Deutscher Wetterdienst
Wetter und Klima aus einer Hand

DWD

From Heat Warnings to Heat Pre-Information

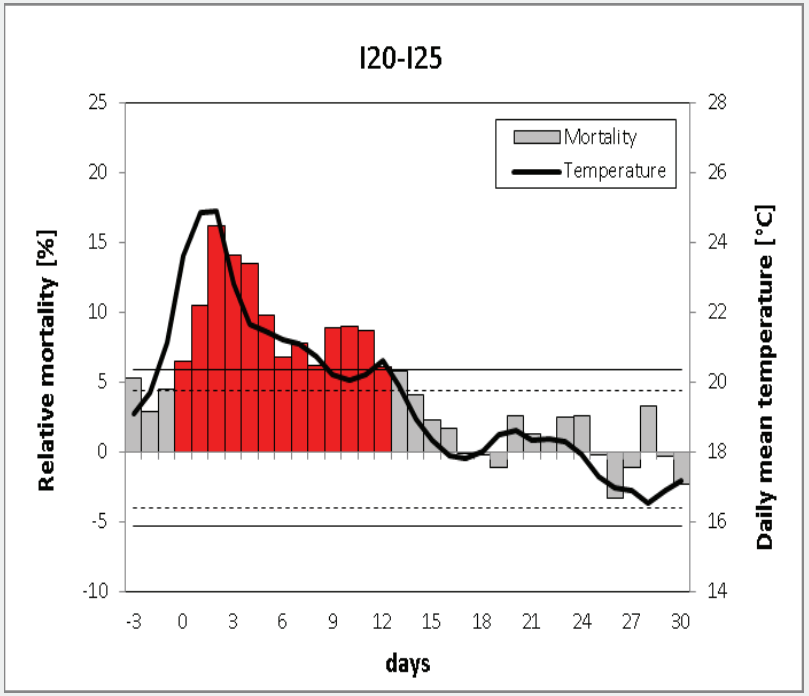
The German Experience

Heat waves, what is the danger?

Heat waves can kill

also in Germany

- mortality due to ischemic heart diseases (ICD Code I20-I25) during heat waves



Hottest 2 week Episodes with Tmax > 30° C

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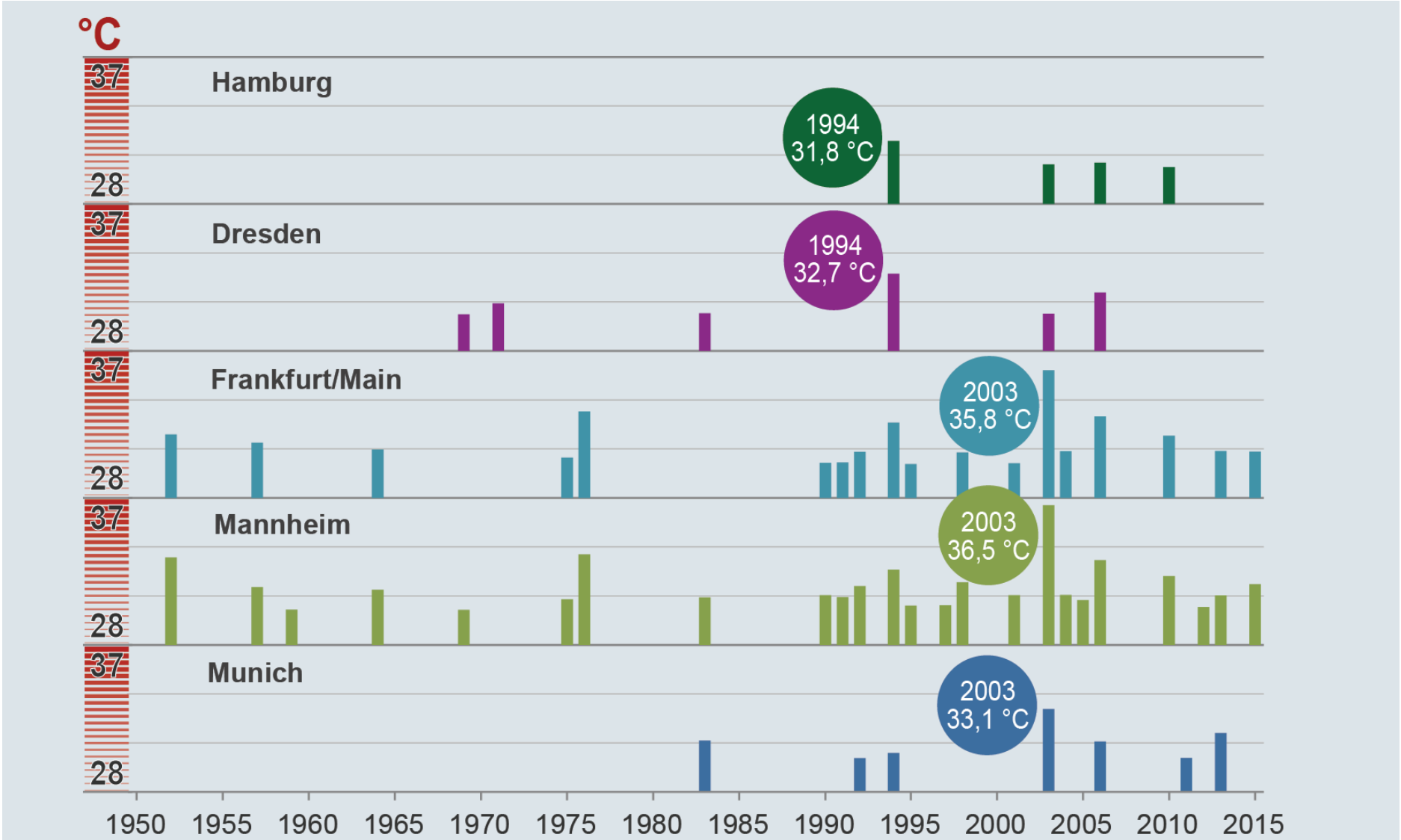
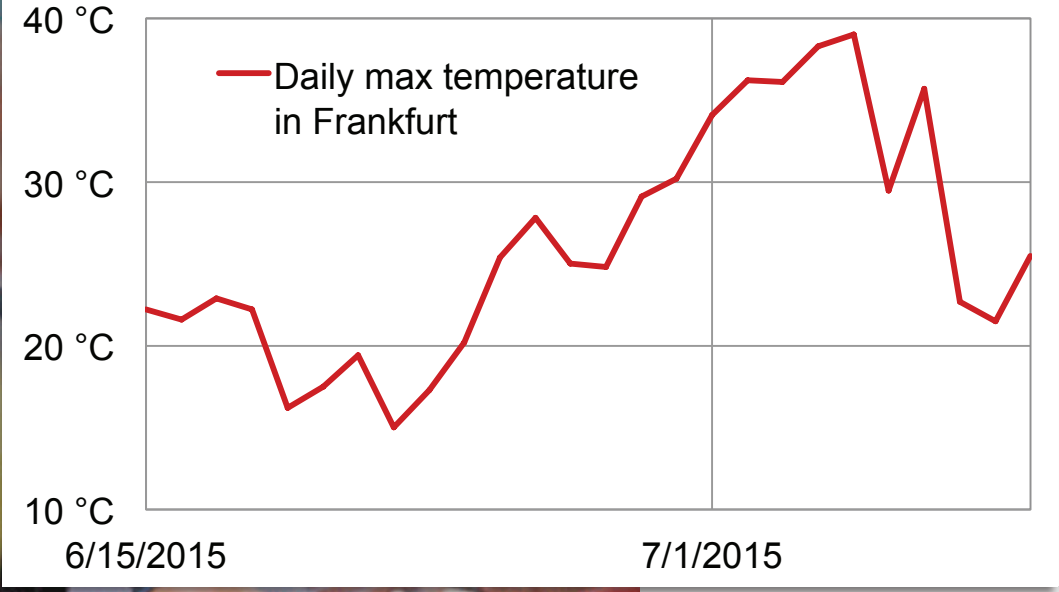


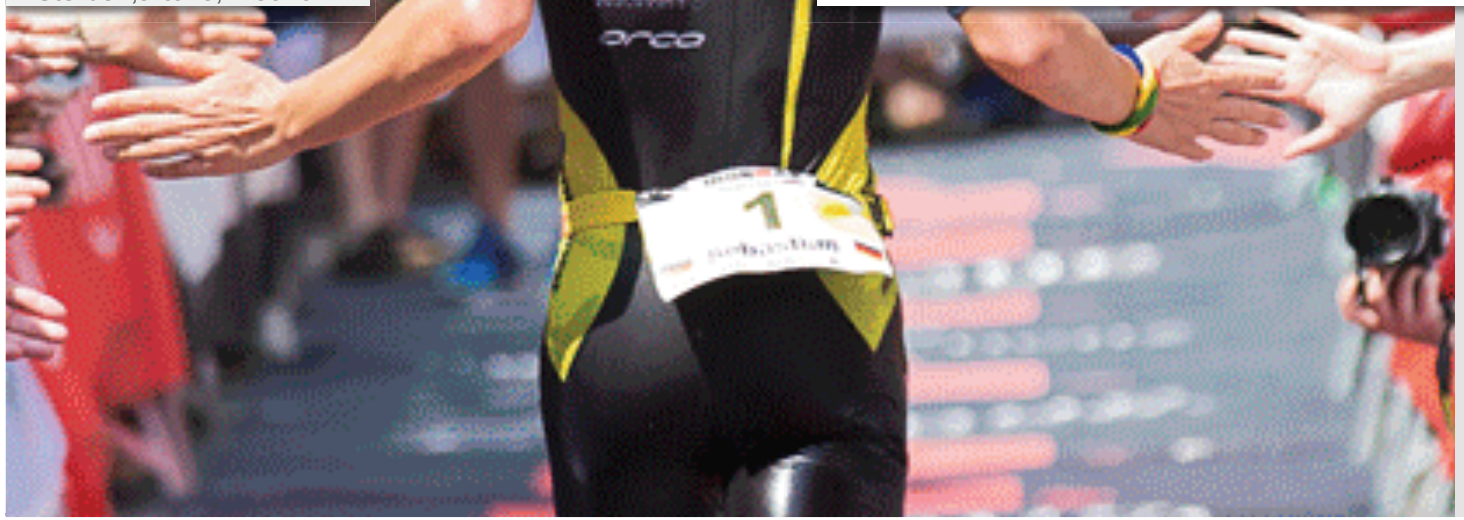
What's currently going on?

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Ironman in Frankfurt: participant is dying

Source:
http://www.fnp.de/lokales/frankfurt/Ironman-Teilnehmer-liegt-im-Sterben;art675,1483204





40,3 °C

Heat record broken in Germany
5 July 2015

Forecasts of heat in seamless prediction – goal: a set of reliable information on all time horizons

Initial value problem

Boundary value problem

Weather	Monthly/ Seasonal	Decadal prediction	Climate projection
Short and medium range			
up to 7 days	30 days till several months	Year 1 to 10	50 or 100 years ahead
75%*	25%		63%
Forecasts of PT are possible	Forecasts of perceived temperature are not reliable		

*: assessment of user needs

German Heat Health Warning System (HHWS)

assumptions:

Health effect of heat load can be described by the Perceived Temperature (PT)

Computation of PT is done by means of a complete heat budget model

The model takes into account the relevant mechisms of heat exchange

A standard person is modelled: Klima Michel, male, 35 years, 175 cm, 75 kg

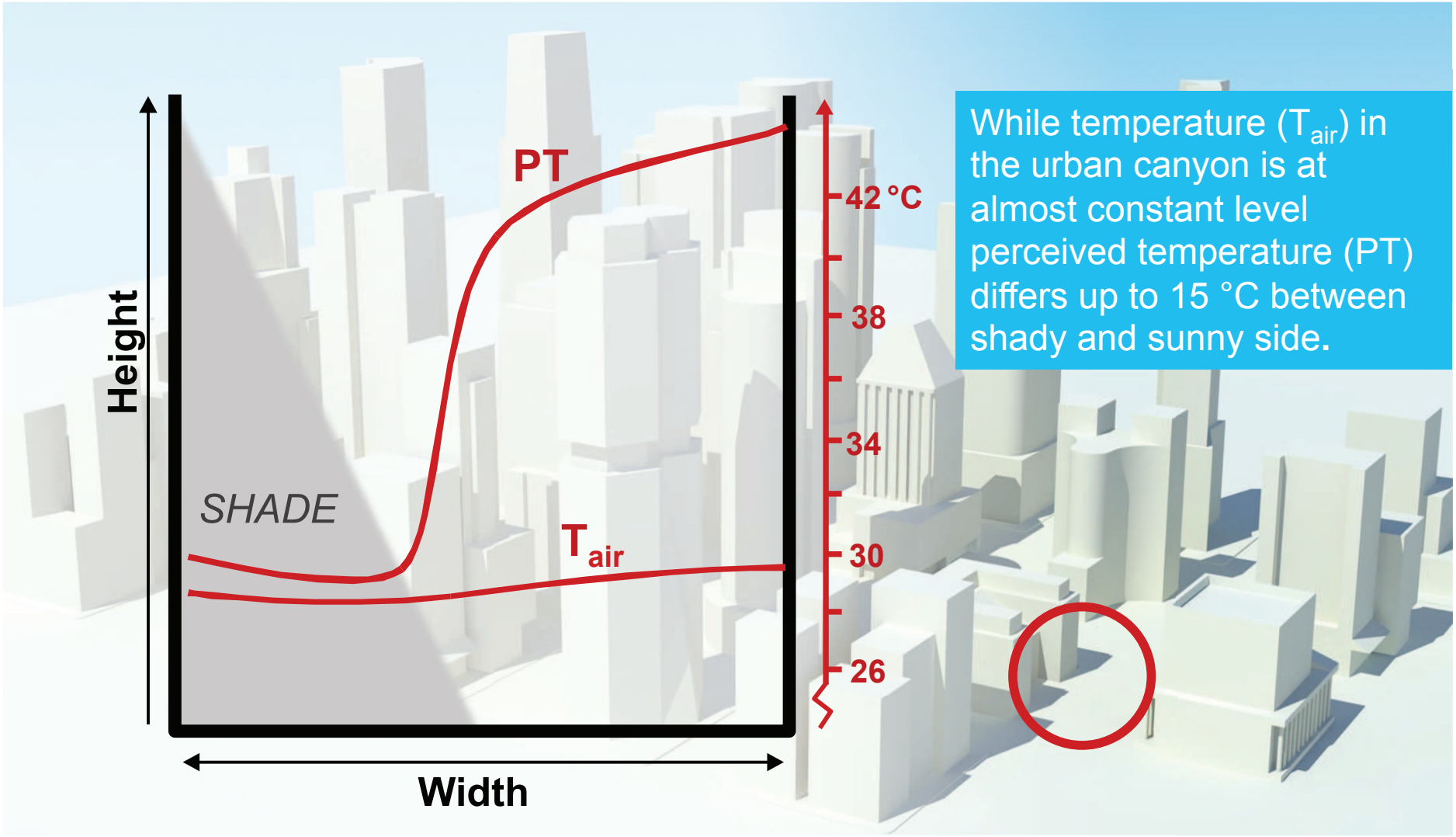
Meteorological parameters:

Air temperature

Wind velocity

humidity

Long and short-wave radiation



While temperature (T_{air}) in the urban canyon is at almost constant level perceived temperature (PT) differs up to 15 °C between shady and sunny side.

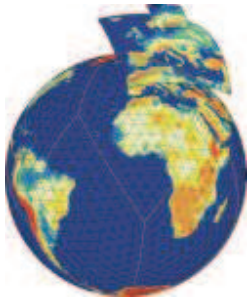
German Heat Health Warning System (HHWS)

- Operational since 2005
- Warnings are produced on a County level
- Warnings issued in case of
  - an extreme heat load (PT>38°C)

    or
  - a strong heat load (PT > ~32°C) on 2 consecutive days

    and
  - high indoor temperatures during night (T_{ind} > ~24°C)
- Target groups:
  - health authorities
  - elderly persons in nursing homes
  - general public
- Aim: prevent heat related morbidity and mortality

Weather - Warning
German HHWS



Numerical weather prediction

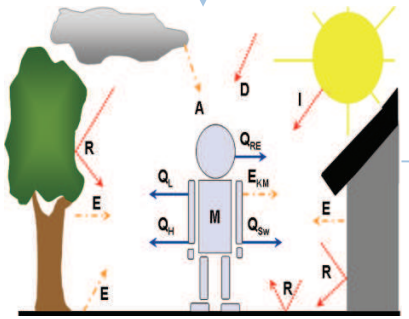
temperature
humidity
wind
radiation

media

public
nursing homes
Ministries, health authorities

Smart-Phone App
Internet
Newsletter
Email, Fax

Warnings for counties



Klima-Michel-Model

Perceived Temperature

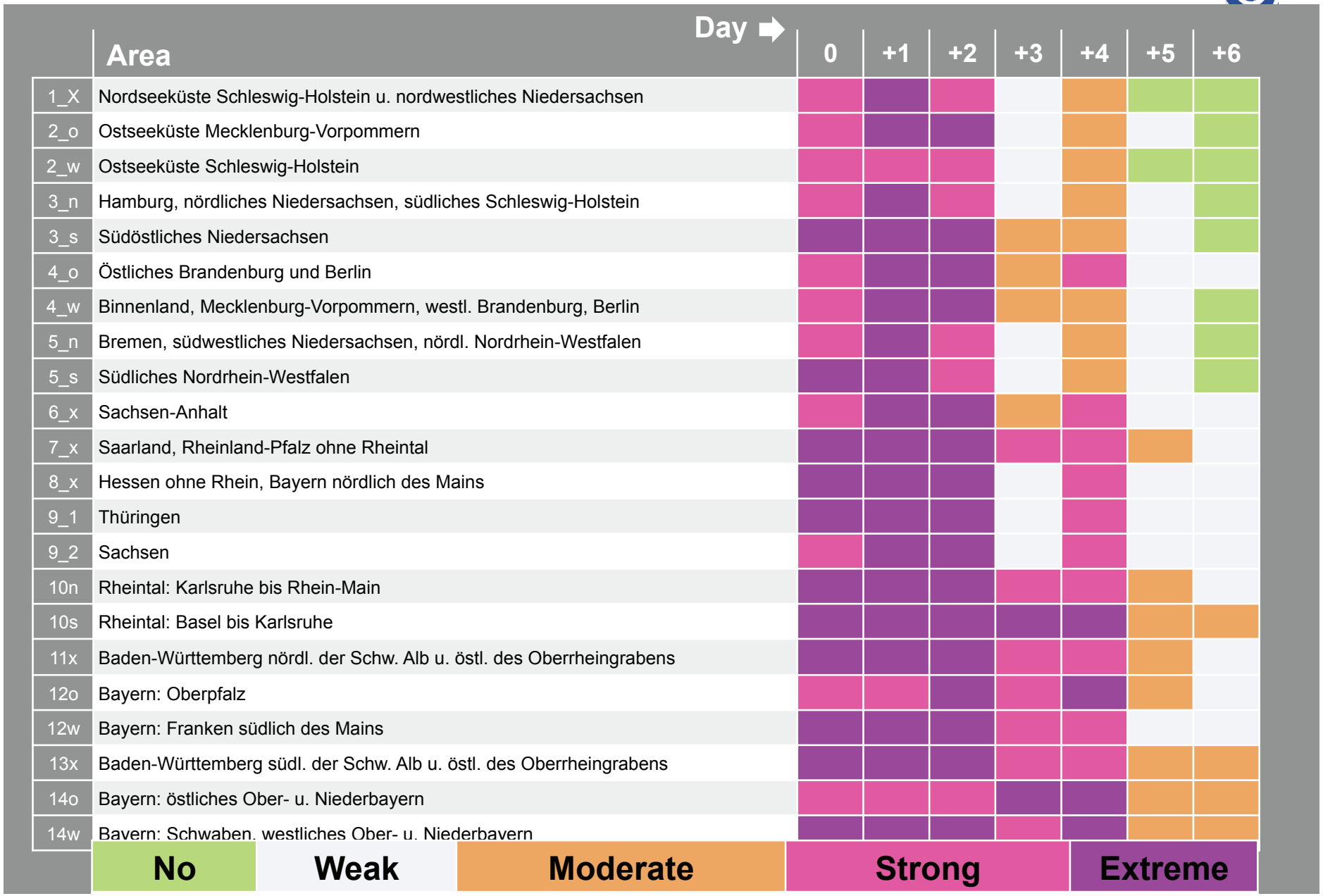
Perceived Temperature last 30 days

Thermal load categories for counties

Bio-meteorologist

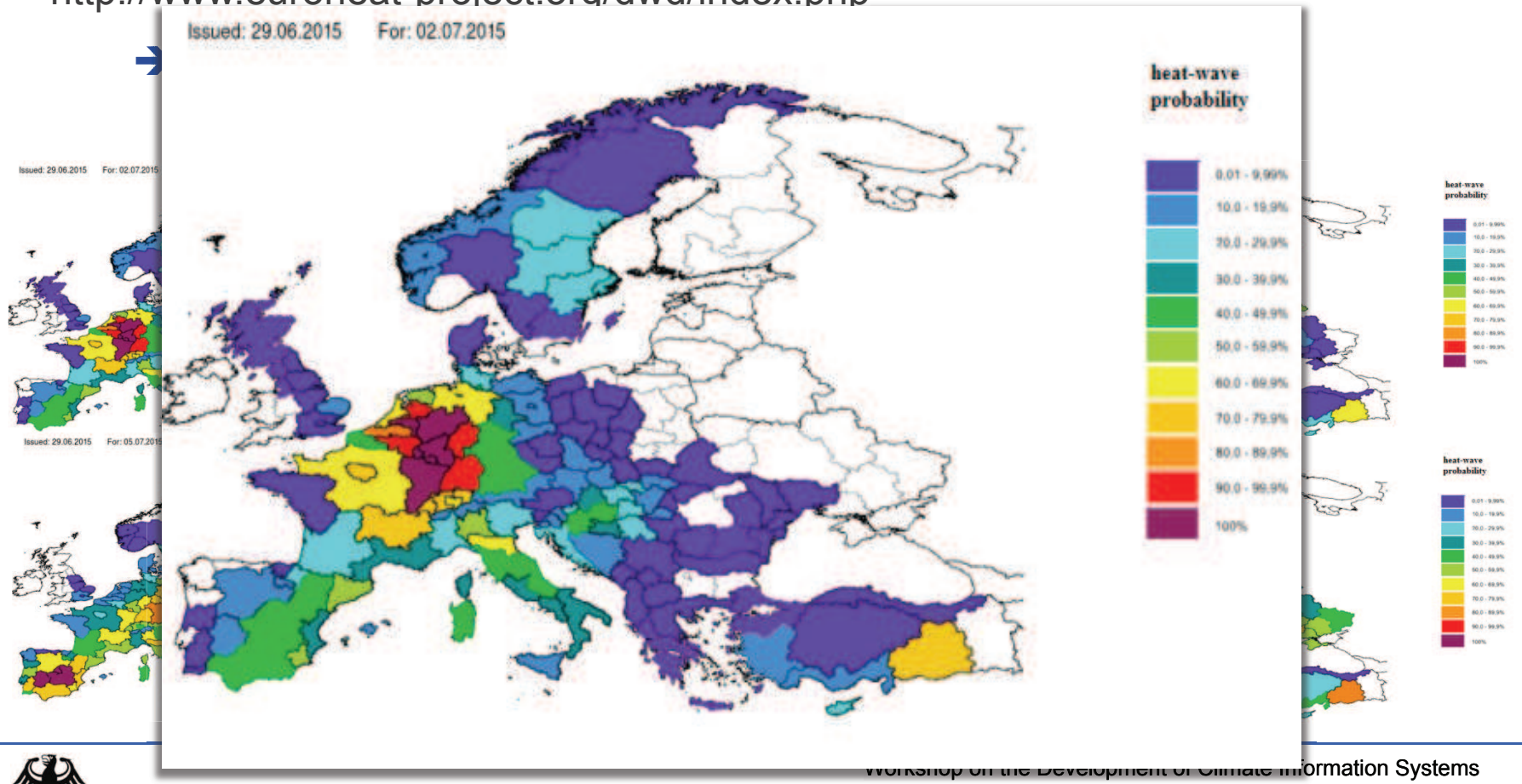
Warning proposal

German HHWS: complemented by heat pre-information



EuroHeat (10 day heat probability)

http://www.euroheat-project.org/dwd/index.php



Forecasts of heat in seamless prediction

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Heat information in monthly/seasonal/decadal prediction

Probabilistic trend
Outlook for next months‘ climate

Challenges:

- Outlooks are seasonal, a single heatwave might be hidden

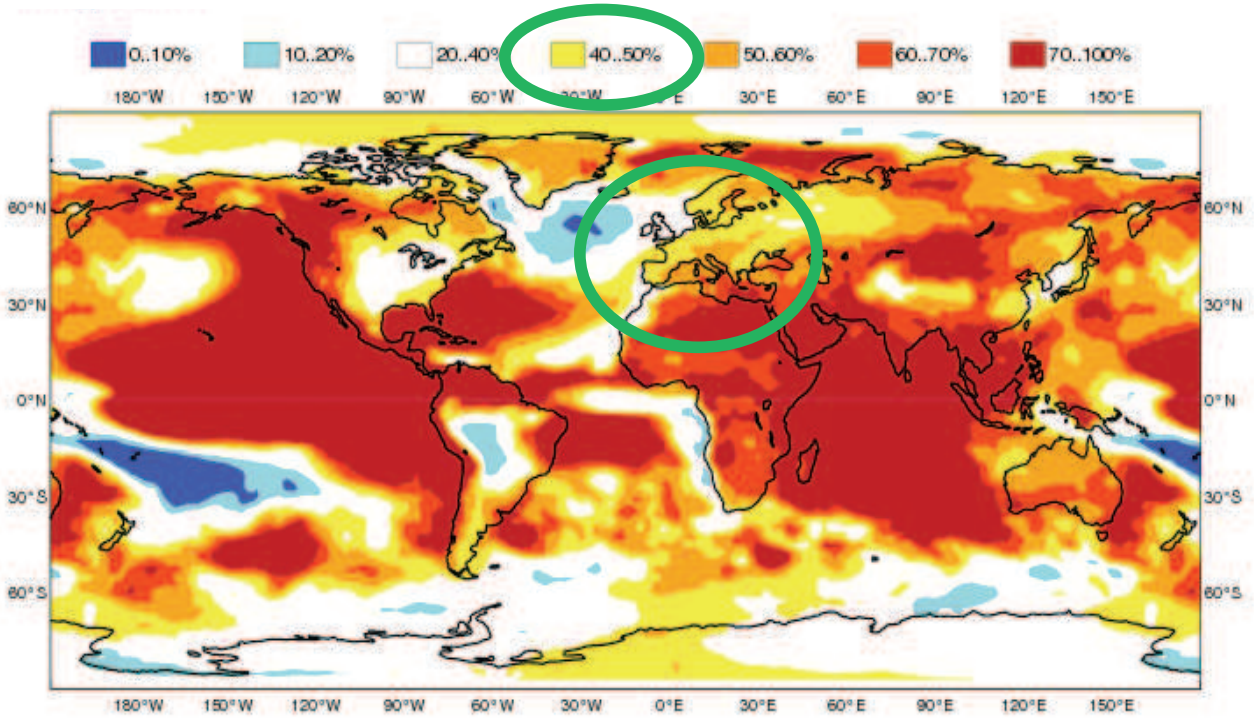
Needed:

- Better forecast quality

Question:

- Given the high uncertainty what kind of information could be useful for the health sector?

EUROSIP forecast for June/July/August 2015, startmonth **May:**
Probability exceeding the upper tercile of 2m temperature climatology



EUROSIP: ECMWF/MetOffice/Meteo-France/NCEP

Source: http://old.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/eurosip/mmv2/param_euro/seasonal_charts_2tm!2m%20temperature!prob%20for%20upper%20third%20of%20the%20distribution!1%20month!Global!201505!/

Forecasts of heat in seamless prediction

Initial value problem → Boundary value problem

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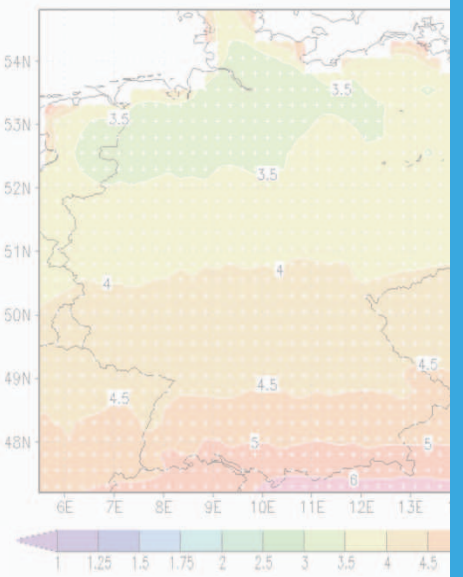
Heat information from climate projections

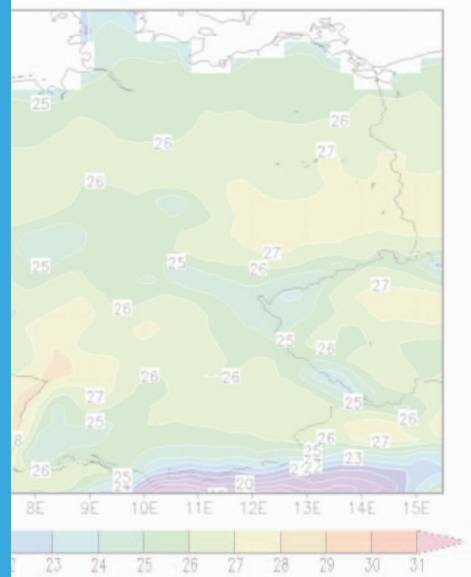
Ensemble mean of SRES downscaled projections (19 members) show that heatwaves increase with respect [illegible]

- Number



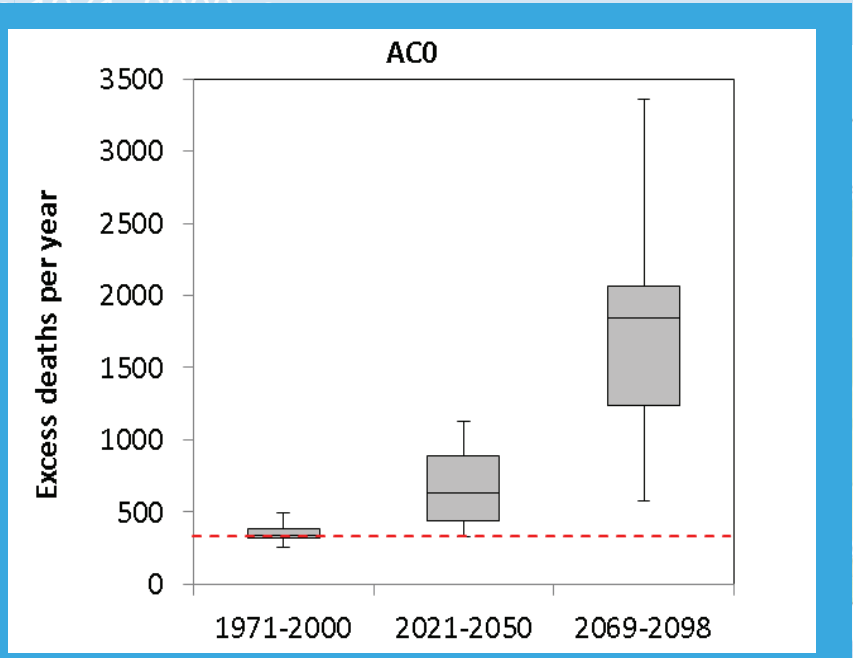
Increase of annual numbe
heat wave days for 2069–

- Intensity



heat wave and amplitude
es Celsius for 1971–2000

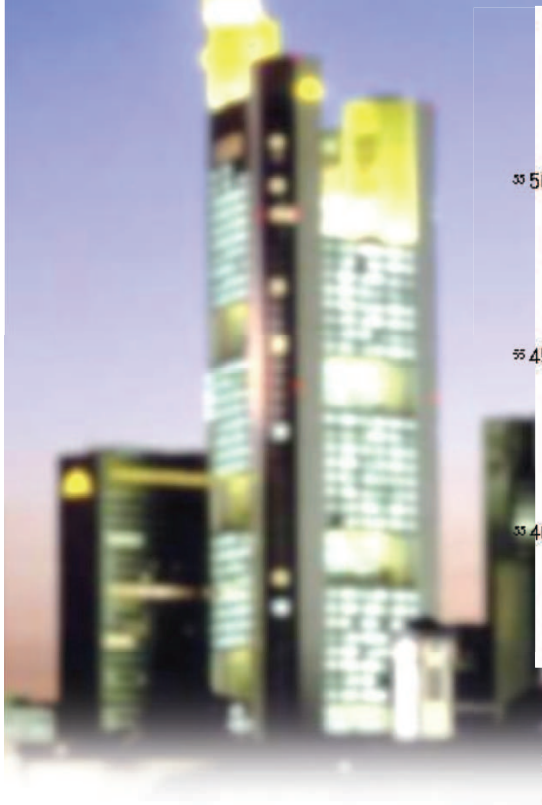
1971-2000 ▶

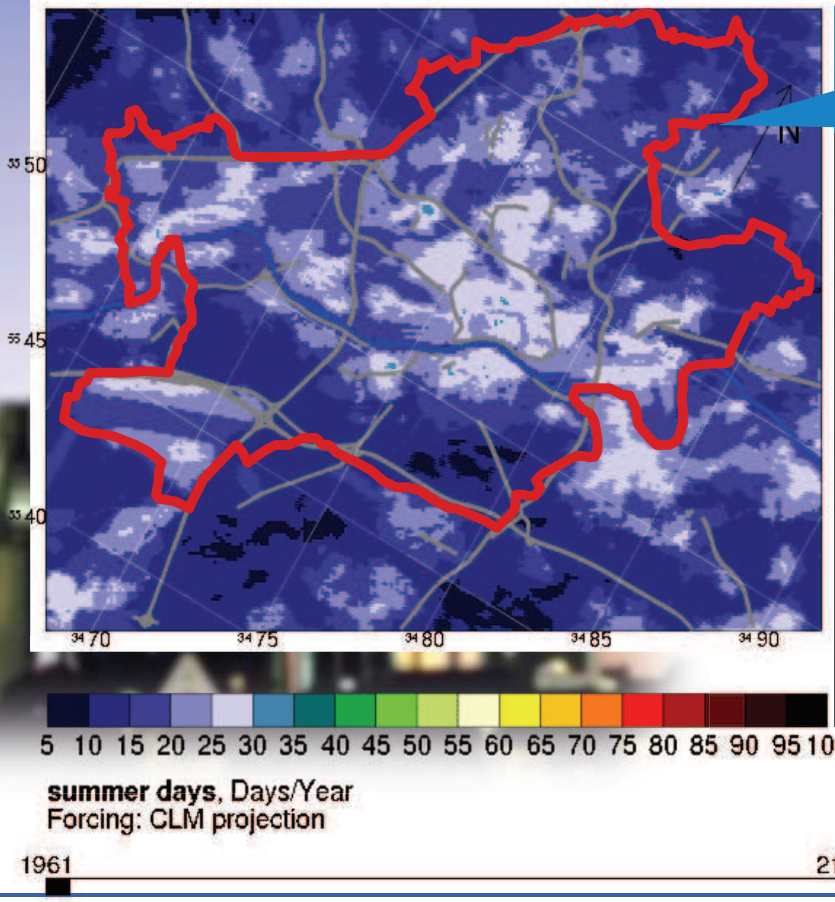


Projected ischemic heart disease excess deaths per year in Germany attributable to heat waves

Zacharias S, Koppe C, Mücke HG (20
Wave-Associated IHD Mortality in Germany. Climate, 3(1), 100-117; doi:10.3390/cli3010100 http://www.mdpi.com/2225-1154/3/1/100

Heat information from climate projections: Cities are highly vulnerable!





Summer days
Frankfurt am Main

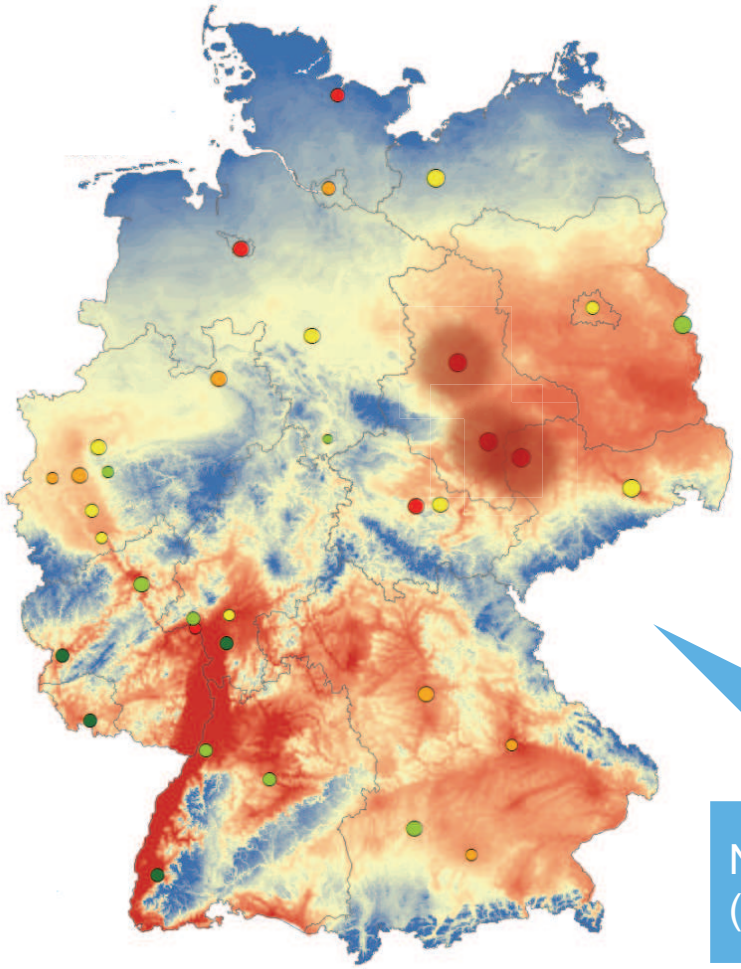
Time series
1961 – 2100

Impact model
MUKLIMO_3
driven by
CCLM (A1B)

Source: Deutscher Wetterdienst

Stand 09/2011

Risk distribution of heat load and demographic change



Green space in Cities (%)	Demographic structure: people above the age of 65 (%)
no value	no value
0 - 11	0,0 – 18,0
12 - 18	18,1 – 20,0
19 - 27	20,1 – 22,0
28 - 37	22,1 – 24,8
38 - 56	

Number of summer days
(temperature >= 25 °C) 1981-2010

High : 67

Low : 0

Summary

1. We are good to predict heat load at scales of day-to-day forecast on county level…
2. …by using a thermo-physiological impact model and inclusion of adaptation and indoor heat load
3. On longer time scales just temperature is used for heat pre-information so far
4. Forecast skill and user needs do not yet match very well
5. Adaptation to climate change in the health sector requires a combined assessment of downscaled climate projections and socio-economic information


Thank you