October 30, 2020
Aegean Sea Earthquake

Yer Çizenler

İzmir Field Response Activity Report

Contains the open and crowdsourced data efforts and their results coordinated with the TMMOB İzmir City Coordination Council following the earthquake on October 30, 2020 which caused damage to buildings and casualties in Izmir, Turkey.

October 30, 2020 Aegean Sea Earthquake

Field Activity Report

INTRODUCTION

On October 30, 2020, Friday 13:51 UTC, a 6.9-magnitude (M_w) earthquake occured 16.5 km deep at the Aegean Sea, off the shore from Samos Island, and 23 km away from Seferihisar, Izmir. Structural damage and casualties were experienced due to the 16-second-long tremors both at the Aegean Region of Turkey and the Northern and Southern Aegean Regions of Greece.

The magnitude of the earthquake was reported as 6.9 (M_w) by Kandilli Observatory and Earthquake Research Institute, 6.6 (M_w) by the National Disaster and Emergency Management Presidency (AFAD), 6.7 (M_l) by the Athens Geodynamics Institute, and 7.0 (M_w) by the United States Geological Survey (USGS). The earthquake had also caused the first ever recorded tsunami in the country. Following the earthquake, 3,550 aftershocks have been recorded, the greatest being a 5.2-magnitude (M_w) one.

Due to the earthquake, there were 116 casualties and 1034 injuries, including the country's first casualty in history due to a tsunami. Multiple buildings have collapsed or got damaged, majority being in Bornove and Bayraklı regions. Additionally, there were 2 casualties and 19 injuries reported in Greece.
(Source: Wikipedia)

Yer Çizenler team, within the hours following the event, have coordinated an emergency meeting and had got in touch with the Chamber of Survey and Cadastre Engineers (CSCE) in İzmir, offering help with their experience on open data collection and management tools in the response and recovery activities of the City Coordination Council (CCC) formed by the Union of Chambers of Turkish Engineers and Architects (UCTEA) in İzmir. With the support of the global OpenStreetMap community through Humanitarian OpenStreetMap Team (HOT), majority of the existing building stock has been mapped in the Izmir city center and Seferihisar, and more than 1000 crowdsourced damage reports have been inspected in the field by the Chamber of Civil Engineers (CCE) İzmir branch.

We are hoping that the crowdsourced datasets to emerge from these efforts would be a valuable resource for the future studies of academia and other professional organizations on analysis, recovery and preparedness for potential future events.

COORDINATION

NATIONAL

UCTEA İzmir City Coordination Council (CCC)

İzmir CCC, formed by professional chambers within the Union of Chambers of Turkish Engineers and Architects (UCTEA) which have registered branches in İzmir, has decided to take part in the damage assessment and recovery efforts following the earthquake. Yer Çizenler had also joined these efforts on the field after the offer of support via CSCE İzmir had been accepted by the CCC.

Following the meeting in the morning of October 31, it was decided to organize a field mission to document the collapsed buildings and to develop a web-based form for the CCC to crowdsource building structural damage information.

At the press release on November 1, 2020, the preliminary report had been shared and a call to the public was made to report building structural damage and immediate needs via izmirdepremi.ushahidi.io.

As a result of the coordination meeting on November 6, 2020, four sub-committees were formed to support the data efforts. The sub-committees and their duties are as follows:

- **Call Center:** This sub-committee was formed to reach out back to the public to ensure the information flow via phone based on the building damage and needs form submissions.
- **Data Entry:** Was formed to convert information from auxiliary mediums into data forms and submit to the system.
- **GIS and Data Visualization:** Was formed to carry out the production, control and update efforts for the spatial data and resulting map products to be used in reports, press releases etc., and the validation of the address and location information of the crowdsourced building damage and needs reports.
- **Field Activities:** This sub-committee was formed to visit the reported buildings on the field in order to assess the structural damage.

The professional chambers within the coordination council has shown the courtesy of allocating a portion of their presentation time slot to Yer Çizenler in the “Izmir Earthquake Shared Wisdom Gathering”, organized by the Izmir Metropolitan Municipality, attended by NGOs, professional chambers and political actors nationwide.

The damage assessment and validation activities on the field are still being conducted by the CCE and their findings will be disclosed in the future as well. The CCC activities and reports can be accessed via http://www.tmmobizmir.org/ in detail.

ITU CSCRS

In November 1, the Center for Satellite Communications and Remote Sensing (CSCRS) within Istanbul Technical University (ITU) has shared high-resolution Pleiades satellite imagery in dated October 31 through a WMTS server with Yer Çizenler, in order to support the mapping, data improvement and validation efforts of the CCC (Figure- 1).

The imagery was used as a reference base in the validation efforts of Yer Çizenler and CCC GIS sub-committee, and also in OpenStreetMap mapathons.

Figure -1: Hi-resolution Pleiades imagery of October 31, 2020 (İTU-CSCRS).

International

Humanitarian OpenStreetMap Team (HOT)

Humanitarian OpenStreetMap Team (HOT), an international organization within the global OpenStreetMap community which Yer Çizenler is partnering with, had gotten in communication with our team through its disaster team for mapping support after the news of the earthquake had reached them. After discussions and the establishment of field coordination with the İzmir CCC, HOT had gone into disaster activation phase and set up mapping tasks for buildings, prioritizing the most severely hit Bayraklı and Bornova regions, and the Sığacık region affected by the tsunami, calling for help from the global OpenstreetMap community.

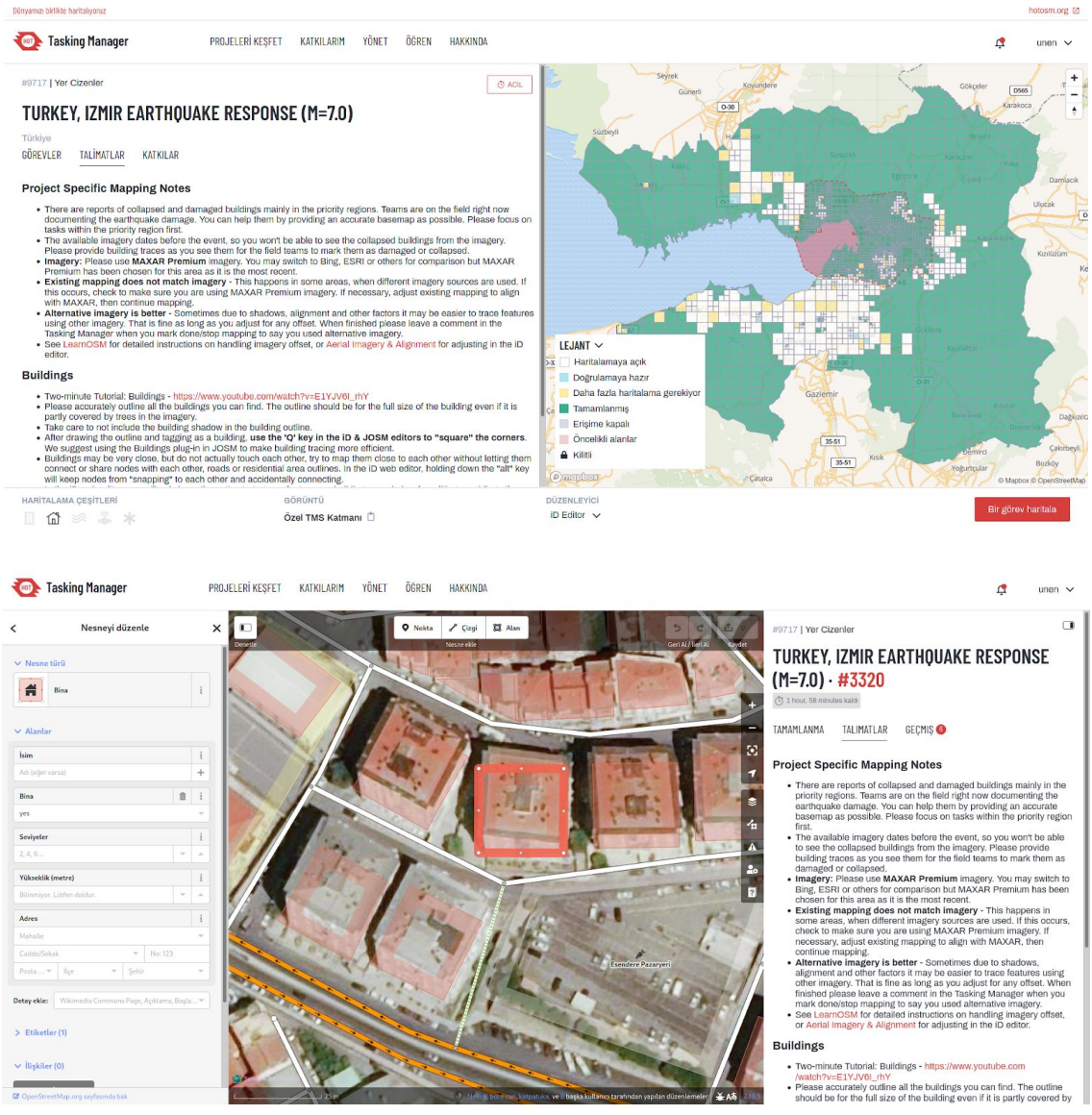

Figure - 2: HOT Tasking Manager, Project #9717 screenshots.

Over 300 people have contributed to the mapping projects #9717 and #9718 (Figure - 2) over the HOT Tasking Manager to date, and continuing to. You can reach the projects and contribute to the completion of Izmir's building stock on OpenStreetMap via the following links:

- tasks.hotosm.org/projects/9717
- tasks.hotosm.org/projects/9718

If you are not a registered OpenStreetMap contributor, but want to learn how to, you can start with the tutorials on learnosm.org and refer to the OSM Wiki in order to access information about OpenStreetMap data standards.

Maxar

Through HOT's communication tools in which the international humanitarian OpenStreetMap community is coordinating, members of Maxar Technologies, a global satellite imagery provider, had been reached to request the release of the post-event imagery of the earthquake region. Maxar, accepting the request, has released the high resolution satellite imagery related to the Aegean Sea Earthquake to the public as part of their Open Data Programme, and also uploaded to OpenAerialMap to facilitate access within OpenStreetMap editors (Figure - 3).

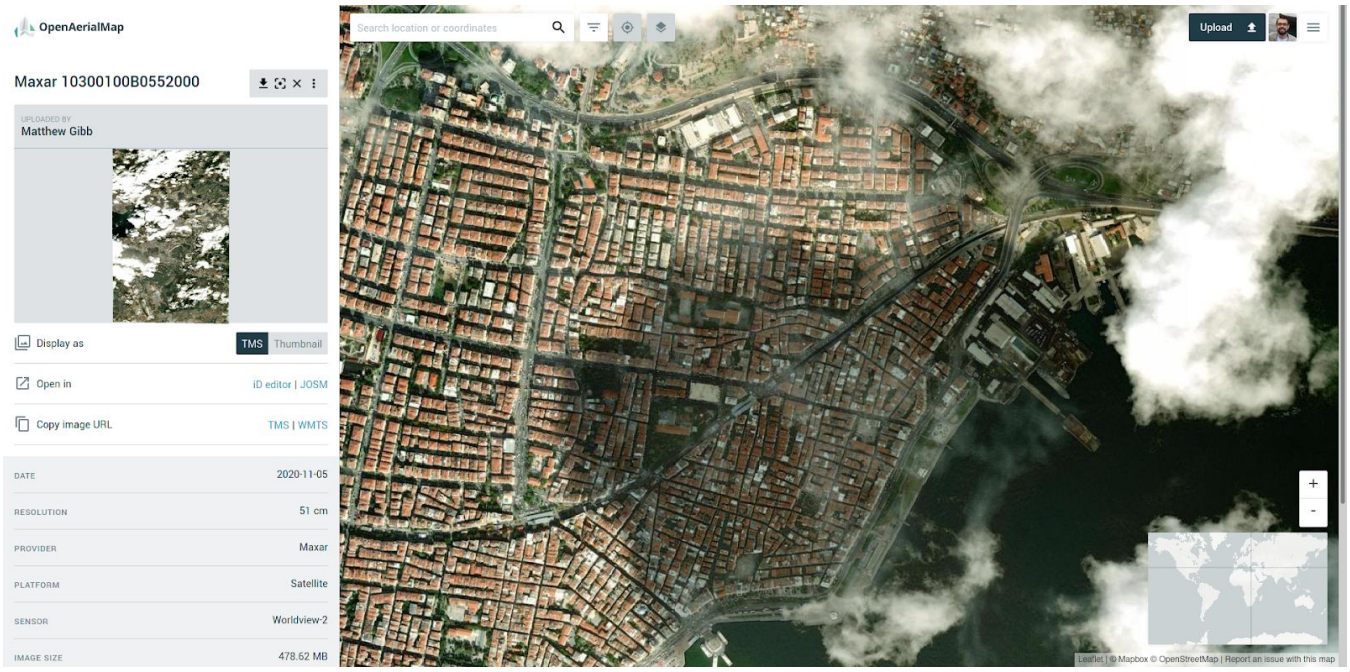

Figure - 3: Post-event satellite imagery of Izmir (Maxar).

OSM-GR

Following the earthquake, Yer Çizenler team reached out to their contacts within the OpenStreetMap contributors in Greece, asked about the effects of the earthquake in Greece, and offered co-activation if any mapping requests in Greece were present. The community members, who have told that the damage in Greece was significantly low compared to Turkey and that there was no need for activating, stated their willingness to support the mapping efforts in Turkey.

ACTIVITIES

Field Activities

In the morning of October 31, Yer Çizenler field team had arrived in İzmir and met with the CCC field volunteers. The volunteer team of 25 people were briefed on OpenDataKit (ODK), OpenMapKit (OMK) ve Mapillary for the collection of collapsed or partially collapsed buildings (Figure - 4). The field teams have collected data via ODK/OMK and the high-resolution street-level imagery surroundings of the collapsed buildings were collected via Mapillary.

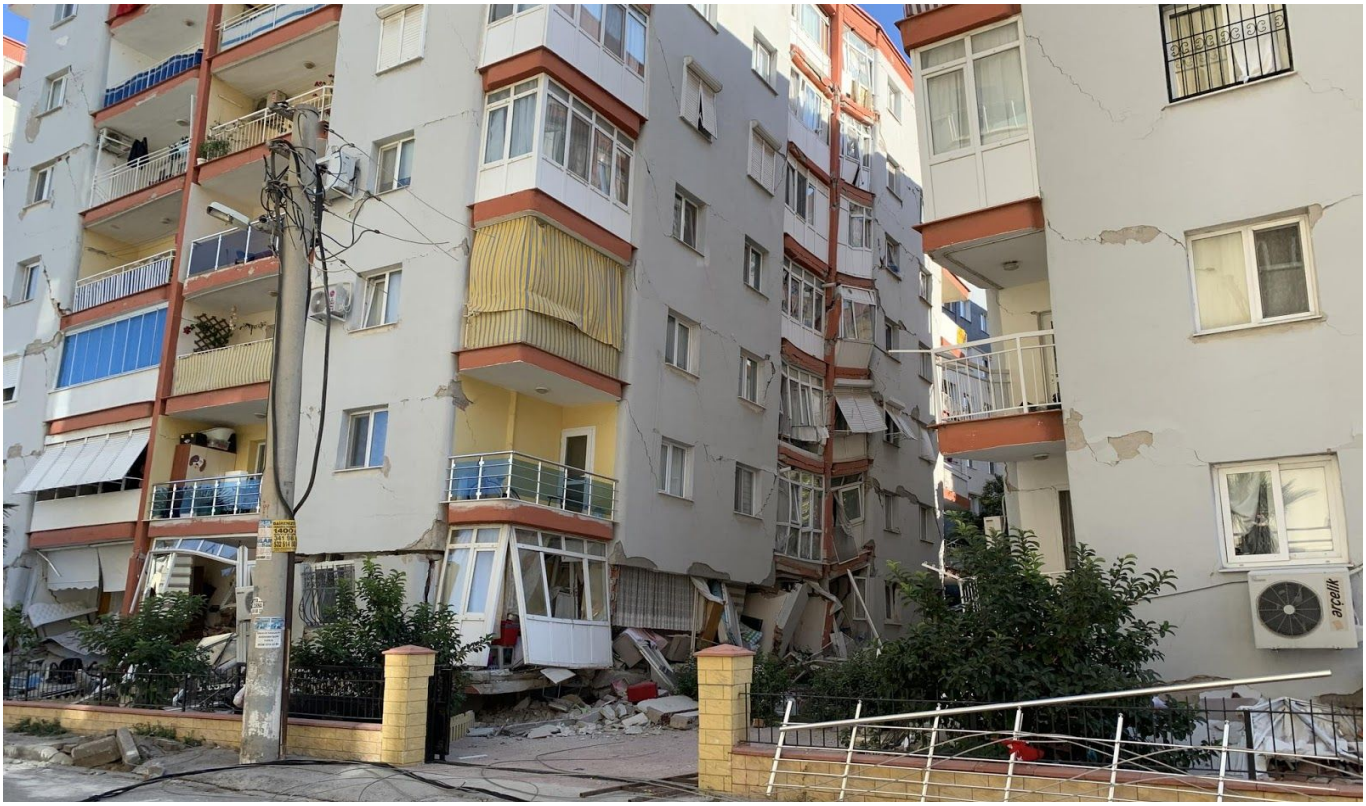

Figure - 4: A partially collapsed building in Bayraklı region.

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In the morning of November 1, Yer Çizenler team visited the Sığacık marina region which was affected by the tsunami for reconnaissance. With the use of smartphones, the high-resolution street-level imagery of the marina region were collected and uploaded to Mapillary servers (Figure - 5).

Figure - 5: Post-event street-level imagery of Sığacık on Mapillary.

In the following weeks, workshops were held with the GIS and data visualization sub-committee in order to improve their skills on usage and management of tools like Ushahidi and uMap which were utilized in the data collection and visualization efforts. In addition, a survey form for ODK was built for the field volunteers coordinating within the CCE in order to physically visit the buildings reported by the public and assess their damage states. The field study in which the volunteers are validating the damage assessments was still ongoing at the time of writing, and the results will be disclosed by CCE to the public when finished.

Online / Remote Activities

The London Missing Maps community had chosen to contribute to the İzmir tasks via the Tasking Manager on their community mapathon held on November 3. During the event where the Yer Çizenler team also attended, numerous contributors in different levels of experience had contributed to the efforts of Yer Çizenler and the CCC by digitizing over 4000 buildings in the region.

On November 4, an online mapathon was held with the attendance of about 40 students from the Civil Engineering Department of MEF University. During this event which took part within the Geomatics class, students had contributed to the building datasets of İzmir and Seferihisar.

On November 8, over 7500 buildings were digitized in OpenStreetMap by 23 people as a result of a mapathon attended by the UCTEA CCC, Chamber of City Planners (CCP), Chamber of Environmental Engineers (CEE), Chamber of Survey and Cadastre Engineers (CSCE), Chamber of Civil Engineers (CCE), and Chamber of Architects (CA) İzmir branches (Figure - 6).

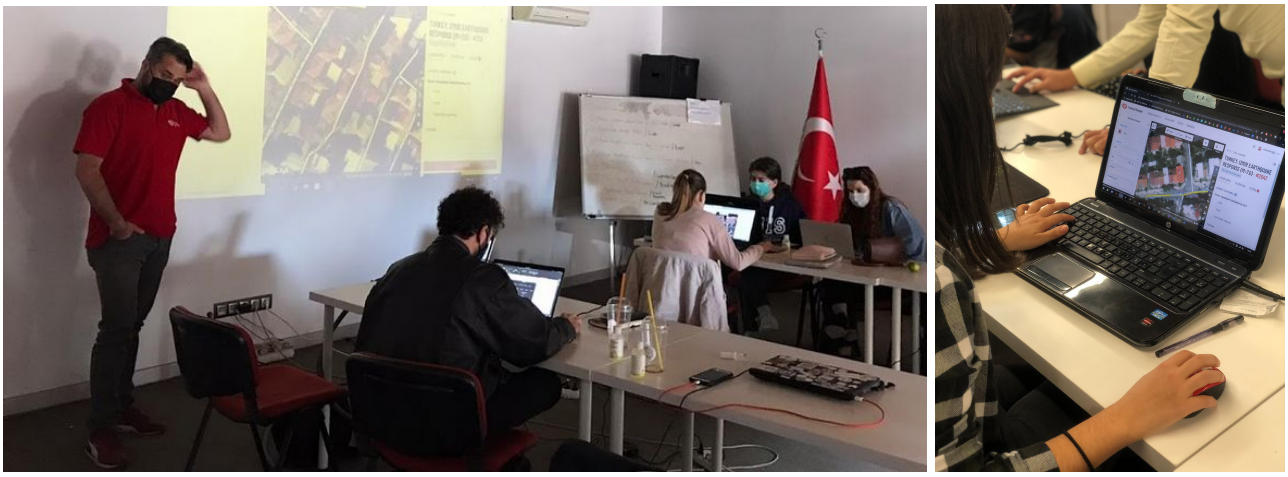

Figure - 6: Izmir professional chambers' mapathon.

The Women's Working Group of the UCTEA CCC gathered on Wednesday, November 11 for an online mapathon with the attendance of Yer Çizenler members Tuğçe Yıldız and Arzu Ece Atila. 11 attendees had been informed about OpenStreetMap and Yer Çizenler's activities, and over 200 buildings were mapped at the end of the event.

11 volunteers from the Open Source Volunteering Program of the Youth Season Association have contributed to Yer Çizenler's mapping projects on the Tasking Manager on November 12, adding more than 2000 buildings to the OpenStreetMap database.

Yer Çizenler team has attended the WikiTuesday meetings of the Wikimedia Turkey User Group in the evening of November 17, and conducted an online mapathon as part of the OSMGeoWeek. 61 contributors have added over 3000 buildings to OpenStreetmap during the event.

DATA TOOLS / MAPS

Just after the event, before coordinating with CCC and HOT, a map of emergency gathering areas of İzmir via uMap (Figure - 7) with the help of Yer Çizenler members and volunteers, visualizing the data from the İzmir Governorship Disaster and Emergency Management Directorate (AFAD). Visualizing the originally tabulated datasets on a map was thought to be useful for the public to be able to access the information on the nearest emergency gathering areas. The map can be accessed via this link.

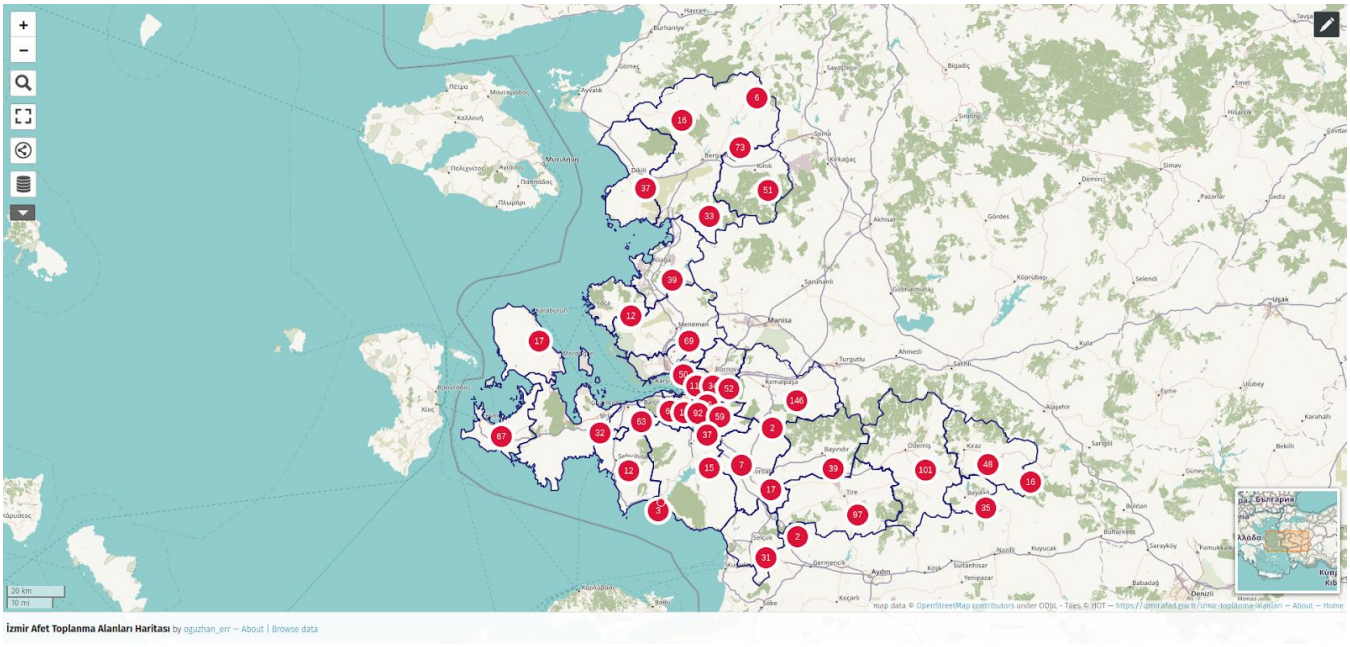

Figure - 7: İzmir emergency gathering areas map.

In order to be utilized in the field campaign on October 31, Saturday, focusing on the determination of collapsed buildings, survey forms were built (Figure - 8) using OpenDataKit (ODK) and OpenMapKit (OMK) and shared with the field teams. Tags and attribution such as address, load-bearing system, number of floors, soft storey, damage state etc. were collected in compliance with the OSM community standards and uploaded to the database at the end of the campaign. The data can be accessed via Overpass.

At the end of the field campaign, the collected data was shared with the public via one online and one offline map (Figure - 9). The offline map was featured in the preliminary earthquake investigation report compiled by UCTEA CCC, and shared via a press release. The online map prepared on uMap was again shared by the CCC via their web site and social media channels.

Izmir_Bina .XLSX

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	A	B	C
1	**list name**	**name**	**label**
2	bina_tags	addr:city	Şehir
3	bina_tags	addr:district	İlçe
4	bina_tags	addr:street	Sokak/Cadde
5	bina_tags	addr:housenumber	Bina Numarası
6	bina_tags	building:structure	Bina Taşıyıcı Sistem Tipi
7	bina_tags	building:prefabricated	Bina prefabrik mi?
8	bina_tags	building:levels	Çatı ve bodrum hariç kat sayısı
9	bina_tags	building:levels:underground	Bodrum kat sayısı
10	bina_tags	roof:levels	Çatı kat sayısı
11	bina_tags	building:adjacency	Yapı Nizamı
12	bina_tags	building:irregularity	Yapısal Düzensizlik
13	bina_tags	building:soft_storey	Yumuşak Kat
14	bina_tags	source	Kaynak
15	bina_tags	earthquake:damage	Deprem Hasar Durumu
16	bina_tags	tsunami:damage	Tsunami Hasar Durumu
17			
18			
19	addr:city	İzmir	İzmir
20			
21	addr:district	Akçaada	Akçaada
22	addr:district	Aliağa	Aliağa
23	addr:district	Balçova	Balçova
24	addr:district	Bayraklı	Bayraklı
25	addr:district	Bayındır	Bayındır
26	addr:district	Bergama	Bergama
27	addr:district	Beydağ	Beydağ
28	addr:district	Bornova	Bornova
29	addr:district	Buca	Buca
30	addr:district	Çeşme	Çeşme
31	addr:district	Çiğli	Çiğli
32	addr:district	Dikili	Dikili
33	addr:district	Foça	Foça

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Figure - 8: ODK form content for the field data collection.

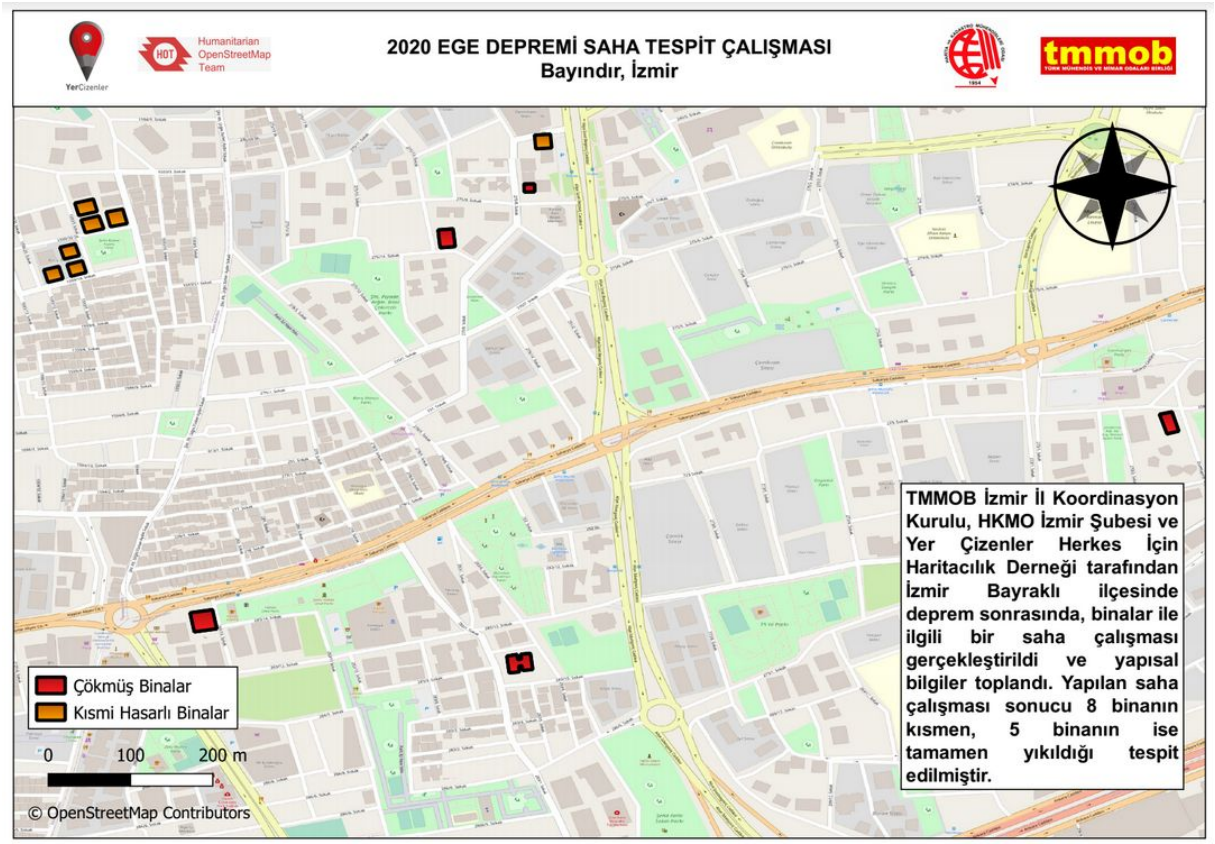

Figure - 9: Map of collapsed buildings due to the earthquake..

A Ushahidi deployment was set up in order for the public to report structural damage and immediate needs to the CCC: izmirdepremi.ushahidi.io (Figure - 10). Through the forms within the deployment which also showed the emergency gathering areas in İzmir, residents of İzmir have reported buildings they thought to be damaged and their immediate needs in their neighbourhoods to the CCC. 1183 submissions were made through the forms, with some duplication. You can visit izmirdepremi.com in order to access the reports and maps using these datasets, prepared by the CCC and Yer Çizenler (Figure - 11).

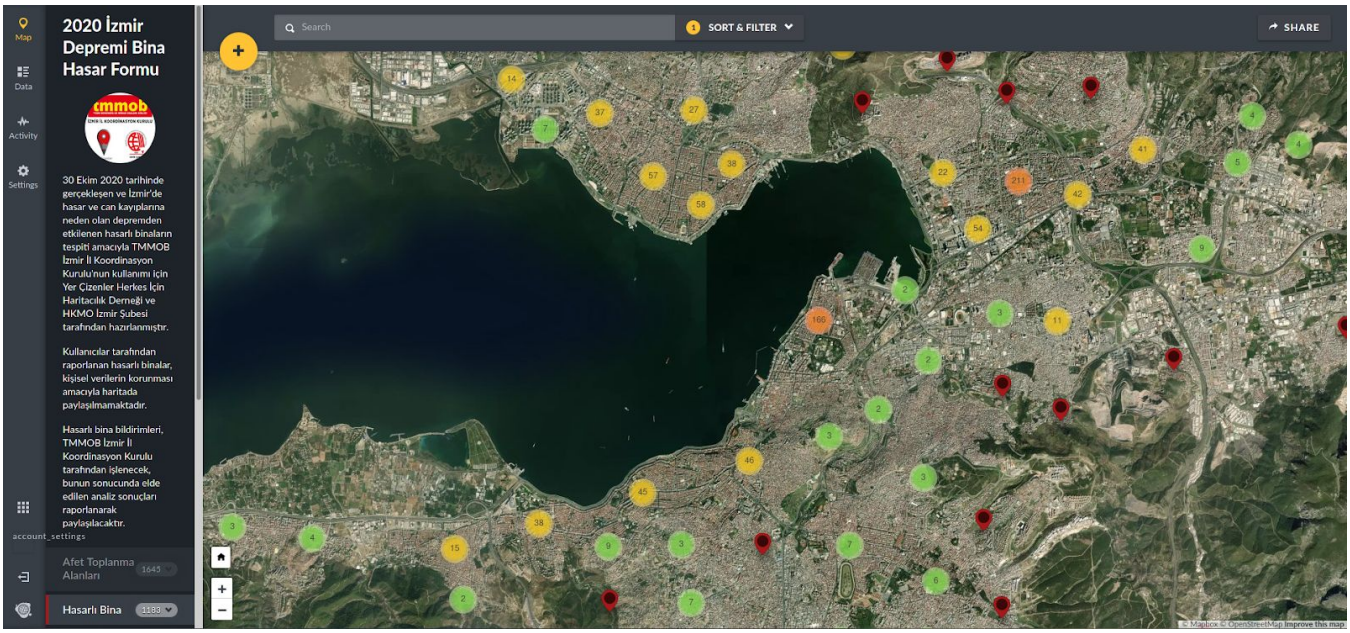

Figure - 10: Landing page of the Ushahidi deployment prepared for UCTEA-CCC.

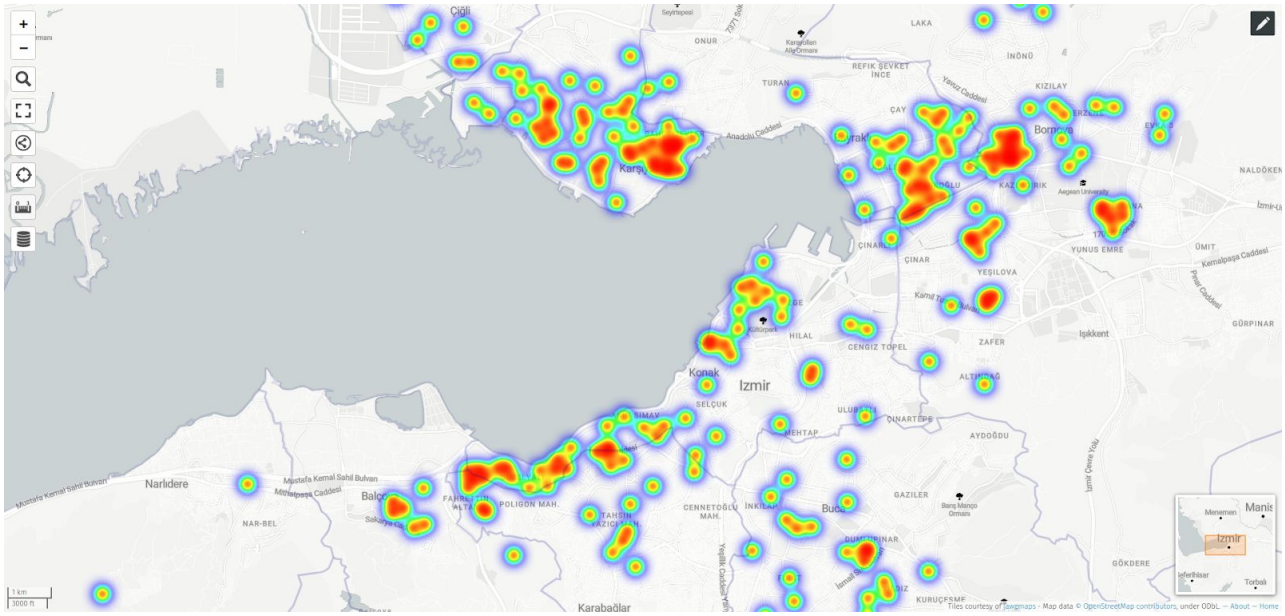

Figure - 11: Density map for the structural damage and needs reported to UCTEA-CCC.

Volunteers coordinating within the İzmir branch of the CCE are still on the field and continuing to visit the reported buildings in order to assess and verify the structural damage through the survey forms. The visual inspection and damage assessment forms used by CCE were converted into ODK survey forms (Figure - 12) and shared with CCE in order to facilitate the data collection and verification process of the field teams. The structural damage data to be collected as a result of the detailed field inspections will be used in technical and academic studies and the outcomes will be published.

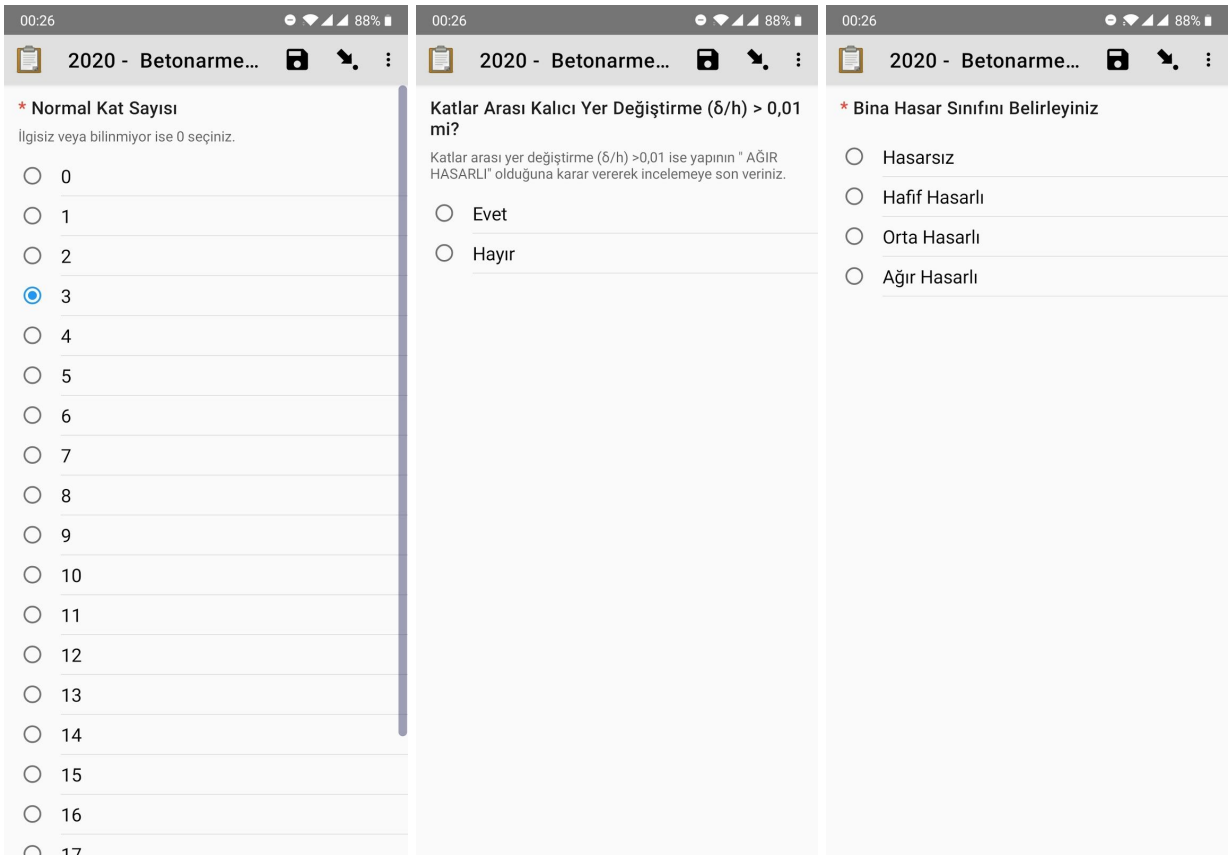

Figure - 12: Sample screens from the ODK deployment utilized by the volunteers of CCE İzmir.

RESULTS AND DISCUSSION

The activities and efforts mentioned in this report, and their outcomes have emphasized the importance and effectiveness of free and community-based data efforts in emergencies, and the effectiveness of the free and open source tools utilized in those processes. The said tools were utilized quickly and easily in a time where decision-making processes must be swiftly turned into action, and met the requirements of the coordination teams throughout.

The involvement of a large community consisting of skilled individuals within the OpenStreetMap ecosystem in the efforts by providing data, tools, technology, and mapping support had made it possible to carry out the coordination efforts in a fast and effective manner.

The resulting efforts highlight an efficient data collection and reporting process which can be repeated for similar potential future disaster or emergency situations. In addition, Yer Çizenler has proved to be in a capacity to fully participate and coordinate in situations of this level with its members and volunteers, and is ready to support the actors on crowd-based open mapping and data efforts in the future if requested.

With our sympathies and condolences to İzmir...

Yer Çizenler Mapping for Everyone Association
İstanbul, December 2020

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Alara Selen Özgen
Murat Tülek
Ceren Gamze Yaşar
Yer Çizenler and Youth Season Volunteers

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