

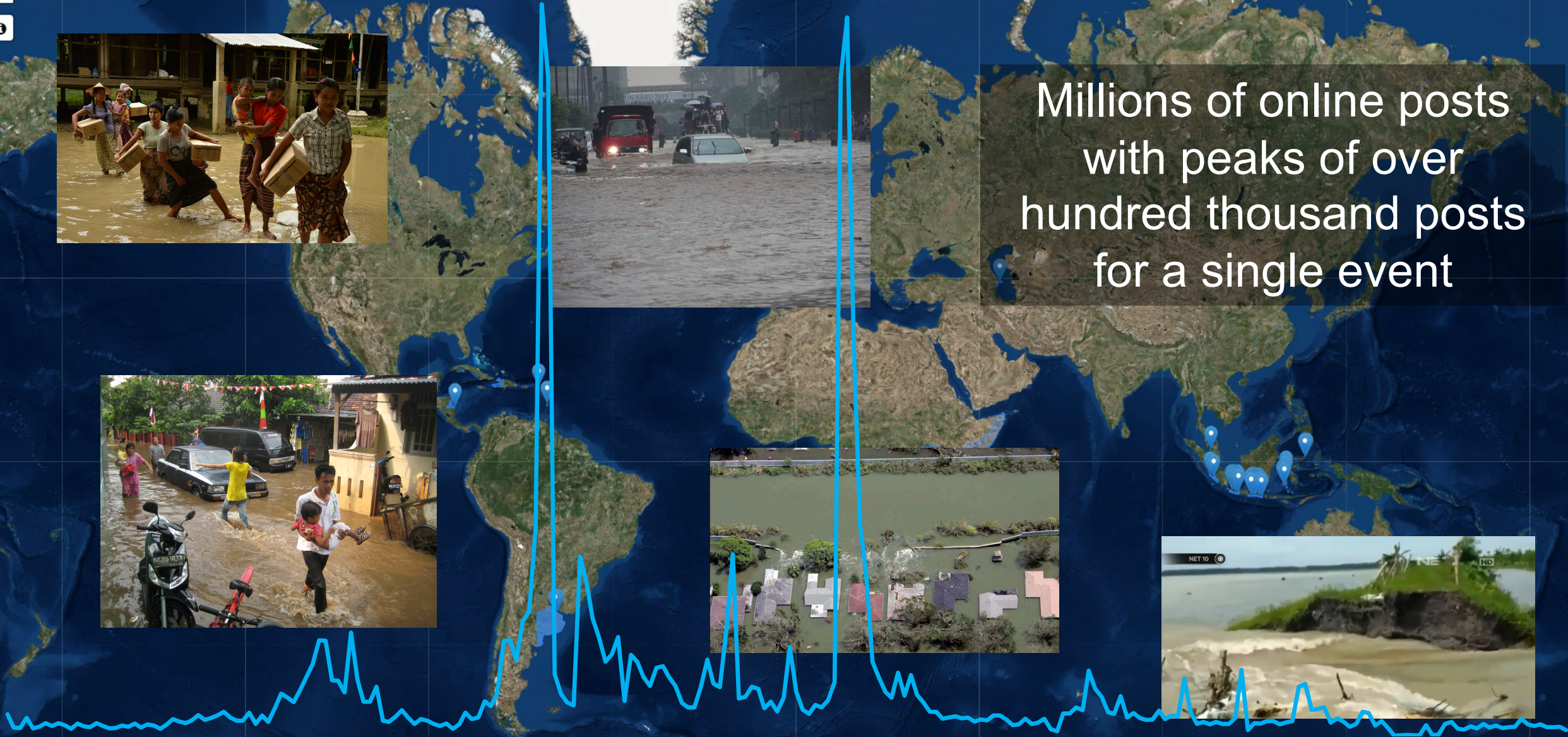
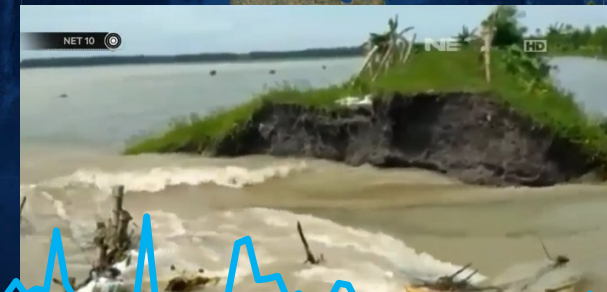


Ground observations from the media for real-time and historical flood assessment

Jurjen Wagemaker  
FloodTags



Millions of online posts with peaks of over hundred thousand posts for a single event



## Collect data



Online media and messenger data  
incl. News Sites, Twitter, Facebook,  
Blogs, Forums, Messengers



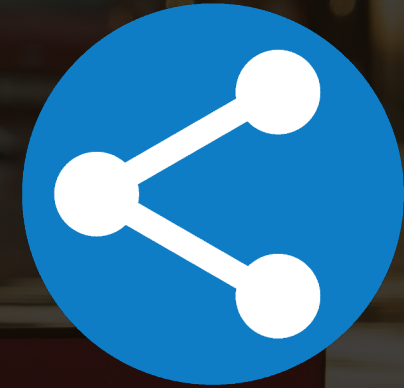
## Analyze Contents



Event detection, information  
extraction for live monitoring  
and historical analysis



## Share Results



Distribute via API and  
Dashboard to Clients directly  
and via third party software



1. First alert of a flood by FloodTags, in OpCen software.

The screenshot shows the 'Operations Center | Admin Dashboard' for the Philippine Red Cross. It features a sidebar with navigation options like 'HOME', 'INTERACTIVE MAP', and 'SERVICES'. The main content area displays 'Floodtags Notifications' with a list of recent incidents, including locations like Cagayan Valley, Iloilo, Western Visayas, National Capital Region, Calabarzon, and Central Luzon. Each notification includes the starting time and the number of related tweets. Below this, there is a section for 'LATEST INCIDENT REPORTS' with a table of recent events.

Location	Starting Time	Number of the related tweets
Cagayan Valley	10/30/2018, 12:55:48 PM	1
Iloilo	10/29/2018, 10:48:15 PM	2
Western Visayas	10/29/2018, 1:08:16 PM	2
National Capital Region	10/27/2018, 9:24:55 PM	2
Calabarzon	10/27/2018, 9:24:55 PM	2
Central Luzon	10/27/2018, 5:30:19 AM	12

2. Follow-up by informing chapters and active collection of additional information

The screenshot shows the 'FLOOD TAGS' dashboard. It features a map of the Philippines with numerous blue circular tags indicating flood locations across various regions. Below the map is a line graph showing the number of tweets over time. To the right, there is a list of tweets related to the flood, including photos and videos of flooded areas. A red arrow points from the text '2. Follow-up by informing chapters and active collection of additional information' to the tweets section.

Floods two weeks ago:  
Tens of thousands of highly relevant tweets

3. Continuous monitoring of the situation in FloodTags Dashboard

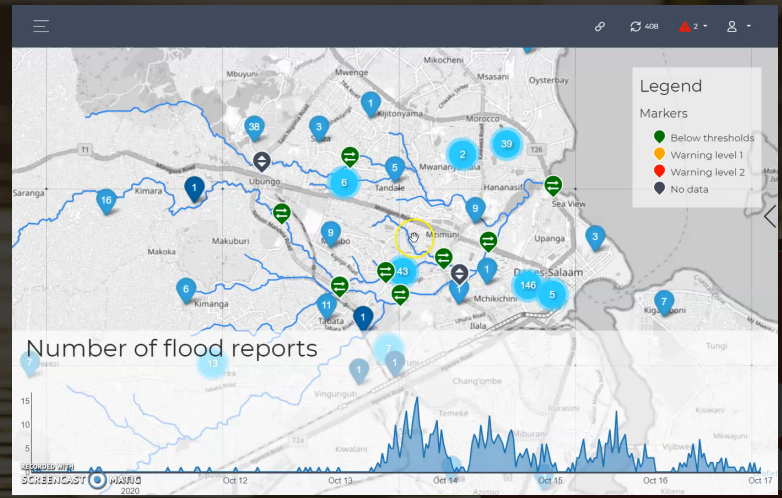
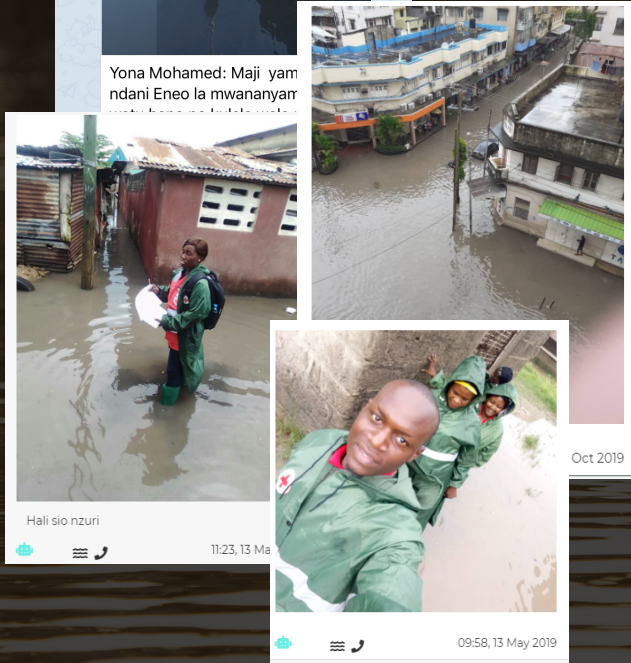
# Emergency Operation Room at the Philippines Red Cross in Manilla

# Active crowdsourcing in Tanzania (for flood response)

With Tanzanian Red Cross Society, Deltares and TAHMO



Disaster managers and volunteers reporting on floods



Communicate

Aggregate

Discuss

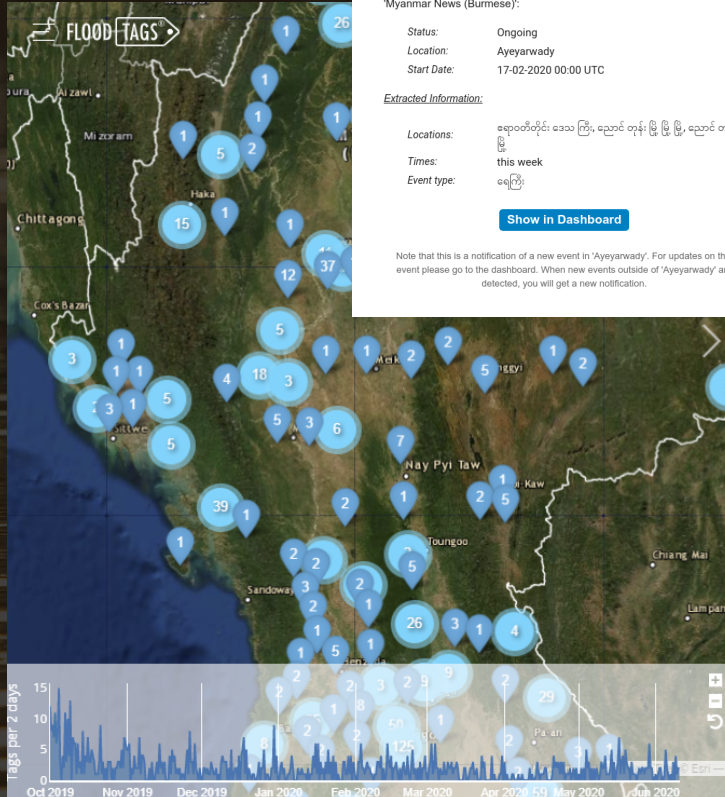
# Model Validation for Index Insurance (Myanmar)

With Radboud University and VisionImpulse



2. Realtime trigger to investigate further, including acquisition remote sensing data

1. Past event detection for flood history



### FLOOD TAGS Event Notification

The FloodTags system has detected a new flood event for the data source 'Myanmar News (Burmese)':

Status: Ongoing  
 Location: Ayeyarwady  
 Start Date: 17-02-2020 00:00 UTC

Locations: ရောတတိုင်း, ဒေသကြီး, ဝေပင်တန်း, မြို့, မြို့, ဝေပင်တန်း  
 Times: this week  
 Event type: ရေကြီး

[Show in Dashboard](#)

Note that this is a notification of a new event in 'Ayeyarwady'. For updates on this event please go to the dashboard. When new events outside of 'Ayeyarwady' are detected, you will get a new notification.

Start: 11 May 2020, 02:00  
 End: 7 Jun 2020, 01:59  
 Bago Region  
 4  
 Confidence: ■■■■

Impact Information

Locations: ပဲခူးတိုင်း, ဒေသကြီး, ပဲခူးတိုင်း, မီး, ကုန်း, မြို့.  
 Descriptions: ရေကြီး, ရေလျှံ  
 People Killed: တယောက်

[See Tags](#)  
[Download Event Tags](#)

The screenshot shows Burmese news articles with red arrows pointing to specific text. The arrows originate from the text '2. Realtime trigger to investigate further...' and '1. Past event detection for flood history'. The text in the articles includes details about flood events in Myanmar, such as 'Bago Region' and 'Ayeyarwady'.

	Event #88	Event #89	Event #90
Start Date	2017-08-25	2017-07-29	2017-08-23
End Date	2017-08-25	2017-07-29	2017-08-23
Dates – Average confidence	0.56	0.99	0.97
Location	Minbu Township	Kyainseikgyi Township	Magway Township
Location – Average confidence	0.99	0.62	0.99
Keywords	flooding, flood	flood, floods, flooding, water	flooding, flood, water, flood, floods
Keywords – Average confidence	0.81	0.96	0.94
Affected People	1500	more than 800	about 23148
Affected People - Estimated Range	1500	>800	~23148
Affected People – Average confidence	0.99	0.99	0.98
Overall – Average confidence	0.79	0.86	0.97
Original Publications	<a href="http://burmese.dvb.no/archives/226018">http://burmese.dvb.no/archives/226018</a>	<a href="http://www.7daydaily.com/story/103201">http://www.7daydaily.com/story/103201</a>	<a href="http://news-eleven.com/news/6425">http://news-eleven.com/news/6425</a>

# Level II Classification Approach

Supervised machine learning for language processing and image analysis

- Development and training of text classifiers in local languages, for the detection of event, location, time, casualties, evacuated, affected and damaged property.
- Development and training of image classifiers for the detection of persons, transport (motorized, non-motorized and water), cattle and rescue workers.
- Human-in-the-loop for on-the-fly corrections and continued training

With Radboud University  
and VisionImpulse



Classification:  
Persons



Classification: Water level above knee



Classification: Water level below knee

Annotation Platform (example from the Philippines, for ease of reading)

(event.flood) (dmg.ppl.evac) (loc.sup) (loc.focus)  
**Typhoon Hagupit**: **500,000** people flee to safety in **eastern Philippines**.

(event.flood) (loc.sup) (loc.focus) (time) (event.flood)  
 A powerful **typhoon** struck the **eastern Philippines** on **Saturday**, bringing intense **rain** and threatening further destruction of areas still bearing the scars of a **super typhoon** little **more than a year ago**.

(dmg.ppl.evac) (dmg.ppl.evac) (event.flood)  
**More than half a million** people fled to shelters ahead of **typhoon Hagupit** making landfall.

Text half  
 Entity **Supplies were cut** Damage, People Evacuated  
[https://raw.githubusercontent.com/ErkanBasar/mebasarcom/master/eifd.febasar\(manual\)2017-07-28T23:14:13](https://raw.githubusercontent.com/ErkanBasar/mebasarcom/master/eifd.febasar(manual)2017-07-28T23:14:13)  
 Entity **More than half million** Damage, People Evacuated  
[https://raw.githubusercontent.com/ErkanBasar/mebasarcom/master/eifd.fEIFD\(auto\)2017-07-28T23:14:13](https://raw.githubusercontent.com/ErkanBasar/mebasarcom/master/eifd.fEIFD(auto)2017-07-28T23:14:13)  
 Confidence 40.64068807943521% led **7,350** people

Legend • Entity (Hide)  
 • Event, Flood Related  
 • Time, Flood Related  
 • Location, Focused Flood  
 • Damage, People Evacuated  
 • Location, Supplementary  
 • Damage, Property  
 • Damage, People Killed

Example classification of text

- Event - Flooding water in  
 - Location - Marikina, east of Manila, Philippines,  
 - Location, Supplementary -  
 - Location -  
 - Time - on 13<sup>th</sup> of August

# Human-in-the-loop to eliminate any remaining uncertainty

With Radboud University  
and VisionImpulse



## Article View

The below shows the labels in the text as given by our algorithm. [Please click here](#) if you would like to edit and overwrite these labels

- Event Identifier
- People Killed
- Damage on Economy
- Location
- People Evacuated
- Location Supplementary
- People Affected
- Event Date
- Damage on Property

မိုးသည်းထန်စွာရွာသွန်းမှုကြောင့် မိတ္ထီလာမြို့ပေါ် ရပ်ကွက် နေအိမ်များ နှစ်လမ်းများ ပေါ်တွင် ရေကြီး၊ ရေလျှံ ခဲ့ပြီး ရွှေကျောင်း ဘုန်းတော်ကြီးကျောင်း အုတ်တံတိုင်းများ ပြိုကျ

မေ ၂၈ ရက် ည ပိုင်းက တစ်နာရီခွဲခန့် ကြာ မိုးသည်းထန်စွာ ရွာသွန်းမှုကြောင့် မိတ္ထီလာမြို့၊ ကျောက်ဖူး နယ်မြေ၊ မိတ္ထီလာ တက္ကသိုလ်အနီး မိတ္ထီလာ ကျောက်ပန်းတောင်းကားလမ်းမတွင် ပေ ၂၀၀ ခန့်လမ်း ရေလျှံ ခဲ့ပြီး အဝေးပြေးကားများ နှင့် အိမ်စီးကားများ ခက်ခဲစွာ သွားလာခဲ့ရကြောင်း သိရှိရပြီး ယနေ့ (မေ ၃၀ ရက်) နံနက်ပိုင်း ထိလမ်း ရေလျှံ မှု ဖြစ်ပေါ်နေသေးကြောင်း သိရှိရသည်

အဆိုပါ မိုးသည်းထန်စွာ ရွာသွန်းမှုကြောင့် မိတ္ထီလာမြို့၊ အောင်ဇေယျာ ရပ်ကွက်၊ အောင်ဆန်း ဝမ်းမြူးသစ်ရပ်ကွက်၊ နန်းတော ကုန်း ရပ်ကွက် နှင့် ချမ်းအေး နယ်မြေ၊ ရန်

မိုးအောင်ရပ်ကွက်နှင့် ပေါက်ချောင်းကွက်သစ်အတွင်းရှိ နေအိမ်အချို့အား တစ်ပေမှ သုံးပေခန့်ထိ မိုးရေဝင်ရောက်ခဲ့ပြီး ပေါက်ချောင်းကွက်သစ်၊ တရုတ်ဂိတ်နယ်မြေရှိ ရွှေကျောင်း

ရပ်သာဘုန်းဝမ်းတော်ကြီးကျောင်းအုတ်တံတိုင်း ၁၅ ခန်းနှင့် မိတ္ထီလာမြို့နယ်၊ ရွှေယောင်ဆိုင်ဝမ်းဘုရားပရဝဏ်အတွင်းရှိ ရွှေဆိုင်ခန်းများ ပြိုကျမှုများ ဖြစ်ပေါ်ခဲ့ပြီး မိတ္ထီလာမြို့နယ်၊ ရန်

မနေ့ညက မိုးအရမ်းများ သွားတယ်။ အခုကျောက်ပန်းတောင်းလမ်းမရေထွက်ပေါက်နည်းနည်းပိတ်သလားလို့ ဝန်ထမ်းအလုပ်သမားတွေ ခေါ်ထားပါတယ်။ ဟိုဘက်က ရေဆိုးကန်ကလည်း ရေတော်တော်လျှံနေတယ်။ ရေဆိုးကန်လက်ပိုင်းနံရံက တာဘယ်လောက်အခြေအနေရှိမလဲတော့မသိသေးဘူး။ လျှပ်စစ်ပိုင်းလားလားရင် တောက်လျှောက်ရေစုတ်ထုတ်ရမယ်။ အခုတော့လျှပ်စစ်မီးမလားသေးတော့ရေထုတ်တဲ့စက်ရုံတွေကလည်း မီးနဲ့လည်တာဆိုတော့ ခဏတော့စောင့်ရအုံးမယ်ထင်ပါတယ်။ ညကမိုးများတာရေထွက်ပေါက်တော်တော်များများ ပိတ်သွားတယ်။ ကျွန်မအိမ်တောင်အိမ်အောက်ရေဝင်သွားလို့ ဆန်အိတ်တွေစိုသွားတယ်။ ကျွန်မအိမ်ဆိုရေမဝင်တာဘဲ နှစ်လောက်ရှိပါပြီ။ အခြားကတော့

ချမ်းအေး၊ တရုတ်ဂိတ်ရေဝင်တယ်ကြားလို့ ကျွန်မတို့အခုလိုက်ကြည့်မှာပါ။ ဟိုမိတ္ထီလာမြို့နယ်၊ စည်ပင်သာယာရေးကော်မတီဥက္ကဋ္ဌ ဒေါ်နီလာဝင်းမှ မေ ၃၀ ရက်နံနက်ပိုင်းကပြောကြားသည်

အရင်တစ်ခါမိတ္ထီလာကန်ရေကြီးတဲ့ကံအခန်းဝါးဆယ်လောက်ပြိုသွားတယ်။ ဘုန်းကြီးကျောင်းဝင်းက အကျယ် ၇ ဧကခွဲလောက်ရှိမယ်။ အဲဒါအကျန်လုံးအုတ်တံတိုင်းခတ်ထားတာ

အခုမနေ့ညက မိုးရွာလို့အုတ်တံတိုင်းအခန်း ၁၅ ခန်းလောက်ပြိုသွားမယ်။ ညည့်နက်မှပြိုကျသွားတာ။ မိတ္ထီလာဘက်မှာ ရှေးခေတ်သောက်ရေကန်အကြီးကြီး နှစ်ကန်ရှိတယ်။ အဲဒီရေကန်ကလျှံကျတာ။ ညဘက်ဆိုတော့အုတ်တံတိုင်းပြိုလည်း လူထိခိုက်မှုမရှိပါဘူး။ ဟိုမိတ္ထီလာမြို့၊ ရွှေကျောင်းရပ်သာကျောင်းဆရာတော်ဦးည ကိုသာရမှ မိန့်ကြားသည်

မိုးသည်းထန်စွာရွာသွန်းမှုကြောင့် မိတ္ထီလာမြို့လမ်းများ နှင့် နေအိမ်များ ရေကြီး၊ ရေလျှံ ဖြစ်ပွားမှုအား မေ ၃၀ ရက်နံနက်ပိုင်းကတွေ့ရစဉ်

## Article Images



Is the image flood related?  Yes  No

Is there at least one person standing knee-deep in water?  Yes  No

Is there a person?  Yes  No

Is there a transportation without motor?  Yes  No

Is there a boat present?  Yes  No

Is there a building present?  Yes  No

Is there a response worker who helps victims?  Yes  No

Is there any cattle present?  Yes  No

What is the level of the urbanization?  Low  Med.  High



Is the image flood related?  Yes  No

Is there at least one person standing knee-deep in water?  Yes  No

Is there a person?  Yes  No

Is there a transportation without motor?  Yes  No

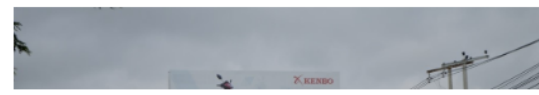
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Is there any cattle present?  Yes  No

What is the level of the urbanization?  Low  Med.  High



Is the image flood related?  Yes  No

Is there at least one person standing knee-deep in water?  Yes  No



# Two level approach

Level I : Standard	Level II: Higher Precision
Technique and accuracy: <b>Rule-based systems with AI support</b> for the information extraction of location and date. For use-cases where some falses are tolerated.	Technique and accuracy: <b>In-house developed AI</b> for higher precision and additional information extraction. For automated systems that require a higher precision.
Returns flood related articles from a broad base of media data, with time and location of large and small floods	Returns flood related articles from a broad base of media data with time and location of large and small floods
-	Elaborate information extraction of the media content, incl. damage figures, number of evacuees, casualties etc.
-	Human-in-the-loop to overrule and improve the system
Detects new flood events using Twitter. Performs well for <b>detection of large floods and many of the smaller floods globally.</b>	Event detection on the basis of a broader base of media data. Performs well for <b>detection of any large and small floods in any country of investigation.</b>
Various filters to find highly relevant flood observations. Georeference using NLP on the body text, down to city or intracity level.	Various filters to find highly relevant flood observations. Georeference using NLP on the body text, down to city or intracity level.
Large coverage: <b>Currently 10 languages covering</b> 1. large floods global and 2. smaller floods <b>in &gt;50 countries.</b> Expanding	<b>At request</b> coverage for any language, Currently covering Burmese, Khmer and Lao. Expanding.



FLOOD TAGS

SEARCH THIS AREA

**Diario La Huella** @LaHuellaSV · Nov 7  
 #Precaución || Las calles del municipio de Santa Ana se encuentran inundadas.  
 Los tragantes de la ciudad están colapsados por la falta de recolección de la basura.



**periódico digital al minuto** @alminuto\_sm · Nov 6  
 #EtaSV || Tras el Desbordamiento del río Lempa, efectivos de la cuarta brigada de infantería evacuaron a personas afectadas por inundaciones en el municipio de Citala en el departamento de Chalatenango.



#RCVNoticias Comayagua fire station reports the rescue of a person in the Brisas de Humuya neighborhood in the second stage, they continue with rescue work by boat in several neighboring sectors where they have suffered floods. <https://t.co/...> More

17:38, 5 Nov 2020



#ActualidadCC. The Choluteca River begins to overflow as it passes through #Tegucigalpa. The rise in the water level due to the constant rain produced by tropical storm Eta. <https://t.co/fXIHseaE9G>

01:11, 5 Nov 2020



Snake is washed away by flood current in a house in the lowlands of Choloma, please be careful. <https://t.co/z63rYzLAa7>

01:11, 5 Nov 2020



#Nacionales La Conred reports floods due to the overflowing of the Motagua river, in Morales, Izabal. Homes have been damaged and people affected by the flood are already being evacuated. <https://t.co/6uEIRJx1NM>

01:10, 5 Nov 2020

# HURRICANE ETA 6-14 NOVEMBER 2020

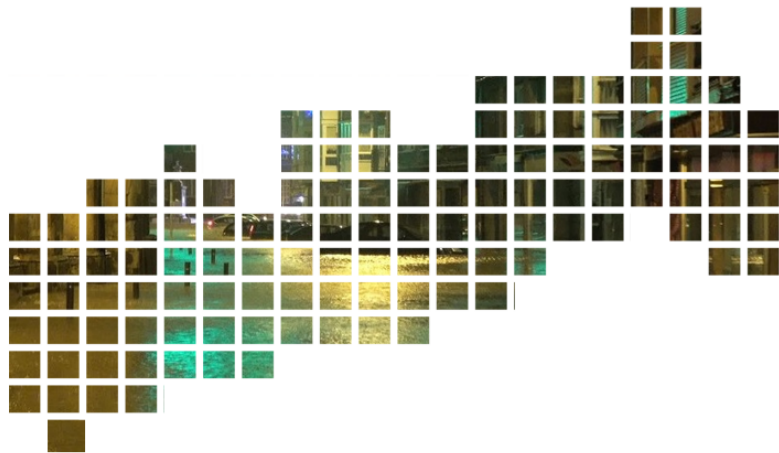
## AER FloodScan Flooded Fraction (FF)



# ICEYE Satellite Imagery Flood validation in Tochigi October 2019

## FLOODTAGS EVENTS SUMMARY

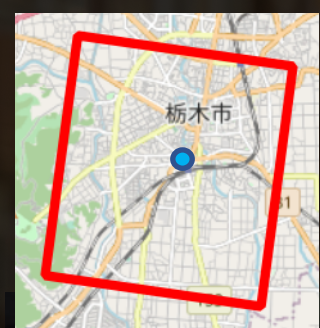
Media analysis of the flood event of 12<sup>th</sup> and 13<sup>th</sup> of October 2019, Tochigi



FINAL



Figure 4: Overview of media content in six areas

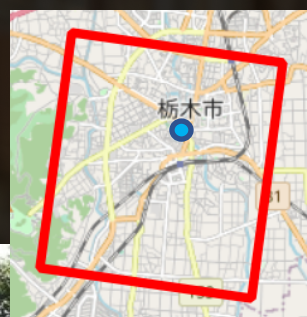


CLOSER

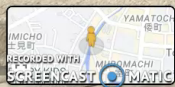


• Main street in front of city hall





Dorayaki Shop, reported 40 cm



Over a random period of 1.5 hours we collected 10.660 English tweets. By using a flood relatedness filter we excluded 75%. Of the remaining 2.665 we annotated and evaluated how much content were discussing different topics within flood management. Here the results:

# Topic: Forecast

20% of tweets are related to flood forecasts

- Very good: About an event for a specific location
- Good: About an event with general location
- Related: Not about a specific event
- Bad: Unrelated

Relevance: Keep track of any flood forecast issued by any organisation and monitor additional expected flood situation by citizens and journalists.

*“CaIMac cancels Outer Hebrides ferries as flood warnings issued for parts of Highlands <https://t.co/myCaiVVzg4>”*

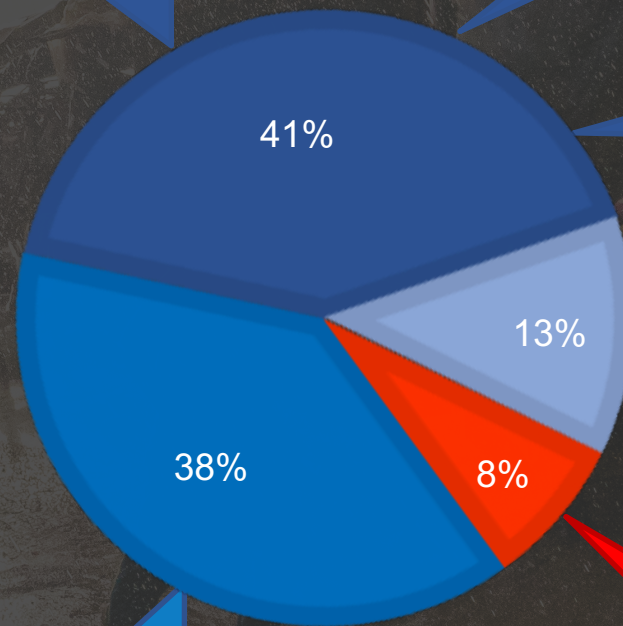
*Heavy rain triggers Flash Flood Warning, Flood Advisory in Cuyahoga & Lorain counties <https://t.co/oG1SR9XORE>*

*“Flood Alert: Rivers Otter and Sid, and Exmouth Area 09:56 21 October <https://t.co/pgwmaMUWhK>”*

*“Beavers ‘won’t reduce risk of flooding’ in Britain <https://t.co/jLG9RgmBl4> “*

*“BOM forecasts flooding, hail and damaging winds as La Niña-fuelled wild weather descends on east coast - ABC News <https://t.co/dCApVA5k5P>”*

*“Test of WKRN flash flood warning. <https://t.co/BCf0ijuDLc>”*



Over a random period of 1.5 hours we collected 10.660 English tweets. By using a flood relatedness filter we excluded 75%. Of the remaining 2.665 we annotated and evaluated how much content were discussing different topics within flood management. Here the results:

# Topic: Logistics

8% of tweets are directly related to logistics

- Very good: About an event for a specific location
- Good: About an event with general location
- Related: Not about a specific event
- Bad: Unrelated

Relevance: The accessibility of flooded areas is of utmost importance to responders. While access and safety of warehouses and other storage locations are essential for the logistical sector.

*"West Street in Poole flooded again! Causing problems for traffic. @TravelDorset @BCPCouncil"*

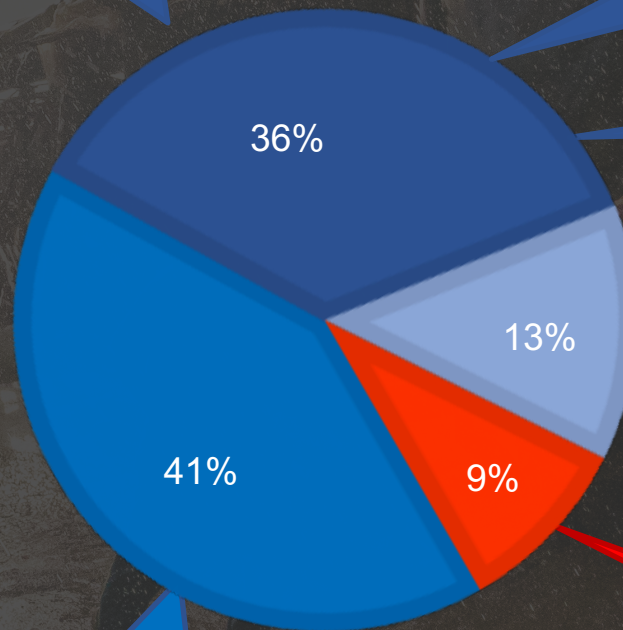
*"TRAFFIC ALERTS: Right lanes of 90 EB blocked near W 44th street because of high water. Ramps to Innerbelt bridge blocked this morning. #GMClc <https://t.co/gfgqT3Qbkm>"*

*"SB W. 117 CLOSED at Madison due to flooding under the RTA Bridge."*

*"Karnataka Chief Minister BS Yediyurappa holds meeting at Kalaburagi Airport over flood-affected areas. @BSYBJP #HNN24X7 <https://t.co/rtmDsro22Y>"*

*"@KenCarman It always floods in the passing lane on 480 under the 80 overpass in streetsboro"*

*"The Isabela Provincial Police Office reported on Wednesday that ten bridges in the province have been rendered impassable by Tropical Storm Pepito. #PepitoPH"*





Over a random period of 1.5 hours we collected 10.660 English tweets. By using a flood relatedness filter we excluded 75%. Of the remaining 2.665 we annotated and evaluated how much content were discussing different topics within flood management. Here the results:

## Other topics include

- Impact data such as damage to houses, infrastructure. And information on numbers of affected people, evacuees and casualties.
- Information on the causes of floods, including discussions of damaged embankments, land disputes, trash accumulation etc.
- Market information for water companies with news on infrastructure problems, investment decisions, community activism and much more
- Other disasters such as excessive rains, droughts and wildfires



Trash washed up on the shore in Manila Bay as heavy monsoon rains poured and caused floods in Metro Manila.

The STAR/KJ Rosales

@PinoyAkoBlog Engineer paano na ang dolomite kung mangyari ulit itong Manila Bay? Ano mitigation nyo di <https://t.co/FqRvJORrSp>



JPM floats 32bn/- to reshape Ng'ombe River, address Dar flood CCM presidential candidate, Dr John Magufuli yesterday in Dar es Salaam said that his government has allocated 32bn/- to reshape Ng'ombe River and in turn, will control floods in parts of... [More](#)



06:58, 15 Oct 2020

# Question and Answer

## Question

*“What do you do in countries where there is no media data?”*

## Our experience

There’s always data. There are no countries where people are just silent when it floods. What the content is differs per country.

## Small Steps

1. Best is to start with a quick inventory of data for your use-case. Possibly including an event report for a flood of your selection
2. Then evaluate and start real-time monitoring or more elaborate risk and trend analyses

## Question

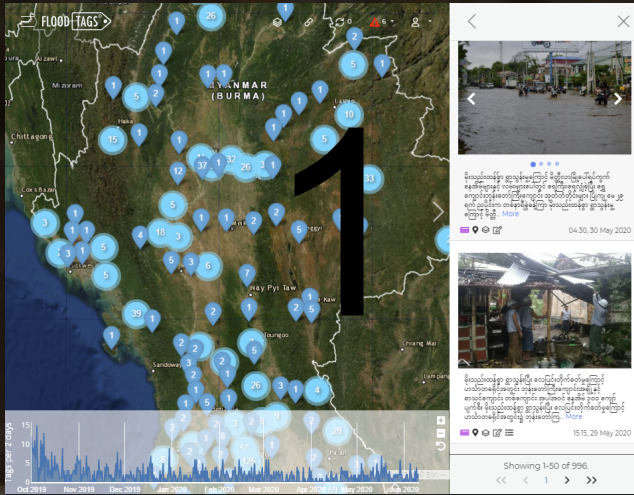
*“Can we get data for research purpose?”*

## Answer

Yes certainly. There are great topics to research such as the improvement of flood maps and flood forecasts by using media data as a supplement

Just when you formulate a research please reserve funds for data acquisition. We get many requests and we are not government funded. Additional funds help to sustain this type of support.

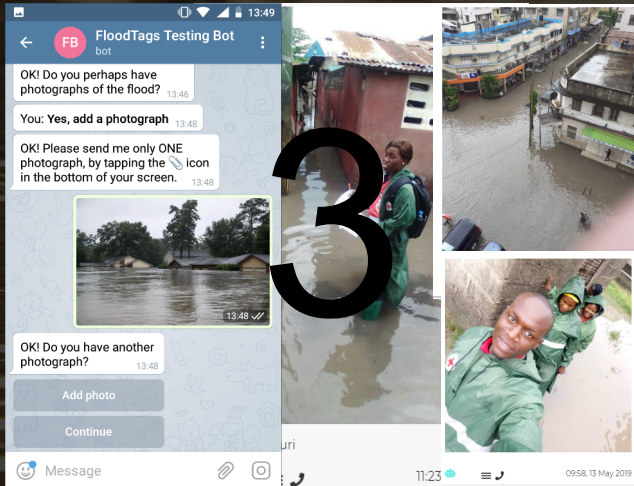
# Media data we can deliver to you



1

Real-time delivery of media data with filters for three levels of detail (i.e. with/ without intracity details and with/ without additional information extraction)

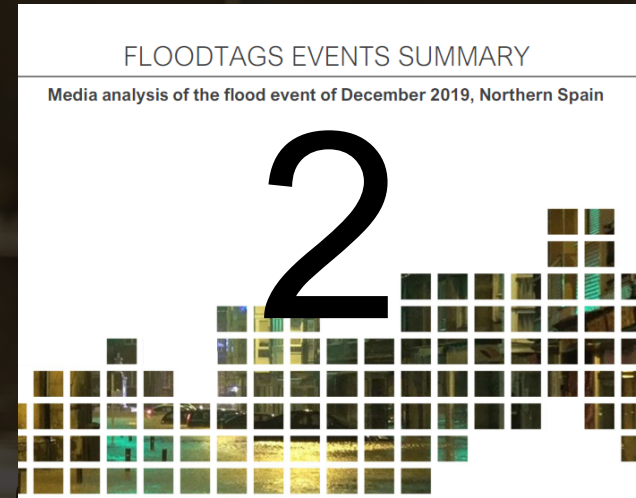
Fixed pricing that depends on the volume of analyzed media content and the level of detail of the output



3

Support to your two-way communication.

Pricing on quotation (this is a project since it involves third party responders)



2

Event report with detailed analysis of past floods, geolocations down to specific coordinates

Past event reports start at € 2.500 – € 5.000 per event

Global coverage. Easy access. Media data feeds into your dashboard or aggregate platform (such as Delft-FEWS) via our API.

First steps can be small, investigating the volume of content and applicability for your use-case.



**Thank you!**

Contact us via [info@floodtags.com](mailto:info@floodtags.com) or [wagemaker@floodtags.com](mailto:wagemaker@floodtags.com)

Or follow us on LinkedIn ("FloodTags")