Health and Environment International Trust,
Mapua, New Zealand

CLIMATE CHANGE IMPACTS ON HEALTH AND WELL-BEING ESTIMATES WITH ISI-MIP DATA

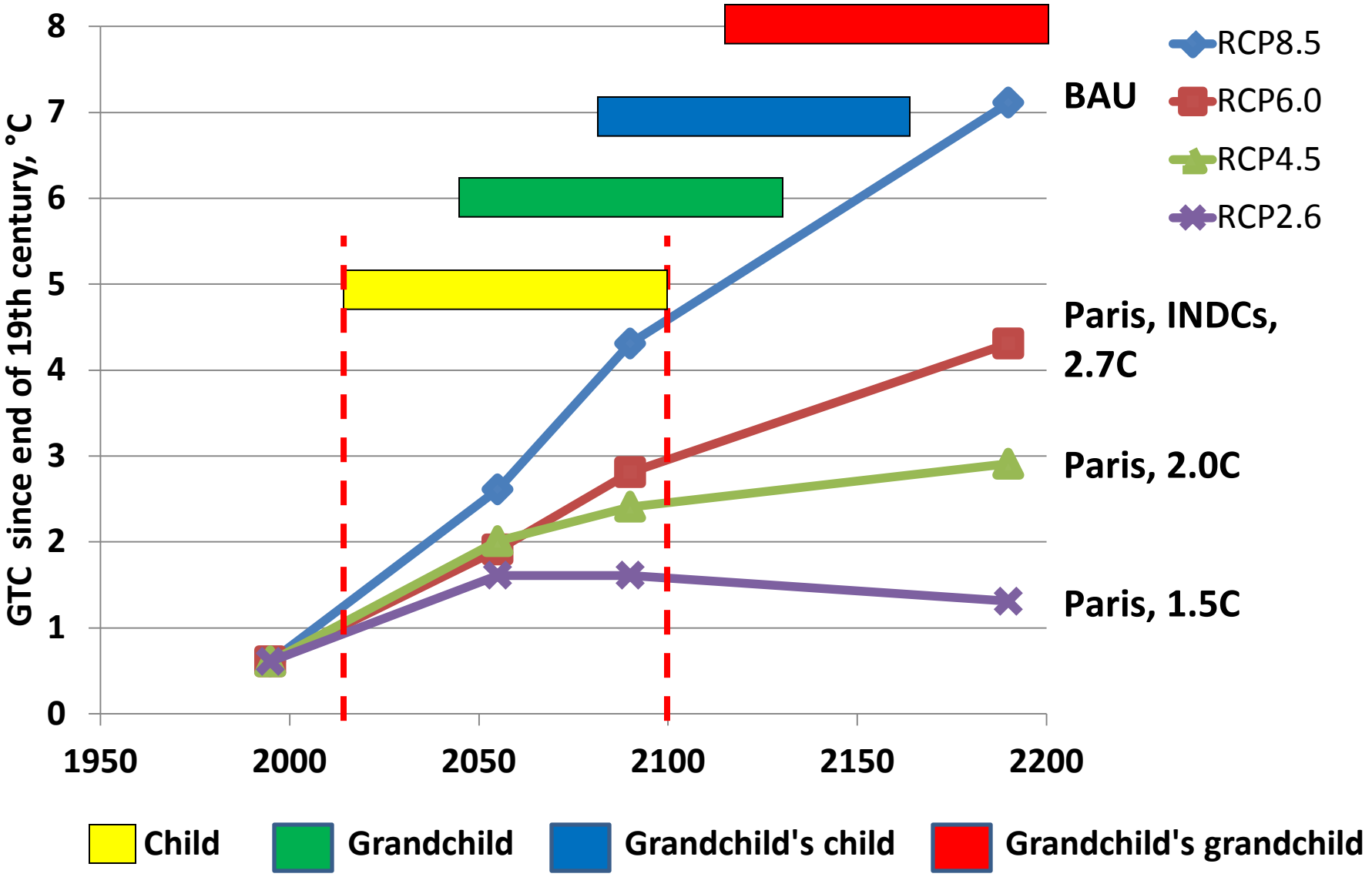
- Need to broaden the health effects included in inter-sectoral impact analysis

Tord Kjellstrom
Now with EU funded HEAT-SHIELD project, protecting workers from heat
Includes 20 institutions in Europe; led by Lars Nybo, Copenhagen

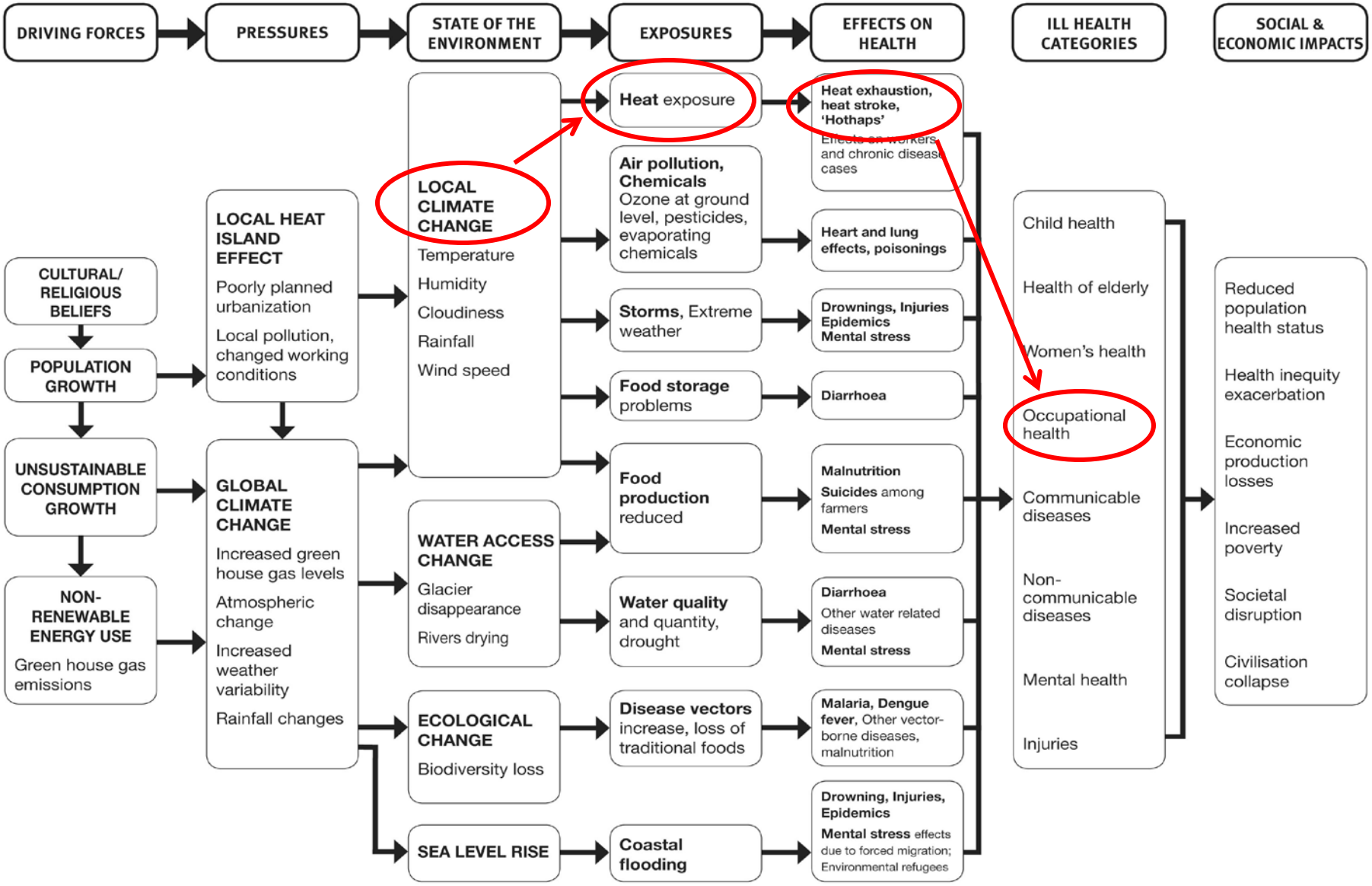
Research team in New Zealand: Bruno Lemke, Matthias Otto, David Briggs, Chris Freyberg and Olivia Hyatt

Seminar at PIK, June 22, 2016

Time trends of modeled global temperature change; Data in IPCC report and Paris (COP21) agreements



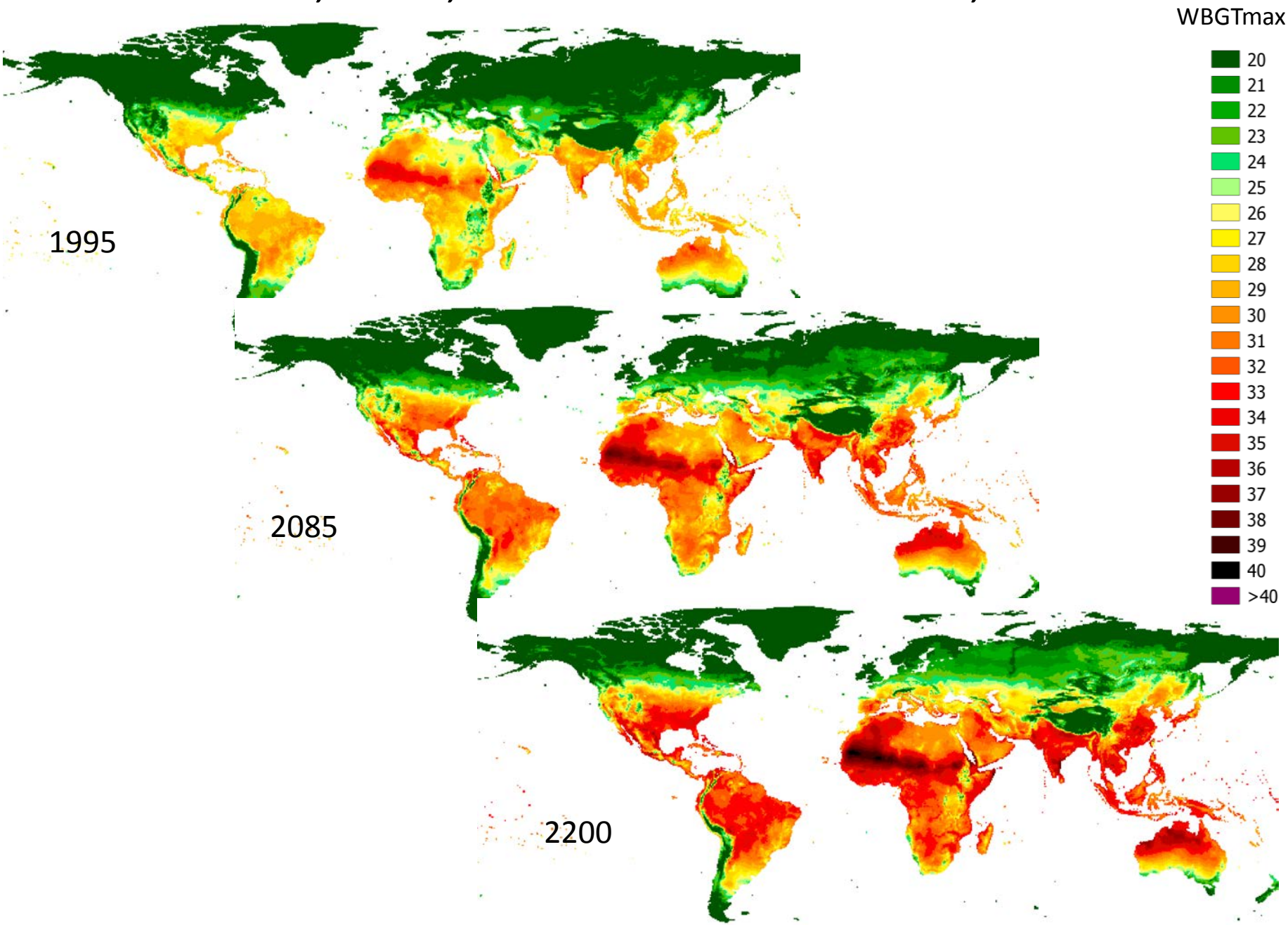
Health impacts of Climate change, DPSEEA framework



Health variables to consider

- Heat mortality
- Extreme weather/rainfall/wind mortality
- Serious clinical direct health impacts – medical emergency treatments (heart, kidney, brain, lungs)
- Serious indirect health impacts (malaria, malnutrition, diarrhoea, mental stress, injuries)
- Heat exhaustion (effects on paid work, unpaid daily activities, sports, children's play)
- Heat discomfort, habitability, migration pressure

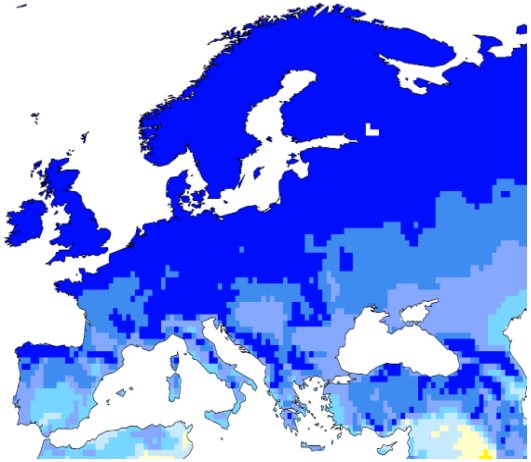
Trend 1995, 2085, 2200 for hottest month, RCP8.5 GFDL



The HEAT-SHIELD project

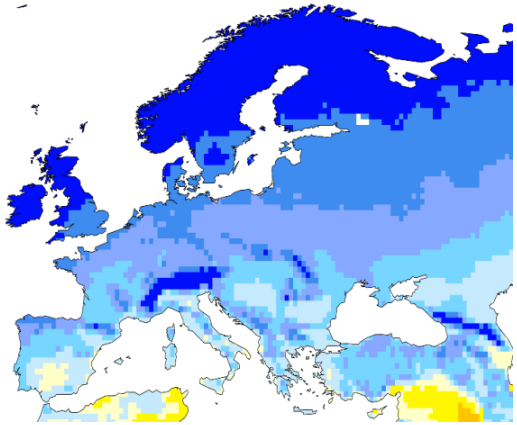
- **Aims:** protecting working people from excessive heat exposure in workplaces, as a result of climate change.
- **Horizon 2020, EU funded** , 20 participant agencies, 2016 – 2020. ….. 8 Work Packages……. Work Package 2:
- **Tasks:** 2.1 Impact of heat on health and productivity
- 2.2 Effect of age, gender, etc on heat risks
- 2.3 Vulnerability mapping
- **Focus on:** working people (mainly age 15-69); weather station data; heat vulnerability; protection/prevention (both adaptation and building case for more mitigation
- **Vulnerability factors**: work practices; urban/rural; indoor /outdoor; home heat conditions

Climate vulnerability, HEATSHIELD project

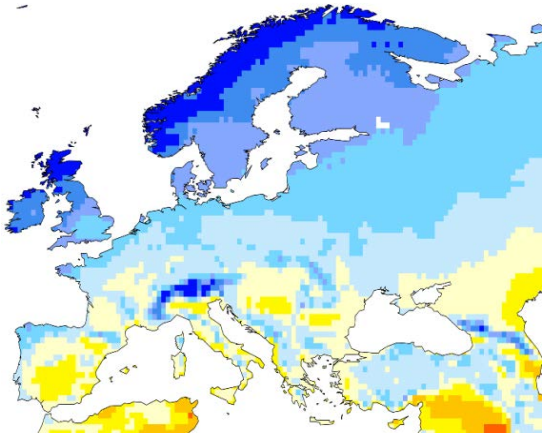


WBGT level, in- shade afternoon

CRU 1995 (1980-2010) WBGTmax of the monthly average of the Hottest Month; **CURRENT**



HadGem and GFDL average RCP 6.0 2085, WBGTmax, monthly average of hottest month.; **MONTH 2085**



HadGem and GFDL average RCP 6.0 2085, WBGTmax, hottest 3 days in hottest month.; **3 DAYS 2085**

Climate change impacts on working people

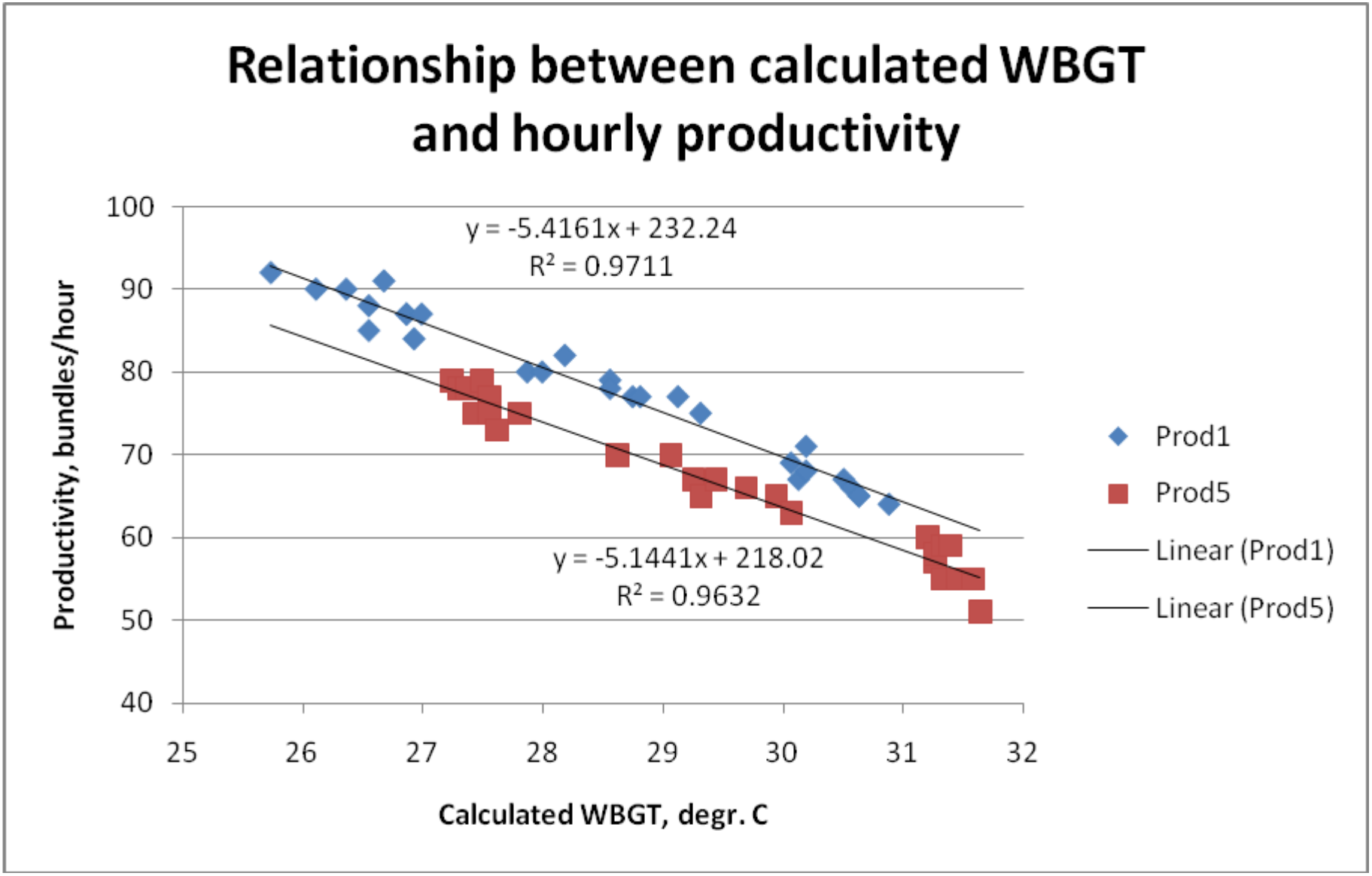
- Our team is developing a program measuring workplace heat exposures and effects on health and productivity and assessing likely impacts due to climate change in different parts of the world. HEATSHIELD focuses on Europe, and includes Tourism, Transport and the three groups below……
- In parallel the global HOTHAPS program carries out field studies in several tropical developing countries. Risk groups include workers in *agriculture*

- and *construction*

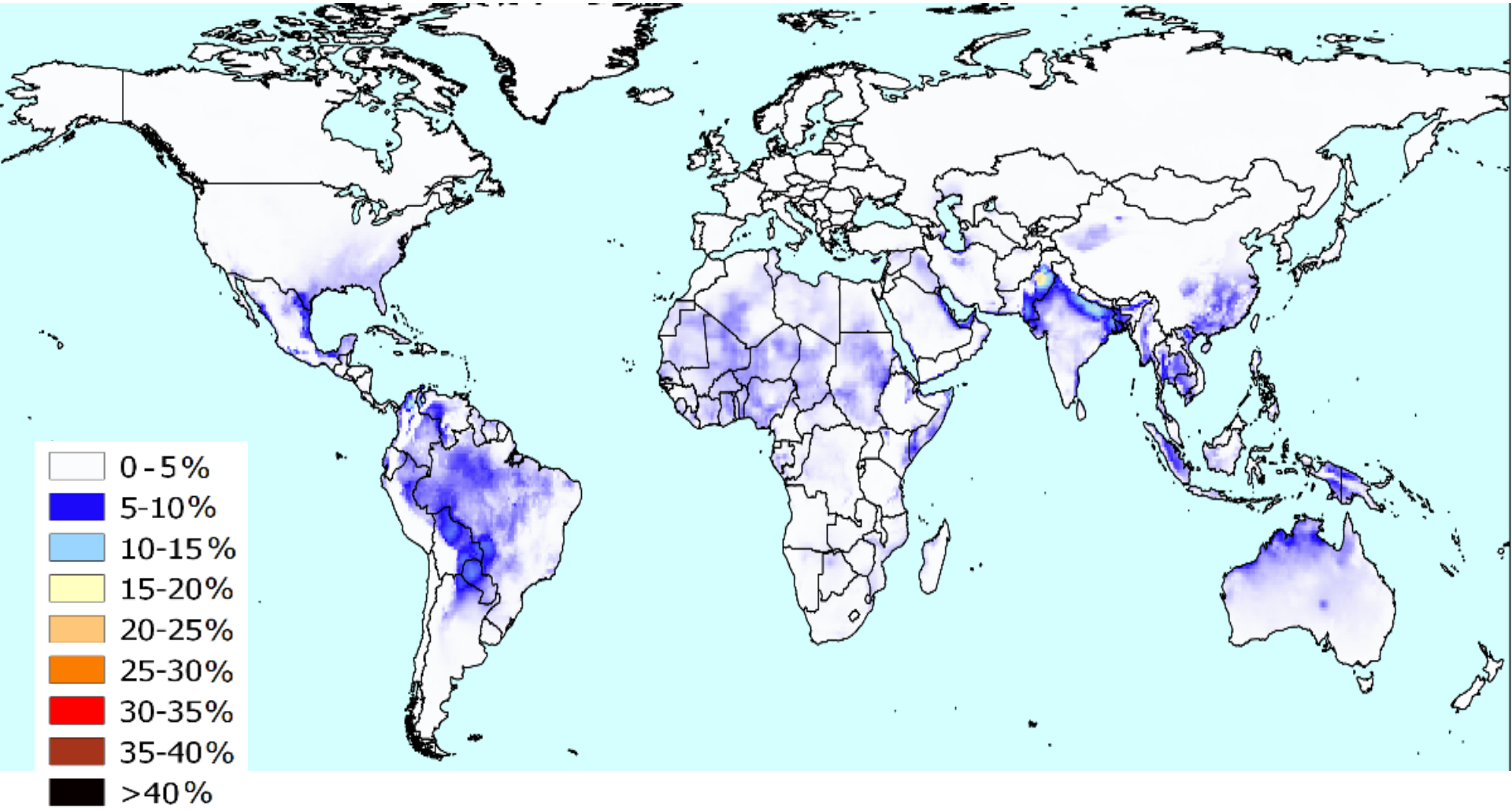
- and *manufacturing* (factories seldom have air conditioning)

Heat impact on productivity of rice harvesters in West Bengal

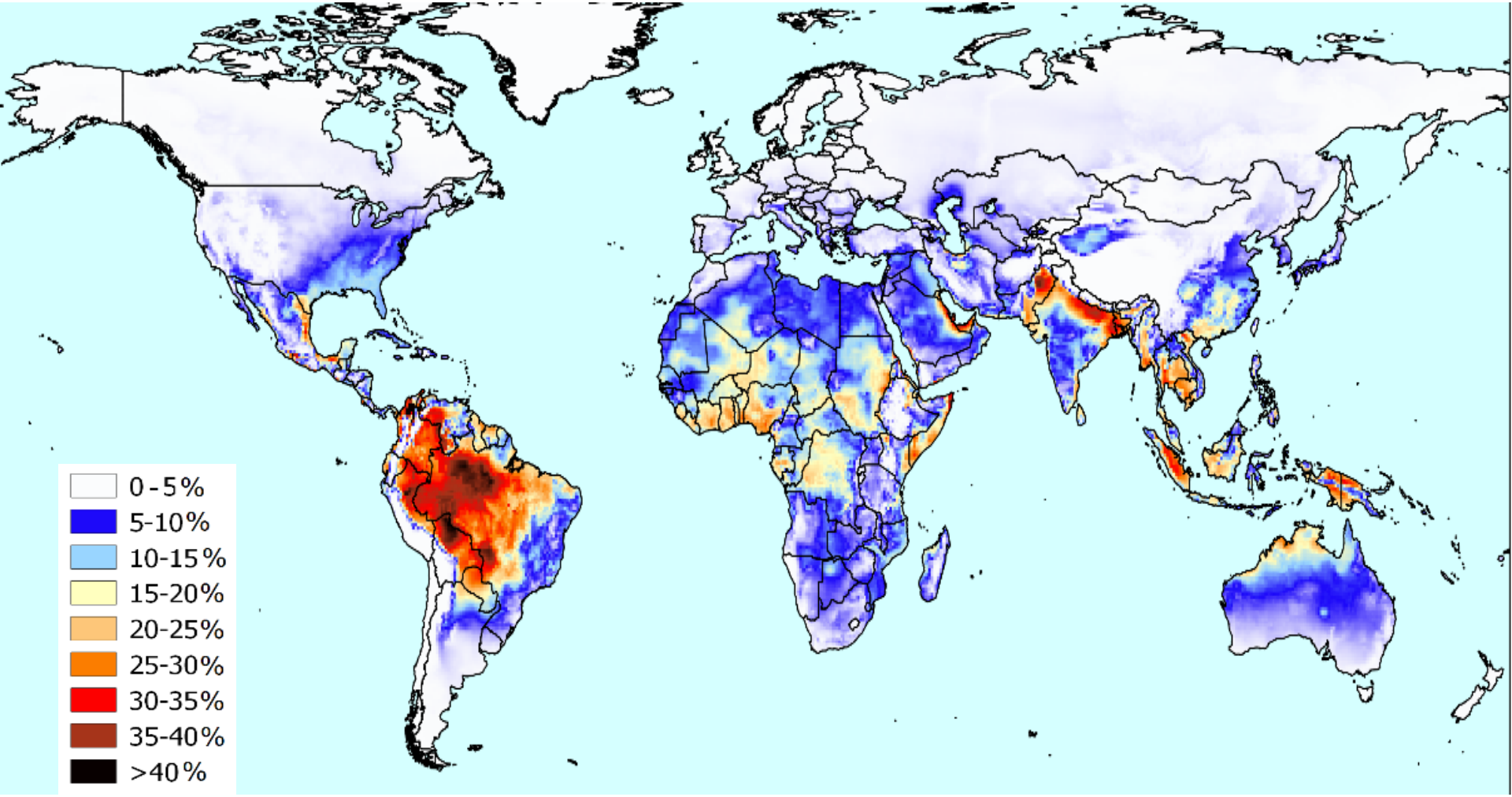
(Sahu et al., 2013)

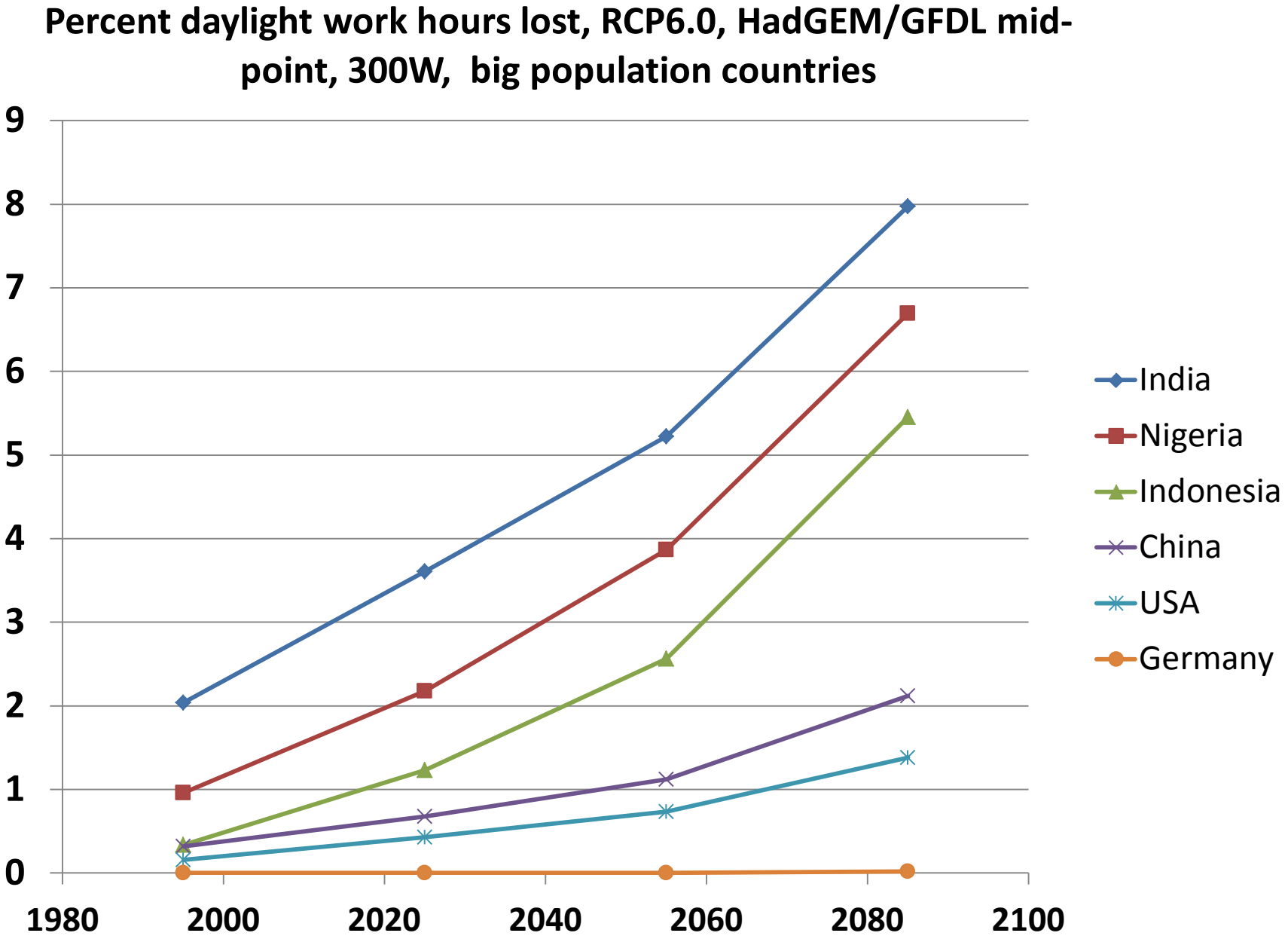


The percent annual daylight work hours lost in each grid cell; (1995, HadGEM2 model, 400W).

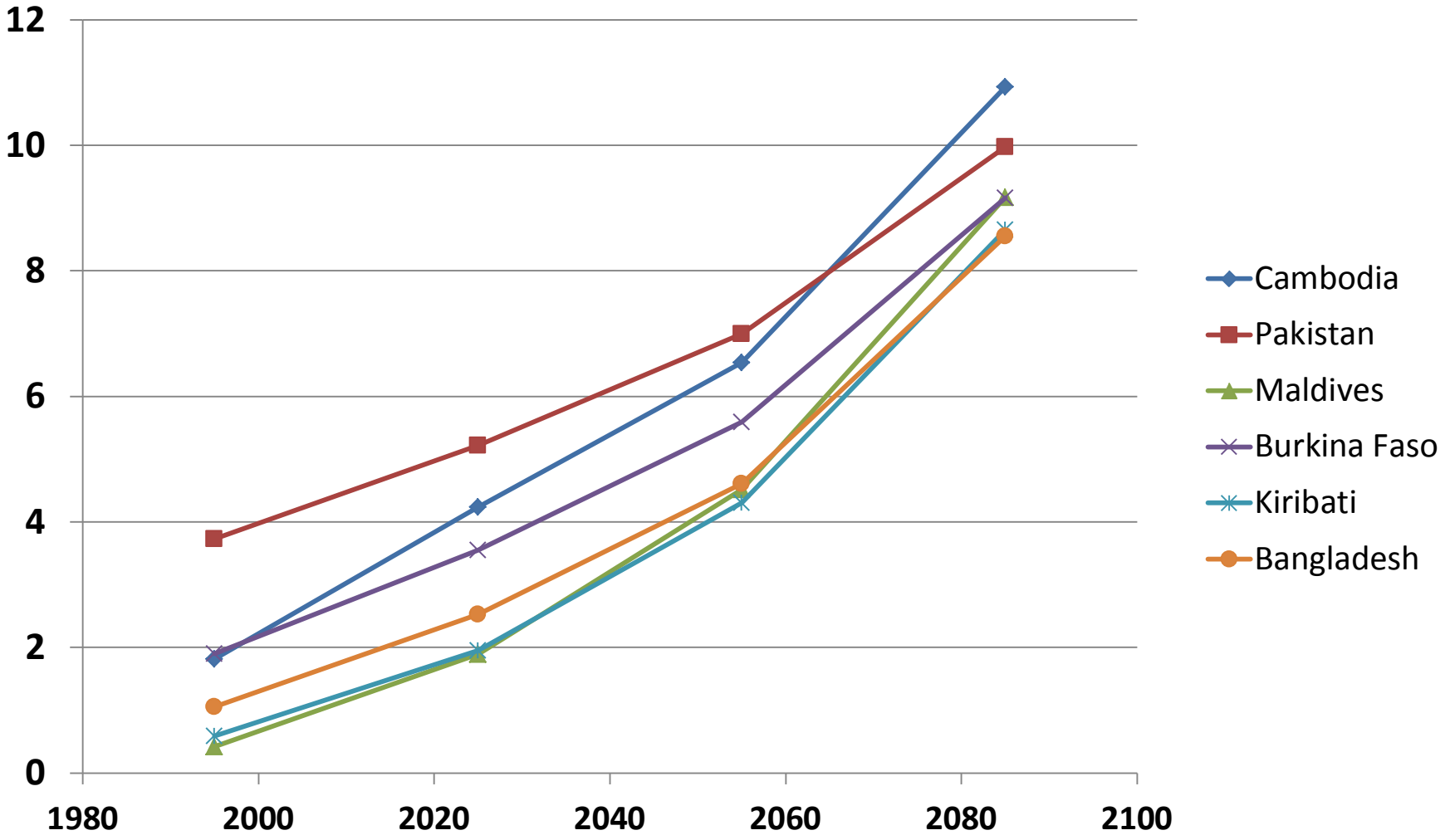


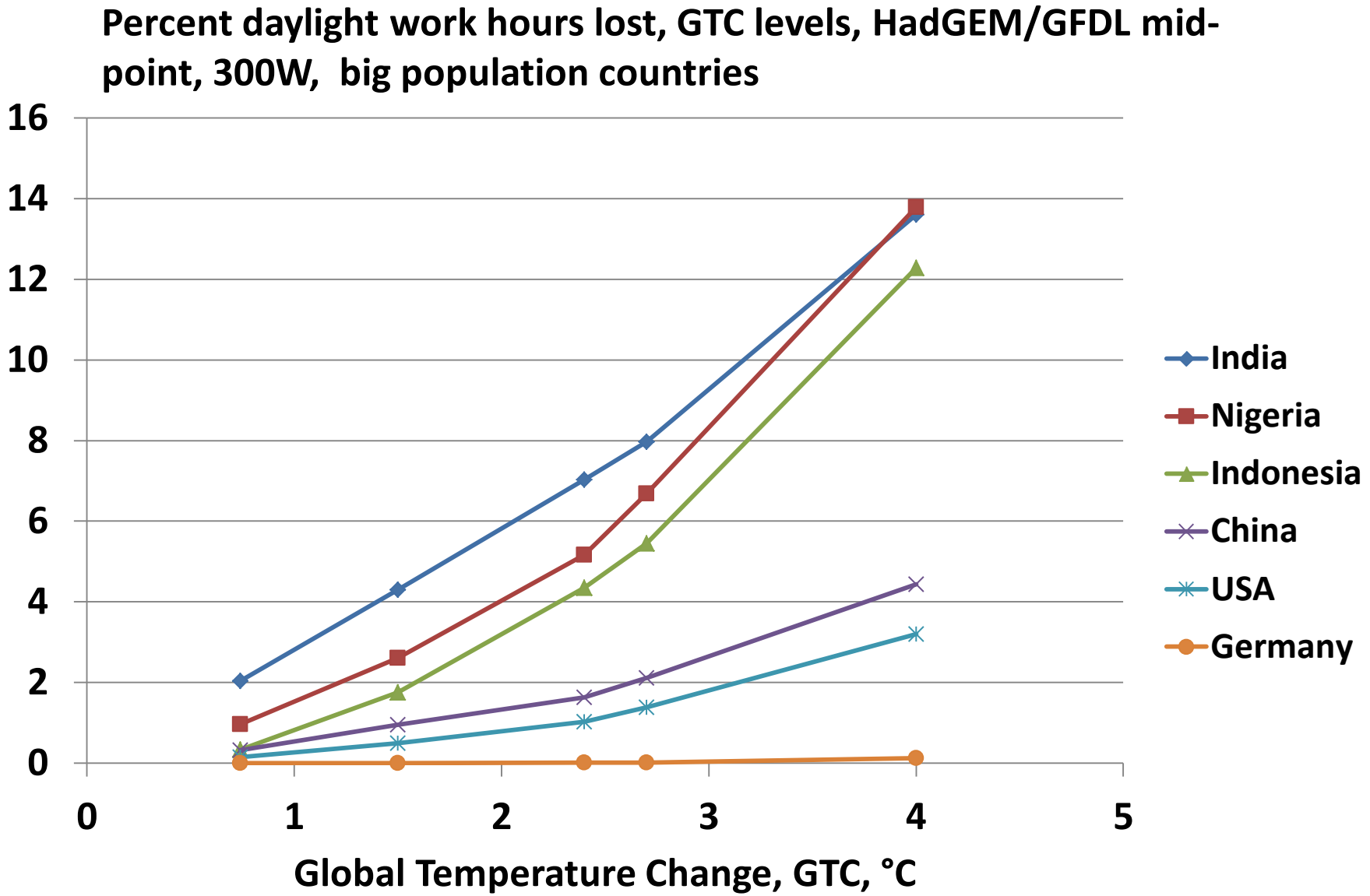
The percent annual daylight work hours lost in each grid cell; (2085, RCP8.5, GTC = 4.0C, BAU, HadGEM2, 400W).




Percent daylight work hours lost, RCP6.0, HadGEM/GFDL mid-point, 300W, big population countries
9
8
7
6
5
4
3
2
1
0
1980
2000
2020
2040
2060
2080
2100
India
Nigeria
Indonesia
China
USA
Germany

Percent daylight work hours lost RCP6.0, HadGEM/GFDL mid-point, 300W, worst affected countries





Economic outcomes: if half of work hors loss affects GDP/person, the India economic development may be loosing > 400 billion USD in 2055.

Health variables to consider

- Heat mortality
  - DALYs: 250,000 deaths (age>=65), 20 yrs lost, **Total = 2 million DALYs**
- Extreme weather/rainfall/wind mortality
- Serious clinical direct health impacts – medical emergency treatments (heart, kidney, brain, lungs)
- Serious indirect health impacts (malaria, malnutrition, diarrhoea, mental stress, injuries)
- Heat exhaustion, Labour Productivity (effects on paid work, unpaid daily activities, sports, children's play)
  - DAWYs: 1 billion workers, 5% of work year lost due to heat; disability fraction 50%, **Total = 25 million DAWYs**
- Heat discomfort, habitability, migration pressure

Need for Harmonisation

Not just Temperature .. Humidity important for physiological effects

Approaches to other direct health related climate variables, wind speed, heat radiation

Standard set of grid cell based data (mean and range of model outputs) for impact analysis, so one can compare results

Conceptual inter-sectoral links better developed and discussed before elaborate calculation models applied

Avoid simple assumptions: e.g. heat waves, outdoor exposure

Agree on gaps in evidence

Joint approach to multi-location backup field studies

Better coordinated collaboration with international agencies and organizations, including business groups and trade unions

Establish links between EU projects and other international projects/programs