



European Commission

JRC TECHNICAL REPORT

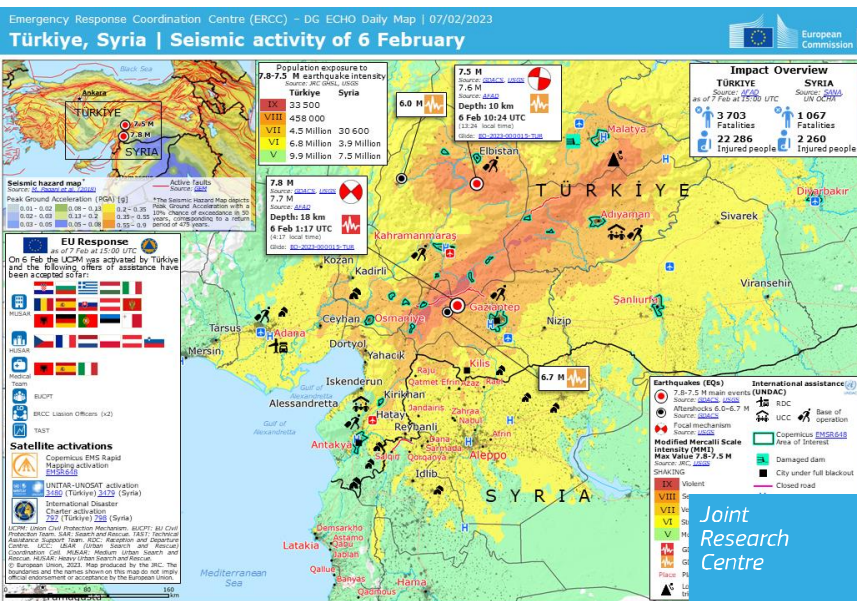
M7.8 and M7.5 Earthquakes in Türkiye and Syria

JRC Scientific Analysis: Update#2

8 Feb 2023 19:00 UTC

Santini M., Necmioglu O., Abad Perez J., Proietti C., Lentini A., Krausmann E., Gkoktsi K., Joubert-Boitat, I., De Girolamo L., Duta A.M., Caravaggi I., Salvitti V., Mastronunzio M., Kamberaj J., Lorini V., Mari Rivero I., Spruyt P., Ceccato P., Linge J., Kotseva B., Spagnolo, L, Moreira Agrela Goncalves A., Dimova S., Tsionis G.

2023



GDACS RED ALERT

M 7.8 in Türkiye on 06 Feb 2023
01:17 UTC – 04:17 local time



GDACS ORANGE ALERT

M 7.5 in Türkiye on 06 Feb 2023
10:24 UTC – 13:24 local time

Joint Research Centre

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Abstract

This is the second update of the JRC scientific analysis of the ongoing earthquake crisis in Türkiye and Syria, which started 6 Feb 2023 at 01:17 UTC – 04:17 local time (previous reports published on 6 and 7 February respectively).

Along with updated figures on the humanitarian impact in both countries, this update provides information on the impact of the event on some critical infrastructures, including dams for which stability there are growing concerns. Suggested approaches for the assessment of their status are outlined, including the use of the recently established European Drone Network that is created and maintained under the Framework Work Contract of Copernicus Emergency Management Service.

The report provides also an overview on the first outcomes of the satellite mapping services activated on the area, i.e. Copernicus Emergency Management Service and UNOSAT, together with some information on the international support to the response operations.

Acknowledgements

The authors wish to thank the many colleagues who contributed to this report in record time.

Executive summary

- Following the strong earthquake of **7.8 M** and the **second event with a M 7.5** occurred on 6 February **in southern Türkiye, close to the border with northern Syria**, as of 8 February 2023 05:30 UTC **1054 aftershocks** occurred along both of the fault systems, with 229 aftershocks of $M > 4$.
- Disaster and Emergency Management Presidency of Türkiye (AFAD) reports, as of 8 February at 10:20 UTC, at least **8,574 fatalities** and **49,133 injured people** across 11 Provinces (Kahramanmaraş, Gaziantep, Şanlıurfa, Diyarbakır, Adana, Adıyaman, Osmaniye, Hatay, Kilis, Malatya and Elazığ). Additionally, AFAD reported **5,777 confirmed collapsed buildings** and **11,302 buildings reported as collapsed** in a press conference on 7 February.
- In **Syria, at least 1,162 people died and 2,285 sustained injuries**, as reported by the Syrian Arab News Agency (SANA). This information is assumed to refer only to government-controlled areas. The White Helmets organisation in **north-western Syria reported that 1,280 people died and more than 2,600 sustained injuries** in rebel-controlled areas, although the numbers are expected to rise significantly given the difficult context in which search and rescue operations are taking place. The number of newly displaced people is not yet known and there is limited information on the shelter conditions and needs of the affected population.
- Due to the extreme shaking caused by the earthquakes, there is a **growing concern related to the situation of the dams** located in the affected area. Currently, concerns are mostly focused on the **Sultansuyu dam, and the Maydanki (Afrin) Dam in Syria**. The Sultansuyu dam is currently under controlled discharge due to the longitudinal cracks along the structure. The current level of the reservoir has reached 1.5m. In particular for the **Maydanki Dam in Syria, a preliminary dam discharge calculation has been performed** (a worst case scenario has been preliminary considered consisting in a dam break), with a preliminary result that the populated place of **Afrin is reached after one hour and 45 minutes**. The residential areas closest to the riverbed, on the right bank, are exposed to flow depths of about 2.7 m. For the Sultansuyu Dam a preliminary dam discharge scenario was calculated as well.
- Turkish authorities have reported on 7 February 2023 **blackouts** in the following places: Osmaniye Bahçe-Düziçi, Kahramanmaraş city centre, Malatya; Akçadağ, Doğanşehir, Doğanlı are out of electricity. All vehicle entries to Hatay, Kahramanmaraş and Adana except humanitarian assistance have been blocked. A major **port in the Mediterranean coastal city of Iskenderun was partially damaged** currently the major fire erupted has been extinguished. Some cargo areas of Limak port at the Iskenderun complex were still on fire. **Natural gas flows** on the Kahramanmaraş-Gaziantep gas transmission line were halted to Gaziantep, Hatay and Kahramanmaraş provinces and some other districts (Pazarcık, Narlı, Besni, Gölbaşı, Nurdağı, Islahiye, Reyhanlı, Kırıkhan and Hassa districts) near the epicentre as a result of the pipeline damage.
- The **European Commission's Copernicus emergency satellite mapping system was activated** by the ERCC on 6 February at 04:43 UTC to support damage assessment ([EMSR648](#)). The JRC Copernicus Mapping Team is providing technical support to the activity. **Optical satellite images of very high resolution (less than 1 meter) were acquired on 07 and 08 February** over 20 areas of interest (AOIs) located near the epicentres of the earthquakes. These areas, with a total area of 664 km², have estimated population of 4.187.550 people.
- **International assistance** was requested by the Republic of Türkiye shortly after the event. The DG ECHO Emergency Response Coordination Centre-ERCC is coordinating the mobilization of the EUCPM. UN OCHA activated the United Nations Disaster Assessment and Coordination (UNDAC) team to coordinate the activities of the teams on the field. On 8 February, **the Syrian government requested assistance through the EU civil protection mechanism** for search and rescue teams and equipment, shelter items and medicines.

1. Earthquake impacts

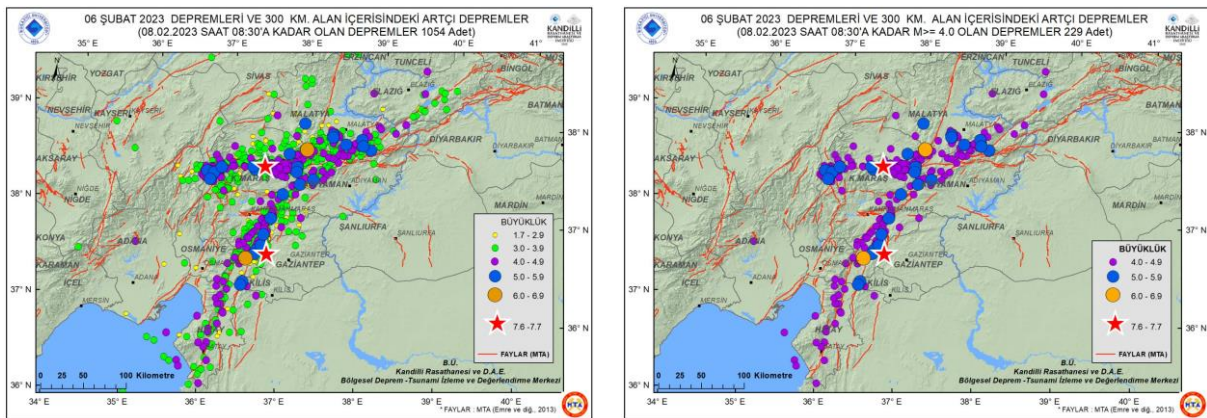
1.1 Situation overview

A series of earthquakes started on 6 February 2023 with a strong earthquake of 7.8 M (7.7 M as reported by Disaster and Emergency Management Presidency of Türkiye-AFAD) at a depth of 18 km occurred at 1.17 UTC (4.17 local time) in southern Türkiye (epicentral coordinates: 37.174°N 37.032°E), close to the border with northern Syria. The epicenter was located in Atalar town (Gaziantep Province, Southeastern Anatolia Region), and about 45 km north of the northern border of Aleppo Governorate in Syria.

A second event with a M 7.5 and 10 km depth occurred at 10:24 UTC at a distance of about 100 km from the first event (epicentral coordinates: 38.024°N 37.203°E), likely worsening the impact and the ongoing Search & Rescue operations.

Following the main shocks, as of 8 February 2023 05:30 UTC 1,054 aftershocks occurred along both of the fault system, with 229 aftershocks of M > 4. The possibility of aftershocks with M>6 cannot be excluded.

Figure 1 – Main shock and aftershocks (left-all aftershocks, right aftershocks with M > 4) of 6 February 2023 earthquakes in Türkiye as of 8 February 2023 05:30 UTC (source: KOERI).



Sea-level rise and coastal inundation have been reported in the Iskenderun area after the earthquake. The source of this inundation may be related to the coastal subsidence due to the earthquake but is subject to further investigation. An activation of Copernicus RRM could be meaningful in this regard.

Figure 2 – Coastal inundation in Iskenderun after the earthquake ⁽¹⁾. Source of this inundation may be related to the subsidence due to the earthquake but is subject to further investigation.



¹ <https://www.mynet.com/galeri/hatay-da-deprem-sonrasi-deniz-sevyesi-yukseldi-sokaklar-sular-altinda-kaldi-araclar-guclukle-ilerledi-iste-o-fotografilar-110107094542/2>

On 8 February, **the Syrian government requested assistance through the EU civil protection mechanism** for search and rescue teams and equipment, shelter items and medicines.

The republic of Türkiye requested international support soon after the first earthquake. State of Emergency for 3 months has been declared in Kahramanmaraş, Kilis, Diyarbakır, Adana, Osmaniye, Gaziantep, Şanlıurfa, Adiyaman, Malatya and Hatay.

As of as of 7 February 11:00 local time, all vehicle entries to Hatay, Kahramanmaras and Adana except humanitarian assistance have been blocked for 48 hours.

A major port in the Mediterranean coastal city of Iskenderun was partially damaged by the earthquake, with dozens of containers being toppled. As a consequence, a major fire erupted that brought all port operations to a halt (Figure below). The fire that engulfed hundreds of shipping containers at the port has been extinguished, but it was not clear when operations would resume due to the damage from the fire and severe structural damage caused by the earthquake. The blaze led to the shutdown of all operations at the terminal until further notice and forced freight liners to divert vessels to other ports.

The cause of the fire is still unknown. There are speculations over plastic raw material or chemicals that ignited. A source from a container broker said the fire most likely originated in a container filled with flammable industrial oil, judging by the flames and smoke. Other containers were toppled on their sides, hampering access for the emergency services. Authorities had tried in vain to tackle the fire by boat on Monday (6 February), with damage nearby from the quake hampering access to the site. The fire was eventually extinguished using combined efforts from land, sea and air.

Some cargo areas of Limak port at the Iskenderun complex were still on fire.

Figure 3 – View of the container fires at Iskenderun port.



1.2 Humanitarian impact

1.2.1 Current humanitarian situation in Türkiye and Syria

The preliminary humanitarian impact (as of 8 February at 16:00 UTC) is:

Situation in Türkiye

Disaster and Emergency Management Presidency of Türkiye (AFAD) reports, as of 8 February at 10:20 UTC, at least 8,574 fatalities and 49,133 injured people across 11 Provinces (Kahramanmaraş, Gaziantep, Şanlıurfa, Diyarbakır, Adana, Adıyaman, Osmaniye, Hatay, Kilis, Malatya and Elazığ) in southern Türkiye (source: <https://en.afad.gov.tr/press-bulletin--16-about-the-earthquake-in-kahramanmaras>).

Situation in Syria

In Syria, at least 1,162 people died and 2,285 sustained injuries, as reported by the Syrian Arab News Agency (SANA). This information is assumed to refer only to government-controlled areas. The White Helmets organisation in north-western Syria reported that 1,280 people died and more than 2,600 sustained injuries in rebel-controlled areas, although the numbers are expected to rise significantly given the difficult context in which search and rescue operations are taking place. The number of newly displaced people is not yet known and there is limited information on the shelter conditions and needs of the affected population.

There is an urgent need of humanitarian assistance especially in north-western Syria, where 90% of the people already relied on aid to meet basic needs, including food and non-food items, winter clothes, shelters, tents, blankets, first aid kits, cooking items, medical equipment. Heavy machines for debris removal, ambulances, fuel, transportation are also needed according to the latest UN-OCHA flash report.

At least 20 hospitals requested blood units and two hospitals in Idlib are out of service. According to The Union of Medical Care and Relief Organizations (UOSSM) four hospitals have been damaged and evacuated in the rebel-held area. Health facilities are overwhelmed. Protection risks have increased. Unexploded ordnances are present in many areas. Children and women from vulnerable families are at risk of exploitation. The rural areas of Aleppo are facing water disruptions due to contamination.

UNRWA estimates that 90% of the Palestinian refugees living in Lattakia camp, Al Nayrab camp, Ein al Tal camp, and Hama camp need assistance as a result of the earthquake.

International organisations are already mobilizing staff and resources on the field; however, access is still restricted in many areas. The Bab Al Hawa border crossing through which international aid is generally reaching the northern areas is temporarily closed due to damage and logistic issues caused by the earthquake. Furthermore, the road connecting Gaziantep and Hatay, where the UN Transshipment Aid Hub is located, is reportedly not accessible. Transport feasibility assessments are ongoing.

1.2.2 Pre-existing humanitarian crisis in Syria due to the conflict

Since 2011, Syria has been the stage of a decade-long civil war between the Syrian regime and rebel forces, which caused extensive urban damage and population displacement. Infrastructure across the country is still in a fragile state due to years of airstrikes and shelling, as the post-war reconstruction effort is still underway.

In rebel-held north-western Syria, there is an especially high number of Internally Displaced People (IDPs), with nearly 1.7 million IDPs living in more than 1,400 camps under difficult living conditions. There are severe disruptions to services and infrastructure including severe electricity shortages, the situation in Aleppo being the worst in the country.

The humanitarian access is hampered by conflict and military operations. UN OCHA classifies 203 out of 270 sub-districts of Syria under severe, extreme or catastrophic conditions. At the end of January 2023, 4.7 million people were in need of humanitarian assistance in Aleppo, Ar-Raqqa and Al-Hasakeh alone.

Syria is also facing a cholera outbreak with 19,438 cases being registered in Aleppo (23% of the total) and 16,366 cases being registered in Ar-Raqqa (19% of the total), as of 31 January 2023.

1.3 Impact on critical infrastructures

1.3.1 Situation of the dams

Due to the extreme shaking caused by the earthquakes, concerns have been raised related to the situation of the dams located in the affected area:

- Türkiye: the Sultansuyu Dam² (exposed to MMI VII).
- Syria: the Maydanki (Afrin) Dam (exposed to MMI VII).

In particular, for the Sultansuyu Dam, which was affected by the earthquake in the Pazarcık district of Kahramanmaraş, the Malatya Governorate announced that the reservoir will be discharged gradually as a precaution measure and that the downstream population should be cautious.³

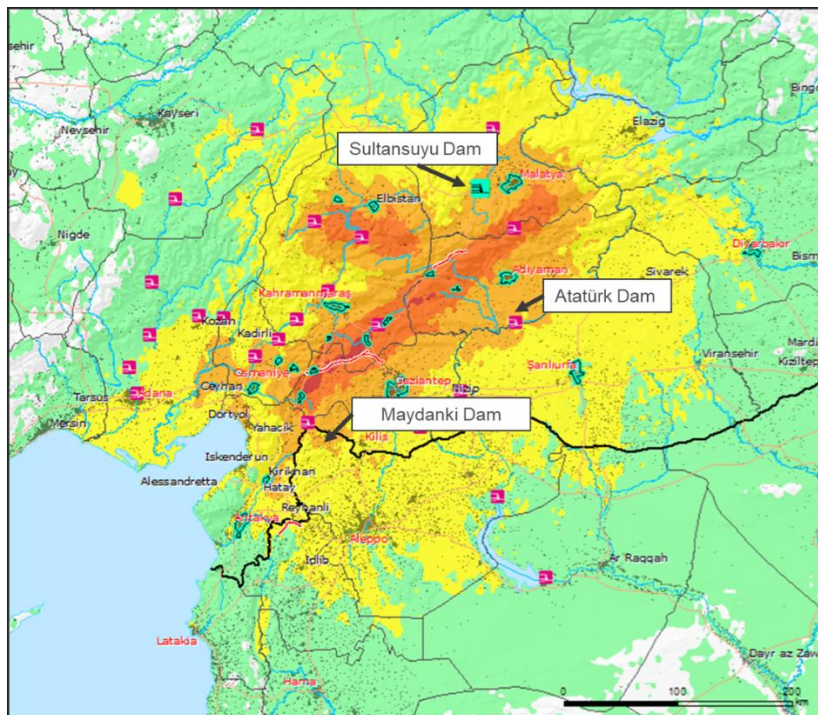
Authorities are aware of the urgent need to perform structural checks of the dams and to monitor their conditions over the next weeks.^{4,5}

At the moment, near-real time data from river gauges in the affected area in the Copernicus GloFAS are not available. To monitor for the level of the dam downstream rivers altimetry data are available.

Below is a list of dams exposed to the strong ground shaking (source: GDACS):

Due to the growing concerns related to the Sultansuyu and the Maydanki (Afrin) Dams, additional information and considerations are provided.

Figure 5: Location of the Sultansuyu and the Maydanki (Afrin) Dams. In the map dams with reservoir capacity above 50k m³ exposed to MMI >= V are also located (MMI=V: green; MMI=VI: yellow; MMI=VII: light orange; MMI=VIII: dark orange; MMI=IX: red).



² <https://www.turkiyegazetesi.com.tr/qundem/malatya-valiligi-sultansuyu-baraji-tedbiren-kademeli-olarak-bosaltilacak-947241>

³ <https://www.cnnturk.com/turkiye/deprem-sonrasi-baraj-yikilmasi-ya-da-patlami-nedir-baraj-nasil-patlar-sultansuyu-baraji-nerede>
<https://www.turkiyegazetesi.com.tr/qundem/malatya-valiligi-sultansuyu-baraji-tedbiren-kademeli-olarak-bosaltilacak-947241>
<https://expatguideturkey.com/earthquake-cracks-occured-at-sultansuyu-dam-in-malatya-dam-is-being-evacuated/>

⁴ <https://www.birgun.net/haber/emo-baskani-uyardi-barajlar-ve-hes-ler-kontrol-edilmeli-akkuyu-denetlenmeli-420369>

⁵ <https://www.sondakika.com/amp/haber-prof-dr-naci-gorur-bu-depremin-gelmekte-oldugunu-15609959/>

Sultansuyu Dam

The severe shaking caused longitudinal cracks along the structure. The current level of the reservoir has reached 1.5m due to the controlled discharge, as stated by *Dr. Ceyhun Ozcelik, Muğla Sıtkı Koçman University Engineering Faculty Water Resources Department.*⁶

Figure 9: Longitudinal cracks on the Sultansuyu Dam.⁷



“The Sultansuyu Dam was designed for irrigation purposes and was built on Sultansuyu River in Malatya. The scope of work for this earth fill type dam includes 1.350.000 m³ of excavation and 3.200.000 m³ of filling while the height of dam is 55 m (from foundation) and the crest length is 721. The derivation tunnel which was constructed within the framework of this contract has 397 m length and 4,5 m diameter”⁸

Figure 10: Image of the Sultansuyu Dam (source: Yüksel)



⁶ <https://expatquideturkey.com/earthquake-cracks-occured-at-sultansuyu-dam-in-malatya-dam-is-being-evacuated/>

^{7*} <https://expatquideturkey.com/earthquake-cracks-occured-at-sultansuyu-dam-in-malatya-dam-is-being-evacuated/>

⁸ <https://www.yuksel.net/en/projects/all-projects/dams-a-hepps/126-sultansuyu-baraj-ve-tesisleri-naat-malatya>

Maydanki (Afrin) Dam

Over the last hours, concerns are growing around the Maydanki Dam, known also as Afrin Dam, in Syria. The dam has been exposed to MMI VII.

“The Maydanki dam in the northern city of Afrin was affected by huge longitudinal and transverse cracks as a result of the powerful 7.8 magnitude earthquake that struck southeastern Turkey and northwestern Syria on Monday and left over 7000 people dead.

The circulating photos and footage showed large cracks occurred in the dam in the northern countryside of Aleppo governorate.”⁹ ¹⁰

Figure 11: Image of the cracks on the Maydanki (Afrin) Dam (source: @hybacarm)



The current available information regarding potential safety check: is *“The engineering office of the Turkish-backed local council of Afrin claimed it checked the dam and that “initial results of safety deep checks showed that the dam’s walls have no leakages and the dam gate has no cracks.”* <https://npasyria.com/en/92435/>

The Afrin Dam (also called Maydanki Dam) is located 12 km north of the town of Afrin in northwest Syria, and it is 70 kilometres (43 mi) from the city of Aleppo, near the village of Midaneka (Maydanki).

Figure 12: Image of the Maydanki (Afrin) Dam (source: Sorce: MIGman Museum)



⁹ <https://english.enabbaladi.net/archives/2023/02/turkey-syria-earthquake-maydanki-dam-cracked-what-is-the-consequence/>

¹⁰ <https://www.cbsnews.com/live-updates/earthquake-turkey-syria-death-toll-rescues-february-7-2023/>

It is an earth-filled water storage and hydroelectric power dam on the Afrin River in northwest Syria. It provides drinking water to almost 200,000 people, irrigates about 30,000 hectares (74,000 acres) of olives, fruit trees and agricultural crops, and supplies 25 MW of hydroelectric power. It is currently under the control of the groups backed by Türkiye.¹¹

1.3.2 Dam discharge Modelling

Dam breach inundation modelling was carried out by the JRC for both of the above-mentioned dams. The calculations have been performed using the NAMIDANCE computer code, from Middle East Technical University. Although the code was originally conceived for tsunami, its hydrodynamic modelling capacities make it suitable for dam breach simulations. It should be noted that no benchmarking for this use-case has been carried out in literature. The simulated results appear realistic, but should be interpreted as orders of magnitude, rather than precise indications.

The inputs for the simulations use as a basis the SRTM30 (<https://dwtkns.com/srtm30m/>) dataset for the topography of the area and including the area from the beginning of upstream reservoir. The depth/bathymetry of the reservoirs was taken from the .GLOBathy global lakes bathymetry dataset (<https://www.nature.com/articles/s41597-022-01132-9>), sampled to 30 m cell size to match SRTM30. The simulations were carried out on a NVIDIA GPU graphic card.

Both of the simulations carried out consider a complete dam collapse, where the dam is removed from the DEM model and the water is left to flow freely.

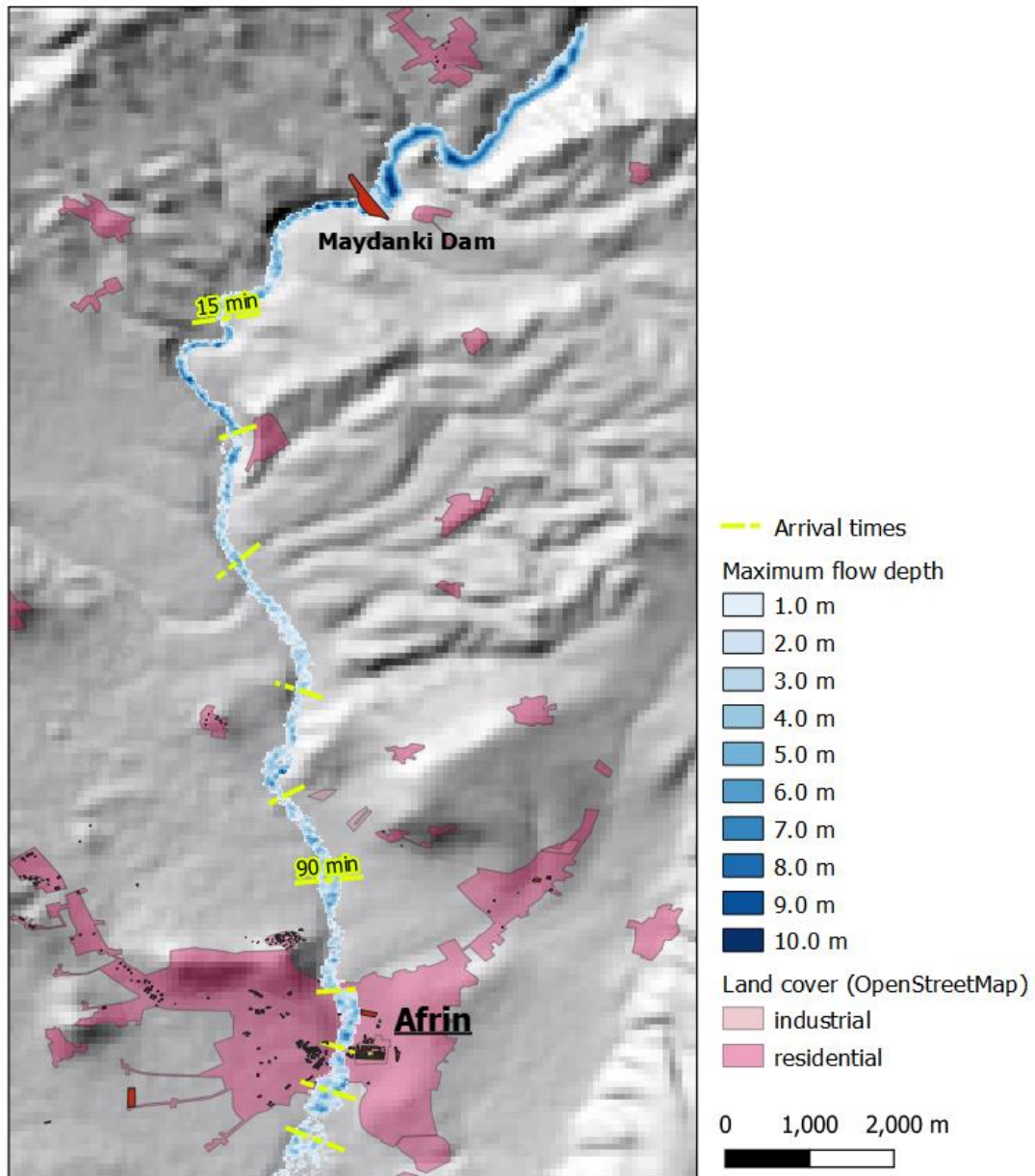
No water mirror height estimates could be obtained from satellite altimetry for either of the considered dams. Thus, the water height was taken from SRTM30.

Maydanki (Afrin) Dam

The simulation was run for a duration of 3 hours. The simulation shows flood waves arriving in the residential areas of Afrin (Syria) after one hour and 45 minutes. The residential areas closest to the riverbed, on the right bank, are exposed to flow depths of about 2.7 m.

¹¹ https://en.wikipedia.org/wiki/Afrin_Dam

Figure 13: Results of the simulation for the Maydanki (Afrin) dam breach. Arrival times are plotted in 15-minute intervals.



Comparison of the available sources to define the extent and water height (SRTM30 and GLOBathy) to other satellite imagery, namely GoogleEarth, raised some questions about the volume of the reservoir: while SRTM30 and GloBathy are in good agreement, GoogleEarth orthophotography shows a much larger reservoir. This could be the result of a shallow lake bathymetry, resulting in a lake footprint that is very sensitive to water height. However, given the timeframe for the current analysis, it is recommended to assume that the simulation provides a minimalist view of the potential crisis.

In any case, for the purposes of this analysis, the very short time-frame between dam breach and inundation of the inhabited areas (about 2 hours) should give an idea of the urgency of setting up monitoring and warning systems at the Maydanki (Afrin) Dam.

Figure 14: Comparison of the Maydanki lake footprint in GLOBathy (white polygon) and GoogleEarth (orthophotography)



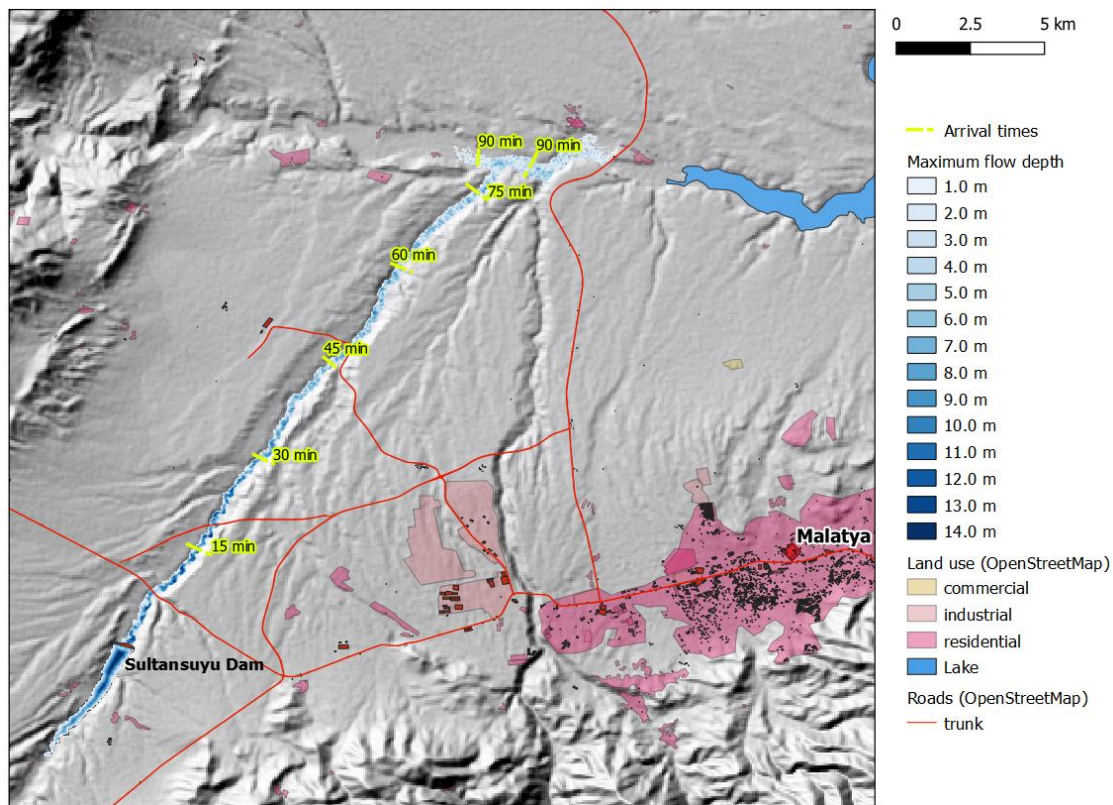
Sultansuyu Dam

The simulation of the Sultansuyu Dam breach was run a duration of 2 hours. A breach of the Sultansuyu Dam would have lower direct humanitarian impacts due to an absence of exposed assets downstream: there appear to be no villages along the Sultansuyu Stream connecting it to the Karakaya Dam reservoir.

The main assets of interest are the bridges that cross the stream at several points. According to the simulation, flow depths at the two southernmost bridges exceed 8 m and 5 m for the third bridge. It could therefore be useful to ascertain whether this would endanger these bridges, that is, whether they are high enough to avoid being flooded and whether the foundations would resist the impact of the flow.

The roads across the southern bridges connect Malatya with Kayseri, although a connection via Kahramanmaraş would still be possible if the bridges were to collapse.

Figure 15: Results of the simulation for the Sultansuyu dam breach. Arrival times are plotted in 15-minute intervals.



1.3.3 CEMS Risk and Recovery mapping activation for the dam breach

An activation of the Copernicus Risk and recovery mapping is ongoing to perform a more detailed dam break and dam discharge scenario for the Maydanki (Afrin) Dam.

Following deliverables are foreseen: reference data set in the flood prone area including identifying possible IDP camp locations, dam break modelling and flood inundation mapping, exposure assessment of citizens and infrastructure (including IDP camps if any). Further updates will be provided.

1.3.4 Impact on critical energy infrastructures

Turkish authorities are reporting blackouts in the following places: Osmaniye Bahçe-Düziçi, Kahramanmaraş city centre, Malatya; Akçadağ, Doğanşehir, Doğanlı are out of electricity.

Overall, the earthquake has damaged critical energy infrastructure in Türkiye. There is damage to both power transmission lines and natural gas transmission and distribution lines. Approximately 30 substations belonging to Türkiye's Electricity Transmission Corporation (TEİAŞ) suffered varying degrees of damage.

Gas pipeline rupture

Main event:

Due to the earthquake shaking, the state-owned **natural gas transmission pipeline** (operated by BOTAS), found at the southernmost Hatay Province in Türkiye, was apparently **ruptured** in two sections (see Figure 12). The distance between the pipeline ruptures is roughly 3 km.

The biggest damage pertains to the rupture of the natural gas line in the Turkoglu district, which is close to the epicentre. This line is part of the main transportation line that carries natural gas to Marash, Gaziantep, Hatay and Kilis. The affected natural gas line in Kilis province continues to be fed from the gas inside the line. The affected areas may experience power outages.

Figure 16: Excerpt from the BOTAS pipeline network in Türkiye showing the affected gas transmission pipeline influence area.



Consequences:

Explosion and fires in the two rupture points. It was estimated that the height of the flames was around 30 meters (100ft). The fires are extinguished.

Precautionary measures:

- **Natural gas flows on the Kahramanmaraş-Gaziantep gas transmission line were halted** to Gaziantep, Hatay and Kahramanmaraş provinces and some other districts (Pazarçık, Narlı, Besni, Gölbaşı, Nurdağı, Islahiye, Reyhanlı, Kırıkhan and Hassa districts) near the epicentre as a result of the pipeline damage.
- BOTAŞ technical teams are carrying out the necessary controls and interventions in the field. In coordination with the natural gas distribution companies in the region, necessary studies are carried out to ensure safe gas flow to the citizens.
- All teams were immediately put on alert by BOTAŞ, and damage assessment studies were started by taking the necessary security measures.
- By establishing the necessary coordination with the natural gas distribution companies in the region, gas supply will continue to be provided by supplying CNG and LNG to critical facilities (such as hospitals, bakeries, etc.) through mobile power plants/ generators.

Ceyhan oil terminal

- Operations were suspended at the **Ceyhan oil terminal** (southern Türkiye, 150 km from the epicentre) and an emergency meeting was being held on the issue. There are reports about damage and spills from tanks at the terminal. BP, for instance, said a small leak from a crude storage tank at Ceyhan caused by the quake has now been stopped. Ceyhan is a major oil export terminal on Türkiye's Mediterranean coast.

Inspections are carried out and operations at Ceyhan will resume once the damage assessment has been finalised.

- Operations at the **port of Dörtiyol** (which sits across the Bay of Iskenderun from Ceyhan) are also suspended until further notice.

Oil pipelines

The crude oil pipeline Baku-Tbilisi-Ceyhan (BTC) from Azerbaijan (purple pipeline in Figure below) were damaged at the connection points of two berths. A damage assessment is carried out. The small leak was quickly fixed but the oil flow is still halted (force majeure notice). The pipeline is not expected to open until Wednesday or Thursday as also the control room at the terminal was damaged.

Crude oil pipelines from Iraq resumed operations in the evening of 7 February. The pipeline operator Botas confirmed that there was no damage to the main pipelines that carry crude oil from Iraq (green pipelines in Figure below).

Figure 17: Zoom on locations of oil pipelines from Azerbaijan and Iraq.



Outlook

JRC will keep monitoring events over the next couple of days. Türkiye keeps experiencing a series of shallow earthquakes with high magnitude; this may also mean that **industrial structures and equipment that were damaged during the first earthquake shock but did not have any release so far, might start releasing with the aftershocks if further damage happens.**

2 Overview of satellite mapping activations

2.1 Outcomes of satellite activations

2.1.1 Copernicus EMS Rapid Mapping activation in Türkiye (EMSR648)

The European Commission's Copernicus emergency satellite mapping system was activated by the ERCC on 6 February at 04:43 UTC to support damage assessment (less than 4 hours after the M7.8. earthquake). The JRC Copernicus Mapping Team is providing technical support to the activity. All information and maps related to this activation are available here:

<https://emergency.copernicus.eu/mapping/list-of-components/EMSR648>

Optical satellite images of very high resolution (less than 1 meter) were acquired on 07 and 08 February over 20 areas of interest (AOIs) located near the epicentres of the earthquakes. These areas, with a total area of 664 km², are home to an estimated population of 4.187.550 people.

For 7 areas, the images acquired were completely or partially free of clouds (AOIs 04, 06, 09, 10, 11, 16 and 19) and could therefore be used for assessing the damages on the infrastructure. On the night of 07-08 February, 10 maps were published in which a total of 488 building blocks and 13.2 km of roads were identified as affected.

Due to cloud coverage, 32% of the area covered by the 20 AOIs have been analysed so far (210 km² on 664 km²).

New images covering 7 areas are being analysed. The results will be published on the night of 08-09 February.

New acquisitions of optical images are scheduled on the next days over all areas. If weather conditions allow, damage assessment will be conducted on the 13 areas that could not be analysed so far. As for the areas already analysed, the new images will be used to consolidate the first results, as well as other sources such as media and social media. In parallel, it is also planned to analyse SAR imagery of very high resolution for specific AOIs to complement the analysis.

Figure 18 - Activation Extent Map: overview of the areas of interest and map production.
Latest update [here](#)

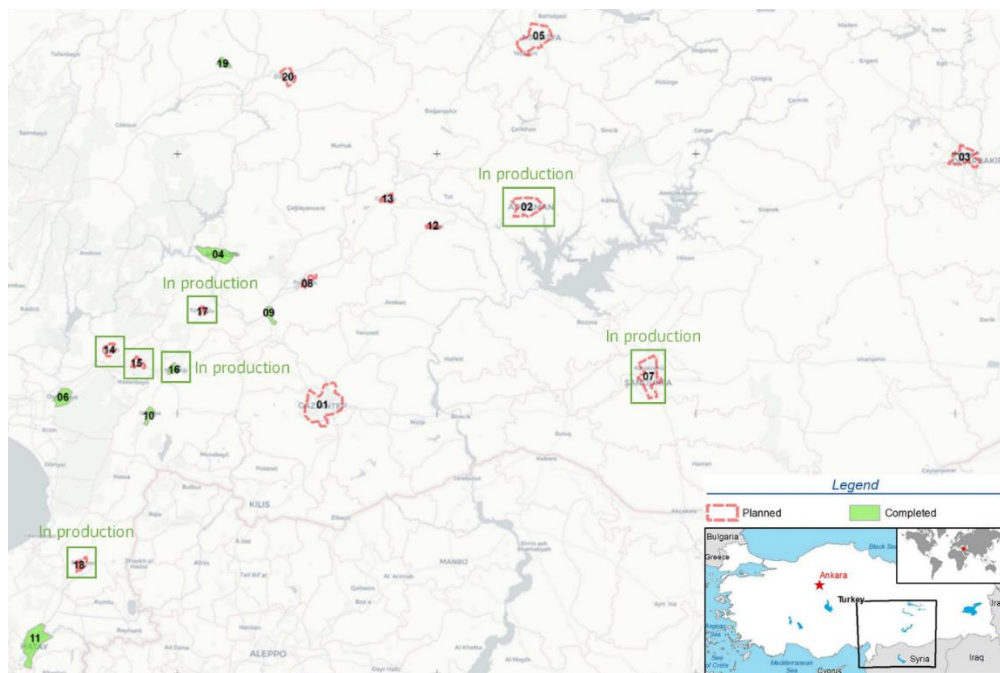


Figure 19 - List of the areas of interest, production status and preliminary results

AOI n.	AOI name	Area (km ²)	Estimated population **	Production status	Production details	Affected roads (km) *	Affected building blocks *	Volume of affected buildings (cubic meters) ***
1	Gaziantep	126	1,270,718	Waiting for satellite imagery	Previous acquisition cloudy ; New attempt on 08.02			
2	Adiyaman	62	220,725	In production	Delivery on the night of 08-09 February			
3	Diyarbakir	52	455,140	Waiting for satellite imagery	Previous acquisition cloudy ; New attempt on 08.02			
4	Kahramanmaraş	56	384,404	Completed		-	123	4,800,041
5	Malatya	87	421,268	Waiting for satellite imagery	Previous acquisition cloudy ; New attempt on 08.02			
6	Osmaniye	34	231,122	Completed	Consolidation expected to be delivered on the night of 08-09 February	-	5	10,351
7	Sanliurfa	60	410,832	In production	Delivery on the night of 08-09 February			
8	Pazarcik	7	22,978	Waiting for satellite imagery	Previous acquisition cloudy ; New attempt on 08.02			
9	Cumhuriye	12	16,653	Completed		0	10	54,277
10	Islahiye	7	16,036	Completed		10	70	
11	Antiochia	85	385,430	Completed		3	220	5,303,279

12	Erdemoglu	6	30,742	Waiting for satellite imagery	Previous acquisition cloudy ; New attempt on 08.02			
13	Golbasi	6	27,283	Waiting for satellite imagery	Previous acquisition cloudy ; New attempt on 08.02			
14	Duzici	10	52,238	In production	Delivery on the night of 08-09 February			
15	Bahce	4	13,558	In production	Delivery on the night of 08-09 February			
16	Nurdagi	4	12,258	Completed	Consolidation expected to be delivered on the night of 08-09 February	0	34	678,051
17	Turkoglu	4	28,582	In production	Delivery on the night of 08-09 February			
18	Kirikhan	12	65,212	In production	Delivery on the night of 08-09 February			
19	Afsin	13	33,725	Completed		0	26	
20	Elbistan	18	88,646	Waiting for satellite imagery	Previous acquisition cloudy ; New attempt on 08.02			
Total		664	4,187,550			13	488	10,845,999

Areas for which there is no value have not been analysed yet.

* Source: Copernicus activation EMSR648. Sum of assets identified as Destroyed, Damaged and Possibly damaged

** The population density grids that were used to estimate the potentially affected population is based on the Turkish census 2011 and has been adjusted based on the 2019 version of the World Population Prospect (WPP2019).

*** Dataset: GHS-BUILT-V R2022A. Source (GHS, JRC). More details in the section 2.3.

2.1.2 Proposal of a surveillance flight by NATO and drone service from CEMS

Investigation of the possibility for a NATO surveillance flight in coordination with the Euro-Atlantic Disaster Response Coordination Centre (EADRCC) to obtain high resolution visual imagery from the highest impacted areas within Türkiye is highly recommended. NATO air base in İncirlik-Adana (Türkiye), which is also impacted by the first earthquake, should have the required aircraft.

Turkish drone operators participating in the CEMS European Drone Network have been located and contacted. Once this support is requested CEMS can deploy in agreement with the Turkish authorities on condition that flight permissions are established. A max of 30 km² per day can be covered with 5 cm orthorectified imagery and Digital Surface Model as output.

2.1.3 International Charter for Space and Major Disasters, and UNOSAT activations in Türkiye and Syria

On 06 February (date of the M7.8 earthquake), the International Charter for Space and Major Disasters was also activated in Turkey ([activation 797](#)), as well as in Syria ([activation 798](#)). As part of these activations, UNOSAT produced a preliminary damage assessment over the town of Latakia in Syria (available [here](#)). The findings are that damage are observed in several and dispersed sectors of the town. A full assessment is expected to be conducted. At this time, no other maps or reports have been published by Charter-UNOSAT.

2.2 Monitoring proposal for urban area

GHS-BUILT-V depicts the distribution of built-up volumes, expressed as number of cubic meters. The data reports about the total built-up volume and the built-up volume allocated to dominant non-residential (NRES) uses. The GHS-BUILT-V raster dataset has been aggregated at building block level according to the degree of damage identify in Copernicus EMS Rapid Mapping activation in Türkiye ([EMSR648](#)).

TOTAL VOLUME (m3)				
CEMS AOIs	AOIs Names	Possibly damaged	Damaged	Destroyed
4	Kahramanmaras	3713444.36	143203.88	943392.92
9	Cumhuriyet	2313.84	51962.72	0
11	Antakya	4104243.92	1128126.2	70909.28
16	Nurdagi	178266.76	477342.16	22442

RESIDENTIAL VOLUME (m3)				
AOIs	AOIs Names	Possibly damaged	Damaged	Destroyed
4	Kahramanmaras	3592892.92	136522.2	928714.76
9	Cumhuriyet	2313.84	51403.84	0
11	Antakya	3841385.36	1125988.48	70909.28
16	Nurdagi	178032.6	476779.6	22442

NON-RESIDENTIAL VOLUME (m3)				
AOIs	AOIs Names	Possibly damaged	Damaged	Destroyed
4	Kahramanmaras	120551.44	6681.68	14678.16
9	Cumhuriyet	0	558.88	0
11	Antakya	262858.56	2137.72	0
16	Nurdagi	234.16	562.56	0

GHS data source:

Pesaresi M., Politis P. (2022):

GHS-BUILT-V R2022A - GHS built-up volume grids derived from joint assessment of Sentinel2, Landsat, and global DEM data, for 1975-2030 (5yrs interval).European Commission, Joint Research Centre (JRC)

PID: <http://data.europa.eu/89h/7a1f6b8a-d520-49a7-8f58-d5ac936b9c8a>, doi:10.2905/7A1F6B8A-D520-49A7-8F58-D5AC936B9C8A

3 Social Media analysis

The Social media for Disaster Risk Management (SMDRM) platform has been triggered by GDACS system for 2 data collections. The main one refers to the event with GLIDE : [EQ-2023-000015-TUR](#).

This section aims to show a representative selection of Tweets of what is happening in Türkiye in real time. The JRC developed an artificial intelligence deep learning model for the automated multilingual classification of messages from social media in terms of impacts on population/infrastructure/services with the scope of supporting humanitarian aid. An automated processing pipeline for filtering impact related tweets was set up. In few hours the tool aggregates and presents relevant information as well as some meaningful message and images that can help depicting the situation among population. Information with statement from authoritative sources is favoured.

Figure 20 – Number of tweets mentioning the event processed in near real time by the SMDRM platform

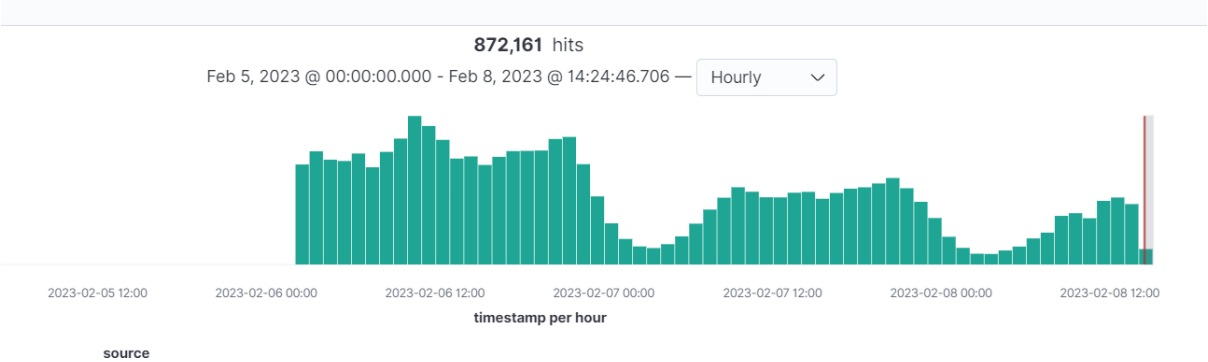
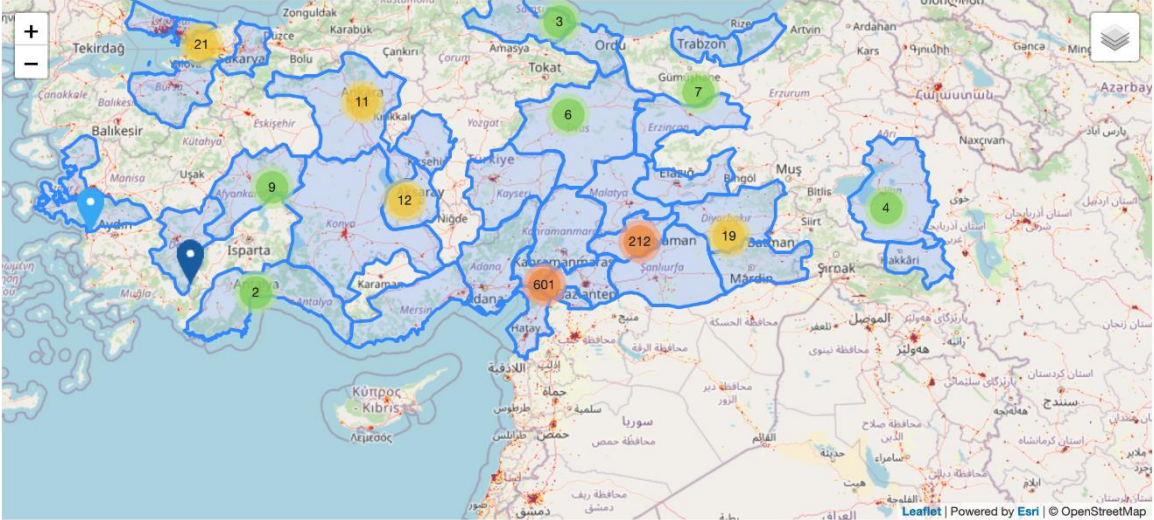
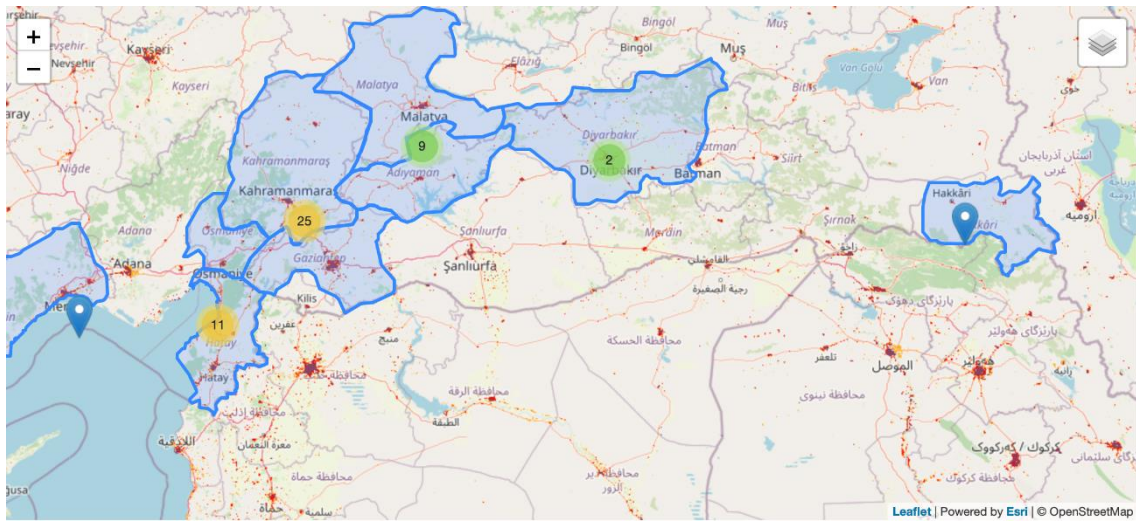


Figure 21 - Country-wide image of non-duplicated georeferenced posts relevant to impacts aggregated by Administrative regions.



An effort to identify messages requesting for help has been done. Tweets mentioning keywords related to debris and help (enkaz altındayım, yardım edin) were identified. The system identified **more than 2.000 messages** relevant and containing request for help. Many messages mentioned specific location at the level of street or sub-urban area. Our platform could geocode only a fraction of them at the level of the administrative area. An additional analysis should be performed on the complete list to determine the location of points. The Figure below details the geocoded requests for help in the area near the epicentre during the first 24h.

Figure 22 – Detail of messages requesting help georeferenced by the platform relevant to impacts aggregated by Administrative regions.



4 International Assistance

Situation in Türkiye

International assistance was requested by the Republic of Türkiye shortly after the event.

Reception and Departure Centre (RDC, coordinates: 36.983613, 35.296541) for incoming international assistance was established on 6 February 2023 in ADANA SAKIRPASA Airport by the UNDAC team.

On 6 February the UCPM was activated by Türkiye and the Emergency Response Coordination Centre (ERCC) is coordinating the mobilization. As of 8 February at 11:00 UTC the situation of UCPM mobilization of in-kind assistance, search and rescue teams, medical teams and an EU Civil Protection team (EUCPT, with ERCC LO and TAST) is reported here below.

- UCPM in-kind assistance: the ERCC received a request for shelter items (50,000 family winter tents, 100,000 blankets and 50,000 heaters). In response to this request, 3 EU Member States (DE, LT and SI) offered more than 12,000 items. As of 8 February, 20 EU Member States (AT, BE, BG, HR, CY, CZ, DE, EE, FR, EL, HU, IT, MT, NL, PL, PT, RO, SK, SI, ES) and three UCPM Participating States (AL, ME, RS) offered a total of 36 teams (31 USAR and 5 medical teams), consisting of 1,509 pax and 101 search and rescue dogs.
- UCPM search and rescue teams: 31 USAR teams including six heavy USAR (AT, CZ, FR x2, NL, PL), 23 medium USAR (AL, AT, BG x4, HR, EE, DE x2, EL x2, HU, IT, MT, ME, PT, RO x2, RS, SK, ES x2), one light USAR (CY) and one canine K-9 SAR (SI) were offered. All 31 USAR teams were accepted by Türkiye and AFAD is identifying bases of operations in four locations: Hatay, K'maras, Adiyaman and Gaziantep.
- UCPM medical teams: one EMT 1 (RO), four EMT 2 (BE, FR, IT, ES) and one medical team (AL) were offered. The national EMT Coordination Cell has been established in country with a physical presence set in Adana.
- EU Civil Protection team (EUCPT): an EUCPT of 11 experts (3 from FI and 1 from FR, LV, NO, NL, PL, RO, SE and SI) arrived on 8 February in Türkiye to support the local and national authorities with the coordination of incoming EU assistance. Two ERCC Liaison Officers are deployed with the EUCPT. A TAST support module of 12 experts (4 from DK, FI and SE) will accompany the EUCPT.

UN OCHA activated the United Nations Disaster Assessment and Coordination (UNDAC) team. As of 8 February, 15:00 UTC, 22 USAR teams from Algeria, Armenia, Azerbaijan, China, India, Israel, Jordan, Kosovo, Malaysia, Pakistan, Qatar, Russian Federation, Singapore, South Korea, Switzerland, Ukraine, United Arab Emirates, United Kingdom and USA have already been deployed. Other 20 USAR teams from Belarus, Brazil, China, Georgia, India, Japan, Moldova, Russian Federation, Singapore, Thailand, Tunisia and USA are mobilising.

Situation in Syria

Search and rescue operations are ongoing, but only 5% of the needed search and rescue operations are being covered. The available UN aid for north-west Syria does not meet the needs of the affected people. Funding appeals have been launched by several international organizations, including an IFRC's Appeal for Syria for CHF 100 million.

On 8 February, the Syrian government requested assistance through the EU civil protection mechanism for search and rescue teams and equipment, shelter items and medicines.

Several countries already sent or offered to send humanitarian aid and assistance, as reported by SANA. Algeria has offered 115 tons of assistance, including food and medical supplies, tents and blankets, out of which 17 tons have already reached Aleppo. An Algerian USAR team is operating in Aleppo.

Tunisia, Libya, Russia, Iran, Qatar and Iraq have also sent aid to Syria. Iraq sent 140 tons of aid and 28 fuel tankers. Libya and Iran respectively sent 40 and 31 tons of humanitarian and relief aid.

The Lebanese Minister of Public Works and Transport announced the opening of Lebanese airspace and ports to facilitate the arrival of aid and rescue teams to Syria and Oman that it would set up an air bridge to transport relief and medical aid.

Three Indian, Emirati and Jordanian planes arrived at Damascus International Airport on 08 February, loaded with humanitarian and medical aid. Another aid plane from India should arrive within 24 hours and other two

planes had arrived from the UAE. Additionally, the UAE plans to send USD 50 million to support Syria and announced its intention to establish a field hospital and send a search and rescue team.

China, Malaysia and Armenia have also expressed readiness to send aid to Syria.

The White Helmets called for international support in north-western Syria (the area not under government control). They reported that only Egypt sent a technical team of specialists to support rescue operations and doctors to provide medical care, while no other international aid was received so far.

5 Expected Updates

The report will be updated upon need to monitor the event and the response activities.

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