ISIMIP: Consistent climate impact scenarios across sectors

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ISIMIP setup

Climate data
5GCM x 4RCPs + Historical observational

Impact Models
- Global
  - Water (13)
  - Agriculture (14)
  - Biomes (8)
  - Infrastructure (1)
  - Health/Malaria (5)
  - Marine/fisheries (9)
  - Permafrost (3)
  - Energy (?)
  - Biodiversity (?)
- Regional
  - Forestry (3)
  - Water (14)
  - Marine/fisheries (≥3)

Socio-economic input
GDP, population from SSPs + Historical data

Synthesis of Impacts in terms of warming
Main goals:
- Intercomparison & improvement of models
- Cross-sectoral aggregation
- Cross-sectoral effects
ISIMIP phases

• Fast Track (2011-2013):
  – Future projections under 4 RCPs
  – Data publicly available; many studies published

• ISIMIP2a (2014-2016):
  – Historical validation under 4 alternative observational datasets
  – Data publicly available early 2017 (most sectors); studies under way; ERL Focus Issue to appear 2017

• ISIMIP2b (2016-2017):
  – Future projections under 2 RCPs, extended PI-control and RCP2.6 scenarios → robust statistics for impacts of 1.5°C
  – Simulations being set up now, to be available by fall 2017
Focus Regions

...allow comparison among regional-scale models, and between regional and global models.
Selected results

Global multi-model impacts assessments, for example...

Crop yields  
(Rosenzweig et al., 2014)

Drought  
(Prudhomme et al., 2014)

Flood risk  
(Dankers et al., 2014)
Selected results

Scaling of impacts with global warming...

Natural vegetation change
(Warszawski et al., 2013)

Water scarcity
(Schewe et al., 2014)
Cross-sectoral analyses

Multi-impact "hot-spots" (Piontek et al., 2014)

Note: Early analysis with a limited number of sectors
Cross-sectoral analyses

1.5°C or 2°C: Makes a difference for impacts (Schleussner et al. 2016)

Many impacts are non-linear in temperature. Has implications for climate policy (Ricke et al., 2016)
Cross-sectoral analyses

- Human livelihood conditions measured through a comprehensive indicator.
- In some countries, projected changes in resources threaten livelihoods.
- In other countries, uncertainty in projections affects assessment of livelihoods.

(Lissner et al., 2014)
General lessons

- Uncertainty related to impact modeling is substantial
  - often similar to/larger than climate-model uncertainty

- RCP-spread can often be minimized by using $\Delta T_{\text{global}}$ as frame of reference
  - at least for aggregate metrics

- It’s an ensemble of opportunity
  - in some areas of great concern, no or only few models exist (e.g. human health, biodiversity...)

![Map of the world](image1)

![Graph of climate data](image2)
Conclusions

• ISIMIP has the most comprehensive database of global (and regional) climate impact simulations

• Consistency across models and sectors makes it useful for applications such as migration, where multiple climate impacts combine

• Note many other ongoing impact modelling activities (AgMIP, WFaS, ...)

• ISIMIP should be continuously developed to serve needs of various users

→ What could ISIMIP do to make data more useful for migration/population modelling in the future?
Thank you