NATIONAL IPCC GROUP ACTION PLAN 2008-

4. National research programme
5. Additional Finnish contribution to IPCC
6. Finnish niches, e.g. aerosols, greenhouse gases, international co-operation
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CLIMATE CHANGE AND ITS SOCIO-ECONOMIC IMPLICATIONS

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FUNDING: Finnish Academy, TEKES, Private Enterprizes, Ministries, Universities & Research Institutes

- **Climate change**
- **Socio-economic impacts in Finland (direct/indirect)**
- **Adaptation needs and means**
- **Mitigation means**
- **Business opportunities/new technologies etc.**

CONTRIBUTION OF FINLAND TO IPCC WORK

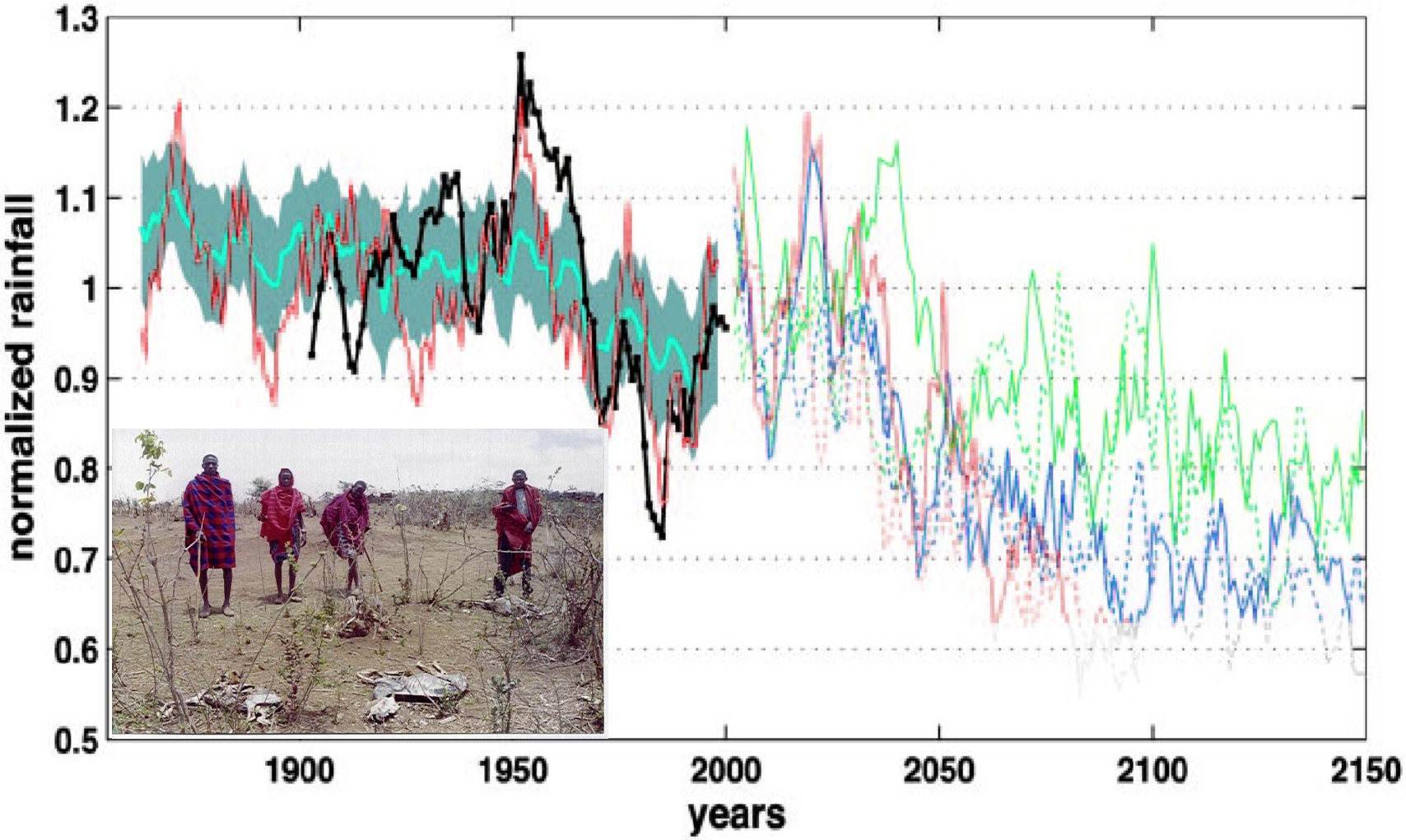
1. More active participation of Finnish scientists as contributing and lead authors, potential areas e.g.

- Aerosol processes, fluxes of greenhouse gases
- Arctic/Antarctic expertise
- Forest & boreal ecosystems
- Snow/ice
- Mitigation & emissions

2. International collaboration/support

- Scientific collaboration with e.g. India, China, Brazil, Argentina
- Support to developing countries: education of scientists, measurements, adaptation studies, disaster prepardness

SAHEL DROUGHT 1850-2150



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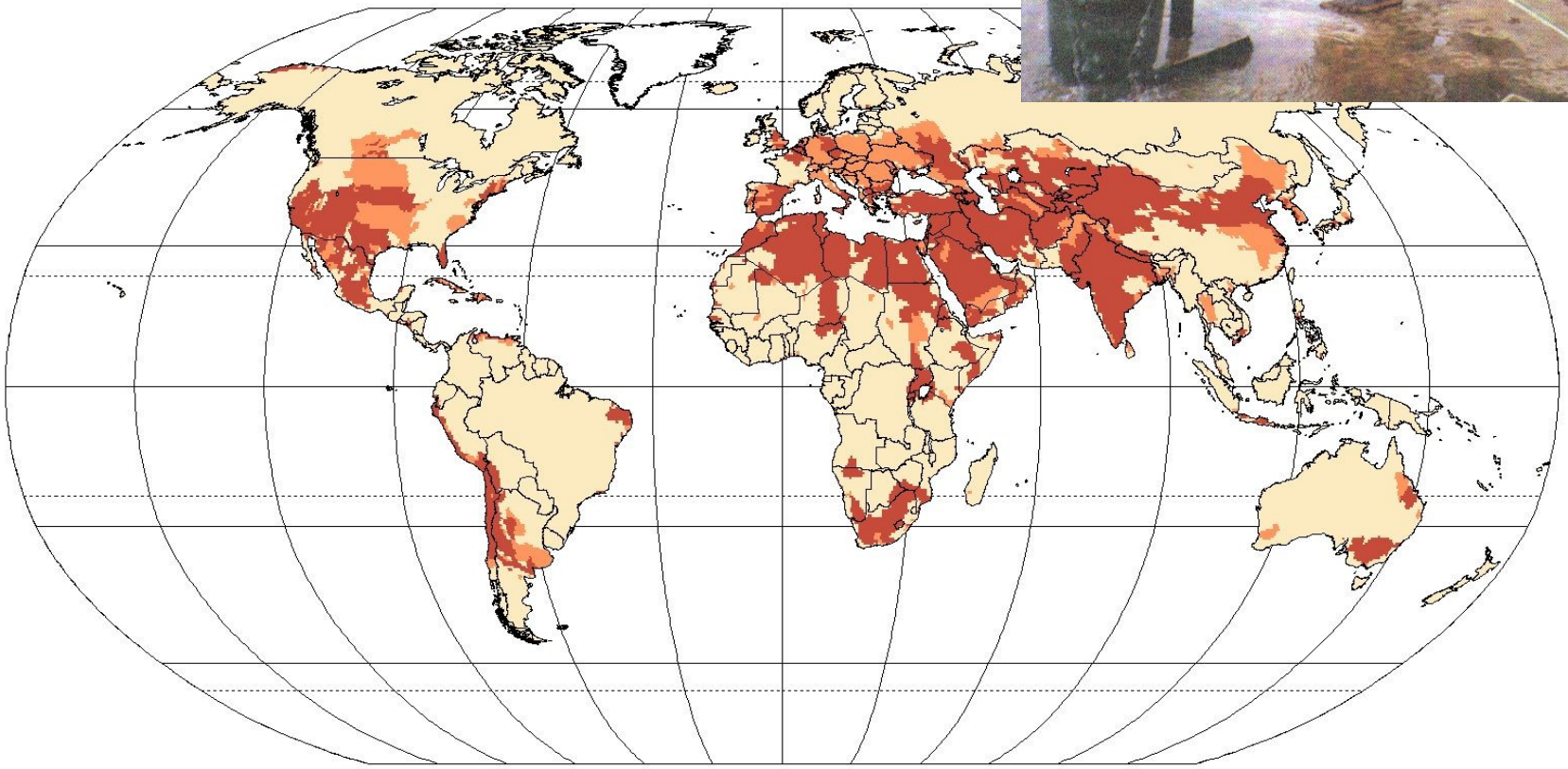
VESIONGELMAT 2020

Withdrawal to availability ratio
(A2 scenario, 2020s, HadCM3)



0 - 0.2 [low water stress]
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(c) Center for Environmental Systems Research, University of Kassel, November 2002- Water GAP 2.1D

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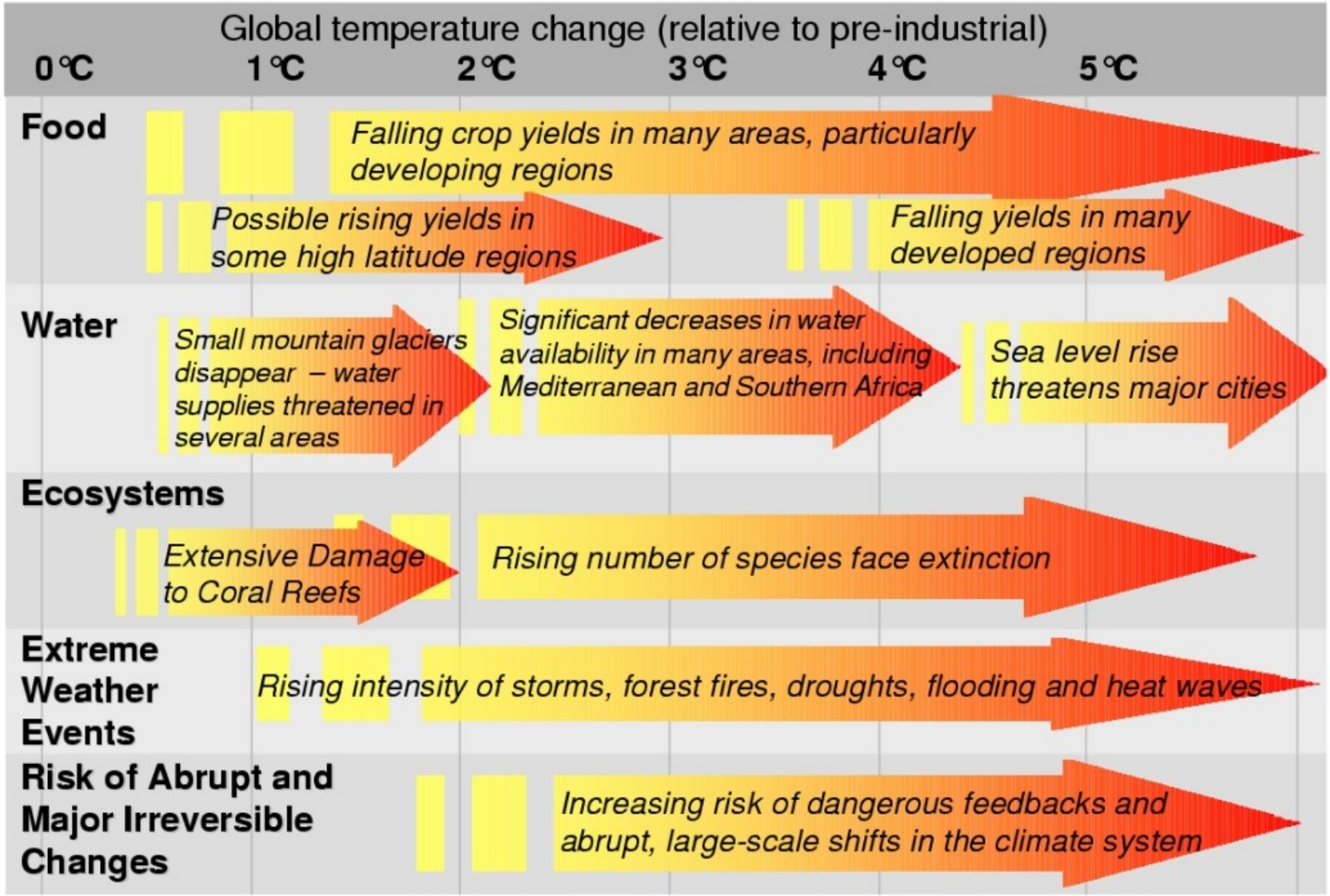
Projected Impacts of Climate Change



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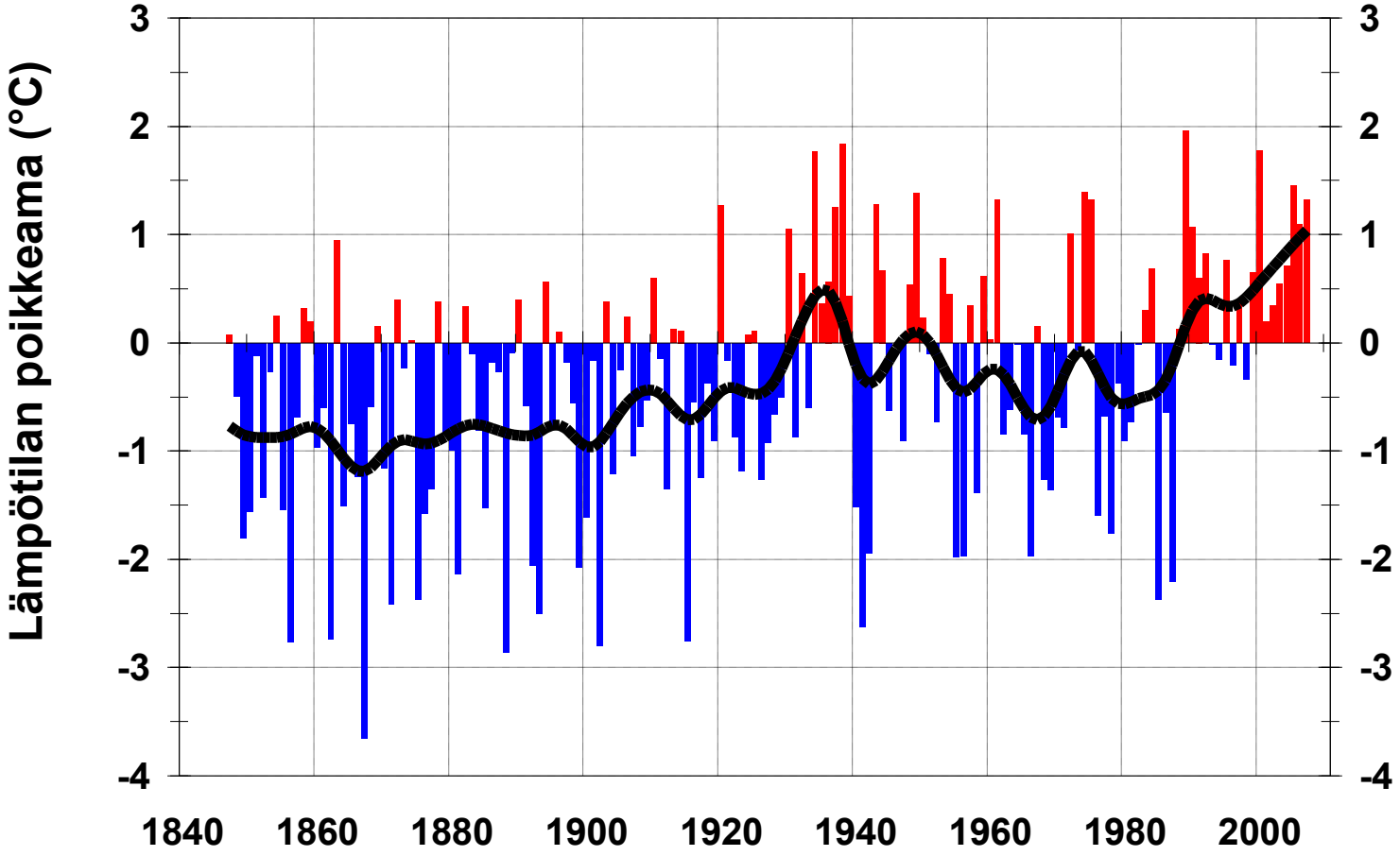
Vuosikeskilämpötila Suomessa 1847-2007
poikkeama jakson 1961-90 keskiarvosta



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Jouni Räisänen, Leena Ruokolainen (HY)

- joulukuu 2006 Helsingissä T_m = 4.0ºC
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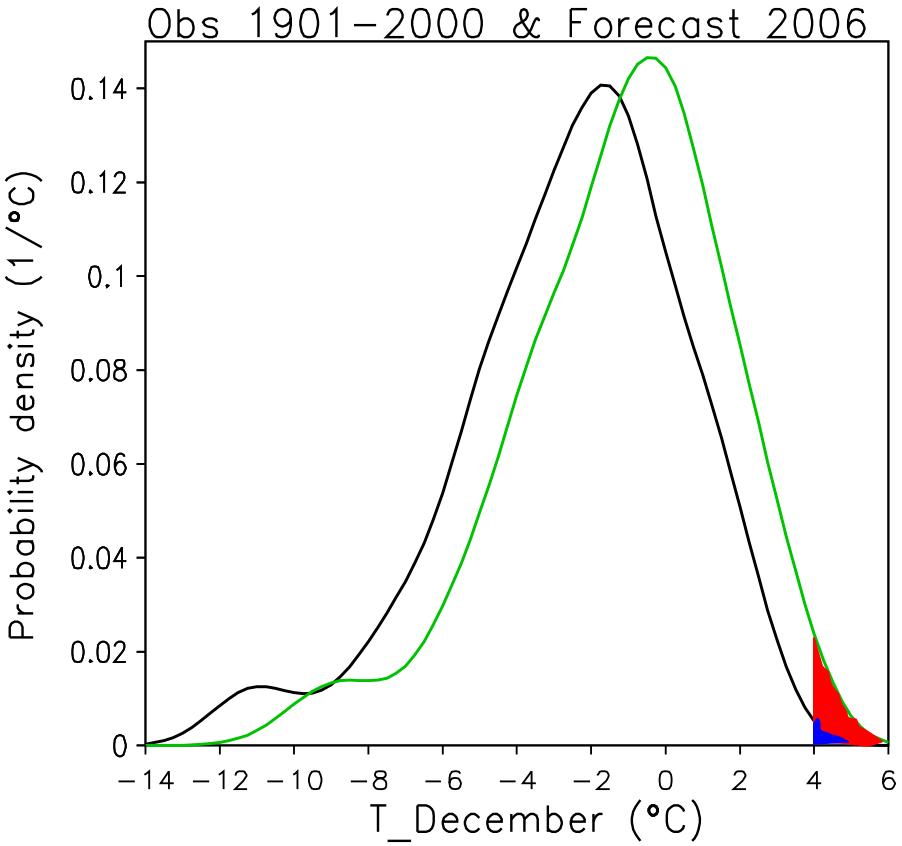
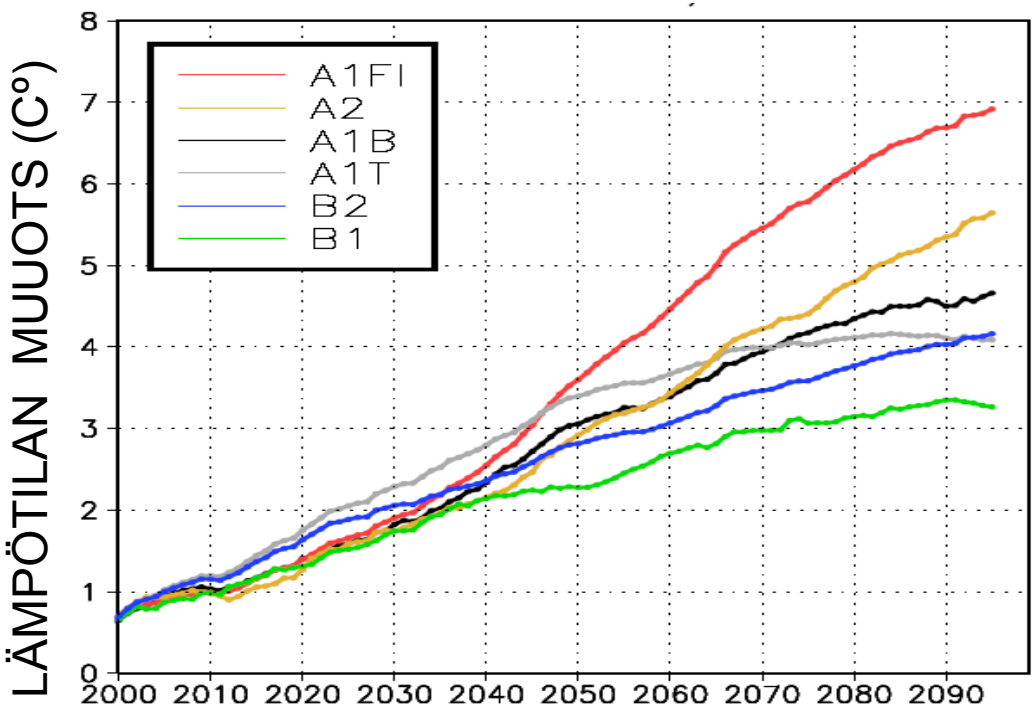


Pienikin keskimääräinen lämpeneminen muuttaa merkittävästi ääritilanteiden esiintymistodennäköisyyttä

v. 2007 T_{maalis} = 3.1ºC havainnnot ≈ 1/1000 -> muuttuva ilmasto ≈ 1/80

Suomi lämpenee lähivuosikymmeninä ~0.4±0.1°C/10 v.

Lämpötilan vuosikeskiarvo, koko Suomi



Vertailujaksona v.1971-2000

Muutos (ºC) 2070-2099

Skenaario	Lämpötilan nousu
A1FI	6.4 (3.8 – 9.0)
A2	5.1 (3.1 – 7.0)
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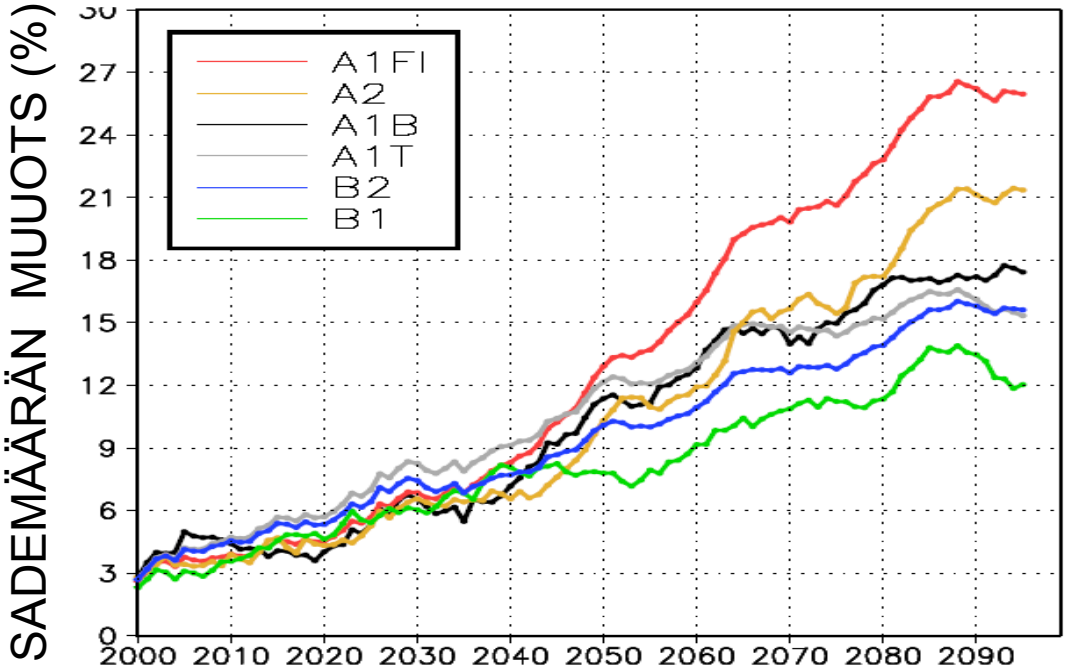
EPÄVARMUUKSIEN SUURUUS:	Lähi-tulevaisuus	Vuosisadan loppu
Luonnollinen vaihtelu	+	+
Mallit	(+)	++
Päästöskenaariot		++

Noin 20 mallin antama paras arvio (suluissa 90%:n haarukka)

Vuotuisen sademäärän muutokset (%) Suomessa eri päästöskenaarioissa



Muutos (%) 2070-2099	
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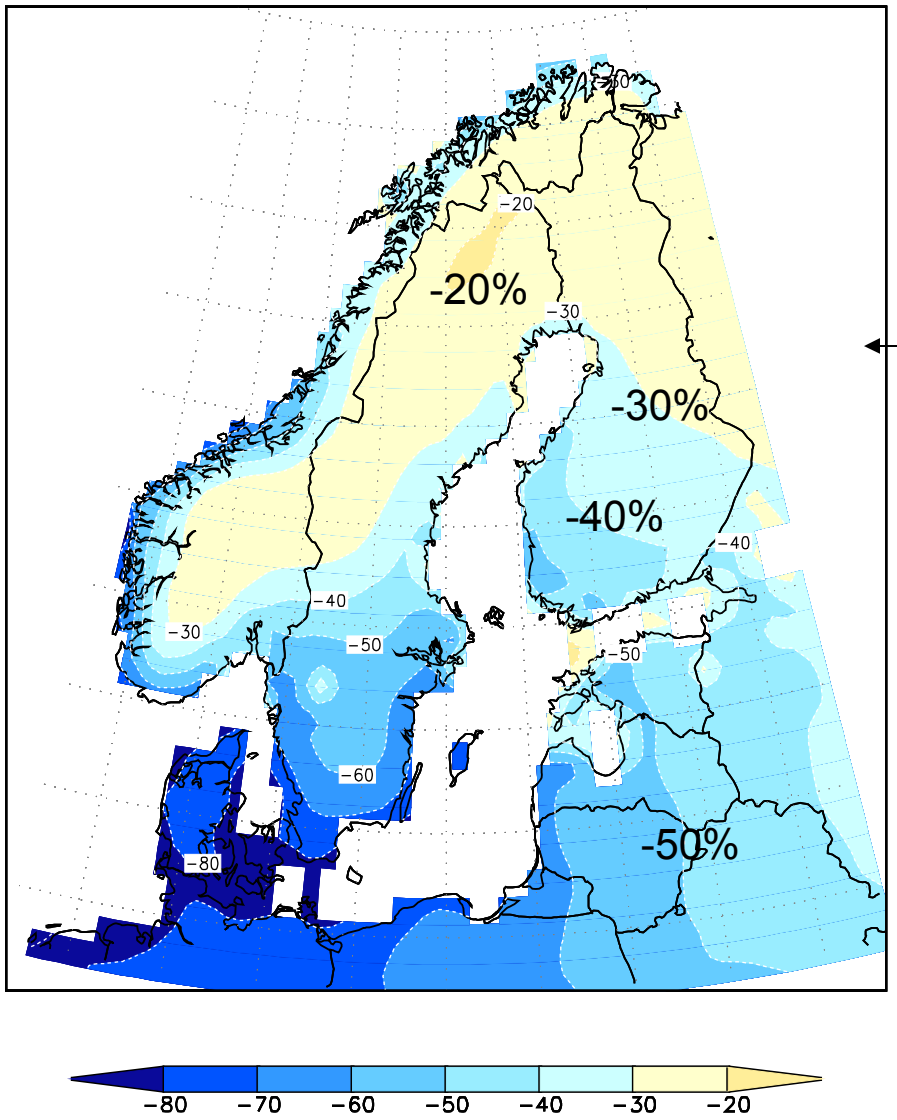


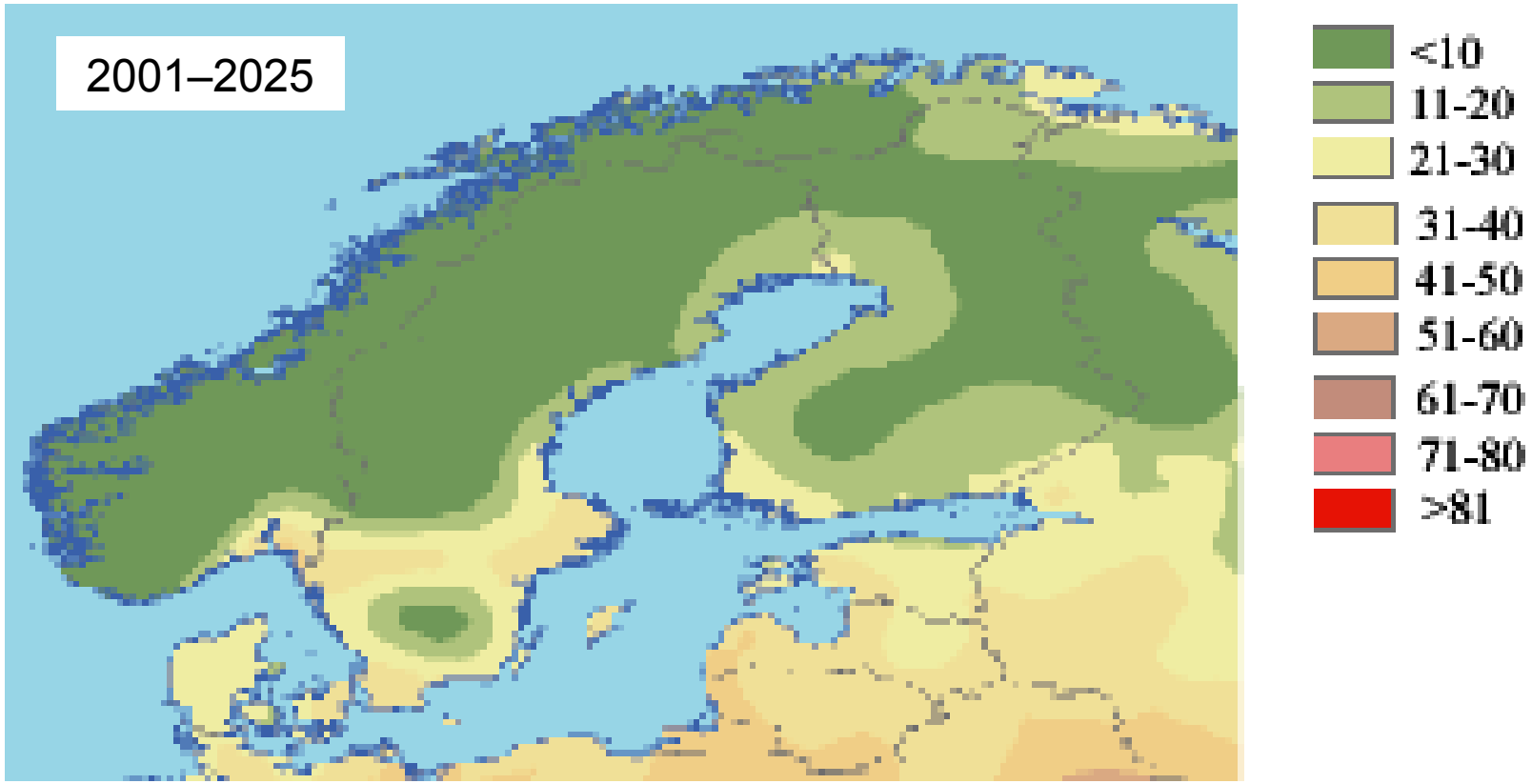
Usean alueellisen ilmastomalliajon keskiarvo

Lämpötilan kohotessa lumipeitepäivät harvenevat

Lumipeitepäivien keskimääräisen vuotuisen lukumäärän muutos (%)
1961-90 =>2071-2100
”emme tee mitään” -skenaariossa

Lumen suhteellinen väheneminen (%) voimakkainta talven alussa ja lopussa

The annual number of days with a forest fire risk (FFI ≥ 4) – preliminary results



Based on the RCA3-E-A2 simulation

Source: Andrea Vajda

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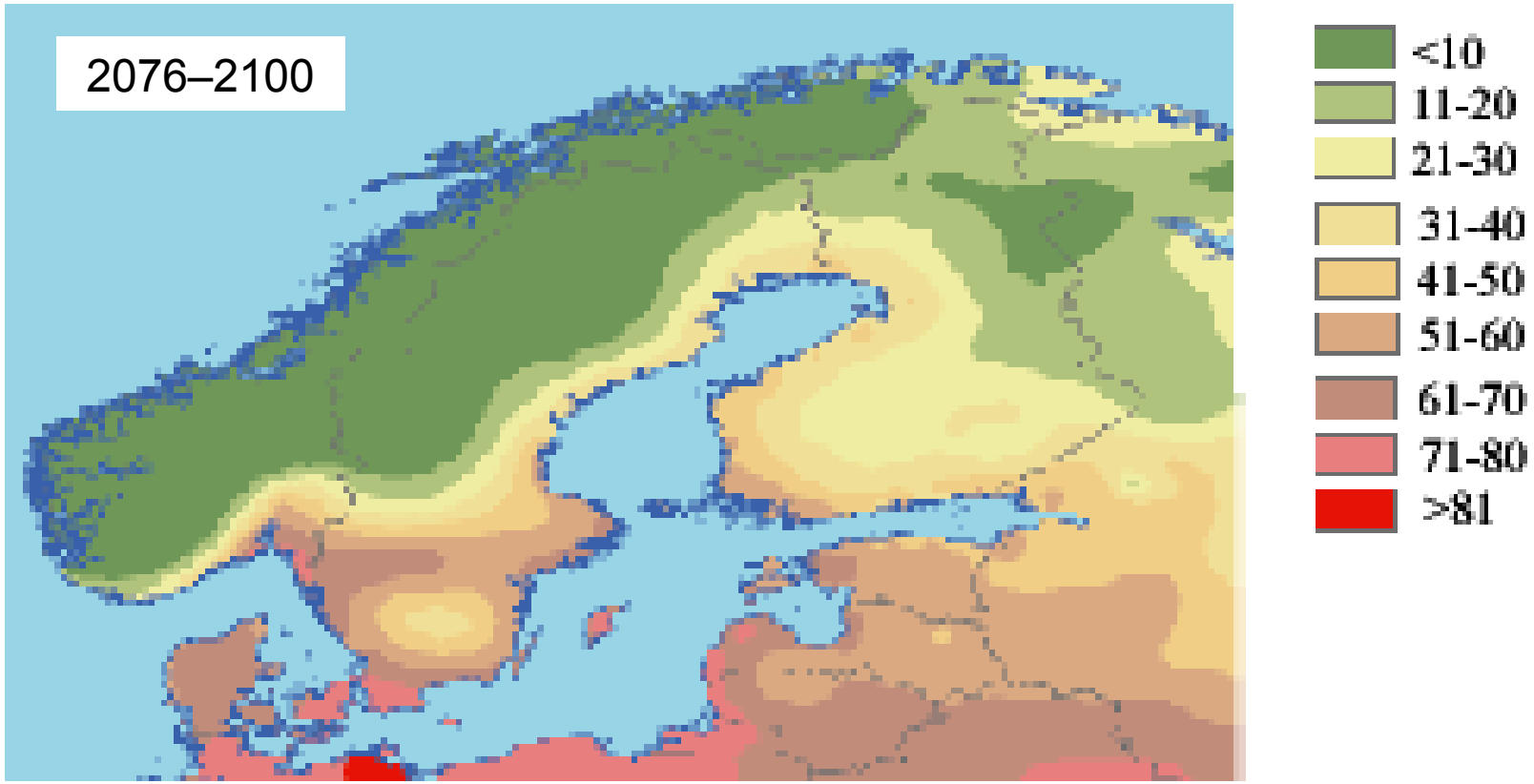

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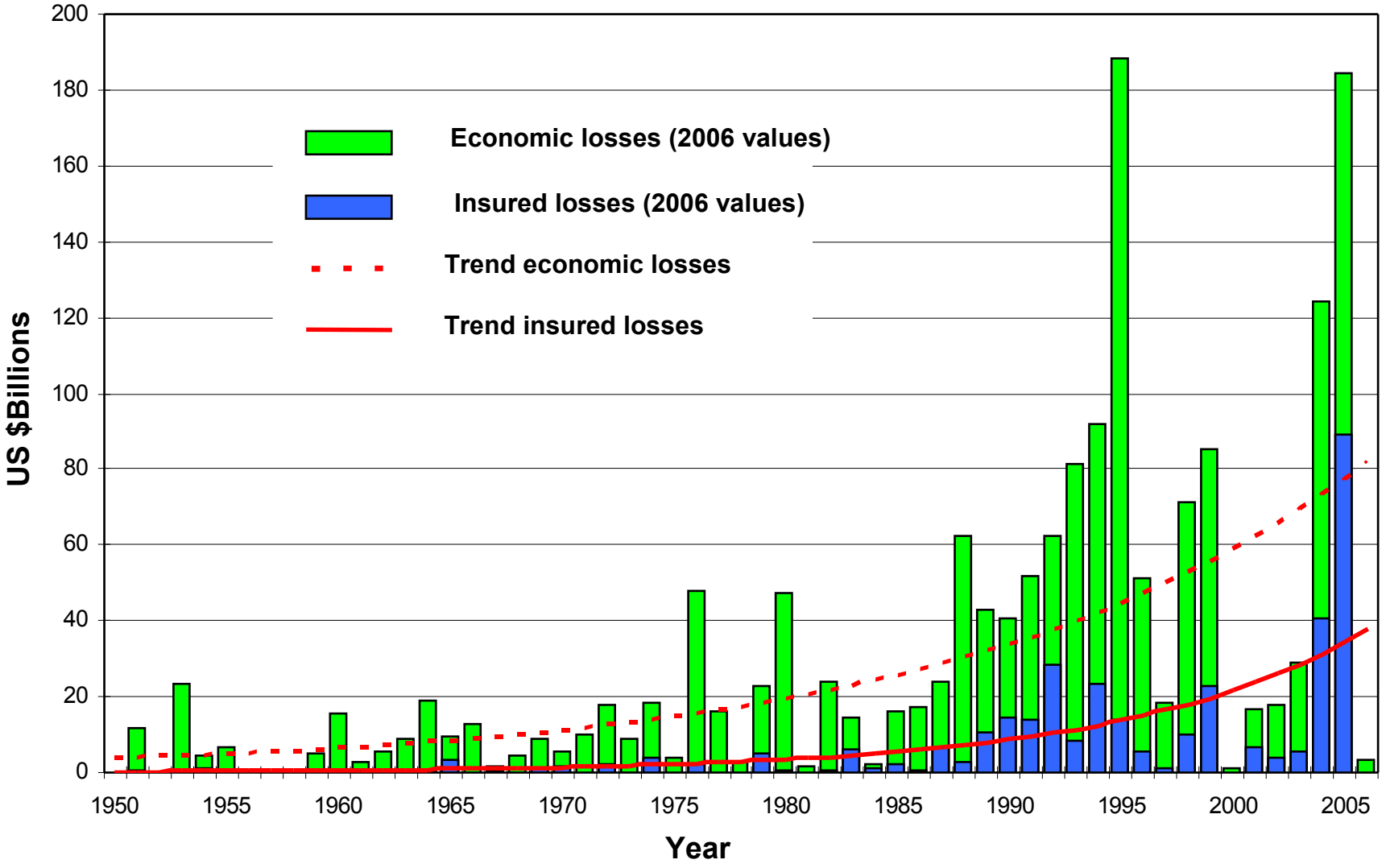
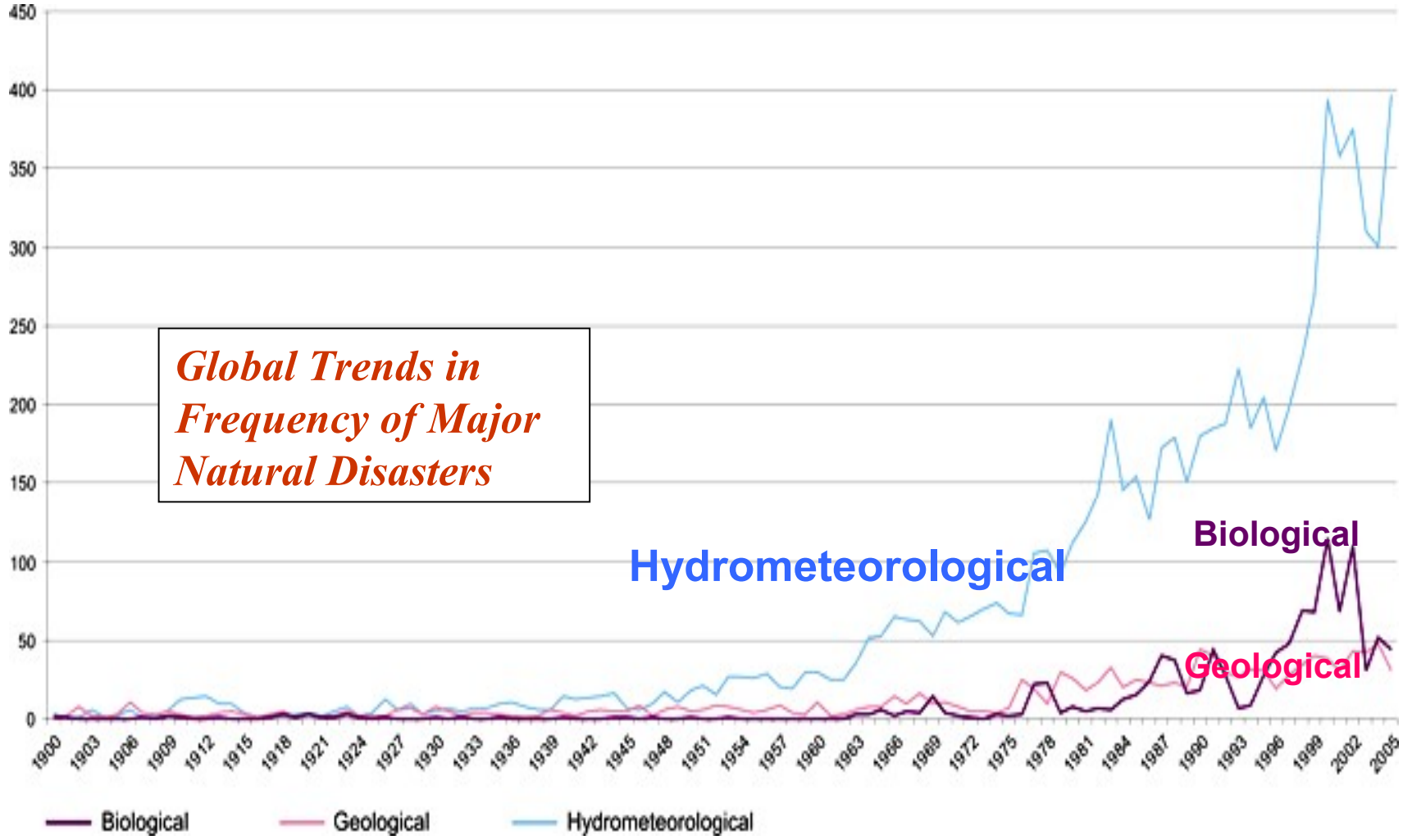
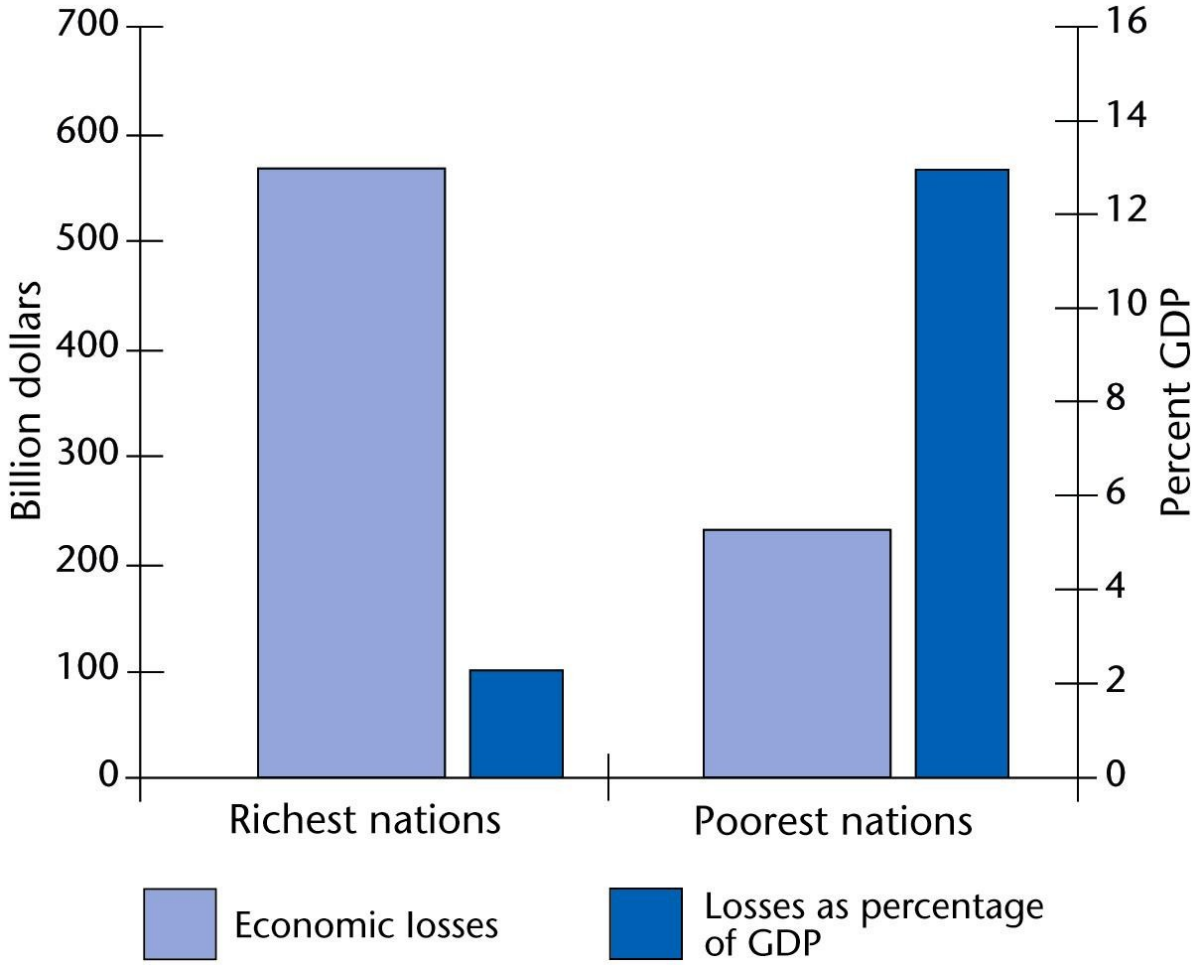
SUURET LUONNONKATASTROFIT 1950 – 2006
Taloudelliset ja vakuutetut tappiot



LUONNONKATASTROFIT 1900 – 2005



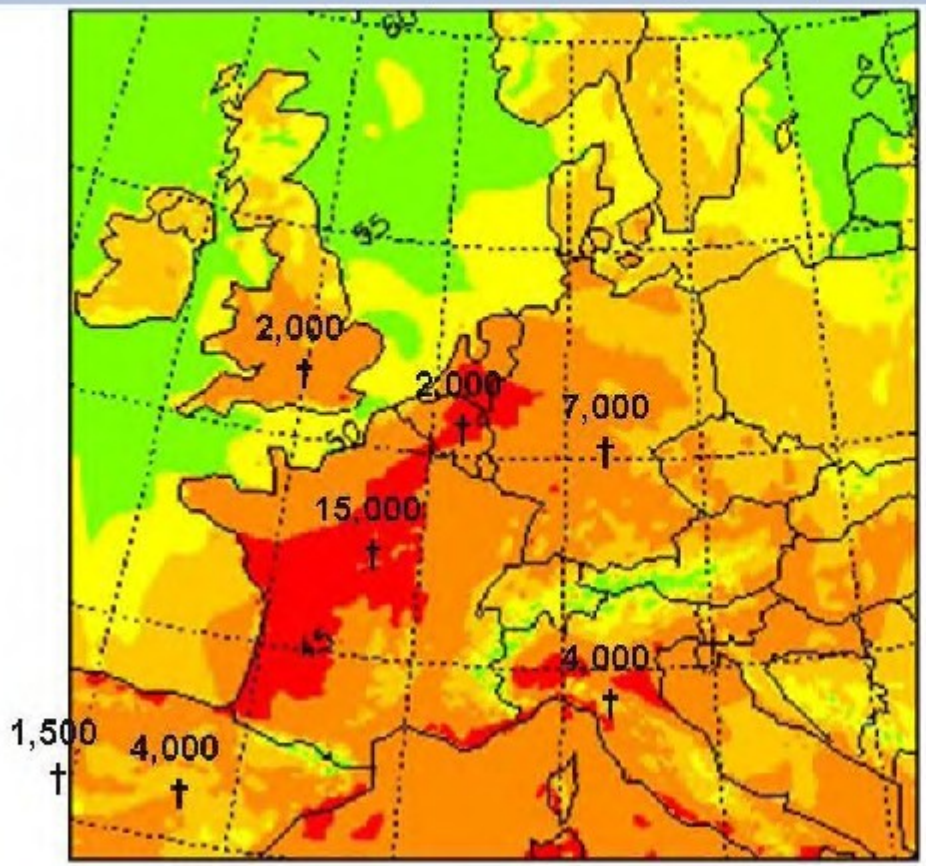
IMPACT OF NATURAL DISASTERS ON RICH AND I



KESÄ 2003 2,3 C NORMAALIA LÄMPIMÄMPI KESKI-EUROOPASSA: 35 000 KUOLLUTTA, 10 Mrd € TAPPIO

Sommer 2003, die größte humanitäre Naturkatastrophe in Europa seit hunderten von Jahren, ca. 35.000 Hitzetote

Hitzetote und Gefühlte Temperatur am 8. August 2003, 13 UTC



Mortalitätsdaten: Earth Policy Institute
Ref. Temp.: Deutscher Wetterdienst

Hitzebelastung

°C
38 extrem
32 hoch
28 mäßig
20 leicht
0 behaglich
−13 leicht
−26 mäßig
−39 hoch
extrem

Kältestress

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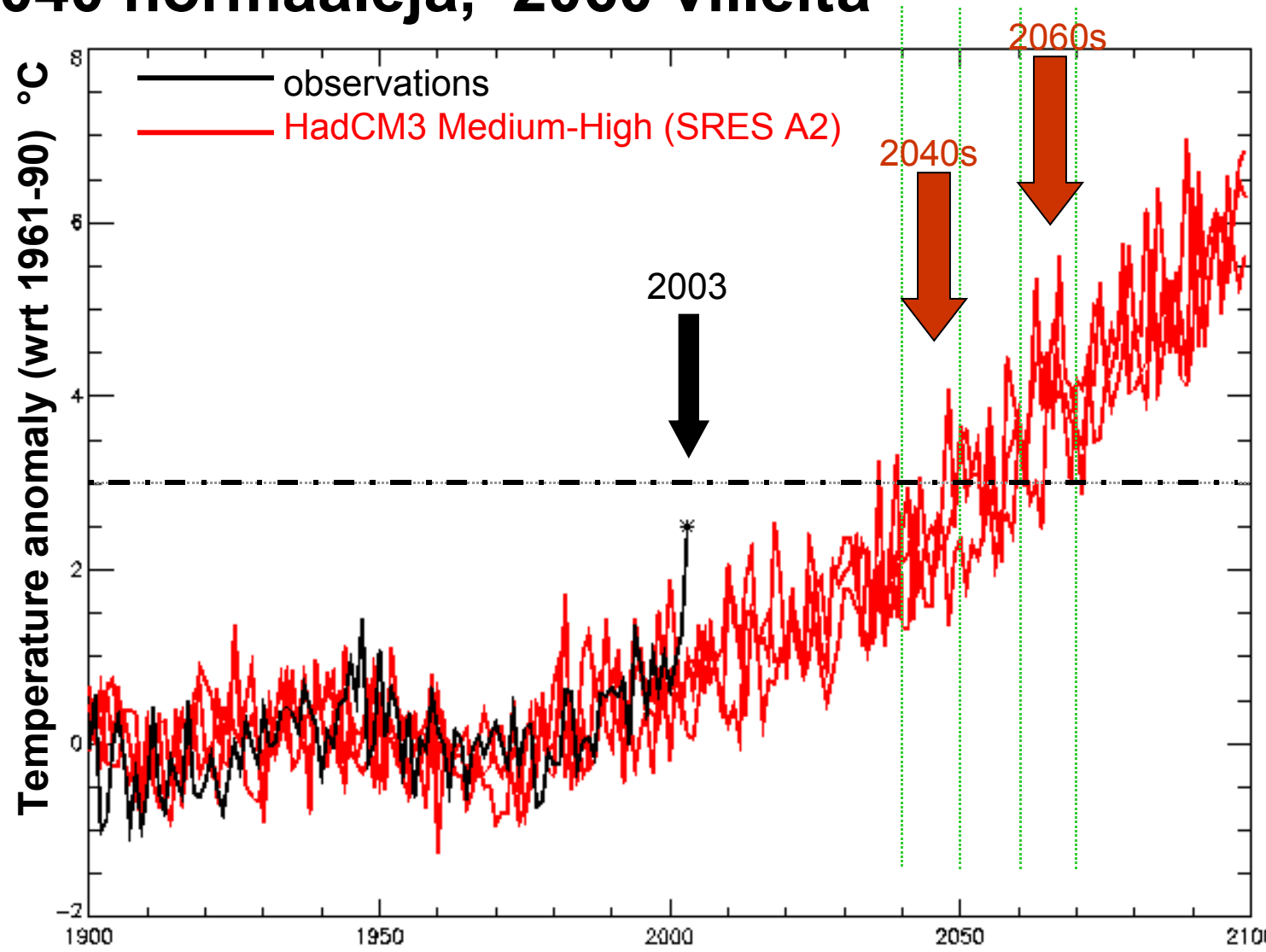
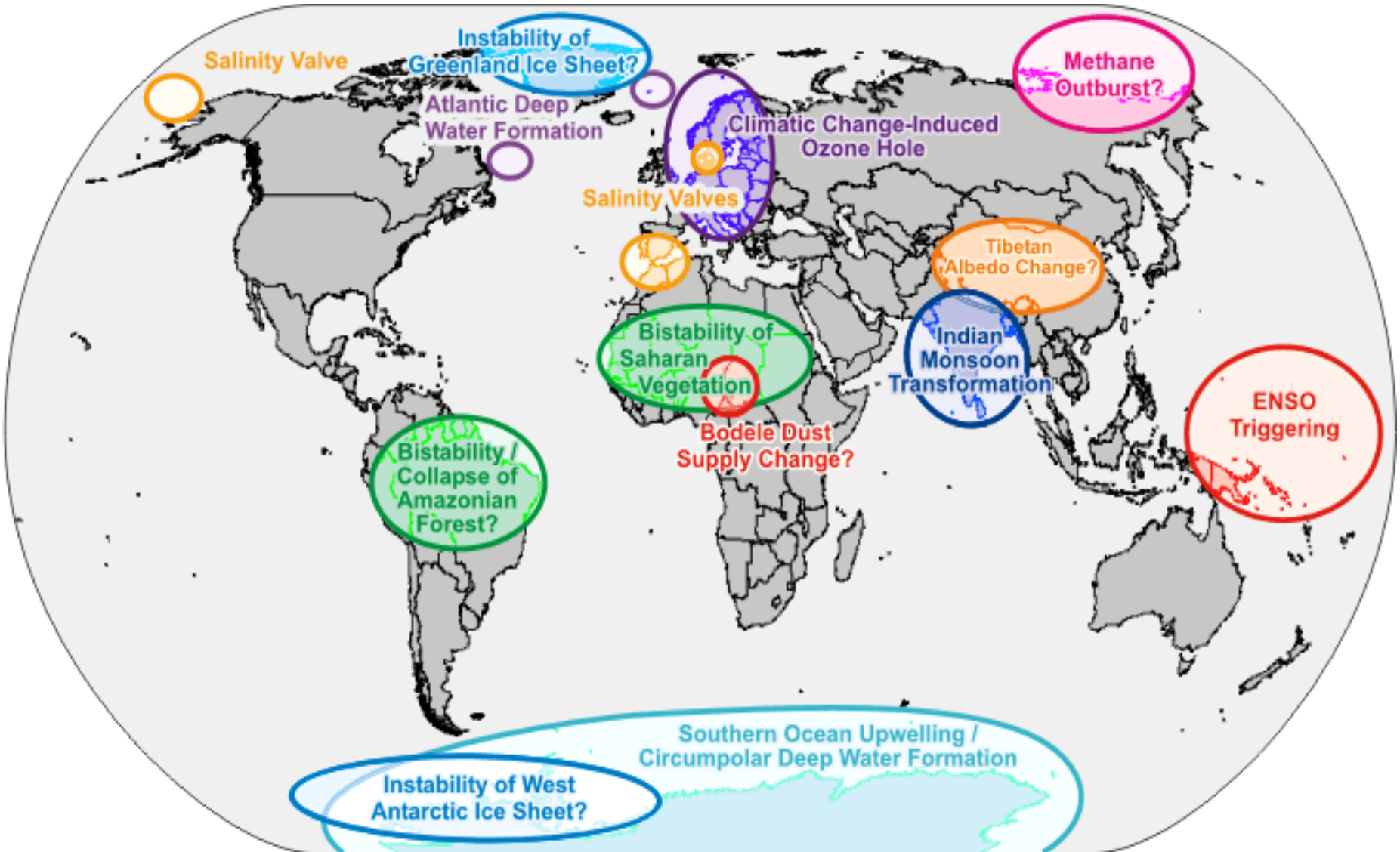
Euroopan 2003 kesälämpötilat: 2040 normaaleja, 2060 viileitä



YLLÄTYKSET OVAT MYÖS MAHDOLLISIA



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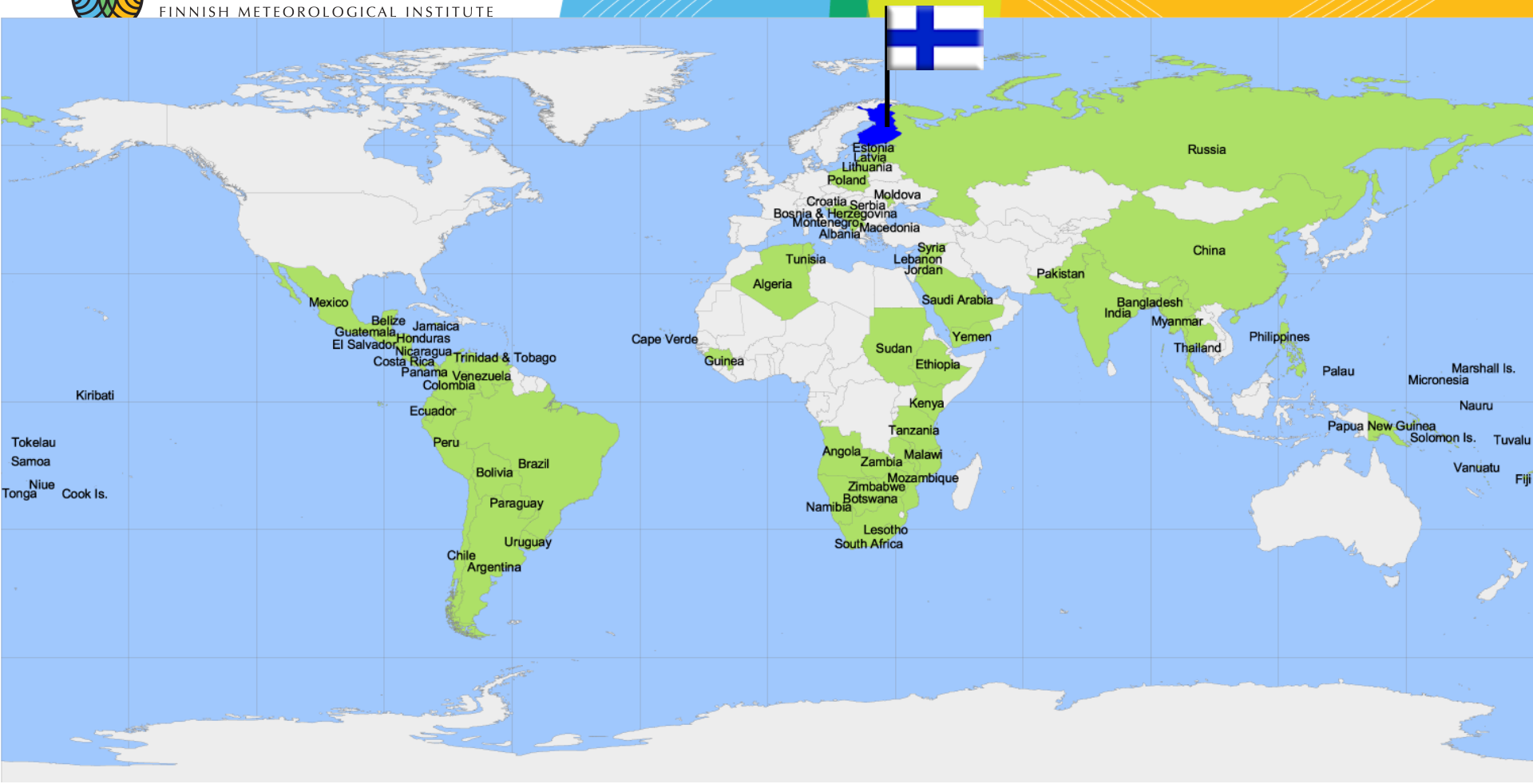
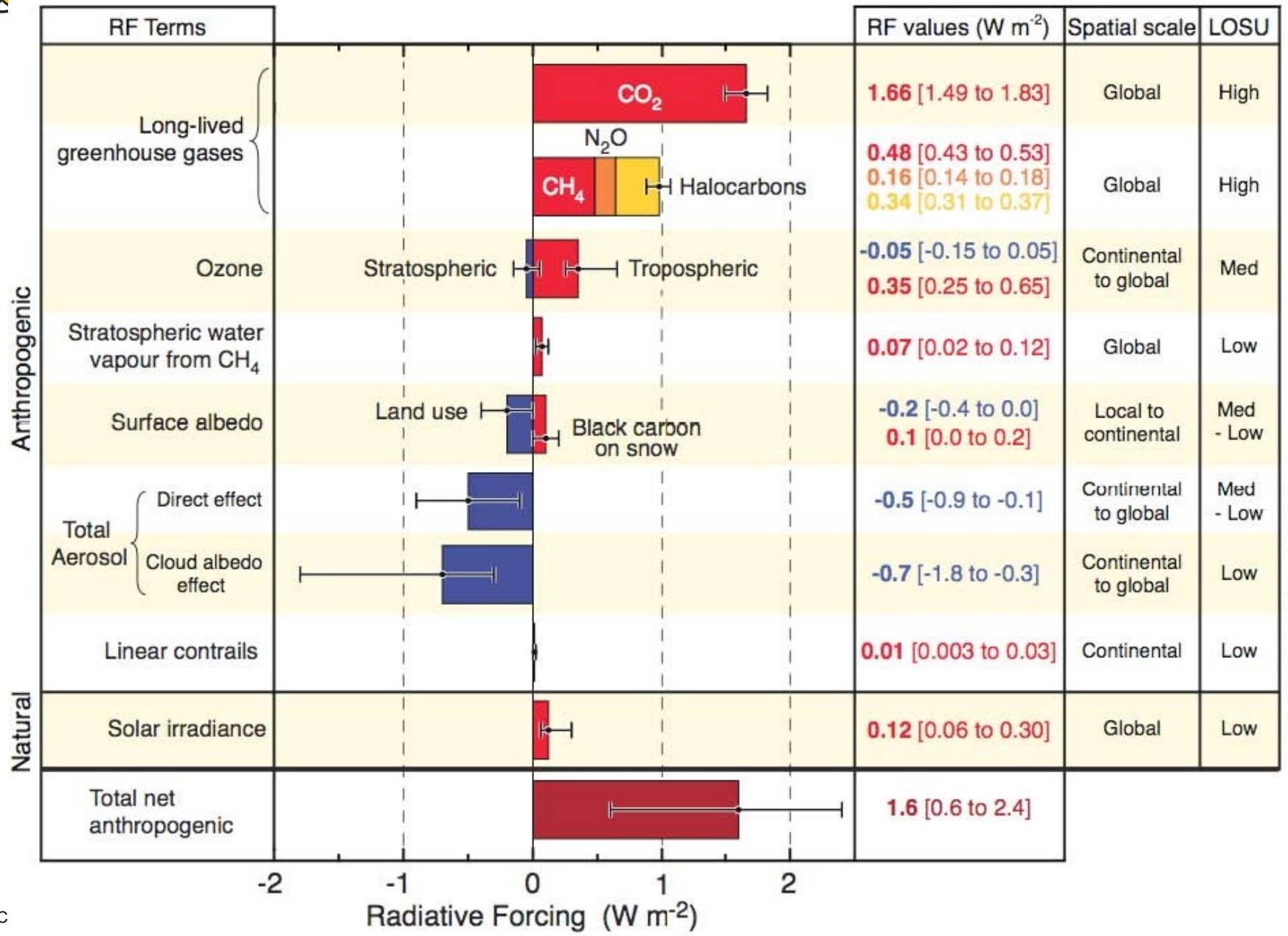


FMI has participated in consultation and development co-operation projects since 1980s in close to 80 countries.

Partners: Finnish Government, Local Governments, Regional Organizations, WMO, EU, UN-ISDR, UNEP, WB, NMHSs, private sector,…..

Radiative Forcing Components



DC

CLIMATE MODEL EVOLUTION

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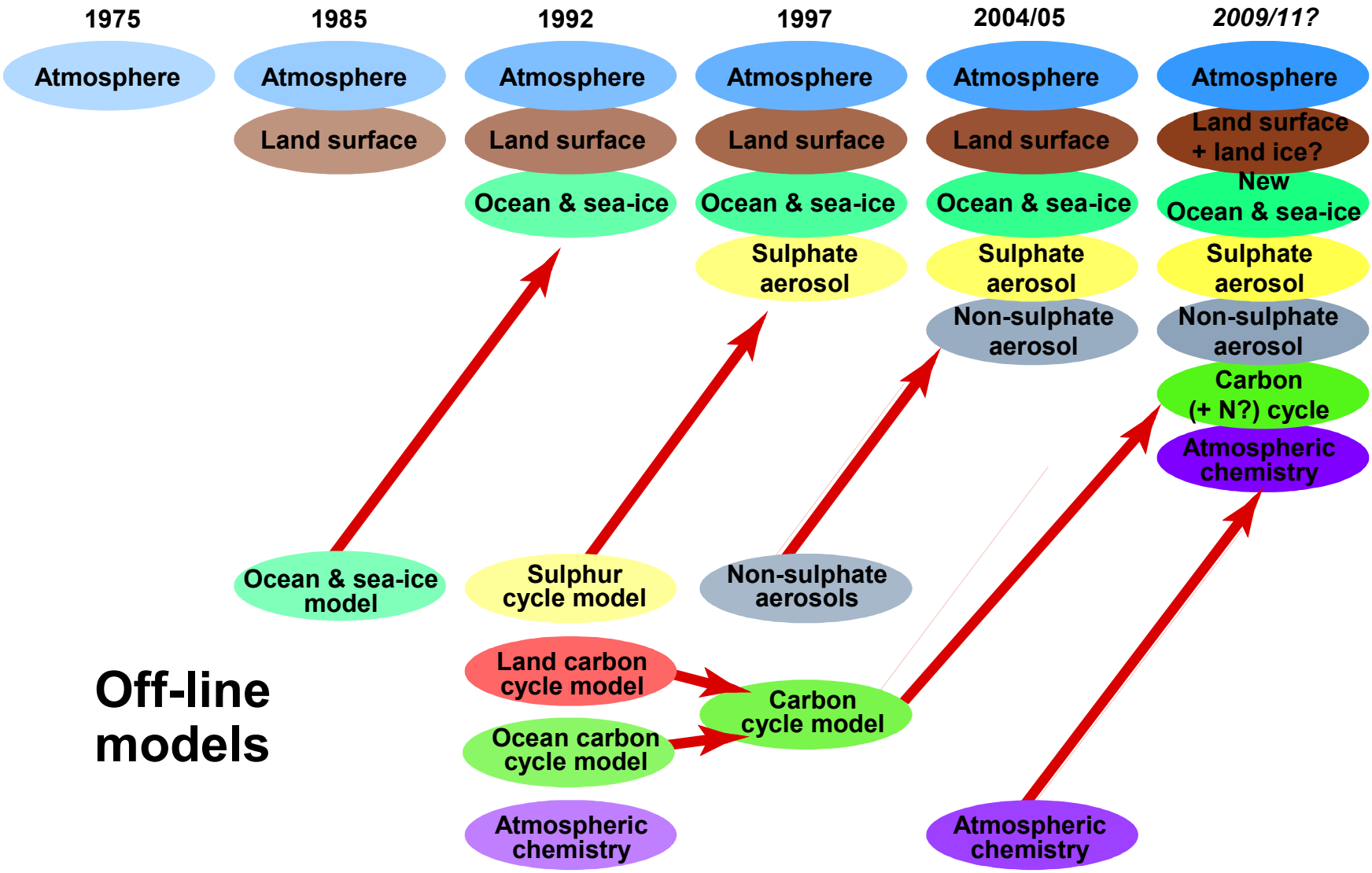
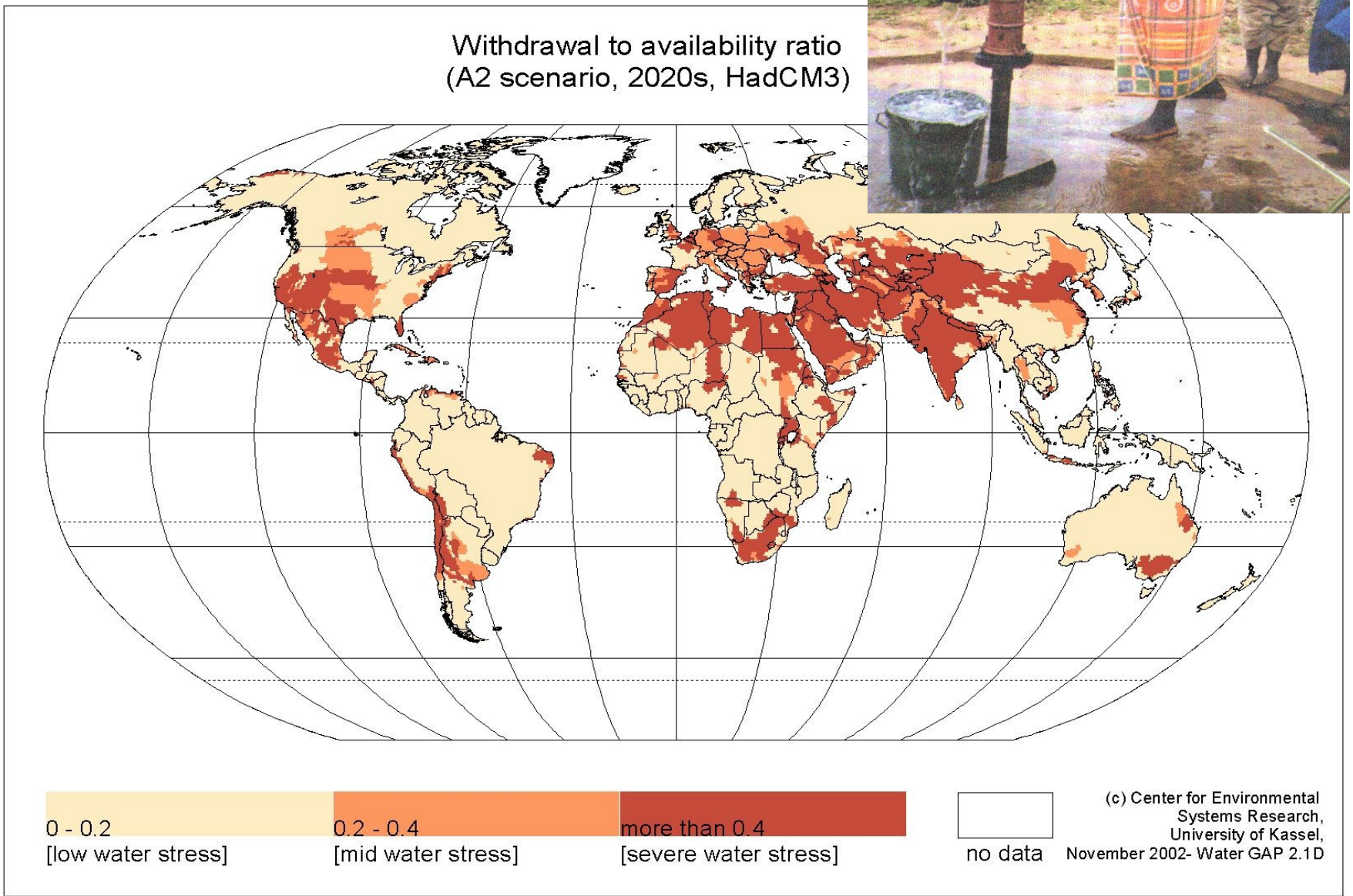


WATER STRESS BY 2020



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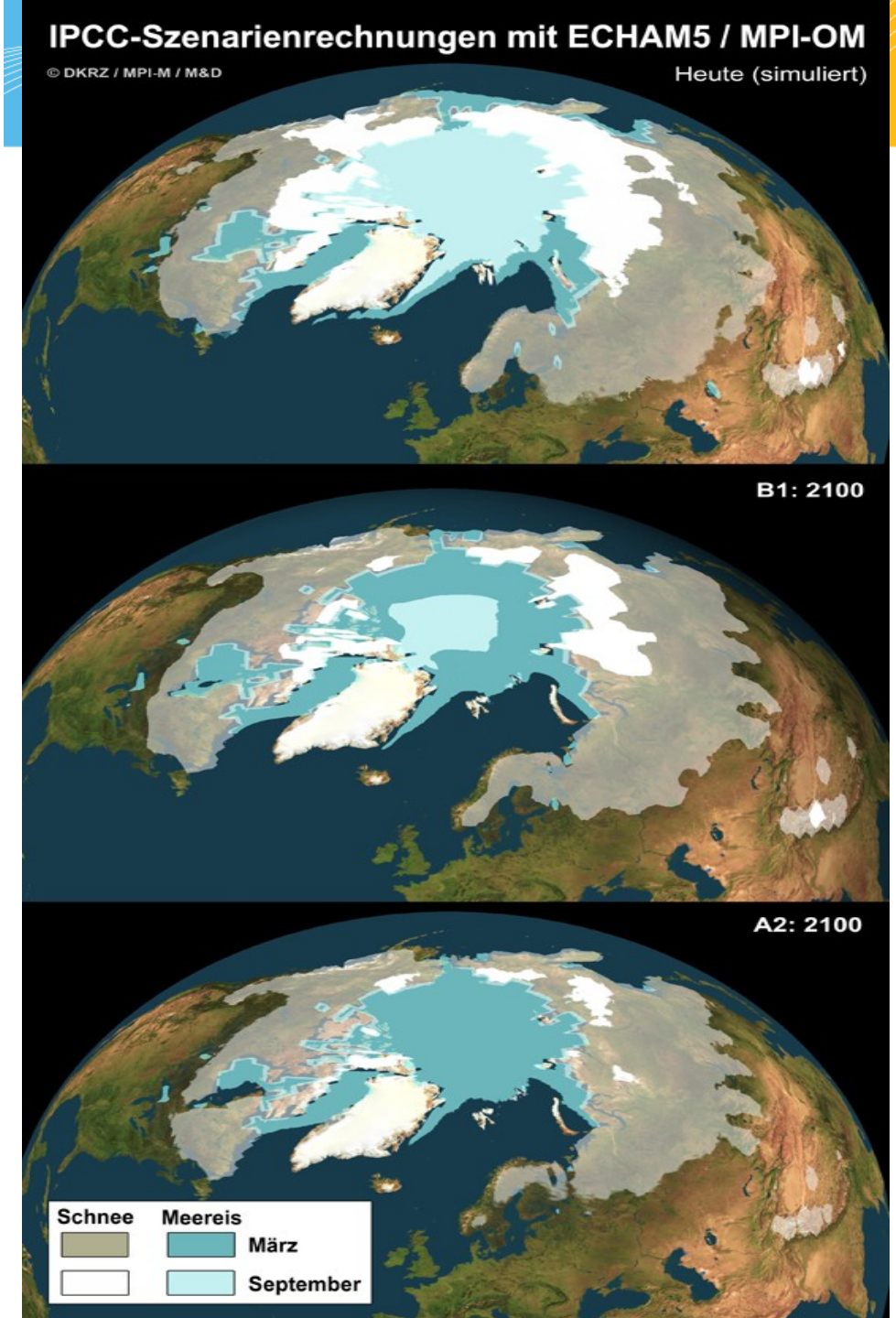
SHRINKING OF ARCTIC ICE/SNOWCOVER

- *PRESENT*
- *2100, EU TARGET*
- *2100, CURRENT EMISSIONS CONTINUE*



AIR POLLUTION SHORTENS THE LIFETIME OF HUMAN BEINGS

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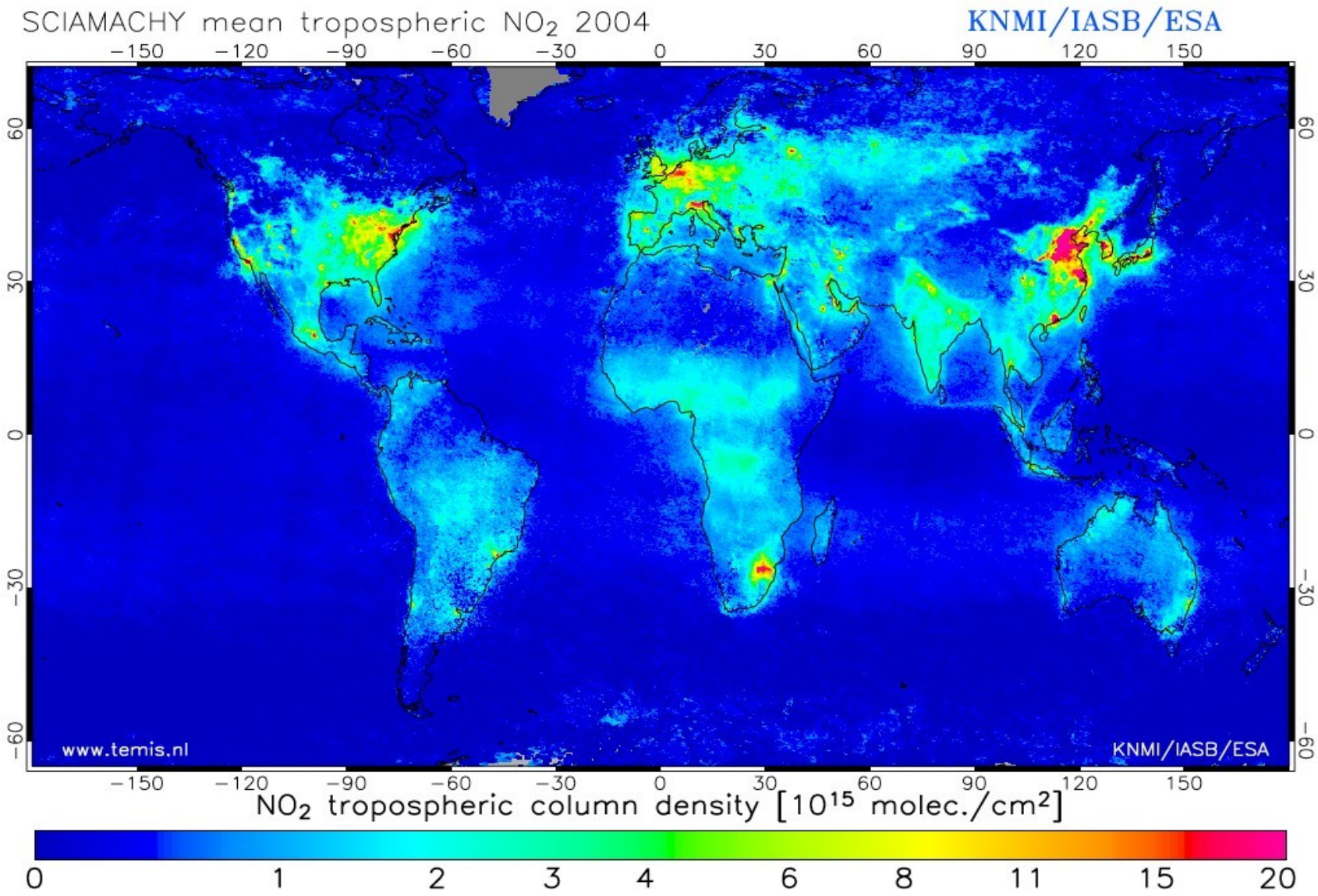

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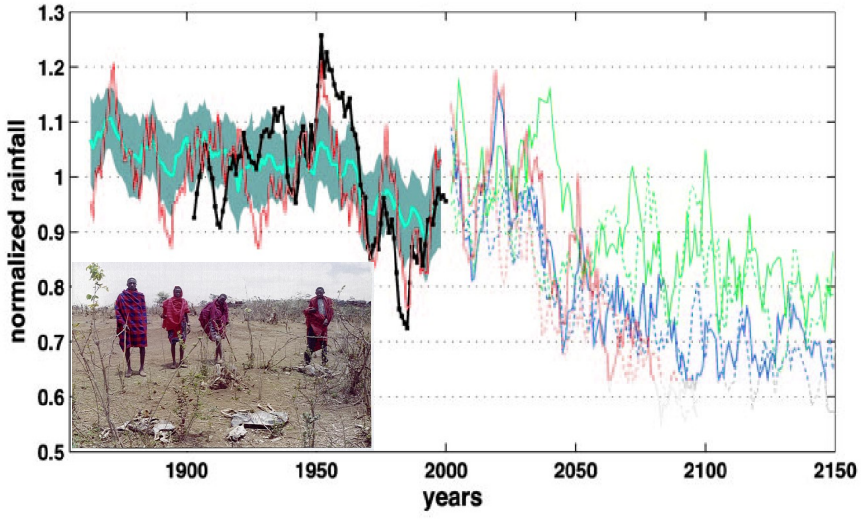

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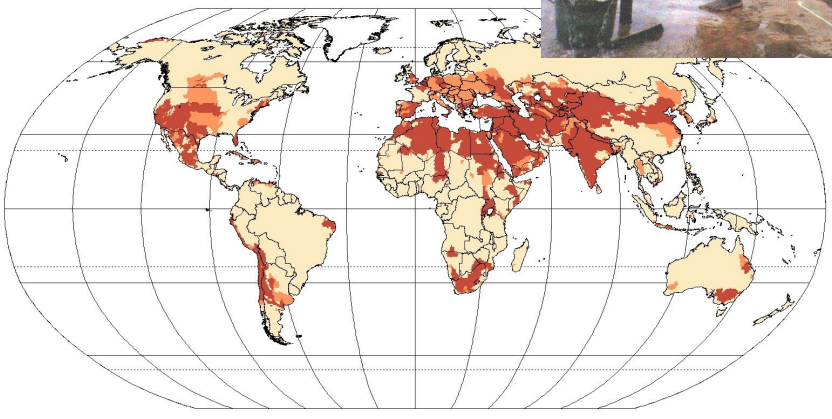

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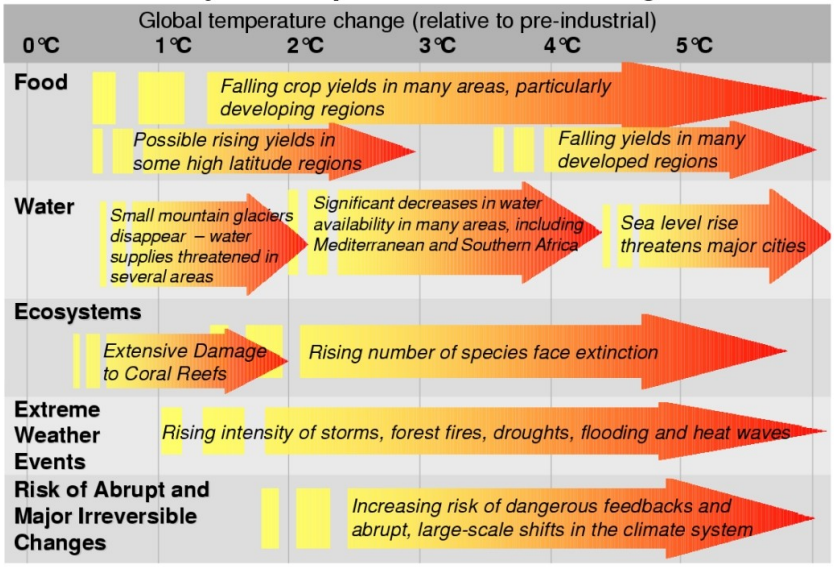

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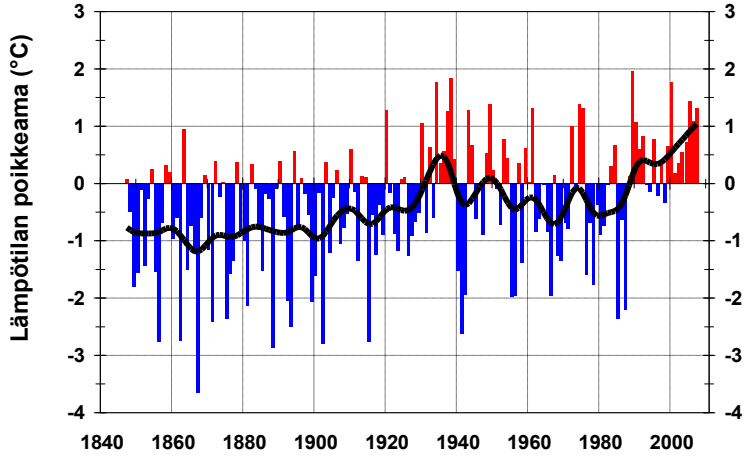

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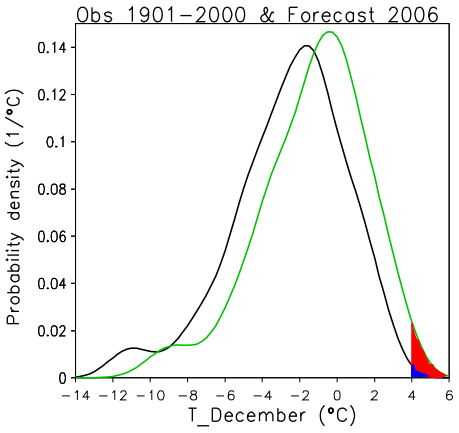

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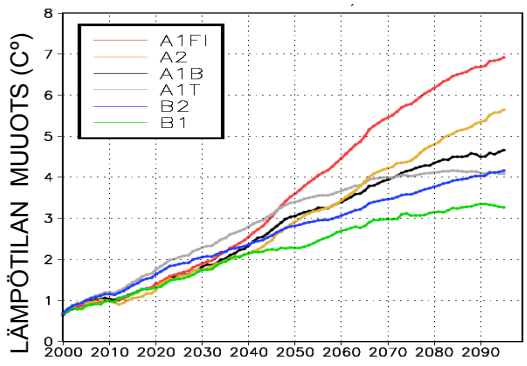

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Mallit	(+)	++
Päästöskenaariot		++

DDR

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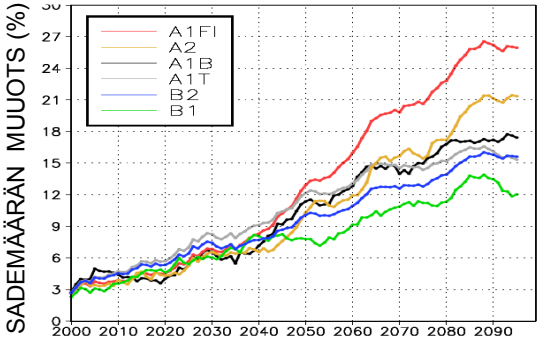
Vuotuisen sademäärän muutokset (%) Suomessa eri päästöskenaarioissa



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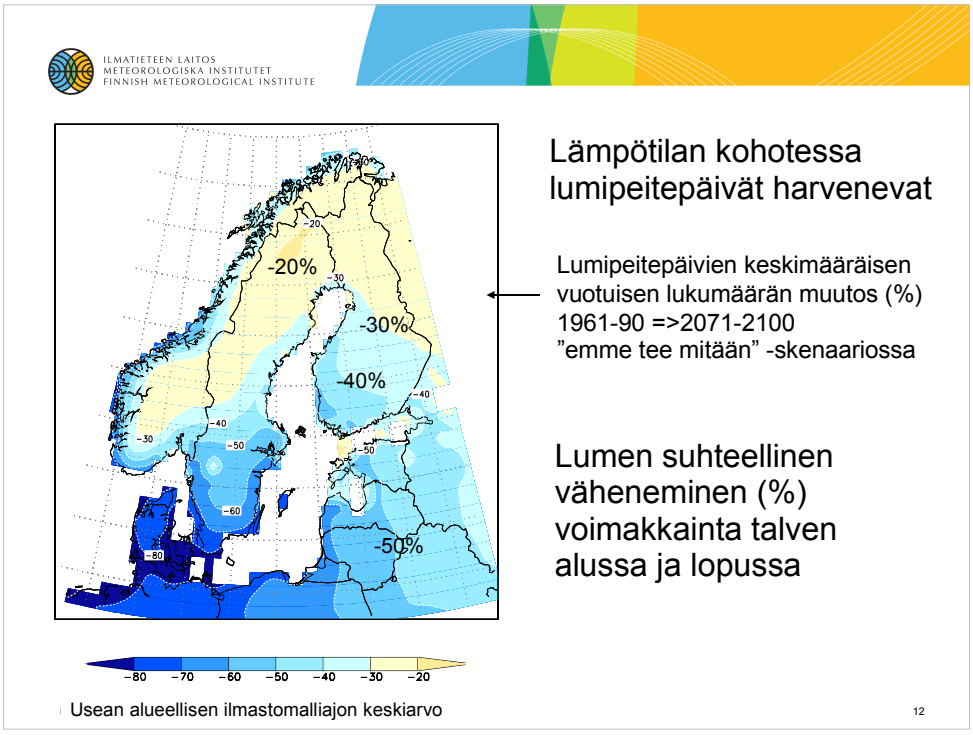

Lämpötilan kohotessa lumipeitepäivät harvenevat

Lumipeitepäivien keskimääräisen vuotuisen lukumäärän muutos (%) 1961-90 =>2071-2100 ”emme tee mitään” -skenaariossa

Lumen suhteellinen väheneminen (%) voimakkainta talven alussa ja lopussa

Pakkasten harvetessa vähenevät myös sellaiset päivät, jolloin maassa on **lumipeite**. Tässä kuvassa näette malliarvion lumipeitepäivien määrän suhteellisesta muutoksesta näiden kahden ajanjakson välillä. Suomessa lumipeitepäivät hupenevat etenkin Lounais-Suomessa, pohjoisempana muutokset ovat pienempiä, suunnilleen 30%. Eniten lumisuus vähenee alku- ja lopputalvesta.

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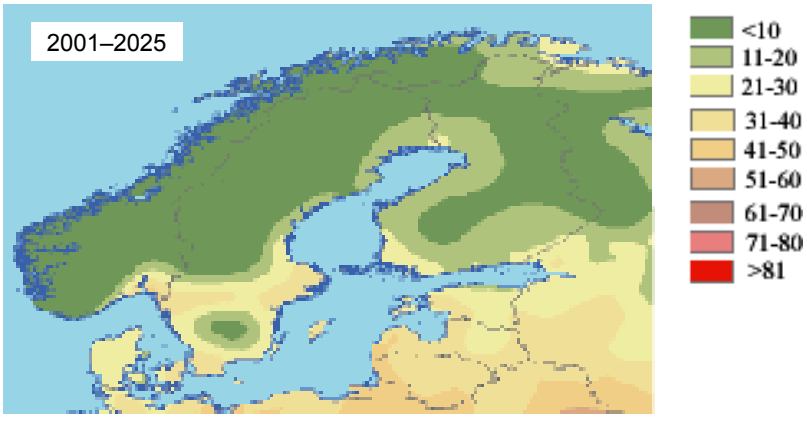
The annual number of days with a forest fire risk (FFI ≥ 4) – preliminary results



Based on the RCA3-E-A2 simulation

Source: Andrea Vajda

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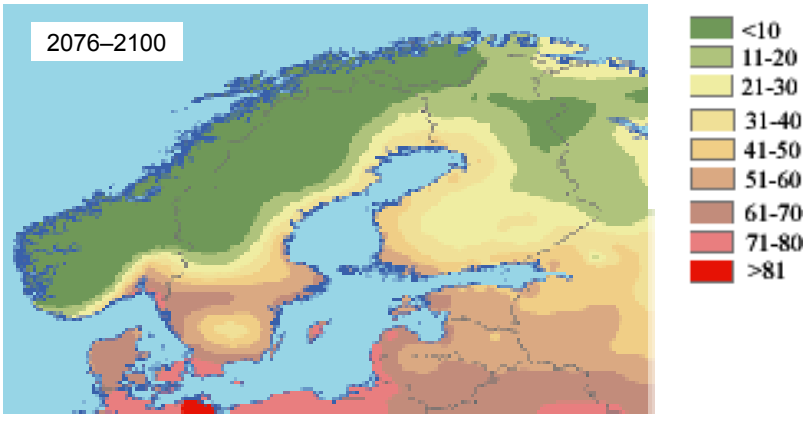
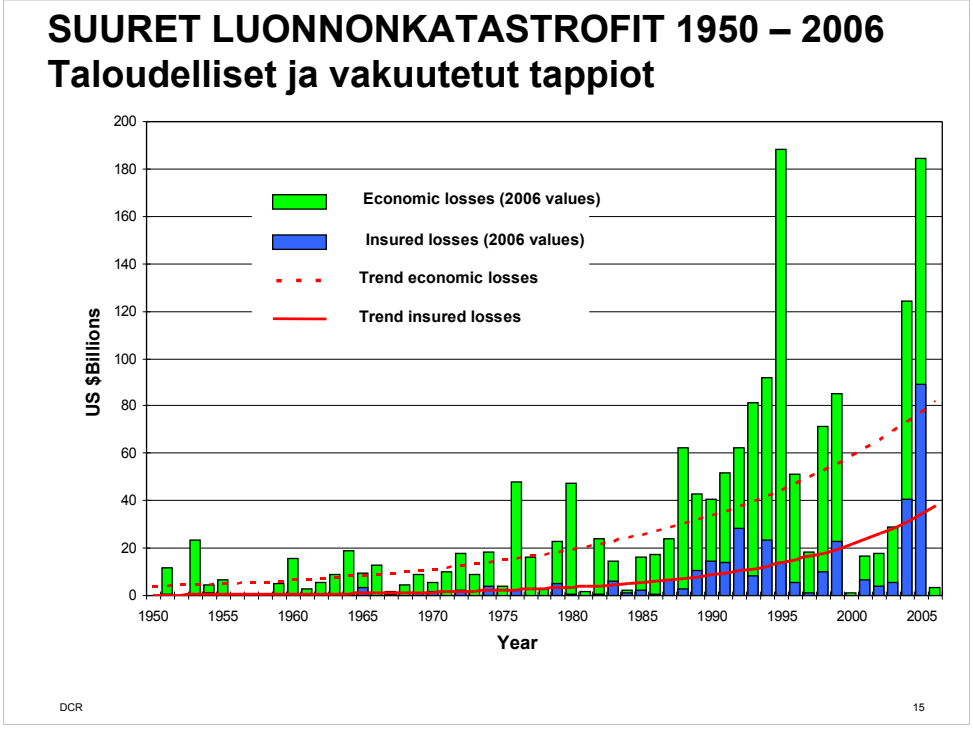
The annual number of days with a forest fire risk (FFI ≥ 4) – preliminary results



Based on the RCA3-E-A2 simulation

DCR

Source: Andrea Vajda

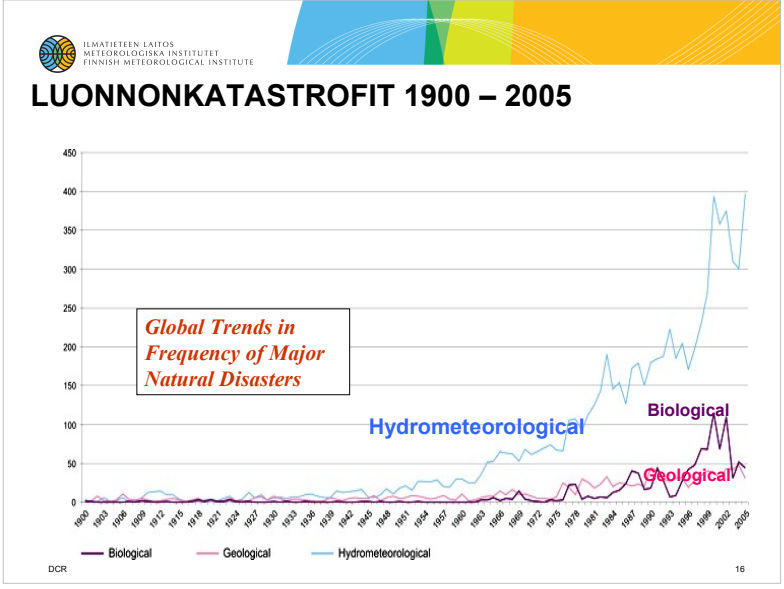


•Evidence from around the world indicates that the costs of weather related disasters are increasing over time almost everywhere in the world.

•Globally, since the decades of the 1950s, the annual direct losses from natural catastrophes in the 1990s increased 14 times, rising from US$3.9 billion to US$40 billion a year using 1999 dollars, while population grew only by 2.4-fold.

•In reality, these losses are larger by a factor of two, when losses from less severe weather-related events are included.

•While it is normal to expect large year-to-year variations in the number and intensity of natural hazards, it is not normal for the costs of natural hazards to continue rising over time. When a natural hazard becomes a disaster, the result is as much as function of the way that the community does business or adapts to the hazard as it is of the natural hazard itself. The fact that both insured and uninsured losses have been rising rapidly in constant monetary terms reflects a failure of communities and society to adapt well enough to current climate variability and extremes. This increasing failure to adapt adequately largely accounts for what can be termed the “adaptation deficit”.

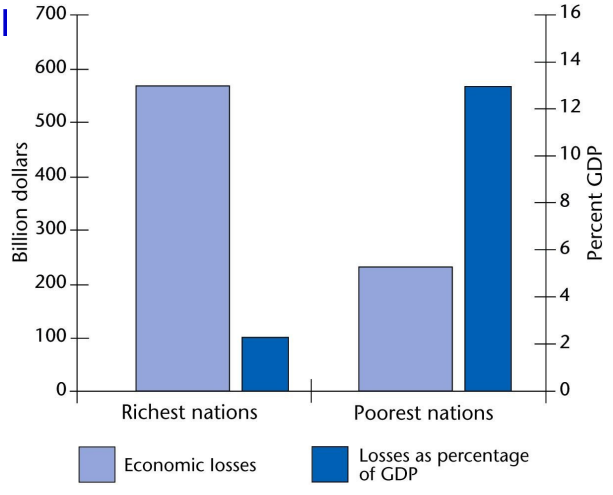


•The International Federation of Red Cross and Red Crescent Societies, for instance, keeps records of the type and number of reported disasters, the numbers of people reported killed and affected by disasters, and damage estimates by country. Their data reveal clearly that, in recent times, 90 per cent of natural disasters are weather- and climate-related. In the decade 1993-2002, drought/famine accounted for 82 percent of all those affected in Africa, 48 percent in Oceania and 35 percent in the Americas, whereas floods accounted for 69 percent of those affected in Asia. Since the seventies the number of water-related natural disasters has tripled (from 1000 to over 3000 incidents per year), while the economic costs have risen 5 fold (from 131 to over 600 billion US dollar per year) and the number of people affected each year is also rising steeply.

•Similarly, the death toll from hydrometeorological disasters accounts for 71 percent of all deaths due to natural disasters. Over the last 30 years, the number of lives lost to natural disasters declined and levelled off at about 80,000 per year, while the number of people affected and estimated economic losses have been steadily increasing.

•Worldwide, for every person killed, around 3,000 people are exposed to natural hazards. During the 1990s, the number of casualties fell under 800,000 but the numbers of affected lives – by injury,

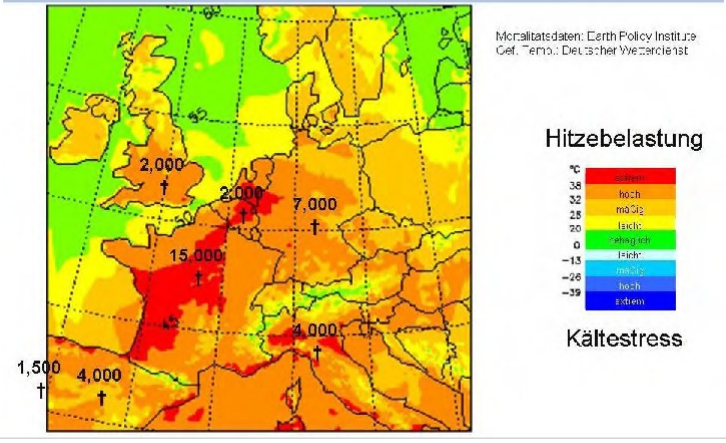
IMPACT OF NATURAL DISASTERS ON RICH AND I



KESÄ 2003 2,3 C NORMAALIA LÄMPIMÄMPI KESKI-EUROOPASSA: 35 000 KUOLLUTTA, 10 Mrd € TAPPIO

Sommer 2003, die größte humanitäre Naturkatastrophe in Europa seit hunderten von Jahren, ca. 35.000 Hitzetote

Hitzetote und Gefühlte Temperatur am 8. August 2003, 13 UTC



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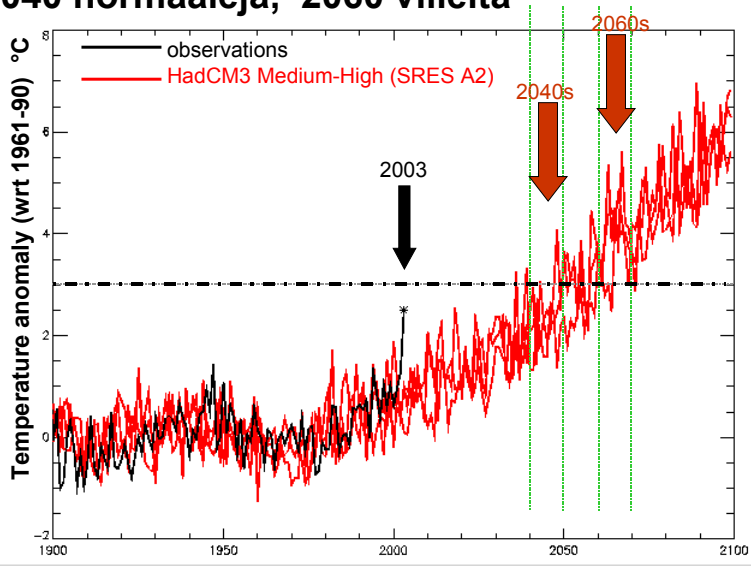
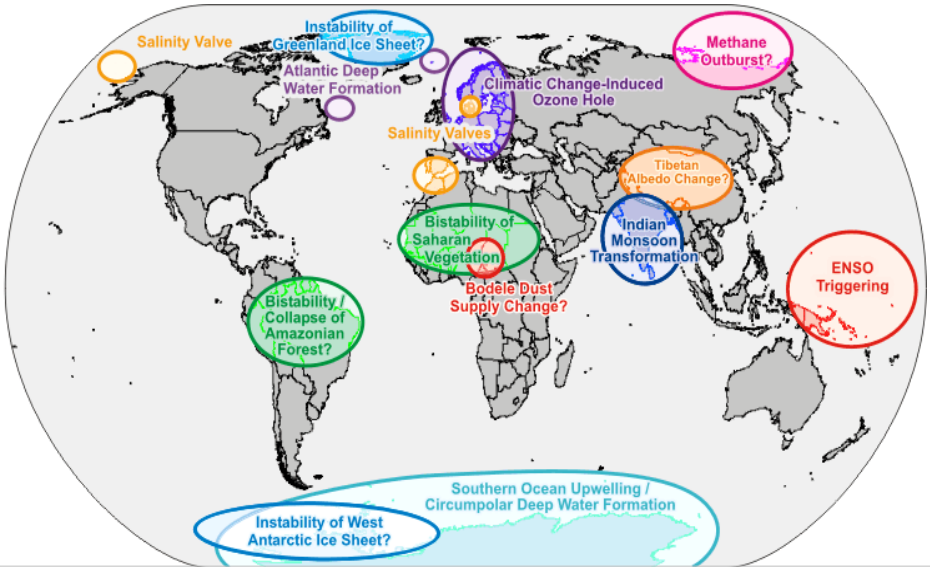
Euroopan 2003 kesälämpötilat: 2040 normaaleja, 2060 viileitä



YLLÄTYKSET OVAT MYÖS MAHDOLLISIA



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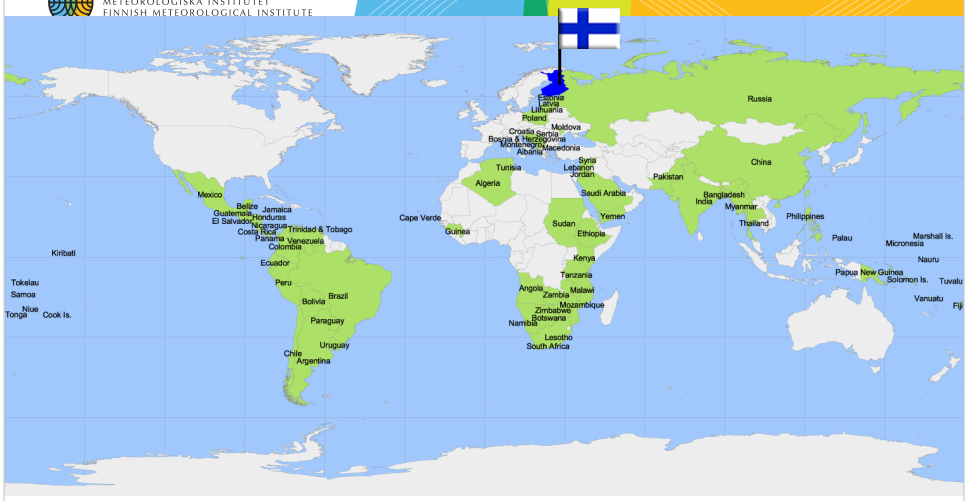
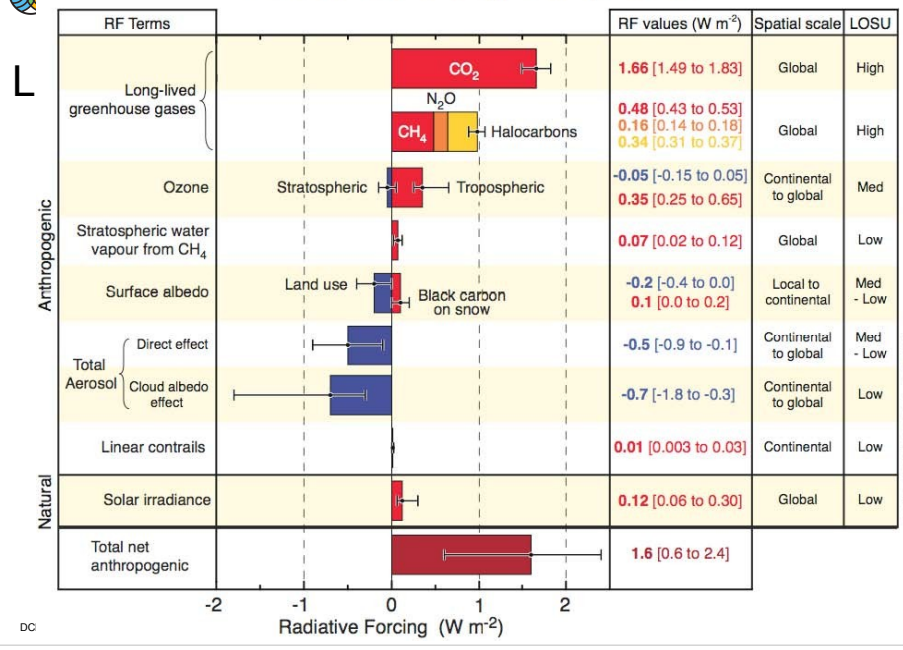
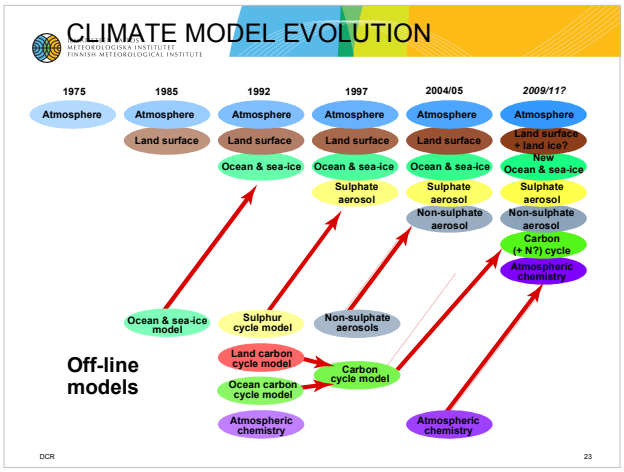


FMI has participated in consultation and development co-operation projects since 1980s in close to 80 countries.

Partners: Finnish Government, Local Governments, Regional Organizations, WMO, EU, UN-ISDR, UNEP, WB, NMHSs, private sector,…..

Radiative Forcing Components





The Hadley Centre climate model has developed over the last 25 years into what we now term an Earth Systems Model.

During that time, models of the main components, atmosphere, land, ocean and sea-ice, have been developed **separately** ("off-line") and **gradually integrated**.

This **coupling of the various components is a difficult process**.

Most recently a sulphur cycle model has been incorporated, to represent the emissions of sulphur and how they are oxidised to form aerosol particles. Other aerosol species are also modelled in HadGEM1. **Currently** in progess is the coupling of the **land carbon cycle** and the **ocean carbon cycle** but these are not yet on-line in HadGEM1. The **atmospheric chemistry component** is modelled outside the main climate model ("**offline**") at the moment. The intention is to couple this into the climate model in due course; however, the atmospheric chemistry model is a very complex with many different chemical species and reactions.

To couple it interactively **will require a lot more computing time**.

The ultimate aim therefore is **to model as much as possible** of the **whole of the earth's climate system** so that all the components can interact and thus the predictions of climate change will continuously take into account the effect of feedbacks.

Climate models are very complex and take large computer resources to run. (**Hierarchy of models**)

WATER STRESS BY 2020

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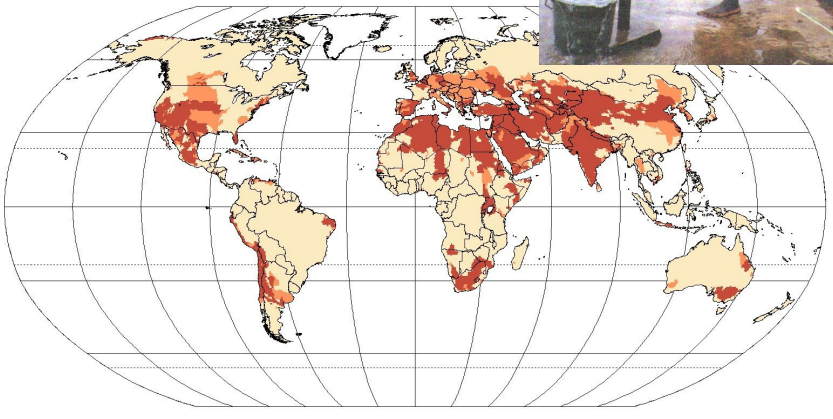
Withdrawal to availability ratio
(A2 scenario, 2020s, HadCM3)



0 - 0.2	0.2 - 0.4	more than 0.4	no data
[low water stress]	[mid water stress]	[severe water stress]	

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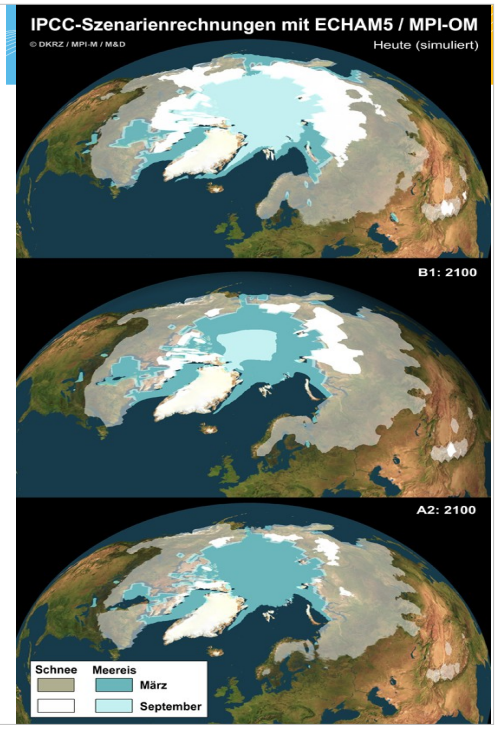
SHRINKING OF ARCTIC ICE/SNOWCOVER

- *PRESENT*
- *2100, EU TARGET*
- *2100, CURRENT EMISSIONS CONTINUE*

DCR



AIR POLLUTION SHORTENS THE LIFETIME OF HUMAN BEINGS