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SAFE-LAND

Mitigating the risk of flooding and landslides via artificial intelligence with a view to extreme climate events

Layman's Report

Project Title:
SAFE-LAND
Mitigating the Risk of Flooding and Landslides via Artificial Intelligence with a view to Extreme Climate Events

Contracting Authority:
European Commission
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12/02/2024 to 11/02/2026

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Consortium partners:

Lead Partner:

eCampus University - Italy

Partners:

University of Pisa – Italy

Regional Department of Civil Protection of Medjimurje County – Croatia

Rescue And Protection Directorate of Ministry of Interior of Montenegro

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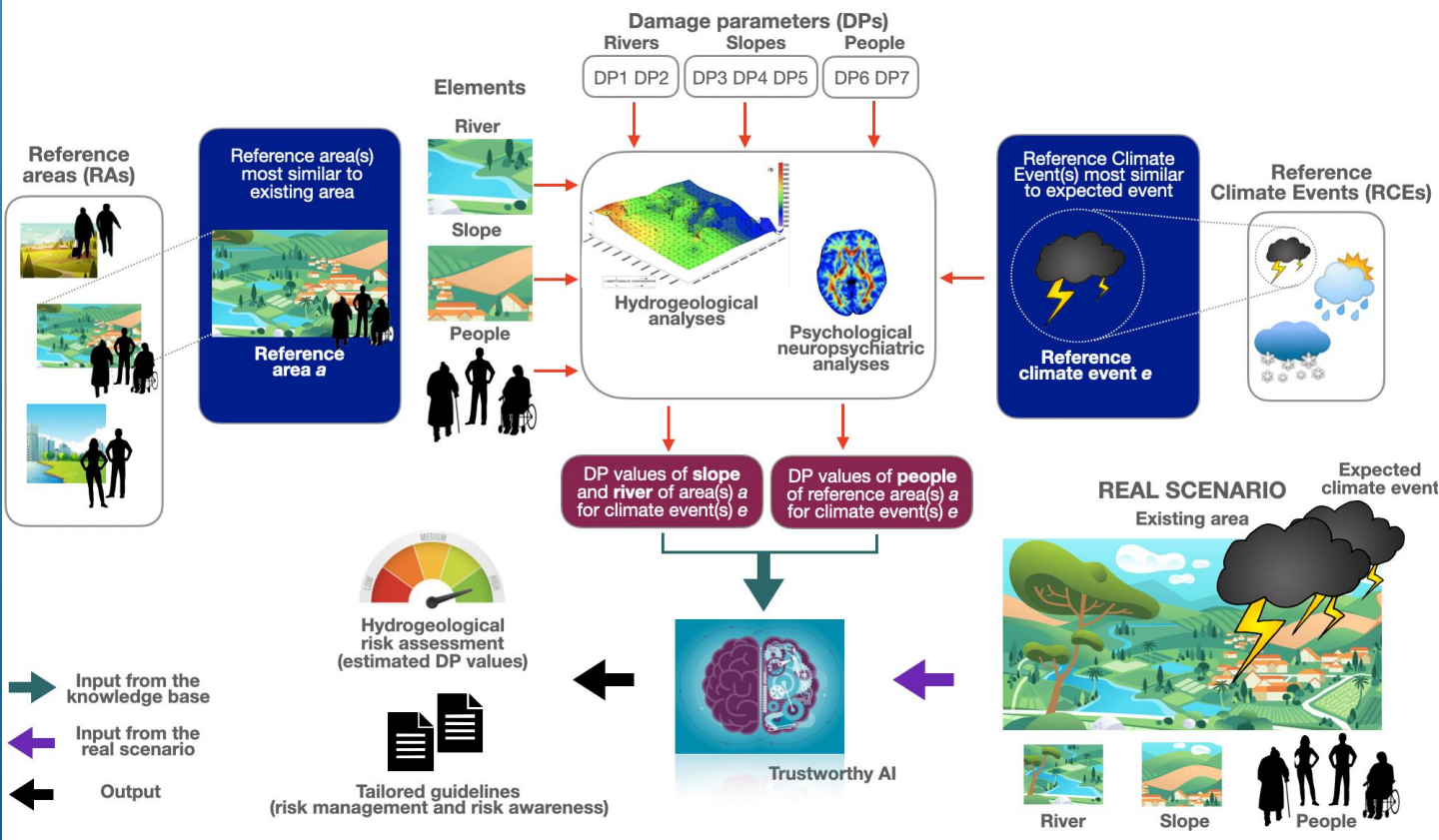
What is SAFELAND about?

Across Europe, landslides and floods are becoming more frequent due to climate change. These events can cause serious damage to people, buildings, and the environment. SAFELAND was created to help evaluate these risks and support authorities in protecting communities.
The project developed an innovative digital tool based on Artificial Intelligence (AI) that helps assess the risk of landslides and floods and suggests practical actions to reduce their impact. At the same time, it also considers how people perceive risk and how awareness can be improved.

SAFELAND – implementation of a decision-support tool



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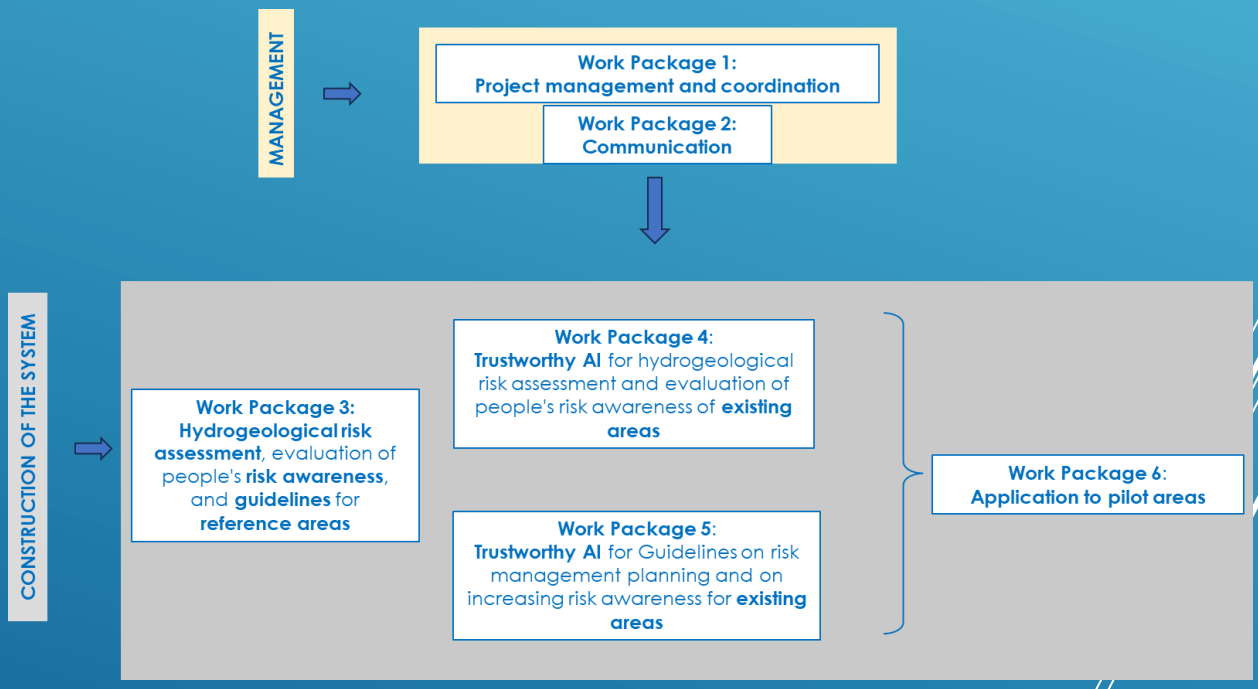
What did the project do?

SAFELAND brought together universities and Civil Protection institutions from Italy, Croatia, and Montenegro over a two-year period.

The project team evaluated the landslide and flood risks for reference slopes and rivers, and analysed how people understand and react to these risks. Scientific data on slopes, rivers, climate events, and information on people's awareness were used to train an AI-based tool.

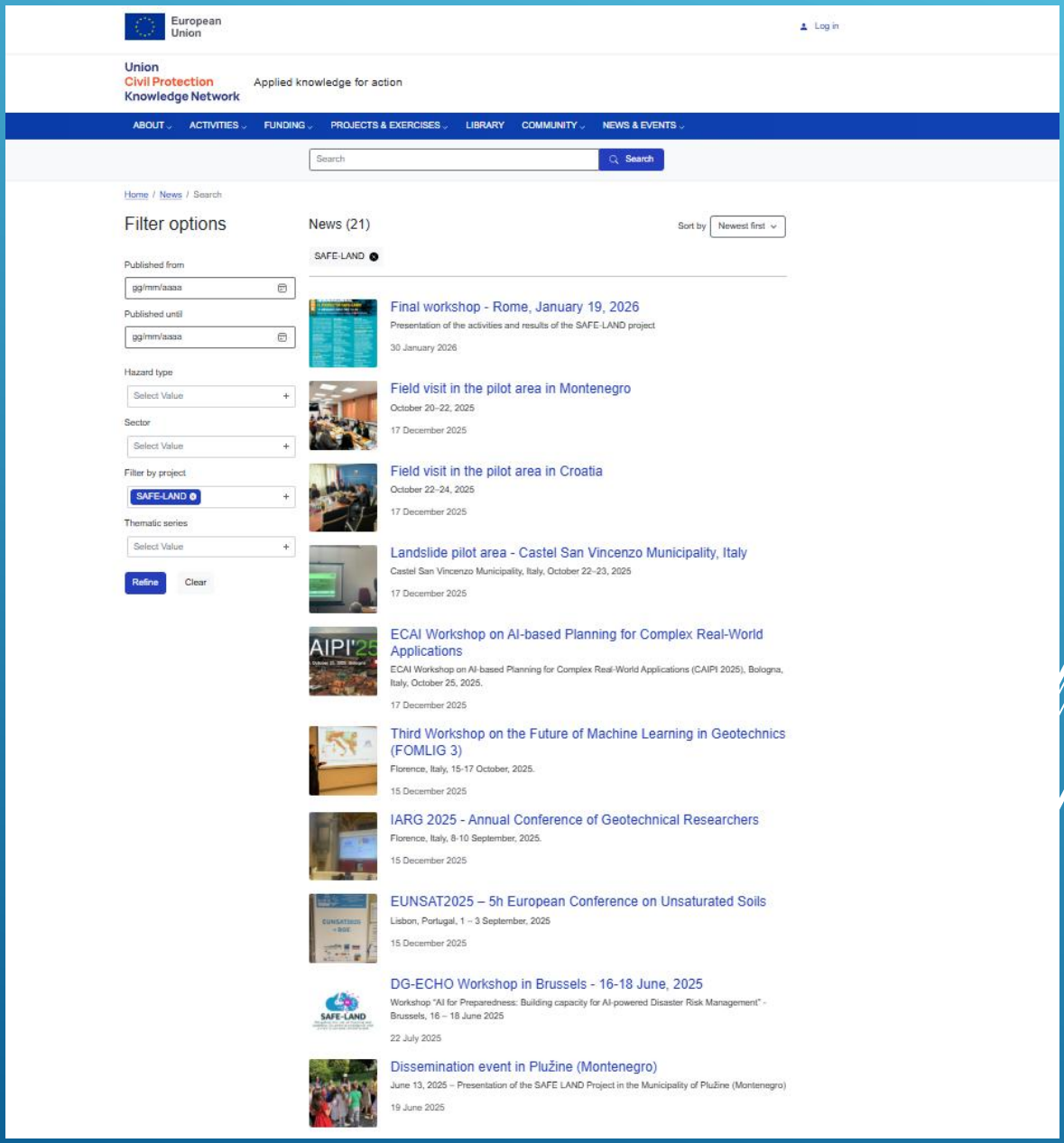
This allows the system to compare real situations with known reference cases and provide useful insights the assessment of the hydrogeological risk and provide risk mitigation measures and increasing awareness.

Project activities were organised into six work packages covering project management, dissemination, technical development, and testing.



WP2 - Dissemination activities

Project results were extensively disseminated through stakeholder engagement events, social media channels, and scientific outputs. Scientific papers were presented at national and international conferences, with additional publications currently in preparation. The project web page within the UCPKN network was continuously updated for disseminating the project objectives, activities and results (SAFE-LAND | UCP Knowledge Network).



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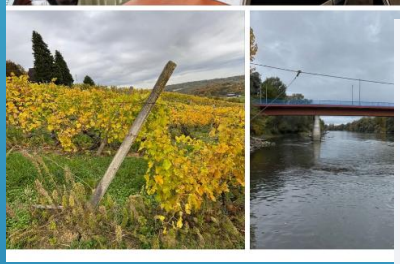
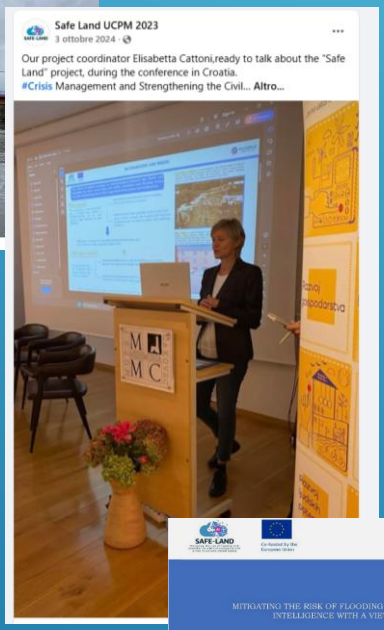
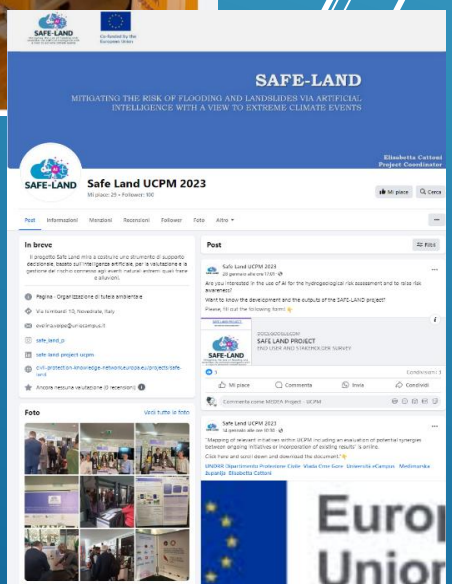
Social media pages





Visibility materials



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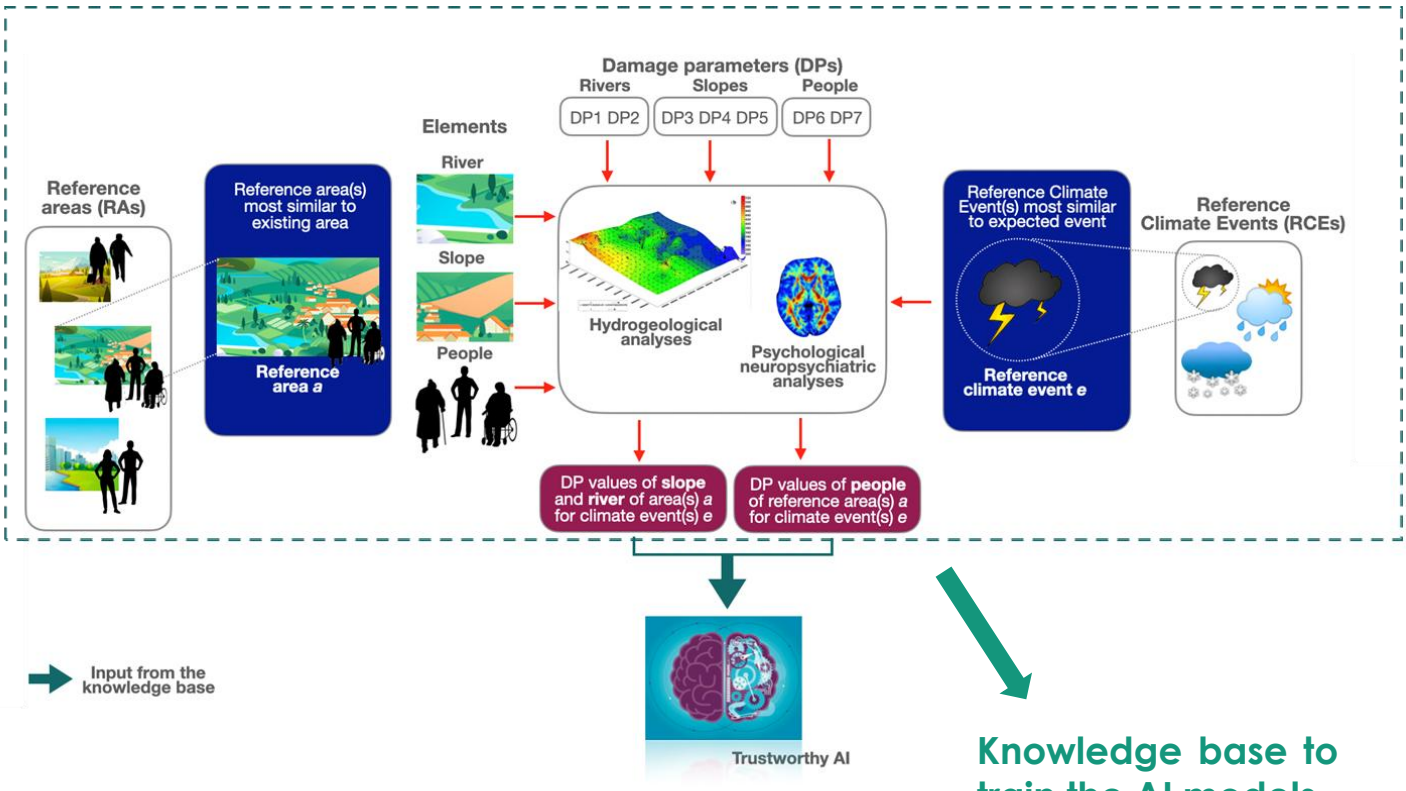
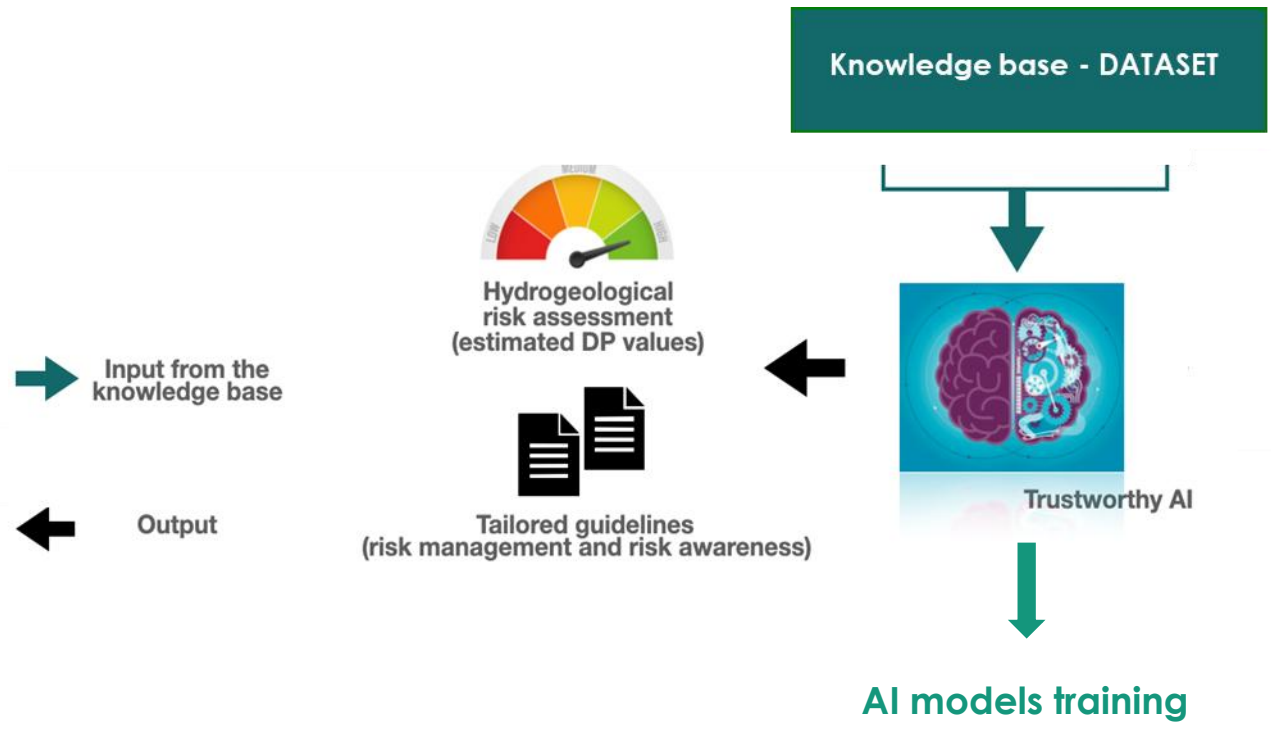
WP3 - Hydrogeological risk assessment, evaluation of people's risk awareness, and guidelines on risk mitigation measures and increasing risk awareness for reference areas

Technical work focused on defining **reference elements - slopes, rivers, and people** - through the identification of their physical, mechanical, psychological and damage-related parameters, alongside the characterisation of reference climate events and the associated variables. Geotechnical and hydraulic **physically based analyses** were carried out to quantify landslide and flood risks for the dataset of reference elements, while structured surveys were conducted to assess and parameterize levels of risk awareness. The results of these activities also supported the development of standardized mitigation measures and awareness-enhancement guidelines. **All these data constituted the knowledge base used to train the AI models.**



WP4 – WP5 - AI models for hydrogeological risk assessment, evaluation of people's risk awareness, and Guidelines

AI models were then developed to **identify similarities between reference conditions and real scenarios**, enabling the estimation of risk levels and the generation of recommendations for both risks mitigation measures and risk awareness improvement. Explainability features were integrated to ensure transparency and to effectively support decision-making processes.



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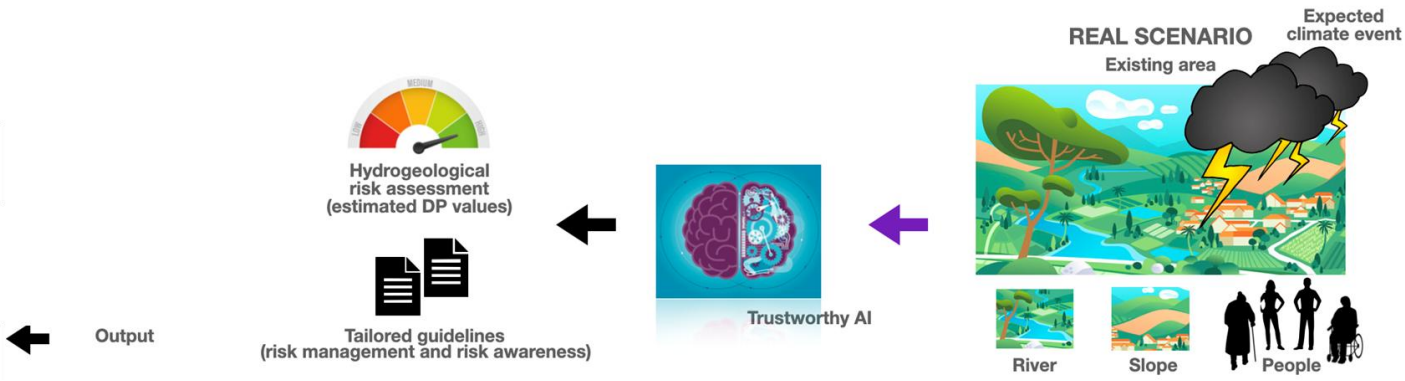
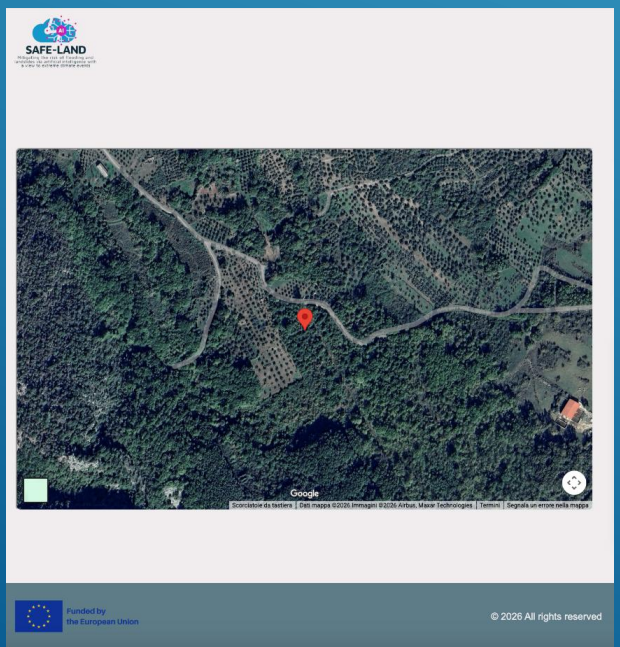
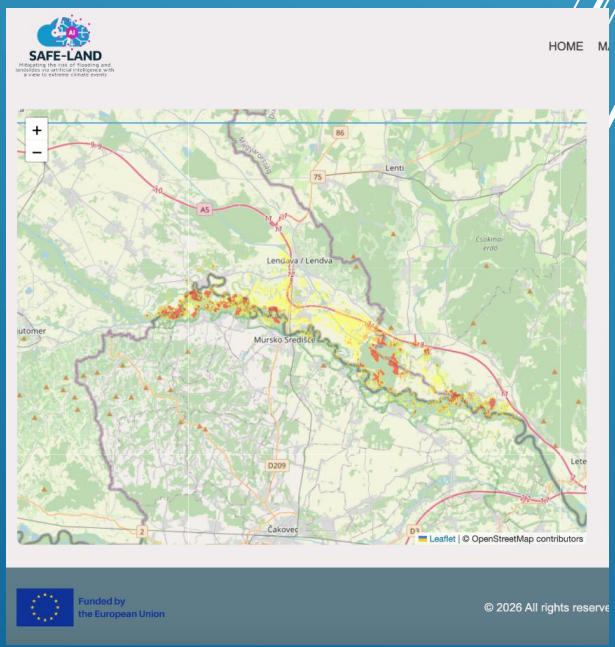
WP6 – Application to pilot areas

The system was tested in different pilot areas in Italy, Croatia and Montenegro. Different case studies were selected in the three countries to evaluate the landslide and flooding risks.



Pilot activities were carried out in six case study areas across Italy, Croatia, and Montenegro to test the tool under real conditions. These pilot activities helped verify that the system works effectively in different environmental and social contexts.





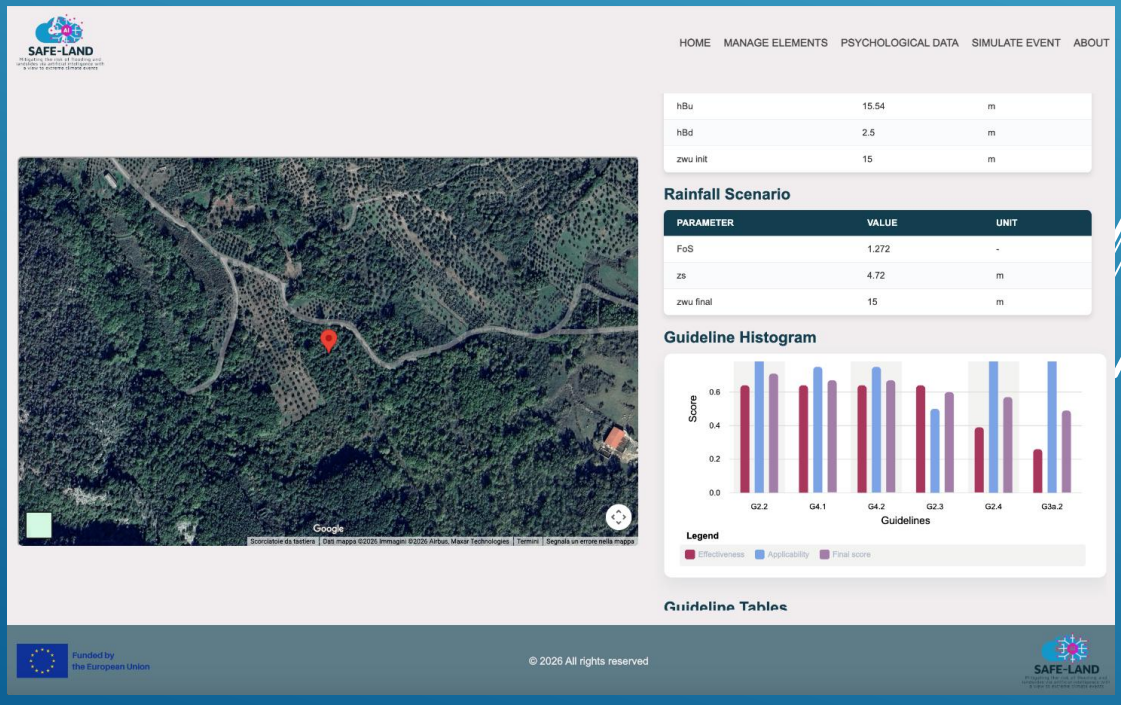
What are the main results?

The SAFELAND AI tool is available as **a web application** that can be used by public authorities and other stakeholders.

For a specific real situation (for example, a slope, a river, or a community), the AI tool provides:

- Near-instantaneous assessment of the landslide and flood risk level, and suggestion of the most appropriate mitigation measure to reduce risk and improve safety
- People's risk perception and strategies to improve it

All results are shown through simple and intuitive graphics, making them easy to understand and use in decision-making.



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Why SAFE-LAND?

Speed

Fast AI-based risk assessment for landslide and flood

Risk awareness

Prediction of population risk perception

Decision-Making Support for risk management

AI-driven prioritisation of high-risk areas

AI-guided selection of optimal risk mitigation measures for each high-risk area, based on effectiveness and applicability (cost-efficiency)

AI-guided strategies to enhance population risk awareness

What happens next?

SAFELAND **web application** will remain available after the end of the project. It can continue to be used over time, supporting long-term risk management across Europe.

All findings will be available through the Union Civil Protection Knowledge Network (UCPKN) platform (SAFE-LAND | UCP Knowledge Network).

Future perspectives: Improving the tool…

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Contact & Links

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Resources:

SAFE-LAND web application: https://safeland.unipi.it

SAFE-LAND on UCPKN: SAFE-LAND | UCP Knowledge Network

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