Perception of Environmental Change: Reconstruction of Place after Post Disaster Relocation

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Abstract: This study clearly evaluates the post disaster reconstruction in physical phases and explores how the place attachment formed from a psycho-social perspective. So the new formation of space during the community reconstruction is explored by measuring the user expectations and defining the psycho-social background of the victims. Furthermore, the socio-spatial dynamics of the post disaster reconstruction are evaluated in Turkey — Düzce case study. The case was designed as a descriptive, correlativ e and relational study. The quantitative data were collected from a questionnaire in order to determine the most important places and evaluate the images of the new and old environs. The evaluation of correlation results clearly shows the victims’ high level of attachment to their old environments. The non relocated victims still protect their high level of attachment whereas the relocated victims cannot reconstruct a high level of attachment as in the old environment though they live 7 year in the new environment. The analysis of the perception of the new environment by the victims shows the lack of use of the old environmental data in the new environment design process. This situation creates adaptation problems to the new environment so that the tendency to relocate from the new permanent housing sites was determined very high.

Key words: post-disaster reconstruction, relocation, place, environmental change

1. Introduction

Disasters destroy assets, undermine the flows of goods and services and disrupt people’s sense of security, thereby forcing relocation of household [1]. All appropriate actions after the disaster are taken to enable individuals and their communities to return to their normal life as soon as possible both physically, socially and psychologically [2]. Disasters occur at the interface of society, technology and environment and are fundamentally the outcomes of the intersection of these features. To adequately analyze disasters the barrier between human activity and eco-system activity must be collapsed, transforming a relationship of difference into a relationship of mutuality [3].

Place researches begin with an understanding of what place means. Relph (1976) suggests that places are given meaning through the range of experiences that allow us to know a place and without meaning, places exist merely as spaces [4]. Place is not only a physical concept but also had a psychological background and corresponds to an interactive comprehension. Because the environment consists of a combination of social and physical attributes. Place attachment is the accumulation of experiences in the physical and social millieu of people. In other words, we build our specific place in some degree that these places cannot exist independent from us [5]. In short, the role of the place is very deep in our life because of the presence of complex mental and emotional ties.

There are several approaches to the study of place connections and a variety of phrases are used to identify them. This phrases are; place attachment, sense of place, sense of community, rootedness, place
belonging, urban identity, place identity and place dependency. For the purpose of this study, the construct of place attachment was used because it represents the most concise description of the type of place connection. On the other hand concept of place disruption used contrary to place attachment. Disruption is defined as “any severe loss may represent a disruption in one’s relationship to the past, to the present, and to the future. Losses generally bring about fragmentation of routines, of relationships, and of expectations, and frequently imply an alteration in the world of physically available objects and spatially oriented action. It is a disruption in the sense of continuity which is ordinarily a taken-for-granted framework for functioning in a universe which has temporal, social, and spatial dimensions... the loss of an important place represents a change in a potentially significant component of the experience of continuity” [6].

Place attachment may disrupt in sudden cases such as disaster whether by voluntary or involuntary relocation. Relocation is defined as; the movement of a settlement (or portion of a settlement from an unsafe location to a safe location to re-establish a community, or it can be defined as; removal to another location with provision of land and housing. It can be voluntary or involuntary. The relocated people affected by disasters are called as: “victims of disaster” [7].

The study aims to understand how the place attachment constructed in two new environments following a disaster, which one of it designed and constructed for relocated people and the other for non-relocated victims after the traumatic events that disrupted the place connections.

2. The Impact of Post Disaster Relocation on Person-Place Relationship

The relocation of any community poses serious problems, due to the attachment of communities to their settlement location on account of ethnic traditions, kinship ties, livelihood security and cultural/historical associations. However, there are situations where relocation is unavoidable, and thus needs to be managed with skill and sensitivity. Relocation of settlements can be a temporary or permanent option. Relocation is temporary with their settlement land inundated and therefore they need to be relocated, with possible external assistance, until flood waters recede. However, when flood waters erode land, or landslides destroy settlements, then relocation has to become a permanent reality. Relocation after conflict can be both temporary and permanent, depending on the extent and continuation of hostilities. In some areas where there are high levels of vulnerability to natural hazards, authorities attempt permanent relocation but this is very rarely a feasible option, since it is normally opposed by residents, who resent such imposed actions and fear the economic consequences. Another objection is that the vacated unsafe land resulting from relocations is normally rapidly re-occupied by incoming families, thus re-establishing the vulnerable status-quo [8].

Involuntary relocations on the other hand often follow natural forces, such as earthquakes, hurricanes drought or flood, or human actions, such as toxic contaminations, or economic development initiatives such as dam or highway building or urban renewal projects. These relocations are often sudden, with change threatening to overwhelm stability. They can involve injury or loss of life and possessions, losses are integral to self-definitions. In fact, the following discussions of two particular disasters will illustrate how places sustain multiple sources of identity, including kin, friends, and neighbours; institutions and cultural structures; and meaningful behaviour settings tied to work, leisure, and celebration [6].

When one is forcibly moved from one place to another because of a natural disaster, refugees have to face many problems in adjusting to their new surroundings. The environmental transition of relocation to restoration housing is conceptualized as consisting of two major elements which are essential
for understanding environment-behavior transactions [9]. Post-disaster behavior in securing shelter and housing is “influenced and constrained by social, cultural, ecological, historical and political-economic conditions”. Finally, the issue of relocation is directly tied to pre-event social location. Most research indicates that victims resist any type of relocation, even to temporary shelters, in order to stay as close to their homes as possible [10].

3. Duzce Case Study

On 17 August 1999 at 03:02, an earthquake measuring 7.4 on the Richter scale struck the northwestern part of Turkey. Officially called the “Kocaeli Earthquake”, it was situated on the North Anatolian Fault Zone and the epicentre of the main shock (40.70°N-29.91°E, with a focal depth of 15.9 km.) was about three kilometres away from the centre of the town Gölcük. The earthquake ruptured 120 km of the North Anatolian Fault Zone, affecting a large area (approximately 41,000 m²) between Bolu and Istanbul, in the economic and industrial heartland of Turkey (34.7% of the GNP) [11]. The major areas affected from this disaster include the provinces of Kocaeli, Sakarya, Yalova, Bursa, Eskişehir and Bolu (Fig. 1). This earthquake resulted with the recorded death of 17,480 people and 43,953 injured people. More than 75,000 buildings within the region were demolished completely [12].

Not even three months after, on 12 November 1999 at 18:57, another big earthquake with a magnitude of 7.2 on Richter scale occurred in Düzce, affecting mainly Bolu, Düzce, Kaynaşlı, Gölyaka, Çilimli, Cumayeri and Gümüşova cities. The epicentre (40.76°N-31.14°E, with focal depth of 14 km) of the earthquake was located in Düzce and it ruptured an additional 43 km of the North Anatolian Fault to the east of Gölyaka. Although smaller in extent, this second earthquake also caused death and destruction; 763 people were recorded dead and 4948 people were injured [13].

Düzce province is located on the North Anatolian fault line in Düzce plain (Fig. 1). As a result of the rapid industrialization in 1980-1998, the migration to the city from the rural areas increased and the housing demand rapidly increased as well. This rapid migration prompted unplanned construction, and builders added more floors to old buildings, reaching beyond the limits of the municipal laws. As there were no reliable construction control systems for the building construction processes in Turkey at the time, new buildings were constructed rapidly with improper techniques and materials and no supervision from the authorities. This created an extremely vulnerable built environment, and such, when the earthquakes struck it caused great amounts of damage to the housing stock and other buildings (Fig. 2). The total area of the city is 2593 km², and according to the 1997 census the population was 307,056 and the density of 108 people/km² is more than Turkey’s 83 people per km² average.

In Düzce, there were 16,666 dwellings or houses totally destroyed, 10,968 semi-damaged and 13,070 slightly damaged — according to the categories used in official statistics [14]. In total, 84% of the houses and were damaged to some degree. Heavily damaged buildings were the Municipality, State Hospital, Düzce High School and University (Tekel) Building [15].

Fig. 1 Areas affected by the Marmara and Düzce earthquakes in 1999 (by permission from Jhonson C., 2009).
3.1 Relocation Process after the Earthquake

Relocation of damaged villages is quite common in Turkey. The decision to relocate is usually based on three factors: 1) when the old location is at risk of future disasters, 2) when the old location is completely destroyed and therefore to remove the debris and rebuild on the same site will take too much time, and/or 3) when there is a chance to relocate to land owned by the government, since it is generally preferred not to have to pay for the land. The decision to relocate is made by the MPWS, often with input from several ministries. In general the geology of the area and the availability of land are the primary facts taken into consideration for relocation, and social aspects such as rootedness in place or connections between the new and old settlements are of less priority. The outcome is that the site plans of all post-disaster settlements are similar although the regions and communities have cultural and social differences [16].

Sometimes relocation requires the expropriation of land from private owners. Since private ownership is protected by the constitution, this often leads to problems. For example in Duzce, a two-year delay in the expropriation of land to build a road meant that people relocated to the 8000-unit settlement outside the city had to travel 14km to reach the city, rather than using a direct road which would be 4 km [16].

4. Research Method

In this study the physical and social reconstruction processes after two devastating earthquakes is to be interpreted in order to understand the selected case in a broader and deeper way through psycho-social effects on the human-environment relations. Research had a focus on samples from the former environment within a number of 50 non-relocated people who were lived in the city centre and another 50 relocated and people who were resettled involuntarily 8km faraway from the from the old city centre.

In order to investigate the psychological and social attachment of the earthquake victims in their current environment a questionnaire survey was conducted. The survey included Socio-demographic information about the victims and evaluation of the social and physical infrastructure of the new city. In addition questions are also directed to earthquake victims for identifying key points in the old-new city. The Duzce city, affected from the 1999 Marmara and Düzce earthquakes, was selected for the case study.

Research has been done with a quantitative method. The quantitative data acquired from the questionnaires were analysed. The three dimensional perceptual determinants of the research were designed and based on different perspectives of the place attachment analysis and evaluation in different, city & neighbourhood, scale and environment (Fig. 3).
Y axis in Fig. 1 illustrates the perceptual determinants of place attachment perceived by the disaster victims. The concept of place attachment used in the research to determine the victim’s level of attachment to their new environments by using two groups which one of it was the relocated victims and the other was the non-relocated. Also the place attachment here is based on understanding psycho-social attachment which is related with two subgroups of psychological attachment in individual level and social attachment in community level. Thus old and new environments tried to be determined and correlatively evaluated according to the formation level of place attachment by time. X axis refers to the relocation and non-relocation status of the disaster victims according to their old and new environs. On the other hand Z axis defines the different scales of the environments that are divided into two sub groups such as the city and neighborhood level.

4.1 Research Scope and Research Question

The research scope covers social and psychological aspects of post disaster reconstruction within the context of relocation and the traumatic impact of the disaster. The case study of the research mainly focused on answering the specific questions of:

- What kind of a environmental place attachment relationships exist between the relocated group and their new constructed environment? What kind of a environmental place attachment relationships exist between the non relocated group and their changing, despite the non relocation status the environment also reconstructed by the victims (e.g., new houses)? Given all this the hypothesis below were outline and tested:

  **Hypothesis:** The group with the experience of post disaster relocation had higher level of attachment to their environment than the non relocated group.

4.2 Pilot Study

The pilot study applied in the initial phase on a focused group of 30 earthquake victim in order to test the questionnaire forms results. This preliminary results and data were analyzed in order to have more reliable results. Some changes and corrections were made on data collection procedures. The summary of the results indicates:

- Using a specific questionnaire rather than a scale because of the length of the scale forms and lack of their reliability & validity analysis in Turkey. The questions were decreased because of the time limitations that was calculated for each respondents between 20-30 minutes. The focus was given to the
questions that directly reveals the place attachment both individual (sense of place) and community (sense of community) levels. The questionnaire designed as to be easily marked.

- New tools were added to identify the most important landmarks of the new and old city. The answers for this phase were limited with three.

4.3 Sampling and Procedures

The population of the research is the Duzce City centre and the permanent housing site constructed after the earthquake and 8 km far away from the Duzce City centre and (Fig. 4). The permanent housing site were consisted from 14 region and 7000 housing unit with an approximate population of 30,000. Beside the Duzce city centre had a population of 66,624 according to 2000 census.

4.3.1 Sample Selection

The independent variables; gender, age, occupation, education level, damage status from the earthquake, years of residence and number of relocation were evaluated according to relocation status of the earthquake victims. The sample size covers the whole population and were calculated approximately 96 people but rounded to 100 people during the implementation phase. The total population size of the sample was around 100000 people.

The population size, \( r \) is the respondents fraction concerned in the research and \( Z(c/100) \) is the critical value for reliability level of \( c \) according to the formulas:

\[
X = Z(c/100)^2 r (100-r) \quad n = \frac{N x \sigma^2}{(N-1)E^2 + x} \quad E = \sqrt{\frac{(N - n)}{n(N-1)}}
\]  

(Poduri, 2000). If the sample included all the earthquake victims population, the sample size was calculated and fixed to 100. This sample had the significance level of 0.05 and response distribution of 50%, confidence interval of 95% and margin of error as 9.8%.

Research sample were consisted of Duzce City Center and Permanent housing site. 20 neighborhood from the Duzce City Center and 5 neighborhood from the permanent housing site (Bahcelievler, Camliye, Yesiltepe, Esentepe ve Guzelbahce) were selected (Table 1).

Also the frame of the sample included the following attributes:

- All the victims will be over the age of 12,
The individuals had to be lived until 1 year before the earthquake in Düzce, be in the earthquake region during the 1999 earthquakes and go on living in the city now.

- The families selected among the earthquake victims relocated from their old settlements to a newly constructed one or those not relocated from their old settlements. The second group also had the sense of transformation in the existing old environment although they have not experienced the relocation process as the first group.

4.3.2 Data Collection Procedures

Babbie (1998) states the most useful and common objectives of social research as the examination, definition and explanation of the title or the event. Despite this, developing a strategy should be the appropriate response to the research questions in order to get valid and reliable results.

For performing the goals of the study the research method the survey method of questionnaire were used in order to evaluate the psycho-social attachment levels to the new environment (Table 2).

4.3.3 Implementation of Data Collection Tools

Data collection tools were consisted of a questionnaire conducted from the victims with face to face interview technique. Survey application takes approximately 10-15 minutes.

The aim of the study is the correlation of the existing place attachment of old and new environs with an understanding of the impact of trauma created by the earthquake. In this phase, the dependent variable place attachment tried to be evaluated clearly and data collection phase ended in this way. The hypothesis related with post disaster relocation was tested with an emphasis on social attachment levels focused on gender and age differentiations. This method reveals comparatively high level of knowledge from large number of respondents.

The questionnaire covers the evaluation of demographic situation of the victims, place attachment and the social relations levels in their existing environment. Also the existing situation of the city during reconstruction period was evaluated as well. Thus, the perception of the victims according to their experiences was determined in the context of relocation.

The questionnaire method used in the research aimed to determine the relations between the dependent (attachment level to the city, old-new environments, neighborhood and the house) and independent (age, gender, relocation) variables.

**Evaluation of the questionnaire:** Survey questions between 1-6 used for learning the socio-demographic structure of the disaster victims. 7th question aimed to understand the level of damage on the properties of victims. The question between 8-9 used to determine the relocate and non relocated victims and number of relocation. 10th question determines the perception of the city by the settlers that reveals the main landmarks of the city. Questions between 11-16 aimed to determine the psycho-social attachment levels of the victims to their existing environment. This 6 question group consisted of two sub groups that includes 11th, 12th, 13th and 15th question were related with psychological attachment. On the other hand 14th and 16th questions related with social attachment. Responses graded from 1 (never agree) to 5 (agree too much).

The total score is calculated by giving points from 1 to 5 for each question (reversed for some specific questions) and adding them. In the second phase this
score divided to the number of question responded. The score is the mean point for each individual. Lastly all the individual score added and then divided to the number of respondents covered in the research. The last score gives the mean place attachment score of the community. The mean of each question is used for the estimation of psycho-social attachment.

18th question is used to determine the important places in the post-earthquake city perverted by the victims. In the 19th question the physical environment is evaluated during the post earthquake reconstruction phase of 9 years. Victims evaluates the existing situation of the city by grading from 1 (very good) to 5 (very bad) for transportation, location of state buildings-schools and socio-cultural services, shopping & recreational potentials.

4.4 Measures

Following the implementation phase of the case study area in the second phase, the relationship between independent variables (socio-demographic characteristics, damage from the earthquake, years of residence, status & number of relocation) and the dependent variables (psycho-social attachment, the attractiveness of the existing environment, environmental belonging, desire to live many years in the existing environment, social attachment and sense of community) were statistically evaluated with “chi-square and correlation analysis”.

In addition all levels and scores of place attachment were evaluated with the independent variables. Perceived landmarks of the old-new city, obtained from the survey questions, were distributed and mapped (see Fig. 5-Map 1). The current situation of the new city were assessed and classified. The chi-square analysis not only reveals the relationships for the whole group but also provide a way to correlate the relocated and non-relocated groups. The last phase of the research was the evaluation of the hypothesis and research questions due to the previous analysis and mapping studies.

4.5 Frequency Distributions

Age distribution, gender distribution, educational status and socio-demographic characteristics such as occupational status, etc. were obtained from the random sampling group of victims in the central province Düzce and permanent housing.

4.5.1 Age

It is founded out that 12% of the victims are between the ages 25-30, 34% between the ages 31-36, 24% between the ages 37-42, 15% between the ages 43-48, 13% between the ages 49-54 and 2% between the ages 55-60.

4.5.2 Gender

Gender distribution of the group is formed of 57% of men and 43%. The number of interviewed group of women and men were in a balance.

4.5.3 Occupation

The vocational distribution of the victims determined as; 5% retired, 11% workers, 47% civil servants, 13% housewife and 24% self-employment. According to these results it can be pointed out that vast majority of the group actually works.

4.5.4 Education Level

The study shows that the 5% of the participants are literate, 6% graduated from primary school, 8% secondary school, 50% of high school and 31% had a university degree.

4.5.5 Years of Residence

It is also observed that 16% of the victims were living in the city between 6-10 years, 12% between 11-19 years and 72% 20 or more years in Düzce City. Vast majority of the group were living in the city over 20 years.

4.5.6 Home Ownership

It is founded out that 29% of the group were tenants, 62% were landlord and 9% were living with their relatives. A large part of the group were homeowners.

4.5.7 Damage Evaluation

The study shows that 67% of the victims suffered from the earthquake and 33% did not have a damage
loss. It is estimated that the group with damage loss had a higher traumatic experience than the other who did not had losses. Thus, in the case study the experience of trauma were examined with the phenomenon in the context of the research.

House Damage: when the victims house damages were evaluated. It can be pointed out that 34% of the victims had no damage, 17% had small (25%) damages, 12% had moderate (50%) damages, 18% had high damage (75%) on their houses and 19% of the houses were collapsed.

Property Damage: The reason for easily overcoming the first shock was the 17 August 1999 occurred nearly three months before the second earthquake that people were very more educated and ready for an earthquake. Some of the heavily damaged buildings were evacuated. Therefore, 7% of the victims with highly damaged houses stated no loss of property.

4.5.8 Number of Relocation

Only 1% of the victims had not relocated after the earthquake whereas 16% relocated one time, 31% relocated 2 times, 23% relocated 3 times, 7% relocated 4 times, 3% relocated 5 times, 19% relocated 6 times, 1% relocated 9 times. The study focused on permanent relocation. The temporary relocation processes between 0-2 years were not evaluated. The tendency that can be outlined here is the temporary relocated settlers had no or very low damages on their houses and/or properties. All the earthquake victims regardless the damages occurred had not entered to their house because of the fear and relocation. Nearly half of these relocations were in a short time period and covers the relocated groups between 0-2 with very limited and low or no house-property damages. On the other hand it is more frequent for the permanently relocated group with moderate or high damages on their house-property.

4.5.9 Overall Attachment

Concept of overall attachment here is used to determine the total score from the psycho-social place attachment questionnaire. When the victims psycho-social place attachment were evaluated it can be pointed out that 29% of the earthquake victims psycho-social place attachment level found low, 31% of them average (normal) and 40% of them high. Thus the victims generally had high levels of psycho-social attachment level.

4.5.10 Place Attachment

When the sub-parameters (attractivity, sense of belonging, desire to live or move) for place attachment were evaluated according to the “Attractivity of the environment”:

- 52% of the victims with high psychological attachment found the new environment attractive, 15% of them average and 33% low.
- 57% of the victims with high psychological attachment feel that they belong to the new environment whereas it is 7% for the victims with average psychological attachment and 36% for the victims with low psychological attachment.
- 47% of the victims with low psychological attachment feel that they do not want to move from their new environment whereas it is 15% for the victims with average psychological attachment and 38% for the victims with high psychological attachment.
- 50% of the victims with high psychological attachment feel that they want to live long term periods in their new environment whereas it is 15% for the victims with average psychological attachment and 35% for the victims with low psychological attachment were found out.

The earthquake victims with high psychological attachment generally found their new environment attractive, they feel the sense of belonging, did not want to move and want to live in the new environment for long time periods in the future.

4.5.11 Community Attachment

The social attachment refers to community level attachment. According to the results of neighborhood attachment it can be pointed out that:

- The ratio of victims with high attachment is 52%,
The ratio of victims with average attachment is 12%.

The ratio of victims with low attachment is 36%.

When the relationship between Community Attachment (Sense of community) and its levels the 61% of the victims had a high level attachment, 11% of them average level and 28% low level attachment. The earthquake victims with high social attachment generally attached to their neighborhood and people, they feel the sense of community in the new environment.

4.6 Perception of the City

4.6.1 New (Post Disaster) City

New City landmarks (buildings-places): The three most important places and/or buildings firstly recalled and remembered by the earthquake victims according to their answers and frequency distributions shows that:

— The main parc in the city center (Anıt Parc) and new municipality building (remembered 15 times) were the most important landmarks of the new city. Latter new governor building with 14 times, Central (Big) Mosque and victims’ own houses with 10 times comes. Then Istanbul Street (remembered 9 times) which is the main street of the city, Asar stream with 8 times and New Hospital with 6 times follows as the other important landmarks. The grading changed according to the weighted ratios as; (Anıt) Park with (2.27), New governor building (2.43), victims own houses with (2.42) that were determined over the average and Istanbul Street with (1.78), Central (Big) with Mosque (2.00), New Municipality with (1.86), New University Campus (1.70), Asar Stream (2.00), Spor Street (2.00) ve New Hospital (1.83) were determined under the average (Table 3).

The intensitivity on the remember of places were generally focused on the most important landmarks of

<table>
<thead>
<tr>
<th>Building-Place Name</th>
<th>First (3 points)</th>
<th>Second (2 points)</th>
<th>Third (1 point)</th>
<th>Total Score</th>
<th>Total Number of Remember</th>
<th>Weighted ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anıt Parc</td>
<td>7</td>
<td>7</td>
<td>1</td>
<td>36</td>
<td>15</td>
<td>2.27</td>
</tr>
<tr>
<td>Istanbul Street</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>16</td>
<td>9</td>
<td>1.78</td>
</tr>
<tr>
<td>Big Mosque</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>24</td>
<td>12</td>
<td>2.00</td>
</tr>
<tr>
<td>New Municipality</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td>28</td>
<td>15</td>
<td>1.86</td>
</tr>
<tr>
<td>New Governor Building</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>34</td>
<td>14</td>
<td>2.43</td>
</tr>
<tr>
<td>University Campus</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>17</td>
<td>10</td>
<td>1.70</td>
</tr>
<tr>
<td>Spor Street</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>22</td>
<td>11</td>
<td>2.00</td>
</tr>
<tr>
<td>Asar Stream</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>16</td>
<td>8</td>
<td>2.00</td>
</tr>
<tr>
<td>Hospital (State)</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>11</td>
<td>6</td>
<td>1.83</td>
</tr>
<tr>
<td>My House</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>29</td>
<td>12</td>
<td>2.42</td>
</tr>
<tr>
<td>General Average</td>
<td>41</td>
<td>40</td>
<td>30</td>
<td>251</td>
<td>121</td>
<td>2.01</td>
</tr>
</tbody>
</table>

the city such as municipality, central (Anıt) parc and governor building (Map 1-Fig. 4). But it can be pointed out that victims perceived in a high level and attached to their own houses that and see it as a landmark. Beside the big (central) mosque had a crucial and important point in the victims mind even though it was demolished and re-built after the earthquake. So victims had some serious ties and attachment with their house and also to the mosque that can be seen as a moral (religious) sensitivity and value to be attached after the traumatic event.

All the data reveals that victims begin to create new attachment in the new city beside the continuing attachment to the old places. The interesting output is that the biggest massy building of Municipality Trade Center and the roman neighborhood in the city center
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Map 1  The distribution of the images in the new city remembered and recalled by the victims.

Table 4  Old city main landmarks according to the perception of the victims.

<table>
<thead>
<tr>
<th>Building-Place Name</th>
<th>Order of Remember</th>
<th>Total Score</th>
<th>Total Number of Remember</th>
<th>Weighted Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tekel (Old University) Building</td>
<td>8 9 3</td>
<td>45</td>
<td>20</td>
<td>2.25</td>
</tr>
<tr>
<td>Duzce High School</td>
<td>3 2 3</td>
<td>16</td>
<td>8</td>
<td>2.00</td>
</tr>
<tr>
<td>Istanbul Street</td>
<td>3 7 5</td>
<td>28</td>
<td>15</td>
<td>1.86</td>
</tr>
<tr>
<td>Big (Central) Mosque</td>
<td>5 8 11</td>
<td>42</td>
<td>24</td>
<td>1.75</td>
</tr>
<tr>
<td>Kultur Neighborhood</td>
<td>6 1 1</td>
<td>21</td>
<td>8</td>
<td>2.63</td>
</tr>
<tr>
<td>Beaker Supermarket</td>
<td>2 5 3</td>
<td>19</td>
<td>10</td>
<td>1.90</td>
</tr>
<tr>
<td>Anit parc</td>
<td>9 8 7</td>
<td>50</td>
<td>24</td>
<td>2.08</td>
</tr>
<tr>
<td>Governor Building</td>
<td>3 4 2</td>
<td>19</td>
<td>9</td>
<td>2.11</td>
</tr>
<tr>
<td>My House</td>
<td>13 2 3</td>
<td>46</td>
<td>18</td>
<td>2.55</td>
</tr>
<tr>
<td>Hospital</td>
<td>4 4 5</td>
<td>25</td>
<td>13</td>
<td>1.92</td>
</tr>
<tr>
<td>Municipality</td>
<td>8 2 2</td>
<td>30</td>
<td>12</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>General Average</strong></td>
<td><strong>64 52 45</strong></td>
<td><strong>341</strong></td>
<td><strong>161</strong></td>
<td><strong>2.11</strong></td>
</tr>
</tbody>
</table>

had very low number of remember respectively 1 and 2. This shows that the experienced places that are the part of social attachment had higher attachment then those not experienced.

4.6.2 Old (Pre Disaster) City

The frequency distribution of the most important 3 landmarks of the old (pre-disaster) city by the victims show that:

According to the number of remember, the big (central) mosque and anit parc were the first remembered (24 times). The following landmarks were respectively the old university (tekel) building (20 times), the houses of the victims (18 times), the state hospital (13 times) and old municipality (12 times). The last two landmarks were Duzce High school (9 times) and the neighborhood of Kultur (8 times) (Table 4).

— According to the weighted ratios the old university building (Tekel) (2.25), Kultur neighborhood (2.63), victims houses (2.55), governor building (2.11) were determined over the average.
whereas Düzce High School (1.78), Istanbul Street (1.86), Big (Central) Mosque (1.75), Biçakçi Market (1.90), Anı Parc (2.08), Hospital (1.92) were under the average.

The intensity were generally focused on Big (Central) Mosque and Anı Parc (Map 2). But the interesting case is that victims remembered their houses even though some were demolished. This can be regarded as the sign of high level of place attachment. On the other hand Kultur neighborhood was found as a very important key point. Because it was the most socialized part of the old city and revealed the victims high level of social attachment. Also the collapsed buildings such as old university (tekel) building, hospital and Düzce high school number of remember showed that even the traumatic events did not directly cause place disruption easily. Contrary the disaster situation reinforced the place attachment in this case. But the affect of disorganization and uncertainty of relocation process create more stress on the community.

Map 2  The distribution of the images in the old city remembered and recalled by the victims.

4.7 Evaluation of the Existing City Services

The evaluation of “location of the existing public buildings” shows that 2% of the victims found them very good, 14% good, 24% average, 44% bad and 16% very bad. The delay in reconstruction in Duzce after the earthquake and untidiness (scattered) public buildings, some still serves in temporary buildings, evaluated by the victims in a negative sense. The victims wanted to spend less time in the public buildings that they want them to be designed closer to the new city center.

The evaluation of the existing transportation situation shows that 1% of the victims found them very good, 22% good, 27% average, 33% bad and 17% very bad. Especially for the relocated population the transportation is a problem because of the temporary 8 km road that had not been finished. On the other hand the habits of the victims were generally based on pedestrian transportation before the earthquake because of the short distances in the city center. So the victims had serious problems to adapt the mass transportation that means at least 1 hour per day.

The evaluation of the shopping facilities shows that 5% of the victims found them very good, 30% good, 41% average, 18% bad and 6% very bad. The victims generally had an average satisfaction level. Even though they continue their pre-earthquake habits for shopping in a characteristic way, most of the victims
wanted big modern shopping malls. The intensitivity in new shopping malls reflects this tendency even though the malls are located far away from the center and are in opposite positions to each other.

The evaluation of the location of the existing education institutions shows that 4% of the victims found them very good, 31% good, 48% average, 11% bad and 4% very bad. It can be pointed out that the scale of the demolition in educational institutions were low when related to other buildings and also the short period in reconstruction of the new prefabricated schools increased the level of satisfaction. Fig. 5 shows the level of satisfaction of the victims from the social and cultural facilities of Duzce city as 1% found them very good, 8% good, 9% average, 33% bad and 49% very bad. The social and cultural life were very lively in the old city and affects the social attachment of the community. But the slow reconstruction of the city after the earthquake and the ruins t, which are still all around the city had a negative impact on the moral motivation of the settlers. Also the lack of organization such as concert halls, theaters, etc. negatively affect the perception of the settlers. On the other hand lack of physical places such as cinemas also directly had affects on creation of social bonds and increases the dissatisfaction of the victims.

The evaluation of the location of the recreational facilities shows that 13% found them very good, 17% good, 31% average, 26% bad and 13% very bad (Fig. 5). The low level of satisfaction results were very interesting that the city had various types of recreational areas and places such as forests, big waterfalls, excursion spots. But he settlers focused on the city center reconstruction where there is a lack of recreational areas and place and they perceive the city by the physical reconstruction of the old city. So the physical reconstruction of the city give also some cues about the communities level of social attachment and individuals level of place attachment. Thus the study seeks the relation between the social and physical places.

![Fig. 5 The evaluation of the recreational, social and cultural facilities, existing public buildings, education institutions, transportation services and infrastructure, shopping facilities.](image)

5. Research Results

The dependent variables (relocation status, frequency of relocation, home ownership, gender, age, occupation, education level, years of residence, the damage level from the earthquake) were correlated with the independent variables of psycho-social place attachment and their sub-levels. The results shows different reasons that affects the victims attachment levels. On the other hand the relationships between the relocated and non-relocated groups tried to be analyzed by these correlations.
5.1 Evaluation of the Relationships

The evaluation of Fig. 7 clearly shows that the meaningful relationships for place attachment were resulted from the non-relocated group. The relocated group had few place attachment relations limited with 3. This situation shows that the non-relocated group adapted to their new environment more than the relocated group. It can also be pointed out that the place attachment created in long time periods. Therefore the solutions that will be based on non-relocation may boost and facilitates the social reconstruction levels of the victims.

![Fig. 6 The relationship between the place attachment and socio-demographic variables of relocated group.](image)

![Fig. 7 The relationship between place & socio-demographic variables of non-relocated group.](image)
This attachment can be seen as a sign of good neighborhood relations in the new environment. The relation between the variables long year residence and relocated population supports this result with a meaningful relation determined for the tendency to relocate from the new environment. Briefly the relocated victims are satisfied from their condition but they do not had the sense of community. On the other hand the homeowners that had not relocated find their environment attractive and feel more belonging. This situation shows that they had strong ties and attachments in psycho-social levels of neighborhood both physically and socially. On the other hand the meaningful relations between the between the neighborhood and years of residence reveals increases the environmental belonging and attractivity and creates the desire of long living tendency in the new environment. But for most of the relocated homeowners it is found that the place attachment level is lower than the one before the earthquake. So it is not easy to create new attachments after disruption.

There are also some meaningful relationships between the relocation status, home ownership, years of residence and psycho-social place attachment. This situation verifies the theory that the place attachment created over time in a stable environment. The homeownership also boost the tendency to attach to place.

6. Discussion

Disasters firstly disrupt the physical attachment of people in a certain place. Relocation from a place not only means a break out from the physical environment but also the destruction of social networks and bonds created in community level over time. Disasters also generally cause housing problems and homelessness. But in all cases, even though the change in duration of solving housing problem, there is a transition process for permanent housing. People feel loss of place in a deeper sense in this phase. On the other hand in case of relocation to another place means new environmental stresses such as adapting to a new environment and forming a new life. The duration of the transition process and different types of temporary shelter and house options change the impact but in all cases the disruption and reconstruction of place attachment occurred again and again. The study shows that as the temporary sheltering and housing processes extends by time the later the place attachment created. The results also show that the attachment can be easily created, even though the same transition happens, in case of non-relocation. Thus in disaster studies the decision of relocating a population to a new environment need to be analysed from physical and social attachment perspective in each case that may end with a solution for environmental adaptation and attachment problems.

The specific results of the research can be summarised as below;
- The increase in the years of residence in an environment increases the environmental attractiveness (whether the physical and social quality of the place is good or not) and environmental bonds. This positive feeling also boosts the neighborhood relationships at individual level and social relationships at community level. These kinds of attachments decrease the desire to move from the existing environment. So there is a direct bond between the psycho-social, physical environment and place attachment that can be evaluated by means of environmental data.
- The other important factor that affects the place attachment is the home ownership. To own or possess a home refers to be permanent in that place and give a kind of relax feeling that increases the place attachment. Home ownership also can be seen as the sign and the tendency of long residence and by means of these the community integration increases.

There are generally 3 tendencies in post-disaster relocation. The first one is “Complete Relocation” and it refers to relocation of all victim population from the disaster area to a safe area generally located faraway from the old center. The complete relocation
approach create both economic, to reconstruct a new settlement from the beginning with infrastructure and superstructure costs, and social problems such as life change in temporary shelter then temporary houses settlements, disruption of place attachment and social bonds. Also designing and constructing a new settlement may create some spatial problems when the old environment is not analysed from its design pattern, physical features, etc. Also new settlement had the rise of desolation because of being far away from the old environment and the difficulty to reconstruct the social life again. The second type tendency is “Reconstruction in the same place” approach and it may give a change to reconstruct all the post disaster attachments easier and quicker. But it is not easy to realise this approach because of the future disaster risks. The third option “Partial relocation” is used to reconstruct the demolished parts of the city which were very close to the old one with a focus on reconstructing the old patterns and neighborhoods that needs too much data about the old environments psycho-social and physical background with a deeper understanding and analysing. Further studies may focus on evaluating the cases where the reconstruction planned in the same area and as the pre disaster environment. So that it will give a chance to correlate the options and find out their strong parts to form better post-disaster solutions.

7. Results

The case study in the research used to determine the psycho-social place attachment levels and also their sub-levels. The results show some meaningful relations between place attachment and relocation, home ownerships, years of residence. The results for relocation show that there were no meaningful relations created during the post disaster relocation process for the whole group. But when the groups were evaluated separately as relocated and non-relocated it is found out that the relocated group had meaningful relations with their environment as a sign of place attachment. Thus, there is a negative relationship between place attachment and relocation. So the test results of the hypothesis reveals that the group with the experience of relocation had low level attachment than those non-relocated. Additionally, even the long period of 7 years of residence in the new environment the creation of place attachment level found insufficient. So the place attachment needs very long time of residences more than 7 seven years for this case. It can be pointed out that to decrease the impact of the traumatic event and to boost the social reconstruction process it is better to use the options of resettlement of the victims in the same places where they live before the disaster. If it is impossible because of the technical specifications or too risky to live in the same places, the option to resettle in a close physical and social environment to the old one in a well designed environment (using old physical patterns of the neighborhoods, preserving the old social structure, etc.). The continuity of the old physical and social environments can be used to decrease the environmental stress levels of the victims that become very high because of the traumatic event and re-adaption problems.

References


