Early Warning

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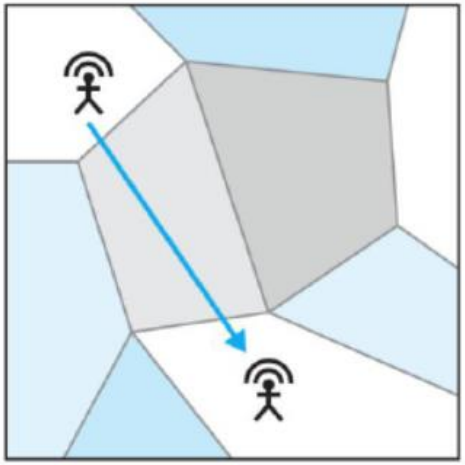
sonatel · BILL & MELINDA GATES foundation · PARIS21

Cell Phone Network "Call Detail Records"

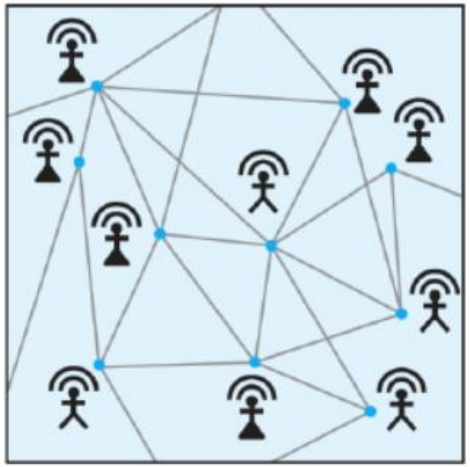
CDR Format:

CALLER ID	CALLER CELL TOWER LOCATION	RECIPIENT PHONE NUMBER	RECIPIENT CELL TOWER LOCATION	CALL TIME	CALL DURATION
X76VG588RLPQ	2°24' 22.14", 35°49' 56.54"	A81UTC93KK52	3°26' 30.47", 31°12' 18.01"	2013-11-07T15:15:00	01:12:02

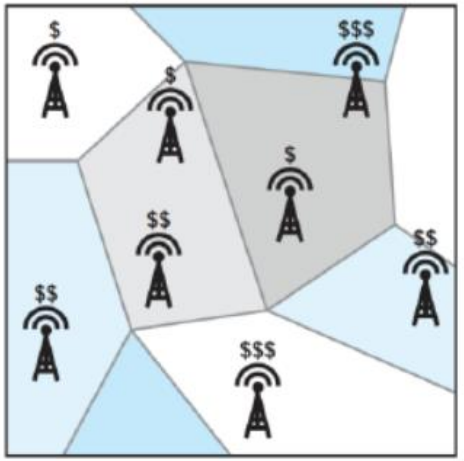
Mobility



Social Interaction



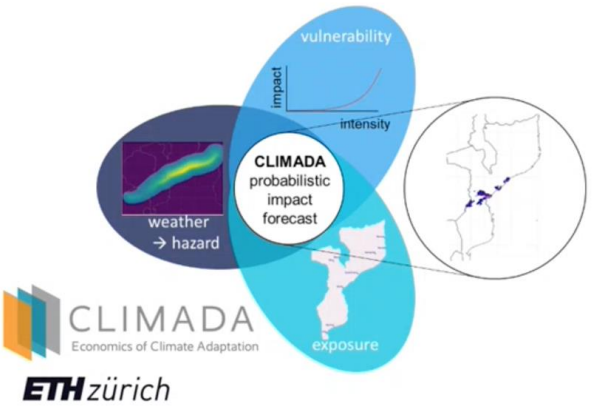
Economic Activity



GLOBAL PULSE

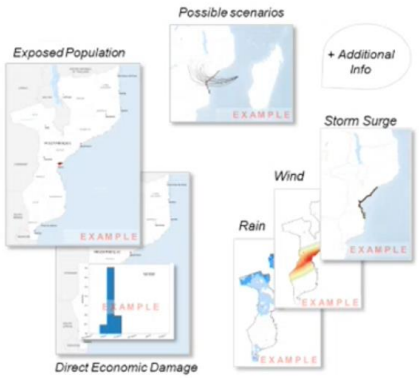
Showcase II: HydroMet Impact Outlook

Impact estimations for Tropical Cyclones and in the future River Floods

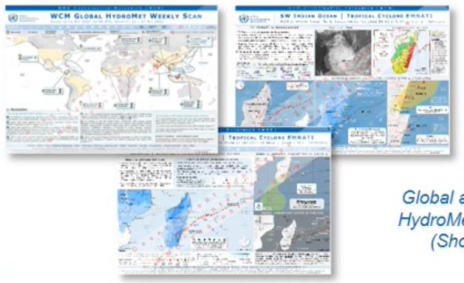


CLIMADA
Economics of Climate Adaptation

ETH zürich

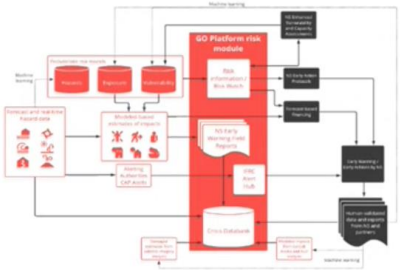


Providing impact estimates for forecasted extreme weather events



WMO

Global and Regional HydroMet Prototypes (Showcase I)



IFRC

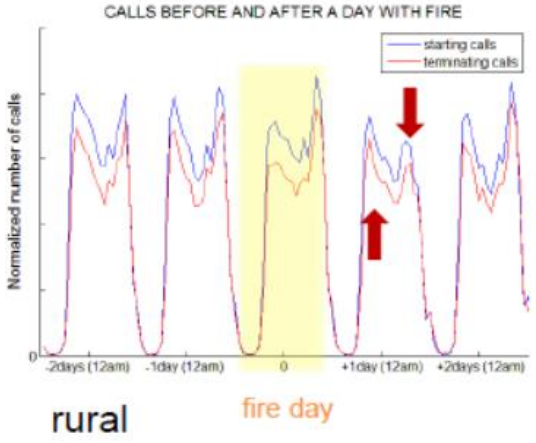
IFRC Go Platform

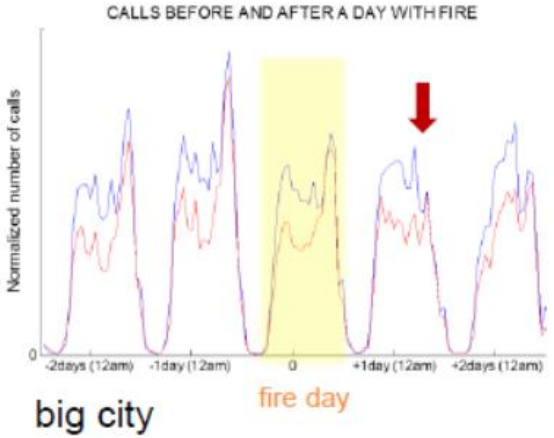
- Based on **authoritative**, **probabilistic** hydromet products
- **Consistent**, **replicable** and **transparent** methodology

⇨ *How to best communicate probabilistic information? How to illustrate probability and intensity? On-going work with IFRC*

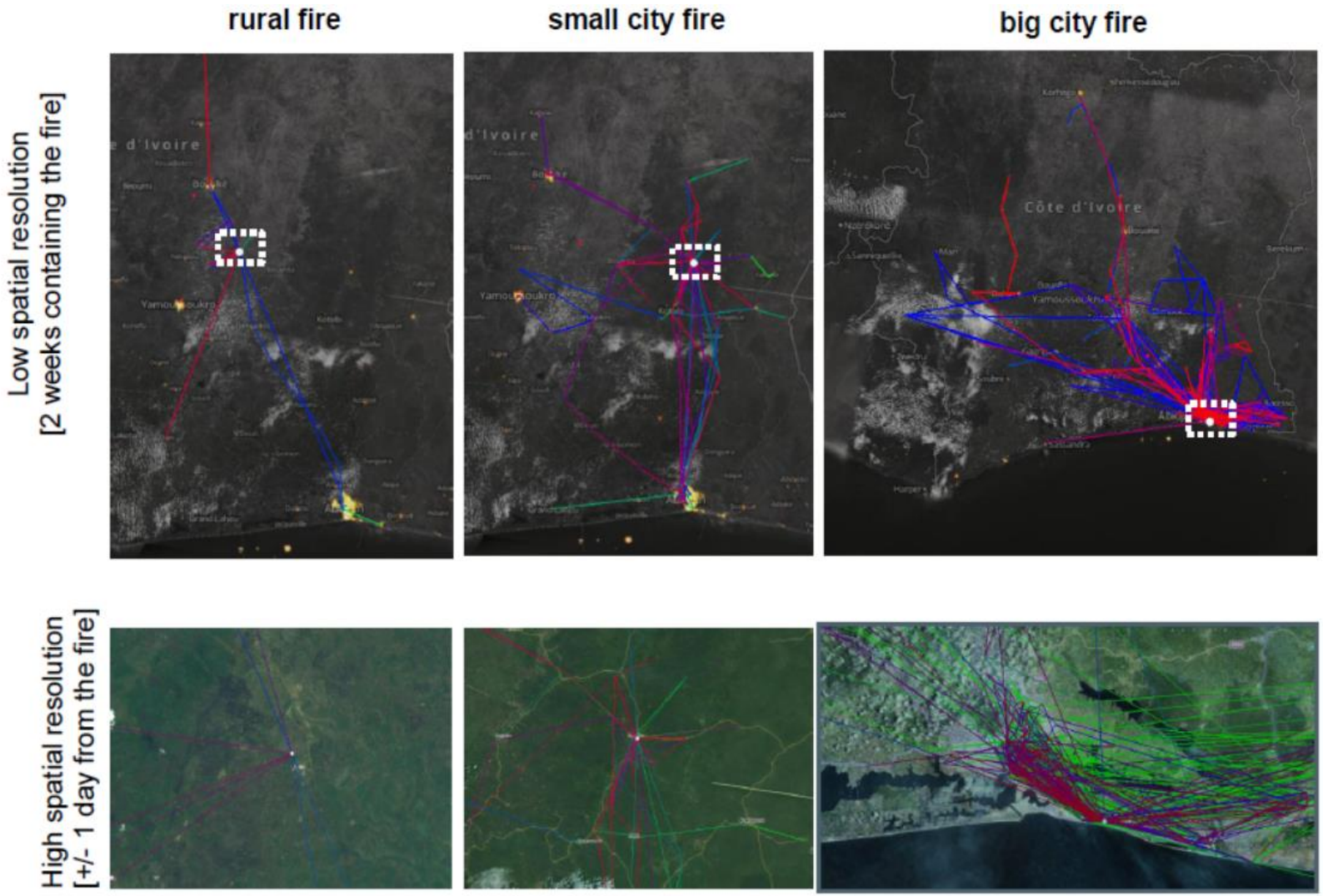
DATA INTEGRATION and MULTI-RESOLUTION MOBILITY

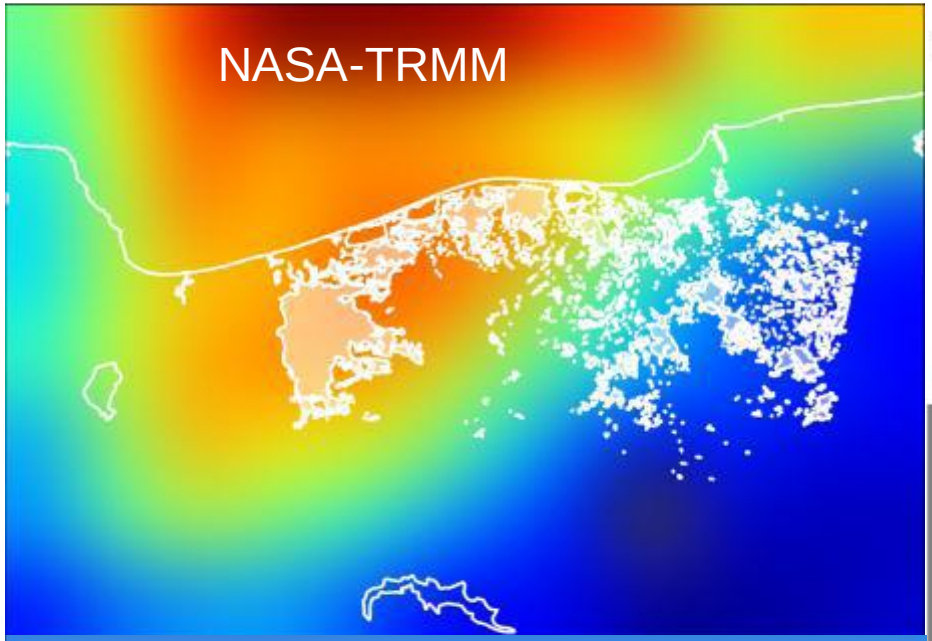
Geo-dependent event signatures

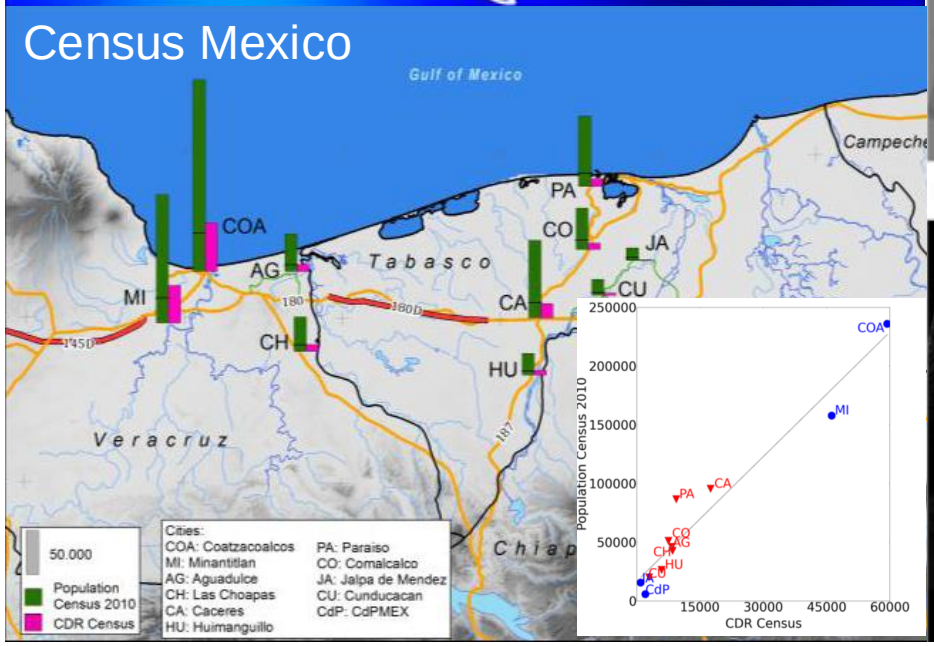


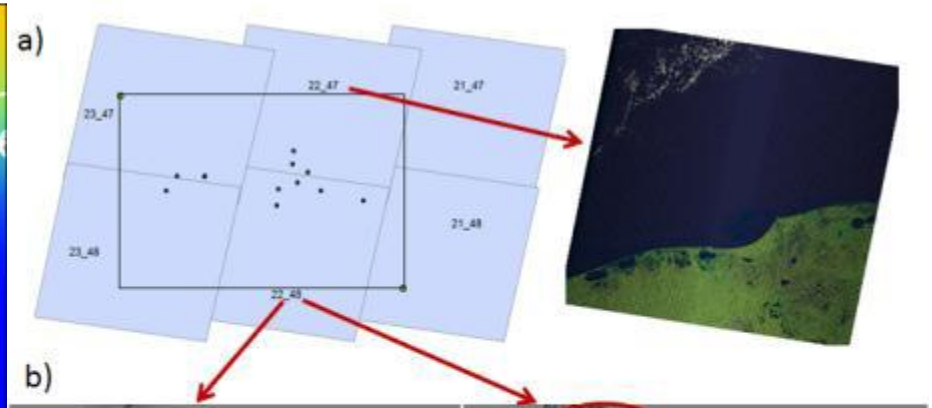


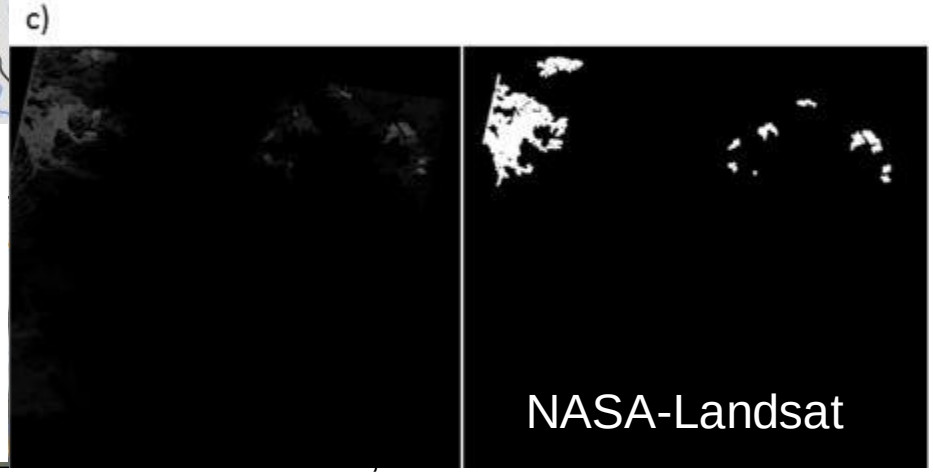
Pastor-Escuredo D. *et al*, D4D'13


rural fire
small city fire
big city fire
Low spatial resolution
[2 weeks containing the fire]
High spatial resolution
[+/- 1 day from the fire]
Côte d'Ivoire
Displacement before the fire
Displacement the day of the fire
Displacement after the fire

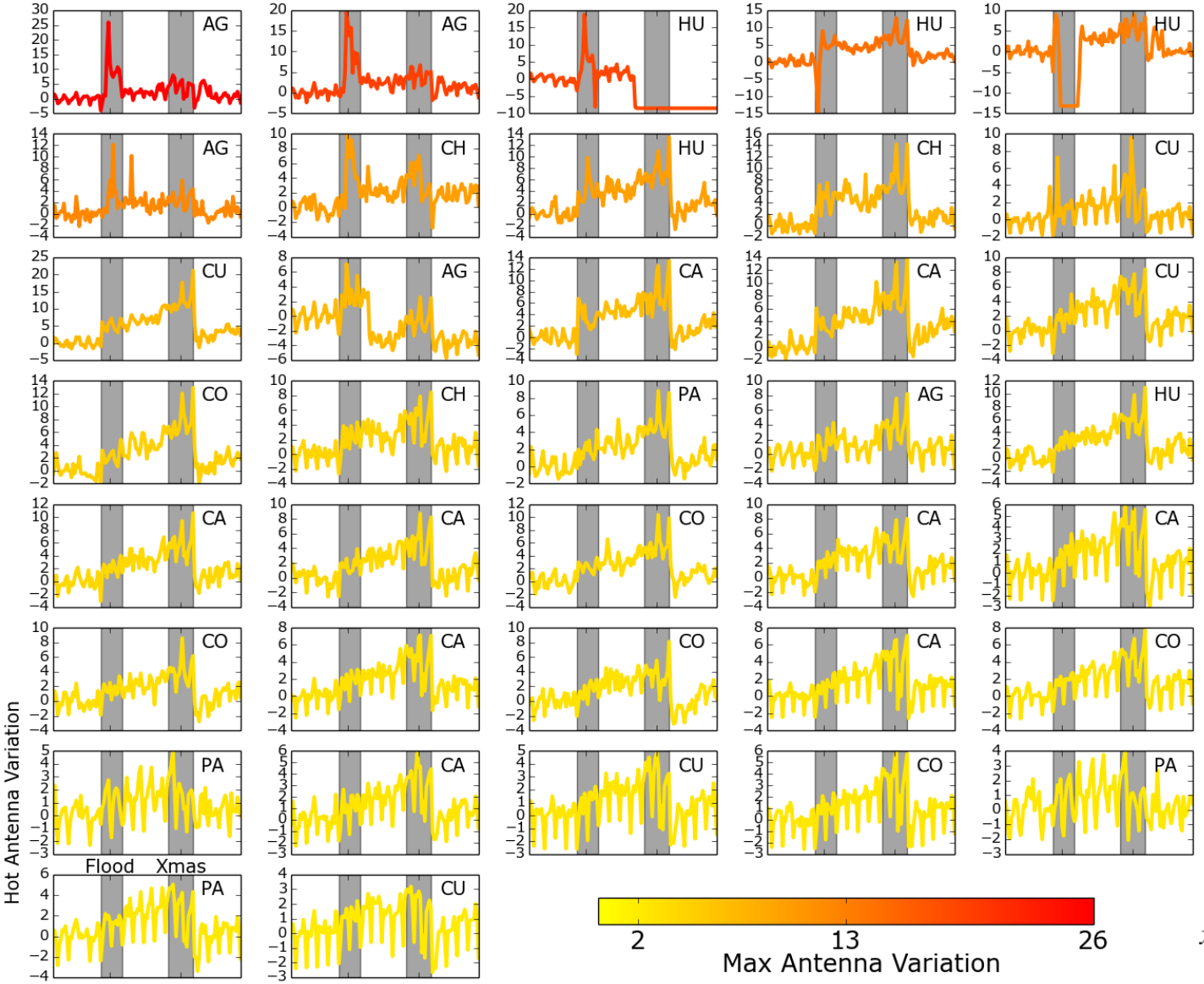

NASA-TRMM


Census Mexico
Gulf of Mexico
Campeche
Tabasco
Veracruz
Chiap
COA
MI
AG
CH
CA
HU
PA
CO
JA
CU
50.000
Population Census 2010
CDR Census
Cities:
COA: Coatzacoalcos
MI: Minantitlan
AG: Aguadulce
CH: Las Choapas
CA: Caceres
HU: Huimanguillo
PA: Paraiso
CO: Comalcalco
JA: Jalpa de Mendez
CU: Cunducacan
CdP: CdPMEX
Population Census 2010
CDR Census
250000
200000
150000
100000
50000
0
15000
30000
45000
60000


a)
b)

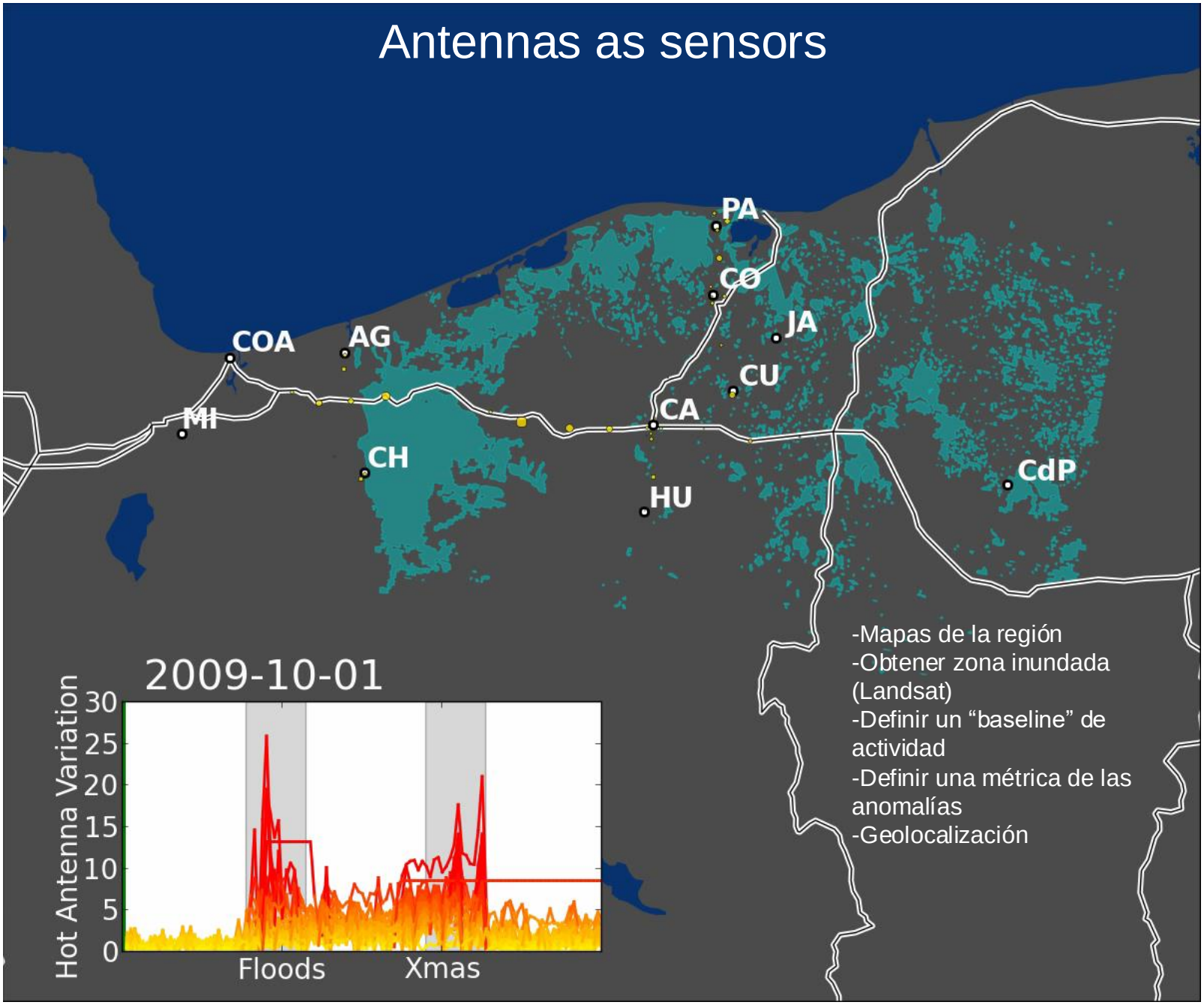

c)
NASA-Landsat

HOTSPOT ANALYTICS



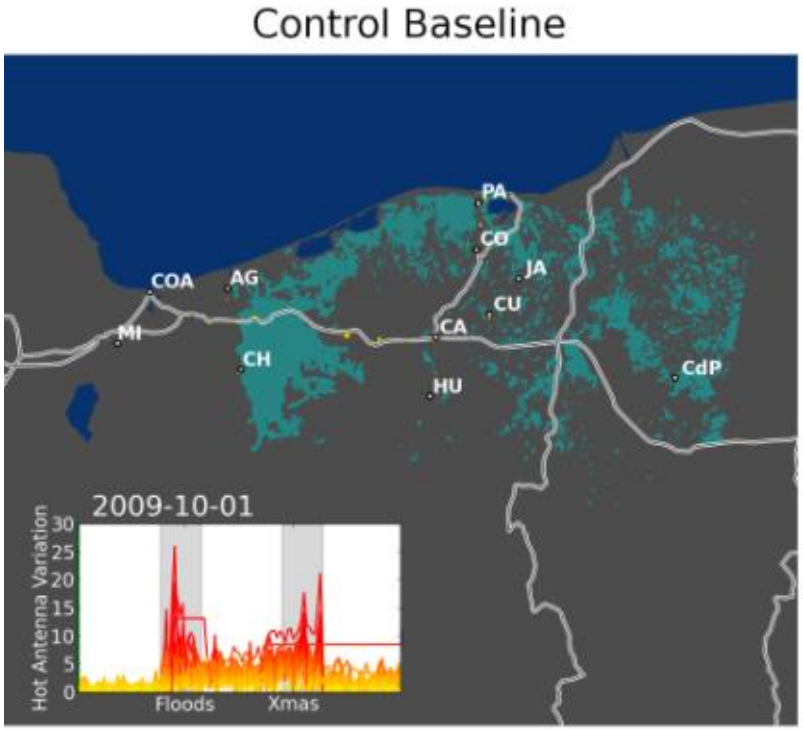
$$x_{norm}(t) = \frac{x(t) - \mu_{BL}}{\sigma_{BL}}$$

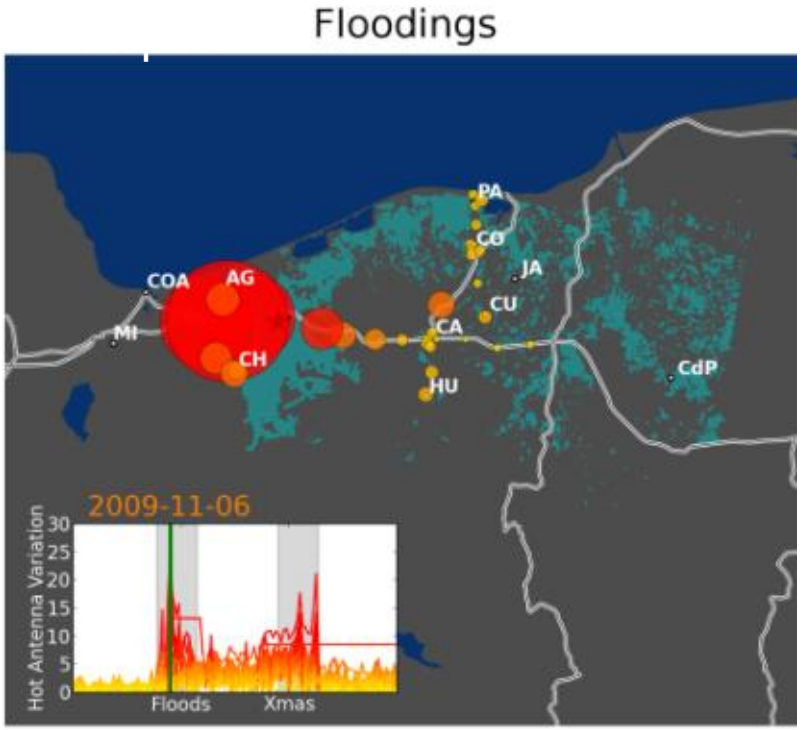
Antennas as sensors

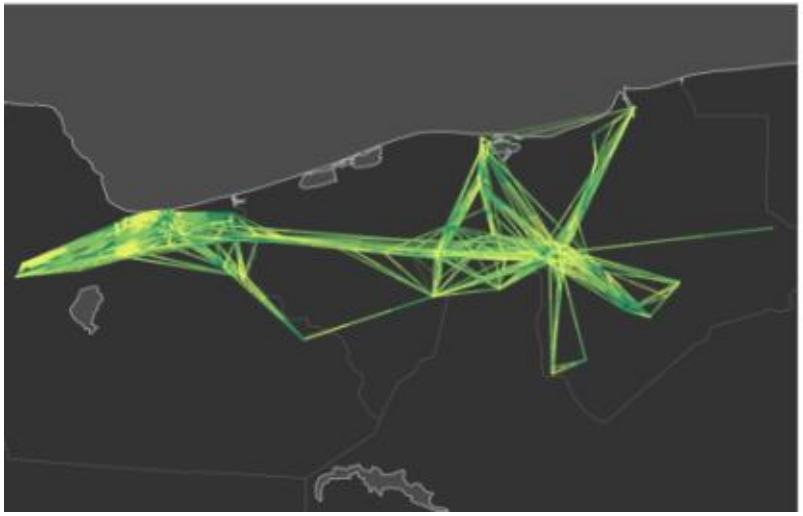


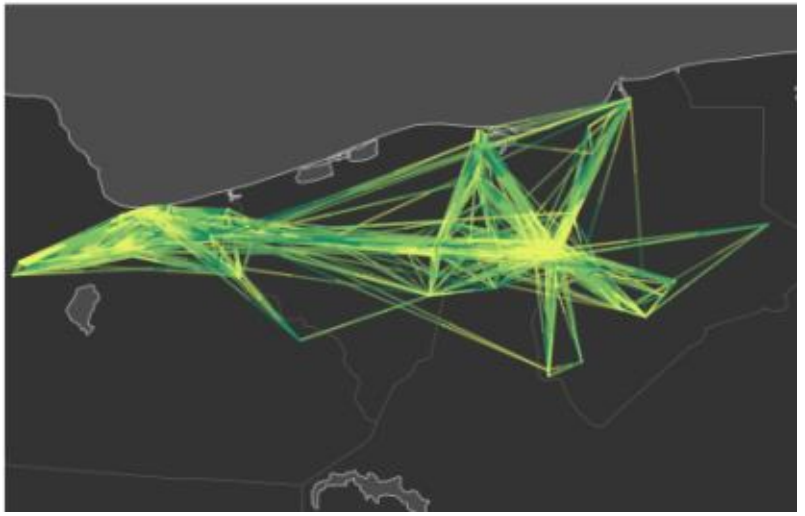
-Mapas de la región
-Obtener zona inundada (Landsat)
-Definir un “baseline” de actividad
-Definir una métrica de las anomalías
-Geolocalización

NETWORKS AND GRAPHS

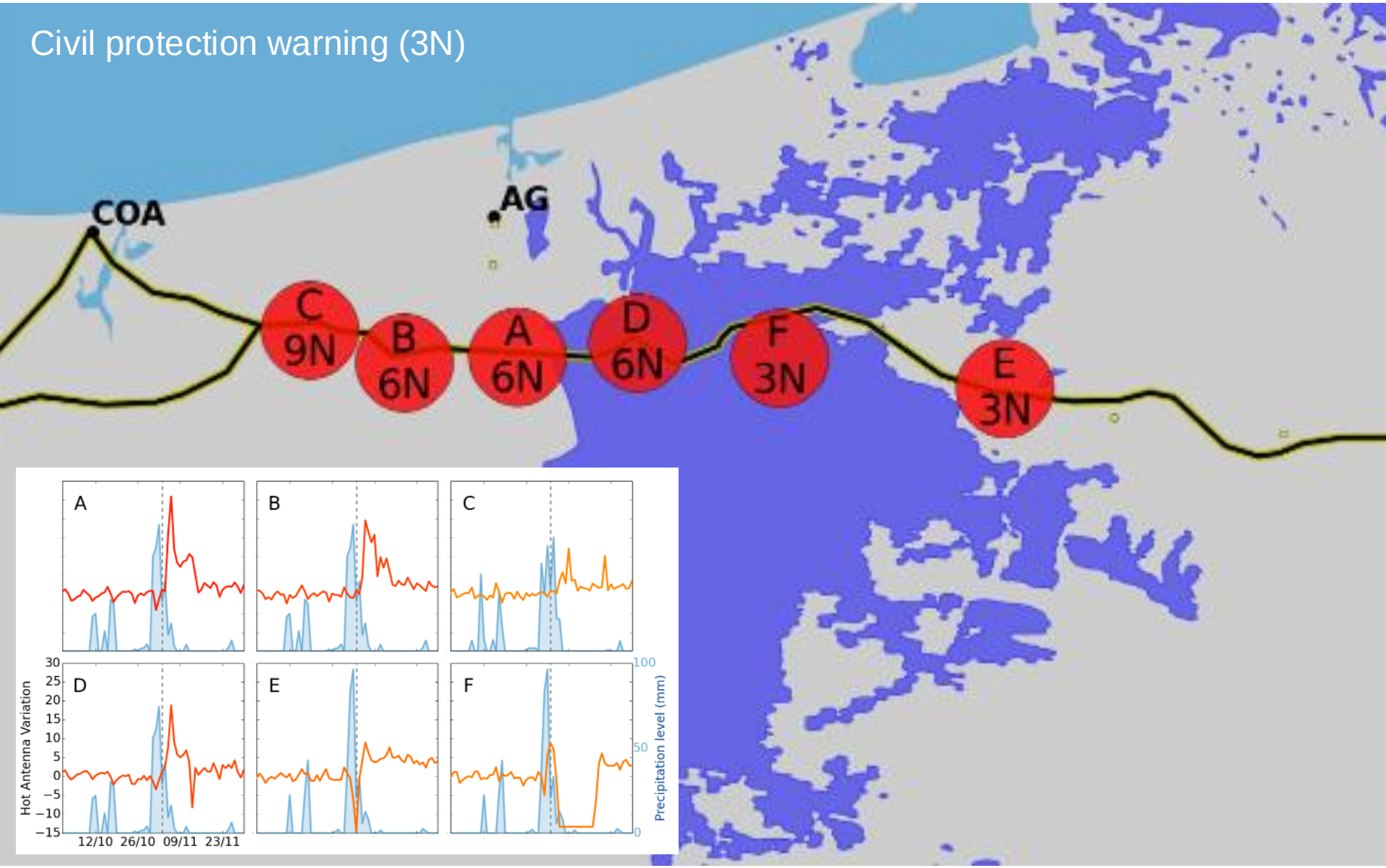




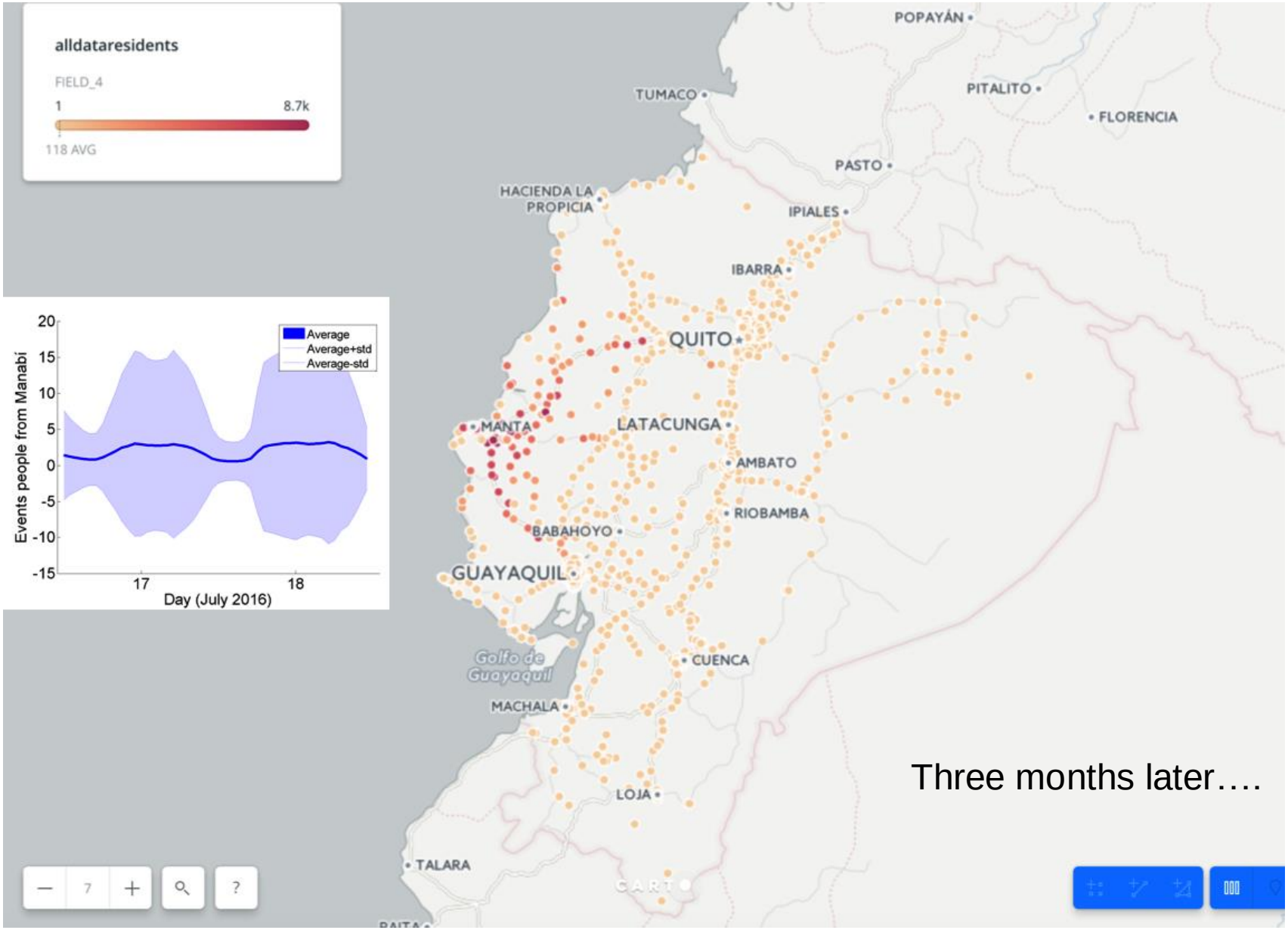


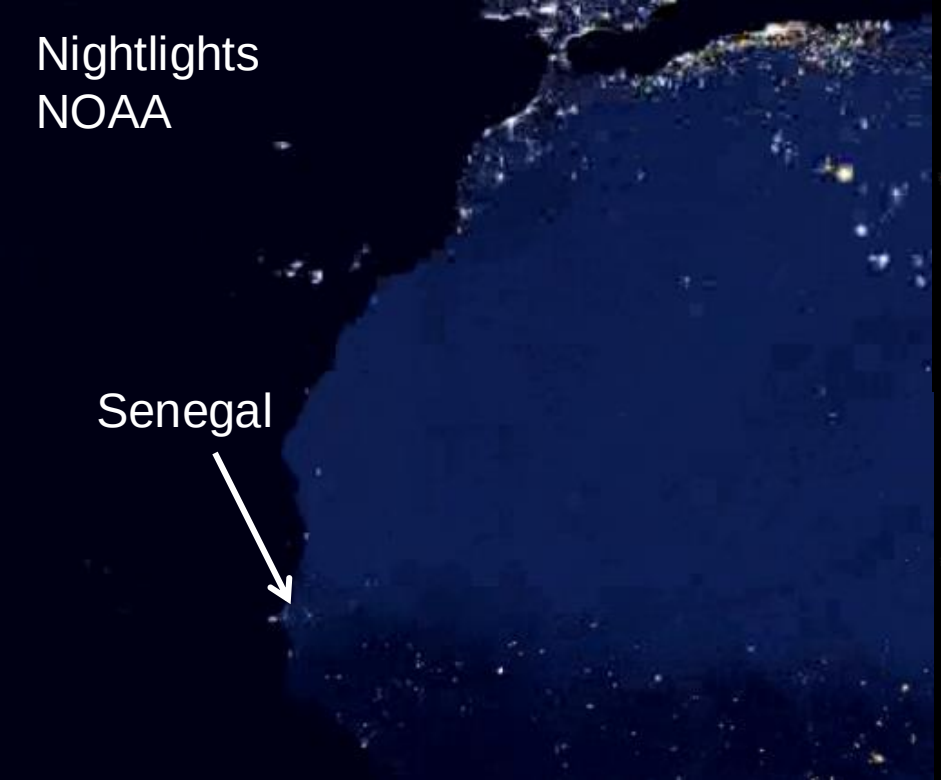


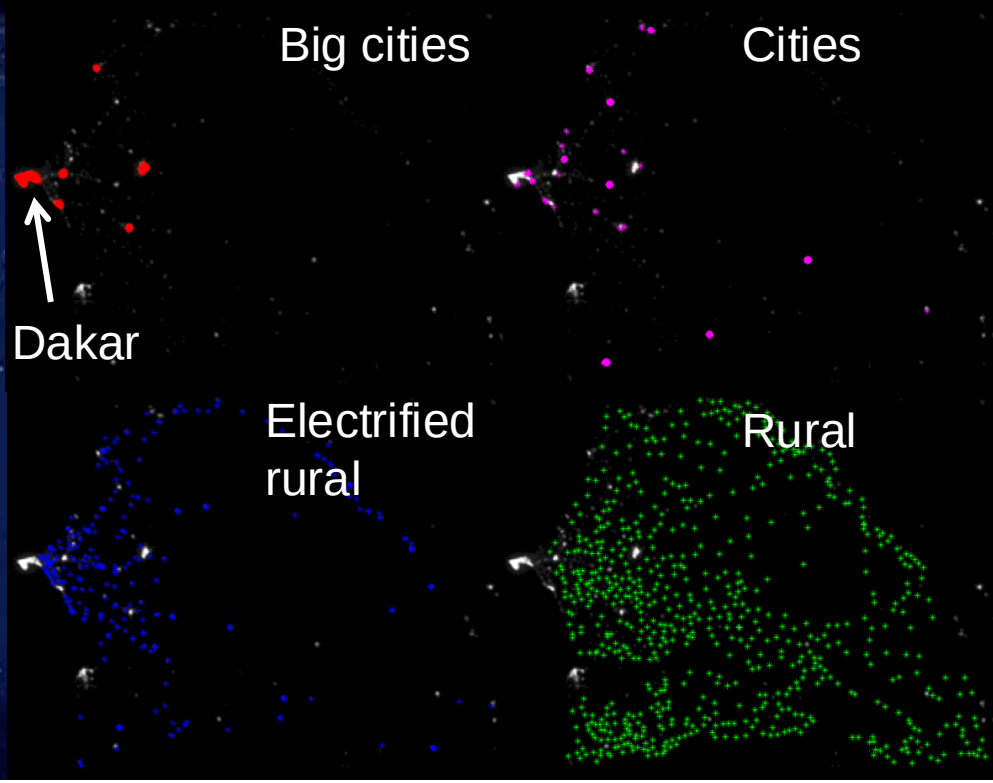
Civil protection warning (3N)

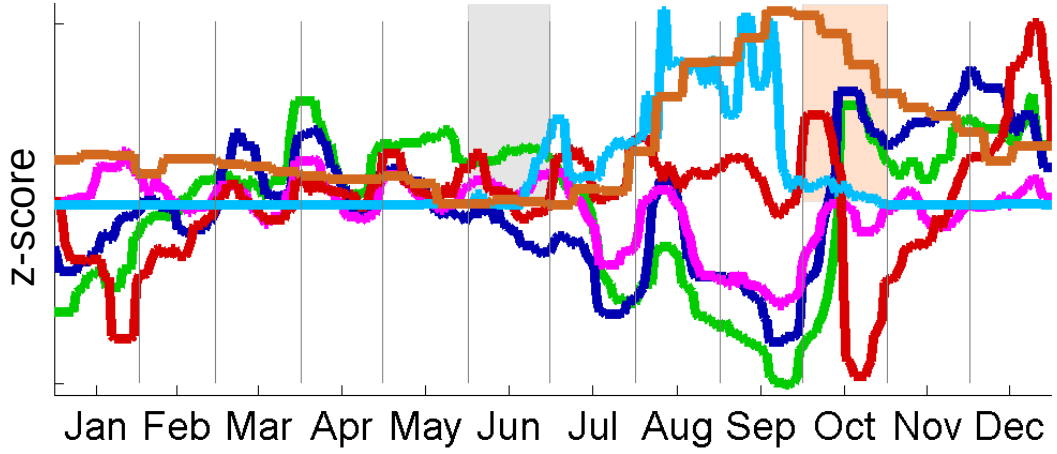


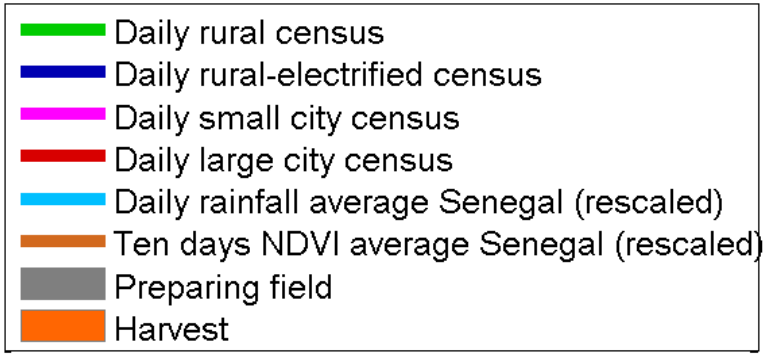
RESILIENCE and REALLOCATION





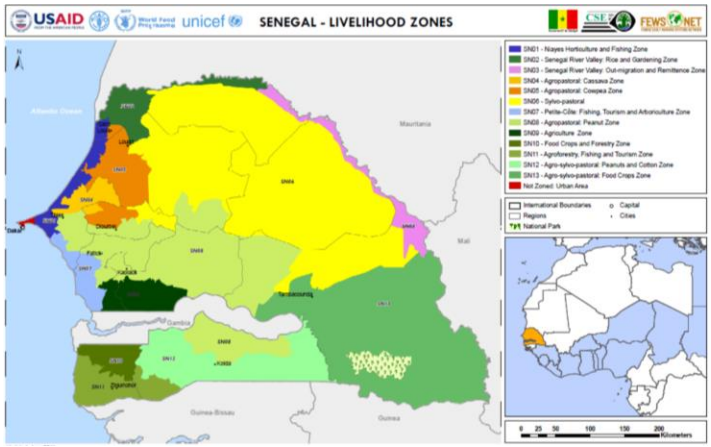


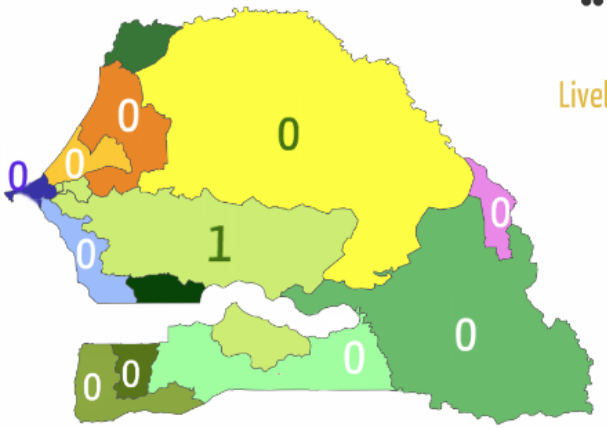


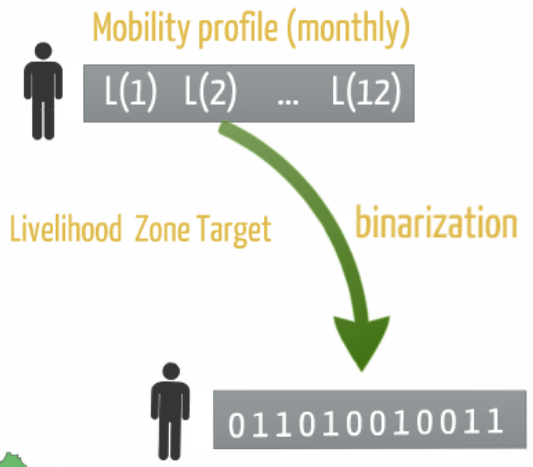


ANOMALY DETECTION

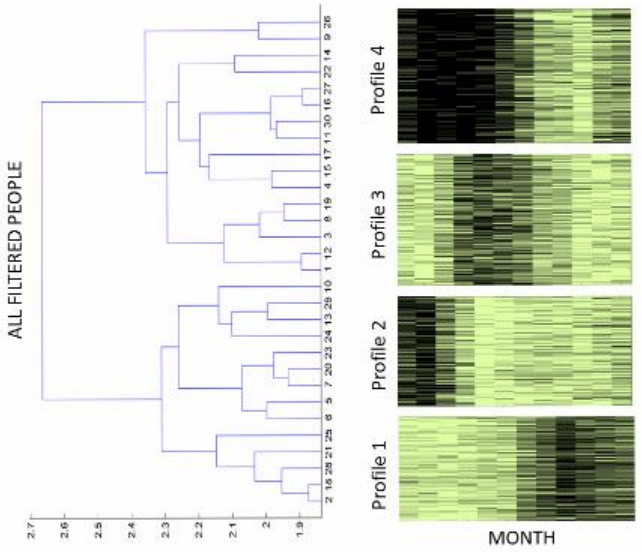
PROFILES and PREDICTIVE ANALYTICS (COLLECTIVE INTELLIGENCE)

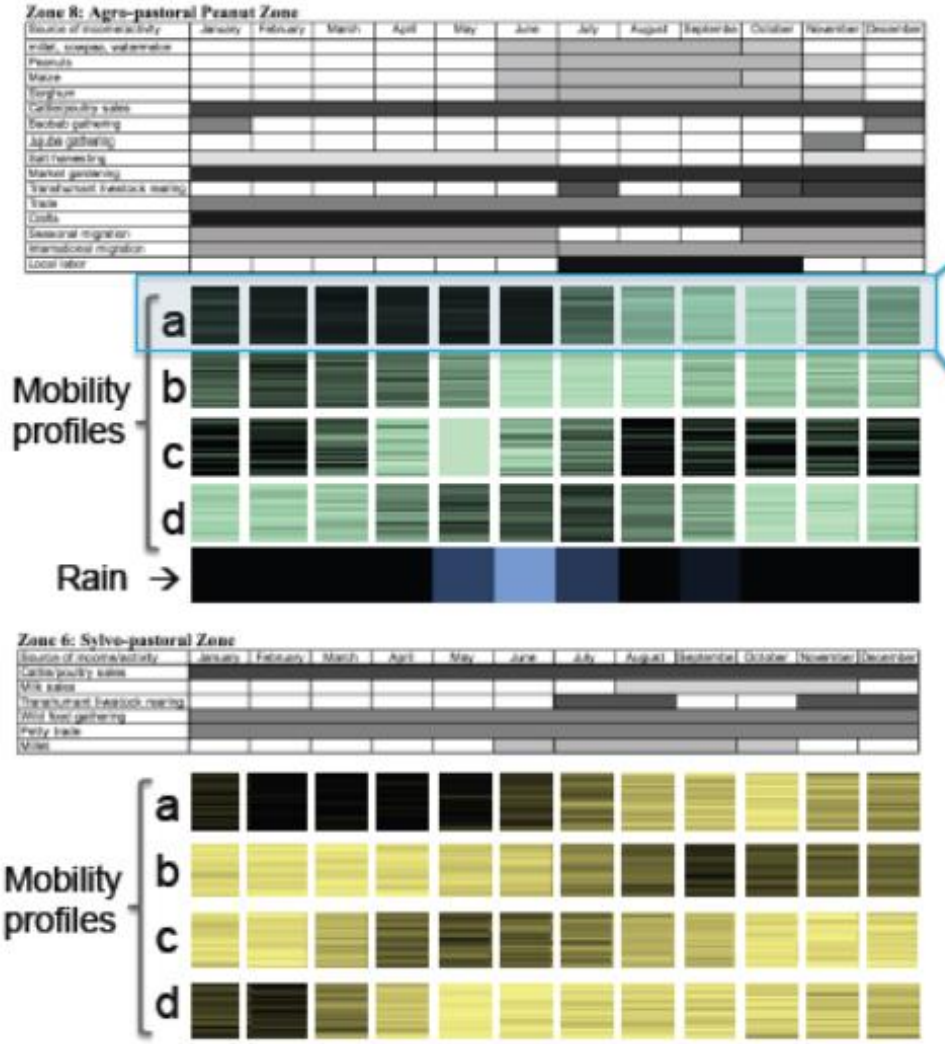


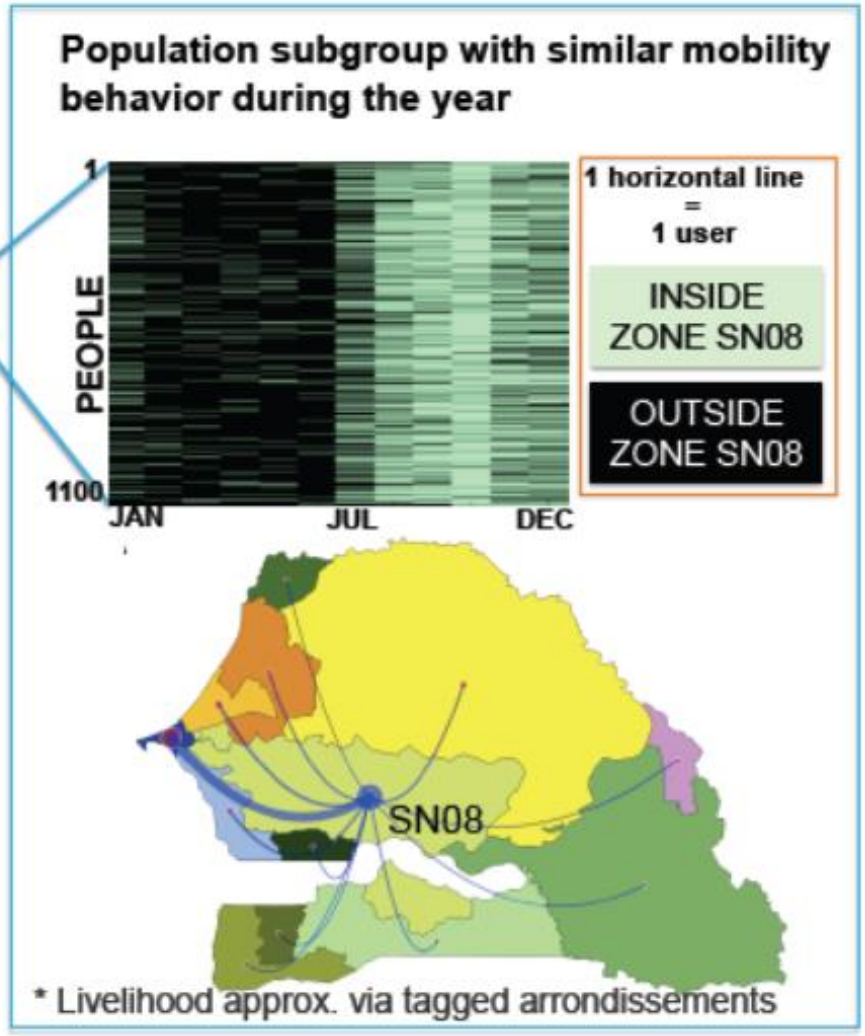




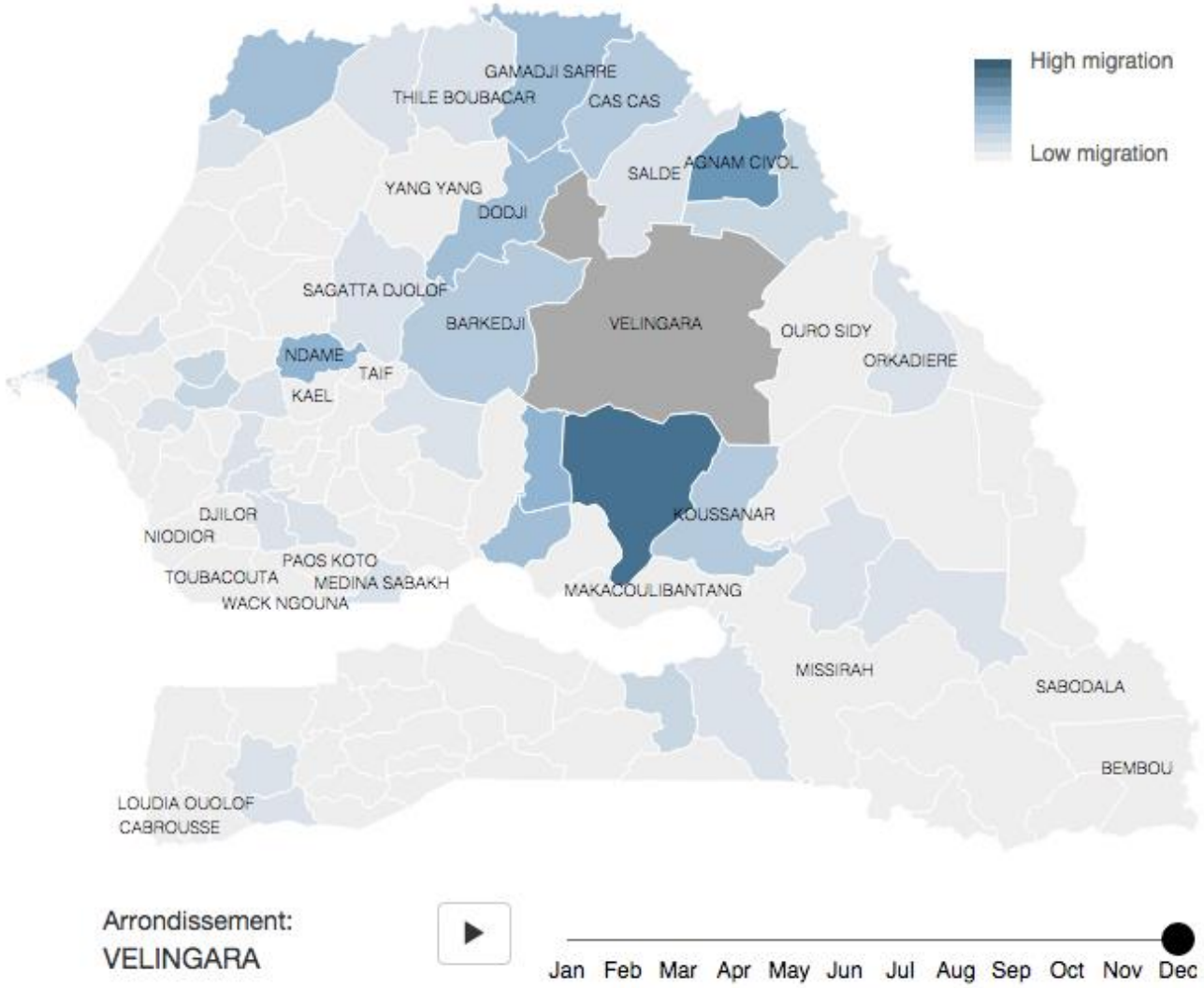
Machine Learning
for profiling mobility







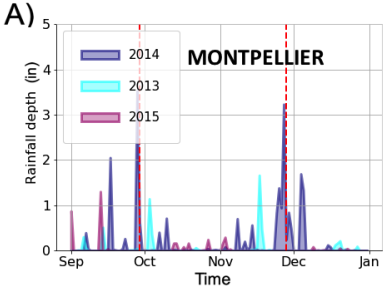
Zufiria P., Pastor-Escuredo D., Ubeda L. *et al*
PlosOne (under review)

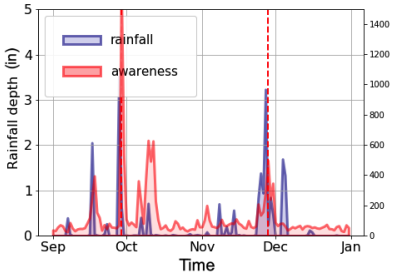


PULSE LAB KAMPALA

SOCIAL MEDIA PROXIES

A)





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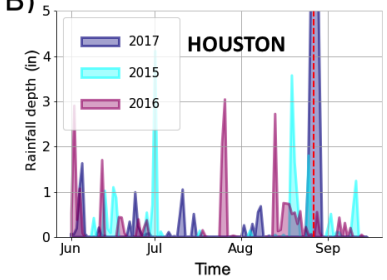

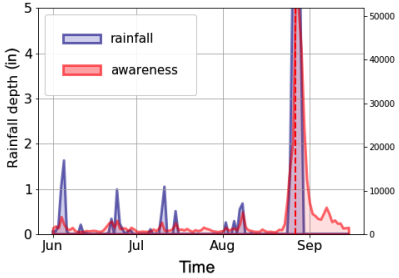

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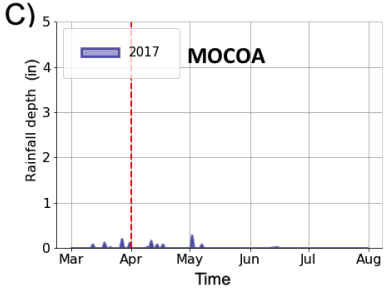
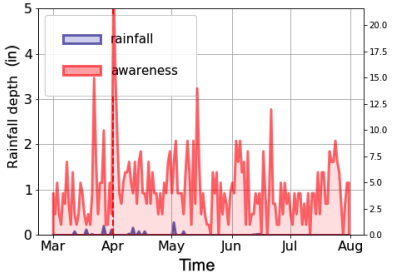
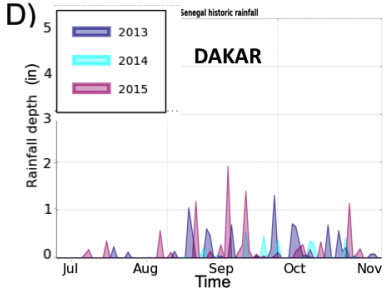
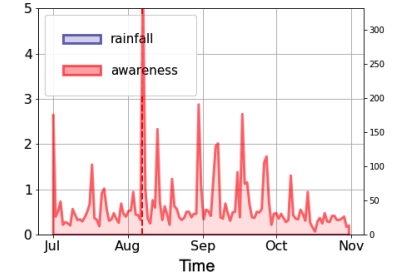
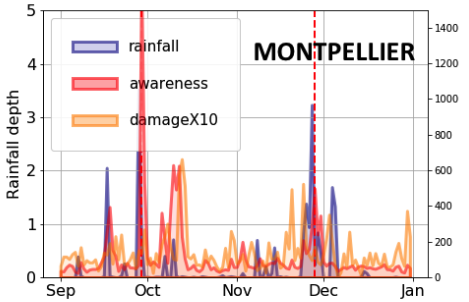


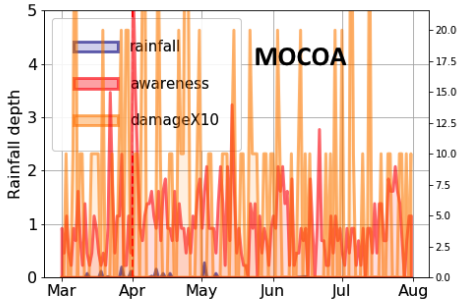


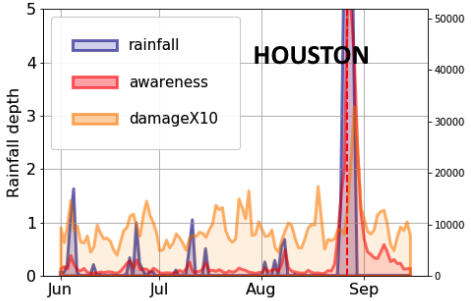
D)

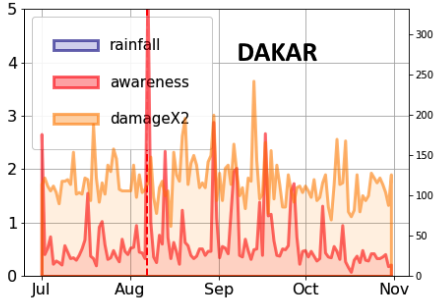




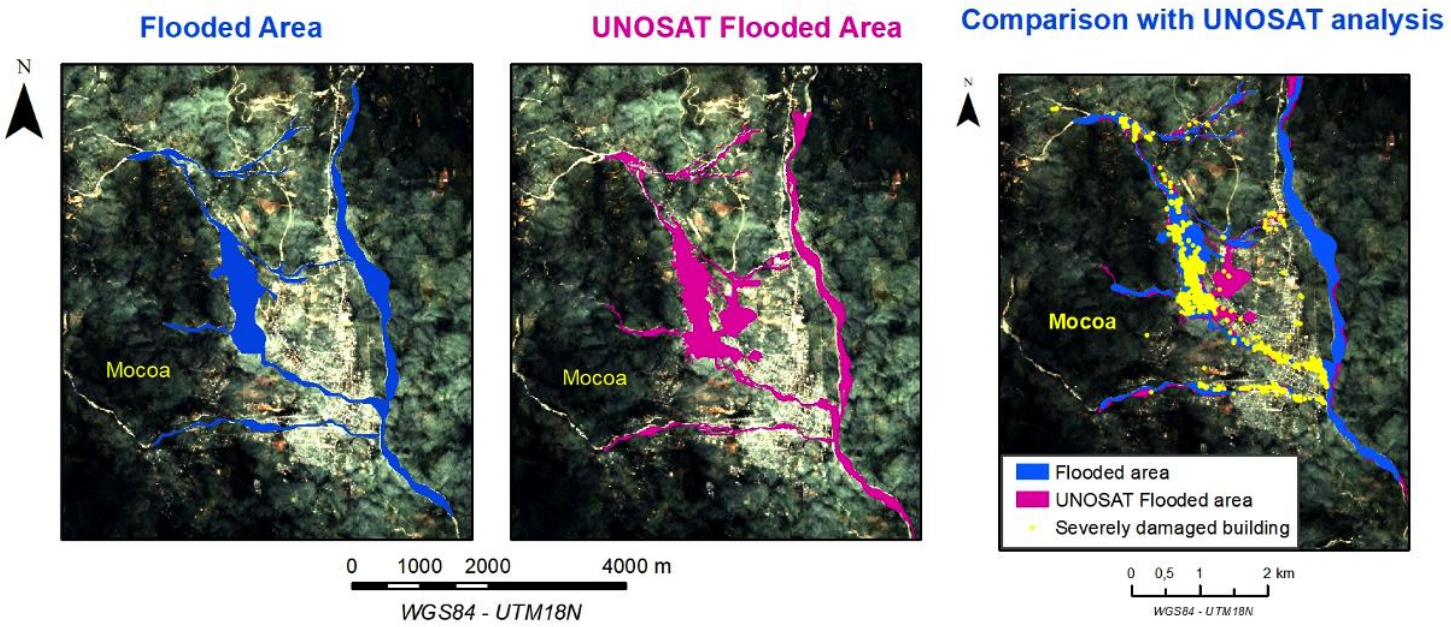








SATELLITE DATA ANALYSIS



UNHCR The UN Refugee Agency

GLOBAL RISK ANALYSIS

October 2022

ACAPS METHODOLOGY AND PROCESS

The ACAPS risk methodology defines **risk as the probability of a hazard or multiple hazards materialising, combined with the estimated impact of such hazards.** The associated risk level (low, medium, or high) rises with the hazard's probability of occurring and the severity of its expected impact.

Impact is the predicted overall humanitarian consequence of a hazard materialising. It can be an increase in the number of people needing assistance, the severity of their needs, or both. The impact is based on the assessment of different components:

- exposure to the hazard (how many people are likely to be affected?)
- the intensity of the hazard (how will the hazard affect people?)
- the population's vulnerability (to shocks)
- and coping capacity (to deteriorating living and humanitarian conditions).

ACAPS classifies impact on a five-point scale: very low, low, moderate, significant, or major.

Probability is the chance of a hazard materialising. ACAPS assesses probability on a five-point scale: very low, low, medium, high, or very high.

Probability and impact levels are not mathematically calculated but **assigned through expert judgement based on context knowledge**. The overall risk level is the combination of the two, meaning it is also assigned through expert judgement.

CRISIS INSIGHT

acaps

- Strategic Foresight - RISK
- Impact and Response
- Anticipatory Action
- Early Warning
- Enterprise Risk Management

Strategic Foresight

- Conflict, epidemics, politics, climate change, mobility, economic crisis, security
- Horizons, Risk, Alerts, Narratives, Outbreaks
- Who
  - Strategic foresight analysts, social media analysts
  - AI and Data Science
  - Generative AI
- Where
  - Social media
  - Newspapers
  - Newsletters
  - Think tanks (ACAPS, International Crisis Group, ACLED, etc)
  - Security reports
  - Dataminr – UN Global Pulse
  - NetBase

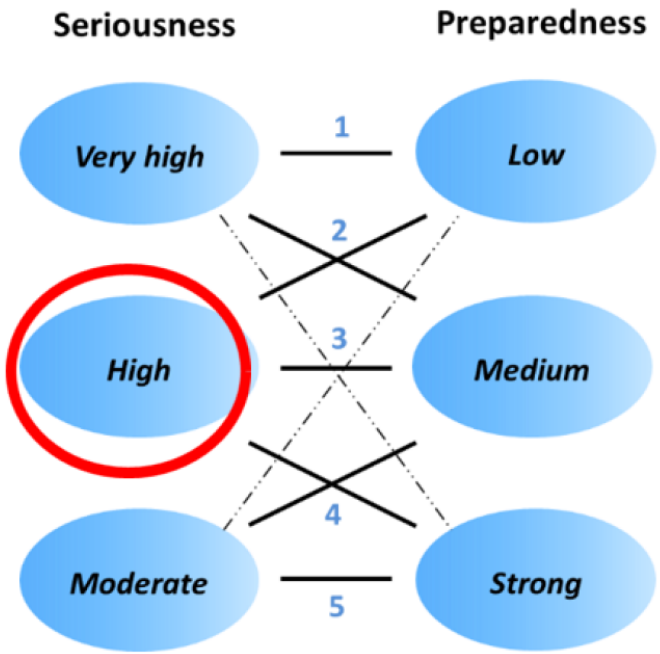
RISK RANKING

IMPACT

Existing emergency response capacities (UNHCR, Government, other UN agencies, NGOs and host communities) to respond to the predicted scenario and the projected additional people in need of humanitarian assistance.

LIKELIHOOD Estimated probability that the scenario will occur in the next 12 months	Emergency response capacity of the government is sufficient to cover the needs.	The inter-agency response capacity in the country is sufficient to cover the needs that the government cannot meet.	New resources (up to 30% of current operations) are needed to cover needs. Support from the Regional Bureau may not be required.	New resources (Between 31% and 79% of current operations) are needed to cover needs. Support from the Regional Bureau is required.	New resources (Over 80% of current operations) are needed to cover needs. Support from Regional Bureau and Headquarters is required.
Score	**1. Insignificant**	**2. Minor**	**3. Moderate**	**4. Major**	**5. Disastrous**
51-100% 5. Very high	LOW	MEDIUM	HIGH	HIGH	HIGH
31-50% 4. High	LOW	MEDIUM	MEDIUM	HIGH	HIGH
16- 30% 3. Medium	LOW	LOW	MEDIUM	MEDIUM	HIGH
6-15% 2. Low	LOW	LOW	LOW	MEDIUM	MEDIUM
0- 5% 1. Very low	LOW	LOW	LOW	LOW	MEDIUM

IASC Early Warning Analyst Group – a refresher



Seriousness	Preparedness	Prioritization
Very high	Low	1st
Very high	Medium	2nd
High	Low	2nd
Very high	Strong	3rd
High	Medium	3rd
Moderate	Low	3rd
High	Strong	4th
Moderate	Medium	4th
Moderate	Strong	5th

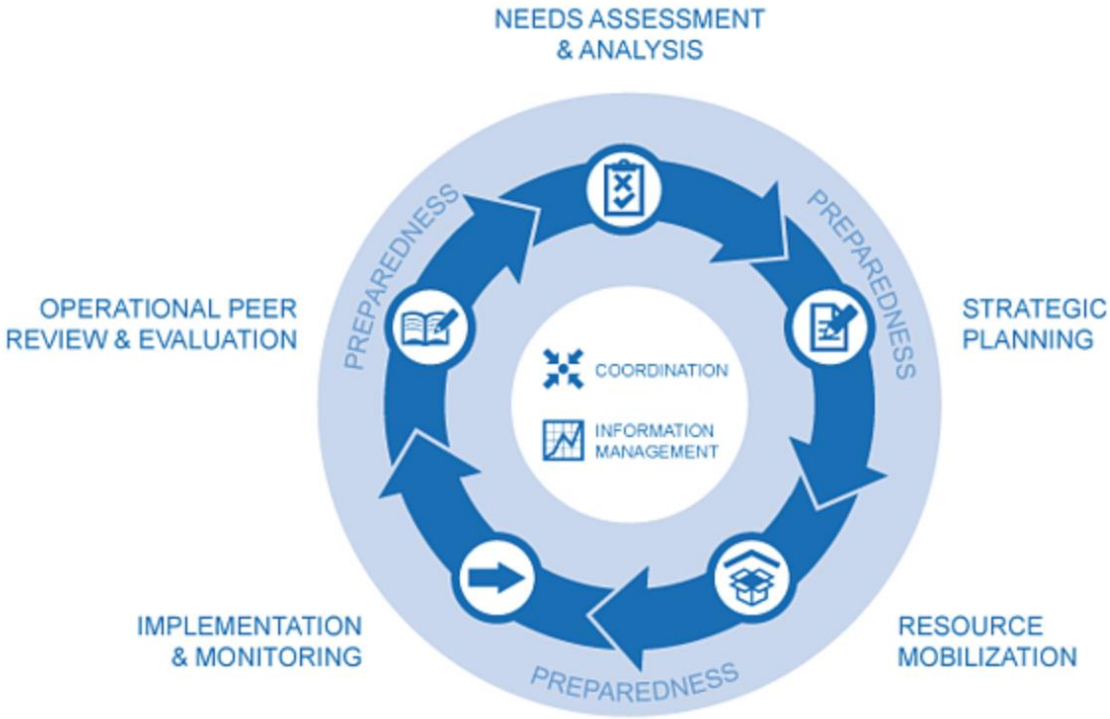
Preparedness

UNHCR The UN Refugee Agency | EMERGENCY HANDBOOK

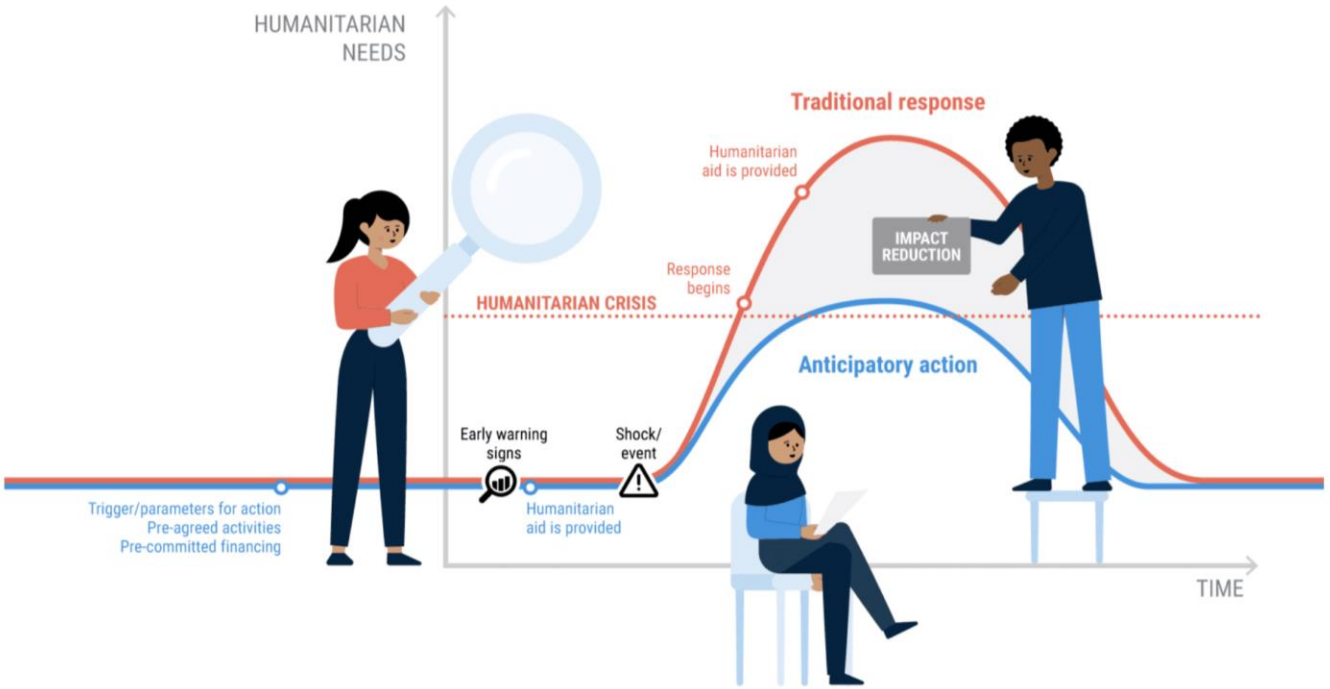
The key building blocks of preparedness, adopted by both tools, are:

- Risk analysis;
- Minimum preparedness actions;
- Advanced preparedness actions;
- Scenario-based contingency plan

Response


NEEDS ASSESSMENT
& ANALYSIS
STRATEGIC
PLANNING
RESOURCE
MOBILIZATION
IMPLEMENTATION
& MONITORING
OPERATIONAL PEER
REVIEW & EVALUATION
PREPAREDNESS
PREPAREDNESS
PREPAREDNESS
PREPAREDNESS
COORDINATION
INFORMATION
MANAGEMENT

Anticipatory Action



Anticipatory Action

What is anticipatory action?

Anticipatory action is acting ahead of predicted hazards to prevent or reduce acute humanitarian impacts before they fully unfold. Effective implementation of anticipatory action ideally requires three elements:

Pre-agreed trigger: This consists of thresholds and decision-making rules based on reliable, timely and measurable forecasts.

Pre-agreed activities: This consists of accountable, feasible, effective and efficient actions to be implemented to support vulnerable communities in the window of opportunity between the trigger moment and the full impact of a shock.

Pre-arranged financing: This consists of funding that is guaranteed and available to be released based on the pre-agreed trigger towards the pre-agreed activities.

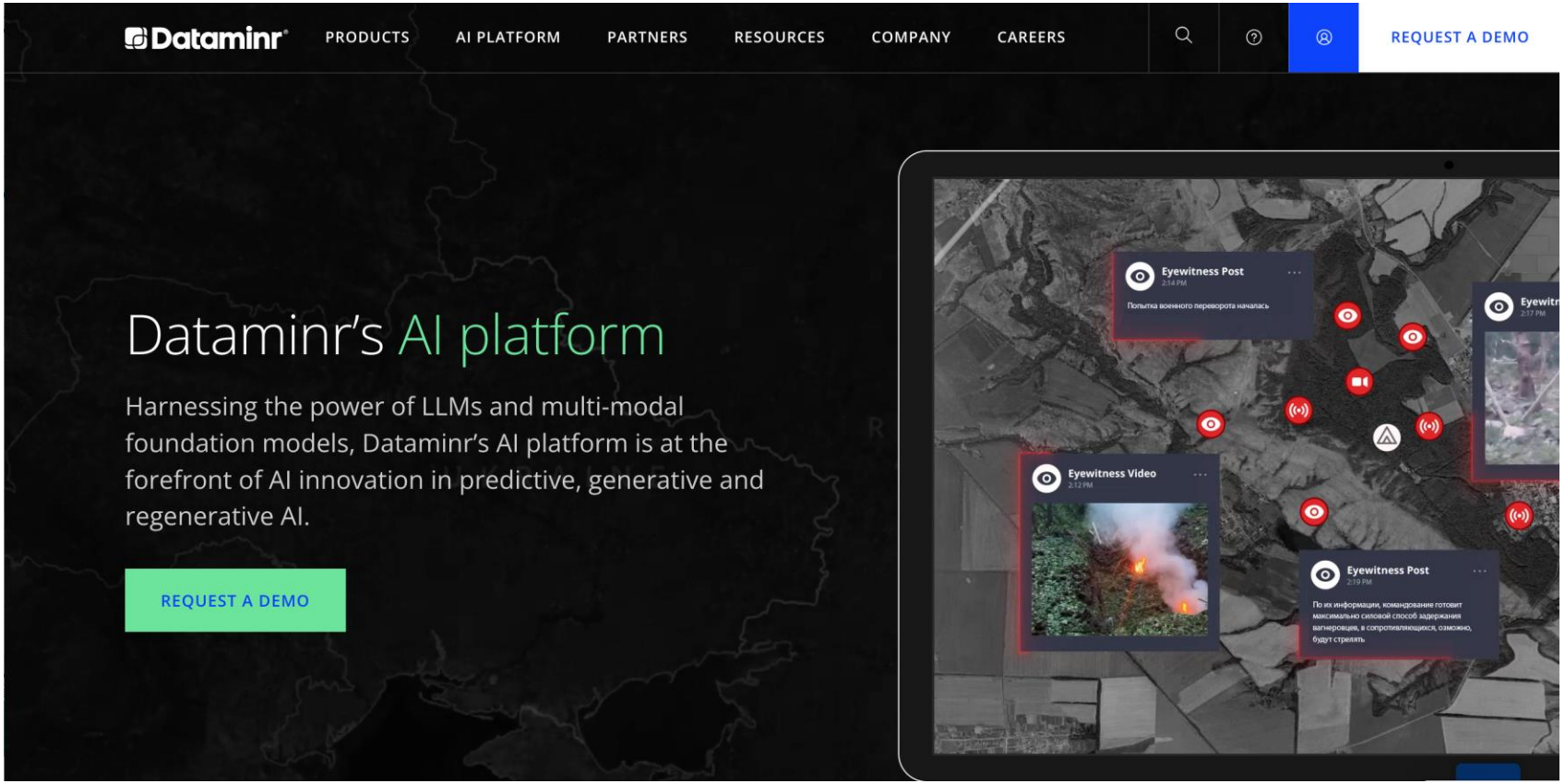
OCHA underpins this approach, with a learning component to iteratively improve anticipatory action over time, but also to provide a growing evidence base that receiving assistance earlier results in significant improvements of the wellbeing of the people impacted by disasters.

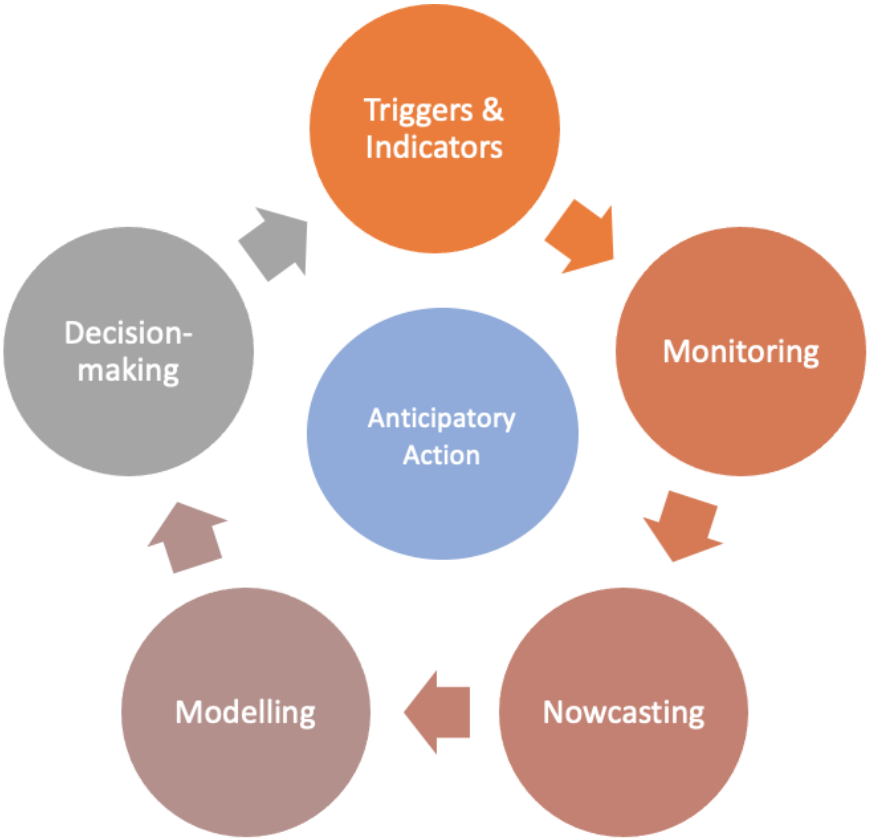
OCHA is committed to use its financing tools to facilitate, generate evidence for and scale up collective anticipatory action.

Early Warning

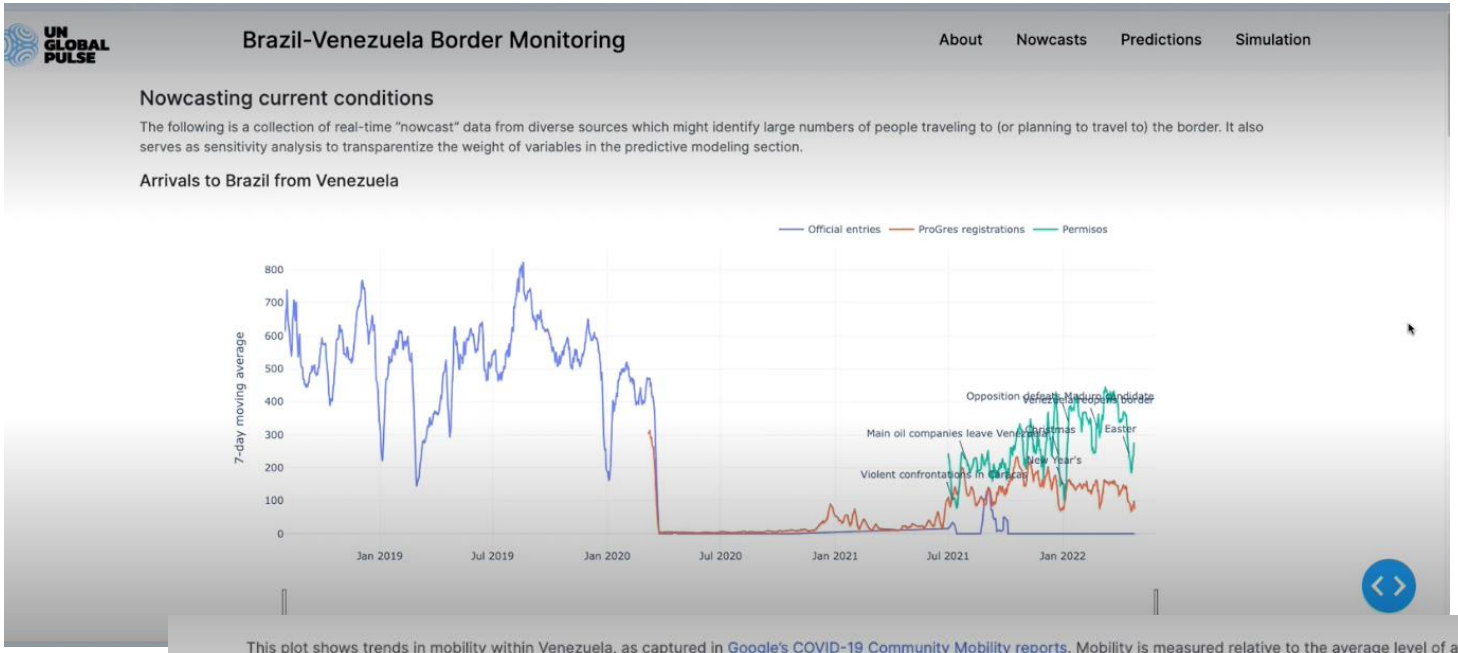
- Indicators
- Predictive Analytics and Artificial Intelligence
- Decision-making
- Reporting
- Planning

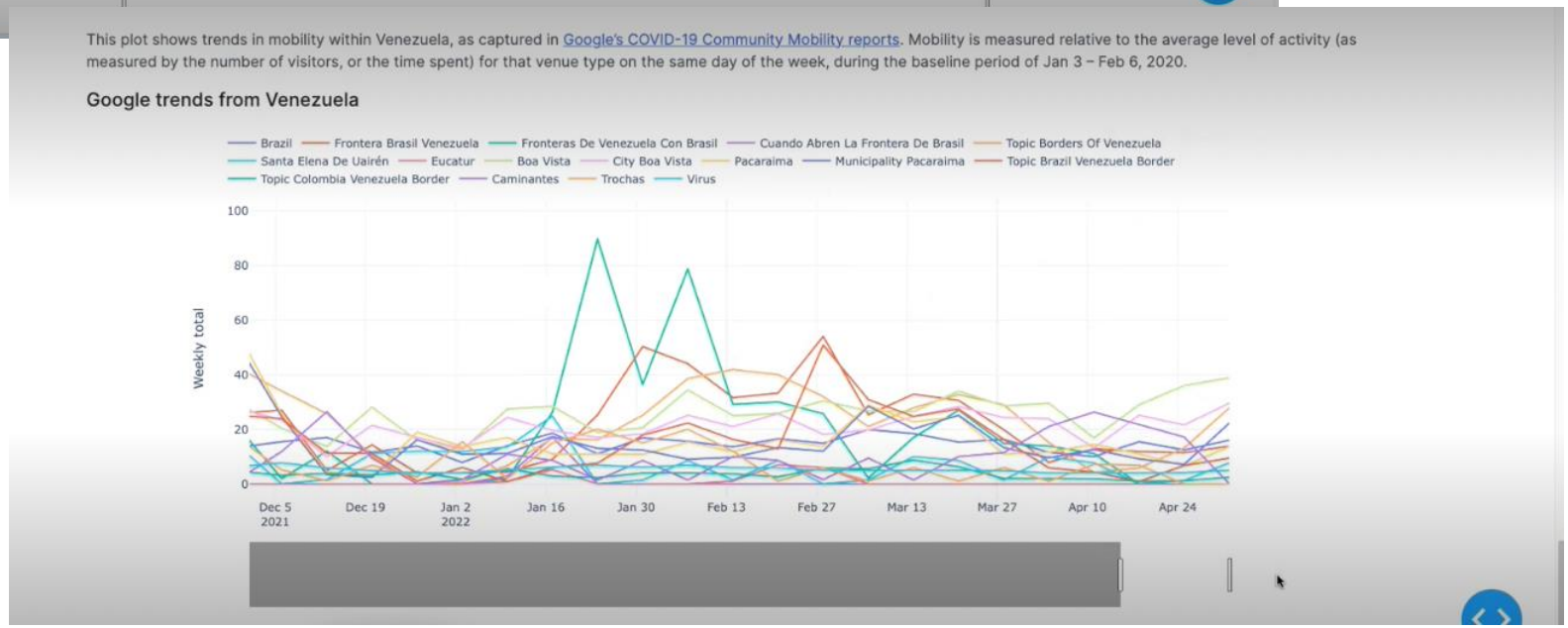
Early Warning



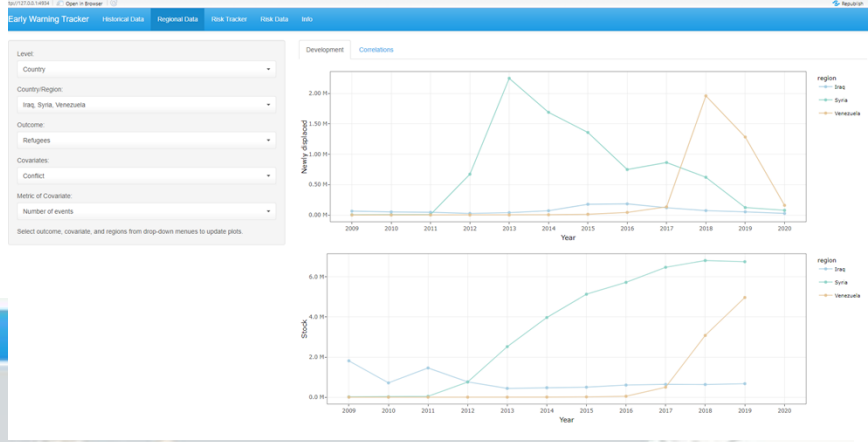

Triggers & Indicators
Monitoring
Nowcasting
Modelling
Decision-making
Anticipatory Action

MONITORING and NOWCASTING





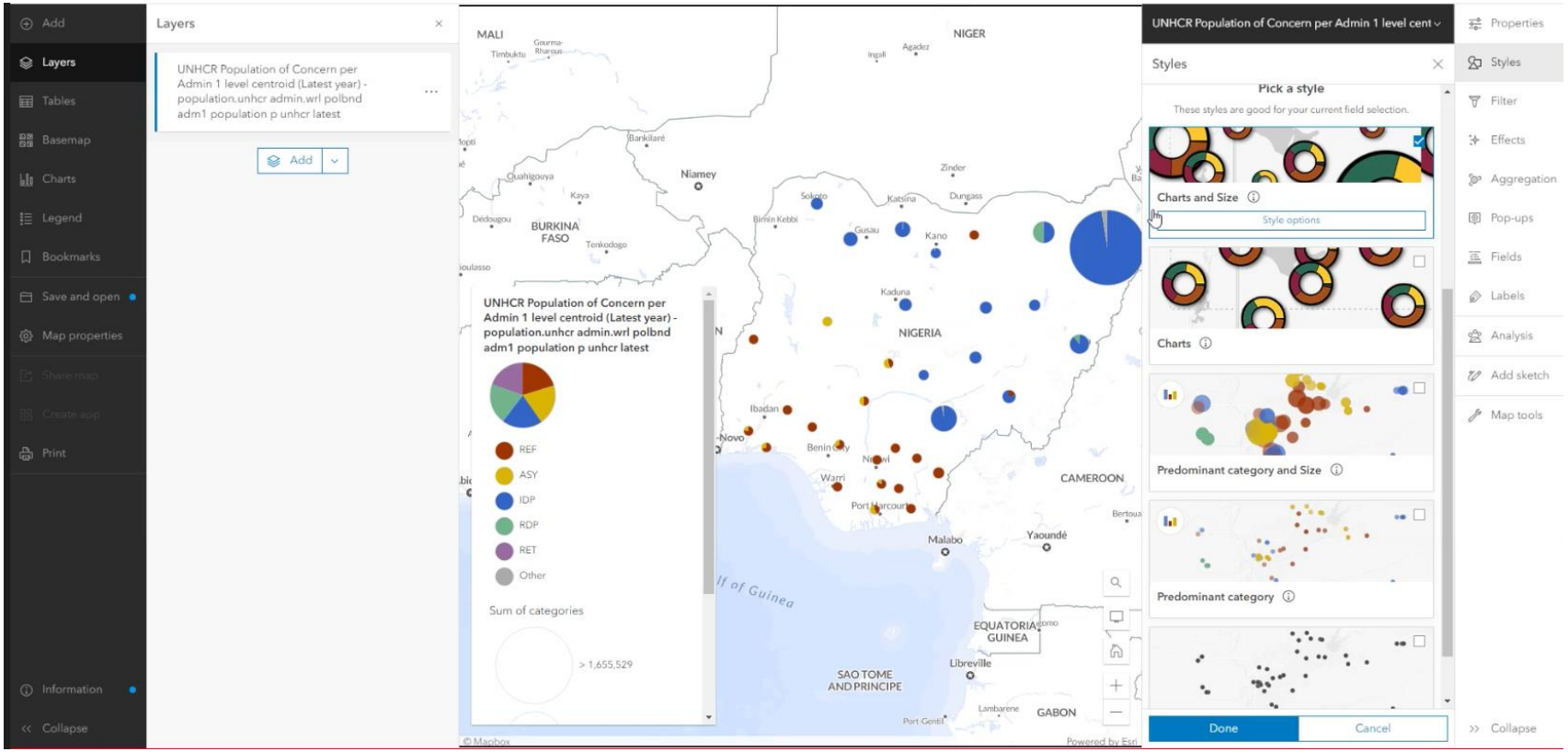
FORECASTING


Early Warning Tracker
Historical Data
Regional Data
Risk Tracker
Risk Data
Info
Level:
Country
Country/Region:
Iraq, Syria, Venezuela
Outcome:
Refugees
Covariates:
Conflict
Metric of Covariate:
Number of events
Select outcome, covariate, and regions from drop-down menues to update plots.
Development
Correlations
Newly displaced
Year
region
Iraq
Syria
Venezuela
Stock
Year
region
Iraq
Syria
Venezuela

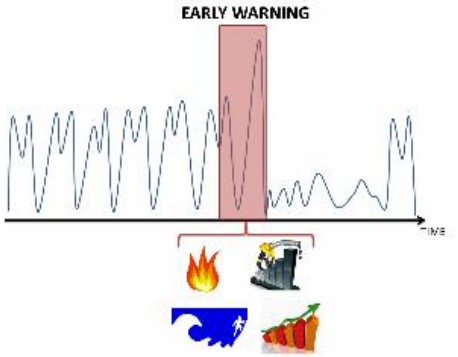

Early Warning Tracker
Historical Data
Regional Data
Risk Tracker
Risk Data
Info
Risk tracker
The risk tracker shows a country's risk of experiencing a major displacement of its population within the next six months. The risk tracker shows the likelihood of such an event in percent, with 0% = "totally unlikely" to 100% = "very likely".
It is important to note that a risk percentage of for example 10% does not exclude the possibility of such an event to happen, it just deems the likelihood of such an event as very low.
Predictive quality of risk index
The histogram below compares earlier risk trackers with real events from the previous months. For each category of the risk index, the bar shows the relative number of countries that actually experienced displacement. The more left-skewed the distribution, the more accurately did the risk index predict the likelihood of displacement.
Share true displaced
Arctic Ocean
NORTH AMERICA
ASIA
AFRICA
SOUTH AMERICA
OCEANIA
Pacific Ocean
Indian Ocean
Southern Ocean
ANTARCTICA
Risk Percentage
0
20
40
60
80
100
UNHCR

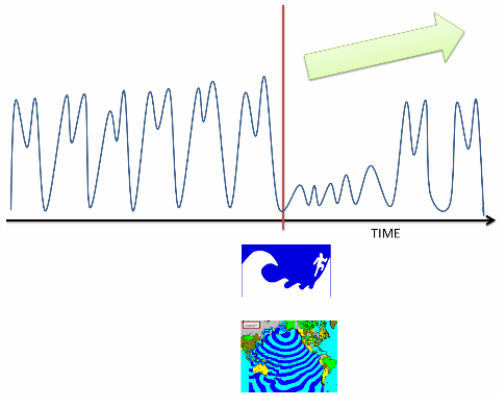
PROJECT PROPOSAL 1

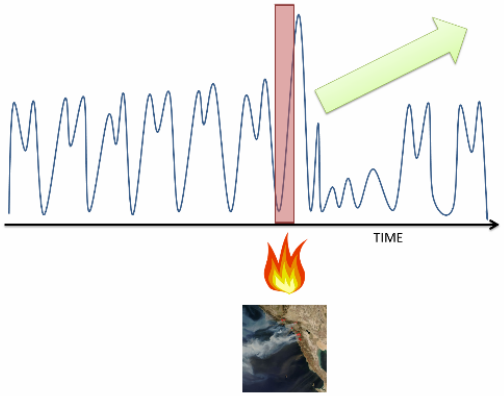
DASHBOARD: WARNINGS AND HOTSPOTS

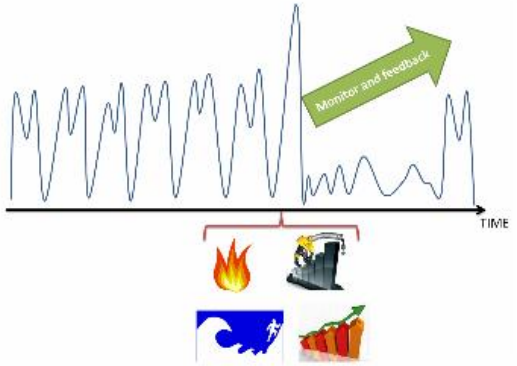


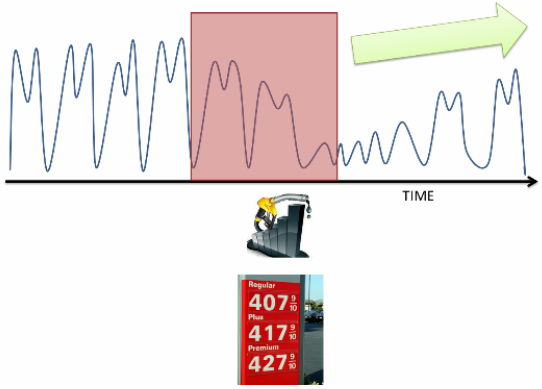
DEEP LEARNING TO MODEL BASELINE-RESPONSE

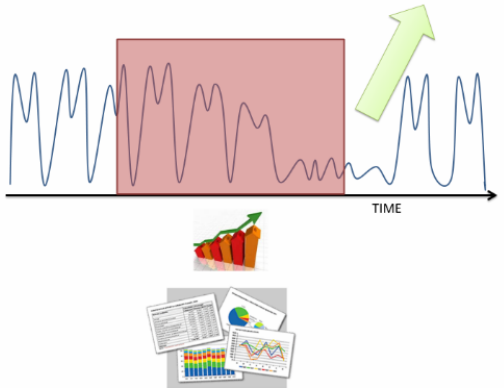


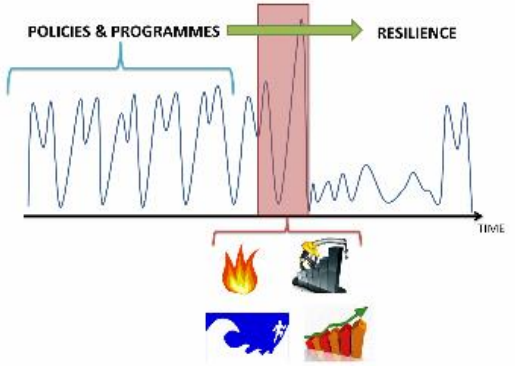












PROJECT PROPOSAL 2

- TRAINING AND FINE-TUNING LLMs (Llama, Gemini, ChatGPT, etc)
  - Social media
  - News
  - Dataminr
  - Reports
  - Contingency plans
- RISK AND IMPACT FORESIGHT better than social media monitoring
- KNOWLEDGE GRAPH to model the knowledge on risk
- INDICATORS
- STUDY IMPACT AND RESPONSE with new training data over time

THANKS!

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