Akademik İncelemeler Dergisi
Journal of Academic Inquiries

E-ISSN : 2602-3016
Publisher : Sakarya University

Vol. 20, No. 1, 143-171, 2025
DOI: https://doi.org/10.17550/akademikincelemeler.1593038

Research Article

Exploring Reflections of the 2023 Kahramanmaraş Earthquake on X: A Computational Study on Türkiye and Syria

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Received: 28.11.2024
Accepted: 22.01.2025
Available Online: 09.03.2025

Abstract: Earthquakes are multidimensional phenomena that disrupt socio-structural systems and erode collective resilience frameworks. Social media acts as a vital platform for information dissemination and communication within such contexts. The Kahramanmaraş earthquakes of February 6, 2023, induced significant physical and demographic consequences across Türkiye and Syria. A review of existing literature indicates a disproportionate emphasis on Türkiye within communication studies, with minimal attention to Syria or comparative analyses between the two nations. This study conducts a comparative analysis of social media discourse on the February 6, 2023, earthquakes in Türkiye and Syria. Employing computational techniques, including sentiment analysis, textual analysis, and network analysis, over 256,227 tweets were examined to identify dominant themes, linguistic patterns, and sentiment polarity shifts. The analysis reveals distinct differences in social media reflections of Türkiye and Syria. Discourse on Türkiye primarily addressed rescue operations and infrastructural damage, while content on Syria centered on humanitarian crises and political constraints affecting disaster response. Posts related to Syria exhibited a higher proportion of negative sentiment. This research contributed an empirical framework for examining the dynamics of public discourse during earthquake crises and clarifies the interrelationship between social media narratives and socio-political structures in contexts characterized by fragile state.

Keywords: Social Media, Kahramanmaraş Earthquake, X, Computational Techniques, Fragile State

1. Introduction

Earthquakes constitute multifaceted phenomena with catastrophic consequences, profoundly affecting not only physical infrastructure but also the intricate fabric of social cohesion and the psychological resilience of individuals (Alfuqaha, 2023, pp. 1-2; Mahbubur Rahman et al., 2023, pp. 2-3; Zanoletti & Bontempi, 2024, p. 24). The 2023 Kahramanmaraş earthquakes serve as a paradigmatic case, precipitating profound humanitarian and societal crises across Türkiye and Syria. The scale of devastation is underscored by the loss of over 50,000 lives in Türkiye and more than 6,000 in Syria, coupled with the displacement of approximately 3.3 million individuals in Türkiye and over 100,000 in Syria (Ağın-Gözükızıl & Tezcan, 2023, pp. 98-101; Demirhan, 2024, p. 433). A meticulous examination of the extant communication studies literature indicates a predominant scholarly focus on Türkiye, despite the shared magnitude of destruction experienced by both countries (Yalçın, 2023; Basmacı, 2023; Demirel & Tuncer, 2024; Demirhan, 2024; Kirazoğlu, 2024). In stark contrast, studies investigating the communicative dimensions of the crisis in Syria or adopting a comparative analytical approach between the two nations remain conspicuously sparse (Sheikh et al., 2024, p. 297; Polyakova & Kuzina, 2024, pp. 39-60). Within this context, the present study endeavors to conduct a comparative analysis of the X (formerly known as Twitter) reflections of the 2023 earthquake in Türkiye and Syria. This comparative framework seeks to elucidate the divergences in public perception across the two nations. Moreover, the research aspires to advance the academic discourse within communication studies by providing an in-depth exploration of the influence of fragile states on media reflections during large-scale crises, thereby addressing a critical lacuna in the literature.

This study undertook a systematic review of the extant literature to critically evaluate the current state of knowledge, identify substantive research lacunae, and articulate its scientific contribution with

Cite as(APA 7): Demirel, S., Çakıcı, Z., & Bulur, N. (2025). Exploring reflections of the 2023 Kahramanmaraş earthquake on X: A computational study on Türkiye and Syria. *Akademik İncelemeler Dergisi*, *20*(1), 143-171. https://doi.org/10.17550/akademikincelemeler.1593038

precision. The literature review commenced with an examination of studies exploring the reflections of earthquakes as crises, emphasizing their depiction through traditional and social media platforms, alongside their sociocultural and psychological implications. Subsequently, scholarly works specifically addressing the February 6, 2023, Kahramanmaraş earthquakes were analyzed to contextualize the research framework. Deriving from the theoretical and empirical insights garnered through the review, research questions were developed, which guided the selection of robust methodological approaches. To address these questions, a computational paradigm was employed to systematically analyze the polarity of social media content—particularly tweets—and to identify prominent discursive patterns and thematic constructs that emerged in relation to the post-earthquake scenarios in Türkiye and Syria. This methodological framework incorporated sentiment analysis, text mining, and network analysis, applied to an extensive dataset exceeding 250,000 tweets ($n > 250,000$). The analytical outcomes, which illuminate the nuanced dynamics of social media discourse in the aftermath of the earthquakes, are delineated in the results section. The concluding section synthesizes these findings, critically evaluates the study's methodological and contextual limitations, and offers sophisticated recommendations for advancing future research within this domain.

2. Media Reflections on the 2023 Kahramanmaraş Earthquakes: A Literature Review

A crisis is defined as an extraordinary condition that disrupts the normal functioning of societal systems, institutions, or individuals, requiring immediate remedial actions. Crises may arise from various sources, such as economic, political, social, or natural disasters, and generally present urgent challenges that demand swift and effective interventions (Rostami et al., 2022, p. 41; Aryal, 2023, pp. 351–353). According to Ulrich Beck's risk society theory, crises in modern societies are not only catastrophic events but also indicators of broader societal transformations and systemic shifts (Beck, 2011, pp. 23–29). Beck further argues that natural disasters such as earthquakes illustrate the paradoxes of modernity, where technological advancements coexist with heightened vulnerability to risks (Beck, 1992, pp. 56–60). Similarly, Zygmunt Bauman's concept of "liquid fear" highlights the pervasive uncertainty and anxiety that earthquakes evoke, exposing the fragility of social structures and the inadequacy of traditional risk management mechanisms (Bauman, 2013). Earthquakes, as crises, are marked by their sudden onset and immense destructive potential, making them quintessential examples of acute disruptions. Their impact extends beyond immediate physical damage to include significant psychological, economic, and social disruptions within affected communities. The aftermath often involves substantial casualties, injuries, infrastructural destruction, and economic instability, creating an environment of uncertainty and systemic breakdown. Earthquakes are classified as crises due to their unpredictability and the urgency of large-scale, immediate responses. Post-earthquake crisis management involves both addressing short-term emergency needs and implementing long-term recovery strategies. These actions aim to alleviate immediate effects while establishing sustainable frameworks for resilience and reconstruction (Rostami et al., 2022, pp. 38–43; Keykhaei et al., 2023, p. 2).

In addition to conceptualizing earthquakes as crises, analyzing their reflections in both traditional and digital media is crucial for a comprehensive understanding of their multifaceted nature. Traditional media often dramatizes earthquakes, focusing on the disaster's scale and the prominence of rescue operations (Correa et al., 2016, p. 521). Some studies in the literature indicate that while earthquakes are typically portrayed in traditional media in accordance with standard communication practices, this approach can sometimes hinder effective crisis management and disaster communication (Fokaefs & Sapountzaki, 2021, pp. 19–20; Özdemir, 2024, p. 120). Specifically, in television and newspaper coverage, where visual content predominates, heightened emotional intensity can obscure practical information necessary for disaster management (Yurdigül et al., 2024, p. 224). Xu et al. (2020, p. 15) suggest that individuals who primarily engage with traditional media may have a diminished perception of disaster severity. Recently, the role of social media in crisis communication and public awareness has

gained prominence in academic research. Studies increasingly highlight social media's capacity to facilitate crisis communication and foster societal engagement in disaster contexts (Greenberg & Scanlon, 2016; Pignone et al., 2022; Fallou et al., 2024; Çakıcı & Meriç, 2024; Meriç & Çakıcı, 2024).

The widespread use of social media for rapid information dissemination and fostering social solidarity plays a critical role in crises. Empirical studies show that social media, particularly during emergencies such as earthquakes, is an essential tool for citizen journalism, crisis management, and organizing humanitarian relief efforts. Platforms like X, Facebook, and Instagram significantly contribute to the swift transmission of information during seismic events, enhancing public awareness and preparedness for the societal impacts of natural disasters. However, the flow of information on these platforms is not limited to positive outcomes; it also facilitates the spread of misinformation, false narratives, and the rapid escalation of panic. These phenomena have been linked to long-term social polarization and heightened societal tensions (Kwanda & Lin, 2020, pp. 6–14; Amiresmaili et al., 2021, pp. 6–7; Eryürük et al., 2024, p. 43). Despite these negative consequences, social media platforms stand out for their participatory, immediate, and dynamic nature, distinguishing them from traditional media (Çakıcı, 2024, p.2). They have been recognized as key agents in shaping and measuring public responses during crises. Thus, social media functions not only as a communication medium but also as a strategic platform for orchestrating and analyzing societal reactions to crises (Shahbazi et al., 2018, pp. 1–9; Bossu et al., 2023, p. 11).

Academic research on the relationship between social media and earthquakes in Türkiye primarily focuses on the coordination of post-disaster relief, public information dissemination, and communication between governmental agencies and the public during crises. The ability of social media to enable rapid information flow and foster social solidarity during crises is emphasized. However, the spread of disinformation, speculative content, and inflammatory language on these platforms is also highlighted as a potential barrier to effective crisis management, which may escalate societal panic and worsen chaos. Studies underline the importance of optimizing social media usage during crises (Tarakcı, 2023; Uzun, 2023; Gökmen, 2023; Demirhan & Hacıoğlu, 2024; Koçyiğit, 2024; Ata, 2024; Öze, 2024; Demirhan, 2024; Serin & Ünlü, 2024). Specifically, these studies argue that the strategic use of social media by both individuals and official institutions, within legal and ethical boundaries, is crucial for maintaining effective crisis communication. Overall, some studies suggests that effective social media usage not only ensures the dissemination of reliable information during seismic events but also plays a vital role in sustaining communication networks. Additionally, the accuracy and reliability of information shared on social media are instrumental in conveying the physical and societal destruction caused by the earthquake, contributing to the success of post-crisis recovery efforts (Eldem Anar, 2021, pp. 1144-1145; Usta & Yükseler, 2021, pp. 265-266; Şahin & Demirbilek, 2023, pp. 323-331).

The earthquake phenomenon has been extensively analyzed in the context of both traditional and digital media. The 2023 Kahramanmaraş earthquake, one of the most catastrophic disasters in the history of the Republic of Türkiye, offers a critical case for examining media coverage of earthquakes, particularly within the framework of existing academic discourse. Türkiye's location along the North Anatolian, East Anatolian, and West Anatolian fault lines makes it prone to frequent seismic events. A historical review of seismic activity in the region highlights numerous devastating earthquakes, including the 1930 Hakkâri earthquake and the 2020 İzmir earthquake (Maden, 2023, p. 406). The deadliest earthquake in Türkiye's modern history occurred in 2023 (Aydın, 2023, p. 2609; Öze, 2024, pp. 519-522). On February 6, 2023, two earthquakes measuring 7.7 and 7.6 in magnitude struck the Pazarcık and Elbistan districts of Kahramanmaraş, respectively. These quakes caused extensive destruction across the provinces of Kahramanmaraş, Adana, Osmaniye, Hatay, Diyarbakır, Elazığ, Gaziantep, Malatya, Kilis, Şanlıurfa, and Adıyaman, as well as in Syria’s Latakia, Aleppo, Hama, and Idlib regions (Demirhan, 2024, p. 433). Following the earthquakes, Türkiye issued a Level 4 alarm, prompting the deployment of foreign

personnel from China, Japan, Mexico, and Spain to assist in search, rescue, and medical operations (Serin & Ünlü, 2024, p. 7). Despite international aid, approximately 15 million people in Türkiye were affected by the earthquake, which resulted in over 50,000 deaths, more than 100,000 injuries, and the displacement of 3.3 million individuals (Ağın-Gözükızıl & Tezcan, 2023, pp. 98-101; Salik-Ata, 2023, pp. 61-62; IOM, 2023, p. 1). In Syria, the earthquake impacted approximately 9 million people, causing over 6,000 deaths, more than 10,000 injuries, and displacing over 100,000 individuals (Sağıroğlu et al., 2023, p. 13; IOM, 2023, p. 1). The subsequent heavy rainfall and flooding exacerbated the humanitarian crises in both Syria and Türkiye (UNFPA, 2023, pp. 1-6).

A review of the existing literature indicates that the earthquake which occurred on February 6, 2023, in Türkiye has been extensively examined from multiple perspectives and within various contexts within the field of communication studies. A portion of the literature has focused on how the disaster was represented through news articles and news photographs in both traditional and digital media platforms (Yalçın, 2023; Basmacı, 2023; Nazlı and Soylu, 2023; Göksel et al., 2024; Kayıhan, 2024; Demirel & Tuncer, 2024; Atalay & Muratoğlu-Pehlivan, 2024; Kirazoluğu, 2024). Additionally, several studies have investigated the social media activities of individuals and organizations during the disaster, specifically examining the nature of their contributions to the dissemination of information about the earthquake (Tarakcı, 2023; Uzun, 2023; Gökmen, 2023; Ata, 2023; Demirhan & Hacıoğlu, 2024; Koçyiğit, 2024). Furthermore, there exists a body of work that addresses the spread of misinformation related to the earthquake through both traditional and digital media channels, with an emphasis on the social repercussions of such misinformation (Öze, 2024; Demirhan, 2024; Serin & Ünlü, 2024). Despite the profound impact of the earthquake in both Türkiye and Syria, it has been observed that the majority of the studies have concentrated primarily on Türkiye. Research from a communication studies perspective that investigates the devastation in Syria, or conducts a comparative analysis between the two countries, remains significantly underrepresented (Sheikh et al., 2024, p. 297; Polyakova & Kuzina, 2024, pp. 39-60).

Modern states bear numerous responsibilities, including ensuring the security of their citizens, establishing a just legal system, delivering essential services, promoting economic well-being, and fostering social cohesion. States that fail to fulfill these duties are categorized as "fragile states" (Milliken & Krause, 2002, p. 756). In fragile states, the ruling elite tends to prioritize personal material interests over the public good, marginalized populations face significant barriers to accessing resources, internal conflicts and severe human rights violations are prevalent, natural disasters precipitate major economic crises, the influence of terrorist organizations increases, and due to ineffective policies, state boundaries become difficult to control, with migration flows being inadequately managed (Pektaş & Davut, 2018, pp. 5-8; Çakıcı, 2024, p. 154). Syria, embroiled in a civil war since 2011, is a prime example of a fragile state that has been unable to maintain economic, political, or social stability (Ewelie & Nwaorgu, 2021, pp. 313-318; Bakkour & Sahtout, 2023, pp. 1023-1024). A review of the literature reveals a conspicuous absence of studies that comparatively examine the social media reflections of the November 6, 2023, earthquakes in Türkiye, a relatively stable state, and Syria, classified as a fragile state. Such a comparative analysis of social media responses to the 2023 earthquake in both countries holds significant potential for offering a deeper understanding of public perception in each context. Furthermore, it can provide insights into how the characteristics of a fragile state influence the dissemination and framing of media content. This study seeks to address the gap in the existing literature by employing computational methods to systematically analyze English-language tweets pertaining to Türkiye and Syria in the context of the 2023 earthquake, thereby contributing to the scholarly discourse on the media reflections of such events.

3. Materials and Method

This research investigates public perceptions and related discourse regarding countries affected by crises, focusing on X posts about Türkiye and Syria following the February 6th earthquakes. Social media, particularly X, is a widely utilized platform for obtaining, sharing, and debating information during natural disasters and crises. The February 6th earthquakes, which affected both Syria and Türkiye, present a compelling case study for analyzing event-related discussions at the country level. For this purpose, tweets referencing both nations were retrieved using the X API (Barrie & Ho, 2021). The collected data were subjected to computational analyses, including sentiment, text, and network analysis, employing the text-as-data approach, a well-established method in the field of natural language processing (NLP), political science and international relations (Grimmer & Stewart, 2013; Wiedemann, 2016; Benoit, 2020). Computational analyses rely on the text-as-data approach. This approach conceptualizes textual elements (e.g., words, tokens) as numerical data points, facilitating extensive calculations, measurements, and modeling of large textual datasets through text mining techniques (Grimmer & Stewart, 2013; Wiedemann, 2016; Benoit, 2020). In this study, computational analyses were employed to examine a substantial dataset comprising 256,227 posts reflecting the aftermath of the earthquakes. By leveraging text mining and NLP tools, the analysis process was significantly expedited, conserving valuable time and resources that would otherwise have been required for manual examination of a dataset of this magnitude.

3.1. Research questions

Within the scope of this research, the polarity, prominent expressions, and themes in posts related to both countries have been analyzed and compared.

RQ1. What is the prevalent sentiment and emotions of posts shared on X about Türkiye and Syria following the February 6 earthquakes?

RQ2. What are the prominent expressions and themes in posts shared on X about Türkiye and Syria following the February 6 earthquakes?

RQ3. To what extent do the polarity, prominent expressions, and themes of posts shared about Türkiye and Syria during crises differ?

3.2. Sentiment analysis

Sentiment analysis is a text classification process (Pang & Lee, 2008; Liu, 2020). Analyzed texts can be user reviews (Demirel, Bulur, Çakıcı, 2024), political statements, speeches, news articles (Wu & Shen, 2015; Atan & Çınar, 2019; Rozado, Hughes & Halberstadt, 2022; Kahraman-Gökalp, Demirel & Gündüz, 2024), and social media posts (Demirel, 2024; Demirel, Kahraman-Gökalp & Gündüz, 2024; Gündüz & Demirel, 2023). The goal of sentiment analysis is to identify the polarity or emotional tone of a text by analyzing the words it contains (Pozzi et al., 2017; Zhang & Liu, 2017; Liu, 2020). The results of sentiment analysis can vary depending on the techniques used. In some cases, numerical values indicating the text's polarity may be obtained, while in others, sentiment analysis software may provide categorical outcomes (e.g., positive, negative) (Thelwall, 2017; Gezici & Yanıkoğlu, 2018; Demirel, 2024). Since it involves the classification and measurement of expressed thoughts, sentiment analysis is also referred to as opinion mining (Thelwall, 2017; Zhang & Liu, 2017; Puschmann & Powell, 2018; Liu, 2020).

For this study, the Python-based natural language processing tool TweetNLP (Camacho-Collados et al., 2022) was employed to classify the posts into sentiment categories (negative, neutral and positive). TweetNLP is a natural language processing software based on RoBERTa, a more extensively trained version of the BERT (Bidirectional Encoder Representations from Transformers) language model developed by Google (Devlin et al., 2019; Liu et al., 2019). TweetNLP offers various functionalities,

including sentiment analysis, topic modeling, hate speech detection, emoji prediction, offensive language detection, and question answering (Camacho-Collados et al., 2022).

In addition to TweetNLP, the National Research Council (NRC) Emotion Lexicon (Mohammad & Turney, 2013) was utilized to identify the primary emotions in tweets. The NRC, a lexicon-based sentiment dictionary, classifies words found in tweets into two polarity categories (positive, negative) and eight distinct emotion categories: fear, trust, anger, sadness, disgust, anticipation, joy, and surprise (Mohammad & Turney, 2013; Silge & Robinson, 2017; Khoo & Johnkhan, 2018; Naldi, 2019). Before classification, the tweets underwent a tokenization process (Wiedemann, 2016; Silge & Robinson, 2017; Welbers, Van Atteveldt & Benoit, 2017; Jo, 2019), which involves breaking the text into individual word tokens. Subsequently, the NRC lexicon was applied to calculate the proportions of emotion categories present in the tweets. Python was employed for sentiment analysis using TweetNLP, while R programming software (R Core Team, 2023) was used for emotion analysis with the NRC lexicon.

3.3. Text analysis

To identify frequently used words within a dataset of a quarter million tweets, computational text analysis was conducted using R programming software (R Core Team, 2023) and the Quanteda package (Benoit et al., 2018). The process called n-grams allowed for the detection of recurring single-word expressions (unigrams) and consecutive words (bigrams) within the tweets (Benoit et al., 2018; Jo, 2019; Wiedemann, 2016). The analysis of word usage frequency in a text corpus, including the identification of unigram and bigram expressions, is referred to as frequency analysis (Silge & Robinson, 2017; Jo, 2019; Welbers et al.,2017). Thanks to frequency of consecutive features (bigrams), co-occurences of hastags can be derived from the tweets. Thus, network analysis of inter-related hashtags (co-occurences) in tweets can reveals prominent discussion points, central themes and more.

Furthermore, frequency analysis on words provides comprehensive insights into the data. If the text corpus being analyzed consists of specific categories which are countries in this study, the relatively frequent words for each country can also be calculated. This is known as relative frequency analysis or keyness analysis (Bondi, 2010; Wiedemann, 2016). Keyness analysis identifies prominent words in each text corpus and facilitates comparisons between categories. In this study, keyness analysis was employed to compare prominent expressions in tweets related to Türkiye and Syria following the earthquake.

3.4. Data collection and preprocessing

Following the earthquakes on February 6th, 2023, tweets in English containing the keywords of “earthquake” and “Türkiye”, and “earthquake” and “Syria” were collected. The first and foremost reason to collect tweets in English is to do an analysis in a global scale since it is one of the most widely spoken and taught languages globally (Dyvik, 2024). More importantly, there are more sophisticated and accurate text mining tools for examining English texts in the field of NLP.

Data collection was conducted using the X API service (Barrie & Ho, 2021). Tweets shared between February 6, 2023—the onset of the earthquakes—and June 1, 2023, the end of the fourth month following the disaster, were included. The objective was to examine posts shared both during the earthquakes and in the subsequent period. In total, 204,416 tweets related to Türkiye and 51,811 tweets related to Syria were collected. Although a larger number of tweets were initially obtained, tweets containing both the words “Türkiye” and “Syria” were excluded from the dataset. No sampling is needed since we were able to access and analyze total number tweets with the relevant keywords via computational techniques.

Since the sentiment analysis was conducted using the RoBERTa-based TweetNLP software (Camacho-Collados et al., 2022), no preprocessing steps were applied for that analysis. However, for text analysis, links, punctuation marks, and emojis were removed from the dataset to make the frequency analysis

results more interpretable. Additionally, commonly used and non-informative stop words (e.g., "the," "a," "an") were filtered out prior to the analysis using the stop word list provided by the NLTK module (Bird, Klein & Loper, 2009).

4. Findings

The research findings include sentiment and text analysis performed on the collected tweets. These outputs are presented separately for tweets related to each country, and the results are compared.

Figure 1

Number of Tweets Over Time After the February 6th Earthquakes

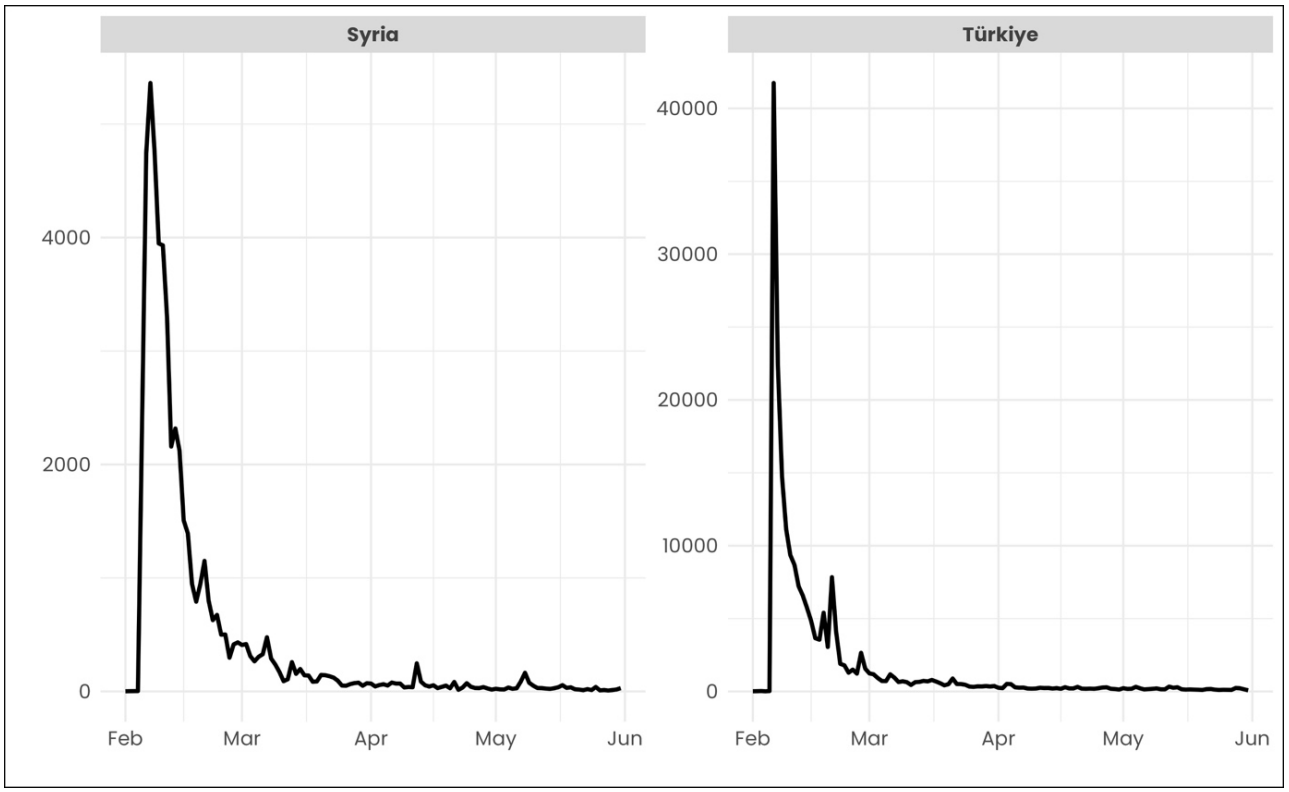


Figure 1 illustrates the temporal variation in tweets referencing the two countries following the February 6 earthquakes. Although the number of tweets differs significantly between the countries, a similar trend in tweet-sharing activity is observed in the aftermath of the disaster. Natural disasters of such magnitude, like the February 6 earthquakes, possess high news and informational value, leading to a surge in X activity. Consequently, the number of tweets containing the terms Türkiye and earthquake exceeded 40,000 shortly after the earthquakes. While a comparable disaster occurred in Syria, a substantial disparity in the volume of tweets is evident.

4.1. Sentiment analysis

Two distinct techniques were employed in the sentiment analysis process. The first is the Python-based TweetNLP tool, developed for social media texts, and the second is the NRC sentiment lexicon, which allows for the extraction of polarity and emotion categories based on words used within the text.

4.1.1. TweetNLP sentiment analysis

As mentioned in the methodology section, TweetNLP classifies each tweet into three categories: positive, negative, and neutral. In the majority of tweets related to both countries, neutral tweets constitute more than half of the total posts. Tablo 1 shows that neutral tweets are followed by negative and positive tweets, respectively. When comparing the distribution of sentiment categories in tweets

related to the two countries, tweets related to Syria exhibit a polarity that is 5% more negative. The proportion of positive tweets for both countries is almost identical.

The distribution of tweets by country suggests that post-earthquake, information-based, neutral tweets dominate the conversation. On the other hand, the proportion of negative tweets reaching 35-40% in both countries can be seen as a reflection of the devastation caused by the earthquake in the social media sphere. Furthermore, the higher proportion of negative tweets in posts related to Syria is a notable finding.

Tablo 1

Number and Proportion of Tweets by Sentiment Categories and Country Related

Tweets related	Number of Tweets	Negative (%)	Neutral (%)	Positive (%)
Syria	51811	39.5	52.5	7.9
Türkiye	204416	34.5	58.4	6.9

Tweets related to the earthquake, classified as positive and negative polarity, are examples of posts analyzed using TweetNLP. As seen in the examples below, positive tweets typically express well-wishes, donations, acts of solidarity, and messages directed at those rescued from rubble after the earthquake. Negative tweets, on the other hand, contain informational posts about the destruction caused by the earthquake (news), individual reflections on the devastating impact of the disaster, and expressions regarding the insufficiency of aid provided post-earthquake.

"This weekend my family came together to support the earthquake victims in Türkiye. Our hearts go out to everyone affected by this tragedy, and we wanted to do our part in helping the recovery efforts" [Olumlu]

"#NFL is partnering with the American Red Cross to help people affected by the Türkiye (Türkiye) #earthquake. Your donation enables the Red Cross to prepare for,respond to and help people recover from these disasters. Thank you in advance for your generosity" [Olumlu]

"Sending love and support to all those affected by the devastating earthquake in Türkiye. Our hearts go out to the families who have lost loved ones and to all those who have been impacted. #TurkeyEarthquake #Condolences\" [Olumlu]

"Feels so satisfying and proud when you see your country sending medical aid to #earthquake stricken #Syria. Syrian people are stuck in war for over a decade now and had limited access to medical facilities already. Hope all their woes come to an end soon" [Olumlu]

"Syria has experienced a terrible earthquake and yet the U.S. still will not ease its sanctions, which greatly hinders relief efforts. Sanctions are always cruel to those most in need, and this is particularly true in Syria right now. #LiftSyriaSanctions" [Olumsuz]

"Magnitude 6.3 earthquake strikes southern #Turkey, two weeks after massive quake killed thousands. #PrayForTurkey" [Olumsuz]

Horrible disaster in Türkiye. Double earthquake affecting 10 cities… thousands dead and many more missing…[Olumsuz]

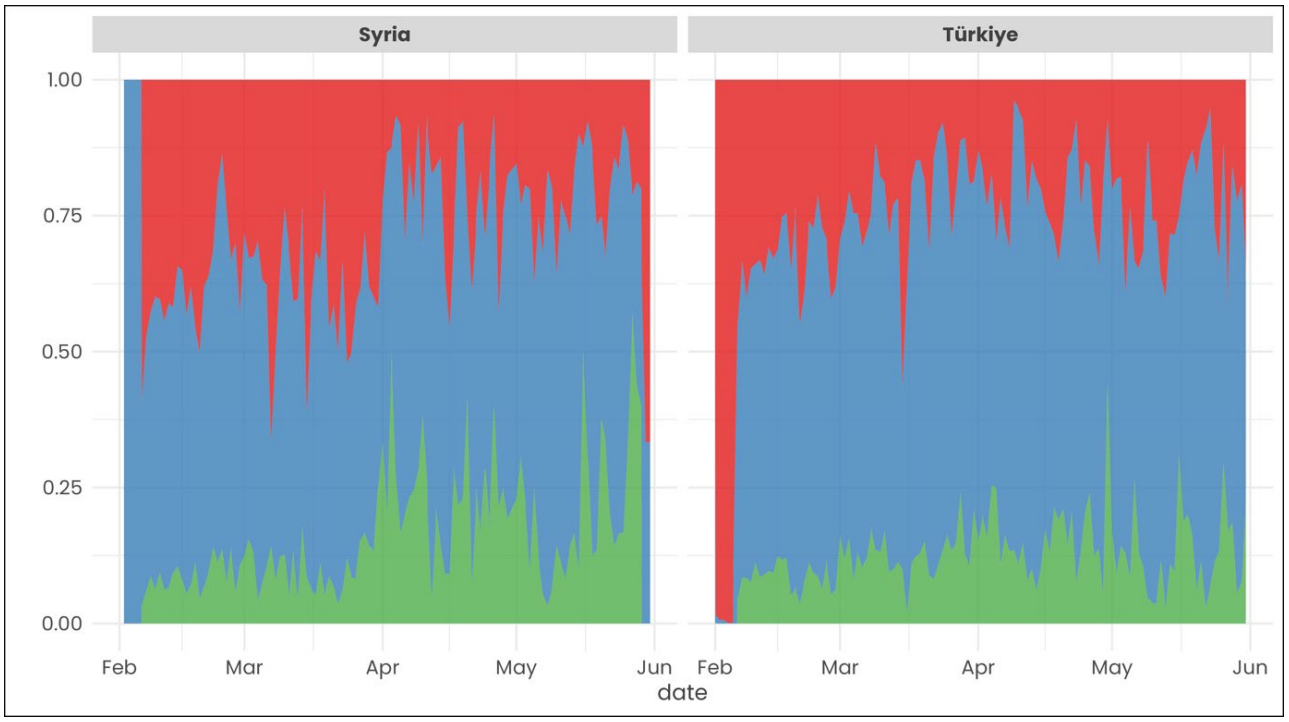
"Sanctions not being lifted from Syria even in the face of an earthquake show that the slogan of humanity is just a sham for the West #LiftSanctions #HelpSyria" [Olumsuz]

In line with the findings in Table 1, Figure 2 shows the temporal variation in the polarity of posts related to the two countries following the earthquake. As observed in the general distribution of sentiment categories in the tweets, Figure 2 shows that the proportion of neutral tweets is the highest, and negative

tweets are followed by positive tweets. Furthermore, as seen in Figure 2, over time, the proportion of positive tweets regarding both countries has increased in the post-earthquake period.

Figure 2

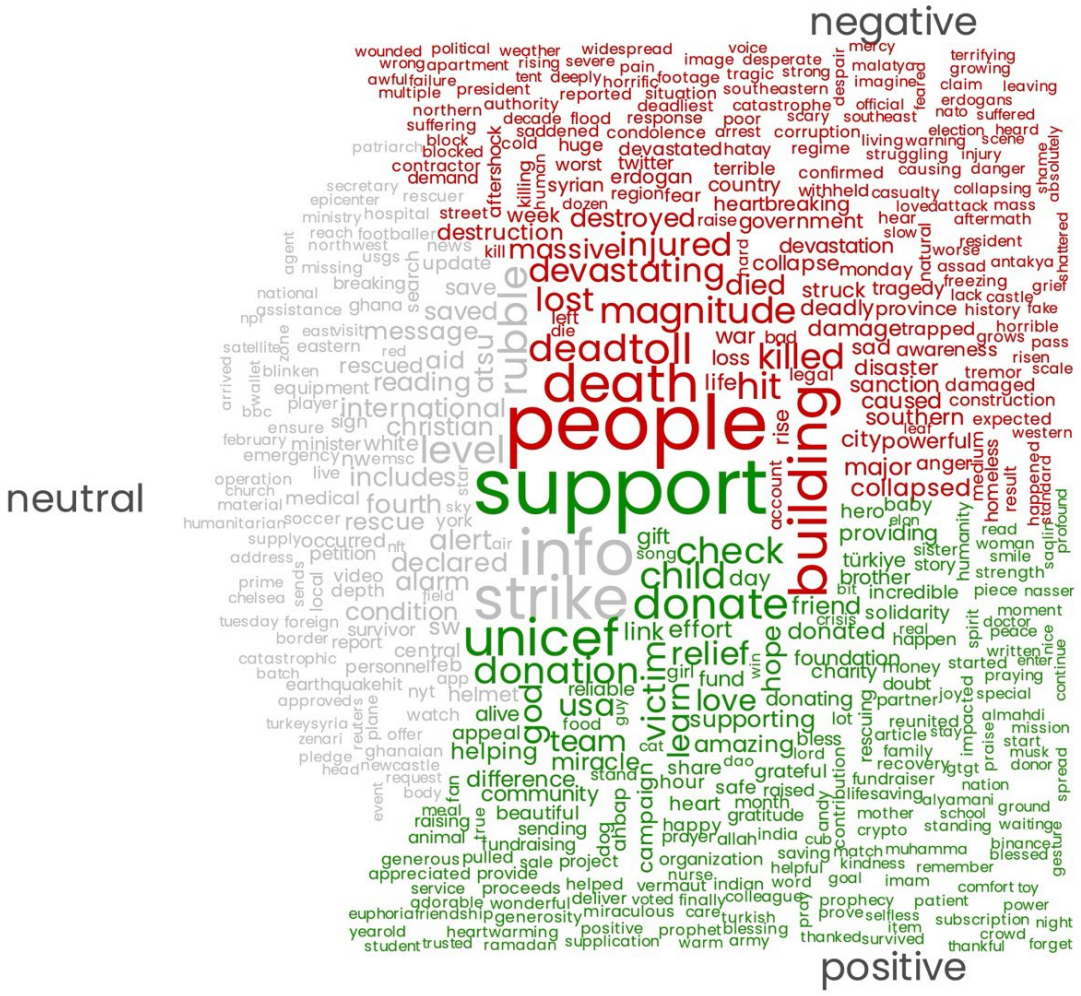
Tweet's Sentiment Shifts Overtime by Country (red: negative, blue: neutral, green: positive)



Following the TweetNLP analysis, high-frequency words within the mentioned sentiment categories can also be identified. These words serve as a preview of the content within the respective categories. As shown in Figure 3, in negative tweets, terms related to the consequences of the disaster, its destructiveness, the number of fatalities, and the damage caused are prominent. In positive tweets, expressions related to search and rescue efforts, requested aid, support from international organizations, and donations are observed. In neutral tweets, words that are more focused on raw information, without indicating polarity, are more prevalent. The findings in Figure 3 pertain to tweets shared about both countries. As indicated in the methodology section, text analysis is necessary to examine the prominent words for each country.

Figure 3

Frequently Used Words in Tweetnlp Sentiment Categories (red: negative, grey: neutral, green: positive)



The sentiment analysis conducted using the NRC sentiment lexicon reveals that words indicating negative sentiment are present at a higher frequency in tweets related to both countries compared to positive tweets. Given the context of the February 6 earthquakes, these findings are expected, as the tweets are related to a natural disaster.

Table 2

Proportion of the Words in Tweets Related to Feb 6th Earthquake by Country and Sentiment

Sentiment	Syria	Türkiye
Negative	55.5	56.3
Positive	44.4	43.6

The distribution of words used in tweets about the countries after the earthquake, classified into 8 basic emotion groups, shows a higher prevalence of words associated with fear, as expected. Following fear, words related to trust, anger, and sadness appear hierarchically. These findings suggest that post-earthquake tweets regarding both countries predominantly express fear, anger, and sadness on X. Furthermore, the presence of words related to trust indicates the ongoing search and rescue operations, fundraising campaigns, and the spirit of solidarity associated with them. The impact of the destruction caused by the February 6 earthquakes is also evident in the TweetNLP analysis, as reflected in Table 2

and Table 3, where the proportion of negative sentiment categories is higher than that of positive categories in both tables.

Table 3

Proportion of the Words in Tweet Related to Feb 6th Earthquake by Country and Emotion

Emotion	Syria	Türkiye
Fear	18.2	18.0
Trust	15.6	15.4
Anger	14.7	14.6
Sadness	14.7	14.5
Disgust	10.7	11.2
Anticipation	10.6	10.6
Joy	8.4	8.5
Surprise	6.7	6.7

4.2. Text analysis

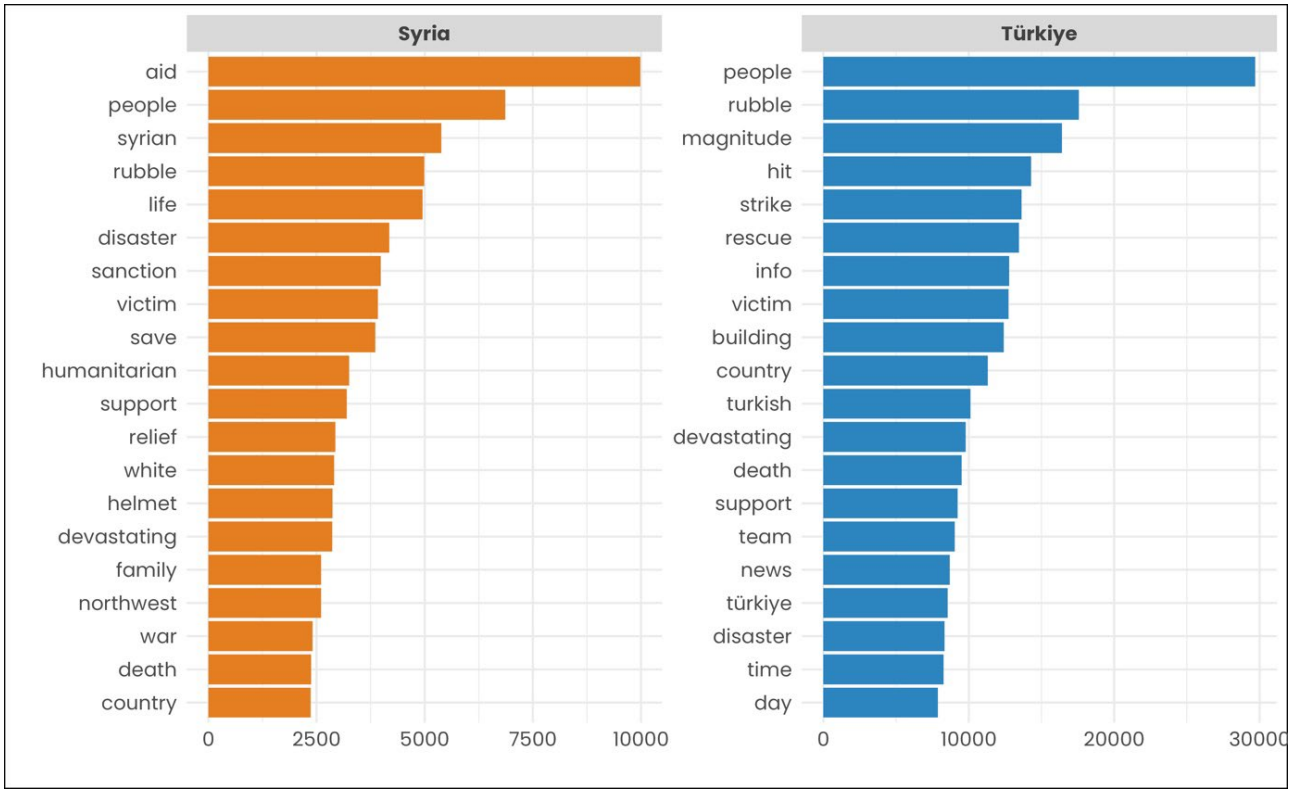
In text analysis, frequency analysis was initially conducted on tweets shared by both countries to identify unigram words and multi-word phrases. Additionally, two distinct tweet sets were created, one for Syria and one for Türkiye, and the most frequently used words within these categories were calculated using keyness analysis. Later, a frequency analysis was also performed on hashtags that provided context to the tweets. All analyses were conducted separately for tweets from each country.

4.2.1. Word frequency analysis

The frequency analysis of the words used in the tweets is directly linked to the earthquakes of February 6. Although the words, being single terms, offer a limited context, the expressions in Figure 4 provide glimpses of the earthquake's intensity, relief efforts, location, and the destruction it caused in both Syria and Türkiye.

Figure 4

Top 20 Unigram Words



The word cloud in Figure 5 demonstrates the high-frequency words extracted from X posts about the earthquake aftermath in Türkiye and Syria. In the word cloud, the prominent terms related to each country are distinctly different, revealing the topics that the public and social media users in each country focused on.

In posts related to Türkiye, terms such as “aid,” “magnitude,” “people,” “Turkish,” “building,” and “rescue” stand out. In the context of Türkiye, the concepts of “magnitude,” “rescue,” and “people” particularly highlight the intense discussions surrounding the rescue operations, the scale of the damage, and relief efforts following the earthquake. Additionally, specific place names like “Erdogan”, “Turkish”, “Kahramanmaraş” and “Hatay” as well as references to leaders, indicate that Türkiye's political and regional dimensions were also a topic of discussion on social media.

In the context of Syria, prominent words include “aid”, “sanctions,” “humanitarian,” “Syrian,” “helmet,” and “white.” The words related to Syria focus primarily on humanitarian aid, sanctions, and the “White Helmets,” the volunteer rescue teams. The prominence of the term “sanctions” suggests that social media users frequently discussed Syria's encounter with international sanctions during the crisis period.

Among the common words for both countries, “aid” and “humanitarian” stand out, yet perceptions diverge between Türkiye and Syria. In Türkiye, local leaders and city names are emphasized, whereas in Syria, humanitarian organizations and international sanctions are highlighted. In the context of Türkiye, the focus is on rescue operations and the extent of the destruction, while discussions in Syria center around the humanitarian crisis and political obstacles.

Figure 5

Top 300 Unigram Words (orange: Syria, blue: Türkiye)

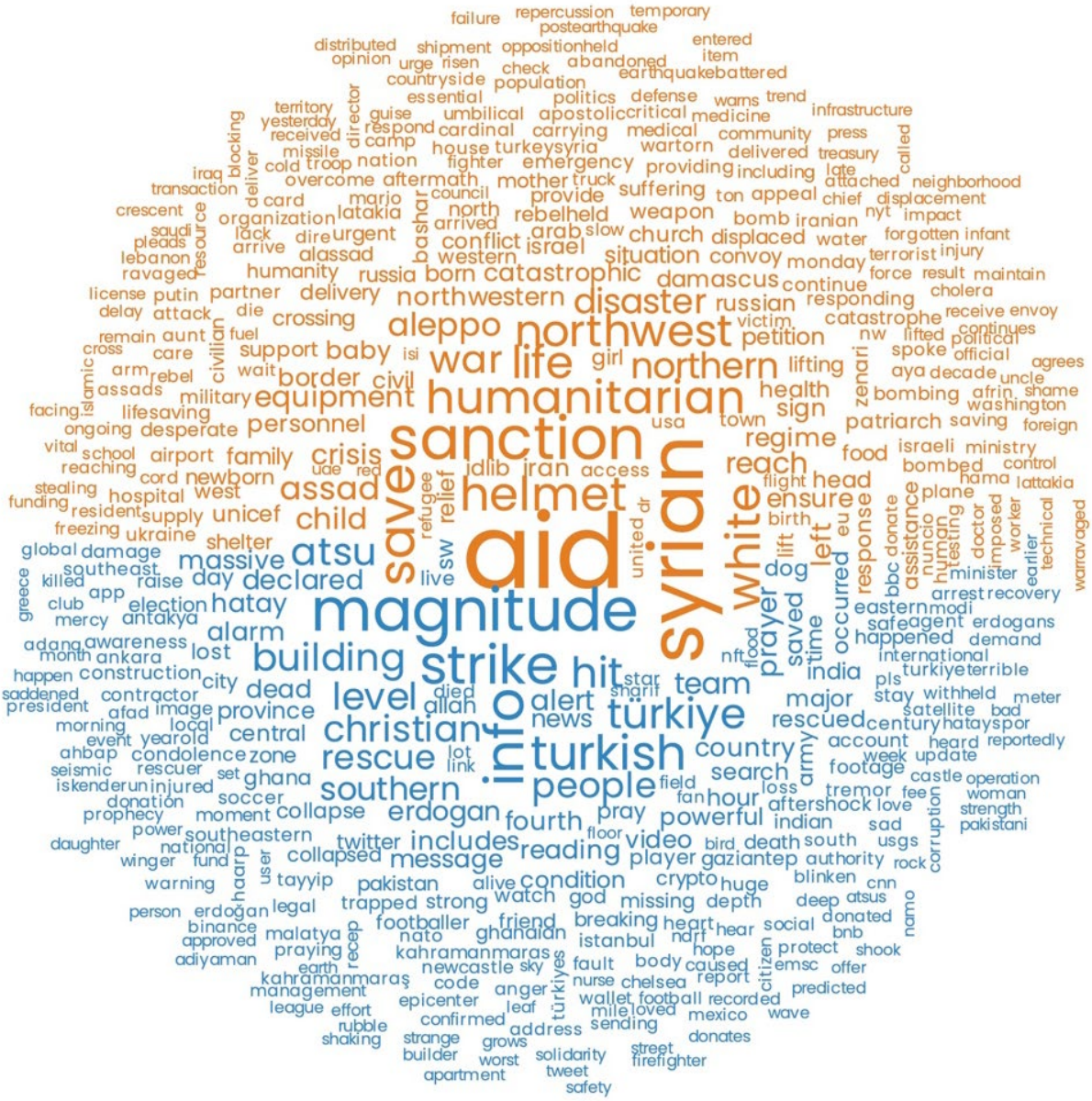
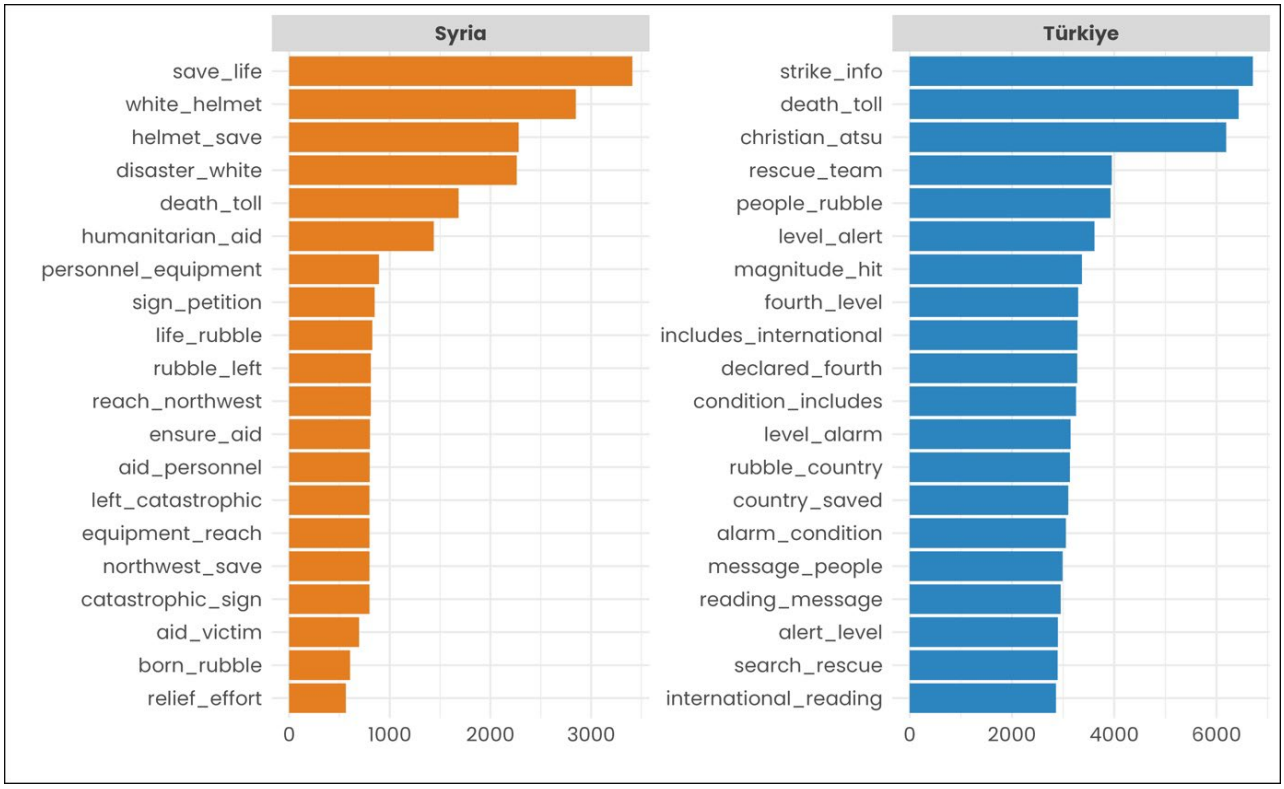


Figure 6 displays the most frequently used two-word (bigram) expressions extracted from X posts related to Türkiye and Syria. Analyzing the prominent bigram terms reveals that discussions in Türkiye primarily focus on operational details, damage assessment, and rescue efforts, while in Syria, the conversations address broader humanitarian crises, including humanitarian aid, the activities of rescue teams, and international sanctions. In the context of Türkiye, public figures (e.g., Christian Atsu, a football player) and local rescue operations are more frequently discussed, whereas in Syria, humanitarian organizations and the crisis itself take center stage. While information flow and the scale of events are debated from a more technical perspective in Türkiye (e.g., strike_info, magnitude_hit, people_rubble, alarm_condition, alert_level), in Syria, the focus on aid and rescue operations (e.g., save_life, white_helmet, humanitarian_aid, aid_victim, relief_effort) is framed in a more humanitarian and emotional context.

Figure 6

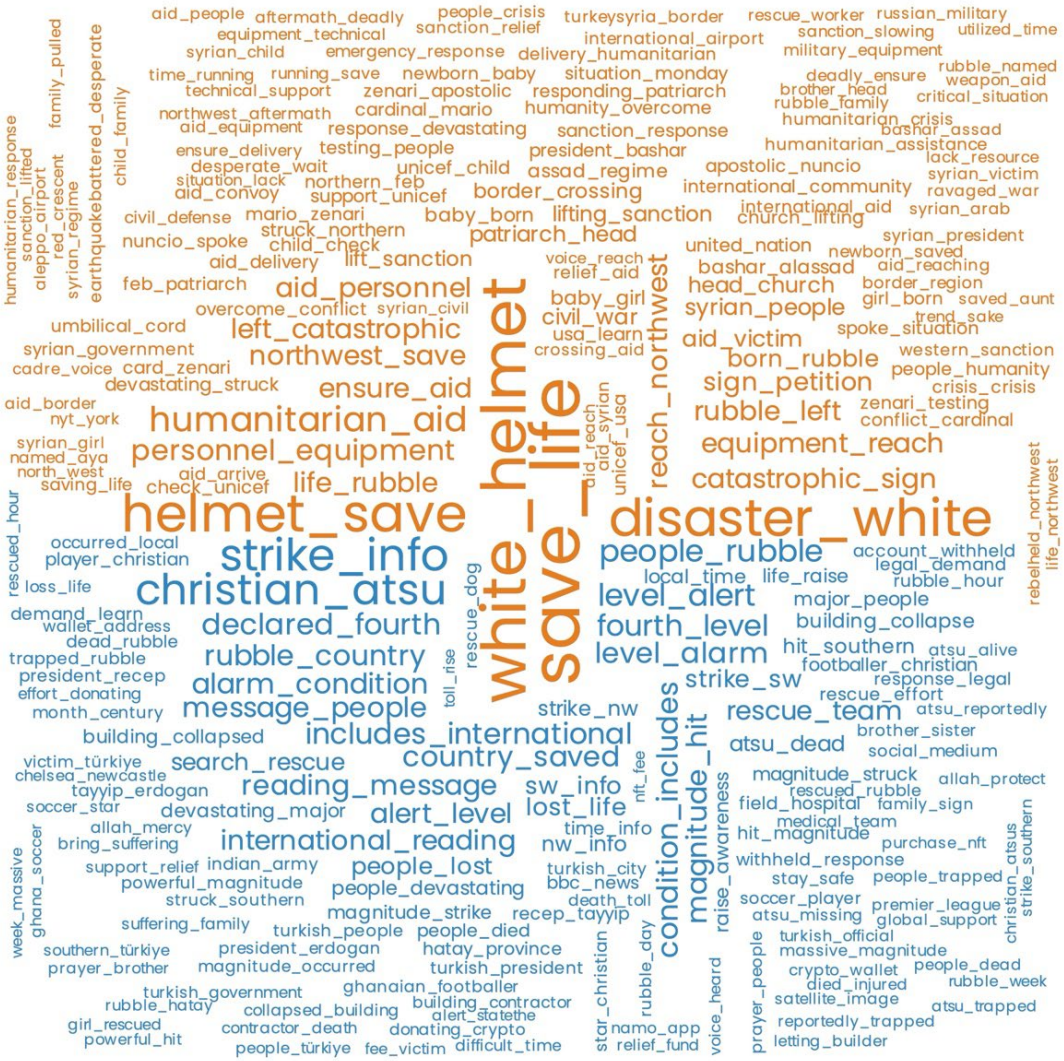
Top 20 Bigram Words



The word cloud in Figure 7 highlights new terms that were not present in the previous bar chart but are prominent here, reflecting broader dimensions of social media discussions between the two countries. Expressions such as “building_collapse” and “trapped_people” indicate that social media in Türkiye frequently discussed the large-scale destruction of buildings, and the individuals trapped under rubble following the earthquake. Particularly, the collapse of buildings and rescue operations have garnered significant attention in the Turkish context. This may reflect ongoing discussions about construction and building standards nationwide. Additionally, the term “president_erdogan” underscores the prominent role played by President Recep Tayyip Erdoğan in this process, as well as the public's perception of his actions, which have been a major topic in social media discussions. This suggests that the impact of political leaders on crisis management has been widely debated in Türkiye.

Figure 7

Top 200 Bigram Words (orange: Syria, blue: Türkiye)



The prominent terms focus on the northwest region of Syria (situation_northwest), highlighting its vulnerability in terms of both conflict and humanitarian aid, a situation that has worsened following the earthquake. This expression may particularly reflect negative comments regarding the region's inability to receive aid. Regarding Syrian President Bashar al-Assad, social media discussions frequently criticize how the Assad regime managed or failed to manage humanitarian aid and rescue operations in the aftermath of the earthquake. This underscores how the political turmoil in Syria, compounded by the natural disaster, has created an even more challenging situation. Additionally, the terms (border_crossing, lifting sanctions) suggest that humanitarian aid in Syria faced significant challenges at border crossings, an issue that prominently figures in social media discussions.

According to frequency analysis, in the context of Türkiye, discussions primarily revolve around rescue operations, the situation of individuals trapped under rubble, and the emphasis on international support through social media. In contrast, discussions about Syria not only cover similar humanitarian issues but also highlight regime and political barriers, difficulties at border crossings, and the role of volunteer rescue teams. In Türkiye, debates often center around the government's measures and President Erdoğan's role in the aftermath of the earthquake, while in Syria, criticisms of the regime, political pressures (obstacles), and the inability to deliver aid at the border have taken precedence.

4.3. Keyness analysis

Keyness analysis statistically demonstrates how words and bigrams in X posts related to Türkiye and Syria differ between the two countries. In posts related to Türkiye, terms such as “magnitude,” “info,” “strike,” “Atsu,” “Christian,” “southern,” “Hatay,” and “Erdoğan” are prominent, while for Syria, words like “sanction,” “aid,” “white,” “helmet,” “Assad,” “regime,” and “war” are more frequently used. Unlike frequency analysis, keyness analysis classifies words between the two categories using chi-square calculations, highlighting their relative significance. In the context of Türkiye, social media discussions focus more on technical and operational details (earthquake magnitude, rescue operations, building collapses), while discussions about Syria center around humanitarian aid, volunteer rescue teams, and political barriers. Posts related to Türkiye concentrate on the physical effects of the earthquake and the ongoing rescue efforts, whereas posts about Syria emphasize political constraints, humanitarian aid limitations, and the role of volunteer organizations. It is evident that sanctions and restricted access to aid in Syria are widely debated on an international level, while leadership and rescue operations in Türkiye hold significant importance in both local and international discussions.

Figure 8

Keyness Analysis on Unigram Words (orange: Syria, blue: Türkiye)

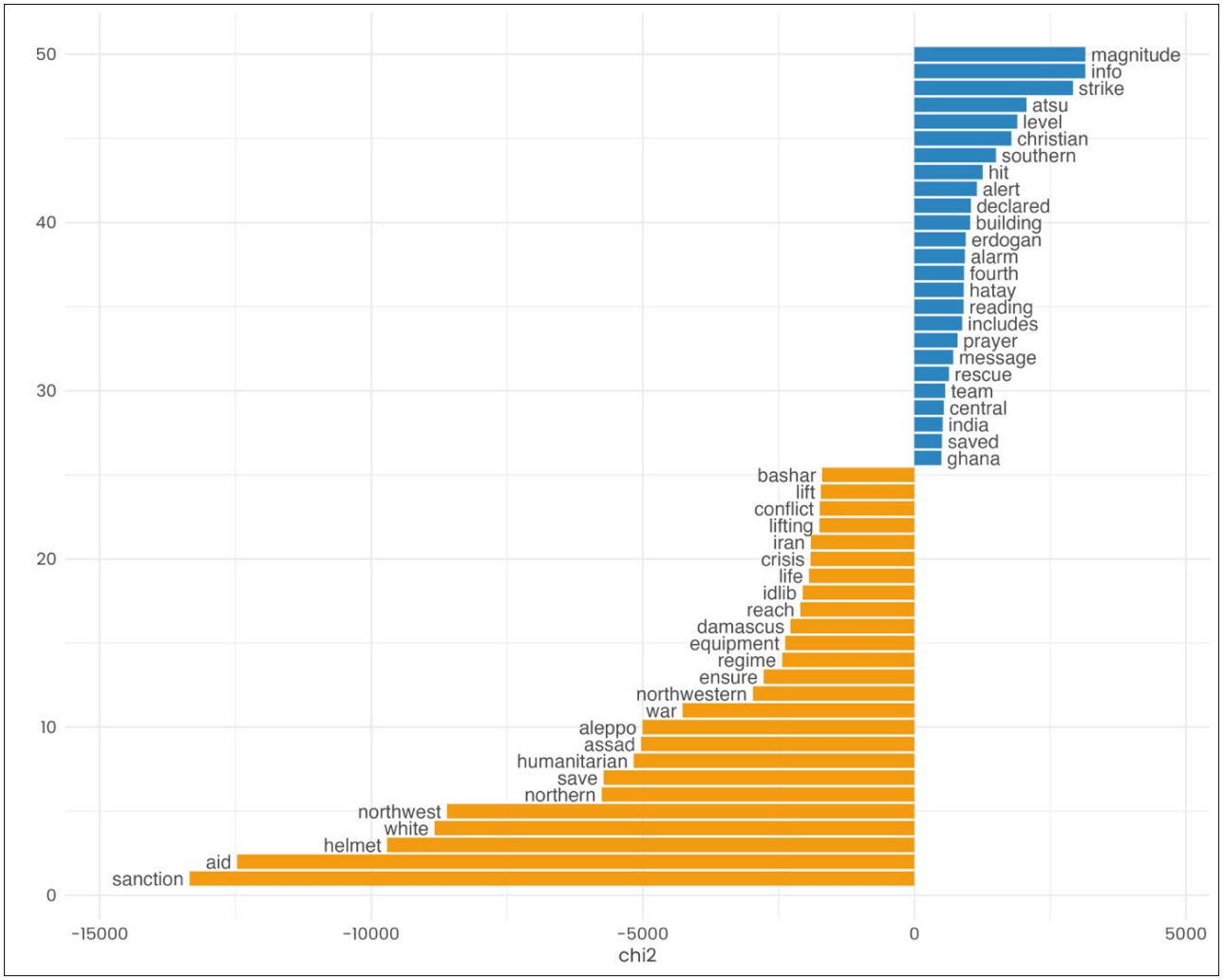
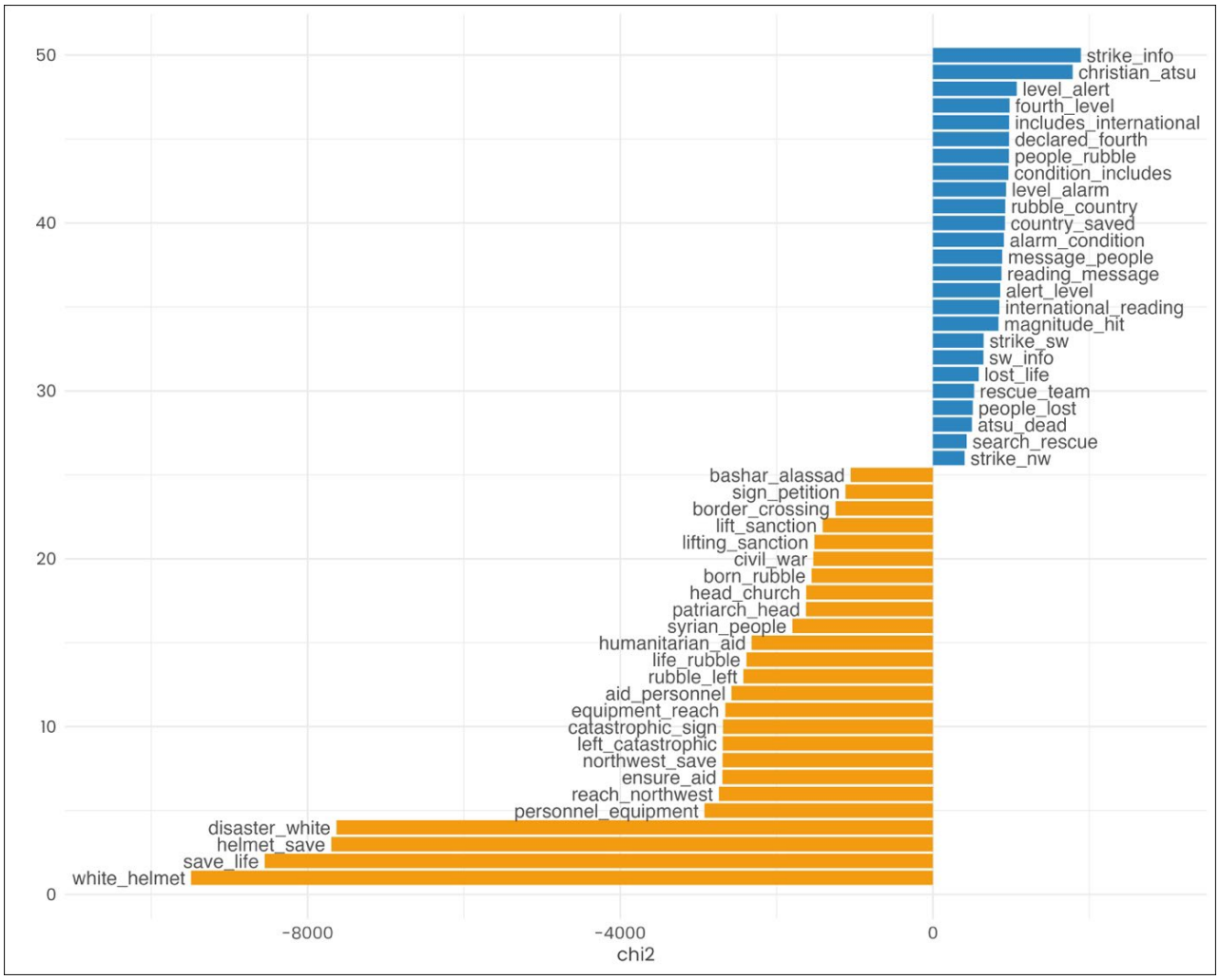


Figure 9 presents findings in line with Figure 8 but with more concrete contextual insights. The earthquake's magnitude, rescue efforts, and the involvement of internationally known figures are prominent topics in Türkiye. In contrast, social media discussions related to Syria revolve more around challenges in humanitarian aid, the White Helmets' rescue operations, and calls for the lifting of sanctions. Additionally, anti-regime rhetoric and obstacles at border crossings have emerged as other

significant topics in Syria's social media discussions. Keyness analysis shows that post-earthquake X discussions related to the countries center around markedly different themes. In Türkiye, the focus is more on rescue operations and the impact of internationally known figures, while in Syria, the broader discussions focus on humanitarian aid, political barriers, and the role of volunteer organizations.

Figure 9

Keyness Analysis on Bigram Words (orange: Syria, blue: Türkiye)



4.4. Hashtag frequency analysis & Co-occurences

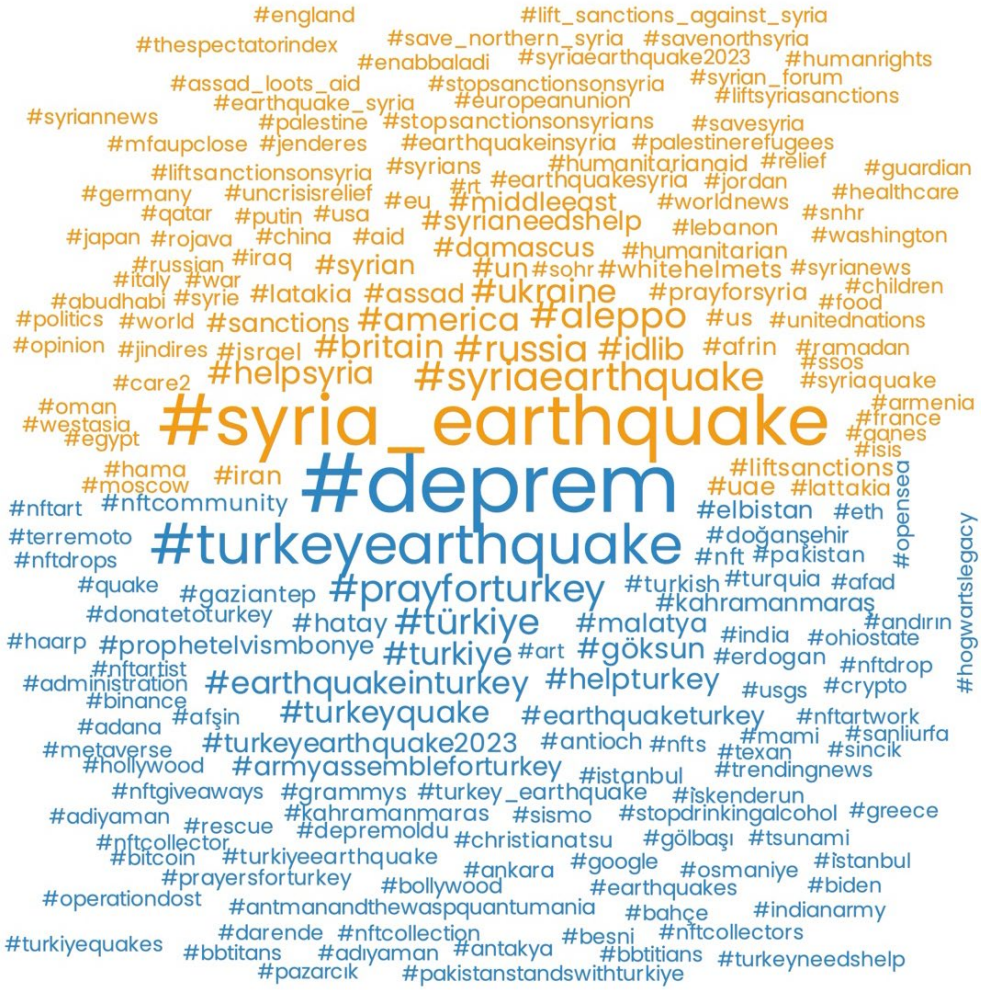
Hashtags are one of the mechanisms used on X to attract attention and shape public opinion. The word cloud in Figure 10 visualizes the most frequently used hashtags in the context of both countries. For Türkiye, the prominent hashtags include #Turkeyearthquake, #prayforturkey, #gaziantep, #hatay, #prayforchristianatsu, #helpforturkey, and #donatetoTürkiye. In tweets related to Syria, the most frequently used hashtags are #syriaearthquake, #liftsanctions, #stopsanctionssyrians, #whitehelmets, #helpSyria, #save_northern_syria, #assad, and #damascus. Therefore, there is a clear parallel with previous findings. Hashtags related to Türkiye primarily focus on rescue operations and international aid, with global solidarity messages (e.g., #prayforturkey) and local city names taking center stage. Calls for aid, efforts to raise international awareness, and information sharing about rescue operations have been the key themes in social media discussions in Türkiye.

Hashtags related to Syria, on the other hand, focus more on humanitarian aid calls and political barriers. The lifting of sanctions, the role of the White Helmets, and the inadequacy of aid to Syria's northern regions have been prominent topics of discussion on social media. Political obstacles to aid have been

widely criticized at a global level, and this awareness has spread across social media platforms. For both Türkiye and Syria, the use of hashtags has proven to be a highly effective tool for raising awareness, fostering solidarity, and generating global calls for aid during crisis situations. While technical details and rescue operations have dominated discussions in Türkiye, the focus in Syria has been on the humanitarian crisis, sanctions, and the role of volunteer organizations, which have been central to broader social media discussions.

Figure 10

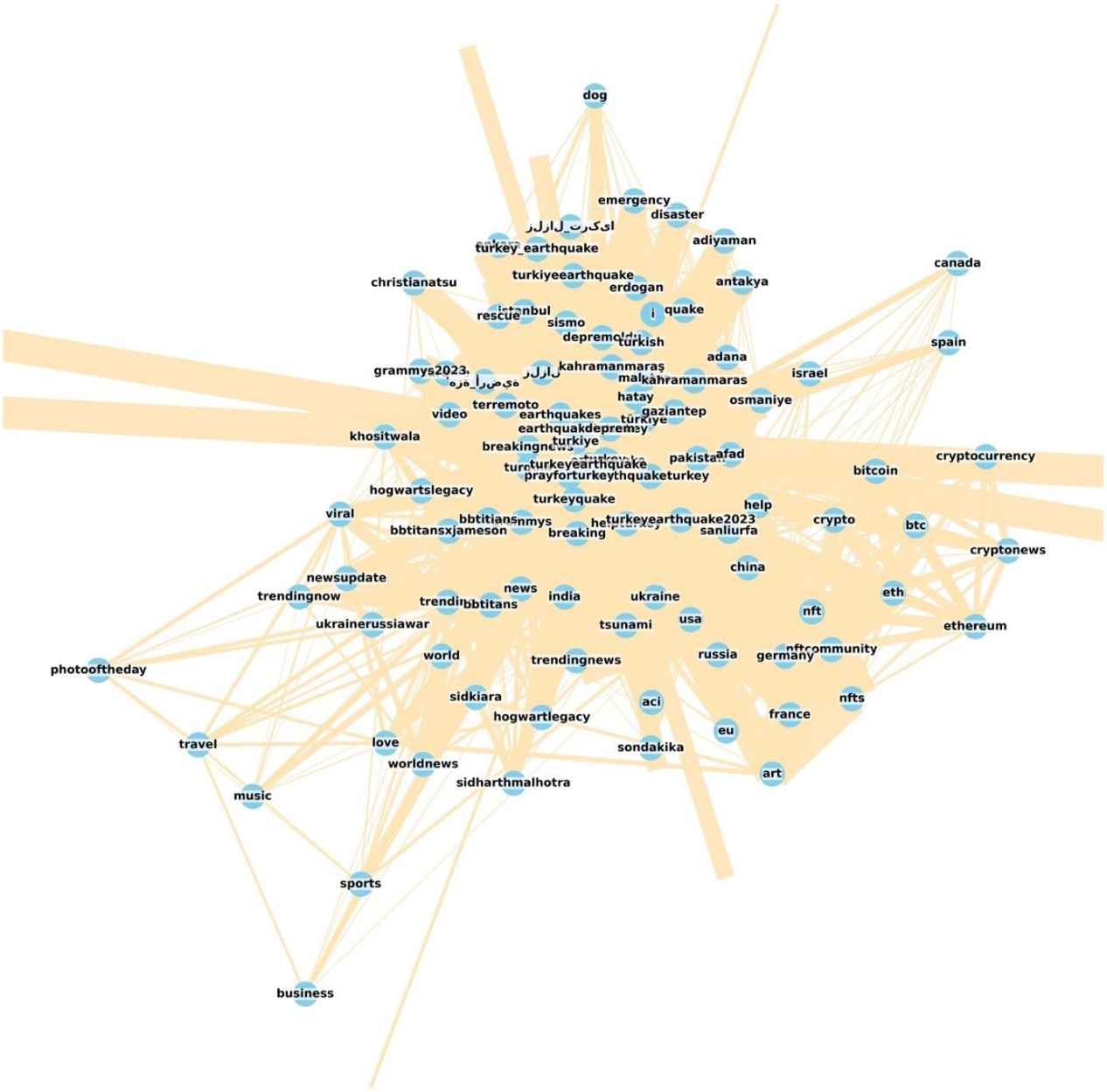
Comparison Word Cloud of Top 100 Hashtags (orange: Syria, blue: Türkiye)



Beyond basic frequency analysis, insights can also be gained through examining the co-occurrence of hashtags in tweets. The hashtag co-occurrence network in Figure 11 illustrates which hashtags were used together in Türkiye's post-earthquake X discussions. This type of network analysis provides a clearer view of the prominent themes, debates, and information flows in social media conversations following the earthquake.

Figure 11

Co-occurences of Top 100 Hashtags in Tweets Related to Türkiye



The first notable theme in the hashtag network is the earthquake and rescue operations. Hashtags such as #quake, #earthquake, #earthquake2023, #turkeyearthquake, and #turkeyquake were used to raise awareness of the earthquake event and its impacts to a wide audience. Hashtags like “earthquake” and “quake” particularly reflect efforts to disseminate information and raise awareness about the earthquake on an international scale. Additionally, the frequent co-occurrence of these hashtags with terms related to rescue operations (#rescue, #help) and specific cities (#adana, #hatay, #kahramanmaraş, #gaziantep) highlights the focus on aid and rescue efforts in the regions affected by the earthquake.

The second theme is related to local and international support. Hashtags such as #prayforturkey, #helpforturkey, and #donatetoturkey are associated with international solidarity and aid campaigns. Global calls for help following the earthquake in Türkiye were disseminated to a wide audience through these hashtags. Furthermore, the frequent co-occurrence of these hashtags with country names like #pakistan, #canada, and #spain indicates support from other nations for Türkiye and their involvement

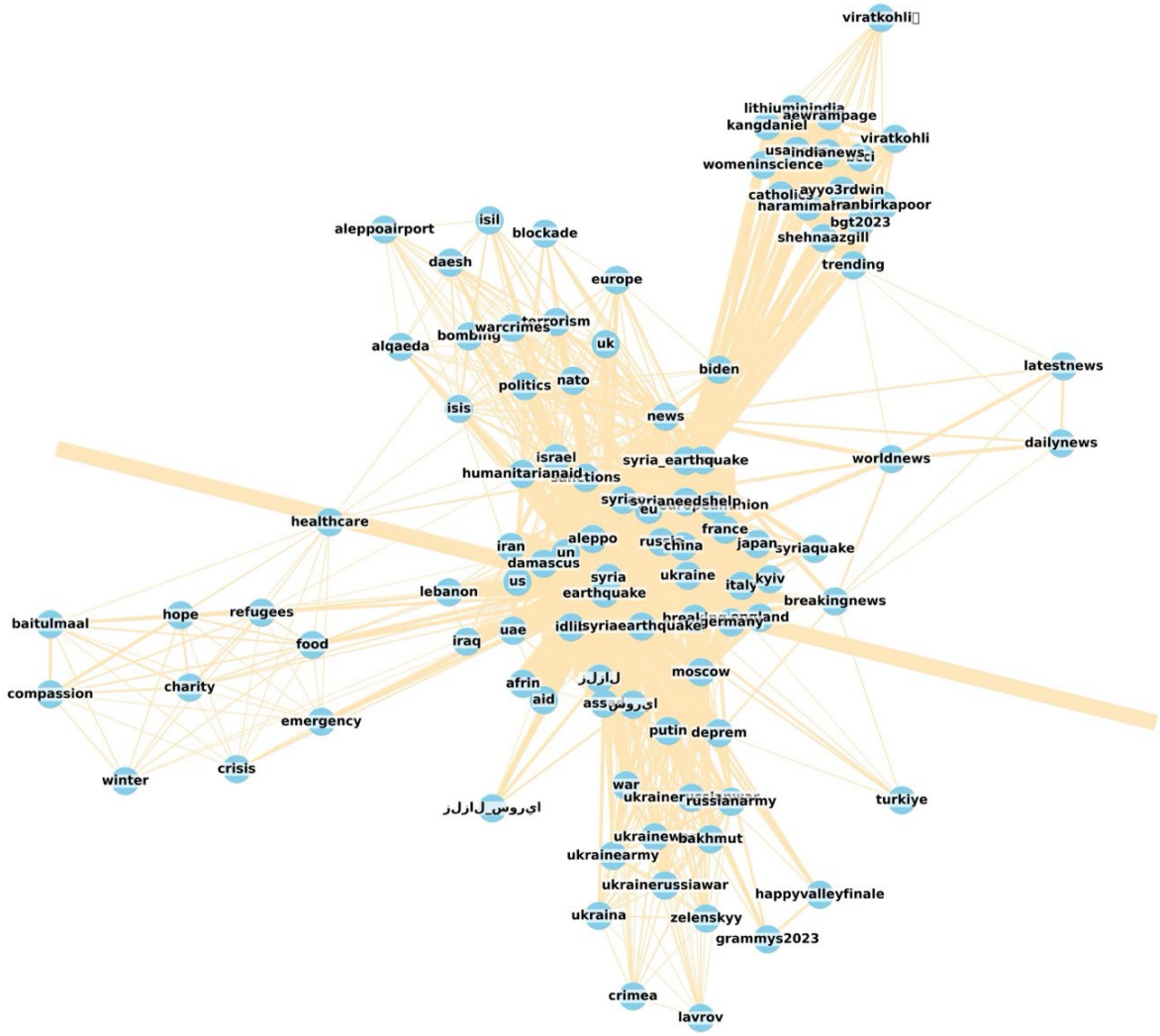
in aid campaigns. Hashtags like “prayforturkey” prominently reflect efforts to spread global solidarity messages

Lastly, tweets related to Türkiye show the use of X around news and information sharing, which is one of the important functions of social media during crises. Hashtags such as #news, #breaking, #trendingnews demonstrate how social media was utilized to spread earthquake news and provide information on emergency situations.

Figure 11 disclose how global awareness is created on X and how calls for aid to Türkiye after the earthquake were amplified. The frequent use of hashtags such as #prayforturkey highlights efforts to build a global solidarity and aid campaign. The repeated use of hashtags related to rescue operations (#rescue) and affected cities (#adana, #hatay, #kahramanmaraş) demonstrates how prominently Türkiye's post-earthquake relief and rescue efforts appeared on social media. The involvement of sports and cryptocurrency communities in raising awareness after the earthquake signals how versatile social media is and how different communities can come together during crises. This highlights the capacity of social media to connect various groups, from international solidarity campaigns to niche communities like sports and digital assets, in addressing global emergencies.

Figure 12

Co-occurences of Top 100 Hashtags in Tweets Related to Syria



An analysis of social media posts related to Syria reveals that the prominent theme in the hashtag network is earthquake and crisis management. Hashtags such as #syriaearthquake, #earthquake, #damascus, and #aleppo are central to discussions about the earthquake in Syria. Tags like "syriaearthquake" specifically focus on crisis management and the difficulties faced by the population in regions severely affected by the earthquake, such as #damascus and #aleppo. Due to Syria's ongoing civil war and current political situation, the challenges ("blockade," "bombing," "isil," "sanctions") in crisis management have been frequently discussed on social media through these hashtags.

A second theme identified is humanitarian aid and calls for support. Hashtags such as #humanitarianaidactions, #charity, #compassion, #hope, and #emergency have gained significant traction on social media in the aftermath of the earthquake in Syria. These hashtags highlight the efforts of international aid organizations and NGOs in providing assistance to the region. In particular, hashtags like #charity and #hope have been used to raise awareness of the humanitarian crisis in Syria and to mobilize support for the affected areas.

The situation in Syria following its ongoing civil war has been addressed in earthquake-related posts with a focus on political and international dimensions. Hashtags such as #isis, #daesh, #warcrimes, #iran, #israel, and #russia have framed discussions on the earthquake within a political and international context. The impact of the civil war and political instability has led to debates on the post-earthquake aid process and international relations in Syria. Hashtags associated with non-state actors, such as #isis and #daesh, have prompted discussions about the security situation and the challenges posed by war, which continue to affect the region even after the earthquake.

Another prominent theme in the hashtag network is the issue of sanctions and border crossings related to Syria. Hashtags such as #blockade, #sanctions, #eu, #us, and #uk highlight one of the major post-earthquake discussions: the international sanctions and the obstacles preventing aid from reaching the country. Hashtags like #blockade and #sanctions represent debates on how the sanctions imposed on Syria have hindered the flow of aid. Hashtags such as #eu and #us are frequently used to criticize the policies of international organizations regarding this issue on social media.

In conclusion, the following insights can be drawn from the hashtag network in Figure 12. Following the earthquake in Syria, humanitarian aid and crisis management became key topics in related X discussions. Calls for humanitarian aid by aid organizations, NGOs, and individuals, along with the challenges of crisis management and the humanitarian crisis faced by refugees, emerged as some of the most prominent themes in this network. Additionally, Syria's political and security issues due to the ongoing civil war were frequently discussed on social media after the earthquake. International sanctions were highlighted as one of the main factors hindering aid access to Syria. In particular, hashtags such as #blockade and #sanctions underscore the negative impact of political obstacles on crisis management.

5. Conclusion

This study undertook a comparative analysis of X content pertaining to the aftermath of the February 6, 2023, Kahramanmaraş earthquakes in Türkiye and Syria, employing computational methods to dissect social media discourse within these two distinct national contexts. The findings illuminated that the reflections of the earthquake on X in both countries occurred within disparate frameworks. In the Turkish context, the focus of online discussions predominantly revolved around the earthquake's magnitude, the execution of rescue operations, and the mobilization of international aid. In contrast, the discourse surrounding Syria—recognized as a fragile state—was largely shaped by themes of humanitarian aid constraints, the detrimental effects of international sanctions, and the broader political environment influencing crisis management strategies.

A striking characteristic of the analysis was the higher proportion of negative tweets concerning Syria, when compared to those addressing Türkiye. This disparity in negativity can be attributed to Syria's fragile state structure, wherein the discourse surrounding the exacerbation of crisis conditions due to sanctions also emerged as a pivotal theme. Furthermore, the substantial presence of calls for humanitarian aid and critiques of international sanctions within Syrian social media discussions underscores the potential of social media platforms as tools for advocacy, raising awareness, and exerting pressure on the international community.

One of the principal strengths of this study lies in its methodological framework, utilizing computational techniques to analyze post-crisis international perceptions through social media data. Additionally, the comparative approach employed in analyzing the social media responses to crises in these two socio-political contexts addresses a notable gap in the existing literature. However, the study is not without its limitations. The analysis was confined to English-language tweets, thus excluding discourse in other languages that may have offered supplementary insights. Moreover, given that social media users do not constitute a representative sample of the general population, the generalizability of the findings is inherently constrained.

By comparing the two countries within their distinct socio-political frameworks, this study provides valuable insights into the contextual dynamics of social media during crisis management. In particular, the political and ethical dimensions of social media’s role in facilitating humanitarian aid and fostering international solidarity are areas that warrant further examination. The findings underscore the need for continued research into the role of social media in crisis communication, particularly in understanding how the social media reflections of crises across diverse contexts influence international aid policies and public perceptions. Future research should also consider the interaction between traditional media and social media, the implications of information manipulation in crisis periods, and the broader international repercussions of media reflections within fragile states.

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Article Information Form

Authors Contributions: All authors contributed equally to the writing of this paper. All authors read and approved the final manuscript.

Conflict of Interest Disclosure: No potential conflict of interest was declared by authors.

Plagiarism Statement: This article has been scanned by iThenticate.