Marmara Denizi'nde Kısa Mesafeli Deniz Yolu Taşımacılığı Hatlarının Etkin Deprem Ulaşım Acil Yönetimi için Değerlendirilmesi

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Öz

Marmara Denizi'nin kuzey bölgesi, Avrupa-Akdeniz bölgesindeki en yüksek sismik potansiyele sahip bölgelerden biridir. 17 Ağustos 1999'da Kuzey Anadolu Fayı'nda meydana gelen yıkıcı depremin ardından yapılan çalışmalar, İstanbul ve çevresinin sismik risk altında olduğunu ortaya koymaktadır ve İstanbul'da kuvvetli bir sarsıntı olasılığının yüksek olduğunu hesaplamaktadır.

1999 depreminden sonra, Afet ve Acil Durum Yönetimi Başkanlığı (AFAD) tarafından modern ve entegre bir deprem yönetim sistemi kurmak için büyük çabalar sarf edilmiştir. Deprem Kriz Yönetimi açısından yapılan çalışmalar, lojistik yönetiminin arama kurtarma operasyonları, tıbbi ekipman ve gıda destekleri ile depremzedelerin güvenli bölgelere taşınmasını sağlamak için en önemli konulardan biri olduğunu göstermektedir. Marmara bölgesindeki deprem tehlikesi göz önüne alındığında, deprem sonrası acil müdahalede zaman baskısı nedeniyle özellikle can kurtarmanın "altın 72 saati" içinde ulaşım acil durum karar sisteminin önemi ortaya çıkmaktadır.

Marmara bölgesinde tahmin edilen yüksek şiddetli bir depremin meydana gelmesi durumunda, karayolu ve köprülerdeki hasarlardan dolayı bazı bölgelerde karayolu ulaşımı mümkün olmayabilir. Etkili bir afet yönetimi için bölgede denizyolu taşımacılığı alternatifleri değerlendirilmelidir. Yarı kapalı bir deniz olan Marmara Denizi, kısa-mesafe deniz taşımacılığı için büyük bir fırsat sunmaktadır. Bu çalışma, etkili bir deprem taşımacılığı acil durum yönetimi için gemi ve liman seçim kriterlerine ilişkin değerlendirmeler sunarak bölgedeki kısa mesafeli deniz yolu ulaşım ağlarını değerlendirmektedir.

Çalışma sonucunda değerlendirilen kısa mesafeli deniz taşımacılığı rotaları ve limanlar, Marmara bölgesinin deprem ulaşım acil durum yönetimi için kısa mesafeli deniz yolu taşımacılığında büyük bir potansiyele sahip olduğunu göstermektedir.

Bu çalışma, "Geçici Barınma Alanlarına Tahliyede Deniz Yolları Ağının Entegrasyonu" başlıklı AFAD'a sunulmuş proje teklifi çalışmasının bir bölümüne dayanmaktadır.
Anahtar Kelimeler : Deprem, acil ulaşım yönetimi, kısa mesafeli deniz taşımacılığı, Marmara Denizi

Evaluation of Short-sea Shipping Networks in the Sea of Marmara for the Earthquake Transportation Emergency Management

Abstract

The north region of the Sea of Marmara is one of the highest seismic potential regions in the Euro-Mediterranean zone. The studies after a destructive earthquake on 17 August 1999 on the North Anatolian Fault reveal that Istanbul and its surrounding area is under the seismic risk and estimate a high probability of strong shaking in Istanbul.

After the 1999 earthquake, huge efforts have been made to establish a modern and integrated earthquake management system by the Disaster and Emergency Management Authority (AFAD). Logistics management is one of the main issues of the Earthquake Crisis

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Management to provide search and rescue operations, medical equipment and food supports and transportation of earthquake victims to the safe regions. Considering the seismic hazard in the Marmara region, transportation emergency decision-making guiding system is necessary since the time pressure of post-earthquake emergency especially within the "golden 72 hours" of life rescue.

If a possible high magnitude earthquake occurs in the Marmara region, road transportation cannot be possible in some of the areas due to damages on highway and bridges. Seaway transport alternatives should be evaluated in the region for efficient disaster management. As a semi-enclosed sea, the Sea of Marmara provides a great opportunity for the short-sea shipping. This study evaluates short-sea transportation networks in the region presenting an assessment on ship and port selection criteria for the efficient earthquake transportation emergency management.

As a result of the study, evaluated short-sea shipping routes and ports show that the Marmara region has a grand short-sea shipping potential for the earthquake transportation emergency management.

This study is based on a part of the project proposal named "Integration of Maritime Networks in Evacuation to Temporary Shelter Areas" for AFAD.
Keywords: Earthquake, transportation emergency management, short-sea shipping, the Sea of Marmara

1. INTRODUCTION

Istanbul is a coastal megacity with approximately 15 million population and 5400 km^2 settlement area. The population of the city increased significantly from the 1970s (Burak, Bilge, & Dernek, 2017; Burak, Bilge, & Ulker, 2020). From the past to present the city has been attracting immigrants (Burak et al., 2017) and also the site of many devastating earthquakes. The city's high urbanization is one of the issues to be considered for the earthquake risk management of Istanbul as well as its high seismic risk (Hubert-Ferrari et al., 2000). If a possible high magnitude earthquake occurs in the Istanbul (Aochi & Ulrich, 2015), necessary of the transportation of millions of the people from Istanbul to the other safety regions arises.

The efficient earthquake transportation management has high importance for the Earthquake Crisis Management especially within the "golden 72 hours" of life rescue in terms of providing of search and rescue operations, medical equipment and food supports and transportation of earthquake victims to the safe regions (Fan & Tangqing, 2010).

This study evaluated short-sea transportation networks in the region presenting an assessment on ship and port selection criteria for the efficient earthquake transportation emergency management considering the transportation context in the Turkey Disaster Management Plan.

2.TURKEY DISASTER RESPONSE PLAN AND MANAGEMENT OF DISASTER TRANSPORTATION

The objective of the Turkey Disaster Response Plan (TAMP) is defining the roles and responsibilities of the groups that will take part in the disaster and emergency response activities. TAMP involves three main service groups related to disaster transportation management considering assumptions about increasing of transportation demand in and outside of the disaster area, damaging on transportation routes and ceasing of transportation for a while. The service groups related to disaster transportation management

and their responsibilities are given in Table 1. Harmonization between these service groups has importance for the efficient earthquake transportation emergency management.

Table 1. The service groups of TAMP related to disaster transportation management and their responsibilities

Duties	The Service Groups		
1.	Evacuation Placement and Planning Service Group	Transportation Service Group	Transportation Infrastructure Service Group
2.	Identifying, planning and implementing evacuation priorities, evacuation routes and areas to be evacuated before, during and after a disaster.	Coordination of transportation services for disaster victims.	Safely and quickly transport and coordination to the disaster area.
3.	Determining emergency meeting areas and to check the suitability of the areas for use.	Transferring of personnel, tools, equipment and materials to the disaster area.	Arrangements for quick transport.
4.	Ensuring that the public in the disaster area is announced that the evacuation will take place.	Transferring of the personnel in charge between the location and the disaster area.	Determinating and announcing of alternative and preferred ways
5.	Ensuring that evacuees are transported from the disaster area to safe areas.	Transporting the victims to emergency shelters.	Arrangements of traffic signs
6.	Carrying out movable national wealth, valuable documents, belongings, and animal evacuation when necessary.	Transportation of aid, supplies and working machines	Have a repair for the damaged roads, ports, terminals and bridges.
7.	Identifying, planning, and implementing evacuation priorities, evacuation routes and areas to be evacuated before, during and after a disaster.	Arrangements for transportation advantaged vehicles and setting up a vehicle tracking system	Remove the debris firstly on the main roads.
8.	-	Transportation of cultural assets.	Measures for the ports and airports for the cargo handling services.

3. THE EFFICIENT EARTHQUAKE TRANSPORTATION EMERGENCY MANAGEMENT

Transportation is one of the main issues of post-earthquake which is to be well organized by the related groups in TAMP to transfer aid, ambulance, medical and technical equipment. For the efficient earthquake transportation emergency system, this study defines two stages which are before the disaster and after the disaster.

- At the first stage inventory and facilities of the transportation routes and modes in the region should be generated and necessary earthquake transportation network simulation programs considering the earthquake scenarios and transportation emergency decision-making guiding systems should be studied and set up before an earthquake for the cities at high risk in order to manage the transportation in an earthquake case.
- The second stage defines the preparations after an earthquake. At this stage, determining the damages in transportation modes (roadway, railway and ports) and preparing the damaging inventory should be prepared quickly in order to eliminate the damaged ports, terminals and piers from the system, run the simulation program

and make a decision between the transportation routes and modes. It is necessary that updating of transportation plans to the disaster area and transfer plans from the disaster area based on transportation network simulations in the integrated disaster management system.

3.1. Short-Sea Shipping in the Sea of Marmara for the Transferring of Disaster Victims

As a semi-closed sea, the Marmara Sea provides great opportunities for the short-sea shipping. Transportation between Europe and Anatolia provides an effective transportation network in the region. Mainly, vehicle and passenger transportation is carried out as domestic shipping in the Sea of Marmara (Dernek & Koldemir, 2016; Ülker & Baltaoğlu, 2018). In this context, currently, there is a total of 26 ro-ro and ferry lines in the Istanbul, Marmara and Çanakkale regions (MTI, 2020). The selection of the existing ships serviced in the Sea of Marmara provides more transport efficiency in case an emergency case. The ships on these lines should be evaluated in terms of ship's and selected port specifications for the transferring of disaster victims from Istanbul to the safety regions. Ship's draft and length overall should not exceed the length and depth of the port.

Total 30 cargo terminals inventory are taken out for the Sea of Marmara except of liquid cargo terminals which are in Tekirdağ, Marmara Ereğlisi, Ambarlı, Zeytinburnu, Haydarpaşa, Pendik, İzmit, Gemlik, Bandırma, Çanakkale, Saraylar given in Figure 1.

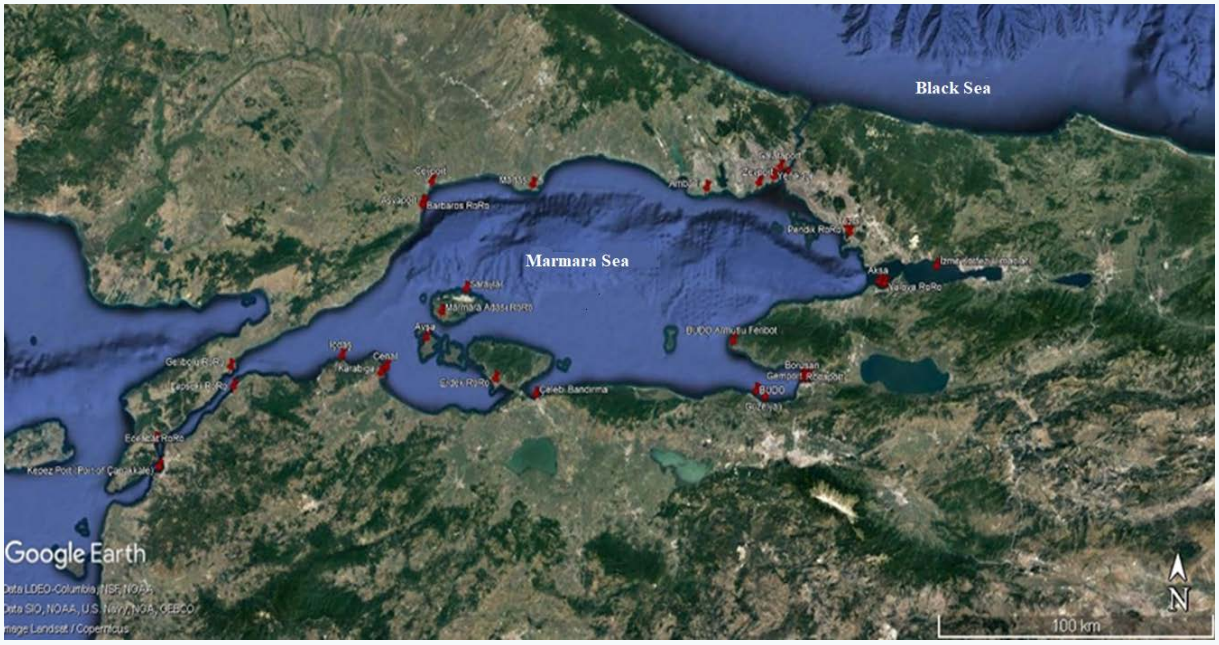


Figure 1. General cargo and container terminals in the Sea of Marmara

In addition to the cargo terminals, there are Istanbul City Lines piers (42 piers), piers for private enterprises which are Turyol, Dentur, Mavi Marmara and IDO (41 piers), fishing ports (50 pieces) and Marinas in Istanbul (8 marinas).

The efficient way of the seaway transportation in the Sea of Marmara for the earthquake victims in Istanbul is the routes from North to South of Marmara Sea considering solid and safe coastal structures. Consequently, the ports in the North of the Marmara Sea which are in Tekirdağ, Marmara Ereğlisi, Ambarlı, Zeytinburnu, Haydarpaşa, Pendik, İzmit and in the South which are in Gemlik, Bandırma, Çanakkale, and Saraylar regions. These ports arise transportation network between the North and South of the Marmara Sea.

4. CONCLUDING REMARKS

This study emphasizes the following remarks for the short-sea shipping in the Sea of Marmara to provide an alternative for the efficient earthquake transportation emergency management in Istanbul;

- Earthquake transportation emergency system is necessary for the megacity Istanbul and the other cities of Turkey at high earthquake risk.
- It is necessary that integration of the earthquake transportation emergency system in the service groups of TAMP.
- The Sea of Marmara has many numbers of ports, terminals, and piers. Consequently, the Sea of Marmara provides an alternative transportation mode and effective transportation networks for Istanbul in case an earthquake.
- Transportation networks should be provided considering specifications of ships and ports.

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