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# GOOGLE TRENDS ANALYSİS OF 2023 TÜRKİYE-SYRİA EARTHQUAKE SEQUENCE FROM A DİSASTER MANAGEMENT APPROACH

Zeynep ADAK[1]
Ahmet ÇETİNKAYA[2]

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## *Abstract*

On 6 February 2023, two devastating earthquakes struck Türkiye and Syria, causing catastrophic loss of life and damage in the region. Türkiye is an active earthquake zone, and strategies for an effective disaster management have vital importance in the geography. In this study, Google search trends are analyzed for the period after the disaster in the region. Breakout search queries in the first week of the disaster are analyzed and categorized by topic. "General earthquake knowledge", "Comparison with previous disasters", "Situational awareness", and "Community disaster recovery" were 4 topics identified in queries. Interest trends in the topics are examined for the first week period. Community disaster resilience is assessed using YouTube search trends in Hatay, the province that had the largest damage. YouTube is considered here as a tool to measure resilient individual behaviors. Analyzing a period of one month following the disaster, signs of community resilience and recovery were identified in search trends by the end of February. Lastly, distribution of Disaster and Emergency Management Authority (AFAD)-related search terms are analyzed to figure out the functions of the authority observable in search queries. Informing the community, hazard mapping, coordinating relief activities, and coordinating voluntary rescue and relief workers were the functions identified in breakout search terms. Informing the community had the highest volume in search interests related to AFAD. Results of this study has future implications for disaster management phases of preparedness, resilience and recovery.

**Keywords:** *Türkiye-Syria Earthquake Sequence, Google Trends, YouTube, Disaster Management*

[1] İstanbul 29 Mayıs University, Asst. Prof., zadak@29mayis.edu.tr , ORCID: 0000-0001-7654-0773

[2] Marmara University, Assoc. Prof., ahmet@marmara.edu.tr , ORCID: 0000-0001-6272-5566

## INTRODUCTION

Earthquakes of magnitude 7.8 and 7.6 struck southern and central Türkiye and northern and western Syria on 6 February 2023, the strongest in the region in more than 80 years. It caused catastrophic loss of life, injuries and damage in the region. In Türkiye only, there was a death toll of 50,096 together with 107,204 injuries (Anadolu-Ajansı, 2023), and the disaster was estimated to cause $103.6 billion damage in the country (Kahramanmaraş ve Hatay Depremleri Raporu, 2023). The magnitude of the earthquake doublet as well as the damage it caused was far beyond the expectations (Dal Zilio & Ampuero, 2023). Türkiye is well known to be an active earthquake zone, and the country continues to work on mitigating effects of earthquakes expected to occur in near future in the geography.

Disaster management is a rather complex process and includes many different overlapping elements. Conventionally, it is accepted to consist of mitigation, preparedness, response and recovery phases that form a cycle. Recently, systems thinking, future-open thinking and strategic thinking frameworks are emerging approaches to deal with the increasingly complex nature of disasters (Sawalha, 2020). As part of this new view of handling disasters, big data emerged as a promising tool in management activities both before and after a disaster strikes.

Especially, data available from online activities of communities gained an increasing attention, especially in the response and recovery phases of disasters. Karami et al. (2020) applied sentiment analysis and topic modelling to Twitter data to improve situational awareness in 2015 South Carolina Flood. Pourebrahim et al. (2019) investigated usage of Twitter during 2012 Hurricane Sandy through content analysis and social network analysis. Shan et al. (2019) analyzed Weibo data to assess the type and scale of damage in man-made and natural disaster cases in China. These are to name a few of the large number research in the field, while a comprehensive systematic review of social media use in disaster recovery can be found in the review by Ogie et al. (2022).

Apart from social networking data, Google Trends data has also been used in disaster management research. Google supplies interest in search keywords or topics over a time period in a region in its Google trends web site. The interest is represented by an index between 0100, and exact search volumes are not supplied. This data about the search interests in a community was proven valuable

in forecasting an upcoming disease outbreak in medical research (Ginsberg et al., 2009). The approach is widely used in health care studies (Nuti et al., 2014). The search engine data has been largely applied to analysis in many different fields from computer science to economics. Its application in management of natural disasters other than epidemics, however, is relatively underdeveloped, and needs more attention. Linkov et al. (2010) explored the interest in disasters over different time periods. The study reported 2004 Indian Ocean tsunami to attract larger interest than the Haiti earthquake, Hurricane Rita and H1N1, while the interest curves were identical with 3-4 days of peak interest and a rapid decline thereafter. It was proposed that learning material should be provided to public during this peak interest period. Hariharan & Park (2021) explored search queries during 2021 Uri winter storm state of emergency period in US to understand citizen requirements related to public agencies. Yeo & Knox (2019) analyzed public attention towards 2016 Louisiana Flood compared to other disasters and to social and political events such as 2016 Olympic Games and presidential elections.

This research utilizes Google Trends, and analyzes search interests following 2023 TürkiyeSyria earthquake sequence. Rising search terms are categorized in topics from a disaster management perspective, and interest towards different topics are compared over time periods. Disaster resilience is analyzed in Hatay province through exploring YouTube queries, by seeking resilient behaviour in search trends. Additionally, queries related to Disaster and Emergency Management Authority (AFAD) are analyzed, and different functions of the authority, and distribution of these functions in search interests are figured out.

## 1. METHODOLOGY

Google Trends is the main tool to observe community interest in this research. Instead of absolute volumes of search queries, Google Trends provides a popularity index with respect to time and region. "Search Volume Index (SVI)" is used in this study to refer this index, while many other different names and abbreviations have been used by scholars. SVI represents the interest towards a search term or topic. + feature is used to calculate total SVI for more than one search term. The comparison feature is used to compare the interest on different search terms over a time period in a region. The web site provides SVI for Web Search, Image Search, Google Shopping Search, News Search, and YouTube Search. Web and YouTube search SVI are used in analyses in this research. Related Queries section

on the website is used to extract search queries related to a search term, or to find out rising search terms over a time period by entering no search term.

## 2. FINDINGS

Results of three different analyses on search interests are detailed in the following. These include extracting the search topics community interested in the immediate aftermath of the disaster, searching for resilient individual behaviour in YouTube queries in Hatay province over one month period, and lastly examining AFAD-related search queries to understand the prominent functions they point to and the distribution of these functions over the search queries.

### *2.1. Search Topics in Immediate Aftermath*

A Google Trends search with no keyword for 6 – 13 February 2023 period, covering one week following the disaster, in Türkiye region resulted in 25 related queries listed in Table 1. The period represents the immediate aftermath of the disaster. All the search terms in the table are labeled as "Breakout" by Google, meaning that the terms grew in volume by more than 5000% compared to the time period before 6th February.

The terms can be placed into four categories in terms of disaster preparedness, resilience and recovery. "General earthquake knowledge" covers 28% of queries, and is considered part of disaster preparedness, while "Comparison with previous disasters" (12%), "Situational Awareness" (48%), and "Community disaster recovery" (12%) are part of relief and recovery phases of a disaster. The order of the search terms in each category in Table 1 are with respect to Google ordering. Thus, the search terms in top of a list had higher volumes than the ones on the bottom.

Interest in search of each category, in Table 1, is compared across the same, 6 – 13 February, date range. Google Trends allows for up to 5 search terms merged with "+" (meaning OR) in a single search, and up to 5 different search queries to be compared in a single graph. To compare the interests across different search categories, fay hattı + ohal nedir + deprem haritası + fay hattı haritası + türkiye fay hattı query is used for "General earthquake knowledge" category, the query Erzincan depremi + 99 depremi + gölcük depremi for "Comparison with previous disasters" category, the query ölü sayısı + afad + afad deprem + taha duymaz +

deprem ölü sayısı for "Situational awareness", and lastly the query deprem yardım + ahbap + afad yardım for "Community disaster recovery". Figure 1 represents the trends of search interests in each category over the period. A SVI of 100 represents the top search query among others in the specified region and time period. Other SVI values are distributed accordingly. When analyzing interest over time for different queries simultaneously, Google Trends re-computes SVI values for each query relative to each other, hence the relative SVI (RSVI).

Figure 1 shows the change in RSVI values of the 4 categories over the one week period. Over the whole period, the largest interest was towards situational awareness, indicating searches made to follow the developments about the disaster to stay informed. These included queries about death toll, as well as AFAD, and province-related ones. The top search volume for the topic was occurred on Feb. 7, while it showed a sharp decrease in the following two days, staying still the highest among the 4 topics. Queries about General Earthquake Knowledge included preliminary general information about seismic events as well as seismic map of Türkiye showing hazardous areas in terms of earthquakes. Turkish government declared 3month state of emergency in the region on Feb. 7, leading to a peak in search volume of the topic with the query "what is state of emergency". It can be observed that except from the topic "Comparison with previous disaster", which might also be considered as part of situational awareness, all three topics showed a peak on Feb 7, one day after the disaster, and decreased steadily thereafter. It can be inferred that it is just the initial aftermath of the disaster when the society shows a highly concentrated interest in the disaster, trying to understand the scale of the disaster – through comparisons with previous ones in the region – , to explore basic background information on the dynamics of the event, to stay informed on the ongoing process in the region, and to participate in the recovery phase through financial or other forms of aid.

**Table 1. Breakout Google queries in period 6 – 13 February 2023 in Türkiye, categorized by topic**

| **General earthquake knowledge** | | **Comparison with previous disasters** | |
|---|---|---|---|
| | *English translation* | | *English translation* |
| 1 Fay hattı | Fault line | 1 Erzincan depremi | Erzincan Earthquake |
| 2 Ohal nedir | What is State of Emergency | 2 99 depremi | 1999 (İzmit) Earthquake |
| 3 Deprem haritası | Earthquake map (Seismic hazard map) | 3 Gölcük depremi | Gölcük Earthquake |
| 4 Fay hattı haritası | Fault line map | **Community disaster recovery** | |
| 5 Türkiye fay hattı | Türkiye fault line | | *English translation* |
| 6 Türkiye deprem haritası | Türkiye earthquake map | 1 Deprem yardım | Earthquake aid |
| | | 2 Ahbap | (A Turkish NGO for charity) |
| 7 Fay hattı nedir | What is fault line | 3 Afad yardım | Disaster and Emergency Management Authority aid |

| **Situational Awareness** | | | |
|---|---|---|---|
| | *English translation* | | *English translation* |
| 1 Ölü sayısı | Death toll | 7 Kahramanmaraş deprem | Earthquake Kahramanmaraş |
| 2 Afad | Afad | 8 Gaziantep deprem | Earthquake Gaziantep |
| 3 Afad deprem | Afad earthquake | 9 Malatya deprem | Earthquake Malatya |

| | | | |
|---|---|---|---|
| 4 Taha Duymaz | (A social media influencer died in the earthquake) | 10 Kayseri deprem | Earthquake Kayseri |
| 5 Deprem ölü sayısı | Earhtquake death toll | 11 Ankara deprem | Earthquake Ankara |
| 6 Adana deprem | Earthquake Adana | 12 Afad son dakika | Afad breaking news |

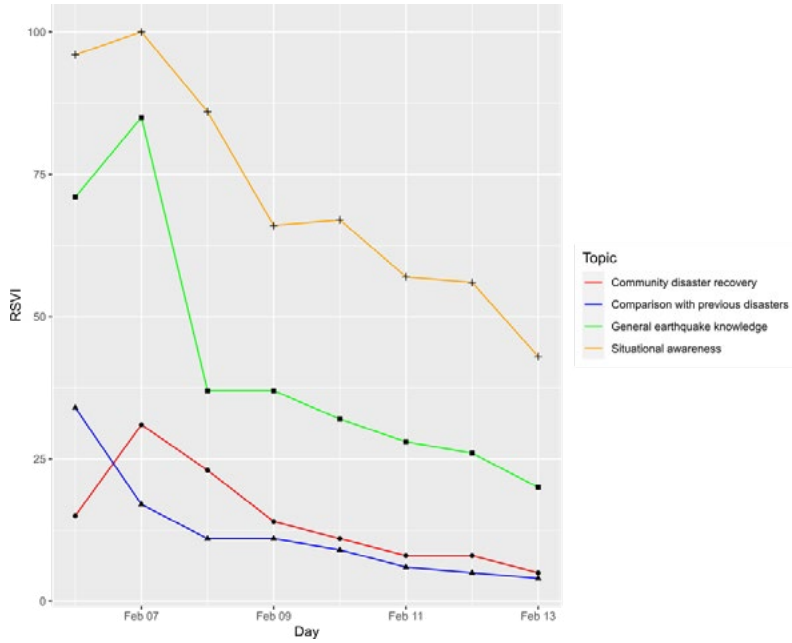


*Figure 1. Interest in different topics over period 6 – 13 February 2023 in Türkiye*

### *2.2. Resilience in Hatay Province*

In disaster management terminology, resilience is a concept used to refer to the adaptive capacities of the individuals, the state and the society to return to an equilibrium state, and to continue to function after a disturbance (Mayer, 2019). Although, there are still no wellestablished comprehensive methods to measure community resilience, recent studies attempt to make use of big data for an alternative measure of resilience process. Up to author's knowledge, there are no previous studies using Google Trends in community disaster resilience analysis. Although, SVI itself may not provide a single, complete tool for measuring resil-

ience, it would certainly provide insights about resilience and recovery processes.

Resilience in Hatay province, one of 11 provinces affected from the disaster, is analyzed here in the period 8 February – 8 March 2023. A period of one month following the disaster is analyzed to assess any sings of resilience and recovery in the community. The first two days after the disaster are not included in the analysis because these days had all breakout Google search queries of basic earthquake terminology and ongoing situation, and, they would hinder the presence of other search queries in the period since Google calculates relative scores. Hatay is chosen as a basis of resilience analysis as it was the province with the largest damage in the earthquake series. The damage was in catastrophic scale, such that the number of collapsed, severely damaged buildings was reported to be 215.255, while the closest following province, Kahramanmaraş, had 99.326 buildings reported (Kahramanmaraş ve Hatay Depremleri Raporu, 2023).

YouTube search terms are analyzed, and breakout and rising search terms are listed in Table 2. YouTube is a medium that provides both informative and entertaining content, and can be used as an appropriate measurement tool to assess resilient individual behaviors, and mental health recovery. Rising search terms are preferred to top search terms, since, rather than portraying the specific period, the top listing characterizes general YouTube use cases, such as TV series and cartoon films for kids.

Search terms in Table 2 can be placed in 4 distinct categories: (1) Earthquake-related, (2) TV Series, (3) TV News Live, and (4) Other. Figure 2 shows the changing interest in these categories. Interest in TV News Live can be attributed in part to the disaster, since an analysis of the top 5 search terms in TV News Live category reveals that the interest in those channels has a peak increase following the disaster, as shown in Figure 3. A second peak is also observable in the figure, indicating the day of an aftershock of 6.4-earthquake in Hatay province. It is clear from Figure 2 that signs of community resilience and recovery started to establish by the end of February as interest towards earthquake and news related queries tend to decrease, while queries on TV series tend to increase.

**Table 2. Rising YouTube queries in period 8 Feb. - 8 Mar. 2023 in Hatay province, categorized by topic**

| **Earthquake-related** | | **TV Series** | |
|---|---|---|---|
| | *English translation* | | *English translation* |
| 1 Deprem Anı | Earthquake moment | 1 Ego 2 bölüm | Ego episode 2 |
| 2 Naci Görür | (A Turkish geologist) | 2 Yalı Çapkını 22 bölüm fragmanı | Yalı Çapkını episode 22 trailer |
| 3 Deprem | Earthquake | 3 Veda Mektubu | Veda Mektubu |
| 4 Taha Duymaz | (A social media influencer died in the earthquake) | 4 Ego | Ego |
| 5 Zilzal Suresi | (A chapter in the Holy Quran, includes earthquake-related verses) | 5 Yalı Çapkını 21 bölüm fragmanı | Yalı Çapkını episode 21 trailer |
| 6 Deprem Son Dakika | Earthquake breaking news | 6 Aşk Mantık İntikam | Aşk Mantık İntikam |
| 7 Celal Şengör | (A Turkish geologist) | **Other** | |
| | | | *English translation* |
| | | 1 Ceren Yaldız | (A social media influencer) |
| | | 2 Cüneyt Özdemir | Journalist |

| TV News Live | | | |
|---|---|---|---|
| | *English translation* | | *English translation* |
| 1 Fox Tv Canlı İzle | Fox TV watch live | 6 Haberler | News |
| 2 a Haber Canlı | A Haber live | 7 Habertürk Canlı | Habertürk live |
| 3 الجزيرة مباشر | Al Jazeera live | 8 Halk Tv Canlı | Halk TV live |

| | | | |
|---|---|---|---|
| 4 CNN Türk Canlı | CNN Türk live | 9 TRT Haber Canlı | TRT Haber live |
| 5 Canlı Haber | Live news | 10 NTV Canlı | NTV live |

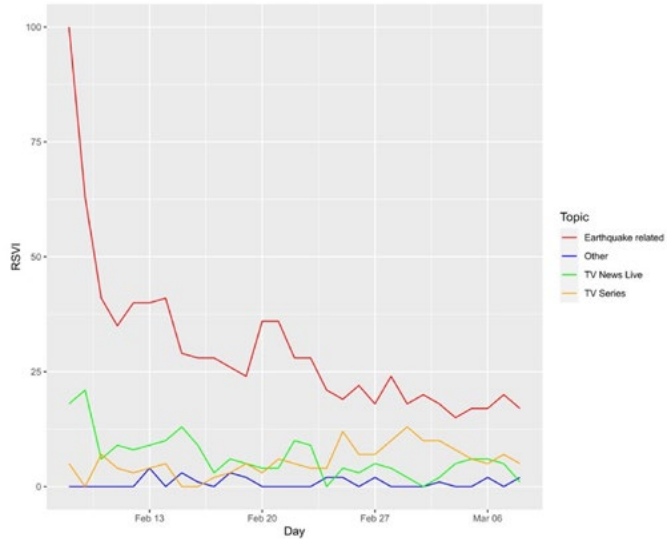


*Figure 2. Interest in different topics on YouTube over period 8 Feb. – 8 Mar. 2023 in Hatay province*

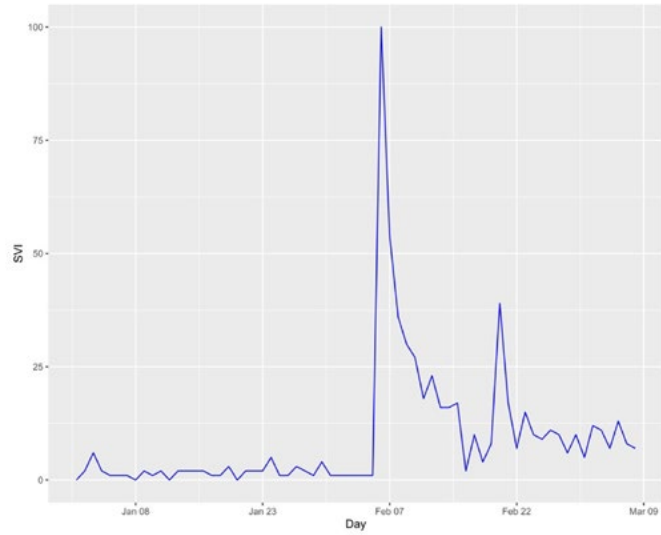


*Figure 3. Interest in TV News Live on YouTube before and after the disaster, in Hatay*

### *2.3. Distribution of AFAD Functions in Queries*

AFAD is the government body responsible from – as declared in its website – working to prevent disasters and minimize disaster-related damages, plan and coordinate post-disaster response, and promote cooperation among various government agencies. To examine the functions of the authority inferred from search queries, AFAD-related search queries are examined. "Afad" keyword is searched for the period 6 February – 6 March 2023 in Türkiye, covering one month after the disaster.

Table 3 gives the list of 24 AFAD-related breakout queries in the period. All search terms in the table are labeled as breakout by Google. The table provides which functions the search terms point to. 4 different functions are identified in search queries: (1) Informing the community, (2) Hazard mapping, (3) Coordinating relief activities, (4) Coordinating voluntary rescue and relief workers. The distribution of these functions can be estimated roughly by the number of times a search term relates to a function. In the table, "Informing the community" function is associated with 10 different search terms among 19 different AFAD-related breakout queries in the period. 5 search queries are not related to the functions of the authority, hence not included in the overall sum. Intensity of each function in search queries are computed as: 53% Informing the community, 32% Hazard mapping, 32% Coordinating relief activities, and 10% Coordinating voluntary rescue and relief workers. Some of the search terms are associated with more than one function.

**Table 3. AFAD-related breakout queries over period 6 Feb. – 6 Mar. 2023 in Türkiye**

| Search Term | English translation | Disaster management function |
|---|---|---|
| 1 AFAD Canlı Deprem | AFAD live earthquake | Informing the community, Hazard mapping |
| 2 AFAD SMS | AFAD SMS | Coordinating relief activities |
| 3 AFAD Deprem Kayseri | AFAD earthquake Kayseri (province) | Informing the community |
| 4 AFAD Yardim | AFAD aid | Coordinating relief activities |
| 5 AFAD Deprem Yardımı | AFAD earthquake aid | Coordinating relief activities |

| | | |
|---|---|---|
| 6 AFAD Gönüllü Başvuru | AFAD volunteer application | Coordinating voluntary rescue and relief workers |
| 7 AFAD Kayıt | AFAD registration | Coordinating voluntary rescue and relief workers |
| 8 AFAD SMS Yardım | AFAD aid sms | Coordinating relief activities |
| 9 AFAD Başkanı kimdir | Who is the head of AFAD? | --- |
| 10 AFAD Fay Hattı Sorgulama | AFAD fault line query | Informing the community, Hazard mapping |
| 11 AFAD Deprem Haritası | AFAD live earthquake map | Informing the community, canlı Hazard mapping |
| 12 AFAD Deprem İBAN | AFAD earthquake IBAN | Coordinating relief activities |
| 13 AFAD Anlık Deprem | AFAD instantaneous earthquake (map) | Informing the community, Hazard mapping |
| 14 UMKE Açılımı | UMKE stands for | --- |
| 15 AFAD Depremzede Kayıt | AFAD earthquake victim registration | Managing recovery of victims |
| 16 AFAD Baskani | AFAD head | --- |
| 17 AFAD son durum | AFAD current status | Informing the community |
| 18 AFAD son 100 deprem | AFAD the last 100 earthquakes | Informing the community, Hazard mapping |
| 18 AFAD Deprem Takip | AFAD earthquake track | Informing the community, Hazard mapping |
| 20 AFAD Açıklama | AFAD declaration | Informing the community |
| 21 AFAD Genel Müdürü | AFAD general manager | --- |
| 22 İsmail Palakoğlu | (A director in AFAD) | --- |
| 23 AFAD Açıklaması | AFAD the declaration | Informing the community |
| 24 AFAD Hesap Numarası | AFAD account number | Coordinating relief activities |

## DISCUSSION AND CONCLUSION

Disaster management is a vital subject in Türkiye, as the country sits on a highly active earthquake zone. This research has investigated Google search interests in the aftermath of the 2023 Türkiye-Syria Earthquake sequence - two earthquakes of magnitude above 7 occurred on 6 February. The scale of the earthquake doublet was overwhelming, and resulted in catastrophic loss and damage. Google Trends has been used in analyses. Google search queries in Türkiye over the week following the disaster have shown to form 4 categories: "General earthquake knowledge", "Comparison with previous disasters", "Situational Awareness", and "Community disaster recovery". The categories point to preparedness, and relief and recovery phases of a disaster. Interest towards "Situational Awareness" has shown to be the highest over the entire period. This shows the community interest to keep track of the disaster. It is important for a state to gain a knowledge on the top websites the community reaches following a search engine query on situational awareness. Such knowledge may facilitate the prevention of rumor, fake news or misinformation spread in times of public confusion in the wake of a disaster.

"General earthquake knowledge" ranked the second topic covering highly queried search terms. The topic includes search queries on basic knowledge about seismic events as well as earthquake map of Türkiye showing hazard level of different regions. The high search volume towards such basic earthquake terminology and regional hazard knowledge is an issue needs to be addressed as part of preparedness to disasters, since the country is anticipated to experience major earthquakes in the near future. "Community disaster recovery" ranked the third in terms of community interest in the topic. It covers efforts from community to take part in the relief and recovery processes by supplying financial aid. As it has been also revealed in AFAD-related queries as discussed below, this collective responsibility observed in the community is vital in terms of a more efficient and rapid resilience and recovery process, and it should be effectively coordinated and managed to get the most out of it.

Disaster resilience in Hatay province has also been investigated in this research. Google Trends has been used as a tool to measure community resilience. Trends in YouTube queries have been analyzed and revealed out to represent 4 categories: "earthquake-related", "TV Series", "TV News Live", and "Other". After

the disaster, a peak increase has been shown to be observed in TV News Live search on YouTube. Thus, a decreasing trend in earthquake-related or TV News Live search, and an increasing trend in TV Series category has been considered as a sign of resilient behaviour, as it is typical for YouTube users to search for episodes of TV series in regular times. Such trend has been observed by the end of February in Hatay. This indicates approximately 2-3 weeks of personal or mental partial recovery following a disaster, a phenomenon needs to be further addressed in future studies. Lastly, search on AFAD (Disaster and Emergency Management Authority)-related queries over one month period after the disaster revealed 4 functions of the authority prevalent in search engine queries: (1) Informing the community, (2) Hazard mapping, (3) Coordinating relief activities, (4) Coordinating voluntary rescue and relief workers, where "informing the community" function related to more than half of the queries, and hazard mapping can also be considered part of it, increasing its share to above 80%. The community seek for official information generally about the death toll, current status in different provinces, regional earthquake map, and declarations, which implies that the authority should supply this information continually from its official website, both for the community to gain accurate and timely information, and for the state to prevent any fake news or misinformation spread. The percentage of "coordinating relief activities" is also considerable, and represents the responsibility the society assumes in the phase of relief and recovery.

Overall, the research here shows that search engine queries may provide helpful insights after a disaster strikes. They may enhance understanding about the preparedness of the community for possible future disasters, provide supportive tools for measurement of community disaster resilience, and report expectations of the society from authorities and government bodies. Other benefits in different management phases are also possible and subject of future research, such as measuring temporal recovery of the society, making comparisons between disasters in the same country, and guiding activities of government units.