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INVESTIGATING THE RELATIONSHIP BETWEEN USER'S DENSITIES AND FUNCTIONS DISTRIBUTION ON MEDITERRANEAN WATERFRONTS: STATISTICAL ANALYSIS APPROACH

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INVESTIGATING THE RELATIONSHIP BETWEEN USER'S DENSITIES AND FUNCTIONS DISTRIBUTION ON MEDITERRANEAN WATERFRONTS: STATISTICAL ANALYSIS APPROACH

Abstract

The type of buildings and activities along the waterfronts have to stimulate the interactivity between public spaces and their users to reach the desired comfort, enjoyment and appropriate densities. This study is part of a continuing research and it aims to highlight the spatial relationship between the type of buildings and the densities on cities waterfronts of the Mediterranean Sea. It undertakes three case studies with different economic and touristic levels. It is a top-bottom approach that analyzes the existing population densities on waterfronts and the surrounding building functions. This paper uses quantitative analysis based on spatial statistics along each of the three waterfronts. The data collection is made through documentation, direct observations, mapping, Global Positioning System, and Geographic Information System software. The outcome of this research evaluates the relationship between functions and population densities to record how locations of functions increase population on waterfronts by making them attractive and recommends how waterfront zoning laws will consider specific land uses and techniques.

Keywords

Building functions, land uses, waterfronts, population densities, and spatial statistics.

This article is available in Architecture and Planning Journal (APJ): https://digitalcommons.bau.edu.lb/apj/vol26/iss1/3

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1. INTRODUCTION

In coastal cities, waterfronts are considered as main public spaces in fields of tourism, commerce, entertainment and others. The redevelopment of waterfronts has become an international interest since they have effects on the local economy of the country and social interactions between people. This urban edge is used in many different methods since it has many forms as the vertical cliff edge, the beach form, the dockside quay, the open square and others. Its treatment also depends on regulations, cultural heritage of the city, history of the space, economical status of the country, type of users and others. In addition, these treatments affect the behavioral outdoor activities that are considered as the actions through participants interact physically and socially with the outdoor environment (Abu El-Ela, 2007).

Public spaces including public waterfronts are open zones that must be used by all citizens as living and entertainment outdoor environments (Lipton, 2002). Interaction between public spaces and citizens have to be durable because it gives the sense of belonging to the neighborhood (Holland et al., 2007). Potential user's life must be studied and taken into consideration in all design and implementation steps in a public space because it is used and understood depending on individual and group characteristics (Gehl, & Svarre, 2013).

Urban analysis is a method to study public life and has been described as the use of multidisciplinary knowledge and abilities with the objective of solving urban complications (Pacione, 1990). Statistics related to definite geographic boundaries provide a wider sense of the context in which social practices emerge. These kinds of statistics are most often arranged descriptively in forms of tables and maps. Spatial data can be used to examine patterns and put it into maps to identify configurations between the area of study and its surrounding areas; and the triangulation of spatial and qualitative data sources to analyze qualitative data by its spatial characteristics (Rucks-Ahidiana & Bierbaum, 2015).

This paper highlights the problem of the variance between different population densities on different zones on waterfronts according to one of the spatial characteristics which is "surrounding functions distributions". The result of the analysis highlights the most preferable building functions that statistically increase the densities of people using the waterfronts according to different age categories. As shown in figure 1, the objectives of this paper are:

To investigate population densities and ages on continuous coordinates along 4 km of three different Mediterranean waterfronts.

To examine the correlation between populations densities according to age categories and existing building functions on waterfronts.

To highlight and compare the most attractive functions which increase population densities in the three case studies.

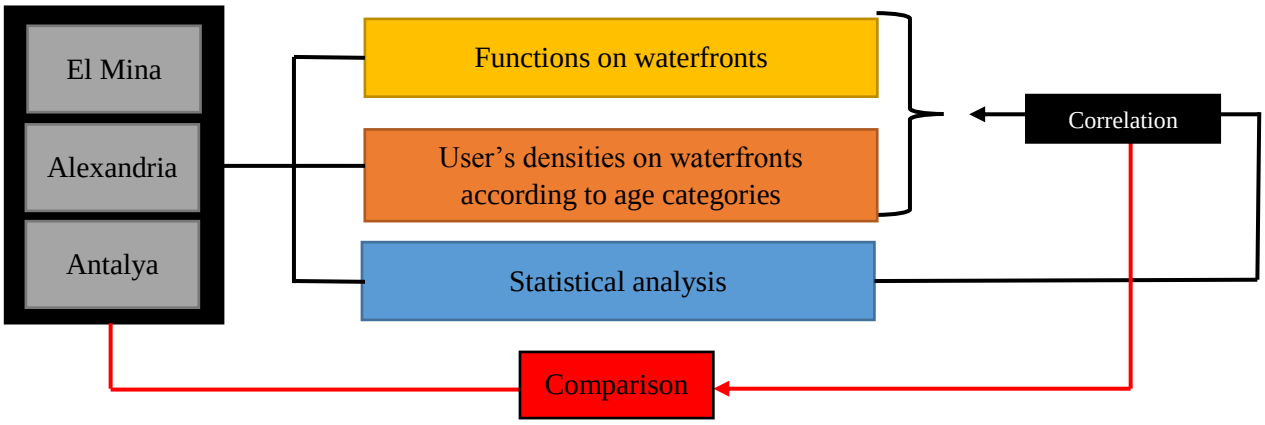

Figure 1: The study idea in a diagram
Reference: Authors

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2. LITERATURE REVIEW

In the following literature, the collected data will focus on activities of waterfronts, its functions and their water dependency to relate the waterfronts activities and functions with land uses and recognize the availability of these functions on the selected case studies. Also, it highlights the attractiveness of spaces to mark positive and ambiguous spaces types and locations.

2.1. Activities on waterfronts

Generally, available activities on waterfronts depend on regulations determining land uses in each zone. People exist on waterfront areas in order to enjoy water recreational facilities, to do sports, to eat, to stay, or to sit and see. Also, they may use waterfronts for work, shop, travel and trade. Residential zones can accommodate staying areas as hotels, chalets, resorts and private houses. Commercial zones can have sports, water recreational activities, working, eating, staying, travelling, shopping and trading. Industrial areas cover working, travelling and trading spaces. Open spaces may contain sports, water recreational facilities, eating, sitting and seeing. As seen in table 1, results show that most of waterfront activities exist in commercial and public works zones.

Table 1. Waterfronts activities in relation to land-uses.
Reference: Authors

Activities		Residential	Commercial	Industrial	Public works
Playing- Sports	Swimming		X		X
	Volley		X		
	Walking or running				X
	Basket		X		
	Fishing		X		X
	Biking				X
	Kids playgrounds				X
Playing- Water recreational facilities	Swimming		X		X
	Diving		X		
	Boating		X		
	Jet skiing		X		
	Rafting		X		X
	Surfing		X		X
Working	Kiosks owners		X		
	Shopping retails owners		X		
	Boats owners		X		
	Fishing		X	X	
	Factories			X	
Eating	Restaurants		X		
	Cafeterias		X		
	Kiosks				X
Seeing and sitting	Parks				X
	Squares				X
	corniche				X
Staying	Resorts/ Hotels/ chalets	X	X		
	Houses	X			
Shopping	Kiosks		X		
	Retails		X		
Travelling	Port		X	X	
	Railways			X	
Trading	Port		X	X	
Education	Schools universities (private or public)		X		X

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2.2. Functions water dependency

As urban sprawl has reached cities water edges, natural areas have been turned into commercial, residential, industrial and recreational expanses. During the late nineteenth and early twentieth centuries, industrial practices were institutionalized in port, canal, and railway infrastructure development as well as in landfill technologies and the construction of factories adjacent to ports (Desfor, 2013). Natural places are transformed into working areas and recreational facilities under the title of commercial waterfront developments. Public zones accommodate plazas, corniche promenade and others while residential zones are private lands where housing dominates the space. In Michigan coastal community working waterfronts studies, they provided examples of how various uses were classified for the purpose of assessing land use in this case study analysis. Also, they classified parcel uses by water-related use: Public access, water-dependent-use, water-dependent use-industry, water-dependent use-utility, water-enhanced use and non-water-dependent use (Washington and Durfee, 2013). As shown in table 2, water enhanced uses where people tend to spend their holidays and afternoons are located mostly in commercial zones while public access areas where people tend for entertainment areas are located in public works zones.

Table 2: Functions water dependency and land uses on waterfronts.
Reference: authors after Washington and Durfee, 2013

Water dependency		Residential	Commercial	Industrial	Public works
Water dependent uses	Public or private marina,	X			
	Boat launch,				X
	Fish cleaning station,			X	
	Bait and supply shop,		X		
	Marine service,			X	
	Repair and storage,			X	
	Yacht club,		X		
	Light house,				X
	Coast guard station,		X		
Water dependent uses - Industry	Manufacturing facility,			X	
	Industrial dock/port,			X	
	Paper plant,			X	
	Cement plant			X	
Water dependent uses - Utility	Water treatment plant,			X	
	Power plant			X	
Water enhanced uses	Hotel,	X	X		
	Motel,	X	X		
	Inn,		X		
	Restaurant		X		
Non-Water dependent uses	Residence,	X			
	Office,		X		
	Retail		X		
Public access	Beach				X
	Public square				X
	Park				X

2.3. Attractiveness of waterfronts

A place is characterized by the flow of human practice and their experiences in time and space (Gieseking, Mangold, Katz, Low & Saegert, 2014). Improving people's quality of life is taking a large part in British policy-making for the last decade. From here, the term spatial planning has evolved to move beyond a narrow focus on land use planning and regulations. Sustainable communities are related to safe and well planned places where people want to live and work, now and in the future (Wagner & Caves, 2012). Quality of public spaces influence people gathering locations within it; from here many principles has been proposed in order to improve its quality: diversity of uses, active facades, social dimension and urban vitality, human scale, lighting, stimulating the local economy, local identity, complete streets, green areas and social participation (Pacheco, 2019).

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The universal positive qualities for public spaces are clean and tidy, accessible, attractive, comfortable, inclusive, vital, viable, functional, distinctive, safe, secure, robust, green, unpolluted and fulfilling. Urban spaces also differs between positive spaces, negative spaces, ambitious spaces and private spaces. As shown in table 3, positive and ambiguous spaces where attractiveness level is high, are located in public works spaces, while are located in commercial and public works areas.

Table 3: Spaces positivity levels and its distribution in different land uses
Reference: authors after Carmona et al, 2008

Spaces positivity level		Residential	Commercial	Industrial	Public works
Positive spaces	Rivers				X
	Natural rivers				X
	Seafronts				X
	Canals				X
	Streets				X
	Squares				X
	Promenades				X
	Parks				X
	Gardens				X
Negative spaces	Main roads				X
	Motorways				X
	Railways				X
	Car parks				X
	Redevelopment spaces				X
Ambiguous spaces	Metros				X
	Bus interchanges				X
	Railways stations				X
	Bus stops				X
	Civic spaces		X		X
	Shopping malls		X		
	Mega structures		X		
	Shops		X		
	Covered markets		X		
	cafes		X		
	Restaurants		X		
	Libraries		X		X
	Religious buildings				X
	Institutional grounds		X		
	Housing estates	X			
	University campuses				X
	Street cafes		X		
	Playgrounds				X
	Sport grounds		X		
Private spaces	Offices		X		
	Houses	X			
	Private clubs		X		
	Private gardens		X		

2.4. Conclusion

As a result, the literature shows the following points containing the main waterfront activities to which people tend when visiting waterfronts; public access areas and water enhanced uses specific to invite citizens for entertainment; positive and ambiguous spaces which attracts people:

Waterfront activities are mainly located in commercial and public works zones as

Playing or doing sports and water recreational facilities;

Working, learning and staying;

Eating, seeing and sitting;

Shopping, traveling and trading;

Public access areas and water enhanced uses are located mostly in commercial and public works.

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Hotels, motels, chalets, resorts inns, and restaurants;
Beach, public square and parks.
Positive and ambitious spaces are mostly located in commercial and public works areas
Seafronts, streets, squares, parks and gardens;
Metros, bus interchanges, railways stations, bus stops, civic spaces, shopping malls, shops, covered markets, cafes, restaurants, libraries, religious buildings, institutional grounds, housing estates, university campuses, street cafes, playgrounds and sport grounds.

The focus in below case studies will be on available main functions related to commercial and public works land uses covering waterfront activities as eating, staying, studying, playing, doing sports, seating and seeing in positive and ambitious spaces as shown in table 4.

Table 4. Chosen building functions, their activities, land use type and its space positivity
Reference: Authors

Land use	Building functions	Activity	Space Positivity
Commercial	Restaurants, cafes	Eating	Ambiguous spaces
	Hotels, Motels, Chalets, resorts	Staying	Ambiguous spaces
Public works	Schools, universities	Studying	Ambiguous spaces
	Playgrounds, sport facilities	Playing/ sports	Positive spaces
	Parks, public squares	Seating/ seeing	Positive spaces

3. CASE STUDIES

The selection of case studies is based on studies and recommendations made by Plan Bleu (2016), UNEP (2016) and the blue frontiers (2018). The selected cities (El Mina in Lebanon, Alexandria in Egypt and Antalya in Turkey) are chosen according to availability of data, similarity of cultures and differences of economic situation and touristic levels (low, medium and high). The methodology of case studies and correlation analysis are explained in the below sections. The chosen building functions in case studies are chosen in commercial and public works zones; from ambiguous and positive spaces; and containing different activities.

3.1. Methodology

The following statistical analysis investigates the relationship between existing building functions and population densities on continuous spots on each waterfront in three different cities. Studies are made first by observation, then using Geographic Information System software. Observation in the field is made to record population using the following steps:

Site visit for three days in a week (beginning/ mid and end of the week) on summer season to document people numbers each day in each zone separately for each age category (children/ youth/ middle age/ old),

GPS to take coordinates in 30 different continuous locations on 4km coastline in each city.

Following these steps in Arc GIS, maps are analyzed in order to determine functions intersections with 500 meters diameter of each location:

Locate important functions as restaurants, schools, hotels, parks and playgrounds on a base map of each city waterfront zone,

Locate coordinates of gathering locations on waterfronts and add data of existing population each day for each age category in each location,

Find available functions in the buffer zones of 500 m of each gathering location,

Calculate correlation between number of people and intersected numbers of restaurants, schools, hotels, parks and playgrounds,

Highlight correlation values according to (Pearson Product-Moment Correlation, 2019):

Weak (0.1 to 0.3), moderate (0.3 to 0.5) and strong (0.5 to 1.0) positive Correlation,

Weak (-0.1 to -0.3), moderate (-0.3 to -0.5) and strong (-0.5 to -1.0) negative Correlation.

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3.2. Alexandria waterfront

Alexandria, is the second biggest city in Egypt, located in the continent of Africa. As seen in figure 3, the chosen part of the waterfront is 4 km long, 600 meters width and close to the old historical bay. Restaurants, schools and hotels are determined in the study zone by their coordinates. In addition, 24 different continuous locations are situated on the waterfront by their coordinates took on the field. Population in each location is documented by age differentiations, for three days in a week on summer season before sunsets on 5 pm. As seen in figure 2, on working days, major population is located on locations: 6, 14, 24 and 25 (40-75 people). In vacation day, population is frequently high on locations 6, 8, 9, and 21 (50-63 people). In further studies (Table 5), correlation values between populations and surrounding functions show that there is weak positive correlation between people numbers and restaurants on working and vacation days. In addition, it shows weak positive correlation between people numbers; and restaurants, schools and hotels on vacation days. Following age differentiations, the data shows:

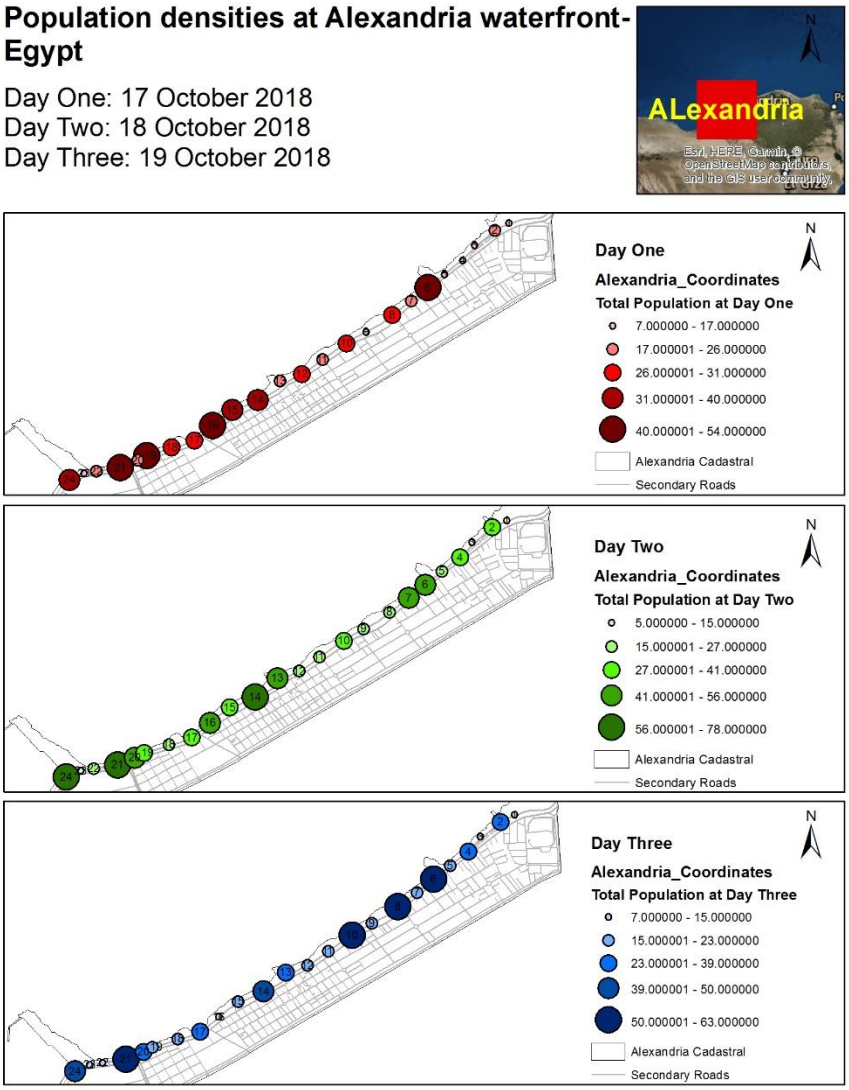

Figure 2: Population in gathering locations on Alexandria waterfront
Reference: Authors

Children (0-14): Children numbers are greater in schools areas.

Adults (15-25): Youth numbers are greater in schools areas.

Middle age (26-55): Middle-aged people numbers are greater near restaurants, schools and hotels.

Old (+55): Old people numbers are greater in schools and hotels areas.

Results show that middle aged people are mostly spread in all locations by large numbers, having their children near schools areas around circulation hubs and bus stations. Also, adults exist mostly around schools and universities going back to their houses by walking on corniche using tunnels and bus stations.

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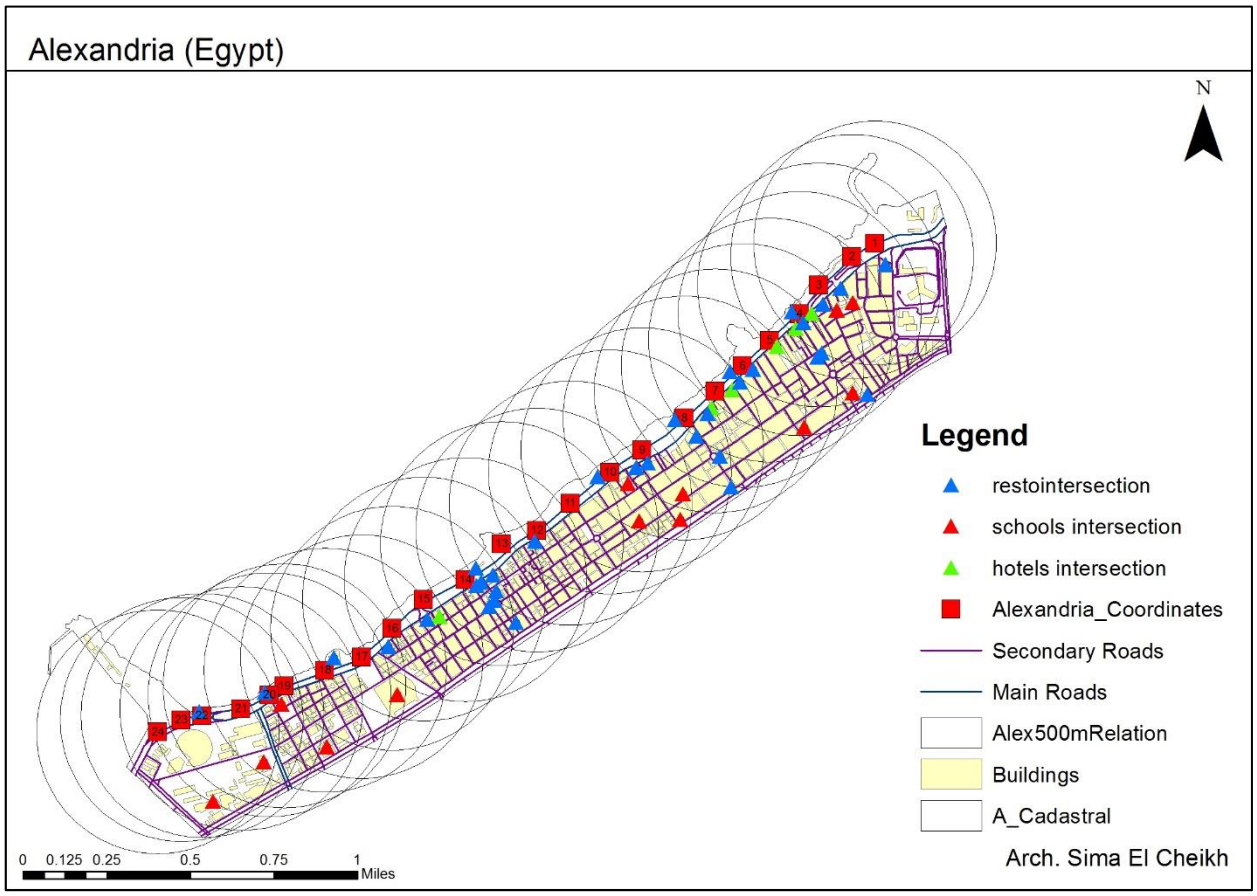

Figure 3: Intersection of gathering locations with city functions on Alexandria waterfront
Reference: Authors

Table 5: Correlation values between population density and intersected functions within 500 meters radius from gathering locations on Alexandria waterfront
Reference: Authors

Alexandria															
	Children (0-14)			Youth (15-24)			Middle Age (26-55)			Old (55+)			Total Population		
	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
Restaurants	-0.59	0.209	-0.279	-0.151	-0.306	-0.231	0.217	0.394	0.292	-0.27	-0.277	-0.14	0.06	0.038	0.087
Schools	0.181	0.286	-0.119	-0.433	-0.298	0.133	0.208	-0.301	0.206	-0.13	0.38	-0.17	-0.156	-0.353	0.189
Hotels	-0.194	0.500	-0.209	-0.494	-0.414	-0.215	0.219	0.238	0.287	0.138	-0.196	0.149	-0.209	-0.104	0.116

3.3. Antalya waterfront

Antalya, is the fifth most important city in Turkey. It is located in the continent of Asia, and known for its high touristic level. The study area spreads to 4 km long and around 1000 meters width. It contains two different forms, half a beach and the other is a cliff-edge. The area contains large numbers of restaurants, parks, playgrounds, hotels and few schools. These functions are allocated by their coordinates on the map as layers in Geographic Information System Software (Figure 5). To evaluate the zone popularity, 33 coordinates are assigned continuously all along the waterfront along with data containing population values by age differentiation, during three days in a week at summer season. As the results show in figure 4, major population is located on locations: 1 to 11, due to presence near high dense urban area containing lot of hotels and restaurants. Also, population is mostly dense between locations 16 to 21 (reaching 205 persons), for being the closest points to the cliff edge, from which people get down directly to reach the beach. After completing the studies in table 6, the results of correlation between population density and functions show that people exist mostly around hotels, playgrounds and restaurants. Following age differentiations, the data shows same gathering for all ages:

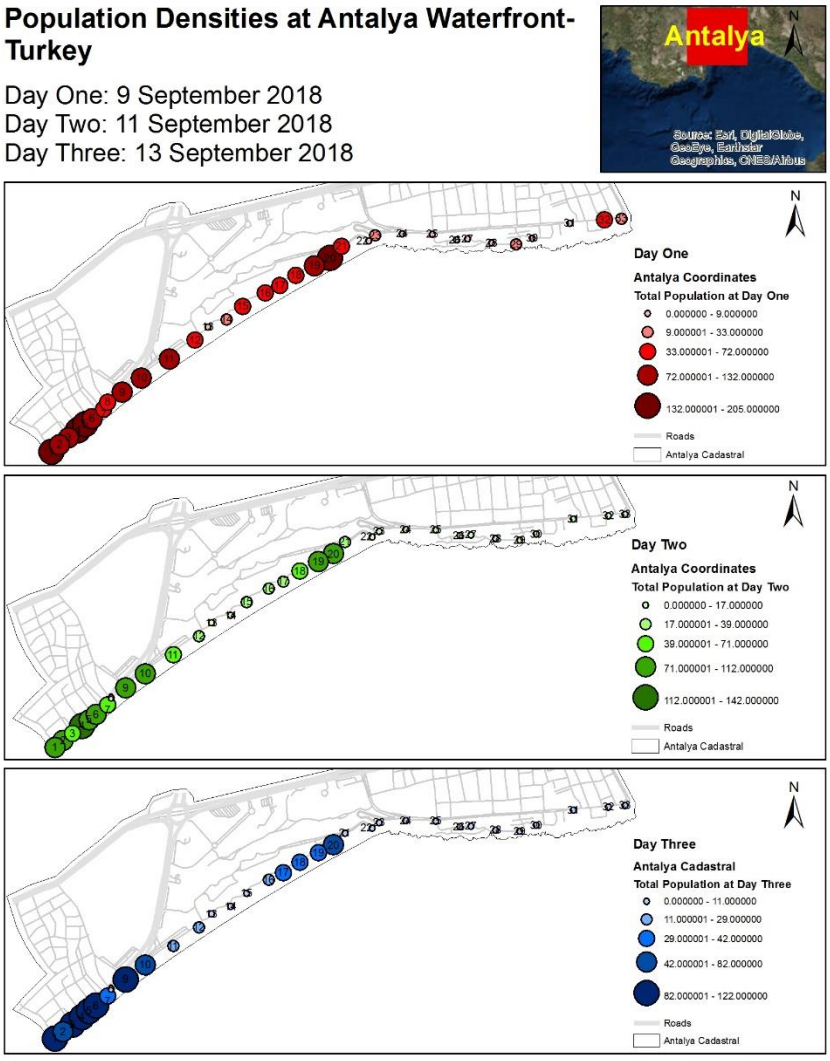

Figure 4: Population in gathering locations on Antalya waterfront
Reference: Authors

- Children (0-14): Children numbers are greater in playgrounds and hotels areas.
- Adults (15-25): Youth numbers are greater in playgrounds and hotels areas.
- Middle age (26-55): Middle-aged people numbers are greater near playgrounds and hotels.
- Old (+55): Old people numbers are greater in playgrounds and hotels areas.

Unusually, parks locations, especially on cliff edge, have negative correlation with populations since people exist only on the beach and use it for swimming, sitting and seeing. Also, schools never affected number of people on the beach. People gather around playgrounds zones and in front of hotels and restaurants.

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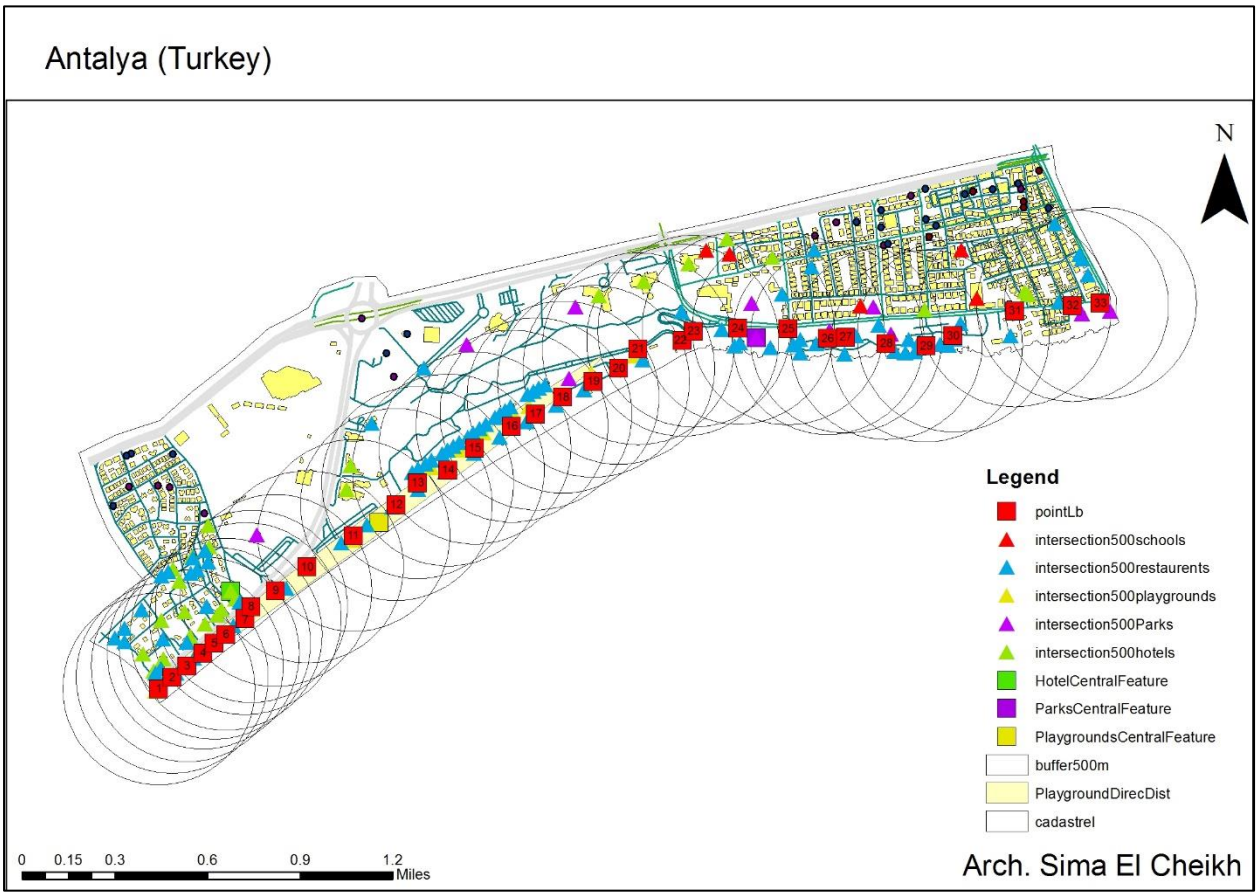

Figure 5: Intersection of gathering locations with city functions on Antalya waterfront
Reference: Authors

Table 6: Correlation values between population density and intersected functions within 500 meters radius from gathering locations on Antalya waterfront
Reference: Authors

Antalya															
	Children (0-14)			Youth (15-24)			Middle Age (26-55)			Old (55+)			Total Population		
	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
Restaurants	0.149	0.242	0.143	0.192	-0.104	-0.033	0.069	0.094	0.134	-0.085	0.031	0.098	0.095	0.100	0.132
Schools	-0.594	-0.555	-0.446	-0.41	-0.487	-0.308	-0.628	-0.605	-0.517	-0.464	-0.319	-0.265	-0.628	-0.610	-0.521
Hotels	0.551	0.645	0.533	0.589	0.433	0.385	0.545	0.618	0.662	0.284	0.420	0.511	0.579	0.635	0.672
Playgrounds	0.560	0.555	0.416	0.363	0.337	0.202	0.563	0.551	0.541	0.369	0.387	0.367	0.564	0.561	0.536
Parks	-0.596	-0.588	-0.461	-0.388	-0.407	-0.328	-0.580	-0.501	-0.507	-0.402	-0.302	-0.399	-0.587	-0.525	-0.524

3.4. El Mina waterfront

El Mina, is a small city located in north of Lebanon next to Tripoli, in the Middle East region. The study area spreads to about 4 km long and around 800 meters width. The city contains large number of schools and restaurants; one hotel; and two playgrounds. These functions are allocated by their coordinates on the map as layers in Geographic Information System Software to relate them with the existence of citizens on the public waterfront (Figure 7). As the two above case studies, 28 coordinates are allocated continuously all along the waterfront with data containing population values by age differentiation, during three days in a week at summer season, to evaluate the population density in each zone. As the results show in figure 6, major population (maximum 50 persons) is located on locations: 1 to 16, in the old city area, due to the presence near high dense urban area containing lot of people whom work in the port or kiosks sellers, walk for sports or seeing and enjoy their time with their families and friends on their public waterfronts. As shown in table 7, correlation between population density and functions shows that people exist mostly around schools, playgrounds and restaurants. Following age differentiations, the data shows same attraction points for all ages:

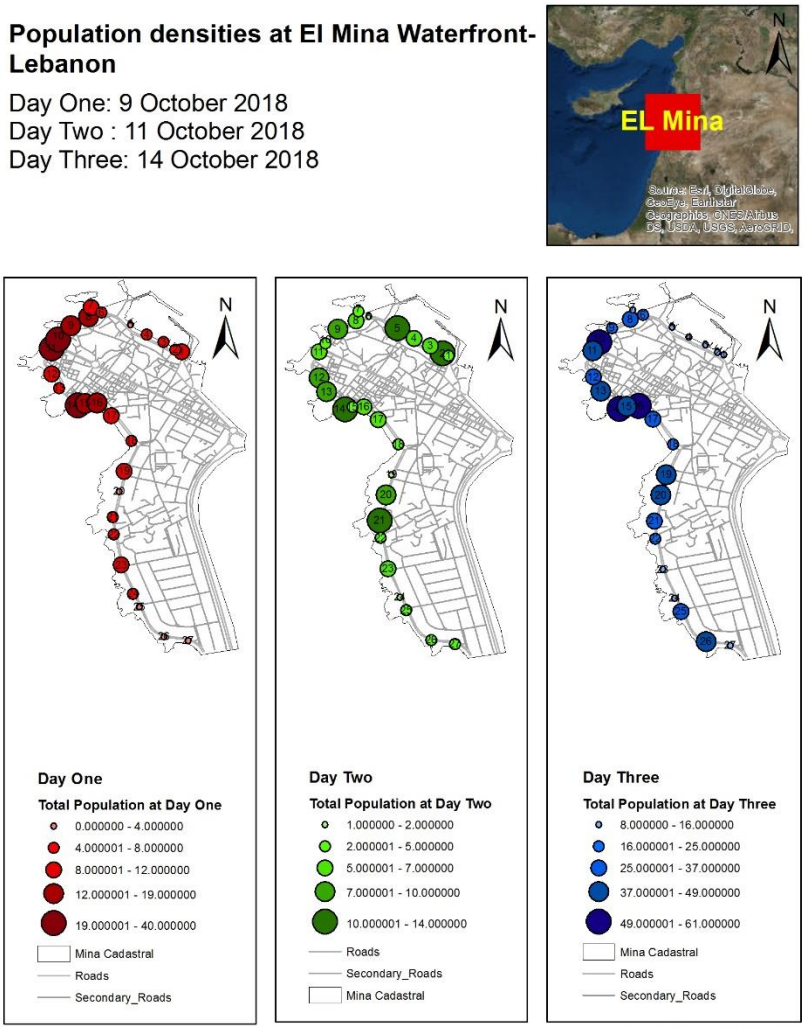

Figure 6: Population in gathering locations on El Mina waterfront
Reference: Authors

Children (0-14): Children numbers are greater in playgrounds, schools and restaurants areas.

Youth (15-25): Youth numbers are greater in schools and restaurants and hotels areas.

Middle aged (26-55): Middle aged numbers are greater in playgrounds, schools and restaurants areas.

Old (+55): Old densities are greater in schools and restaurants areas.

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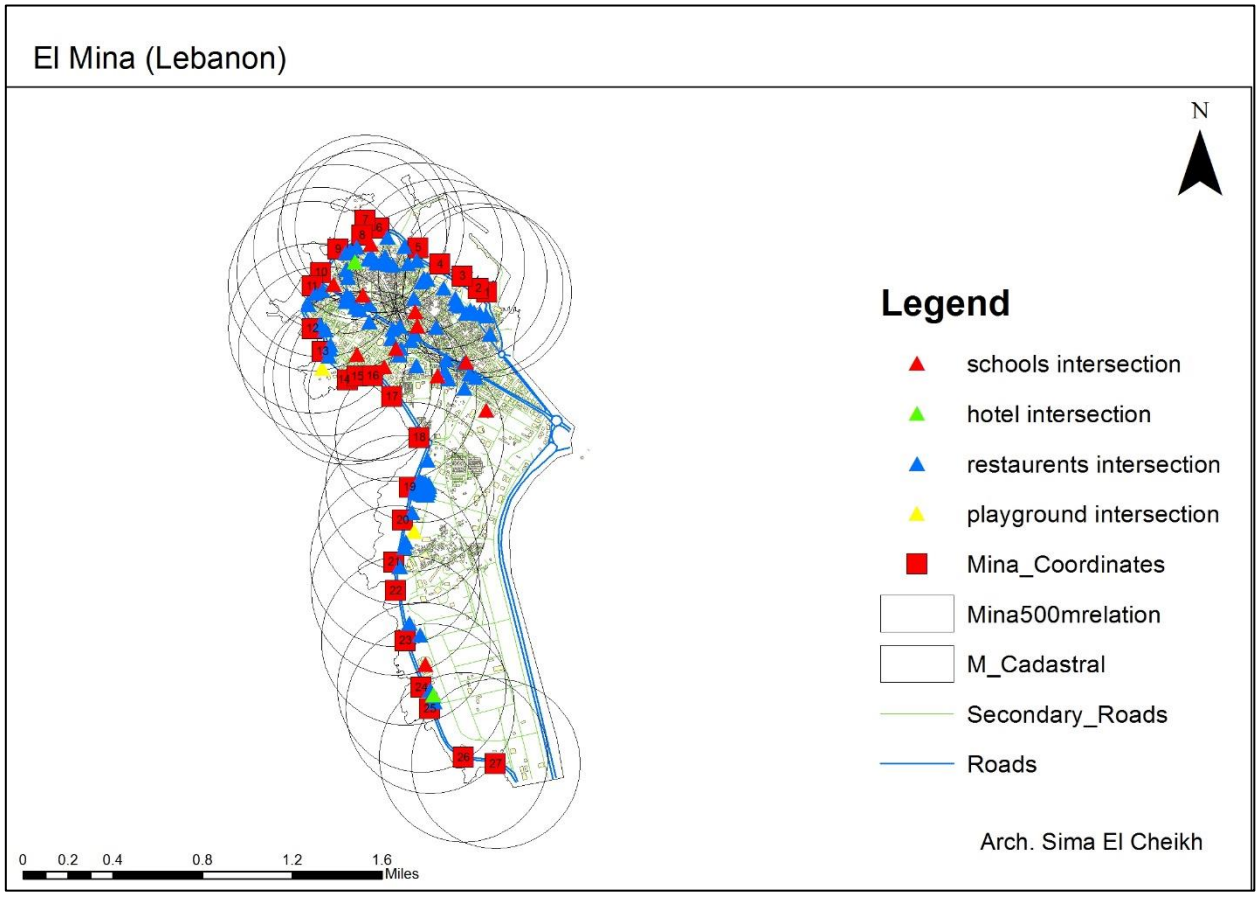

Figure 7 Intersection of gathering locations with city functions on El Mina waterfront
Reference: Authors

Table 7: Correlation values between population density and intersected functions within 500 meters radius from gathering locations on El-Mina waterfront
Reference: Authors

El Mina															
	Children (0-14)			Youth (15-24)			Middle Age (26-55)			Old (55+)			Total Population		
	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
Restaurants	0.101	0.119	0.061	-0.010	0.239	0.354	0.391	0.068	0.016	0.421	0.366	0.462	0.394	0.350	0.143
Schools	0.126	0.199	0.357	0.125	0.147	0.543	0.327	0.080	-0.037	0.547	0.108	0.235	0.411	0.241	0.223
Hotels	-0.010	-0.142	-0.061	0.304	-0.069	-0.121	0.119	-0.143	-0.60	0.062	0.086	0.125	0.153	-0.160	-0.088
Playgrounds	0.425	0.084	0.334	0.226	0.189	0.200	0.192	0.396	0.566	0.187	-0.341	-0.188	0.301	0.290	0.611

4. CASE STUDIES COMPARATIVE ANALYSIS

Positive correlation values have been given numerical values as the following:
1: Weak positive correlation (0.1 to 0.3)
2: Moderate positive correlation (0.3 to 0.5)
3: Strong positive correlation (0.5 to 1.0)

A total of three days is calculated for each city as seen in table 8. The analysis showed that children in Alexandria gather mostly in the surroundings of schools AND HOTELS. In Antalya, children gather near hotels and playgrounds in a high ratio, while in El Mina they gather in the areas of playground, schools and restaurants. Youth gather mostly around schools in Alexandria, around hotels and playgrounds in Antalya and around schools, playgrounds and restaurants in El Mina. Middle aged meet in the areas containing restaurants and hotels in Alexandria, hotels and playgrounds in Antalya and playground, schools and restaurants in El Mina. Old people exist mostly around schools and hotels in Alexandria, hotels and playgrounds in Antalya and restaurants and schools in El Mina. The totals showed that schools and hotels attract people mostly in Alexandria; hotels and playgrounds in Antalya; and restaurants, schools and playgrounds in El Mina. The summation of the three countries together shows that on waterfronts the most attractive functions are consecutively hotels, playgrounds, restaurants, schools and finally parks.

Table 8. Correlation weight values for all age categories and total population on all three waterfronts
Reference: Authors

	Children (0-14)			Youth (15-25)			Middle Age (26-55)			Old (55+)			Total			Total
	Alexandria	Antalya	El Mina	Alexandria	Antalya	El Mina	Alexandria	Antalya	El Mina	Alexandria	Antalya	El Mina	Alexandria	Antalya	El Mina	Three cities
Restaurants	1	3	2	0	1	3	4	1	2	0	0	6	5	5	13	23
Schools	2	0	4	1	0	5	2	0	2	2	0	5	7	0	16	23
Hotels	3	9	0	0	7	2	3	9	1	2	6	1	8	31	4	43
Playgrounds	None	8	4	None	5	3	None	9	6	None	6	1	None	28	14	42
Parks	None	0	None	None	0	None	None	0	None	None	0	None	None	0	None	0

5. CONCLUSION

This paper tends to find the most attractive functions on waterfronts which invite people to visit waterfronts of Mediterranean cities through a theoretical and spatial analysis. In the first stage, a theoretical review covers the components of waterfront activities and their relationship with land uses, which shows that most of waterfront activities as sports, water recreational activities, working, eating, swing, sitting, staying, shopping, travelling and trading exist in commercial and public works zones. Also, it covers the activities dependency on water, which shows that water enhanced uses are located in commercial zones and public access spaces are located in public works zone. It studies also the attractiveness of waterfronts, which covers positive and ambiguous spaces.

In the second stage, data about population and age categories; gathering location coordinates; locations of available hotels for staying, restaurants for eating, playgrounds for playing, schools for learning, parks for walking and siting. The paper conducts analysis of correlation coefficients which shows the effectiveness of the relation between the available functions and population densities on waterfronts of three cities in tables 5, 6, 7 and 8.

In a commercial city such as Alexandria, people are present mostly in the buffer zones of hotels, restaurants and schools or universities. The citizens use waterfronts in the afternoons to reach bus stations and go back home after work, school and university time. Also, visitors of the city are present in the surroundings of hotels available all along the city waterfront. People also enjoy their time having launch in restaurants available all along the beach. People create a link between available functions, as getting out from work or school to have a walk on the corniche in order to go back home using transportation facilities; use available cafeterias for a rest; and use the parking to park. The waterfront is crowd but not for major entertainment reasons.

In Antalya, the touristic case study, tourists and citizens are equally present all along the waterfront for many uses as swimming, walking, biking and eating. As the results show, the most attractive functions on Antalya waterfront are hotels and playgrounds. Tourists occur in the surrounding of their staying hotels in large densities to enjoy the beach. The cliff edge, where parks and restaurants

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exist, is not populated which means that the beach form is more attractive from user's perspective. Playgrounds all along the beach are also populated due to large number of children and youth whom exist to enjoy the company of their friends and families. When the waterfront provides many activities complementary to each other, people exist greatly since they can swim, eat, play, walk, bike near their staying areas. As seen in Antalya, people didn't gather greatly in the cafeterias on the cliff edge since the place is only providing eating zones.

In the historical and non-developed city "El Mina", the most attractive functions are restaurants, schools and playgrounds. People tend to visit the waterfront in order to have a sit and eat in available restaurants, to visit playgrounds where they can entertain their children. Also, El Mina contains many schools and universities in a small area so children, youth and middle aged are normally present in schools boundaries in the afternoons. Citizens use the waterfront for parking near schools and universities which is not an activity related to enjoying a public space. People tend to use the waterfront for the least kind of activities when no other options exist, they create their own activity.

As shown in Table 8, the summation of the three countries together shows that on waterfronts the most attractive functions are consecutively located in playgrounds, hotels, restaurants, schools and finally parks. People are firstly attracted to waterfronts to reach entertainment areas as children playground, splash pads and sprinkles, swimming areas, basket balls, volley and sledding. The second attractive functions are hotels where tourists exist and restaurants where people can rest, eat and have time with families and friends. Schools are not directly related to waterfronts but the numbers indicated a relationship that may be because the presence of dense population of children and youth whom may get out of educational facilities and have some time on waterfronts in restaurants and playgrounds. Parks indicated a zero relationship with densities of users which is because preferences go to the beach and its components rather than parks.

6. DISCUSSIONS

Waterfront areas differ from a city to another according to land uses distribution; water edge shape; type of waterfront either beach or rocks; corniche and street location; city touristic and commercial level. Citizens follow the availability of functions using their waterfront for daily uses going to school and work in non-developed areas and gathering around little available primitive playgrounds and having an only option of enjoyment in restaurants. This results in weakening the waterfront attractiveness although its high natural strength as in El Mina and Alexandria. Availability of hotels and entertainment areas together, or strengthening commercial areas with public zones results in increasing people enjoyment and density as well. The outcome recommends that the waterfront zoning and development laws have to consider developing commercial and open areas consisting of public activities and entertainment facilities while preserving natural beach shape in order to enhance public amusement.

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