Spatial Characteristics of Urban Waterfronts: Evaluations on the Historical Waterfronts of Istanbul

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Abstract

In the second half of the 20th century, urban waterfront development began in North America and spread around the world. During the development process, urban waterfronts were assigned various functions, however following their spatial transformation, various problems such as weak interaction with water, weak physical accessibility, and the loss of historical identity have occurred directly affecting open spaces. Since the 19th century, the transformation of Istanbul waterfronts has occurred in parallel to the urban development process but without being a part of holistic planning approach. In time, the loss of open spaces, the lack of qualities such as the spatial interaction with water, the weak accessibility by public transportation and the lack of diversity for recreational activities have grown into common problems. This article discusses the results of a study focused on the spatial characteristics of open spaces especially referring to historical waterfronts (Eminönü, Karaköy, Kadıköy, Üsküdar, Beşiktaş) in consideration with the qualities of 'water-based environment', 'connectivity and continuity', 'imageability', 'compatibility' and 'looseness'.

Introduction

Since the early ages, waterfronts have been prospering as urban areas by gaining various functions, predominantly in relation to trade, transportation, recreation and communal activities provided by the water source (Mumford, 1961; Hartshorn 1992; Kostof, 1992). During the 19th century, most of the waterfront cities experienced a period of industrialization. Together with the port areas and docks, specific industrial production activities occupied waterfronts (Bruttomesso, 2001; Marshall, 2004; Meyer, 1999; Hoyle, 1992; Breen & Rigby, 1996).

In the second half of the 20th century, due to abandoned port and production activities, development was launched regarding spatial and functional characteristics of urban waterfronts, which originated in North America and spread all over the World (Hoyle, 1988; Bruttomesso, 2001; Marshall, 2004; Meyer, 1999; Hoyle, 1992; Schubert, 2012). During the development process, urban waterfronts began to function as marinas, ferry terminals, cruise ports, shopping and entertainment spaces, parks and promenades, concert venues and festival areas, and as a variety of open spaces (Kibel, 2007; Gastil, 2002;Dovey, 2005 ; Marshall, 2004; Meyer, 1999; Breen & Rigby, 1996).

Following the spatial and functional transformation, waterfronts have become multi-purpose (Gastil, 2002) urban areas with various potentials such as improving the image of the city and re-opening the water's edge to urban life. Beside the potentials, various problems such as dense privatization, large-scale development (Meyer, 1999), lack of spatial integration with the water (Breen and Rigby, 1996), incompatibility between multiple activities (Moughtin, 2003), weak connections with the rest of the city and the loss of waterfront identity (Bruttomesso, 2001) have emerged that were affecting the open spaces on waterfronts adversely. Also, some other particular consequences, which may have affected the spatial characteristics of open spaces on waterfronts can be summarized as follows: car dominance, large scale passive open spaces, lack of destinations and other necessary services, and individual architectural entities having no relation with its urban context (Project for Public Spaces, 2000).

Today, the urban waterfronts development which still continues, is defined as the fourth cycle of the post-industrialization period or the first cycle of a new phase which acquired a broader meaning as waterfronts take on urban characteristics (Shaw, 2001; Desfor and Laidley, 2011; Schubert, 2012). In particular, related to recreational and socio-cultural activities, waterborne transportation and other services such as waterfront parks, promenades, beaches, open-air museums, open spaces of education facilities or decks of ferry terminals have become the main urban open spaces on waterfronts.

This study aims to demonstrate the results of a study concentrated on the spatial characteristics of open spaces on urban waterfronts which developed during the post-industrialization period. In consideration with the case of Istanbul, which is located at the water's edge, specifically the research has converged on the following questions focused on the urban areas of Istanbul (Eminönü, Karaköy, Kadıköy, Üsküdar, Beşiktaş), where three historical waterfronts meet: How have the historical waterfronts of Istanbul developed since the 19th century regarding open space use? What is the level of access to open spaces on historical waterfronts and what is the role of waterborne transportation services for access to these open spaces? What are the spatial features that stand out with respect to the integration of the water?

The notion of open space on urban waterfronts

During the post-industrialization period, open spaces were created in a planned manner with the idea of bringing urban life back to the waterfronts. In relation to this approach, physical connections, spatial integration with

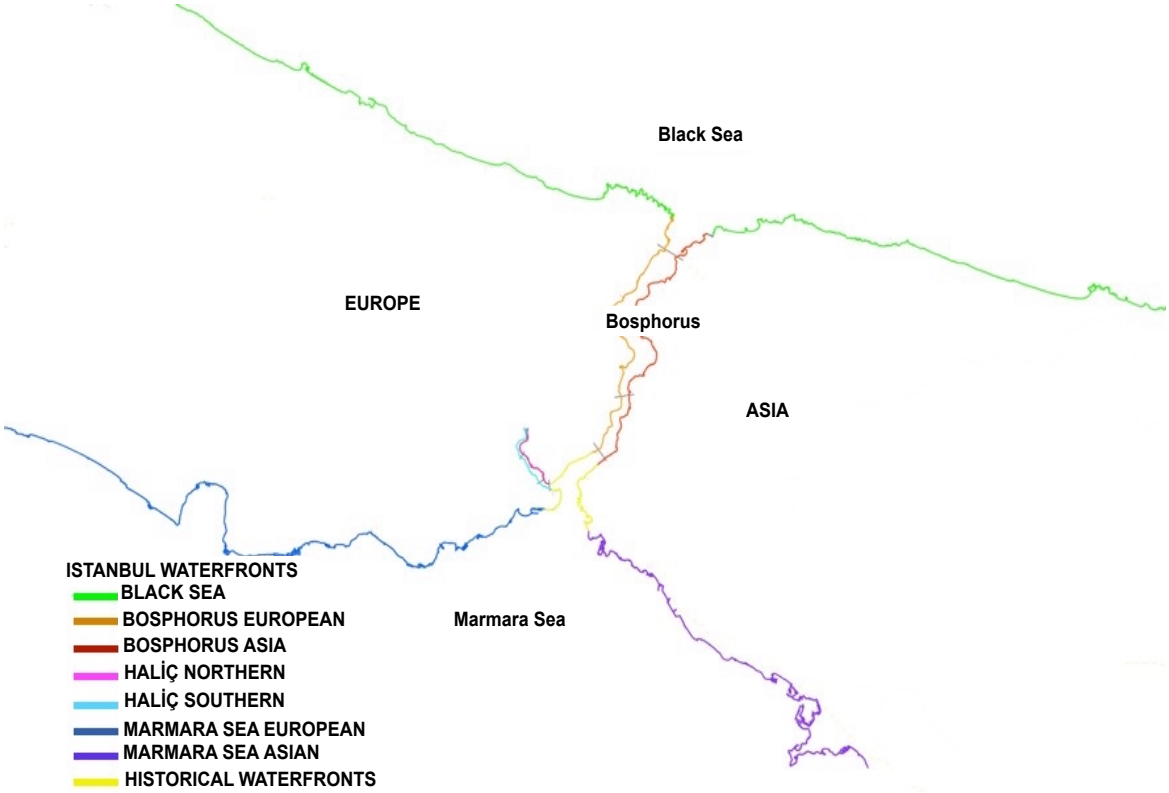

Diagram 1: İstanbul waterfronts

the water, diversity of activities, urban identity and the compatibility of various functions were taken into consideration. In general, the studies about urban open spaces on the waterfronts focused on, firstly the interaction with the water, then accessibility, variety of activities and their spatial organization, innovative design approaches, strengthening the role of open spaces on the waterfront identity and providing spaces for temporary outdoor activities.

Due to their location at the water's edge, the waterfronts were naturally expected to be integrated spatially with the water (Marshall, 2004; Breen and Rigby, 1994). Specifically, the mental and physical rehabilitation effect of the water revealed the importance of visual and physical interaction with it on open spaces (Torre, 1989). In this case, the waterfront spaces adjacent to the water, supporting water access were decisive for the water-related environment (NYPC, 2017). Furthermore, water-based recreational activities such as swimming and fishing play an important role in terms of interaction with the water since they cannot be performed without the existence of a water source. In addition, activities such as visiting a public art exhibition, attending a religious ceremony, hiking, getting fresh air, cycling, running and many other recreational activities support the relation with the water. Also, associated with those recreational and social activities, the open spaces such as parks, beaches, promenades or pavilions provided a high quality spatial relation with the water (Craig-Smith et al, 1995).

The physical connections such as pedestrian ways, streets or bridges are also categorized as open spaces that give access to the waterfronts. These connections provided linkages between open spaces, which were important for the liveability of spaces and realization of activities (Gehl, 2011). Moughtin (2003) argued that, although large-scale open spaces were divided into small-scale ones on Canary Wharf, the lack of an access plan in relation to the city considering the streets, squares and parks did not support the open space usage. In this case, the accessibility of the waterfronts is one of the main components for providing opportunities that bring people together and enable them to socialise.

Bruttomesso (2001) showed that spatial relationality was the most important element in his studies. Additionally, the development had three main criteria for determining the distinctive features of urban waterfronts: multiple functions, various activities and the co-existence of open spaces, and other types of areas. On the other hand, Moughtin (2003) drew attention to the incompatibility that might occur between economic functions, recreational activities and waterborne transportation, which altogether established an active relation between urban life and the water.

The expectations of the users also matter in terms of physical, visual and functional access to open spaces. Stevens (2009) referred to three expectations of users, particularly in reference to temporary recreational spaces on the waterfronts: flexibility, innovation and escapism (Dovey, 2005; Franck & Stevens, 2006). From a broader perspective, flexibility is shown to be an important component of successful waterfront developments. Also Moretti (2008) mentioned that temporary activities on the waterfronts led to the discovery of new urban spaces. In

addition, Lehtovuori (2005) stated that activities played an important role in the production of new urban areas, as in the case of Helsinki where the activities were becoming so routine in the spaces that users were constantly demanding open spaces.

Case Study: Istanbul

The spatial characteristics of open spaces on Istanbul Waterfronts

Istanbul is an historical waterfront settlement and port city located on the continents of Europe and Asia, where the Bosphorus connects the Black Sea and the Marmara Sea by passing through the European and the Asian sides of Istanbul. Together with the Marmara Sea, Haliç, a natural extension of the Bosphorus, defines the Historical Peninsula waterfronts that constitute the historical center of Istanbul (Diagram 1).

The waterfront development movement that emerged in the 1970s in North America was emulated in Istanbul by the late 1980s, when the planning activities were carried out after de-centralization of industry from the waterfronts (Bilgin et al., 2010; Kuban, 1998; Müller-Wiener, 1998; Özgencil, 2008). During the period 1980-2000, together with de-industrialization, private investments emerged on the waterfronts, functioning as tourism and retail services.

Today, in addition to the private investment areas, water-dependent economic activities such as ports on the Marmara Sea waterfronts and recreational activities on the Black Sea waterfronts have proliferated, while the European side of the Bosphorus waterfronts are continuously lined with recreational areas such as parks and promenades. On the historical region of Eminönü,

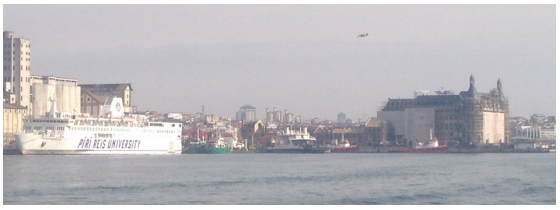

Image 1: Haydarpaşa Train Station Building and Harbor on Kadıköy Waterfronts (Photo: S.Secmen)

Image 2: Lighthouses and Bosphorus Bridge at the back, view to Üsküdar Waterfronts (Photo: S.Secmen)

the
Karaköy, Kadıköy, Üsküdar and Beşiktaş waterfronts (Diagram 2), where the waterbodies of Marmara, Haliç and Bosphorus meet, water-dependent economical activities such as commercial ports and a cruise port, waterborne transportation, retail and other types of commercial services are run. Consequently, the historical waterfronts acquire high rates of mixed-use functions among the rest of the Istanbul waterfronts, where commercial entertainment and economic functions are in dominance. Furthermore, the historical waterfronts include the most important historical, cultural and urban

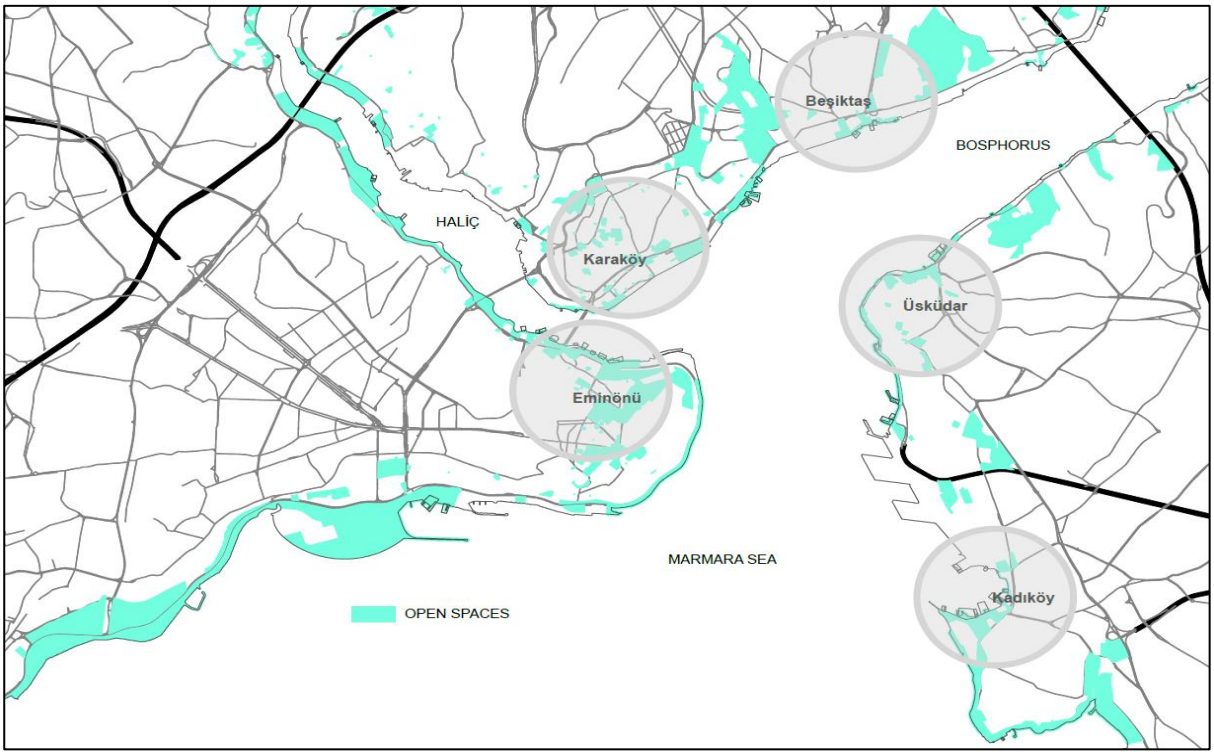

Diagram 2: Historical waterfronts location and areas

components of Istanbul such as Historical Peninsula skyline, the historical Galata waterfronts and Haliç shipyards, Bosphorus villages of Beşiktaş and Üsküdar, the Maiden's Tower, Haydarpaşa Train Station and harbor, Galata Bridge, Bosphorus Bridge, lighthouses and various piers (Image 1 and Image 2). Also, this unique waterfront area is the only waterborne transportation node and has the most vibrant waterfront of Istanbul.

However, due to its dense urban context, the open spaces are limited. Eminönü, Karaköy, Kadıköy, Üsküdar and Beşiktaş areas are intertwined in a complex manner with waterborne transportation, recreational activities, socio-cultural and economic relations. In this case, the public transportation node and the piers, the recreational activities such as watching scenic views or fishing, the socio-cultural areas such as the squares, streets and open spaces around religious buildings are all integrated with the commercial services (Diagram 3).

The main spatial issues on the historical waterfronts of Istanbul

As a result of the rapid urbanization in Istanbul since the 1940s, the total of open areas on the waterfronts gradually decreased, while Istanbul expanded away from the waterfronts and spread towards the peripheries (Kuban, 1998). In addition, large-scale urban investments such as highway bridges, modern ports and motorways have had significant effects on the waterfronts (Bilgin et al., 2010; Yalçıntan et al., 2014). Although several planning decisions have directly or indirectly affected the waterfronts, waterfront planning or management studies have not been conducted in any period within a holistic approach.

In the 19th century, the historical waterfronts were aligned mostly with piers on the water's edge and with the large commercial buildings behind the water's edge of Eminönü and the Galata Harbor and with the financial center behind the waterfront of Karaköy. Later, in the 20th century, the relationship of the city center with the water's edge became more commercial due to piers, shops, shipyards and the fish markets (Bilgin et al., 2010; Kuban, 1998; Müller-Wiener, 1998; Akın, 2011; Akın, 1998). Under those conditions, the limited space in the Istanbul Harbour prevented open spaces from being integrated into it, while traditional water spaces such as passenger piers were fragmented due to irregular growth of the harbour, which limited the conjunction with the water (Erkal, 2011).

On the other hand, the local water-dependent economy associated with urban open spaces - such as the fish market or other market areas, as well as the traditional pier squares where waterborne transportation, local economy, social and cultural life and recreation were intertwined - has lost ground. However, fishing activity has always been an important recreation for constructing the image of Galata Bridge (Müller-Wiener, 1998; Akın, 2011; Özler, 2007) (Image 3).

In time, the loss of open spaces, the lack of spatial qualities, such as the spatial and functional interaction with water, the weak accessibility by public transportation, poor

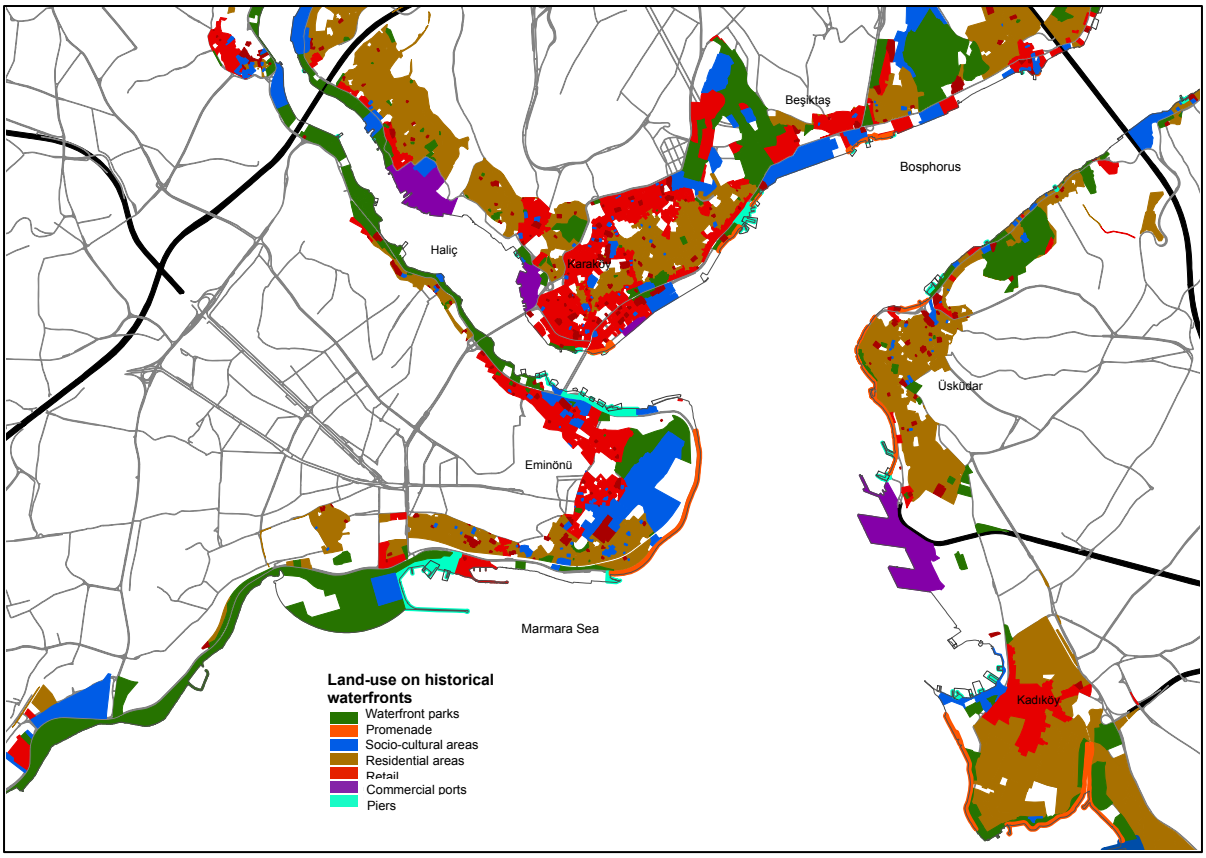

Diagram 3: Land-use analysis of historical waterfronts

Image 3: Galata Bridge (above) and waterborne transportation node on Karaköy Waterfronts (below) (Photos: S.Secmen)

pedestrian access and the lack of diversity for recreational activities became the main issues of historical waterfronts. Although accessibility is the priority problem, the lack of spatial continuity of uses and the loss of importance of waterborne transportation have also been identified as relevant issues. Especially the negative impacts of vehicular roads on physical and visual access, which are located parallel to the water's edge, have been ongoing since the 1940s (Bilgin et al., 2010; Kuban, 1998). On the other hand, it is a challenge for urban open spaces which are under pressure of private investments to expand. Even the existing large-scale area with the potential of transformation into an urban open space is being renovated as a highly privatized cruise terminal.

The main spatial and functional issues that emerged on the historical waterfronts in relation with open spaces may be summarized as follows:

(i) The water-dependent local economies such as fishing and related activities have been replaced by global investments such as cruise terminals, which are located on the historical city waterfronts. Instead of opening the waterfront to public use, the abandoned harbour of Galata has been transformed into a private area for investments: cruise terminals and retail facilities that circumvent public usage.

(ii) Since it is questionable for the spatial expansion of open spaces to occur due to the dense urban context, lack of diversity of open spaces and activities - specifically recreational ones - do not inspire users to spend time on the historical waterfronts. For instance, the existing recreational spaces are only limited to fragmented walkways or small rooms for sitting. Consequently, open spaces are used for necessary urban activities such as transportation or retail during certain daytime periods.
(iii) The loss of importance of waterborne transportation as a public service from the historical waterfronts to the rest of the city has weakened accessibility. Nevertheless, the area has the strongest waterborne transportation connections within its boundaries, providing strong accessibility by water to its five centres. Moreover, the area is at the intersection of other types of public transportation and it consists of five different transfer centres that make it highly accessible from the rest of the city.

(iii)The motorways running parallel to the water's edge impede visual access to the water and physical access to the waterfront. However, being the historical centre, the area includes a wide range of cultural and architectural entities on the waterfronts. The significant form of the water's edge provides various scenic views in various directions, specifically in particular locations such as Kadıköy and Üsküdar that carry high potential for recreational activities. Also, the existence of water-dependent historical port areas such as the Haliç shipyard and Haydarpaşa Port constitute important components of urban identity to be appreciated.

Evaluation of the spatial characteristics of Istanbul waterfronts

Methodology

The aim of this paper is to discuss the results of a study focused on the spatial characteristics of Istanbul waterfronts, denoting in particular the historical ones where the three waterfronts meet: Eminönü, Karaköy, Kadıköy, Üsküdar, Beşiktaş. The evaluation of spatial characteristics of open spaces on urban waterfronts have been developed in consideration with the five parameters developed through the research: 'water-based environment', 'connectivity and continuity', 'imageability', 'compatibility' and 'looseness'.

The criteria were developed from the theoretical studies and twenty-four different research and development projects (Diagram 4) such as New York Waterfront Vision Plan, 2016; New York Waterfront Design Guide, 2016; Excellence On The Waterfronts Award Programme, 1994; Turning The Tide Research Report, URBED, 2003; Thames Blue Ribbon Network Policies, 2011; Chicago Waterfront Development Plan and Riverwalk Design Guide, 1997; Barcelona Moll de La Fusta Planning, 1998; Aker Brygge Waterfront Project, 1980; Akerhus Waterfront in Oslo; Baltimore Inner Harbor Development, 1975; New York Battery Park Planning, 1980; HafenCity Development Project, Hamburg, 2000; Urban Waterfronts Manifesto, 1999; 'Waterfront' Research Project and Fluid City Paradigm, 2007-2013; Palermo Waterfront Planning Development, 2012; Waterfront Cities and Spaces, Project for Public Spaces, 2000; The Cool Sea Waterfront Communities Project, 2007; Fluid City Theory, Dovey, 2005; Harborscape Workshop, Aalborg, 2005; Amsterdam Open Space Planning, 1995; Development of Amsterdam Canals as public event space, 1990-2010; Oslo Fjord City Programme, 2030; San Francisco Waterfront Development, 1960-2000; Kopenhagen Waterfront Develoment and water-recreation parks, 1980-2010.

The spatial components of open spaces were classified as 'spatial qualities', 'activities', 'socialization',

'accessibility' and 'commercial services' (Diagram 4). The theoretical background of waterfront development considers mainly the interaction with water (Marshall, 2004; Breen and Rigby, 1996; Malone, 1996; Stevens, 2009), the accessibility of the waterfronts (Breen & Rigby, 1996; Bruttomesso, 2001; Moughtin, 2003; PPS, 2018; Smith & Ferrari, 2012), the diversity of activities and their spatial organization (Bruttomesso, 2001), innovative design approaches (Carta, 2012; Meyer, 1999), the significance of urban identity (Bruttomesso, 1999) and the occurrence of temporary activities (Stevens, 2009; Dovey, 2005; Meyer, 1999; Carta, 2012, Moretti, 2008). Due to the classification of spatial components, the criteria were categorized as 'water-based environment', 'connectivity and continuity', 'imageability', 'compatibility' and 'looseness'.

The water-based environment criterion assesses mainly the level of spatial and functional integration of open spaces with water. It focuses on the identification of characteristics of open spaces in terms of interaction with the water. In particular, the presence of spaces adjacent to the water, waterborne transportation services (ferry, etc) and water-dependent recreational activities such as fishing or swimming enhance the interaction with the water and also diversify the relation between the water and activities. In this case, the spatial components of this criterion are water spaces, waterborne transportation facilities, water-dependent recreation, water-related recreation (walking, running, etc), water-dependent economic activities (fishing), services such as eating, shopping, water quality and access to water, the form of the water's edge (bay, etc), design quality and comfort, type of spatial integration with water and the characteristics of view of water.

The continuity and connectivity criterion evaluates the continuity of physical, visual and functional access of open spaces along the waterfront, from the inner parts to the water's edge to the rest of the urban areas. In this case, public transportation, pedestrian paths, visual corridors and unobstructed views and functional variety are the main considerations of this criteria.

The imageability criterion deals with the legibility of the image of waterfronts and components of each urban waterfront's identity. The criteria considers the waterfront as a whole rather than identifying open spaces as isolated image components of the city. Since the imageability of the waterfronts positively influence the usage of open spaces, they are considered as supportive components for the visibility and legibility of the waterfronts in relation to the criteria. The spatial components of this criterion are the waterfront image and legibility, collective meaning of waterfront areas, communal events on the waterfronts, the built and natural identity of the waterfronts, permeability and scale.

The compatibility criterion explores the problems and the conflicts that may occur between open space activities and other functions not limited to, but specifically related with the highest potential for conflicts between waterborne transportation and water-dependent recreational activities. The spatial components of this criteria are the diversity, hierarchy and spatial relations between functions and the potential for liveability of open spaces.

The looseness criterion assesses the level at which open spaces on the waterfronts are capable of adaptation to spatial changes. It also studies the spatial properties that support the occurrence of spontaneous activities. The spatial components of this criterion are potential for

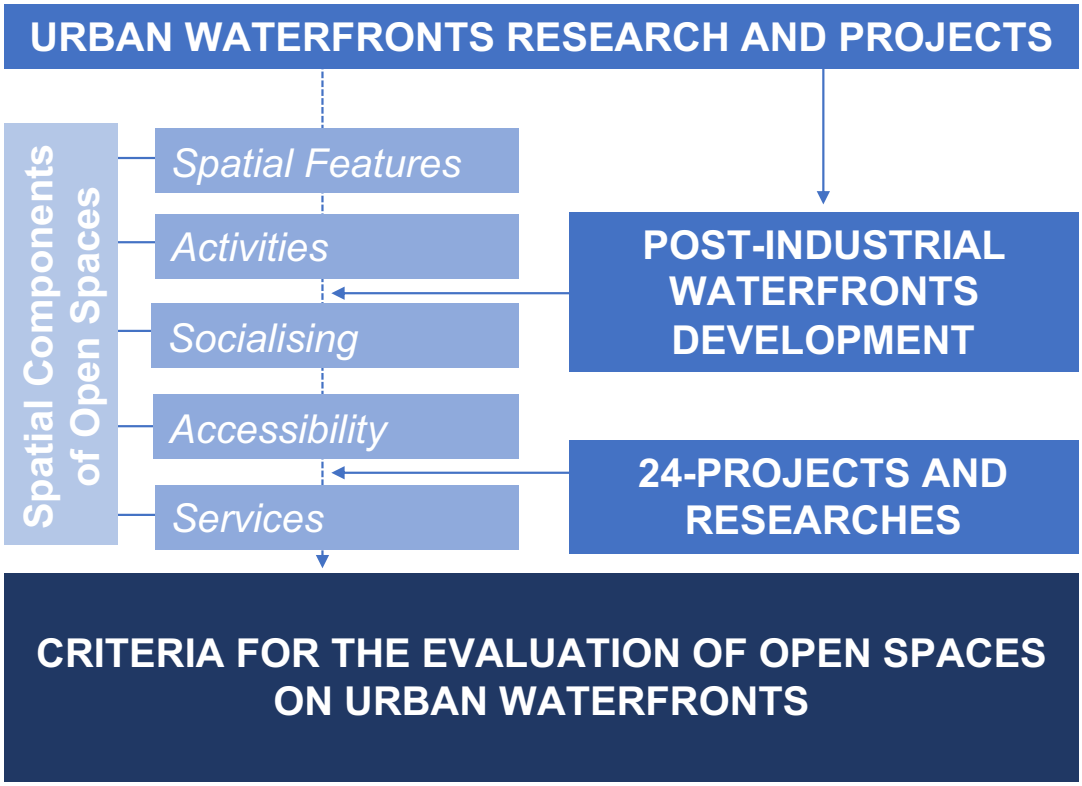

Diagram 4: The method of the identification of criteria for the evaluation of open spaces on urban waterfronts

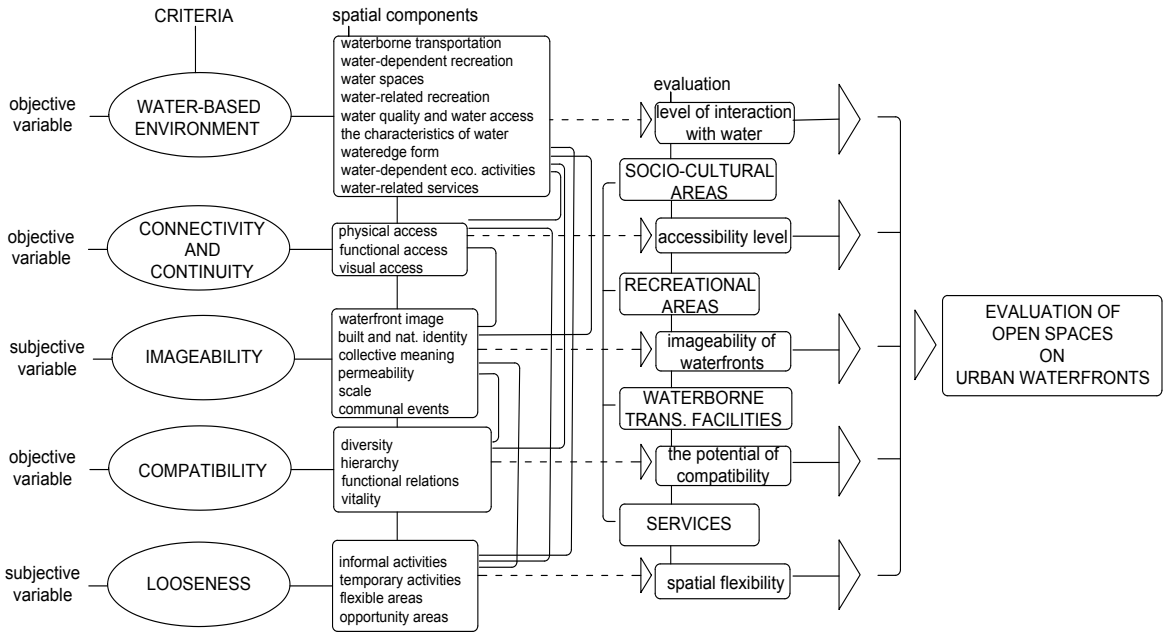

Diagram 5: Model proposal

informal activities, the spatial flexibility, the existence of temporary activities and the abandoned areas that carry the potential for the transformation into urban open space.

The spatial data of these five criteria are appraised through a scoring system regarding the priority of criteria. The ranking among the waterfronts based on the scores given is carried out according to the method determined within the original research. The model proposal, combining the five criteria in a holistic way is designed for the evaluation of open spaces on any type of waterfronts of any city (Diagram 5). Furthermore, the method combines objective assessments through scoring and subjective assessments, through interviews with twenty scholars from architecture, landscape architecture and urban planning disciplines (architects-8, urban planners-10, landscape architects-2).

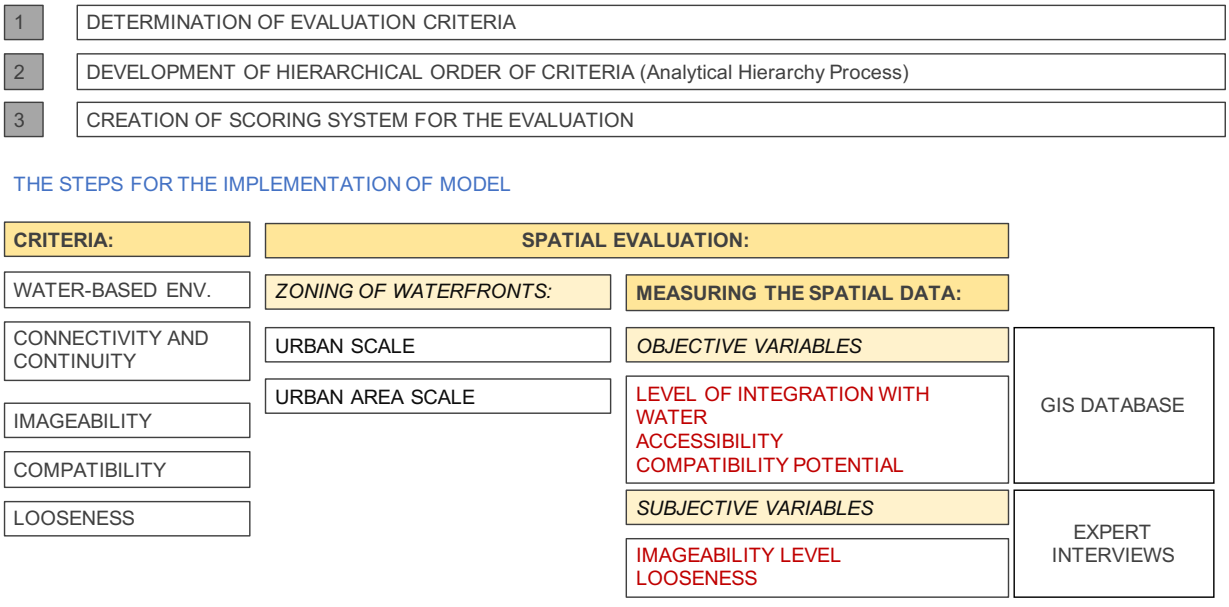

Diagram 6: The steps of method

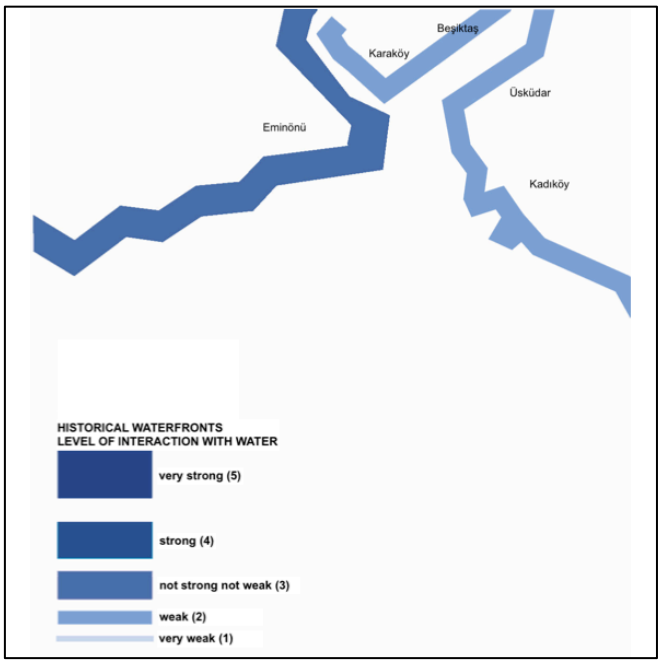

Diagram 7: Level of interaction with water on open spaces

SPATIAL COMPONENTS	Eminönü	Karaköy	Kadıköy	Üsküdar	Beşiktaş	*SCORES*
water spaces	4,06	1,44	2,39	2,28	1,89	**2,41**
waterborne transportation fac.	3,75	1,75	3,25	2,00	1,63	**2,48**
water-dependent recreation	2,74	1,79	1,52	1,56	1,36	**1,79**
water-related recreation	2,58	2,27	2,46	2,04	2,76	**2,42**
water-dependent eco.activities	2,14	2,00	1,75	1,21	1,14	**1,65**
water-related services	2,50	3,17	1,33	0,33	0,50	**1,57**
water quality and water access	1,00	1,00	1,00	1,00	1,00	**1,00**
wateredge form	4,67	4,17	3,67	3,67	3,17	**3,87**
the characteristics of water	5,00	5,00	5,00	5,00	5,00	**5,00**
level of interaction of places with water	**3,16**	**2,51**	**2,48**	**2,12**	**2,05**	
level of interaction of historical waterfronts with water	**2,41**					**weak**
scoring system	0: none / 1:very weak / 2:weak / 3:not strong not weak / 4:strong / 5:very strong					

Table 1: Scores of the level of interaction with water in relation with spatial components of the water-based environment criteria

The election procedure of the experts was established due to their academic background concerning the urban waterfronts' development. The experts were asked to evaluate the statements of the parameters in terms of the spatial characteristics of urban open spaces on Istanbul waterfronts by using a scoring scale (1-5) based on the Likert method. The open spaces on the waterfronts of Istanbul were evaluated through the model in order to identify the levels and performance of the criteria (Diagram 6).

Furthermore, the spatial components of five criteria vary in different scales, and the model is applied at two levels, which are the urban scale and the urban area scale. The urban scale considers the integrated relation between the urban waterfronts with different characteristics in the metropolitan area, while the urban area scale focuses on a specific waterfront area. This article presents the evaluation of the urban area scale.

Results and Discussion

According to the findings, the historical waterfronts stand out due to the performance of spatial characteristics of open spaces on Istanbul waterfronts. Regarding the water-based environment criteria, specifically the waterborne transportation areas and the water spaces such as piers and decks are the decisive factors for the performance of water-based spatial components on the historical waterfronts. However, the water-dependent recreation areas (i.e. spaces for fishing) and also water-related recreation areas (i.e. spaces for walking along the water) are not found to be strong. In the area, Eminönü waterfronts provide the strongest interaction with water in relation with spatial components of the criteria. On the

other hand, the areas having the weakest interaction with water were identified as Üsküdar and Beşiktaş (Diagram 7 and Table 1).

The contribution of the form of the wateredge to the criteria supporting the relation with water has been evaluated as the strongest component (Table 1) due to the distinctive form of Historical Peninsula (Diagram 7), which is surrounded by water including several piers aligned along Eminönü waterfronts towards the Haliç. In this case, the waterborne transportation areas on Eminönü waterfronts have the highest value among the others due to the high density of piers and decks used by ferry passengers for local transportation.

In addition to the pier structures, the Galata Bridge, the walkways along the Eminönü wateredge and the boat parking areas reinforce the performance of water spaces component. The high density of seafood eating services and the water-dependent recreational activities such as fishing and swimming make a positive contribution to the interaction of the area with water. The strength of retail-entertainment services such as food and beverage on the waterfronts of Karaköy supports the attractiveness of open spaces. In addition, the cruise port and the historical shipyard area of Haliç also creates an active waterfront view. On the other hand, recreation areas and water spaces directly related to water cannot be mentioned as making a strong contribution to the relationship of Karaköy area with water.

Due to the bay form of Kadıköy wateredge, the surface of the water becomes the focus, which strengthens the interaction of urban open spaces with water. The piers and the open areas behind the piers, concentrated along the bay, support waterborne transportation; also the walkway, as an extension of the bay, supports water-related recreational activities such as running or watching scenic views. In addition, Haydarpaşa Port and Train Station Building reinforce the effect of being on the waterfront by drawing a dynamic waterfront appearance. On the contrary, water-dependent recreational activities such as fishing are very weak.

The historical Maiden's Tower which is located on the water and very close to the Üsküdar waterfront, strengthens the water-based environment criteria regarding the components of water spaces. The waterfronts of Beşiktaş have a limited water's edge and the lowest value among all waterfronts in terms of the various water spaces, waterborne transportation areas and water-dependent recreational activities.

In terms of connectivity and continuity criteria, the accessibility of the historical waterfronts was found to be easier than the other waterfronts in Istanbul. Especially, on

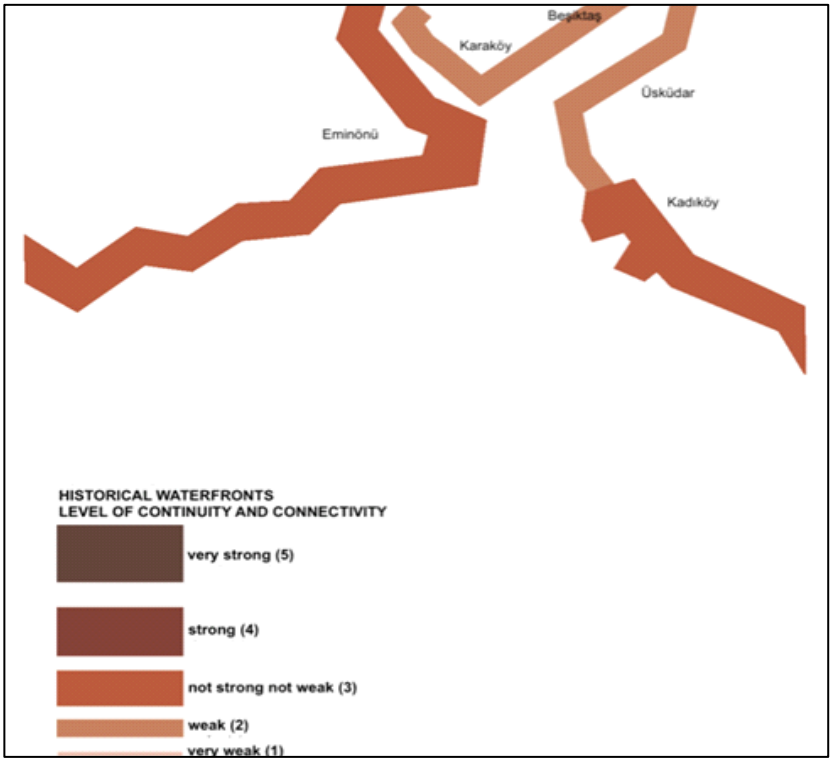

Diagram 8: Level of continuity and connectivity of open spaces

spatial components	Eminönü	Karaköy	Kadıköy	Üsküdar	Beşiktaş	*SCORES*
visual access	3,74	3,29	3,76	3,58	2,90	3,46
physical access	3,12	2,75	3,15	2,89	2,44	2,87
functional access	2,67	2,73	2,63	2,29	2,67	2,60
connectivity and continuity level of places	3,18	2,92	3,18	2,92	2,67	
connectivity and continuity level of historical waterfronts	2,96					WEAK
scoring system	0: none / 1:very weak / 2:weak / 3:not strong not weak / 4:strong / 5:very strong					

Table 2: Scores of the level of continuity and connectivity of open spaces in relation with spatial components

historical waterfronts, visual access is strong since three water corridors intersect. Also, the physical access is strong due to the waterborne transportation nodes and several public transportation transfer centres. Together with the easy accessibility, the diversity of recreational, cultural and service functions greatly support functional access (Diagram 8 and Table 2). Among the historical areas, Eminönü and Kadıköy waterfronts are stronger than the other places in terms of visual and physical access, while all places have similar features regarding functional access (Diagram 8 and Table 2).

In terms of visual access, Eminönü waterfront is very strong due to its scenic waterscape views that the curvilinear form of the edges of the Historical Peninsula provide. This presents a very strong visual access with different perspectives to the other waterfronts within the area. In addition, the historical Galata Bridge which connects the waterfronts of Eminönü and Karaköy makes a significant contribution to the visual access. It is an axis that provides views in all directions. However, the high-density vehicular road along the waterfront constitutes a barrier for accessibility.

The public rail system, high-density public connections of waterborne transportation, the presence of other types of public transportation and the Galata Bridge are the main connection axes on the waterfronts of Eminönü. They strengthen the physical access both within the area and to the other urban areas in Istanbul. The Galata Bridge is the most important connection as it sustains rail and bus transportation as well as pedestrian movement. The pedestrian connections between the water side of the area and the inner parts of the waterfront where the historical large-scale commercial buildings are found to be strong. In addition, open areas that are partially concentrated at the back of the piers provide strong permeability. However, the traffic congestion of Eminönü Square makes pedestrian movements difficult.

The visual access from the waterfronts of Kadıköy is also very strong in relation to the closed bay form, where open areas and the architectural values are strongly oriented to the water. Kadikoy Square has pedestrianized wide open areas, which are close to the water-side of the waterfront. In addition, the pedestrian connections are stronger than the Eminönü waterfront as the square is located far away from the vehicular traffic. The continuity of the connections between the open spaces of the waterfront such as pedestrian paths and bicycle lanes are is also

Diagram 9: Level of imageability of waterfronts

spatial components	Eminönü	Karaköy	Kadıköy	Üsküdar	Beşiktaş	*SCORES*
Waterfront Image	4,36	3,42	3,75	3,32	3,03	**3,58**
Collective Meaning	5,00	5,00	4,00	4,00	4,00	**4,40**
Communal Events	1,50	1,50	3,00	0,00	1,50	**1,50**
Built and Natural Identity	5,00	5,00	4,33	3,33	4,33	**4,40**
Permeability	3,00	3,00	3,33	3,67	2,83	**3,17**
Scale	3,38	3,13	2,88	2,50	1,63	**2,70**
level of imageability of areas	**3,71**	**3,51**	**3,55**	**2,80**	**2,89**	
level of imageability of historical waterfronts	**3,44**					**not strong not weak**
scoring system	0: none / 1:very weak / 2:weak / 3:not strong not weak / 4:strong / 5:very strong					

Table 3: Scores of the level of imageability of waterfronts in relation with spatial components

Diagram 10: Level of compatibility of open spaces

spatial components	eminönü	karaköy	kadıköy	üsküdar	beşiktaş	*SCORES*
relations between functions	3,25	2,63	2,78	3,01	2,92	**2,92**
diversity and hierarchy	2,85	2,72	2,43	2,26	2,02	**2,46**
vitality	3,50	3,00	3,50	2,50	2,75	**3,05**
hybrid areas	3,00	3,00	2,50	2,50	2,50	**2,70**
level of compatibility of areas	**3,15**	**2,84**	**2,80**	**2,57**	**2,55**	
level of compatibility of historical waterfronts	**2,80**					**WEAK**
scoring system	0: none / 1:very weak / 2:weak / 3:not strong not weak / 4:strong / 5:very strong					

Table 4: Scores of the level of compatibility in relation with spatial components

strong. The low-density of the buildings on the open areas where Kadıköy piers are located, provides strong permeability and the ease of movement.

The findings obtained for imageability criteria were also found to be very strong for the historical waterfronts. Specifically, Eminönü, Karaköy and Kadıköy regions have higher values than Üsküdar and Beşiktaş. This finding is not surprising since the waterfronts of Eminönü, Karaköy and Kadıköy include historical elements such as the Haydarpaşa Train Station, the Historical Peninsula skyline or the Galata Bridge (Diagram 9 and Table 3). In this case, the historical elements, which are defined as the landmarks (Lynch, 1960) of the historical waterfronts, make a significant contribution to the imageability. Further, the water-related landmarks such as the lighthouses and the Haydarpaşa port structures and water-dependent nodes such as piers are found to strengthen the imageability of the whole area. On the other hand, among the imageability components, the urban identity (Lynch, 1960) is found to be stronger than the waterfront image of the area in terms of its unique visual impact through the historical environment, the functional importance by having mixed land use and the spatial relation with the city regarding its central location. The historical waterfronts were found to have a lower value in comparison with the other waterfronts in terms of compatibility (Moughtin, 2003) due to functional diversity and density. Although the vitality on the historical waterfronts is strong due to its central location and the existence of important nodes (pier area, ferry terminal, etc.), it is evaluated that there is a risk of incompatibility due to functional diversity specifically between recreational (i.e.fishing) and economic activities (i.e.ports). According to the evaluations, Eminönü has higher compatibility potential than the other waterfronts in the area. The similar rates of concentration of recreational and economic activities indicate the potential for incompatibility and also a hierarchy between functions were not found to exist. Nevertheless, the Haliç waterfront parks and the Sarayburnu waterfront walkway, as dominant open spaces, do constitute cohesion between different types of functions which have the potential to strengthen the relations between the activities (Diagram 10 and Table 4).

In terms of looseness, only Karaköy waterfronts have higher values. Significantly, the low rates of open spaces and the historical pattern do not easily allow for spatial changes, while the conversion of large-scale abandoned areas into private investments, - which were supposed to have the potential to be transformed into open spaces – effectively eradicated the features of flexibility and adaptability from prospective changes (i.e. the abandoned

Diagram 11: Level of looseness of open spaces

spatial componets	Eminönü	Karaköy	Kadıköy	Üsküdar	Beşiktaş	*SCORES*
Flexible areas	1,90	1,96	0,88	0,79	1,72	1,45
Informal activity	3,60	3,60	1,20	1,20	3,60	2,64
Temporary activities	0,00	5,00	5,00	0,00	5,00	3,00
Opportunity areas	5,00	5,00	0,00	0,00	0,00	2,00
level of looseness of areas	2,63	3,89	1,77	0,50	2,58	
level of looseness of historical waterfronts	2,20					WEAK
scoring system	0: none / 1:very weak / 2:weak / 3:not strong not weak / 4:strong / 5:very strong					

Table 5: Scores of the level of looseness in relation with spatial components

Haliç Shipyard is an important opportunity area for becoming urban open space). In contrast, the Galata Bridge, occupied intensely with recreational fishing activity, was found to have a higher potential for any type of informal activity. In addition to Eminönü and the Galata Bridge on the waterfronts of Karaköy, fishing is one of the dominant informal/spontaneous activities. Furthermore, besides fishing on the rocks of the water's edge of Eminönü-Sarayburnu walkway, swimming activity is also noted during summer. Apart from all these activities, Karaköy has various small-scale open spaces in its dense urban context, which may provide opportunities for informal activities in consideration with the criteria. In the region, due to the historical pattern, the contribution of open spaces to physical changes is very low. However the potential of informal activity is slightly higher (Diagram 11 and Table 5).

Conclusion

Since the beginning of urban waterfront development, spatial relations have been considerably varied by the waterfronts. Besides the repurposing of historical port areas and revitalisation of fish markets, cruise ports, business and residential areas, accommodation services, commercial entertainment spaces such as cafes, restaurants, marinas, festival marketplaces were established on the waterfronts. As a result, recreational spaces, - such as water sport facilities, waterfront parks, walkways, cycling paths, promenades, concert and festival venues - have become essential to the waterfronts. In addition, the integration of public services, such as waterborne transportation, has supported the accessibility to the waterfronts (Bruttomesso, 1999; Marshall, 2004; Schubert, 2012).

In the case of historical waterfronts in Istanbul, specifically on the historical peninsula of the 19th century, the interaction of the water-dependent economy on the waterfronts did not go beyond commercial activities and did not allow the diversification of urban open spaces within the dense urban pattern. Also, the waterfront development was not planned and these areas were not given diversity of spaces and functions as in other urban waterfront development movements around the world. According to the results of this research, today the urban open space uses on the historical waterfronts are not strong in terms of spatial characteristics.

In terms of water-based environment, the mobility of ferries and the combination of three different water bodies on the historical waterfronts make the region attractive in terms of scenic views. It is suggested that the water-based node of the city, which includes visual water corridors and panoramic views in all directions, should be integrated with water-related recreational activities and new vista points by exploiting the advantage of the dynamic form of the waterfronts. Also, the interaction of the area with the water should not be limited only to waterborne

transportation areas. Indeed, it is an important issue for the spatial characteristics of the waterborne transportation areas to gain attractive design features that emphasize interaction with the water. The continuity of fishing, which has been a symbolic activity of the Galata Bridge for centuries, is important not only for the image of historical waterfronts but also for the image of Istanbul. On Kadıköy waterfront, Haydarpaşa Train Station has been a socio-cultural area in which waterborne transportation, observation decks and water-dependent economy (port area) are related to each other. In this case, the spatial characteristics of Kadıköy waterfront should be conserved in terms of the original waterfront-scape presented by the water's edge and the surrounding water on which piers are aligned. In addition, on the waterfront of Besiktas, opportunities should be provided for access to water with open spaces within the context of large-scale buildings. Therefore, the waiting spaces for passengers to embark and disembark should be planned not only as basic platforms but as water spaces with qualified design features oriented in order to strengthen its relation with the water.

In terms of continuity and connectivity the visual relation with the water landscape on the historical waterfronts offers unexpected opportunities, especially due to the dynamic form of the edge. In contrast, however, a vehicular road and various structural barriers weaken visual and physical access. The waterfront walkways located along the water are valuable connection paths in close relation to the water. They are also water spaces with recreational opportunities that should be given priority on the waterfronts. However, the interrupted walkways on the historical waterfronts should be improved for the continuity of access along the waterfronts. Also, the visual relation of pedestrian walkways with water views should also be strengthened. The essential issue is to strengthen visual, physical and functional access at the same level in order to improve the accessibility of open spaces. In this case, open spaces on the waterfronts should be so arranged that the negative impacts of visual and physical barriers would weaken while the functional access would improve.

In terms of strengthening the imageability, the preservation of the built heritage on historical waterfronts should be considered as the main strategy. For instance, the Haydarpaşa Railway Station, the image of Haliç Shipyard and its structures should be preserved as unique water-dependent landmarks. These image components are essential to preventing the loss of collective memories of the waterfronts. In consideration of the essential role of urban open spaces to the waterfront's image, communal activities, waterborne transportation services, waterfront parks, recreational activities and waterfront squares should be increased.

In terms of avoiding incompatibility, to avoid the dominant effect of the Cruise Port on the waterfronts of Karaköy, the functional and spatial characteristics of Karaköy ferry piers, the open spaces at the back of these piers and fishing activity along the water's edge should be strengthened, so that the potential for various activities would be conspicuous. On Kadıköy waterfronts around the pier areas, the vitality potential should be maintained, where urban open space usage is strong. On Eminönü water's edge, the walkway platform, where the extension of open spaces to the square will be beneficial for more space for recreational activities to take place in a comfortable way, may be considered. As practiced in contemporary waterfront cities such as Barcelona or Oslo, spatial solutions with a co-presence of activities may be produced in locations where the waterborne transportation and the beach are together. This is preferable to disconnecting them as opposing activities.

In terms of looseness, urban gaps should be created on the waterside of the densely built waterfronts and existing non-functional empty spaces should be cleared of barriers so that the potential can be revealed for spontaneous activities. For instance, on the large-scale built areas on the waterfronts of Besiktas where there are palaces adjacent to the water, the nodal openings to the water and walkway connections may be established. Also, the opportunity areas, such as the ones that have lost their function, should be transformed into open spaces. For instance, the Haliç shipyards is the last opportunity area of the historical waterfronts that should be opened up to public use.

The findings and proposals mentioned above are expected to be used as the basis for the planning and implementation of studies for Istanbul waterfronts and specifically for the historical waterfronts. It is essential for local governments to establish research groups for the waterfronts to develop strategies and policies and integrated management systems based on scientific studies.

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