

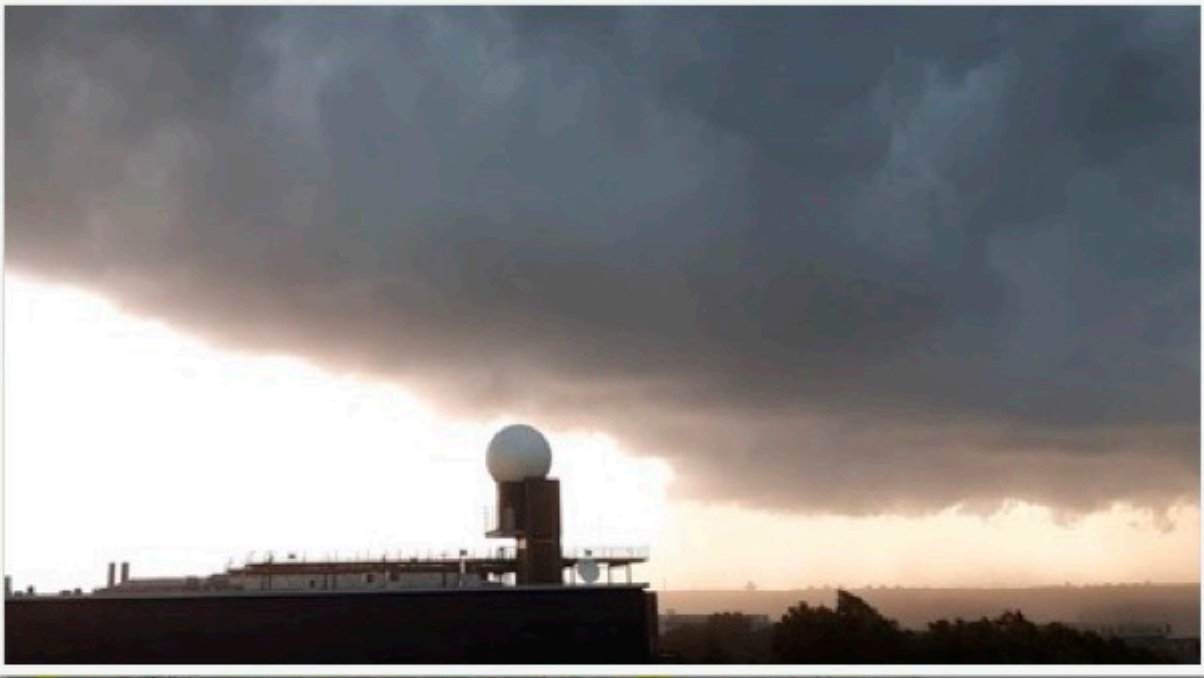
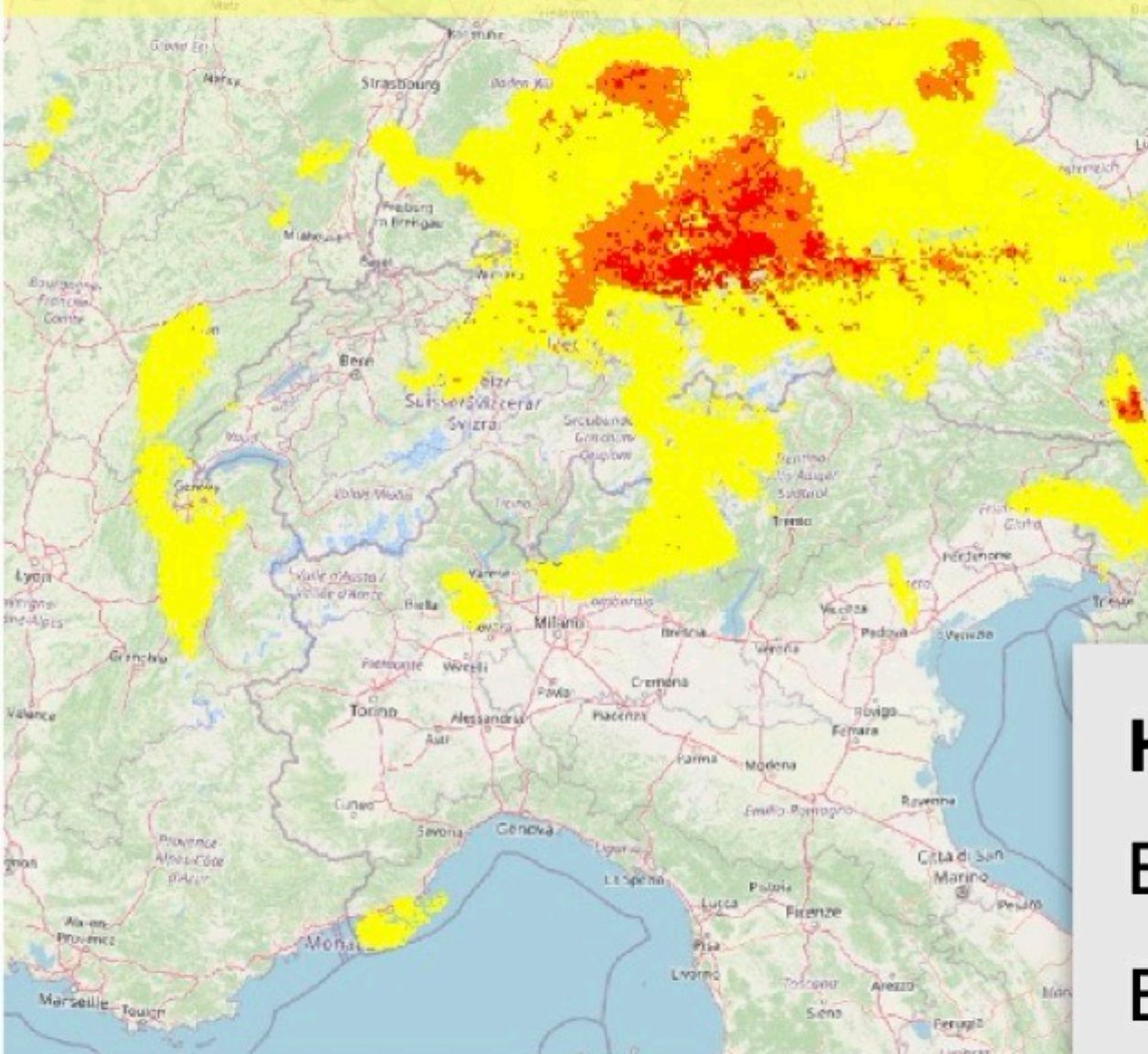
INLINE: Integrated pan-European rainfall and floods impact forecasts for cooperation in emergency management

Main objective

Advance on the capabilities of EWS with tools to anticipate the impacts caused by storms, heavy rain and floods, to support the decision-making workflows of various levels of Civil Protection Agencies (CPAs), including their coordination and cooperation.

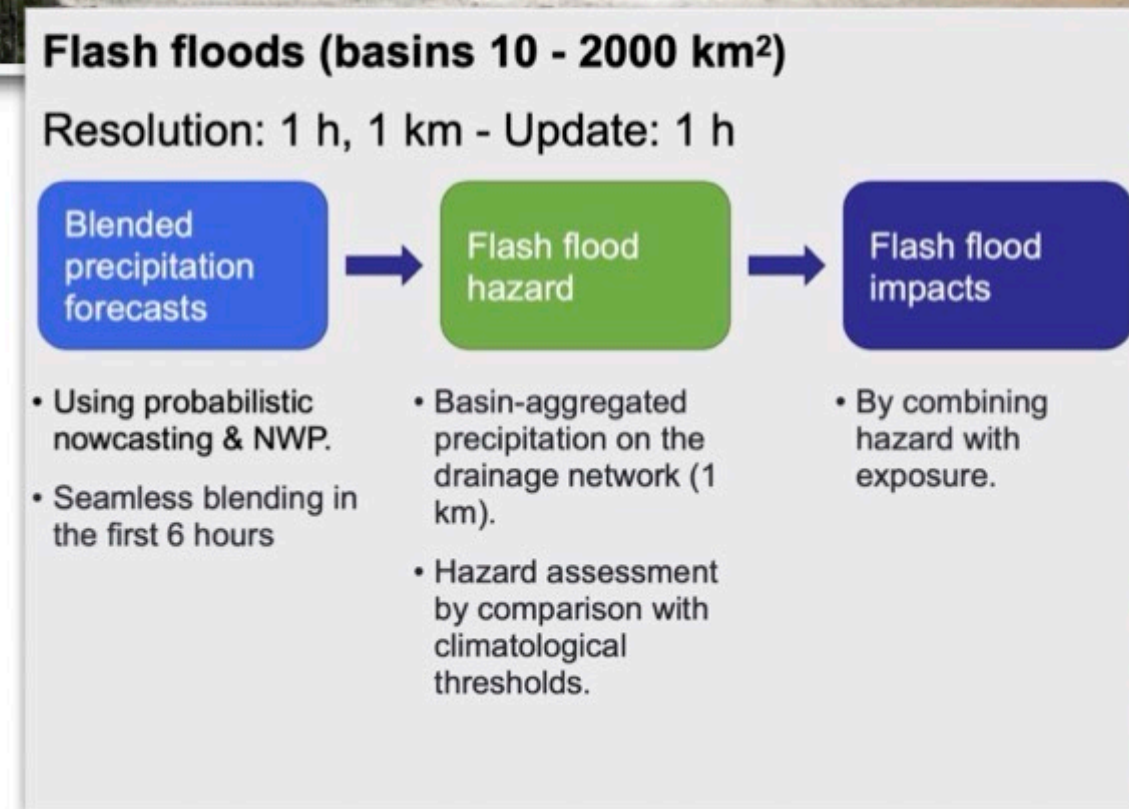
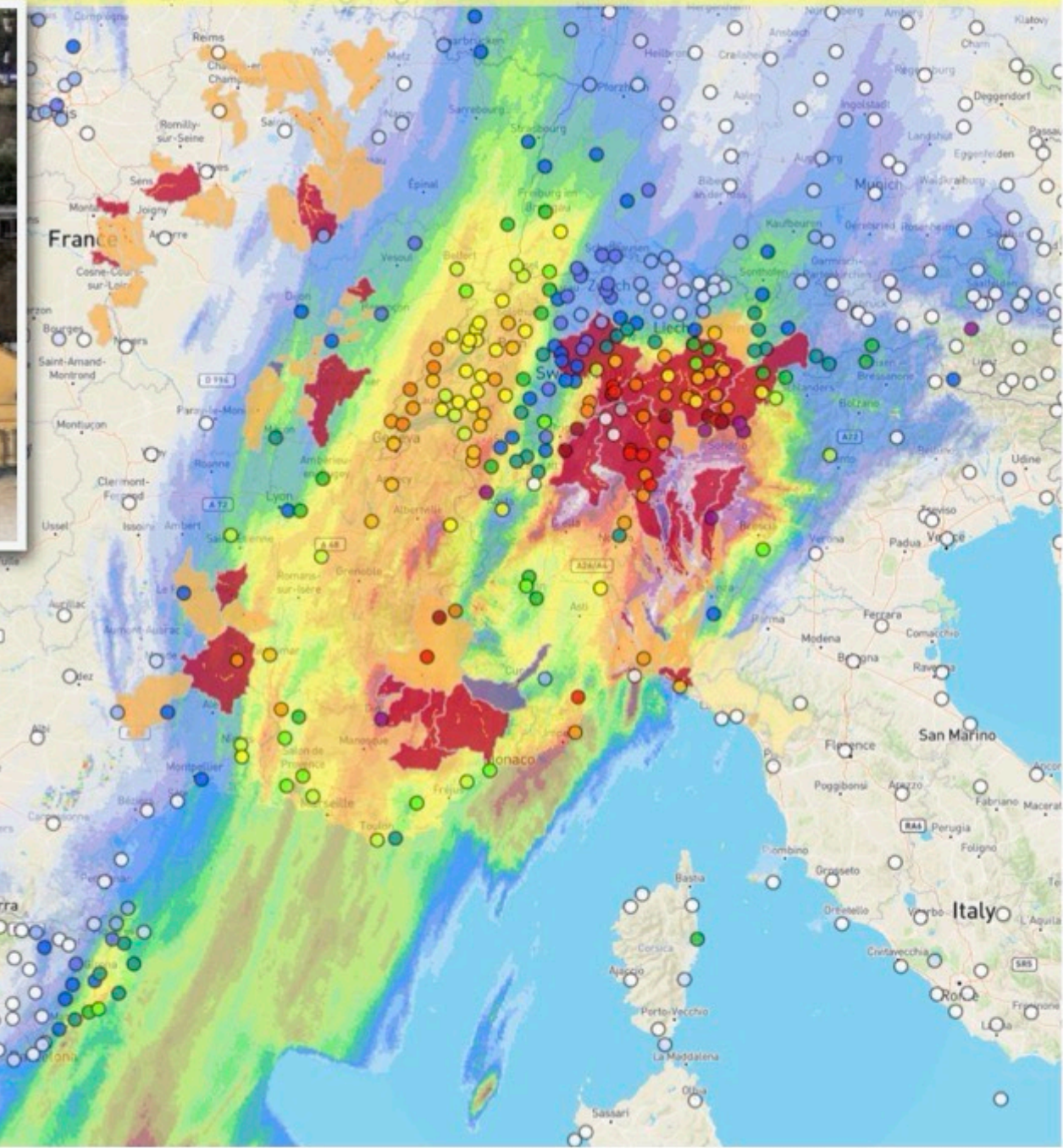
Impact forecasts for storms and heavy rainfall

Storm impact nowcasting (0-3 h).



Heavy rainfall, hail, lightning
Based on radar nowcasting & ML
European-wide exposure.

Flash flood impacts (0-120 h).

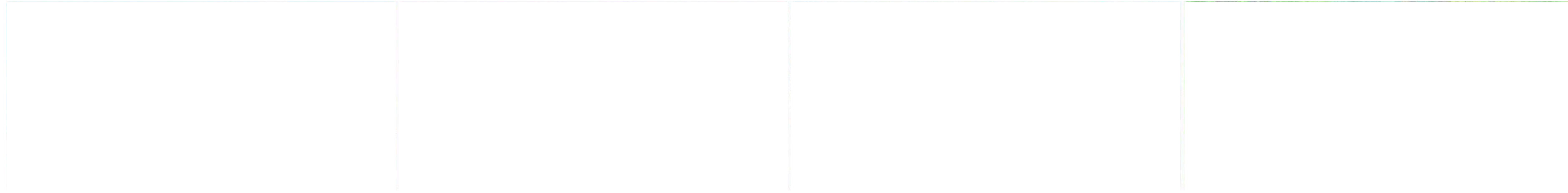


Specific objectives and expected outputs

- **Improved precipitation estimation for hydrological forecasting.**
- **Enhanced pan-European impact forecasting products with the use of AI**, applying a strategy to provide compound impact forecasts, and implement configurable user-defined notifications.
 - *more reliable and longer storm probabilistic hazard nowcasts*
 - *improved impact forecasts by combining the hazard with multiple exposure datasets*
- **Local adaptability of multi-hazard storms and compound floods forecasting** for improved preparedness and response management during flood events.
 - *New/more flexible notification functionalities*
- **Demonstration of the impact forecasts with end users** at European scale and in the pilot site.
 - *Assessment of the added value of the integration for CPAs*
- **Creation of an INLINE Community of Interest** to promote the adoption of the developed impact forecasting products and functionalities.
 - *Uptake of developed functionalities for storms and floods forecasting*
 - *Sustainability of the products*

Real-time compound impact forecasting for CPAs

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.

Notification details: Cá

Type	Product
	Flash flood impa
	Flash flood impa
	Flash flood impa
	Flash flood impa

Showing 1 to 4 of 4 entries

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

gaditano) ⚙️

Medium (20)

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AEMET)

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AEMET)

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Ben

Notifications

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

- Summarised over territorial units (depending on the level of CPA).
- Displayed in the list of notifications.
- Trigger of automatic messages (based on the thresholds and frequency defined by the user).

Examples:

- Official warnings (issued by the NHMs authorities).
- Directly based on the available real-time products.
- By dynamic combination of products and exposure datasets (e.g. significant flood hazard near a Seveso).

Evaluation

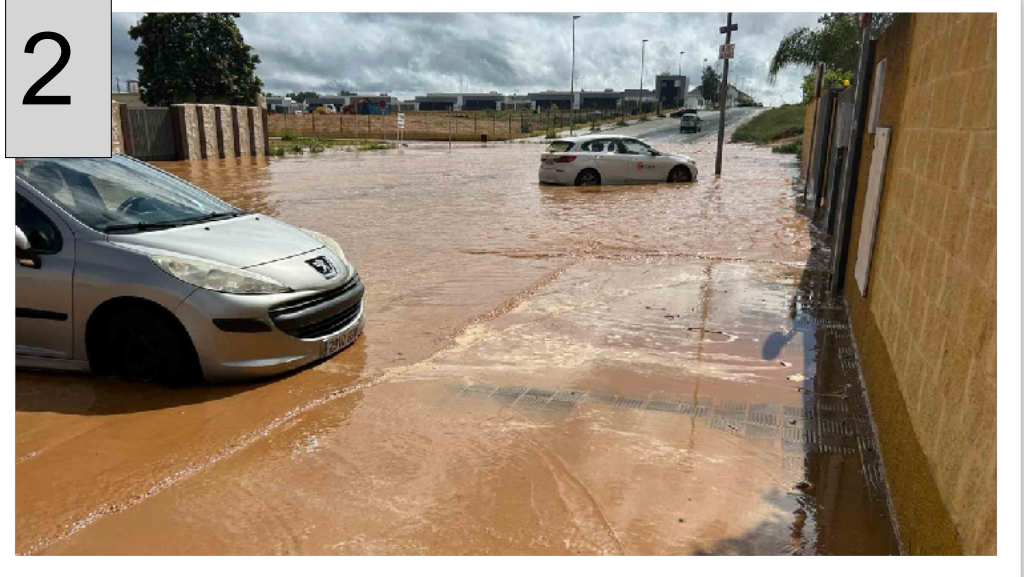
Combining hazard and impact forecasts, official warnings and exposure and vulnerability datasets for compound impact forecasting to support coordination and cooperation of CPAs.

Notification details: Cádiz

Type	Product	Start Date	End Date	Description
	Flash flood impact	2024-03-31 06:00	2024-04-01 00:00	Advertencia de inundación en Campi2a gaditana.
	Flash flood impact	2024-03-31 06:00	2024-03-31 18:00	Advertencia de inundación en Campi2a gaditana.
	Flash flood impact	2024-03-31 06:00	2024-03-31 12:00	Advertencia de inundación en Campi2a gaditana.
	Flash flood impact	2024-03-31 06:00	2024-03-31 12:00	Advertencia de inundación en Campi2a gaditana.

Showing 1 to 4 of 4 entries

Forecasting time: Sat, 2024-03-30
Leadtime(h) 0-6h 6-24h



Emergencias 112

El 112 gestiona más de 120 incidencias por el temporal durante la madrugada y la mañana del domingo

La mayoría de los avisos se ha producido por los efectos de la lluvia en las provincias de Cádiz, Granada y Málaga

Mujer caminando bajo la lluvia (EFE).

Emergencias 112 Andalucía, servicio adscrito a la Consejería de la Presidencia, Interior, Diálogo Social y Simplificación Administrativa de la Junta, ha gestionado **durante la madrugada y la mañana de este Domingo de Resurrección** -hasta las 13.00 horas-, **más de 120 de incidencias ocasionadas por la borrasca Nelson** a su paso por Andalucía.

La mayoría de emergencias que se ha producido durante el día de hoy se ha debido a los efectos de la lluvia, especialmente en las provincias de **Cádiz, Granada y Málaga**, donde los avisos por lluvia activados por la AEMET eran naranjas; los requerimientos atendidos en el 112 han sido, en su mayor parte, por anegaciones parciales de viviendas, locales y

The challenge: evaluating the storm & floods impact forecasts

Hydrometeorological forecasts

- Precipitation estimation
- Impact on model initialization
- Storm hazard nowcasts
- Flash flood hazard forecasts

Impact forecasts

- CPA operations on selected events.
- With impact reports (impact databases).

Added value for emergency management

- Through the creation of a Col.
- Survey strategy.

Over a 15-months demonstration

INLINE demonstration

- September 2025 – November 2026.

INLINE demonstration

- September 2025 – November 2026.
- With the participation of an INLINE Community of Interest.

CRAHI
UPC
Centre de Recerca Aplicada en Hidrometeorologia
UNIVERSITAT POLITÈCNICA DE CATALUNYA

ECMWF

ILMATIETIEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

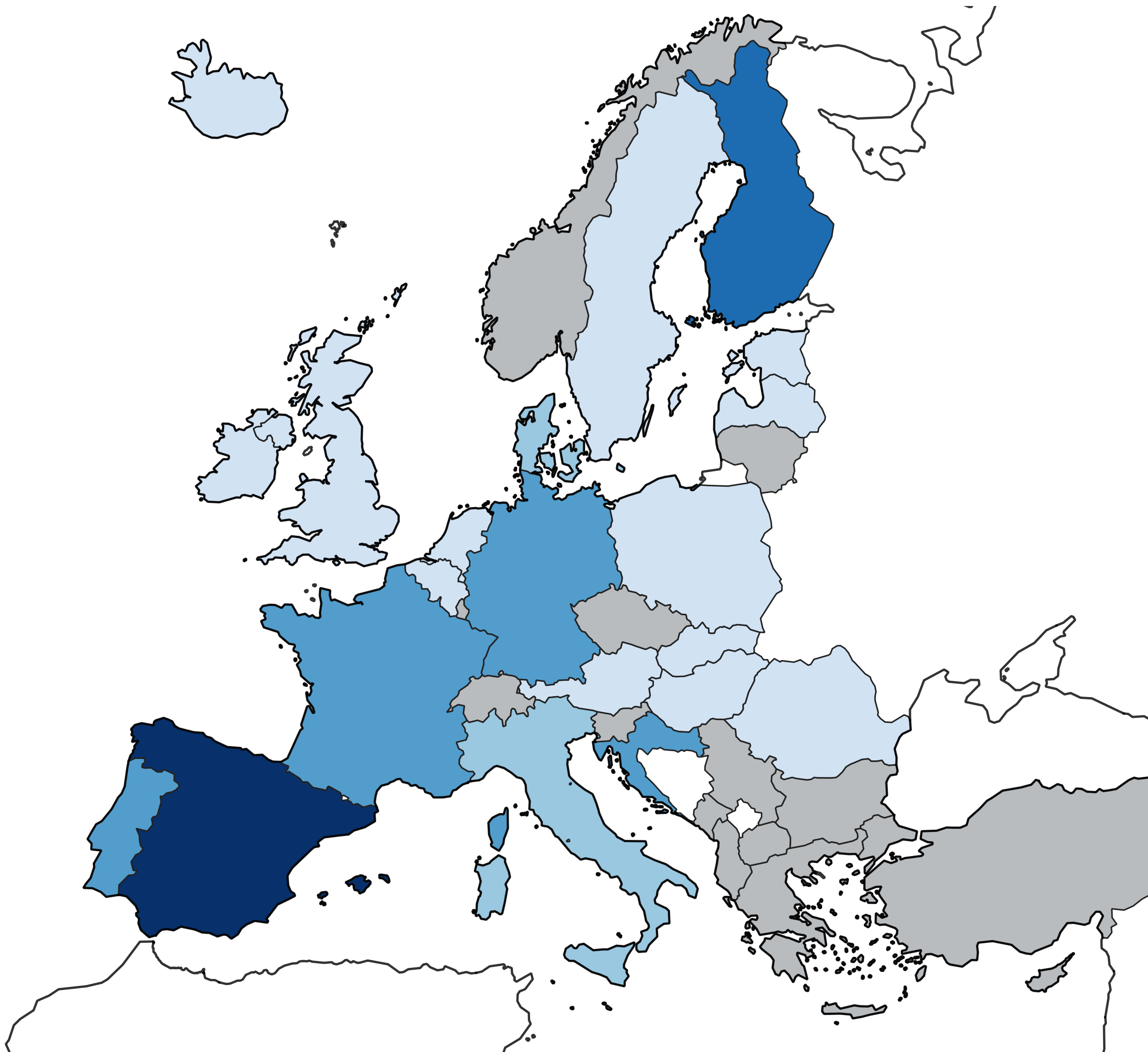
AEMet
Agencia Estatal de Meteorología

IPMA
Instituto Português do Mar e da Atmosfera

Agencia de Medio Ambiente y Agua de Andalucía
Consejería de Agricultura, Pesca, Agua y Desarrollo Rural
Consejería de Sostenibilidad, Medio Ambiente y Economía Azul

GOBIERNO DE ESPAÑA
MINISTERIO DEL INTERIOR
DIRECCIÓN GENERAL DE PROTECCIÓN CIVIL Y EMERGENCIAS

EMERGENCIA E PROTEÇÃO CIVIL
AUTORIDADE NACIONAL



COI members

- 0
- 1
- 2
- 3
- 4
- 11

INLINE demonstration

- September 2025 – November 2026.
- With the participation of an INLINE Community of Interest.
- Access to the products in real time through
 - +WMS
 - +INLINE web-based platform
- Integration of *local* products/information (exposure, vulnerability, observations...)
- Contribution to the evaluation (feedback about the products, functionalities and results during events).

The INLINE Platform

<https://gebrada.upc.es/inline-platform/login.php>



Login

INLINE

lisbon2026

Login

[Don't have an account? Sign Up Here](#)

[Forgot your password? Reset here](#)

(*) Access to the platform is limited to the INLINE project partners and stakeholders.



The INLINE Platform

INLINE Platform

Tools Help crahi

Flash flood forecast summary (0-120h) Official warnings (1) Official warnings Meteorological layers (1) Seamless precipitation accumulation Flash flood impact layers (1) Flash flood impact over sub-catchment Storm impact layers (0-3h) (1) Storm Risk Storm Impact Animated flash flood nowcasting Flash flood past 24-h summary Static layers

2026-05-21 08:00 - 2026-05-21 14:00 UTC

notifications

product selector

date & time selector

Forecasting time: Thu, 2026-05-21 08:00 UTC

Leadtime(h) 0-6h 6-24h 24-48h 48-120h

The INLINE Platform

INLINE Platform
Tools Help crahi

Flash flood forecast summary (0-120h) ^

Official warnings (1)

Official warnings 👁️ ⓘ

Meteorological layers (1)

Seamless precipitation accumulation 👁️ ⓘ

Flash flood impact layers (1)

Flash flood impact over sub-catchment 👁️ ⓘ

Storm impact layers (0-3h) (1)

Storm Risk 👁️ ⓘ

Storm Impact v

Animated flash flood nowcasting v

Flash flood past 24-h summary v

Static layers v

Fcast Summary

2026-05-21 08:00 - 2026-05-21 14:00 UTC

Storms monitoring

Floods monitoring

24-h summary

Static layers

Forecasting time: Thu, 2026-05-21 08:00 UTC

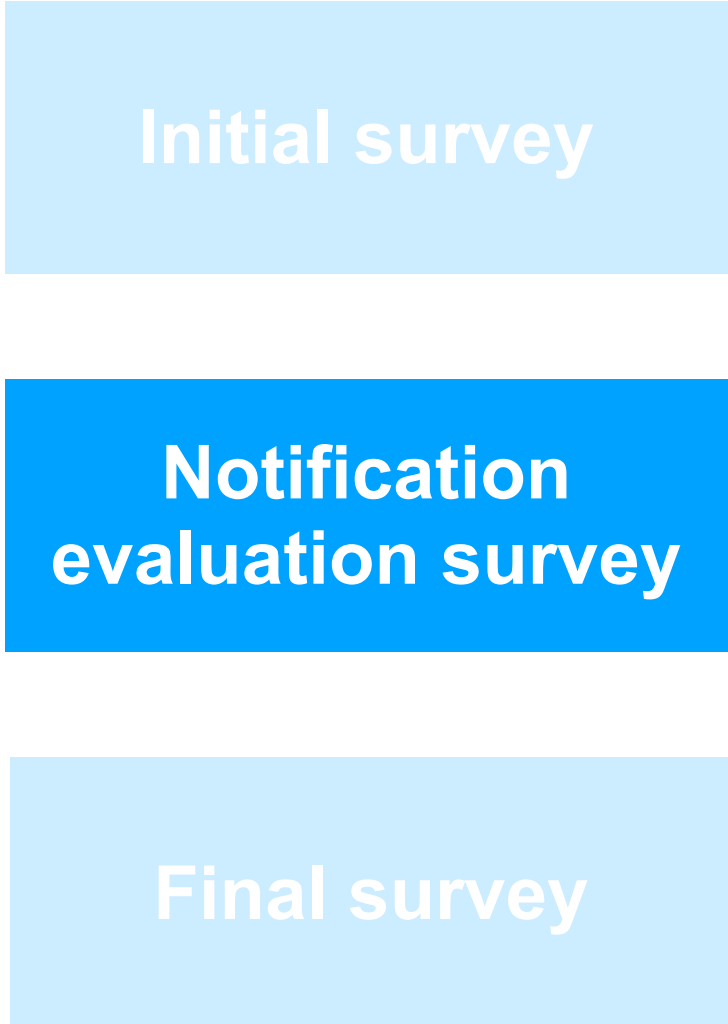
Leadtime(h)
0-6h
6-24h
24-48h
48-120h



Evaluation of impact forecasts with end-users

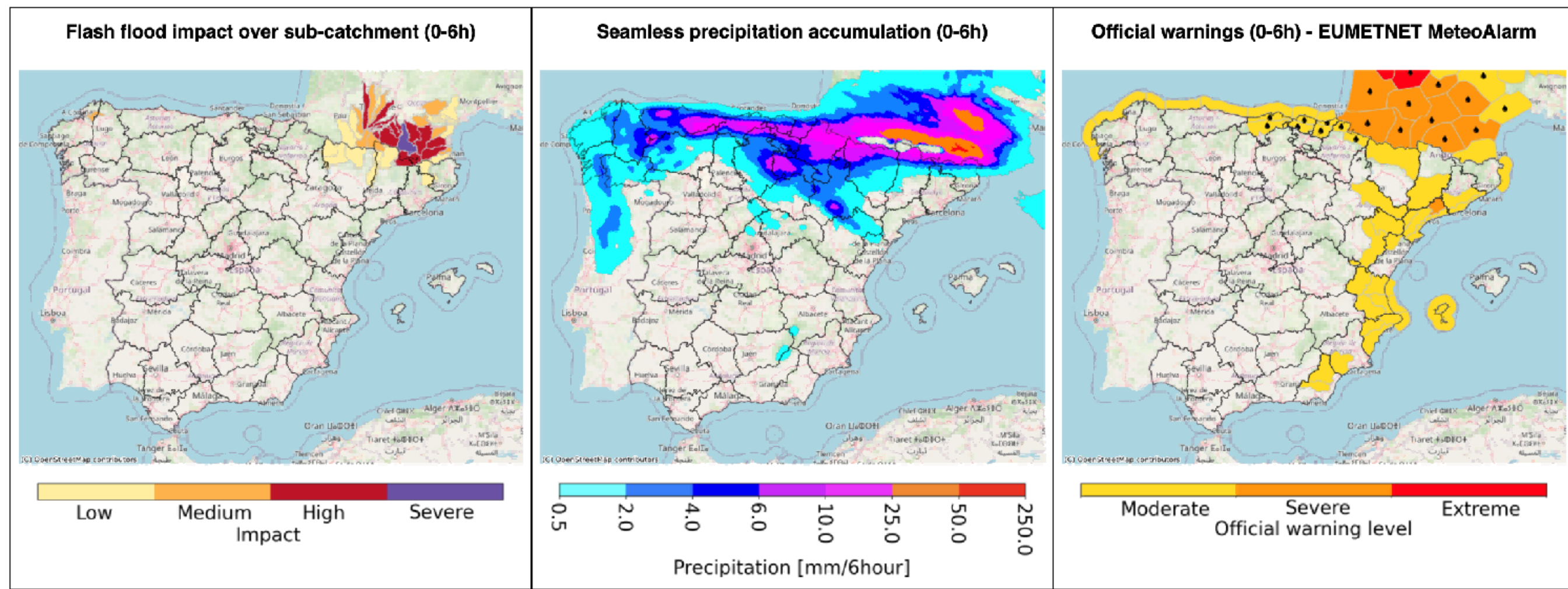
Notification Evaluation Survey

A notification-based evaluation survey has been launched for INLINE users, allowing them to provide feedback on forecasts and report missed events.



Notifications Update (forecasting time: 2026-02-16 at 16:00 UTC)

This email provides you with the latest INLINE notifications 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 notification for Girona.

Active notifications:

Detailed list of currently active notifications.

Notification ID	Type	Source	Area	Level	Start time	End time
33034558	Flood	Edera product notification (Flash flood impact)	A Coruña	3	2026-02-16 16:00 UTC	2026-02-16 23:00 UTC
33034559	Flood	Edera product notification (Flash flood impact)	Girona	3	2026-02-16 20:00 UTC	2026-02-17 01:00 UTC

[Please provide us feedback about these notifications with this link.](#)

INLINE Team

Evaluation of impact forecasts with end-users

Notification Evaluation Survey

A notification-based evaluation survey has been launched for INLINE users, allowing them to provide feedback on forecasts and report missed events.

The screenshot shows a survey page on KoboToolbox. On the left, a vertical navigation menu contains three buttons: 'Initial survey' (light blue), 'Notification evaluation survey' (dark blue), and 'Final survey' (light blue). The main content area is titled 'INLINE Notification Performance Feedback' in orange. It includes a welcome message, an email input field, a radio button question about feedback type, and a 'Thank you for your time!' section with contact information. A language dropdown menu is visible in the top right corner, showing options for English, Spanish, and Portuguese. A printer icon is also present.

Evaluation of impact forecasts with end-users

Notification Evaluation Survey

A notification-based evaluation survey has been launched for INLINE users, allowing them to provide feedback on forecasts and report missed events.

Initial survey

Notification evaluation survey

Final survey

Analysis

Weather tracker: Spain and Portugal hit by third deadly storm in two weeks

Alice Fowl, Claire Jones and Morgan Thomas for MetDesk

Storm Marta sweeps Iberian peninsula just days after Storms Kristin and Leonardo brought deadly flooding and major damage



Distrito de Aveiro em Portugal

pablongoti 关注

Portugal está a ser fortemi ... 更多

Evaluation of impact forecasts with end-users

Notification Evaluation Survey

A notification-based evaluation survey has been launched for INLINE users, allowing them to provide feedback on forecasts and report missed events.

Initial survey

Notification evaluation survey

Final survey

start	end	abc Please enter yo
Search	Search	Search
Feb 6, 2026 8:...	Feb 19, 2026 ...	jmunozs@proteccic
Feb 9, 2026 2:...	Feb 9, 2026 2:...	mmonteror@protec
Feb 6, 2026 3:...	Feb 9, 2026 2:...	mmonteror@protec
Feb 6, 2026 8:...	Feb 6, 2026 3:...	mmonteror@protec
Feb 6, 2026 8:...	Feb 6, 2026 8:...	mmonteror@protec
Feb 5, 2026 1:...	Feb 6, 2026 8:...	mmonteror@protec
Oct 29, 2025 1:...	Feb 6, 2026 8:...	jmunozs@proteccic
Feb 5, 2026 1:...	Feb 5, 2026 1:...	mmonteror@protec
Feb 4, 2026 4:...	Feb 4, 2026 5:...	jacqueline.kernn@d
Feb 3, 2026 9:...	Feb 3, 2026 9:...	rosamaria.torres@c
Jan 24, 2026 ...	Jan 24, 2026 ...	jacqueline.kernn@d
Nov 14, 2025 ...	Nov 14, 2025 ...	joonatan.kama@en
Oct 29, 2025 1:...	Oct 29, 2025 1:...	jmunozs@proteccic
Oct 29, 2025 1:...	Oct 29, 2025 1:...	ecriado@proteccior
Oct 27, 2025 9:...	Oct 27, 2025 1:...	joaquina.faz@corre
Sep 2, 2025 1:...	Oct 25, 2025 9:...	rosamaria.torres@c



Evaluation of impact forecasts with end-users

Notification Evaluation Survey

A notification-based evaluation survey has been launched for INLINE users, allowing them to provide feedback on forecasts and report missed events.

Initial survey

Notification
evaluation survey

Final survey

Initial Survey of the INLINE Project

Dear Participant, Thank you for taking the time to contribute to this survey on key features of flood and storm impact forecasting systems to gather your insights regarding the development and evaluation of the INLINE project. While we encourage you to complete the survey for a comprehensive view, please feel free to answer as many or as few questions as you like—every piece of feedback is incredibly valuable to us. This survey will be used to quantify users' understanding of INLINE products and to evaluate the overall success of the project. Estimated completion time: 25 minutes.

Section 1: Background Information

1.1 Please enter your Email address. *

1.2 Which organization/company/institution are you affiliated with?

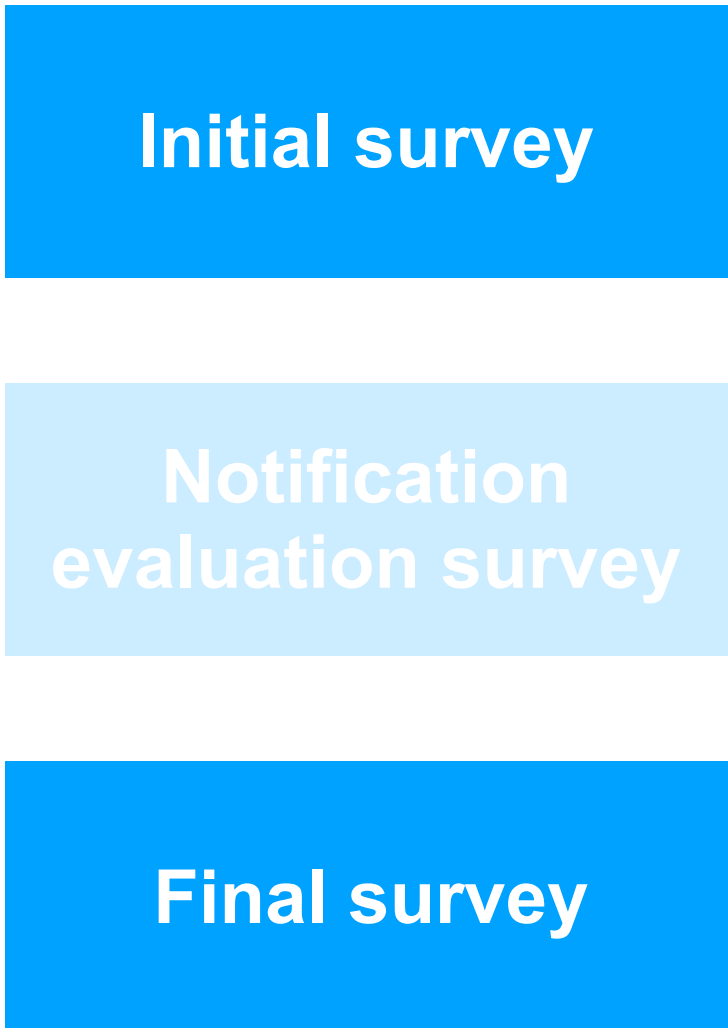
1.3 What is your role there?

- Emergency manager, Civil Protection operator
- Weather or risk forecaster
- Emergency first responder
- Technical or Administrative Support Staff (e.g. IT, office coordinator, manager)
- Scientist or Researcher

Evaluation of impact forecasts with end-users

Notification Evaluation Survey

A notification-based evaluation survey has been launched for INLINE users, allowing them to provide feedback on forecasts and report missed events.



Initial Survey of the INLINE Project

Dear Participant, Thank you for taking the time to contribute to this survey by providing feedback on the performance of flood and storm impact forecasting systems to other users. Your insights regarding the development of these systems are valuable. To view, please feel free to answer the questions below to quantify users' understanding of the system.

▼ **Section 1: Background Information**

1.1 Please enter your Email address

1.2 Which organization/company/institution are you affiliated with?

1.3 What is your role there?

- Emergency manager, Civil Protection, etc
- Weather or risk forecasting
- Emergency first responder
- Technical or Administrative
- Scientist or Researcher

Final Survey of the INLINE Project

Dear Participant, Thank you for participating in the final comprehensive evaluation of the INLINE project. This questionnaire is designed to assess the final outcomes of the INLINE project systematically. We aim to thoroughly measure its actual performance in terms of forecast quality, decision support, added value, and the effectiveness of cross-border cooperation, and to gather valuable feedback for future development. Your feedback is crucial for objectively measuring the project's achievements. All collected data will remain anonymous and be kept strictly confidential. Estimated completion time: 25-30 minutes.

▼ **Section 1: Background Information and Overall Satisfaction**

1.1 What is your role in the INLINE project?

- Scientist or Researcher
- Project developer: IT, management, etc
- Stakeholders: National hydro-meteorological institutes, etc
- End-user: CPA (civil protection agencies), etc
- other

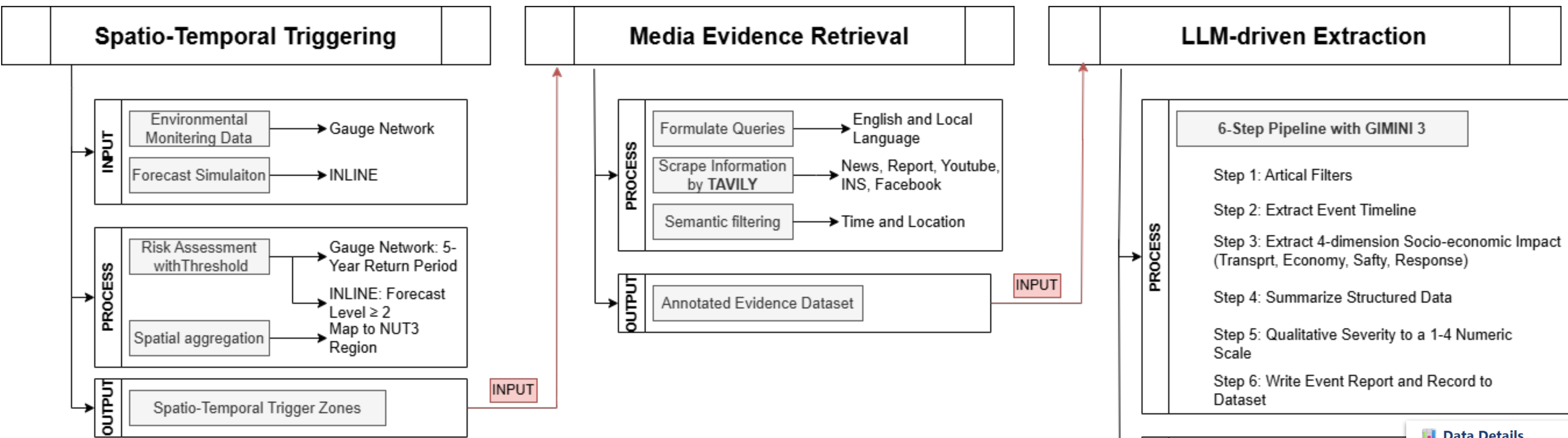
1.2 Which organization/company/institution are you affiliated with?

INLINE Community of Interest

- Have you registered?
- Access to the products in real time (and offline)
- Regular online meetings.
- Set up your own notifications.
- Provide feedback and analysis of recent events.

Systematic evaluation of impact forecasts

Through automatic LLM collection of flood events and impact assessment over Europe - FloodEcho (Li et al., EGU26-848 (HS4.5)).



The screenshot shows the 'EU Flood Monitoring Flood-scanner' interface. The 'Overview Dashboard' displays the following statistics:

- 7177** Total Records
- 535** Processed Records
- 2.65** Average Risk
- 4.00** Max Water Level (m)

Below the dashboard is an 'Event Distribution Map' showing flood events across Europe, with a dropdown menu set to 'All Countries'. The interface includes a sidebar with navigation options like 'Global Query', 'Overview Dashboard', 'Event Query', 'Data Input', and 'Data Analysis'.

The 'Data Details' panel provides a comprehensive view of a specific event:

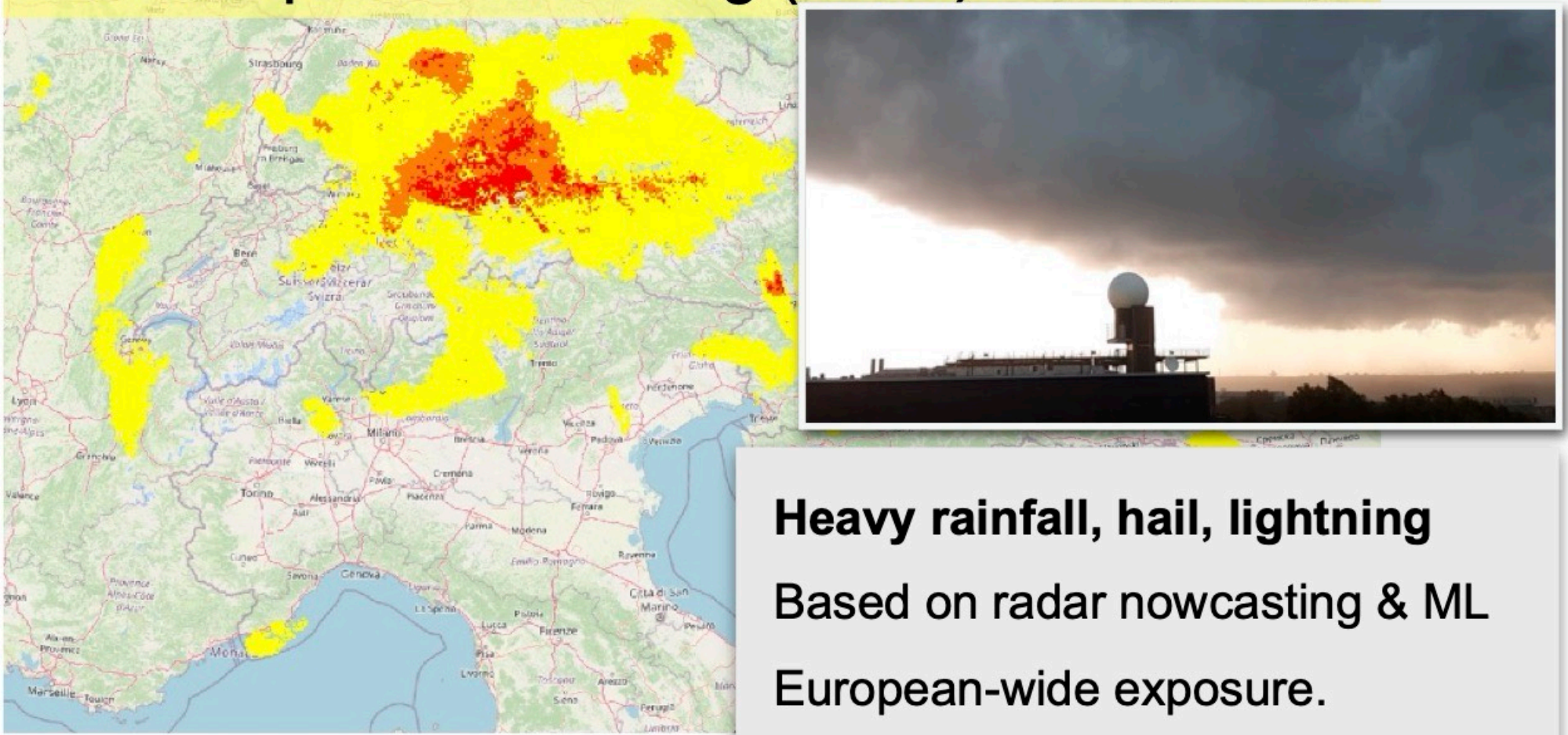
- Overall Impact Level:** 4 (Severe (4 Level))
- KEY FACTORS:**
 - SE-20: Closed in both directions
 - Grazalema streets: Inundated
 - Marbella streets: Flooded
 - Málaga: Multiple vehicle collision
- KEY FACTORS:**
 - Grazalema Town Hall flooded
 - Two commercial premises inundated
 - Agricultural terrain saturated beyond capacity
- KEY FACTORS:**
 - Grazalema: Entire town evacuated
 - Deifontes: 20 families and one hotel evacuated
 - Málaga: 3 pedestrians injured in traffic accident
- KEY FACTORS:**
 - Red Alert issued for Cádiz and Málaga
 - Level 2 Emergency Plan activated by regional government
 - Cruz Roja mobilized across Andalusia
- KEY FACTORS:**
 - Total evacuation of Grazalema town
 - Record-breaking rainfall (220L in 9h) overwhelming drainage
 - Systemic disruption of municipal services and regional transport

INLINE: Integrated pan-European rainfall and floods impact forecasts for cooperation in emergency management

Objective: Advance on the capabilities of EWS with tools to anticipate the impacts due to storms, heavy rain and floods to support the decision-making workflows.

Through the integration of products in real time.

Storm impact nowcasting (0-3 h).

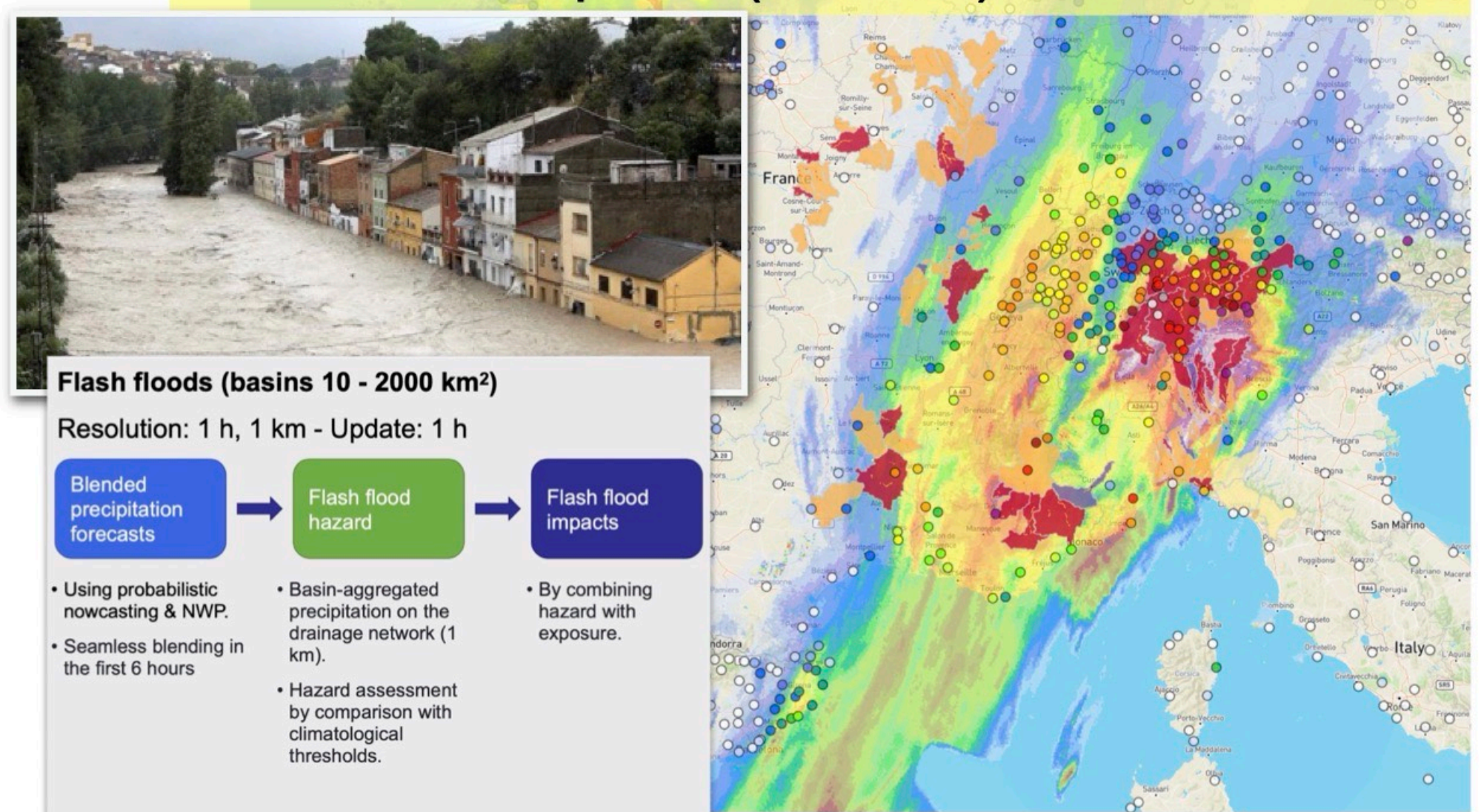


Heavy rainfall, hail, lightning
Based on radar nowcasting & ML
European-wide exposure.



- Official NHMs warnings (Meteoalarm).
 - Gauge-adjusted OPERA QPE.
 - Probabilistic rainfall forecasts (0-120h).
 - Storm hazard nowcasts (0-3h):
 - Hail.
 - Wind gusts.
 - Heavy rain.
 - Lightning.
 - EDERA pluvial flood nowcasts (0-3h).
 - EDERA FF hazard forecasts (0-120h).
 - EDERA FF impact forecasts (0-120h).
 - EFAS flood forecasts.
 - EFAS rapid risk assessment.
 - Combined exposure map (1km):
 - Population density.
 - Transportation networks.
 - Energy, health, education infrastructures.
- Integration of high-resolution exposure & vulnerability datasets
New/more flexible user-adapted notification functionalities

Flash flood impacts (0-120 h).

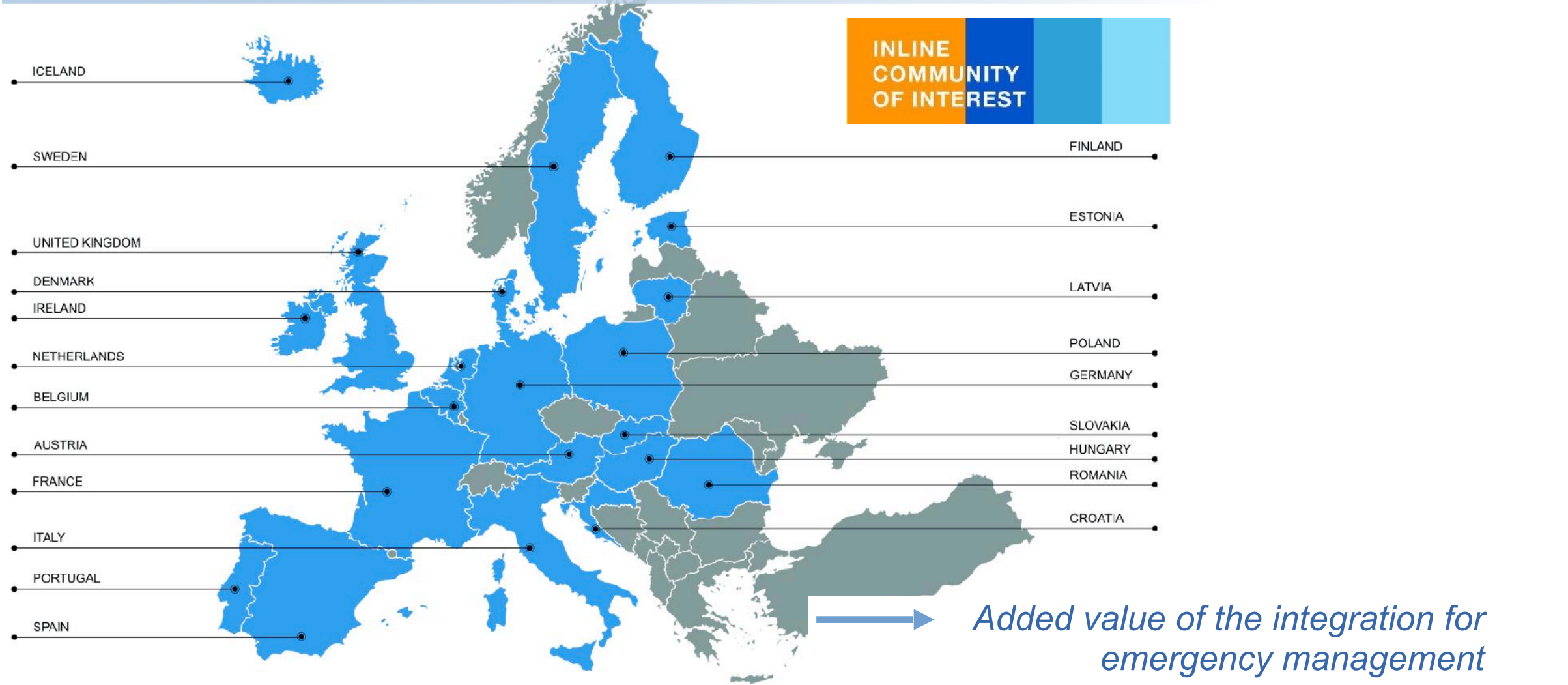


Flash floods (basins 10 - 2000 km²)
Resolution: 1 h, 1 km - Update: 1 h

Blended precipitation forecasts → Flash flood hazard → Flash flood impacts

- Using probabilistic nowcasting & NWP.
- Seamless blending in the first 6 hours
- Basin-aggregated precipitation on the drainage network (1 km).
- Hazard assessment by comparison with climatological thresholds.
- By combining hazard with exposure.

Real-time demonstration with end users.



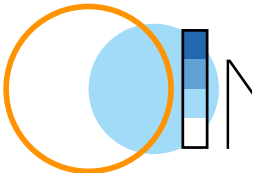
ICELAND, SWEDEN, UNITED KINGDOM, DENMARK, IRELAND, NETHERLANDS, BELGIUM, AUSTRIA, FRANCE, ITALY, PORTUGAL, SPAIN, FINLAND, ESTONIA, LATVIA, POLAND, GERMANY, SLOVAKIA, HUNGARY, ROMANIA, CROATIA

Added value of the integration for emergency management

Integration in CEMS Floods.

Emergency Management Service

Improved version of radar-based products in EFAS
Sustainability of the INLINE results



INLINE: Integrated pan-European rainfall and floods impact forecasts for cooperation in emergency management