Chapter 14
A Cooperative Game Theory Approach to Post-Disaster Housing Problem

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ABSTRACT

Housing problem, which occurs after disasters, is needing urgent attention. Earthquake is the most important one of the disasters in Turkey, like many place rest of the world. A large number of buildings damaged and collapsed after the earthquakes, so the victims need to shelter to provide their needs. In this state private organizations are located in the emergency relief problem. To eliminate this problem as effectively cooperative game theory is used in this paper. Our study shows that cooperative game theory can help us to define a fair cost allocation between private organizations for supporting the housing problem by using facility location games.

INTRODUCTION

Turkey is located in the middle of the European and the Asian side, where is located in a seismically active region within the Mediterranean sector of the Alpine Himalayan seismic belt. This area is seismically active region. This system is one of the most important seismic belts of the world, which is west-east running system extends from the Mediterranean to Asia. Turkey, which is one of the most seismically active areas in Europe, has a long history of large earthquakes. Most earthquakes in Turkey are occurs as a result of tectonic elements (Erdogan et al., 2009; Bagci, 1996).

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In last two decades occurred severe earthquakes in Turkey, causing thousands of casualties, injuries, as well as significant economic losses. The most severe of which were as follows, Erzincan (1992), Kocaeli (1999) and Duzce (1999) earthquakes can be said as the most severe ones, with magnitudes of 6.9, 7.4 and 7.2, respectively (Ilki and Celep, 2012). For this reason, the seismicity of this belt has been the subject of many studies and has attracted the attention of academicians.

The seismic zones map of Turkey in Figure 1 published by the Ministry of Public Works and Settlement in 1996, which is also approved by the Council of Ministers, and used geographic information system analysis to divide Turkey into 4 regions. Seismic zones map of Turkey is shown in Figure 1 (Unal et al., 2012).

On the seismic zones map of Turkey, First-degree seismic zone is taken as region 1, Second-degree seismic zone is taken as region 2, Third-degree seismic zone is taken as region 3, Fourth-degree and fifth-degree seismic zones are taken as region 4. The seismic zones map of Turkey (Figure 1) shows that Turkey can be faced with frequent disasters due to its zone characteristic (Unal et al., 2012).

We see that 62% of the damaged buildings have been caused by the earthquakes, if the statistics of the damaged buildings in Turkey during the last sixty years are taken into consideration (Limoncu and Bayülgen, 2008).

In particularly, in the latter half of 1999, two devastating earthquakes shook the Marmara and Bolu regions of Turkey, the industrial heartland of the country to the east of Istanbul. Approximately. It is estimated that, in total, 380,000 people the buildings were damaged or collapsed, leaving more than 120,000 homes to be damaged beyond repair More than 250,000 people in need of housing (Johnson, 2007). Figure 2 shows that Housing Losses in Turkey aftermath Earthquakes between 1992-99 years (Arslan and Unlu, 2006)

In Turkey, in which has a high seismic risk, elimination of housing needs of people is very important after a possible earthquake, as in the world. Housing can be seen first priority among practices that to be done after an earthquake. The housing means to take refuge in an enclosed space to be protected from the effects of nature or living and settle down by finding proper conditions to survive.

In the aftermath of large-scale natural disasters such as hurricanes, tsunamis, floods and earthquakes, emergency management agencies are pressed to provide temporary housing solutions for displaced families, in order to enable them to reestablish their household daily activities until permanent housing

Figure 1. Seismic zones map of Turkey