

Introduction

The negative consequences of climate change are already impacting the lives of the European citizens at present. Climate related events will pose even more severe threats to the continent over the next century. This study showcases and quantifies the impacts that climate change has had at the European level, while highlighting the future damages to the economy, infrastructure and well being of EU citizens. The focus is on Southern Europe and on coastal regions, which are going to be most affected by such extreme events. The aim is to provide evidence of climate change impacts at the regional level, in order to amplify the demands for more ambitious adaptation strategies at both the EU and the national level.

Methods

In order to gather data and information about the impacts and costs of climate change at the European level, research methods include the analysis of:

- Existing adaptation policies
- Studies from the European Environment Agency (EEA) and the Joint Research Centre (JRC)
- Regional reports and case studies

Impacts of climate change:

Present

The last decade (2008-2017) has been the warmest decade on record, with the year 2017 being one of the world's three warmest years ever recorded. In addition, global mean sea level in 2016 was the highest yearly average that was ever measured, breaking another record. Temperatures and rainfalls are undergoing variations and are expected to also experience future changes.

Droughts and heatwaves have increased in frequency and intensity, mainly in Southern Europe, with detrimental impacts on the individuals' health and the economic sector.



The 7 main hazards of climate change

Future

Heatwaves show an increase close to 100% throughout the continent by the end of the century. Extreme wildfires could increase in frequency in most of Europe. Sea level rise will make coastal floods more common along Europe's coasts, with extreme events manifesting every 2 to 8 years in the 2080s.

Southern Europe would experience higher levels of intensification of heatwaves (occurring almost every year in the 2080s) **and streamflow droughts** (every 2 to 5 years). This unequal spatial pattern of distribution highlights the issue of key hotspots potentially subject to multiple hazards of climate change at the same time (Forzieri et al., 2016) (Figure 1).



Human Wellbeing: Two out of three individuals will be affected annually by extreme-weather events by 2100. The average of people exposed is of 351 million (ranging between 126 million to 523 million) during the 2071-2100 period.

Again, the geographical distribution presents a **major concentration of hotspots in Southern Europe, in concomitance with a rise in frequency of heatwaves.**

Damages to Infrastructure: The Expected Annual Damages (EAD) to infrastructure at present are €3.4 billion per year for EU+ countries (EU Member States plus Norway and Switzerland), but they are expected to soar. In 2020s, they will be equal to €9.3 billion per year; in 2050s, €19.6 billion and in 2080s, €37.0 billion.

The cost of damages will strongly increase in Southern European regions, making them not only hotspots for health issues, but also for the economic impacts of climate change.

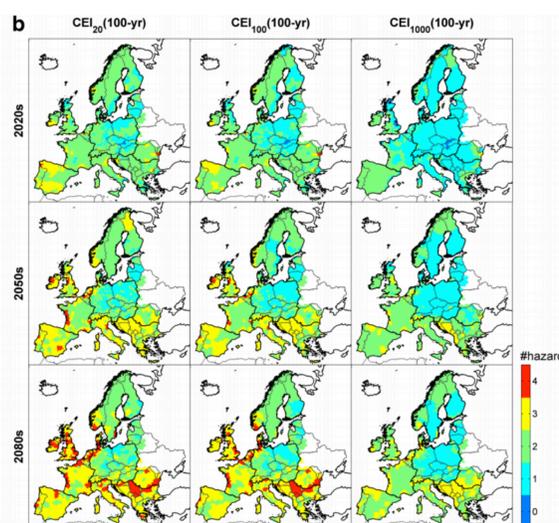


Figure 1. Projections of the areas exposed to the main hazards of climate change (at least four, in red) up to the 2080s, with different relative increases (Forzieri et al., 2016)

Economic costs

We are already paying for the economic losses of climate change, and the European Union has a clear view of such costs. Between 1908 and 2016, EEA member countries had to pay approximately €436 billion for the total economic losses caused by weather and climate-related extremes.

By the end of the century (2080) the annual costs of climate change in the EU will be around €190 billion (equivalent to a net welfare loss of 1.8% of current EU GDP). **Southern Europe will be heavily impacted and will experience the highest relative welfare losses around 3% of GDP (€190 billion per year).**

Conclusion

Planning and implementing effective adaptation measures to climate change is a necessity, if we want to face the impacts that are already taking place, while also building resilience for future extreme events. The threat of more frequent heatwaves and damages to natural habitats, agriculture, infrastructure, human health and many other sectors is predicted to also pose an economic burden on the whole of Europe in the long term.

Southern Europe and coastal regions are shown to be majorly impacted both at present and in the future by climate change, therefore, intervening at the local and regional level is a priority. As a result, climate change in Europe also becomes a matter of climate justice and inequality, adding a further layer of complexity to this challenge.

Useful References

- European Environment Agency. (2018). *Economic losses from climate-related extremes*
- European Environment Agency. (2018). *Global and European temperature.*
- Forzieri, G. et al. (2016). Multi-hazard assessment in Europe under climate change. *Climatic Change*, 137(1-2)
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