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Process-based models for climate impact attribution across sectors

PROCLIAS highlights from WGs 1-4

WG3: Understanding multiple climate risks

Simon Gosling, Shiri Shamir, Louis-Francois Pau, Maryna Strokal, Rohini Kumar, Shouro Dasgupta, Aleš Urban + all WG3 members

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Three main highlights

- Global water quality
- Heat, health and adaptation
- Labour

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Global water quality

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- Maryna Strokal
- Rohini Kumar
- Ilaria Micella
- Mirjam P. Bak
- Arthur H. W. Beusen
- Martina Flörke
- Simon N. Gosling
- Ann Van Griensven
- Bruna Grizzetti
- Nynke Hofstra
- Edward R. Jones
- Carolien Kroeze
- Albert Nkwasa
- Tineke Troost
- Michelle T.H. van Vliet
- Mengru Wang

Water quality models exist to address causes, hotspots and impacts, but diverse in approaches, time and space (examples)

CWaTM-WQ
(temperature)

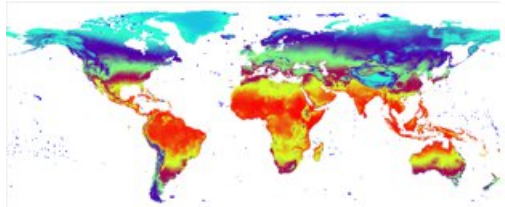
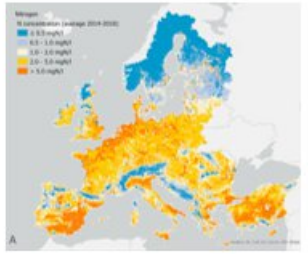


IMAGE-GNM
(phosphorus, nitrogen)

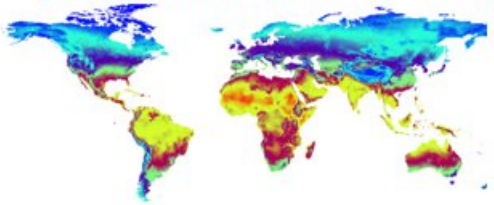
mQM
(nitrogen)

GREEN
(nitrogen, phosphorus)



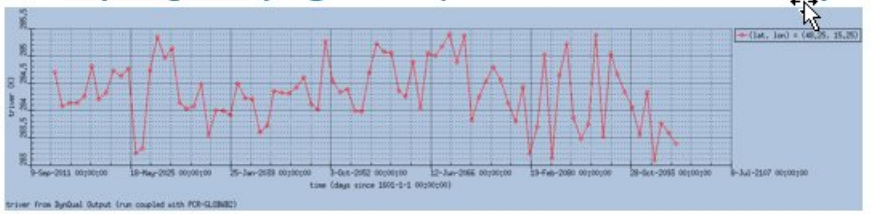
SWAT+
(nitrogen, phosphorus)

DynQual
(temperature, BOD, TDS)



MARINA
(nitrogen, phosphorus, plastics, triclosan, diclofenac)

DynQual *(e.g., temperature, time series)*



GLoWPa
(Cryptosporidium)

ISIMIP/Proclias and WWQA joint effort

- Submitted model results:

Reference	Model name	3b/2b runs	Spatial extent	Spatial resolution	Temporal extent	Temporal resolution	Scenarios	Pollutant
Dor Friedman	CWatM	ISIMIP 3b	Global	0.5° x 0.5°grids	2015-2100	Annual, monthly	SSP1-RCP2.6, SSP2-RCP4.5, SSP3-RCP7.0, SSP5-RCP8.5	Triver
Edward Jones	DynQual	ISIMIP 3b	Global	0.5° x 0.5°grids	2005 - 2100	Annual, monthly	ssp126, ssp370, ssp585	Triver, TDS,BOD
Nynke Hofstra	GloWPa	ISIMIP 2b	Global	0.5° x 0.5°grids	2010, 2020, 2030 and 2050	Monthly	SSP1-HIST, SSP3-HIST, SSP5-HIST, SSP1-RCP2.6, SSP3-RCP2.6, SSP5-RCP2.6, SSP1-RCP8.5, SSP3-RCP8.5, SSP5-RCP8.5	Crypto
Arthur Beusen	IMAGE-GNM	ISIMIP 2b	Global	0.5° x 0.5°grids	1970-2070	Annual (5-year timestep)	SSP1-RCP4.5, SSP2-RCP6.0, SSP3-RCP6.0, SSP4-RCP6.0 and SSP5-RCP8.5	TN,TP
Maryna Strokal Ilaria Micella	MARINA	ISIMIP 2b	Global	Outlets of basins	2010 2050	Annual	SSP1-RCP2.6, SSP5-RCP8.5	TDN,TDP,MIP,MAP,TCS,DCL
Martina Florke	World Qual / Water GAP							
Rafa Marce	GLOBAL-FATE							

Reference	Model name	3b/2b runs	Spatial extent	Spatial resolution	Temporal extent	Temporal resolution	Scenarios	Pollutant
Tieneke Troost	WFLOW-DELWAQ	ERA5 (2b?)	Global / acute toxic pressure by chemicals	30x30 sec (~1x1km)	2010	Annual average based on daily output	SSP1-RCP2.6, SSP5-RCP8.5	acute toxic stress on species loss (msPAF)

Reference	Model name	3b/2b runs	Spatial extent	Spatial resolution	Temporal extent	Temporal resolution	Scenarios	Pollutant
Albert Nkwasa	SWAT+	ISIMIP 2b	Regional/Africa	0.5° x 0.5°grids	2010-2050	5 -year annual time step	RCP2.6, RCP4.5, RCP8.5	TN,TP
Rohini Kumar	mQM	ISIMIP 2b	Regional/Europe	0.5° x 0.5°grids	1970-2070	Annual	SSP1-RCP2.6, SSP1-RCP4.5, SSP5-RCP8.5	TDN
Bruna Grizetti	GREEN	MPI-ESM-LR downscaled with COSMO-CLM and bias corrected	Regional/Europe	River basins and coastal outlets to the sea	2015-2055	Annual	SSP1-RCP4.5	TN,TP

- Making plans for ISIMIP3 runs considering data availability.

- Results from the sector were included in a **session at EGU** last week:

EDI

Water quality and availability modeling, risk analysis and decision support under current conditions and future scenarios

Convener: Albert Nkwasa[ECS] | Co-conveners: Miriam Glendell, Danlu Guo[ECS], Rohini Kumar, Matthew Miller, Olivia Miller[ECS], Michelle van Vliet

Orals | Wed, 17 Apr, 14:00–18:00 (CEST) Room 2.31

Posters on site | Attendance Thu, 18 Apr, 16:15–18:00 (CEST) | Display Thu, 18 Apr, 14:00–18:00 Hall A

Posters virtual | Attendance Thu, 18 Apr, 14:00–15:45 (CEST) | Display Thu, 18 Apr, 08:30–18:00 vHall A

- [illegible] lude papers that cover five main research directions:

Potential research directions for model intercomparisons

- Direction 1: Robust pollution hotspots and trends
- Direction 2: Cross-scale analyses
- Direction 3: Impacts on different sectors
- Direction 4: Source attribution
- Direction 5: Overarching

for model intercomparisons of water quality across sectors, pollutants, scales, and scenarios considering the large diversity among models

- Follow-up ISIMIP/PROCLIAS water quality **workshop for next steps in paper writing**: 13-14 June (location TBC).

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Heat, health and adaptation

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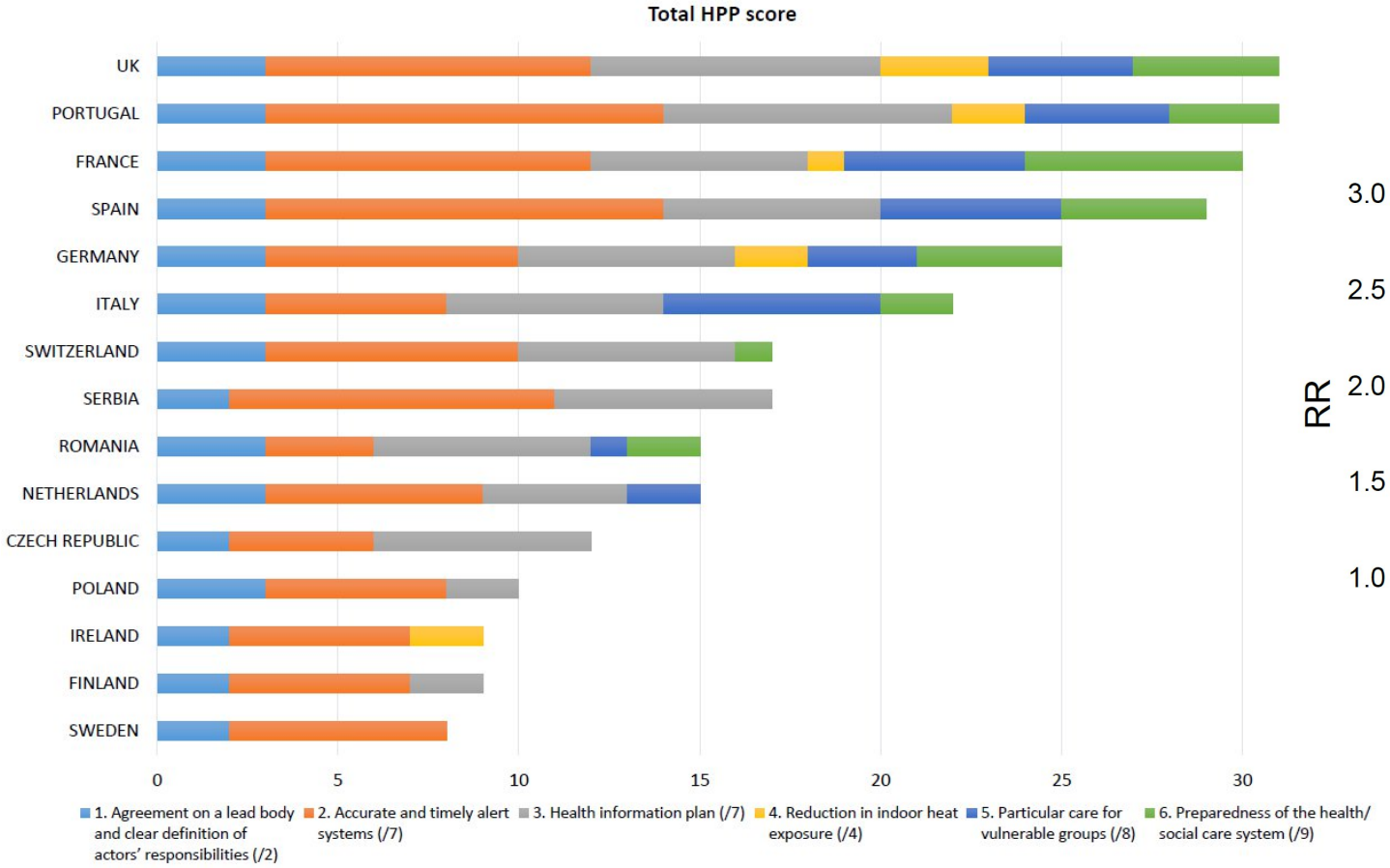
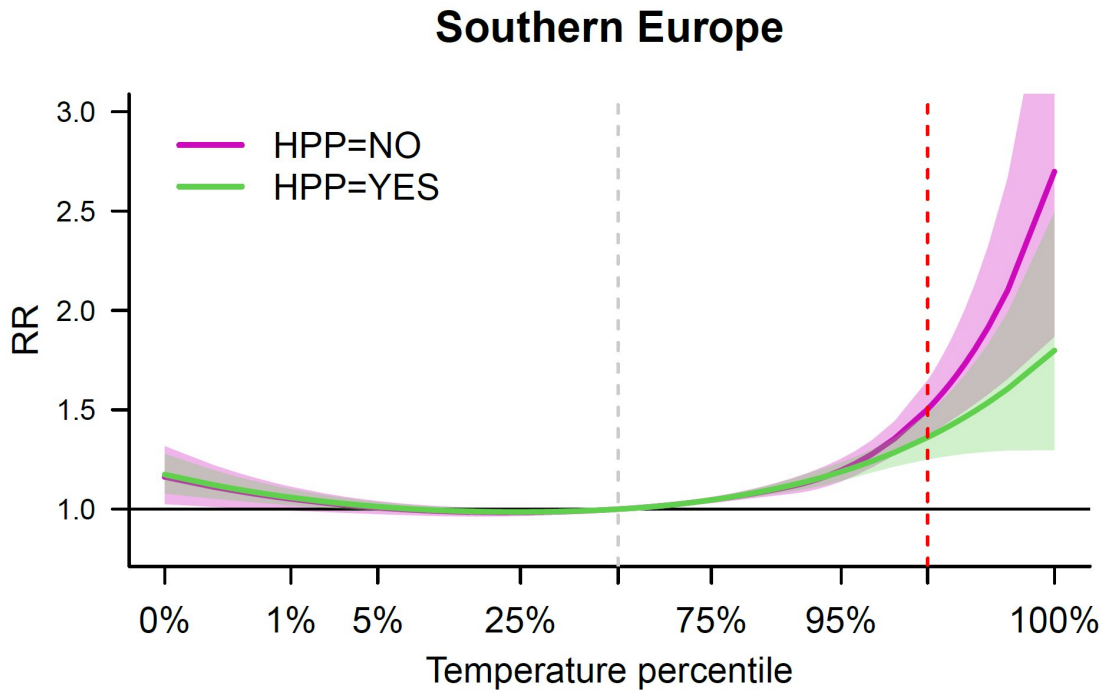
Participants from 17 countries:

- Wim Thiery
- Lidija Srnec
- Aleš Urban
- Simona Procházková
- Martin Hynčica
- Martin Novak
- Luis Francois Pau
- Salomé Henry
- Veronika Huber
- Andreas Matzarakis
- Shiri Zeman-Shamir
- Joanna Wieczorek
- Vladimir Djudjevic
- Shouro Dasgupta
- Katie Johnson
- Francesca de'Donato
- Elina Dace
- Werner Hagens
- Joanna Wieczorek
- Vladimir Djudjevic
- Silvia Kohnova
- Tjasa Pogacar
- David Garcia-León
- Joan Ballester
- Thessa Beck
- Ana Casanueva
- Nuria Pilar Plaza
- Samuel Lüthi
- Martina Ragettli
- Simon Gosling
- Claudia Di Napoli
- Elizabeth Robinson

- Work has focussed on **cataloguing** heat early warning systems (HEWs) and heat-and-health action plans (HHAPs) across Europe, through expert workshops and surveys:





- Work is also looking at modelling the effects of HEWs and HHAPs on mortality, as an **adaptation mechanism**.
- A manuscript "The efficiency of heat prevention plans to reduce heat-related mortality in Europe" is in the final stage of preparation - planned **submission by June 2024**.

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Labour

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- Shouro Dasgupta
- Elizabeth Robinson
- Simon Gosling
- Katie Johnson
- Franziska Piontek
- Louis Francois-Pau

The Australian Journal of Agricultural and Resource Economics

AARES Australasian Agricultural & Resource Economics Society

ORIGINAL ARTICLE | Open Access

Climate, weather and child health in Burkina Faso

Shouro Dasgupta, Elizabeth J. Z. Robinson

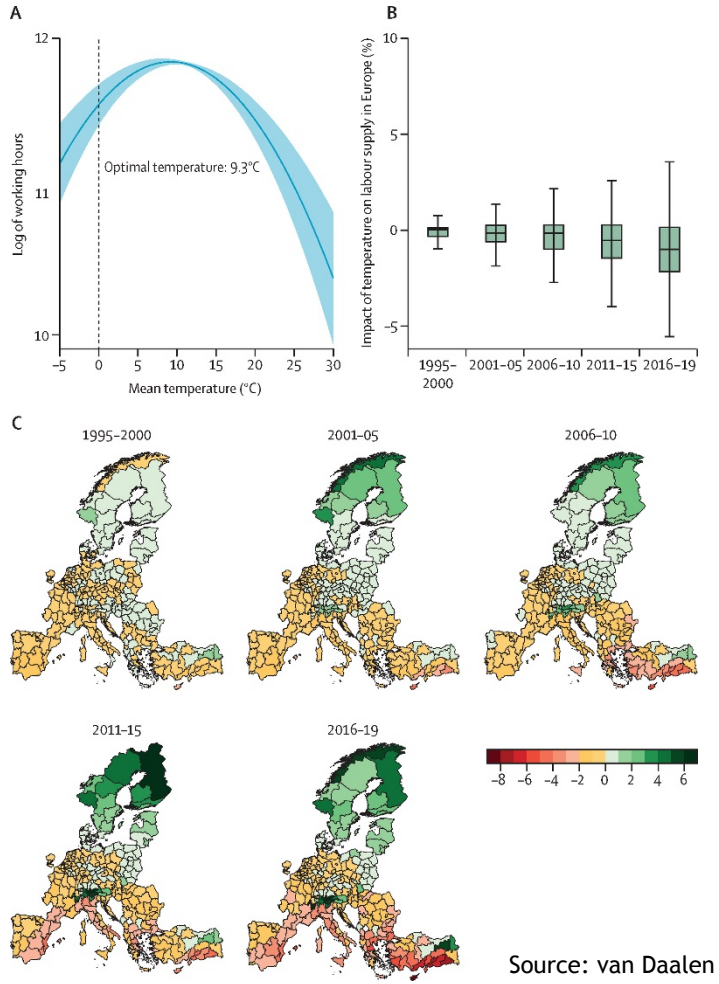
First published: 08 August 2023 | https://doi.org/10.1111/1467-8489.12530

- The 2022 Europe report of the **Lancet Countdown** on health and climate change.
- The relationship between labour supply (number of working hours) and temperature in Europe is non-linear.
- Labour supply in high-exposure sectors is around 1% lower nowadays compared to1965-94.

Future plans:

- Invited review at *Nature Reviews* on heat stress and labour force impacts
- Adaptation in the labour force in Israel.
- Attribution of labour impacts.
- Meeting in September/October 2024
- STSM to Grantham Institute.

- The first comprehensive assessment of the impact of climatic stressors on **child health** in Burkina Faso.
- Empirical analysis of the impact of climate and weather shocks on mortality, stunting, and wasting.



Source: van Daalen et al. (2022)

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Final remarks

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PROCLIAS has helped with…

- **Creating new sectors** in ISIMIP, and helped established sectors **grow**.
- **Sustainability** of research.
- **Cross-sectoral** linkages and assessments.

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Process-based models for climate impact attribution across sectors

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WG3: Understanding multiple climate risks

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