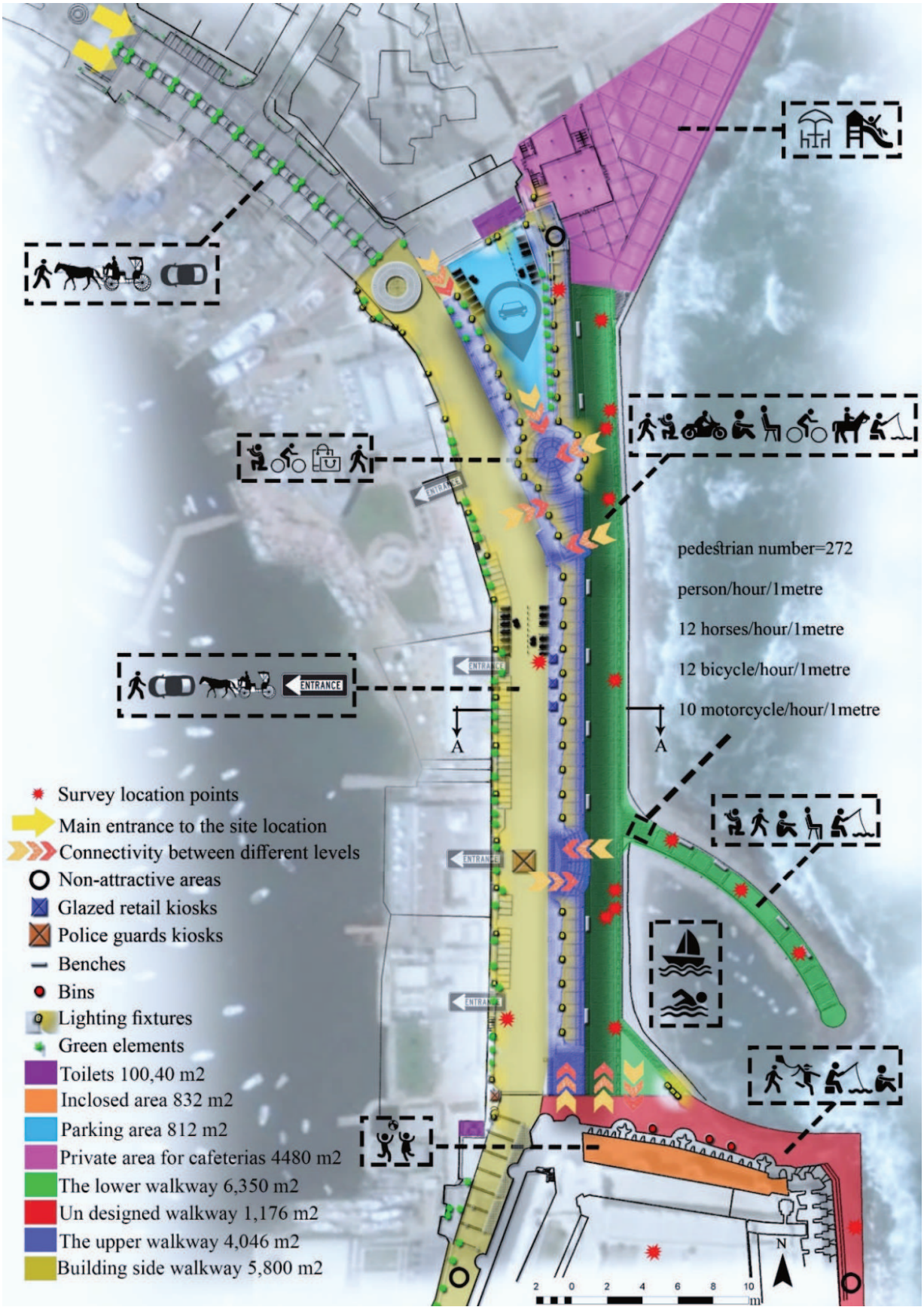

Fig.4 A map shows the layout of Pharoas area of study. Source: Reasercher 2017.

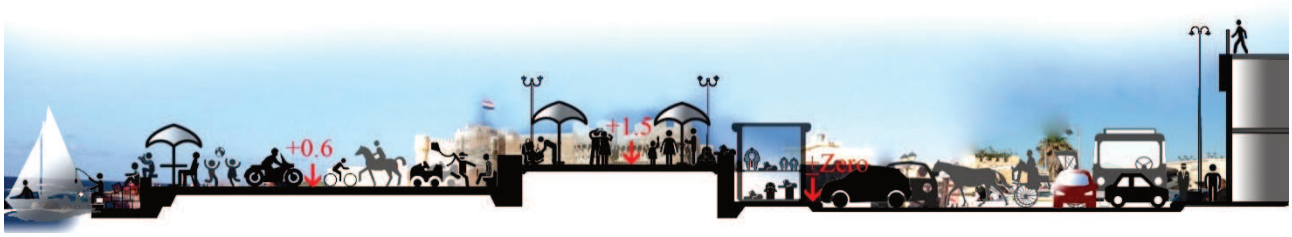

Fig.5 is Section A-A shows physical activities by visitors illustrating the interaction between visitors and physical environment. Source: Reasercher 2017.

In Fig.4 the enclosed area highlighted in orange is 832m2 where children gather to play ball games in front of the castle because it is the safest place and also well illuminated at night. In Fig.5 a section in the area shows that it is divided into three different levels on the left the lower walk way which is 0.6m above zero level. And in the middle the upper walkway wich is 1.5m above street level . on the right side the building side walkway.

4 FINDINGS

4.1 Individual factors

The survey is a representative of a random sample of 100 person 50 onsite and 50 online survey where 37% of the surveyed inhabitants are males, with females of 63% of the sample. A ratio of 56% the age cohort of 21–30, 14% are under 20 years old, while 10% are 41-50, 9% 31-40 ,5% are 51-60 and 7% are 60 and above. A fraction of 45% are living with family members, 33% with spouse, 18% with family members, 3% spouse and parents, and 2% are living alone. A percentage of 42% occupy a full-time job and a part time job, and 13% are retired, 4% are searching for a job while 39% are students. A range of 51% reach the area by their private cars. while 34% get on mini bus. A ratio of 21% by bus, while 8% come by walking 2% cycling.

The Gender of the visitors as shown in Table 2 and Health condition shown in Table 3 presented significance to the physical activities occurred in Pharoas area. While other individual factors showed no significant relation on physical activities in the studied area of Pharoas.

Physical activities	Male		Female	
	No.	%	No.	%
Sitting/ resting/reading/listening to radio or music (n = 47)	18	38.3	29	61.7
Chatting (n = 12)	3	25	9	75
Playing chess/ watching other play chess (n = 2)	1	50	1	50
Walking (n = 22)	5	22.7	17	77.3
jogging (n = 1)	1	100	0	0.0
Using elderly exercise facilities (n = 3)	1	33	2	66.7
Play ballgames (n = 5)	2	40	3	60
Cycling (n = 1)	0	0	1	100
Photograph-ing (n = 5)	5	100	0	0.0
Watching playing kids (n = 3)	0	0	3	100
$\chi^2(^{MC}p)$	$14.741^{*}(0.042^{*})$			

Table 2 shows the significance of Gender on Physical activities in Pharoas public open space. Source: Researcher, 2017.

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Physical activities	Health Conditions					
	Good		Normal/Fair		Poor	
What do you usually do in parks	No.	%	No.	%	No.	%
Sitting/ resting/reading/listening to radio or music (n = 47)	36	76.6	10	21.3	1	2.1
Chatting (n = 12)	10	83.3	2	16.7	0	0
Playing chess/ watching other play chess (n = 2)	1	50.0	0	0	1	50.0
Walking (n = 22)	14	63.6	8	36.4	0	0.0
jogging (n = 1)	0	0.0	1	100.0	0	0.0
Using elderly exercise facilities (n = 3)	3	100.0	0	0.0	0	0.0
Play ballgames (n = 5)	1	20.0	4	80.0	0	0.0
Cycling (n = 1)	0	0.0	0	0.0	1	100.0
Photograph-ing (n = 5)	5	100.0	0	0.0	0	0.0
Watching playing kids (n = 3)	1	33.3	2	66.7	3	3.0
$\chi^2(^{MC}p)$	$33.889^{*}(0.003^{*})$					

Table 3 shows the significance of Health condition on Physical activities in Pharoas public open space. Source: Researcher , 2017.

4.2 Social environment factors

There were 60% of surveyed people approved there are drug use in the area. And 50% also approved that their families are active. A ratio of 82% agreed their friends often ask them to hang out. A percentage of 85% approved on existence of lots of other active people in the area. A potion of 75% disapproved to know lots of people in Pharos area. A proportion of 80% disapproved of existence of other people who they could share them in doing activities. while help 64% agreed on existence of people who are willing to help. A percentage of 50% positively responded that people in the area can be trusted. The social environment factor has no significance on physical activities takes place in Pharoas area, while physical environment has significant relation with the physical activities of the visitors. However, in Table 4 there is a very strong significant between the social environment factors and rate of visiting the area or declining visiting it. Followed by the physical environment factors of the place which also impact the decision of the visitors to visit the area or not, as shown in Table 5.

4.3 Physical environment factors

The respondents chose Fig.6 the physical environment factors to be sufficient in Pharos area.

The main physical environment factors were found to be enough in the area was the air quality and ventilation where 92 people out of 100 choosed to be enough. The least suffcient factors were the quantity and quality of basic facilities where only 12 out of 100 agreed to be enough in the area.

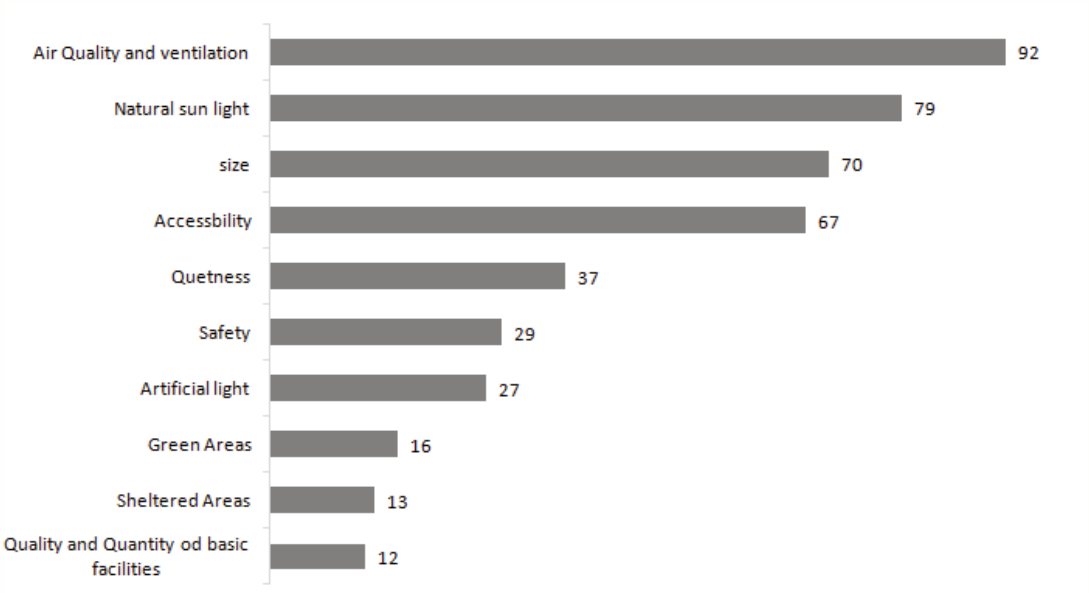

Fig.6 shows the existing physical environment were enough. Source: Researcher 2017.

What activities visitors do in Pharao's area	N	Total social environment factors	Total physical environment factors
		Mean ± SD.	Mean ± SD.
Walking by sea side	75	47.85 ± 21.53	65.60 ± 14.15
Visiting Citadel of Qaitbay and it's maritime museum	25	48.44 ± 22.65	66.13 ± 11.49
Visiting Aquarium Museum	17	43.79 ± 22.73	64.71 ± 12.42
Fishing	9	66.67 ± 27.78	70.0 ± 18.41
Sailing boat trips	14	55.56 ± 24.65	72.86 ± 15.84
Shopping for handmade ornaments and accessories	5	53.33 ± 26.53	65.33 ± 10.70
Horse /Carraige riding	13	57.26 ± 21.20	76.15 ± 14.39
Cycling/Charged cars	10	63.33 ± 22.86	79.67 ± 18.62
Sitting/Relaxation	71	52.58 ± 21.90	65.02 ± 15.09
F(p)		1.612(0.122)	2.253*(0.02*)

Table 4 shows the significance relation of Physical activities with physical environment factors and the insignificant relation between social environment factors and physical activities in Pharoas public open space. Source: Researcher, 2017.

	Total social environment factors	Total opinions to parks physical environment
Visiting Pharoas area	Mean ± SD.	Mean ± SD.
Yes	63.43 ± 22.81	64.86 ± 16.97
Seldom	44.78 ± 18.04	65.12 ± 13.07
No	43.33 ± 19.91	65.33 ± 7.24
F(p)	8.619*(<0.001*)	0.005(0.995)

Table 5 shows the significant relation of physical environment factors and social environment factors with visiting Pharoas public open space. Source: Researcher, 2017.

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5 DISCUSSION

From author's observation the main attractive man-made physical environment factor is the castle located in the area which is a historic building attracts people specially who live out of Alexandria.while the sea was the main attractive natural environment attracting people. The social environment factors affected the walkway visitors' physical activities in a significant way were most of the visitors were accompanying their families and also affected positively from residents of the area from their activeness of selling or fishing or swimming in the small bay. But also affected negatively from being annoyed by the street venders or the harassments they experience. The polices affected the walkway as in the weekends or vacations when the parking areas are fully occupied, officers from the police station prevent cars from entering the area and ask people to search for another area to park thier cars.

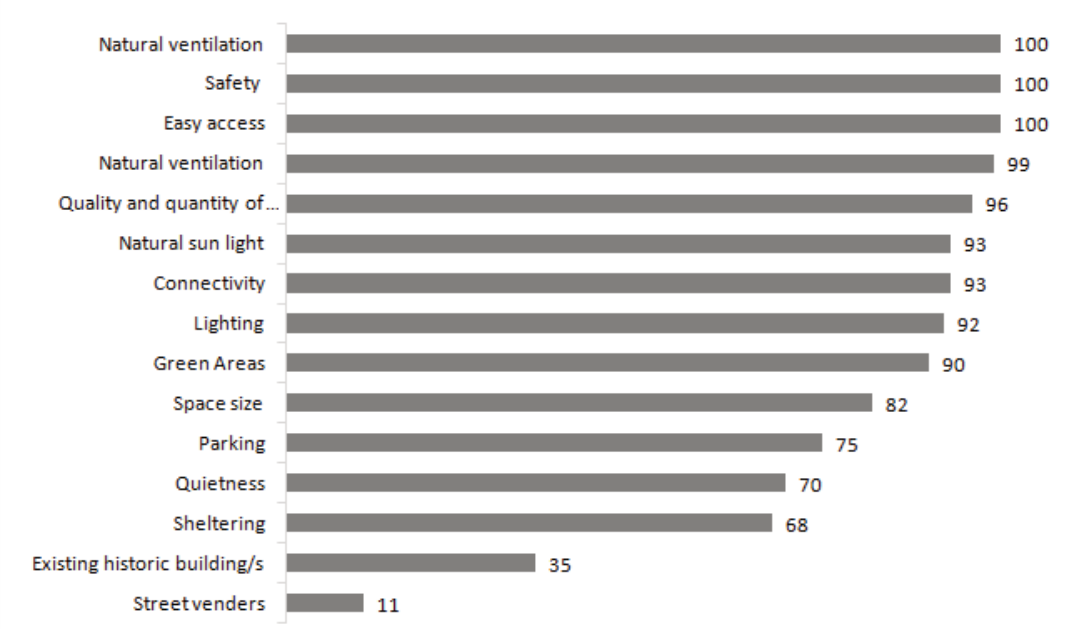

Fig. 8: Physical environment factors visitors see very important or important to exist in the selected public open space they choose to visit. Source: Researcher 2017.

	The time taken by visitors to reach the public open space they usually visit							
	<15 min (n = 14)		15-30 min (n = 31)		30-60 min (n = 43)		>60 min (n = 13)	
	No.	%	No.	%	No.	%	No.	%
Physical activities								
Sitting/resting/reading/listening to radio or music	5	35.7	10	32.3	27	62.8	5	38.5
Chatting	2	14.3	7	22.6	3	7.0	0	0.0
Playing chess/watching other play chess	0	0.0	2	6.5	0	0.0	0	0.0
Walking	5	35.7	9	29.0	6	14.0	2	15.4
Jogging	0	0.0	1	3.2	0	0.0	0	0.0
Using elderly exercise facilities	1	7.1	0	0.0	2	4.7	0	0.0
Play ballgames	1	7.1	1	3.2	1	2.3	2	15.4
Cycling	0	0.0	1	3.2	0	0.0	0	0.0
Photographing	0	0.0	0	0.0	4	9.3	1	7.7
Watching playing kids	0	0.0	0	0.0	0	0.0	3	23.1
$\chi^2(^{MC}p)$	$40.230^{*}(0.004^{*})$							

Table 6 shows the significanct relation of the time taken by visitors to reach the area of public open space they usually visit with the physical activities they practice in the same area. Source: Researcher , 2017

From the visitors demands for pharoas area:

- Design: hard scape and lanscape features should be mantained and more areas of shelter be implemented.
- Services: Inhance basic facilities‘ quantity and quality.
- Safety: Increase security provision.

In Fig. 8 it is shown the number of people who choosed the shown factors either to be very important or important physical environment factors in any open public space they would like to visit. And the most significant factor to physical activities in a selected public open space is the time taken to reach as shown in table 6.

6 CONCLUSION

This research highlights the importance of understanding the process of assesment of a succesful public open space towards physical activities within it.In the context of Alexandria , it highlights the unprecedented conditions of the public open space designs need for rethinking critically concerning the future scenarios designing or redesigning them. It aims to provide a complementary theoretical approach to include the nature of the different settings of public open spaces development based on different factors and users conditions involved in the whole process of public open spaces allocation. It encourages other scholars to further elaborate on the factors that affect public open spaces choices which has the most postive impact on physical activities, in different cities of Egypt. After tackling the socio-ecological factors influencing public open space location choice in Alexandria, Egypt, it was found that the frequency of the visitors visit the public open space, the time visitors spend in it , followed by the time taken to reach the public open space then the physical environment factors followed by the health condition and gender from indvidual factors. While the social factors appeared to be the strongest factors to encourage or discourage visitors from visiting a specific public open space.The main expressed factor influencing respondents' decision in selecting their usually frequent public open spaces locations or the studied walking area of Bahary.Thus, it rejects the hypothesis that people tend to choose where to spend their leasure time based only on the nearest public open space to thier area hence they are already few.

Also, it explains why the majority of Egyptians would rather visit rehabiltation public open space with a natural view and basic facilities in an inadequate closed cafeteria or restuarant within the reach of public transports. Moreover, it can explain that even if social factors play an important role for Egyptians,

most inhabitants have significant support from their family and friends affecting their selectio of public open space . In fact, most of the survayed have mentioned that they accompany either their family or friend with a neglected percent of alone response.

Finally, the research predicts interrelation between the current socio- ecological domains of a certain public open space and the future expectation of it in the future. It opens the field to scholars concerned with human environment interaction development to tackle the unexpressed factors like policy factor to be studied more in depth which indeed influence the self-selection process of public open space as well as the physical activity done by visitors and their interaction with surrounding environment.

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