Assessing the epistemic quality of climate information for adaptation

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Who we are and what we do

Expertise:
Philosophy of Science
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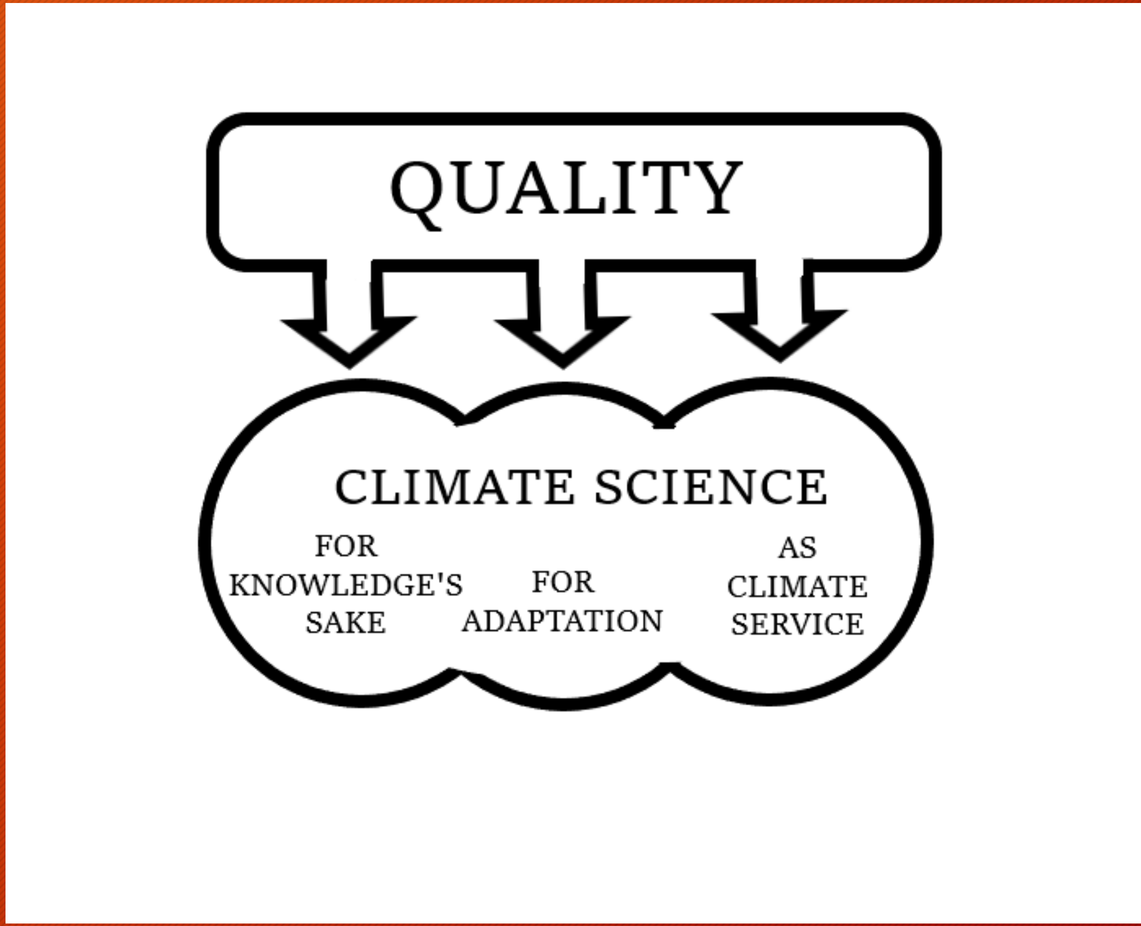
E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

LSE THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

What is climate information for adaptation?

Climate science can produce knowledge for many purposes:



What is climate information for adaptation?

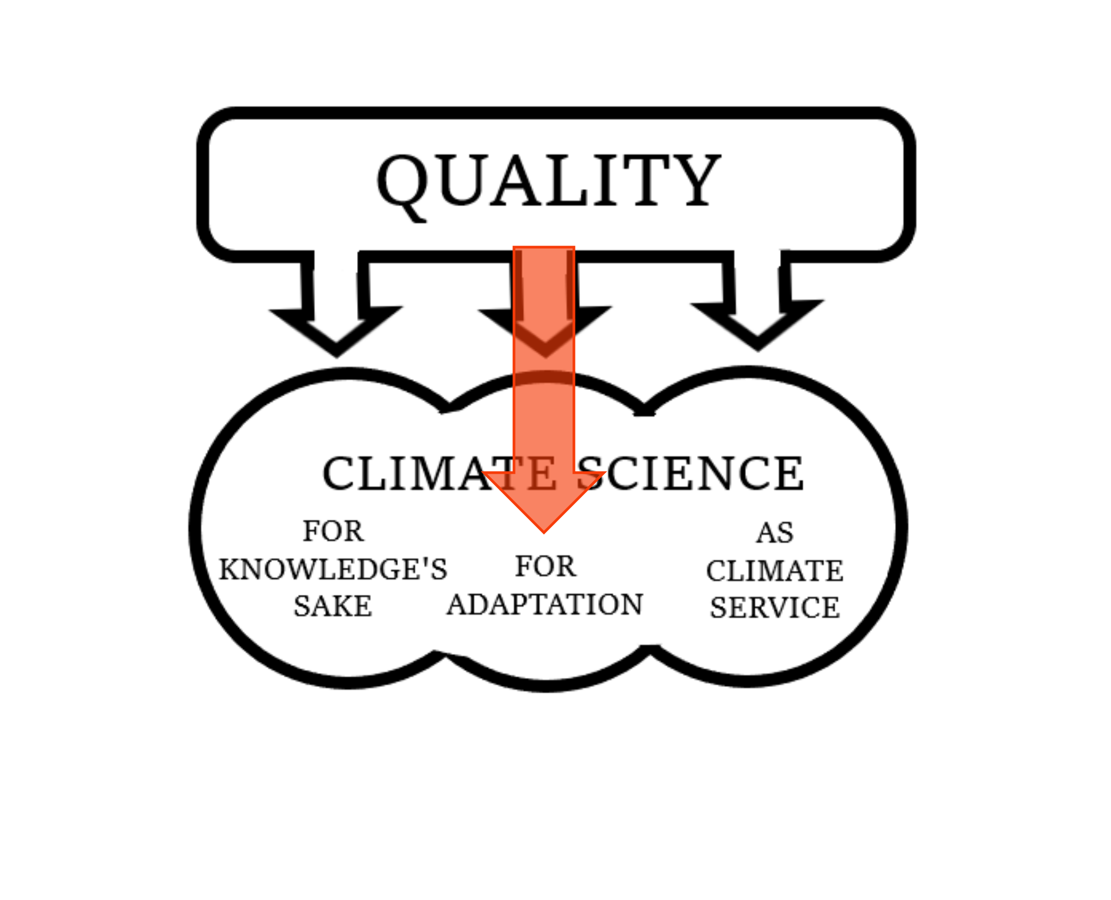
The target of our framework:

"science-based statements about future climate"

Spatial scales: regional to local.

Temporal scales: 1 to 100 years.

What is climate information for adaptation?



In this framework, we set aside the issue of *usability* of climate information. We only focus on the *epistemic* components of quality, i.e. those that contribute to a proper justification of a knowledge claim.

Outline of the presentation

- Issues with climate information for adaptation.
- The purpose of information for adaptation.
- The structure of information for adaptation.
- Quality metrics.
- Conclusion.

Issues with climate information for adaptation

- Epistemic Issues: limitations to the justification of knowledge claims.

- Quantification Issues: limitations set by how information is presented.

Epistemic issues

- Limited empirical testing.
- Gaps in past data.
- Shared assumptions of GCMs and Reanalysis data.
- Out of sample predictions. (Stainforth et al. 2007)
- Probabilities or possibilities? (Katzav 2014, Betz 2009)
- Fitness for purpose? (Nissan et al 2019)

Quantification issues

- Focus on quantification can lead to a false sense of precision. (Parker and Risbey, 2015)
- Why and when should quantitative knowledge be prioritized?

What is epistemic quality?

The higher the epistemic quality of a statement or estimate, the more reasonable it is to believe that we are making an accurate statement or estimate.

The purpose of information for adaptation

To properly assess epistemic quality we need to consider that:

- Different purposes of producing information need different methods.
- Different methods need different quality assessment strategies.
- Purpose: informing adaptation, prioritizing accuracy.

The structure of information for adaptation

Information for adaptation, and its justification, can be analyzed in terms of:

1. The quality and type of evidence.

   e.g. observational/model time-series data, proxy data, expert judgment, etc.

2. The quality of the relationship between the evidence and the statement.

   e.g. validity of the methodological details regarding how the information is extracted from the evidence, or how different lines of evidence are aggregated, etc.

Quality metrics of our framework:

- Robustness.
- Completeness.
- Theory.
- Adequacy for purpose.
- Transparency.

Robustness

The triangulation of a result using independent lines of evidence.

- Triangulation: about the relationship between evidence and statement. (2)
- Independence: about the type of evidence. (1)
- Example: Multi-model ensembles are not very robust because the models are not independent: shared assumptions.

Completeness

Use all relevant and independent lines of evidence.

- Relevance: the relationship between evidence and the statement. (2)
- Example: Are multi-model ensembles enough? We may need expert elicitation, observations, etc.

Theoretical underpinning of physics and methods.

- Physics as evidence: thermodynamics, fluid dynamics, etc. (1)
- Methods as tools of inference: statistical tools and assumptions met. (2)
- Example: for out of sample predictions, observations are not enough, we need theory.

Adequacy for purpose

Empirical adequacy for the purpose of informing adaptation.

- Is the evidence used adequate for the statement that is being made (1) and the purpose that it serves (2)?
- Example: are models adequate for predicting future precipitation?

Transparency

Accessibility of evidence and methods.

- Is all the data available? (1)
- Are the methods explained? (2)
- Example: peer reviewed summaries and reports for experts and non-experts.

Caveats and future work

- The metrics are quality *indicators*, not necessary and sufficient conditions.
- Overall quality is case dependent: no simple way of aggregating metrics.
- Future work: case studies to test the framework.

Key References

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