# **FLO**od crisis management **W**ith Earth observation **S**olutions

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*BEODAY 2024*

Which roads are blocked?

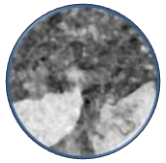
Which areas are flooded?

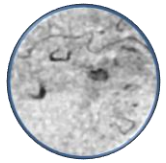
Where are victims?

Which houses need reconstruction?

How is vegetation impacted?

Are there agricultural losses?





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RECOMMANDATIONS PERMETTANT D'AMÉLIORER LA GESTION DE CRISE EN BELGIQUE

À l'attention du Ministre de l'Intérieur

Stakeholders' needs

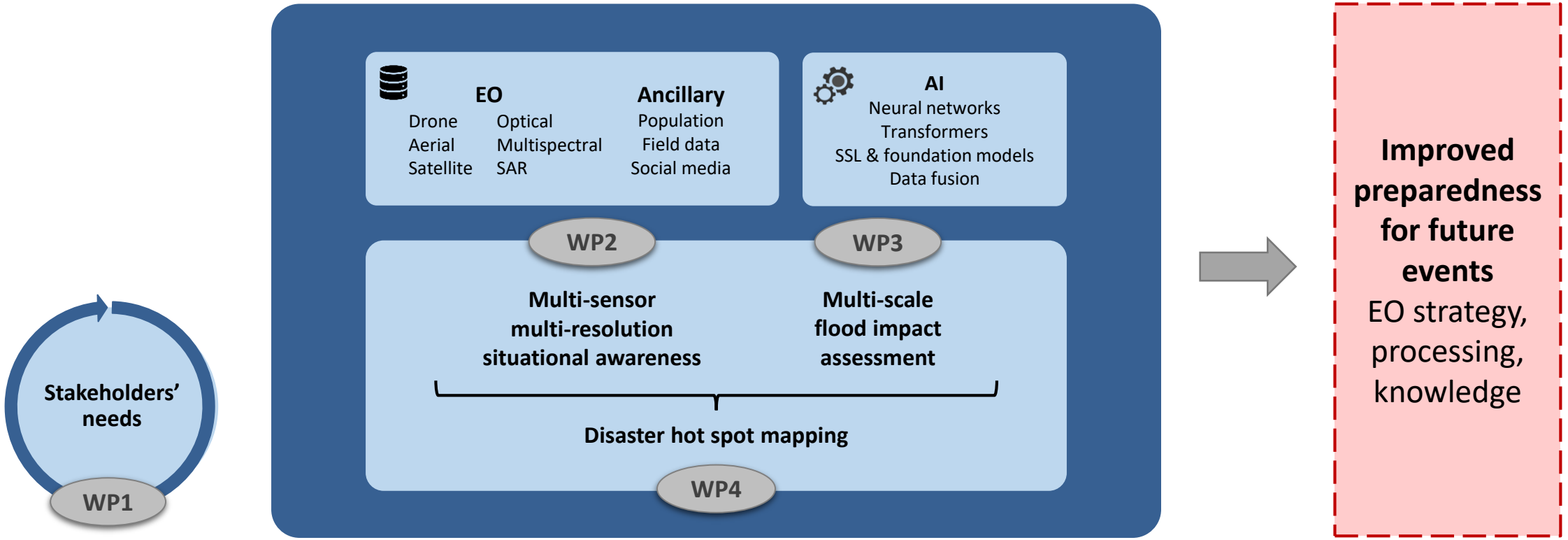
EO data

water

MDPI

Article

Here Comes the Flood, but Not Failure? Lessons to Learn after the Heavy Rain and Pluvial Floods in Germany 2021


Stakeholders' needs
WP1
EO
Drone
Aerial
Satellite
Optical
Multispectral
SAR
Ancillary
Population
Field data
Social media
AI
Neural networks
Transformers
SSL & foundation models
Data fusion
WP2
WP3
Multi-sensor multi-resolution situational awareness
Multi-scale flood impact assessment
Disaster hot spot mapping
WP4
Improved preparedness for future events
EO strategy, processing, knowledge

# User-centered research

**Stakeholders' needs**

- Crisis managers National/regional/provincial/local levels
- Contacted organisations
    1. Services of the Governor of the Province of Namur
    2. Municipality of Liège
    3. Walloon Regional crisis centre (CRC)
    4. National Crisis Centre (NCCN, 2 pers.)
    5. Services of the Governor of the Province of West Flanders
    6. Emergency zone of Luxembourg
    7. Municipality of Trooz
    8. Services of the Governor of the Province of Liège
- Database with over 80 potential contacts
- Aftermath & reconstruction managers interviewed in a later phase

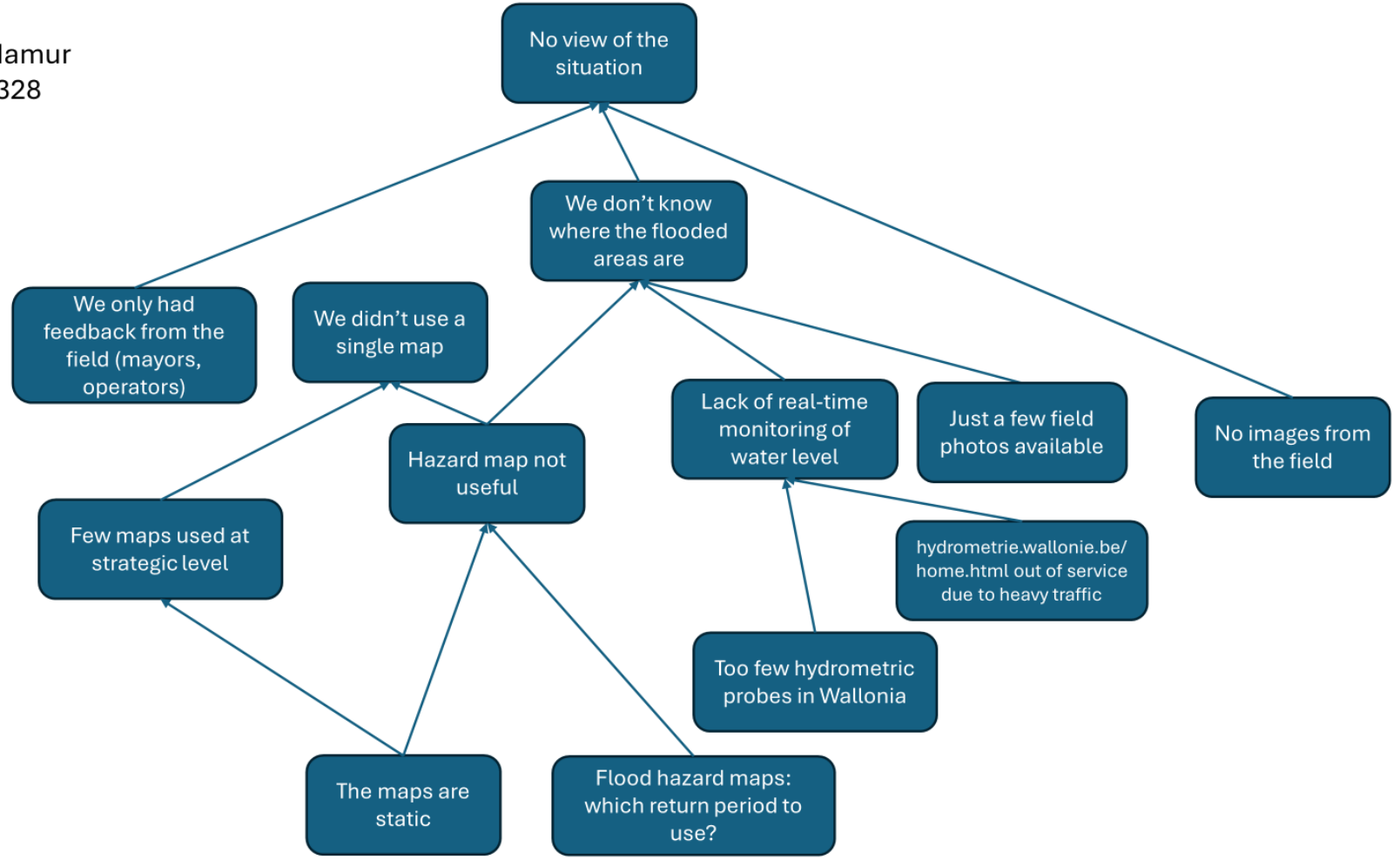
# User-centered research

- 5 validated problem trees

**Stakeholders' needs**

GouvNamur
20240328

Crisis



# User-centered research

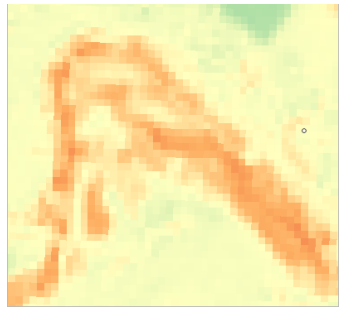
Stakeholders' needs

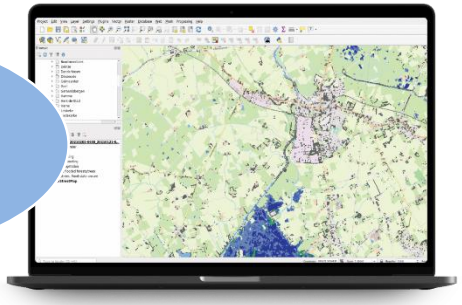
Requirement Identification

Agile prototyping

Validation

EO information

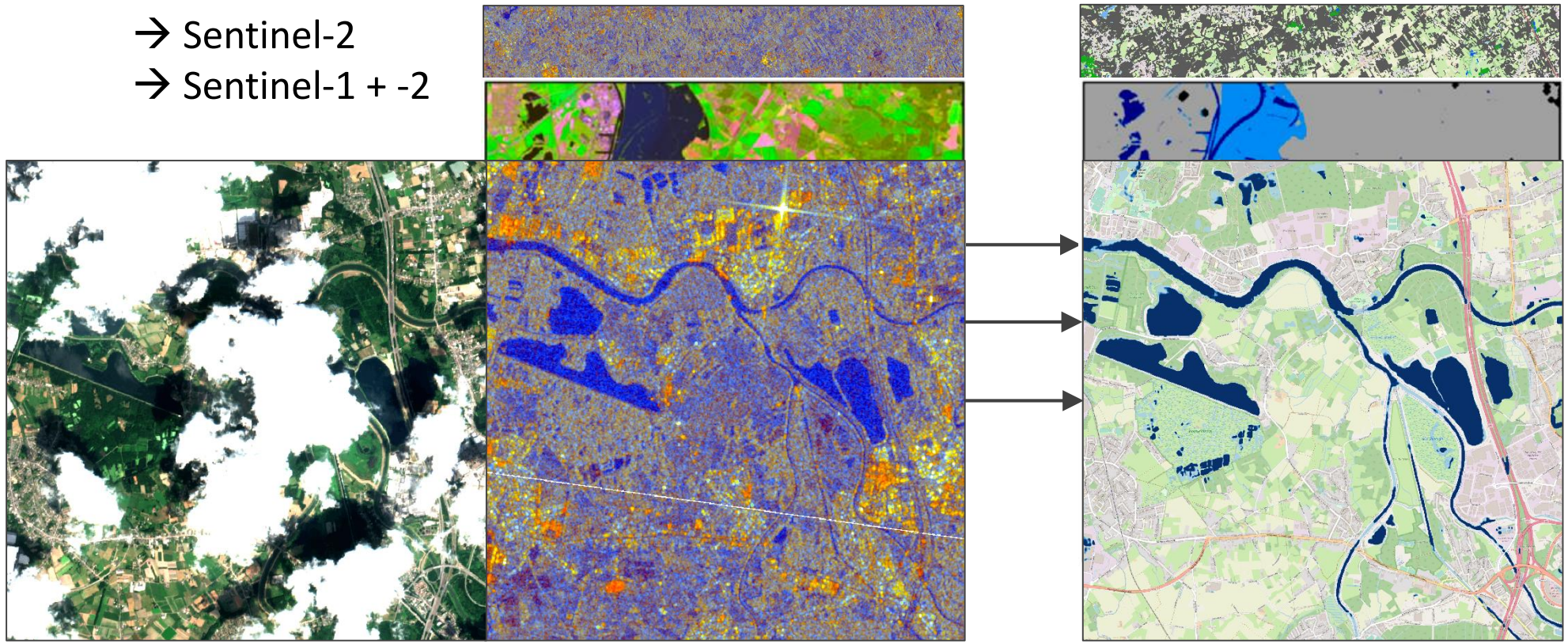




# Fast situational awareness

Flood extent: Build on established sensors & leverage upcoming sensors

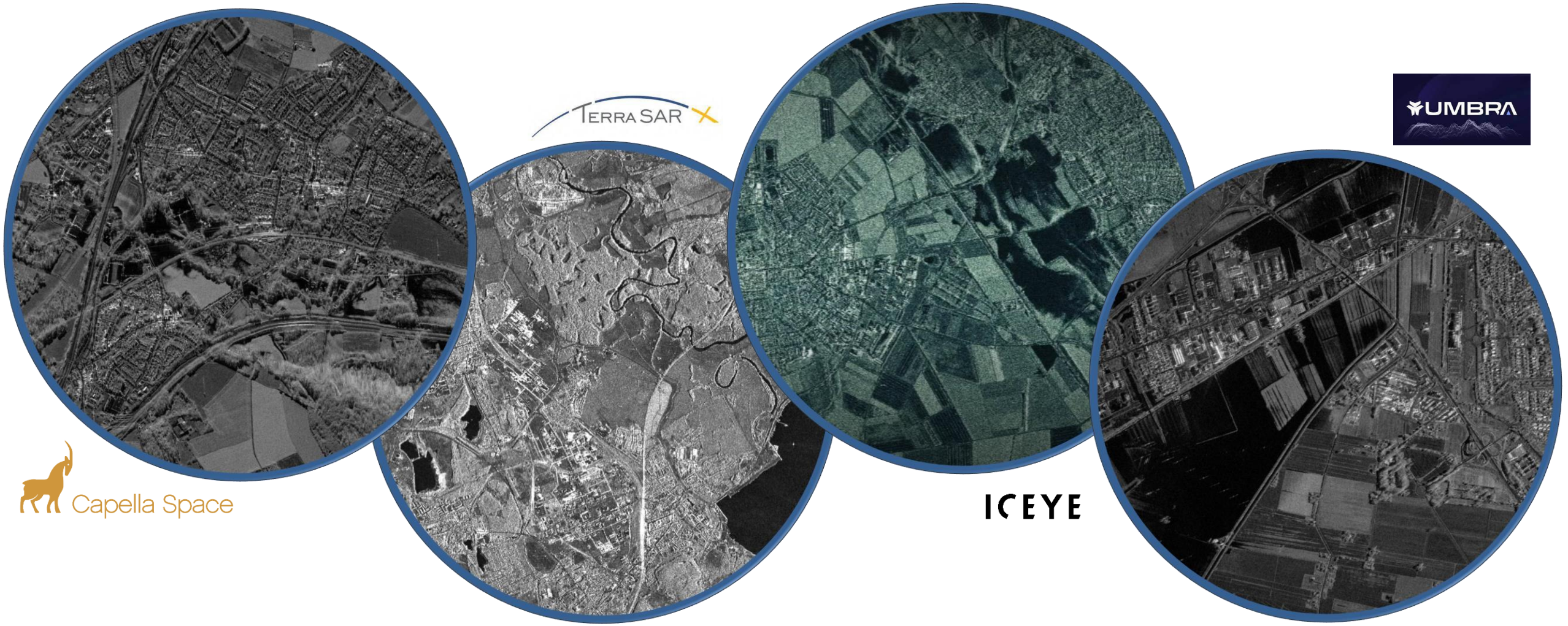
→ Sentinel-1
→ Sentinel-2
→ Sentinel-1 + -2



GEO.INFORMED

# Fast situational awareness

Flood extent: Build on established sensors & leverage upcoming sensors: commercial SAR

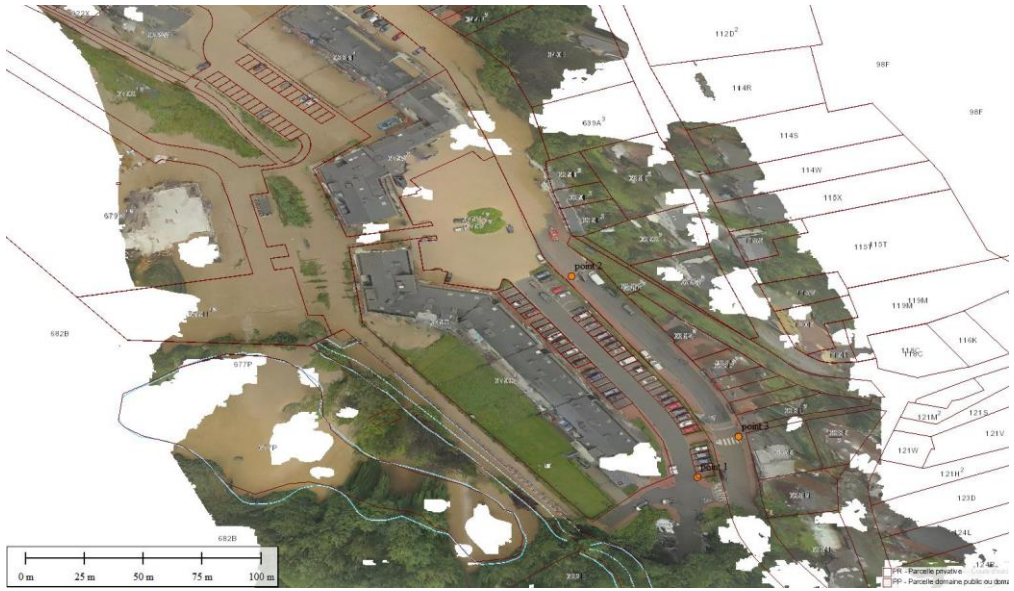


# Fast situational awareness

Flood extent: Build on established sensors & leverage upcoming sensors: UAV

VMM imagery

Oblique imagery



# Fast situational awareness

UAV-based crisis support through edge AI

Waterbouwkundig Labo

Region serializer

Downscaling

Foundation Model
(e.g. DINO ViT)

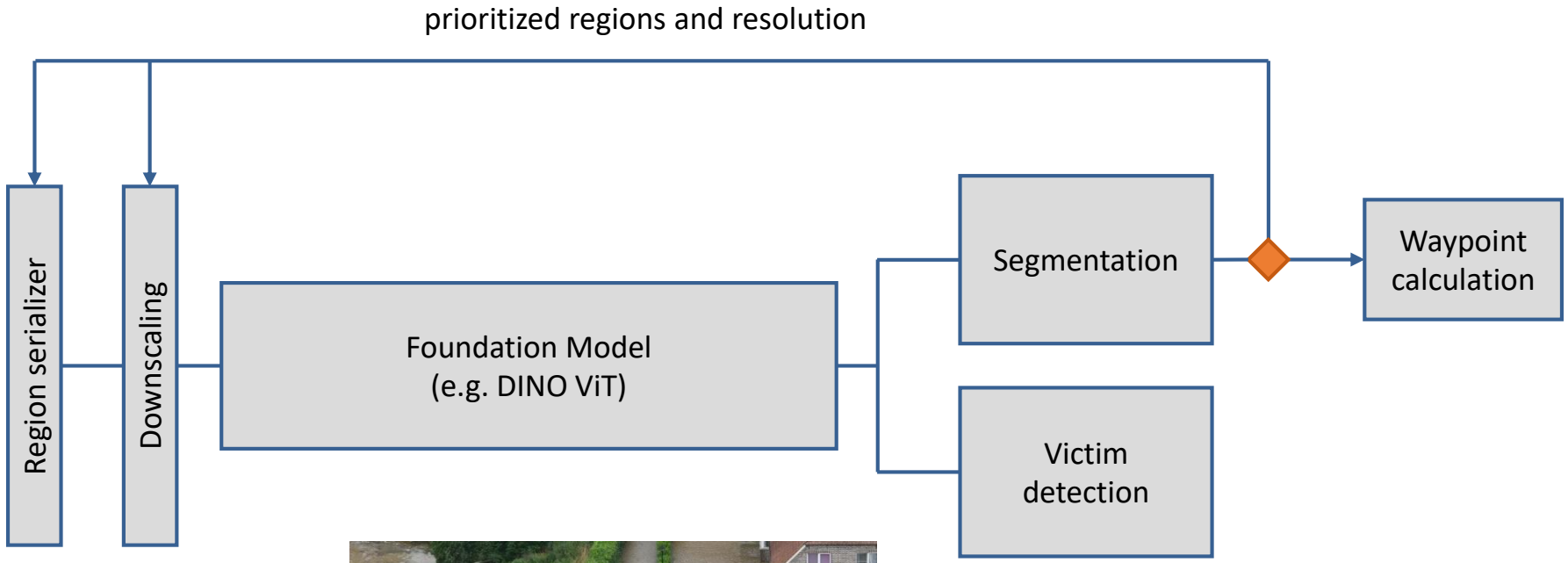
Segmentation

Victim
detection

# Fast situational awareness

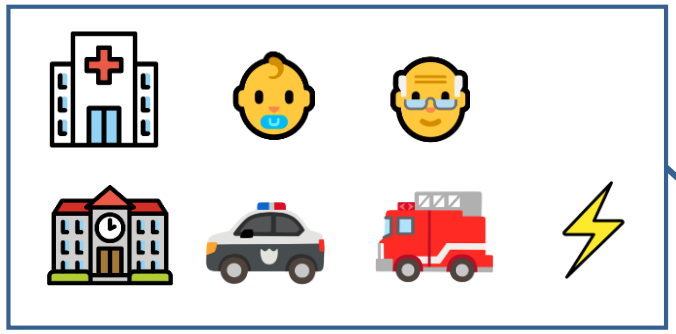
UAV-based crisis support through edge AI

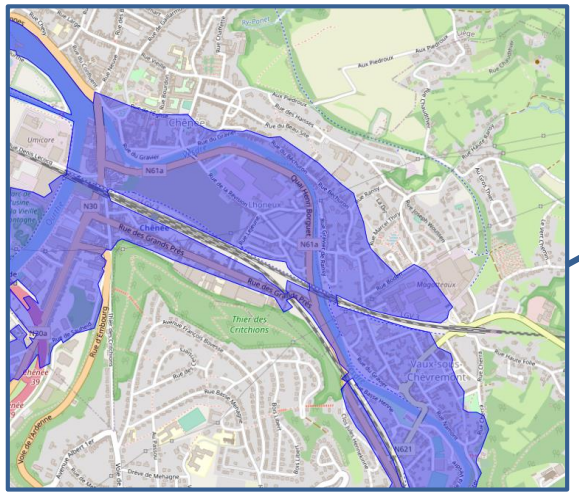
Waterbouwkundig Labo

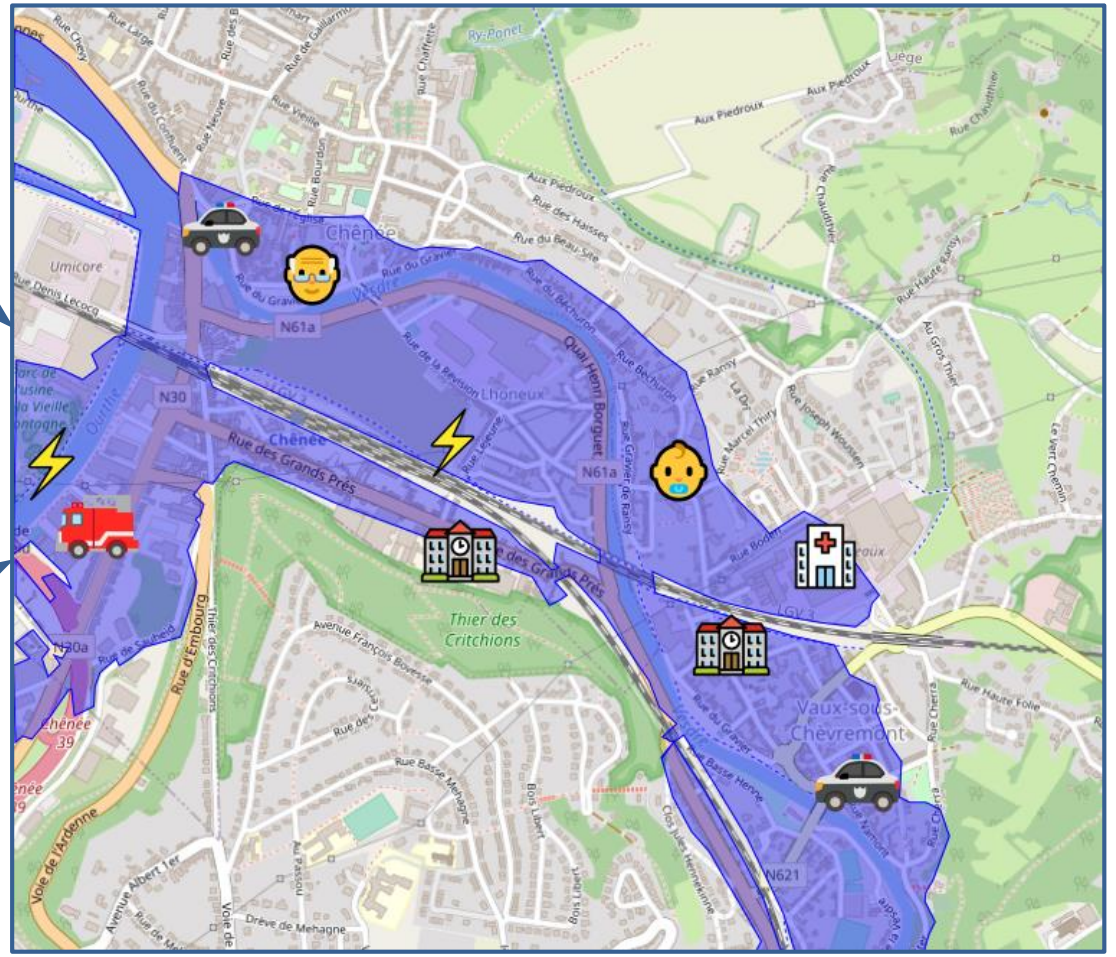


# Fast impact assessment

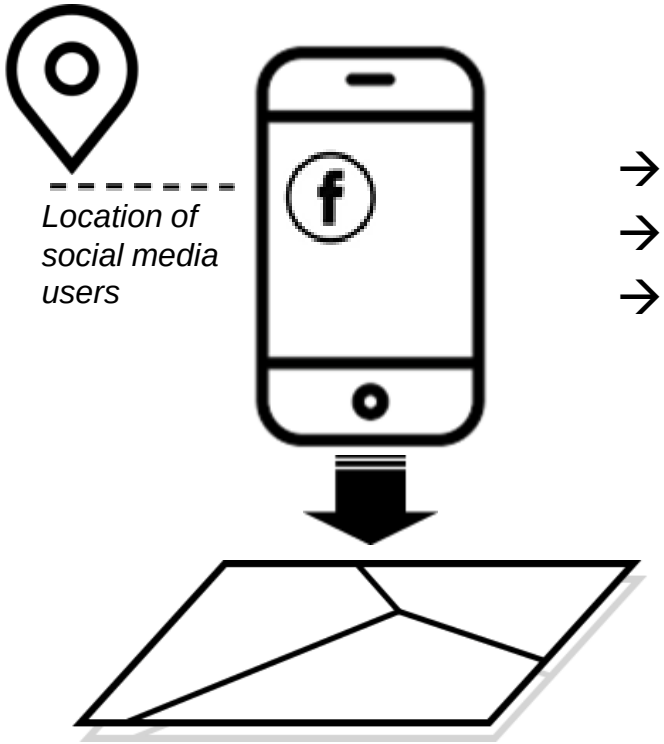
Critical and vulnerable facilities – land uses → priority for help





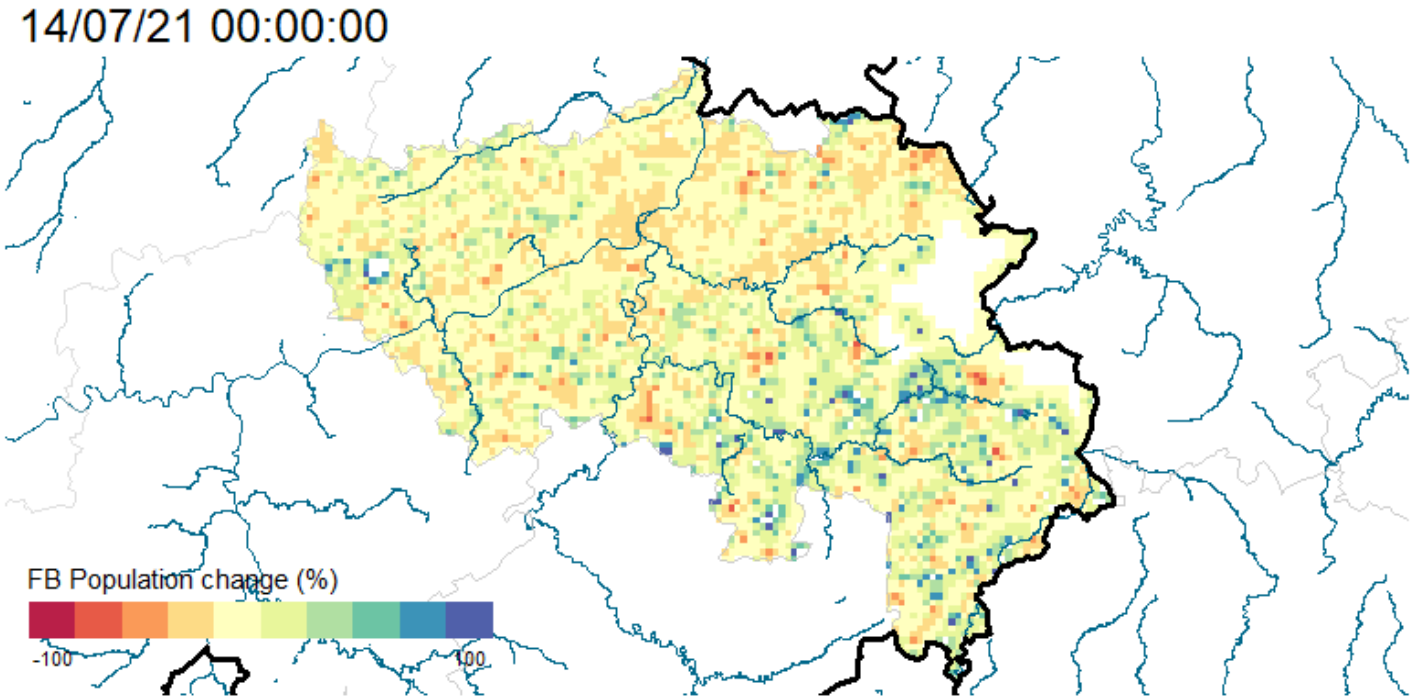


# Fast impact assessment



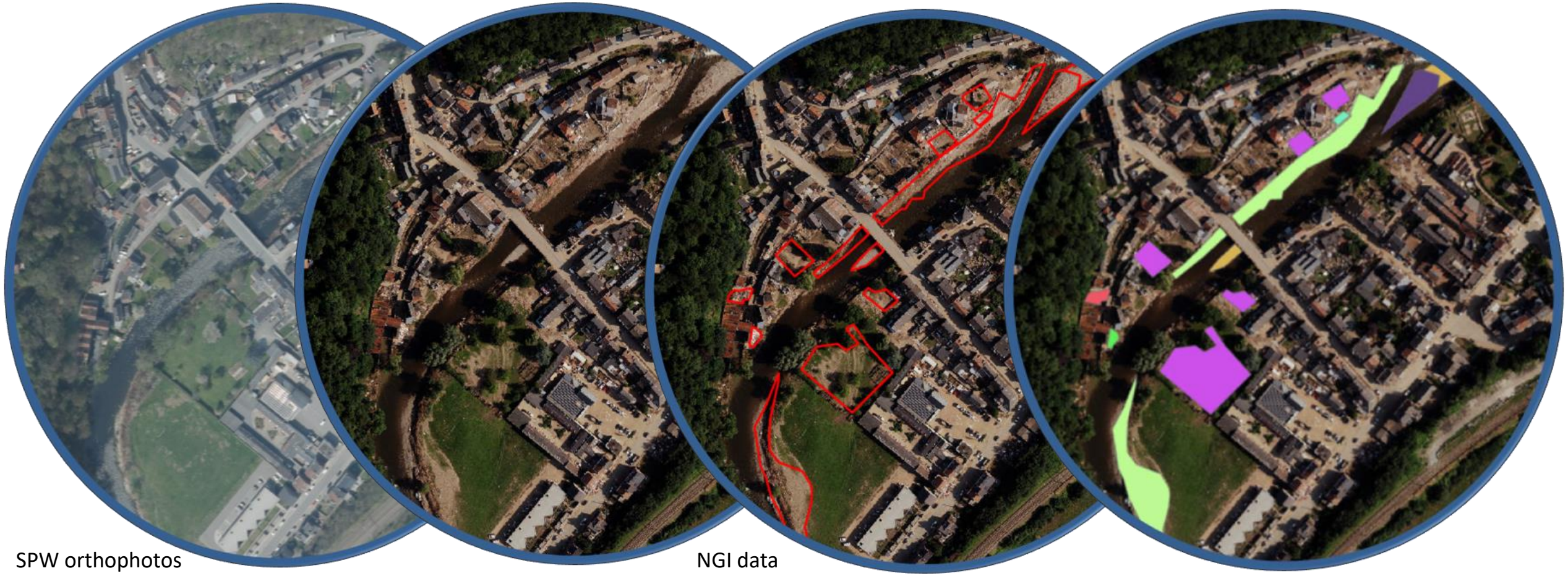

→ Identification of areas heavily impacted
→ Population dynamics over time
→ Prove reliability with stakeholders

*Dynamic population mapping*



# Long-term impact assessment

Identification & classification of damages at multi-scale: aerial imagery



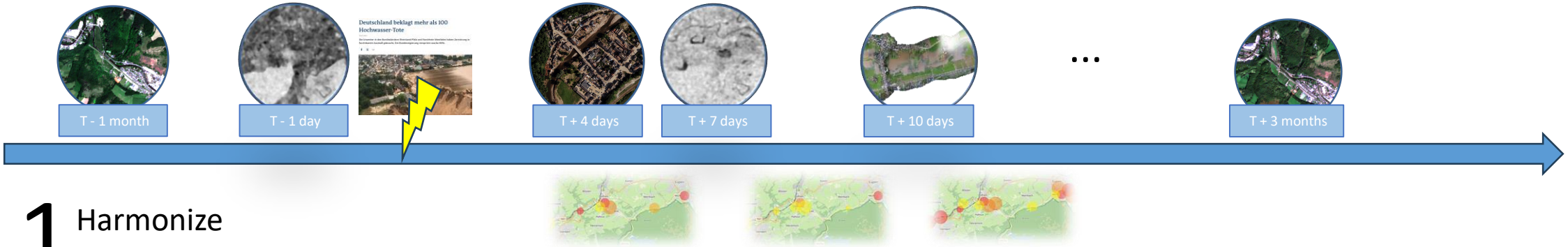
SPW orthophotos

NGI data

# Long-term impact assessment

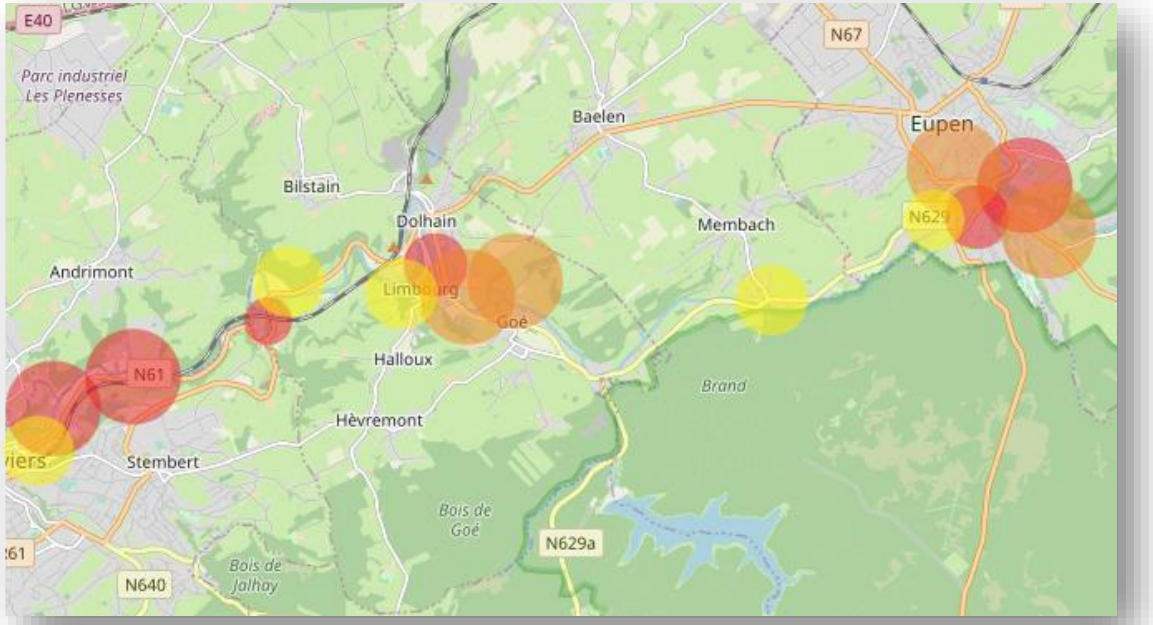
Identification & classification of damages at multi-scale: multispectral satellite imagery

# Integration: disaster hot spot mapping



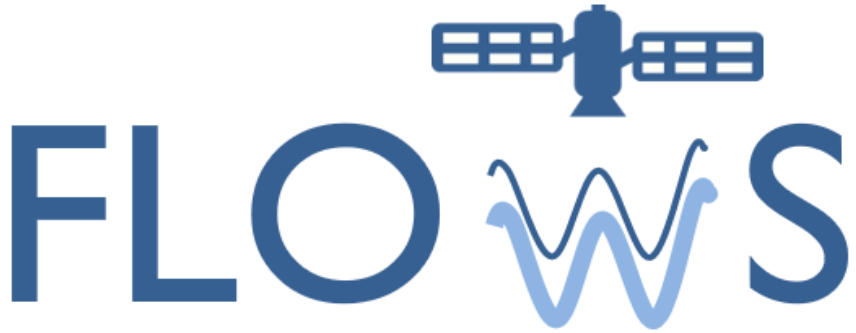

1 Harmonize input data

2 Probabilistic data fusion




3 Uncertainty quantification

4 Demo of hot spots map




This is just the beginning…