



# Social Media in Emergency Management & Post-Disaster Recovery

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

**2020 ICoSIET**  
Keynote Speech

**Dr Diana Contreras**

Dr. Sean Wilkinson

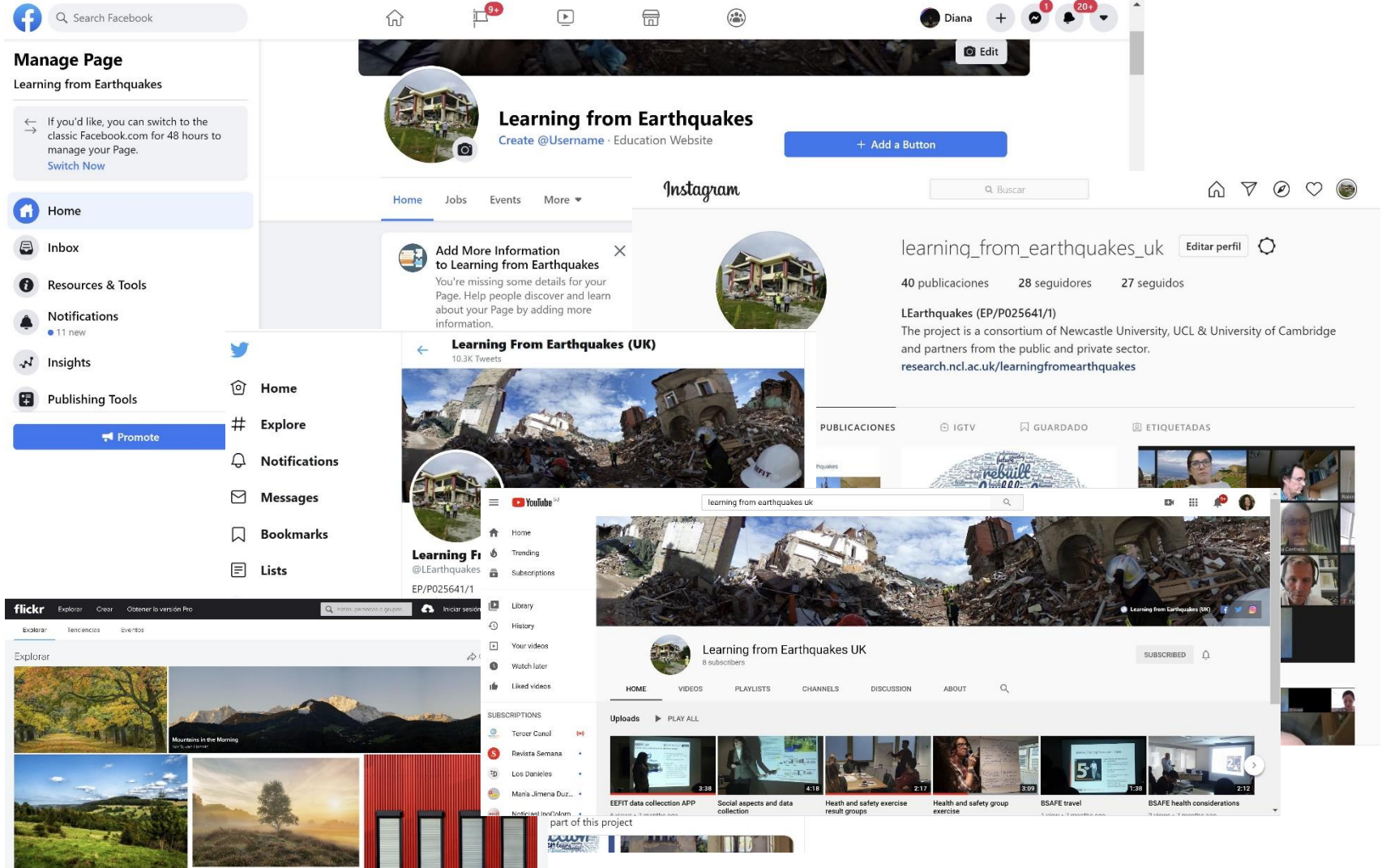
Mr. Nipun Balan

Prof. Philip James

The 21<sup>st</sup> October 2020

Engineering and Physical Sciences Research Council (EPSRC) Grant no. EP/P025951

# Introduction



**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](#)

**Facebook Profile: Learning from Earthquakes**  
Create @Username · Education Website  
[+ Add a Button](#)

**Instagram: learning\_from\_earthquakes\_uk**  
40 publicaciones 28 seguidores 27 seguidos  
LEarthquakes (EP/P025641/1)  
The project is a consortium of Newcastle University, UCL & University of Cambridge and partners from the public and private sector. [research.ncl.ac.uk/learningfromearthquakes](http://research.ncl.ac.uk/learningfromearthquakes)

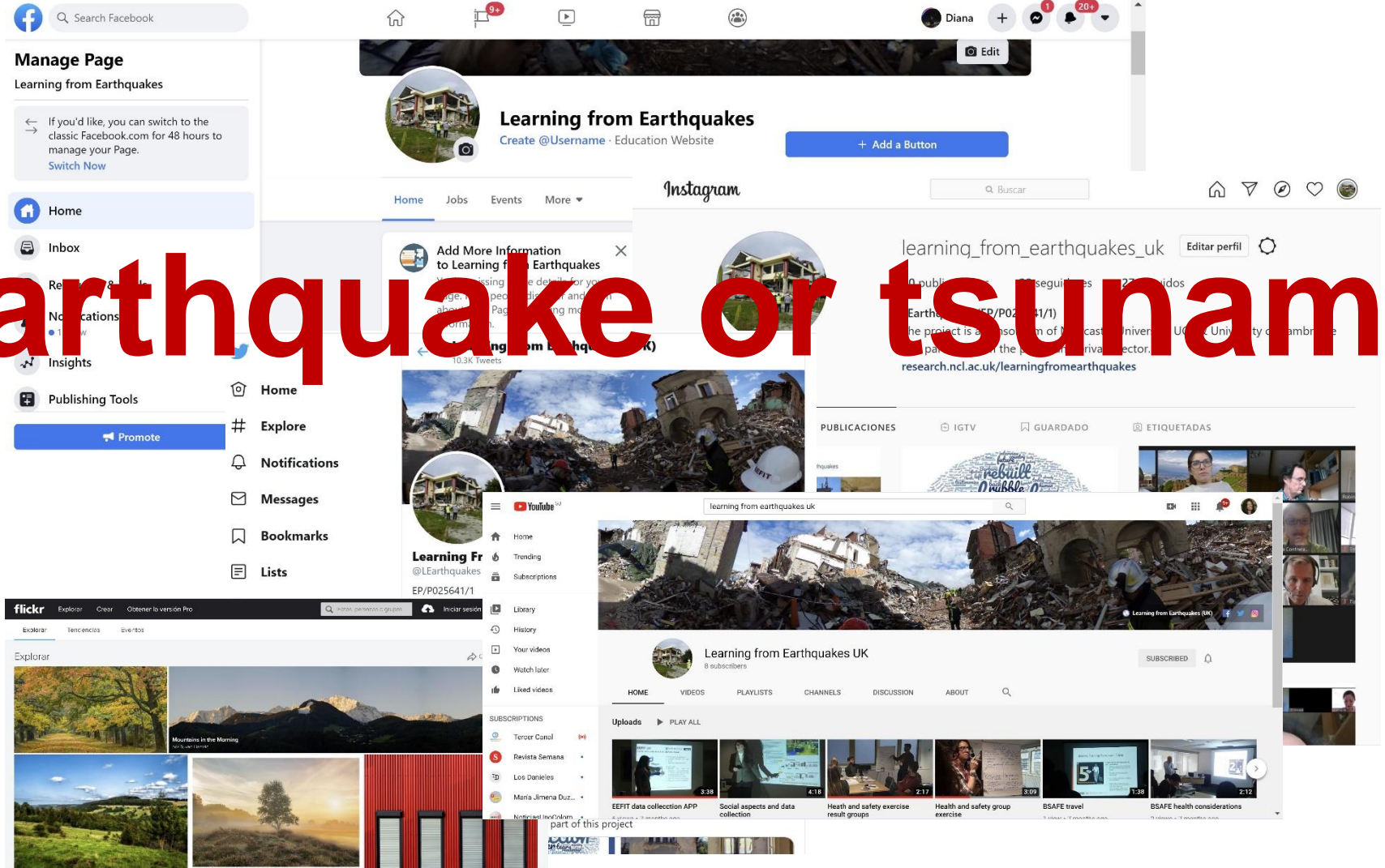
**Twitter: Learning From Earthquakes (UK)**  
10.3K Tweets

**YouTube: Learning from Earthquakes UK**  
@LEarthquakes  
EP/P025641/1

**Flickr: Explorator**  
Mourains in the Morning  
National Inclusion

# Introduction

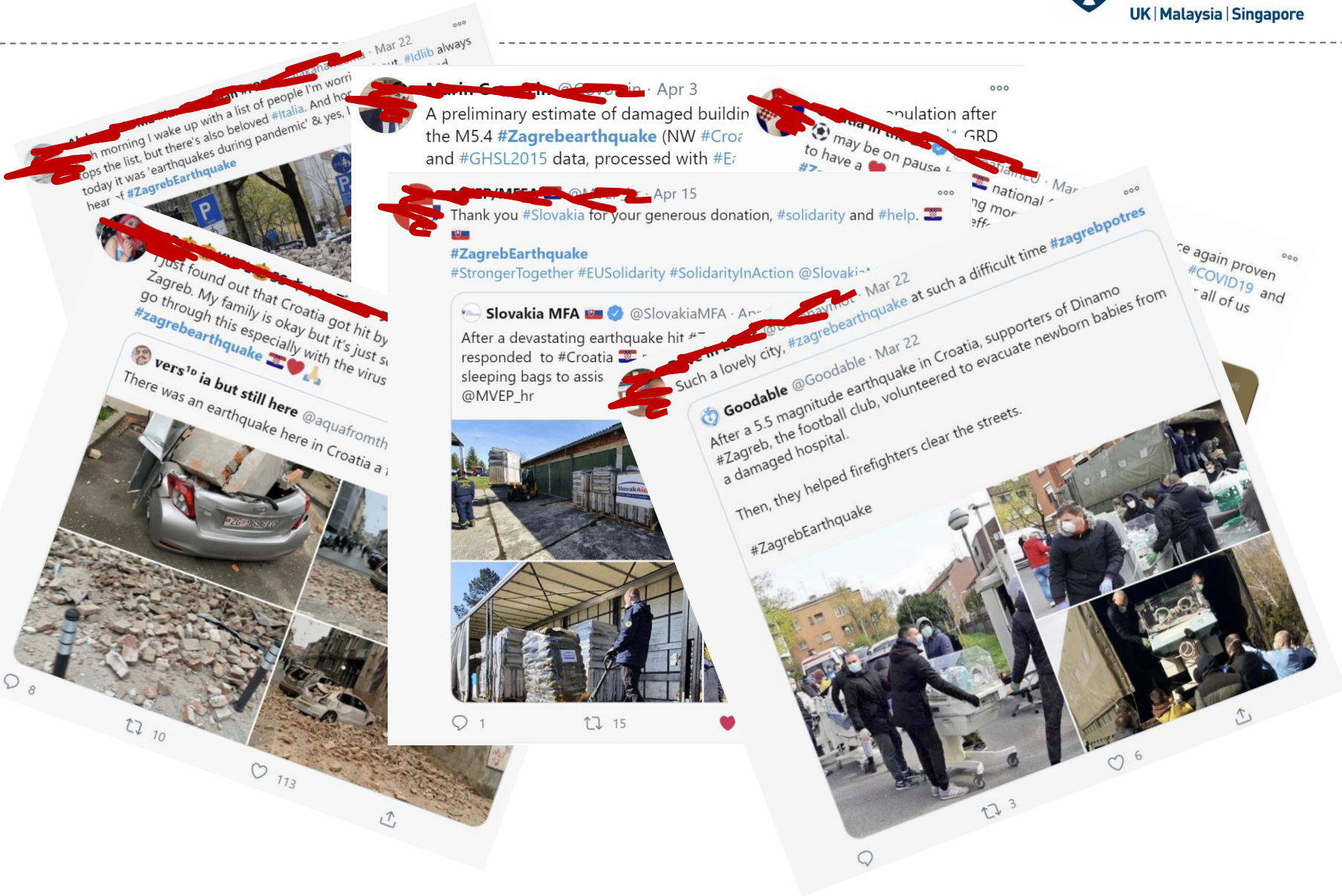
# earthquake or tsunami



The collage features several digital platforms:

- Facebook:** A page for 'Learning from Earthquakes' with a profile picture of a house and a blue 'Add a Button'.
- Instagram:** A profile for 'learning\_from\_earthquakes\_uk' with a bio mentioning a project in collaboration with Newcastle University.
- YouTube:** A channel for 'Learning from Earthquakes UK' with 8 subscribers, showing a video player with thumbnails for 'EERT data collection APP', 'Social aspects and data collection', 'Health and safety exercise result groups', 'Health and safety group exercise', 'BSAFE travel', and 'BSAFE health considerations'.
- Flickr:** A gallery titled 'Explorator' with various landscape photos.

# Introduction



**Post 1:** ... morning I wake up with a list of people I'm worried about... today it was 'earthquakes during pandemic' & yes, I hear of #ZagrebEarthquake

**Post 2:** ... Apr 3  
A preliminary estimate of damaged buildings in Zagreb after the M5.4 #Zagrebearthquake (NW Croatia) and #GHSL2015 data, processed with #E...

**Post 3:** ... Apr 15  
Thank you #Slovakia for your generous donation, #solidarity and #help. #ZagrebEarthquake #StrongerTogether #EUSolidarity #SolidarityInAction @Slovakia...

**Post 4:** ... Mar 22  
I just found out that Croatia got hit by an earthquake. My family is okay but it's just so hard to go through this especially with the virus #zagrebearthquake

**Post 5:** ... Mar 22  
Slovakia MFA @SlovakiaMFA - After a devastating earthquake hit Croatia, we responded to #Croatia with sleeping bags to assist @MVEP\_hr

**Post 6:** ... Mar 22  
Such a lovely city, #zagrebearthquake at such a difficult time #zagrebpotres

**Post 7:** ... Mar 22  
Goodable @Goodable - After a 5.5 magnitude earthquake in Croatia, supporters of Dinamo Zagreb, the football club, volunteered to evacuate newborn babies from a damaged hospital. Then, they helped firefighters clear the streets. #ZagrebEarthquake

**Post 8:** ...  
vers to ia but still here @aquafromth  
There was an earthquake here in Croatia a...

**Photos:** Debris on the ground, a silver car with a damaged trunk, a person using a pallet jack to move supplies, and volunteers in winter clothing pushing a gurney with a baby in a hospital setting.

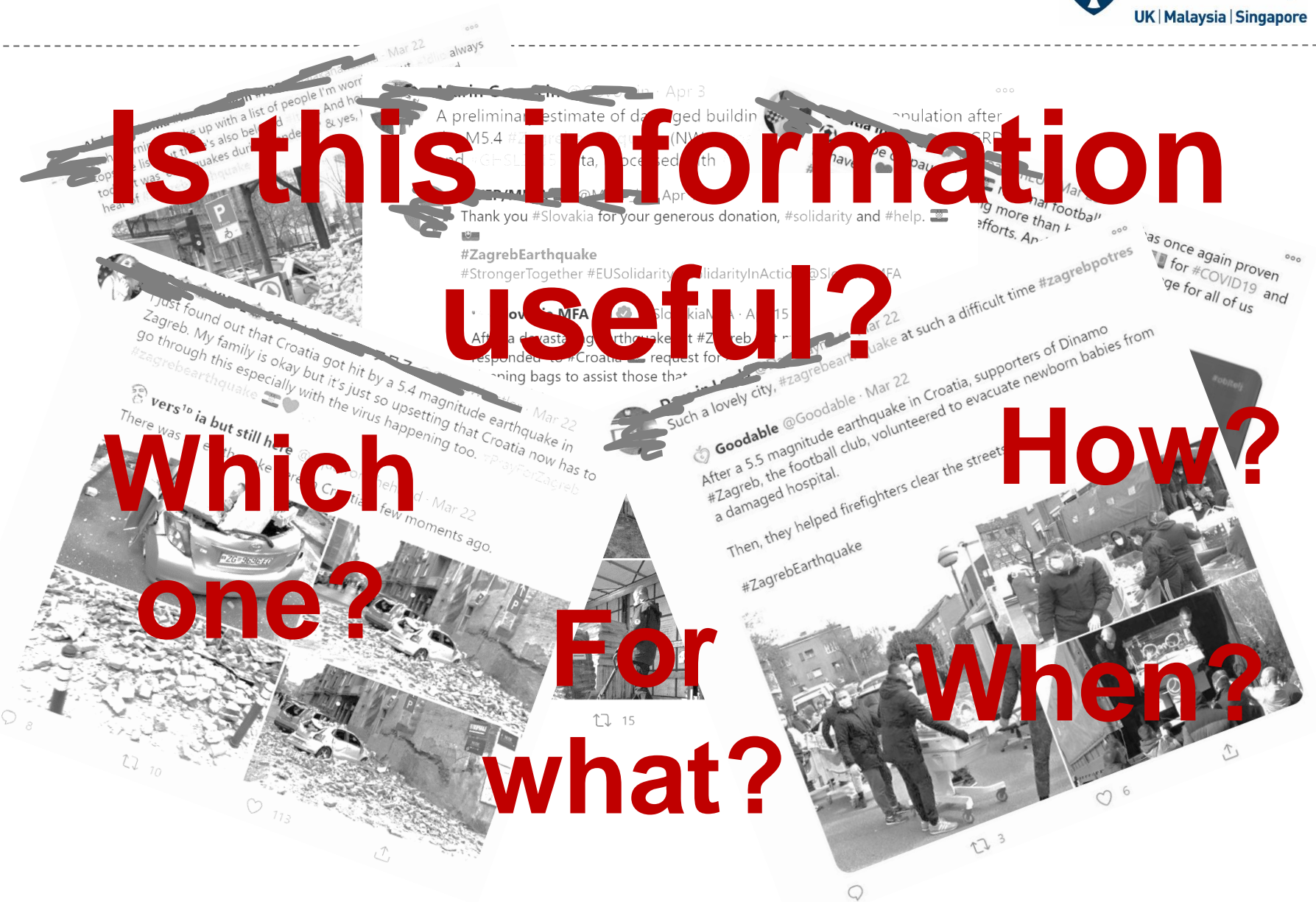
Is this information useful?

Which one?

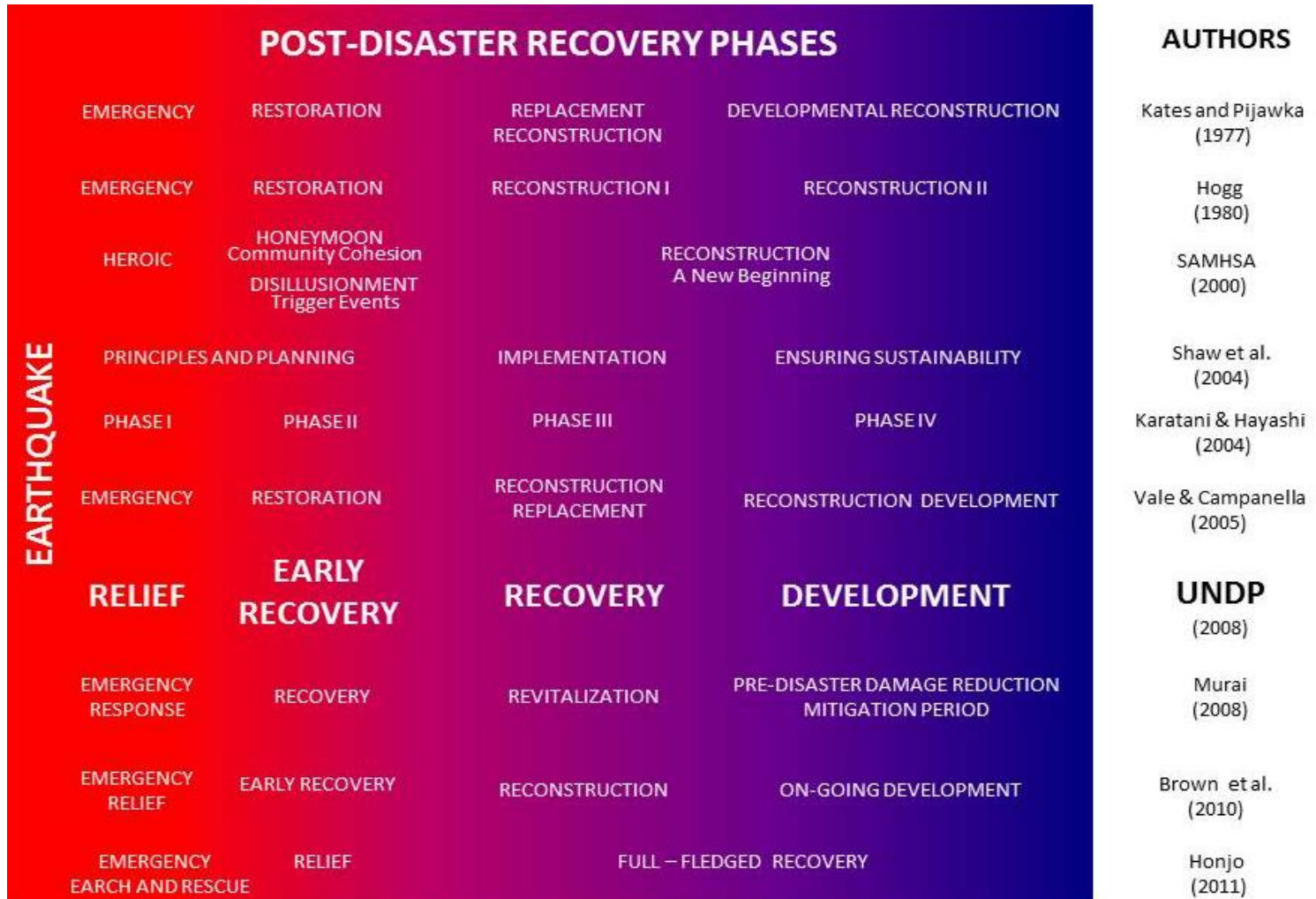
How?

For what?

When?

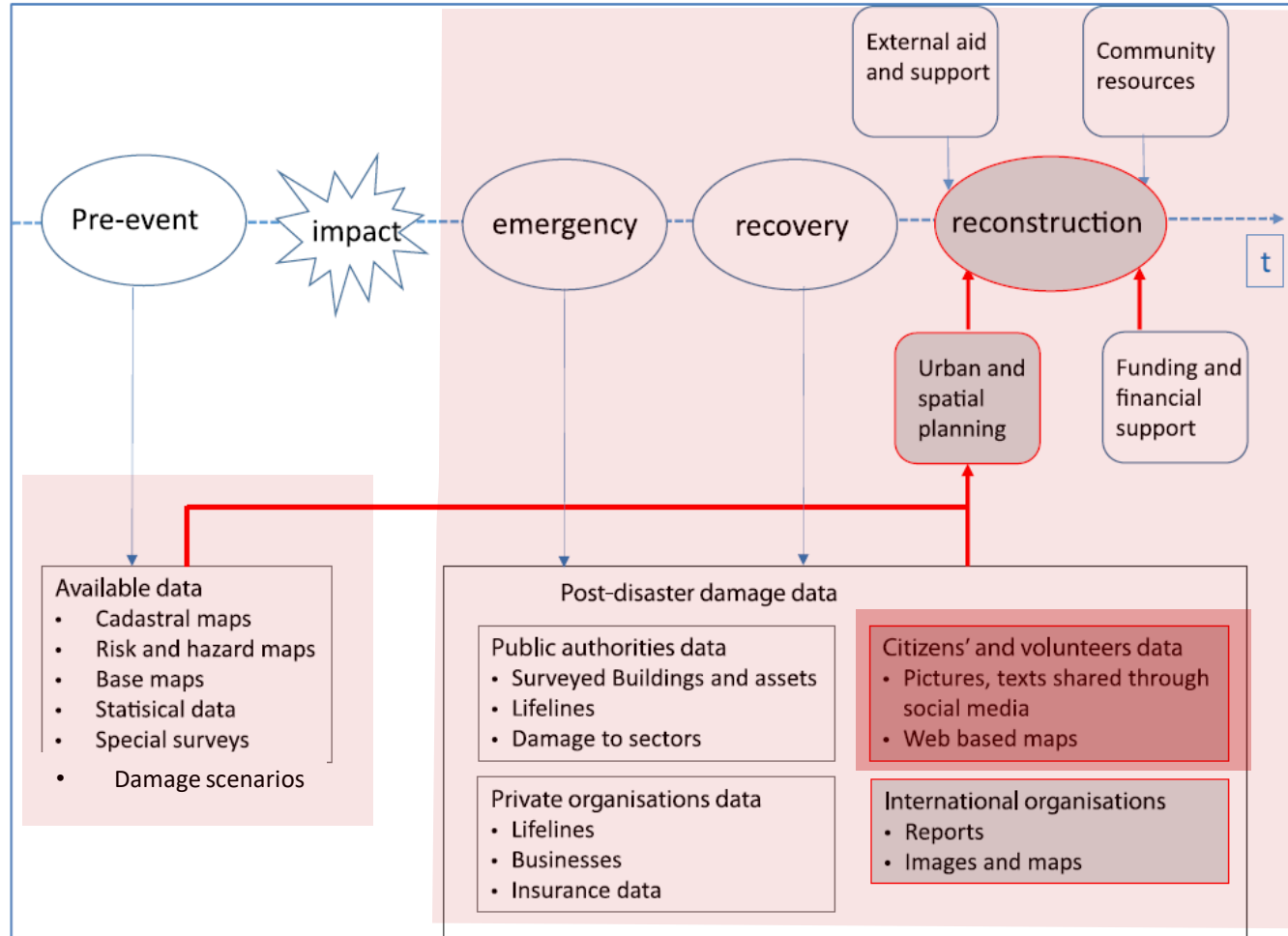


# Introduction



CONTRERAS, D. 2016. Fuzzy Boundaries Between Post-Disaster Phases: The Case of L’Aquila, Italy. *International Journal of Disaster Risk Science*, 7, 277-292. Fig. 2. Pag. 279

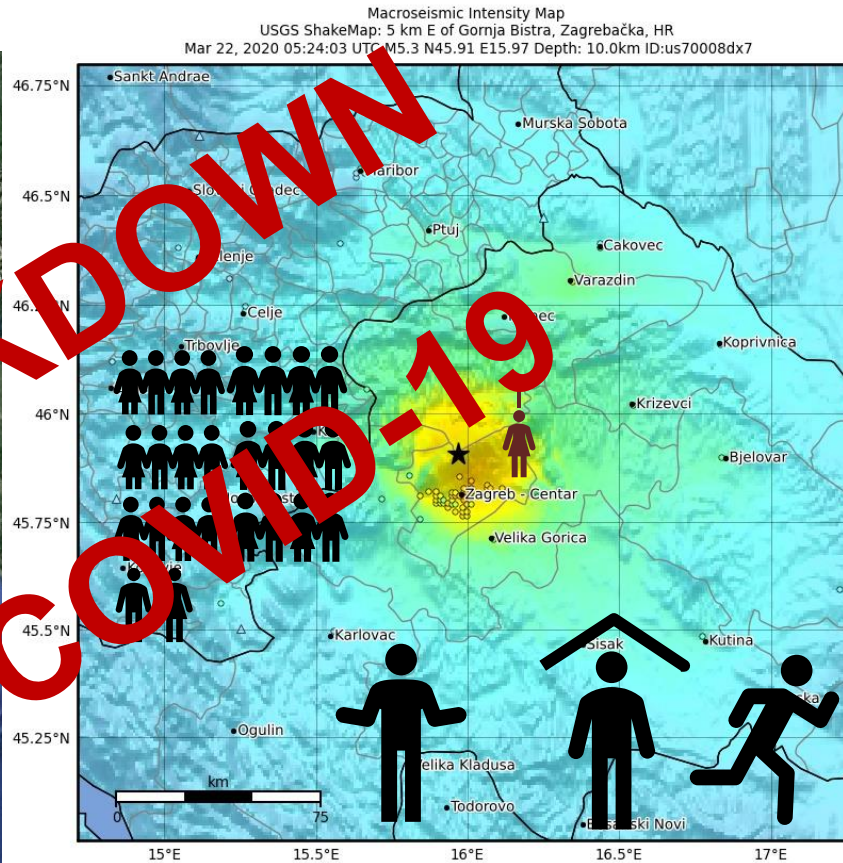
# Introduction



Framework showing the relationship between data useful to support planning for reconstruction and the different event 'phases'

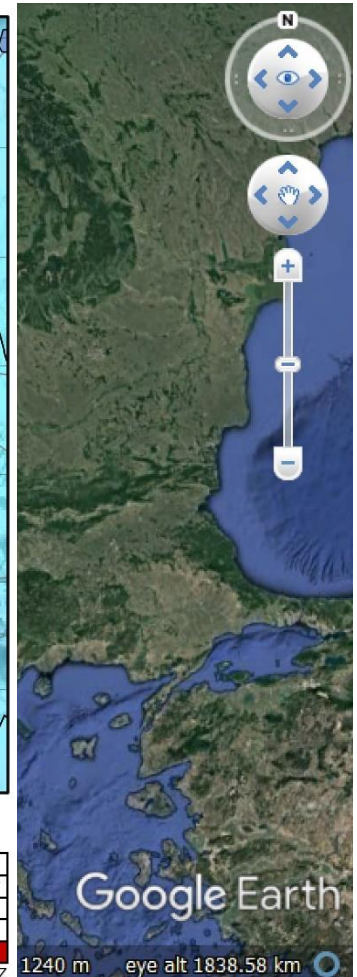
Adapted from: Mejri, O., Menoni, S., Matias, K., & Aminoltagheri, N. (2017). Crisis information to support spatial planning in post disaster recovery. *International Journal of Disaster Risk Reduction*, 22, 46-61. doi:<https://doi.org/10.1016/j.ijdrr.2017.02.007>. Fig. 2, Pag. 48.

# Case study: Zagreb earthquake



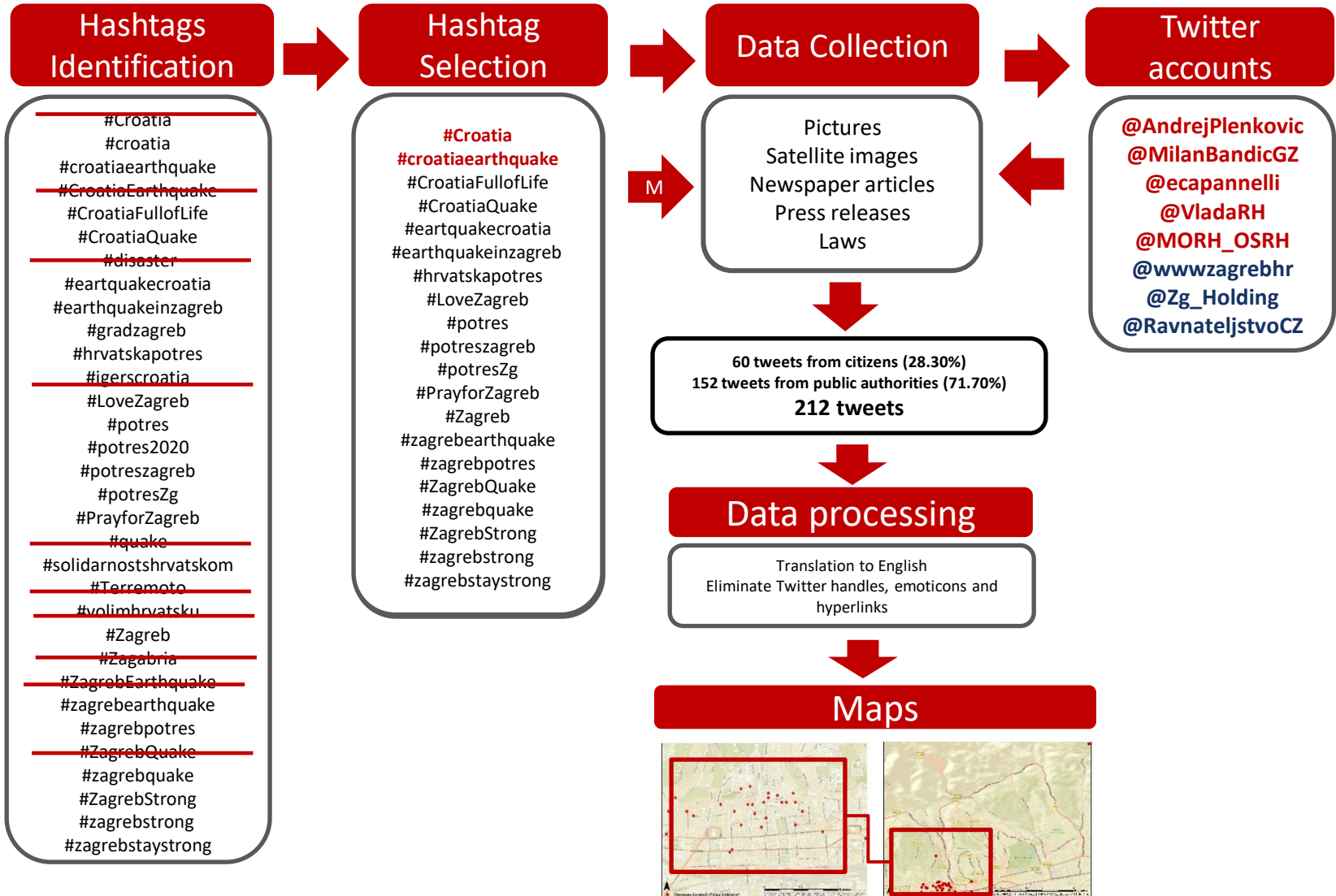
SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.0464	0.297	2.76	6.2	11.5	21.5	40.1	74.7	>139
PGV(cm/s)	<0.0215	0.135	1.41	4.65	9.64	20	41.4	85.8	>178
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Worden et al. (2012) Version 8: Processed 2020-04-02T11:58:27Z  
 Δ Seismic Instrument ○ Reported Intensity ★ Epicenter





# Methodology



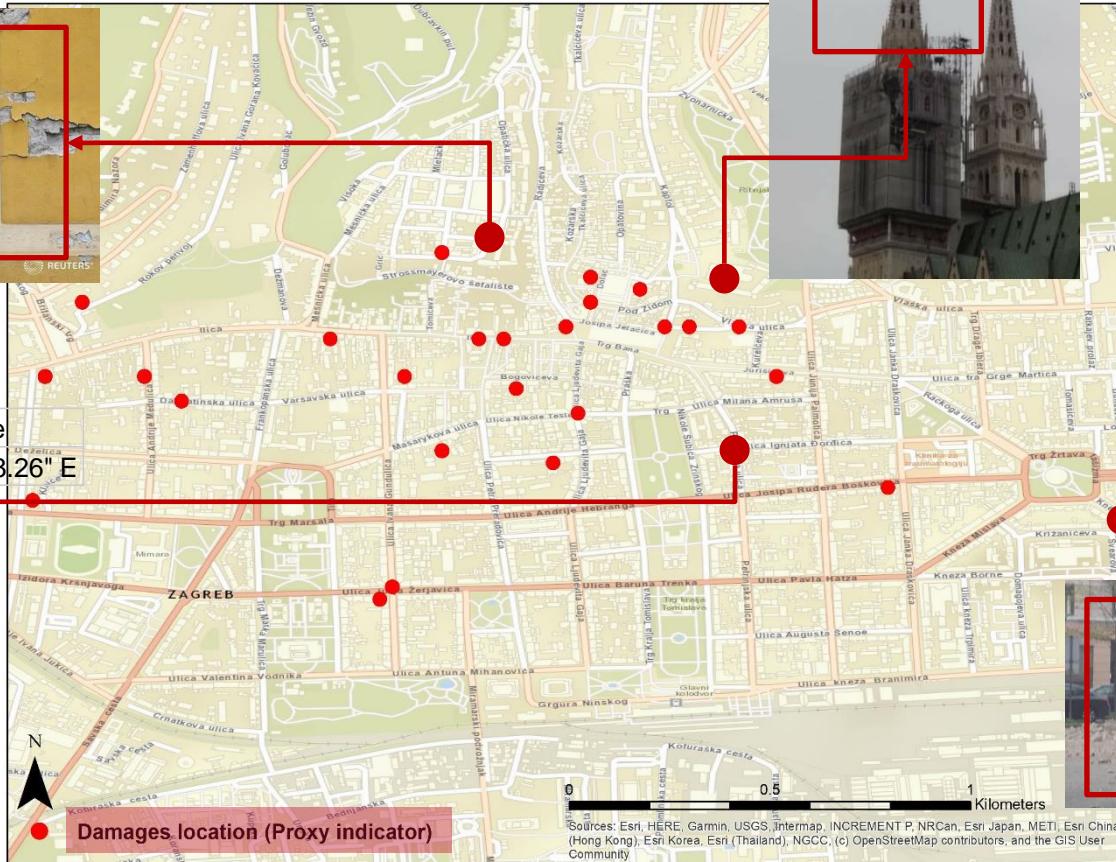
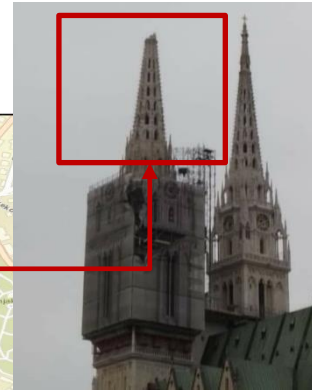
FUTURE STEPS

ON-GOING

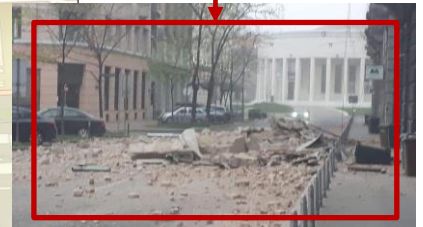
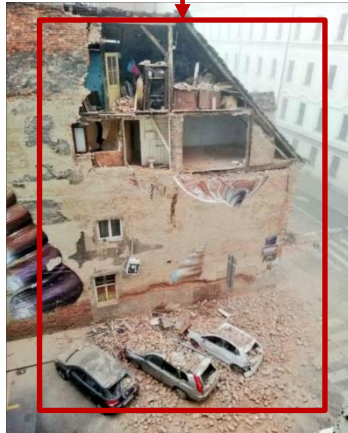
# Methodology

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



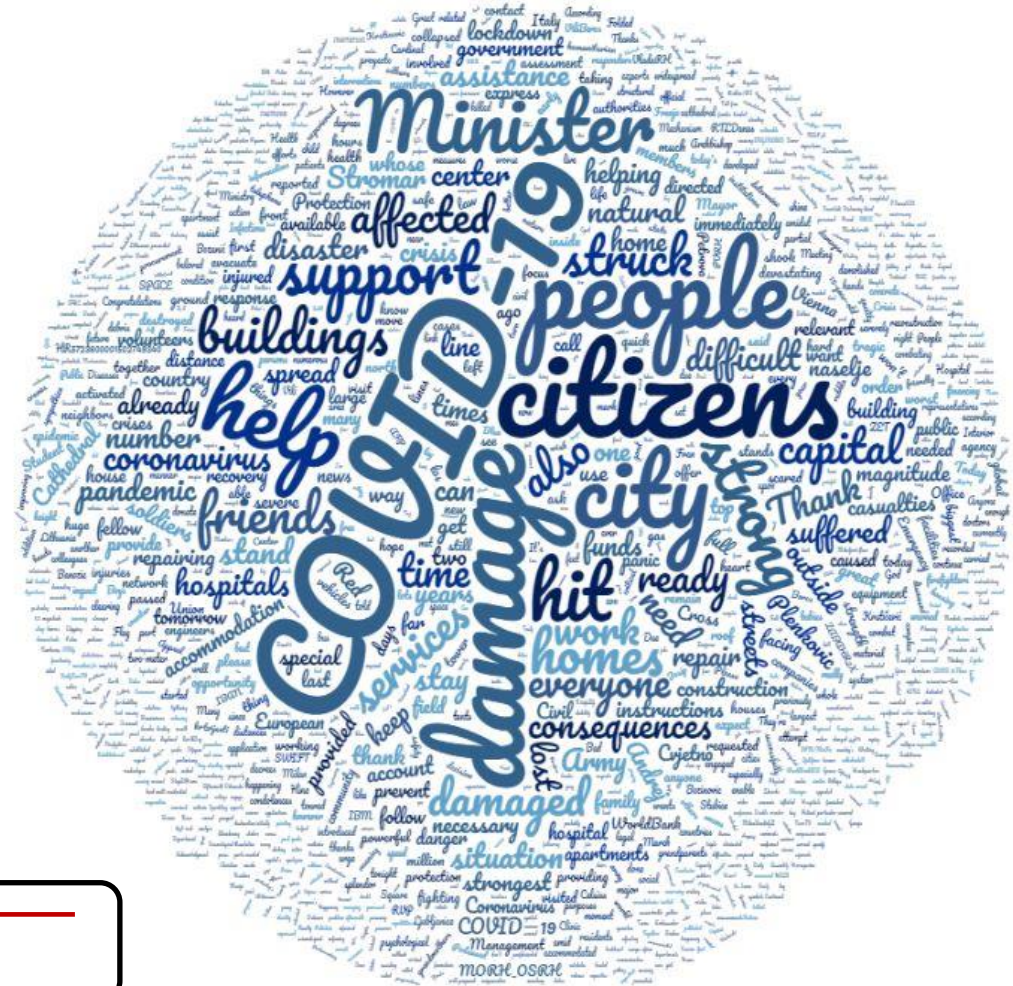
# Results

~~'earthquake'~~  
~~'Croatia'~~  
~~'Zagreb'~~  
~~'this morning'~~  
~~'morning'~~  
~~'Croatian'~~

~~'thoughts'~~  
~~'stay strong'~~  
~~'pray'~~  
~~'solidarity'~~

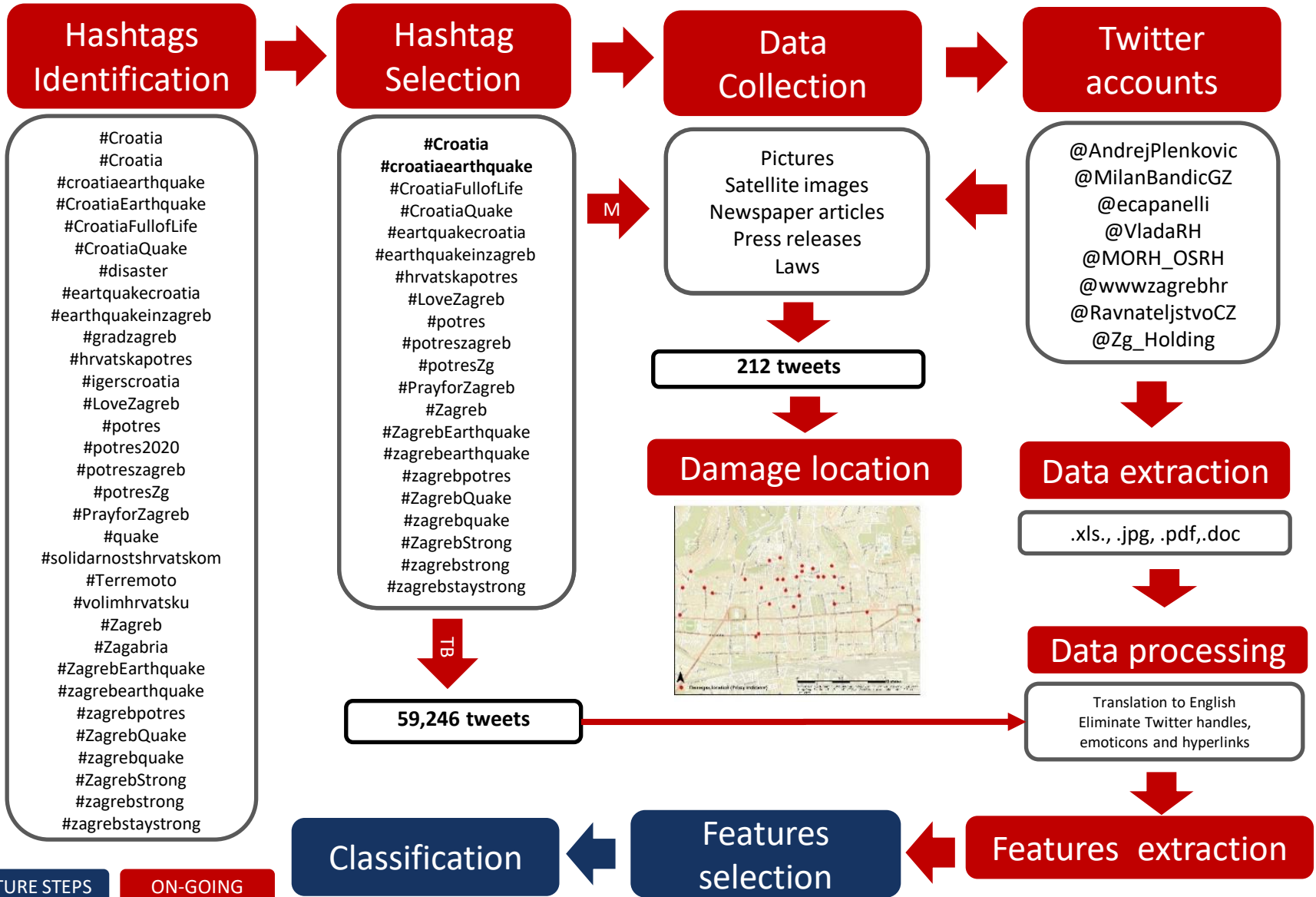
~~'following'~~  
~~'now'~~  
~~'just'~~  
~~'will'~~

~~'City'~~  
~~'city'~~



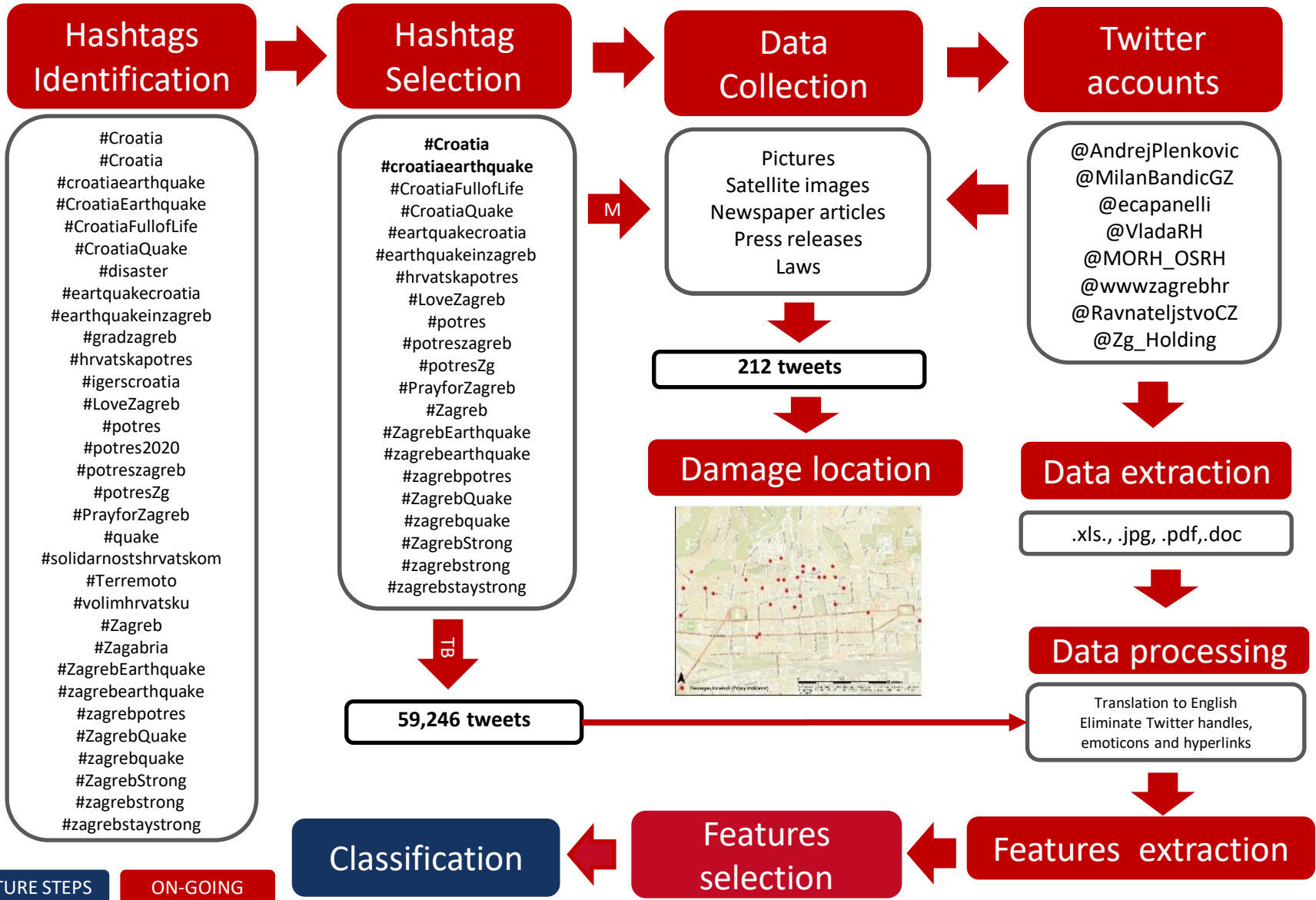
Feature extraction: Word cloud or bag of words (BOW)

# Methodology

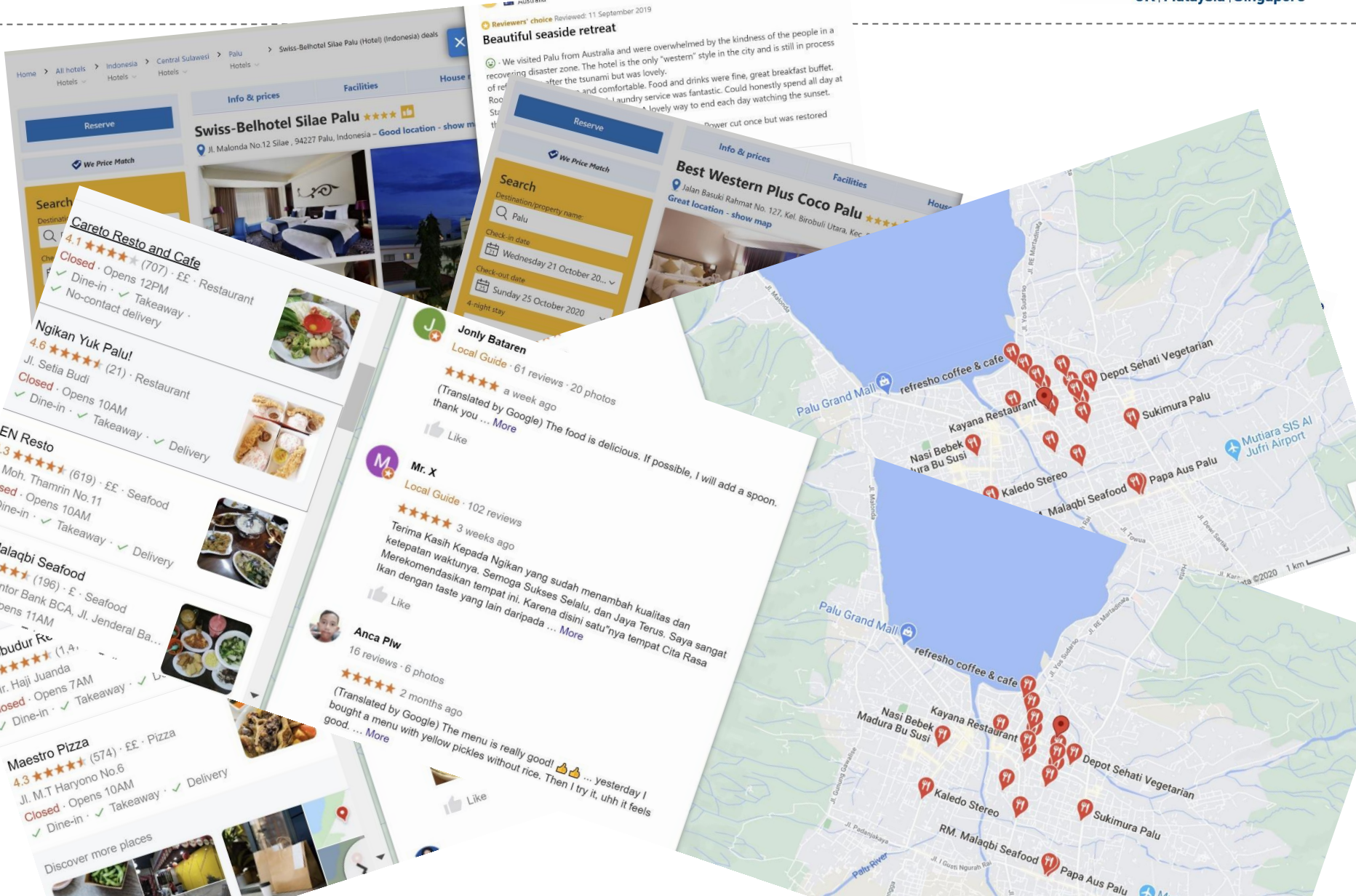




# Methodology



# Sentiment analysis



**Swiss-Belhotel Silae Palu** ★★★★★  
A. Malonda No.12 Silae, 94227 Palu, Indonesia - Good location - show map

**Best Western Plus Coco Palu** ★★★★★  
Jalan Basuki Rahmat No. 127, Kel. Birobuli Utara, Kec. ...

**Careto Resto and Cafe** 4.1 ★★★★★ (707) · ££ · Restaurant  
Closed · Opens 12PM  
Dine-in · Takeaway · No-contact delivery

**Ngikan Yuk Palu!** 4.6 ★★★★★ (21) · Restaurant  
Jl. Setia Budi  
Closed · Opens 10AM  
Dine-in · Takeaway · Delivery

**EN Resto** 4.3 ★★★★★ (619) · ££ · Seafood  
Jl. Moh. Thamrin No.11  
Closed · Opens 10AM  
Dine-in · Takeaway · Delivery

**RM. Malaqbi Seafood** 4 ★★★★★ (196) · £ · Seafood  
pan kantor Bank BCA, Jl. Jenderal Ba...  
Closed · Opens 11AM

**Borobudur Resto** 4.3 ★★★★★ (14) · Restaurant  
Jl. Ir. Haji Juanda  
Closed · Opens 7AM  
Dine-in · Takeaway · Delivery

**Maestro Pizza** 4.3 ★★★★★ (574) · ££ · Pizza  
Jl. M.T Haryono No.6  
Closed · Opens 10AM  
Dine-in · Takeaway · Delivery

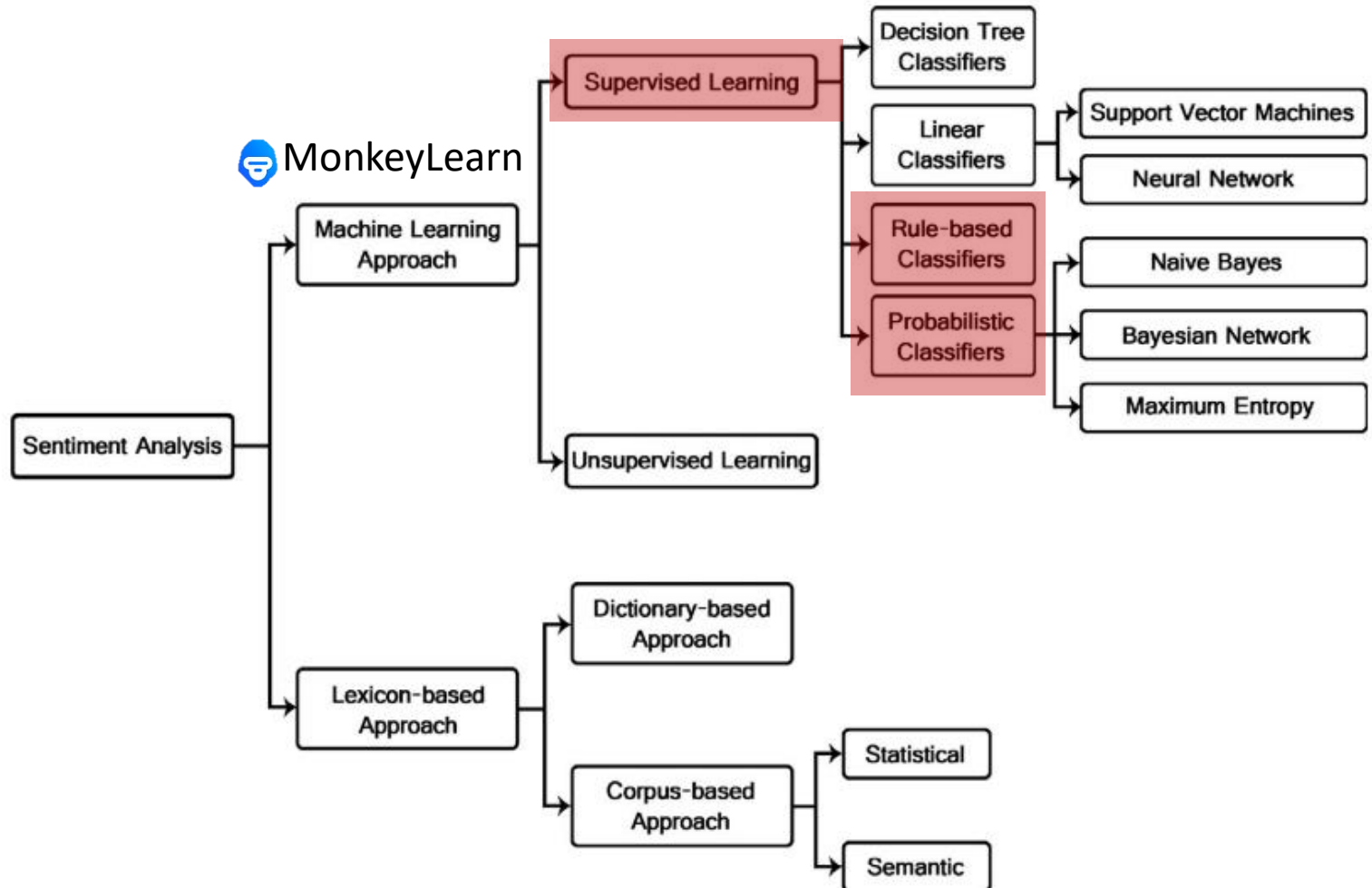
**Beautiful seaside retreat**  
Reviewed: 11 September 2019  
We visited Palu from Australia and were overwhelmed by the kindness of the people in a recovering disaster zone. The hotel is the only "western" style in the city and is still in process of recovering after the tsunami but was lovely.  
Rooms were clean and comfortable. Food and drinks were fine, great breakfast buffet. Staff were friendly and helpful. Laundry service was fantastic. Could honestly spend all day at the hotel. A lovely way to end each day watching the sunset.  
Power cut once but was restored

**Jonly Bataren** Local Guide · 61 reviews · 20 photos  
★★★★★ a week ago  
(Translated by Google) The food is delicious. If possible, I will add a spoon.  
Like

**Mr. X** Local Guide · 102 reviews  
★★★★★ 3 weeks ago  
Terima Kasih Kepada Ngikan yang sudah menambah kualitas dan ketepatan waktunya. Semoga Sukses Selalu, dan Jaya Terus. Saya sangat Merekomendasikan tempat ini. Karena disini satu nya tempat Cita Rasa Ikan dengan taste yang lain daripada ... More  
Like

**Anca Plw** 16 reviews · 6 photos  
★★★★★ 2 months ago  
(Translated by Google) The menu is really good! 🍴👍👍 ... yesterday I bought a menu with yellow pickles without rice. Then I try it, uhh it feels good. ... More  
Like

# Methodology



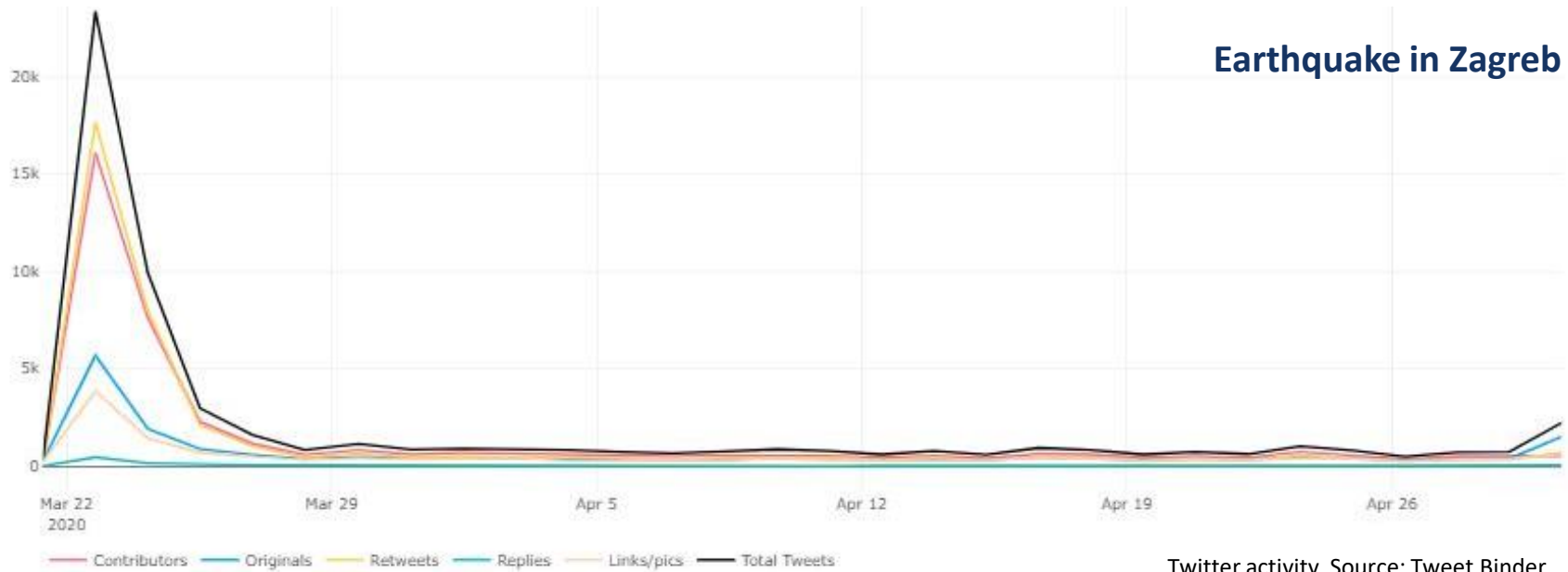
## Sentiment analysis process

Medhat, W., Hassan, A., & Korashy, H. (2014). Sentiment analysis algorithms and applications: A survey. *Ain Shams Engineering Journal*, 5(4), 1093-1113. doi:<https://doi.org/10.1016/j.asej.2014.04.011>. Fig. 1. Pag. 1094.



# Results

## Earthquake in Zagreb



GENERAL STATISTICS	
Total tweets	59,246
Original	19,840 (33.49%)
Retweets	39,406 (66.51%)
Replies	1,369

# Results

## **Positive** (Confidence 93.4%)

Solidarity with our neighbours in Zagreb

## **Negative** (Confidence 98%)

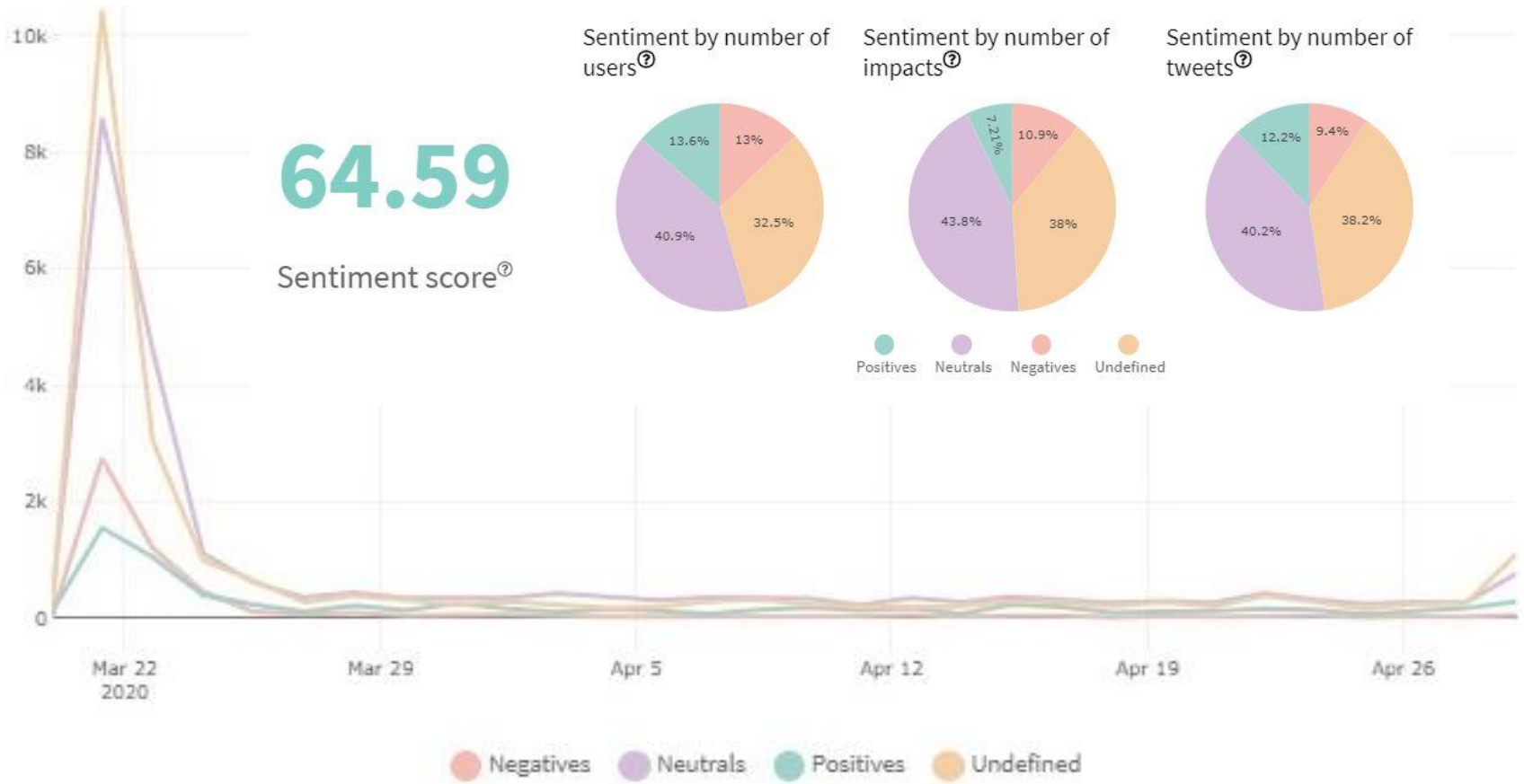
Horrific photos from today's earthquake in Croatia Croatia earthquake babies in incubators collapsed ceilings destruction and patients displaced

## **Neutral** (Confidence 81%)

Croatian Red Cross emergency teams patrol the streets of Zagreb and distribute blankets to people affected by the 5.3 magnitude earthquake that struck this morning Zagreb earthquake

# Results

## Earthquake in Zagreb The 22<sup>nd</sup> March 2020



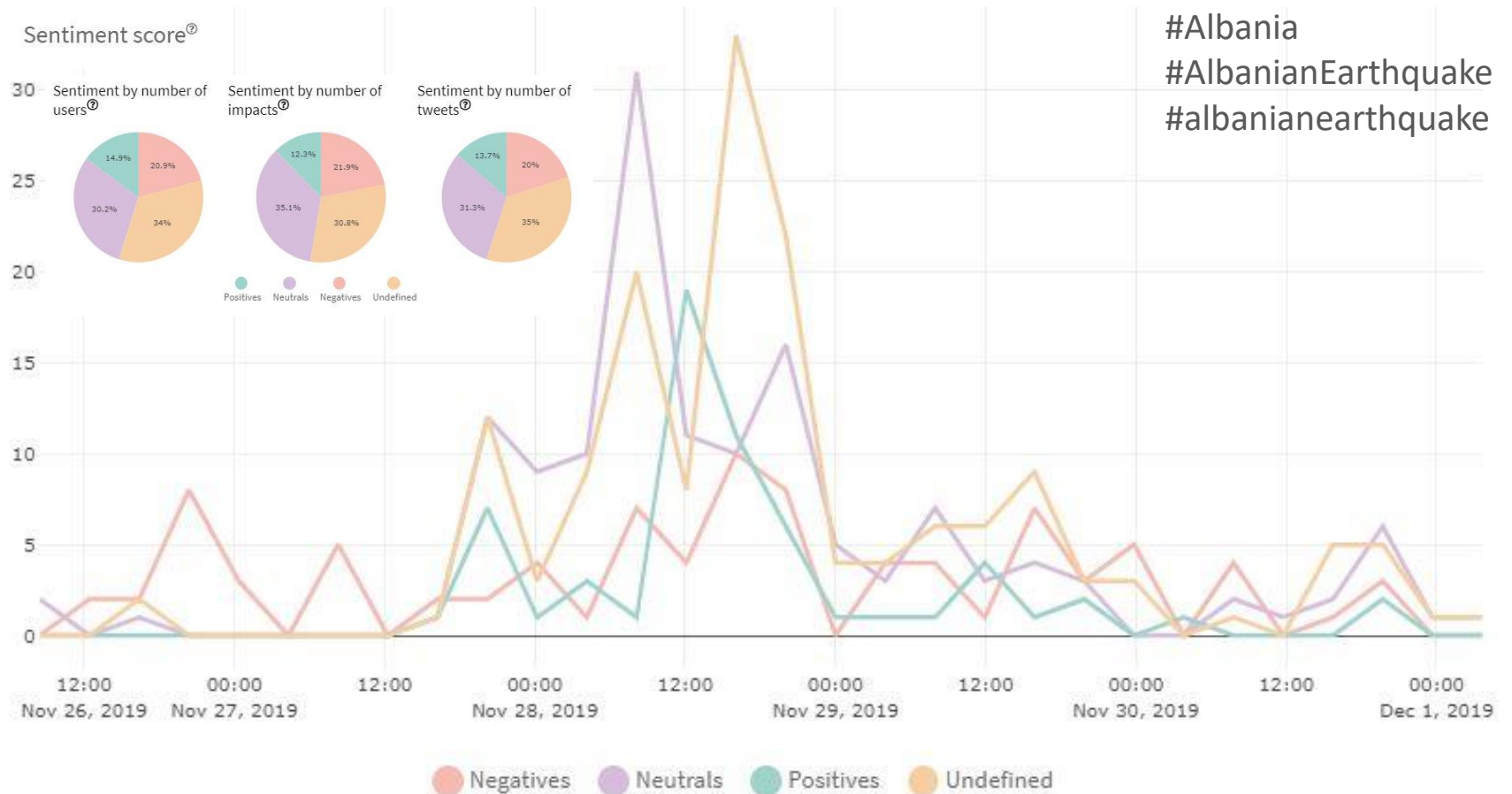
Sentiment timeline. Source: Tweet Binder

# Results

675 Tweets  
57.54

Earthquake in Albania  
The 26th November 2019

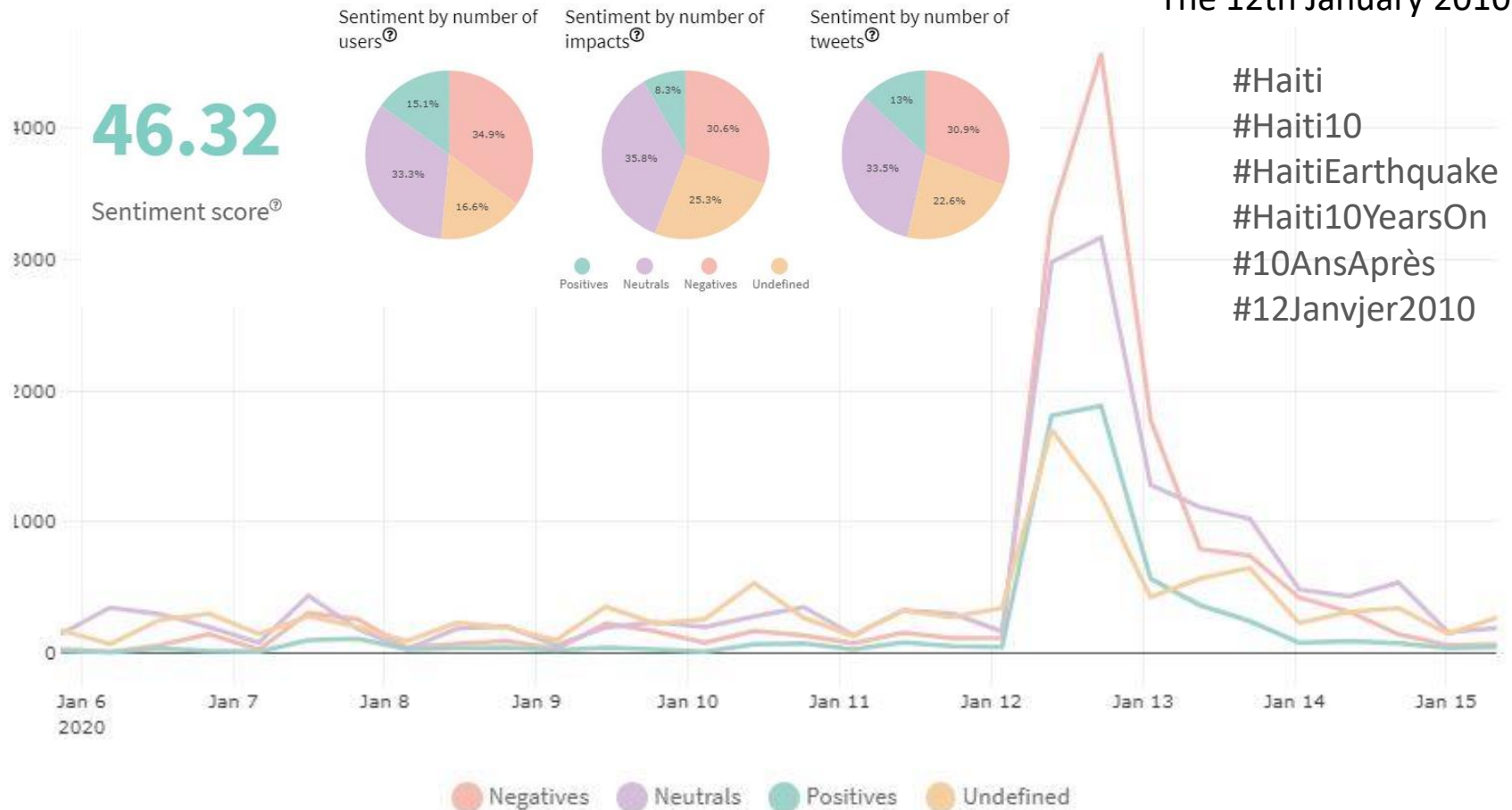
#Albania  
#AlbanianEarthquake  
#albanianearthquake



# Results

## 47,200 Tweets

### Earthquake in Haiti – 10th anniversary The 12th January 2010



Sentiment timeline. Source: Tweet Binder

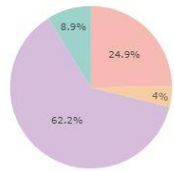
# Results

## 44,189 Tweets

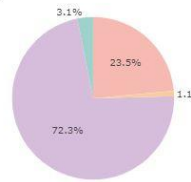
### 45.55

Sentiment score<sup>®</sup>

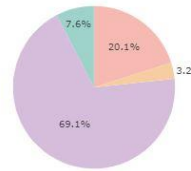
Sentiment by number of users<sup>®</sup>



Sentiment by number of impacts<sup>®</sup>



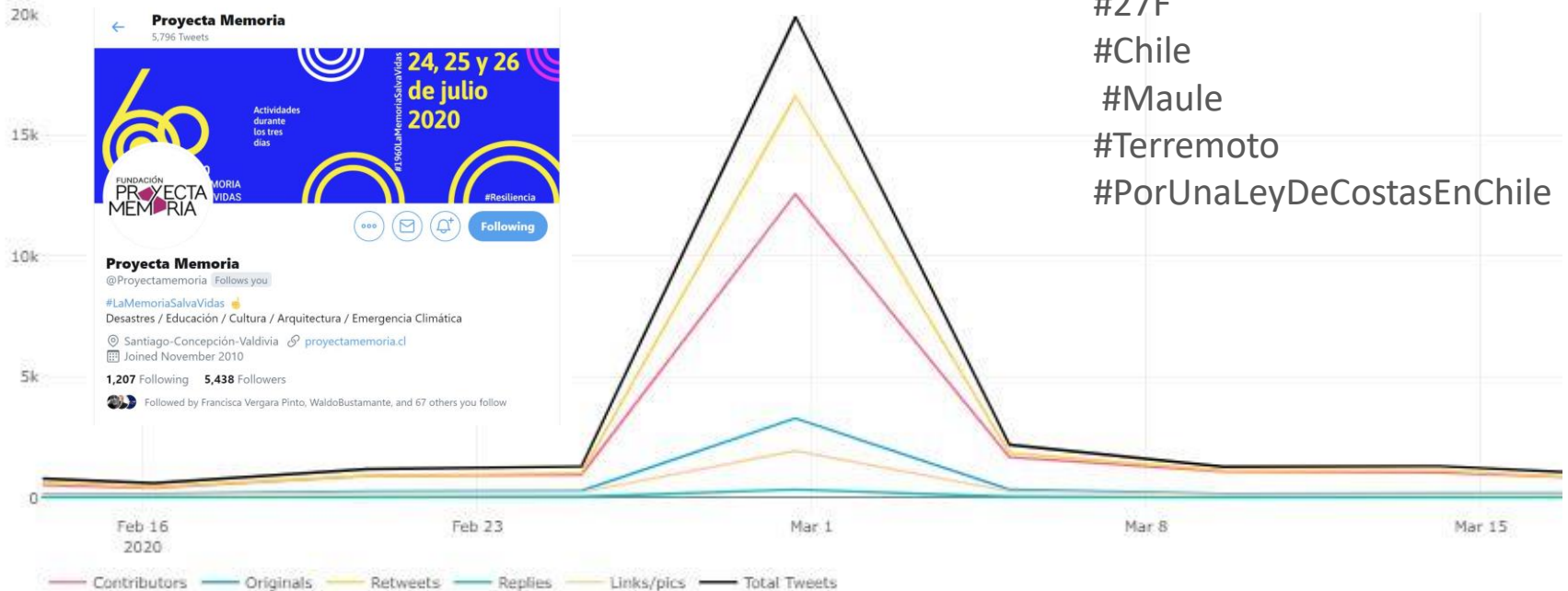
Sentiment by number of tweets<sup>®</sup>



Positives Neutrals Negatives Undefined

## Earthquake in Chile – 10th anniversary The 27th February 2010

#27F  
#Chile  
#Maule  
#Terremoto  
#PorUnaLeyDeCostasEnChile

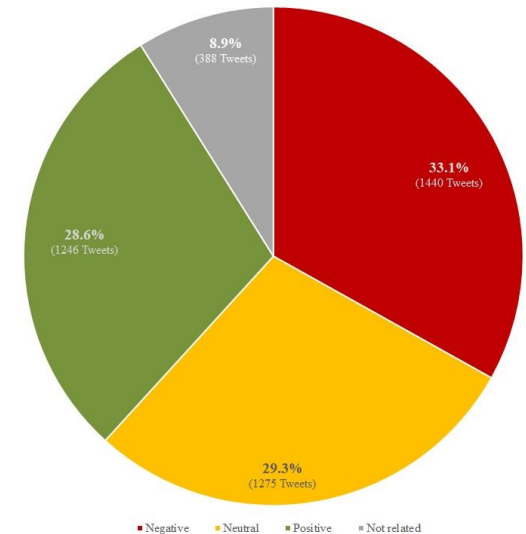
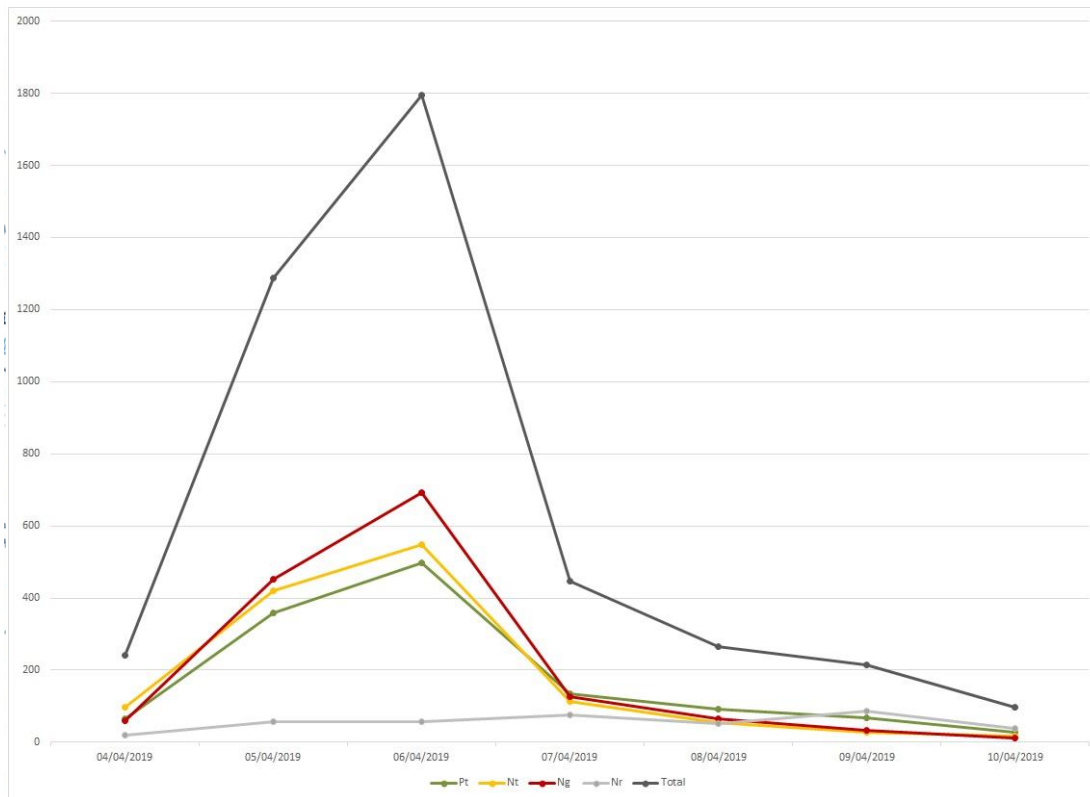


Sentiment timeline. Source: Tweet Binder

# Results

## 4,349 Tweets

### Earthquake in L'Aquila – 10th anniversary The 6th April 2009



■ Negative ■ Neutral ■ Positive ■ Not related

# Examples: L'Aquila tenth anniversary

## Positive (Confidence 90.9%)

I saw on TV .. the rebirth of L'Aquila, of what in 10 years has been restored and the great commitment of all those beautiful people to rebuild (bricklayers/engineers/carpenters/restorers/architects/carpenters, etc.) ). I am touched

## Negative (Confidence 80%)

Another interesting and very painful report on nine. "L'Aquila - 10 years later. I would recommend to many politicians to look at it..and to be ashamed to think of the poor people who still live among the rubble. The Red zone."

## Neutral (Confidence 81.8%)

L'Aquila earthquake the comparison between 2009 and 2019

## Not related

do you see that I \* a q shining in the sky? If you ask me I'll pick you up just to give you .. special tweet for you



# Examples

## Sarcasm

### Positive

Monkey learn: Positive (Confidence 65%)

Grammarly: Neutral

In L'Aquila, so much time has gone by without reconstruction, that in the school there are the remains of a dinosaur.

## Special cases

### Neutral

Monkey learn: Neutral (confidence 91.5 %)

Grammarly: Confident

GI Group Location: L'Aquila ABR IT Weekly from Monday to Saturday, in shifts. 1101-SG) seeks 1 administrative employee. The employee will oversee phases and / or bands of process activities, both in ... More; jobs by ...

## Local knowledge requested

'il titolare della porta mi perdona ma non riesco a superarlo. Dopo 10 anni gli abitanti dell'Aquila hanno ancora difficoltà a tornare a casa, ma miliardi sono stati spesi per riorganizzare le chiese prima di tutto! Nella serie "sticazzi dei vivi", pensiamo alle tombe dei santi. Italia bigotta"

# CONCLUSIONS

- The **activity in social platforms** is extremely **high after a disaster** but **medium to low during the anniversaries**
- We definitive need to **empower the citizens** to share information through social media platforms after a disaster or during the anniversaries based on the concept of **citizens as sensors**
- **Information needed after a disaster: Location of people** trapped, injured or death, **damaged buildings, lifelines** (water, electricity, gas) and **needs** (water, food, shelter)
- **Information needed during the anniversaries: achievements, failures** in the post-disaster recovery process and **commemoration ceremonies**.
- Emergency managers and scientist can **learn from citizens to improve emergency response and being more efficient in post-disaster recovery processes based on the priorities indicated by people**
- We need to develop our **own model for sentiment analysis**, based on **machine learning** and train the model using **rules defined by experts** and data collected from other events and post disaster recovery anniversaries

# Recommendations

When an **Earthquake** or **Tsunami** strike....

**Keep you safe !!! and...**

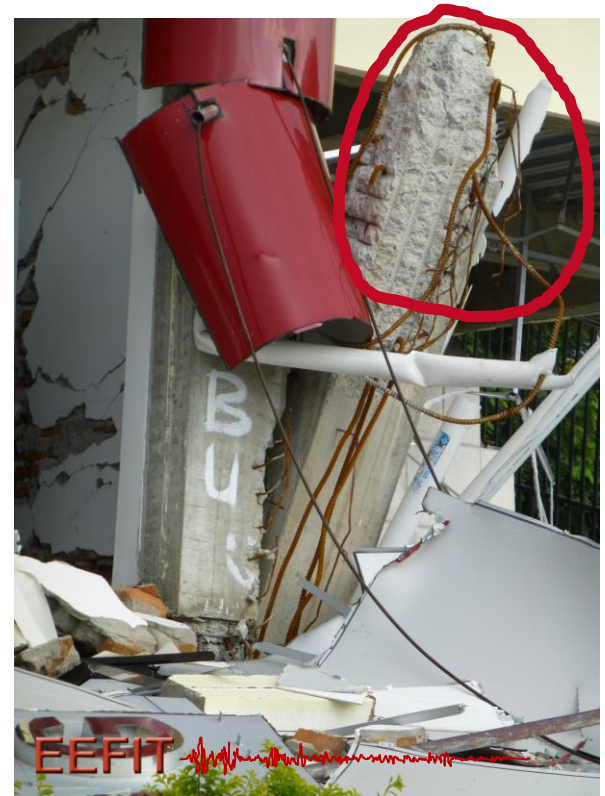
**Take pictures !**



**Upload pictures**

**Share location**

## Take pictures !



Faculty of social and political sciences – Tadulako University (Indonesia)  
The 17<sup>th</sup> November 2018

# Recommendations

## Take pictures !



Tadulako University Hospital (Indonesia)  
The 17<sup>th</sup> November 2018

## Take pictures !



Sigi schools (Indonesia)  
The 20<sup>th</sup> November 2018

## Take pictures !



Sigi (Indonesia)

The 18<sup>th</sup> November 2018

Keep you safe !!! and...  
**Please Tweet !**



Including pictures

**2023**

2018 Sulawesi earthquake and tsunami

**#Sulawesi\_recovery**



# References

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- Mangalathu, S., & Burton, H. (2019). Deep learning-based classification of earthquake-impacted buildings using textual damage descriptions. *International Journal of Disaster Risk Reduction*, 36, 101111. doi:10.1016/j.ijdr.2019.101111
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- Stecanella, B. (2020). Tutorial on Sentiment Analysis with Python. Retrieved from <https://monkeylearn.com/blog/sentiment-analysis-with-python/>

# Follow us

## Project: Learning from earthquakes

<https://research.ncl.ac.uk/learningfromearthquakes/>

[@LEarthquakes](#)

[https://www.instagram.com/learning\\_from\\_earthquakes\\_uk/](https://www.instagram.com/learning_from_earthquakes_uk/)

<https://www.facebook.com/Learning-from-Earthquakes-110392457215986>



**Dr Diana Contreras**

<https://www.ncl.ac.uk/engineering/staff/profile/dianacontreras-mojica.html>

[@DianaContrerasM](#)

[https://www.instagram.com/diana\\_contreras\\_mojica/](https://www.instagram.com/diana_contreras_mojica/)

<https://www.facebook.com/diana.m.mojica.50/>

TERIMA KASIH

GRACIAS

DANKJEWEL

HVALA

dziękuję

धन्यवाद

MULTUMESC

ขอบคุณ

THANK YOU

متشكراً

謝謝

GRAZIE

OBRIGADA

DANKE

ХВАЛА

KÖSZÖNÖM

# Recommendations

When an **Earthquake** or **Tsunami** strike....

**Keep you safe !!! and...**

**Including pictures**