

## Chapter 12

# Application of Fuzzy Analytic Hierarchy Process for Evaluation of Ankara–Izmir High-Speed Train Project

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### ABSTRACT

*In Turkey, where important projects are materialized in transportation and logistics field, different alternatives are developed for transportation systems. Among these, high-speed train (HST) systems are the most popular transportation types. HST is preferred for many economic, technological, ecological, and social situations. In this chapter, it is made the evaluation of the Ankara–İzmir HST line. The fuzzy analytical hierarchy process (FAHP), which is one of the multi-criteria decision-making (MCDM) techniques, is used in the evaluation. Fuzzy logic contributes to decision making using linguistic variables in uncertain environment. This chapter takes into consideration in the realization of the HST project some criteria such as the places in the railway line, the population structure of the cities, accessibility, and accession to significant logistical points. As a result, “population structure” criterion among the evaluation criteria was found to have more importance.*

### INTRODUCTION

The transportation and logistics system has an economic, technological, ecological, safe and mobile structure that is formed to supply human needs. Throughout the history of humanity has evolved continuously until today. Transportation; transport of people, animals and goods to another location in accordance with needs. This situation leads to an economic cost. Economic reasons, time and reliability of transportation have revealed the necessity of using alternative transportation routes (Süt et al., 2018). Railway transportation has made significant progress in the 20th century due to its wide use network.

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As a result of this development, it has been continuously compared with the transportation systems such as airline, highway and maritime and benefit cost analysis has been made. Not every investment has the areas where passenger and freight transport is dense (Levinson et al., 1997). As the speed limit on railways increases over the years, it can also be a competitor to highways and airlines by saving time. In terms of seeing the railways, the use of energy, which is an important problem today, and the use of non-gasoline energy source, it is effected at all compared to other transportation systems. Its contribution to increased environmental pollution is much less than other transportation systems and its land use is low. The development of technology and high speeds is the faster according other transportation systems. The operation of the railways, the highway can be predicted. One of the important investments in railway transportation is HST projects. HST first started in 1964 at 210 km / h in Japan. It has been used in other countries in the following years (Givoni, 2006). Continuous improvement and development of a planned, ongoing or already constructed line and evaluated with the specified criteria are very important for the HST line. High speed train applications are important smart transportation systems. Intelligent transportation is Information and Communication Technologies supported and integrated transportation systems. It operates between buses, trains, subways, cars, sea and air transportation, bicycles and pedestrians.

The rail systems which are operated in many countries and developed with each passing day, take place in the literature with various applications. Givoni (2006) emphasizes that the reduction of travel and waiting times of the HST is an important factor in the preferences of the passengers. Akgüngör and Demirel (2007) compared the Ankara-İstanbul HST line project and the existing line. Mateus et al. (2008) conducted a study for the selection of possible station locations for the HST. Shen et al. (2014) different situations such as station locations, development of regional accessibility, potential of population growth were evaluated. Gökçeoğlu et al. (2014) proposed a model for the railway route selection on the high-speed railway line. Delaplace and Dobruşkes (2015) conducted a comparison study between the French Airlines and the HST line services. He et al. (2015) in their study in China stated that the environmental risks of HST are low and the economic and social benefits are high. Hamurcu and Eren (2017) stated that MCDM techniques used for the selection of rail system projects. Yang et al. (2018) stated that HST plays an important role in stable regional economic development. Süt et al. (2018) examined the Ankara-Sivas HST line. Yao et al. (2019) compared the links between railways and airlines in China.

In Turkey, domestic transport in particular, the railways and seaways are not used adequately.

An unbalanced, expensive and ineffective transportation system, it is known to cause serious problems. Although the transport and logistics sector in Turkey has made significant progress in recent years is still an emerging sector. However, it has the potential to be an important transfer center between these regions with its advantageous position between Asia and Europe, its young and dynamic demographic structure, the dynamics of the sector suitable for growth.

HST projects in Turkey are continuing rapidly. Turkey, with the busiest HST project applications by passengers, is regarded as one of the world's many countries. It is foreseen that such projects, which provide important facilities in terms of time and budget, will continue in the coming years. For improve the effectiveness of the projects to be carried out, the interest in the studies to be carried out in this field in the literature is increasing daily. The most important one of these projects; Ankara-Eskişehir, Ankara-Konya, Ankara-İstanbul HST line are applications. Ankara-Sivas and Ankara-İzmir HST projects are also ongoing projects. The subject of this study is the provinces located on the Ankara-İzmir HST line which is under construction. Provinces on the line; and integration with other transport systems, access to important points such as logistics and tourism, potential of expanding the line, population structure

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