

The Pre- and Post Earthquake Evaluation of the Existing and Suggested Green Areas in the District of Zeytinburnu within the Context of Risk and Disaster Management

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ABSTRACT

In the province of Istanbul, many green areas of great functional significance have been destroyed by rapid and unplanned urbanization, urban sprawl, inadequate infrastructure, mass internal immigration and other like reasons. Available open spaces are both inadequate in size and the standards used in their design also do not accord with, or reflect, modern life style expectations. In the aftermath of the disastrous Marmara earthquake of 1999, the importance of adequate open spaces in Istanbul that can be utilized for purposes of evacuation, gathering and sheltering became painfully evident. In the present study, the existing green areas or open spaces in the district of Zeytinburnu, which according to the JICA study is one of the ten districts facing the strong possibility of another earthquake disaster, were investigated from the point of view of their requirements, both prior to and after an earthquake. It was established that the number of existing active and passive green areas per person does not meet the expected standards. These areas are also not homogeneously and effectively distributed. There is need for open spaces reserved for more than one purpose in cases of emergencies. In urban development projects and applications areas having vital importance in case of a disaster should be planned so that they are located close to 'residential areas' are permanent, sufficiently large, easily controllable and accessible to the public. In view of the fact that in addition to their physical, psychological, economic and ecological functions they also serve as evacuation spaces in case of an earthquake and/or similar disasters green areas should be considered within the context of risk and disaster management. With this purpose in mind, we have evaluated such areas in the district of Zeytinburnu in terms of adequacy and needs and have made proposals in terms of requirements and risk improvements. The geographical information system was utilized in order to minimize the existing deficiencies.

Key Words: Green areas, earthquake, green corridor.

1. INTRODUCTION

1.1. Scope and Purpose of the Research.

Green areas constitute one of the basic needs of mankind and thus play an important role in our lives. From a city planning/design approach they were, however, often simply considered to be areas that served to conceal or cover the unsightly appearances of the structures around them. Today, however, we understand that, in addition to their functions as

decorative elements, they are vitally important for human health in an ever-growing urban environment [1].

The province of Istanbul is marred by substantial urban sprawl and blight and, due to this, the green areas in certain districts of the city, one of them the Zeytinburnu area, are gradually disappearing. Despite the rapid and constant growth in size and population of the city in general, the number of these vital areas is actually

decreasing, rather than increasing in proportion with population changes.

The city experienced a disastrous earthquake during the night of August 17, 1999. The tremors were so strong that the residents fled to the streets and, with the strong aftershocks, did not reenter their homes for several days. During his period they had a very difficult time finding open spaces where they could take shelter. This earthquake fully revealed the shortfall and inadequacy of green areas in the city [2].

Now the threat of another major earthquake looms over the future of the country particularly that of Istanbul and this threat means that adequate spaces must be developed and provided for the use of the residents during that kind of emergency situation. But earthquake planning of green areas is not only based on the needs felt during the critical earthquake stages. Methodologically, an earthquake can be considered in three stages: prior to, during and after the tremor. Thus, the planning of green areas in connection with an earthquake must also consider the conditions prior to and after an earthquake.

This planning must not only focus on the size of the green areas, for while the size of available open areas is very important from the perspective of providing adequate space for people to shelter in emergency conditions, the conditions and qualities of green areas are often just as important as their sizes. This includes the equipping of these green areas so that the quality of the area must be determined both in terms of how they augment the sheltering function and in terms of how they support and improve the quality of life of the residents in their lives in non-emergency times and situations. To this end the goals of this study are aimed at revealing whether the green areas in the city are adequate in quality and size to meet the needs of emergency situations and of the residents in a state of ever-growing urbanization. This study was particularly concerned with the character of green areas, which serves to improve the quality of life for people in a developing city.

This study also aims to propose means by which the green areas can be increased in number and the active and passive green areas in the city made more accessible to the public, as well as how they could be converted to more modern recreational areas. Zeytinburnu, a densely populated, working-class residential and light industrial district in central Istanbul, is an example that indicates that the planning of green areas should be re-evaluated so that both the emergency and recreational needs of people living in a particular area are met while a more enjoyable, relaxed, healthy and peaceful life is also provided for them.

This research has been carried out so that the green areas of the predominantly residential district of Zeytinburnu can meet the needs for green area utilizations that are of contemporary standards of the residents in the pre-earthquake period and also can serve as an area that can be used for planning for

emergency utilizations and gathering during an earthquake and in the post earthquake period and that can function as areas that can be accessed quickly and will remove the residents from danger and that can be used as open areas.

1.2. Materials and Methods

In addition to the field work carried out in this investigation, we also utilized the report titled The Study on a Disaster Prevention/Mitigation Basic Plan in Istanbul Including Seismic Microzonation prepared by the Japan International Cooperation Agency (JICA) and the Istanbul Metropolitan Municipality (İ.B.B). The geographical information system was utilized to minimize errors. The information pertaining to years 1975, 1980, 1985, 1990, and 1995, which forms the database of the system, was taken from the doctoral thesis of Yıldız Aksoy and submitted to the Science Institute of Istanbul Technical University (İTÜ) in 2001. The conditions for periods between 2000 and 2004 were constituted by the project team within the context of the Zeytinburnu Green Corridor Project. The field analyses were associated with the geographical information system.

2. DESCRIPTION OF THE INVESTIGATED AREA

2.1. Characteristics of the Zeytinburnu District

Located in the western part of the city of Istanbul, the district of Zeytinburnu covers an area of 1142 hectares (2822 acres). Due to the presence of historical city walls, the western regions of the city have been designated as protected areas. Zeytinburnu can be considered as a commercial area due to the presence of industrial enterprises, a marina and a harbor; it is also a recreational area and a popular excursion spot with its vineyards, gardens and parks; several hospitals constructed on lands owned by foundations are found here. Because it is a peaceful location right outside the city walls throughout the years many religious sects have sheltered in this district. In addition to all of this, today it has also become one of the important residential areas of Istanbul. The Zeytinburnu district is bordered by Bayrampaşa in the north, Esenler in the northeast, Eyüp in the northwest, the Sea of Marmara in the south, Fatih in the east, Bakırköy and Güngören districts in the west [3].

2.2. The Existing and Proposed Green Areas of Zeytinburnu District

The types of existing green areas in the Zeytinburnu district were evaluated with respect to land sizes. The sum of active green areas was about 549.910 m²; whereas the passive green areas covered about 1.459.725 m², the total being 2.009.635 m² (Table 1).

Thus, there is 2,2 m² active and 5,7 m² of passive green area per person, totaling 7,9 m². Functionally, 0.3 % of the active green areas constitute playgrounds for children, which represents 0,01 m² per child [4].

Table 1. Population-Green Area Ratios of Zeytinburnu District in Different Years [4].

YEAR	POPULATION	ACTIVE GREEN AREAS (Playgrounds for children, Park Areas, Sports Areas)		PASSIVE GREEN AREAS Wooded Areas, Grassy Areas, Traffic islands and Squares, Cemeteries		TOTAL GREEN AREAS	
		Total Area (m ²)	Per Person Area (m ²)	Total area (m ²)	Per Person Alan (m ²)	Total Area (m ²)	Per Person Area (m ²)
1975	123.548	31.450	0,3	631.980	5,1	663.430	5,4
1980	124.543	45.155	0,4	637.230	5,1	682.385	5,5
1985	147.849	45.155	0,3	744.430	5,03	789.585	5,3
1990	165.679	15.295	0,1	794.430	4,8	809.725	4,9
1995	203.279	286.505	1,4	1.029.870	5,1	1.316.375	6,5
2000	247.669	363.290	1,5	1.431.565	5,8	1.794.855	7,3
2004	255.649	549.910	2,2	1.459.725	5,7	2.009.635	7,9

The existing active and passive green areas in Zeytinburnu district do not meet the specified standards in terms of per person area. The functional distribution of green areas according to needs of people of different age groups is important. An investigation into the distribution of green areas in Zeytinburnu district according to functional distribution reveals that there are 3 playgrounds for children covering an area of 1015 m². According to the regulations of the Ministry of Public Works and Settlement dated 1985, and inclusive of the amendment made later which was published in the official gazette number 23804 on September 2, 1999, a total of 10 m² of green area should be distributed among each individual. The standard [1] allotment of 1,5 m² of playground area per person would mean that there should be 383.475 m² of playground area for children in the Zeytinburnu district. Thus, the Zeytinburnu district is deficient in 1,49 m²/ per person from the expected standard value, or deficient in 383.470 m² of playground areas. (Table 2).

While the Zeytinburnu district should have 766.945 m² of sports areas based on the standard ratio of 3 m²/ per person, at the present there are no open-air sports areas, but merely one district stadium covering an area of 18.100 m². Thus, it is deficient in standard value by 2,93 m²/person and lacks

748.845 m² of sports areas, of which 511.300 m² should be for open-air sports areas and 237.545 m² for a district stadium (Table 2).

There are 31 parks in the Zeytinburnu district and of these 19 are pocket parks, 9 are small parks, 1 is a district park, 1 is a neighborhood park and another one is a city park. The total area covered by parks in Zeytinburnu is 530.795 m². Pocket parks, small parks, the district park and the neighborhood park constitute 374.790 m² of the total park area. Based on the standard of 2 m²/ per person, the park area should be 511.300 m². Thus, there is a deficiency of 127.820 m² in playground, small, neighborhood and district park areas [4].

The sole city park in the Zeytinburnu district has an area of 156.005 m². According to standards set by the Ministry of Development and Housing the city park area should be 894.770 m² based on 3,5 m²/ per person. Thus, the Zeytinburnu district is deficient in 741.380 m² of city park area [4].

As indicated by the figures given above, the functional distribution of existing green areas in Zeytinburnu district does not meet the standard recreational needs of people in different age groups.

Table 2. Comparison of The Ministry of Development and Housing Green Area Norms with Norms of Foreign Countries and the Deficiencies in Green Areas in Istanbul and Zeytinburnu District [4].

Function	USA	Amsterdam	Stockholm	Rome	Warsaw	England	France	Turkey Ministry of Development and Housing Norms (m ² /per person)	Istanbul City Existing (m ²)	Istanbul City Norm Deficiency (m ² /per person)	Istanbul City Area Deficiency (m ²)	Zeytinburnu Existing (m ²)	Zeytinburnu District Norm Deficiency (m ² / per person)	Zeytinburnu District Area Deficiency (m ²)
Playgrounds for children	*	*		3, 2	-	*	3, 5	1. 5	0,03	1, 47	14.761.490	1.015	1, 49	383.470
Pocket, Small, Local and District Parks	3, 9	-	5, 6	5, 5	1, 5	20	4, 2	2	1, 1	0, 9	9.037.645	374.790	0, 5	127..820
City Parks	13-20	9	23, 8	11, 6	5, 3	40	10	3. 5	0, 5 0,23	2, 7	27.112.940	156.005	2, 9	741.380
Green Area Zones Near City	60	30	48, 1	18	17, 5	8	10	-	-	-	-	-	-	-
Sports Areas	*	6. 5	10	7, 5	7, 5	10	8	**3	0, 06	2, 94	29.522.980	**** 18.100	*** 2, 93	748.845
TOTAL	77-84	45,5	87, 5	4, 8	45, 3	78	35,7	10	2, 0	8, 00	80.435.055	703.355	7, 3	1.853.445

* Areas were calculated within the boundaries of parks.
 ** 2 m²/per person open-air sports areas
 1 m²/per person district stadium.

***2,0 m²/ per person open-air sports areas norm deficiency.
 0,96 m²/per person district stadium norm deficiency.

****District Stadium

The green areas in Zeytinburnu should not be evaluated only in terms of population/area ratios. The location and distribution of these areas within the district are also very important.

When we look at the distribution of the green areas we see that these areas have not been distributed homogenously and that, as a result of this, these green areas do not constitute alternative utilization areas, either during an earthquake or in the post earthquake period.

In the Zeytinburnu district the locations having larger green areas are Maltepe (595 m²/per person), Kazlıçeşme (366 m²/per person), Merkezefendi (5,5 m²/ per person) and Seyitnizam (1,2 m²/per person) quarters; and those with smallest number of green areas are Veliefendi, Yeşiltepe (0.02 m²/per person), Telsiz (0.1 m²/person) and Nuripaşa (0.06 m²/per person) quarters. On the other hand, Gökalp and Yenidoğan quarters have no active green areas [4].

As to areas of passive green areas, Maltepe (1095 m²/ per person), Kazlıçeşme (677 m²/ per person), Çırpıcı (7,3 m²/ per person) and Merkezefendi (6,5 m²/ per person) have the largest areas; whereas Telsiz (0,08 m²/ per person), Gökalp (0,07 m²/ per person), Yenidoğan and Nuripaşa (0,06 m²/ per person) have the smallest. Based on total green areas, the largest areas/person ratios are found in the Maltepe, Kazlıçeşme, Merkezefendi and Çırpıcı quarters. The underlying reason for this is that while the Kazlıçeşme

and Maltepe quarters have the least population they also have larger areas of green areas; Merkezefendi, on the other hand, has a large area made up of cemeteries. Thus, the existing green areas are not homogeneously distributed in the Zeytinburnu district.

An evaluation of the available green areas and their necessary functional distribution must be carried out prior to formulating plans towards increasing the number of green areas in the Zeytinburnu district. The current development plans for the Zeytinburnu district indicates that the total area of green areas has been designated at 721.000 m². Despite this, the existing active green areas in Zeytinburnu cover an area of 549.910 m². This means that there is a total of 171.090 m² of green areas proposed in the plan but not yet actualized. Also, according to the development plan, there should be 34.477 m² of playground areas for children. This means 0,2 m²/ per person. In point of fact, however, at the present there are 3 playgrounds which cover a total area of 1015 m² or 0,04 m²/ per person. Thus, 33.462 m² of playground area proposed in the plan has not yet been actualized (Table 3).

The development plan also indicates that there should be 668.423 m² of park area or 2,6 m²/per person. Thus, 137.628 m² of designated park area has not been actualized. Also, the area designated for the district stadium is 18.100 m² in the plan [4].

Table 3. Status of Active Green Areas in the Zeytinburnu District [4].

Function	Area Designated in Development Plan (m ²)	m ² /per person	Existing Situation (m ²)	m ² / per person	Area Designated in Development Plan but Not Actualized (m ²)	m ² / per person	Materialization Ratio (%)
Playgrounds for children	34.477	0,2	1.015	0,04	33.462	0,1	3
Park Areas	668.423	2,6	530.795	2, 1	137.628	0,5	79
Sports Areas*	18.100	0,04	18.100	0, 04	-	-	100
Zeytinburnu	721.000	2,8	549.910	2, 1	171.090	0,7	76

* District Stadium

3. RESULTS AND PROPOSALS

In this study the green areas presently in use in Zeytinburnu district were evaluated and were found to be inadequate. The equipping and the quality of green areas are just as important as their size.

The equipping and the quality of green areas are as important as the size of the areas themselves. For this reason, it is necessary that the inadequacies of the green areas be improved from a qualitative perspective and that their utilization functions are increased.

As the population of Zeytinburnu district continues to increase, the inadequacy of green areas becomes more prominent. However, due to increasing concern of the municipality for the preservation of the environment, considerable improvements have been made in plans for the development of such areas in the course of the past four years. In spite of this, the existing active green areas in Zeytinburnu are inadequate in terms of both their sizes and numbers.

The area/per person ratios of existing green areas are not in accordance with the accepted standards (Table 4).

Table 4. Existing and Proposed Green Areas in Zeytinburnu District [4].

Function	Existing Situation			Proposed Green Areas			Total Green Areas		
	Area (m ²)	Number	* m ² /per person	Area (m ²)	Number	** m ² /per person	Area (m ²)	Number	** m ² /per person
Playgrounds for Children	1015	3	0,04	44667	18	0,2	45.682	21	0,24
Park Areas (pocket, small, local, district and city parks)	530.795	31	2,1	1.024.122	116	4,8	1.554.917	147	6,9
Open-Air Sports Areas	-	-	-	94.388	17	0,4	94.388	17	0,4
Sports Facilities	159.338	9	0,6	-	-	-	159.338	9	0,6
Total Active Green Areas	691.148	-	2,7	1.163.177	-	5,4	1.694.987	-	8,14

* Population in 2004 : 255.649

** Future Population: 215.102

Our investigations have shown that the green areas are not homogeneously distributed in a manner to meet the general needs of the public. Also, the existing green areas are not properly distributed to meet the standard recreational needs of different age groups.

Many people are unable to find shelter at an evacuation center in the aftermath of a major earthquake and are faced with great difficulties in searching for lost ones among destroyed structures which often block their way. In case of an emergency condition there is need for green areas and wide evacuation passages [5]. Presently, however, there is no emergency evacuation system in Istanbul and Zeytinburnu and it is vitally important that local evacuation areas be developed to minimize loss of life and property during an earthquake or other natural disasters.

Proposed evacuation and gathering areas for Zeytinburnu district have, however, been planned for each neighborhood based on the data provided by the BIMTAŞ Planning Group. The plan carefully considered the integration with and the connection of evacuation corridors to belt lines. The demolishing of high rise, high risk buildings located on planned evacuation corridors which may be expected to prevent the formation of green areas has been considered for both ends of the corridor or the demolition of those that may cause problems in the widening of the corridor [6].

Public lands, schools, mosques, hospital grounds, park areas, playgrounds and sports areas were selected as areas where people could gather [7].

In choosing these areas particular care was taken to make sure that they were safe and away from any structure which might be damaged in case of a disaster (for this reason pocket parks situated amidst risky buildings were excluded), that there were no installations nearby which might present a danger and that the people living in the area would be able to find their way easily [8].

The regional evacuation grounds serve the same function as shelter areas. The public requirement for shelter should be met within a few days after the earthquake [9].

Among the existing parks in the Zeytinburnu district, we have determined the ones that could be used as shelter areas, but designating a shelter area in each neighborhood, along the city walls to the east of the district and along the city park located to the west of the district. We have proposed that earthquake parks be established where people could gather, find temporary shelter and get emergency treatment after an earthquake or a similar disaster and that the parks already in existence be re-evaluated as earthquake emergency parks.

Our investigations have indicated that, in general, in the city of Istanbul and the district of Zeytinburnu the sizes and numbers of present green areas are inadequate. This problem must be resolved in accordance with the green area standards set by the Ministry of Public Works and Settlement. It is a must that the 18th article of the Zoning Law be

applied and that the Communal Estates and the Public Domains be exploited in order to lower the equity interest ratio in case it exceeds the legal limit of 35% [10].

In the development plan for new green areas, the existing green areas should be re-evaluated and the new plan should specify the effectiveness and the function of each one of these areas. The plan should also definitely include the lands which were designated as green areas in the original development plan but never actualized, as well as similar areas that have been occupied by squatters [10].

The green areas form a part of the urban and urban landscaping planning process and it is important that they provide a dominant and marked service in case of an emergency condition. Thus, they should be incorporated into urban planning at the very beginning [11].

The green areas play a significant ecological, physical and economic role in public health and local habitation of people and they should be organized so that they also have effective functions after a disaster such as an earthquake.

Generally, the distribution of green areas in Istanbul and in Zeytinburnu district is not homogeneous and as a consequence of this they cannot be expected to provide for an alternative use during and after a disaster, such as an earthquake.

Due to this non-homogeneous distribution, the provisions for sheltering and similar organizations following an earthquake cannot be planned properly. The poor conditions of existing green areas, their inadequate sizes, poor furnishings, inadequate infrastructures, wrong choice of urban furnishings and plants limit their services following an earthquake.

The quality of a green area and how it is designed are just as important as its size. Thus, it is necessary to perform renovation studies and to improve qualities of these places to make them more attractive to the public. So, Zeytinburnu Municipality should make an effort in this direction.

The use of green areas as dumps for debris and rubble after an earthquake has an undesirable effect on the general psychology of people living close to those areas. At the present, since these areas are not secure against fires and similar problems arising in the course of an earthquake they cannot be used to diminish damages and problems in case of such an emergency condition [11].

In order to improve the living conditions in Zeytinburnu district it is necessary to create new green areas and to improve the existing ones based on the needs and the physical, physiological, psychological and social character of the people in the area. The social and cultural realities that have resulted in illegal/deviant construction in the area have also culminated in an inadequacy of green areas or have resulted in the creation of areas that do not accord with the standards expected in modern city life. As a natural consequence of all of these

developments, such areas cannot be utilized for alternative purposes in the face of a disaster.

We have investigated 34 parks in Zeytinburnu district with respect to their location, size, equipment and quality to decide whether they could be utilized in case of an earthquake. The following parks were found to be equipped adequately for use in case of an earthquake or another natural disaster: the 80th Yıl Cumhuriyet Park, Mehmet Tahan (Sümer) Park, Şelale (Sultan Bacı) Park, Atatürk Gençlik Park, Özgürlük Park, İston Park, Lokman Hekim Tıbbi Bitkiler Park, Merkezefendi Park, Stad Park, Şehitler Park, Osman Zeki Bayraktar Park, Öğretmenler Park, Uğur Mumcu Park, Huzurevi Park, Topkapı City Park and the Türkmenistan Park. However, the manner in which these parks are distributed in the district, their continuity, location and deviation from accepted standards are obstacles to planning their use in the event of an earthquake.

The poor conditions of existing green areas in the district, their limited sizes, poor furnishings, inadequate infrastructures, wrong choice of urban furnishings and plants and the lack of care provided limit their services following an earthquake.

It is necessary to develop a green system utilizing the existing green areas and those planned for the future. The district needs new green areas for a healthier, more aesthetic or in general, for a better quality of life psychologically, sociologically and economically. People should be able to relax, to enjoy nature and relate themselves to their environment in those areas. The green areas should be located so that they are easily accessible without a traffic problem.

The earthquake of August 17, 1999 revealed the necessity of making fundamental alterations in the traditional landscape planning of Istanbul and particularly of its Zeytinburnu district.

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