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STUDY ON SAFETY MANAGEMENT IN TURKISH EARTHQUAKES

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Abstract: Natural disasters affect not only humans but also all living beings and societal elements. The term "disaster “meaning a Great Calamity. Among these calamities, earthquakes stand out as the most significant in terms of the damages they cause. Internationally, all authorities define earthquakes as the disasters that result in the highest loss of life and property. This paper highlights the urgent need for effective debris management measures, drawing on established scientific knowledge and operational experience from scientific studies authored by universities. By highlighting the challenges faced during earthquake debris management and safety management and the associated threats to public health and the environment, this study was undertaken to raise people's awareness against similar negligence in future catastrophic events.
Keywords: earthquake, debris management, safety management, risk management

1. INTRODUCTION

Destructive February earthquakes in Turkey and Syria proved a devastating example of global challenges around building safety standards and resilience measures. The death toll from the earthquakes, which struck on February 6 and hit 7.7 and 7.6 on the Richter scale, quickly surpassed 50,000. As of March 1, more than 11,000 aftershocks had occurred, according to Turkey’s Disaster and Emergency Management Authority (Frost, 2023).

The February 6 earthquakes that shook Turkey and Syria were the deadliest global disaster since 2011 and are expected to have driven economic losses of more than US$90 billion, according to Aon.On February 6, 2023, two highly destructive earthquakes struck southeastern Turkey causing widespread destruction across 11 provinces (Melgar et al, 2023). The aftermath saw tens of thousands of buildings in ruins, with ongoing demolition efforts. The authors, conducting post-event field surveys, identified and assessed various disposal sites established in the severely affected regions. Upon examination of these sites and their surroundings, it was determined that none met the safety criteria for effective earthquake debris management. These seismic events occurred within or in close proximity to the prominent seismic gap known as the Maraş Seismic Gap, along the East Anatolian Fault Zone (EAFZ). The first of these devastating earthquakes had a

magnitude of Mw=7.7, while the second registered a magnitude of Mw=7.5. Initial reports from the affected area indicated substantial damage and casualties (Görüm and Tanyaş, 2023, Mercimek, 2023, USGS, 2023).

Turkey has no specific dam safety legislation and lacks transparency over the operational safety and maintenance of its 579 dams. The status of the dams' structural integrity is difficult to ascertain, with government records and UK-based experts suggesting it may be insufficient. February's catastrophic earthquakes have brought renewed international scrutiny on the effectiveness of Turkey's state institutions in managing the country's infrastructure, including its dams. These could pose serious risks to downstream inhabitants if they are not adequately maintained (Asunakutlu, 2009, Oakey, 2023).

Turkey is a country known for its unique geography that bridges continents and cultures. It also bridges several tectonic plates including the Eurasian, African, and Arabian plates through the Anatolian plate (Bommer et al., 2022).

Due to its geological position and geomorphological structure, Turkey is very prone to experiencing natural disasters such as earthquakes, wildfires, landslides, and floods. According to the World Risk Index, Turkey is the 113th among 180 most disaster-prone countries. Turkey ranks third in the world in terms of earthquake-related casualties and eighth regarding the total number of people affected (Okumus, 2022).

Managing safety in the event of earthquakes is of paramount importance, particularly in nations like Turkey that are susceptible to seismic activity. Geographical location of Turkish places it in a high seismic risk zone due to its proximity to several active fault lines, including the North Anatolian Fault, the East Anatolian Fault, and the Hellenic Arc. Critical shortcomings were observed, primarily linked to the proximity of these disposal sites to densely populated areas, where thousands of residents were residing. Additionally, the sites were found to be operating either within or in close proximity to surface water bodies, posing environmental risks. These findings underscore a hasty approach to rapid recovery, leading to significant oversights in disaster management planning and execution To address this persistent threat, Turkey has formulated a comprehensive earthquake safety management strategy (Ayyürek, 2014, Can 2005, Comfort, 2011).

The global focus on Turkey's response to the earthquakes, and the significant contribution of its lax construction regulations to the extent of the damage, have made the topic of dam security even more sensitive. This was reflected in attempts to access documentation and speak to contacts about the subject for this report. One contact commented that any dam failure would have major domestic and international political ramifications. There are no dam safety laws in Turkey. While this is unfortunately the case in most Middle Eastern states, in Turkey the number of dams, the number of internationally classed large dams, and the significant implications of the dams on riparian states, necessitates specific and accountable dam safety be in place. International observers cite Turkey's lack of specific, coherent, and cohesive legislation for the monitoring and regulation of dams as a cause for serious alarm. They state that more should be done to push the Turkish government "to pay heed" to the question of dam safety via comprehensive legislation that ensures accountability for dam safety and addresses key safety issues. The safety measures for the effective operation and management of Turkey's dams originate from several government non-dam-specific laws covering flooding, defence, natural disaster and environment, which have not been updated for 20 years. This contrasts with the UK, for example, which has three separate legislative acts specifically related to dam safety across England, Wales, Scotland and Northern Ireland. In the UK, dams are considered

a matter of public interest and safety. Annual dam safety incident reports are published on The British Dam Society website and British Government website, and in June 2022 the country updated guidance on dam surveillance, monitoring and good ownership practices. Up-to-date records on the status of Turkey's dam and waterways infrastructure, however, are not readily retrievable: annual inspection reports and General Dam Safety Evaluation Reports are not accessible online (Oakey, 2023).

2. METHODOLOGY

The methodology applied for highlighting the emergence of a security crisis in the regions affected by the earthquake on February 6, 2023, by leveraging insights from prior security management and earthquake preparedness systems in Turkey. The evaluation of the adequacy of pre-earthquake preparations is conducted based on resources and scientific studies conducted by universities.

The methodology has been applied to various segments of the earthquake-affected region, including urban areas in disarray where the population ranges from hundreds of thousands to millions. These areas have witnessed the loss of thousands of lives and the impact on millions of individuals. The approach is recommended for its applicability to devastated urban areas and other sectors affected by the earthquake.

3. RESULTS AND DISCUSSION

In this essay, we will delve into the key facets of earthquake safety management in Turkey, encompassing preparedness, response, and recovery and these are respectively as follows (Akdağ, 2005):

1. Preparedness:

a. Seismic Risk Assessment:

Turkey conducts extensive seismic risk assessments to identify vulnerable areas and structures. It involves understanding the geological features and earthquake history of different regions. The country is divided into seismic zones, with regulations and building standards tailored to the level of risk in each zone.

b. Building Codes and Regulations:

Turkey has strict building regulations and building codes to ensure new structures are earthquake resistant. The Turkish Seismic Structural Design (TEBD) Code is regularly updated to reflect the latest seismic engineering practices.

c. Public Awareness and Education:

Governments and various organizations conduct public awareness campaigns to inform people about earthquake preparedness and safety measures. Schools and organizations also regularly conduct seismic drills to ensure everyone is well prepared in the event of an earthquake (Aydınbaş, 2023).

d. Emergency Response Plans:

Turkey has established comprehensive emergency response plans that entail coordination among various government agencies, search and rescue operations, and medical assistance.

e. Earthquake monitoring:

Turkey has a network of earthquake monitoring stations to detect and locate earthquakes. The most important of these stations is the Kandilli Observatory and Earthquake Research Institute in Istanbul.

2. Response:

a. Disaster Management Agencies:

The Emergency and Disaster Management Agency (AFAD) is responsible for coordinating disaster response activities in Turkey, including earthquakes. AFAD cooperates with other agencies such as the Turkish Red Crescent, the Turkish Search and Rescue Association and the Turkish Medical Association.

b. Search and Rescue Operations:

In the event of an earthquake, Turkey quickly deploys search and rescue teams to affected areas to locate and assist survivors. International humanitarian organizations often cooperate with Turkish agencies to provide additional assistance.

c. Temporary Shelter and Relief Supplies:

Turkey has established a system to provide temporary shelter for people displaced by the earthquake, including the use of tents and temporary housing. Relief goods such as food, water and medical aid are distributed to those in need.

3. Recovery:

a. Reconstruction and Rehabilitation:

Following a significant earthquake, Turkey concentrates on the reconstruction and rehabilitation of afflicted areas, encompassing the rebuilding of damaged infrastructure and residences. The government often offers financial incentives and support for the construction of earthquake-resistant structures.

b. Psychological Support:

Psychological support services are extended to those who have undergone the trauma of an earthquake. These services aid individuals and communities in coping with the psychological aftermath of the disaster.

According to the Building and Housing Qualifications Survey conducted by TURKSTAT in 2021, in the 10 cities most affected by the earthquakes that struck on 6 February 2023, the proportion of buildings built in 1981-2000 is 26.1% and the proportion of buildings built in 2001 and later is 51.8% (Figure 1). In Hatay, where the earthquake caused the most destruction, the proportion of buildings built before 2001 is 46.1% and the proportion of buildings built after 2001 is 50%. In Kahramanmaraş, the proportion of buildings built before 2001 is 38.6% and the proportion of buildings built in 2001 and later is 58.1%. The average ratio of 6+ storey buildings in the 10 provinces most affected by the earthquake is 30.6%. The ratio of storey buildings is 22.59%.

According to data released by the Ministry of Environment, Urbanization and Climate Change as of 15 February 2023, out of 387.346 buildings for which damage assessment work has been carried out, the number of collapsed, heavily damaged or urgently demolished buildings is 50.576. Figure 1 presents The distribution of collapsed buildings in cities affected by earthquakes is depicted in a percentage breakdown based on the construction years (TERRA, 2023).

Overall, improving earthquake preparedness in Turkey should focus on strengthening building standards, increasing public awareness and education, and promoting regional co-operation. This is an ongoing process that requires government involvement, community engagement and active participation of all stakeholders (Ay, 2023, Veri Kaynagi, 2023).

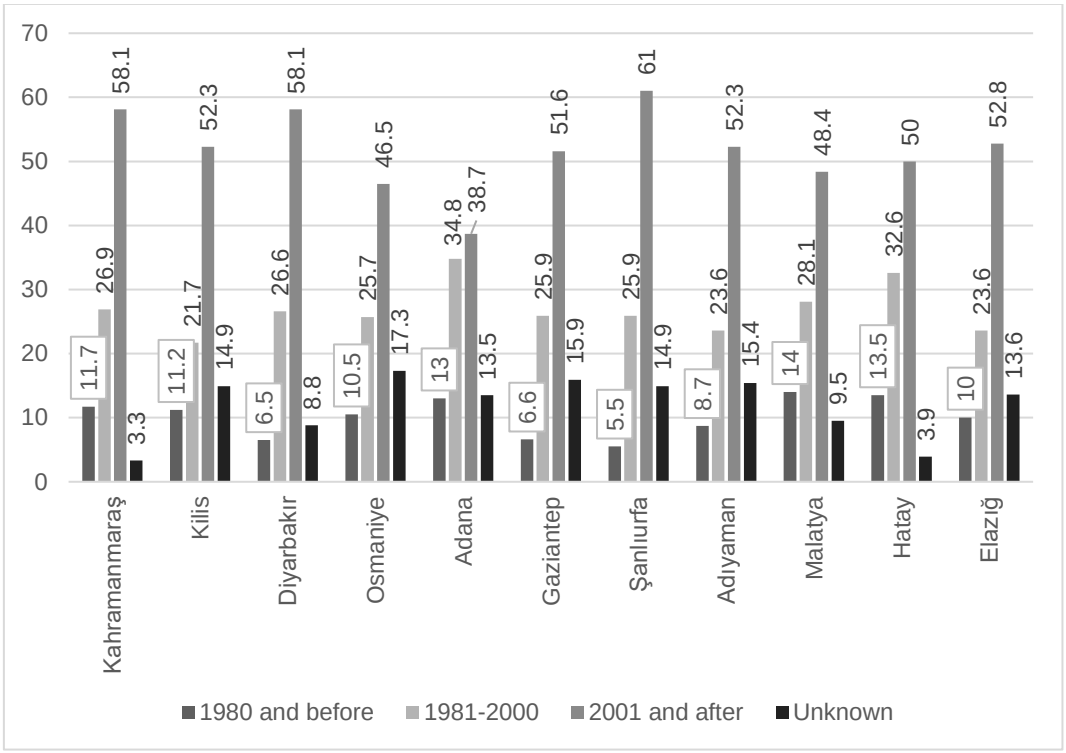

Fig. 1. The distribution of collapsed buildings in cities affected by earthquakes is depicted in a percentage breakdown based on the construction years.

However, these measures have been insufficient. In particular, telephone signals, which would have been most useful in search and rescue operations, were installed at the top of high-rise buildings and communication services did not work for a long time due to the collapse of many of these buildings, and it was revealed that many buildings in the earthquake zone were not earthquake-resistant, even some high-rise apartment buildings cut the load-bearing columns to expand the business areas underneath, and thousands of buildings collapsed because the public and the development team did not object to this, and it was found in many places that the building whose column was cut before the earthquake was destroyed and the building whose column was not cut was intact.

Turkey had building safety standards, but experts fear these were not adhered to. Turkey is no stranger to destructive earthquake activity. In 1999, the country was rocked by the magnitude 7.6 Izmit earthquake, estimated to have led to more than 17.000 fatalities. It was in the aftermath of this catastrophic event, more than 20 years ago, that new standards began to be brought in. But soon after the February 2023 earthquakes hit, experts shared concerns that some of the damage could and should have been prevented (Frost, 2023).

4. CONCLUSION

Every earthquake occurring in Turkey serves as an opportunity for learning. Government authorities and relevant institutions evaluate what has been effective and what can be improved in intervention and recovery efforts. The information obtained from these assessments is used to review policies and procedures for upcoming seismic events.

In summary, earthquake safety management in Turkey is a multifaceted approach involving preparation, intervention, and improvement. The country has made significant progress in minimizing the impact of seismic activities through building regulations, public awareness, and a robust disaster management system. It is crucial to tighten the scrutiny of building permits,

reconsider the conditions required for becoming a contractor by relevant institutions, and prevent the legalization of improperly and illegally constructed buildings through practices like amnesty. However, considering the ongoing seismic risk in the region, continuous improvements and readiness are essential to ensure the safety and well-being of the Turkish population in the face of earthquakes.

If the majority of Turkey's dam safety monitoring equipment is indeed outdated or sub-standard, this has serious implications for the security of Turkey's dams and for the validity of recent ministerial comments about dam safety post-earthquakes. It is possible that some dams may have passed the serviceability limit state, i.e., are no longer structurally operational and could degrade to the point of collapsing. While this remains unlikely, the difficulty in accessing Turkey's data leaves international observers and downstream riparian populations uncertain of the situation (Oakey, 2023).

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