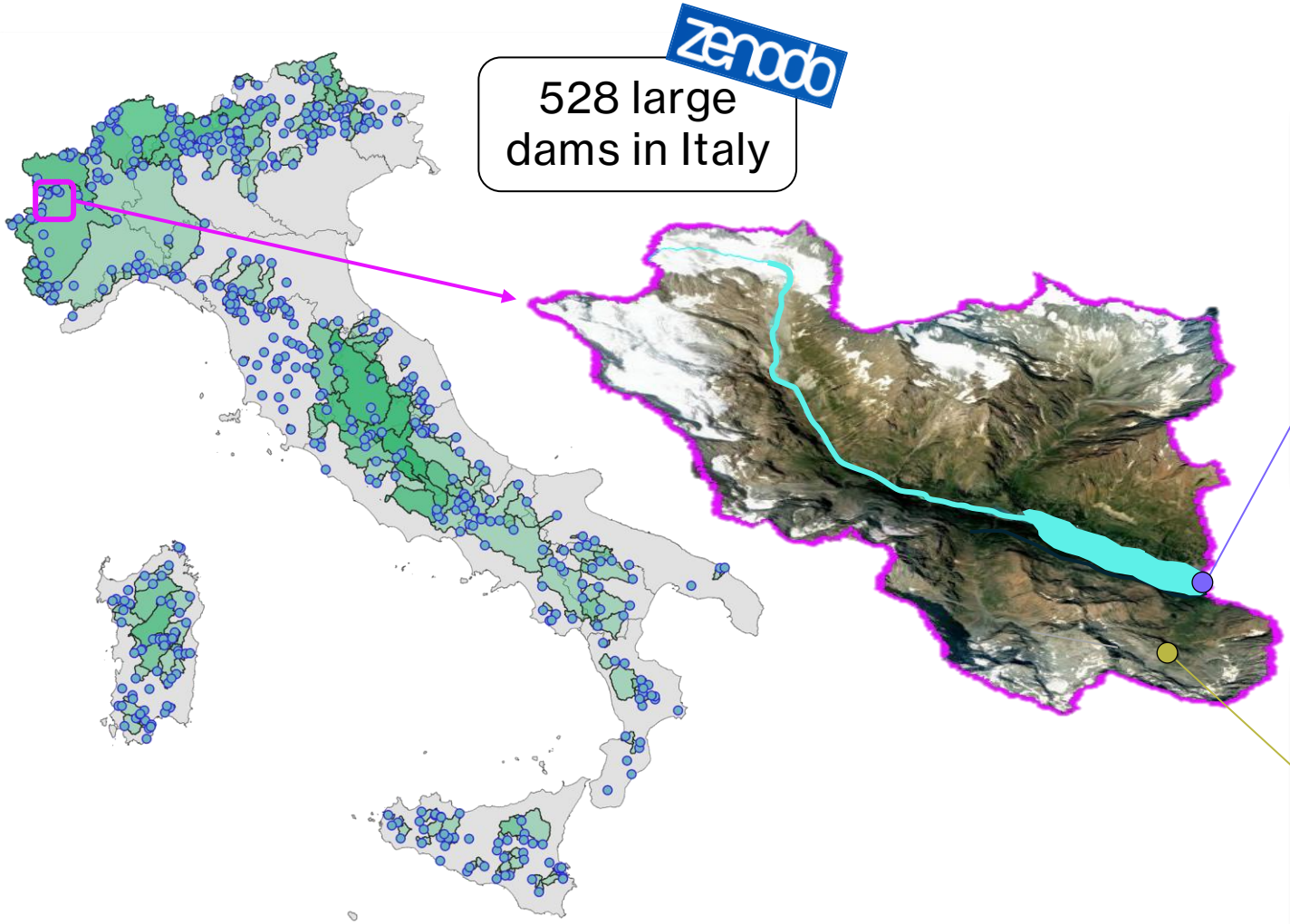
A new resource on Italian large dams, their catchments, and key attributes

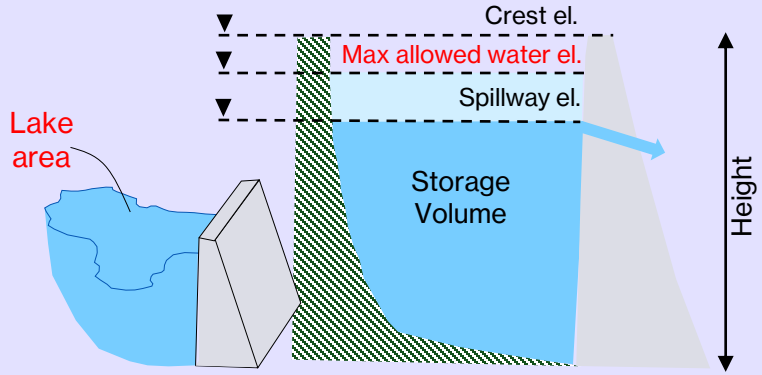
Giulia Evangelista[1], Paola Mazzoglio[1], Daniele Ganora[1], Francesca Pianigiani[2], Pierluigi Claps[1]

1 Politecnico di Torino

2 Ministero delle Infrastrutture e dei Trasporti



Geometric features, including lake areas verified via high-resolution DTMs



Catchment boundaries and over 100 basin attributes

Useful for..

- ✓ reconsidering the potential flood scenarios that the dam may face;
- ✓ an expeditious assessment of the interaction of dams and their host environment;
- ✓ quickly quantifing the infrastructure's effectiveness in mitigating flood peaks.

This study was carried out within the RETURN Extended Partnership and received funding from the European Union Next-GenerationEU (National Recovery and Resilience Plan – NRRP, Mission 4, Component 2, Investment 1.3 – D.D. 1243 2/8/2022, PE0000005 – Spoke TS2)

Overview

zenodo

ESSD paper

Background

Large dams in Italy

Structural features of the dams

Upstream basins

Catchment attributes

Applications

Background

> No availability of a complete country-wide dataset

- Fragmentary information available on the infrastructure side (geometrical features)
- No information available on the upstream basins

> Poor representativeness of global datasets when looking at the national scale

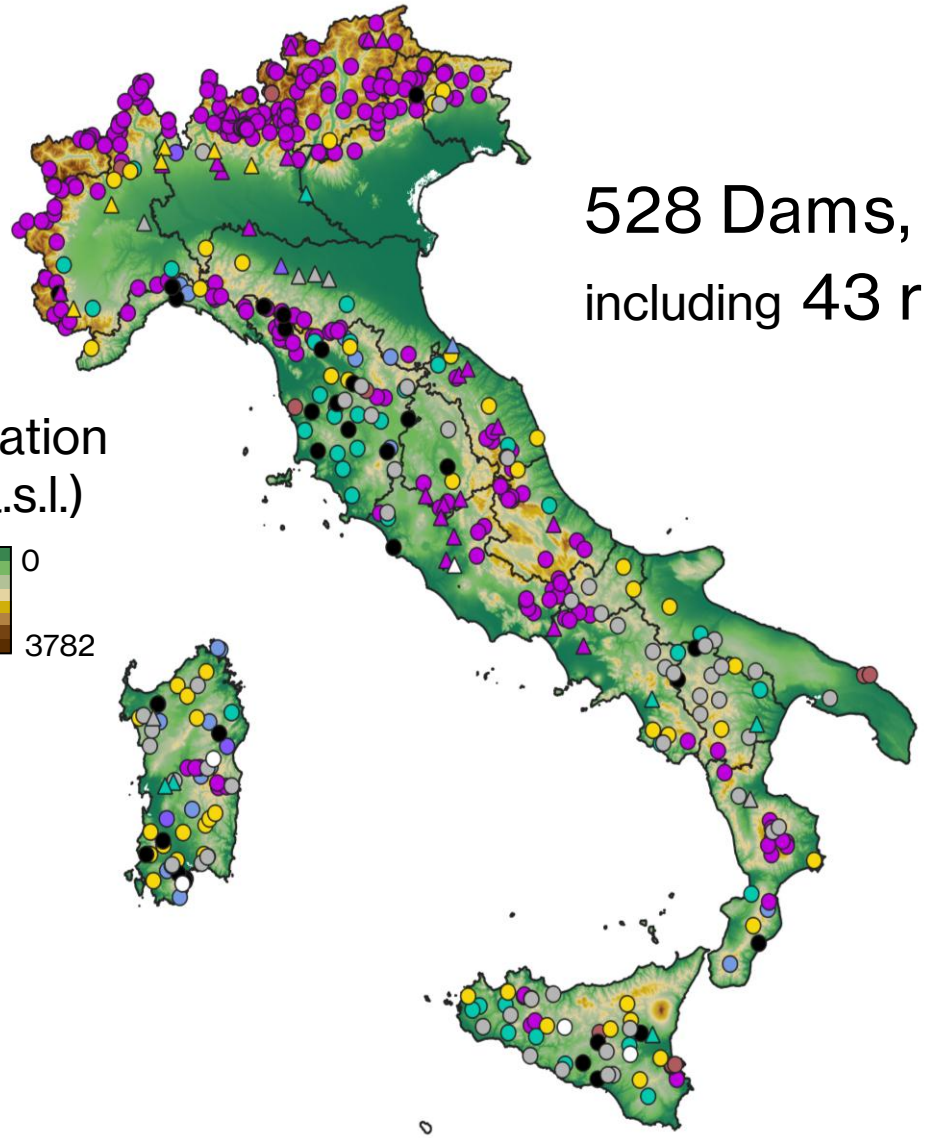
Cartography of Large Dams

Jan 2022

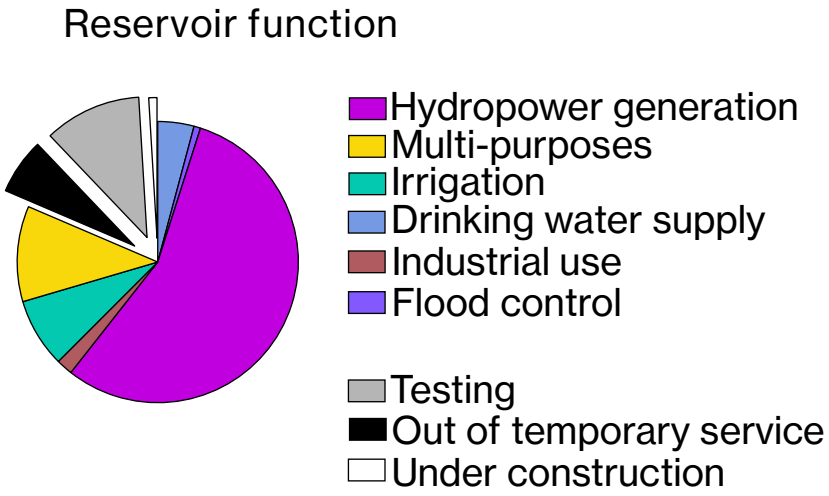
Direzione generale per le dighe e le infrastrutture idriche

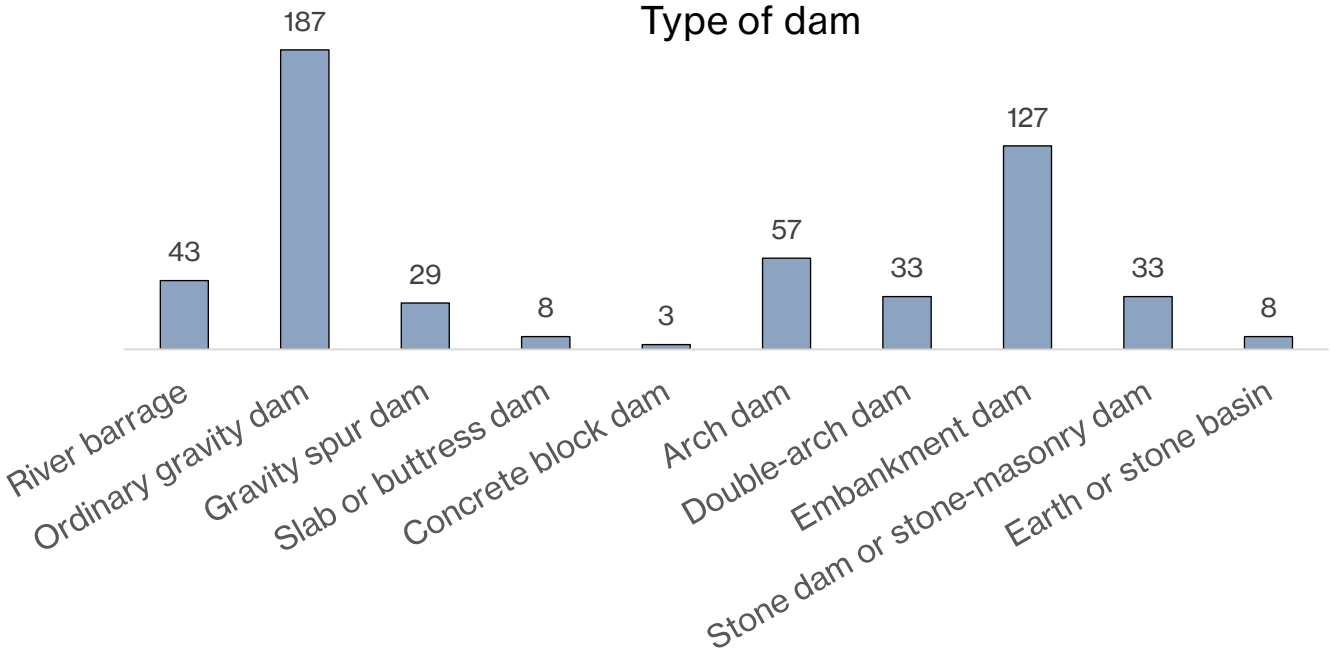
Dipartimento per le opere pubbliche, le politiche abitative e urbane, le infrastrutture idriche e le risorse umane e strumentali

The first catalogue of large Italian dams



528 Dams,
including 43 river barriers





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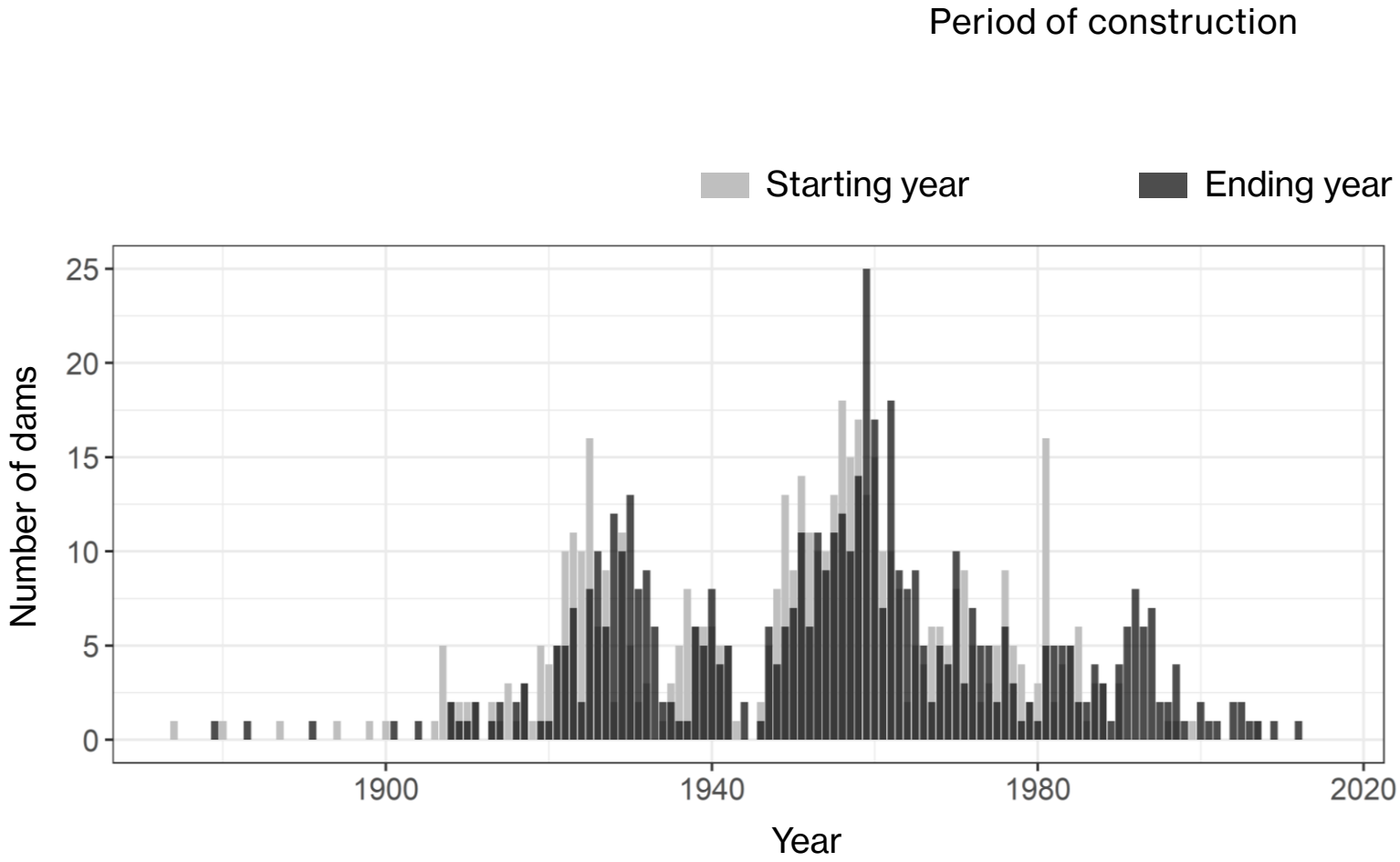
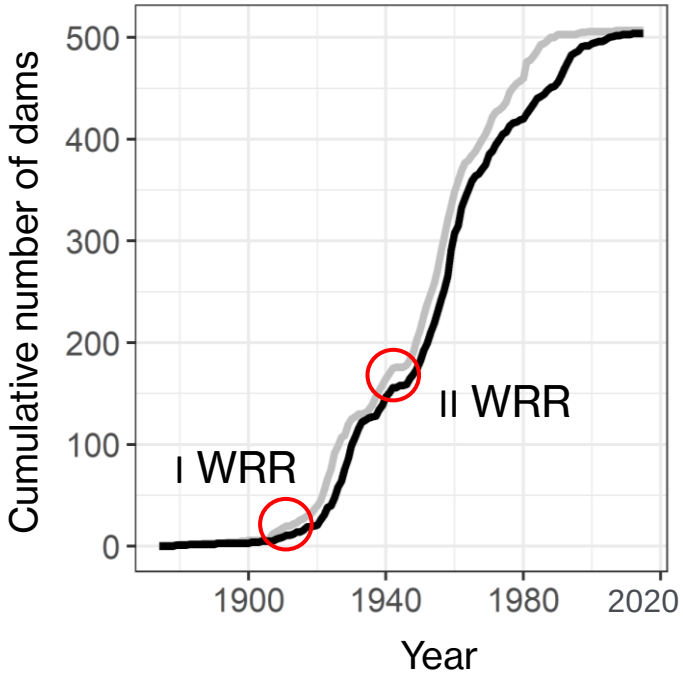




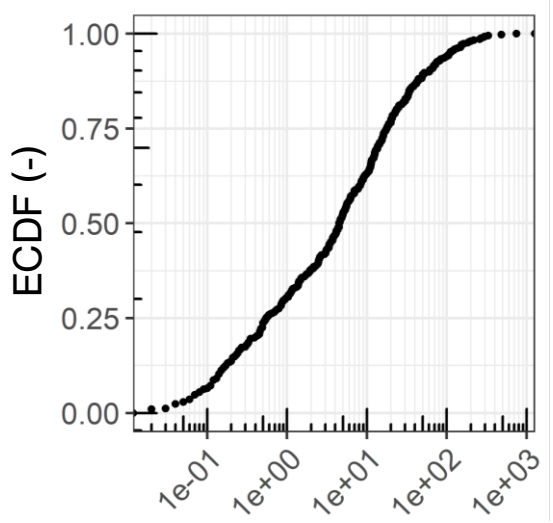
Structural features of the dam

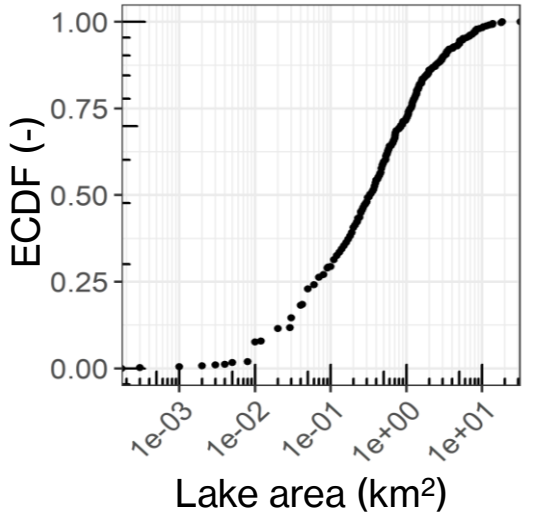
- Hard to find in already released (e.g. global) datasets.
- Directly related to the dam's capacity to effectively mitigate flood peaks.

Parameter	Units
Height of the dam wall	m a.s.l.
Elevation of the spillway crest	m a.s.l.
Elevation of the maximum allowed water level	m a.s.l.
Elevation of the dam crest	m a.s.l.
Reservoir storage volume	Mm^3
Total length of the spillway crest	m
Lake area	km^2

QUALITY CONTROLLED VALUES of the LAKE AREAS

Systematic comparison of the values retrieved from the General Department of Dams with those acquired from a high-resolution DEM





Upstream basins

BASIN BOUNDARIES

30-m resolution SRTM DEM

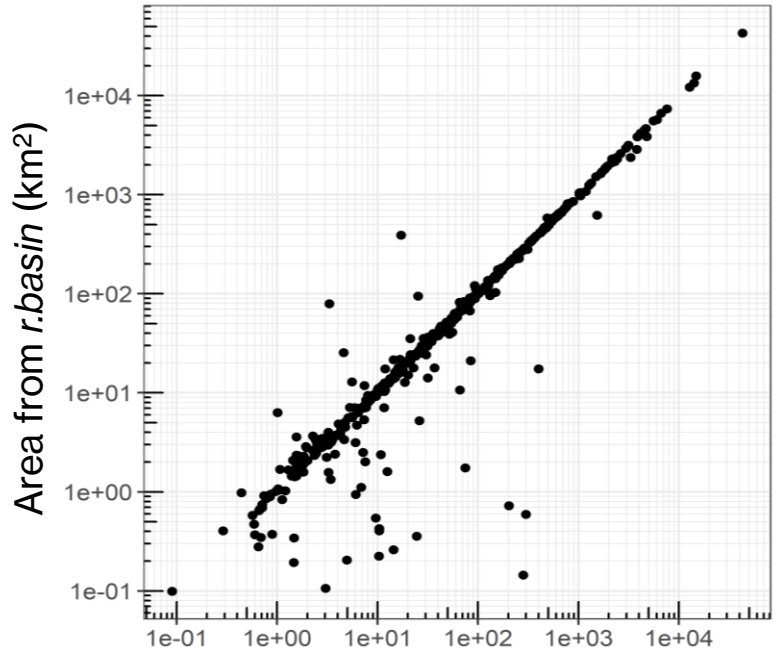
GRASS GIS suite

- > Pit filling
- > Drainage directions computation
- > Total contributing area computation
- > Stream network extraction

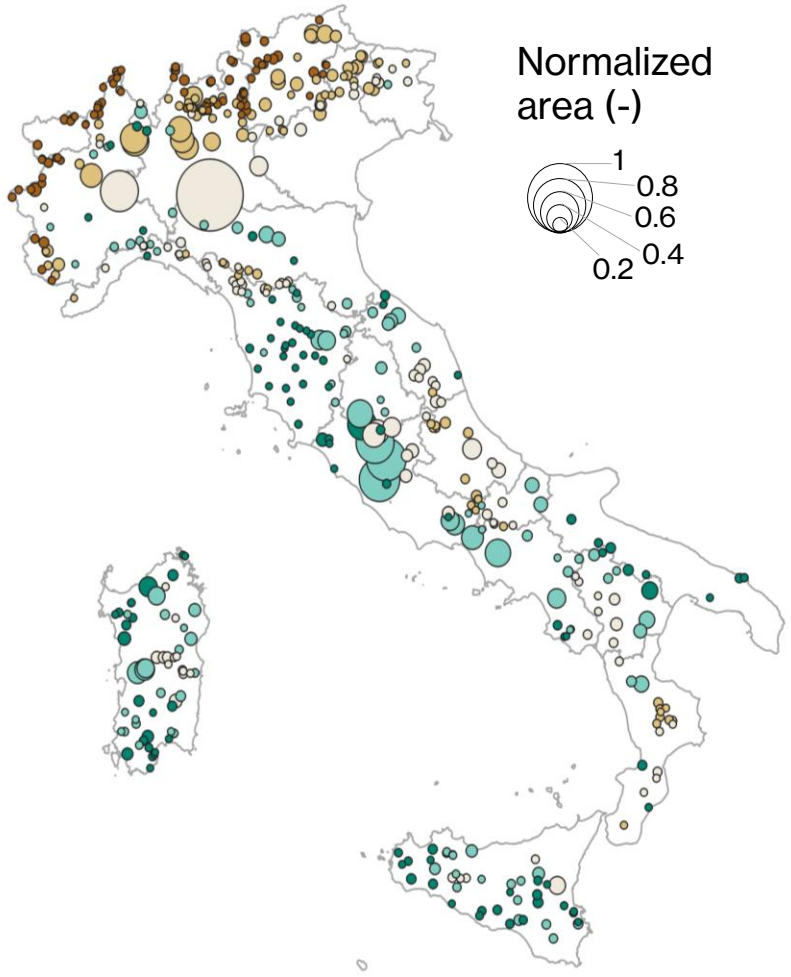
61 geomorphological attributes

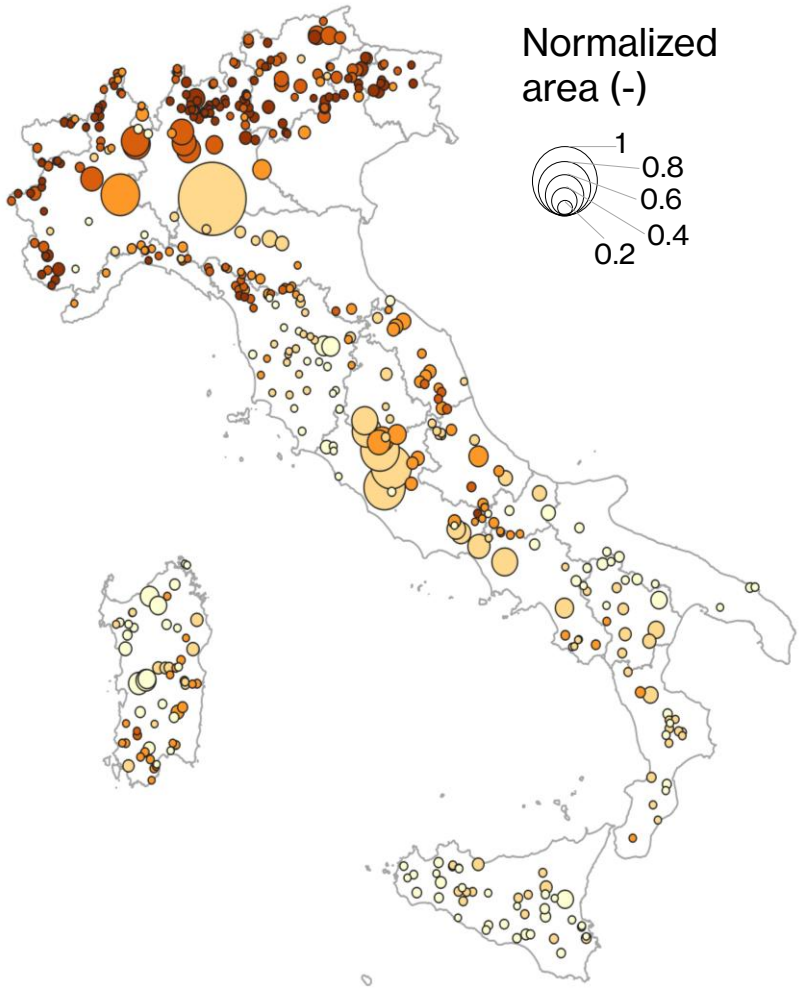
- > *Altitude and Geometry*
- > *Horton parameters*
- > *Stream network*
- > *Shape factors and width function*

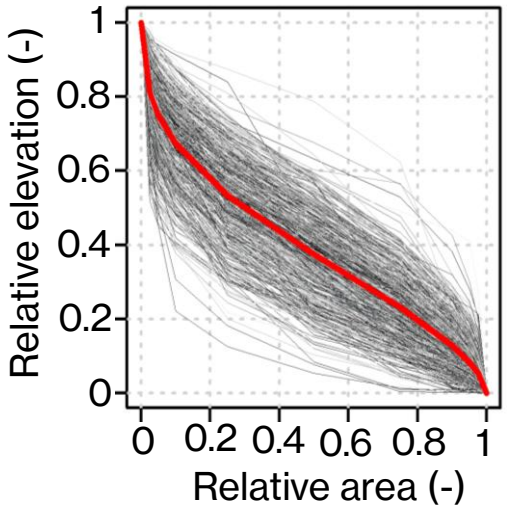
Quality control on basin area values



Catchment attributes







Mean basin elevation (m a.s.l.)

30	466	790	1257	2057
466	790	1257	2057	2966

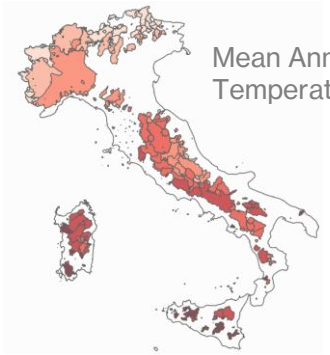
Mean basin slope (%)

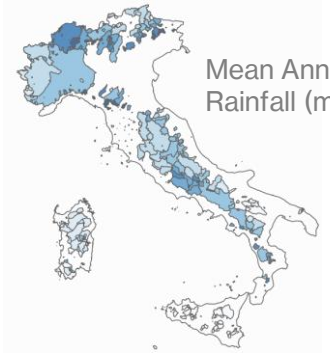
1.5	11	15.3	21.3	27.2
11	15.3	21.3	27.2	37.5

Other catchment attributes

14 climatological descriptors

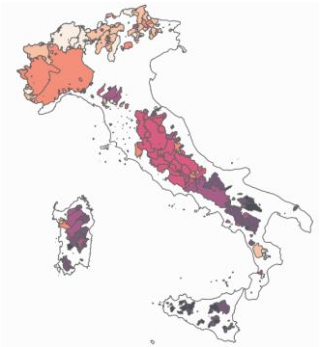
SOURCE: BIGBANG 4.0
(1951 - 2019, 1 km resolution)



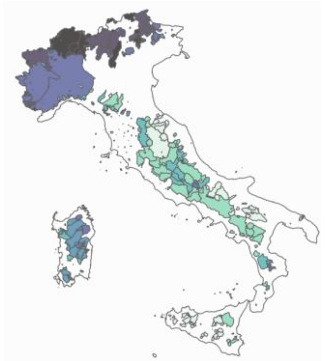


18 soil, land cover and NDVI descriptors

Curve Number
SOURCE: Carriero, 2004



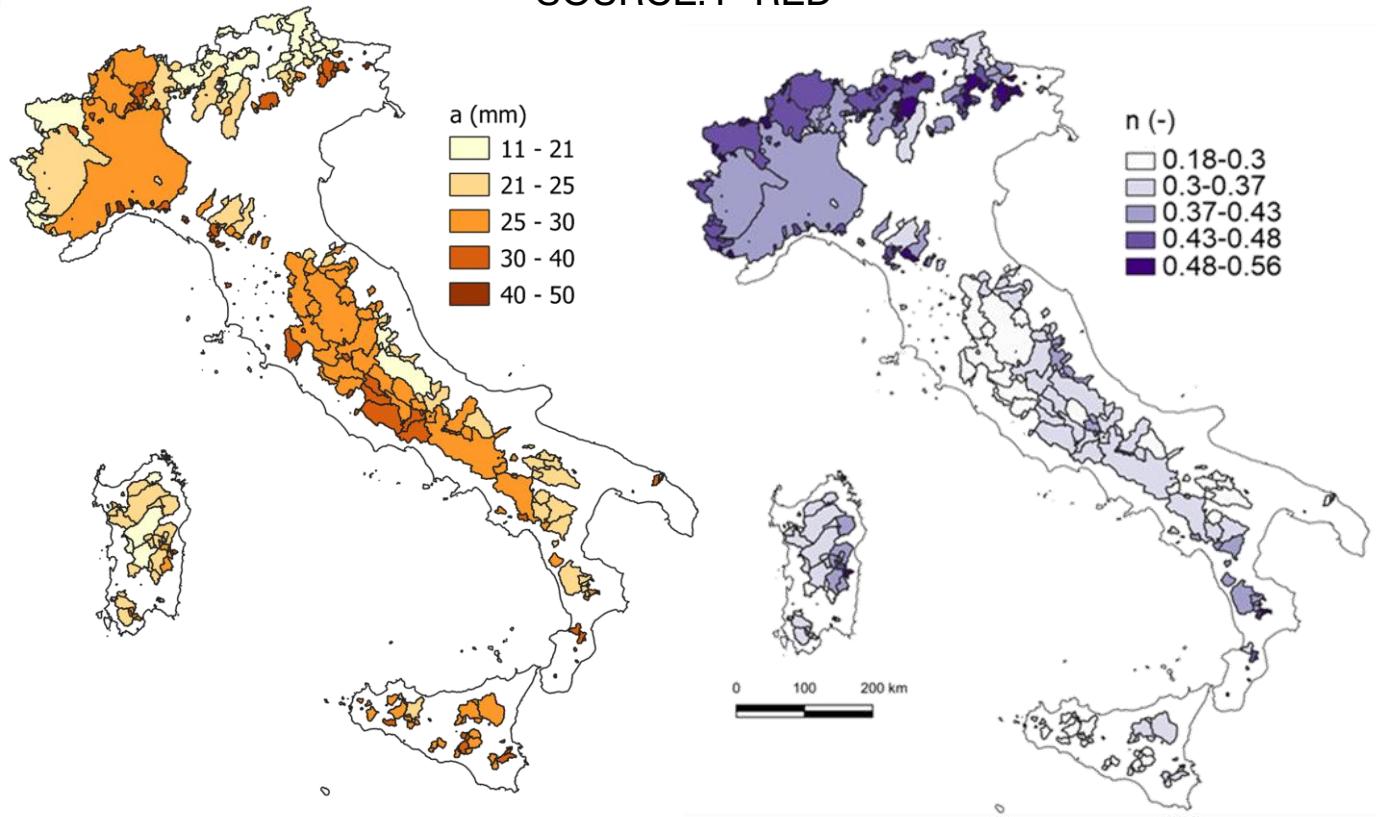
Saturated conductivity (cm/d)
SOURCE: Saxton, 1986



Examples of variables

24 extreme rainfall descriptors

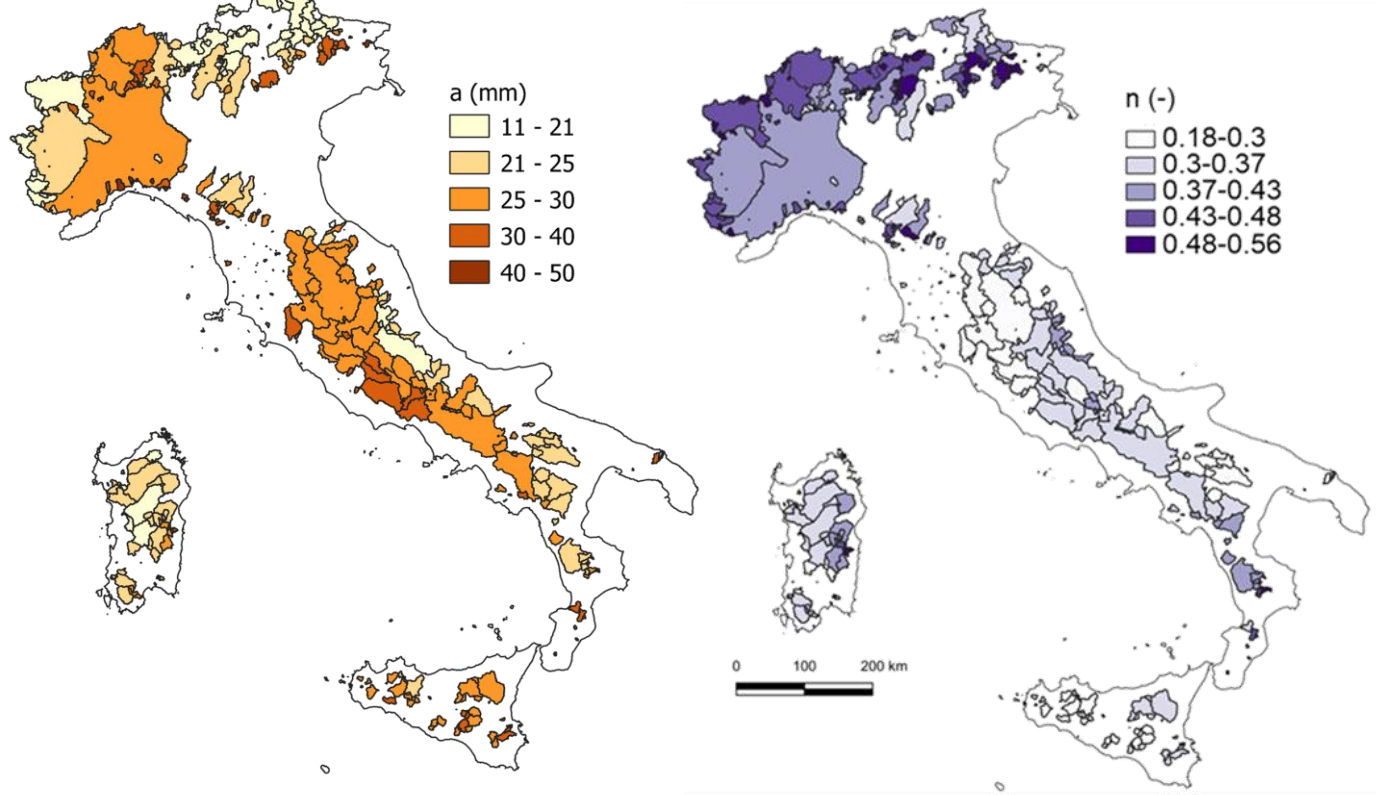
SOURCE: I²-RED



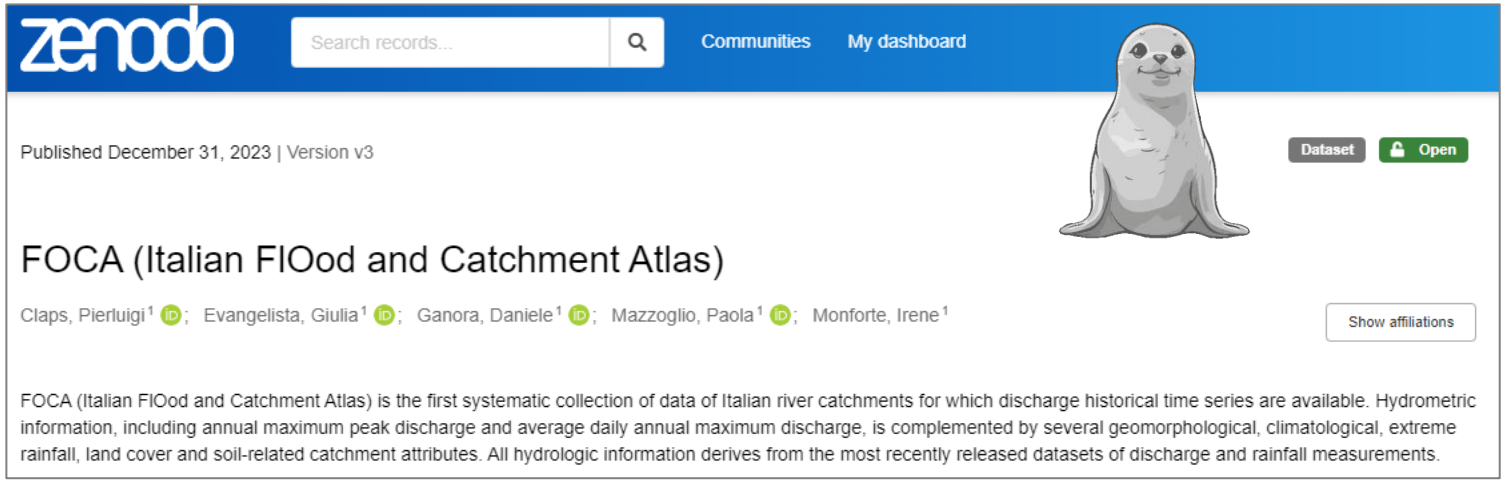
- Extreme rainfall information is derived from the most up-to-date and comprehensive data collections currently available.
- Extreme rainfall descriptors are estimated using rain gauge measurements.

24 extreme rainfall descriptors

SOURCE: I²-RED



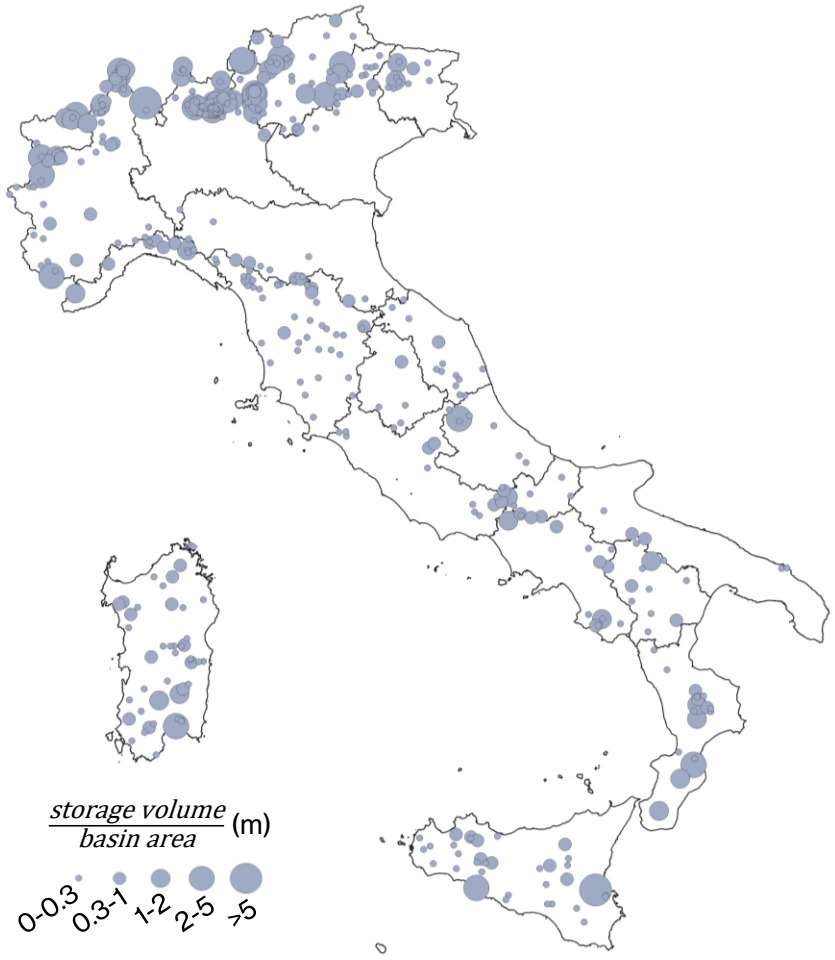
Perfect integration with the «twin» dataset FOCA!



Same basin attributes, calculated using the same procedures, for all gauged catchments in Italy.

Applications

Quantify the infrastructure's effectiveness in mitigating flood peaks



EXAMPLE