



CASE STUDY 4

Flood



CrossEU

Italy

Climate Change Hotspots (CCH)

Valley areas of the Trentino Alto Adige region

- This territory is increasingly exposed to short-duration extreme precipitation events due to climate change.
- The combination of complex orography and geomorphological fragility makes the region particularly susceptible to hydrogeological hazards, especially flash floods and debris flows, whose frequency and intensity are expected to rise under future climate scenarios.
- Among the others, the high concentration of alluvial fans across the territory significantly contributes to hydrogeological vulnerability. These geomorphological formations are highly susceptible to flash flood events, as they tend to accumulate debris flows and channel sudden water surges during episodes of intense rainfall.

Objectives

- Assess the magnitude and frequency of current and future flood impacts and of their plausibility;
- Monetize the benefits that mitigation and adaptation strategies could provide to society in alternative impact scenarios;
- Explore how the social benefits of mitigation and adaptation strategies vary across different shares of the population.

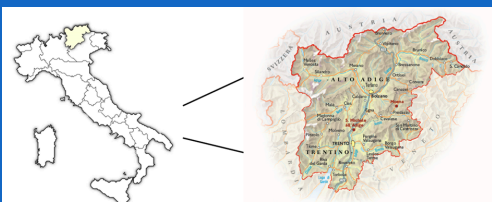
Methods

- Future flood scenarios are constructed using climate projections generated by a multi-model ensemble of convection-permitting regional climate models.
- The projections are downscaled and remapped over the study area at a spatial resolution of 3.02 km. The time horizon comprised three 10-year periods (1996–2005, 2041–2050, and 2090–2099) modelled under the RCP 8.5 scenario.
- Hydrological models are used to transform precipitation inputs into flood hydrographs.
- The outputs are then applied to estimate physical impacts across five key land use categories: i) residential areas, ii) productive areas, iii) roads, iv) agricultural land and v) touristic infrastructures.
- The individual economic damage associated with a 1% increase in the flooded area in each land use category are monetized through a Choice Experiment embedded in a large-scale survey.
- The average social cost of flood impacts under alternative future scenarios are calculated by aggregating the estimates at the scale of the Trentino-Alto Adige population.

Context

Floods are among the most pressing climate-related risks in Alpine regions, where settlements and infrastructure are often concentrated in valley areas with limited space for water retention. Trentino-Alto Adige represents a significant case study, combining increasing hydro-climatic pressures with geomorphological constraints and socio-economic exposure.

The reference event for this case study is Storm Vaia, which struck the Eastern Alps in October 2018. The storm brought exceptional rainfall after a prolonged dry period, triggering widespread flooding, landslides and severe damage across the region. It stands as a stark example of how evolving climate conditions can amplify the impact of extreme events in already vulnerable territories.



Trentino Alto Adige map and examples of flood impacts in the region