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Utilizing Geographic Information Systems to Identify and Map Climate Hazards in Greece: A Regional Analysis

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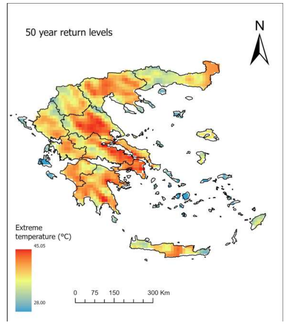
Motivation, Data and Methods:

- Identification of the prevailing climate hazards (e.g., extreme heat, forest fires, drought, floods) and their changes, in terms of frequency, intensity, and trends.
- Identification of Exposure, Sensitivity, and Potential Impact using a plethora of indicators - Application of the extreme value theory (EVT) for assessing the return levels of extreme temperature and precipitation.
- High-resolution reanalysis data (ERA5-Land) are used. The sensitivity of diverse regions was determined through the analysis of Earth Observation and socioeconomic data.
- GIS tools were developed for the synthesis of the climate hazards and the estimation of the potential impact in classes (from 1: very low to 5: very high).

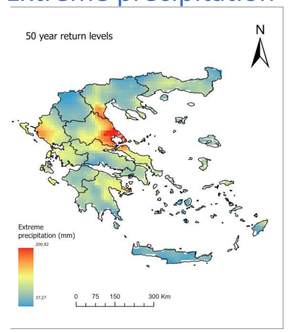
Extreme value analysis

Peak-over threshold
(1971-2022)

Extreme temperature



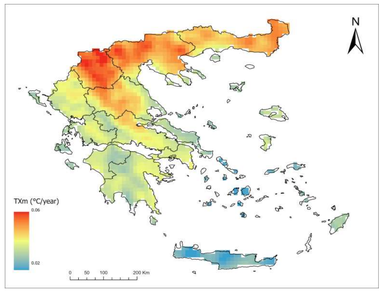
Extreme precipitation



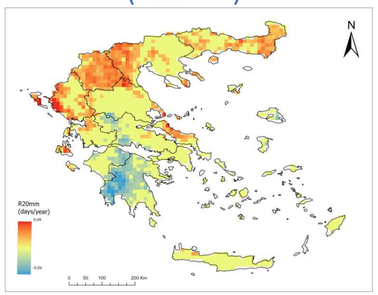
Linear trends

Sen slope
(1971-2022)

Maximum temperature (TXm)

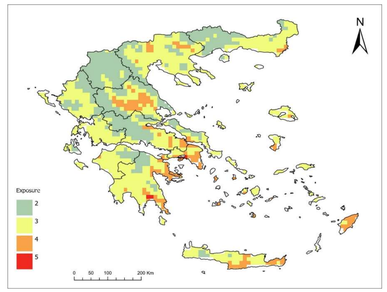


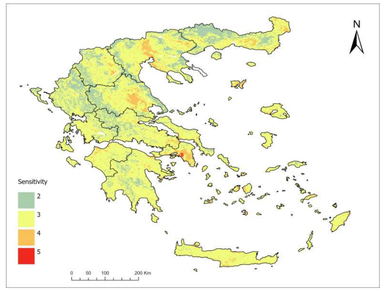
Precipitation greater than 20mm (R20mm)

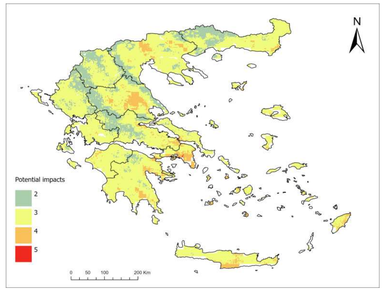


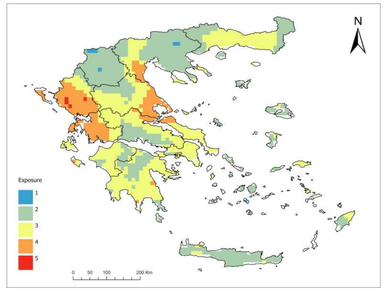
Past and present climate 1981-2010

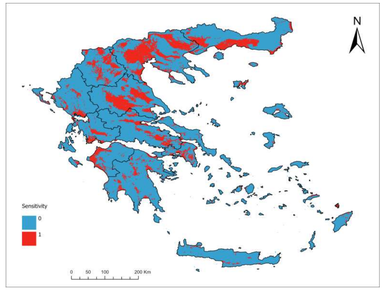
	Synthesis of exposure indicators	Synthesis of sensitivity indicators	Potential impacts (Exposure + Sensitivity)
Extreme heat	WSDI, SU, TR, TXge35	LST, Land Cover, Population, NDVI	
Floods	R20mm, R99ptot, Rx1day	Flood zones	

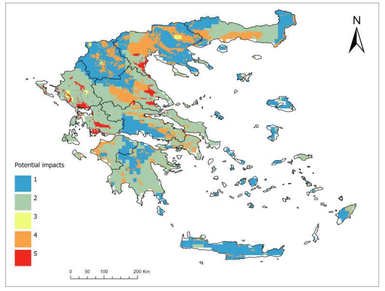




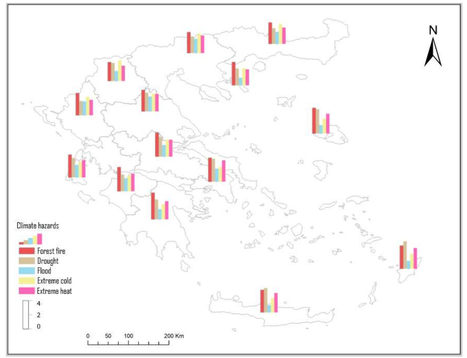








Climate hazards by Administrative region 1981-2010



Conclusions:

- The areas with the highest precipitation return levels are located in Western Greece and Eastern Thessalia. High return levels of extreme temperature in urban areas.
- Increase in maximum temperature mainly in Northern and Central Greece. A mixed behavior for annual precipitation (decrease in Southern and mainland Greece).
- Population health in urban centers, agricultural production, and livestock farming are significantly affected by the extreme heat hazard. High - potential impact areas are located in Thessalia and the urban areas. High - potential impact flood areas are located in Western Greece.
- The climate hazards by administrative region provide valuable insights for policymakers, researchers, and the general public to adapt to and mitigate the effects of climate hazards on a regional scale.