EARTHQUAKE RECONNAISSANCE USING SOCIAL MEDIA (SM) & CROWDSOURCING PLATFORMS

LEARNING FROM EARTHQUAKES (LfE): BUILDING RESILIENT COMMUNITIES THROUGH EARTHQUAKE RECONNAISSANCE, RESPONSE AND RECOVERY

Tools and methods for post-disaster reconnaissance missions

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OUTLINE

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  - 2020 Aegean earthquake
- Results
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  - 2020 Aegean earthquake
- Post-disaster recovery
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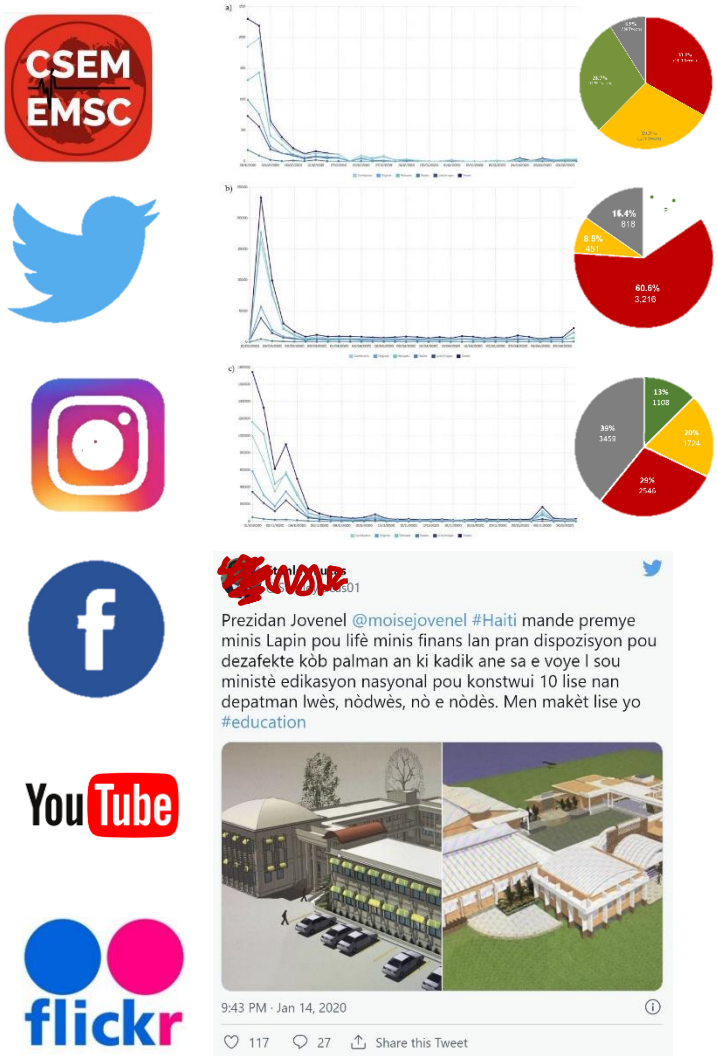
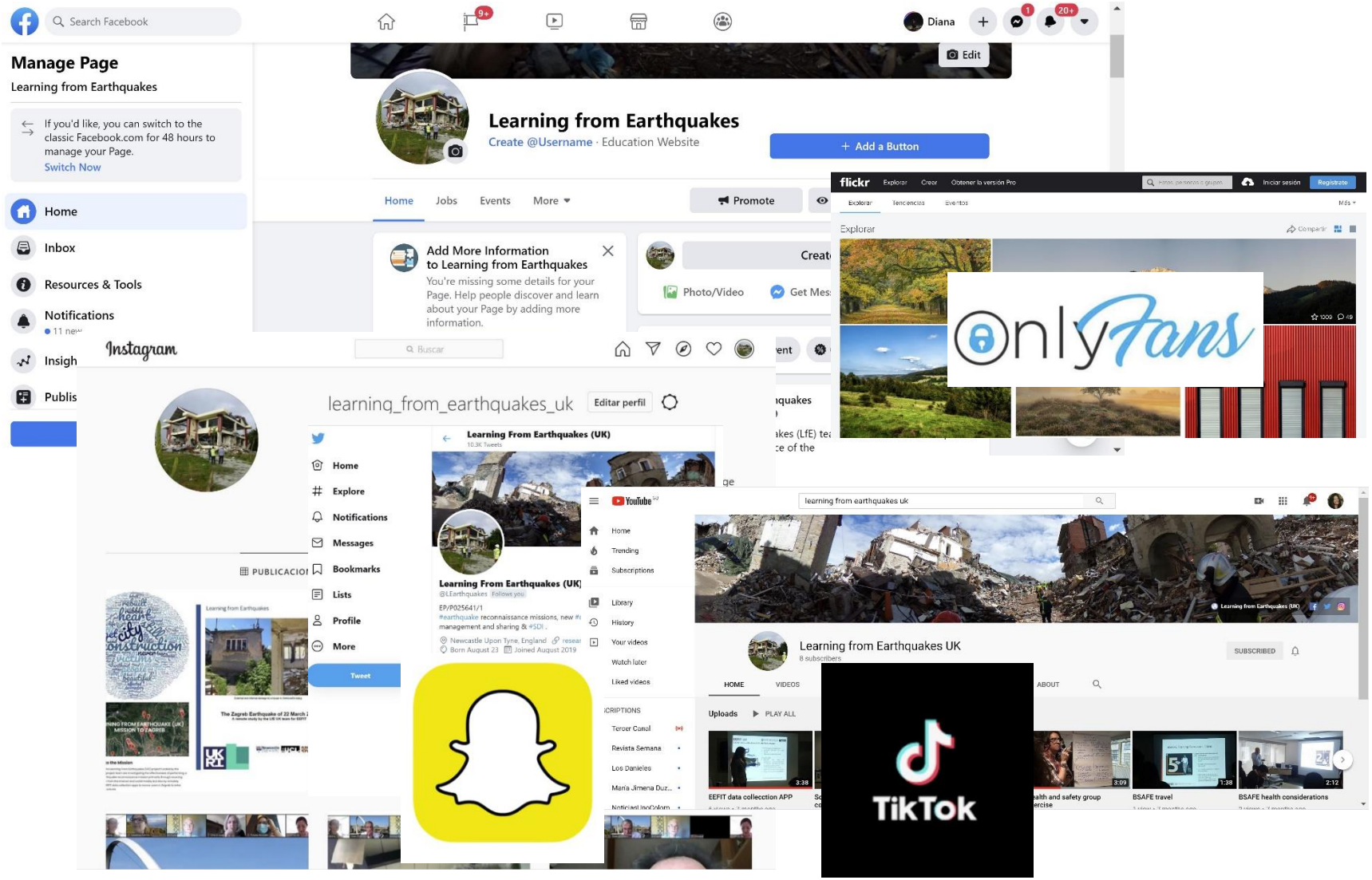
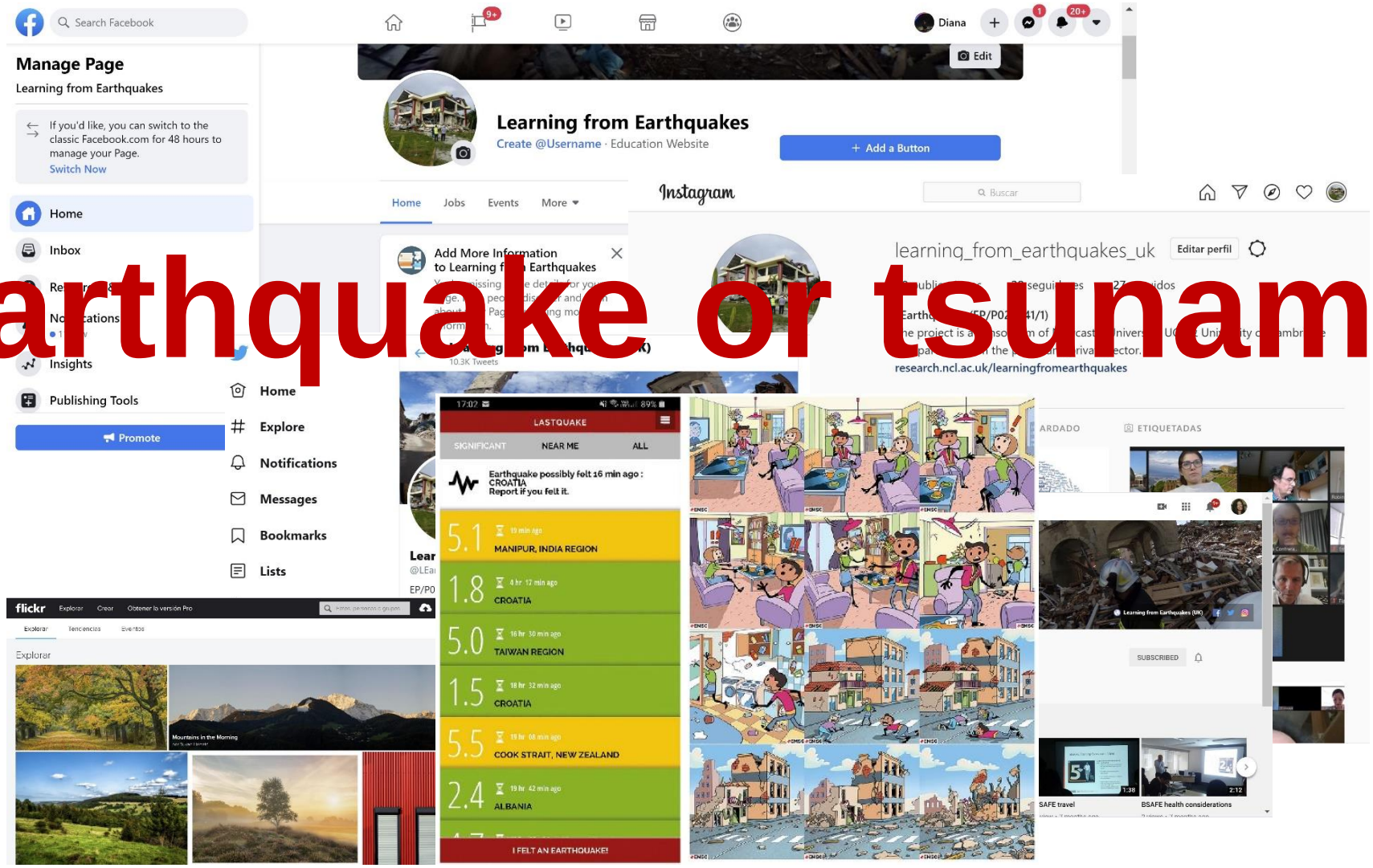
- Future developments



Motivation


Search Facebook
Manage Page
Learning from Earthquakes
If you'd like, you can switch to the classic Facebook.com for 48 hours to manage your Page.
Switch Now
Home
Inbox
Resources & Tools
Notifications
Insigh
Publis
Learning from Earthquakes
Create @Username · Education Website
+ Add a Button
Edit
Home
Jobs
Events
More
Promote
Add More Information to Learning from Earthquakes
You're missing some details for your Page. Help people discover and learn about your Page by adding more information.
Photo/Video
flickr
Explorar
Iniciar sesión
Registrate
OnlyFans
Instagram
learning_from_earthquakes_uk
Editar perfil
Learning From Earthquakes (UK)
Home
Explore
Notifications
Messages
Bookmarks
Lists
Profile
More
Tweet
YouTube
learning from earthquakes uk
Trending
Subscriptions
Library
History
Your videos
Watch later
Liked videos
Learning from Earthquakes UK
SUBSCRIBED
HOME
VIDEOS
ABOUT
Uploads
PLAY ALL
EEFIT data collecction APP
BSAFE travel
BSAFE health considerations
TikTok

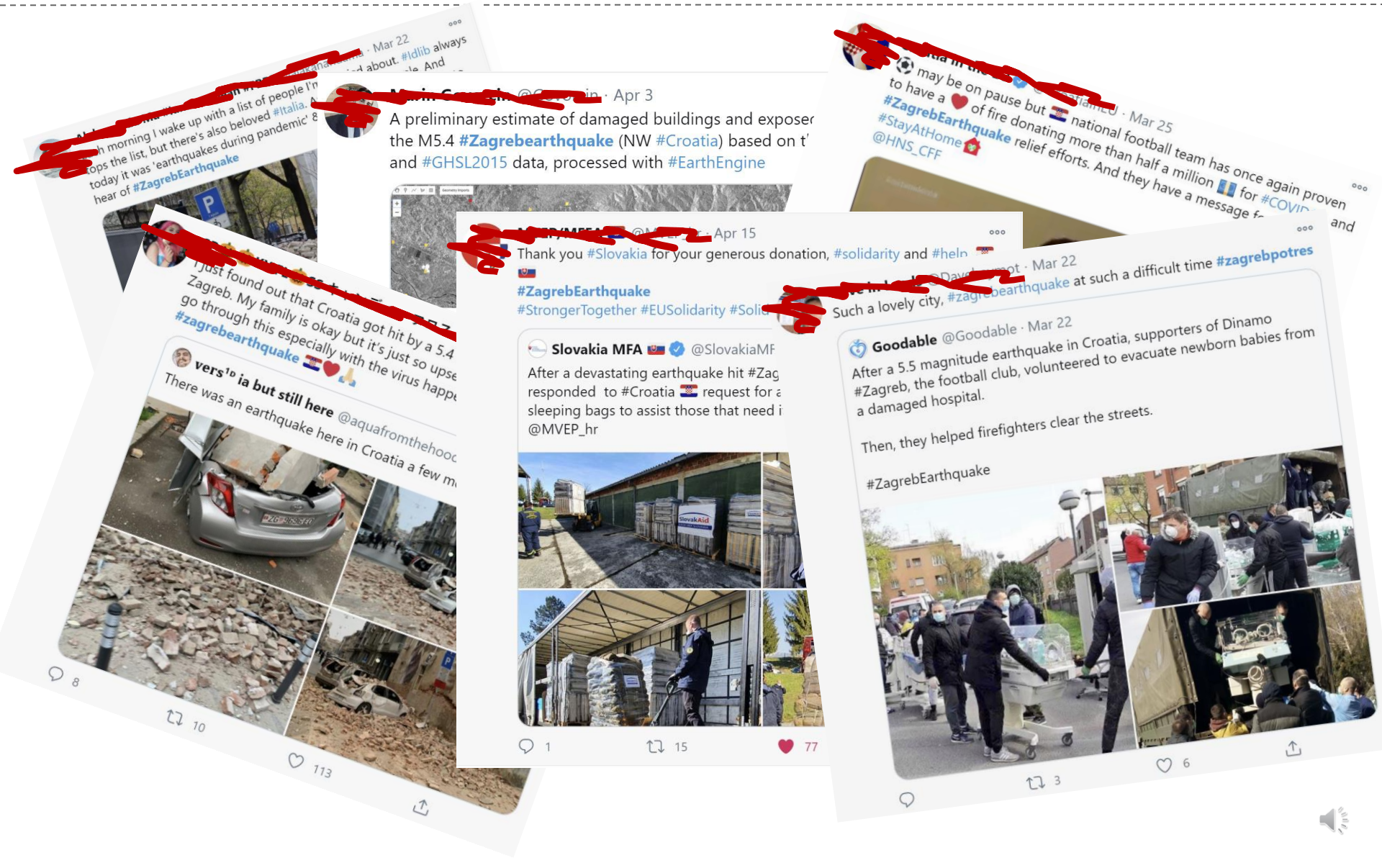
Motivation



earthquake or tsunami

Motivation

Newcastle University
UK | Malaysia | Singapore



Motivation

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DATA DRIVEN DECISIONS

Emergency response

Firefighters assist a person affected by the earthquake in Zagreb, Croatia
https://www.bibliatodo.com/En/christian-news/strong-earthquake-shakes-croatia-amid-quarantine-we-face-two-crises/

Post-disaster recovery

L'Aquila, Italy. Photo: Dr Diana Contreras

Earthquake reconnaissance

Christchurch, New Zealand

PDNA

Temporary shelter in Bogota DC, Colombia. IDIGER

Preparedness

Search and Rescue (SAR) training. IDIGER

Background

SOCIAL MEDIA & CROWDSOURCING PLATFORMS

Image

Text

The house really moved. Feel this one was the strongest since the big one. I felt very light. It was pretty violent, but it was short. It woke me up from my sleep. I was afraid it would continue. I tried to create the triangle of life next to the sofa. Not in motion yet. I heard [illegible] cracking [illegible] if it was because of the earthquake. Everything rattled for a few seconds. The cracks in our walls are getting bigger... Yep felt that one too. Short but strong 10:34 am Kuşadası - kadinlar Sea Mah. Happened 2 times. It woke me up. It took about 7 seconds..

INFORMATION

Background

EMERGENCY RESPONSE & EARLY RECOVERY ASSESSMENT

chimney
have
owerful

Sentiment Analysis (SA)

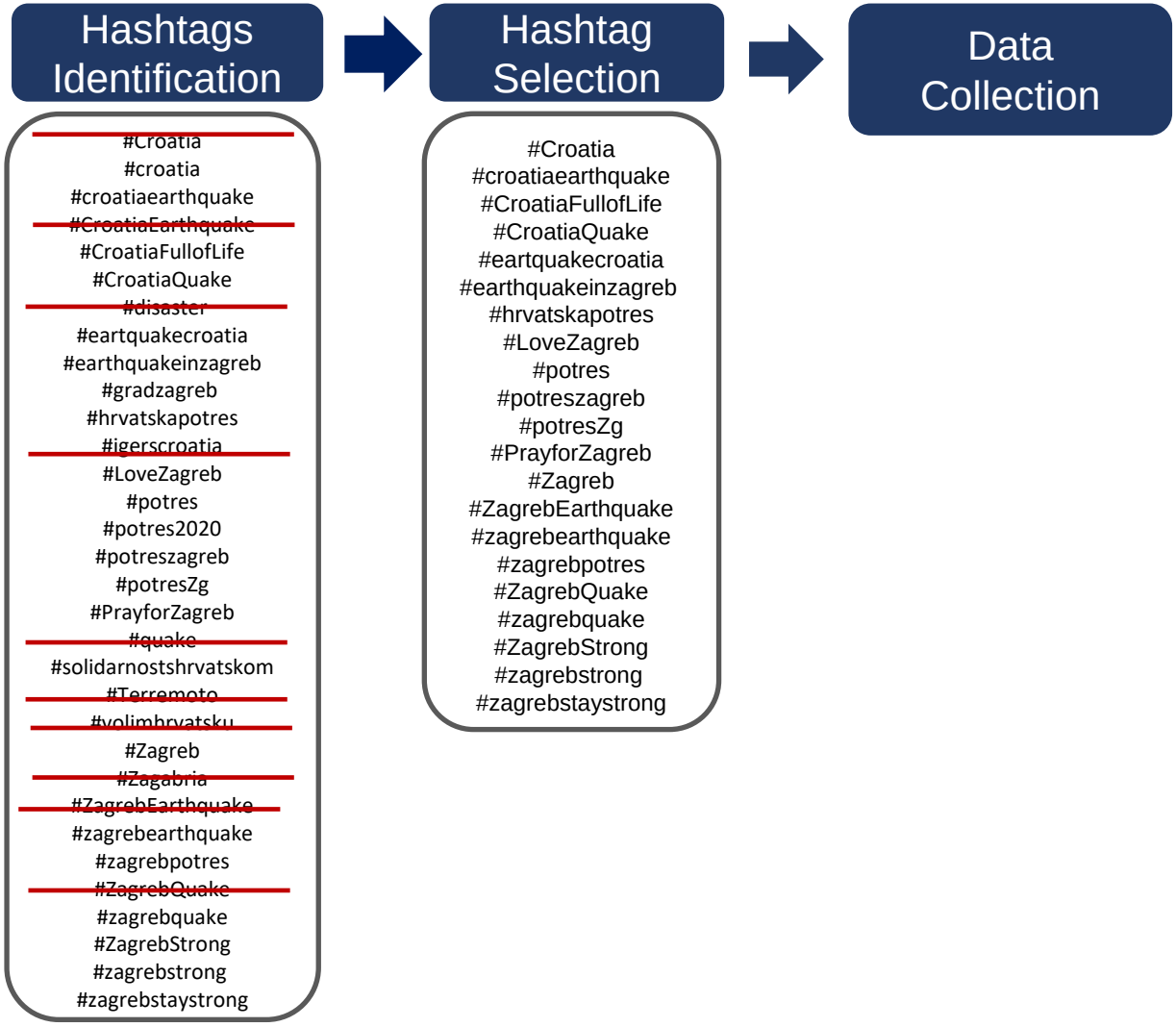
Polarity

- Positive
- Neutral
- Negative
- Unrelated

Topic Analysis

- Building damage
- Geotechnical effects
- Lifelines affected
- Injuries-casualties
- Emergency response
- Solidarity messages
- Preparedness
- Seismic information
- Intensity
- Early recovery
- Intensity

Methods: 2020 Zagreb earthquake



Methods: 2020 Zagreb earthquake

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Hashtags Identification

~~#Croatia~~
#croatia
#croatiaearthquake
~~#CroatiaEarthquake~~
#CroatiaFullofLife
#CroatiaQuake
~~#disaster~~
#eartquakecroatia
#earthquakeinzagreb
#gradzagreb
#hrvatskapotres
~~#igerscroatia~~
#LoveZagreb
#potres
#potres2020
#potreszagreb
#potresZg
#PrayforZagreb
~~#quake~~
#solidarnostshrvatskom
~~#Terremoto~~
~~#volimhrvatsku~~
#Zagreb
~~#Zagabria~~
~~#ZagrebEarthquake~~
#zagrebearthquake
#zagrebpotres
~~#ZagrebQuake~~
#zagrebquake
#ZagrebStrong
#zagrebstrong
#zagrebstaystrong

Hashtag Selection

#Croatia
#croatiaearthquake
#CroatiaFullofLife
#CroatiaQuake
#eartquakecroatia
#earthquakeinzagreb
#hrvatskapotres
#LoveZagreb
#potres
#potreszagreb
#potresZg
#PrayforZagreb
#Zagreb
#ZagrebEarthquake
#zagrebearthquake
#zagrebpotres
#ZagrebQuake
#zagrebquake
#ZagrebStrong
#zagrebstrong
#zagrebstaystrong

Data Collection

59,246 tweets
58,501 tweets

5852 tweets
3988 Tweets

CSEM EMSC

31,403 intensity reports

45 intensity resports

Data extraction

.xls., .jpg, .pdf,.doc

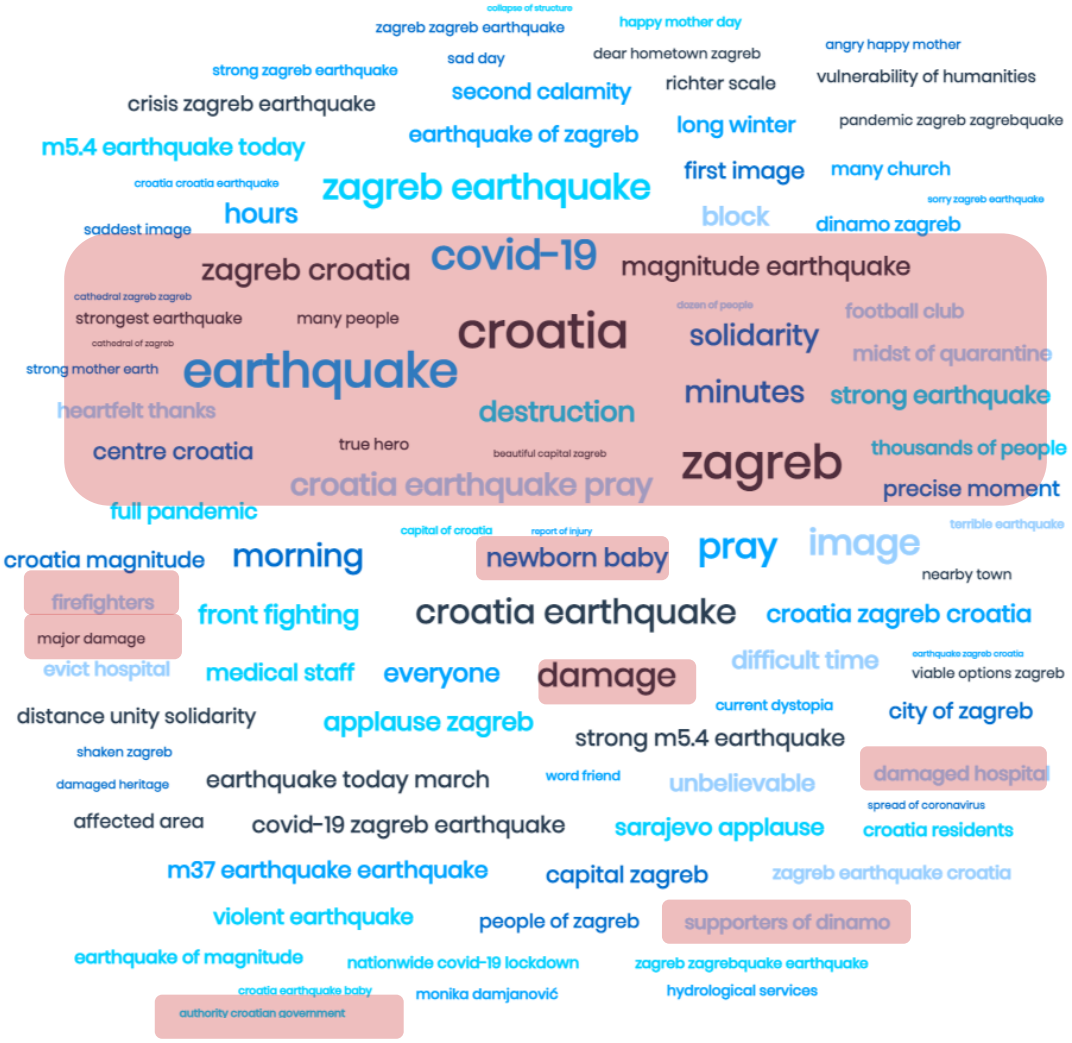
Data processing

Translation to English
Eliminate Twitter handles, emoticons and hyperlinks

Keywords extraction

Wordclouds

Results: 2020 Zagreb earthquake



Keywords extraction using word clouds

word	count	relevance
earthquake	1609	0.677
croatia	1479	1
zagreb	1281	0.695
covid-19	561	0.113
image	282	0.158
pray	281	0.08
zagreb earthquake	269	0.258
croatia earthquake	251	0.304
damage	206	0.088
morning	174	0.128
minutes	147	0.077
croatia earthquake pray	144	0.996
zagreb croatia	129	0.198
solidarity	123	0.102
destruction	108	0.099
hours	104	0.091
magnitude earthquake	85	0.387
newborn baby	84	0.387
everyone	82	0.084
front fighting	81	0.374
applause zagreb	81	0.374
block	81	0.074
croatia zagreb croatia	72	0.498
difficult time	71	0.323
strong earthquake	71	0.281
strong m5.4 earthquake	62	0.429
earthquake today march	62	0.429
m5.4 earthquake today	62	0.429
first image	62	0.286
unbelievable	62	0.11
covid-19 zagreb earthquake	61	0.422
medical staff	61	0.281
sarajevo applause	61	0.281
m37 earthquake earthquake	59	0.408
centre croatia	59	0.272
capital zagreb	58	0.198
city of zagreb	54	0.374
earthquake of zagreb	54	0.374
long winter	53	0.244
full pandemic	53	0.244

Words frequency (40/100)

Results: 2020 Zagreb earthquake

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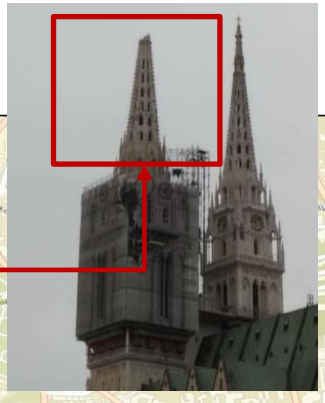
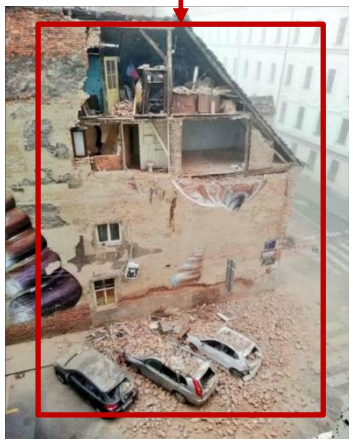
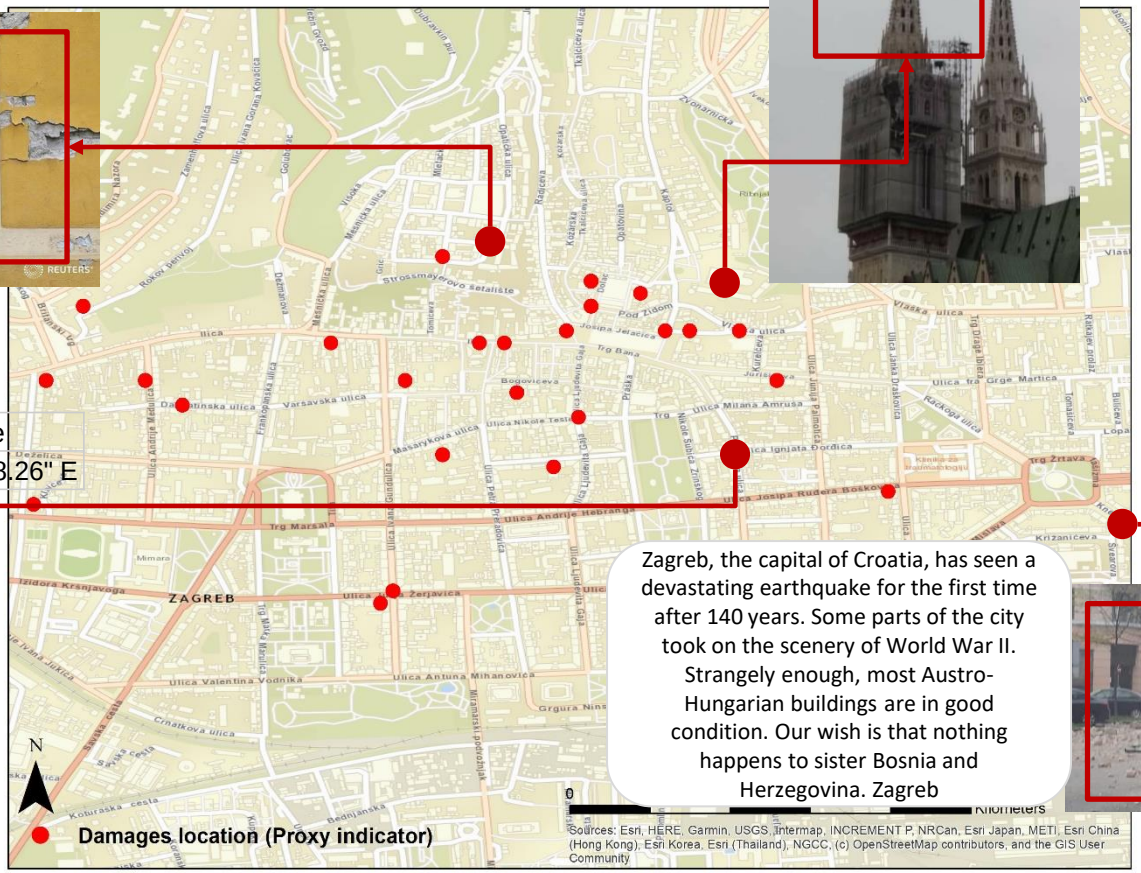
Latitude	Longitude
45°48' 55.29" N	15° 58' 28.69" E

Latitude	Longitude
45° 48' 52.28" N	15° 58' 47.24" E



Latitude	Longitude
45°48' 38.08" N	15° 58' 48.26" E





Zagreb, the capital of Croatia, has seen a devastating earthquake for the first time after 140 years. Some parts of the city took on the scenery of World War II. Strangely enough, most Austro-Hungarian buildings are in good condition. Our wish is that nothing happens to sister Bosnia and Herzegovina. Zagreb

Results: 2020 Zagreb earthquake

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In the wake of the Zagreb earthquake, our thoughts are with the Croatian Meteorological and Hydrological Service. Their headquarters were damaged but thankfully the staff are all safe. National meteorological and hydrological services worldwide provide vital information for all and rise to the challenges they face.

Good morning Zagreb Hrvatska Croatia Earthquake Zagreb Earthquake

Not only that you gave birth during COVID-19 but also earthquake happened and on top of it all it is winter time. Only love for all these brave women and Zagreb!

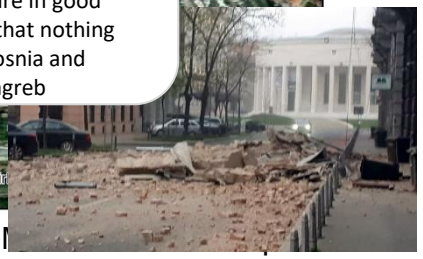
This morning, Croatia was hit with several earthquakes in the midst of the COVID-19 pandemic. We hope all of you are okay! Thankfully, our staff and their families are. Please stay safe everyone! Croatia Zagreb COVID-19

arthquake in Zagreb this morning. oronavirus, mums with their new-orns on the streets. It just started to snow. What is happening with the world ? Pray for Croatia

In full quarantine due to COVID-19, a Magnitude 5.3 earthquake in Zagreb, Croatia, left severe material damage and several people injured, authorities reported. The earthquake occurred after 6 in the morning. bravo

The doctors in Zagreb Croatia are true heroes even when the hospitals are destroyed from the earthquake they are still working hard and looking after the new-born

Zagreb, the capital of Croatia, has seen a devastating earthquake for the first time after 140 years. Some parts of the city took on the scenery of World War II. Strangely enough, most Austro-Hungarian buildings are in good condition. Our wish is that nothing happens to sister Bosnia and Herzegovina. Zagreb



nstagram

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Air the GIS User Community

uploaded by Twitter users the day of the 22nd M

Results: 2020 Zagreb earthquake

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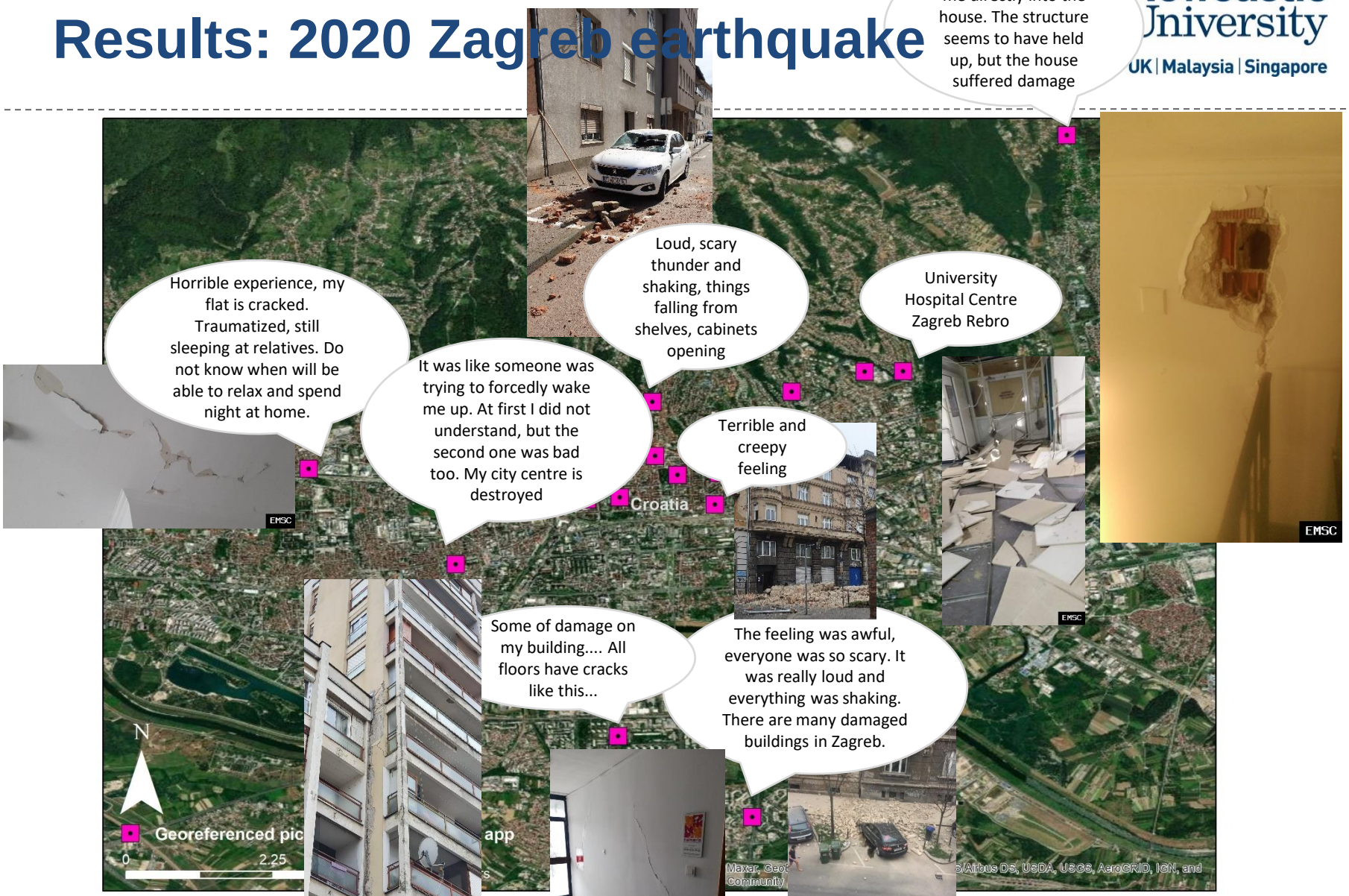
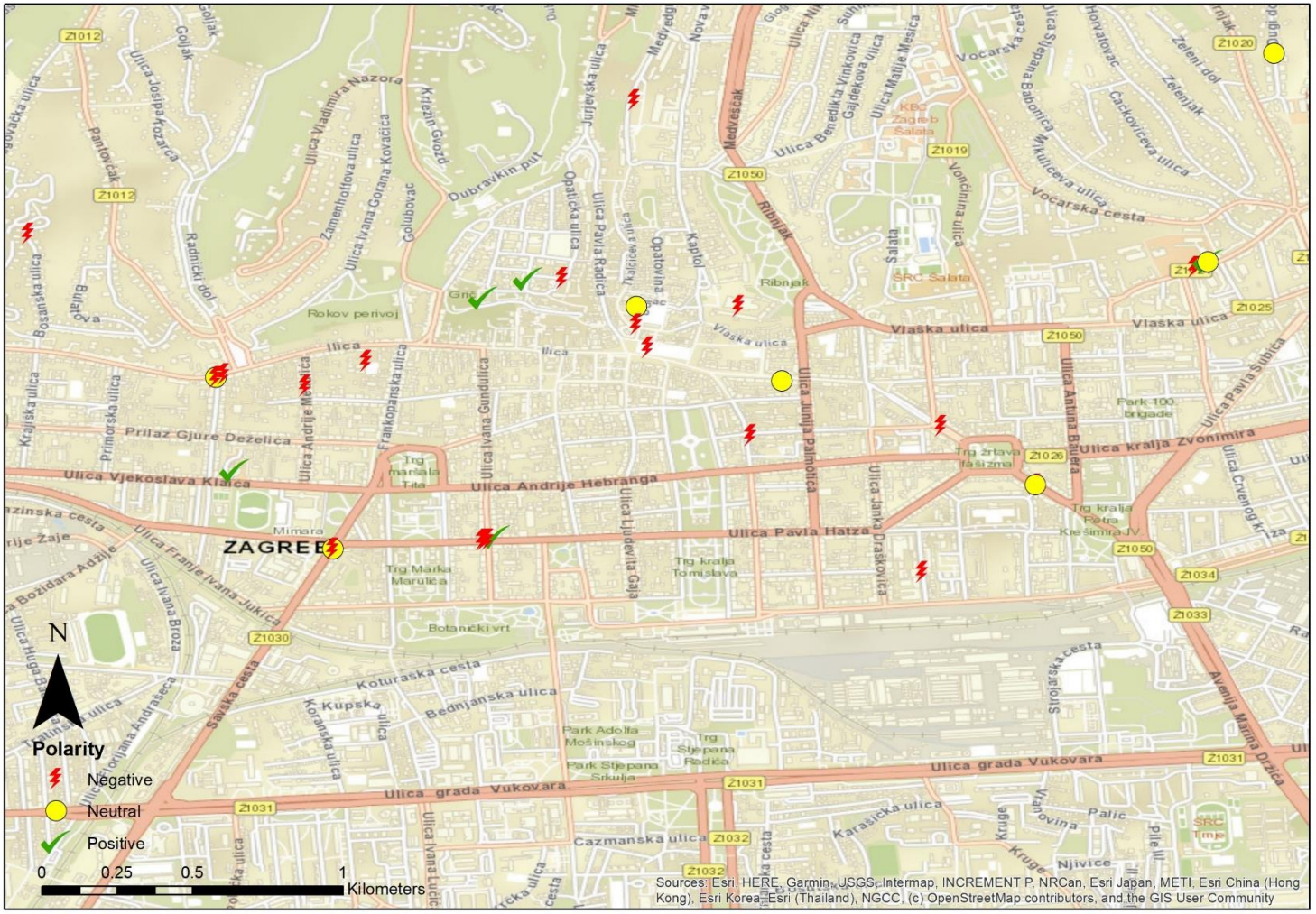


Examples of pictures ... one by ... users ... uake in Zagreb. Source: EMSC

Results: 2020 Zagreb earthquake



Polarity tweets and LastQuake app comments

Results: 2020 Zagreb earthquake

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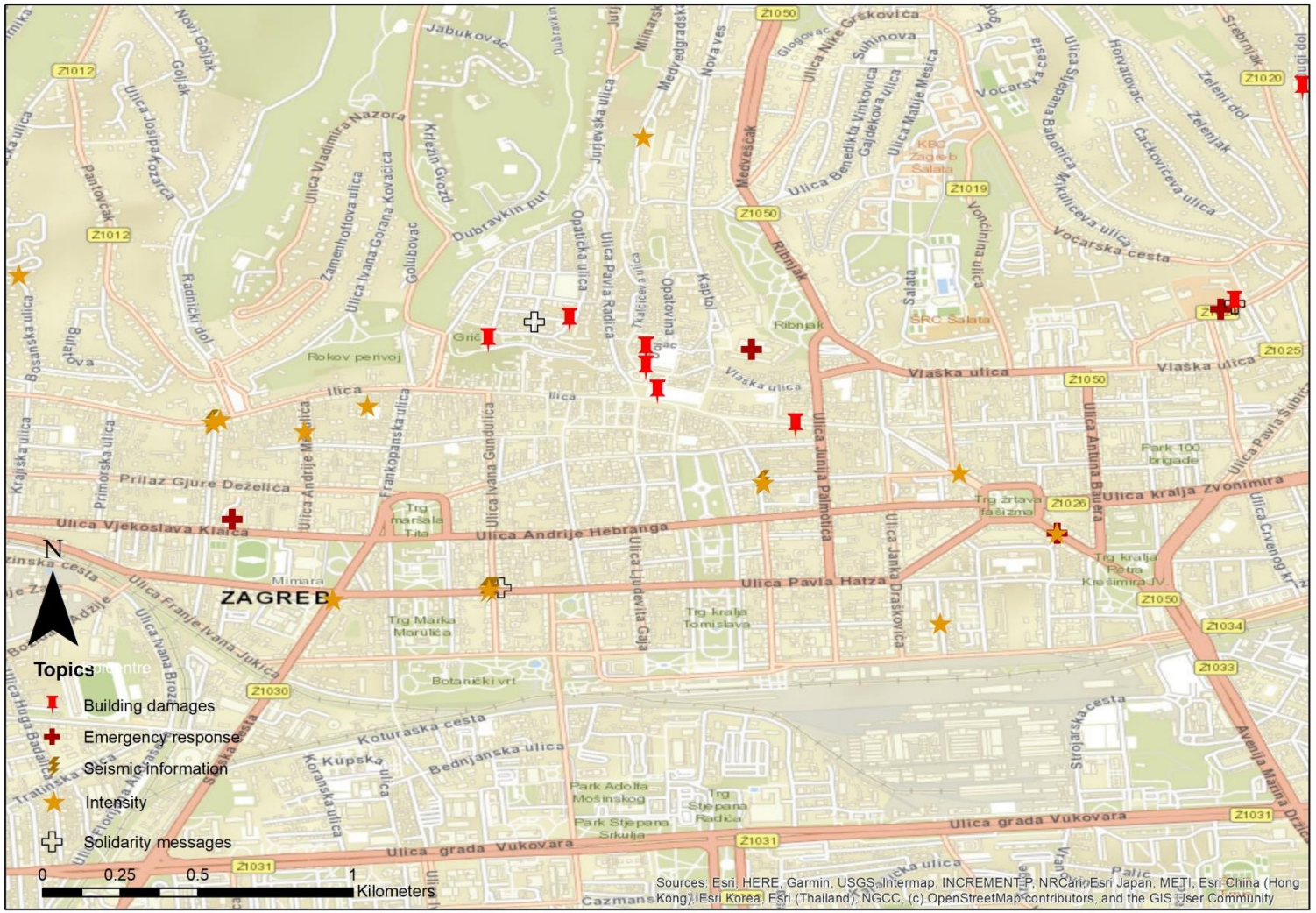
Emergency response assessment

Polarity	Twitter & Instagram	LastQuake app	Total	Percentage
Negative	511	0	511	54
Positive	320	0	320	34
Neutral	109	0	109	12
Total	940	0	940	100

Results: 2020 Zagreb earthquake



Topics addressed in tweets and LastQuake app comments

Results: 2020 Zagreb earthquake

DATASET

Contreras, D., Wilkinson, S., Fallou, L., Landès, M., Tomljenovich, I., Bossu, R., . . . James, P. (2021). **Supervised polarity and topic classification of LastQuake app user's pictures with comments – Zagreb 2020 earthquake**. Retrieved from: https://data.ncl.ac.uk/articles/dataset/Supervised_polarity_and_topic_classification_of_LastQuake_app_user_s_pictures_with_comments_Zagreb_2020_earthquake/14687163

DOI: https://doi.org/10.25405/data.ncl.14687163.v1 .v1

Methods: 2020 Aegean earthquake

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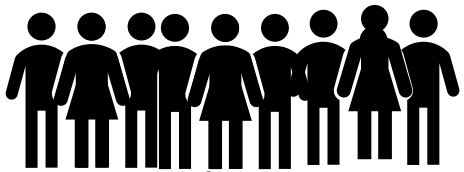
1 Data collection

Components of EMSC's multichannel rapid information system Source: Bossu et al. (2020). Figure 3. Pag. 35

İZMİR flagged, we felt it violent. There is a destroyed building.



LastQuake app users

2 Data storage

3 Data extraction

XLS file

4 Data process

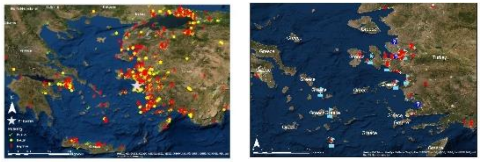
Translation to English
Correct spelling mistakes

5 Data analysis

Sentiment/topic Analysis
Supervised classification

6 Database

7 Maps



Methods: 2020 Aegean earthquake

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Rules

Polarity	Rules
Positive	▪ Reports of light intensity ▪ Reports of short seismic movements ▪ Reports of slight shakes ▪ Supporting and solidarity messages ▪ Emergency response messages ▪ Preparedness measures
Negative	▪ Reports of long seismic movements ▪ Reports of strong shakes ▪ Reports of strong intensity ▪ Reports of aftershocks ▪ Report of damages in buildings and/or lifelines ▪ Reports of injuries and/or casualties ▪ Reports of fear and anxiety
Neutral	▪ Seismic information

Rule-set for polarity classification of text data produced by LastQuake app users.

Results: 2020 Aegean earthquake

Positive

- '**Low** damage'
- 'We felt it, but it was **short**'
- 'Everybody should **respect** and act according to **scientific rules and regulations**. Otherwise, everybody will lose'

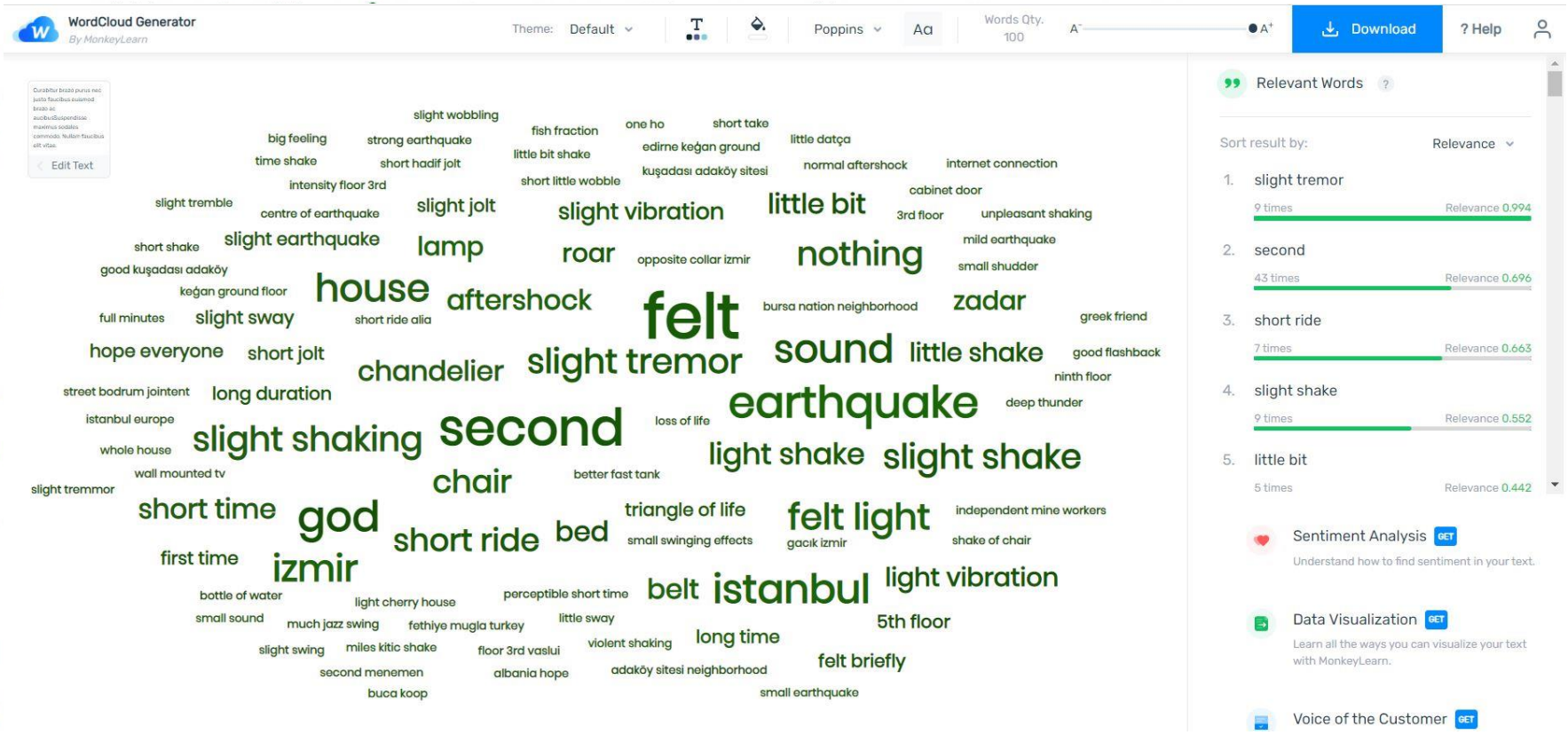
Negative

- '**Everything rattled** for a few seconds. The **cracks in our walls are getting bigger**'
- 'Chios, Vrontados. Very **strong shake**, ground floor, **cracks in walls objects fell**.'
- 'I felt that earthquake when I was in school in Athens. The floor was moving and the walls too. **It was very scary** because it happened so suddenly!'

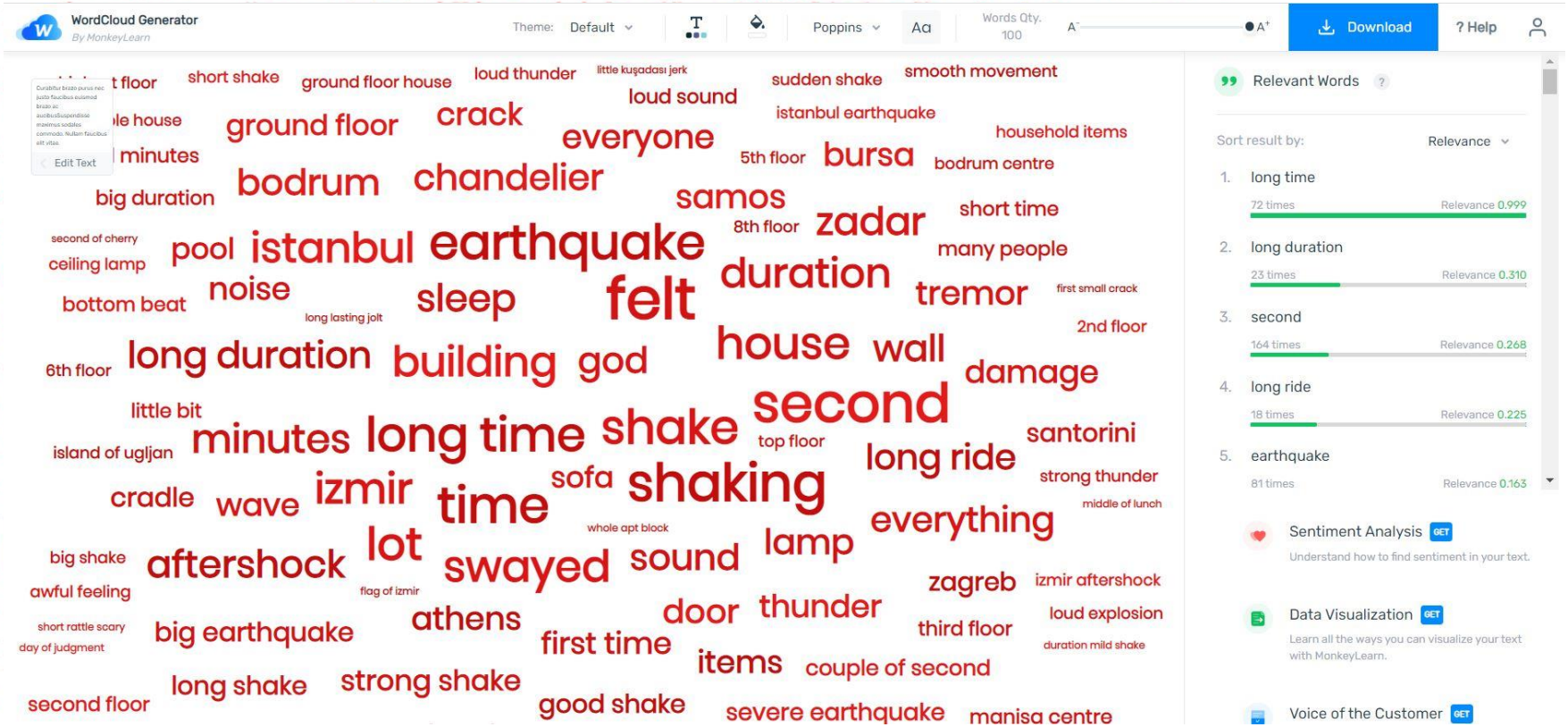
Neutral

- '**The epicentre is in Samos**, Greece, not in Western Turkey'.
- 'Moment intensity **VI**'
- '**It is not Dodecanese islands**. It is North Aegean Samos island'

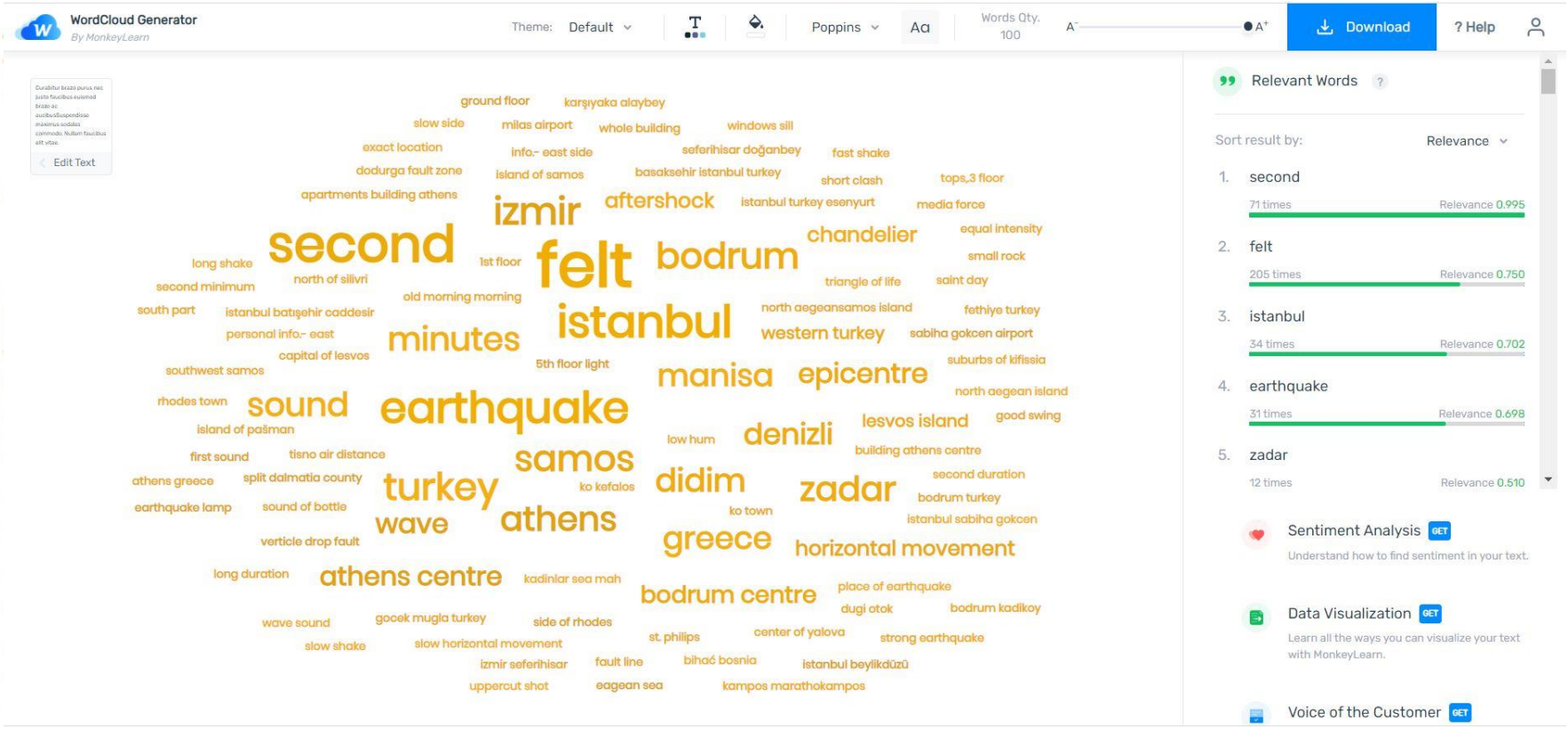
Results: 2020 Aegean earthquake



Results: 2020 Aegean earthquake



Results: 2020 Aegean earthquake



Results: 2020 Aegean earthquake

Buildings damaged

- ‘There are buildings destroyed in different districts of Izmir. We shook so violently. The items in the house were overturned. Earthquakes still continue. May God help us. Get past us all’
- We were caught in Atasehir in my 12-floor house. I said everything is over. We waited for the building to come out. All flats in the building have cracks and collapse in the plaster’

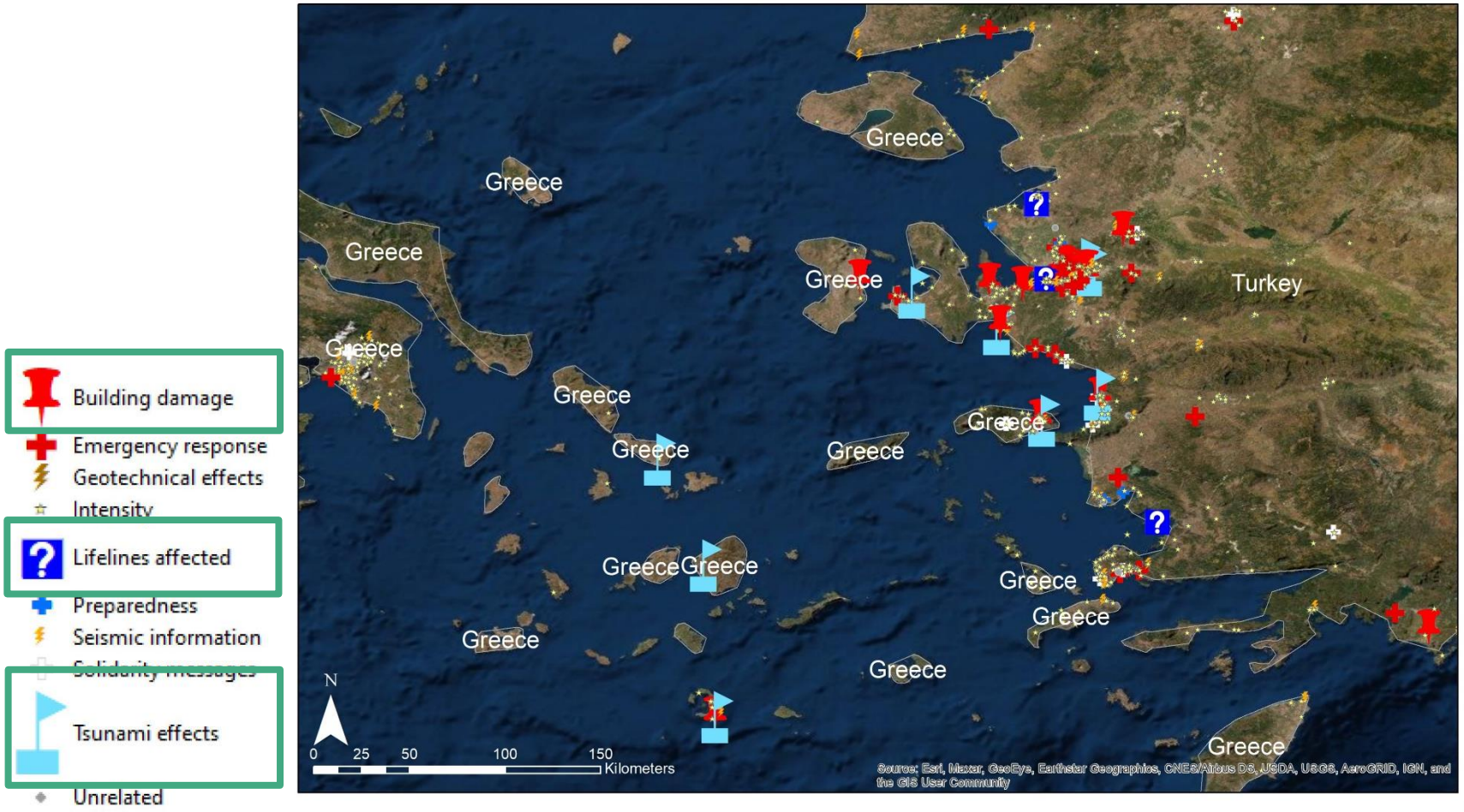
Lifelines affected

- ‘It was the first time I saw the .300-ton transformers shaking like a cradle, which was shifted in Aliagada. God bless us all’.
- ‘Very powerful and long lasting. All neighbours are on the street. No visible damage although telephone poles sway and a line broke. Many smaller quakes within the last 45 minutes or so’.

Tsunami

- ‘The sea rises here and falls again so you can say it rises if I can estimate that by 50 cm and 2 minutes later it goes down again’
- ‘I was in the tsunami, 1 meter the sea could go to the stairs of the bank. Car with water but started, got the hell out of there...pfff’

Results: 2020 Aegean earthquake



Data source: European Mediterranean Seismological Centre . EMSC

Results: 2020 Aegean earthquake

DATASET

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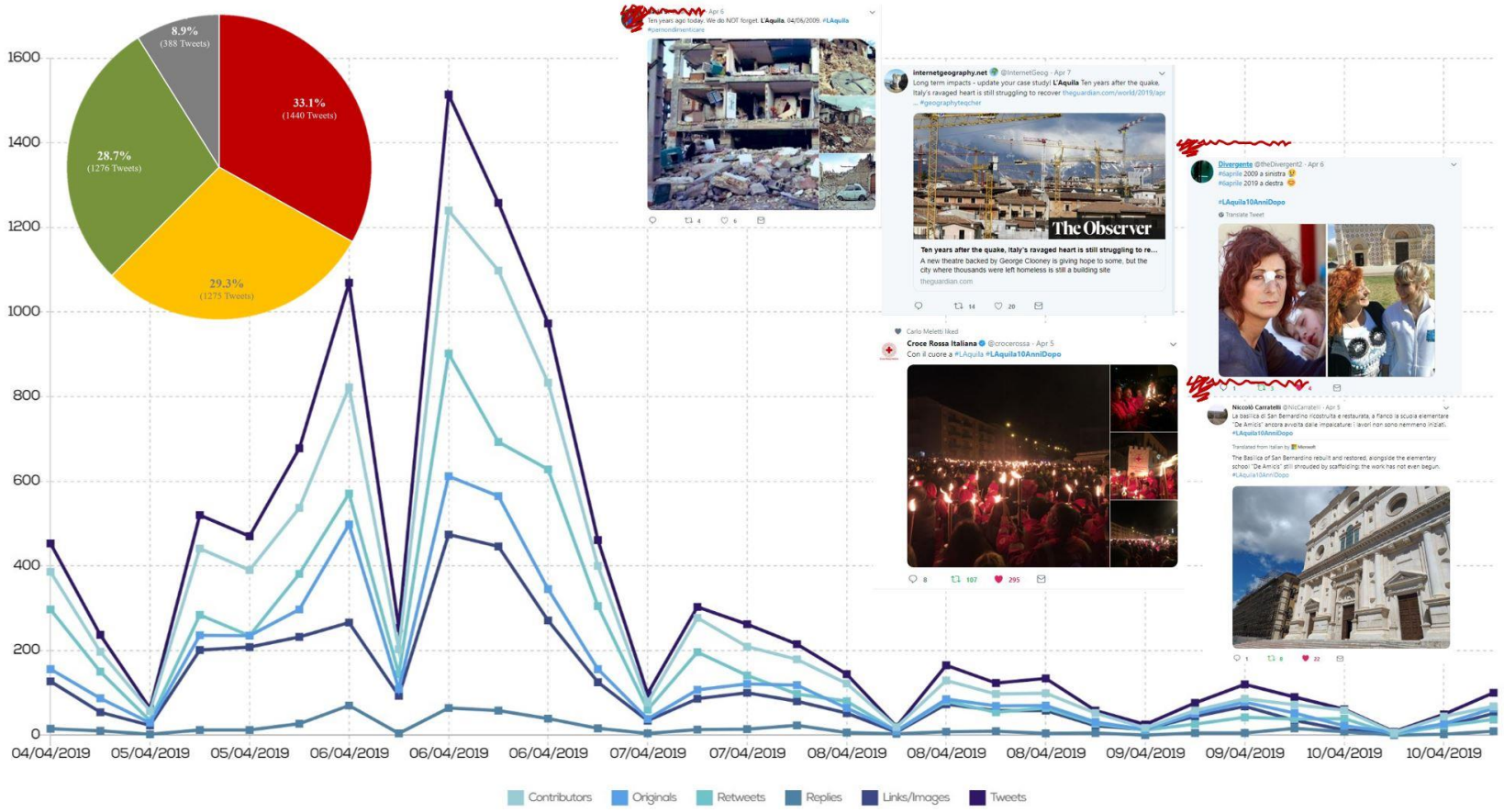
DOI: https://doi.org/10.25405/data.ncl.14604354.v3

Post-disaster recovery



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- Database: https://doi.org/10.25405/data.ncl.14579196.v1

Limitations

- Lack of georeferenced data on Twitter and Instagram
- Lack of trained social media users
- Cleaning and processing data
- Classification rules and topics
- Algorithm accuracy

Future development

- Georeferenced data - EMSC
- Training social media users
- Reduce time for cleaning and processing data
- Validate classification rules and topics
- Increase algorithm accuracy for unsupervised classification of data

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