ISIMIP: Consistent climate impact scenarios across sectors

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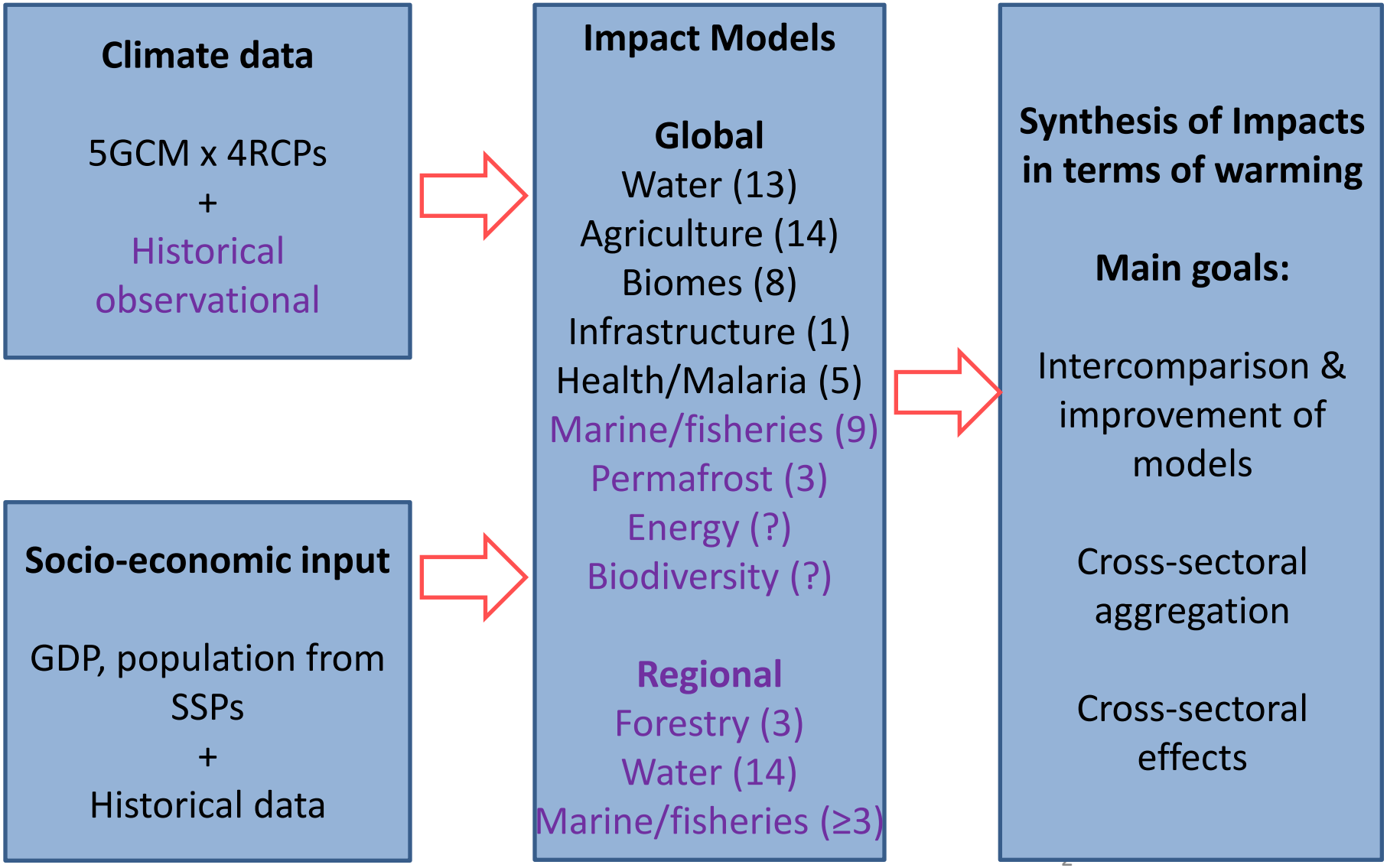
ISIMIP setup

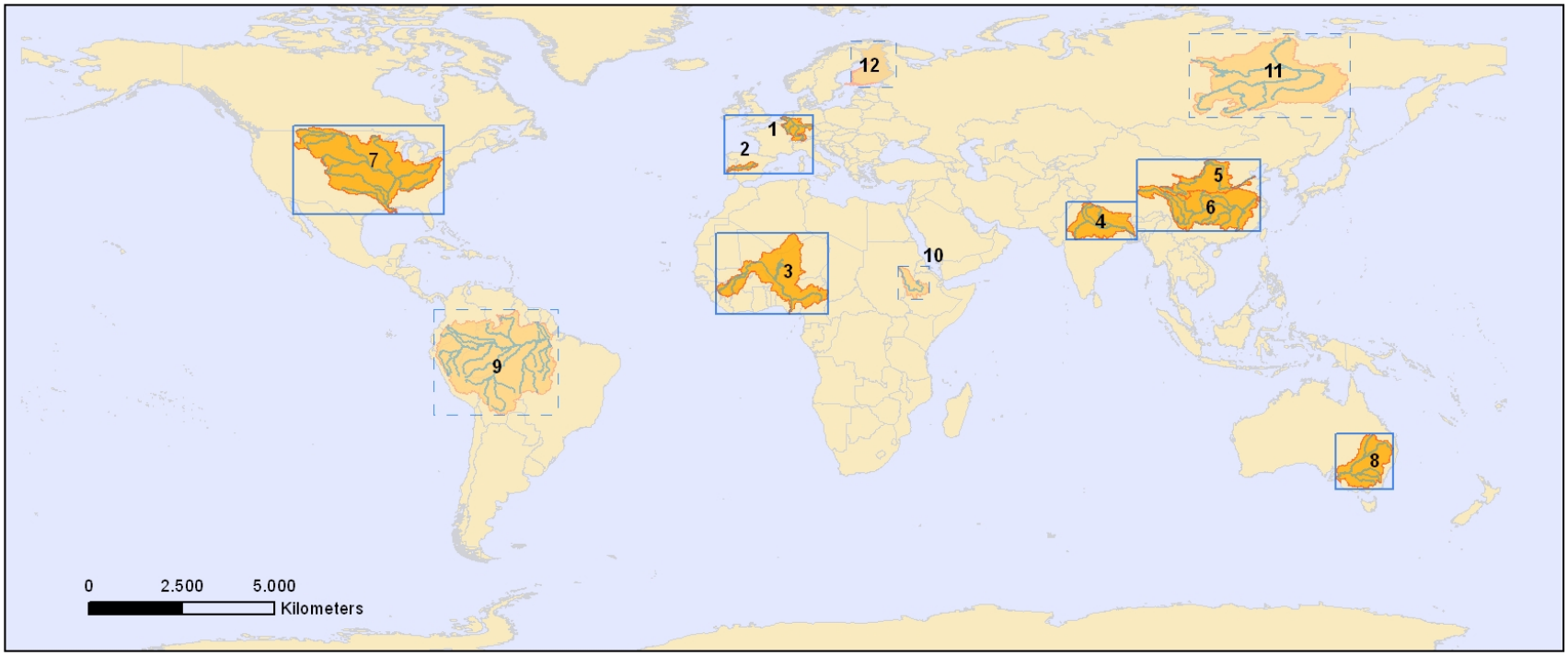


ISIMIP phases

- 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



Europe
- 1. Rhine
- 2. Tagus
- 12. Finland

Africa
- 3. Niger
- 10. Blue Nile

Asia
- 4. Ganges
- 5. Yellow
- 6. Yangtze
- 11. Lena

N.America
- 7. Mississippi

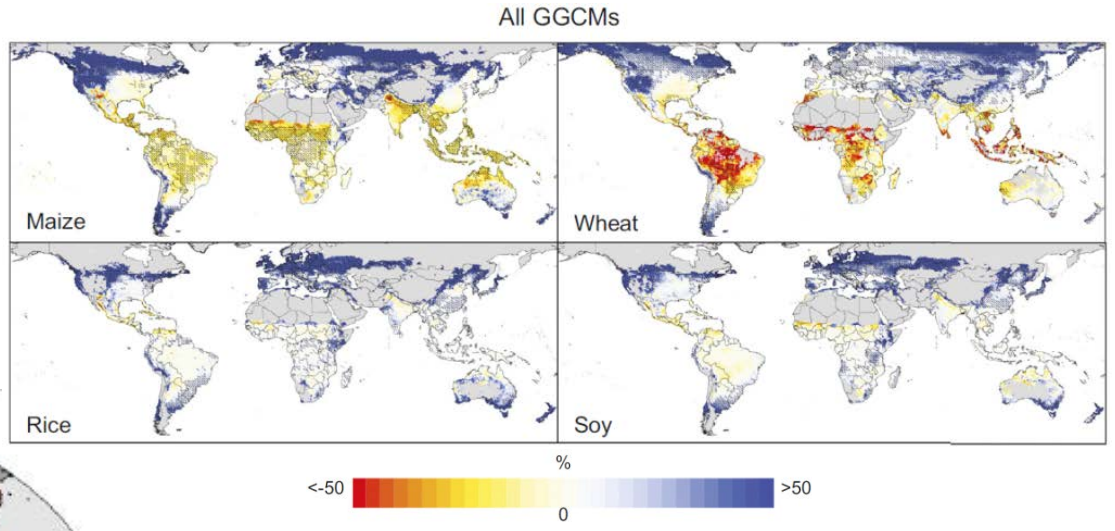
Australia
- 8. Murray Darling

S.America
- 9. Amazon

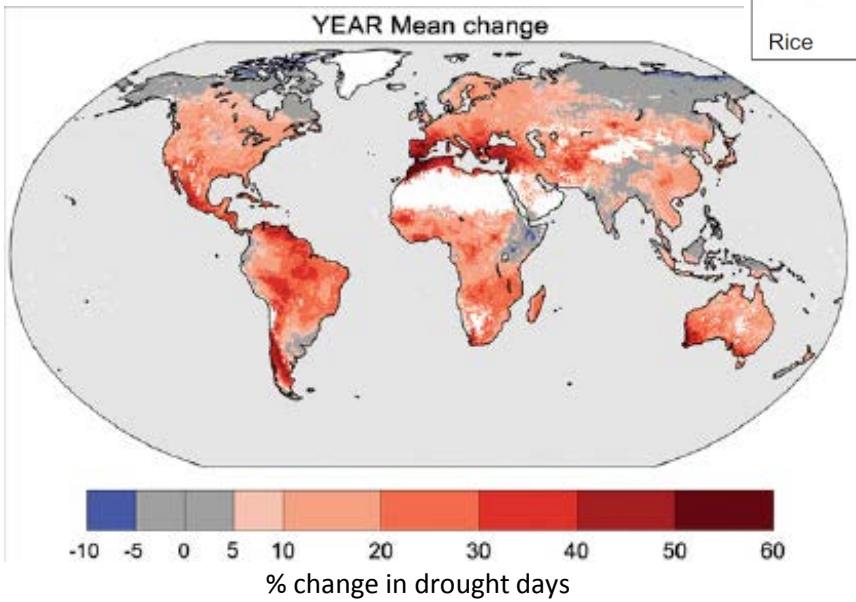
Selected results

Global multi-model impacts assessments, for example…

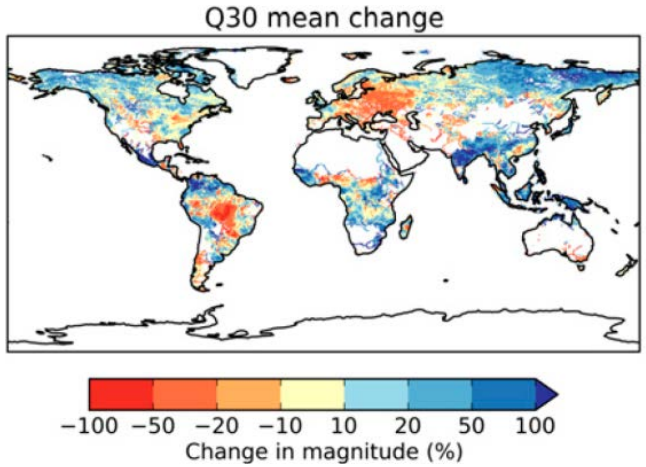
Crop yields
(Rosenzweig et al., 2014)



Drought
(Prudhomme et al., 2014)



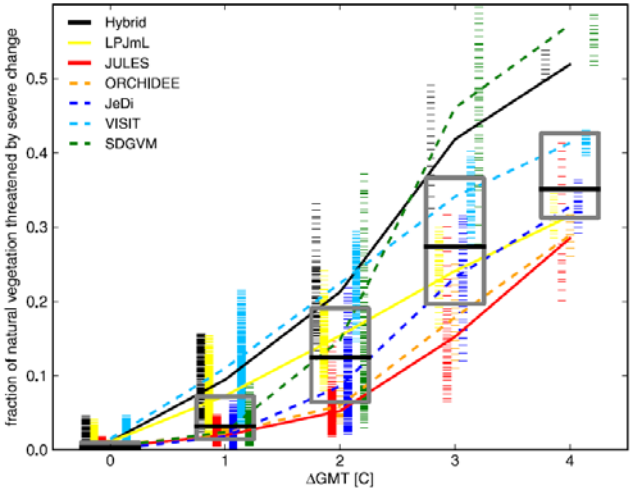
Flood risk
(Dankers et al., 2014)

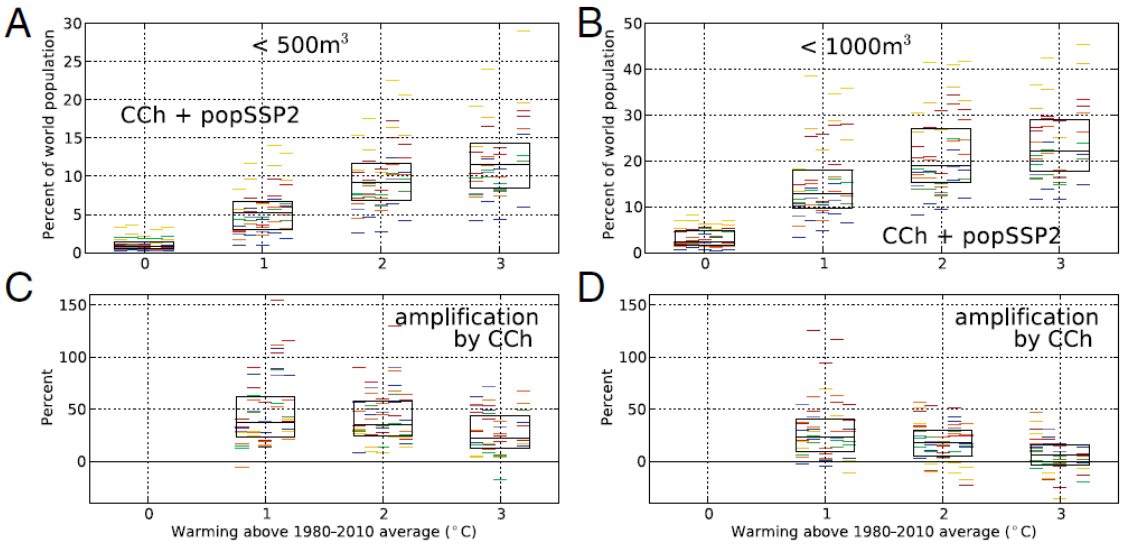


Selected results

Scaling of impacts with global warming…

Natural vegetation change
(Warszawski et al., 2013)

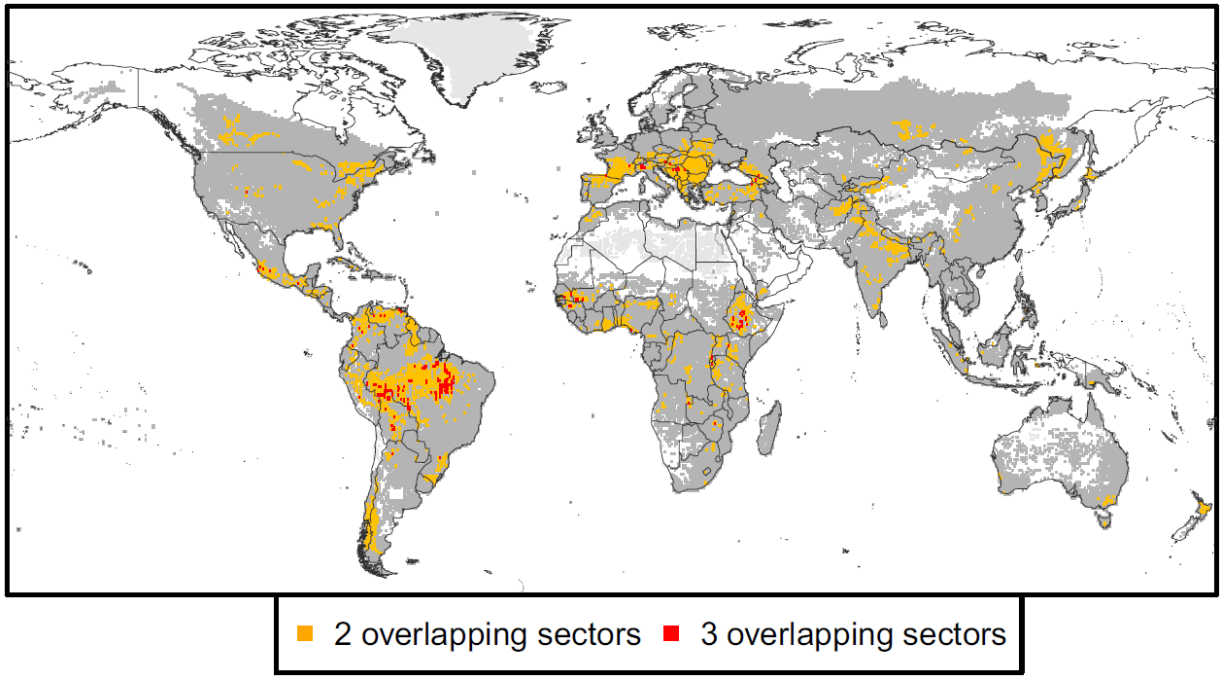




Water scarcity
(Schewe et al., 2014)

Cross-sectoral analyses

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

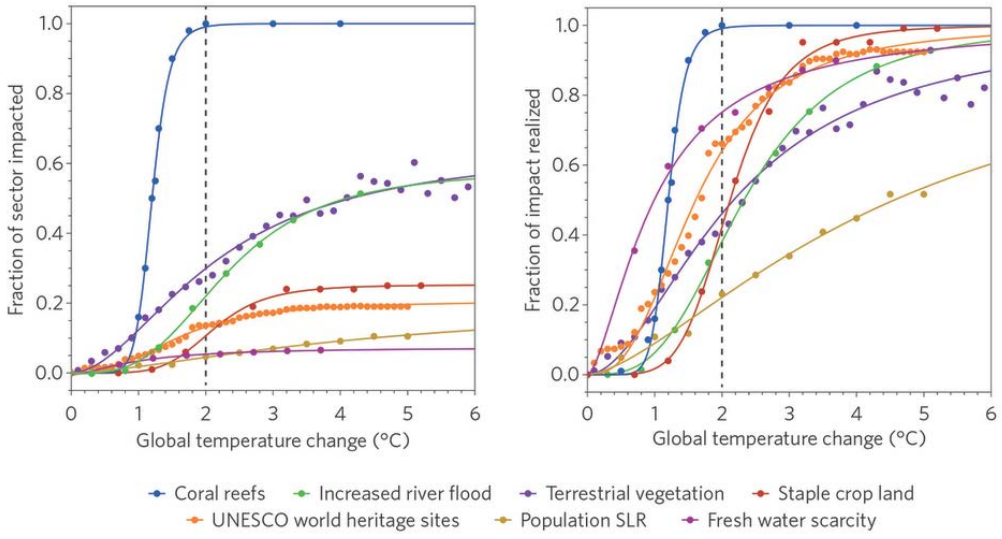


Note: Early analysis with a limited number of sectors

Cross-sectoral analyses

		1.5°C	2°C	
Heat wave (warm spell) duration [month]				
	Global	1.1 [1;1.3]	1.6 [1.4;1.8]	Tropical regions up to 2 months at 1.5°C or up to 3 months at 2°C
Reduction in annual water availability [%]				
	Mediterranean	9 [5;16]	17 [8;28]	Other dry subtropical regions like Central America and South Africa also at risk
Increase in heavy precipitation intensity [%]				
	Global	5 [4;6]	7 [5;7]	Global increase in intensity due to warming; high latitudes (>45°N) and monsoon regions affected most.
	South Asia	7 [4;8]	10 [7;14]	
Global sea-level rise				
	in 2100 [cm]	40 [30;55]	50 [35;65]	1.5°C end-of-century rate about 30% lower than for 2°C reducing long-term SLR commitment.
	2081-2100 rate [mm/yr]	4 [3;5.5]	5.5 [4;8]	
Fraction of coral reef cells at risk of long-term degradation [Constant case, %]				
	2050	90 [50;99]	98 [86;100]	Only limiting warming to 1.5°C may leave window open for some ecosystem adaptation.
	2100	70 [14;98]	99 [85;100]	
Changes in local crop yields over global and tropical present day agricultural areas including the effects of CO_2-fertilization [%]				
Wheat	Global	2 [-6;17]	0 [-8;21]	Projected yield reductions are largest for tropical regions, while high-latitude regions may see an increase. Projections not including highly uncertain positive effects of CO_2-fertilization project reductions for all crop types of about 10% globally already at 1.5°C and further reductions at 2°C.
	Tropics	-9 [-25;12]	-16 [-42;14]	
Maize	Global	-1 [-26;8]	-6 [-38;2]	
	Tropics	-3 [-16;2]	-6 [-19;2]	
Soy	Global	7 [-3;28]	1 [-12;34]	
	Tropics	6 [-3;23]	7 [-5;27]	
Rice	Global	7 [-17;24]	7 [-14;27]	
	Tropics	6 [0;20]	6 [0;24]	

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

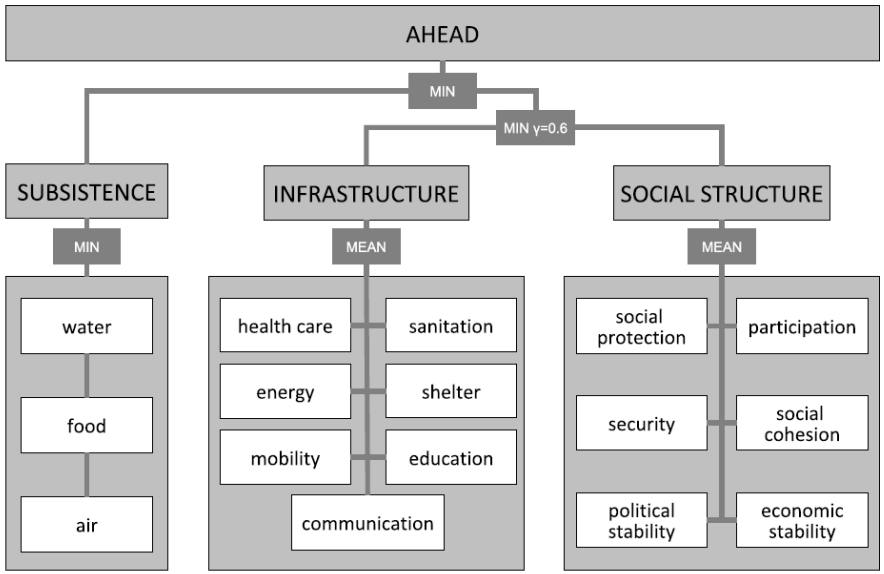


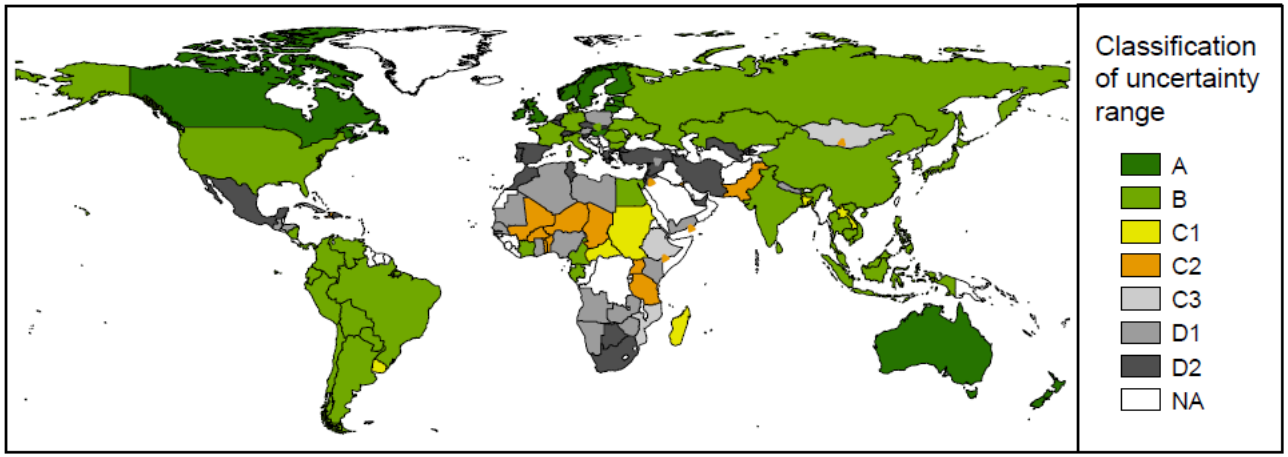
Many impacts are non-linear in temperature. Has implications for climate policy (Ricke et al., 2016)

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.

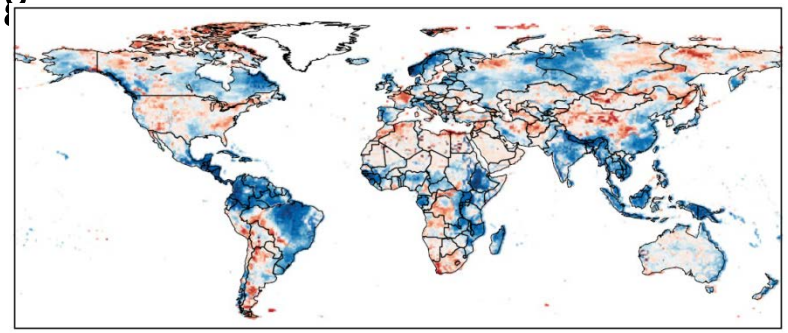
(Lissner et al., 2014)





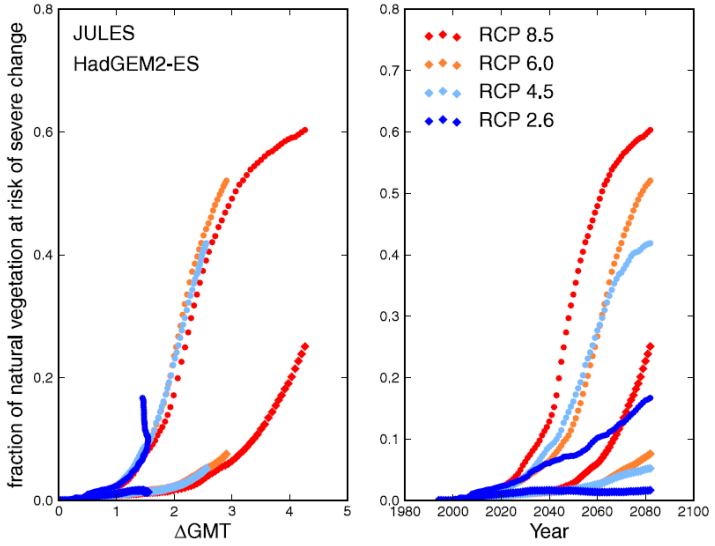
General lessons

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



- RCP-spread can often be minimized by using ΔT_{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…)



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