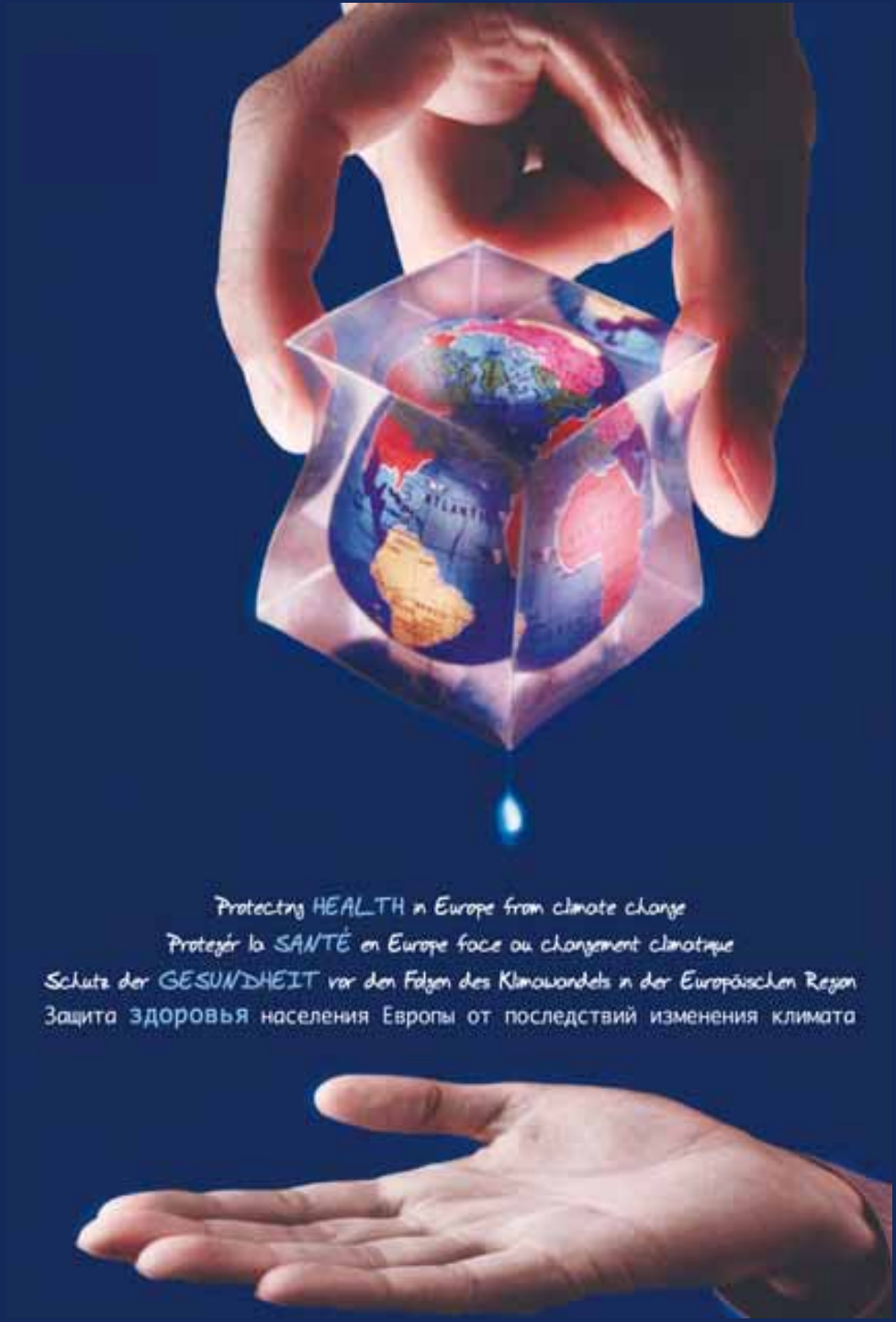
EUROPE

Protecting health in Russian North from climate change

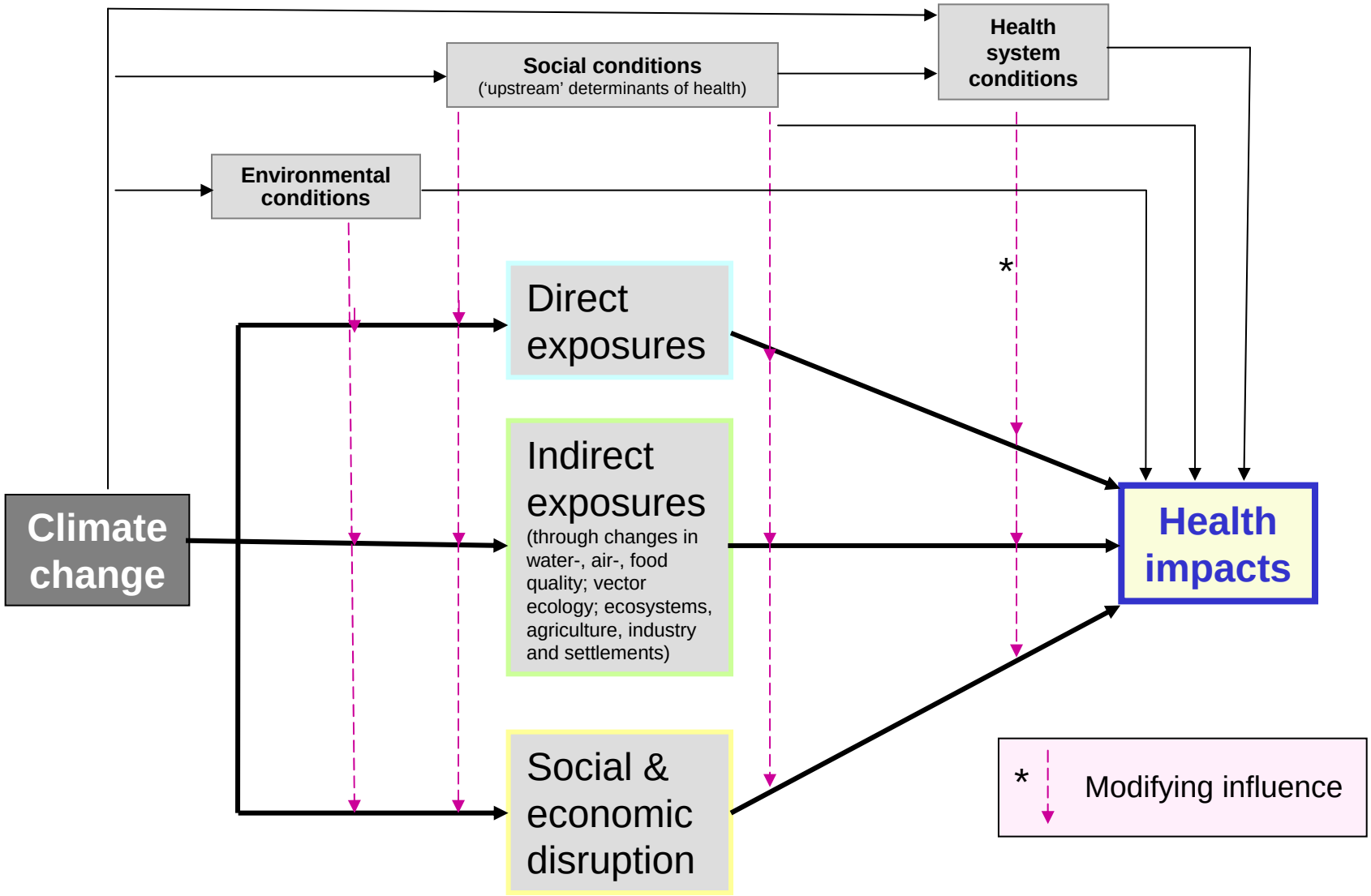
Moskow, May 2008



Content

- Climate change
- What are the health effects?
- What can we do about it?
- Suggested readings

Schematic diagram of pathways by which climate change affects health



Bettina Menne, May, 2008

1. Climate Change

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Warming is unequivocal

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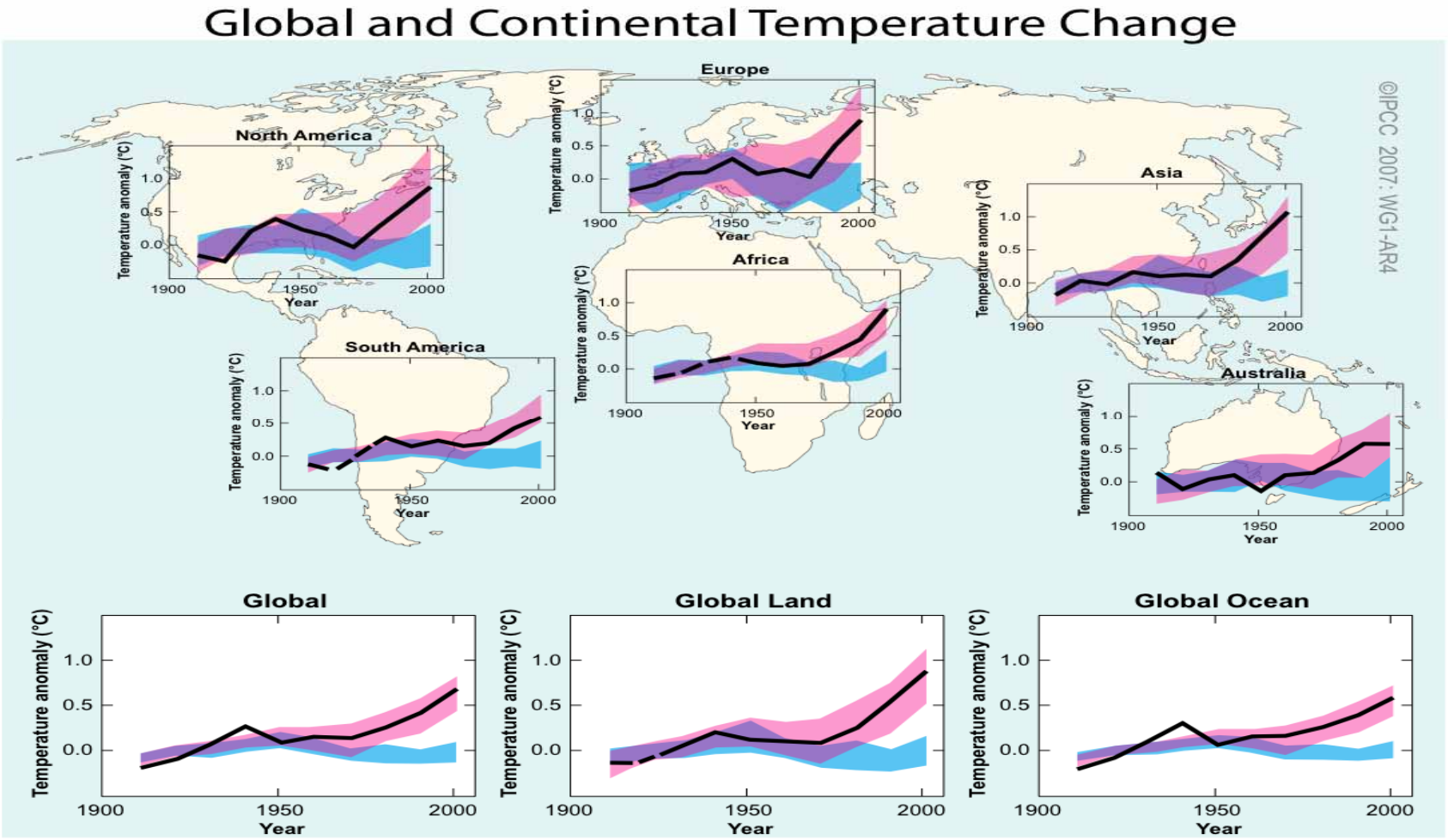
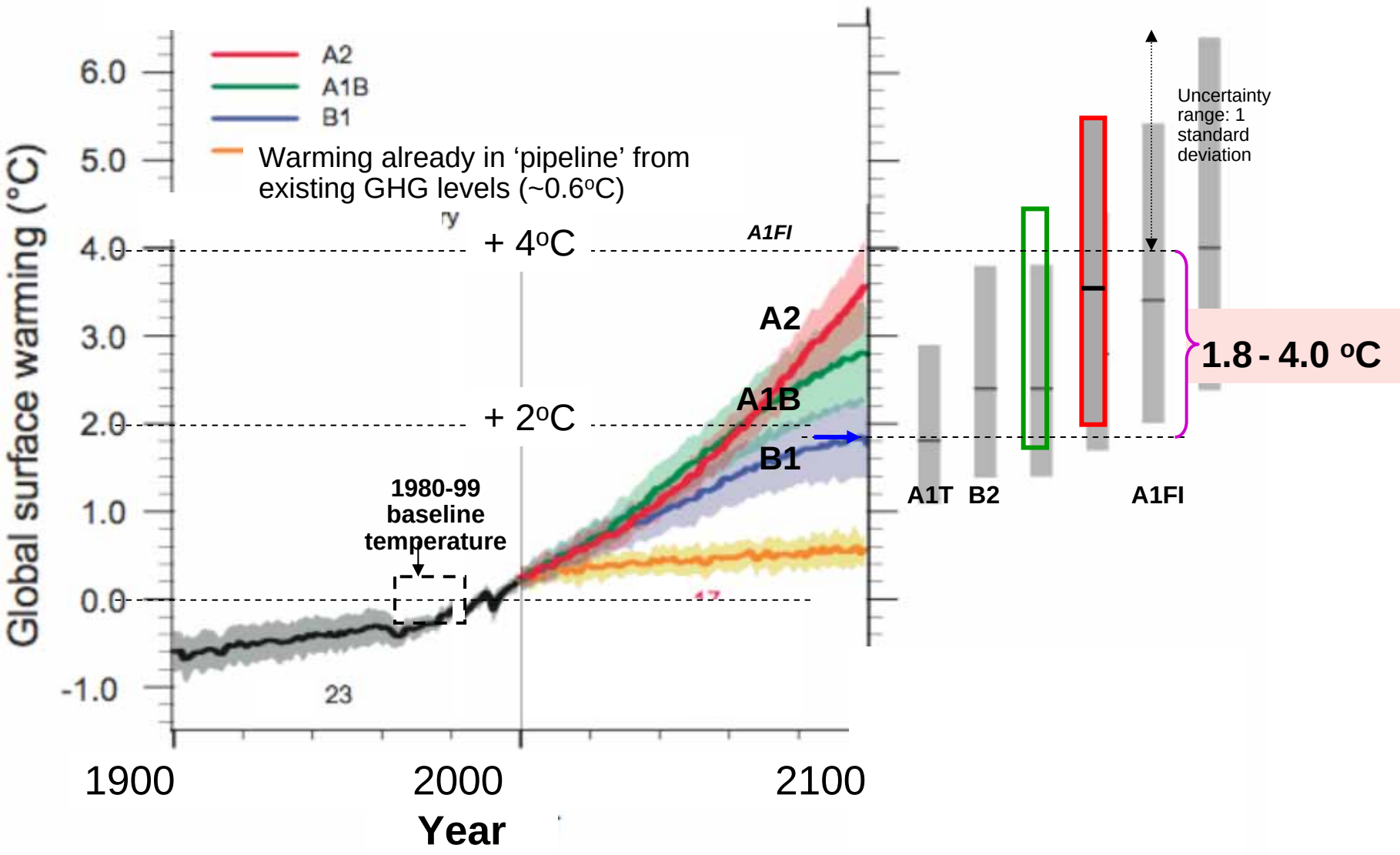


IPCC, 2007

Projected warming, to 2100: for six future global greenhouse gas emissions scenarios

Intergovernmental Panel on Climate Change (IPCC), 2007



Projections higher for the Arctic and sub-arctic

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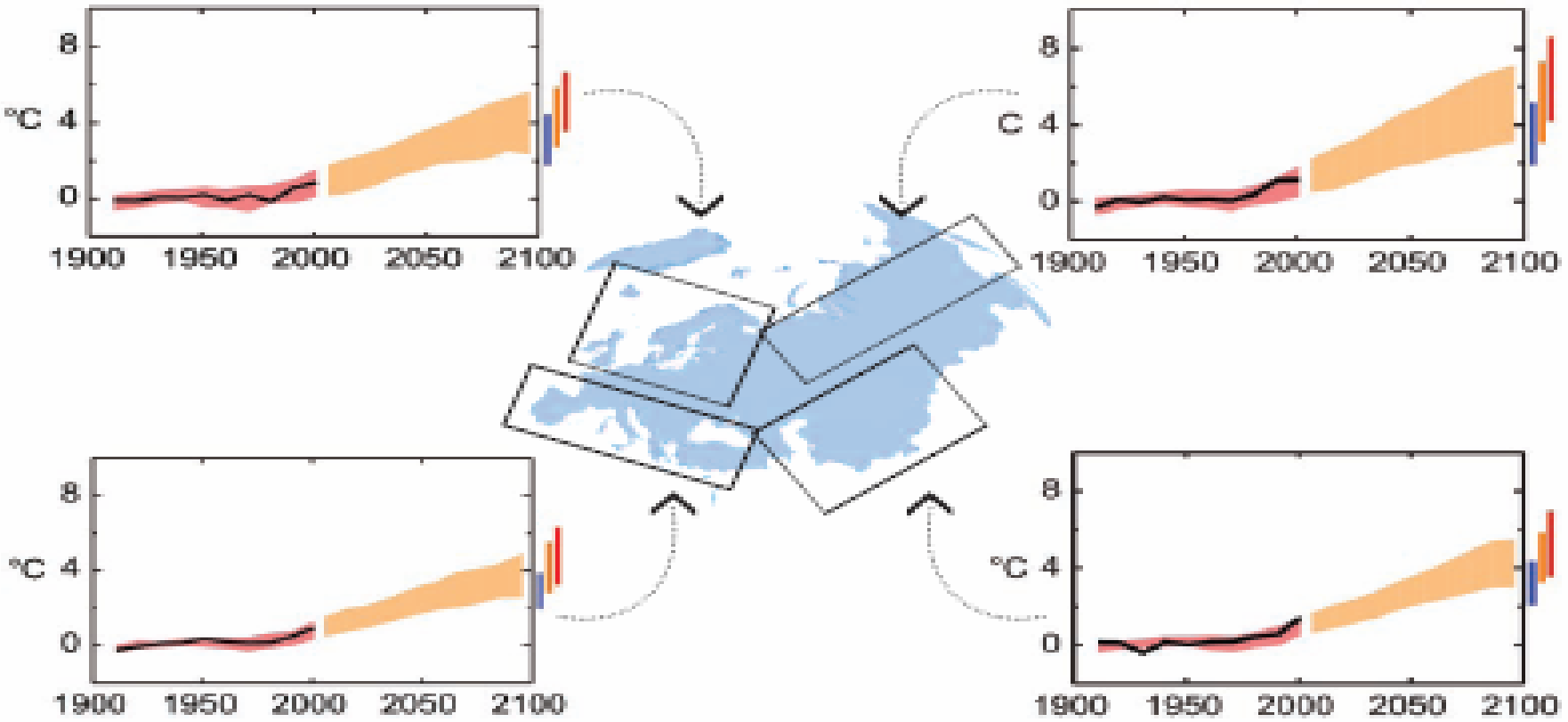
Fig. 2. Temperature anomalies in four parts of the WHO European Region, with respect to 1901–1950 and as projected for 2001 to 2100



Note. Temperature anomalies with respect to 1901 to 1950 for four Europe land regions for 1906 to 2005 (black line) and as simulated (red envelope) by multi-model data set (MMD) models incorporating known climate-forcing mechanisms; and as projected for 2001 to 2100 by MMD models of the (the Special Report on Emission Scenarios (SRES)) A1B scenario (orange envelope). The bars at the end of the orange envelope represent the range of projected changes for 2091 to 2100 for the B1 (blue), A1B (orange) and A2 scenarios (red).

Source: Christensen (6).

Extreme events




Phenomenon	Observed frequency	Projections 21st century
Cold days and nights	↓	Virtually certain
Hot days and nights	↑	Virtually certain
Warm spells/heat-waves	↑	Very likely
Heavy precipitation events.	↑	Very likely
Incidence of extreme high sea level	↑	Likely

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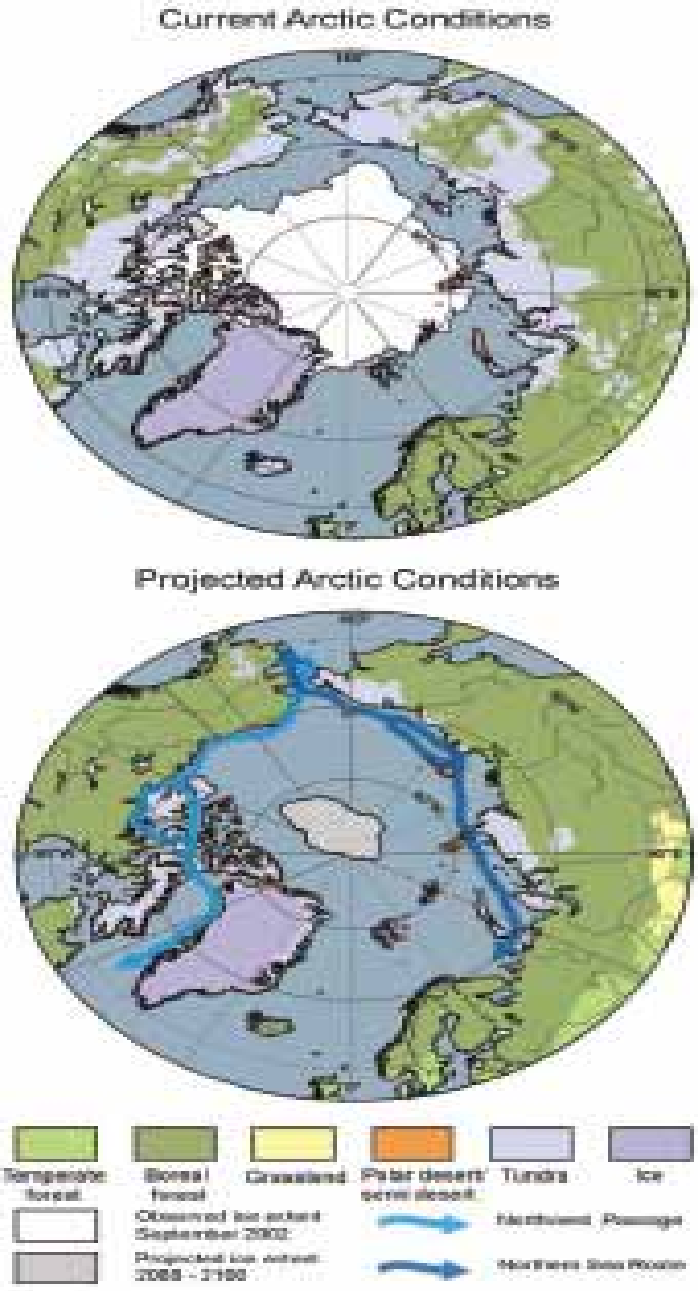


IPCC, 2007

Ecosystem changes

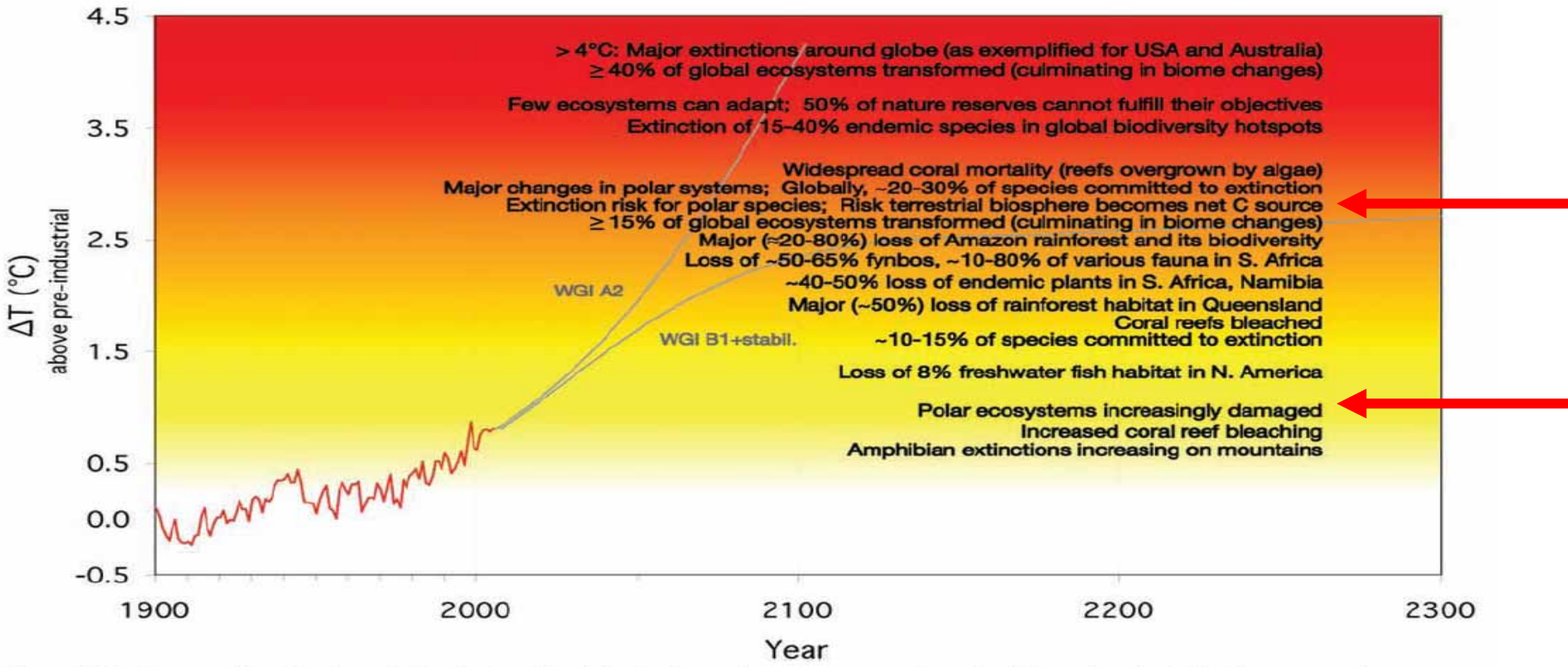


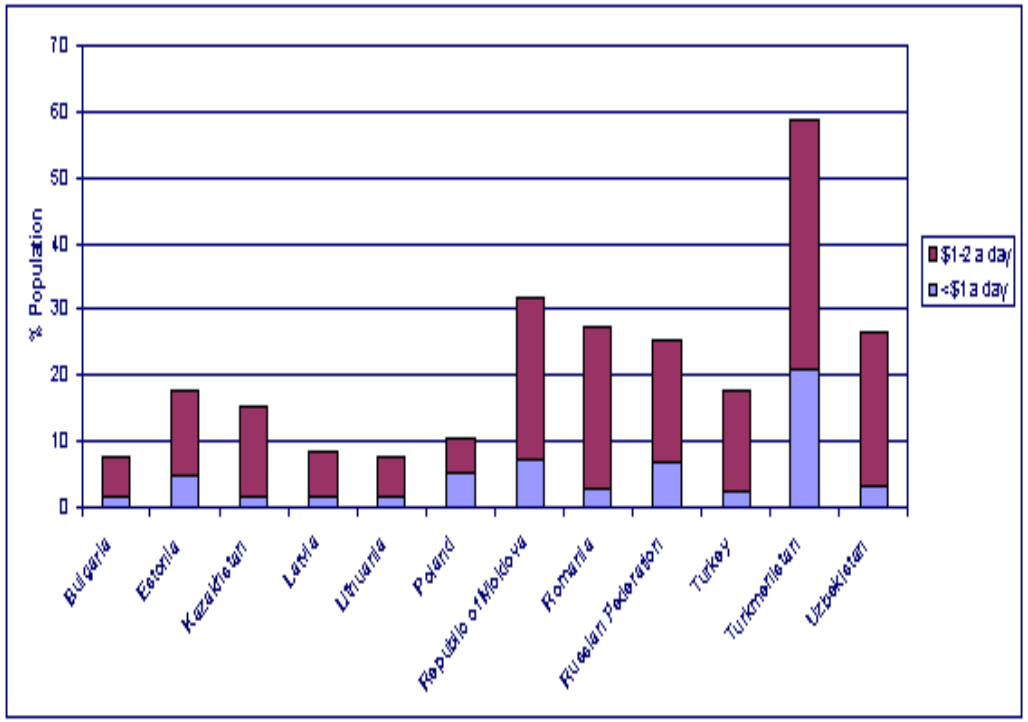
Figure TS.6. *Compendium of projected risks due to critical climate change impacts on ecosystems for different levels of global mean annual temperature rise, ΔT, relative to pre-industrial climate, used as a proxy for climate change. The red curve shows observed temperature anomalies for the period 1900-2005 [WGI AR4 F3.6]. The two grey curves provide examples of the possible future evolution of global average temperature change (ΔT) with time [WGI AR4 F10.4] exemplified by WGI simulated, multi-model mean responses to (i) the A2 radiative forcing scenario (WGI A2) and (ii) an extended B1 scenario (WGI B1+stabil.), where radiative forcing beyond 2100 was kept constant at the 2100 value [WGI AR4 F10.4, 10.7]. White shading indicates neutral, small negative, or positive impacts or risks; yellow indicates negative impacts for some systems or low risks; and red indicates negative impacts or risks that are more widespread and/or greater in magnitude. Illustrated impacts take into account climate change impacts only, and omit effects of land-use change or habitat fragmentation, over-harvesting or pollution (e.g., nitrogen deposition). A few, however, take into account fire regime changes, several account for likely productivity-enhancing effects of rising atmospheric CO_2 and some account for migration effects. [F4.4, T4.1]*

IPCC, TS, WG2, 2007

Impede growths?

- Climate change will impede nations' abilities to achieve sustainable development pathways as measured, for example, by long-term progress towards the Millennium Development Goals;
- The estimate of the total (average) cost of climate change increases to 11-20% GDP if health included;
- The social costs of carbon (or marginal benefit of reducing carbon emissions by one tonne of carbon) run from US$-10 to US$+350 per tonne of carbon.

Fig. 1. Population living on <US $2 and <US $1 a day in some countries in WHO's European Region



IPCC conclusions

- The most affected regions are: the Arctic, because of the impacts of high rates of projected warming on natural systems and human communities

Polar Regions	• The main projected biophysical effects are reductions in thickness and extent of glaciers and ice sheets and sea ice, and changes in natural ecosystems with detrimental effects on many organisms including migratory birds, mammals and higher predators; • For human communities in the Arctic, impacts, particularly those resulting from changing snow and ice conditions are projected to be mixed; • Detrimental impacts would include those on infrastructure and traditional indigenous ways of life; • In both polar regions, specific ecosystems and habitats are projected to be vulnerable, as climatic barriers to species invasions are lowered.

IPCC, Synthesis Report, 2007

2. The health impacts

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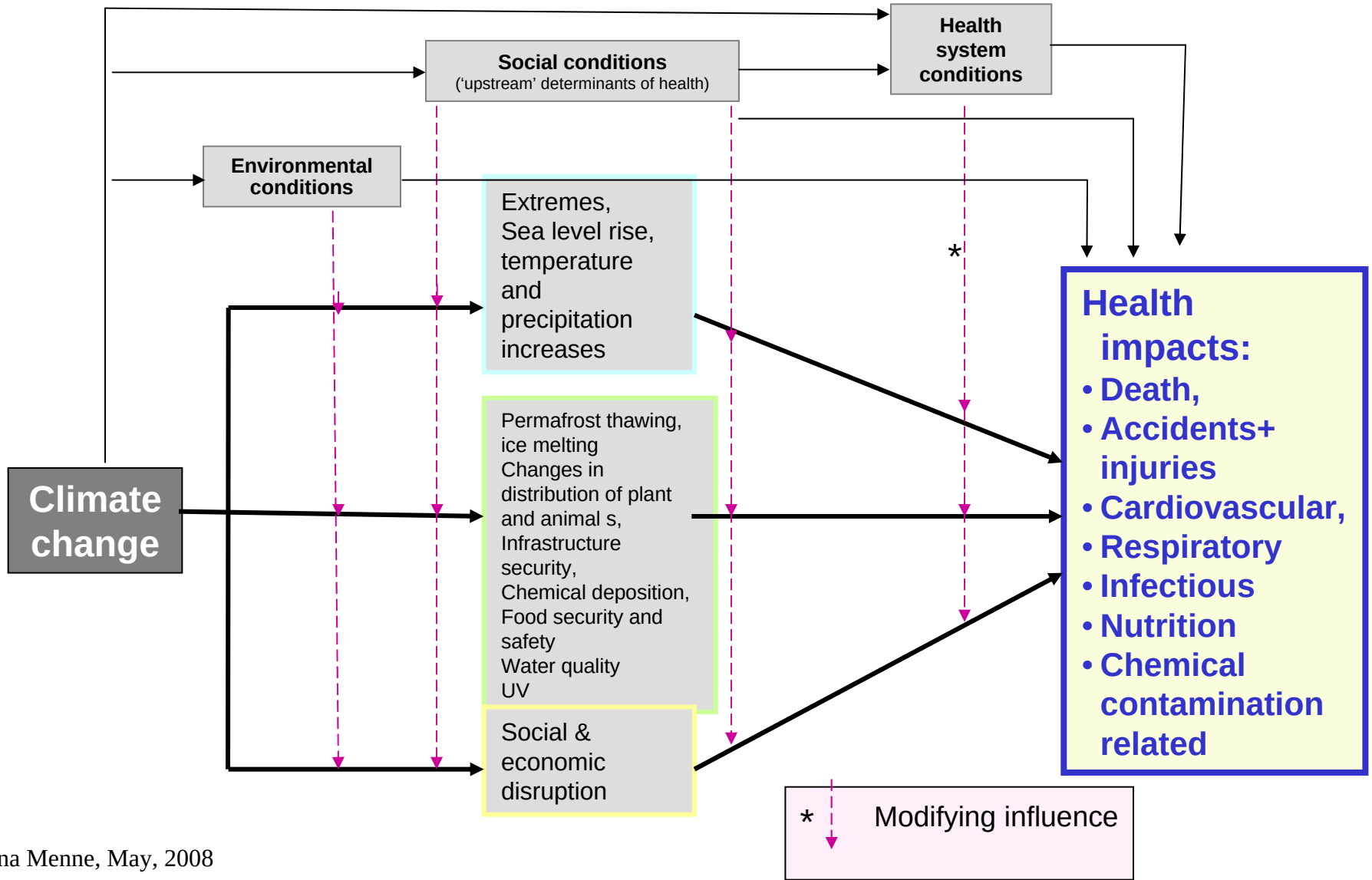
Potential climate change health effects in the Russian North?



Bettina Menne, May, 2008

Cold impacts will continue at least for the next few decades

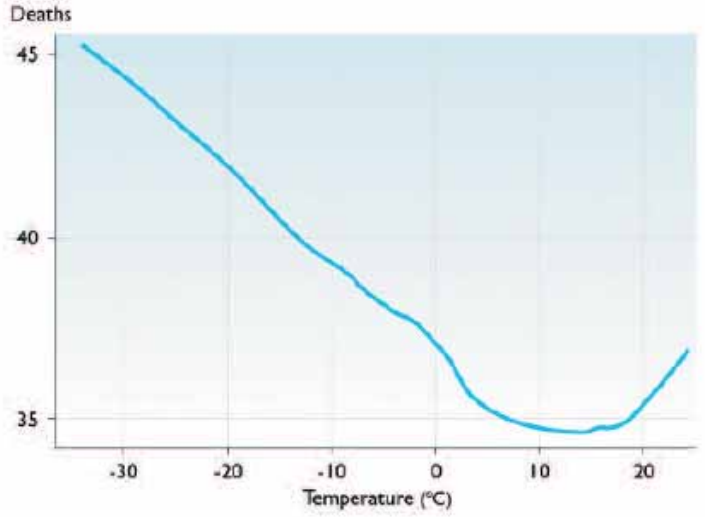
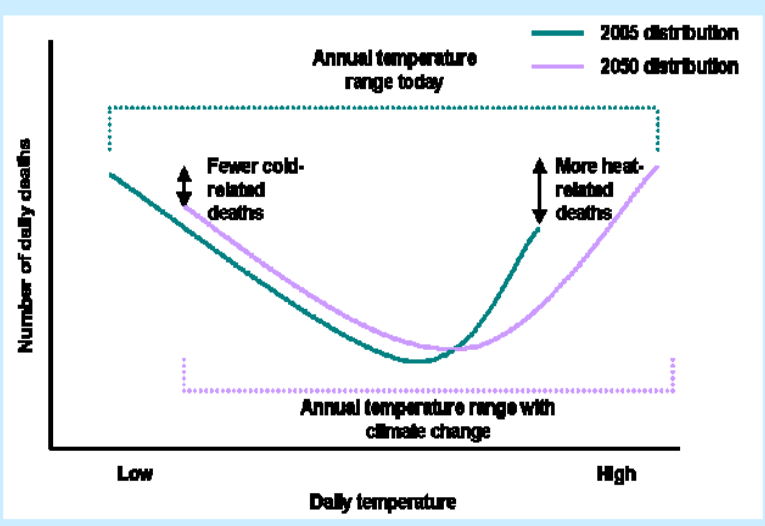


Fig. 15.7. Deaths from coronary heart disease and mean daily temperature in Finland, 1971–1995 (Donaldson et al., 2003).



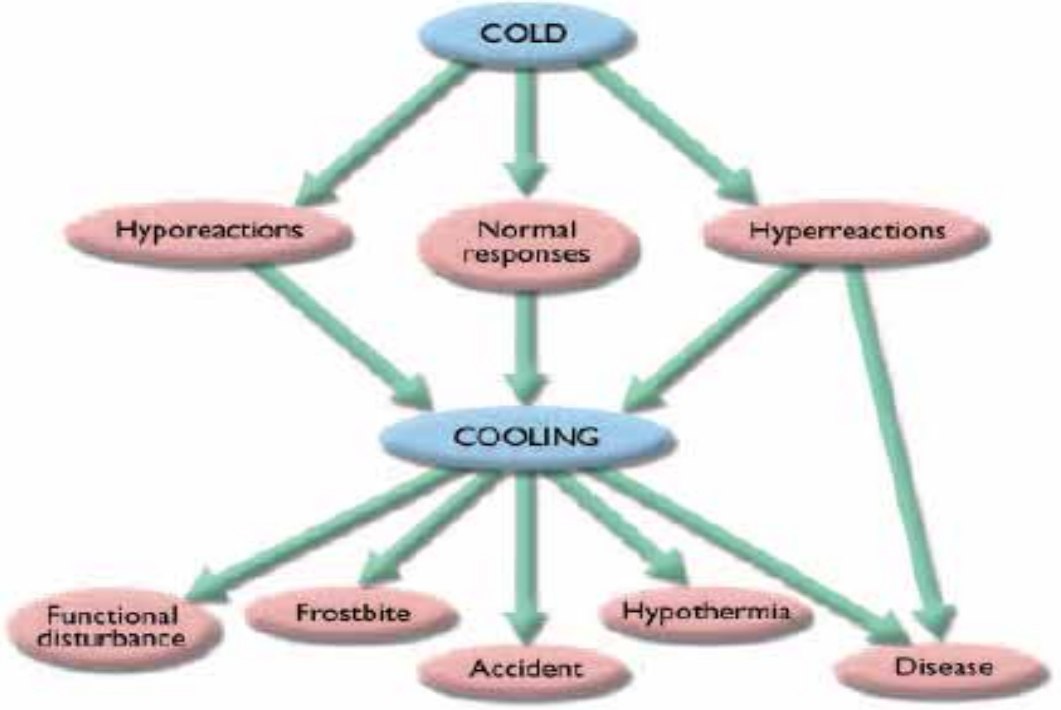


Fig. 15.6. Interactions between temperature and health.

Berner et al, in ACIA, 2005; Donaldson, 2003;McMichael, 2007

Ozone depletion, climate change and health

- UV induces cortical cataracts, cutaneous malignant melanoma, sunburn weakens the immune response
- GHG induced cooling of the stratosphere is expected to prolong the effect of ozone-depleting gases, which will increase levels of UV radiation reaching some parts of the earth's surface.
- Higher ambient temperatures will influence clothing choices and time spent outdoors, potentially increasing UV exposure

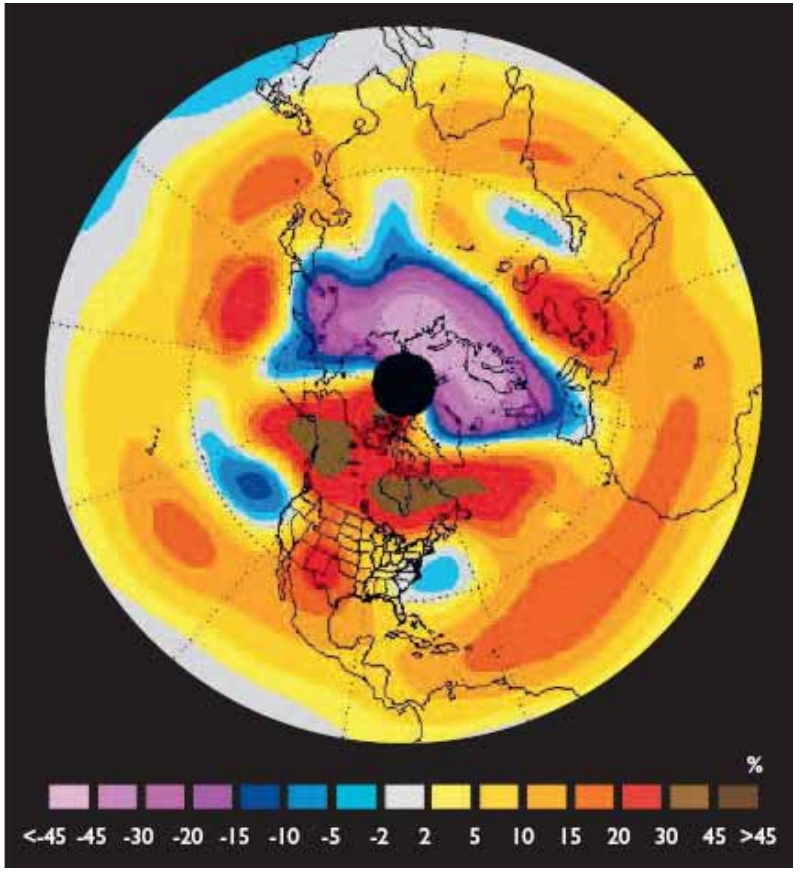


Fig. 15.8. Total ozone anomalies in the northern hemisphere for March 2003 relative to the mean March value for 1979 to 1986. Areas where the March 2003 value is within ±2% of the long-term mean are shown in light gray (data provided by NOAA, National Weather Service, 2003).

Permafrost thawing

Risks to human health:

- Transportation gaps
- Access and availability of health care
- Isolation
- Infrastructure damage

Figure TS.11. *Projected future changes in the northern Asia permafrost boundary under the SRES A2 scenario for 2100. [F10.5]*

The possible change in infectious disease distribution is a risk to public health security

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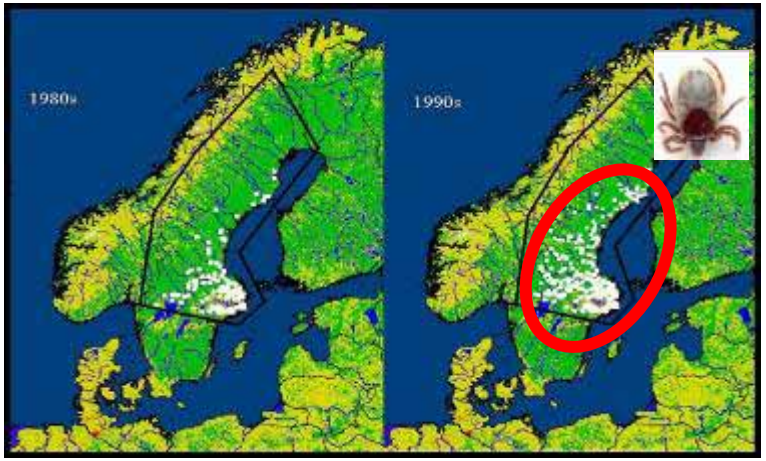
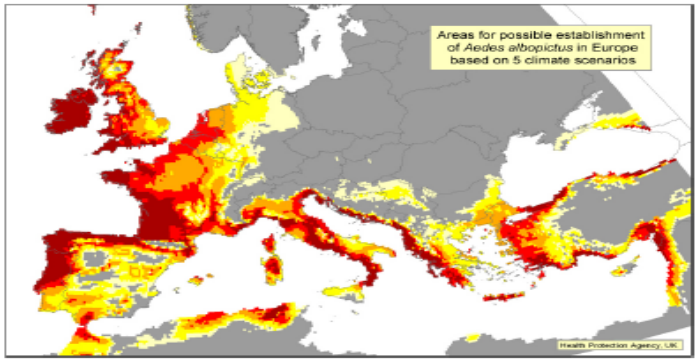
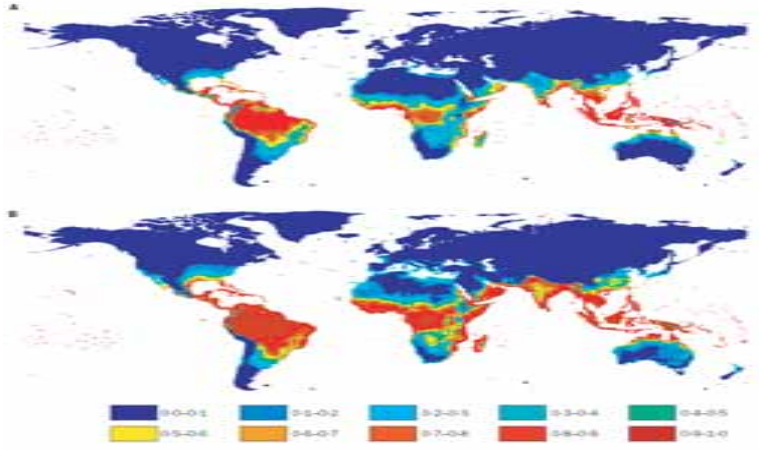
Schaeffner, Lindgren, Hales





Areas for possible establishment of *Aedes albopictus* in Europe based on 5 climate scenarios. The image shows likelihood for establishment. Scenario 1 (light yellow) = 450mm annual rainfall, -1°C January isotherm, scenario 2 (yellow) = 500mm rainfall, 0°C – scenario 3 (orange) = 600mm, 1°C – scenario 4 (red) = 700mm, 2°C – scenario 5 (brown) = 800mm rainfall, 3°C

Source: Unpublished map made by Medlock J. & Schaffner F., based upon Medlock et al. 2006 – Analysis of potential for survival and seasonal activity of *Aedes albopictus* in the UK. J Vector Ecol. 31 (2): 292-304



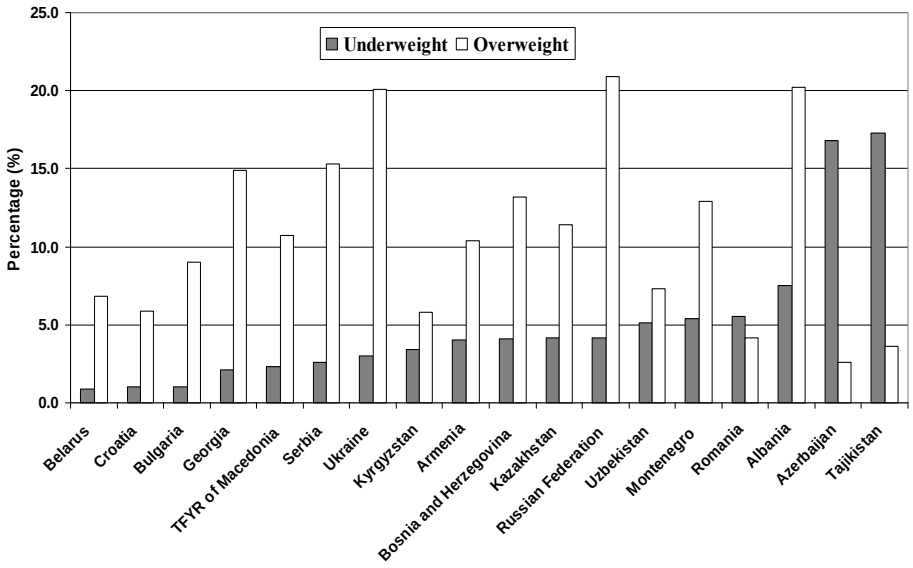
Bettina Menne, May, 2008

Infectious disease changes in the Russian North (ACIA, 2005)

- Changes in zoonosis
  - Tularemia, rabies epidemics, brucellosis, echinococcus, an arctic strain of trichinella, cryptosporidium
- Changes in bird migration
  - E.g. West Nile fever
- Changes in tick distribution
  - Tick borne encephalitis
- Changes in Mosquitoe distributions

Risks to nutrition

Double burden of child malnutrition



Source: Adapted from Cattaneo A et al. Child nutrition in CEE and CIS countries: report of a situation analysis. Geneva, UNICEF, 2007.

FOOD SECURITY

- It is likely that there will be productivity increases in northern Europe, but decreases along the *Mediterranean, in south-eastern Europe and in Central Asia.*
- It is projected that crop yields could decrease up to 30% in Central Asia by the mid-21st century.

Food in ACIA, 2005

- Effect on consumption
  - a change in the distribution of important food species;
  - the unpredictable nature of weather, as this can influence the possibilities for hunting or fishing;
  - Low water levels in lakes and streams, the timing of snow, and ice extent and stability, as these can influence access to hunting locations and key species; and by
  - a shorter winter season and increased snowfall (two effects of a warmer climate), as these may decrease the ability of northern people to hunt and trap (Maxwell, 1997).
- Climate changes may influence the availability and health of traditional food species via:
  - impacts on critical components of their diet (e.g., climate impacts on vegetation may influence caribou health and abundance);
  - impacts on their ability to forage and survive critical seasons (e.g., deeper snow and changes in freezing rain
  - incidents can negatively affect the ability of caribou and reindeer to forage in winter);
  - warming, as this may increase the exposure of some species to insects, pests, and parasites; and via
  - temperature changes as these may influence migration and breeding patterns.

The example of climate change influence on cod fishing

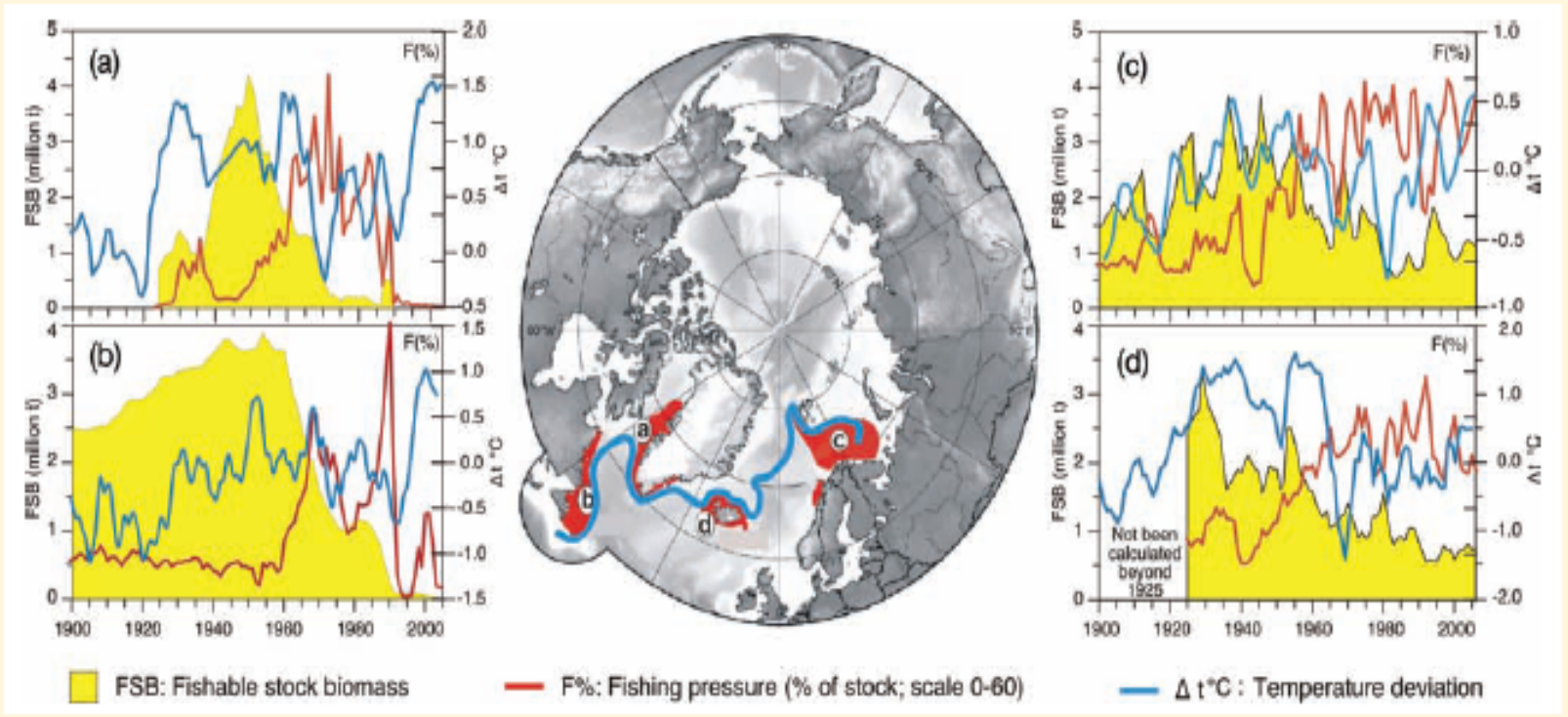


Figure 15.5. *The geographical distribution of four major cod stocks in the North Atlantic (red patches). The continuous blue line indicates an average geographical position of the Polar Front. The graphs (a: West Greenland; b: Newfoundland/Labrador; c: Barents Sea, and d: Iceland) show the developments of fishable stock (yellow shading), catches (red line) and temperature (blue line) during the period 1900-2005. Data sources: Greenland (Buch et al., 1994; Horsted, 2000; ICES, 2006); Newfoundland/Labrador (Harris, 1990; Lilly et al., 2003); Iceland (Schopka, 1994; Hafrannsóknastofnunin, 2006; ICES, 2006); Barents Sea (Bochkov, 1982; Hylen, 2002; ICES, 2005a), data since 1981 were kindly provided by the Polar Research Institute of Marine Fisheries and Oceanography (PINRO), Murmansk, Russia.*

IPCC, 2007

Lakes and permafrost

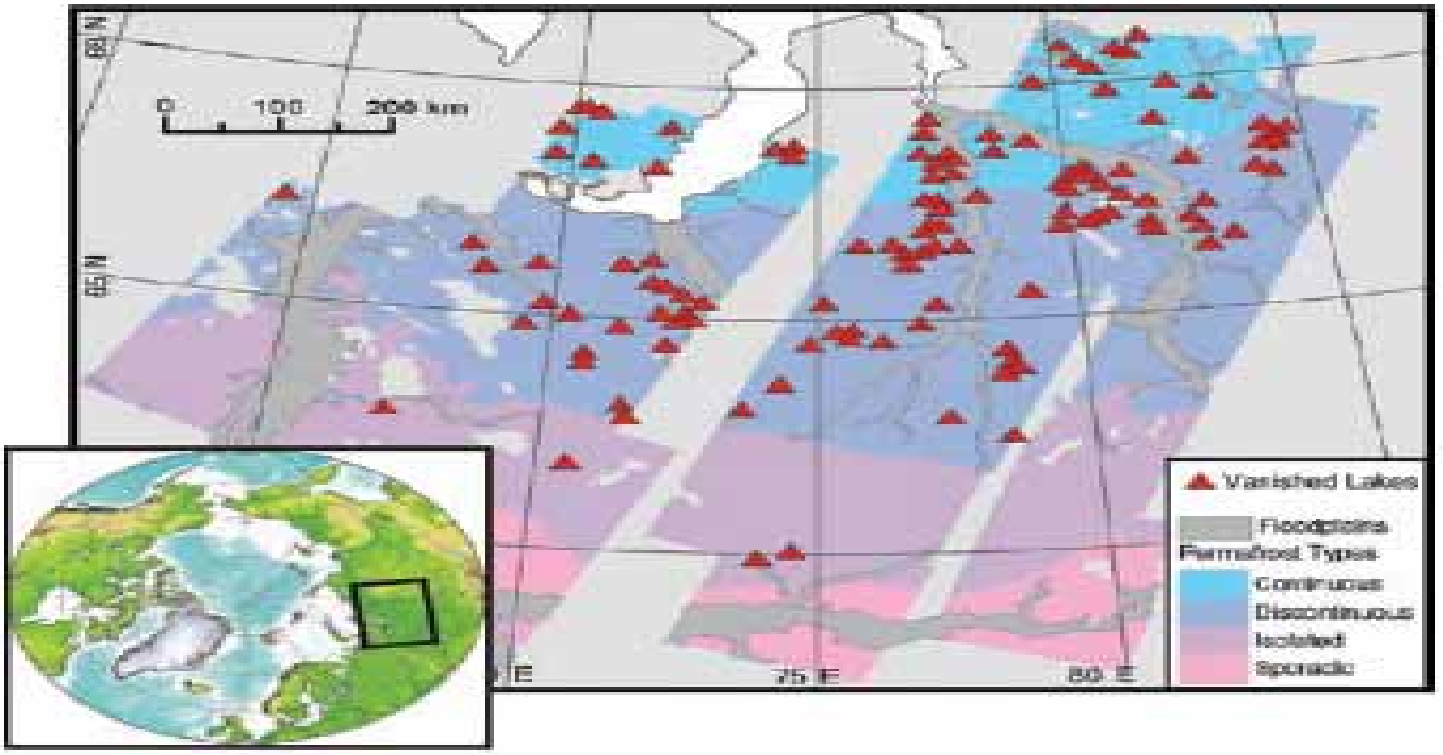
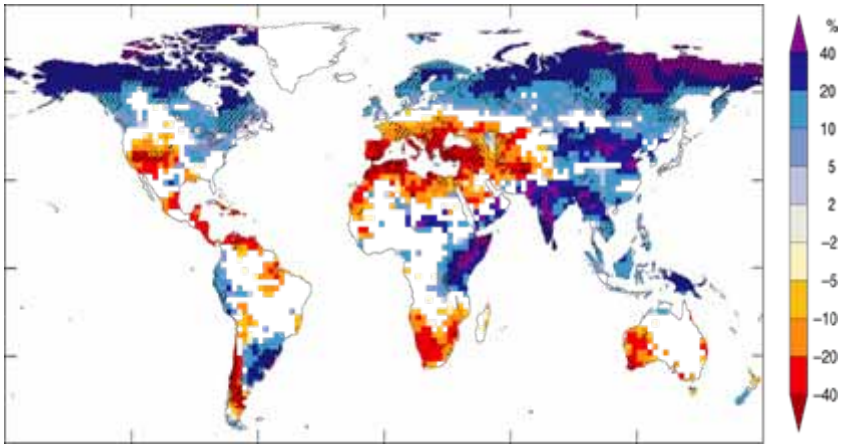


Figure 15.4. *Locations of Siberian lakes that have disappeared after a three-decade period of rising soil and air temperatures (changes registered from satellite imagery from early 1970s to 1997-2004), overlaid on various permafrost types. The spatial pattern of lake disappearance suggests that permafrost thawing has driven the observed losses (redrawn from Smith et al., 2005).*

IPCC, 2007, chapter 15 and Technical summary

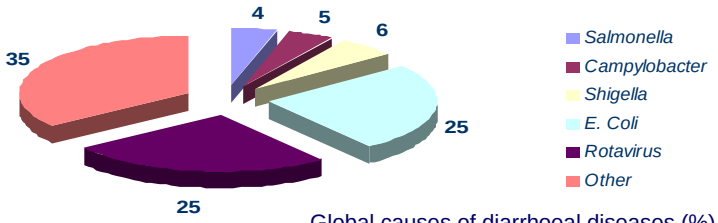
Changes in water quantity and quality



IPCC, 2007

Many causes of diarrhoeal diseases are water-related

18 000 premature deaths from diarrhoeal diseases



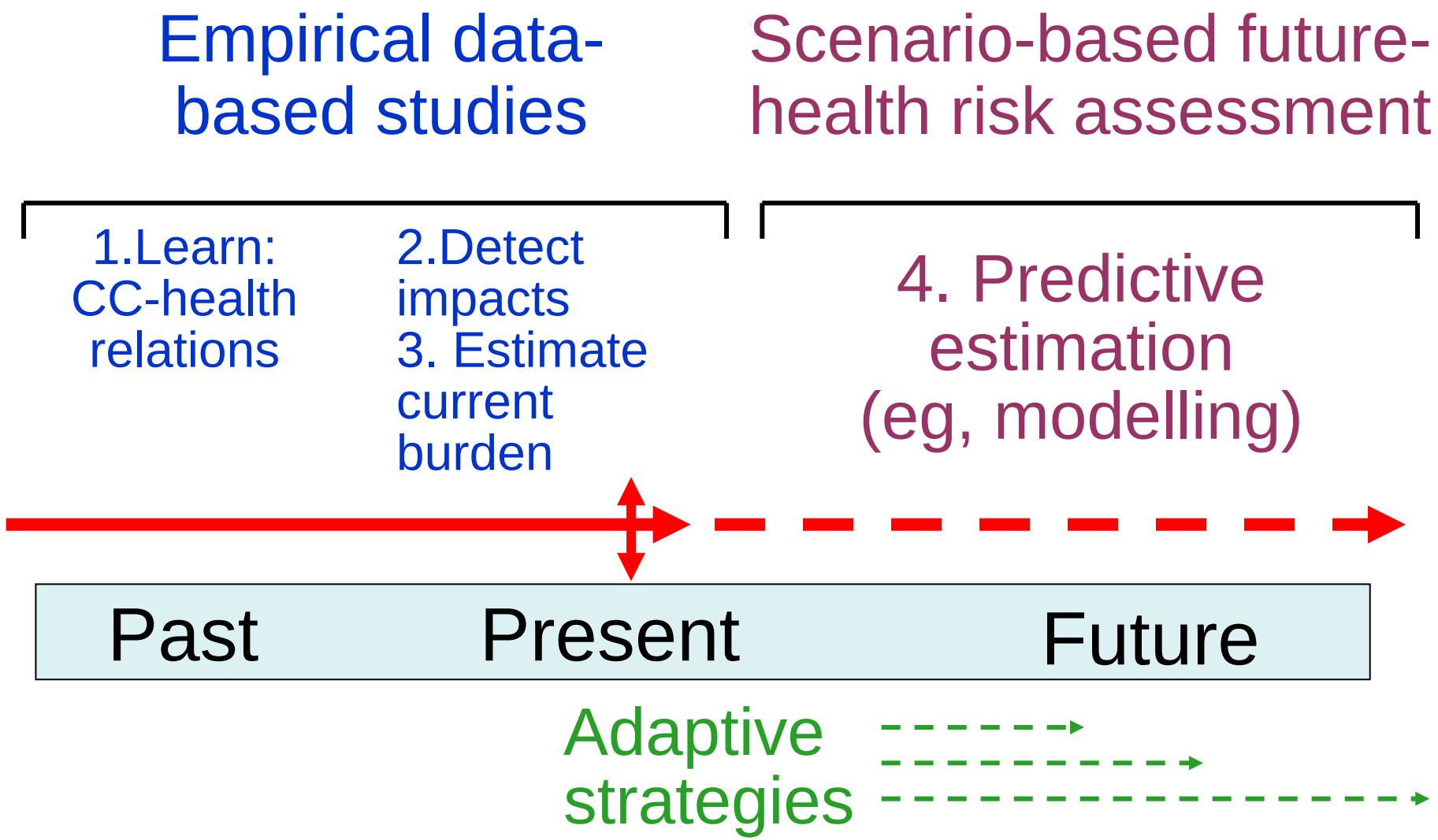
Global causes of diarrhoeal diseases (%)

- In the Arctic 5 components:
  - Reduced ground water supply
  - Risks to coastal communities
  - Risks to river communities
  - Floods and storms
  - Infrastructure damage
  - Permafrost melting induced instability

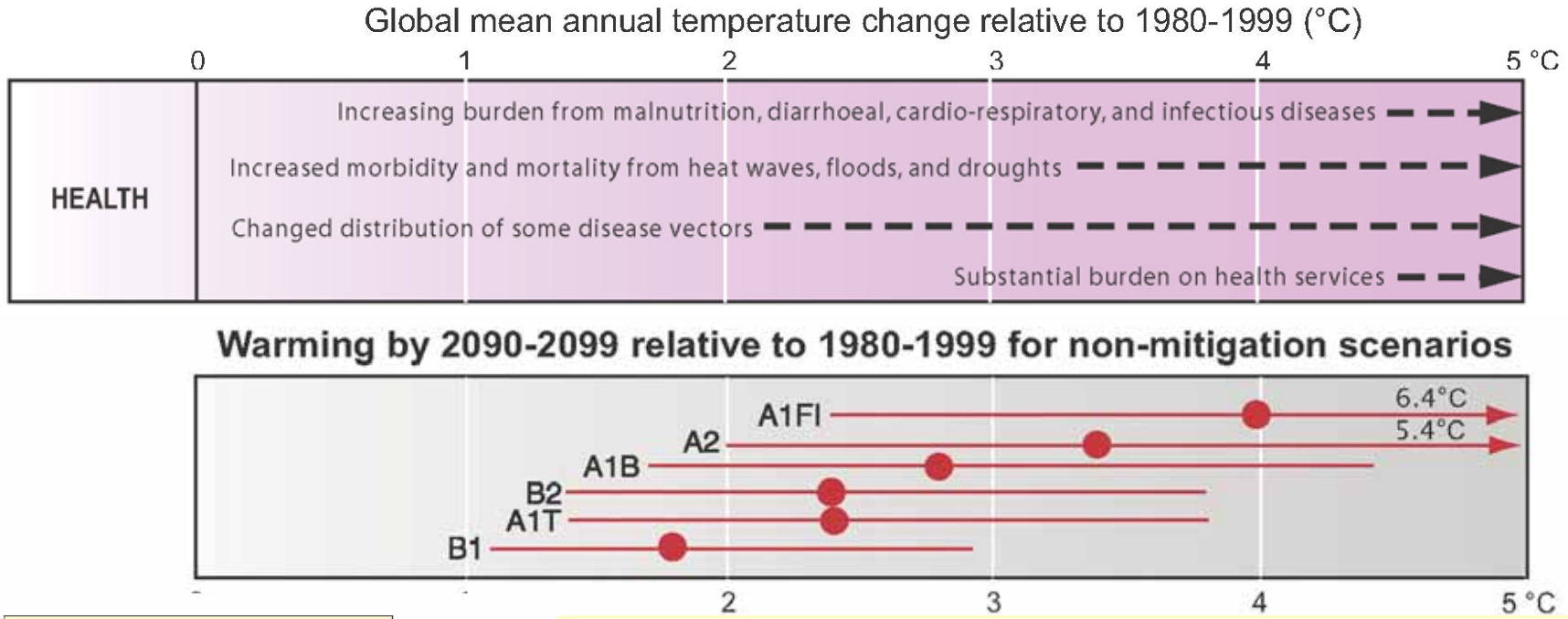
Pollutants deposition (POPs, heavy metals, etc)

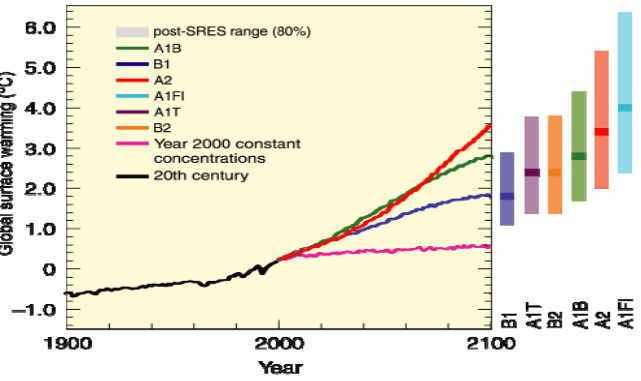
- Most at risk: pregnant women, the developing fetus, and the developing infant are the most sensitive stages of human life;
- The exposure is to a mixture
- Toxicological models and wildlife studies suggest that neurodevelopment, growth, immunological development, and endocrine function are the most likely targets for effects from exposure;
- Sensitivity to these compounds varies widely in wildlife and laboratory species.

Studies carried out



Small changes in temperature do already affect health





More systematic understanding of the timing of impacts is available. There is high confidence that even small changes in global temperature impact human health. The impacts become more adverse and widespread with increasing temperature.

3. Taking action?

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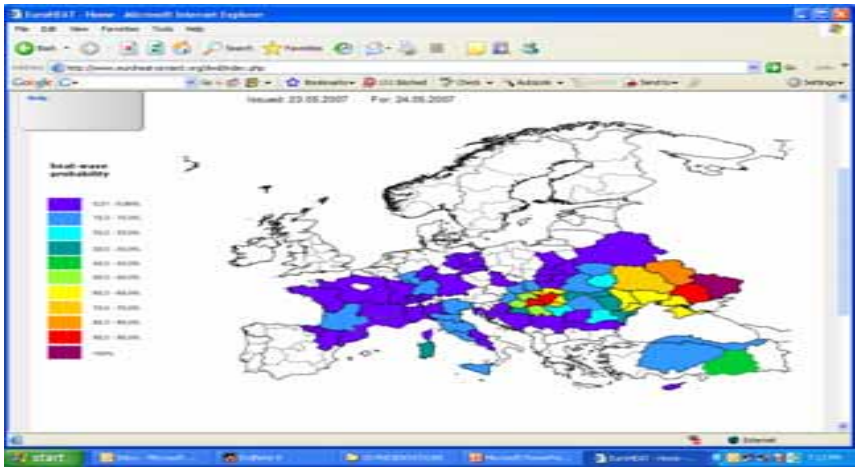
Understanding vulnerability for action?

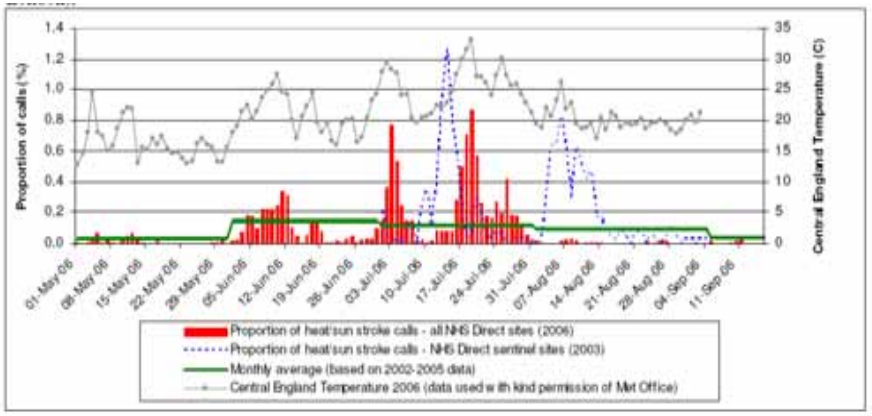
How do we best adapt/prevent avoid/limit potential impacts?

Which policies, measures and strategies can be safely promoted?

What action is needed *now*?

How to avoid/limit potential impacts?





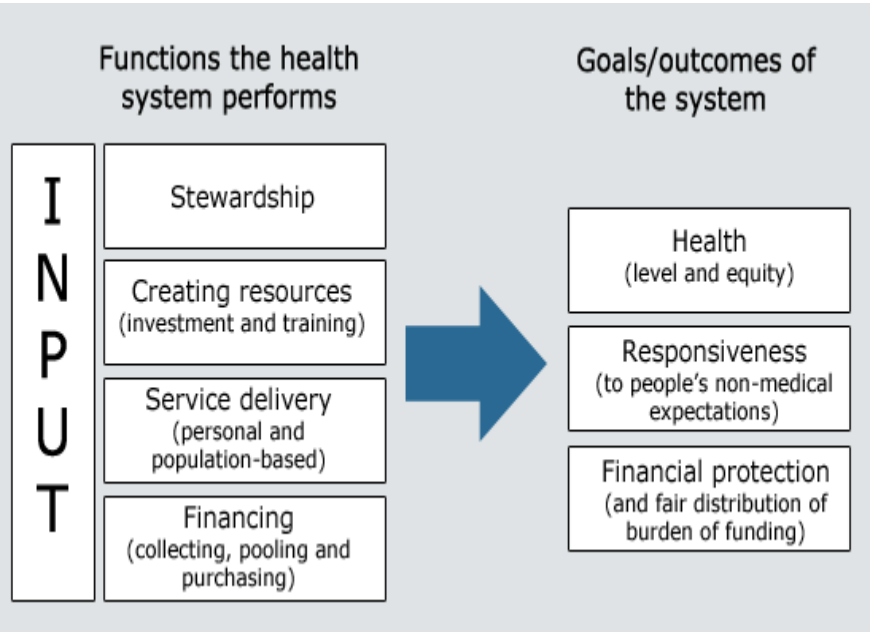
HOW TO REDUCE HEALTH EFFECTS

Implement heat-health action plans by

- *ensuring health systems' preparedness and ability to respond*
- *reducing community exposure to heat*
- *providing timely weather-related health alerts and advice to citizens*

Bettina Menne, May, 2008

Strengthening the health system response



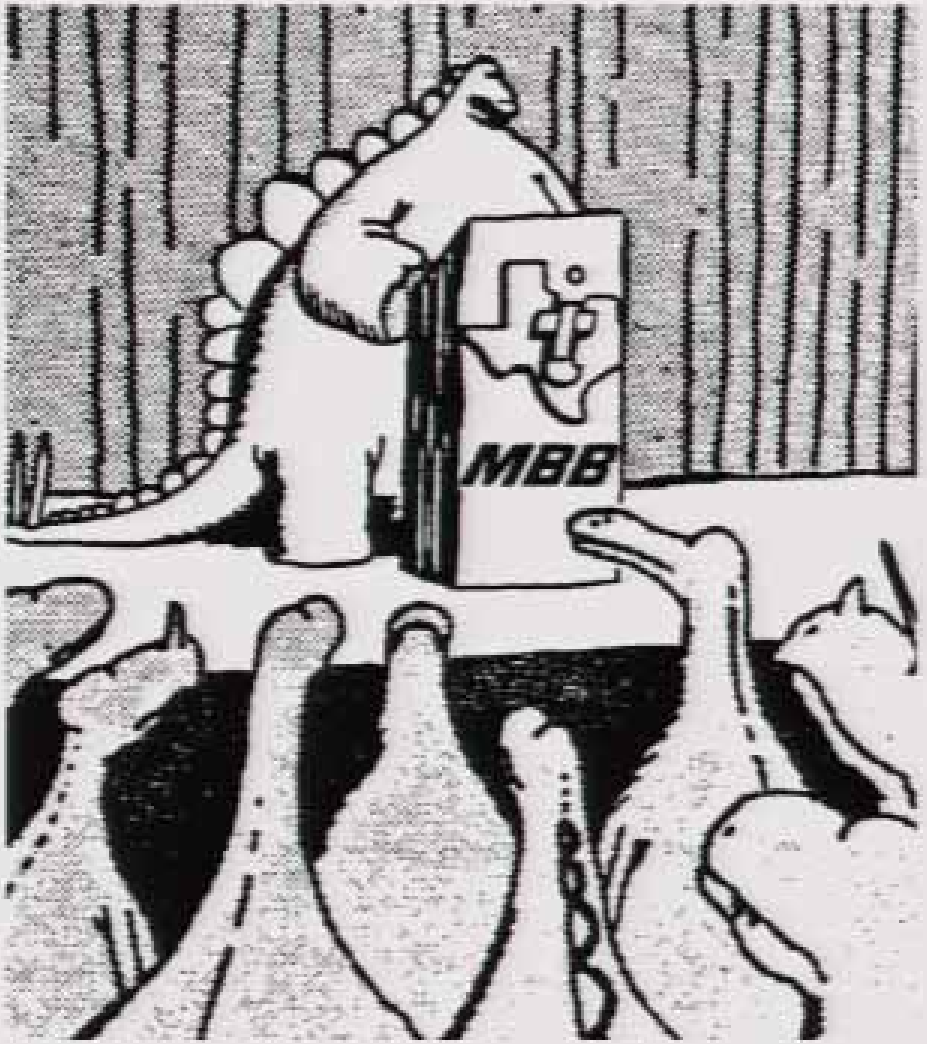
For health systems to protect health under a changing climate, it means to think about,

(a) how can high levels of health, equity and security be ensured

(b) how can responsiveness be guaranteed and

(c) how can populations be financial protected and resources fairly distributed.

There is *high agreement* and *much evidence* that mitigation actions can result in near-term co-benefits (e.g. improved health due to reduced air pollution) that may offset a substantial fraction of mitigation costs (IPCC, SYR; SPM wg3)



"The picture's pretty bleak, gentlemen. The world's climates are changing, the mammals are taking over, and we all have a brain about the size of a walnut"

Gary Larson

For more info

- www.euro.who.int/globalchange