Advanced Technologies Facilitating DRR and Climate Change Adaptation (Session 3)

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What is a UAV?

UAV is a relatively small size remote controlled or automatic pilotless aircraft.

Advantages	Disadvantages
• Image acquisition **on demand** • Cheap and cost effective • High **spatial-resolution** • High accuracy • **Easier to deploy** • No hindrances from clouds	• Relatively small coverage • Care required to use in populated areas • Chances of misuse due to easy • Drone regulations can restrict usage

Our Own Custom Built UAVs

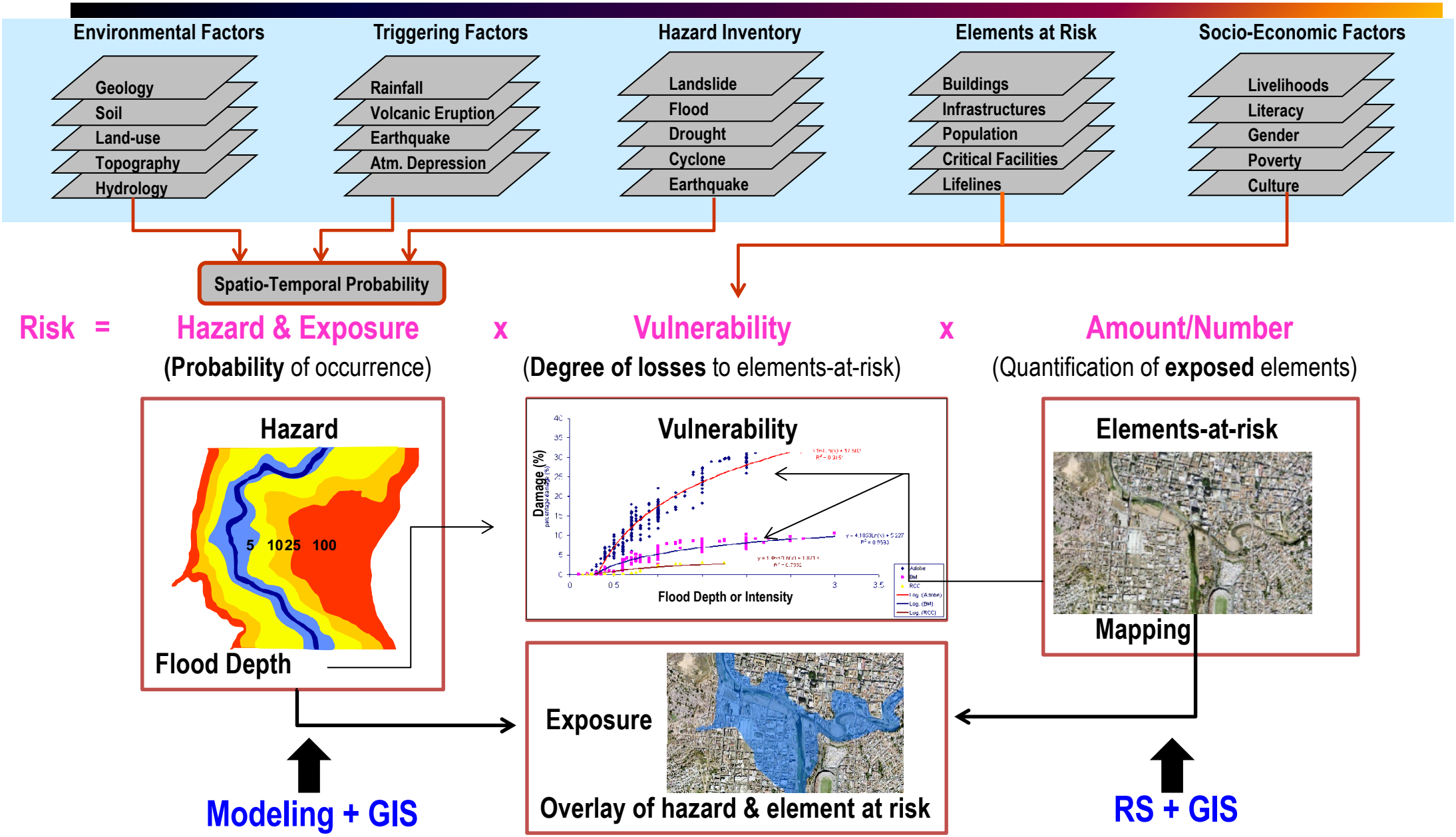
Fixed-Wing

Testing

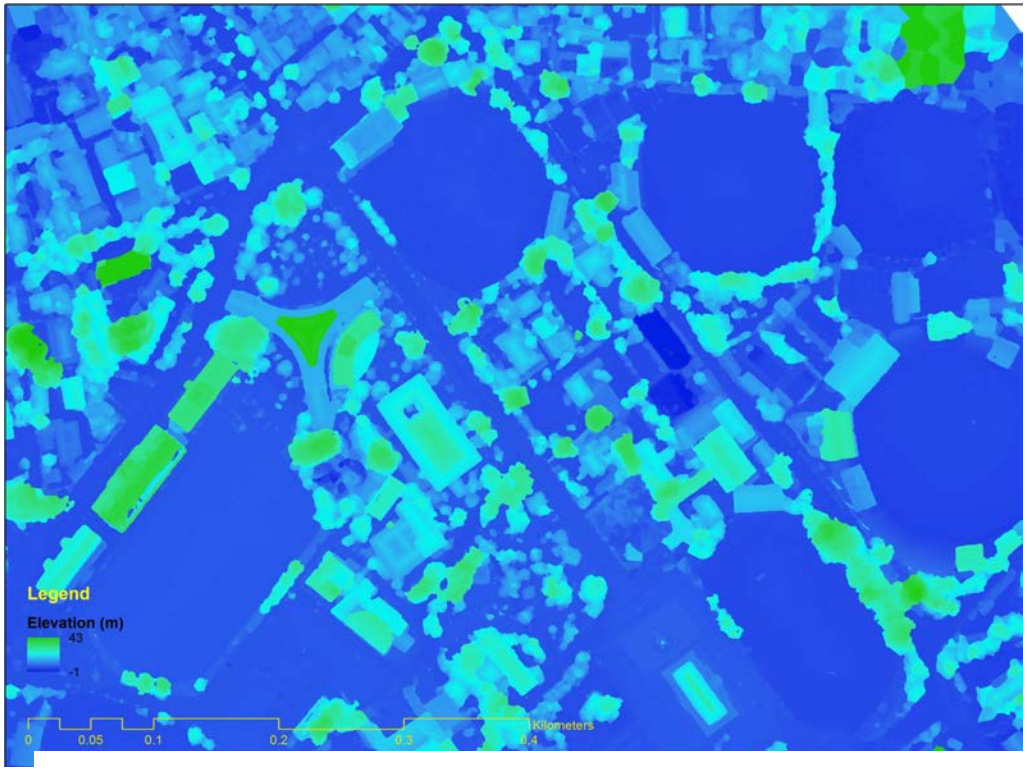
Applications of UAVs in Disaster Management

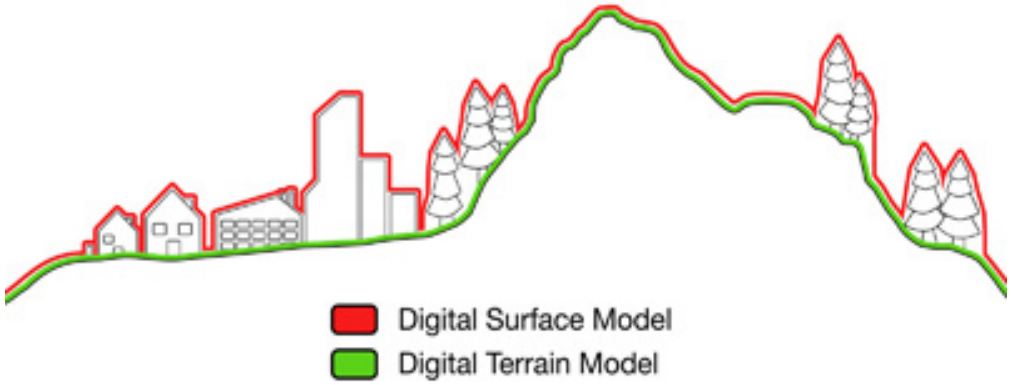
Area	Applications
Disaster Management 	**<u>Pre-disaster</u>** • Risk assessment **<u>During a disaster</u>** • Providing relief materials • Damage mapping

Risk Assessment

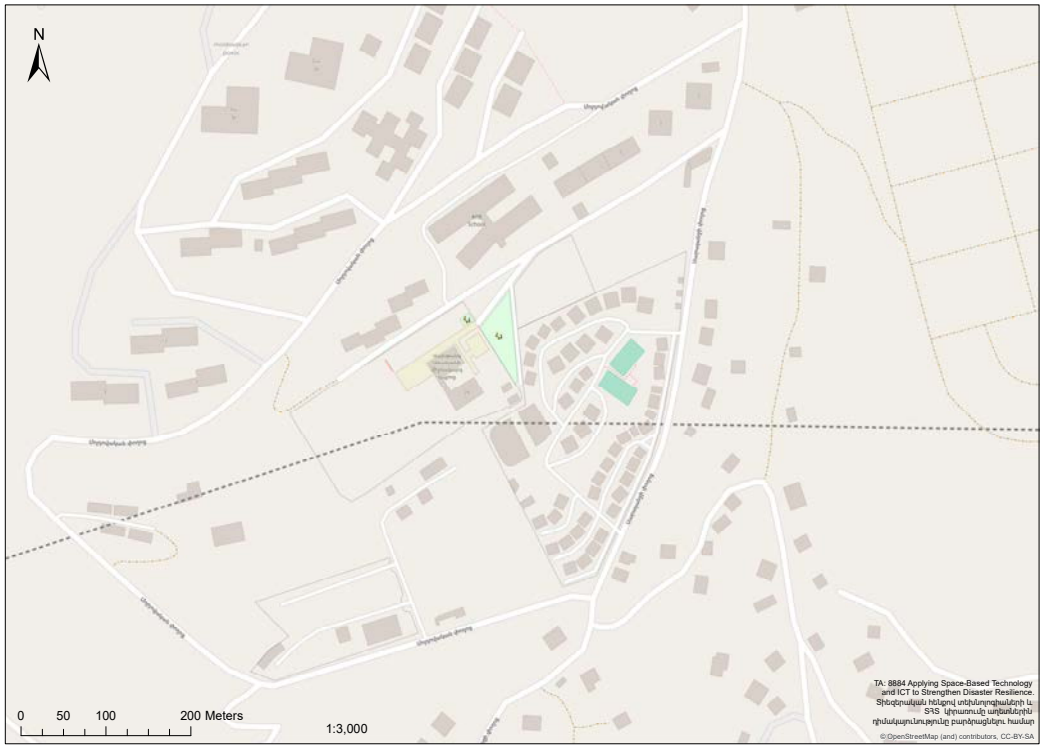


Landuse Map and Elevations (for Hazard Analysis)





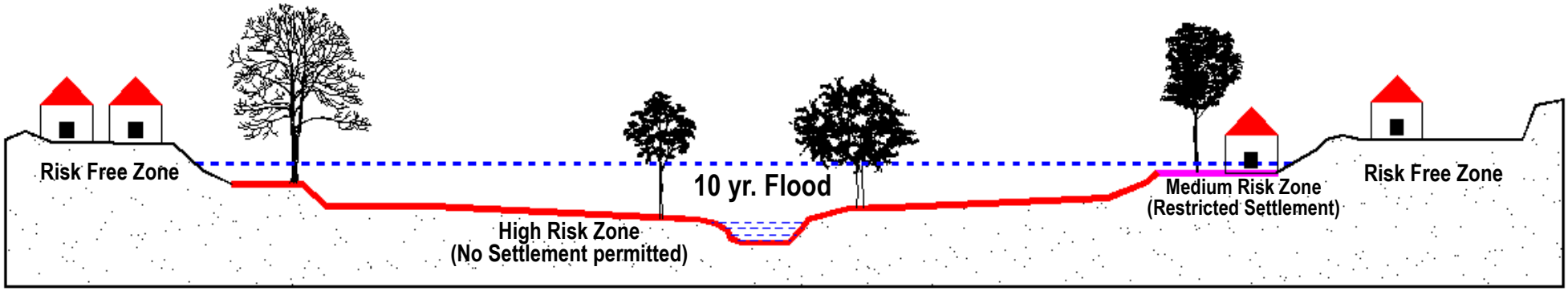
Elements-at Risk Mapping (for Exposure Assessment)



Quantitative (Absolute) Risk Assessment

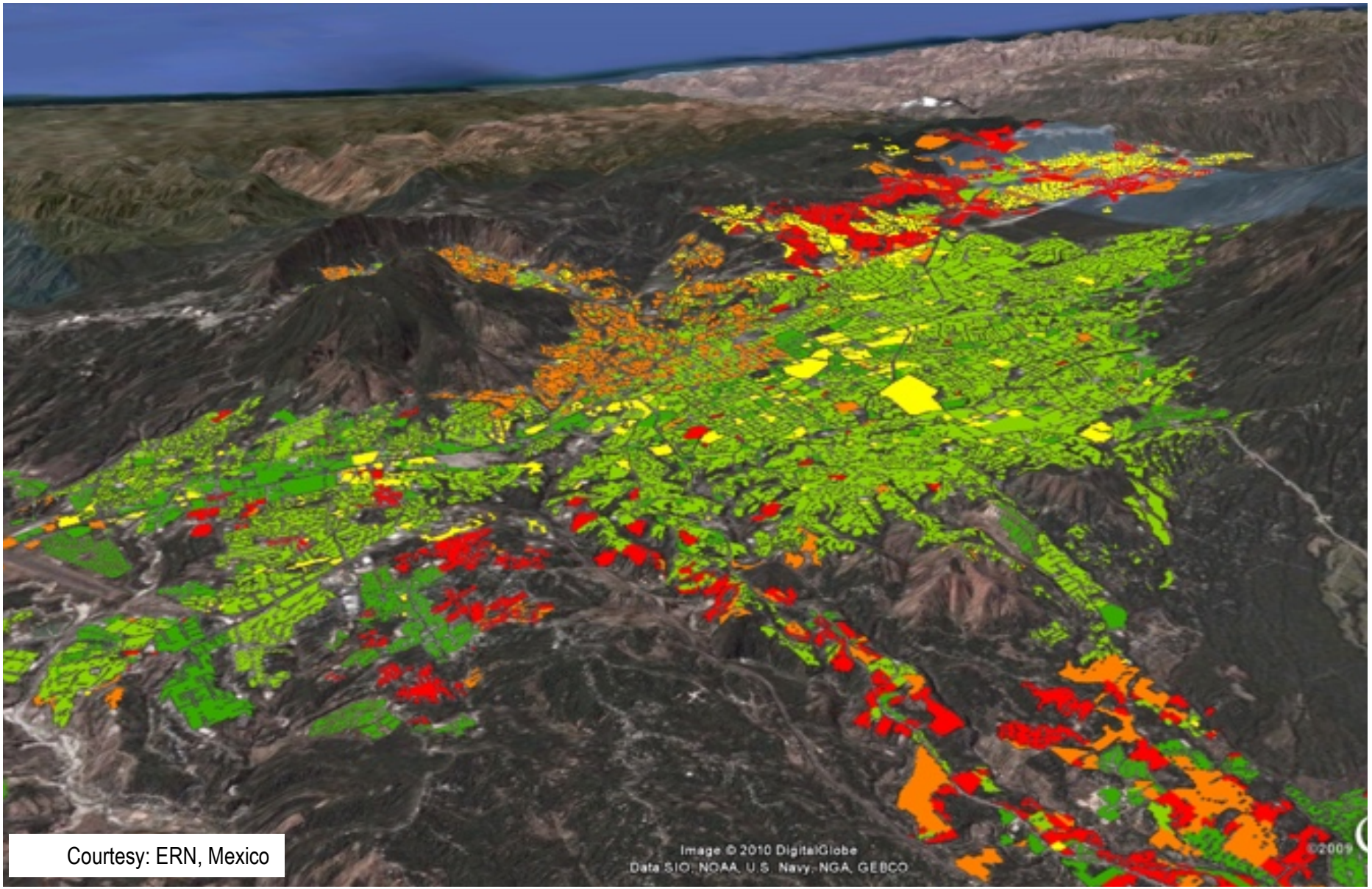
What is the cost for risk zoning and relocation?

What is the insurance premium in different risk zones?



Risk = Hazard	**x Vulnerability**	**x Amount (Asset)**	
$Risk_{Lt}$ = 0.1	x 0.5	x 100,000	= 5,000 US$
$Risk_{Mid}$ = 0.1	x 1.0	x 100,000	= 10,000 US$
$Risk_{Rt}$ = 0.1	x 0.2	x 100,000	= 2,000 US$
$Risk_{Total}$			**= 17,000 US$**

Disaster Risk Maps (City Level)



Courtesy: ERN, Mexico

An Edible and Disposable UAV for Relief called Pouncer (During a Disaster)

Challenges

- Relief aids dropped over disaster or war zones from planes using parachutes **lack precisions** in delivery;
- A plane can para-drop food packet only fro **5-6 km** above;

Solution

- A plane will be able to drop the Pouncer **35 km** away from its targets with an accuracy up to **7 m**;
- Wing span will be approx. 3 m and the self-flying and fast, and carry up to **50 kg** of food, fuel and water to cook;
- A fully loaded version could feed up to **50 people** for a day at a cost approx. 300 USD each;
- 70 drones could be stored and released in a C-130 aircraft at once - bringing aid to up to **3,500 people**.

http://www.zdnet.com/article/this-edible-food-drone-could-offer-aid-in-disaster-zones/

Mapping the Extent of Disasters (Post-disaster)

Other New Technologies

Floating Houses in the Netherlands


DURA VERMEER
FACTS
WATER & BOUWEN
STRATEGIE
VISIE
INPASSING IN HET
REGIONALE WATERSYSTEEM

A Floating House in a Developing Country

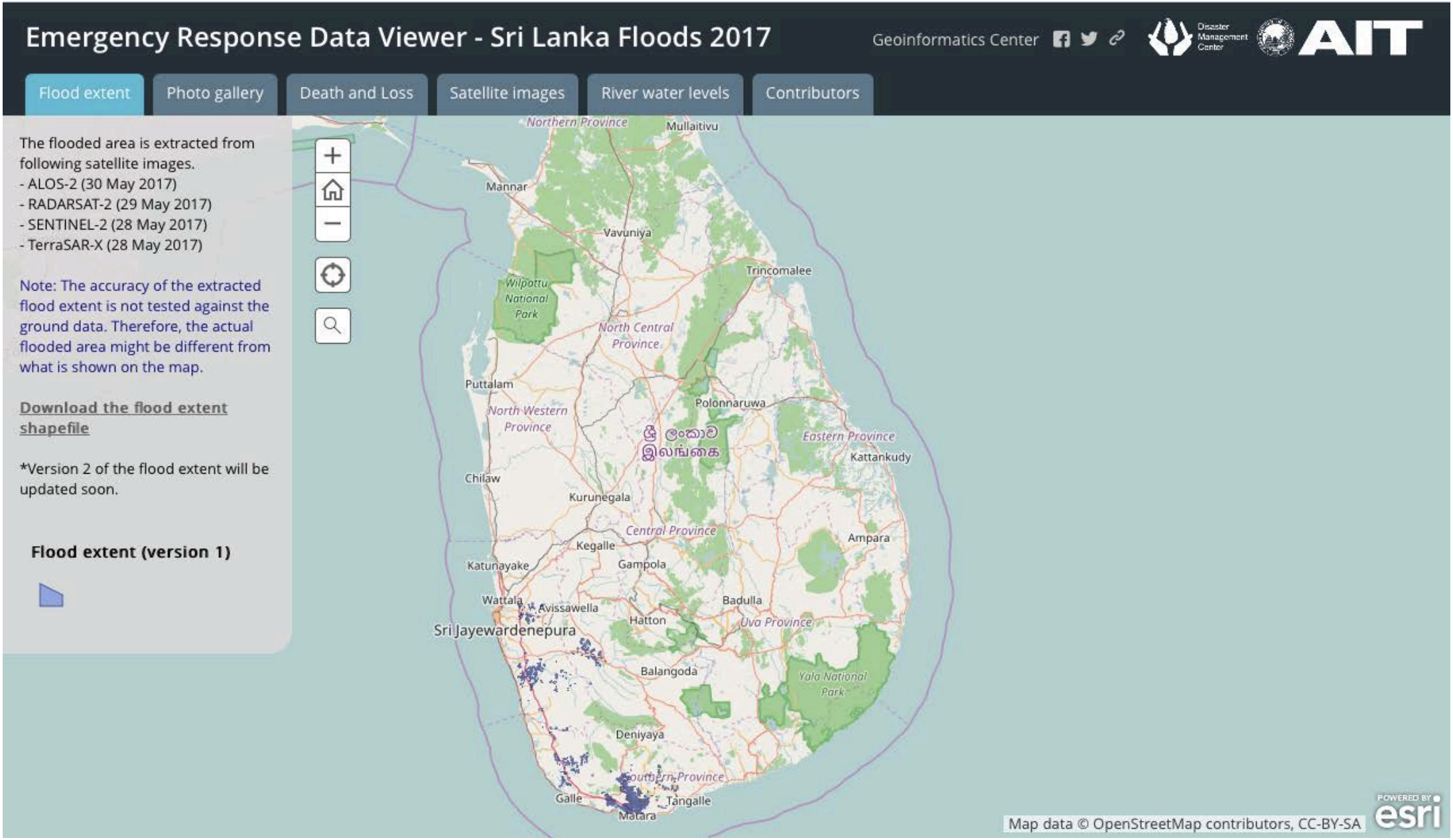
A Floating Car

- An electric car which can **float and move** on water in case of flooding;
- Unveiled in February this year, is capable of floating like a boat and can operate for about **24 hours**;
- World's smallest four-seat electric car, measures 2.5 meters in length and weighs only 460 kilograms;
- Production and sales of the vehicle will start in **Thailand** in October next year.

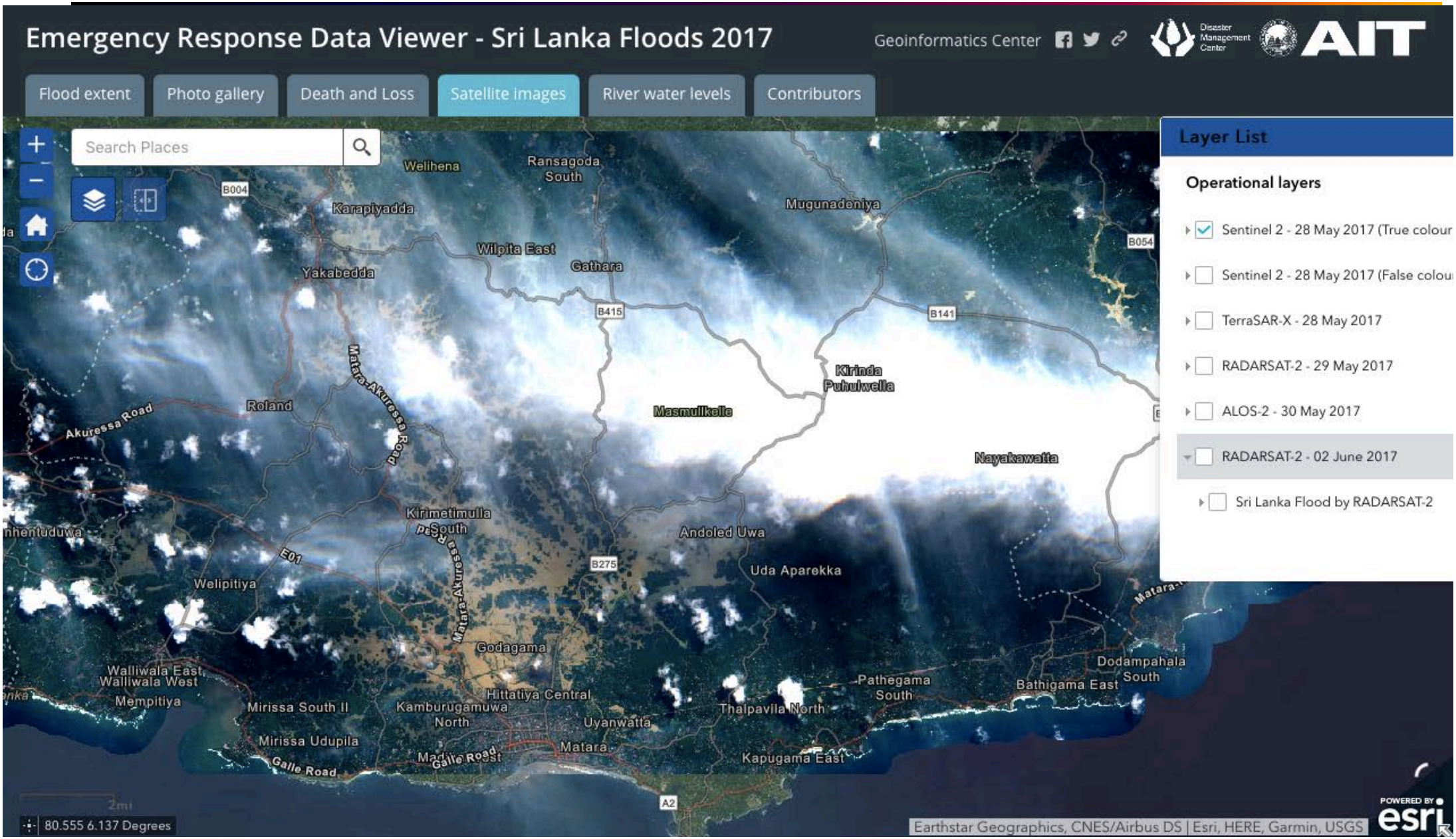
http://fomm.co.jp/wordpress/index_en.html

Crowdsourcing Information for Disaster Response

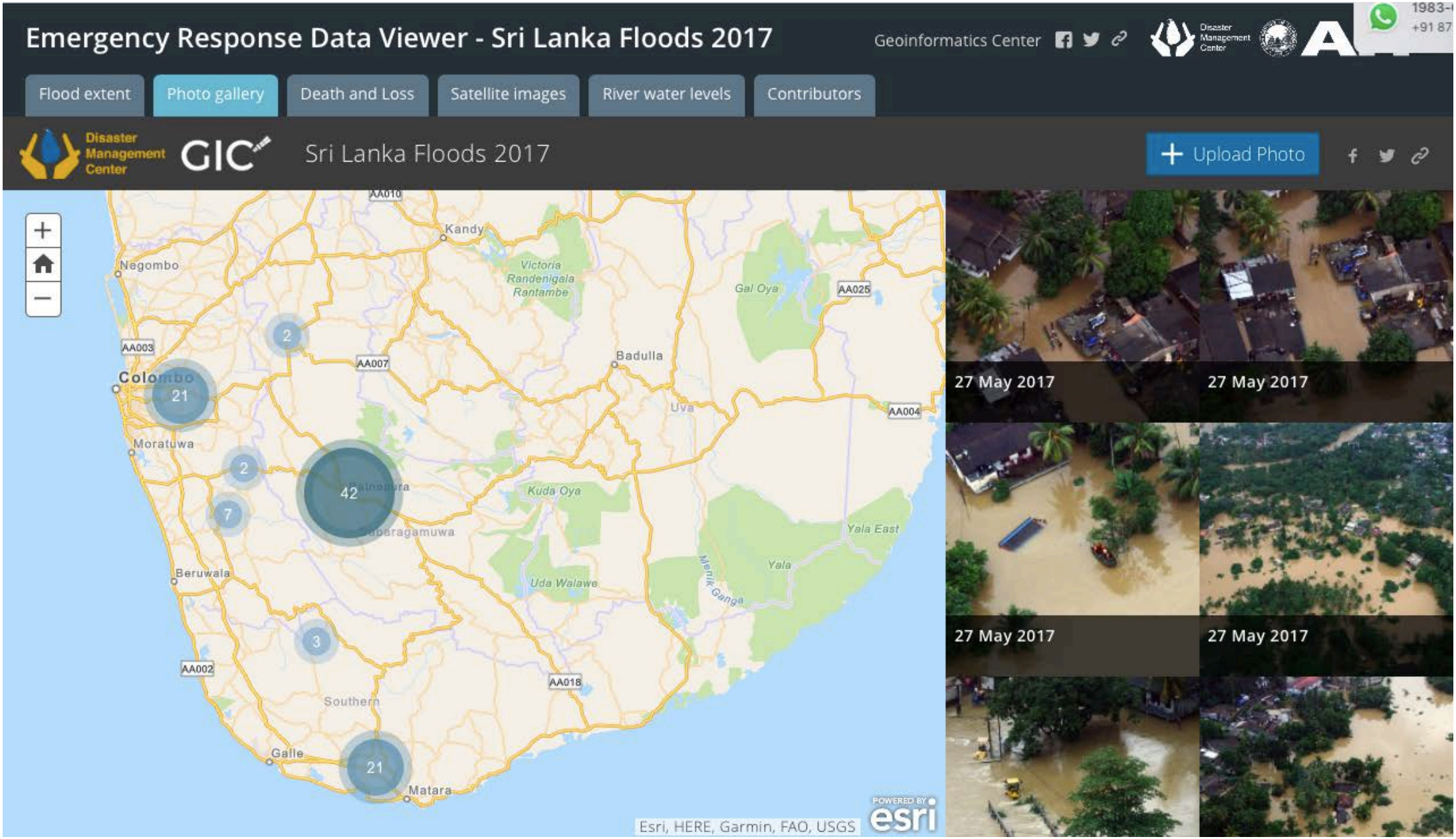
Web-GIS Platform for Sri Lanka Flood (May 2017)



Flood Image Acquired by Satellites

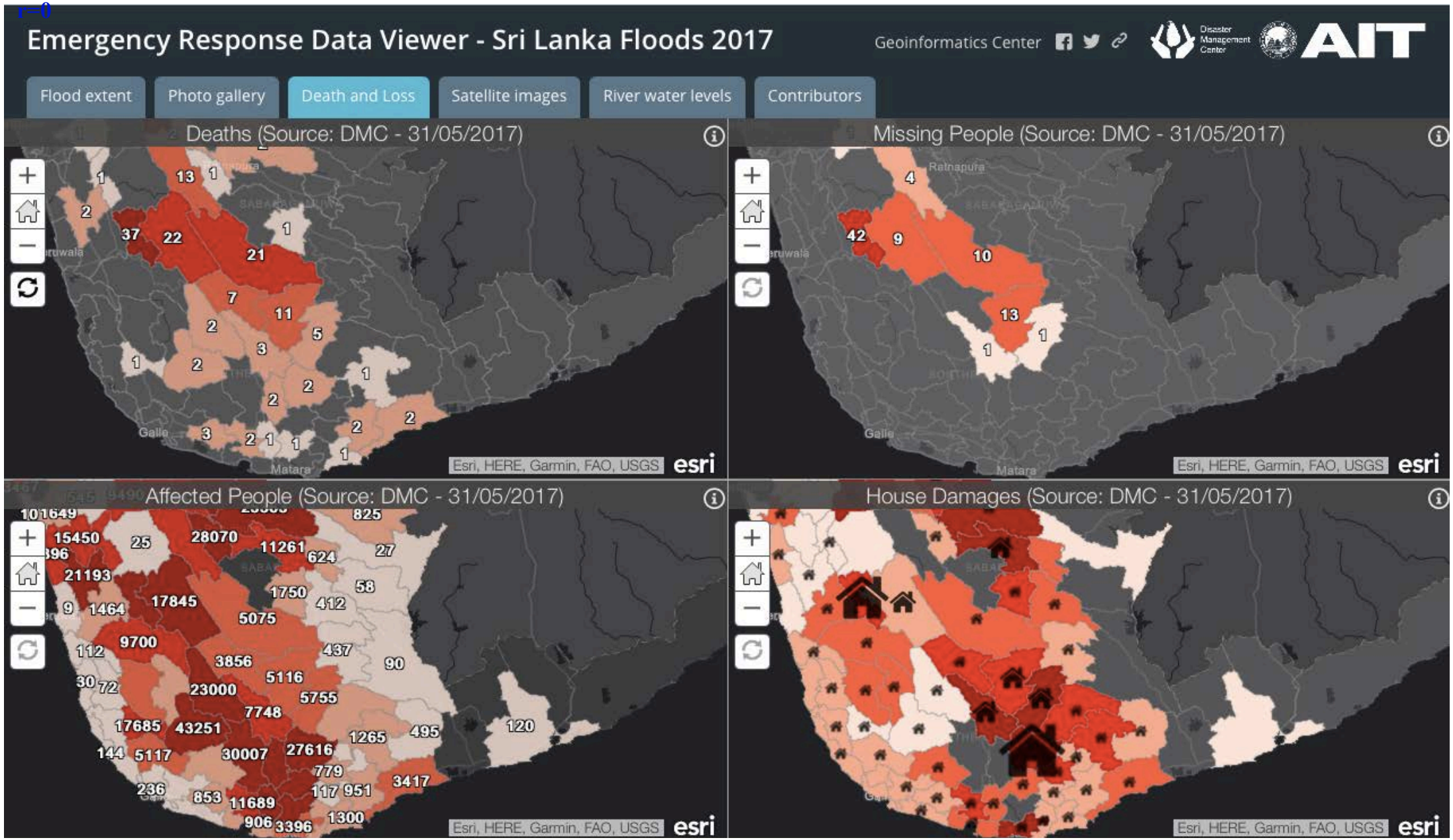


Flood Photo Around Colombo City



Affected, Dead, Missing People and Damage

https://www.youtube.com/watch?v=MgK4qcnMQ3k&t=7m20s&authuser=0https://www.youtube.com/watch?v=Cf7Gafe_jpw&t=7m&authuser=0



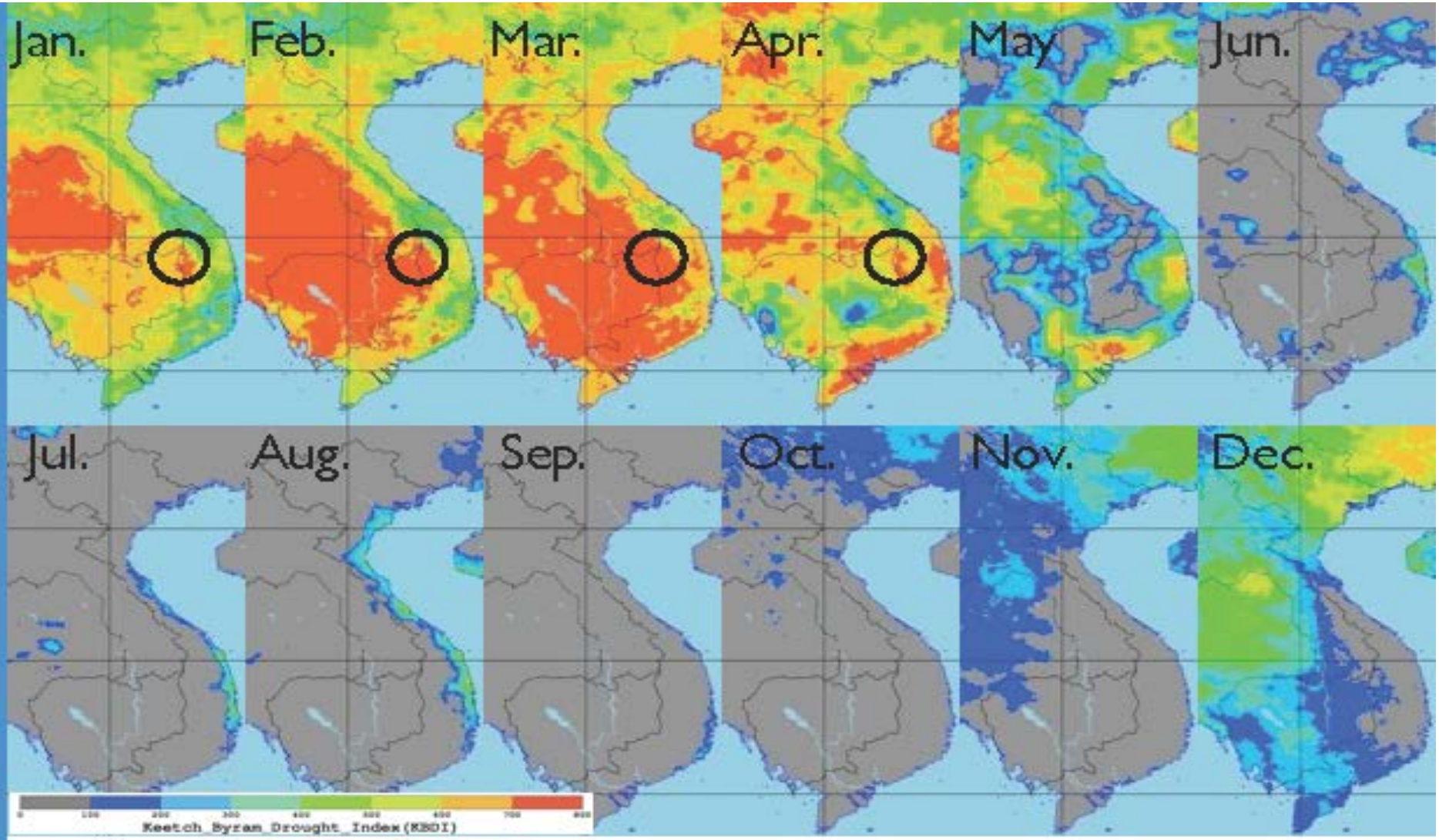
Drought Monitoring

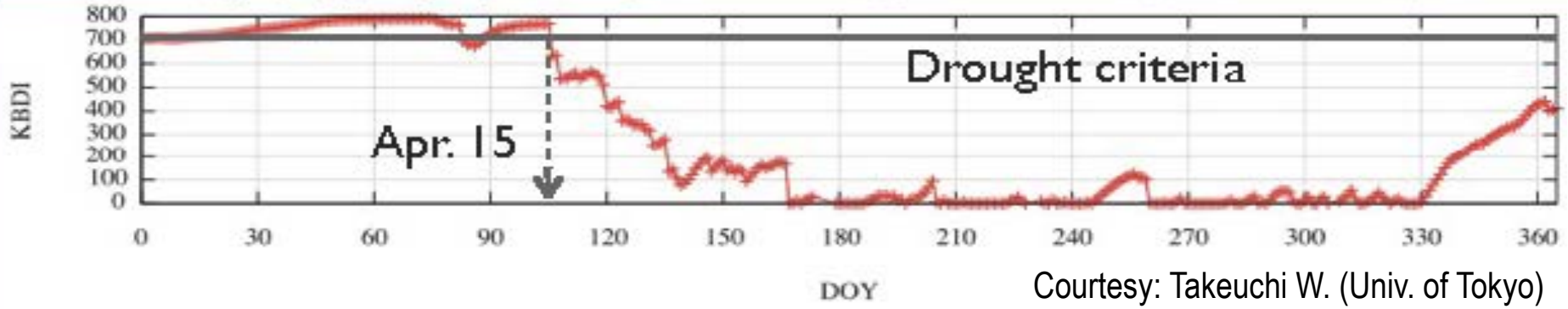
Type of droughts

- Meteorological droughts (everyday in 4km)
  - GSMaP
  - MTSAT
  - KBDI (rainfall + land surface temperature)
- Agricultural droughts (16days in 250m)
  - MODIS NDVI (vegetation index)
  - MODIS LAI (leaf area index)
- Hydrological droughts (everyday in 10km)
  - AMSR-E LSWC (land surface water coverage)
- If we have a prediction of the above indices based on weather forecasting, it is called a potential drought.

Courtesy: Takeuchi W. (Univ. of Tokyo)

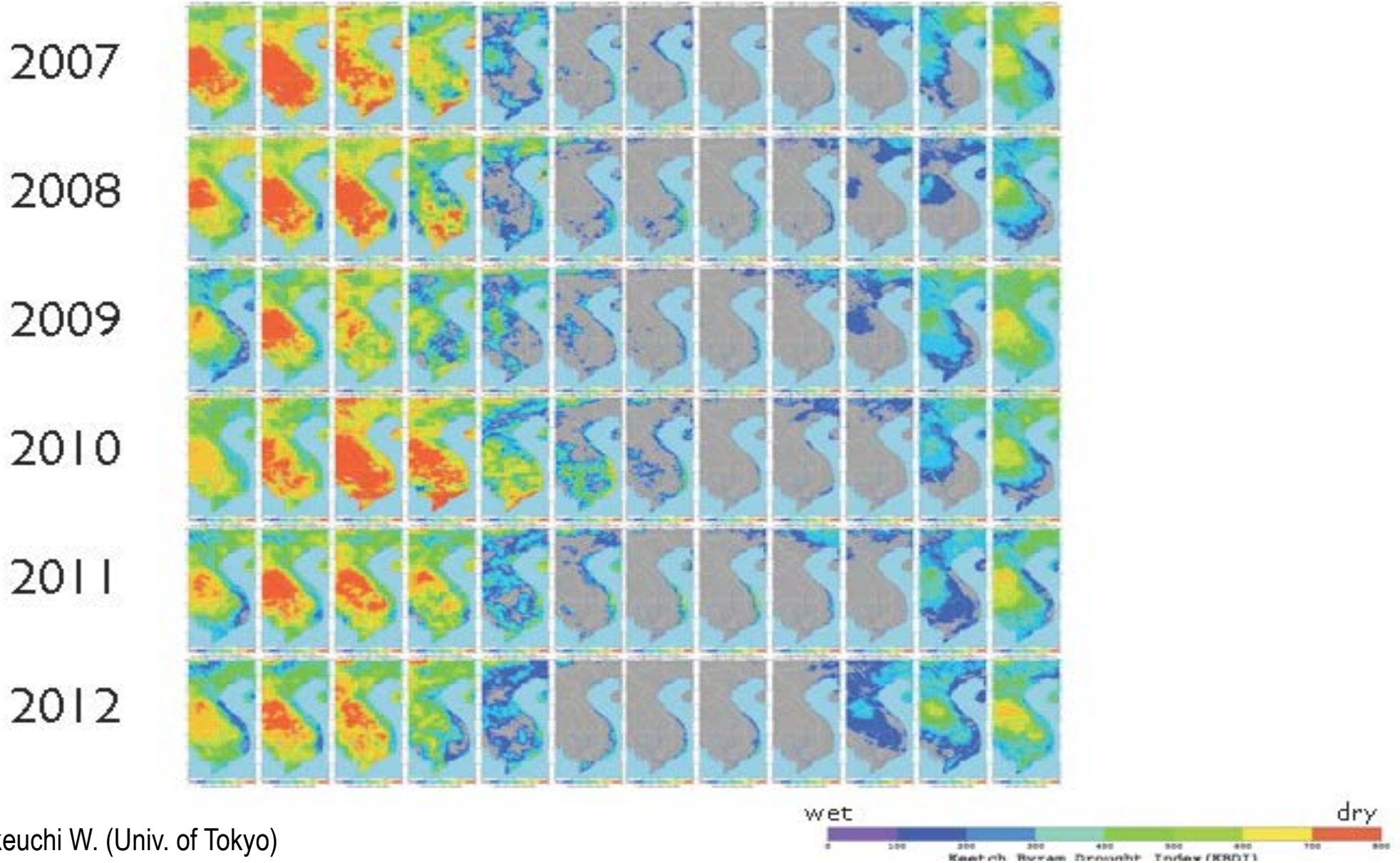
KBDI captures 2007 drought offset in central highland





Courtesy: Takeuchi W. (Univ. of Tokyo)

Monthly drought index map from 2007 to 2012 (Jan-Dec from left to right)



Courtesy: Takeuchi W. (Univ. of Tokyo)

Thank you for your kind attention