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FINNISH METEOROLOGICAL INSTITUTE

Climate Change
- how inconvenient can it get?

Climate Change and Health
Duodecim – UTA Global Health Summit
Helsinki, June 2, 2014

Reija Ruuhela
Senior Climate Expert
Climate Service Centre

Humans seek wealth and wellbeing – and as a side-effect - emit greenhouse gases into the atmosphere, and change the climate

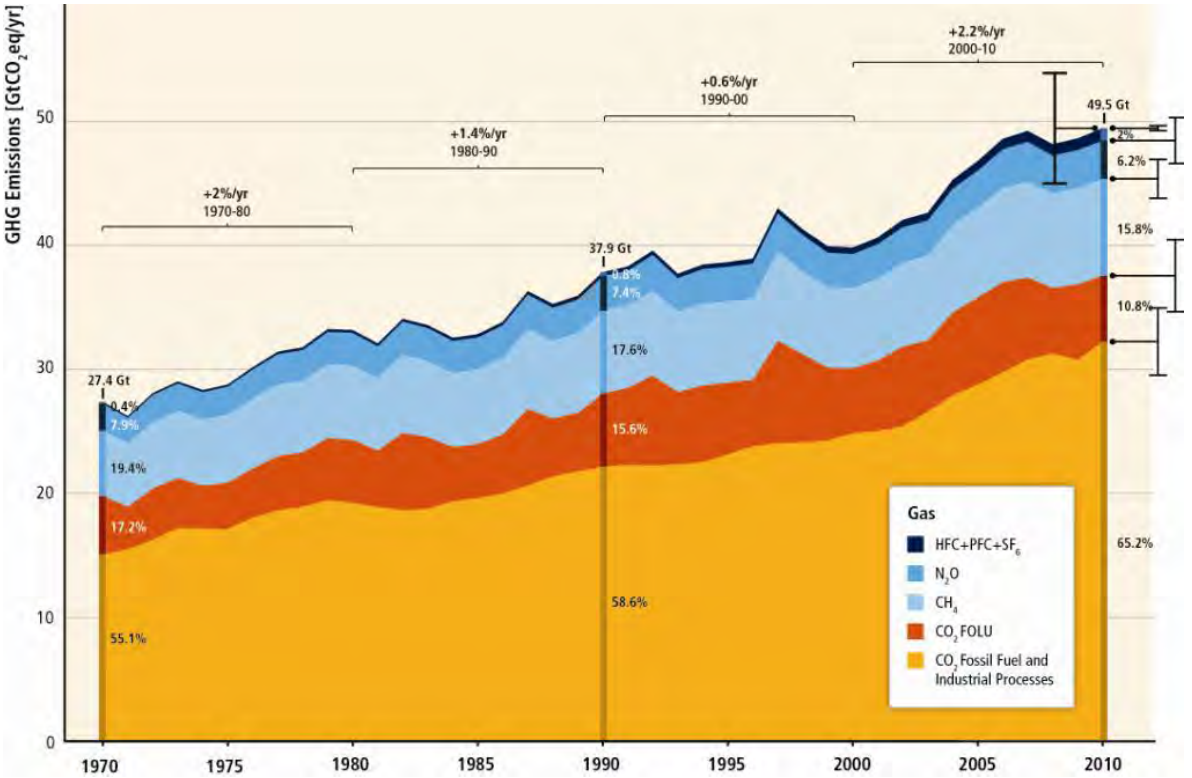


Figure SPM.1. Total annual GHG emissions by groups of gases 1970-2010

Rich countries are historically responsible for climate change, developing countries are catching up

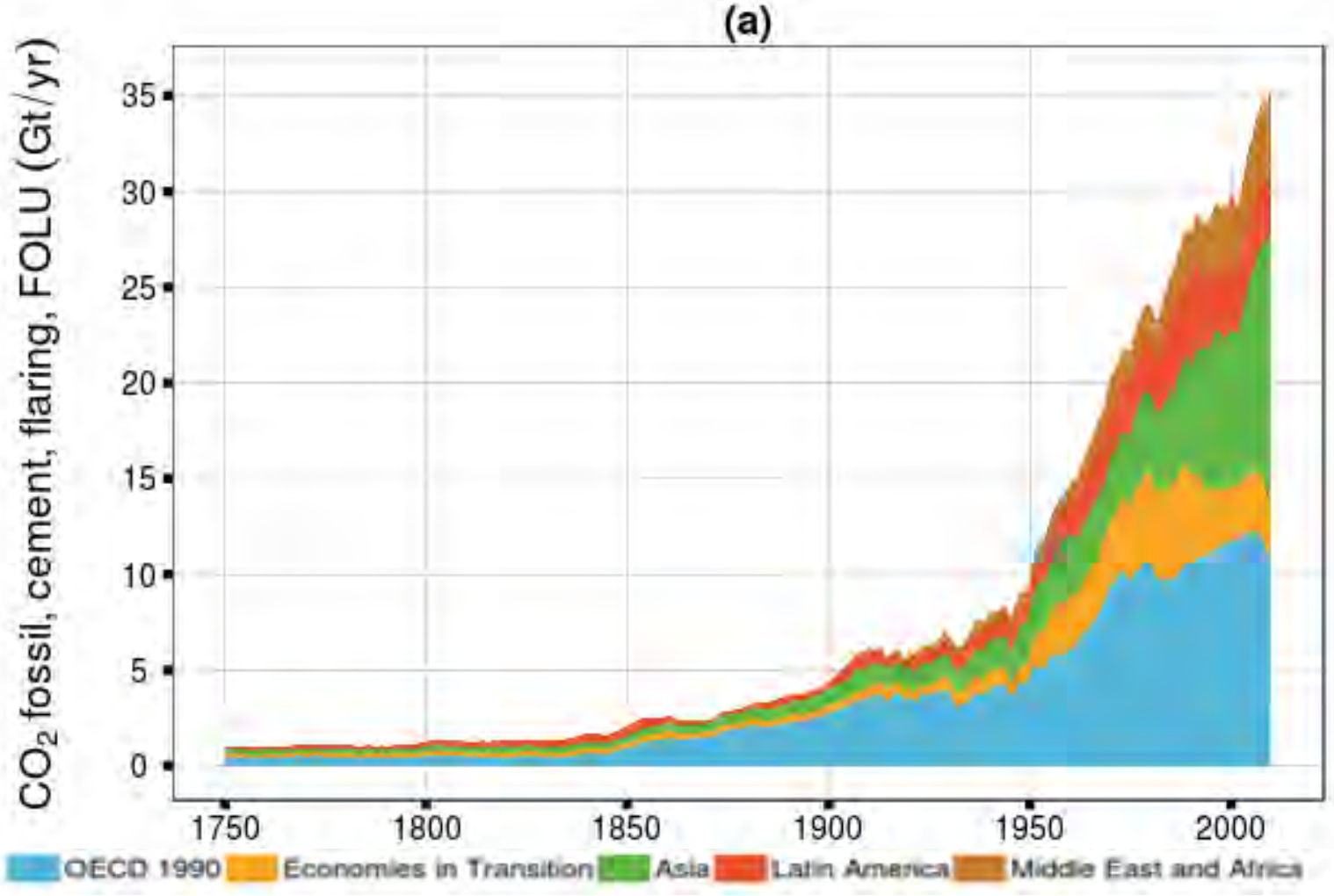
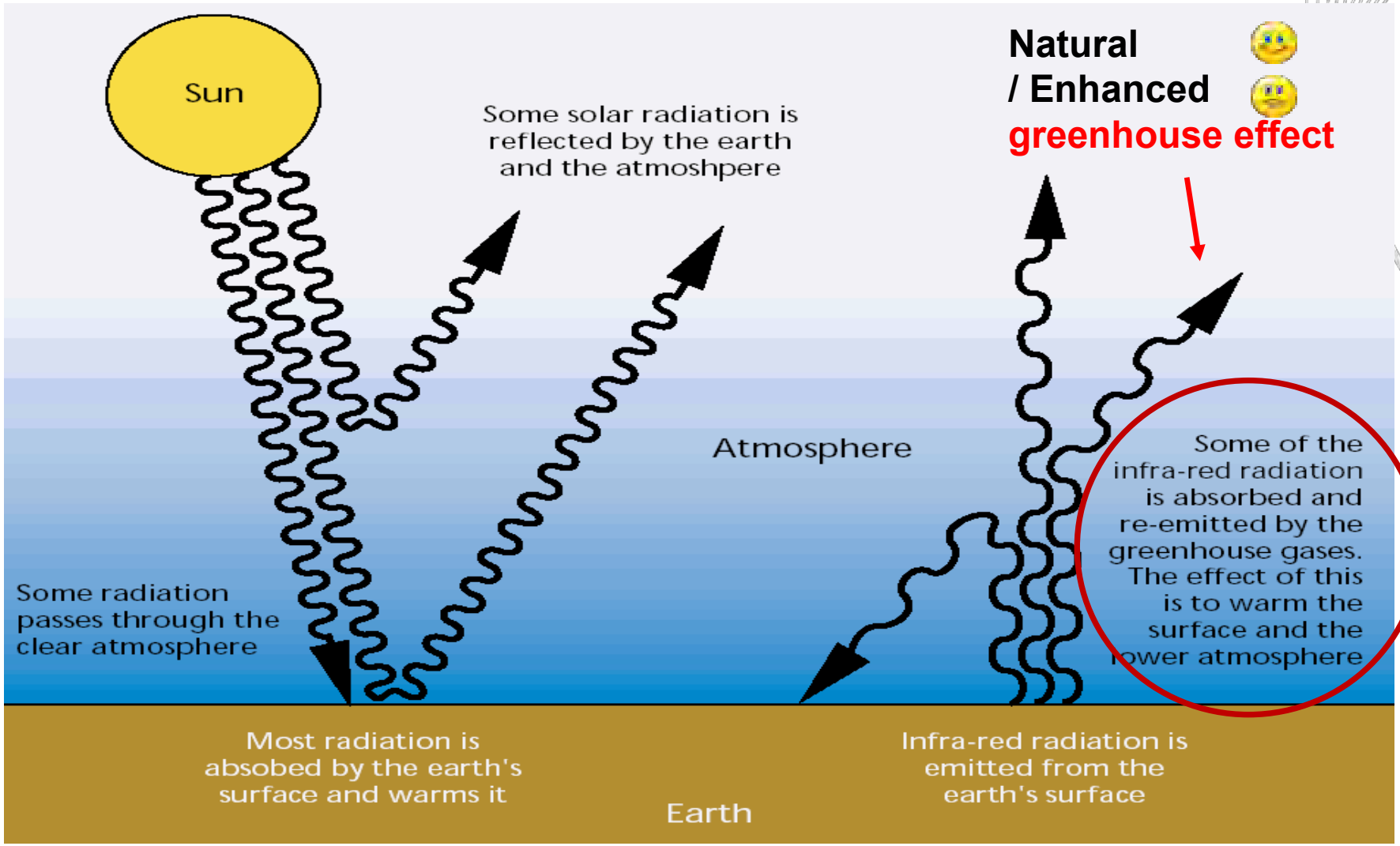


Figure SPM.2. Historical anthropogenic CO2 emissions from fossil fuel combustion, flaring, cement, in five major world regions

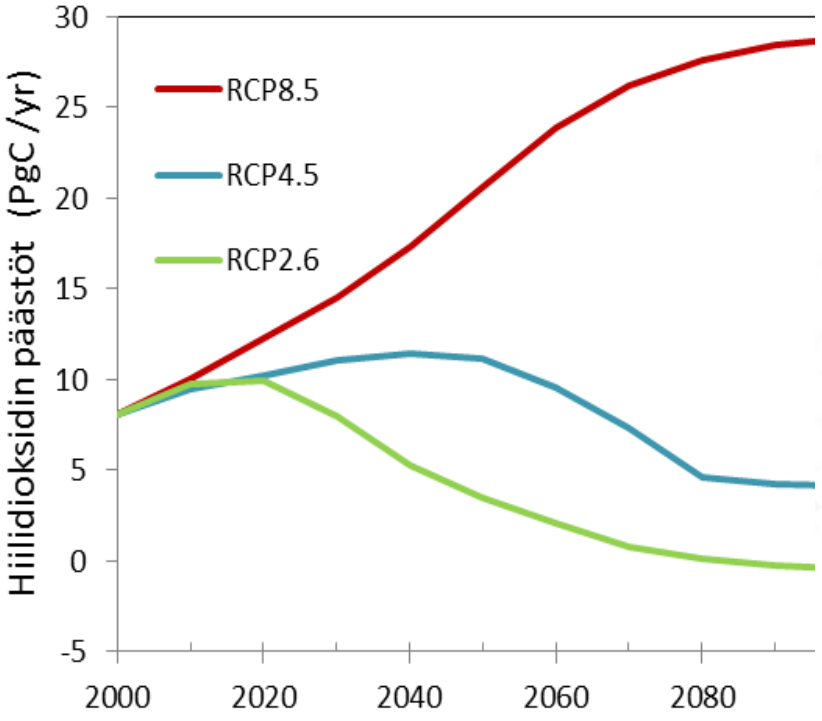
Changes in greenhouse gas concentrations cause imbalances in the Earth's energy budget



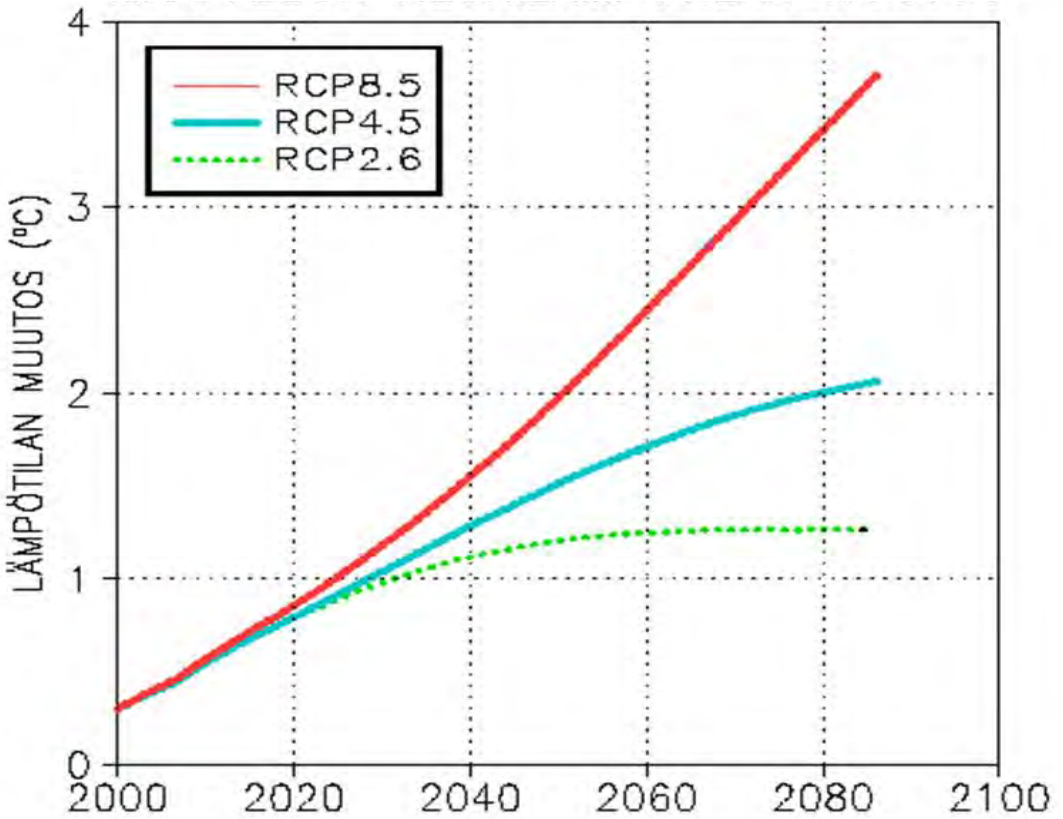
http://www.greenhouse.unimelb.edu.au/images/GHGeffect.gif

How inconvenient it will be – depends on us

GHG emissions

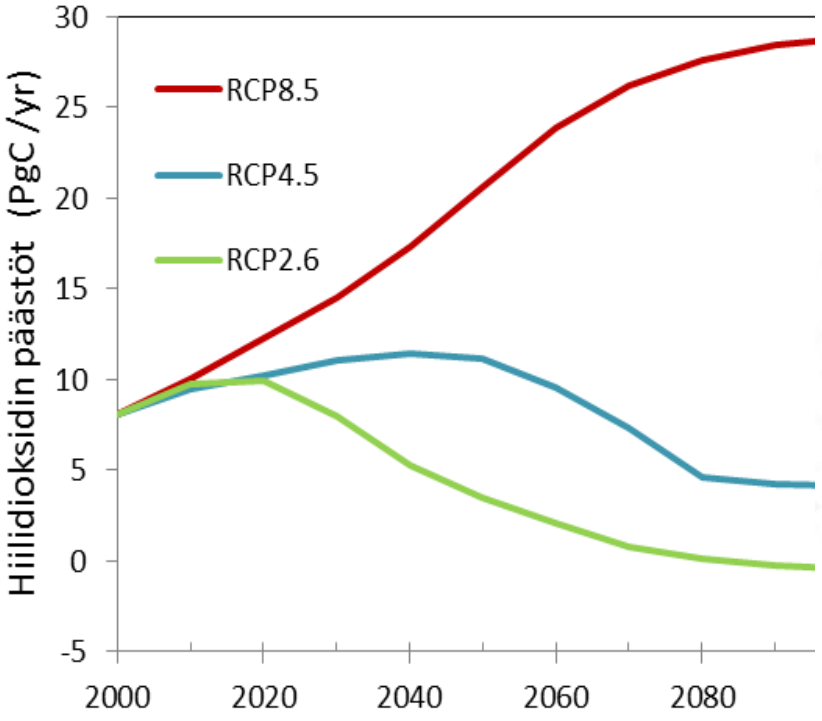


Change in global temperature



How inconvenient it will be – depends on us

GHG emissions



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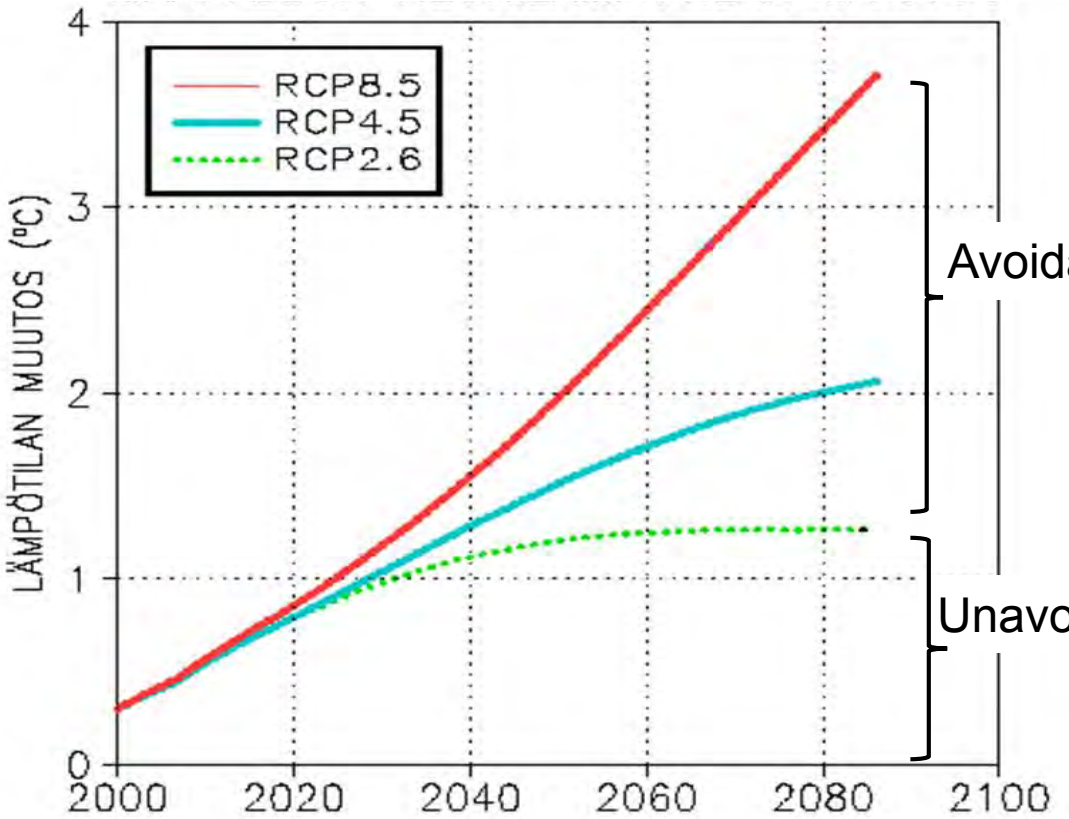
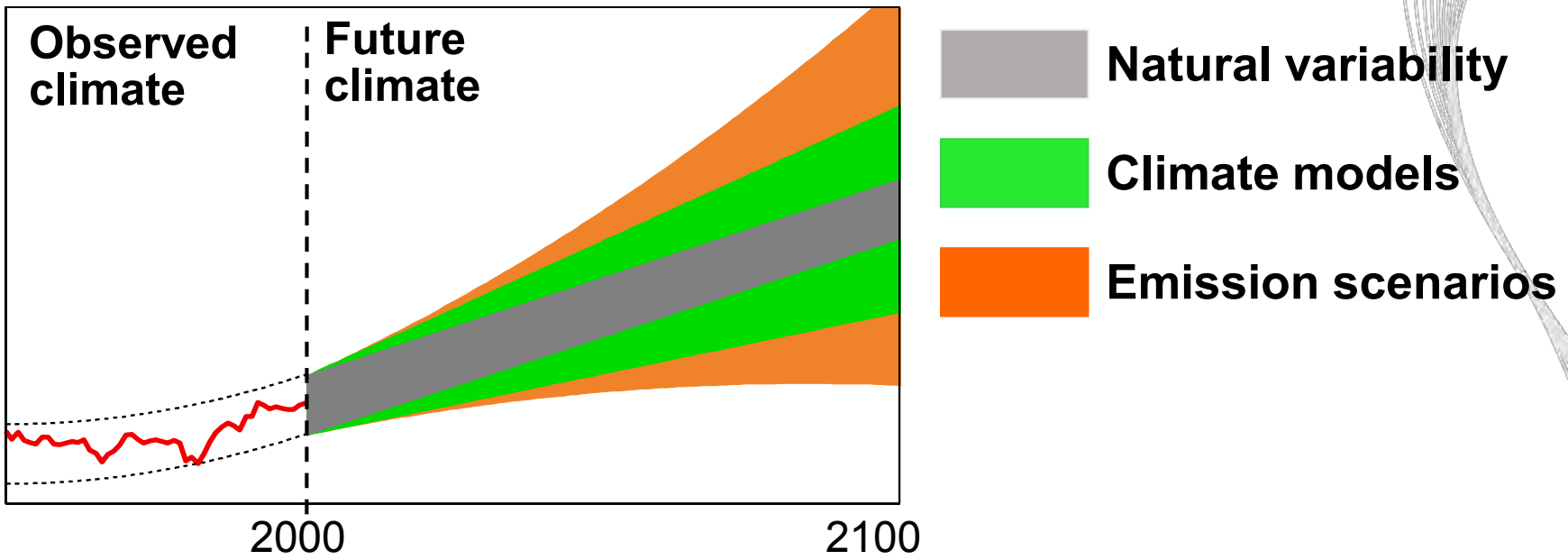


Uncertainties in climate change schematically



LEVEL OF UNCERTAINTY	Near future	End of the century
Natural climate variability	+	+
Climate model sensitivity	(+)	++
Emission scenarios		++

Source: J. Räisänen (Univ. of Helsinki)

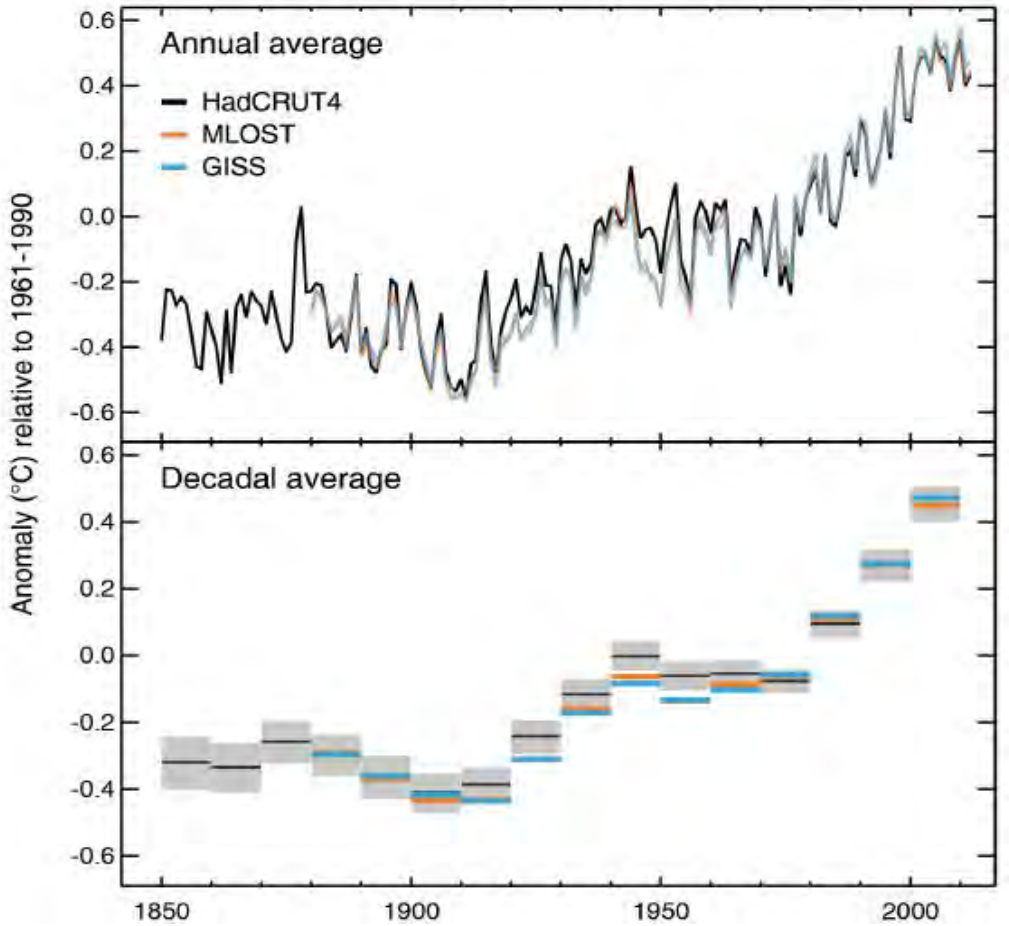
Climate change, impacts, mitigation, and adaptation

- It is likely that we will never be able to make predictions that are detailed enough and certain enough to make a 'predict and adapt‘ approach to adaptation a viable option.

- It is important to look at the range of projections from different models rather than just relying on one outcome chosen from many possibilities.

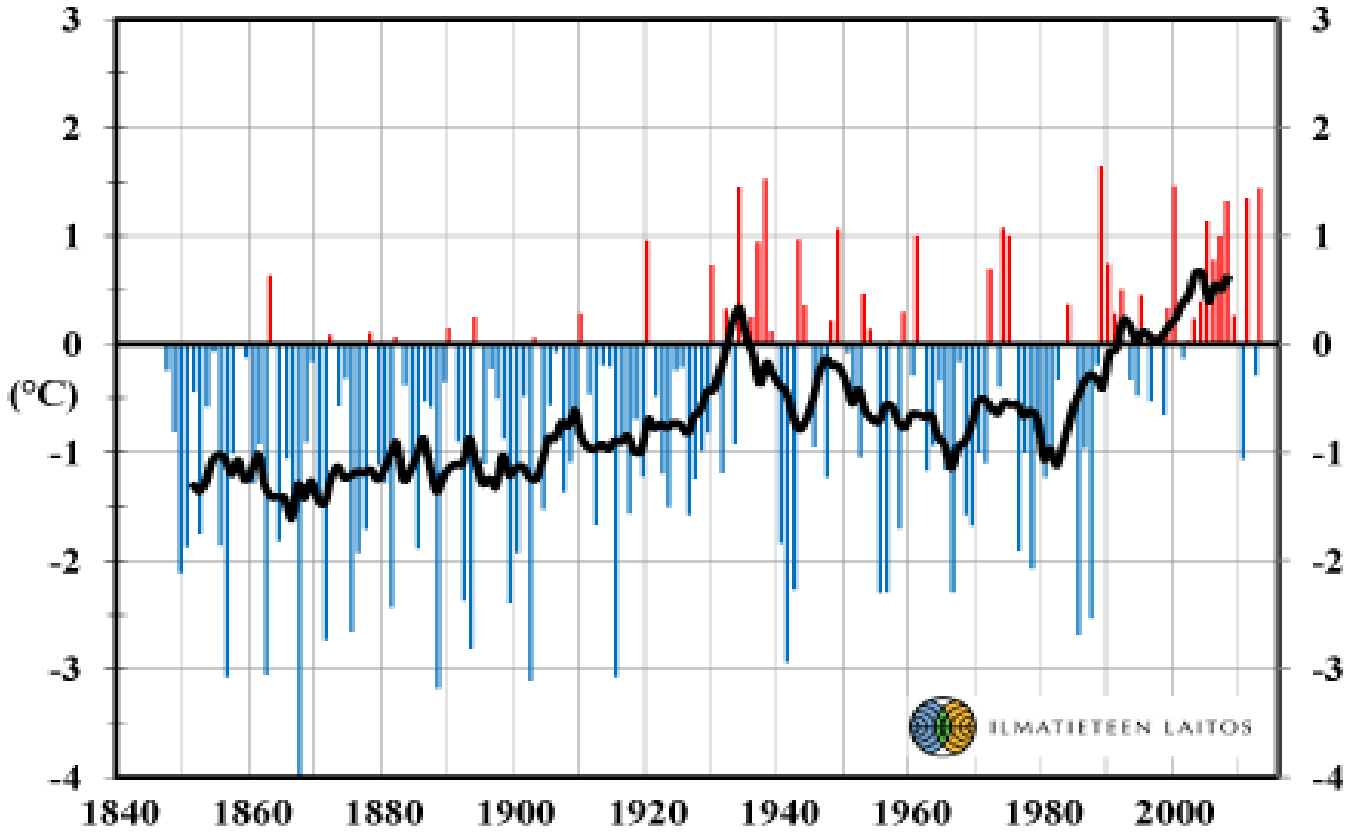
- Both mitigation and adaptation are urgently needed!

Global warming can clearly be seen in the long time series of global temperature



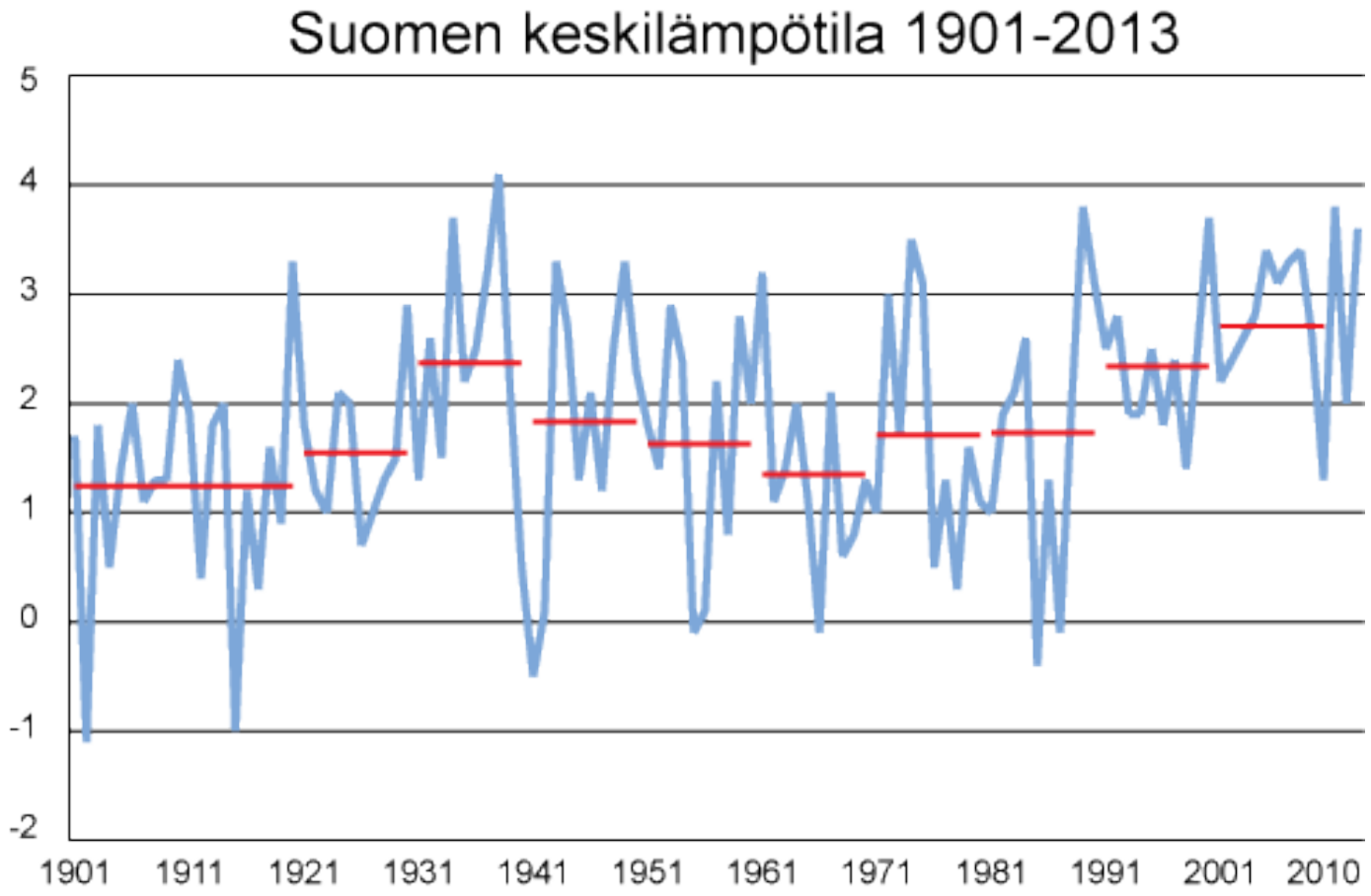
Anomaly of global average temperatures 1850-2012 vs.1961-1990

Climate change can be seen also in smaller areas –
Annual temperature in Finland 1847-2013 vs. 1981-2010



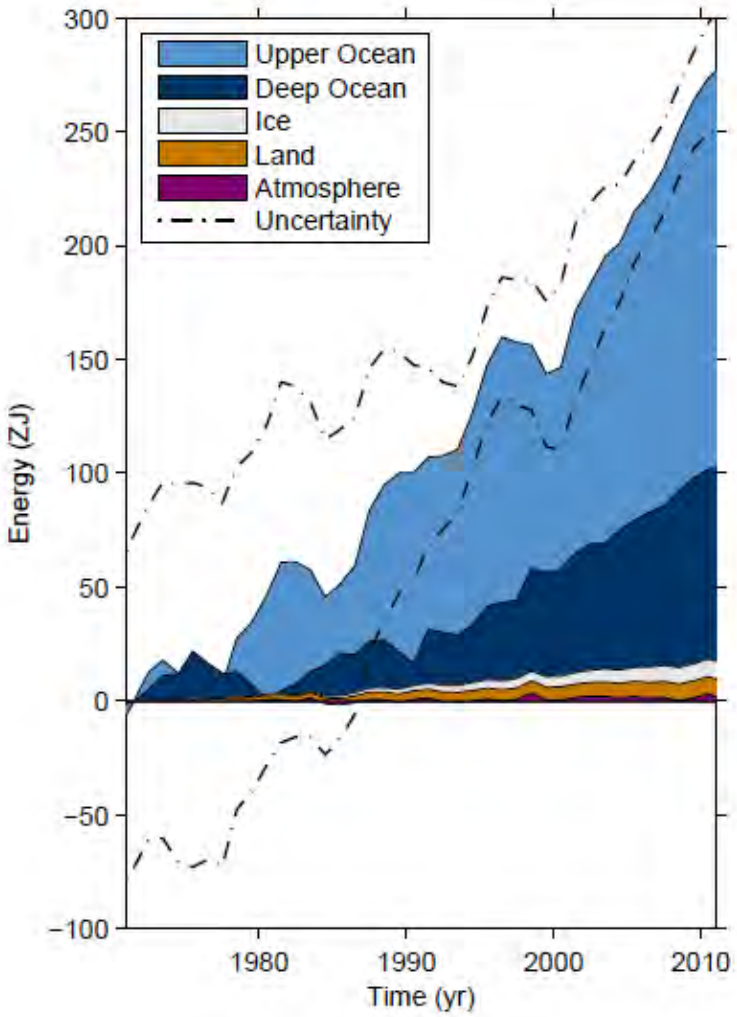
Finland's annual mean temperature anomalies from the mean value [ºC] for 1981-2010 in 1847-2013 (blue and red columns). The black curve shows the ten-year running mean.

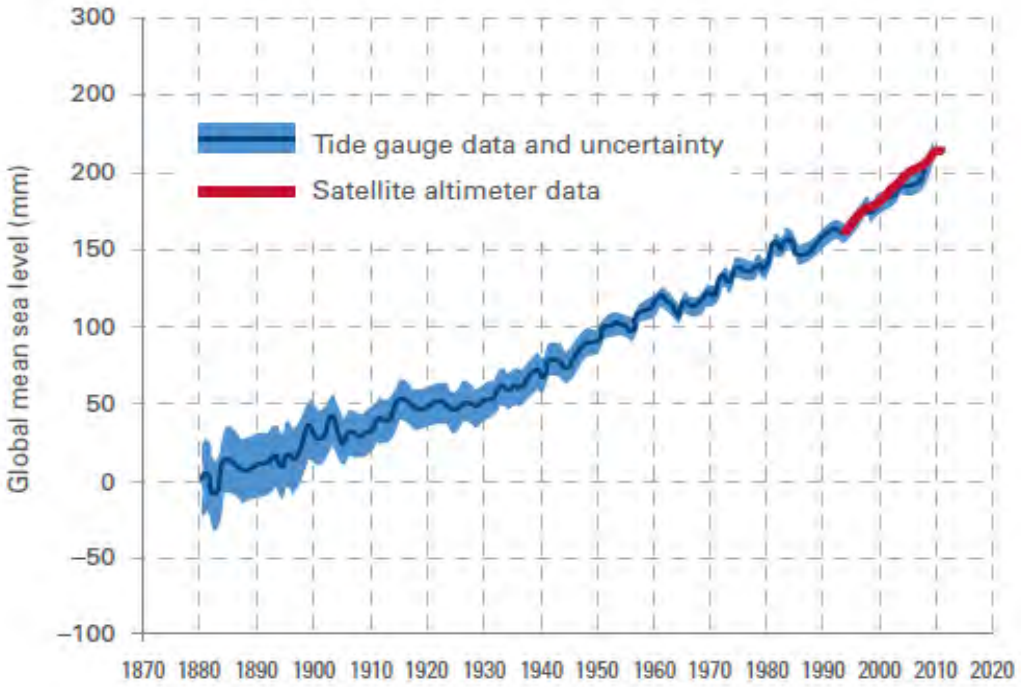
Last decade was the warmest ever also in Finland



Finland's annual mean temperature 1901-2013 and the ten-year means

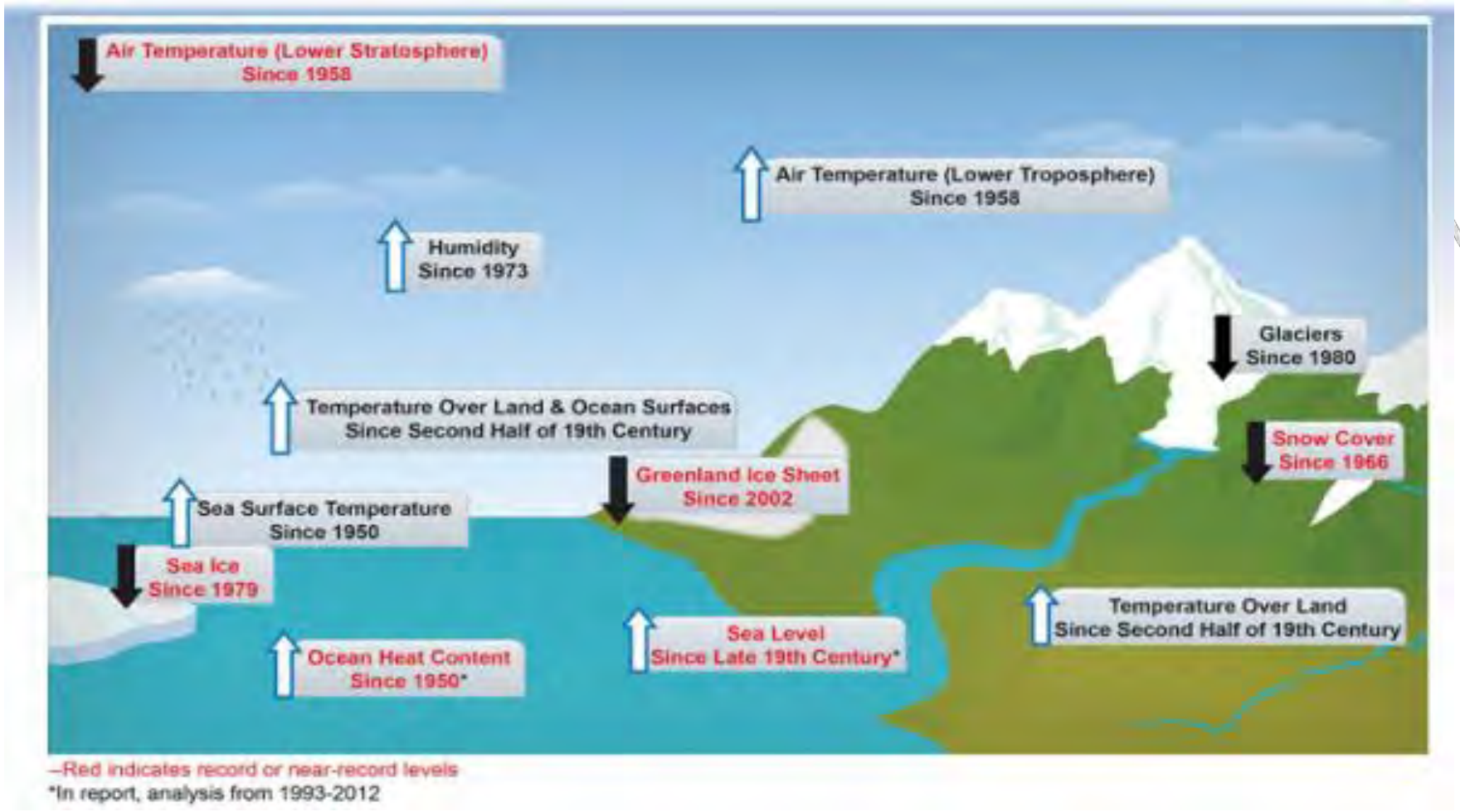
Heat is stored in the oceans - sea level is rising





Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010 (*high confidence*).

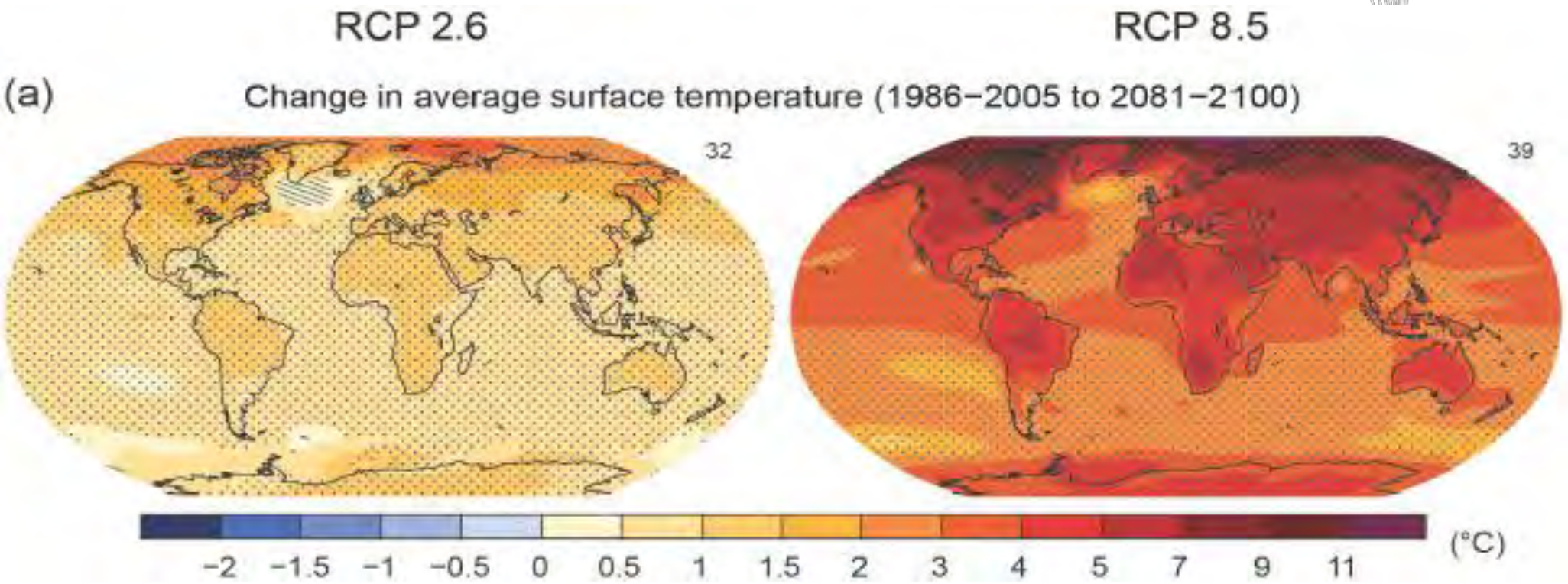
Some indicators to monitor climate change



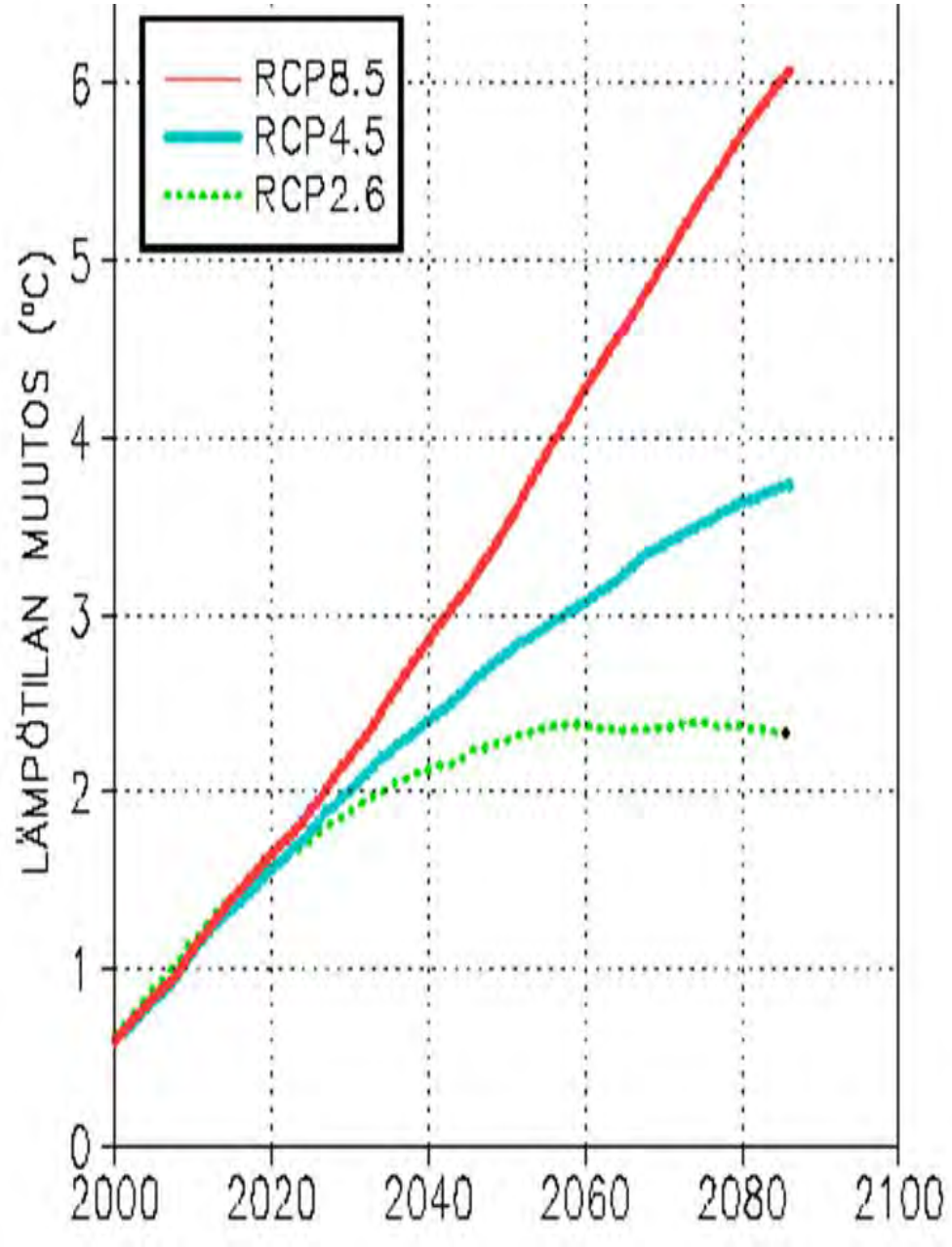
TEMPERATURE 2081-2100 VS. 1986-2005

Cut of emissions

No reductions

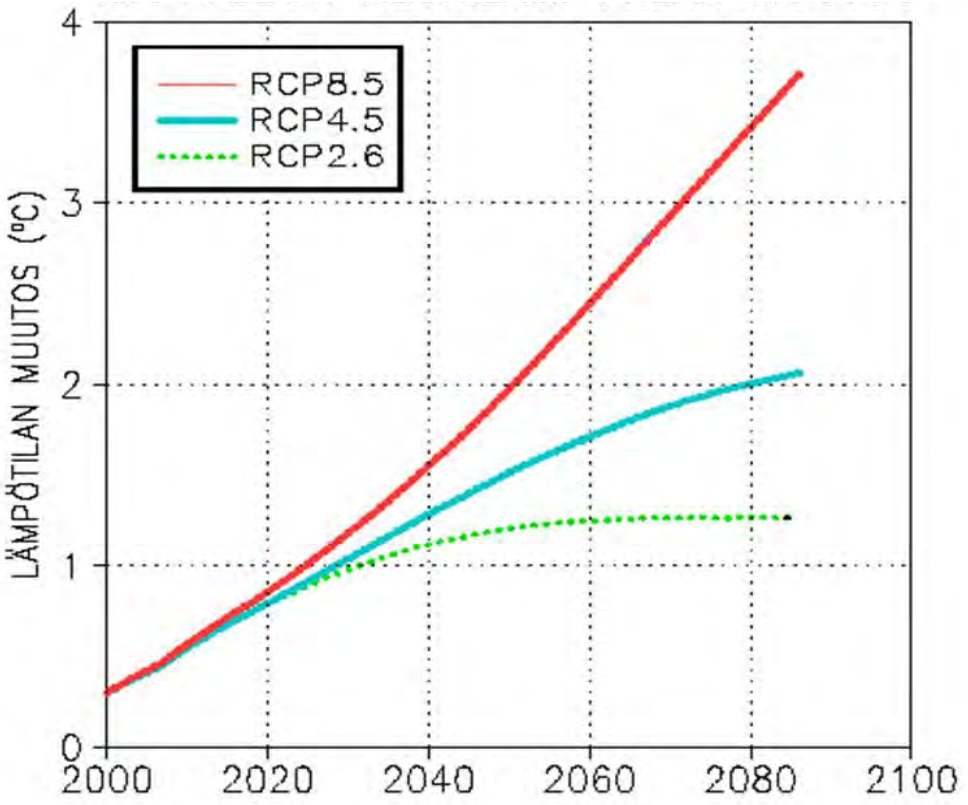


Change in annual mean temperature in Finland (°C)



In Finland the temperature will increase more than than globally on average

Change in the global mean temperature (°C)

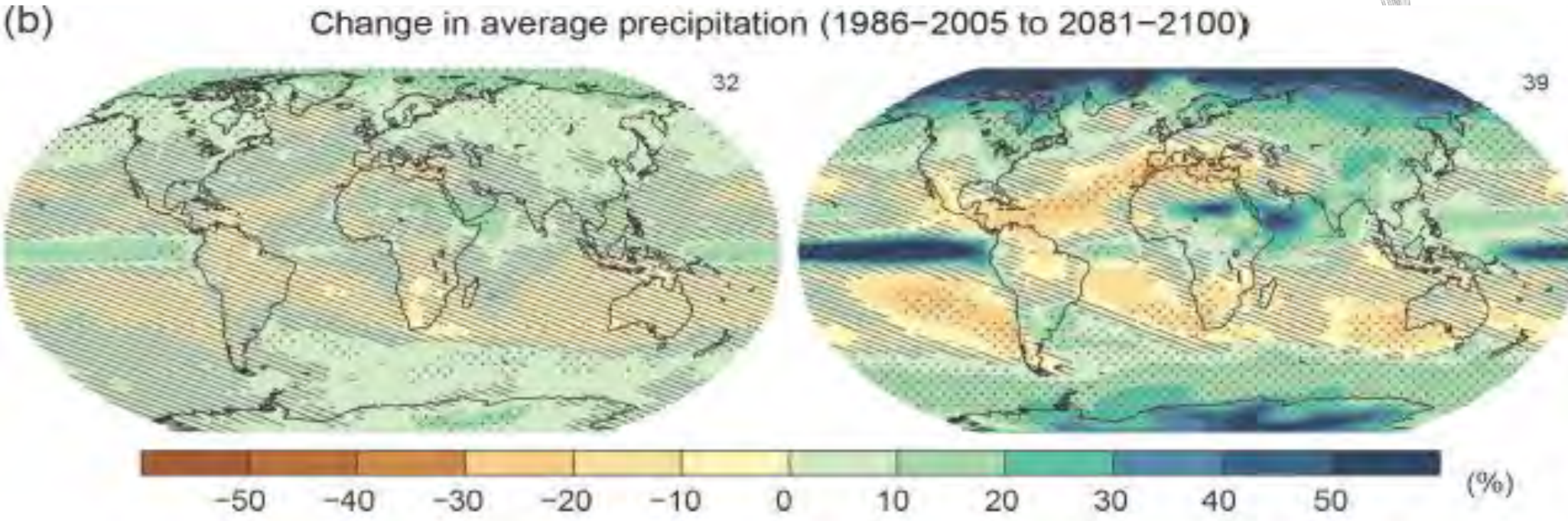


Ref: Kimmo Ruosteenoja (IL)

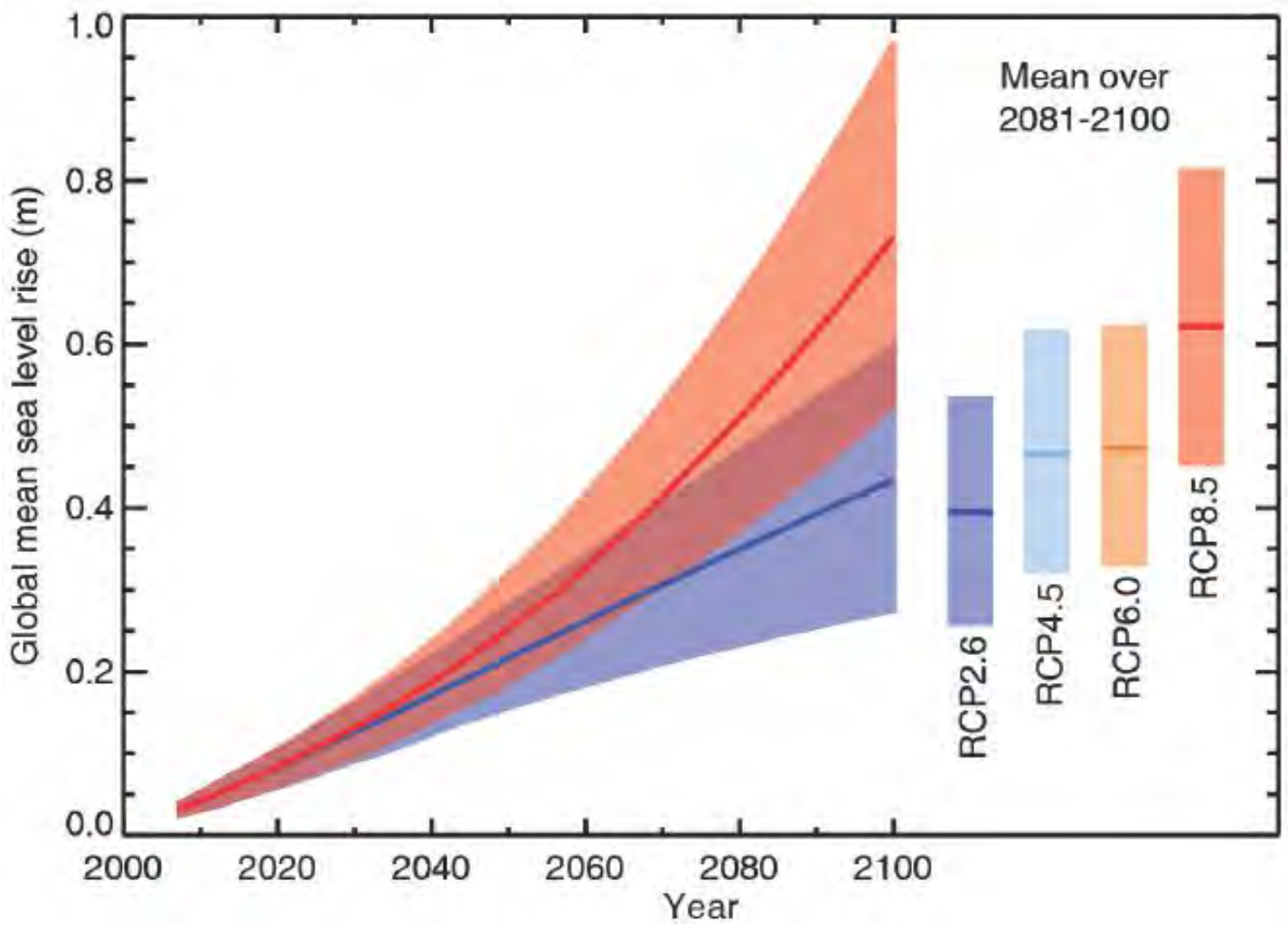
PRECIPITATION 2081-2100 VS. 1986-2005

Cut of emissions

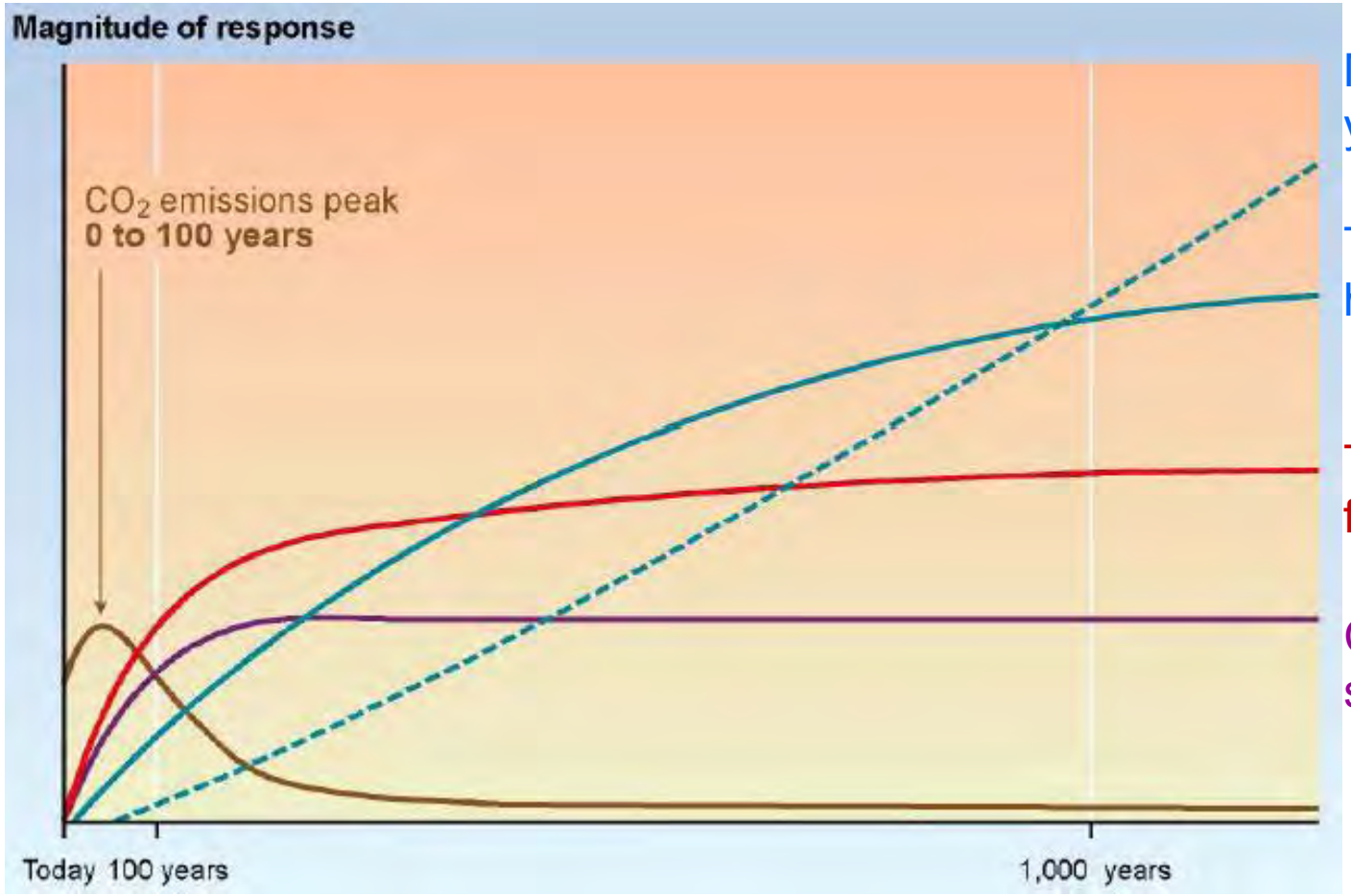
No reductions



Sea level will rise less than 1 m during this century (+19 cm by 2010)



. . . but once started, sea level rise will continue hundreds – even thousands of years



Melting of ice, thousands of years

Thermal expansion hundreds –1000 years

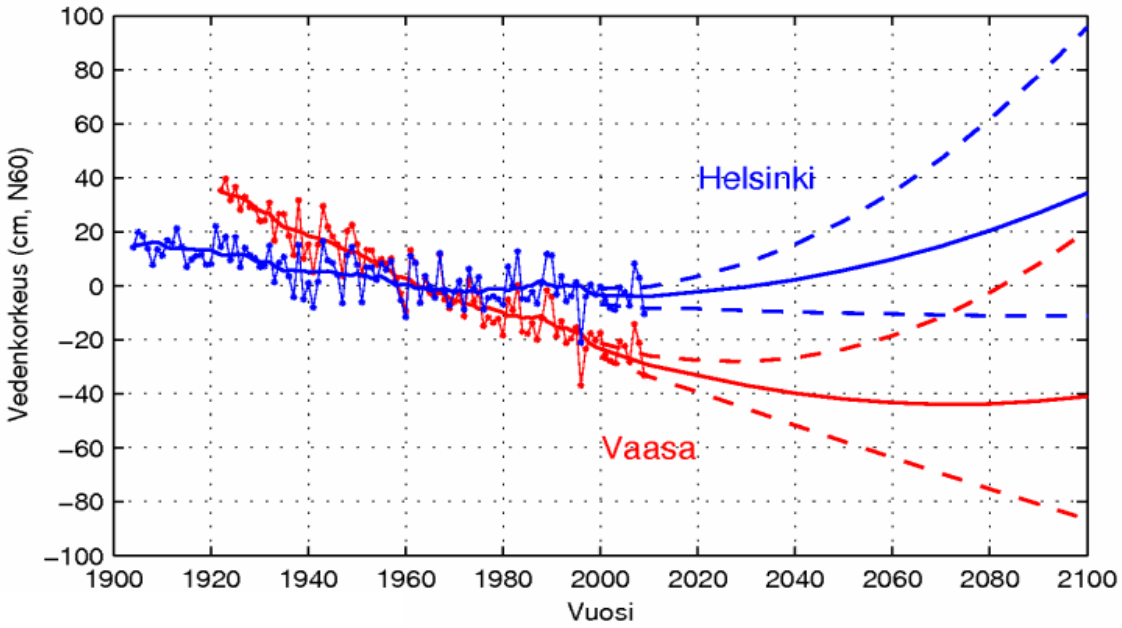
Temperature will stabilize in few centuries

CO_2 concentration will stabilize in 100-300 years

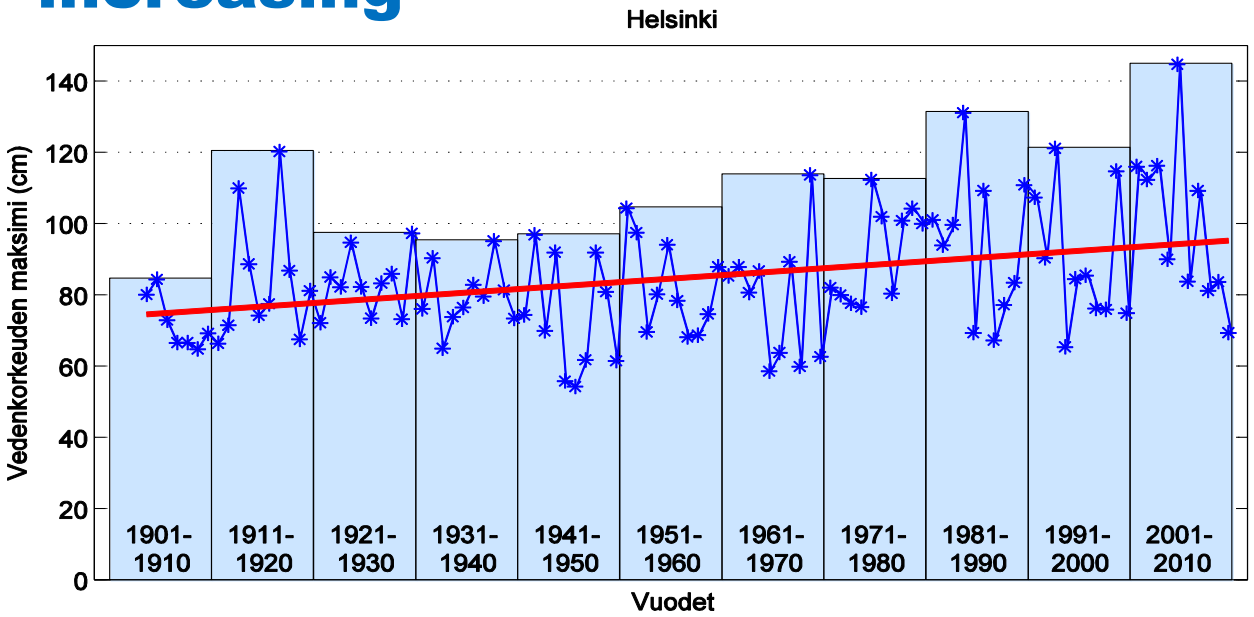
CO_2-emissions

Sea level changes in Baltic Sea

In the past, observed post-glacial land uplift has been stronger than sea level rise in Finland.



Observed annul maximum has been increasing



In Finland both benefits and adverse effects: some examples

- Warmer climate => longer growing season;
  less heating energy for buildings
- Warmer and wetter winters => moisture problems in buildings;
  challenges in road maintenance;
  wind-induced damages to forests
- Stronger rain events => increasing risks of urban floods
- Longer heat waves => health problems, forest fires
- Sea level rise => urban planning

Global negative impacts influencing Finland!

Surprises to come?

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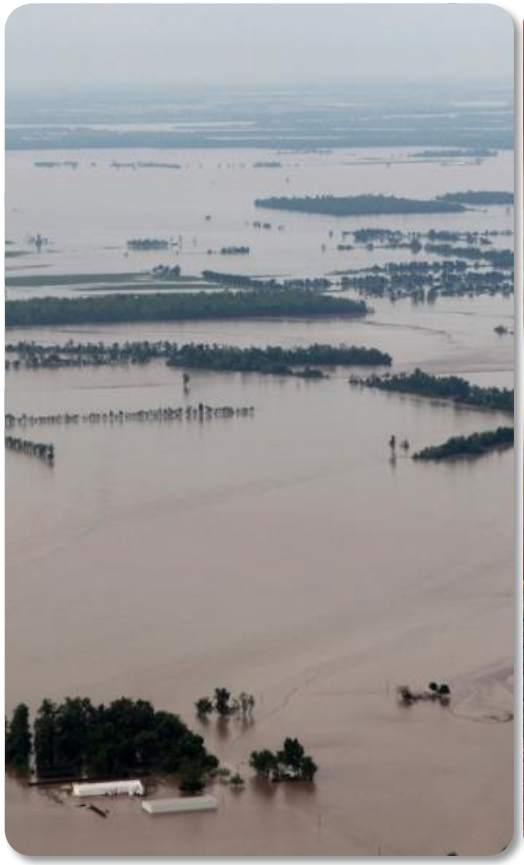
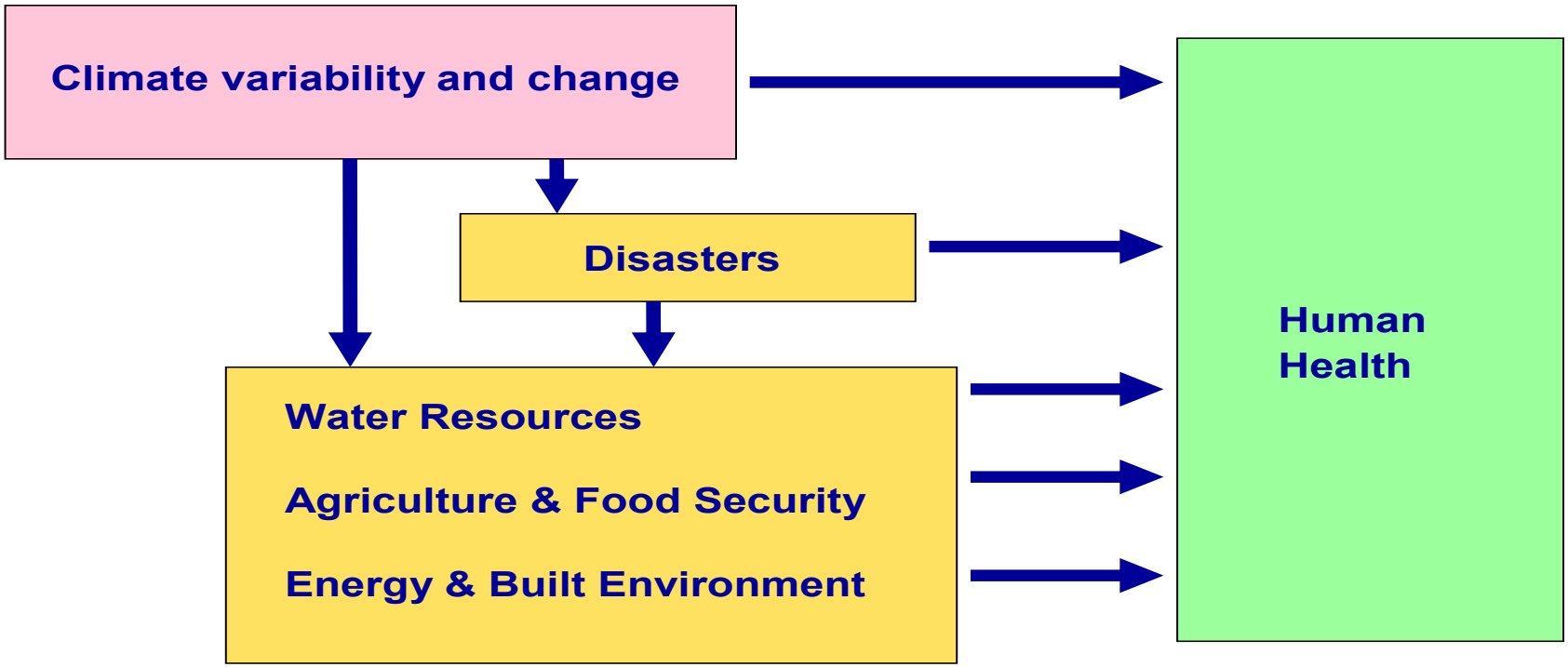
A changing climate leads to changes in extreme weather and climate events

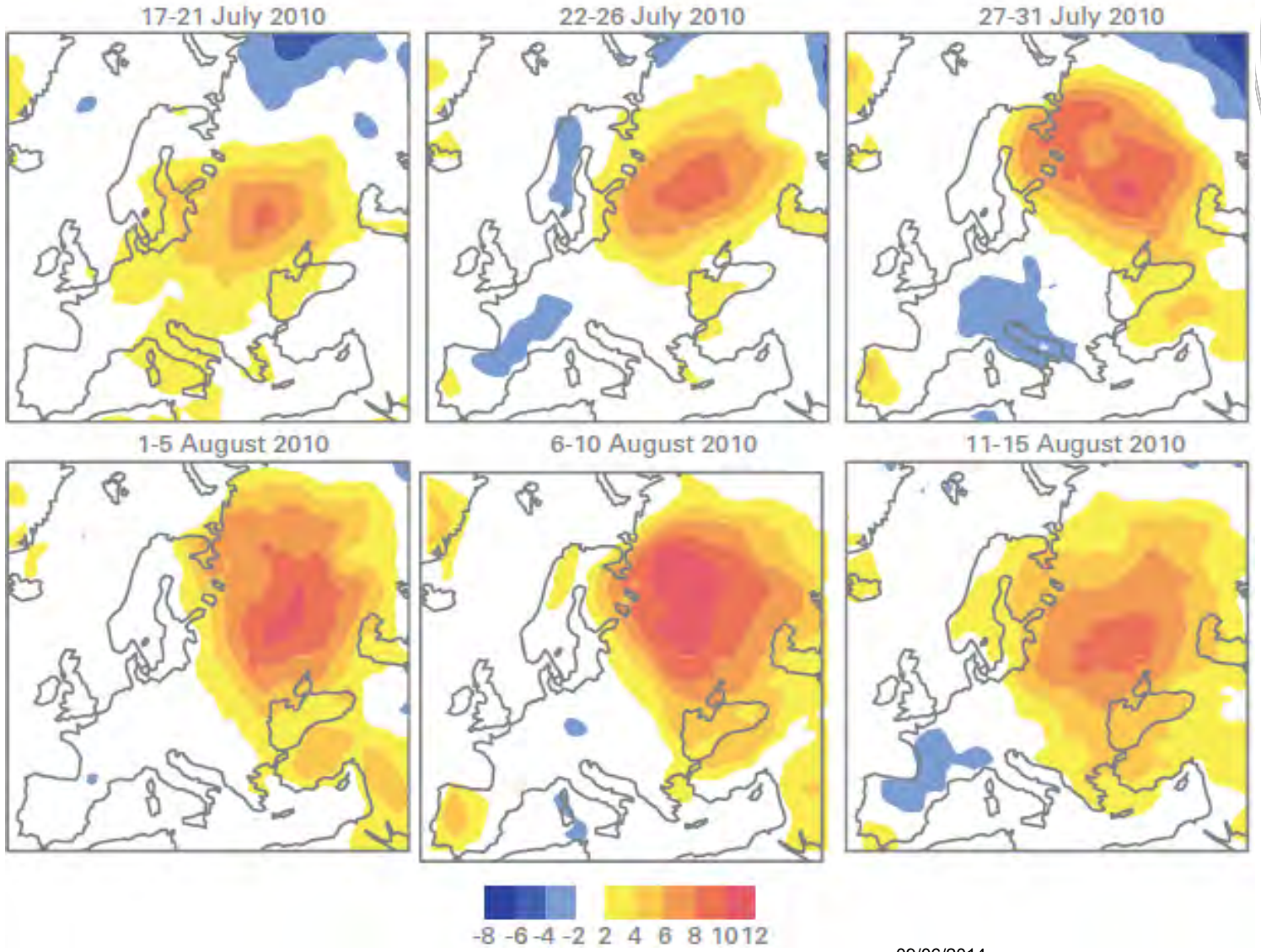



Weather and climate affect to human health and well-being in various ways



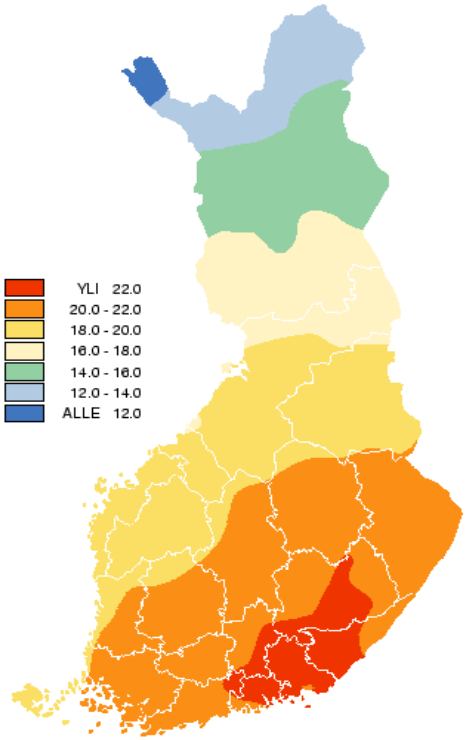
Living with Climate Variability and Change
Understanding the Uncertainties and Managing the Risks WMO Conference in Espoo, July 2006

Heat wave in Jul-Aug 2010 in Europa: 55000 deaths

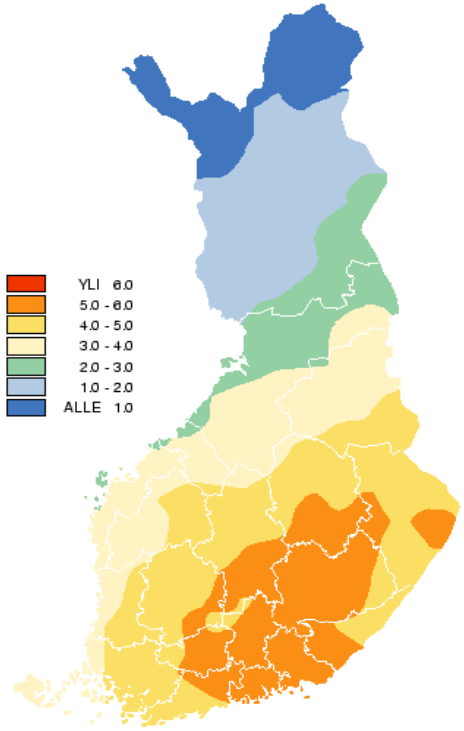


July 2010: new heat record, 37.2 °C
- in Southern Finland monthly mean temp anomaly > +5 °C

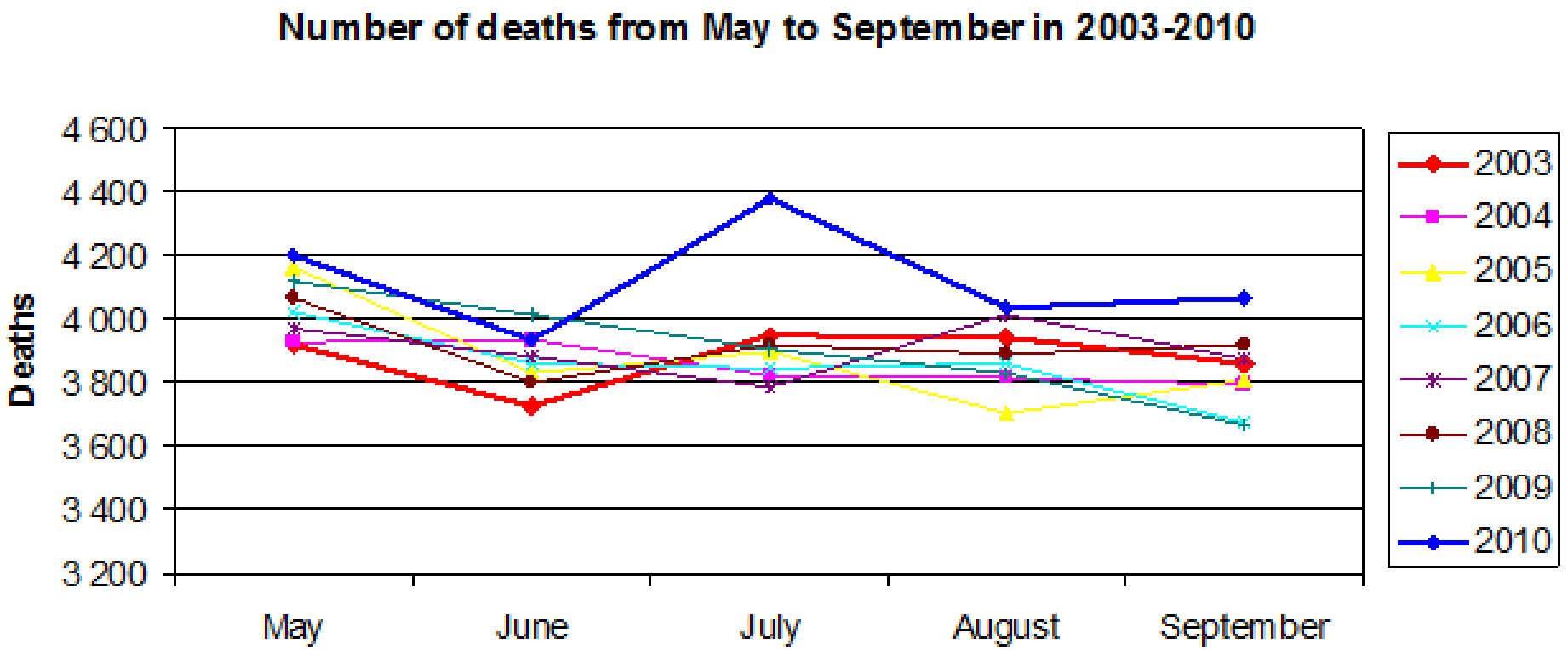
Keskilampotila [C] 7/2010



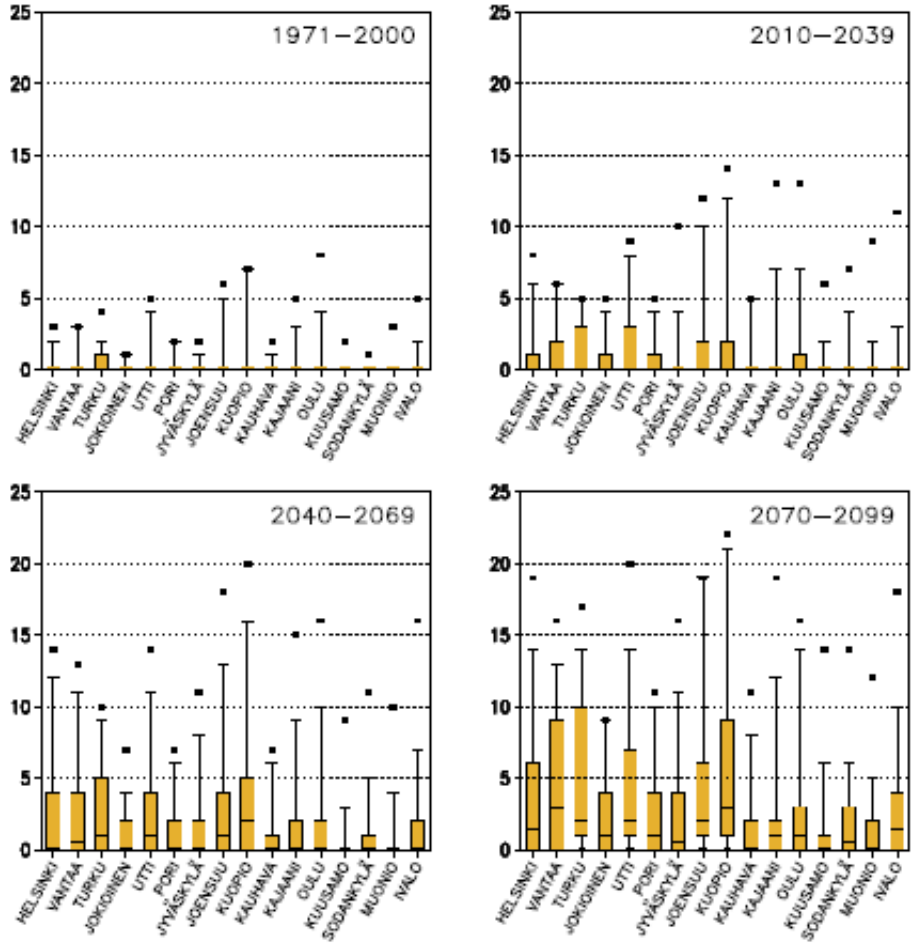
Lampotilan poikkeama normaalista 7/2010 [C]



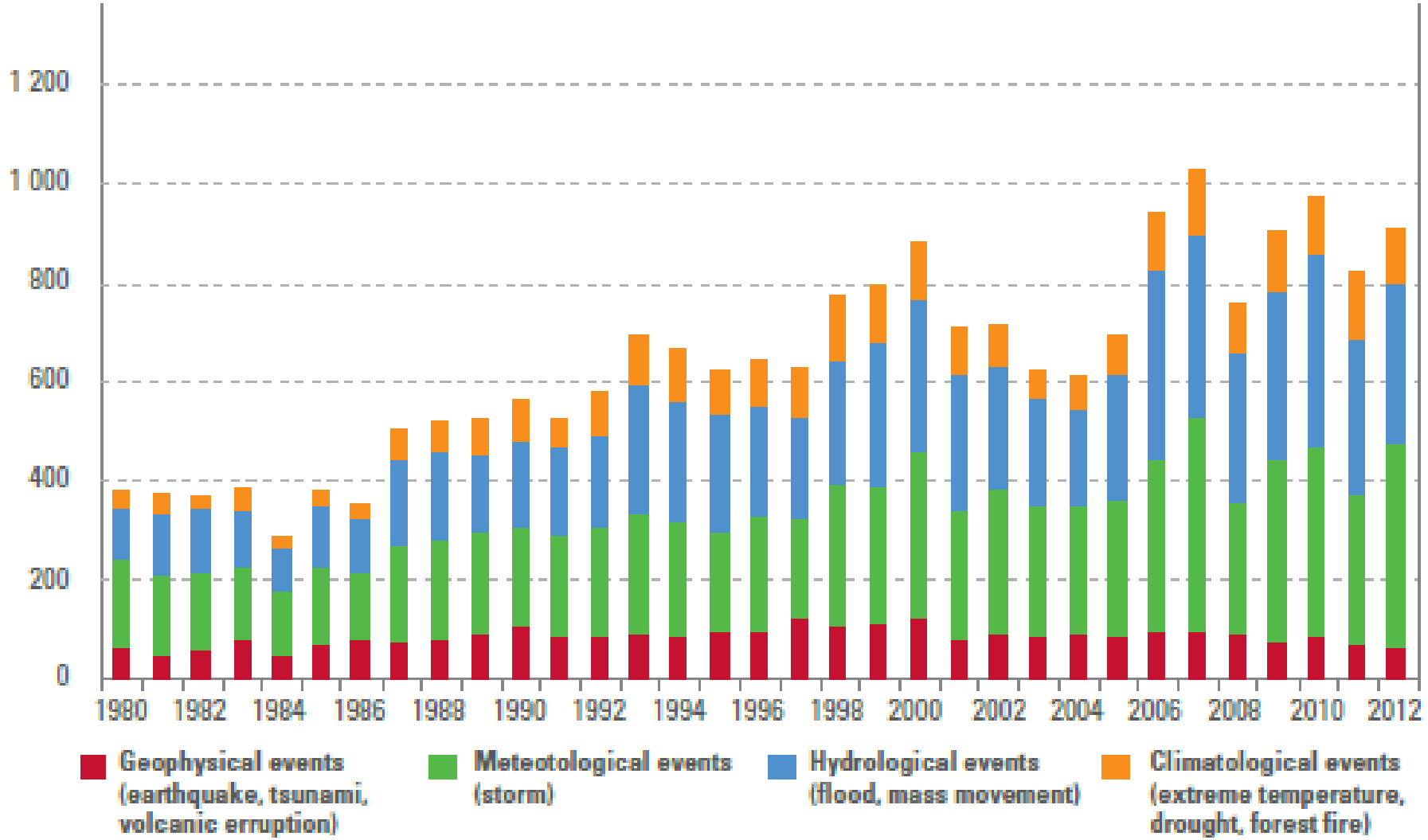
The heat wave increased mortality also in Finland



Number of very hot days (T_{mean} > 24 °C) will increase and heat waves become longer



GLOBAL LARGE NATURAL DISASTERS 1980–2012



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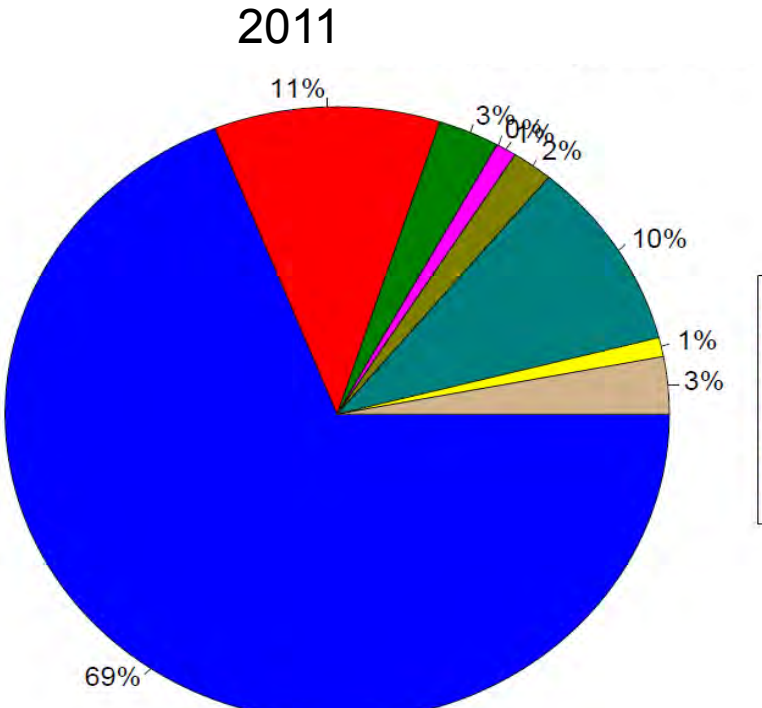
Energiateollisuus

WEATHER IS THE MAIN CAUSE FOR FAILURES IN ELECTRICITY DISTRIBUTION



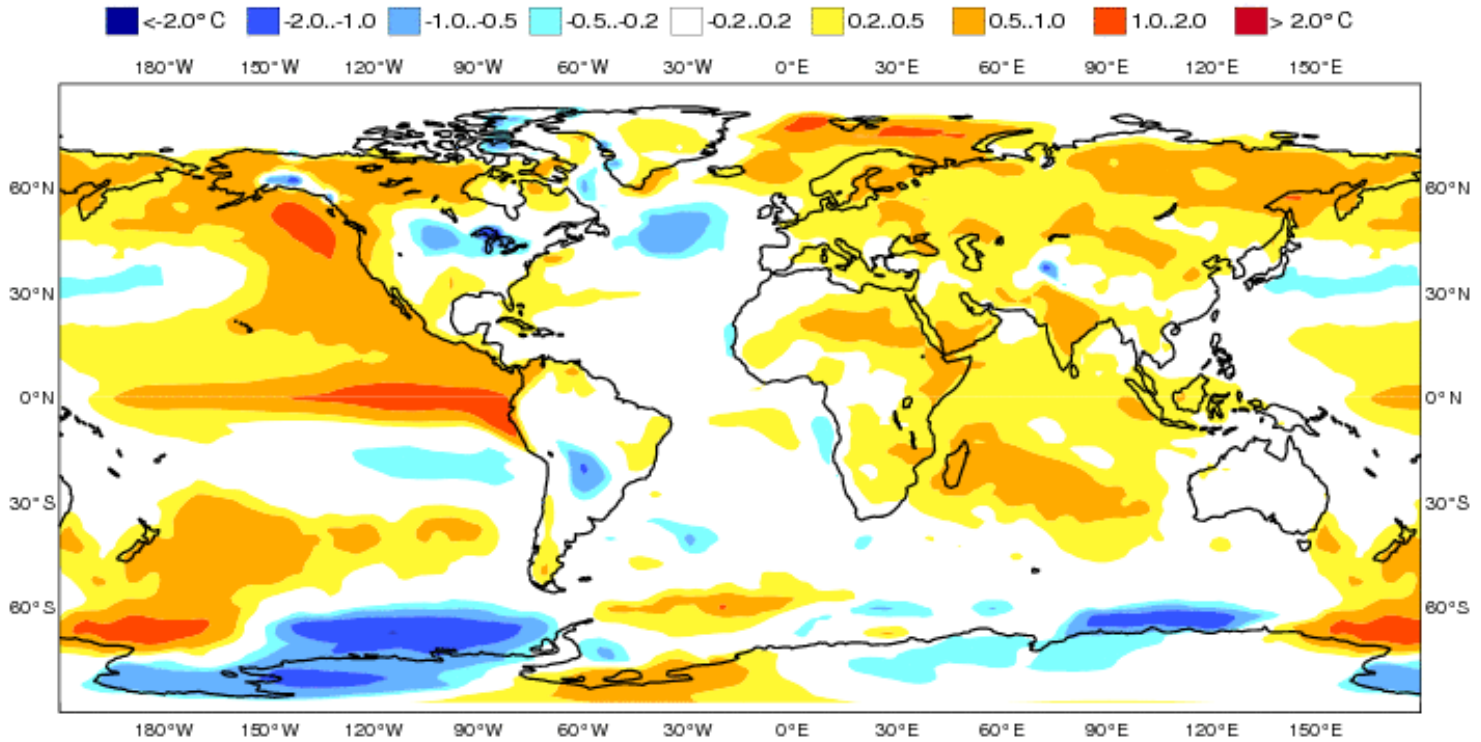
MAJORITY OF ELECTRIC NETWORK OF SW FINLAND WAS BROKEN AFTER STORM TAPANI 26 DEC 2011

FMI SENT EARLY WARNINGS TO ENERGY COMPANIES 4 DAYS BEFORE

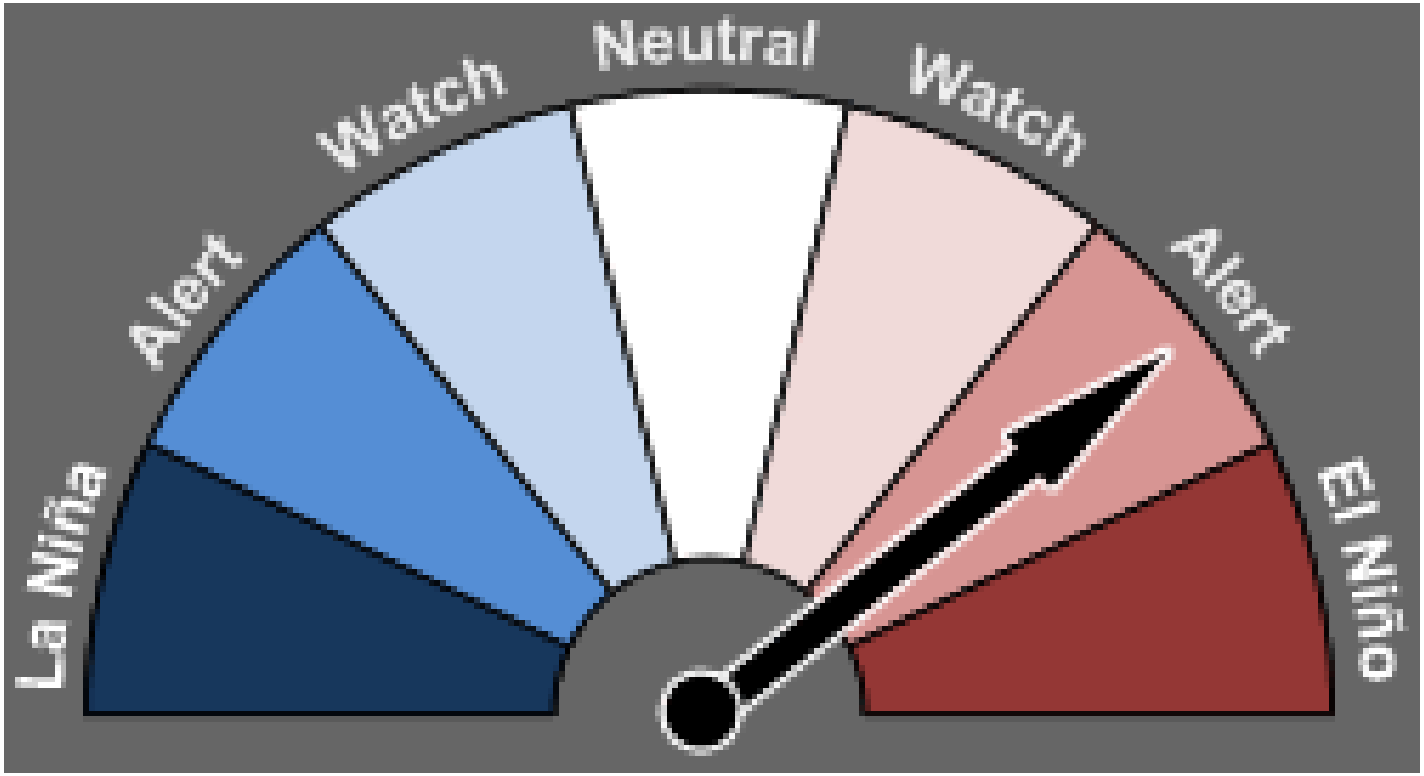
Seasonal prediction – June-July-August warmer than climatological normal for Finland

EUROSIP multi-model seasonal forecast
Mean 2m temperature anomaly
Forecast start reference is 01/05/14
Variance-standardized mean

ECMWF/Met Office/Meteo-France/NCEP
JJA 2014



El Niño likely to develop in the second half of 2014

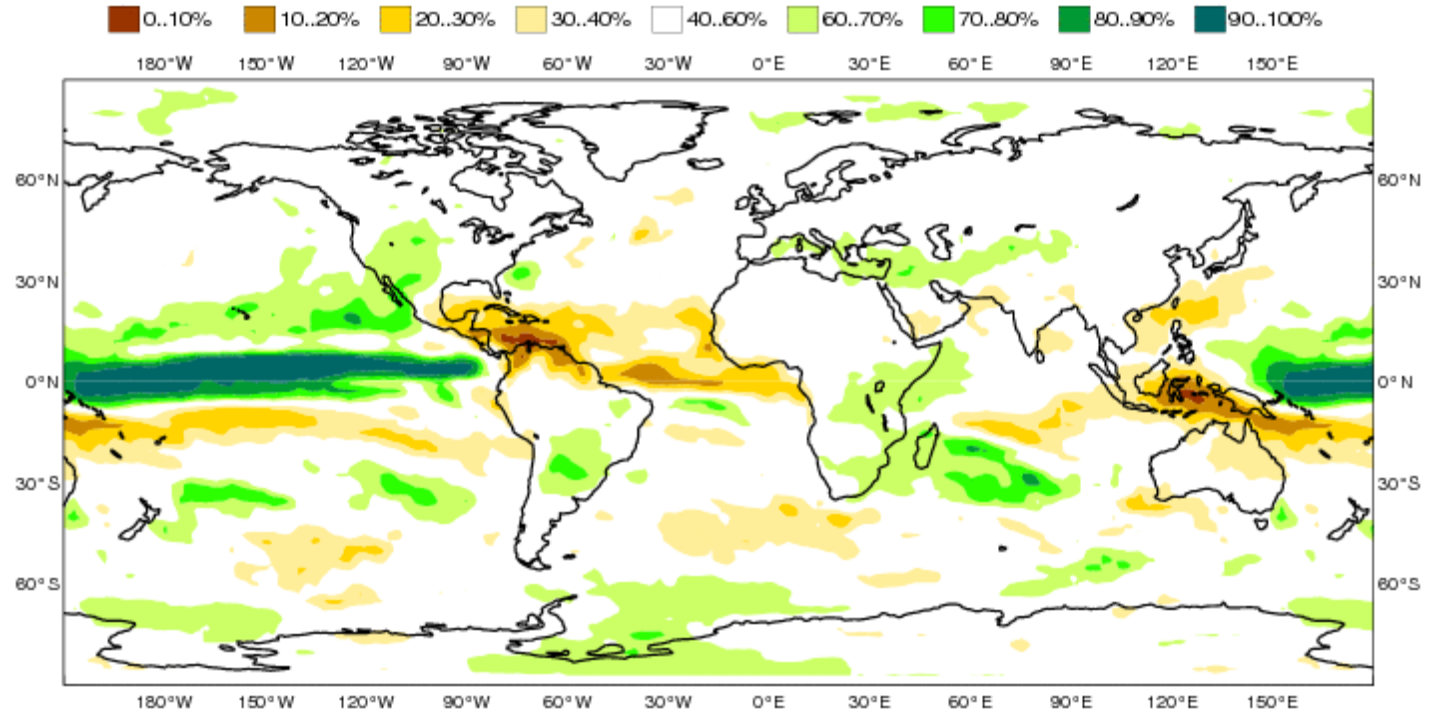


http://www.bom.gov.au/climate/enso/tracker/#tabs=Summary

Climate predictability in seasonal time scale is better near equator than in higher latitudes - due to understanding of ENSO (El Niño Southern Oscillation = El Niño – La Niña)

EUROSIP multi-model seasonal forecast
Prob(precipitation > median)
Forecast start reference is 01/05/14
Unweighted mean

ECMWF/Meteo-France/NCEP
ASO 2014



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For more information

Climate guide.fi

Ilmasto-opas.fi

http://ilmatieteenlaitos.fi/ilmasto

Thank you for your interest!

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