



HAZRUNOFF

PROJECT

*Integration of **sensing** and **modelling** technologies for **early detection** and follow-up of hazmat and flood hazards in **transitional and coastal waters***



Funded by
European Union
Civil Protection
and Humanitarian Aid

HazRunoff at a Glance



Programme: **DG ECHO** - Directorate-General for European Civil Protection and Humanitarian Aid Operations



Start date: January 2018
End date: March 2020



Total budget: 643,770.10 €
EU Grant: 482,827.57 € (75%)



Main Aim:

To increase preparedness and response capacity on floods and pollutant hazards in rivers, transitional and coastal waters, through the development of a situational **awareness and emergency response framework** and associated **tools**, capable of **supporting civil protection units and water pollution authorities**.



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Partners and associated partners



- Instituto Superior Técnico, IST (*Coordinator*)
- Bentley Systems Portugal
- Câmara Municipal de Loures
- Portuguese National Authority for Civil Protection



- Centre de documentation, de recherche et d'expérimentations sur les pollutions accidentelles des eaux, CEDRE
- French Navy



- Centro Tecnológico del Mar - Fundación CETMAR
- Augas de Galicia



- EOMAP GMBH & CO KG
- BfR -German Federal Institute for Risk Assessment



- Public Health England (PHE)
- UK Maritime Coast Guard Agency



<http://www.hazrunoff.eu/>



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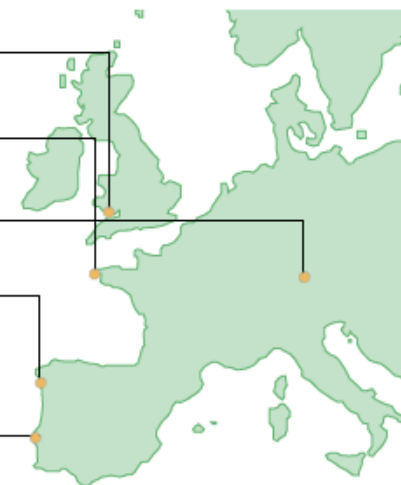
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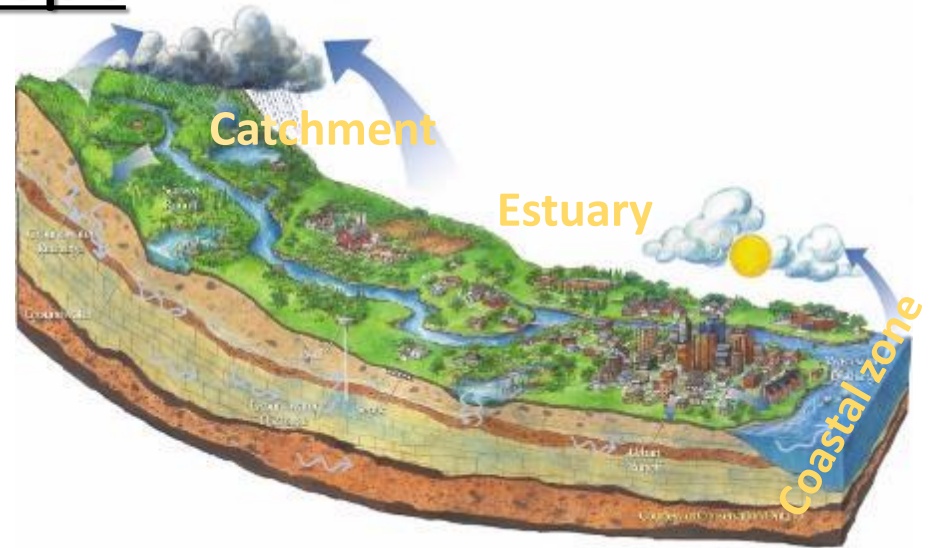
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HazRunoff objectives & scope

- To fill the gaps around knowledge and preparedness involving early warning & detection, follow-up, and response to flooding and hazmat contamination in **inland, transitional and coastal waters**, including urban areas,



- integrating:

- in-situ** sensing technologies
- airborne** (UAV/drones) and **satellite** remote sensing
- holistic high-resolution **modelling**
- operational tools (web platform)** for situational **awareness** and **crisis management**
- improved **contingency planning** and adapted **protocols for response and communication**

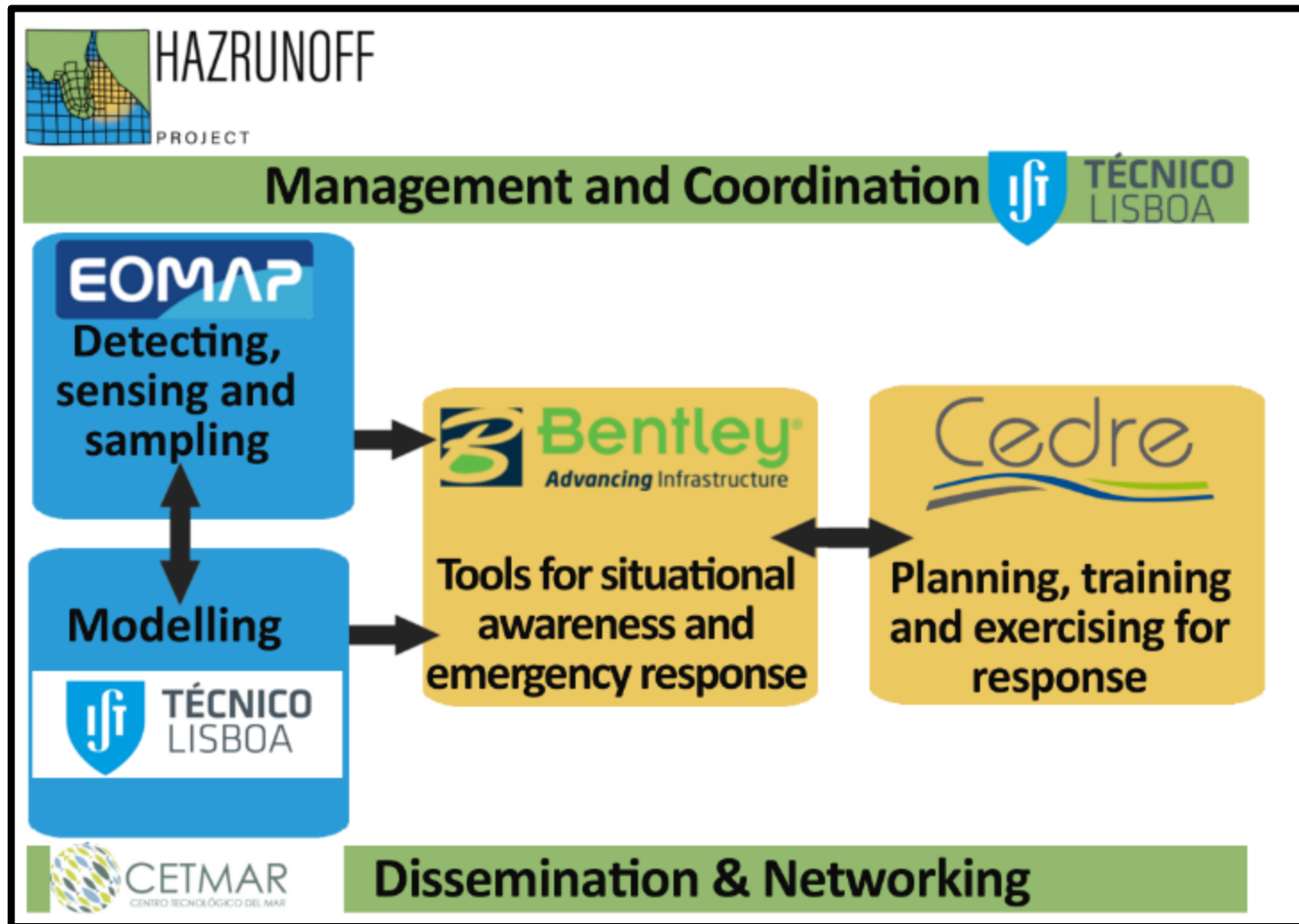


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HazRunoff Work Streams





Natural hazards are usually associated to Extreme meteorological events!

The capacity to forecast meteorology and its implications on storm surge and on river discharge is essential to deliver alerts and to plan crisis management.

The capacity to follow the crisis evolution is based on the capacity to collect actual data: satellites and drones are the most suitable platforms .

Communication of actual data during the crisis using web services is convenient.

Simulation of scenarios and training based on those scenarios is essential to create awareness and for training.

Modelling

To simulate and **integrate the water continuum from the watershed up to the estuary** to reproduce and forecast the processes associated with floods and the dispersion of pollutants

«To be implemented in each pilot area»

Meteorological modelling

To simulate and forecast meteorological variables with the adequate horizontal resolution

Watershed modelling

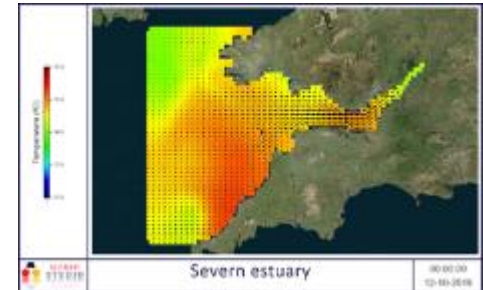
To estimate river flows in regular and extreme conditions

Estuarine modelling

To simulate estuarine circulation including storm surge and floods

Urban storm water modelling

To simulate the water drainage in the main cities associated to the pilot study cases



Integrated flood modelling

To implement a method for full coupling watershed, estuarine and urban drainage models

Pollutants, thrash and debris dispersion modelling

- Radioactivity dispersion in water bodies
- Air dispersion modelling



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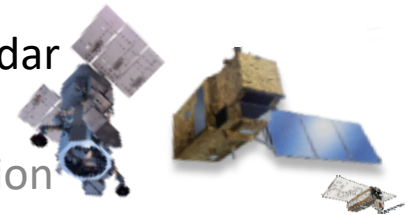
Detecting, sensing and sampling

Data acquisition and measurements regarding **flooding and water contamination**. Early detection and warning and contribution to **model initialization and validation**

APPROACHES:

-Remote sensing: Satellite optical sensors, synthetic aperture radar (SAR) and hyperspectral

Water level, turbidity, oil slick identification and chemical spill detection



-Integration of in-situ environmental data:

Rivers control stations: water quality (pH, dissolved oxygen, temperature, conductivity and turbidity, etc.) and flowrate.

Laboratory measurements of chemicals behaviour and fate



-Unmanned Aerial Vehicles (UAV):



Identification and mapping of floods (environmental parameters characterisation) and water pollution

-Gap analysis and assessment of sentinels and indicators

Review monitoring and detection technologies, key pollutants (and/or proxy indicators) for incident alerting and produce an automated tool to help assess and interpret monitoring data

Tools for situational awareness & emergency response

To support flood and hazmat emergency responders by centralizing and integrating data from observation and prediction, decision making and communication

USER FRIENDLY WEB-BASED TOOLS AND MOBILE INTERFACES

-Multi-hazard early warning system:

Daily reports / Event-triggered early warning notifications

-On-demand pollutant dispersion system:

Web-based multi-platform and mobile-friendly tool for the on-demand simulation of fate and behaviour of objects and substances in transitional waters



-Realtime dashboards for situational awareness:

Online dashboards to present information about hydro-meteorological conditions, pollution indicators and different measured and modelled data coming from other project work streams



Tools for situational awareness & emergency response

-Communication and social media in crisis management:

- **Evaluation of social media and internet systems for early alerting incidents**

Development of search **terms relevant** to Hazmat and Flooding incidents in inland, estuarine and coastal water and bespoke selection of “key words” for social media trial



- Alerting about aquatic incidents
- Increasing public participation

- **Response communication protocols**

Crisis communications – Warning and informing message around priority pollutants. Impact assessment in social networks during incident, exercise or historical incidents (sentiment analysis)



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Planning, training and exercising for response

To contribute actively to an efficient preparedness and response to floods and hazmat response in transitional waters.

-Risk management:

To develop maps and tools that help prioritising emergency response actions

- Hazard prioritisation framework to identify key pollutants
- Hazard mapping approach to identify main hotspot and vulnerable areas

-Adapting response protocols in transitional waters:

To **identify past incidents** in transitional waters, highlighting the main difficulties encountered, their specificities and preforming an analysis of equipment available according their characteristics and performance

-Development of training activities:

To help **key staff** in emergency response to HNS and oil incidents, specially adapted to the conditions in transitional waters

-Exercises and demonstration:

To test simultaneously the project techniques, methodologies and operational tools. **Table-top exercises on virtual hazard scenarios**



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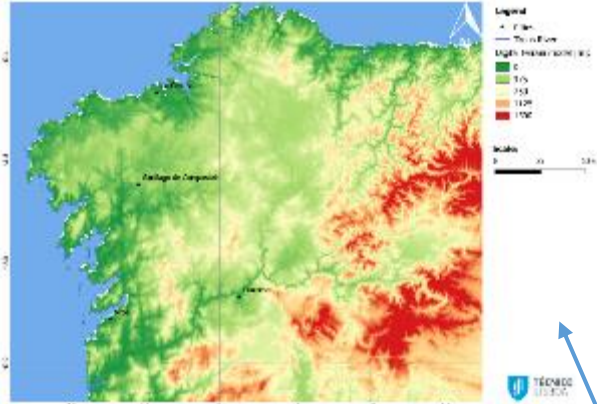


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HazRunoff pilot areas

<http://www.hazrunoff.eu/case-studies/>

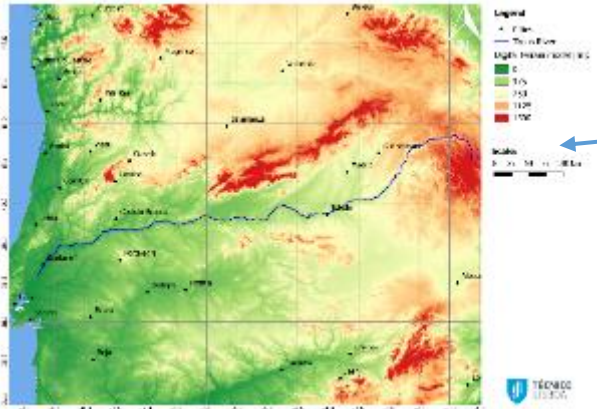
Spain – Ulla and Sar Rivers \ Ría Arousa



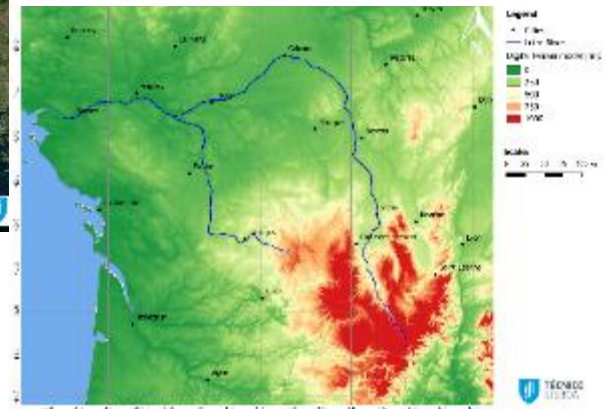
UK - Severn river \ estuary



Portugal - Tagus river \ estuary



France - Loire river \ estuary



Meeting



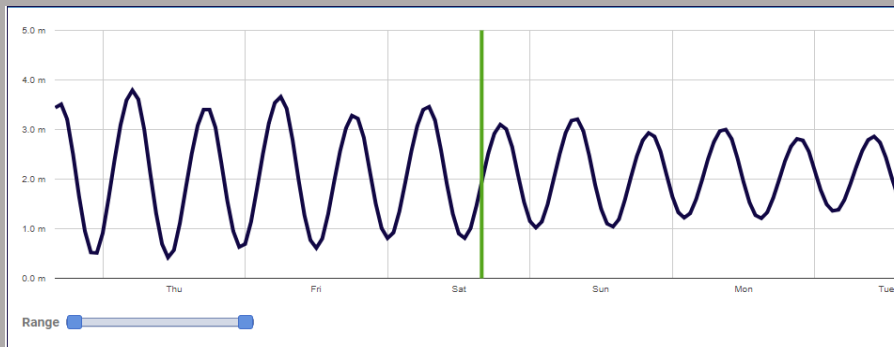
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Products \ Tools

- tools for situational awareness and crisis management
- **Risk management tools** to support contingency planning and decision making
- Response **protocols** adapted **for transitional waters**
- **Training material** and courses to help key staff in emergency response
- **Communication** to social media in crisis management

Water level [m] | Modelled: blue; Measured: green

Villagarcia tidal gauge



Water flow [m/s] & water column

Area 1



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HazRunoff expected impact

To Speed up early warning and detection, follow-up and response to floods and multiple hazmat contamination in transitional waters through:

- **Earlier forecast** of hazmat incidents (oil and chemicals) and a more efficient follow-up of pollution in transitional waters
- **Earlier detection** of hazmat incidents (oil and chemicals) and a more efficient follow-up of pollution in transitional waters
- Increase **preparedness** and knowledge on multiple types of floods

Based on a modelling strategy of simulating flash floods, storm surges, etc.

- Increase **awareness** on marine pollution originated in inland waters or estuarine environments

Based on automatic data analytic on social media



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HazRunoff expected impact

- Stronger and safer capacity for identification and monitoring of contaminated areas

Based on remote techniques avoiding human direct contact with pollution

- Improved contingency planning

Based on hazard mapping for multiple types of hazards

- Improved knowledge on chemical properties and behaviour on transitional waters

Based on lab measurements in 20 chemical substances

- Improved knowledge and awareness on hazards as a consequence of new training material, courses and exercising



Identification of data gaps, especially in river catchments is a major short term contribution of the project.



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