Towards a better integration of socioeconomic scenarios in assessments of future climate risk and vulnerability

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Abstract

The overwhelming majority of integrated assessments of future climate risks are made using climate scenarios and projections superimposed on current socio-economic conditions only; hence they fail to account for the influence of socio-economic changes. Following the recent IPCC-related new scenarios framework for climate change research, a few assessments of climate risks have attempted to integrate socio-economic changes through the combination of climate and socio-economic scenarios. However, a number of shortcomings remain, such as the lack of consideration of vulnerability, the low spatial resolution, and the lack of contextual focus. In this paper, we seek to examine these shortcomings through an exploratory assessment of future heat stress risk in 271 European regions up to 2030, based on the combination of several climate and socio-economic scenarios. We also discuss the main barriers faced – such as the availability of socio-economic projections and the diversity of existing socio-economic scenarios – and provide a reflection on promising approaches to foster the use of socio-economic projections and scenarios [...]
Towards a better integration of socioeconomic scenarios in assessments of future climate risk & vulnerability

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Introduction

Climate risk & vulnerability depend on:

- Climatic conditions
- Socioeconomic conditions
Introduction

Climate risk & vulnerability depend on:

- Socioeconomic conditions
- Climatic conditions

(Knutti and Sedlacek, 2012)

(KC and Lutz, 2014)
Introduction

New set of IPCC-guided scenarios

Climate scenarios (RCPs – Representative Concentration Pathways)

Global socioeconomic development trends (SSPs – Shared Socioeconomic Pathways)

Foster the use of socioeconomic scenarios in future assessments of climate risk and vulnerability (and in IAV studies to a larger extent) (O’Neill et al., 2015)
Exploratory study to explore the use of SSPs for assessments of future climate risk & vulnerability

Assess heat stress risk in Europe NUTS-2 regions in 15 years from now (2030), based on climate scenarios AND socioeconomic scenarios (SSPs)

(Rohat et al., 2017)
SSPs only quantified at national scale → had to be coupled with existing EU (ESPON) scenarios quantified at NUTS-2 scale

Social vulnerability based on:
GDP per capita; old-dependency ratio; pop density; education; urbanization

(Rohat et al., 2017)
Use of bias-corrected outputs of ensembles of RCMs, readily available within EURO-CORDEX Project

Heat stress index based on changes in averaged daily max temperature

(Rohat et al., 2017)
Exploratory study – Results

Heat stress risk scenarios (combined scenarios)

RCP 2.6 * current
RCP 2.6 * SSP2
RCP 2.6 * SSP5
RCP 8.5 * current
RCP 8.5 * SSP2
RCP 8.5 * SSP5

(Rohat et al., 2017)
Socioeconomic scenarios significantly influence future heat stress risk. Must account for future socioeconomic conditions (and their uncertainty through scenarios) when assessing future climate risk & vulnerability.

However, still numerous limitations / shortfalls:

- Still lacking of consistent quantitative socioeconomic projections (in terms of diversity and spatial/temporal scales)
- Lack of contextual/regional focus of the global SSPs
- Methods to match different sets of scenarios are not well-developed and not reliable/precise enough

Needs further research to support the use of socioeconomic scenarios in assessments of future climate risk & vulnerability.
Further research – Aims

Develop a method to systematically match scenarios from multiple sets of locally-developed scenarios with the global SSPs

→ Reduces normative judgments and increase reliability of the matching
→ Integrates contextual info through the use of local and sectoral scenarios
→ Enables to co-use quantitative outputs of the matched scenarios to create a rich database of consistent quantitative socioeconomic projections, to be used in assessments of future climate risk & vulnerability

Case-study: social vulnerability in European Union at NUTS-2 scale up to 2050

Sets of scenarios are (in addition of SSPs):
❖ DEMIFER: Demographics-focused scenarios
❖ CLIMSAVE: Environment-focused scenarios
❖ ET2050: Territorial development-focused scenarios
Further research – Method

1. Detailed reading and analysis of each scenarios’ storylines

2. Classification of scenarios’ assumptions

3. Pairwise comparison of the similarities / discrepancies between each pair (i.e. two scenarios of a different sets)

<table>
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<th>Averaged over all domains</th>
<th>SSPs</th>
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<th>DEMIFER</th>
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</table>

4. Identification of groups of scenarios (made of several pairs) with the highest matching score

*(Rohat et al., in prep.)*
Further research – Method

(Rohat et al., in prep.)
Co-use of existing quantitative projections enables the creation of a rich database (+20 variables) of consistent socioeconomic projections, e.g. for the 10 selected variables of social vulnerability

(Rohat et al., in prep.)
Further research – Results

Spatially-explicit

e.g. aggregated SVI

(Rohat et al., in prep.)
Conclusions

- Socioeconomic development plays a very important role in the determination of future climate risk & vulnerability
  - Must account for future socioeconomic conditions and their uncertainty (through scenarios) when assessing future climate risk & vulnerability

- The systematic matching of the numerous existing sets of scenarios shows great potential to create SSPs-consistent database of quantitative socioeconomic projections
  - Enables to quantitatively explore the influence of different types of socioeconomic developments on future social vulnerability

Next steps:
- Explore the influence on future climate risk & vulnerability of different combinations of climate and socioeconomic scenarios
- Integrate adaptation options within socioeconomic scenarios
Thank you!

Questions?

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