

Early Flood Warning Systems

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<http://scottbridle.com/my-images/aerial-abstracts>

Outline

1. Types of early warning systems

Monitoring

Rainfall-runoff model predictions

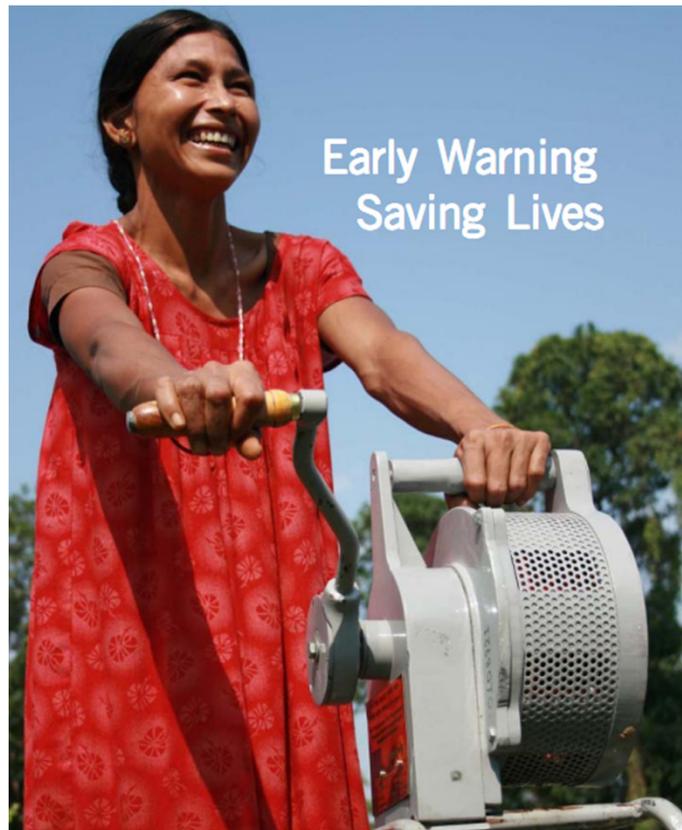
Advanced systems

2. Challenges for forecasters

3. Emerging resources

Nepal: Community-based early warning

Nepal has limited infrastructure and few resources.
Data, particularly automated data, is limited.



Hand sirens for flood alarm

Nepal: Community-based early warning



**Lookout towers for floods
(originally for dangerous animals)**



**Use what people
are familiar with**

**Learn from experience
to refine your system**

Examples from Jakarta

Upstream video of river



Downstream flood marks



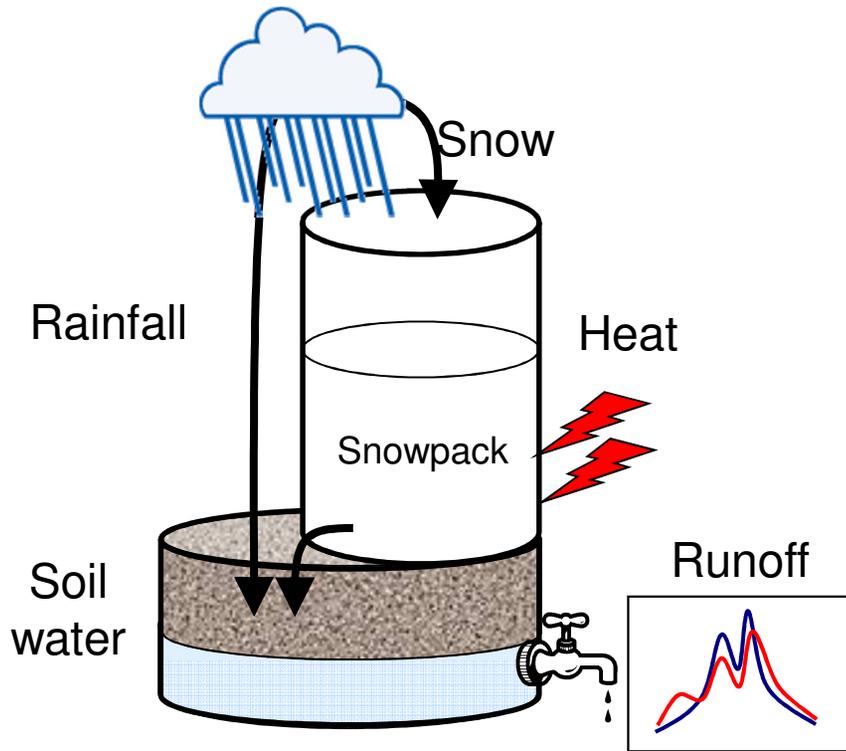
18 hours later

Community message boards



In many places,
upstream river monitoring
gives early warning for
those downstream
(i.e. no computer model)

Rainfall-runoff models



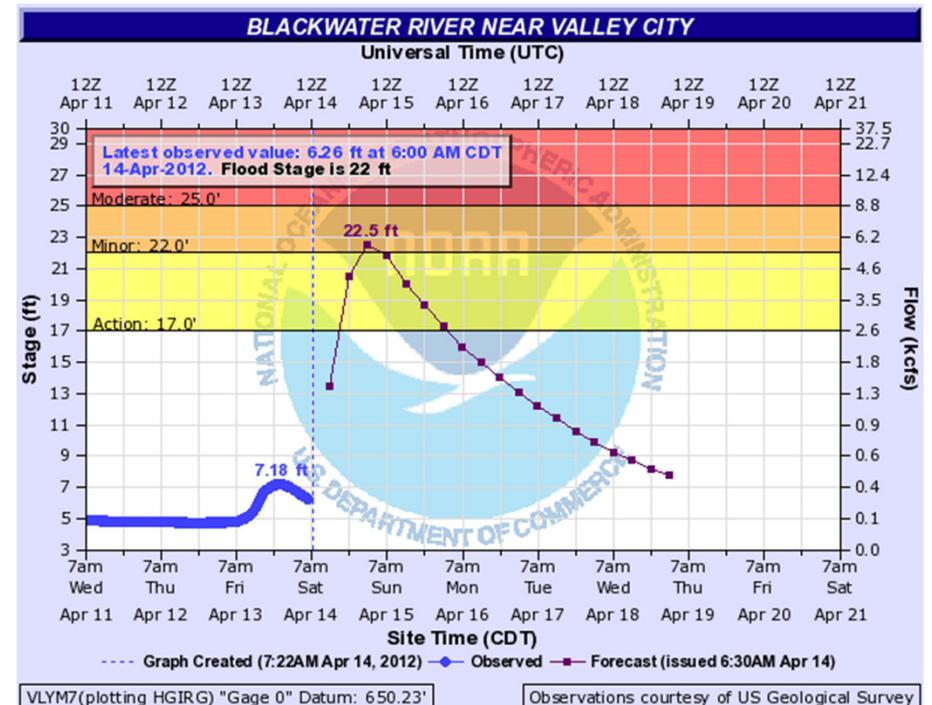
Inputs: Precipitation (past + future)

Potential evaporation

Some places: Temperature

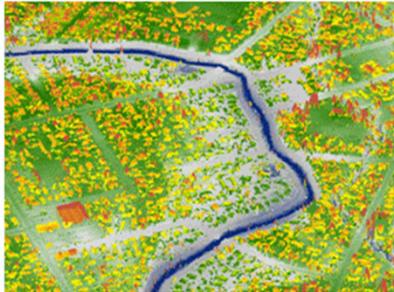
Outputs: Daily/hourly runoff

Simple: 300 lines of computer code

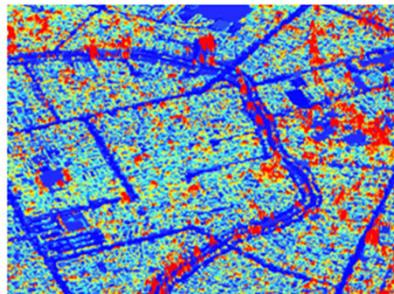
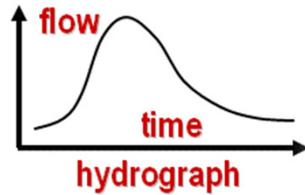


Advanced forecasting systems

Inundation modelling:



elevation model



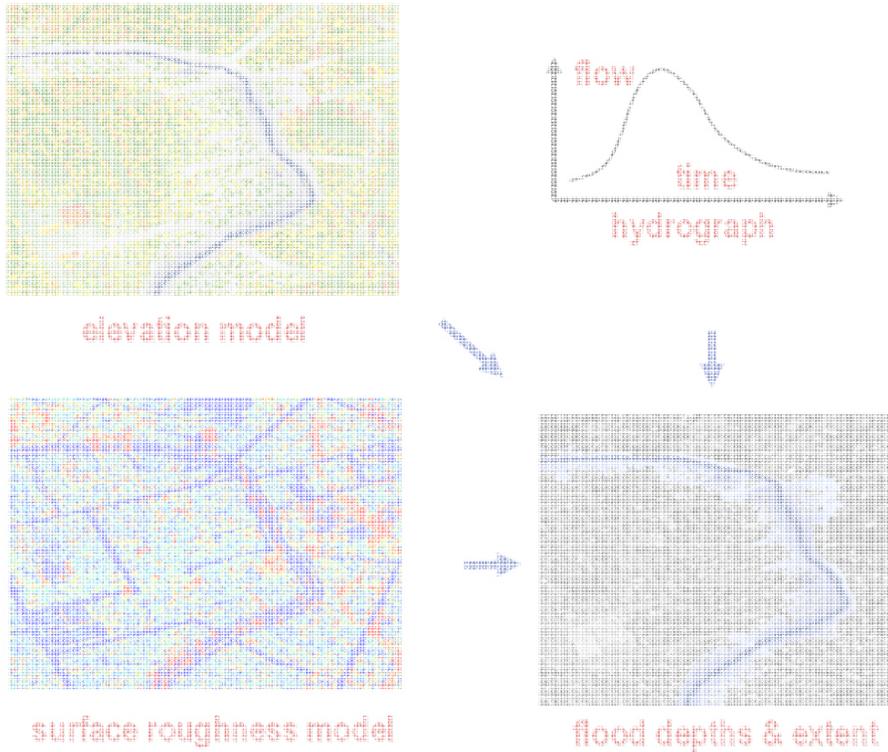
surface roughness model



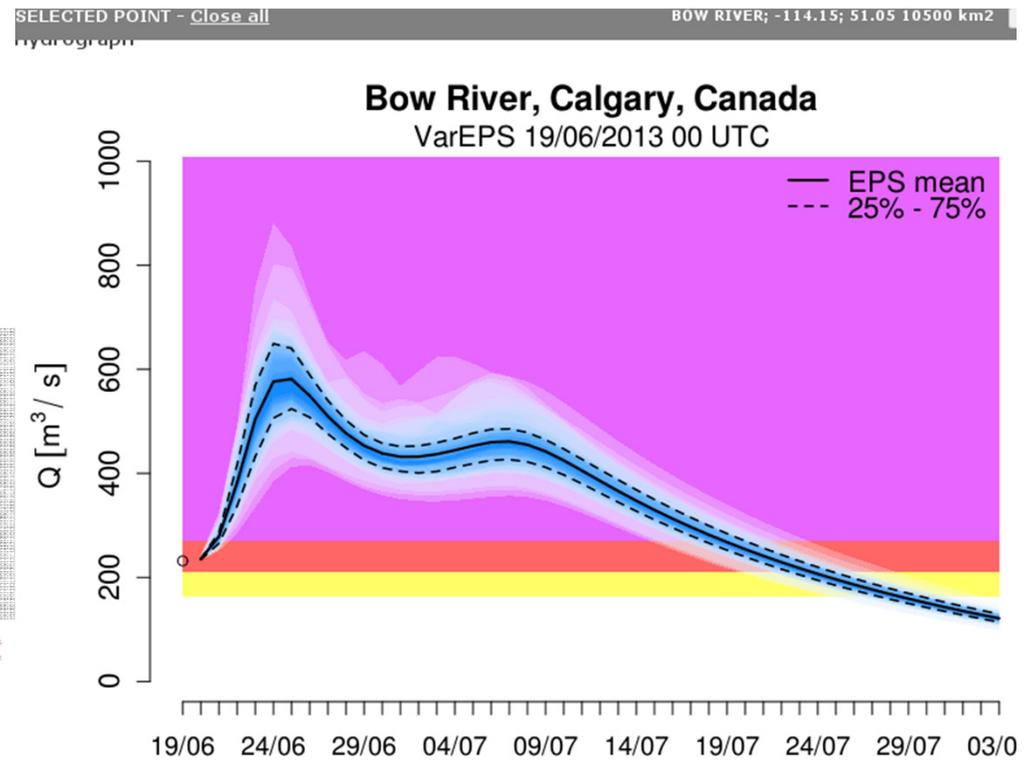
flood depths & extent

Advanced forecasting systems

Inundation modelling:

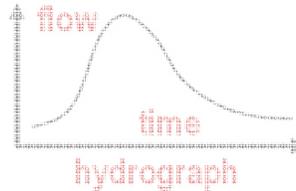


Probabilistic forecasting:

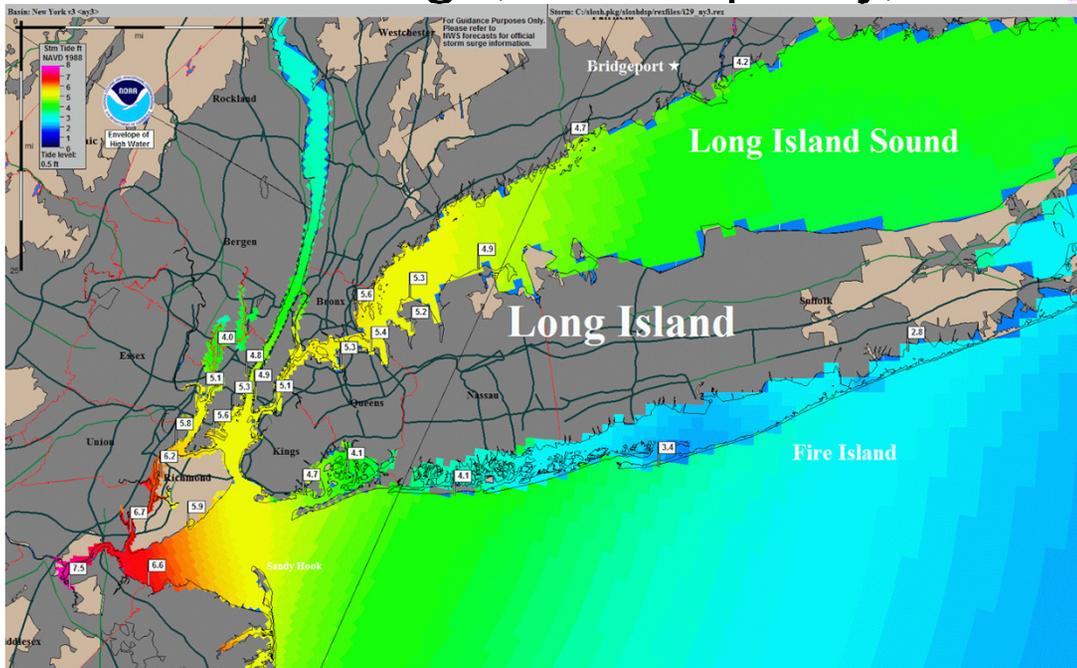


Advanced forecasting systems

Inundation modelling:



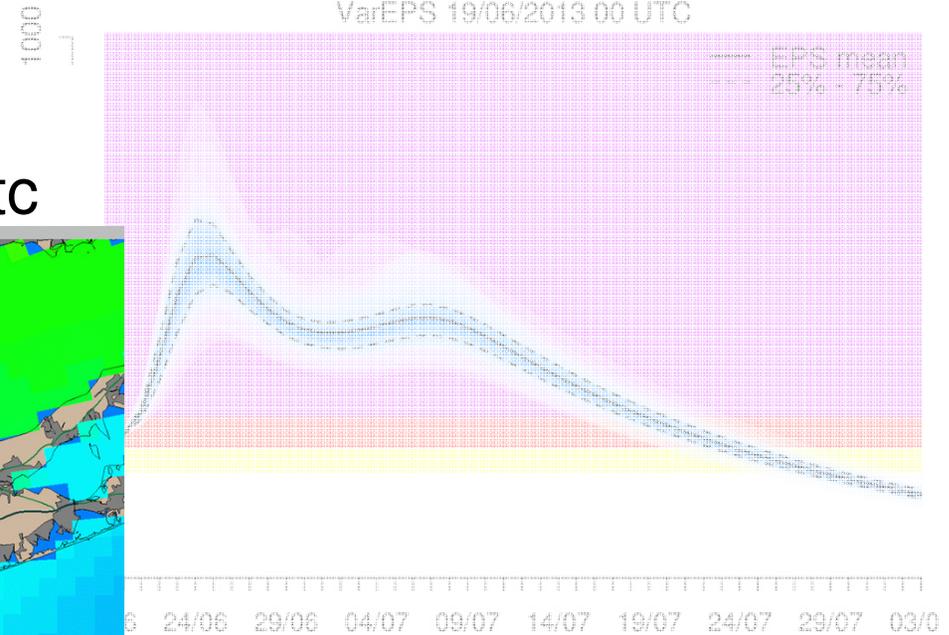
Interdisciplinary forecasts:
Storm surge, water quality, etc



Probabilistic forecasting:



Bow River, Calgary, Canada
VarEPS 19/06/2013 00 UTC



Outline

1. Types of early warning systems
- 2. Challenges for forecasters**
 - Data
 - Unnatural systems
 - Communication
3. Emerging resources

Everyone has data problems

Too much, too little, not the right density or quality.

Trouble getting, cleaning, infilling,
using, archiving, versioning, visualizing, redistributing...

Until 2008, Australian water data managed by 200 entities.



Important rivers are often not natural.

Human influence hard to monitor/predict.



**World's dirtiest river
(Indonesia)**

**Toowoomba,
Australia**



<http://tompagano.blogspot.com/2011/09/manggarai-gate-garbage-part-22.html>

Communication of forecasts: Is there a difference between forecasting (quantifying the future) and warning (inspiring users to right action)?

Why are these “forecasts”
not probabilistic?

DEPARTURES		Gate	Time	Remarks
Airline/Flt. No.	Destination			
MEHICANA 933	GUADALAJARA	122	5:40P	BOARDING
AER LINGUS 144	DUBLIN	104	6:00P	BOARDING
MEHICANA 905	MEXICO CITY	102	6:05P	BOARDING
BRITISH AIR 282	LONDON HEATHROW	121	7:15P	NEW TIME
AEROFLOT 322	MOSCOW	106	7:00P	ON TIME
PHILIPPINE 113	MANILA		7:25P	CANCELLED
LUFTHANSA 5299	ZURICH	120	8:25P	NEW TIME
QANTAS 026	AUCKLAND-MELBOURNE	102	8:30P	ON TIME
PHILIPPINE 103	MANILA	104	9:55P	ON TIME
		101	9:00P	ON TIME



Who is the customer?

Should forecasts be public and free?

Outline

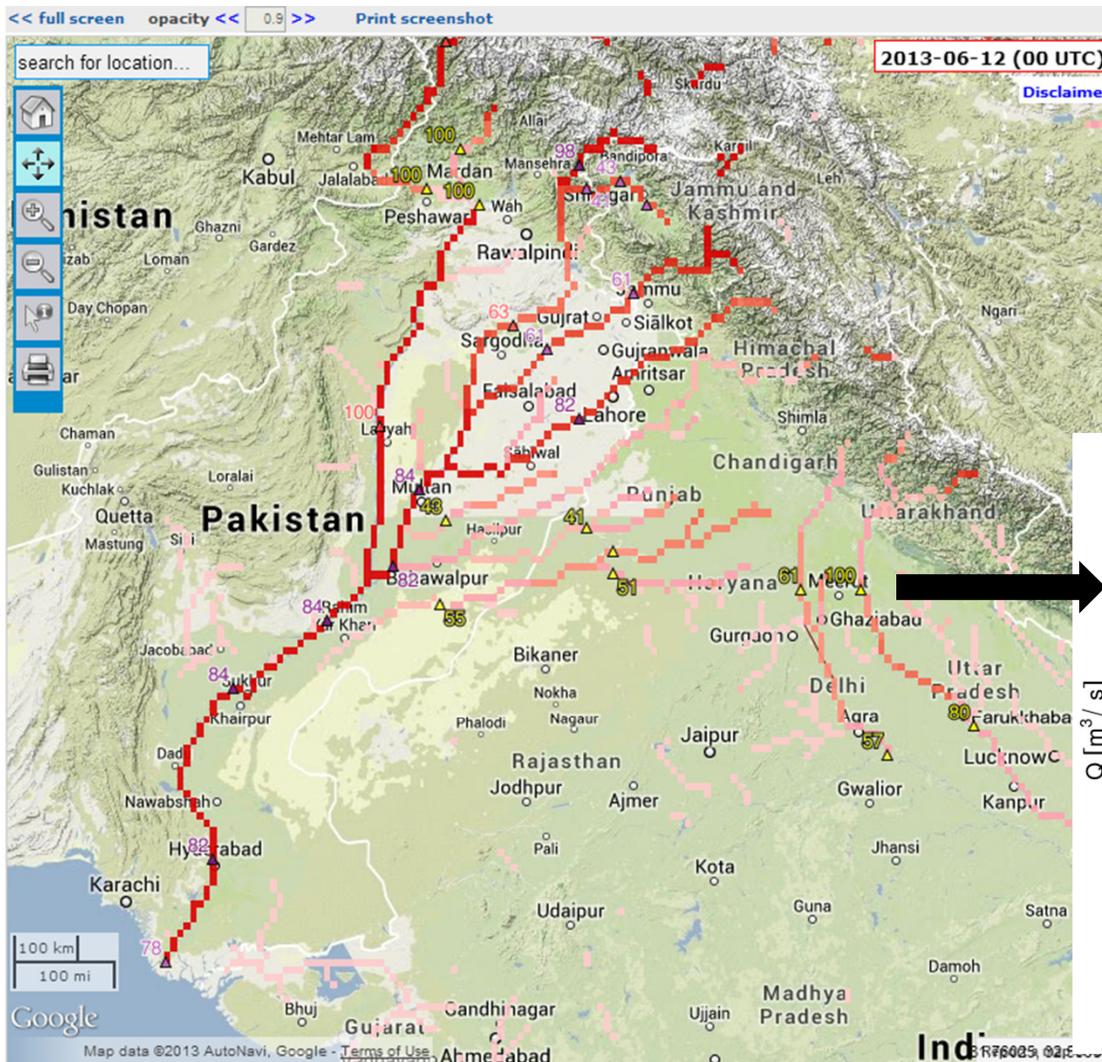
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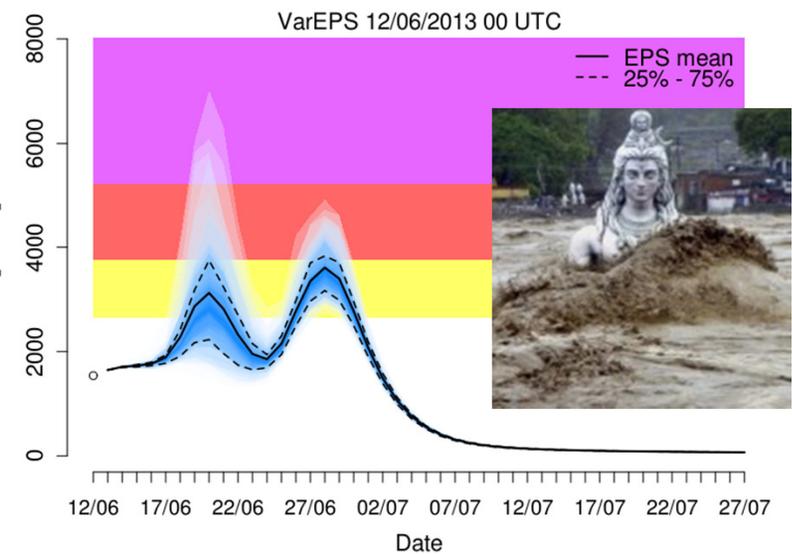
Global forecasting systems

Social media

GloFAS (Global Flood Awareness System) using the world's best weather forecasts

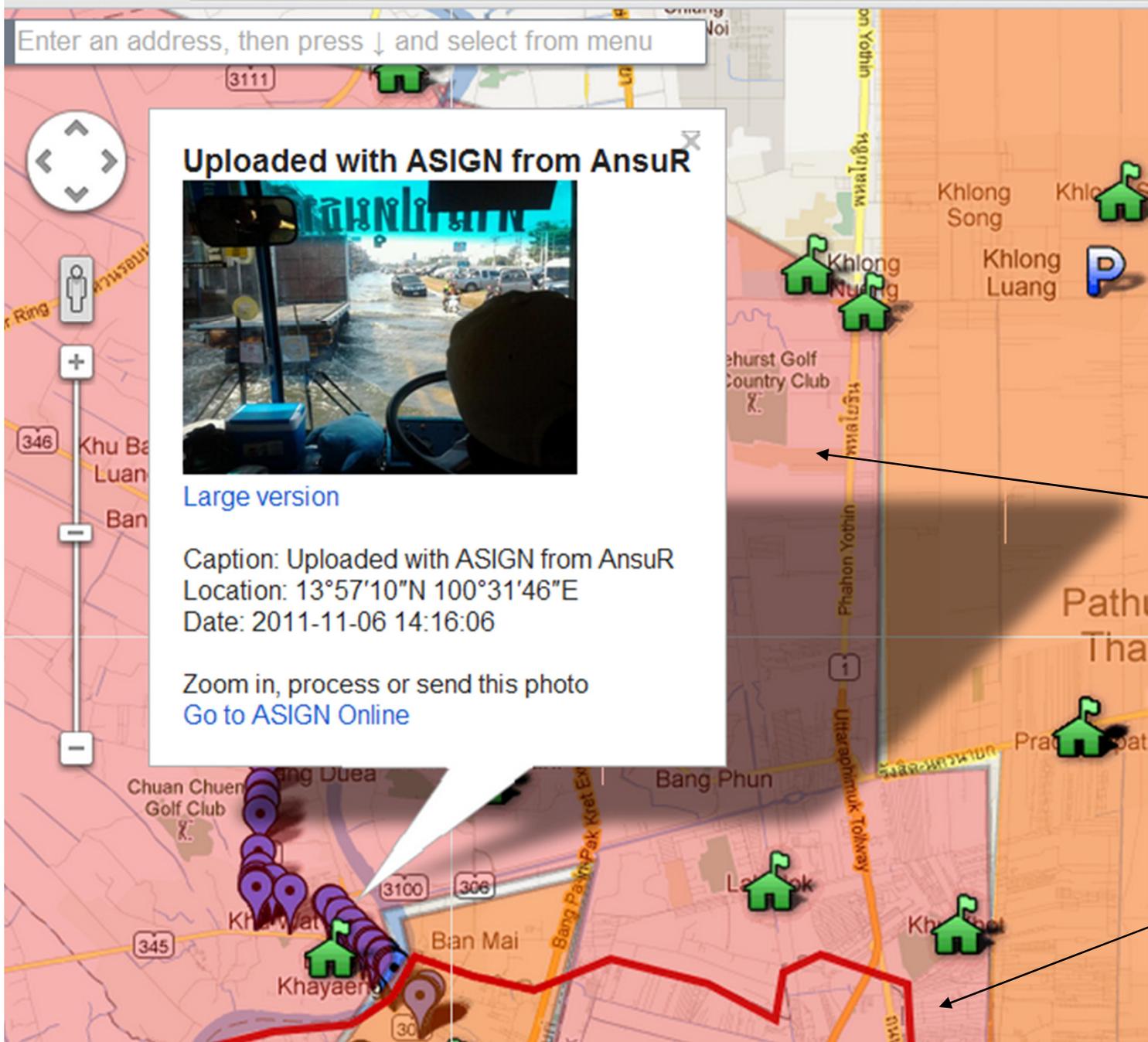


Issued:
12 June 2013
Flood:
16-18 June



<http://www.efas.eu/efas-forecasting.html>

<< 45 Days >>



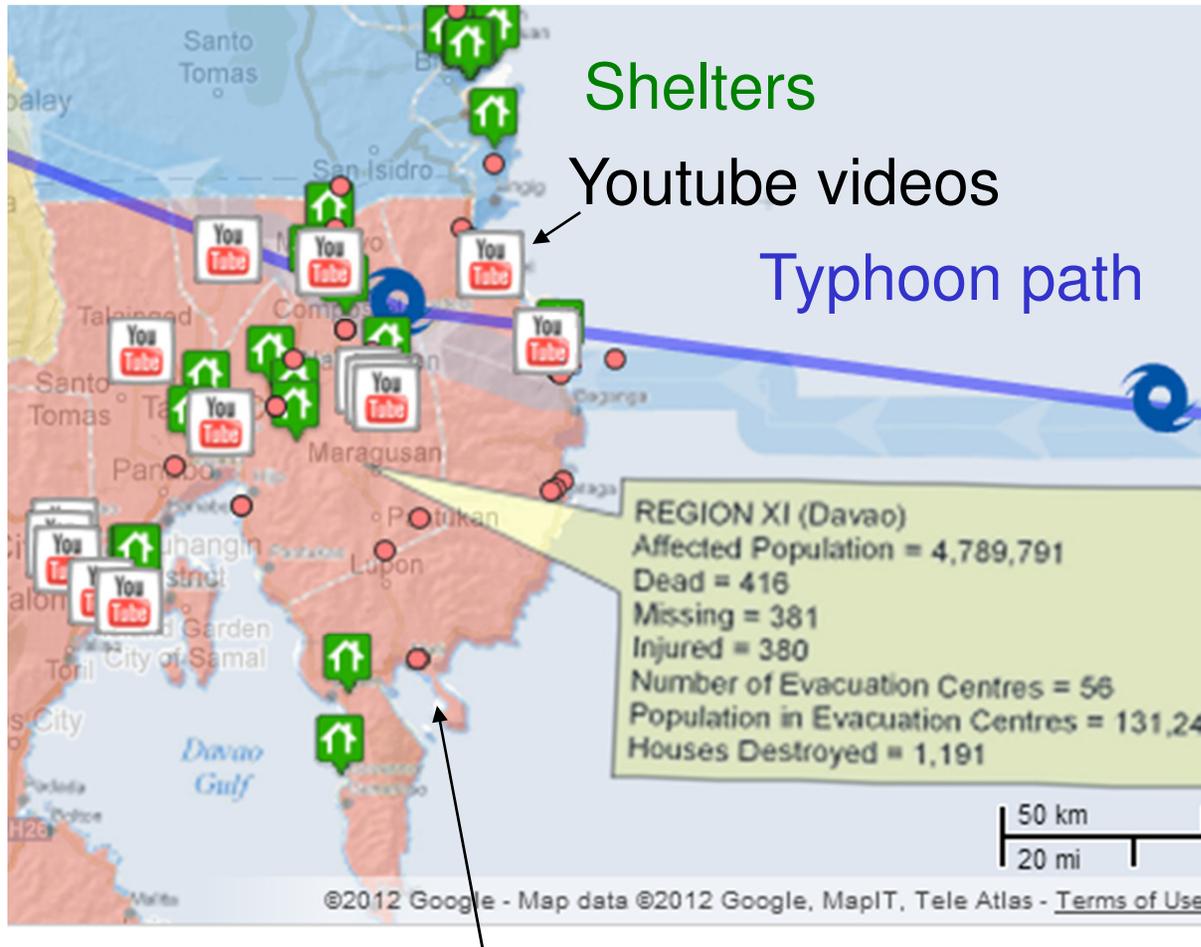
Google Crisis Response

Shelters

Parking

Risk
areas

Water
barrier



- Flood hazard maps (Ilocos, La Union, Pangasinan)
- Photos and Videos
 - Crowdsourced Photos and Videos
 - [Zoom to area](#) · [Download KML](#)
 - Content curated from social media by [Digital Humanitarian Network](#) solution team at the request of UNOCHA
 - Pablo-related YouTube videos
 - [Zoom to area](#) · [Download KML](#)
 - Selected videos about Typhoon Pablo (Bopha). [CitizenTube playlist](#). Credit: [Storyful](#)
- Additional hazard maps
- Scope of humanitarian crisis
 - [Zoom to area](#)
 - Effective: Dec 7, 2012, 4:00 PHT. Source: MapAction via [OCHA ReliefWeb](#).

User-uploaded photos

<http://google.org/crisismap/2012-pablo> (Philippines 2012)



Temporarily testing new Twitter stream on Typhoon Haiyan!!!

Monitoring of media is fairly common in many larger organisations. The use of social media in natural disasters has also den benefits. The same technologies can be used to monitor main stream and social media reports of floods. Making use of US platform we want to show the potential of monitoring floods at the global scale.

The main map shows reports of the last day. Update the time window by moving the slider below the map.

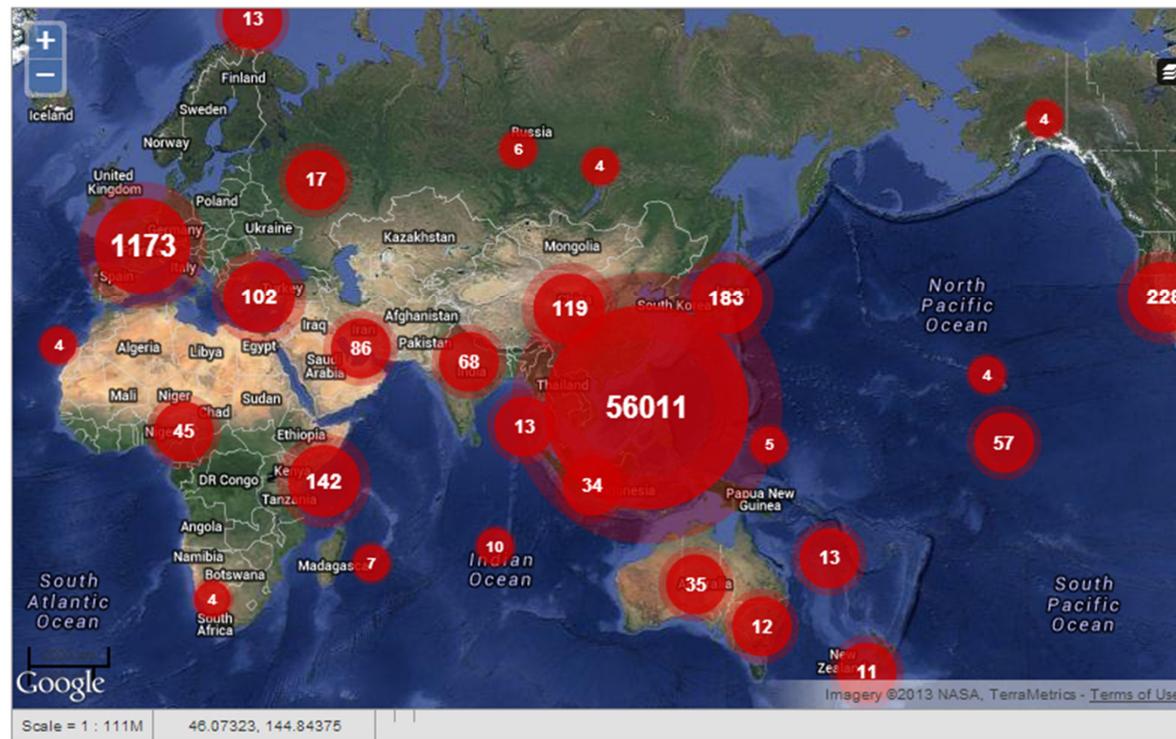
Follow us : [@Twitter](#), [Facebook](#), [Paper Trial](#) :-)

>50,000 Twitter hits in 3 days Typhoon Haiyan

FILTERS → [ALL](#) [NEWS](#) [PICTURES](#) [VIDEO](#)

[FULL SCREEN MAP](#)

↓ CATEGORY FILTER [HIDE]



- ALL CATEGORIES
- EMM NEWS
- GOOGLE NEWS
- FLICKR_FLOODS
- EMERGENCY INFO
- YOUTUBE
- TWITTER
- INFOPIG
- COPERNICUSRUSH
- RAPPLER

How to Report

By using an app:
[iPhone](#)
[Android](#)

By sending an email:

Summary

1. Types of early warning systems
Observation based -- Modeling -- Advanced systems
2. Challenges for forecasters
Data -- Unnatural Rivers -- Communication
3. Emerging resources
Global forecasting systems -- Social media



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