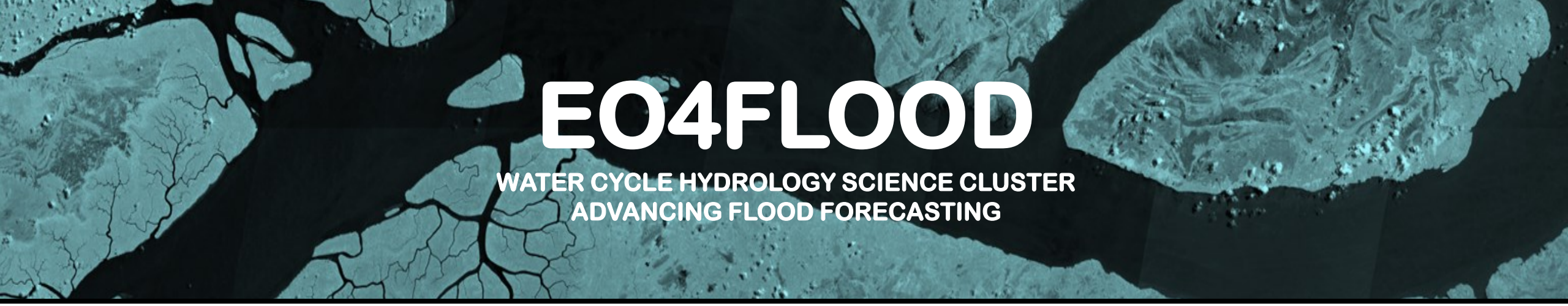
EO4FLOOD
WATER CYCLE HYDROLOGY SCIENCE CLUSTER
ADVANCING FLOOD FORECASTING

Overview

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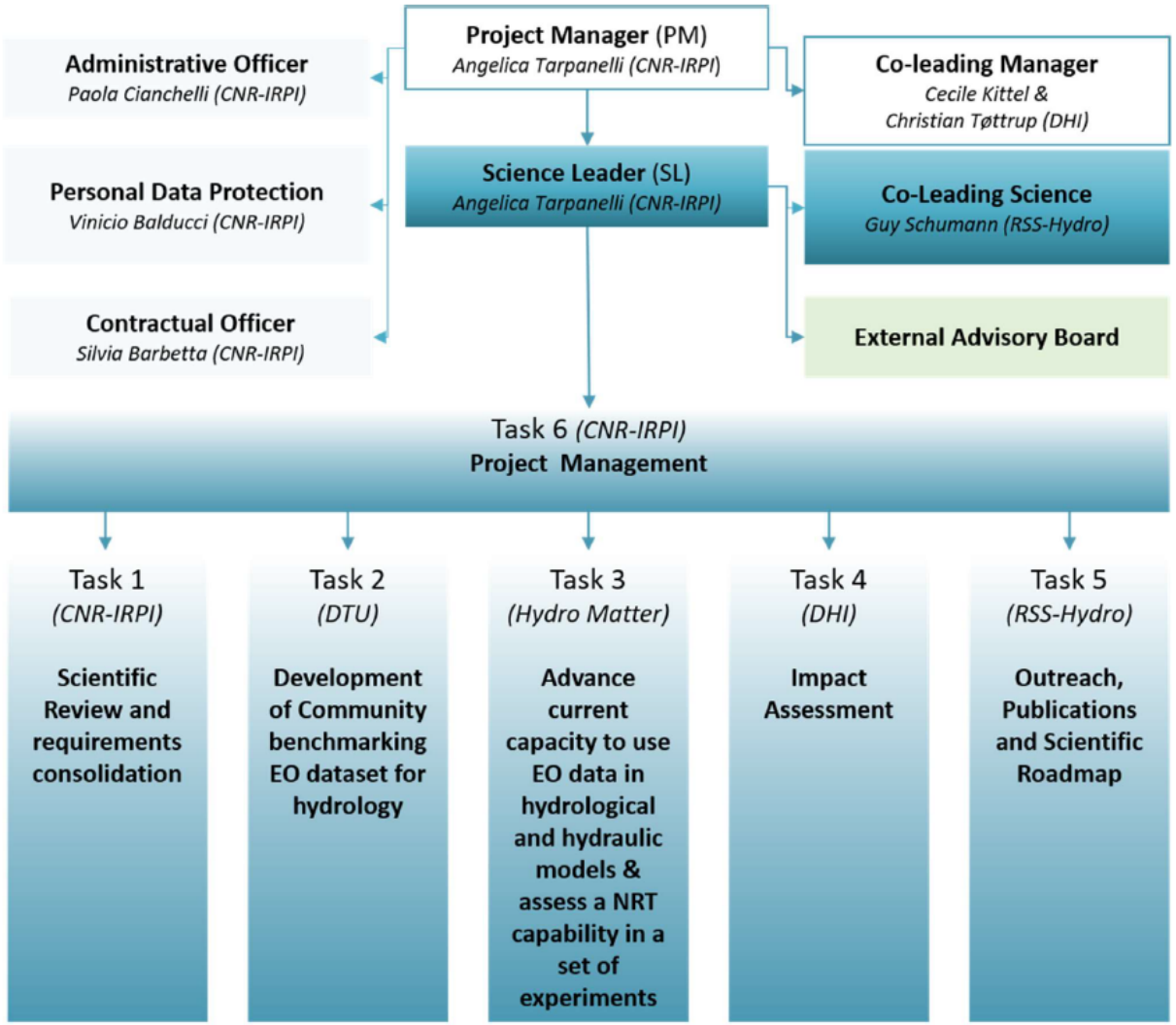
Management structure



Project overview

Task 1: Scientific Review and requirements consolidation (CNR-IRPI)

WP110 (CNR-IRPI)
Consolidation of the scientific requirement of the proposal

Task 2: Development of Community benchmarking EO dataset for hydrology (DTU)

WP210 (DTU)
EO dataset

WP211 (CNR-IRPI) - Precipitation
WP212 (CNR-IRPI) - Soil Moisture
WP213 (Magellium) - Snow
WP214 (GIS) – River Width
WP215 (CNR-IRPI) - Reflectance Indices
WP216 (DTU) - Multi-mission Water Level
WP217 (DTU) – Water Surface Slope
WP218 (CNR-IRPI) - River Discharge
WP219 (GMV) - Flood Extent

WP220 (TUM)
Quality Control

WP230 (CNR-IRPI)
Historical in-situ dataset

WP240 (GIS)
Uncertainty

Project overview

Task 3: Advance current capacity to use EO data in hydrological and hydraulic models & assess a NRT capability in a set of experiments (Hydro Matters)

- **WP310 (DHI)** Hydrological modelling
- **WP340 (DHI)** Regionalization analysis
- **WP350 (TUM)** Near Real Time EO dataset
- **WP320 (CNR-IRPI)** MCP Probabilistic forecast
- **WP360 (Magellium)** Near Real Time Application
- **WP330 (RSS-Hydro)** Flood modelling
- **WP370 (GMV)** Validation

Task 4: Impact Assessment (DHI)

- **WP410 (DHI)** Impact of dam in the river regime
- **WP420 (RSS-Hydro)** Land use change impact in floods
- **WP430 (SMHI)** Population trends, flood dynamics and impact on flood exposure

Task 5: Outreach, Publications and Scientific Roadmap (RSS-Hydro)

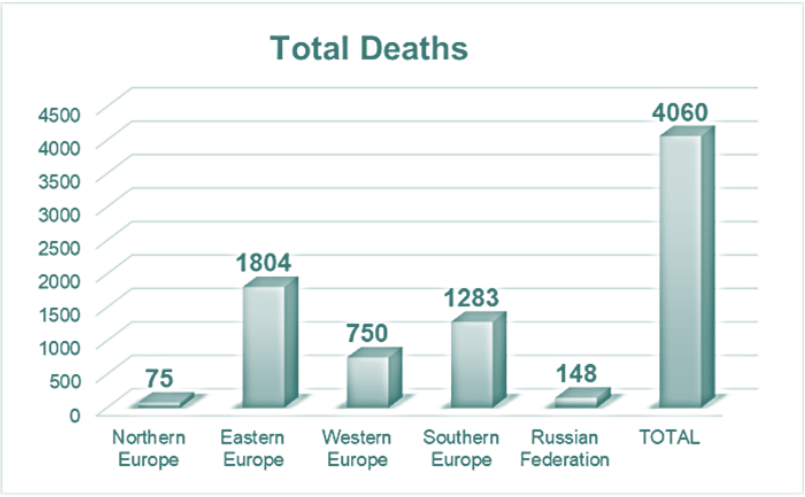
- **WP510 (GMV)** Dissemination
- **WP520 (RSS-Hydro)** Publications
- **WP530 (CNR-IRPI)** Roadmap

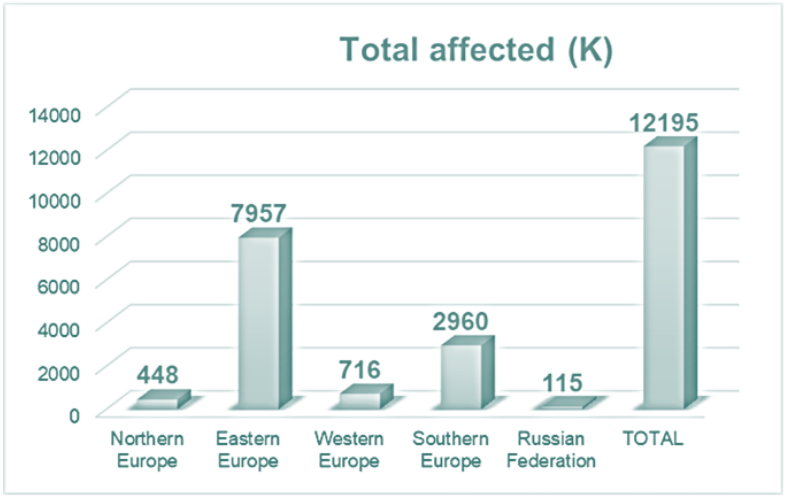
Scientific and technical objectives

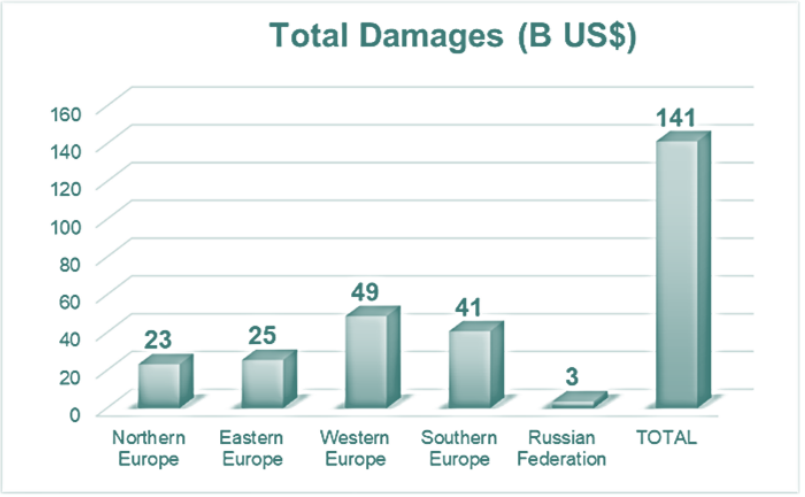
Floods are one of the most common and costly natural hazard.

Catastrophic floods endager lives and cause human tragedy

as well as heavy economic losses.







Data elaborated by the EM-DAT, *The International Disaster Database*

Scientific and technical objectives

Flood Forecasting System (FFS) can mitigate the societal impacts of flood events.

Key variables of historical input data:

Satellite data offer a solution to provide broad spatial and temporal coverage

- Precipitation	GPM every 30' at 0.1° (IMERG as real time product)
- Soil moisture	SMAP, AMSR2, ASCAT with resolutions and revisit time good for FFS. Potential improvements with Sentinel-1 and CYGNSS
- River discharge	From altimetry (Cryosat-2, Sentinel-3 , -6, SWOT), optical sensors (NIR or visible) by rating curves
- Flood extent	SAR (Sentinel-1, TerraSAR-X and COSMO-SkyMed)

Scientific and technical objectives

The integration with EO data has a high chance to enhance forecast accuracy and expand flood forecasting capabilities globally. The integration of EO products within the flood forecasting system has four main purposes:

1) Data forcing

2) Setting initial conditions

3) Model calibration

4) Data assimilation framework

It is time to invest in the development of the integration of all these systems in order to provide timely and accurate products for flood forecasting activities, by maximising the use of available observations from ground-based and remote instruments into available models.

Scientific and technical objectives

EO4FLOOD aims to develop a new generation of flood forecasting systems that synergistically integrate cutting-edge EO data, advanced hydrological models and AI tools. The goals of this initiative are structured around three main pillars:

Development of an Advanced Open Earth Observation (EO) Dataset (EO4FLOOD dataset)	Utilization of the EO4FLOOD Dataset in Flood Forecasting Models	Demonstration of the EO Data and Models' Utility for Science and Society
Provide viable information to the global scientific community for enhanced flood forecasting.	Enable more accurate and timely predictions that can be crucial for effective disaster preparedness and response, also assessing predictive uncertainty	Improve environmental representations and create advanced, purpose-built tools for decision-makers, enhancing both scientific understanding and practical, real-world applications.

Scientific and technical objectives

Limitations:

- **latency** at 3-5 days is a challenge for their applicability to small-medium basins
- The request for (quasi) **global coverage** from EO products can be hardly obtained for river discharge due to the hydrological complexity and its spatial and temporal variability
- The **daily resolution** is not guaranteed because the temporal resolution of current satellite products is lower and the current multi-mission techniques can provide only up to 3 days of temporal resolution for medium basins.
- **Availability of in-situ data** (limited in-situ stations, especially in remote or inaccessible regions)
- Assumption of **readiness** of some technologies such as AI is misleading (ongoing research and development needed to address technical challenges and ensure the reliability and accuracy of these technologies in real-world applications)

Scientific and technical objectives

EO4FLOOD aims to advance flood forecasting systems by conducting testing and evaluation of the most advanced satellite products available integrating them into operational flood forecasting systems.

By leveraging the strengths of both satellite and in-situ data, we aim to demonstrate the maturity of satellite products for implementing a robust and reliable forecasting framework capable of providing timely and accurate predictions of flood events.