



# IRIDE Cyberitaly Hydro-Meteo Digital Twin

# Simulating the consequences of extreme weather events on assets and territory for better planning and decision making.

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About the IRIDE constellation. The IRIDE constellation is a programme of the European Union – Next GenerationEU funded by the Presidency of the Council of Ministries of the Italian Republic, pursuant to Article 1, paragraph 254, of the Italian Law 180/2019 and Funded by the Presidency of the Council of Ministries from the Complementary Fund carried out under an ESA Contract for the purposes of ED PNRR IRIDE PROGRAMME.

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## Hydro-Meteo Digital Twin – What-If Scenario

- When will the rain hit? ٠
- How much flooding will occur?
- When and how do we alert the public? •
- What neighborhoods will flood? ٠
- Do we evacuate or protect in place? ٠
- How many homes/people do we have to • evacuate?
- Do we have enough reaction time to ٠ evacuate?
- If we evacuate, where do the evacuees go?
- What is the evacuation route?



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## Hydro-Meteo Digital Twin – What-If Scenarios

The Hydro-Meteo Digital Twin provides a complete set of tools to simulate several What-If scenarios related to extreme weather events

#### What-If Scenario #1 Return Period - Flood inundation mapper



Flood inundation maps calculated for different return periods

#### What-If Scenario #2 Meteo-Forecast

simulation



Flood inundation maps calculated for different meteo model runs (4D)

#### What-If Scenario #3 Flood risk management toolkit



Flood danger maps and flood potential damage maps for different simulated river hydrometric levels Flood Hydraulic Protection Measures Simulation Tool



Inclusion in the simulation of hydraulic protection measures, «natural based».

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# **Hydro-Meteo Digital Twin Components**

### Hydraulic Simulation

Automated interface for defining and running hydraulic modeling simulations



#### **Flood Hazard**

Providing accurate and timely flood hazard assessments, to help communities prepare and respond more effectively to flood events



#### Potential Damage Map

It generates potential damage maps and assess flood impacts based on hydraulic simulation results



#### **DT Configuration Assistant**

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# Multi-purpose 3D Database

**3D Simulation ready DB** 

#### HydroReady DTM

Supervised and unsupervised process to obtain the physical component of the FFT Digital Twin application.

Additional topographic/hydrographic data:

- Known drainage lines (streams).
- Known crests.Known depressions.
- Tall vegetation
- Embankments
- Bridges





Funded by the European Union NextGenerationEU









About the HBDE constabilities. The HDE constabilities is a programme of the European Union - Next Desensional UNION - Nex

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# **Flood Hazard**

## Flood hazard data

- The results of the hydraulic simulations determine the extent of the flooded area and provide critical information such as the velocity and depth of the water in the defined areas.
- Input: Flood modelling data.
- Output: Hazard map based on velocity and depth distribution

Hazard level	Flood depth (m)	Flood velocity (m/s)	Conditions
Low	0 - 0.3	0 - 1.0	18
Medium	0.3 - 0.5	0 - 1.0	8
	0.5 - 1.0	0 - 0.5	27
	≤ (1.5 - velocity)	0.5 - 1.0	Depth ≤ (1.5 - velocity)
High	> 1.0	-	Depth > 1
	900	> 1.0	Velocity > 1
	> (1.5 - velocity)	0.5 - 1.0	Depth > $(1.5-velocity)$

A Hazard is something that has the potential to harm you. Risk is the likelihood of a hazard causing harm.

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# **Potential Damage map**

#### Input

- Flood Extent/Flood Depth
- Facilities/Roads/Buildings





#### The Impact tool computes:

- 1) Agricultural damage
- 2) Residential / Non-residential damage



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