The 6 February 2023 Mw7.8 and M7.6 Kahramanmaras Earthquakes AFAD-Earthquake Clearinghouse

Examples of Clearinghouse Management, Data Collection and Partnership Communications

Recep CAKIR, PhD
(AFAD-Earthquake Clearinghouse Liaison for 6 Feb. 2023 M7.8 and M7.6 K. Maras Earthquakes)

2024 EERI Annual Meeting
(2024AM)
April 9–12, 2024, Seattle, WA

February 6th, 2023 Earthquake Sequence Earthquake Clearinghouse Team

The Disaster and Emergency Management Presidency of Turkey, Ankara, Turkey (AFAD)

Yunus Sezer, AFAD President (former)
Orhan Tatar, AFAD General Director (Earthquake-Risk Reduction)
Filiz Kadiroglu (Clearinghouse coordinator at AFAD)
Doruk Senturk (Groundmotion data and IT coordination)
Aykut Akgun (Mass movements- landslides, rock falls..) (current Earthquake Dept Head)
Sevgi Karakoc (coordination staff)
Kerem Kuterdem (IT)
Nihan Karacameydan (IT)
Dogus Ok (IT)
Enes M Ozturk (IT)

Environmental System Research Institute-Turkiye, Ankara ESRI-TURKIYE

Baris Uz
Baki Pak
Gozde Ozgun
Caglar Uzuner
Alperen C Isikkaya
Meral Eryilmaz
Recep Koksal
Nur O Yildiz
Elif Celikel
Ekin Senol

The Scientific and Technological Research Council of Turkey (TUBITAK)

Hasan Mandal, President
Duygu Celik, Assoc. Prof.
Ahmet Yozgatligil
Hasan H Yavasoglu
Selin Ozturk
Gorkem Gun
Burak Dundar

INITIATION
of the EARTHQUAKE CLEARINGHOUSE (DEBIDES)

Prof. Dr. Orhan TATAR
AFAD Earthquake Risk Reduction Dept. General Director

Establishment of Earthquake Clearinghouse was included in the AFAD earthquake emergency response plans in December 2022.

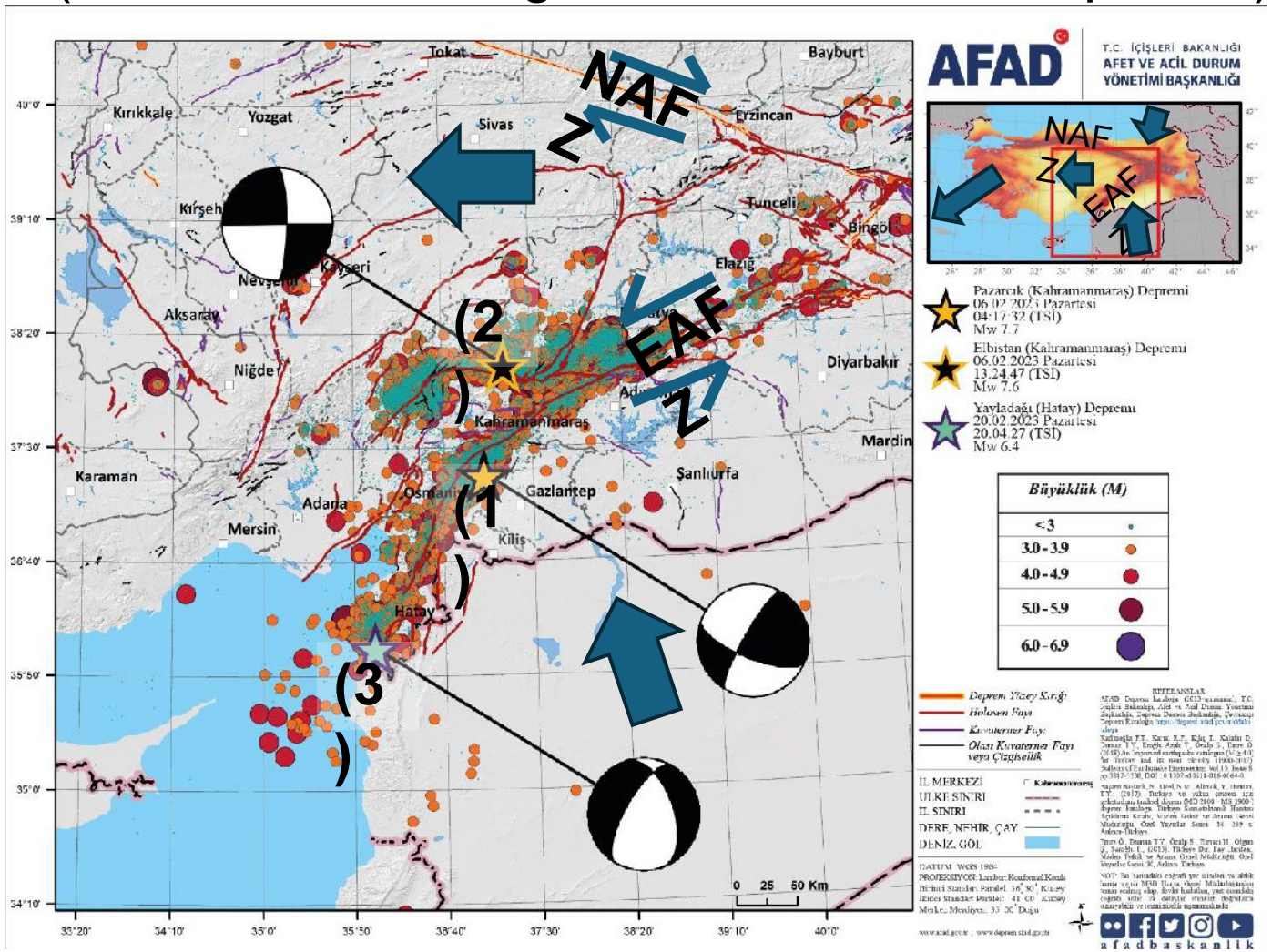
Note that: Dr Tatar's early action (a few months before the 6 February 2023 disaster) making Earthquake Clearinghouse a part of the AFAD earthquake response plan was the corner stone of this effort.

Dr. Recep CAKIR
Liaison for AFAD-Earthquake Clearinghouse (DEBIDES)

- February 6, 2023 4:17AM (local time) Mw7.8 Pazarcik-Kahramanmaras
- February 6, 2023 1:17 PM (local time) Mw7.6 Elbistan-Kahramanmaras
- Arrived in Ankara midnight, directly went to Disaster Management Center in the second week at Disaster Management Authority of Turkey (AFAD in Turkish) – had night meetings with the team
- Next morning, Physical Earthquake Clearinghouse was established
- First contacted EERI and worked on their tools and forms (2 days) (rescue operations were about to end)
- EERI-Fulcrum app did not work for the country. So, I moved on the ESRI-Survey123
- That took 2-day of server setup at AFAD's IT and ESRI team started working with me
- Also TUBITAK (NSF-equivalent agency of Türkiye) funded ~500 researchers from universities in Turkey and they started reconnaissance work
- TUBITAK team started working at the EQ-Clearinghouse – data were flowing primitively on whatsapp
- ESRI technical team worked on the data and helped generating recon forms to collect the data for Earth scientists, engineers, social+ medical scientists
  (Forms followed the EERI norms and customized depending on the detail asked by recon teams)
- We used EERI's forms to built on the ESRI-Survey123
- Also, AFAD's teams (~30 staff) went to field for observing the landslides and rock falls
- EERI frontier teams started arriving in Türkiye. Then we had large online meeting with EERI teams before they mobilized

- We closely worked with EERI's 2nd team – focusing on hospitals, dams, pipelines and other critical facilities

Eastern Anatolian Fault Zone (EAFZ)
generated >7 event in 1866 (Intensity=X)
(until Feb 6 2023, generated <M7 earthquakes)



Feb 6 to May 6, 2023 main- and after-shock distribution (33,591 events detected)

Source: AFAD, preliminary report, June 2nd, 2023

Unexpected Earthquake Sequence

(1) 06.02.2023 04:17:34 (Local time), Pazarcık (Kahramanmaraş) Earthquake
AFAD- **Mw: 7.7** --- Lat: 37.288 Long: 37.043 Depth:8.6 km
USGS- Mw: 7.8

(2) 06.02.2023 13:24:47, Elbistan (Kahramanmaraş)
AFAD- **Mw: 7.6** --- Lat: 38.089 Long: 37.239 Depth: 7 km

(3) 20.02.2023 20:04:27, Yayladağı (Hatay) Earthquake
AFAD- Mw: 6.4 --- Lat: 36.037 Long: 36.021 Depth: 21.7 km

Some devastating numbers:

- **Direct hit on 11 cities**

(Hatay, Gaziantep, Malatya, Diyarbakır, Kilis, Şanlıurfa, Adıyaman, Osmaniye, Adana and Elazig)
(disaster declaration released –extra ordinary condition decleared)

- **Included 6 neighbor cities**

(Bingöl, Kayseri, Mardin, Tunceli, Niğde and Batman) in the disaster region).

- **reported;**

Death toll: ~53,000 people

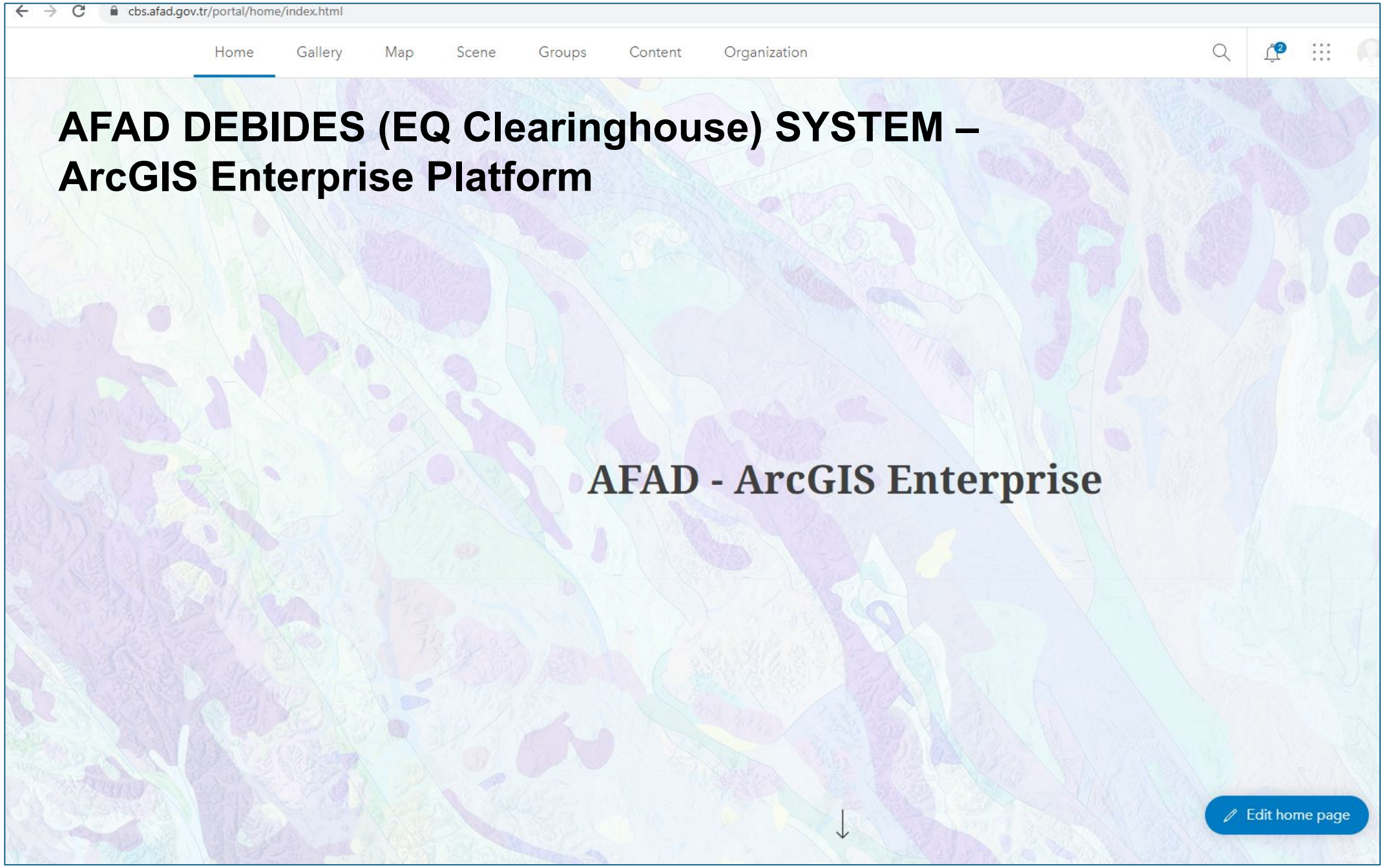
Injured : ~108,000 people

Collapsed building: ~38,000

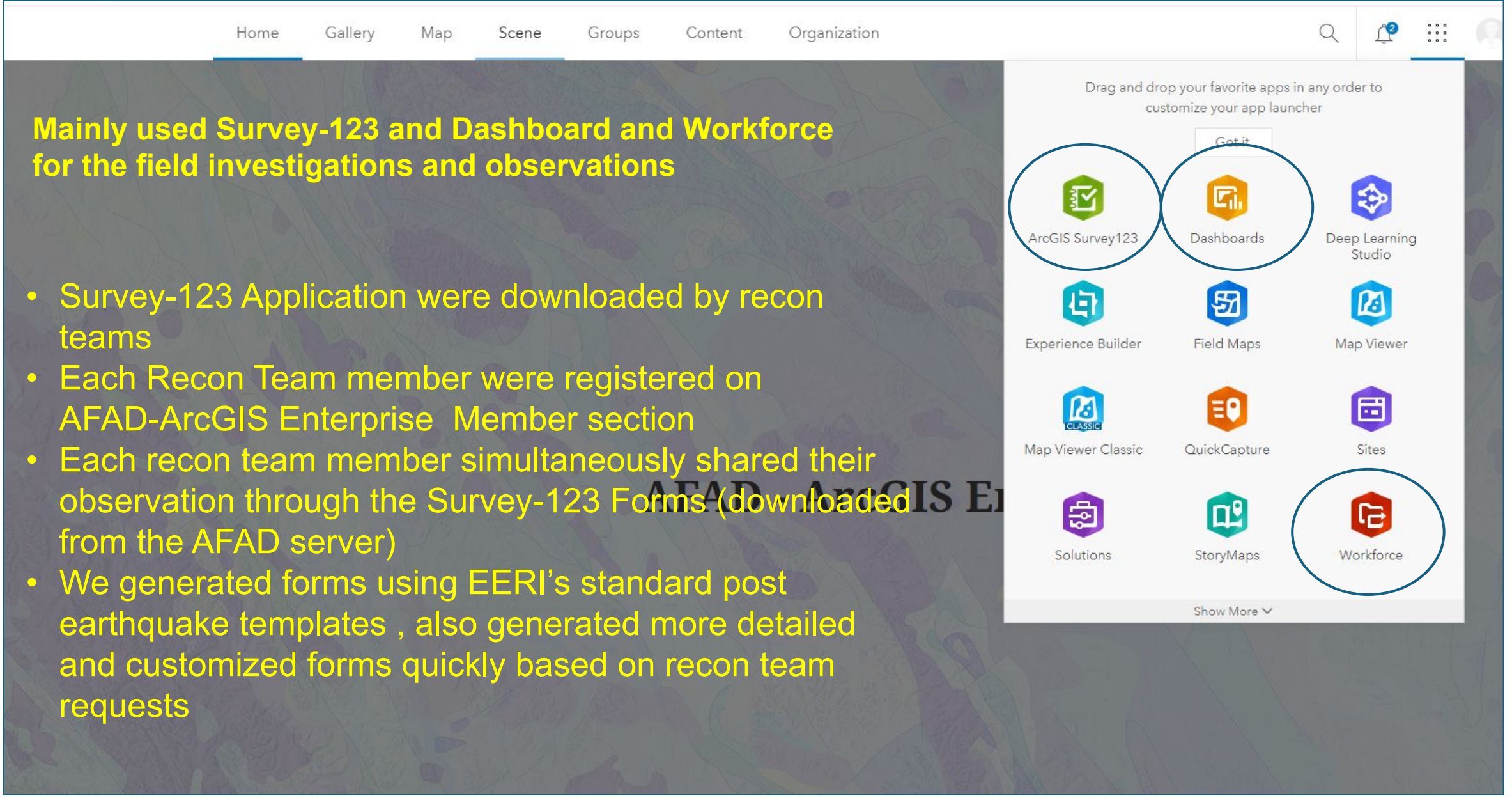
Damaged and heavily damaged buildings > 150,000

This is the highest death toll and huge building/economic damage in earthquake history of Turkiye.
(way larger than 1939 Erzincan Earthquake (Mw7.9) and 1999 Kocaeli Earthquake (Mw7.6).

Source: AFAD, preliminary report, June 2nd, 2023


cbs.afad.gov.tr/portal/home/index.html
Home
Gallery
Map
Scene
Groups
Content
Organization
AFAD DEBIDES (EQ Clearinghouse) SYSTEM –
ArcGIS Enterprise Platform
AFAD - ArcGIS Enterprise
Edit home page

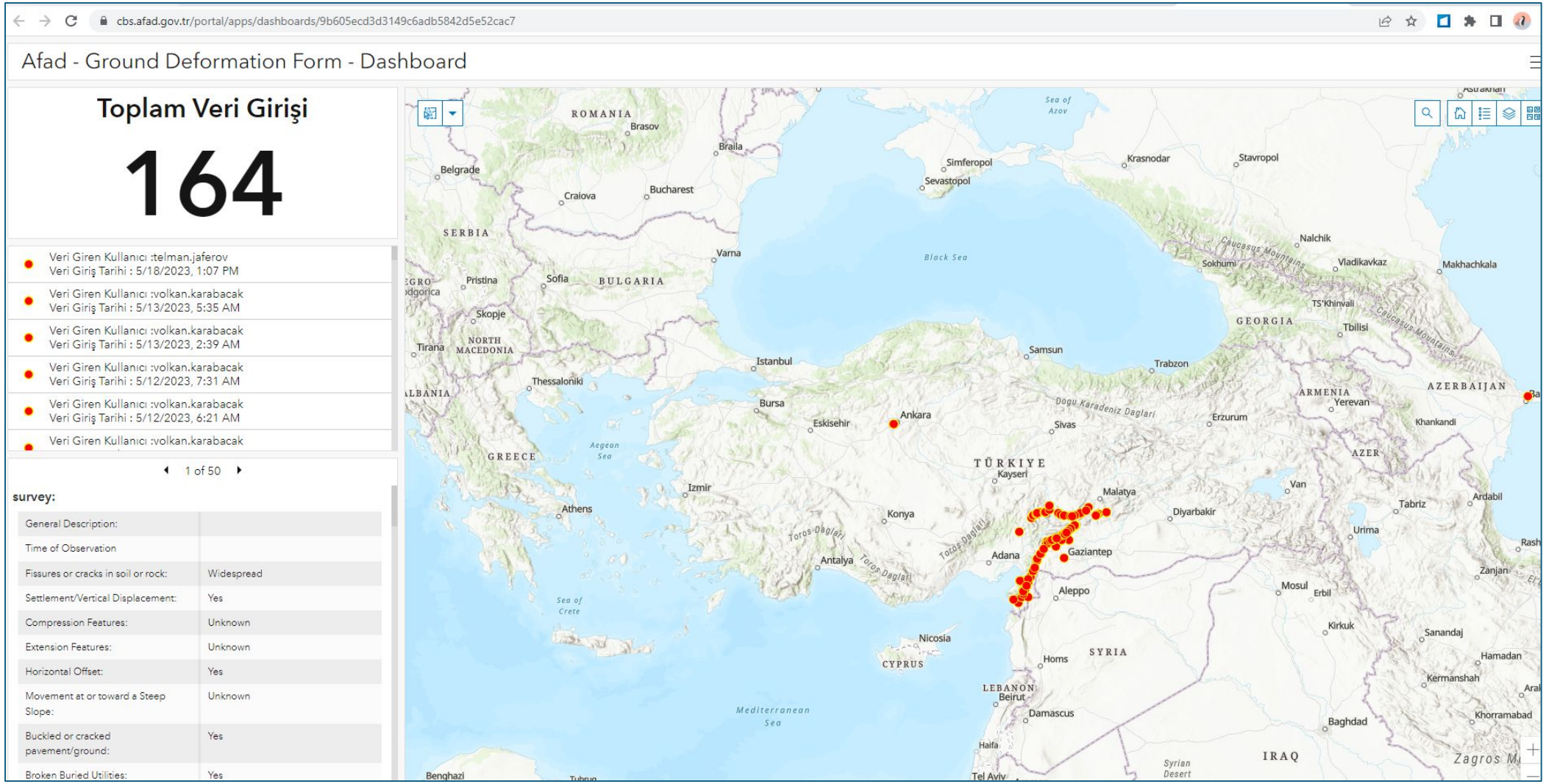
AFAD ESRI-ArcGIS Enterprise system for Reconnaissance Efforts



Mainly used Survey-123 and Dashboard and Workforce for the field investigations and observations

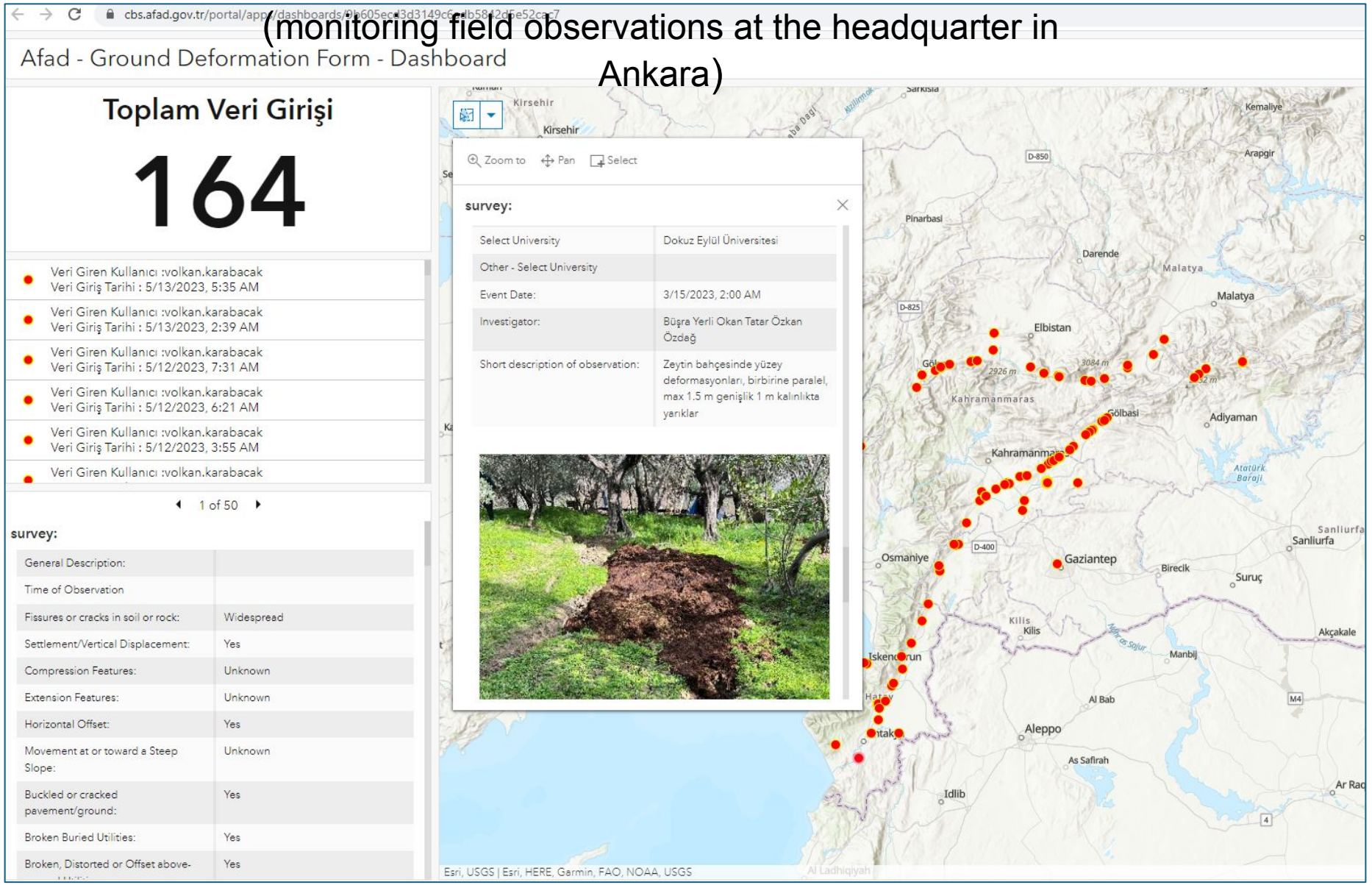
- Survey-123 Application were downloaded by recon teams
- Each Recon Team member were registered on AFAD-ArcGIS Enterprise Member section
- Each recon team member simultaneously shared their observation through the Survey-123 Forms (downloaded from the AFAD server)
- We generated forms using EERI's standard post earthquake templates , also generated more detailed and customized forms quickly based on recon team requests

DASHBOARD for EMERGENCY MANAGERS (monitoring field observations at the headquarter in Ankara)

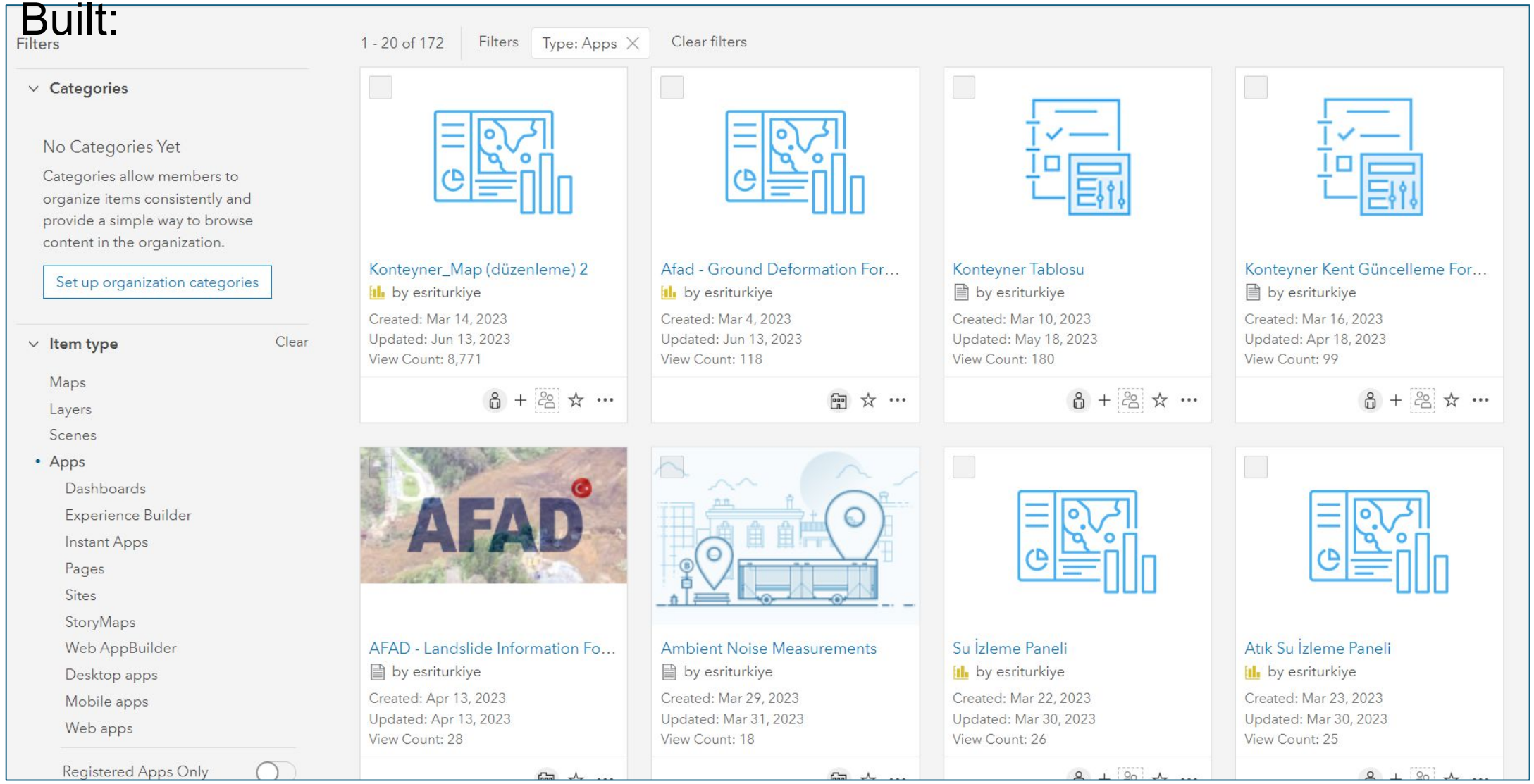


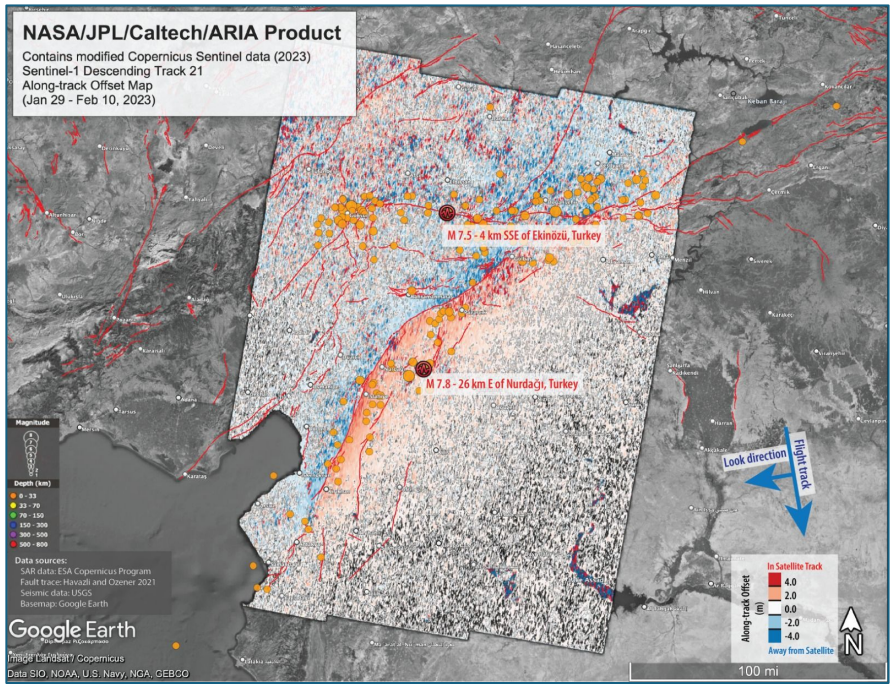
DASHBOARD for EMERGENCY MANAGERS

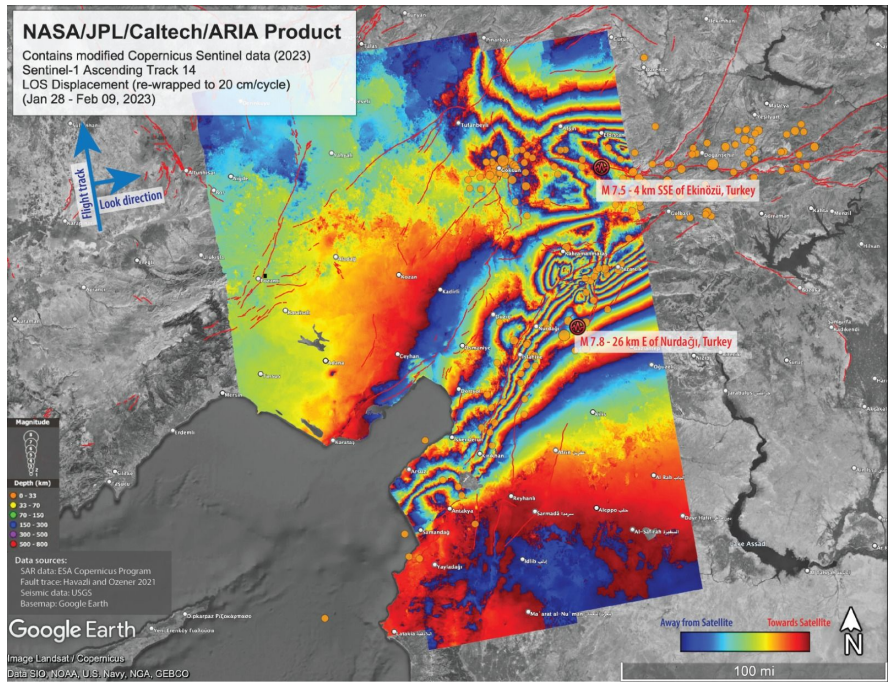
(monitoring field observations at the headquarter in Ankara)

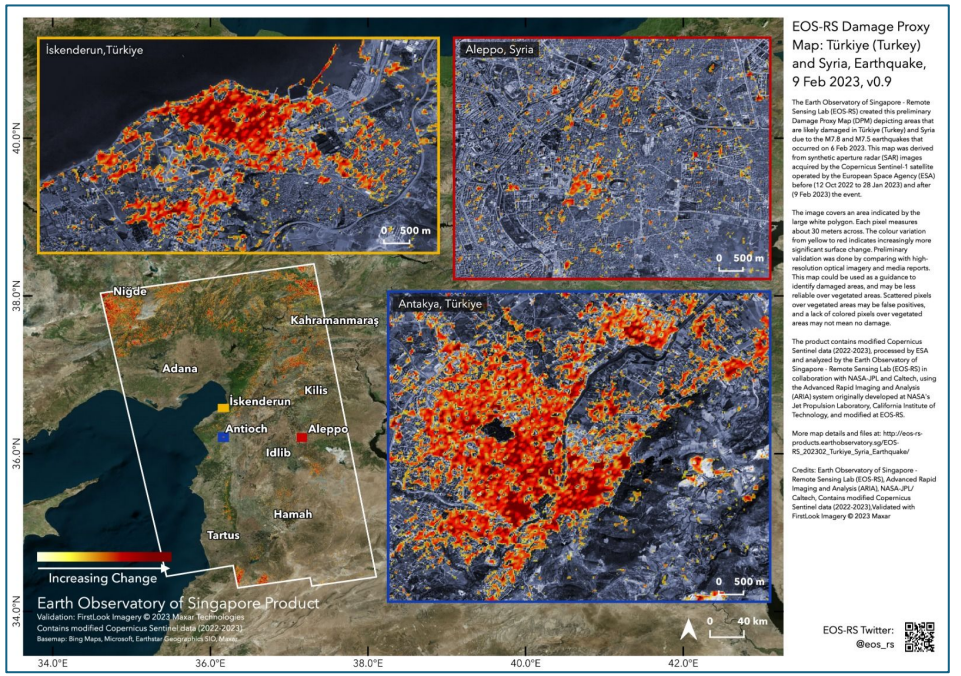


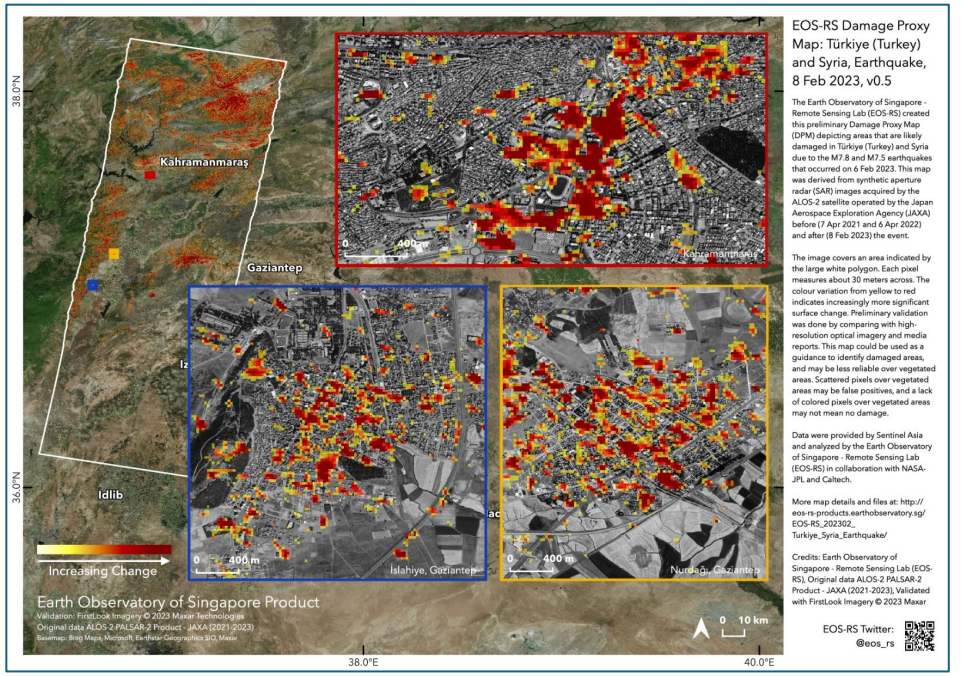
Examples of Forms Built:





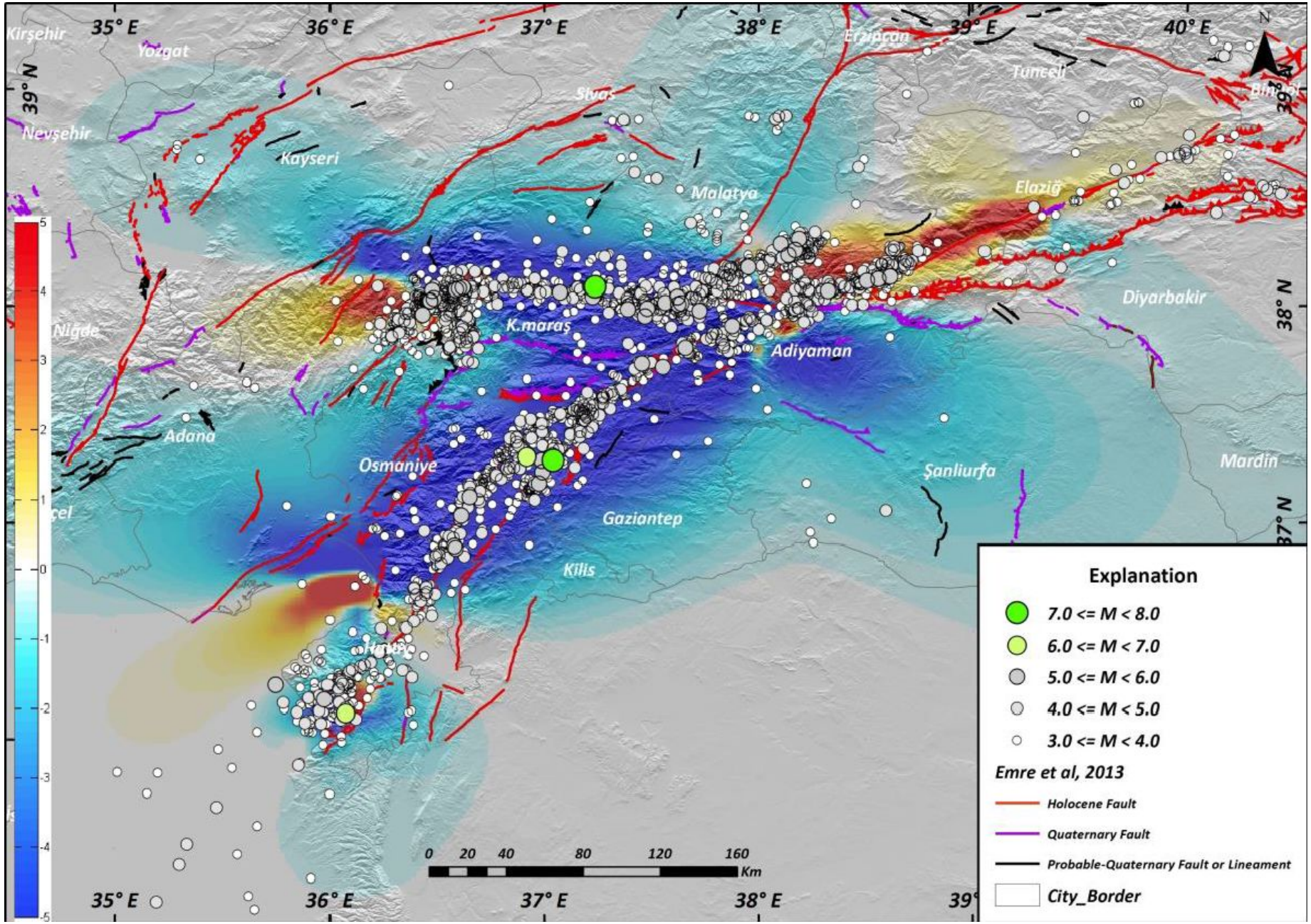






InSAR, SAR Products by ARIA-NASA and EOS-Singapor

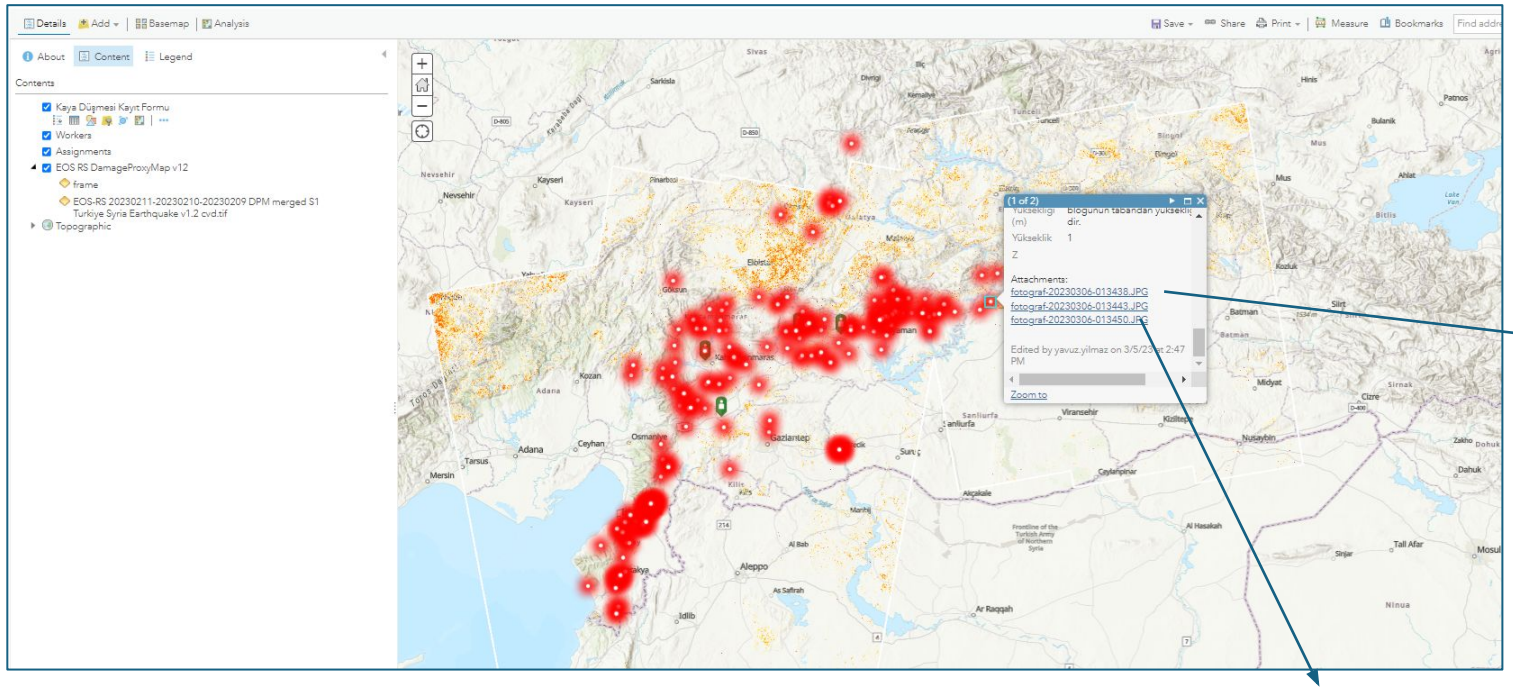
- Damage proxy maps served as basemaps for the field investigators (for example, landslides, rock falls in mountainous areas)



Coulomb Stress Failure Map after the 3 events with aftershock distribution

Coulomb Failure image from Temblor: https://temblor.net/earthquake-insights/gerilme-degisimi-hesaplamalari-2023-turkiye-depremlerinde-artci-soklar-icin-ipuclari-veriyor-14979/

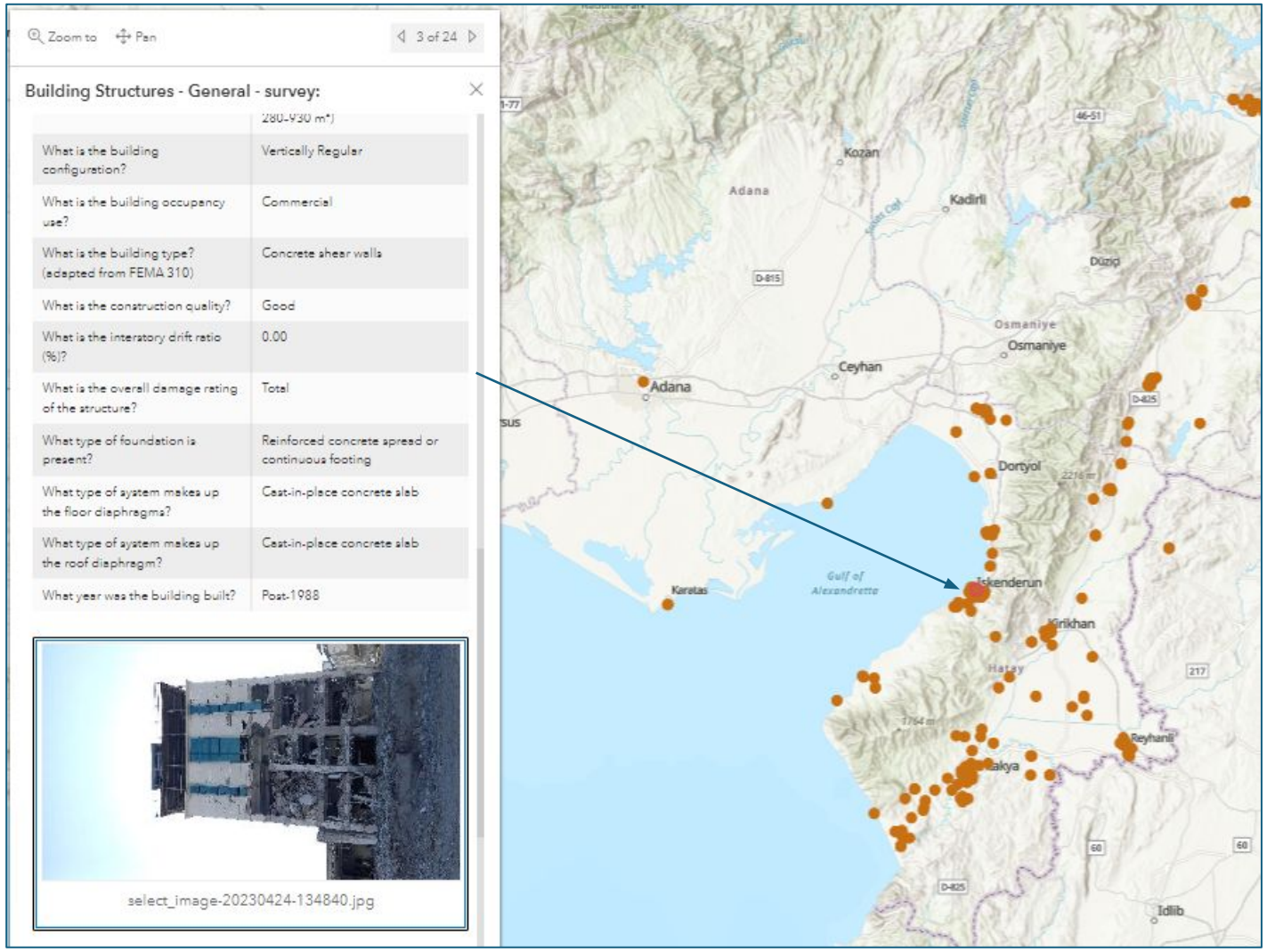
Rockfalls



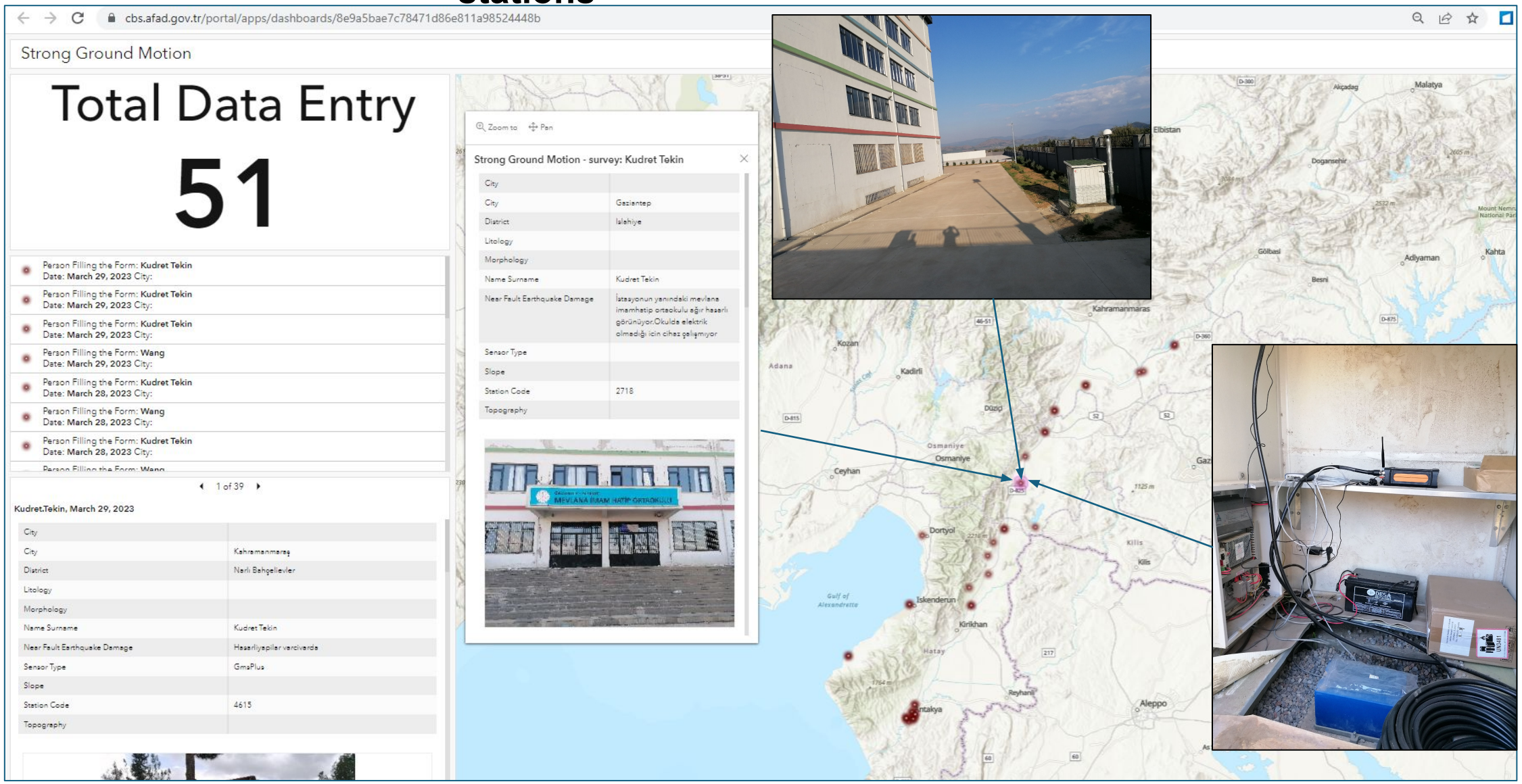
Background images:

- ESRI base maps
- Damage Proxy Map (provided by Sang-ho Yun)

Example of building observation by structural engineers



Conditions of strong motion stations



HOSPITALS visited by EERI-Hospitals Reconnaissance Team (led by Ali Sumer)

Total Data Entry

21

Person Filling the Form: **gordon.wray**
Date: 3/20/2023, 3:50 AM City: Gaziantep

Person Filling the Form: **gordon.wray**
Date: 3/20/2023, 3:45 AM City: Kahramanmaraş

Person Filling the Form: **gordon.wray**
Date: 3/20/2023, 1:21 AM City: Adana

Person Filling the Form: **ali.sumer**
Date: 3/19/2023, 10:42 PM City: Hatay

Person Filling the Form: **gordon.wray**
Date: 3/19/2023, 1:43 AM City: Kahramanmaraş

Person Filling the Form: **gordon.wray**
Date: 3/19/2023, 1:43 AM City: Kahramanmaraş

Person Filling the Form: **gordon.wray**
Date: 3/19/2023, 1:43 AM City: Kahramanmaraş

Person Filling the Form: **gordon.wray**
Date: 3/19/2023, 1:43 AM City: Hatay

Person Filling the Form: gordon.wray

1 of 21

3/20/2023, 3:50 AM

Date:	3/20/2023, 2:00 AM
Hospital Name:	Nurdagi
City:	Gaziantep
Hospital Type:	State
Number of Beds:	
Number of Stories:	3.00
Tagging Status:	
Lateral Force Resisting System:	Shear wall
Material of LFRS:	Concrete
Base Isolation System?	No
Year of Construction:	12/31/1, 2:10 PM
Current Operational Status:	Not functional
Did it ever lose function?	Yes
When did it lose function?	2/6/2023, 1:00 AM
How long did it take to restore function? (days)	1,000.00

Last update: 4 minutes ago

Zoom to Pan

survey:

In-patient service continued?	No
Out-patient service continued?	No
ER service continued?	Yes
Reason for closure?	
Other - Reason for closure?	
Did the hospital setup an outside emergency operation?	Yes
For how long?	7
Structural Damage Observed:	
Non-Structural Damage Observed (Architectural Component, MEP equipment, MEP Distribution System, Egress):	Day 1 - Emergency services provided on first floor Day 2 - Out patient services provided on first floor Day 10 - Clinic services provided on first floor
Life-line interruptions or damage?	

add_photo-20230320-134422.jpg

Last edited by gordon.wray on 3/20/2023, 3:45 AM.

LESSONS – TAKE HOME MESSAGE

- First time an Earthquake Clearinghouse officially established after a major disaster in Turkey.
- AFAD-EQ Clearinghouse managed to help earthquake recon teams from US (EERI, GEER), Chile, UK, France, Greece, Germany, Italy, Japan, China.
- ESRI-Survey123 and ArcGIS Enterprise tools (i.e., Dashboard, Workforce) effectively used
- Government support for the recon teams were provided through the EQ Clearinghouse
- Use Earthquake clearinghouse in virtual platform to share the information serving for the future earthquake studies and fast recovery.
- Use current technology and data available for the rapid response and collection of perishable data (liquefaction, damaged buildings/structures, mass movements ..);
- Include available data in the rapid data collection tools as background or base maps – for example, NASA-ARIA, USGS, EMSC, AFAD, KOERI products can be connected to the recon mobile app forms (make sure large images provided as zoom-leveled small-sized images.
- ESRI's support was tremendous – make sure technical GIS support is in the EQ Clearinghouse office (at least until EQ Clearinghouse members role the whole system)
- *Recommend*: Make sure senior person (has experience post disaster cases must lead) – or EQ clearinghouse leads must join EERI-GEER recon efforts after other damaging earthquakes around the world
- Helps countries develop future partnerships in disaster response (US, Greece examples)
- Same tools can be used for management of tent and container cities – perishable data collection starts at almost same time –ESRI ArcGIS Enterprise modules works very well almost all stages of post disaster responses – fast information support saves lives and help faster recovery – faster form making capacity allowed customized forms (i.e., detail forms for hospitals)
- Turkish Government started rebuilding cities, towns and villages in short time (2-3 months after the mainshock) – for this reason fast data collection by the earthquake professionals and researchers were shared daily with Urban Design and Development Department.
- These all need to be exercised! (as EERI offers one on Friday)

- Data sharing agreement (big lesson) (make sure your app has the disclaimer)
- GEER-USGS post earthquake slow communication process-must be reviewed (personal observation) (budget talk etc should be done way earlier, response team and their plan must be in hand) (specifically for large earthquakes and megathrust earthquakes?)
- EQ Clearinghouse early exercise – very important
- Drones were extensively used by the various recon teams
- ~500 researchers from Turkish Universities were deployed for recon - funded by TUBITAK – used only whatsapp for data transfer method, later working with EQ Clearinghouse Tubitak recovered entire data in ArcGIS system
- As a backup disk to secure the recon data was set by the AFAD; a disk space and folder system were reserved for each recon team funded by the TUBITAK (example platforms, Box, NetCloud)
- Physical EQ Clearinghouse were initiated in Ankara. Regional crises centers were informed. For this large area two earthquake clearinghouse were supposed to be established (AFAD provided all its staff for rescue operations and aids (rescue operations, food, shelter …)
- EQ CH open the all opportunities to build partnerships starting with regional countries (Greece and Europe) to form EQ CH centers in Europe, while Turkiye shares and improves its own.
- Earthquake CH initiation procedure were included in the AFAD Earthquake Emergency Response Plan just 1 month before the February 6th earthquakes – had no chance to practice
- So, I was the only one to coordinate this effort as a liaison

- This EQ CH effort initiates to close a gap in disaster management in Turkey – for lessons learned and providing essential information for recover and preparedness.

- Next need AFAD-EQ CH officially stat facilitating meetings and bringing stakeholders to work on the problems caused damages and loss of lives. The data collected from the recon efforts and stored in geospatial environment and reports provided must be analyzed and mitigation actions mast be built.

- Safety information provided to recon teams arrived in Ankara– which is critical support for everyone: Teams visited AFAD and met EQ Clearinghouse staff were given information about the region and culture – people in the region were in trauma, so the recon teams were informed the psychological form of the children and families.
- Safety tip for driving, mask use (aspestos problem), toilets (poartable), need of extra battery for the smart phones, and local AFAD office locations and contact phone numbers when they arrive in the region (AFAD local offices were main contact for the questions) .

Questions ?

Thanks to

- **AFAD Staff**: IT office, regional office leaders, driver (Cesur), earthquake department staff,…
- **Prof Dr. Sabri Erdil** (Asst. to Interior Minister)
- **Hasan Mandal** (President of TUBITAK)
- **Assoc. Prof. Duygu Yazici** (TUBITAK)
- **Prof Dr. Mehmet Celebi**, USGS
- **Prof Dr Hasan Sozbilir** (DEU-Izmir)
- **Assoc Prof. Song-Ho Yun**, (EOS-Singapor)
- **Volkan Sevilgen** (Temblor)
- **Maggie Ortiz-Millan** (EERI)
- **ESRI-TURKIYE** (providing all technical support and personel)
- **Corina Allen and Casey Hanell** - Washington Geological Survey