

Reconstruction with Victim Relocation and Environmental Transition after a Disaster: A Case Study of the Marmara Earthquake in Turkey

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In Turkey, housing recovery policies require the National Government to provide permanent housing for owner-occupiers of damaged houses. Those houses are usually constructed in suburbs far from the damaged built-up area. After the 1999 Marmara earthquake, most owner-occupiers were able to buy inexpensive government-provided permanent houses. However, the government did not offer a program to aid house-renters, because government support for housing is based on compensation of private property. Further, in their post disaster housing scheme, the government intended to expand the city area.

In this study, we surveyed residents of the damaged built-up area in Degirmendere, Turkey and recorded the reconstruction progress after the Marmara earthquake. We also studied residents who live in permanent houses in Yuvacik, Turkey. We analyze resident relocation according to the government's recovery project, and study city growth in the years following the earthquake. We also clarify victim behavior as it relates to individual recovery effects on housing relocation, and adaptation to the changed environment.

After the Marmara earthquake, some owner-occupiers moved into permanent housing, while others rented their permanent houses to others because the permanent houses were not desirable. While rebuilding did occur in the damaged built-up areas, problems were encountered because of building height regulations and difficult negotiations among condominium cooperative housing. The primary results are as follows: (1) Process of the expansion has also affected residents' views on suburban living and low-rise apartment housing, as well as their environmental evaluation. (2) Residents' generations vary in permanent housing and most residents become gradually satisfied even if they were not originally satisfied about the environment of the newly built permanent housing area. (3) Many problems remain in the damaged built-up area. Ten years after the disaster, many buildings are under construction by real estate development companies. Many residents who lived in the same condominiums at the time of the disaster do not live together in the rebuilt areas.

Keywords: Turkey, Relocation, City Growth, Adaptation of Changed Environment, Owner-Occupiers' Recovery, Renters' Recovery

1. Introduction

When considering a recovery plan for a large scale disaster, it is important to discern the influence of public housing rebuilding support on private land development, and to determine influences on city formation in the future. Particularly important is the recovery plan for a damaged built-up area where the population has increased and the city has expanded, such as in Turkey and China. In Chongqing, China, a recovery plan that gives priority to suburban development with relocation of victims has taken place. This study examines the relation between the government's house reconstruction plan and the expansion process of the city during Turkey's Marmara earthquake, which occurred in a region near Istanbul in the eastern part of Turkey in 1999. Briefly, this study examines: (1) The effects of rehabilitation housing policy for earthquake disaster victims and new government regulation of land-use; (2) The relationship between public measures and private development when considering a mid-term span of ten years; and (3) How victims shifted to a new environment during the process of recovery, based on an investigation of house rebuilding, redevelopment of stricken areas, and a resident attribute and consciousness survey.

The previous paper^{1,2)} introduced housing assistance programs, and evaluated the supply of permanent houses and housing repair assistance programs, based on qualitative surveys, i.e. interview surveys to the limited samples. The evaluation was done at the time of construction/supply of permanent houses. By contrast, the current paper is based on the survey results obtained after the area where the permanent houses are situated developed into a town, e.g. after at least five years have passed after the residents moved in the houses, or after TOKI (housing development administration of Turkey) built new apartments close to the permanent houses. With the results of qualitative surveys whose samples were deliberately chosen, the paper primarily analyzes the living environment both for families who moved in a permanent house in a suburb after their previous place was destroyed and for families who live in a disaster area. In addition, it looks into what kind of people live in inappropriate residential areas, such as the area where the construction of houses is prohibited.

By featuring the above, the current paper aims to evaluate rehabilitation housing policy for earthquake disaster victims more comprehensively. To achieve that goal, the following will be carried out: (1) evaluation of any housing recovery measures; (2) survey on the permanent housing residents' level of satisfaction; and (3) investigation into the actual situation in the areas where the construction of houses is prohibited or limited.

2. Aspects of the damage and house rebuilding support

2-1. Damage and characteristics of the stricken area

The Marmara earthquake is the generic name for the Kocaeli earthquake (complete destruction of more than 66,000 households and more than 17,000 dead) in August 1999, and Bolu earthquake (complete destruction of more than 26,000 households) in November 1999. This study focuses on the Kocaeli prefecture, which was most damaged in the Kocaeli earthquake. Population mobility from farm and village areas to city areas continues in Turkey, and the region damaged by this earthquake is undergoing remarkable development, with an industrial zone status that is surpassed only by the economic metropolis of Istanbul. According to an investigation conducted by the Izmit City Assembly and an Ankara University³⁾ research group one month after the earthquake, the household ownership rate was 58.3% (Renters 36.5%, others 4.0%). Damages were concentrated in condominiums constructed in the urban area along

the seashore where ground foundation is unstable (23.6% of total condominiums were completely destroyed), while damages to many farming village houses in the surrounding area were comparably small (about 8% of total houses).

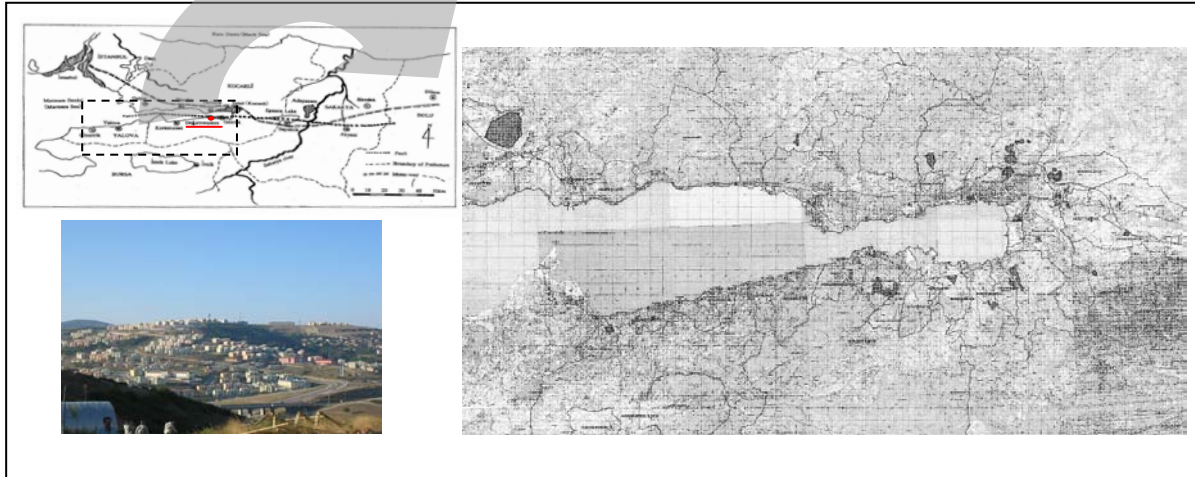


Figure 1. Map of public permanent houses in Kocaeli

2-2 House rebuilding support from Turkish national government.

Sengun ⁴⁾, Nakabayashi ⁵⁾, Ichiko ⁶⁾, and Ishikawa ⁷⁾ have reported on the Turkish government housing rebuilding support plan and housing supply outline, and Sawada ⁸⁾ has reported on the underlying laws. The area greatly damaged was a built-up area where city infrastructure was organized; however, it was a city of inflowing population and unstable ground foundation with a large number of middle-height condominiums that were not protected by anti-earthquake regulations. Therefore, the mid-height condominiums were not rebuilt due to a lack of consensus on the rebuilding format⁹⁾; a large amount of lower height multifamily housing that meets anti-earthquake regulations was promptly built to urban suburbs (a total of 54,053 households were built in the 7 cities stricken, of which 17,778 households were built in the Kocaeli prefecture). Regulations regarding recovery and victim relocation are described in Turkey's disaster laws; thus, new town developments and victim relocation took place.

The owners (excluding those who leased) of the completely destroyed buildings were able to choose any of following options: (1) Loan financing along with the right to purchase low priced, publicly provided, permanent suburban housing; (2) loan financing for rebuilding; and (3) loan financing for purchasing land/the building (Table 1). The majority chose to purchase the permanent housing. In addition, public support continued for financing repair costs for owners of houses that were not completely destroyed by the earthquake. Support was in place only for home owners due to the compensation of private property regulations, as per Turkey's disaster laws.

2-3 Building height regulations and prohibition in damaged build-up area

Building height is restricted in the damaged build-up area where the ground is unstable, limited rebuilding of mid-height condominiums took place where damages were concentrated (Figure 3). Besides the fact that making contact with residents was difficult due to the disaster,

the number of floors of the completely destroyed condominiums decreased, and thus rebuilding could not take place on the same scale and resulted in difficulties in forming an agreement. In prohibited area on the outskirts of the fault, owner-occupiers could not reconstruct house.

Table 1. Government support for owners of damaged houses ⁽²⁾

	Damage Level	Housing Recovery Scheme
Owner-occupiers	Collapsed	All building are pulled down and withdrawn. Owners can choose from three types of aid: (loan: payment 20years, payment of deferment 2years/free of interest) • Supply and loan of permanent public houses for recovery • Loan of assistance for reconstruct at same place (15billion Turkish Lira) • Loan of assistance for house purchase (15billion Turkish Lira)
	Medium Damaged	After repairing, Owner applied (loan: payment 20years, payment of deferment 2years/free of interest) • Loan of assistance for repairing (2billion Turkish Lira)
	Slightly Damaged	After repairing, Owner applied (loan: payment 20years, payment of deferment 2years/free of interest) • Loan of assistance for repairing (0.6billion Turkish Lira)
Owner-occupiers/renters	Every Family	• assistance for rent houses (0.1billion Turkish Lira/month, for 18 months)

3. Outline of method and results of investigation

3-1. Outline of investigation

In this study, a structured interview investigation for quantitative analysis and qualitative interview research was conducted with residents of the damaged built-up area and residents of the housing development reconstructions. (Table 2; Figure 2) Information was also gathered from the government and self-governing bodies.

Table 2. Survey outline⁽³⁾

Survey name	Date	Method	Subject	Sampling
attribute of residents survey	2006.8	Structured interview	Residents in permanent public houses (a part of Yuvacik area)	Complete enumeration
	2006.8	Structured interview	Residents in built-up area (Merkezi, Yuzbasilar)	Complete enumeration (in specified buildings)
			• All buildings newly constructed after disaster	
			• Some buildings medium damaged	
		Residents in surrounding built-up area		
			• Some buildings newly constructed after disaster	
consciousness of residents survey	2003-2009	Semi structured interview	Residents in Built-up area (Merkezi, Yuzbasilar)	Random sampling
	2003-2005	Semi structured interview	Residents in permanent public houses (Yuvacik)	Random sampling
Recovery process survey	2005.8	Investigation looks from the outside	All buildings in Built-up area (Merkezi, Yuzbasilar)	Complete enumeration
	2006.8	Investigation looks from the outside	All buildings in Built-up area (Merkezi, Yuzbasilar)	Complete enumeration
	2009.8	Investigation looks from the outside	All buildings in Built-up area (Merkezi, Yuzbasilar)	Complete enumeration

3-2 Outline of investigation results

Transitions of the reconstructed housing development, damaged city areas, and neighboring areas are sorted in a chronological order in Figure 3. Resident attributes of each locality ten years later are sorted and presented in Table 3. The owners of collapsed buildings purchased the public permanent houses at a low price; however, there was no obligation to

reside there, and they were not deemed attractive due the geographical inconvenience of being located in the suburbs. This led to late occupancy, with many later tenants renting from household owners.

The damaged built-up area remained vacant for a long time due to height restrictions on the reconstructed buildings; however, seven years after the disaster developers have purchased ownership and therefore construction of low-rise buildings has proceeded⁹⁾. In contrast, maintenance such as road system construction in the early stages after the disaster resulted private developers and public housing companies developing large scale condominiums in the damaged city outskirts areas, which were originally allowed only low-rise buildings. As a result of this house rebuilding support and later development by private enterprise, The resident attributes tends to be separated clearly as a result of these house rebuilding support and later development by private enterprise even more than before the earthquake.

Chapters 4 and 5 analyze these changes based on the conscious change of inhabitants in.

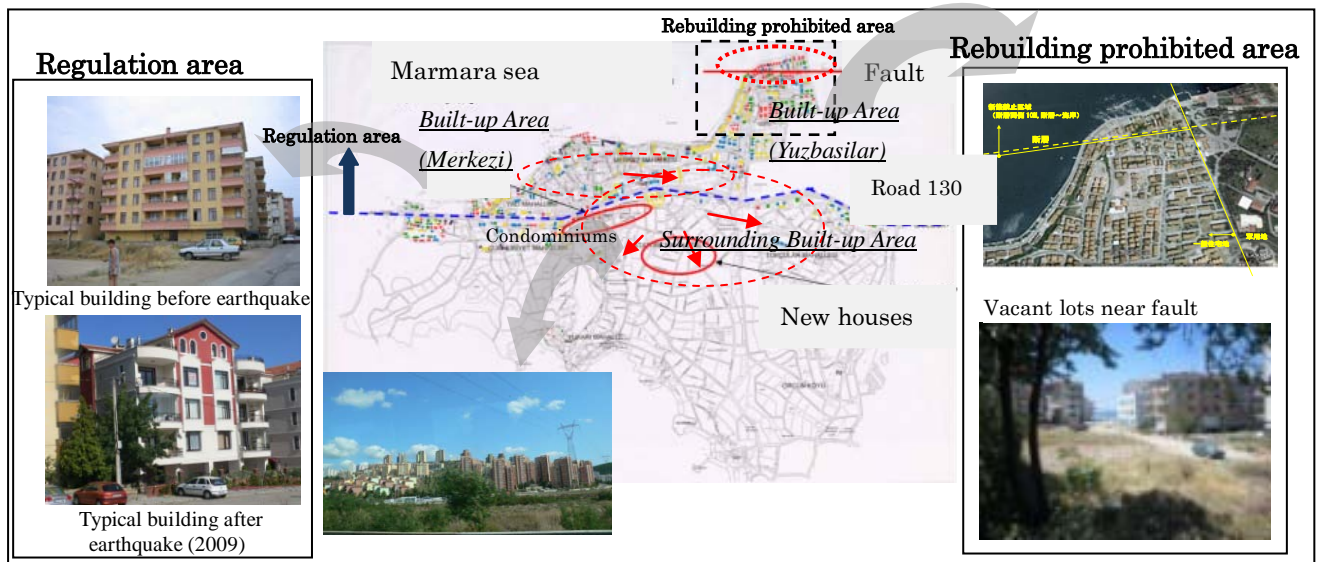


Figure 2. Recovery process in built-up area and surrounding area in Degirmendere

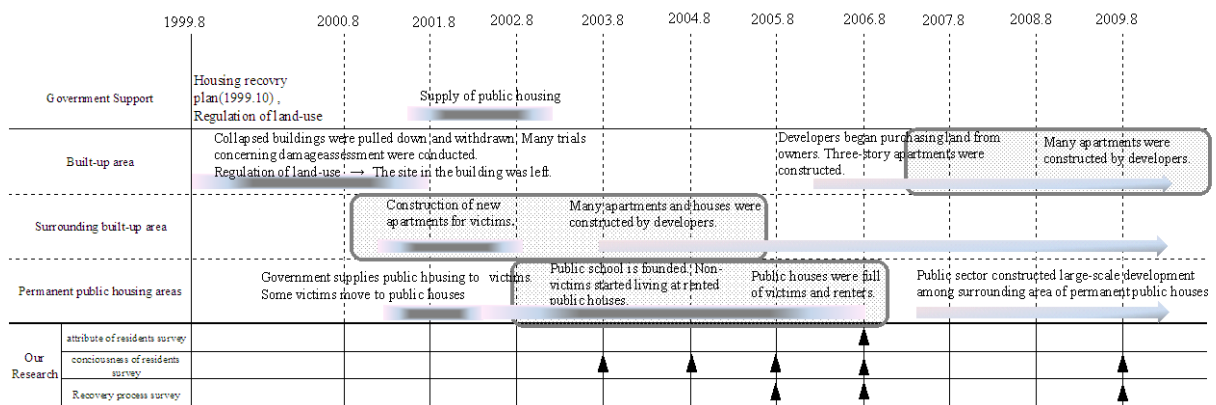


Figure 3. Reconstruction process in Kocaeli prefecture based on result of the survey

Table 3. Resident attributes

Current home	Victim	Number of families responded	Number of families visited	Relocation	Typical residents	Date moved into home after earthquake	Reason for moving into home
public permanent houses	victim	71	132	○	owner-occupier, various age	①after 2years, ②after 3-5years	safety,economy,no choice
	non-victim	21		○	renter, 20-40years old	after 3-5years	safety,economy,neighborhood
Moderately damaged house in built-up area	victim	16	84	×	owner-occupier,aged	—	convenience, neighborhood, own house
	victim	12		○	renter/owner-occupier 40-60years old	①after 3years ②after ~6years	convenience, neighborhood
	non-victim	9		○	renter/owner-occupier, various age	①after 3years ②after ~6years	convenience, economy
new building in built-up area	victim	22	40	○	owner-occupier 40-60years old	after ~6years	safety,convenience, neighborhood
	non-victim	7		○	owner-occupier30-50years old	after ~6years	safety,convenience, own house
new building in surrounding built-up area	victim	18	40	○	owner-occupier, various age	after ~2years	safety,nature
	non-victim	7		○	renter, 20-40years old	after ~2years	safety,convenience

4. Change in the situation of public permanent houses and victims' adaptation to new environment

About half of the residents rented or purchased their new housing under personal contracts; therefore, tenancing times are different (Figure 5). Many of the families who changed the address immediately after complete construction of permanent house in were those living in urban areas whose householder was retired or who were not wealthy. Turkish government completed approximately 54,000 permanent houses in disaster areas. Because they were supplied at an early stage by a large amount, it was before the completion of the infrastructure such as road constructions or elementary and junior high schools. The permanent houses which were completed at the early summer of two years after the earthquake, and the heating facilities were developed a half year later and the education facilities were completed one year later.

Many vacancies and a low satisfaction rate were prevalent, particularly among owners of completely destroyed houses from damaged built-up areas who were originally supposed to move in earlier but could not because of transportation inconveniences and changes of environment (Figure 5). Young families living in urban areas tend to reside temporarily in rented accommodations and such for the purpose of commuting even if they lost their own house. As social infrastructure was developed, families who purchased a permanent house in the peripheral areas of permanent houses moved in. Afterward, they were rented as safe, economy and high-quality housing stock, and younger generations started to be attracted with the rise of price and popularity.

Upon investigation, residents were more satisfied seven years after the disaster (2006) and wished to remain in the permanent houses in the future. Since then, the ownership of condominiums in the damaged city areas where residents of permanent houses owned property has been bought by developers, and as a result, the development of the damaged city areas has begun (Figures 6, 7).The direct role of disaster victims as reconstruction assistance is limited, but the diversity of residents will probably satisfy requirements for communities to be sustainable as mixed community in the long run.

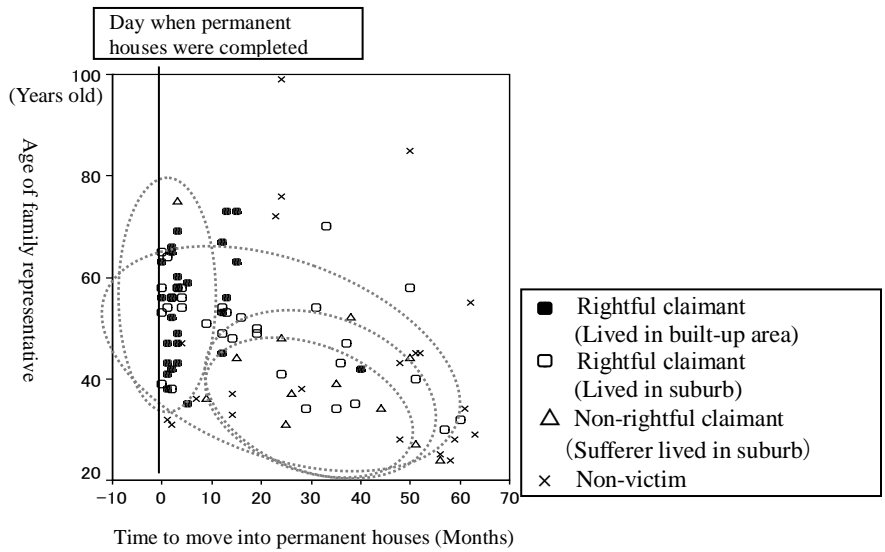


Figure 4. Move-in date for permanent houses¹³⁾

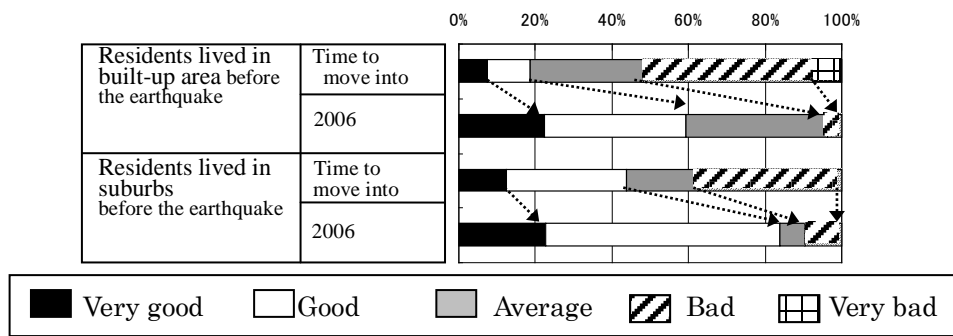


Figure 5. Evaluation of environment of permanent houses (2006)¹³⁾

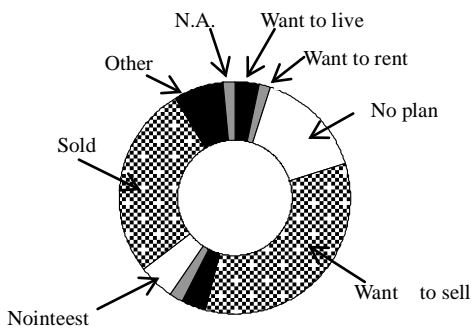


Figure 6. Plans for land ownership (2006)¹³⁾

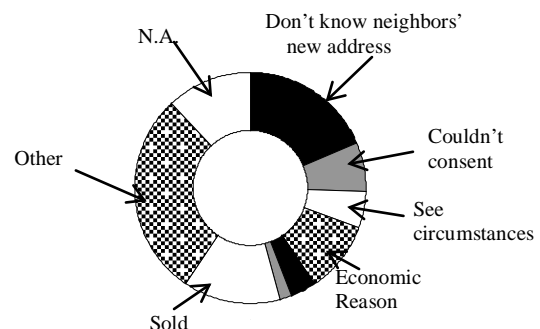


Figure 7. Reasons for not rebuilding on-site (2006)¹³⁾

5. Change in the situation of built-up in and around the area and victims' adaptation to the changed environment

Houses for purchase were developed early for victims in and around damaged city areas. Later, private condominiums were developed in the land between the damaged city areas and suburban permanent houses, and many condominiums were developed by a public housing supply company (TOKI)⁽⁴⁾ in the area surrounding the public permanent housing.

In the damaged city areas, developers purchased ownership of collapsed condominiums, rebuilt them as low-rise buildings, and sold them about seven years after the disaster (Figure 9), as it did not involve the participation of the previous residents during the building process. On the basis of our survey results regarding new buildings in the investigation area (Figure 2), households in the new buildings are composed of almost equal amounts of individuals who flowed in after the earthquake and victims of the area from the other area (Table 4). In addition, more financially stable victims now live in these properties, as the sale price per lot increased high because the square footage available for building became lesser due to the restriction in floor numbers.

On the basis of this investigation, those buildings that were moderately damaged and located close to the prohibited area on the outskirts of the fault are now occupied by comparatively young household owners and the former renters have already moved out. As a result, weaker household owners such as senior citizens and lower income tenants occupy these homes due to low rent prices (Figure 9).

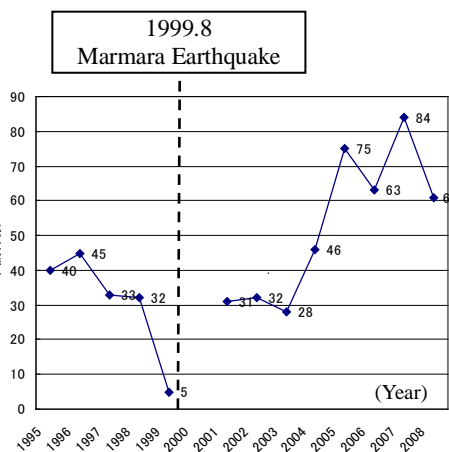


Table 4. Ownerships of houses (2006)

	Own whole building or house	Own housing unit	Borrow housing unit from unrelated person	Borrow housing unit from relative	Else	N.a.	all
Permanent houses, victim	0	59	10	0	1	1	71
Permanent houses, non victim	0	0	20	1	0	0	21
Moderately damaged house in built-up area, victim, remain	0	16	0	0	0	0	16
Moderately damaged house in built-up area, victim, relocation	0	5	6	0	1	0	12
Moderately damaged house in built-up area, non victim	0	4	5	0	0	0	9
New building in built-up area, victim	0	18	4	0	0	0	22
New building in built-up area, non victim	0	5	2	0	0	0	7
New building in surrounding built-up area, victim	7	8	3	0	0	0	18
New building in surrounding built-up area, non victim	2	0	5	0	0	0	7

Figure 8. Transition of number of architectural confirmation applications in Degirmendere municipality⁽⁴⁾

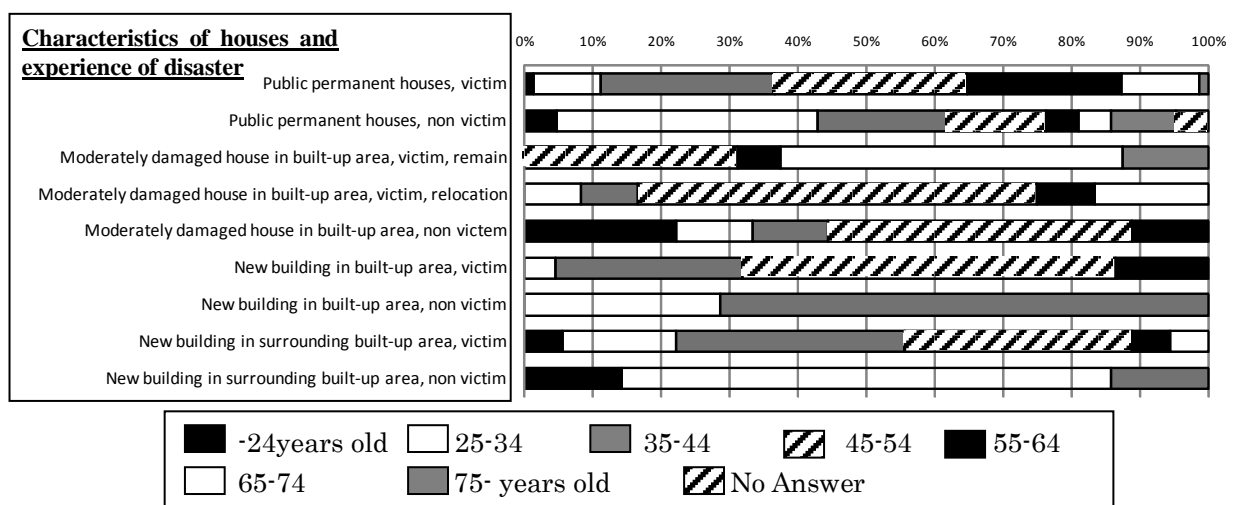


Figure 9. Age of family representative (2006)

6. Conclusion

The Marmara earthquake was a disaster that occurred in an area undergoing economic growth and urbanization due to the population inflow in Turkey.

Moreover, relocation of victims to the suburbs was based on building safety and compensation of private property for owner households. Much financial support was offered by international organizations, which included large-scale suburban development and infrastructure upgrades such as roads in the recovery process. In addition, public permanent houses had no burden on the substantially of victims themselves to live.

This paper discussed the rehabilitation housing policy for earthquake disaster victims comprehensively: (1) Evaluation of any housing recovery measures; (2) survey on the permanent housing residents' level of satisfaction; and (3) investigation into the actual situation in the areas where the construction of houses is prohibited or limited. We conclude the following 3points;

1) These government rehabilitation housing policy for earthquake disaster victims worked effectively as victim support for householders who were in serious need of housing; however, about half of the housing units in the suburbs were leased to younger generations or pensioners as leased housing stock with low prices and good quality. In the beginning, victims who had lived in urban area were not satisfied with the environment because of inconveniences and many vacancies. Residents were more satisfied seven years after the disaster (2006) and wished to remain in the permanent houses in the future. Since then, the ownership of condominiums in the damaged city areas where residents of permanent houses owned property has been bought by developers, and as a result, the development of the damaged city areas has begun. On the other hand, residents who had lived suburb and borrow housing units from owners were satisfied with environment from the beginning.

2) The construction of permanent housing in the suburbs and the introduction of building height regulations and prohibition in damaged build-up area have prompted the development of new residential areas surrounding the built-up area, along with new suburbs. The housing recovery assistance targeted for the construction of permanent housing in the suburbs incidentally induced the development of the city fringes and contributed to the expansion of the urban area. This process has also affected residents' views on suburban living and low-rise apartment housing, as well as their environmental evaluation. Ten years since the earthquake, and with a constant population influx into the disaster area, the changes that have occurred in that area can be grasped through the medium-term changes of the city and the changes seen in the residents' mindset.

3) Damaged built-up areas face a number of challenges. Elderly household owners remain and younger people for the need of lower rent have replaced many previous residents in the areas where new construction is prohibited. In the areas with building height restrictions, the sites of the apartments lost in the earthquake often remained without being rebuilt for an extended period of time, due to the former residents' inability to build new apartments of the same size. Low-rise apartments were eventually built on such sites by developers who purchased the ownership of collapsed condominiums about seven years after the earthquake. In such instances, however, the construction of such apartments did not involve the participation of the previous residents during the building process, nor did it result in the victims' returning to their

original places of abode. Most of condominiums in the built-up area were cooperative-built-house. After the disaster, under building height restrictions, residents hardly discuss the rebuilding of their condominiums. Financially stable victims and non-victims move to new these houses and live in these areas.

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Notes:

- (1) The map was provided by Kocaeli prefecture government office.
- (2) One hundred million Turkish Lira = 19,200 yen (1999.12).
- (3) Semi-structured interview is based upon an interview guide with typically five to eight broad questions plus probes to supplement them if respondents have difficulty in elaborating their perspectives.
- (4) Data were provided by Golcuk municipality office.
- (5) Housing Development Administration of Turkey <http://www.toki.gov.tr/english/index.asp> 2010/03/28

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