TEMA

TRUSTED
EXTREMELY PRECISE
MAPPING AND PREDICTION
FOR EMERGENCY
MANAGEMENT

TEMA Overview

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Data Week 2023 - AI and Data Spaces for sustainable smart city

Funded by the European Union

This project has received funding from the European Union's HE research and innovation programme under the grant agreement No. 101093003

The Project at a Glance

PROJECT NAME:

TEMA
Trusted Extremely Precise Mapping and Prediction for Emergency Management

CALL:

HORIZON-CL4-2022-DATA-01-01
Methods for exploiting data and knowledge for extremely precise outcomes (analysis, prediction, decision support), reducing complexity and presenting insights in understandable way (RIA)

Project Consortium:

19 partners
from 8 European countries,
key players in the fields of data analysis, AI, modelling, drone technologies, simulation and visualization, analytics and cloud computing, as well as policy counselling
and emergency response authorities/public bodies.

Project Duration:

48 months.
Starting date: 1 December 2022

Budget:

€ 11.340.223,50

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Motivation

Project’s Motivation

Climate change is leading EU countries to experience increasingly frequent and damaging adverse climatic events, such as large **fires and flooding**.
The impact of these events is expected to make **EU increasingly vulnerable** due to the magnitude and frequency with which they will occur in the coming years.

According to the Emergency Events Database (EM-DAT), natural hazards have cost about **3 trillion dollars** of economic destruction and **1.3 million casualties** with more than **4.4 billion people injured** between 1998 and 2017. [1]

In Europe, between 1980 and 2020, disasters affected nearly **50 million people** and caused economic losses of roughly **€12 billion per year**. [2]

Technologies related AI, XAI and XR, which are useful for solving NDM (Natural Disaster Management) problems, have reached a very high degree of maturity compared to just a few years ago.

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The Project Vision

The Vision

TEMA aims to develop beyond-state-of-the-art technologies for facilitating Natural Disaster Management, by dynamically exploiting **data sources and Artificial Intelligence technologies** in order to provide an accurate assessment of an evolving crisis situation.

The **goal** is to deliver a technical solution that is supportive in disaster response and management by **bringing situational data** to relevant end-users, enabling transferability to tackle different disaster types in various geographic regions, thus providing the **relevant information** that can help make the best possible **operative decisions**.

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Objectives

Main Objective

TEMA will be an AI-enabled **NDM platform** which will be validated and demonstrated in two socially important cases: **forest fires and floods**.

Advanced AR-enabled **TEMA** visualization will be **interactive, intuitive and accessible**. It will allow human operators to understand complex NDM phenomena and easily evaluate alternative **response strategies**, by smart selection of platform parameters and by novel ways of combining heterogeneous (visual and non-visual) data and/or AR.

Moreover, **TEMA** will provide a scalable and efficient **NDM-Analytics-as-a-Service** (NDM-AaaS) for making the developed advanced analytics tools available over the cloud.

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Specific Objectives

Improve Natural Disaster Management

using new digital technologies and extreme data analytics;

Improve and accelerate

extreme data analytics,
by increasing trustworthiness,
accuracy and responsiveness of
extreme data analysis algorithms;

Improve and accelerate

emergency phenomenon modeling, evolution predictions, simulation and interactive visualization.

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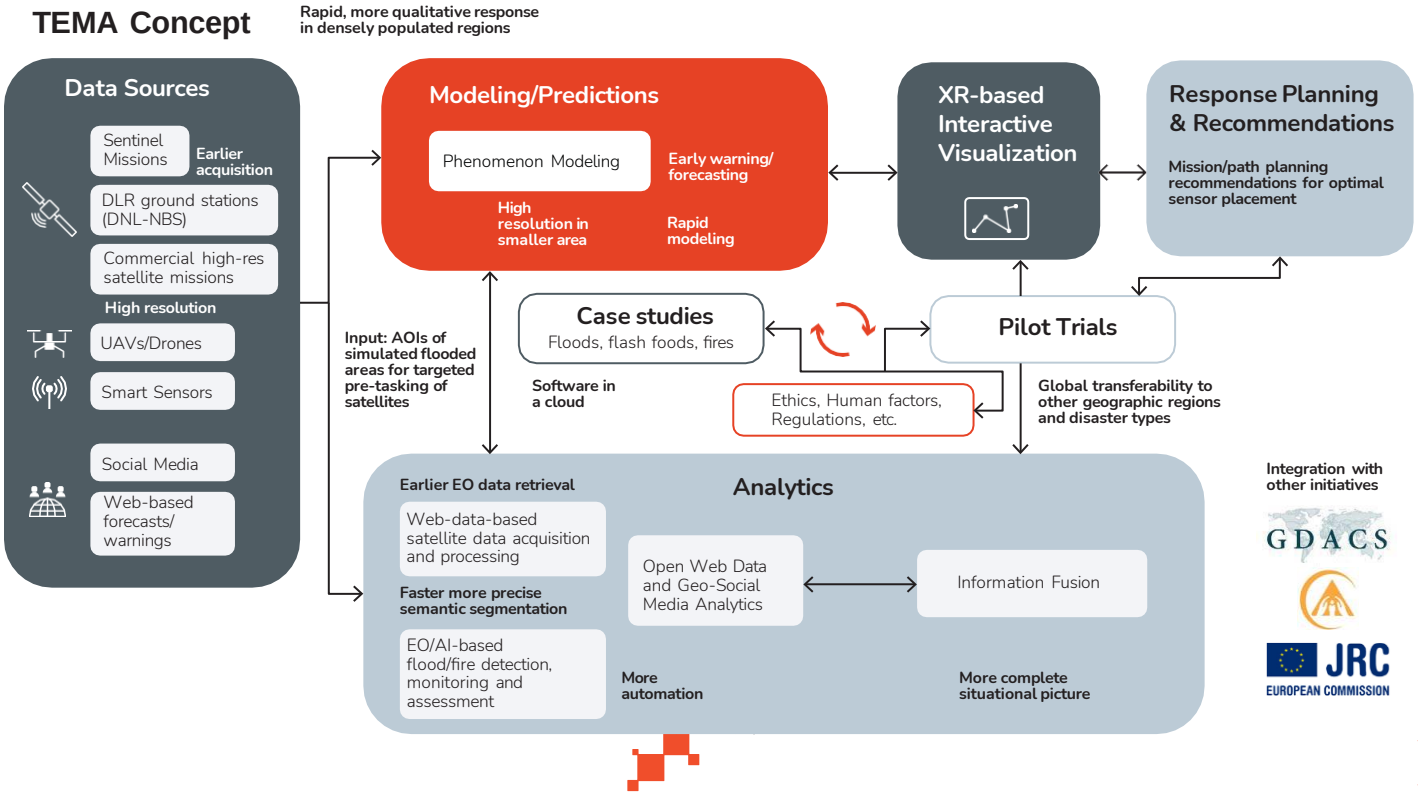
Approach

Concept


TEMA Concept
Rapid, more qualitative response in densely populated regions
Data Sources
Sentinel Missions
Earlier acquisition
DLR ground stations (DNL-NBS)
Commercial high-res satellite missions
High resolution
UAVs/Drones
Smart Sensors
Social Media
Web-based forecasts/ warnings
Modeling/Predictions
Phenomenon Modeling
Early warning/ forecasting
High resolution in smaller area
Rapid modeling
XR-based Interactive Visualization
Response Planning & Recommendations
Mission/path planning recommendations for optimal sensor placement
Input: AOIs of simulated flooded areas for targeted pre-tasking of satellites
Case studies
Floods, flash foods, fires
Software in a cloud
Pilot Trials
Ethics, Human factors, Regulations, etc.
Global transferability to other geographic regions and disaster types
Analytics
Earlier EO data retrieval
Web-data-based satellite data acquisition and processing
Faster more precise semantic segmentation
EO/AI-based flood/fire detection, monitoring and assessment
Open Web Data and Geo-Social Media Analytics
Information Fusion
More automation
More complete situational picture
Integration with other initiatives
GDACS
JRC
EUROPEAN COMMISSION

Pilots

Germany

1. Central-European Regional Floods Pilot site: Bavaria

Central Europe, due to presence of big rivers, can experience heavy persistent rains that cause regional floods.
In this pilot, the objective of TEMA is to provide information to be used to warn the responsible authorities, population and public protection, and provide information about the accessibility of the affected region leading to improved NDM.

Greece

2. Mediterranean Flash Floods Pilot site: Municipality of Mantoudi-Limni-Agia Anna

In the Greek pilot, a flood model will be set up for the area and calibrated based on information retrieved from historic flood events as well as near-real-time information coming from the observations of streamflow gauges.

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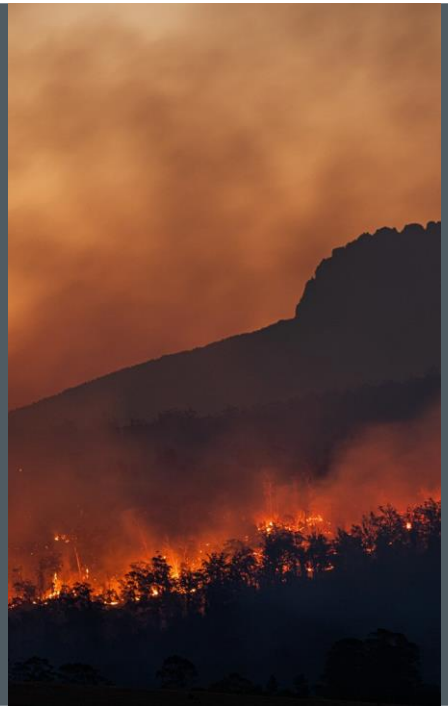
Pilots

Italy

3. Mediterranean Forest Fires

Pilot site: Montiferru (Sardinia)

The forest fire scenario will be played out with available data about the area vegetation, geomorphological data, damage details and safety procedures that have been adopted, output of meteorological models, forecast fire danger bulletins, satellite images, videos from drones filming the burnt area. The TEMA platform will also be used for examining the conditions of post-event territory, with particular regard to the implications for geomorphological risk.

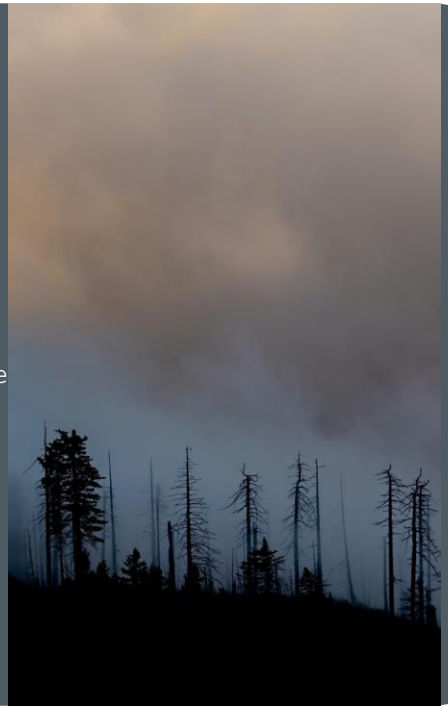


Finland

3. Finnish Forest Fires

Pilot site: Kainuu area

The pilot will provide a study case on forest fire management operations through the aggregation of environmental data sources, both existing and collected during the project. These datasets will be enriched with earlier reports on prevention strategies. It will be possible to examine and improve procedures for managing disasters and for decision making.



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Results and Benefits

Key Results

Advanced real-time visual and social media analytics software

Advanced federated analytics middleware for edge-to-cloud continuum paradigms

Near-real-time forest fire and flood modeling software

NDM-AaaS software

A set of proposed technical standards for extreme data analysis

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Meet the Consortium

Intro Presentation draft

Meet the Consortium

The Consortium

ARISTOTLE UNIVERSITY OF THESSALONIKI

Atos

Bayerisches Rotes Kreuz

DLR Deutsches Zentrum für Luft- und Raumfahrt German Aerospace Center

ENGINEERING THE DIGITAL TRANSFORMATION COMPANY

Fraunhofer HHI

KAMK · University of Applied Sciences

PELASTUSLAITOS KAINUU

KEMEA

LATITUDO 40

Nelen & Schuurmans

NORTHDOCKS

PARIS LODRON UNIVERSITÄT SALZBURG

REGIONE AUTÒNOMA DE SARDIGNA
REGIONE AUTONOMA DELLA SARDEGNA

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theLisboncouncil think tank for the 21st century

UNIVERSIDAD D SEVILLA

Università degli Studi di Messina

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Thanks for Your Attention

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