



UNICORN

FROM DATA TO ACTION

Project funded in the Horizon Europe Programme HORIZON-EUSPA-2023-SPACE under Grant Agreement 101180172

Project

UNICORN aims to contribute to building resilience against climate risks by developing Earth Observation-powered tools for early warning, forecasting, and hazard monitoring, empowering businesses and communities, and boosting emergency management.

By providing a suite of services that can be integrated into current systems, and leveraging cutting-edge tech and Copernicus data, UNICORN empowers communities and authorities to proactively anticipate and prepare for natural hazards through improved forecasts of **floods, wildfires, and volcanic eruptions.**

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Vision

UNICORN envisions a future where advanced Earth Observation technologies provide critical tools for predicting and mitigating natural disasters, ensuring that societies and industries are better equipped to handle the impacts of climate change. We aim to develop Copernicus based applications that integrate scientific knowledge into emergency management policies, improving forecasting, preparedness, and response at local, regional, and national levels.

UNICORN seeks to be a leading force in advancing disaster resilience strategies through collaboration, innovation, and technology, empowering stakeholders to face an uncertain climate future with confidence.

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Overview

UNICORN's primary objective is to provide businesses and policymakers with Copernicus-based applications. This aims to enhance the preparedness of local authorities, citizens, and industries for more frequent extreme events and geohazards. Additionally, it seeks to improve prediction, fostering better resilience to climate change.

The goal is to enhance local emergency management and facilitate short-term recovery processes. To do so, a series of tools for the early warning, forecasting, and monitoring of hazards are developed. UNICORN showcases the impact of these applications across 4 use cases through an end-user validation method towards building a resilient European landscape.

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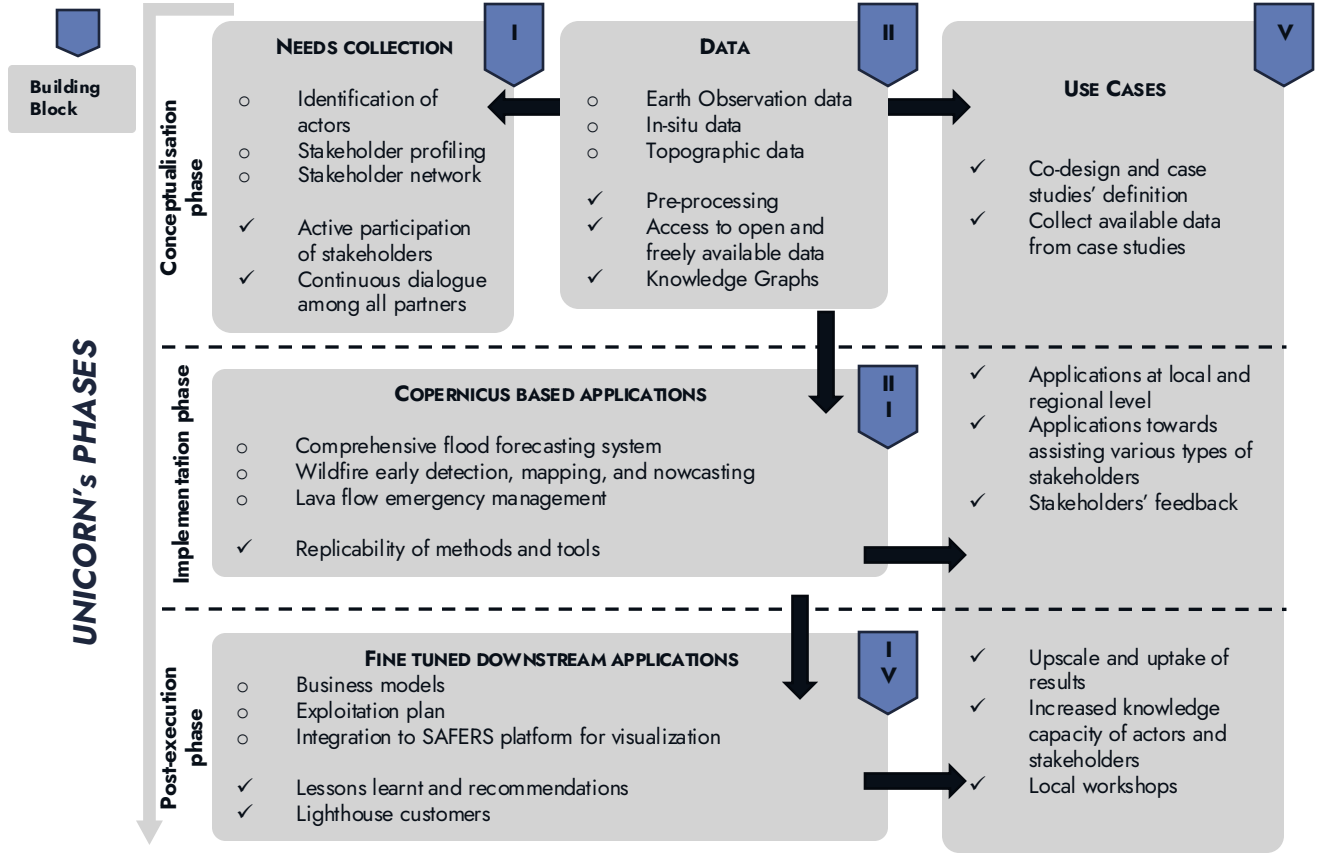
Project steps



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Unicorn Use Cases

Copernicus Emergency use cases with public and private end-users

UNICORN directly tackles the current emergency management challenges and presents innovative solutions to ensure swift, accurate, and actionable impact towards better preparedness of local authorities, citizens and industries, and businesses for more frequent extreme events, geohazards, and insurance costs.

UNICORN's foundation is laid on the development of four strategically selected Copernicus emergency applications corresponding in 4 use cases which incorporate specific areas, regions, and countries from the Mediterranean area of Europe that have a long history of natural hazards and extreme events.
These use cases through which the applications are implemented, monitored, and validated in real-world conditions are diverse due to the scale of operation (local, regional, and sub-national), the hazards, the type of engaged stakeholders, and the applied technologies.

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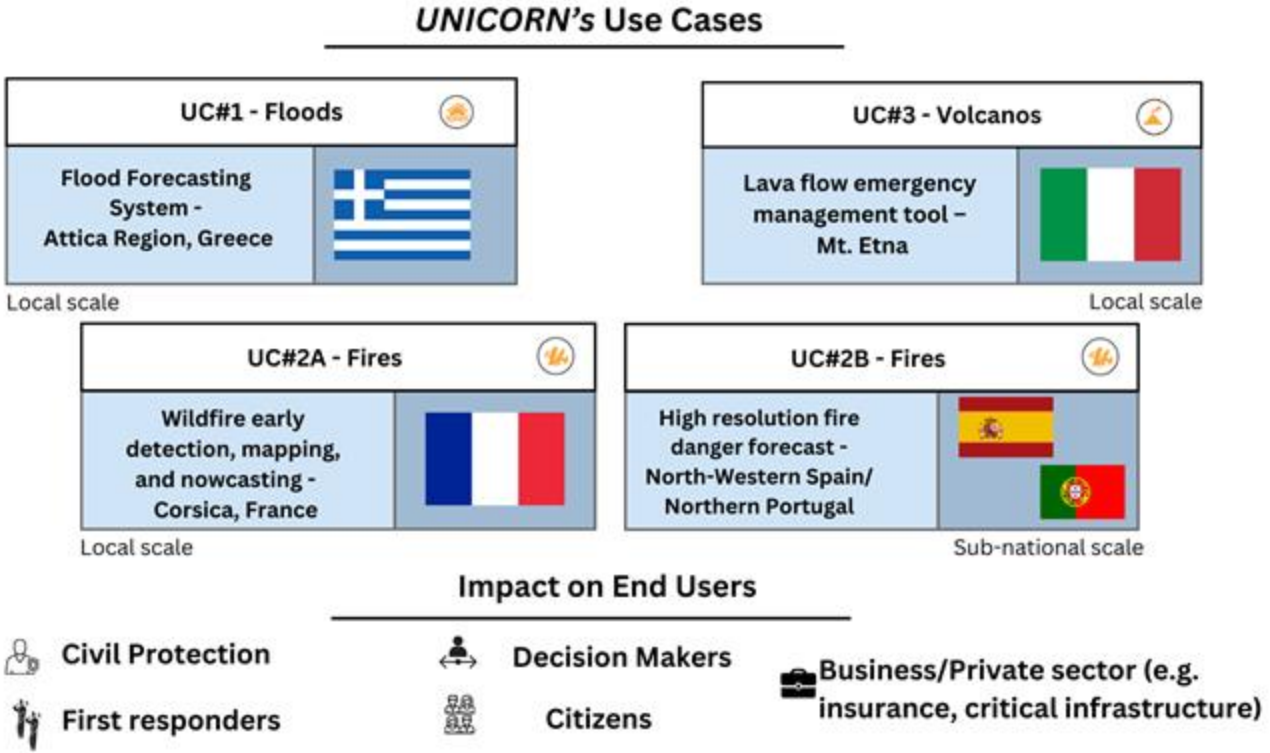

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Use Case #1

Flood Forecasting integrating Copernicus data and weather forecast fusion, Mandra river basin, Greece

Flood events in urban and peri-urban areas threaten lives, infrastructure, and economies, especially in flash flood-prone regions like Mandra, Greece, where a 2017 flood caused 24 fatalities. Use Case #1 enhances flood forecasting by integrating high-resolution WRF-ARW weather forecasts (2×2 km grid), Copernicus soil moisture data, and real-time observations from three hydrometeorological stations. The service employes dynamic matching of observed and forecasted conditions to select best-fit scenarios from pre-run hydrological and hydraulic simulations using updated Curve Numbers (CN) and high-resolution DEM (2 m), providing flood extent and depth mapping for the next two days without real-time model execution. This rapid scenario-matching approach enables civil protection, first responders and decision makers to make data-driven decisions. By combining Copernicus Earth Observation data, real-time hydro-meteorological measurements, and advanced computing, the system improves flood prediction accuracy, enhances early warnings, and supports civil protection and emergency response.

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Use Case #2A

Copernicus-based wildfire early detection, mapping and nowcasting, Corsica Island, France

Use Case #2A develops an advanced wildfire management system for Corsica, France, tested in North Corsica after the 2017 Olmeta di Tuda fire. The system follows a three-tier approach: rapid fire detection using AI on multi-source satellite data (MODIS, VIIRS, Sentinel-3, Meteosat), precise burned area mapping and impact assessment via Sentinel-2, and fire propagation nowcasting based on weather forecasts and AI-processed land cover data. Engaging local stakeholders like SIS2B, forest services, and emergency responders, the system leverages Copernicus data and AI to optimize fire suppression strategies.

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Use Case #2B

High-resolution fire danger forecast, North-Western Spain/Northern Portugal

Unlike other natural hazards, most wildfires in Europe are human-induced. Monitoring fire risk in combustible and reforested areas requires collaboration between public and private institutions, as highlighted by the EU Forest Strategy. Use Case #2B analyzes wildfire danger and risk in specific regions, assessing mitigation measures, insurance sector involvement, and real-case scenarios in reforested areas. The focus is on the northwestern Iberian Peninsula, a diverse landscape of public and private forests, including reforestation zones. By integrating data science, AI, HPC, and GIS, the study evaluates the ability to predict ignition potential in the target area.

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Use Case #3

Lava flow emergency management tool based on Copernicus data merged with numerical modelling, Sicily Island, Italy

Use Case #3 develops a prototype emergency management tool for lava flows, using Mount Etna (Sicily, Italy) as a case study. The system integrates lava flow alerts, satellite-based monitoring, flow simulations, and modeled loss forecasts for ongoing eruptions. Designed for emergency managers, governments, and businesses, it enhances preparedness and disaster response. Additionally, it can support parametric insurance structures, offering a valuable resource for the (re)insurance sector.

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Stakeholders

Industry

Infrastructure, logistics, insurance, energy

Civil protection authorities

Emergency management services

Policy making bodies

Local/ Regional/ National administrators

First responders

Firefighters, medical services, rescue teams

Society

Civil society organisations, citizens

Scientific community

Academia, Researcher

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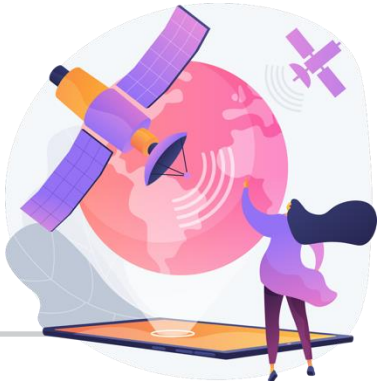

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