PLOTO project

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Horizon Innovation Actions | Project no. 101069941

Co-funded by
the European Union

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PLOTO project in a nutshell

- **Project name:** Deployment and Assessment of Predictive modelling, environmentally sustainable and emerging digital technologies and tools for improving the resilience of IWW against Climate change and other extremes
- **Start date**: 01/09/2022
- **End date**: 28/02/2026
- **Grant Agreement number**: 101069941
- **Maximum grant amount**: 7.497.694,38 EUR
- **Topic**: HORIZON-CL5-2021-D6-01-09 - Climate resilient and environmentally sustainable transport infrastructure, with a focus on inland waterways
- **Number of partners**: 20
- **Number of countries**: 8

PLOTO project in a nutshell

The EU-funded project PLOTO aims to address:

a) multi-hazard risk understanding,

b) smart prevention and preparedness, as well as

c) faster, adapted and efficient response.

PLOTO proposes a new integrated system to support operational and strategic adaptation and mitigation measures, by better absorbing and efficiently recovering from climate change impacts (including extreme events). The overall goal also includes increasing the resilience of Inland Water Ways (IWW).

Challenges (1/2)

- **Green Deal (11 December 2019)**
  - Initial roadmap of the necessary **key policies** and **measures**
  - Tackling **climate** and **environmental-related** challenges
- The development of European **green ports** & **multimodal hubs of the future** to 2050 is not only linked to **infrastructure**, but also to:
  - **Smarter** approaches
  - More **efficient**, **innovative** technical solutions
  - **Sustainable** management of goods and freight flows
  - **Seamless** integration of the port community and inland multimodal terminals & hubs, balancing environmental effects and economic requirements

Challenges (2/2)

- **Freight transport and logistics sectors**
  - **Vital** to the EU's Single Market, and for Europe's prosperity
  - **Well-performing** and **dynamic** -> improve overall **productivity** and **competitiveness**
  - **Global freight traffic** is anticipated to **triple** for inland modes in the next 30 years
  - In the **EU**, surface freight traffic is expected to **rise** by **53%** by **2050**
- **<u>Sector growth not without complications</u>:**
  - **Saturated infrastructure, carbon emission goals, energy constraints**
- **Smaller ports** are in urgent need of a **concrete roadmap** to **sustainability** that has ready-to-use cases

Use cases and scenarios

PLOTO will perform extensive tests in **three** different demo sites (Belgium, Hungary, Romania)

- **Case Study A**: Danube Area, including the waterways and inland ports
- **Case Study B**: Budapest port (inland) connected to the railway
- **Case Study C**: Region of Wallonie in Belgium

The demonstration will focus on the following **main objectives**:

1) Improve **multiple-hazard assessment** and **strategic management** for **protection** of the IWW ports and sections
2) Improve **strategic** and **operational decision making**
3) Test the various **PLOTO outcomes** in **real-scale critical parts** of the IWW

Methodology

PLOTO is a purely technological project, but driven by the actual needs of the end-users via:

- **Designing pilot activities** (scheduled within the project lifetime)
- **Adopting an agile development** and **start-up mentality**
- **Producing early prototypes** validated with stakeholders in **intermediate** schedules for **continuous amelioration**
- **Engaging an interdisciplinary** team of experts

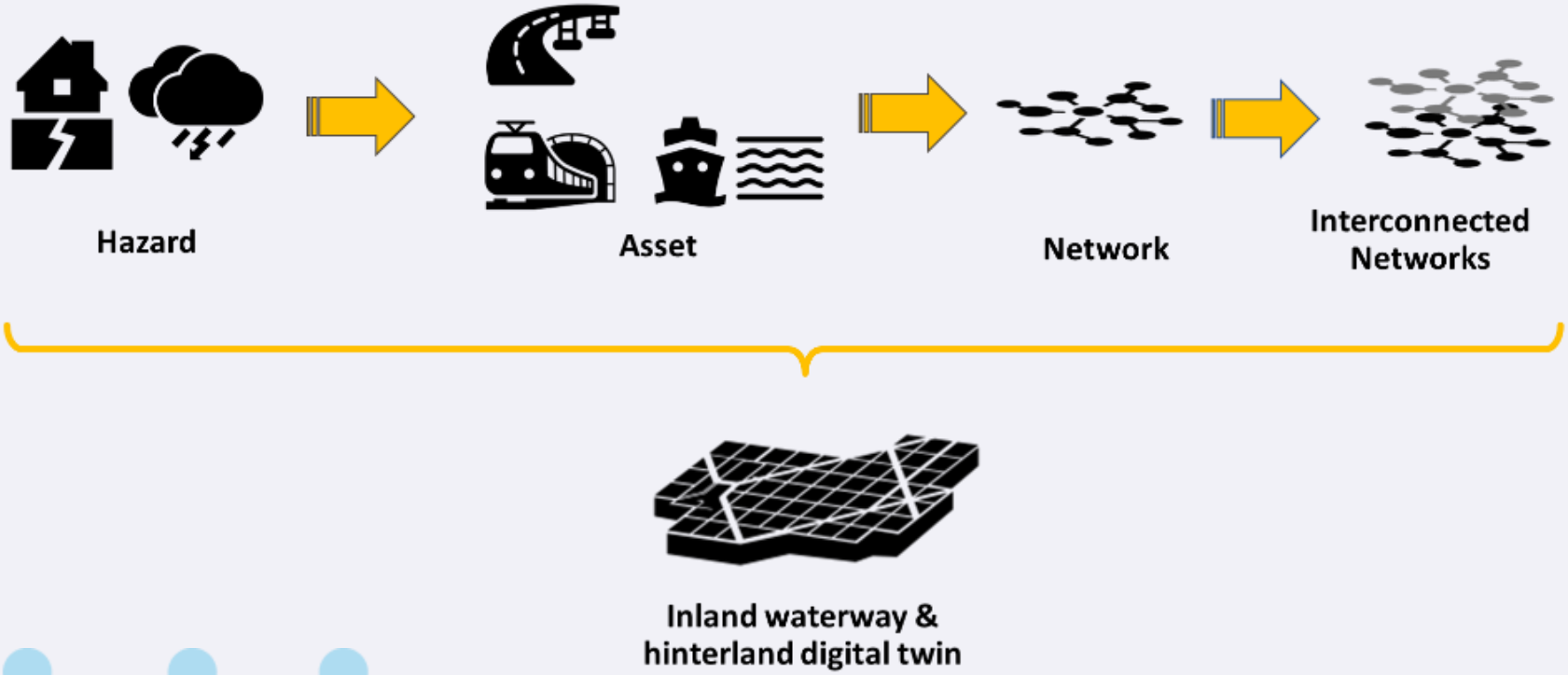
Methodology

PLOTO technological backbone includes:

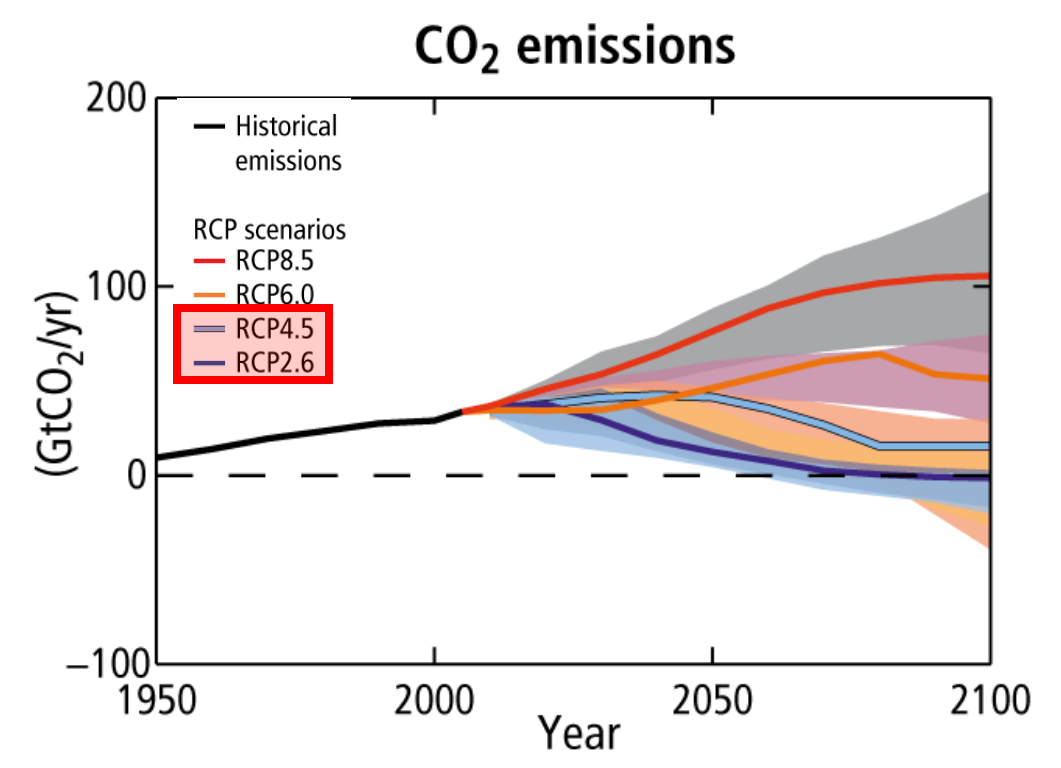
1. Climate, Atmospheric Forcing, and Multi-Hazard Modelling
2. Multi-Hazard Vulnerability Modules and Assessment Toolkit (MHVAT) for IWW and assets
3. Improved Computer Vision (CV) Techniques and ML Techniques
4. Remote Sensing, including Quick Assessment Damage Maps, Fore-Now/Casting Weather Predictions Methods & Tools
5. PLOTO Middleware and Data Fusion (DF)
6. IWW Assessment Tool (IWAT) and IWW Digital Twin (DT)
7. Enhanced visualisation Common Operational Picture (COP)
8. Incident Management System (IMS) and Decision Support System (DSS)

PLOTO modular design

- A modular design is adopted to connect hazards, exposed assets and interconnected infrastructure networks to form a digital twin of the IWW that interacts with all PLOTO modules to efficiently transfer and process sensor data

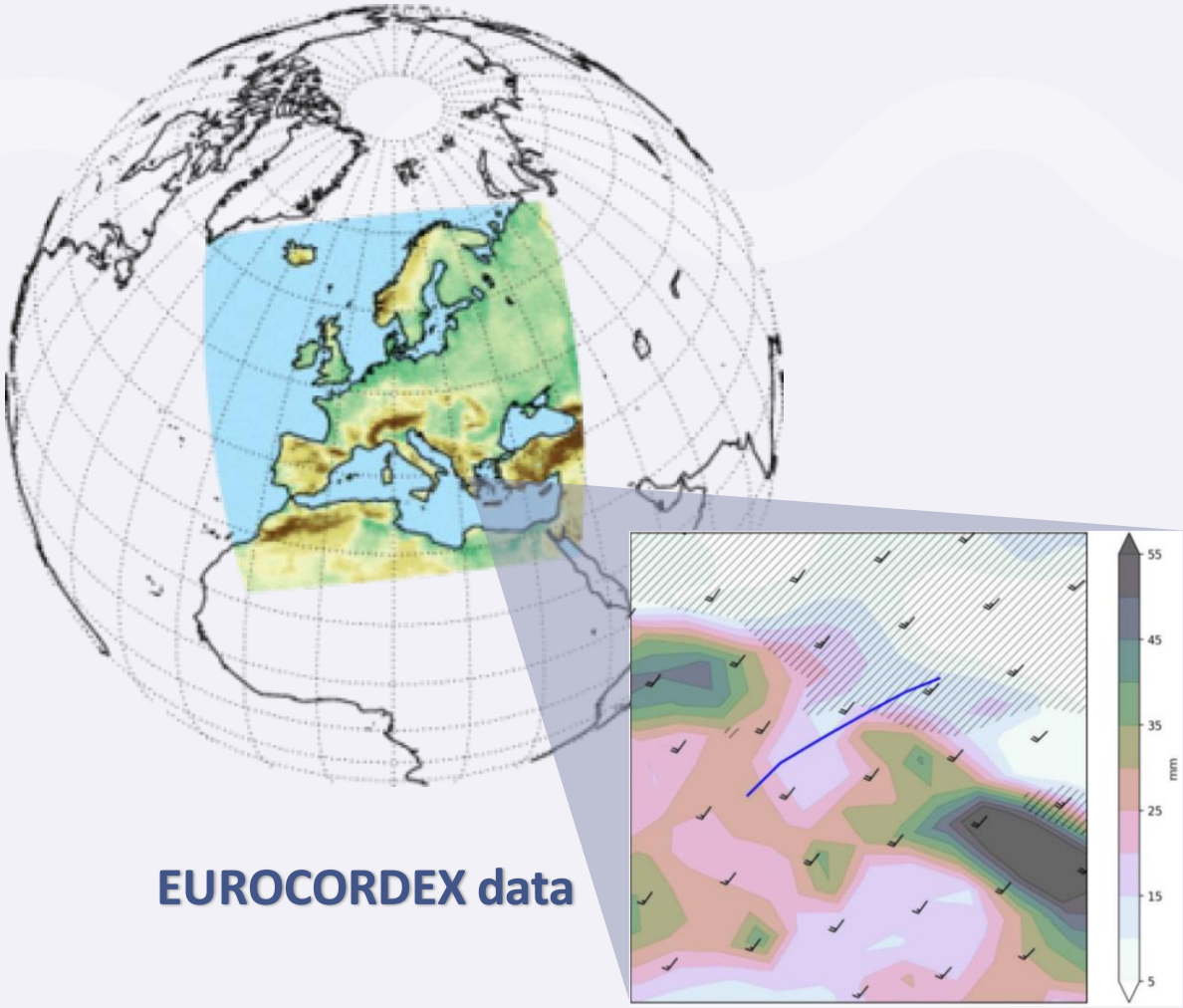


Hazard – Climate change



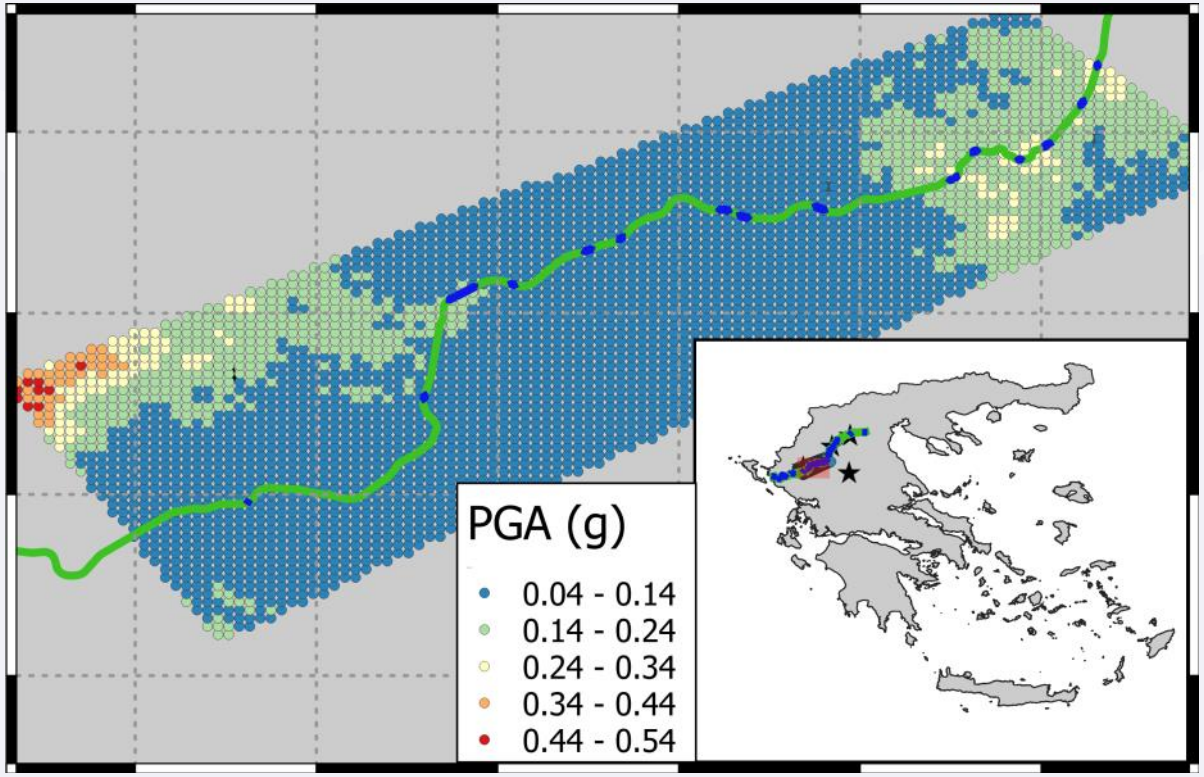
https://ar5-syr.ipcc.ch/topic_futurechanges.php

Alternative Climate Change scenarios



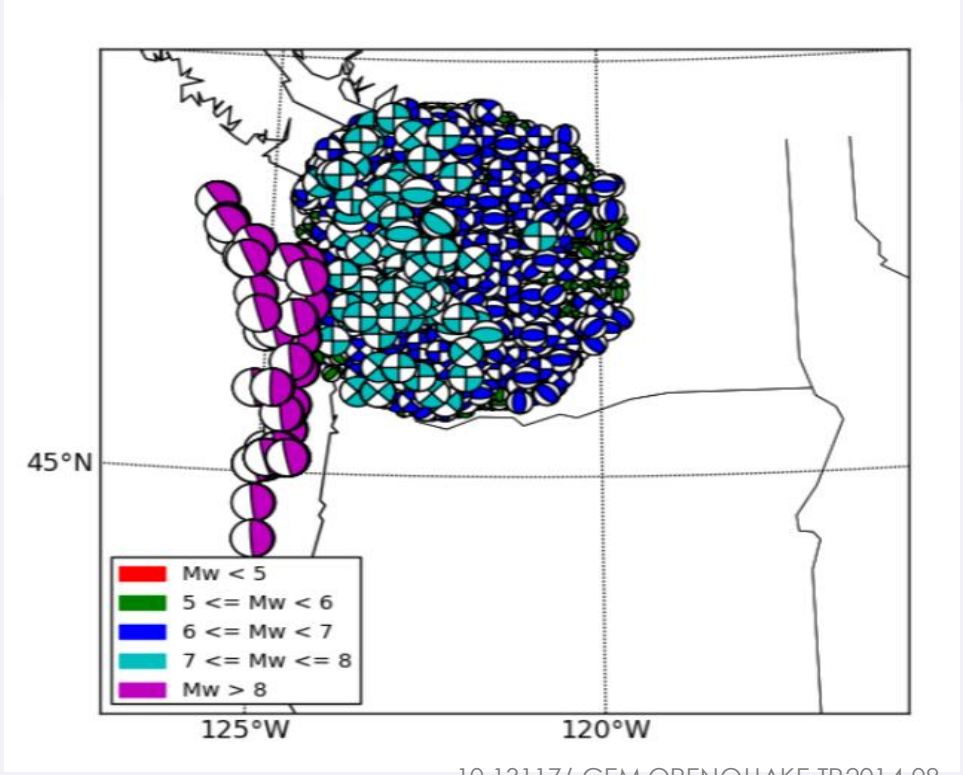
EUROCORDEX data

Hazard – Earthquake



Ground Motion Field

Spatially correlated intensities



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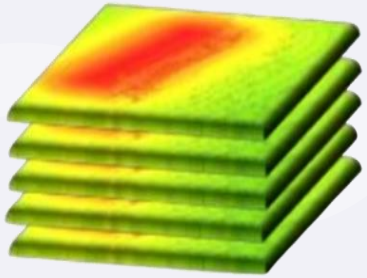
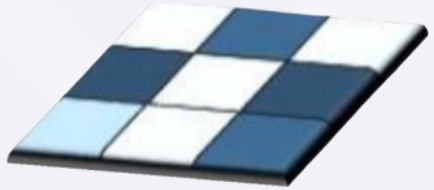
Stochastic event set

Each event = one GMF

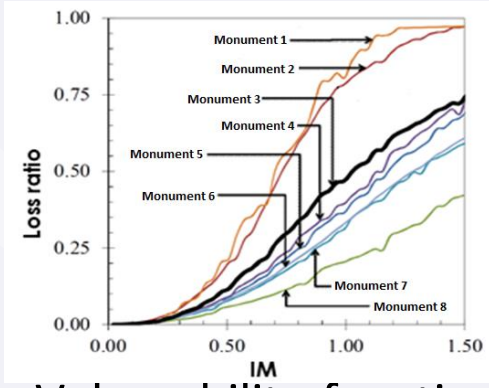
Impact per hazardous event & aggregation



Intensity Measure fields

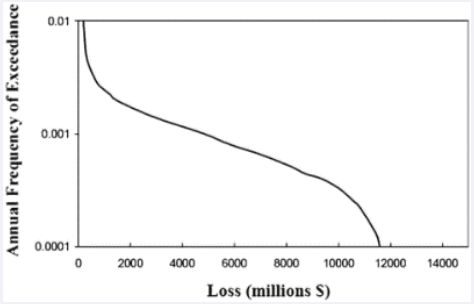


Exposure model

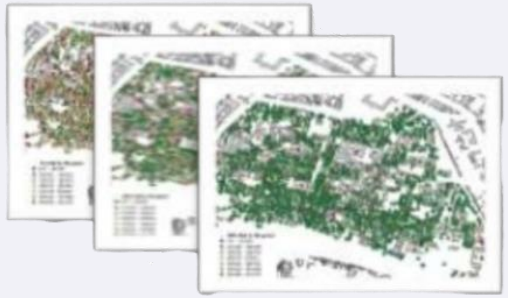


Vulnerability functions

Analysis…



Loss curve



Loss map

Target groups

- Regional/national water authorities
- Ministries of transport
- Freight companies
- Passenger organisations/associations
- Reinsurance companies
- Shipping industries
- Relevant research and industry community dealing with hydrological and climatic modelling, remote sensing and ground monitoring for IWW
- Standardisation organisations at EU and global level

Outcomes

1. Climate-aware crisis management by providing real-time information of the weather conditions
2. Risk models and assessment of the IWW elements' vulnerability under multiple hazards
3. Analysis framework to enable the flow of information from hazard to system risk/resilience
4. System that integrates data from three (3) remote sensing levels: satellites, UAVs and ground based, with the focus on optimal use of different sensor types
5. Modelling and simulation environment for assessing the resilience of IWW and potential impacts due to various hazards
6. PLOTO integrated prototypes and execution of the project's pilots based on the defined scenarios

Impacts

1. Ensure navigability for inland waterways by assuring at least 50% capacity during extreme weather events
2. Enhance infrastructure resilience to extreme weather and human caused events by assuring at least 80% capacity at network level during the disruptions
3. Ensure resilience and smooth functioning of passenger mobility and freight transport / logistics networks operating on these infrastructures
4. Increase the use of recycled materials within or across transport modes by at least 30%
5. Reduce environmental impact (emissions, soil/water pollution, degradation of ecosystems) during construction, maintenance, operation and decommissioning of the infrastructure in line with the EU environmental legislation

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