

Towards Enhancement of Alexandria City Waterfront: Quality of Life Assessment Model

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1 ABSTRACT

Coastal cities evolve in alignment with people centred development to accommodate their needs. Nevertheless, uncontrolled changes of significant elements of urban morphology such as land uses along the waterfront and respective public activities, lead to alterations in the quality of life provided. The research explores models that study the various configurations and implying the effective role of controlling urban developments guidelines in terms of environmental behavioural, social well being, health and safety.

This paper is divided into two main sections: Firstly, it focuses on Alexandria City's Urban Morphology, prospect of transformation plans and highlights the nature-based integrative solutions on its waterfront for the short and long-term plans through multiple disciplinary contributions. Secondly, the research defines the structured model to assess Quality of Life of Waterfront Settings, «QLWS» in Alexandria City, used for the analysis of selected sites. This model is used as a tool to assess the attractiveness and satisfaction of the existing spatial configurations in regard of professional observation. The discussion derives implications from the analysed data to support tracking relevant morphological mutations of social and physical parameters.

The research provides a guide to evaluate and promote natural based system integration for further transformation of sites incorporated within the city's strategic plan of 2032 to ensure sustainability, inclusivity, liveability and resilience.

Keywords: Coastal Cities, Natural Based Solutions, assessment indicators, Waterfront, Quality of Life

2 INTRODUCTION: URBAN DESIGN AND PLANNING DRIVEN BY NATURE-BASED SOLUTIONS

Coastal cities evolve in alignment with people centred development to accommodate their needs. Nevertheless, uncontrolled changes of significant elements of urban morphology such as land uses along the waterfront and respective public activities, lead to alterations in the quality of life provided. The research explores models that study the various configurations and implying the effective role of controlling urban developments guidelines in terms of environmental behavioural, social well being, health and safety. Urban design and planning driven by nature-based solutions play a significant role in transforming urban waterfront areas into sustainable and resilient spaces. It offers a transformative approach to building sustainable and liveable cities and has the ability to mitigate climate change, enhance biodiversity, improve human well-being, and foster economic growth.

Alexandria's waterfront proximity to the coast and recreational areas makes it an important setting for studying the health and well-being of residents and planning aspects that contribute to residents' quality of life (AS+P, 2020). The Alexandrian waterfront has undergone significant urban development and redevelopment projects, The city's waterfront has undergone two phases of development (AFD Report, 2015). The first phase involved widening the road and adding lanes by backfilling a portion of the sea. The second phase concentrated primarily on economic factors (Tawil, Arnouty, & Fadle, 2020).

3 RESEARCH METHODOLOGY

The research is divided into two main sections. Firstly, the study focuses on Alexandria City's Urban Morphology and its prospect of transformation plans, highlighting the nature-based integrative solutions on its waterfront for the short and long-term plans through multiple disciplinary interventions. Secondly, The research introduces the details of the structured model to assess Quality of Life of Waterfront Setting "QLWS" in Alexandria city, used for the analysis of selected sites. This model is used as a tool to assess the attractiveness and satisfaction of the existing spatial configurations in regard of professional observation. Finally, The discussion derives implications from the analysed data to support tracking relevant morphological mutations of social and physical parameters.

3.1 Nature-Based Solutions

The research relies on the opportunities provided by the hybrid (or multi-actor) governance for upscaling urban nature-based solutions (referred to as urban NbS), representing a demand-driven and cost-effective realization of urban enhanced spatial quality of life. The notion of applying nature-based solutions in urban development strategies implies the integration of multiple disciplines for the adapted design and diversity of settings along the extended waterfront of Alexandria city that sustains the transformative potentials. The policies and procedures needed by urban planners have an open approach to collaborative governance of applying nature-based solutions while learning with and about new appealing designs, perceptions and images of nature from different urban actors (Haase A., 2018).

The most relevant concepts in adopting nature-based infrastructure and engineering with nature are the two common concepts which define NbS as “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits”; while the second concept states that “NbS are inspired and supported by nature and simultaneously provide environmental, social, cultural and economic benefits” (LIU, et al., 2021). Therefore from the two main approaches of NbS, the process adopted in this research enables a balanced system maintaining nature-based solutions through professional observation and analytical representation of the community and social perceptions to ensure inclusivity, liveability and resilience.

3.2 Quality of Life in the Alexandria Waterfront «QLWS» Assessment Model Indicators Setting

Contemporary lifestyle patterns have changed the meaning and scope of activities in open public spaces, shifting their focus from daytime to nighttime. In these circumstances, the vitality and liveability of these spaces depends on their ability to adapt to and support the flexibility of these changes, despite their physical limitations (Rokanjac, 2022). The principles of improvement and the criteria for assessing the public spaces of a large city, such as multifunctionality, safety, legibility, sustainability, human scale, interactivity and flexibility (Kozlova et al., 2018). Existing open spaces adhere to most of these criteria classified into two categories, physical and socio-cultural (Nayer, 2015). Finally, the urban spaces are evaluated by identification indicators associated with each criterion, and classification of it. The evaluation can determine the value of each indicator and its role in increasing the quality of life in an urban area, and in the present, spontaneously supplemented with objects and structures, expanding their boundaries and following the rhythm of urban development (Mahdzar S, et al., 2014).

To conclude the set of indicators and sub-indicators proposed in this research as a prominent tool for the assessment for the Quality of Life in Alexandria Waterfront “QLWS”, they are used to analyse respective zones along the extended coastal line of the City of Alexandria. The structured model refers not only to quantitative but also qualitative dimensions related to the Nbs approaches, where the categories and indicators are derived from the Smart Urban Quality by Chiara G. et. Al., 2018. The set of indicators also supports the observation process by the research team, as the sub-indicators describe the urban context with completeness eliminating subjectivity during the evaluation process. This significant assessment is represented by the information displayed in Table 1.

“QLWS” combines traditional aspects of urban quality with smart and sustainable aspects related to quality of life, health and well-being. The observation enables the researchers to consider the perception levels of visitors of the waterfront regarding: a) Emotional wellbeing, b) Spatial and Environmental Characteristics, c) Social wellbeing, and d) Safety and security. In addition, each of these aspects is defined through the sub-categories identifying the actual status of users’ experience in the visited sites presented in the case studies, such as presence of green area, attractiveness of surrounding buildings, quality of street lighting, easy mobility and others.

The overall analysis derived from the structured model indicators set supports the relevant integrated environmental services to maintain quality of life. The study extends to overlook the potential activities and their inclusivity to assure liveability and sustainable public space in terms of economic opportunity and social inclusion. The perspectives summed up by the research team describe each variable and sub-set of indicators in order to actively apply sustainable management and conservation of natural resources to meet major societal challenges. Therefore “QLWS” provides for a balanced analytical scheme carried out using

this assessment model of quality rating, relative to every need, at the census area of study, while investigating potentials of liveability and sustainability in the studied public spaces along the waterfront.

Main Indicators	Emotional wellbeing	Spatial and Environmental characteristic	Social wellbeing	Safety and security
Sub - Indicators	Presence and quality of green area	Noise control (Urban traffic)	Presence of spaces, services and activities suitable for children	Security and accessibility
	Attractiveness of surrounding buildings	Air pollution Control		Endurance to natural disaster
	Easy mobility	Presence of open spaces, services and activities	Economic opportunity and social cohesion	Design elements (Preventing any crime or injuries)
	Environmental maintenance	Healthcare services	Perception of safety	

Table 1: Indicators for the structured model of Quality of Life of Alexandria Waterfront, "QLWS", by authors.

4 URBAN MORPHOLOGY AND LANDSCAPE

The morphology of Alexandria City is strongly influenced by its coastal setting. The city has a long coastline that extends about 32 km along the coast of the Mediterranean Sea. It plays a significant role in shaping the city's identity and development and offers its residents a combination of natural beauty, recreational activities, cultural experiences, economic opportunities, and community gathering spaces. According to El Tawil et al.(2020), it is one of the major touristic targets, as well as one of the major motorists roads linking the entire city due to the linearity of Alexandria as a city.

Alexandria's waterfront proximity to the coast and recreational areas makes it an important setting for studying the health and well-being of residents and planning aspects that contribute to residents' quality of life. The Alexandrian waterfront has undergone two phases of significant urban development and redevelopment projects. The first phase began in the year 2000 and involved widening the road and adding lanes by backfilling a portion of the sea. The second phase began in the year 2018 and concentrated primarily on economic factors by moving some recreation areas and positioning the Sidi-Gaber bridge, which is elevated over the main street (Tawil, Arnouty, & Fadle, 2020).

The first stage of development improved social cohesion and harmony by making the city more walkable, connecting it longitudinally and providing spaces for cycling, creating an active zone. Providing spaces for walking (leisure and exercising) and cycling played a major role in enhancing the physical activity levels and mental health of residents (Frag, Saadallah, & Ayad, 2021). However it witnessed an increase in air pollution due to increased traffic density. The second stage relied on restaurants, cafeterias, and siting zones, whereby it encountered an increase in water pollution as a result of the presence of new places built directly on the sea without leaving any buffer zones. Furthermore, the construction of new cafes and restaurants and parking areas for them resulted in the loss of some parts of the sea view (Figure 1 a&b), which is a prominent natural view for Alexandria's residents. This led to a rise in despair by the residents (Tawil, Arnouty, & Fadle, 2020).



Figure 1 (a) and (b): Cafes, restaurants and parking areas blocking parts of sea view, by authors.

5 STUDY AREA AND SELECTION CRITERIA

Since improving public spaces, revitalizing the waterfront, and promoting sustainable development practices have been the main goals of modern urban planning initiatives, six open public places are selected for this study in an attempt to assess their attractiveness and satisfaction as a contribution to making the waterfront area a desirable place to live and enjoy the benefits of coastal living. By assessing environmental behaviour and its impact on the quality of life along the Alexandria Egypt waterfront, valuable insights can be gained to inform strategies for enhancing sustainability, fostering a sense of environmental responsibility, and improving the overall well-being of the community. The findings can guide the development of targeted

interventions, policies, and educational initiatives aimed at promoting sustainable behaviours and improving the environmental quality of the waterfront area.

The selected sites for the study are public open spaces and they extend along the shoreline of Alexandria City. The selected open areas for the study are located in the following areas respectively : 1) "Qaitbay" waterfront area, 2) "Ras El Tin" area, 3) "El Selsela" park area, 4)"Cleopatra" area, 5)"Louran" area and 6)"Bir Masoud" area (Figure 2). These six study areas are selected because they are not restricted to a specific group, but rather are welcoming to individuals and families of all ages. They are accessible all year and provide the best possible sea view. Moreover, they encourage interaction and connection between residents and the waterfront. Each of these areas represents a 100 to 500 m walking buffer.



Figure 2: Base map of the Six Selected Study areas along Alexandria extended Waterfront, by authors.

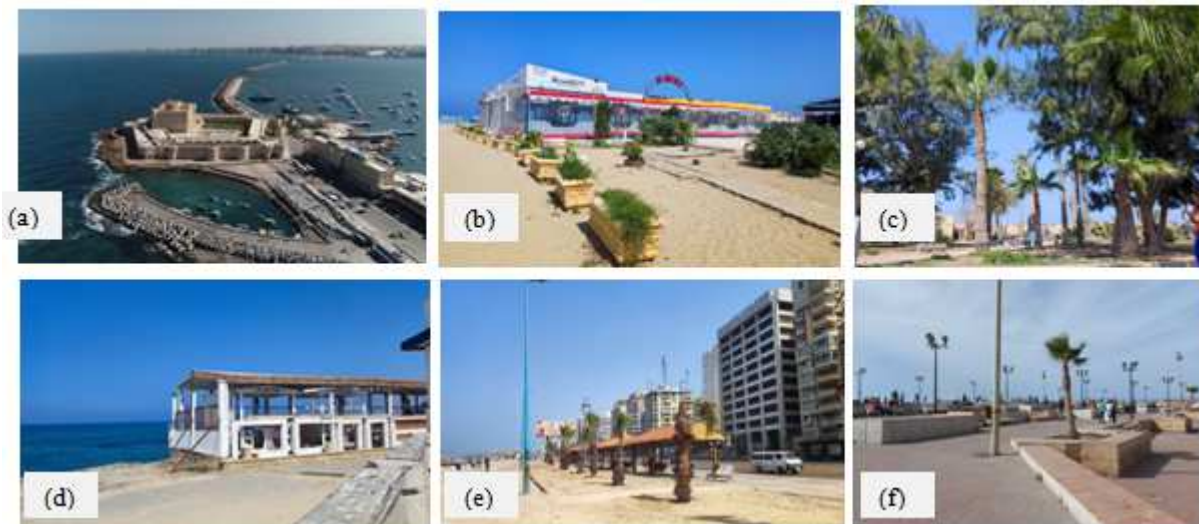


Figure (3): Six study areas (a) “Qaitbay” waterfront area. (b) “Ras El Tin” area, (c) “Selsela” park area (d) “Cleopatra” waterfront area, (e) “Louran” waterfront area and (f) “Bir Masoud” area, by authors.

5.1 “Qaitbay” Waterfront

The Citadel of Qaitbay area is situated in the Eastern Harbour of Alexandria city overlooking the sea (Figure 3a). It is known for its historical significance and is a major asset to the city and attracts citizens for gathering and tourists to enjoy its great view and enhance its monumentality. Qaitbay Citadel is a fortress built in the 15th century by Sultan Qaitbay. It offers panoramic views of the surrounding cityscape and the sea. It features cultural and recreational spaces that add to its appeal. A mix of facilities is provided along the waterfront that would appeal to visitors, and establish a specific local sense of place due to the Citadel of

Qaitbay. There are also shops, cafes, and restaurants that cater for the needs of residents and visitors. The area has a lively atmosphere with a blend of local businesses and tourist-oriented establishments.

5.2 “Ras El Tin” area

Ras El Tin is situated on the eastern edge of Alexandria, along the Mediterranean Sea. Its location provides direct access to the waterfront. The Ras El Tin area features beautiful sandy beaches along the waterfront (Figure 3b). Residents and visitors can enjoy sunbathing, swimming, and beachside activities. The beaches in this area offer a space for people to unwind and enjoy the coastal environment. The Ras El Tin waterfront offers a pleasant promenade where residents and visitors can stroll and enjoy views of the sea.

5.3 “Selsela Park” area

Selsela Park is a public park located in front of the Bibliotheca Alexandrina in Alexandria City. It is a popular recreational space that serves as a gathering place for residents and visitors (Figure 3c). Its location provides convenient access for visitors to enjoy the park, relax and socialise. The park includes paved walking paths that meander through the greenery. It also provides seating areas scattered throughout the park.

5.4 “Cleopatra” waterfront area

The Cleopatra area is a well-known district. It is a bustling and vibrant part of Alexandria city. It is characterized by its wide streets, high-rise buildings, and a mix of residential, commercial, and recreational spaces. There is also a path only for pedestrians where they can walk and exercise freely. The waterfront parts of this area is home to numerous restaurants, cafes, and entertainment venues easily accessible by various means of convenient transportation options such as: public buses, taxis, and private cars. However, the presence of restaurants and cafes along the waterfront affect the sea view for the residents where some of these establishments partially obstruct the view of the sea (Figure 3d) and block parts of the walking paths made for pedestrians.

5.5 “Louran” area

Louran is a residential area in the middle of Alexandria city. The waterfront area in Louran also contains promenades that offer opportunities for leisurely walks, picnics, and gatherings to its residents. The studied area in Louran is a shaded public area constructed for pedestrians to sit and rest in the shade, socialise and enjoy the waterfront atmosphere, with restaurants and cafes beside it to provide food and beverage services. Patches of green areas and palm trees are also present but are currently under development (Figure 3e).

5.6 “Bir Masoud” area

“Bir Masoud” is an open space overlooking the sea located in the Sidi-Beshr residential area. This place has many legends revolving around it and is famous for a being a place that fulfils wishes by throwing coins into the well. The open space provides opportunities for socialising, picnicking, and enjoying the view of the sea. It also serves as valuable public resources where individuals and families can unwind, engage in leisure activities and some where residents can do some fishing. Restaurants are available around the area to provide food and beverage services to the residents (Figure 3f).

6 URBAN REGENERATION OBSERVATION AND ANALYSIS RESULTS

A site visit to the six sites under study was carried out in order to gather data, assess the attractiveness and satisfaction of the current spatial configurations, and record observations. Assessment was done using the survey mentioned above, that evaluates the following attributes: a) Emotional Wellbeing, b) Spatial and Environmental Characteristics, c) Social Wellbeing and d) Security and Safety from Natural Disaster, Crime and Injuries of each site. The following section discusses each of the mentioned indicators in the areas under study.

6.1 Emotional Wellbeing Attribute

Emotional well-being is influenced by various indicators, which are shown in table 2.

EMOTIONAL WELLBEING	INDICATORS		SUBINDICATORS	
	i. Presence and Quality of green area		% of green area available	
			Relative attractiveness	
	ii. Attractiveness of surrounding buildings		Design : form and material	
			Finishes	
Maintenance				
iii. Easy mobility		Availability of different transportation modes		
iv. Environmental maintenance		Cleanliness of space		
		Condition of space		
		Condition of pedestrians' area		
		Quality of seating		

Table 2: Indicators influencing the Emotional Wellbeing Attributes, by authors.



Figure 4: Surrounding area at (a) Qaitaby waterfront area, (b) El Selsela park area and (c) Cleopatra waterfront area, by authors.

Table 3 illustrates observations of each site under study regarding the emotional wellbeing attributes.

Indicator: (i) Presence of Green Area		
Study area	%	Actual Condition for related settings
Qaitbay waterfront area	0%	No green area
Ras El Tin area	20%	Ras El tin mainly consists of beaches along with restaurants, cafeterias and clubs. The available green space can only be found in the children's playing areas
El Selsela Park area	85%	The entire park comprises green areas with pedestrian paths flowing through them, as well as trees and palm trees to provide shade to people.
Cleopatra waterfront area	0%	No green area
Louran waterfront area	67%	The existing green areas and palm trees are between the seating area and pedestrian route, however these green spaces were still under renovation at the time of the site visit.
Bir Masoud area	0%	No green area
Indicator: (ii) Attractiveness of Surrounding Buildings		
Study area	%	Actual condition of related settings
Qaitbay waterfront area	65%	Some of the buildings there are currently under renovation
Ras El Tin area	42%	Buildings in the Ras El Tin area are not attractive and some need maintenance
El Selsela Park area	83%	The park is located in front of Bibliotheca Alexandrina. Moreover, it contains a white statue of a mermaid which is considered as a landmark of the area
Cleopatra waterfront area	67%	Consists of residential buildings overlooking the sea. Some of them are newly built, others are old and need some renovations.
Louran waterfront area	67%	
Bir Masoud area	67%	
Indicator: (iii) Presence of Easy Mobility Services		
Study area	%	Actual condition for related settings
Qaitbay waterfront area	100%	All areas are reachable and accessible via several means of transportation, including public transportation, taxis, private automobiles, and buses.
Ras El Tin area		
El Selsela Park area		
Cleopatra waterfront area		
Louran waterfront area		
Bir Masoud area		
Indicator: (iv) Environmental Maintenance Indicator		
Study area	%	Actual condition of related settings
Qaitbay waterfront area	55%	Poor condition of space and pedestrian area as a result to the current developments taking place there
Ras El Tin area	67%	Moderate condition of space in which maintenance is required to the seating areas and to the restaurants and cafeterias located there
El Selsela Park area	80%	The overall condition is due to cleanliness and good condition of the pedestrian route
Cleopatra waterfront area	75%	Some of the seating areas there need maintenance
Louran waterfront area	75%	Moderate condition of space and seating area due to the current development taking place there
Bir Masoud area	90%	Good condition of the space, pedestrian area, and seats

Table 3: Percentage and observation of the Emotional Wellbeing Attributes in each site under study, by authors.

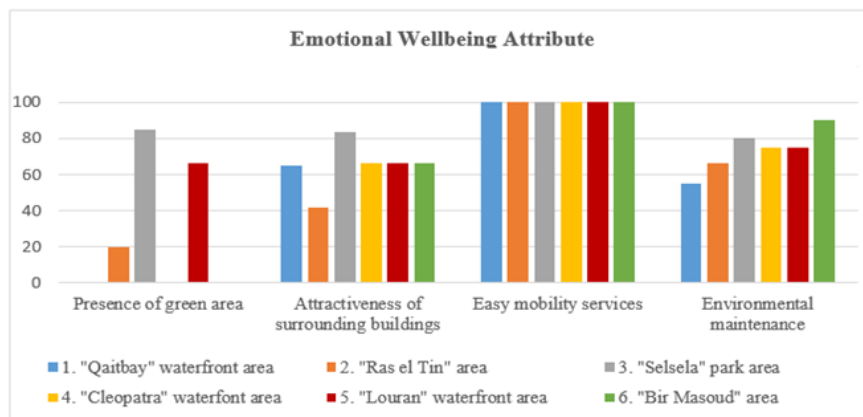


Figure 5: Percentages of Emotional Wellbeing Indicators in the six understudy areas, by authors.

6.2 Spatial and Environmental Characteristics Attribute

The assessment of Environmental Characteristics attribute adopted a number of indicators. They are shown in table 4.

SPATIAL AND ENVIRONMENTAL CHARACTERISTICS	INDICATORS	SUB - INDICATORS	
	i. Noise control (Urban traffic)		Horns level control
			Distance from traffic, cars
	ii. Air pollution Control		Number of street lanes
			Flow of traffic
			Availability of trees
			Availability of open space
	iii. Presence of open spaces, services and activities		Percentage of open space
			Quality of services
			Presence of urban furniture
			Presence of parking areas
	iv. Healthcare services		Presence of medical office
			Quality of medical office
		Presence of ambulance	

Table 4: Indicators adopted for the Environmental Characteristics Attribute, by authors.



Figure 6: Urban furniture and seating areas at (a) El Selsela Park, at (b) Louran area and at (c) Bir Masoud area, by authors.

Table 5 illustrates percentages and observation of each site under study in Environmental characteristics attribute.

Indicator: (i) Noise Control (Urban traffic)		
Study area	%	Actual Condition for related settings
Qaitbay waterfront area	95%	The furthest away from car traffic. People enter the area with their cars only to park. This results in the low levels of car horns in the area.
Ras El Tin area	50%	Beaches are considered far from the traffic, but restaurants and cafeterias there are closer to traffic
El Selsela Park area	33%	Closer to car traffic, resulting in light levels of car horns making the place a bit noisy during some times of the day.
Cleopatra waterfront area	33%	
Louran waterfront area	33%	
Bir Masoud area	33%	
Indicator: (ii) Air Pollution Control		
Study area	%	Actual Condition for related settings
Qaitbay waterfront area	85%	Air pollution control in the six understudy areas are moderate to high. This is because they all overlook the sea and thus receive fresh air from it. However, they are near the cars traffic with wide street and high traffic flow condition.
Ras El Tin area	67%	
El Selsela Park area	83%	
Cleopatra waterfront area	67%	
Louran waterfront area	75%	
Bir Masoud area	65%	
Indicator: (iii) Presence of Open Spaces, Services and Activities		
Study area	%	Actual Condition for related settings
Qaitbay waterfront area	73%	The Qaitbay waterfront has high percentage owing to the availability of vast open spaces and good quality of services available
Ras El Tin area	67%	Availability of vast open spaces but moderate quality of services
El Selsela Park area	55%	Moderate quality of services and urban furniture. Absence of parking areas
Cleopatra waterfront area	55%	Moderate condition of urban furniture where some of the seating needs maintenance as well as moderate quality of available services
Louran waterfront area	27%	Got the lowest percentage due to the lack of parking spots, in addition to the fact that it is now under development, resulting in inferior service quality.
Bir Masoud area	67%	Lack of parking areas along with moderate services and urban furniture.
Indicator: (iv) Healthcare Services		
Study area	%	Actual Condition for related settings
Qaitbay waterfront area	70%	Health care services are available as it is an important touristic attraction area
Ras El Tin area	60%	There is a healthcare medical office available near there but it needs improvements
El Selsela Park area	0%	These areas rely on mobile ambulance services
Cleopatra waterfront area	0%	
Louran waterfront area	0%	
Bir Masoud area	0%	

Table 5: Percentage and observation of Environmental Characteristics Attributes in each site under study, by authors.

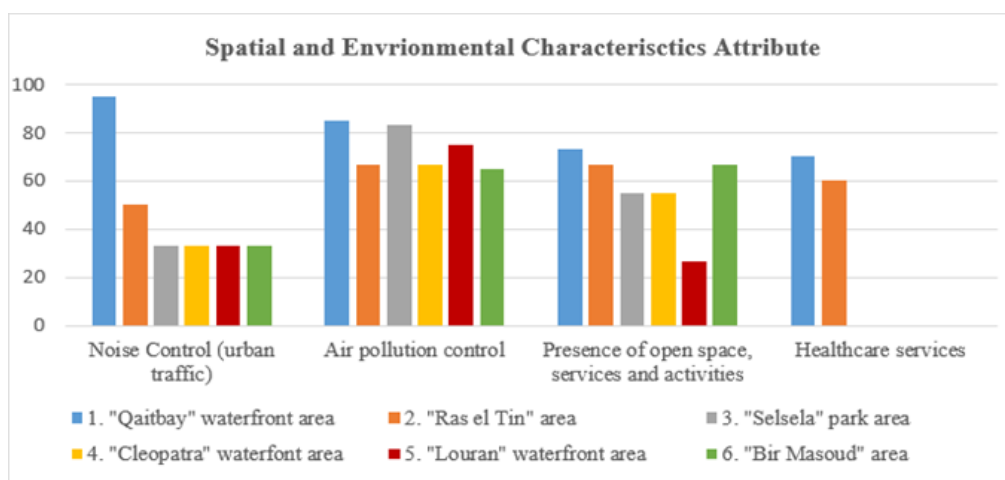


Figure 7: Percentages of Spatial Environmental Characteristics Indicators in the understudy areas, by authors.

6.3 Social Wellbeing Attribute

Social wellbeing is also assessed by evaluating and observing several indicators, they are demonstrated in table 6.

SOCIAL WELLBEING	INDICATORS	SUB - INDICATORS
	i. Presence of spaces, services and activities suitable for children	Availability of Childcare facility Quality of available childcare facility Percentage of open childcare space
ii. Economic opportunity and social cohesion	Socio-economic level Social Cohesion	
iii. Perception of safety	Sense of safety Availability of threat Type of threat (if available)	

Table 6: Indicators assessed in the Social Wellbeing Attribute, by authors.

Indicator: (i) Presence of Spaces, Services and Activities Suitable for Children		
Study area	%	Actual condition for related settings
Qaitbay waterfront area	0%	No playing area for children available
Ras El Tin area	60%	There is a playing area for children but of poor condition
El Selsela Park area	15%	No playing area for children available, however they can play in the green areas available
Cleopatra waterfront area	89%	There is a playing area for children alongside the cafés and restaurants situated there
Louran waterfront area	0%	No playing area for children available
Bir Masoud area	0%	No playing area for children available
Indicator: (ii) Economic Opportunity and Social Cohesion		
Study area	%	Actual condition for related settings
Qaitbay waterfront area	89%	The highest percentage, because the majority of visitors are tourists and the location provides excellent opportunities for social cohesion
Ras El Tin area	50%	It allows high social cohesion opportunities among residents, however the people are of moderate socioeconomic and economic status.
El Selsela Park area	67%	They are equal in percentages because they receive residents of similar socio-economic level. Social cohesion is high but less than that at Qaitbay waterfront area.
Cleopatra waterfront area	67%	
Louran waterfront area	67%	
Bir Masoud area	65%	It allows very high social cohesion opportunities among residents, however the people are of moderate socioeconomic and economic status specially visitors from neighbouring rural areas.
Indicator: (iii) Perception of Safety		
Study area	%	Actual condition for related settings
Qaitbay waterfront area	89%	High sense of safety as they are crowded with people during the daytime, especially on weekends. However the presence of beggars results in the slight decrease of security perception
Ras El Tin area	56%	May experience more risks than other areas because of their lower socioeconomic status. However, it is crowded with people during the daytime and at night especially on weekends and in the summer.
El Selsela Park area	56%	Sense of safety at El Selsela park area decreases at night because the street lights are inadequate, thus people avoid going there after it gets dark
Cleopatra waterfront area	89%	High sense of safety as they are crowded with people during the daytime especially on weekends. However the presence of beggars results in the slight decrease of security perception
Louran waterfront area	67%	Even though streetlights in the Louran area are also inadequate at night, but with the presence of nearby cafes, people feel safer there than they do in the El Selsela park area
Bir Masoud area	56%	May experience more risks than other areas because to their lower socioeconomic status. However, its crowded with people during the daytime and at night especially on weekends and in summer.

Table 7: Percentage and observation of Social Wellbeing Attribute in each site understudy, by authors.



Figure 8: Open Spaces at (a) Selsela park area, (b) Ras El Tin area and (c) Louran waterfront area, by authors.

Table 7 illustrates percentages and observation of each site understudy in Social wellbeing attribute.

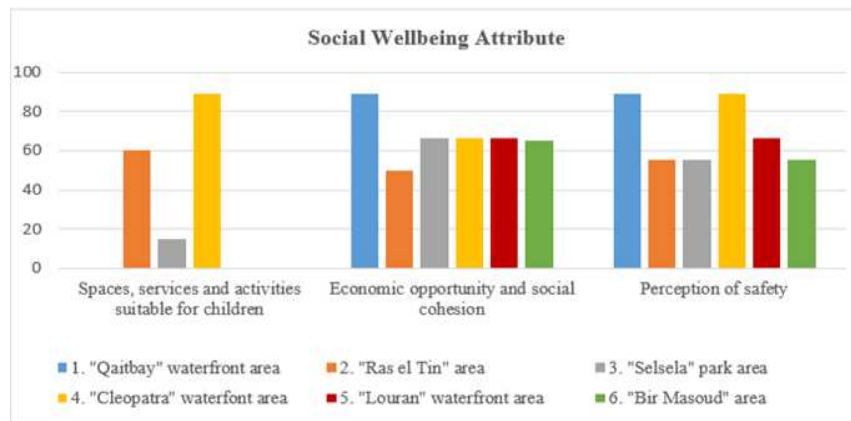


Figure 9: Percentages of Social Wellbeing indicators in the six areas understudy, by authors.

6.4 Security and Safety from Natural Disaster, Crime and Injuries

Indicators and Sub-indicators that are used to assess security and safety from natural disaster and crime are illustrated in table 8.

SECURITY AND SAFETY from natural disaster, crime and injuries	INDICATORS	SUB-INDICATORS	
	i. Security and Accessibility		Surveillance
			Security presence
			Low level of crime
			Sightlines and clear visibility
			Clear access points
			Convenient access points
	ii. Endurance to Natural Disaster		Clear boundaries of space
	iii. Design Elements (to prevent any crime or injuries)		Endurance of space from natural disaster
			Quality of paving materials
		Smooth and safe pedestrian movement (no obstacles)	
		Clear pedestrian routes	
		Lighting levels of space	
	Density of visitors		

Table 8: Indicators and Sub-indicators assessed in the Security and Safety Attribute, by authors.

Table 9 illustrates percentages and observation of each site understudy in Security and Safety Attribute

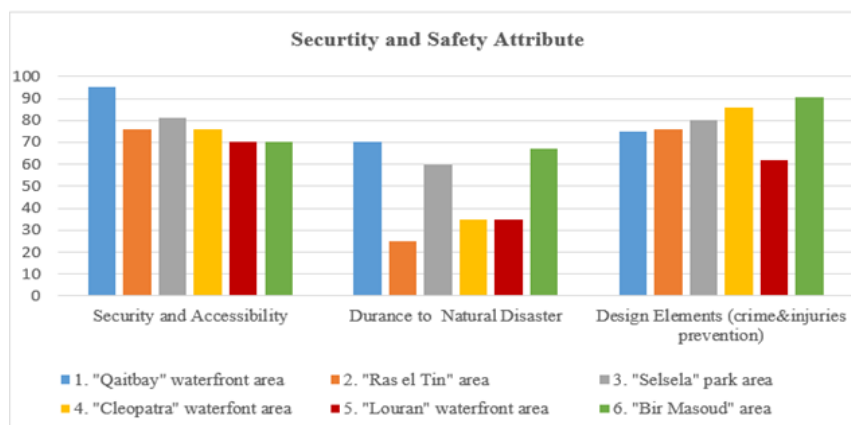


Figure 10: Percentages of Safety and Security indicators in the six areas understudy, by authors.

Indicator: (i) Security and Accessibility		
Study area	%	Actual Condition for related settings
Qaitbay waterfront area	95%	It is found to be the highest. Due to the importance and significance of the Qaitbay waterfront area as a main attraction site for tourists in Alexandria City, there is constant surveillance and security presence to reduce the level of crime. There are also clear and convenient access points to the area. However, some buildings there are under development that slightly reduces the clear visibility of the whole area.
Ras El Tin area	76%	It is near a military base and has clear accessibility points, however these access points need improvements to be more convenient.
El Selsela Park area	81%	It is near a military base and has clear and convenient accessibility points.
Cleopatra waterfront area	76%	Has relative high percentage of security in addition to clear and convenient accessibility points.
Louran waterfront area	70%	Has moderate percentage of security, however there are clear and convenient accessibility points.
Bir Masoud area	70%	
Indicator: (ii) Endurance to Natural Disaster		
Study area	%	Actual condition for related settings
Qaitbay waterfront area	70%	Endurance is high due to water catchments installed around the area.
Ras El Tin area	25%	Endurance is low because it is mainly a beach that makes it very susceptible to any changes of the sea and some of the restaurants and cafeterias are on the beach.
El Selsela Park area	60%	Percentage is moderate because there is a military base there that has catchments installed to prevent any harm.
Cleopatra waterfront area	35%	Endurance is low due to the proximity to the sea and susceptibility to its effects.
Louran waterfront area	35%	
Bir Masoud area	67%	Endurance is relatively moderate to high because its level is higher than that of the sea level and the main street as well.
Indicator: (iii) Design Elements		
Study area	%	Actual condition for related settings
Qaitbay waterfront area	75%	Design elements are affected, due to current development taking place there.
Ras El Tin area	76%	Area receives high density of residents. However, smoothness in movement and lighting levels of space are moderate in level.
El Selsela Park area	80%	Good condition of paving materials. There is smoothness in movement and clear pedestrians paths, however the area has low lighting levels at night.
Cleopatra waterfront area	86%	Good condition of paving materials, smoothness in movement and clear pedestrians paths.
Louran waterfront area	62%	Lowest in percentage due to the developments that are currently taking place there.
Bir Masoud area	90%	Good paving materials, high density of visitors, smooth movement in the area and adequate lighting levels.

Table 9: Percentage and observation of Security and Safety Attribute in each site under study, by authors.

6.5 Quality of Life in each of the areas under study

Combining the attributes evaluated above: a) Emotional Wellbeing, b) Spatial and Environmental Characteristics, c) Social Wellbeing, d) Security and Safety from Natural Disaster, e) Crime and Injuries of each site, it is possible to determine the quality of each of the areas under study, illustrated in the Table 10, below. Impact of indicators are calculated with equal weights to assure maximum value of quality of life to all study areas.

Indicators	Emotional wellbeing	Spatial and Environmental characteristic	Social wellbeing	Safety and security	Total score	Total Quality of life
Area under study	Out of 400	Out of 400	Out of 300	Out of 300	Out of 1400	%
Qaitbay waterfront area	220	323	178	235	956	68.3%
	The Qaitbay waterfront area has the highest quality of life, as it is one of the primary tourist destinations. Nevertheless, quality of life there is affected by lack of green areas, lack of children facilities and development taking place there. However, the percentage of its quality of life is projected to rise once the developments there are completed.					
Ras El Tin area	229	244	166	177	816	58.3%
	Quality of life in the Ras el Tin area is considered low because of the few green areas with only some trees and palm trees, low maintenance and quality of services, moderate condition of space, and is near traffic causing noise. Moreover, it has low endurance to any natural risks.					
Selsela park area	348	171	138	221	878	63%
	The Selsela Park area has moderate quality of life as it is very close to traffic, has no parking, no kid-friendly amenities, and is dark at night. However, it has a large green area and good endurance to any natural risks.					
Cleopatra waterfront area	242	155	245	197	839	60%
	The Cleopatra area contains a path only for pedestrians, where they can walk and exercise freely. However, some of these paths are obstructed by cafes and restaurants. Its percentage can be considered moderate due to several factors such as: lack of green areas, some of public seating needs repair, proximity to traffic which results in loud noise from car horns, especially during the rush hours/ Moreover it has low endurance to any natural risks.					
Louran waterfront area	309	135	134	167	745	53.2%
	The Louran area has the lowest quality of life percentage, which is likely due to the ongoing development there, where green spaces are still being refurbished and finishing touches are still being added. It is also near to traffic and has no children friendly area.					
Bir Masoud area	257	165	121	227	770	55%
	Quality in the Bir Masoud area is considered as low, due to the absence of green areas and trees and being situated near car traffic. Moreover, there is no nearby medical healthcare facilities and no security presence.					

Table 10: Quality of Life for each area under study, by Authors.

7 DESIGN GUIDELINES AND RECOMMENDATIONS

The analytical assessment demonstrating the integrative approach is represented according to the impact of the measured aspects collectively as per Figure 11 (below). The results shows that there is always capacity for integrating solutions related to spatial configurations in order to simulate visitors experience in the selected site. However, as the analysis demonstrates, the impact varies between the areas selected due to differences in design capacities and existing infrastructure.

One of the major implications is demonstrating how a longer promenade enhances the visitors' experience such as at "Qaitbay" waterfront area and "Cleopatra" waterfront area, where visitors experience the most social well being aspects due to the variety of activities and the changing views along the waterfront. On the

otherhand, the more contained sites as the “Selsela park” and the “Ras El Tin” area offer more greenery and zones of activities, however, they do need more pedestrianised continuity in the pathways. Using the open areas as cultural hub spaces through gathering and open exhibitions areas for public art works can highlight the local identity of the, which improves the social wellness of the area with low social wellbeing attributes. Organizing seasonal festivals, and cultural events can also encourage social interaction and celebrate community diversity.

Regarding the emotional wellbeing, the research recommends urban greening by increasing the landscaping features with greenery and trees as noticed on the high impact of integrated values in the “Loran” waterfront and El Selsela areas, and moderate at Ras el Teen, meanwhile sites as Qaitbay and Cleopatra lack the benefits of green covers and provided shades. Moreover, green areas and trees reduce ambient temperatures, improve air quality, and lower energy demands for cooling. Designing the waterfront area with therapeutic landscaping elements such as sensory gardens, aromatic plants, and textures can engage the senses and promote attractiveness of the space. Some retail areas promote the use of artificial plants in the last two sites, this decreases the aesthetic values as well as the environmental considerations.

Relatively all the sites require more integration of safety measures by installing well-placed lighting to illuminate pathways, seating areas, and gathering spaces, enhancing the spacial arrangements, furnishings the transitional activities, the quality of sustainable materiality of the furnishings, pavement, and fixtures. Moreover, enhancing the resilience aspects of all waterfront areas to natural disasters is crucial to improve safety and security of areas.

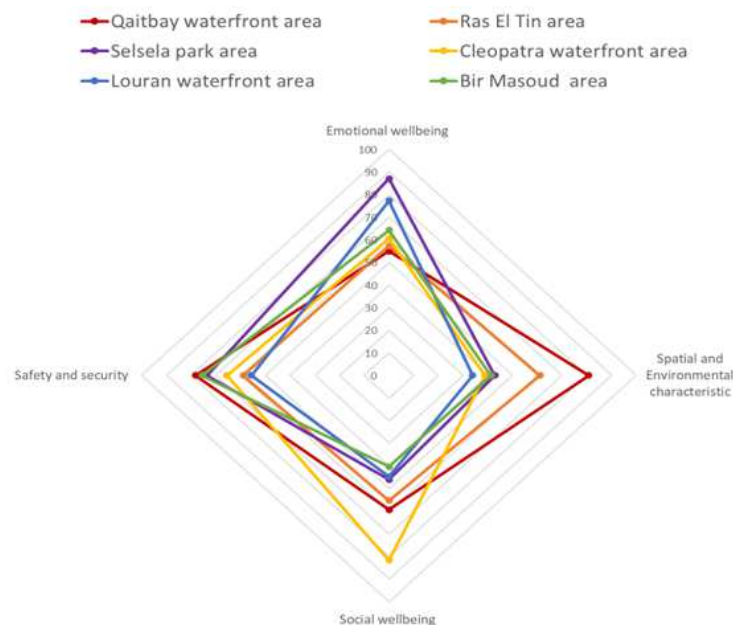


Figure 11: Integrative assesment for selected indicators, by Authors.

8 IMPACT OF URBAN POLICY REGARDING NBS IN SELECTED SITES

The researchers recommendations derived from the model verification of the quality of life in the study areas along the Alexandria waterfront support an integrative urban policy approach. The set of recommendations include socially sustainable and responsible mobility solutions.

The researchers promote the idea of “Green and Blue Infrastructure” as natural infrastructure linking the whole territory of a city by integrating green spaces, parks, and pedestrian-friendly waterfront promenades into the planning tools. Implementing green and blue infrastructure involves creating a network of interconnected natural and semi-natural features in urban waterfronts, which is also stated in the authorities’ strategic planning procedures. Community responsiveness towards existing and future interventions should be integrated in the decision making process. For example, Green and Blue Infrastructure contributes to monitoring extentions of retail facilities, which takes into account spatial potentials as well as social, economic and cultural factors.

Green and Blue infrastructure attracts tourism, improves property values, and stimulates economic development, particularly in waterfront urban areas that prioritise sustainable and nature-oriented design.

Another nature-based solution is incorporating green roofs into waterfront buildings. as it can help manage the strain on urban drainage systems during rain, and improve water quality. Green roofs can also contribute to energy efficiency by insulating buildings and reducing the urban heat island effect.

Finally, the recommendations for improvements along the waterfront of Alexandria also concern the societal responsiveness to the deterioration of the distributional and procedural efficiency of plans, the need to provide choices, as well as incorporating public contribution into the short and long term processes of decision making.

9 CONCLUSION

The research findings support the integration of citizens' contribution in the decision making process to confirm the consistency of policies and planning processes which will maintain the characteristics of Egyptian cities, bearing in mind the need to control change and inform new development attempts along the extended waterfront.

The green and «blue» spaces in and around the city fulfil an increasingly important role in the welfare of Alexandria's inhabitants and as criteria for businesses to establish themselves in the city. Positioning itself as an international attractive city Alexandria should use its events as an occasion to foster not only the core of the metropolitan area, but also the neighbouring cities.

The findings of the Assessment Model «QLWS» highlight how implicit opinion of expertise in combination with bottom-up consultation procedures can impact new policy formulation. They recognise the role of current and future voices in upgrading level of services and quality of life provided on the waterfront. They recognise that accessibility, transport, joint events, communication and marketing will become priority measures to ensure the success of future regeneration of communities and overall potential of Alexandria waterfront.

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