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Research Article

AFTER DISASTER FUNCTIONS OF OPEN GREEN AREAS EARTHQUAKE PARK AND URBAN FURNITURE

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ABSTRACT. It is known that 96 % of Turkey's lands are under risk of earthquakes. This reminds us the need of effective pre-works in our country and region against this situation. Earthquakes are not only responsible for life and economic loss; but also cause primary post-problems such as panic, miscommunication and lack of transportation. It is obvious that open-green spaces of Turkey cannot perform their duty of creating safe areas after earthquake and secondary post-earthquake disasters. Problems at organizing temporary post-earthquake settlements revealed the need of urban Earthquake Recovery Parks and rural accumulation centres; which can solve the majority of the problems caused by post-earthquake chaos. The goal of accumulation parks is accurate transportation of aid to city centre; while earthquake recovery parks carry the duty of accumulating and coordinating disadvantaged people after the disaster. So, subsettlement of these parks should be earthquake resist; and their furniture should be refunctionable. In this article; city furniture's suitable for such parks and their design criteria are examined by benefiting the example of Post-Earthquake Disaster Preventing Corridor Design in Tokyo-Japan.

Keywords: *Earthquake Park, Recovery Park, Standards, City Furniture.*

INTRODUCTION

Earthquakes have caused significant loss of life and property throughout history in Turkey due to their seismic and topographical characteristics; however, in our country, many residential and industrial areas were built in risky areas; zoning plans based on faulty site selections have caused illegal construction and unhealthy urban patterns. One of the most important criteria in urban planning is the decisions about how the land will be used.

The relationship between occupancy and emptiness, built area and public space in the city, and the fact that these areas can be used for different purposes and activities in daily life and as a gathering and sheltering area in extraordinary situations are important parameters that reflect the identity of the city.

The diversification of the functions of public open green spaces in daily life, their post-disaster location, infrastructure features, urban furniture are important issues of urban planning and disaster management. In line with these issues, apart from the assembly areas, the concept of Disaster Park, which is a phenomenon in the intersection of urban planning and disaster, also gains importance [4].

MATERIALS AND METHOD

The resilience capacity of urban areas directly changes depending on the location selection, building functions and compositions, the application of environmental system factors such as infrastructure and open-green space organizations. Therefore, urban environmental planning for disaster protection and mitigation forms the basis of planning against disasters [1].

Within the scope of this study, the Tokyo City Plan, which was put into practice as a transformation plan with the name of "Grand Design for Recovery after an Earthquake" in May 2001, was examined with disaster design principles. Using the example of Post-Earthquake Prevention Corridor Design in Tokyo, Japan, the urban furniture that can be used in such parks and the standards that can be used in the projecting phase are examined.

This plan, which was created with the participation of the residents of the metropolitan area, based on the example of the "Disaster-Protective Green Corridor Design" designed within the framework of the "General Design Plan for Post-Earthquake Development" in Tokyo, the capital of Japan, is the project of the post-earthquake recovery strategy project, the infrastructure systems together with the main arteries. Developed and It aims to create earthquake resistant structures suitable for urban areas and financial resources. In addition, the plan is designed to develop the roads leading to the buildings as a green line together with parks and waterways [4]

FINDINGS

The findings obtained from the study include studies aimed at minimizing the damage caused by disasters before, immediately after and after the earthquake:

Actions to Keep Earthquake Damages to a Minimum Level:

Necessary disaster prevention works before the earthquake

It varies according to the earthquake hazard class of the region. It is to consider seismic sensitivity and soil data in construction decisions in areas with high earthquake risk, not to settle in these areas as much as possible and to build earthquake-resistant structures, to use construction techniques suitable for the ground structure, to apply soil improvement methods in the region if necessary.

Rescue and relief works to be done immediately after the earthquake

What a planner, who is calculating the period to be experienced immediately after the earthquake, should do about rescue and aid works;

a- Making pedestrian-vehicle traffic optional: It is an important design criterion for accessibility, earthquake and safety issues. Increasing accessibility is among the main tasks of planners [2].

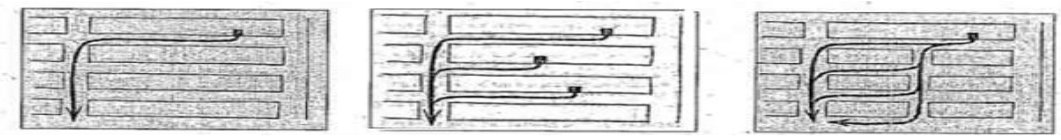

Fig. 1. *An example of how the number of streets and options increase as the size of the building blocks decreases [2]*

Street Texture Plan: It should be kept in mind that connected textures are the most efficient types of streets, and dead-end streets should be avoided.

Classic Dead End

Unmerged Connected Dead End and United Connected Dead End

Fig. 2. *It can be said that the level of accessibility and the number of options provided decrease as you go from left to right [2].*

b- Planning Assembly Areas and Earthquake Parks: Turkey is a country located in an earthquake zone. Trauma experienced during an earthquake causes panic in people. Unfortunately, many lives are lost in these earthquakes. However, it is very important to be able to act collectively and regularly at this stage. In the turmoil experienced after the earthquake, the work that needs to be done cannot be done on time and the loss of life increases because the rescue efforts cannot be organized. Earthquake and Recovery Parks should be established in order to prevent this turmoil and to consciously ensure coordination in the disaster area. The purpose of the Recovery Parks is to ensure that the aid coming to the centre reaches the right places. Earthquake Parks, on the other hand, are parks where people in the disaster area can gather, find each other, and thus ensure coordination. In addition to the experts, many people from the regions where the parks are located, from different parts of the city and from the surrounding provinces will be assigned for the immediate transformation of these parks after the earthquake. These people should be trained in advance. The installation of Earthquake and Recovery Parks should be earthquake resistant.

Gathering areas: They are established outside the city for the purpose of collecting and correctly directing the aid, vehicles and rescue teams coming to the centre (Fig 3).

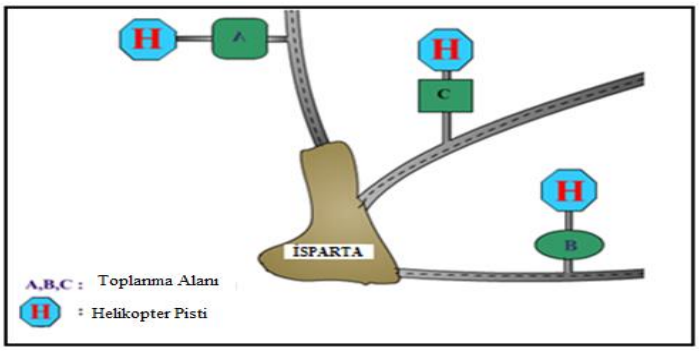

Fig. 3. *Gathering area [1]*

Earthquake parks: These are the parks that should be established in the city centres apart from the assembly areas established outside the city. It should include the

following equipment:

Generator: It is important to use the same installation and uniform generator in all earthquake parks. Guard boxes and similar points in parks should be used [4] (Fig 4).

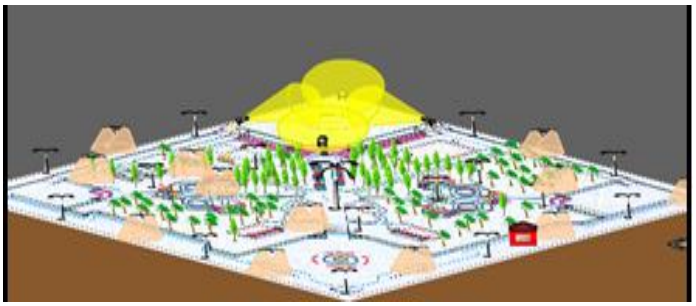

Fig. 4 Generators *[1]*

Ramps: Ramps, which are used as skating and skate rinks in daily life, can be used to unload vehicles in times of crisis (Fig 5).

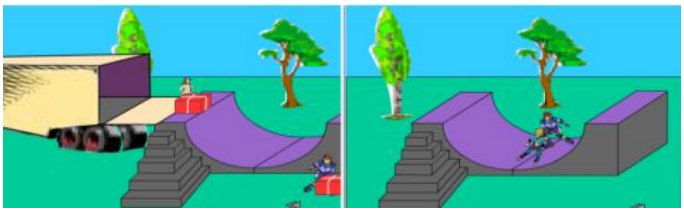

Fig. 5. *Ramp and skate track [1]*

Garbage Collection Area: These areas should be outside the earthquake parks, areas at lower elevations that will not cause pollution within the park.

Sound System: A central sound system should be available for the announcement of announcements in earthquake parks.

Sports Facilities: Sports facilities should be created in the parks with the infrastructure where large tents can be set up in times of crisis.

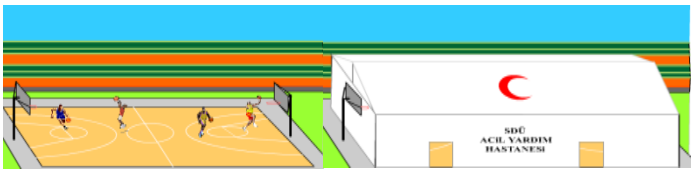

Fig. 6. *Sport Facilities [1]*

Seating Groups: There should be seating groups that can be converted into tents in parks (Fig 7).

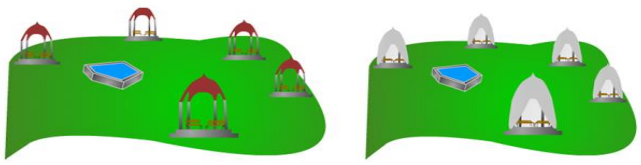

Fig. 7. *Seating Groups [1]*

Management and Computer Center: A package program that can record all kinds of information and fiber optic system internet access should be designed in the event of a crisis [4] (Fig 8).

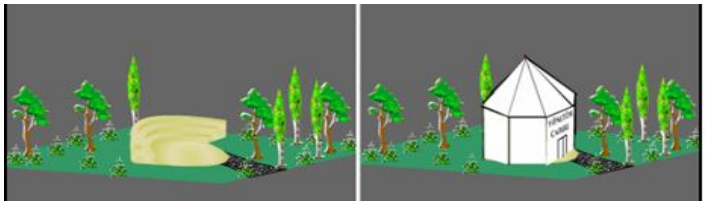

Fig. 8. *Management and computer [1]*

Ice Skating Fields: It is possible to use the ice rinks as morgues. In addition, a registration centre should be established here, as in cemeteries.

Laundry and Dishwashing Room: There are many fountains in an area to be built in the park, and it can be used as a laundry and dishwashing place in times of crisis. In these areas, the connections of the machines to be used should also be considered.

Lost Assembly Area: The billboards in this area, which was designed for family members who lost each other and especially for children, will be billboards in times of crisis.

Service Units: Toilets in earthquake parks should be built very robustly and considering the intensity at the time of crisis. In addition, shower cabins should be built and hot water should be provided to these units with solar energy.

Car parks: A parking lot should be built around the earthquake park for vehicles coming in during the crisis, and the locations of the tankers that will distribute drinking water and liquid cleaning materials should be determined (Fig 9).

Fig. 8. *Parking Lots [1]*

Heliport: A runway should be built outside the parking area for aircraft that will use the earthquake park. The lighting for this runway must be connected to the generator system (Fig. 10).

Fig. 10. *Helipad [1]*

Baths: The pools in the parks can be turned into a bath after the water is drained and tents are set up over them. The water coming by the tanker is heated and transferred to the portable water system (Fig 11).

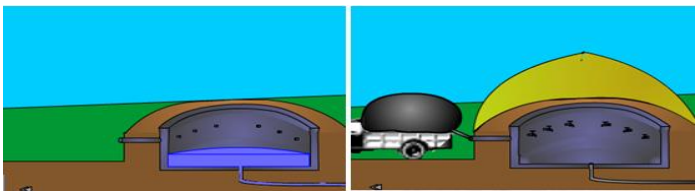

Fig. 11. *Turkish Bath [1]*

Flashers: Flashers placed at high points of the city will provide a point of orientation for earthquake victims who have no sense of direction (Figure 12).

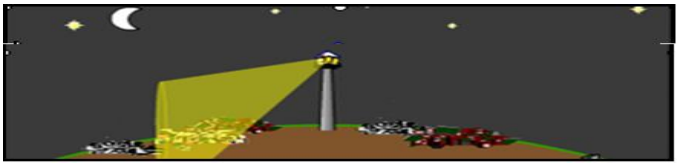

Fig. 12. *Flashers [1]*

Cemeteries: Video and photographic records of funerals can be kept at the registration centre located in the cemeteries during the crisis [4]

Green areas in cities, stadiums, hospital gardens, school gardens and university residential areas are the most suitable places for earthquake parks (Fig 13). In order for these parks to be organized very quickly right after the earthquake, a group consisting of expert personnel and local authorities must be trained and task distribution must be made beforehand. In this way, it can be ensured that systems that need to be operated primarily, such as lighting and flashing systems, can be operated without waiting for expert teams.

Fig. 13. *View of a stadium and earthquake park after the earthquake [4].*

Fig. 14. *a, b, c, d [5].*

By planning a park with ergonomic, sustainable and transformable urban furniture, the Japanese can provide multi-purpose services to their citizens. For example, he designs a city park not only as a recreation area, but also as a shelter in case of emergency; They are also called disaster prevention parks.

The "Ozu Disaster Prevention Park" in the city of Ichikawa is used as a base for the emergency evacuation of citizens in the event of a disaster. This area was created in 2004 by the conversion of Ichikawa dairy farms. There are multi-purpose plaza, picnic area, pond, and water park and recreation areas in this park. Emergency facilities include the heliport area and its facilities, storage areas, evacuation area, drinking water tanks (underground), fire tank, multiple taps for the use of citizens, lighting elements working with solar energy .In a clever way, the electricity produced by itself is used for the lamps in the park with the help of the propeller and solar energy panels on the pole (Figure 14d). The very important point here is that the established facilities are also multi-purpose. For example, the tops of benches, which are sitting groups, are removed in the event of a disaster and transformed into kitchen elements (Figure 14a). Another park is located right next to the new blocks built in Tokyo Sugamo. This 2.2-hectare park can accommodate 500 people temporarily for 1 week. [5].

The disaster-oriented facilities are; storage rooms with water reserves, batteries, lamps, blankets, radio, emergency toilets and other emergency units. Here, too, benches are rapidly transforming into kitchen units. The pergolas in the park are also converted into covered tents so that the victims are not affected by bad weather conditions (Figure 14b). The most important point is to remove the manhole covers at certain points and turn them into emergency toilets .The benches in the park can be used as a hearth after the disaster. They have been specially designed in the form of a box to put materials inside the benches. Emergency rescue equipment suitable for the use of disaster victims and easy-to-install toilet equipment are stored on the park benches, which will be used as shelters during disasters. Citizens of such storage benches are informed by writings

or signs located right next to the benches. Rescue equipment includes saws, hammers, and generators, rebar cutting tools, ropes, hydraulic jacks, etc. [5].

The equipment to be installed on the toilets consists of a manhole-type tent or other portable material, the infrastructure of which has already been prepared. This type of equipment is modular ready and can be installed by two adults in 5 to 10 minutes. Portable stretchers can also be placed inside these benches (Figure 14c). Thus, such urban furniture with emergency and health equipment can be transformed into rescue furniture. In addition to the stretcher, emergency beds, kitchen counters, baseball and tennis equipment to be used in the park in normal times are also placed on these benches. [5].

Restructuring works to be carried out after the earthquake (tent, container,..)

The problems experienced in the post-earthquake rescue operations, the establishment of tent cities, the arrangement of temporary settlement areas, and the need for post-earthquake organization and restructuring to be taken out of the city to a large extent show that green areas are insufficient to fulfil their post-earthquake functions.

In order to solve this problem, Temporary Disaster Centres, where people can meet their basic needs after the earthquake, should be included in the zoning plans. While these centres are being designed, outside areas of the city that can be easily accessed and which can also serve in matters such as temporary car park of municipalities, warehouse, weekly street market, recreation and picnic area of the city, and green areas should be chosen by being allocated to the service of municipalities or public institutions-organizations in normal times. In this way, it will be possible to prevent problems in the process of creating land for Temporary Disaster Centres [14].

Size standards and principles of disaster areas: The sizes of disaster areas should vary between 3,000 m^2 (100 tents and 400 population) and 30,000 m^2 (1,000 tents and 4,000 population). The sizes of the areas to be arranged as tent areas should be between a minimum of 3.5 - 4.5 m^2 and a maximum of 7.5 m^2 per person. When arranging a tent area, calculations should be made considering that the tents can accommodate 4 people, are resistant to external factors, and will be arranged in groups of 20-25 and in the form of islands. [7].

Prefabricated structures, on the other hand, should be designed in sizes ranging from 10-200 m^2 and in such a way that they can be easily assembled [13].

It is necessary to build shelters, bridges and roads against earthquakes; refugee camps and evacuation areas should be arranged on a 1 m^2 scale for each refugee and the size of the refuge areas should be at least 10 ha [8]

The tent areas in the sample plan represent 20-25 tents, each of which is 30 m^2. According to this calculation, the area needed in the plan is 9.600 m^2 – 12.000 m^2, on average 10.000 m^2. An evacuation area of this size confirms the standard of at least 1 m^2 of evacuation area per person, totalling 10 ha, as Şengezer [8] states in his book. [7].

RESULTS

As a country that needs to learn to live with disasters due to its location, it is very

important to implement disaster-sensitive urban planning decisions. In order for a disaster (earthquake) park to be accepted as a gathering and sheltering area, the risks and requirements around it should be evaluated; It is necessary to determine the existing and necessary functions, and to make the necessary arrangement, addition and design decisions according to these evaluations.

The inclusion of disaster parks, which will serve as epicentres for post-disaster crisis management, in the city at various scales should be ensured by disaster-sensitive, disaster-cantered urban planning decisions. We can list some important decisions that should be considered in the planning of disaster parks as follows;

· Different disaster risks should be considered in site selection for disaster parks. Criteria for site selection; It should be created according to the socio-cultural structure of the disaster area, the variety of disasters it faces, and its climatic and topographic characteristics.

· Urban disaster parks should be designed at scales that will balance the demand for asylum and the supply.

- A community-based disaster risk reduction system should be implemented and training and exercises should be carried out in the field at regular intervals. Thus, the adequacy of the area against emergencies will be evaluated.
- Regardless of whether the existing parks are transformed or a new one is designed, the use of disabled, sick and elderly individuals should be considered.
- In order to set up the number of tents determined during the post-disaster tent setup, the ground to be set up should be clarified by drawing or using different materials, and the tent setup plans should be supported by visuals.
- Be prepared for secondary disasters (fire, etc.) by creating evacuation routes to the Disaster Park.
- Disaster park and evacuation roads should be equipped with lighting and information elements using renewable energy sources (solar energy, wind energy, etc.).
- In the design of disaster parks, it should not be forgotten that besides meeting the daily park and recreation needs, they should be built in additional structures that can meet the basic humanitarian needs of the disaster victims.

Another point as important as the Disaster Parks is the evacuation roads leading to the area. In addition to determining evacuation routes, preparations should be made for other natural events that may occur after the disaster. Based on the earthquakes experienced in the past, extinguishing equipment and water wells should be available on the evacuation routes and in the area for fires that occurred after the earthquake. [16].

In our country, where most of our cities are at high disaster risk, our parks need to be redesigned as disaster parks. In this way, in addition to reaching the desired green areas in our green-poor cities, it can be ensured that emergency shelter, intervention and coordination centres, which are a very important requirement especially for crowded metropolises, can be provided after disasters. [16].

Earthquake Oriented Planning Standards:

Physical planning, which is a spatial organization, includes three stages. The first step is to choose the development aspects of the cities appropriately, to meet the needs of the city and to become disaster resistant. Then, the settlement criteria of the areas with different risk levels are determined. Finally, the least risky areas are selected according to the land use criteria. In this context, landscape designs; usage patterns vary according to their location and purpose.

- In the development of evacuation areas, safe routes should be created by considering the elderly and the disabled, signs with embossed shapes should be used, municipalities should be made compulsory to include earthquake parks in planning, and disaster-resilient model zone projects should be prepared primarily in high-risk areas.
- Open areas should be continuous and their optimum distances to housing and other areas should be analysed. In order for the existing and newly created open areas to form a system, they should be associated with the transportation network and natural structure, for this, the regions determined as landslide, flood and liquefaction areas, the 20 m wide zone determined along the streams and main arteries, and the risk areas determined in all under dam basins. It should be arranged as an open-green area.
- Emergency water networks should be developed or alternative water supply routes and emergency storage systems should be provided. Closed water network systems should be preferred and equipment that will provide continuous water to units that will serve as first aid centres should be installed .
- After the earthquake, fire and safety precautions should be taken in and around the evacuation axes, main transportation axes should not intersect; Helipads should be arranged in risky areas and hospitals.
- Lighting elements, flower beds, various poles, billboards, stops, etc. to be placed along the road. Urban furniture should be located within a band of 100-200 cm on the road front, depending on the width of the pavement, so as not to obstruct the passage on the pavement.
- In order to ensure that the road remains open in the event of a disaster, the height of the lighting elements is specified in relation to the width of the road, as seen in the road section. In this sense, it should be at different heights according to the width of the road, being shorter than 6 m on 15 m and narrower roads.

6 m and shorter poles will be placed at least 50 cm from the road side of the pavement, and longer poles will be placed at least 75 cm inwards.

Post-earthquake Disaster Recommendation Green Corridor Design

Using the example of Post-earthquake Prevention Corridor Design in Tokyo, Japan; Urban furniture that can be used in such parks and the standards that can be used in the

project design phase are examined.

Within the framework of the Earthquake-Planning Relationship; Determined after examining the studies aimed at keeping the damage caused by earthquake and post-earthquake secondary disasters to a minimum; Standards that can be brought to planning under the Landscape Architecture professional discipline have been determined:

- Development of post-earthquake recovery strategy project,
- Development of infrastructure systems together with main arteries,
- Developing urban areas and creating earthquake resistant structures by mobilizing financial resources,
- Developing the roads leading to the buildings as a green line together with parks and waterways,
- The distance between the zones is determined as 1.2 km, it is ensured that zone owners can reach safe zones within 30 minutes on foot,
- Designing major cities in terms of effective disaster prevention issues such as fire defence, emergency medical services, rescue and safety, based on this example of approximately 50 hectares,
- Disaster action plans, evacuation axles and arrangement of safe shelter points,
- Creation of open space reserves,
- Necessary criteria for disaster safety such as the construction of fire resistant buildings have been determined (Fig 15). [1]

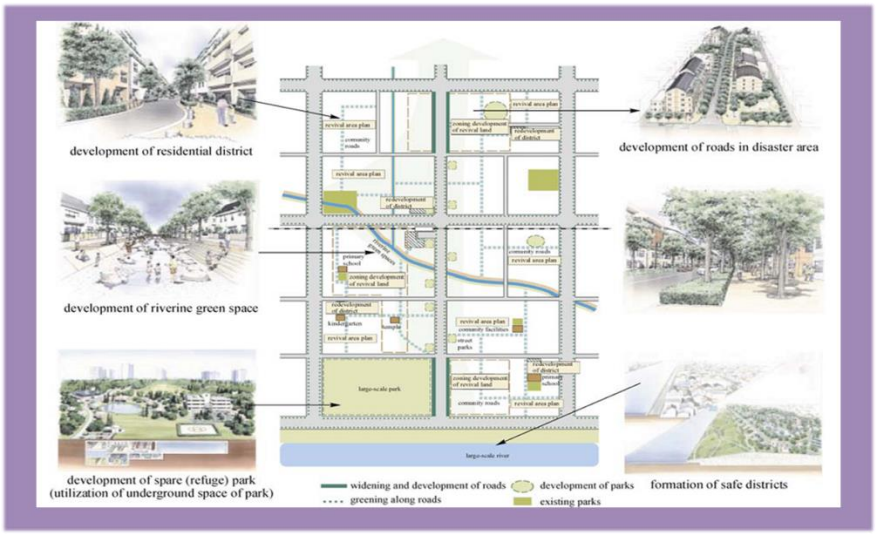

Fig. 15. *Disaster prevention proposal green corridor design diagram [3] [1]*

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