Health Environment International Trust,
Mapua, New Zealand

Pufendorf HEAT and Indoor Environment projects: Metalund seminar:

Climate change impacts on Working Life and Society --- a real challenge for inter-disciplinary research in Medicine, Technology, Social sciences and Economics.

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Australian National University, National Centre for Epidemiology and Population Health, Canberra, Australia (Visiting Fellow)

University College London, Institute for Global Health, London, UK (Honorary Professor)

Who am I ?

- Swede living outside since 1976

- Bachelor of Medicine
- Master of Mechanical Engineering
- Doctor of Medical Science, 1977

- 40 years of teaching and research in Environmental and Occupational Health
- 12 years at World Health Organization
- Professor at University of Auckland, NZ; Australian National University; Folkhälsoinstitutet; Visiting links to Lund University, Umeå University, University College London

- Now concerned about my grandchildren's world in 2025, 2055, 2085, etc ……. Climate Change a major threat
- The most important action I can take is to do research on this and disseminate knowledge

Climate change: Key facts

- Climate Change (CC) is already happening
- The “easiest” to model is temperature
- Excessive HEAT a current problem
- It is going to get worse (Temp, Hum, Air movement, Sun)
- Particular problem for working people, and sports people
- Most human beings live in hot areas

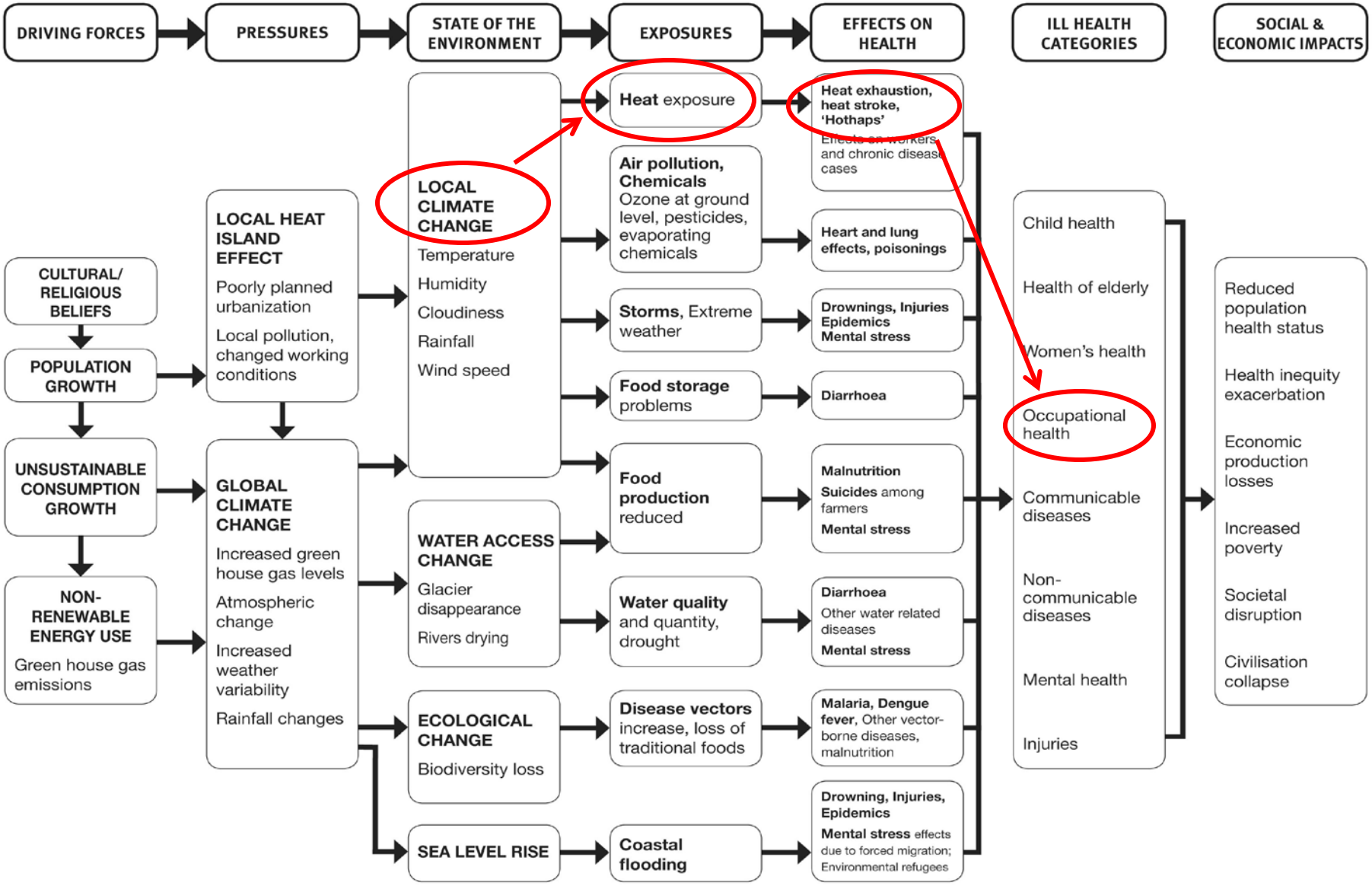
- The Lancet: “CC is the worlds greatest public health challenge this century”
- CC creates more ….. Extreme weather, Forest fires, Flooding and sea level rise, Heat deaths, Malaria, Diarrhoeas, Malnutrition, Mental stress, Injuries …. and
- Work capacity loss …. Labor productivity loss
- Labor productivity loss …. The costliest CC impact in the USA and in most low and middle income countries
- December 2015 deadline for policy input

The heat and work problem

- **Heat stress at work is a well-known occupational health hazard. It can create serious health effects, including death, unless sufficient rest periods or work schedule arrangements are implemented or cooling technology is provided. In some jobs "self-pacing" can create protection based on individual workers' decisions.**

- **However, when the workers protect themselves from over-heating ("Heat Exhaustion", ICD code T67) by taking more rest or working more slowly, the labour productivity is reduced leading to lower incomes or lower economic outputs. .... This is an overlooked economic development and human rights challenge linked to current and future climate**

Climate change and health in DPSEEA framework



Heat stress: a common hazard in outdoor workplaces in tropical countries

Sugar cane cutting, Nicaragua

Construction workers in India:

1-hour lunch break in cool period, 5-hour break in hot period

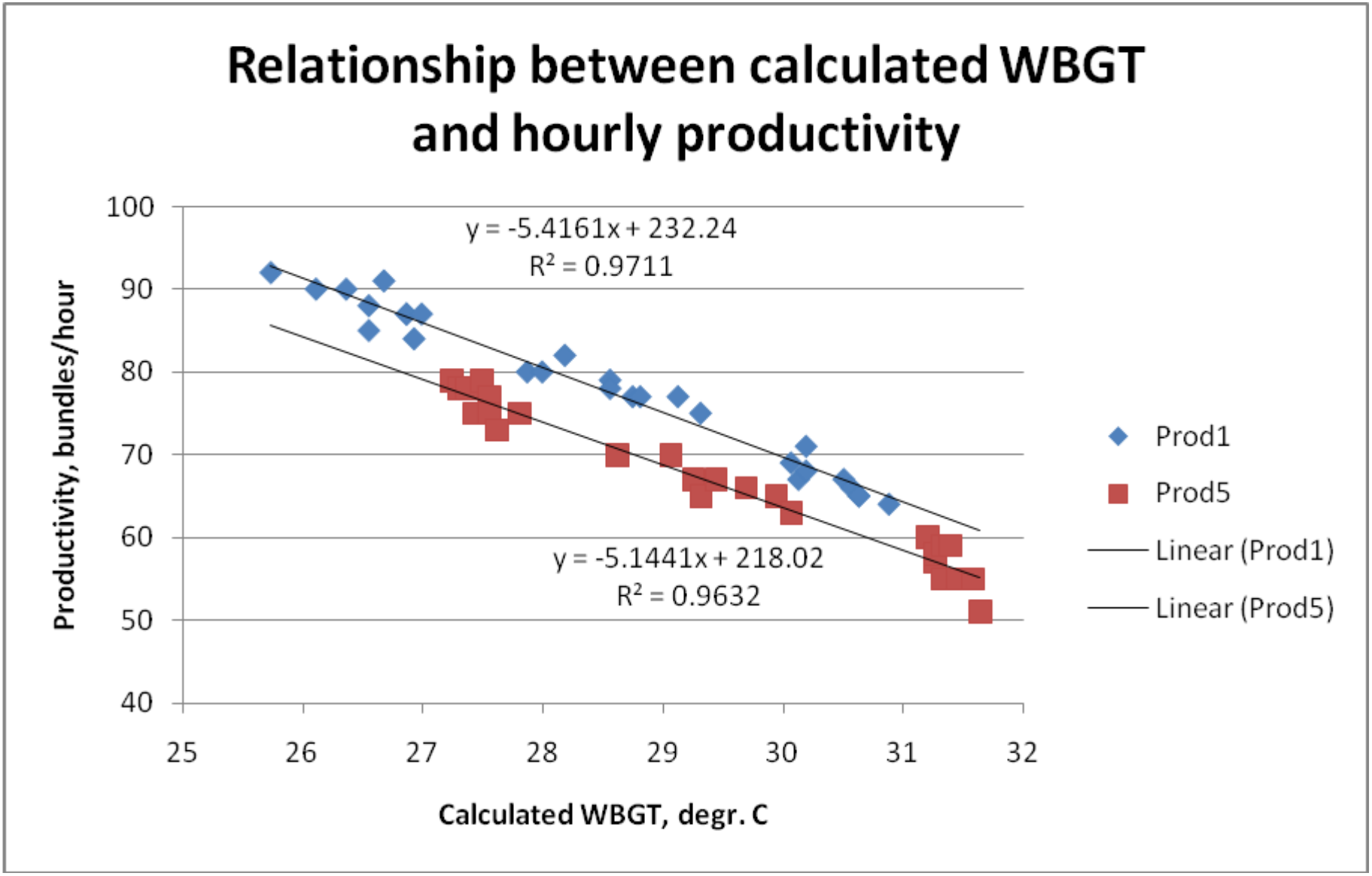
Hot also inside factories: Le Lai shoe factory No 2, Haiphong

2 hour longer workdays in summer due to fixed daily output targets

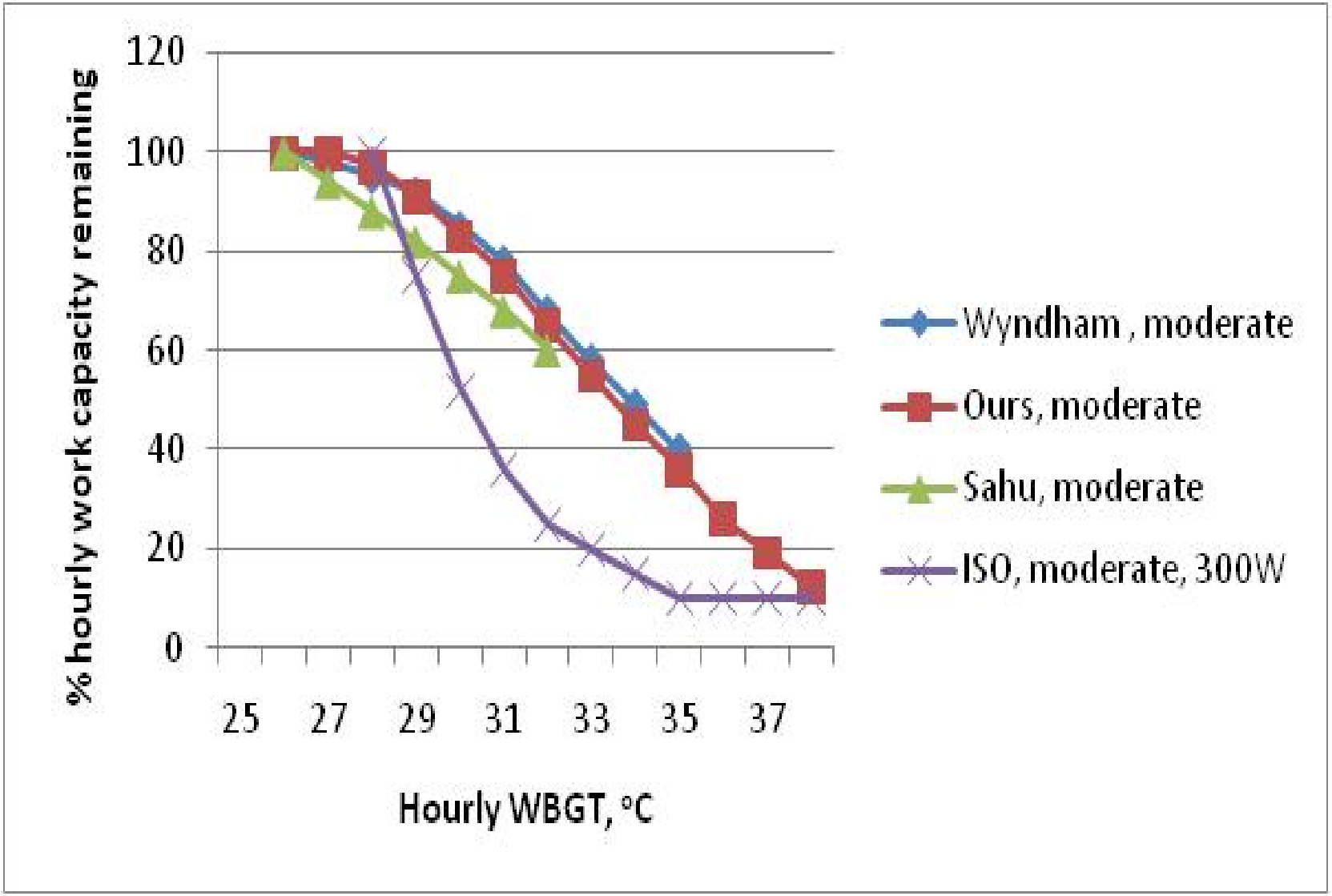
Exposure to chemicals that evaporate faster in hot work environments

Heat stress in agriculture: Rice farm worker in West Bengal (source: Sahu et al., 2013)

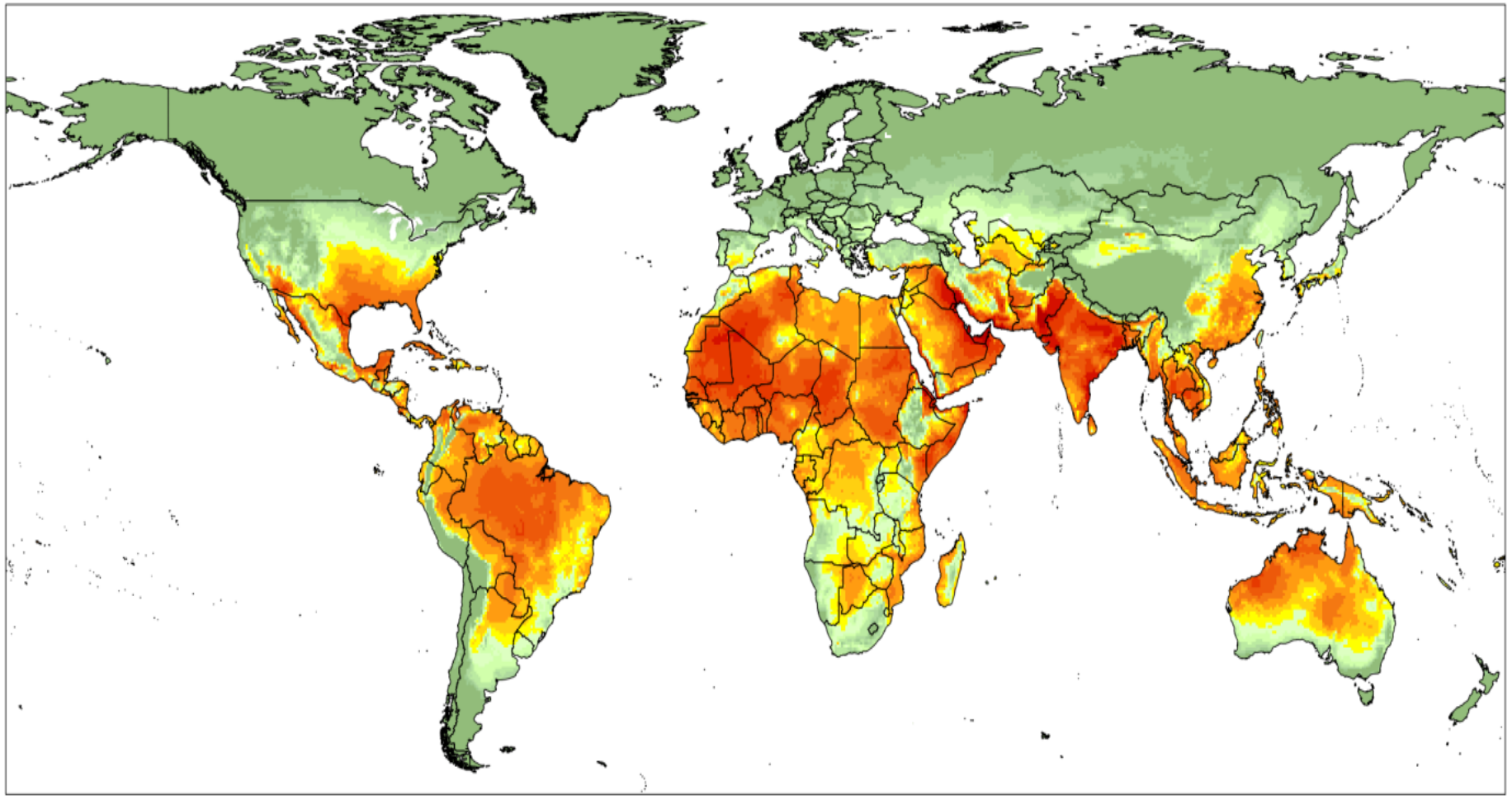
Heat impact on productivity of rice harvesters in West Bengal (Sahu et al., 2013)



Comparison two epidemiological study results, our fitted curve and the ISO standard; moderate work (300W)



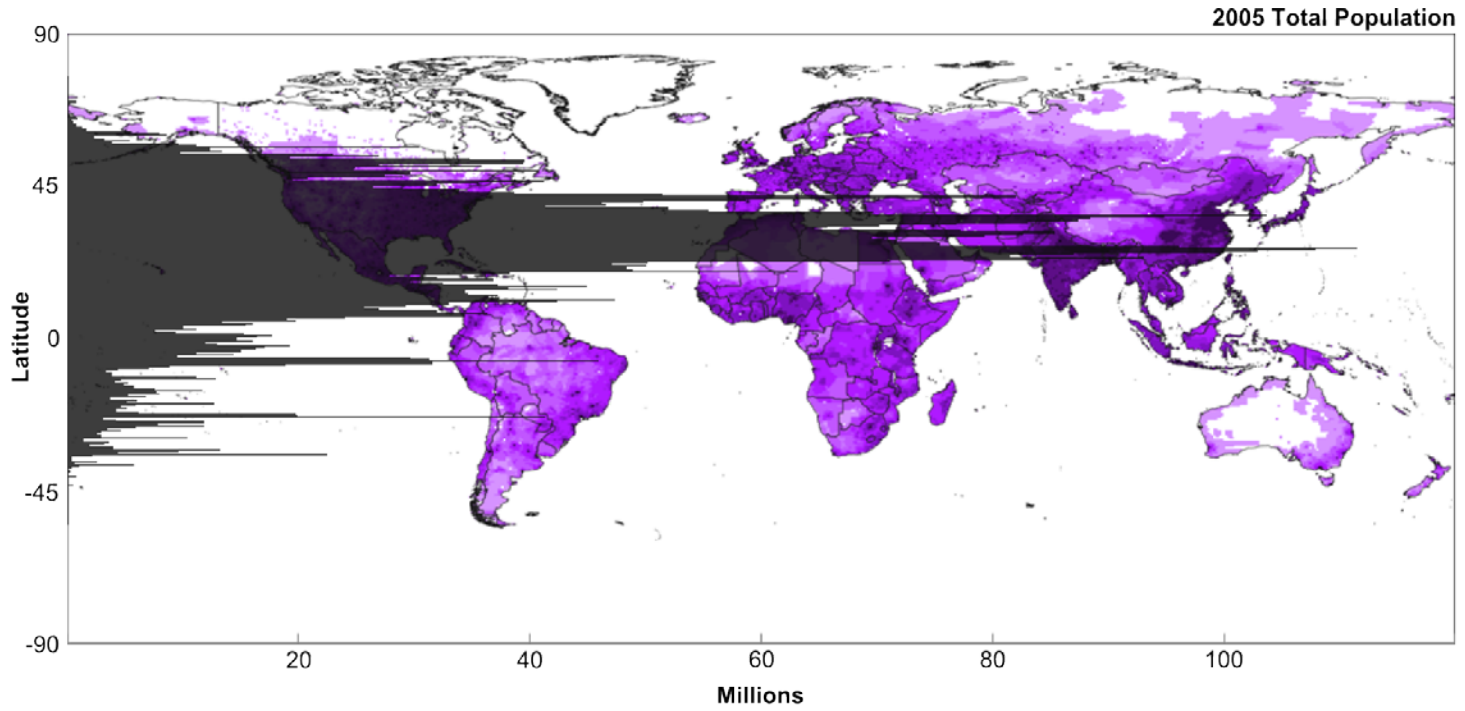
Hottest month, afternoon heat levels

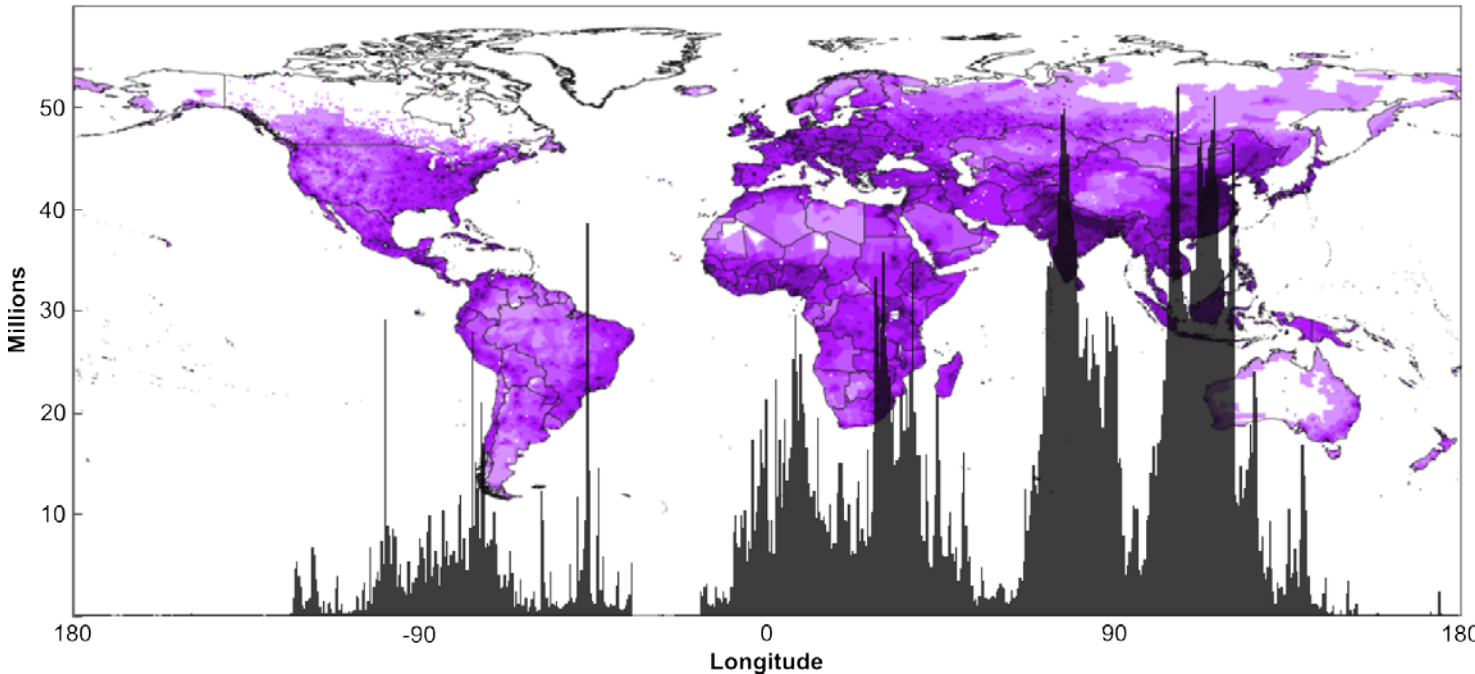


CRU 1995 (30yr ave 1980-2009). Monthly averages of daily indoor WBGTmax (afternoon values) for the hottest month in each part of the world (based on 65000 grid cells).

Global population distribution by latitude and longitude in 2005

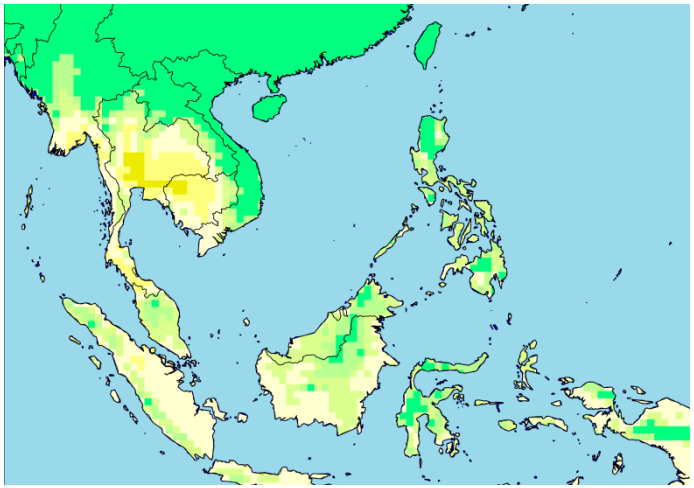
(Olivia Hyatt et al., 2013, to be published)



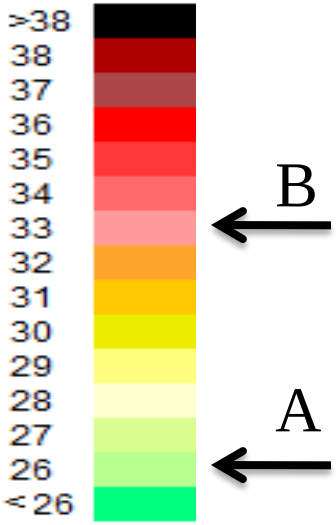


Projected WBGT heat stress index in South-East Asia, afternoon, March

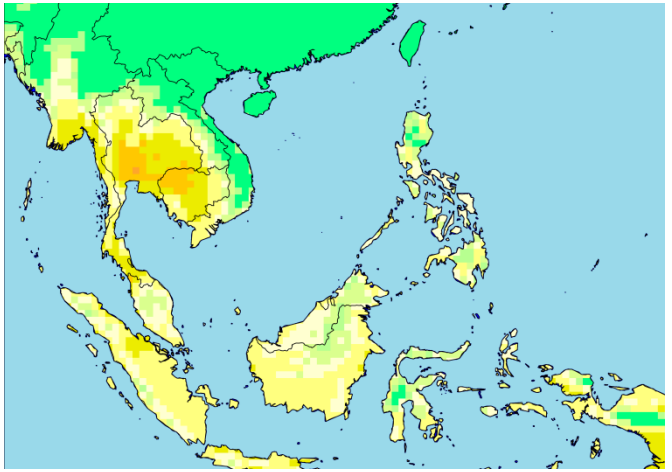
In shade 1975



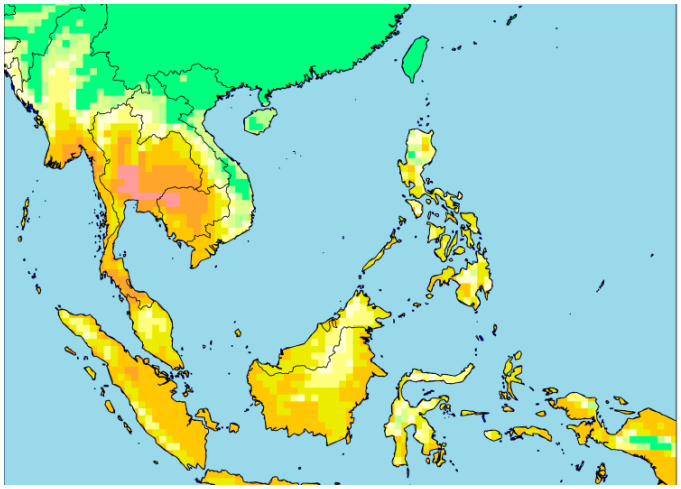
WBGT



In shade 2050



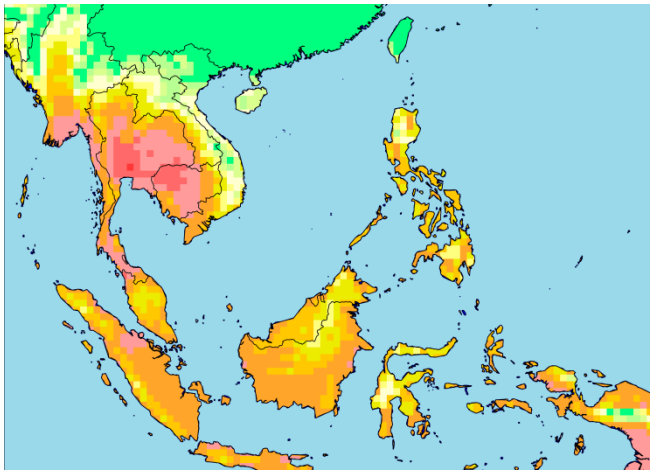
In sun 1975



A = risk threshold heavy work

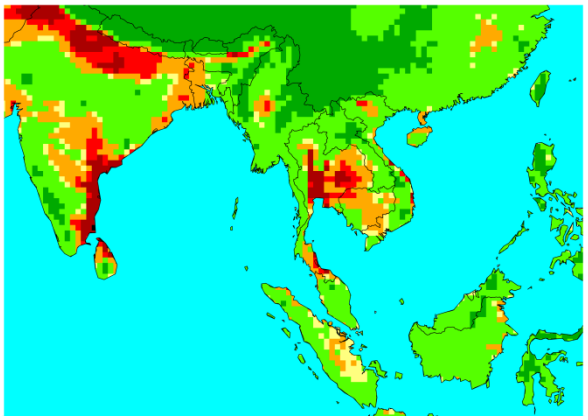
B = risk threshold light work

In sun 2050

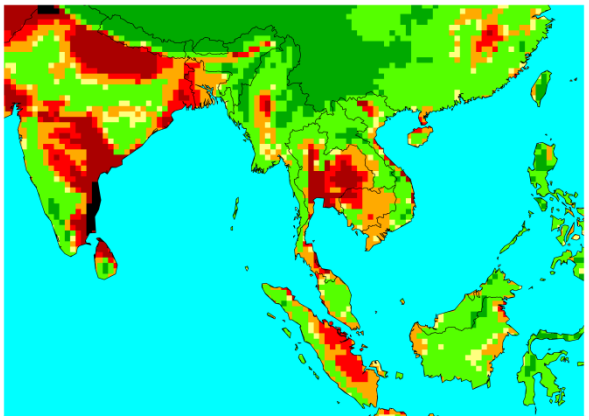


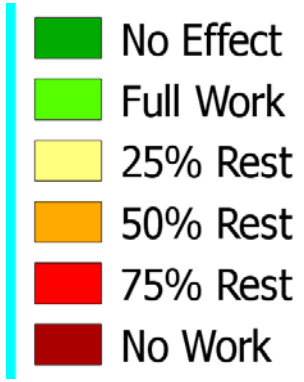
MIROC RCP model; afternoon climate in sun; Work capacity, ISO standard (% rest needed); 200W work; July

1995

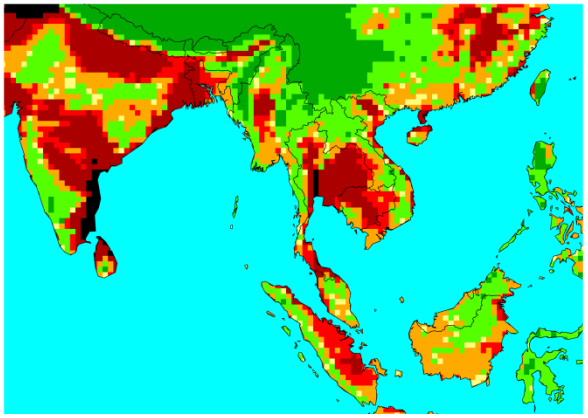


2025

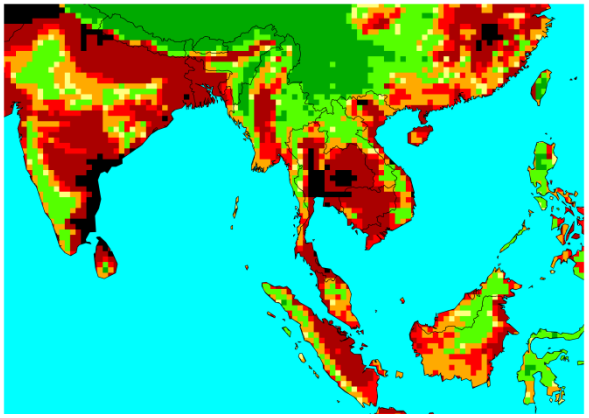




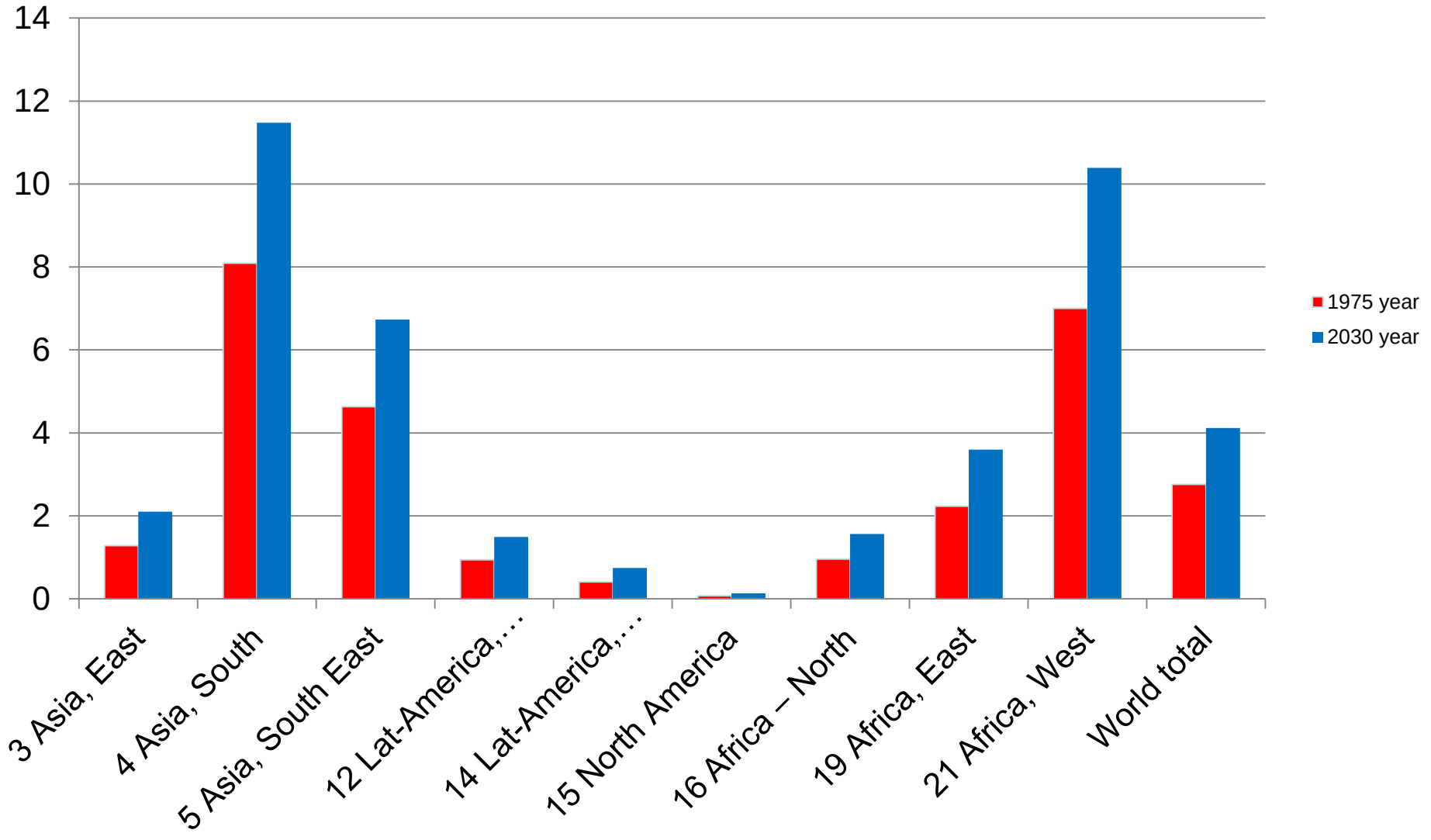
2055



2085



Work capacity loss (% of daylight hours) in 2030 based on regional climate change (average of 3 models), population in 2030 and estimated workforce distribution in 1975 and 2030. Equity issue ….



The lack of global attention

- **This threat to health and the community economy has been overlooked in much heat stress impact analysis until now. The most affected people are likely to be the poor and under-privileged in low and middle income tropical countries, but USA and Australia will also be affected.**

- **A new major international report, the**
- **Climate Vulnerability Monitor 2012, highlights the importance of this aspect of climate change impacts on occupational health.**

Estimated economic costs (billion US$, PPP); Climate Vulnerability Monitor, 2012, report:

	2010 Net	2030 Net	2030	2030	2030
	Global	Global	Low emission Dev Countries	High emission Dev Countries	High income countries
Climate change	**609**	**4345**	**1730**	**2294**	**179**
Disasters	29	213	40	142	28
Heating/cooling	-33	-77	30	7	-65
Labor productivity	***311***	***2400***	***1035***	***1364***	***49***
Sea-level rise	86	526	166	310	29
Health impacts	23	106	84	21	0
Carbon economy	**540**	**2429**	**429**	**1401**	**444**
Health impacts	172	630	226	341	37

Many low and middle income countries estimated to loose 2-8% of GDP in 2030 due to increasing workplace heat exposures

New tool for climate impact analysis:

Hothaps-Soft software and database

- **18,500 weather stations; 3,800 with almost complete data (>90% of days, 1980-2012)**
- **7 climate variables**
- **Outputs: monthly distributions; time trends; trends for extreme days;**
- **Comparisons with same location grid cell data**
- ***To add: health risk functions, impact estimates***
- ***Outputs: national reports, ClimateCHIP reports***

- **Further development in progress …….**

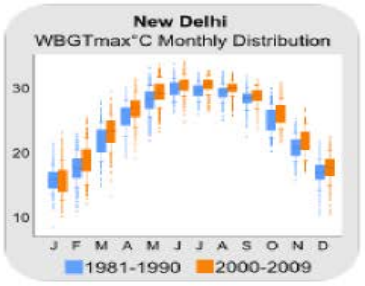
⑩ Website: ClimateCHIP.org

Climate CHIP

Home CHIPs Analysis Tools Resources About Us

Climate Change Health Impact & Prevention

Climate CHIP is a non-profit website supported by charitable grants from organizations and individuals concerned about local and global threats to human health and society from climate change. We aim to provide a range of information and resources about heat stress and other health impacts of climate change.



Climate CHIPs

The Climate CHIP team is working towards producing a series of reports and other interactive resources on the health effects of climate change.

Health effects of climate change
Climate CHIPs
Your Area: Climate data

Information & Resources

The Climate CHIP team has published widely.

Our Publications
Our Powerpoints

Analysis Tools

Climate CHIP offers a number of tools to help you understand the effects of climate change in your area of the world.

Hothaps-Soft
Heat Stress Index Calculation

News & Events

National Science Symposium - Safeguarding Human Health in Cities under Climate Pressures

8 August 2013, Canberra, Australian

This Symposium will showcase new research on "Urbanism, Climate Adaptation and Health" led by the National Centre for.....more

http://climatehealthandcities2013.eventbrite.com/

Collection of scientific papers on Workplace Heat and Occupational Health

The journal Industrial Health (from the Japan National Institute of Occupational Health) published in February 2013 a.....more

http://www.jniosh.go.jp/en/indu_hel/2012.html#2013

Click here for more and extended News

To add: links to other website and reports? Regional presentations of ClimateCHIP reports? Other materials?

Research needs 1. What can we do at LU? Medicine

- Better knowledge of ALL effects on working people in different climate and social settings
- Describing quantitative exposure-response relationships (averages) for specific effects
- Describing quantitative individual variation functions for these exposure-response relationships
- Identifying special health problems for vulnerable groups, e.g. body heat as a teratogen
- Identifying biomedical treatments for climate effects
- Analyzing health service impacts and their quantitative contributions to work load, e.g. is death easier to deal with than morbidity and treatment?
- …….

Research needs 2. What can we do at LU? Technology

- Better and cheaper methods for climate variable measurements
- Continuous monitoring, dataloggers, WiFi connections, etc, using modern IT technology for climate and health research
- Local protection methods, cooling techniques, based on sustainability criteria
- Personal protection, clothing
- Architecture methods to reduce heat exposures indoors
- Urban design issues to reduce heat exposure both outdoors and indoors
- ……..

Research needs 3. What can we do at LU? Social sciences

- In which social settings are peoples´livelihoods already now affected by climate factors
- Equity and Human Rights aspects of climate impacts
- Describing annual cycle of life, work, and wellbeing in relation to climate change
- …..

Research needs 4. What can we do at LU? Economics

- **What are the economic costs locally, antionally and globally of climate change impacts on workking people?**
- **What is the balance between cost of mitigation or adaptation in specific industries/sectors?**
- **Which economic methods can be used to encourage and facilitate switch to sustainable energy supply for cooling systems?**
- **……**

The End …. Thank you !

……. kjellstromt@yahoo.com