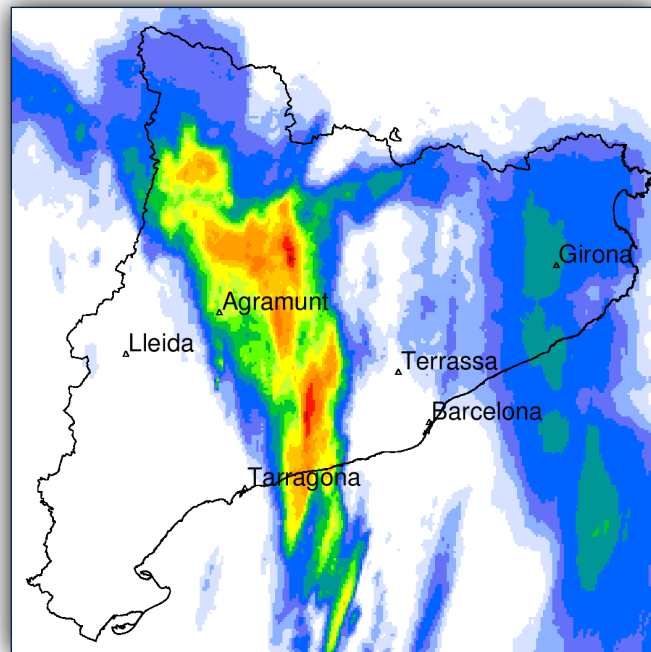


# Ideas for impact-based warnings

Marc Berenguer

# From hazard to impact

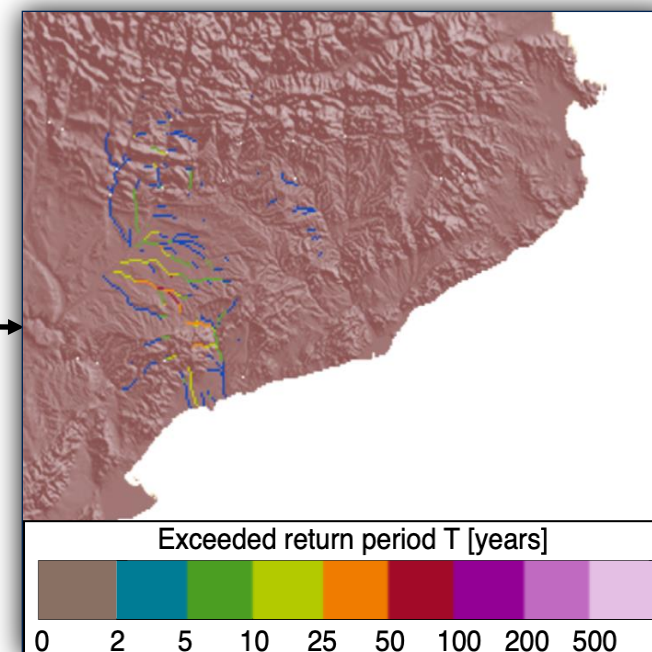
High-resolution rainfall obs & nowcasts



Rainfall thresholds

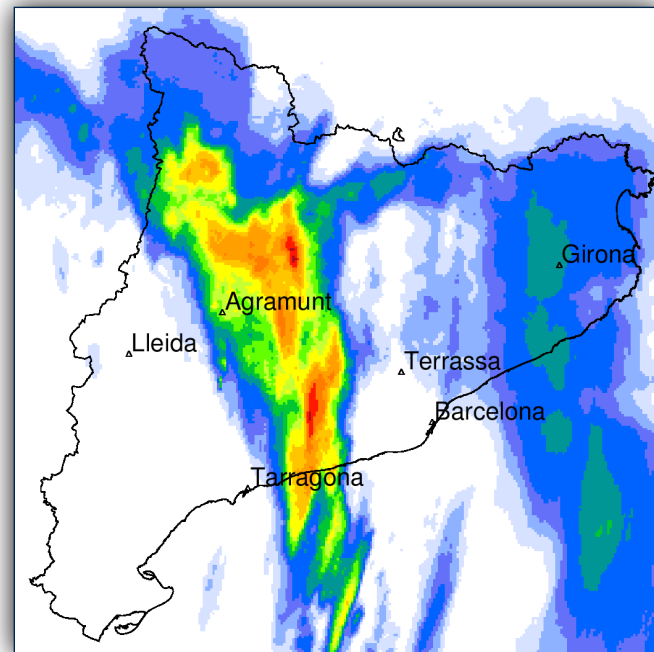
**Hazard module**

ERICHA FF index



# From hazard to impact

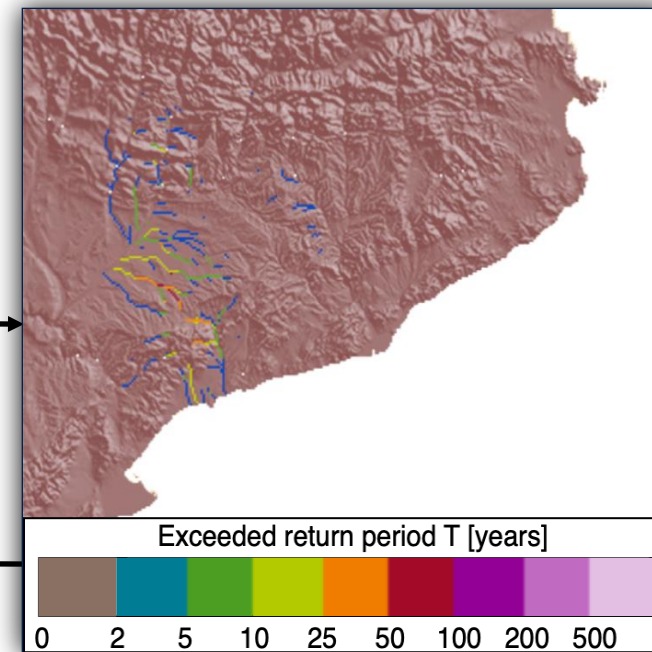
High-resolution rainfall obs & nowcasts



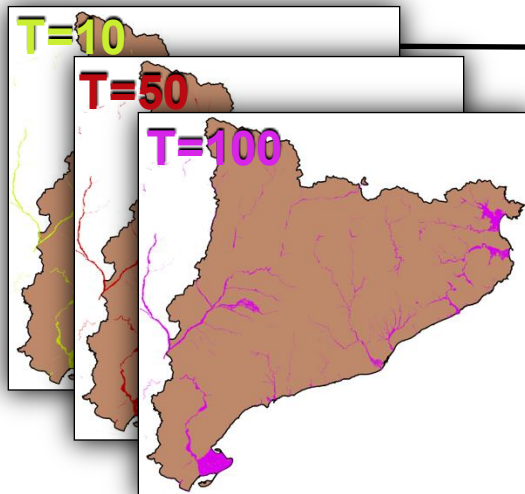
Rainfall thresholds

**Hazard module**

ERICA FF index

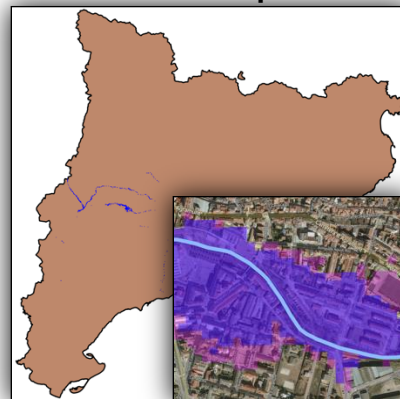


Flood maps catalogue



**Flood map module**

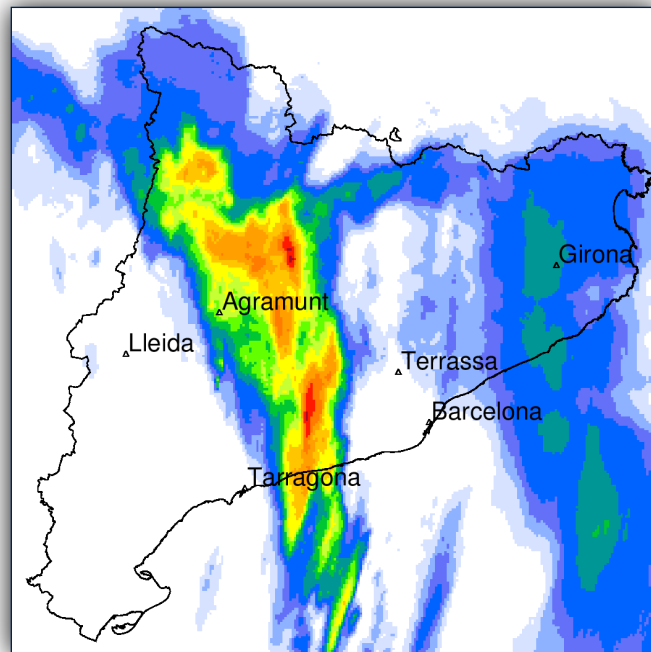
Flood depths





# From hazard to impact

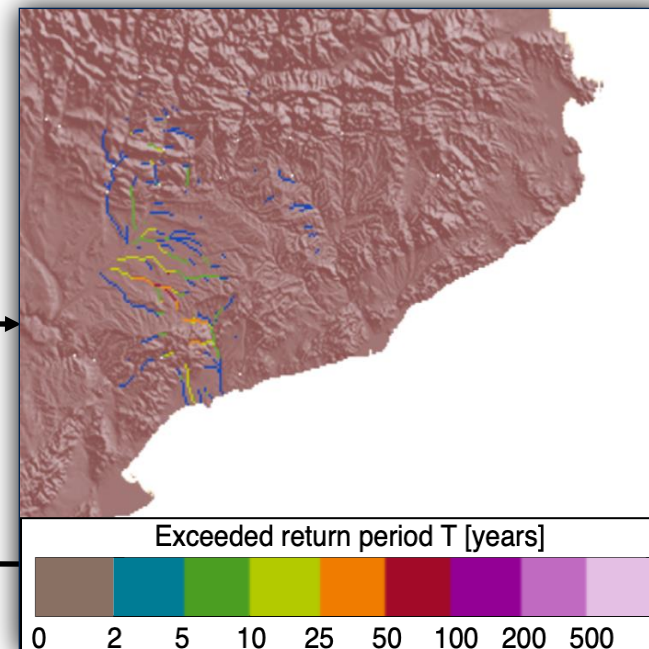
High-resolution rainfall obs & nowcasts



Rainfall thresholds

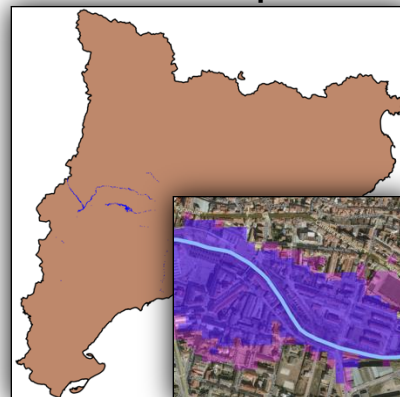
**Hazard module**

ERICA FF index



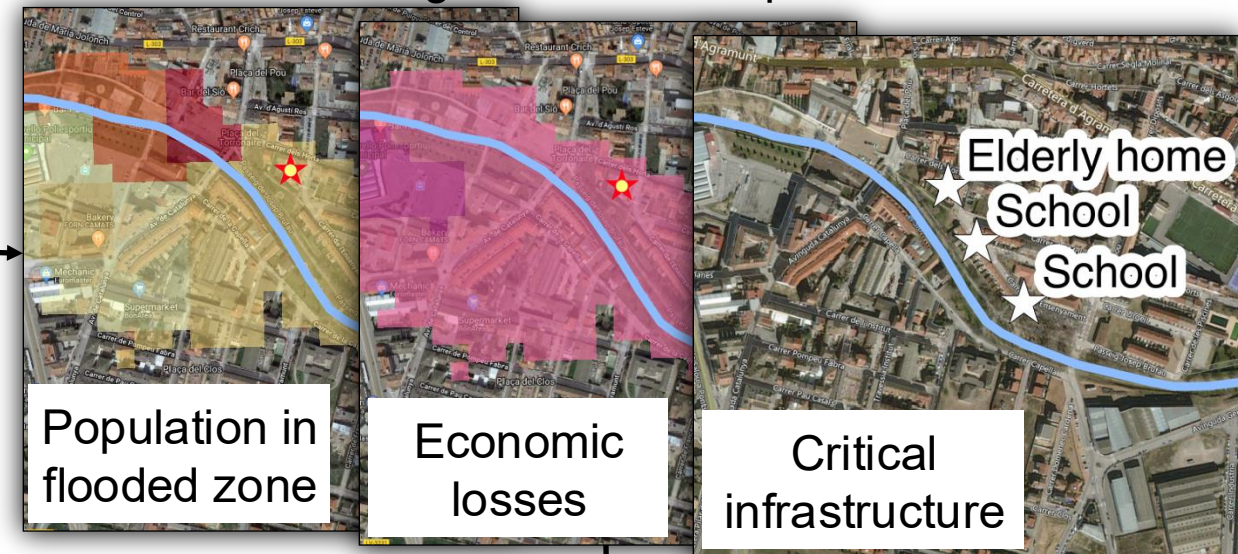
**Flood map module**

Flood depths

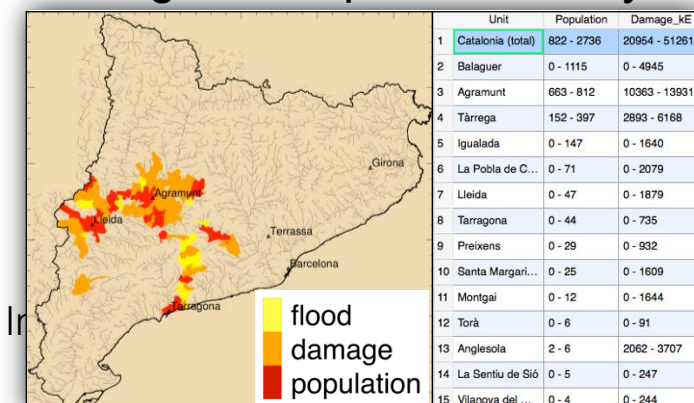


**Impact assessment module**

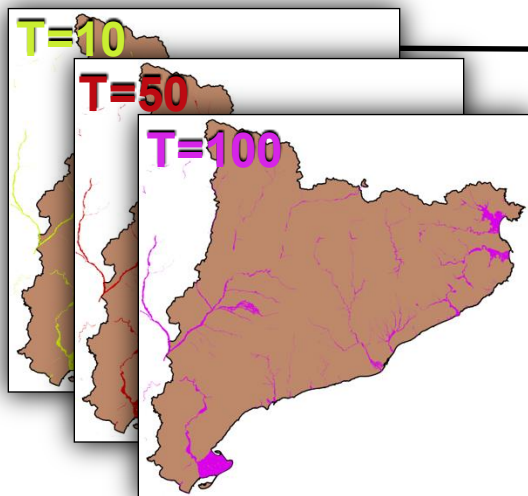
High-resolution impacts



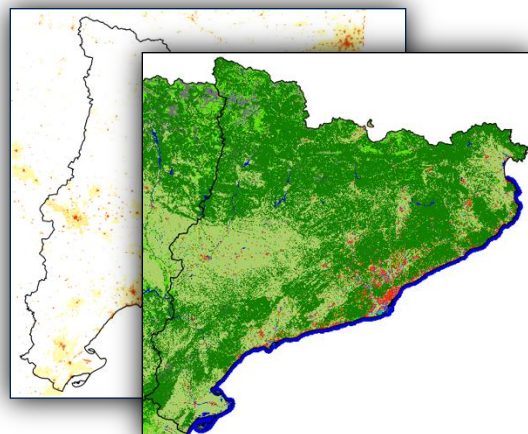
Regional Impact summary



Flood maps catalogue



Exp. & Vulnerability



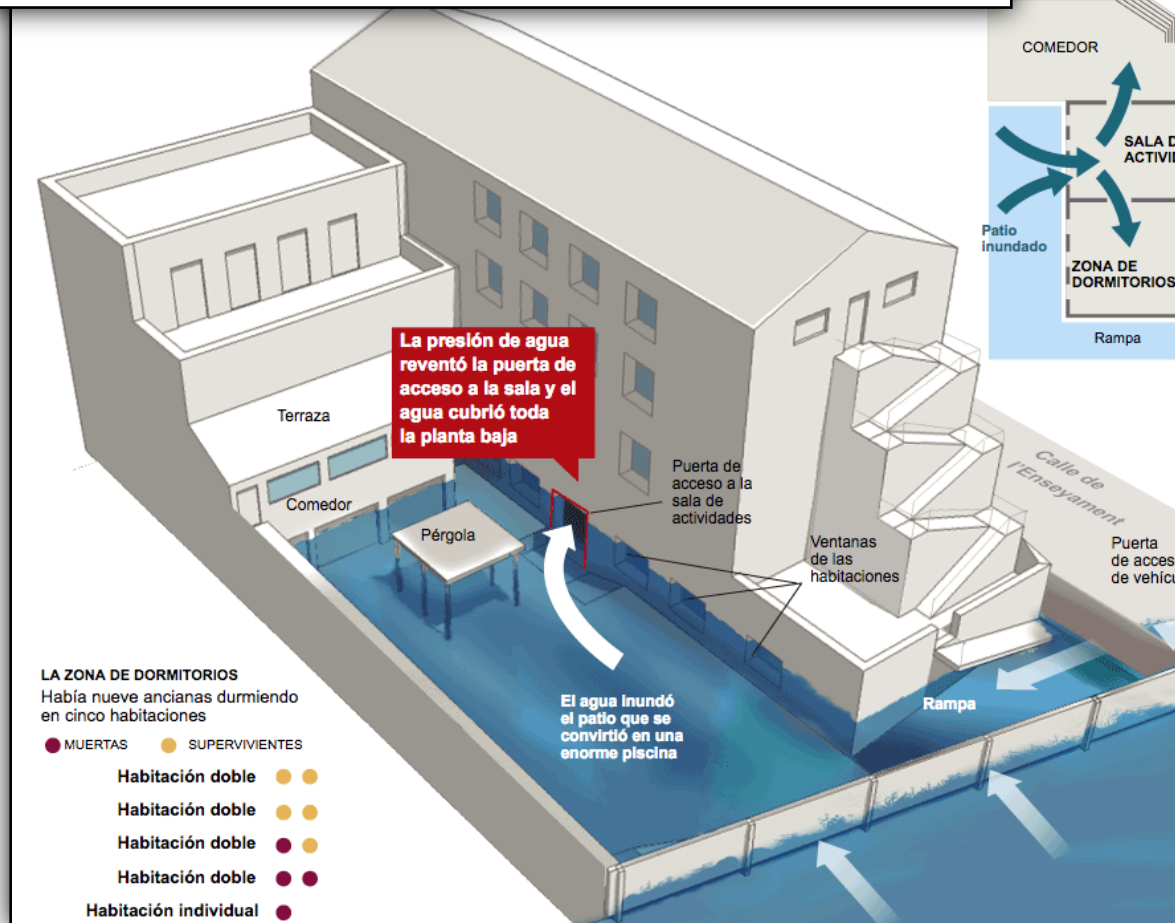
Ritter, J., Berenguer, M., Corral, C., Park, S., Sempere-Torres, D. (2020) Environment International 136, 105375.



# Case Study (Agramunt 02-03 Nov 2015)



Source: *El Imparcial* (2015)



Source: *El Periodico* (2015)

- Impacts:
  - 5 casualties
  - Significant economic damage
- Emergency management:
  - 02:21 UTC:  
High water levels reported 10 km upstream
  - 03:00 UTC:  
River starts to flood parts of the town
  - 03:03 UTC:  
Elderly home informed by fire brigades
  - 03:05 UTC:  
112 call, too late to evacuate basement





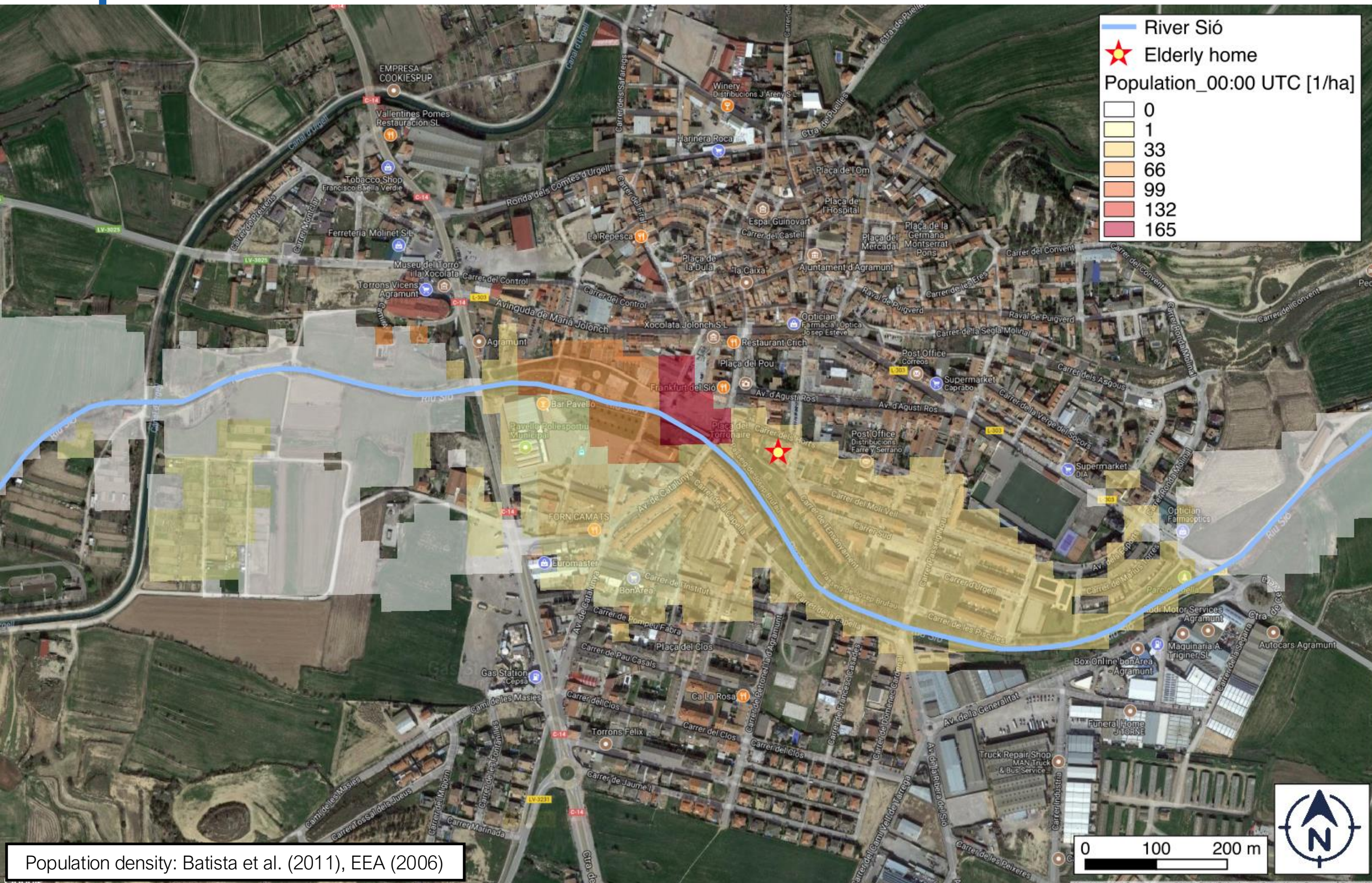
# Inundation extent 00:00 UTC



EU Floods Directive maps : MAPAMA (2013)

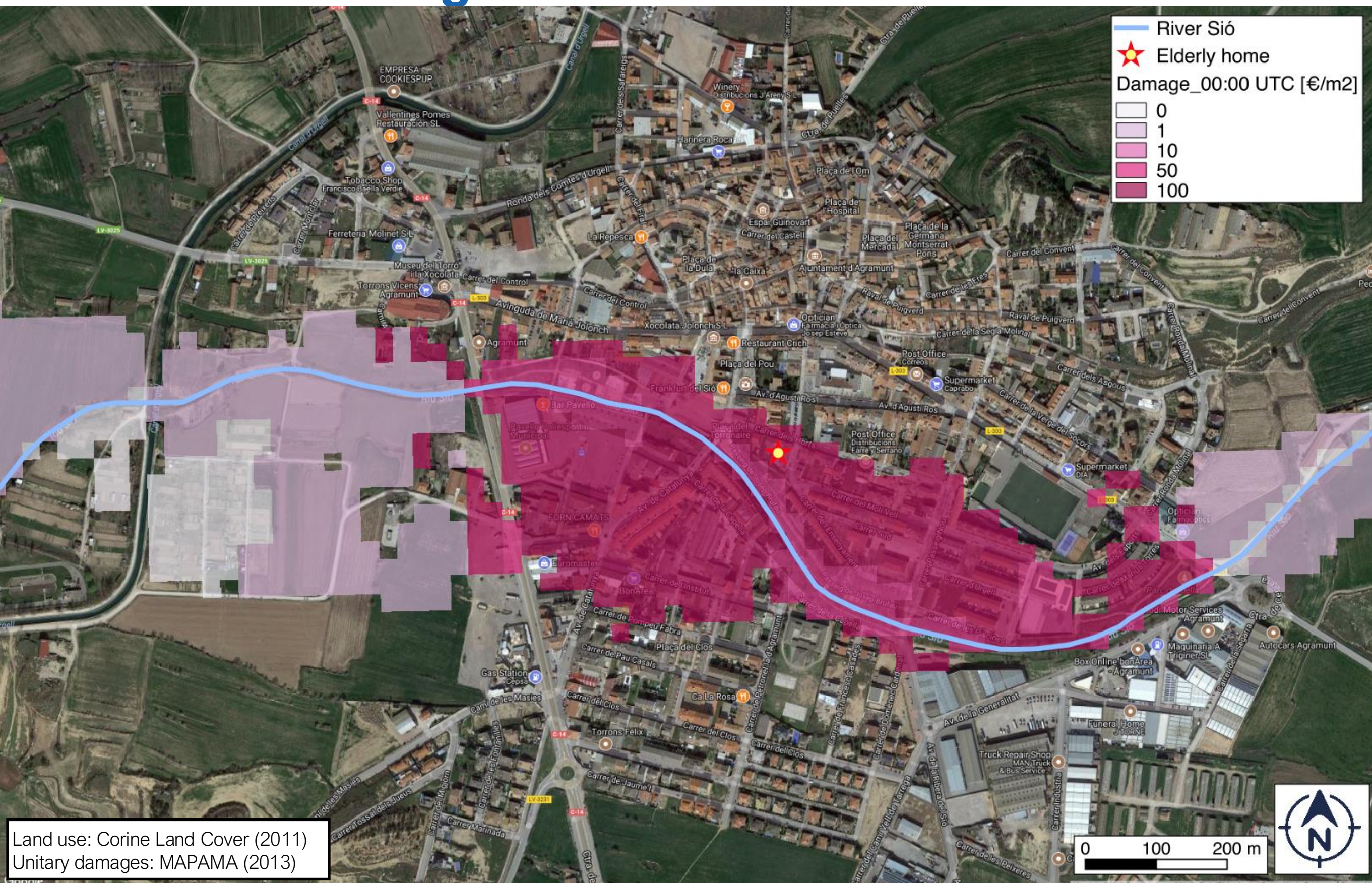


# Population in flood zone 0000 UTC





# Economic damage 0000 UTC





## Affected infrastructures 0000 UTC (modelled)



Type	Name	Telephones	Address
School	Escola de Preixens - ZER El Si	973 392 229	C. Sant Joan s/n, 25316 Preixens
School	Esc. de Musica Municipal	973 312 965	Av. de la Generalitat 5, 25300 Preixens

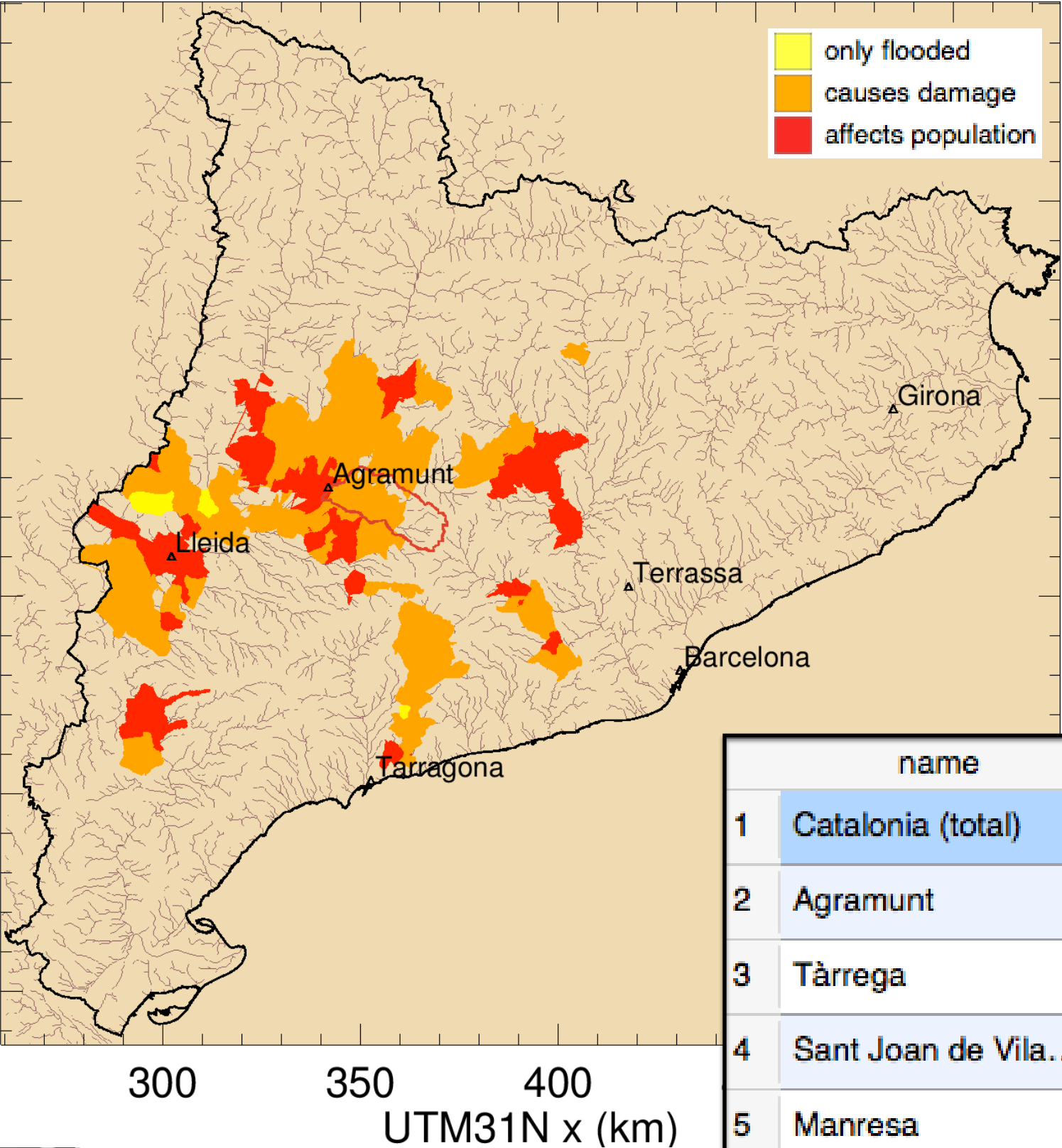
Infrastructure: various sources





# Impact summary - After event validation

## After event impact summary



	name	popul_imp	damage_EUR	crit_infr
1	Catalonia (total)	1405	134701266	3 School;
2	Agramunt	663	19816561	2 School;
3	Tàrrega	152	5018438	
4	Sant Joan de Vila...	125	1942630	
5	Manresa	90	5896189	

98 Municipalities in total



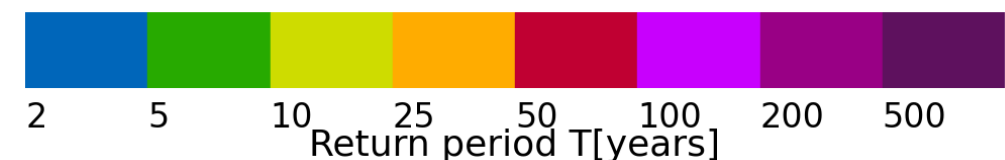
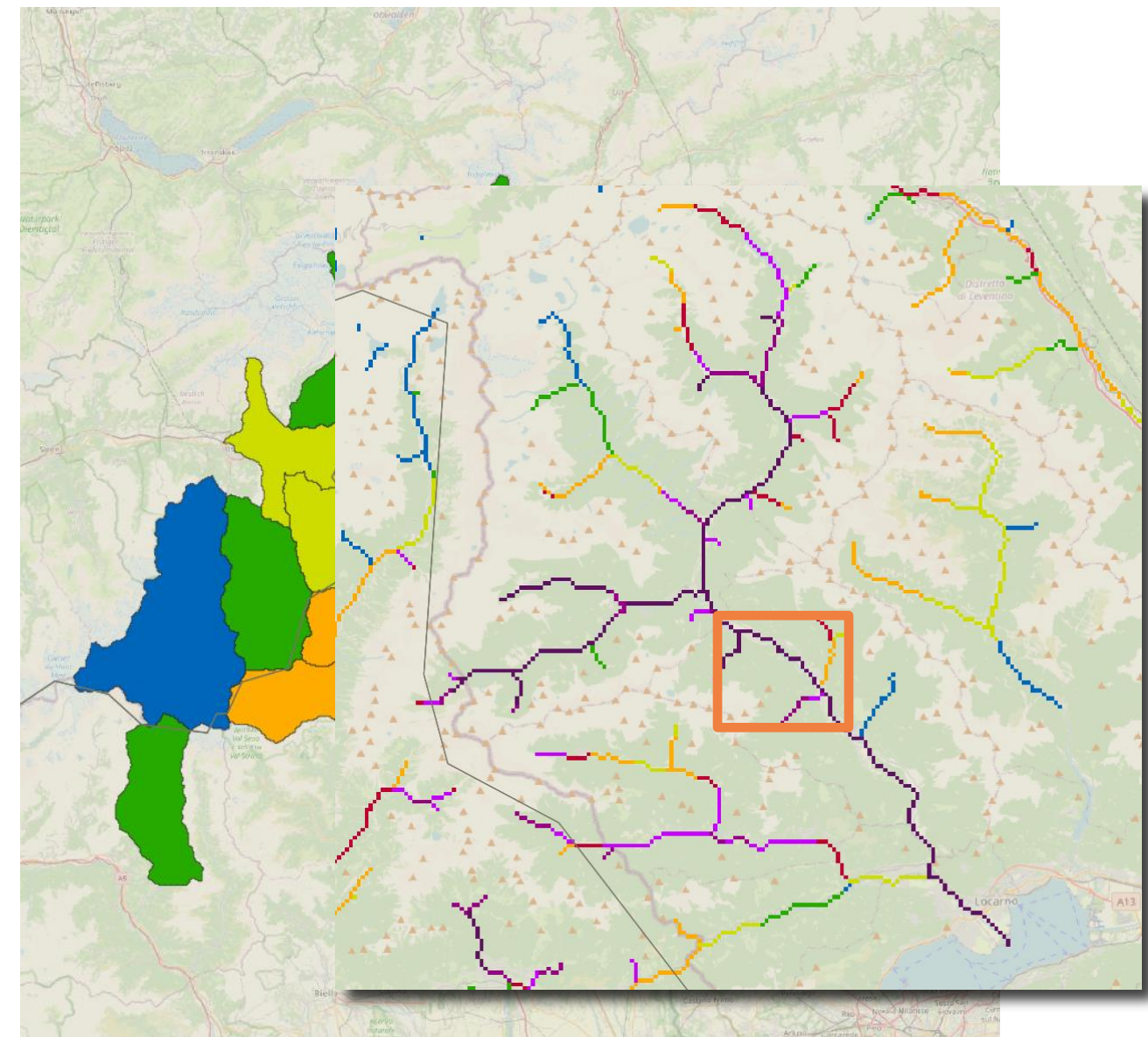


# Ticino Canton (29 Jun 2024)

## Intempéries des 29 et 30 juin 2024 en Valais et au Tessin: revivez notre suivi

Publié le 29 juin 2024 à 13:59. / Modifié le 01 juillet 2024 à 23:37. - <https://www.letemps.ch/suisse/geneve/en-direct-pas-de-fan-zones-a-geneve-et-dans-le-canton-de-vaud>

*Les inondations dévastatrices dans la nuit de samedi à dimanche ont entraîné des glissements de terrain, faisant au moins **quatre morts**: trois dans le Val Maggia (TI) et à proximité, et un dans le Haut-Valais, à Saas Grund, où demeurent aussi au moins*



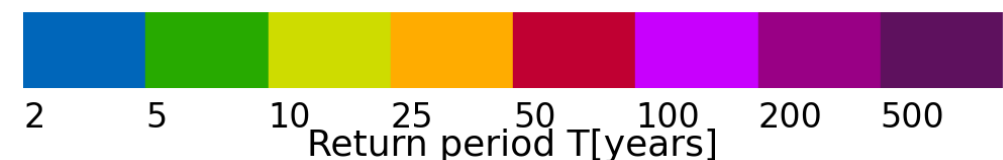
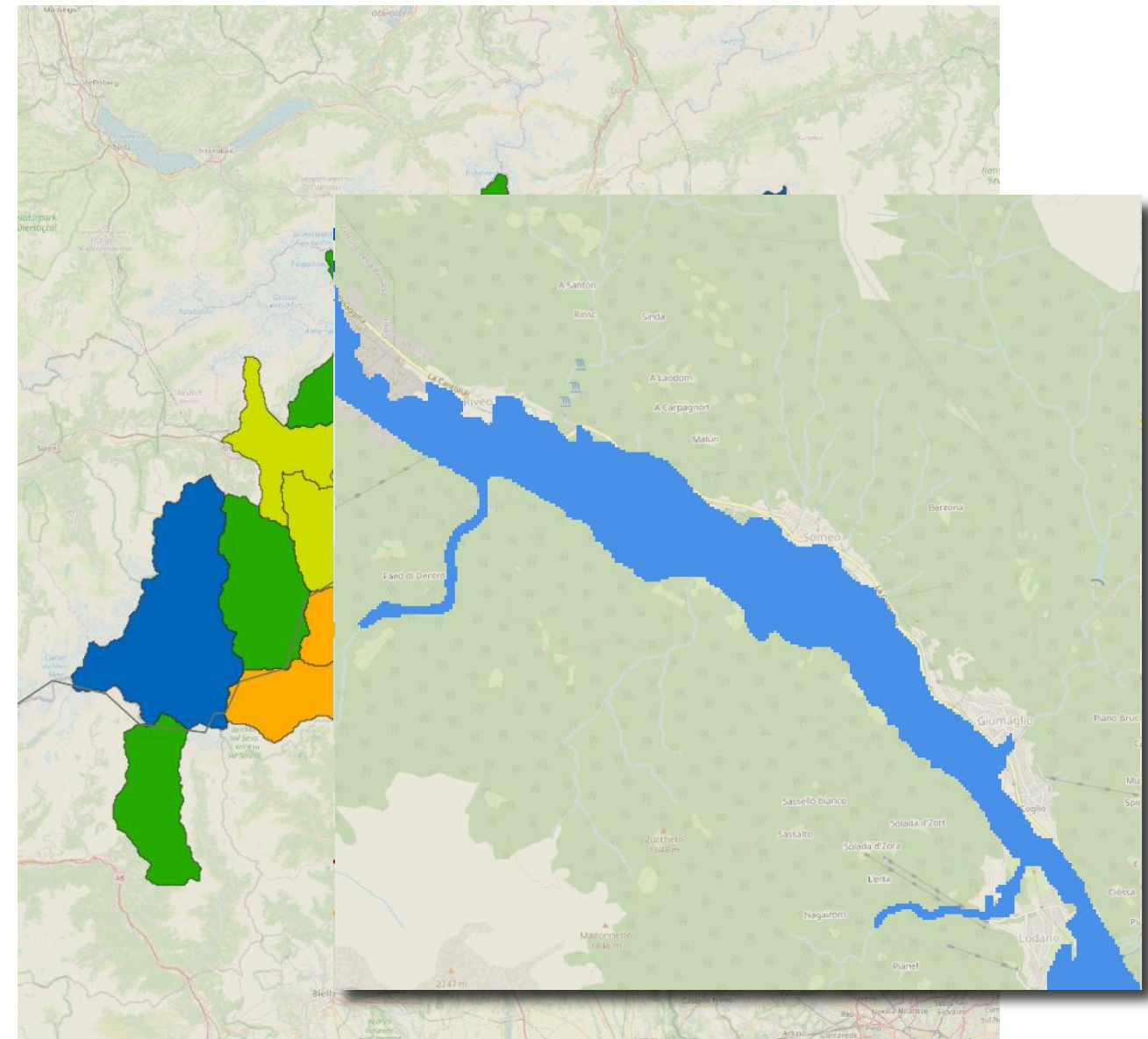


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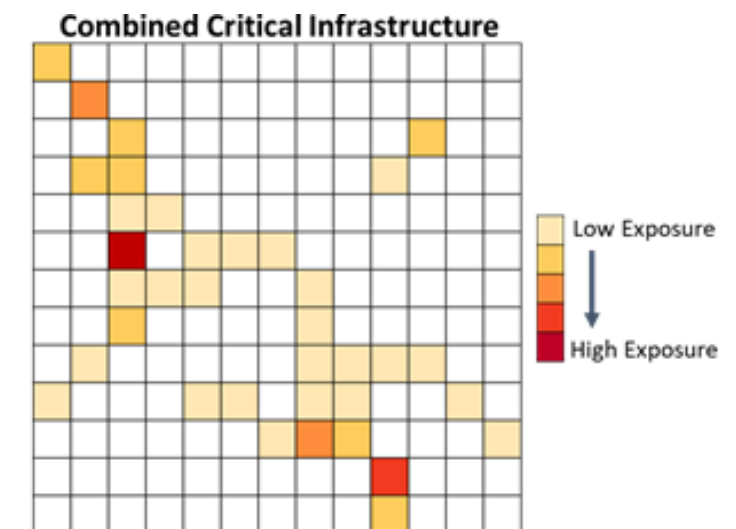




# Combined Exposure Information

- Pan-European exposure datasets have been sourced, processed and combined into a single 1 arcmin exposure layer
- Exposure layers chosen from end user engagement
- Each dataset normalised and combined with equal weighting

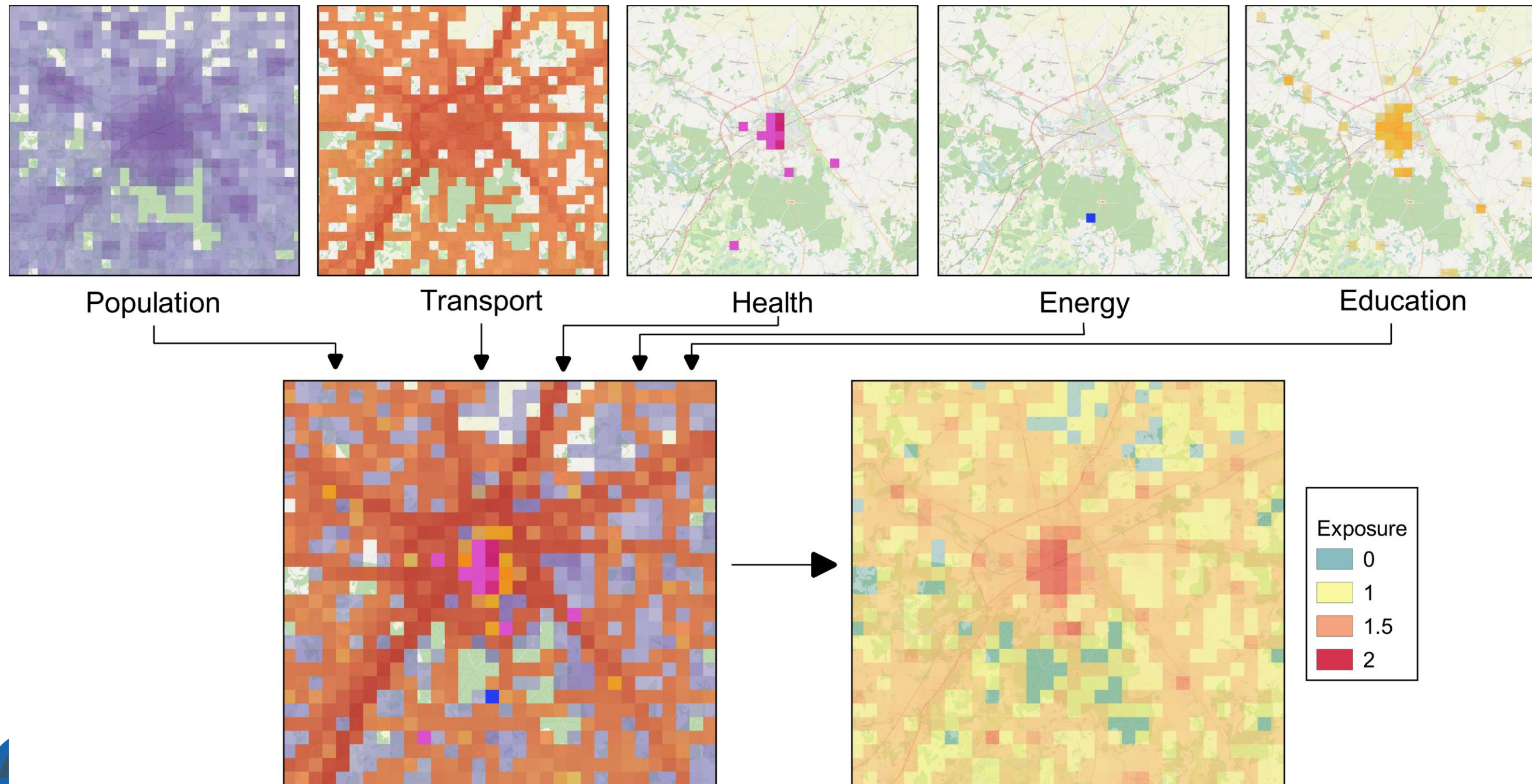
Exposure Type	Source
Population	Global Human Settlement Layer
Education facilities	JRC via OpenStreetMap
Health facilities	JRC via OpenStreetMap
Energy generation	HARCI-EU & JRC
Transportation	HARCI-EU & JRC





# Combined Exposure Information

- Each layer was regrided and cropped to the same extents, transformed using Box-Cox and normalised
- All layers combined together and normalised

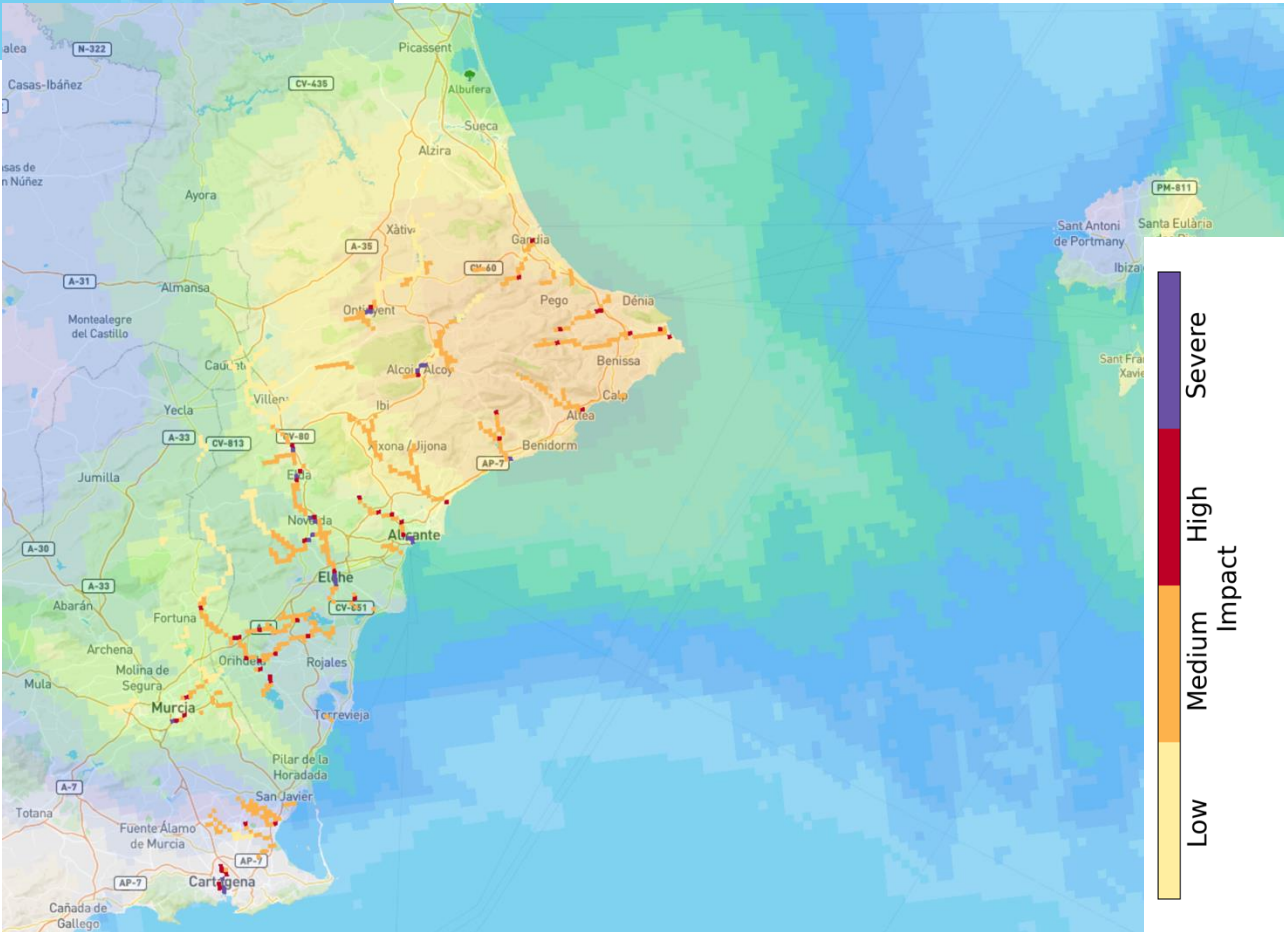
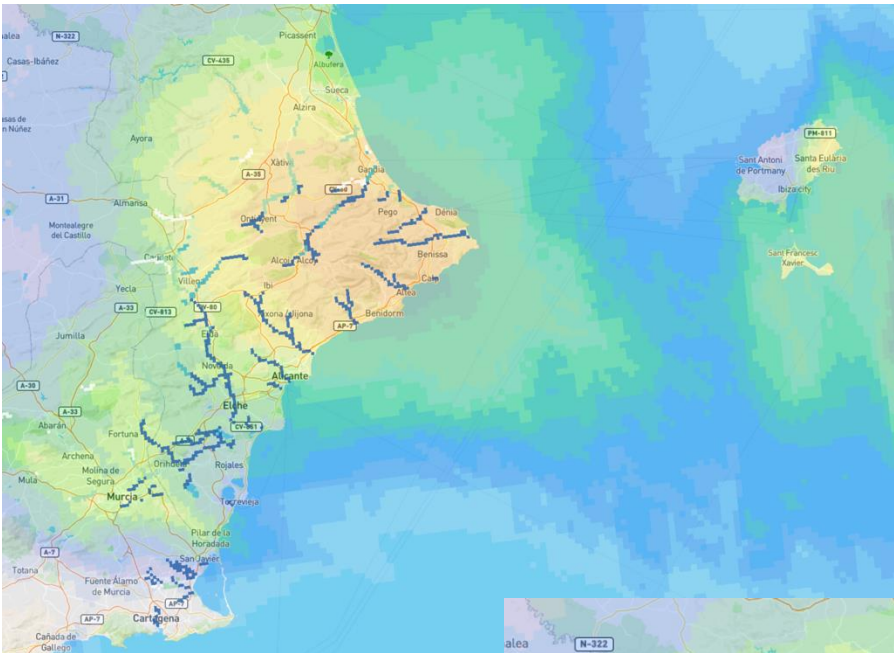
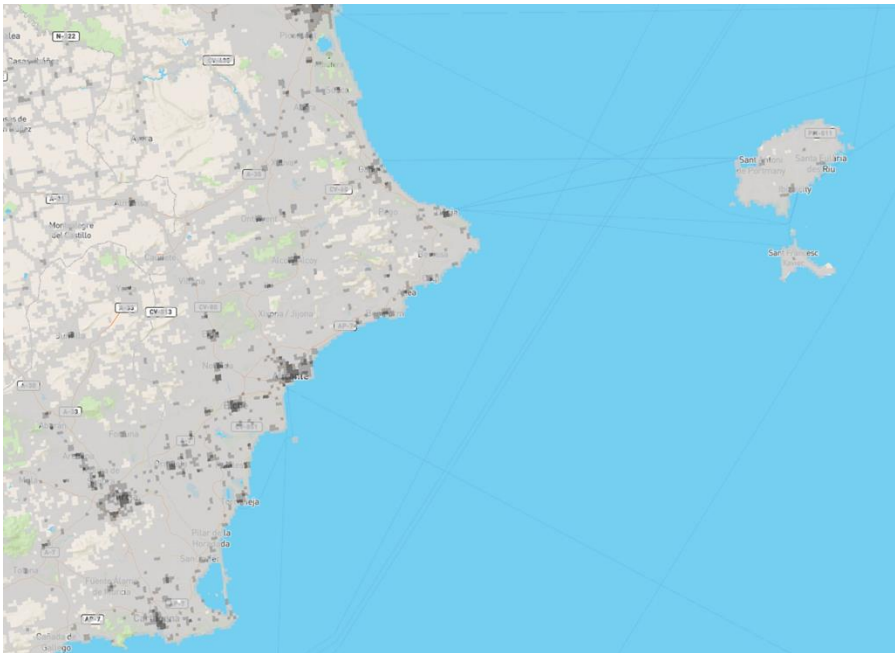




# Flood Impact Forecasts

Aim to translate flood hazard forecasts into flood impacts

Will help end users prioritise emergency response to most impacted areas



*Impact = hazard \* exposure*

Combined Exposure

probability

	Combined Exposure			
	Low Exposure	Medium Exposure	High Exposure	
High Likelihood				Severe
Medium Likelihood				High
Low Likelihood				Medium
				Low





# Real-time compound impact forecasting

Combining hazard and impact forecasts, official warnings and exposure and vulnerability datasets for compound impact forecasting to support coordination and cooperation of CPAs.

Integrated through tailored notifications





# Notifications

Combining hazard and impact forecasts, official warnings and exposure and vulnerability datasets for compound impact forecasting to support coordination and cooperation of CPAs.

## Notifications Updates

This email provides you with the latest updates on potential warnings related to your area. For more information you can access our [platform](#).

### Regions with new information:

The following regions have received new notifications.

- New level 3 warning for Almería.
- New level 3 warning for Granada.
- New level 2 warning for Granada.
- New level 3 warning for Málaga.

### Active notifications:


Detailed list of currently active notifications.

Warning Type	Source	Area	Level	Start time	End time
Flood	Edera product notification (Impact)	Málaga	3	March 30, 2024, 7 p.m.	March 31, 2024, midnight
Flood	Edera product notification (Impact)	Granada	3	March 30, 2024, 7 p.m.	March 30, 2024, 10 p.m.
Flood	Edera product notification (Impact)	Almería	3	March 30, 2024, 7 p.m.	March 30, 2024, 11 p.m.
Coastalevent	Official Warning (AEMET. State Meteorological Agency)	Costa - Litoral gaditano	2	March 31, 2024, 1 a.m.	March 31, 2024, 6:59 a.m.
Coastalevent	Official Warning (AEMET. State Meteorological Agency)	Costa - Estrecho	2	March 31, 2024, 1 a.m.	March 31, 2024, 7:59 a.m.
Coastalevent	Official Warning (AEMET. State Meteorological Agency)	Costa - Ceuta	2	March 31, 2024, 2 a.m.	March 31, 2024, 6:59 a.m.
Flood	Edera product notification (Medium range impact)	Granada	3	March 31, 2024, 6 a.m.	April 1, 2024, 6 a.m.
Flood	Edera product notification (Medium range impact)	Málaga	2	March 31, 2024, 6 a.m.	April 1, 2024, midnight


Filter (ex: Litoral gaditano)

Severe (2) High (5) Medium (20)


#### Cádiz

Source: Edera  
Type: Edera event notification  
Hazards: 


#### Costa - Estrecho

Source: MeteoAlarm (AEMET)  
Type: Official warning  
Hazards: 


#### Costa - Litoral gaditano

Source: MeteoAlarm (AEMET)  
Type: Official warning  
Hazards: 

#### Almería

Source: Edera  
Type: Edera event notification  
Hazards: 

#### Córdoba

Source: Edera  
Type: Edera event notification  
Hazards: 



# Some questions

- Vulnerability datasets relevant to the end users (including their territorial extent).
- Extension based on datasets available at the European scale.
- Possibility to integrate dynamic vulnerability datasets.
- Accuracy of the vulnerability datasets.





# Thanks