

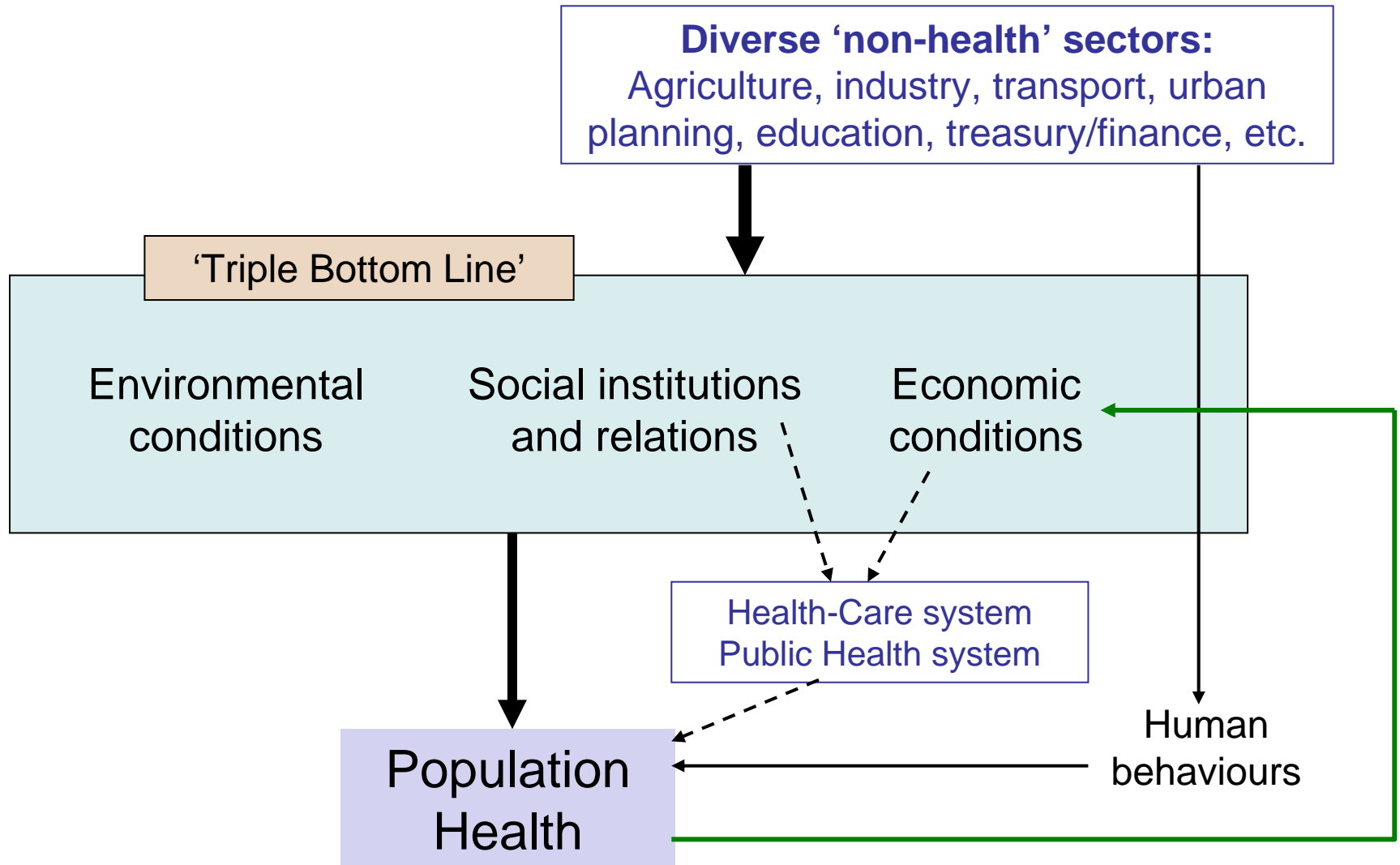


# Joined-up Agendas: Ecological Sustainability and Population Health

**A.J. McMichael**

**National Centre for  
Epidemiology and Population Health  
The Australian National University  
Canberra**

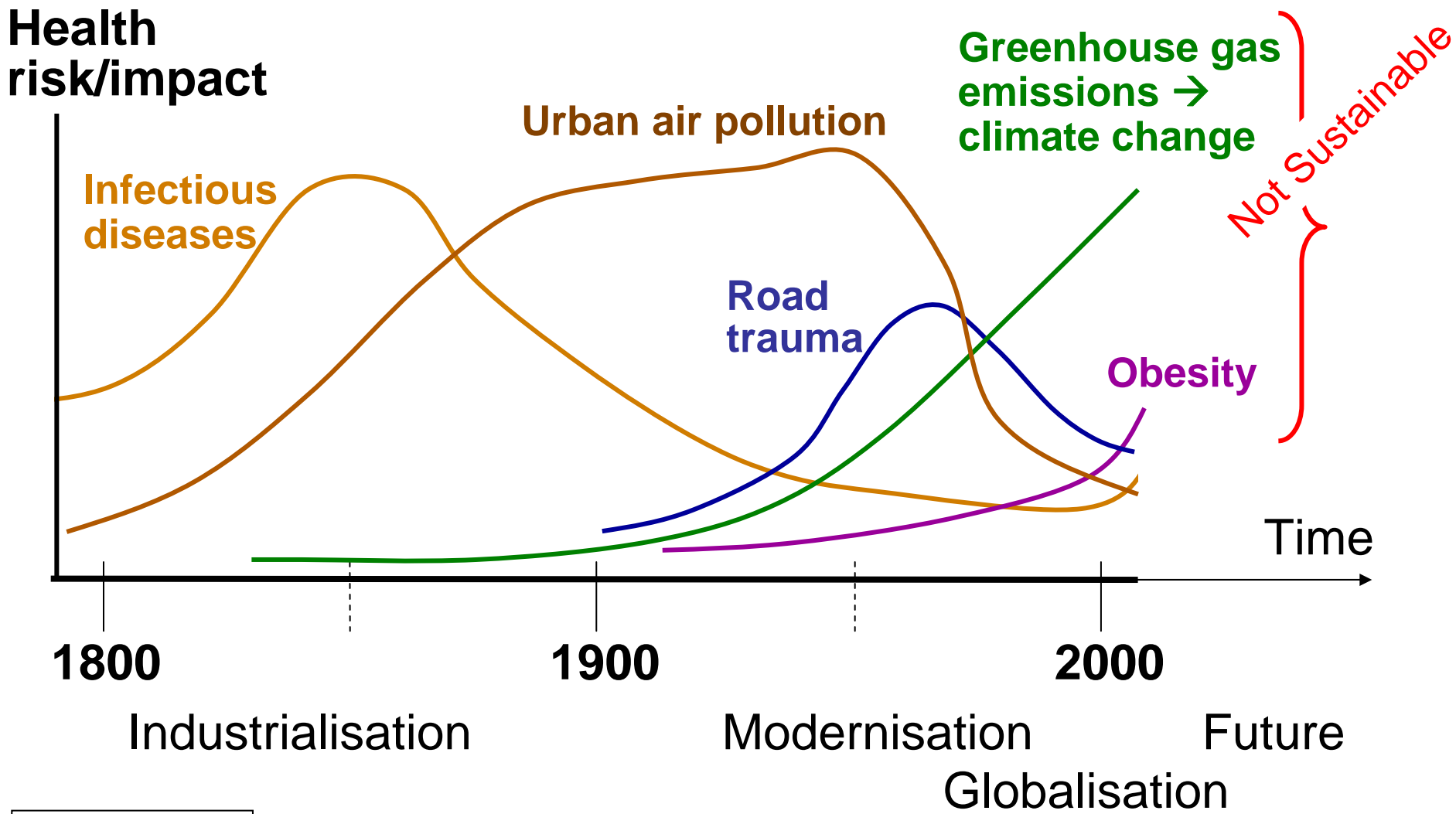
# What Do We Really Want to Sustain?



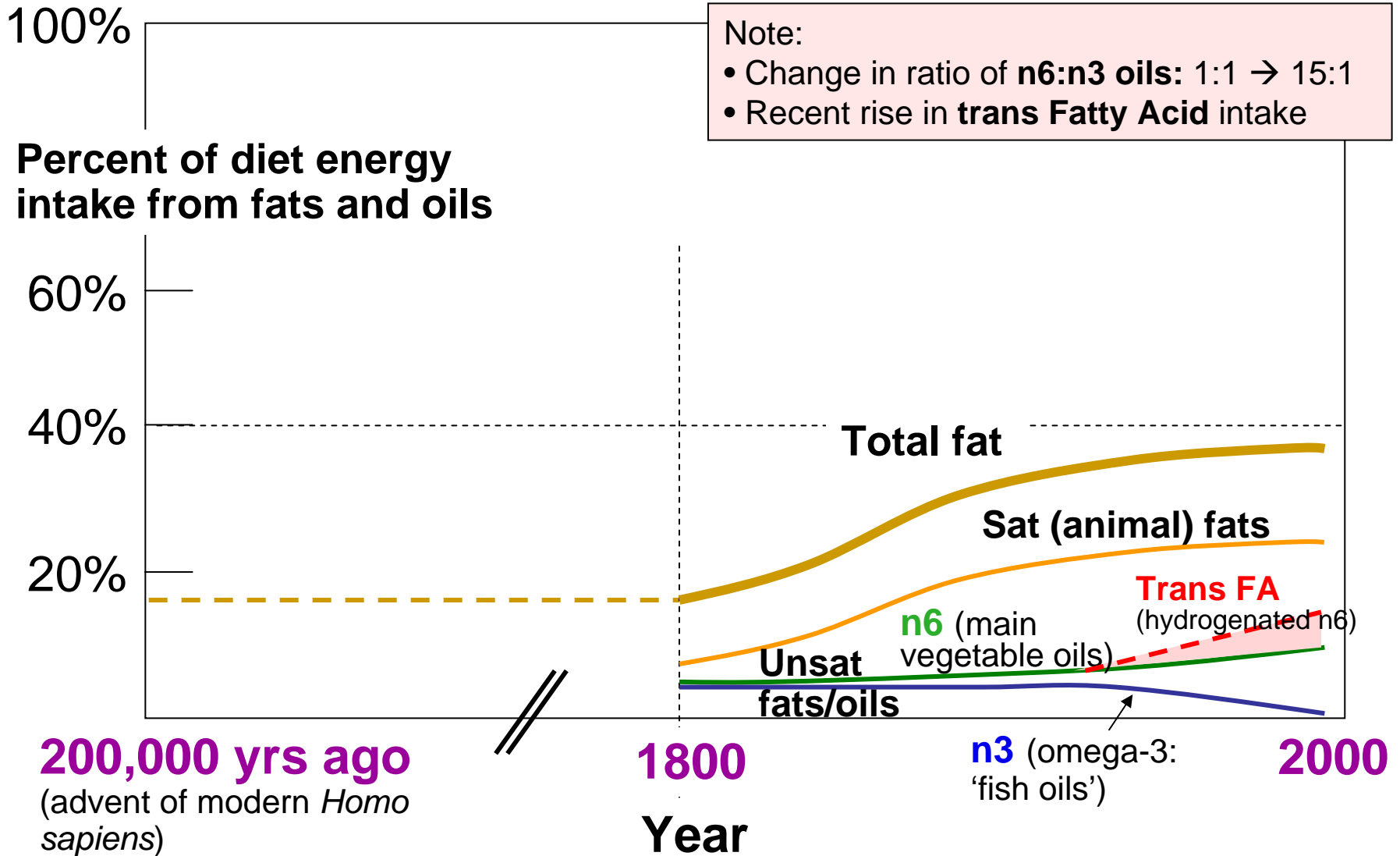
- Population health changes: historical, current**
- Global environmental changes**
- Climate change (CC) – real and accelerating (?)**
- Food-related examples:**
  - Fisheries
  - Red meat (ruminants)
  - ..... Cooper's ale
- CC Adaptive strategies – multi-sectoral**
- CC mitigation – revitalise Health Promotion?**
- Conclusion**

# Rise-and-Fall of 'Urban Health Penalties'

## The Developed Country experience



# Changes in dietary fat amount and composition since industrialisation



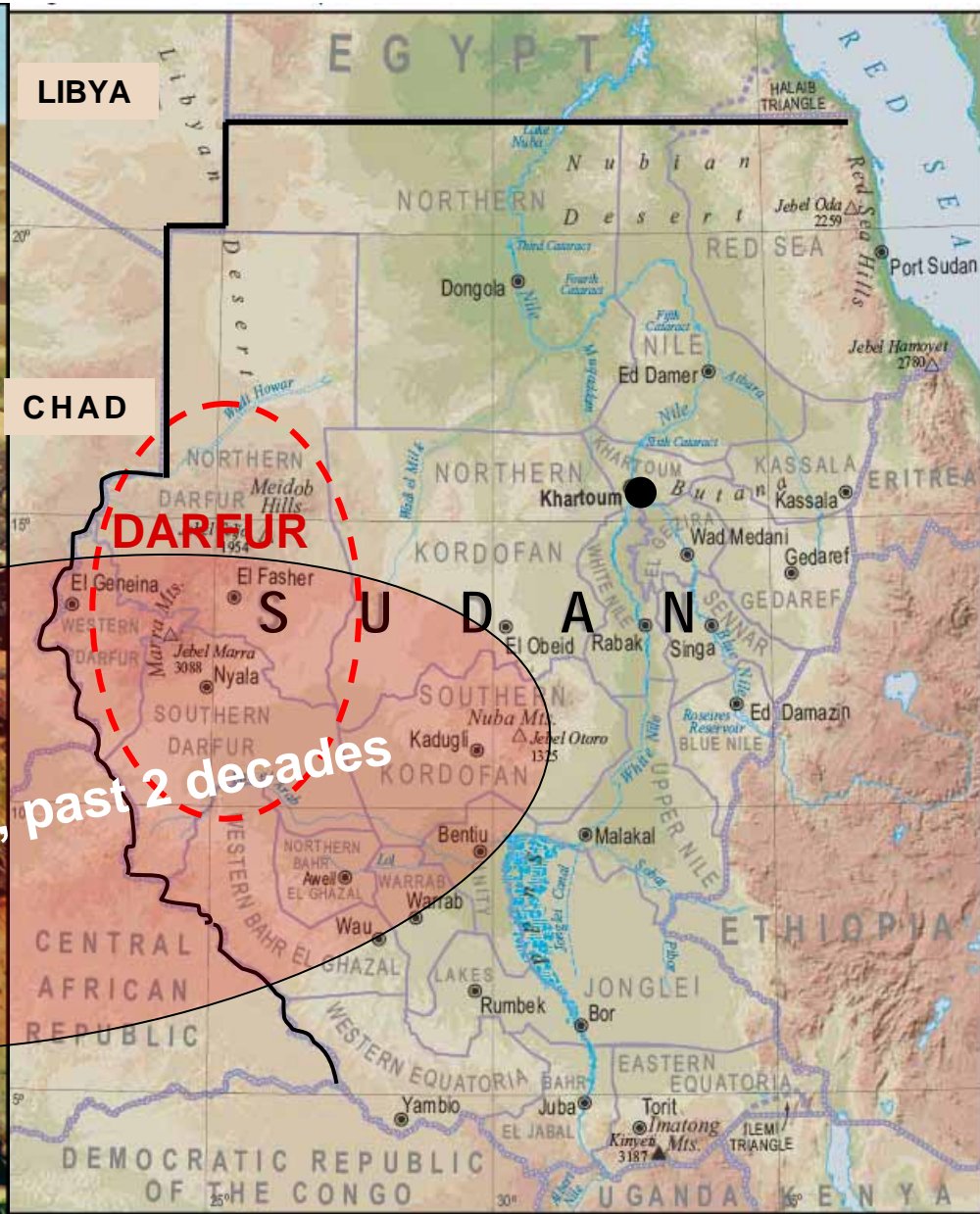


# Sudan

### Post-Conflict Environmental Assessment



Drying trend, past 2 decades



First published in June 2007 by the United Nations Environment Programme.  
© 2007, United Nations Environment Programme.

ISBN: 978-92-807-2702-9

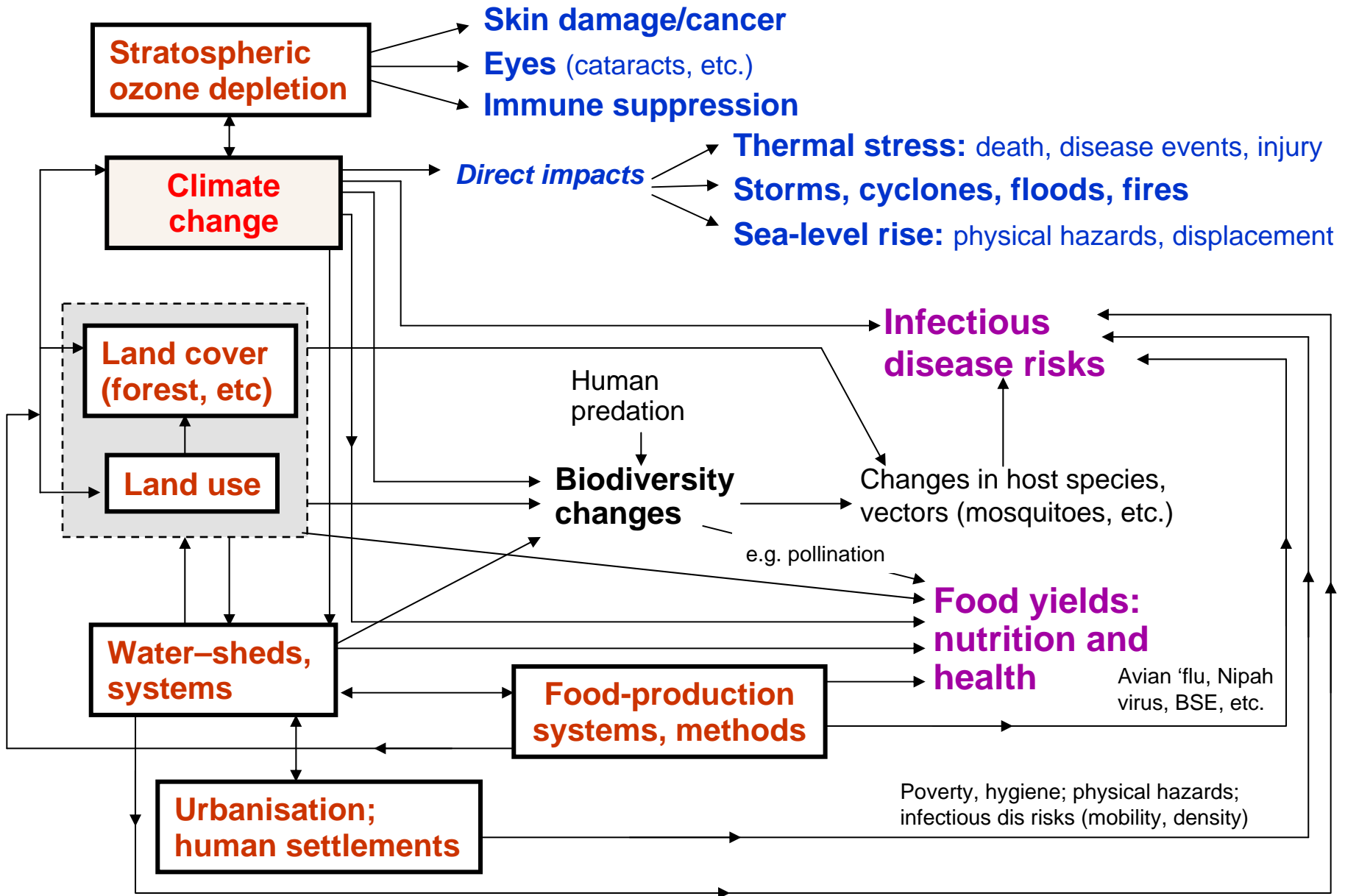
United Nations Environment Programme

# Darfur: Population, Environment, Climate, Conflict, Survival

From UNEP 2007 Report – Foreword:

UNEP's analysis indicates that there is a very strong link between land degradation, desertification and conflict in Darfur. Northern Darfur – where exponential population growth and related environmental stress have created the conditions for conflicts to be triggered and sustained by political, tribal or ethnic differences – can be considered a tragic example of the social breakdown that can result from ecological collapse. Long-term peace in the region will not be possible unless these underlying and closely linked environmental and livelihood issues are resolved.

# Global Environmental Changes: paths, health risks



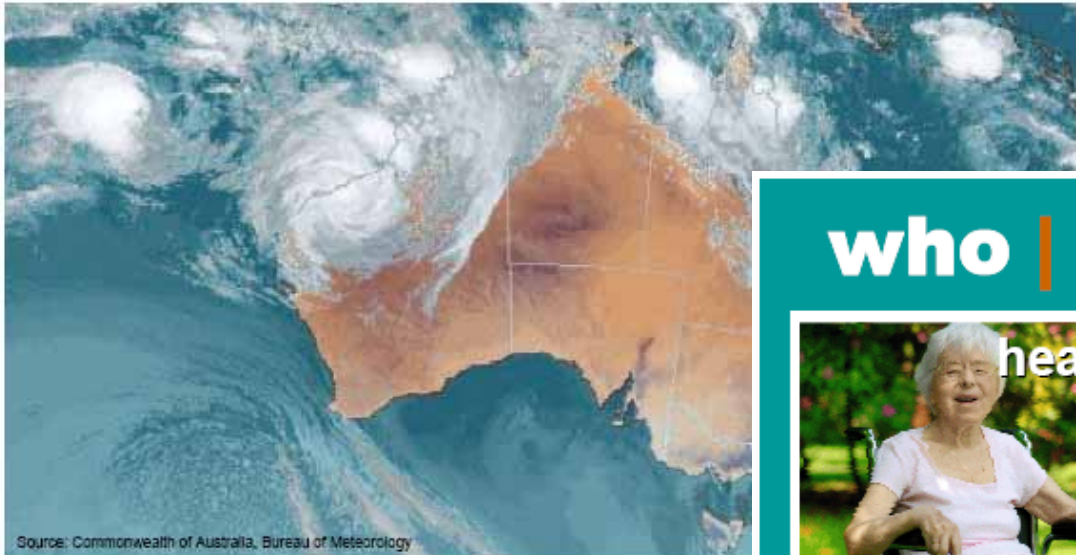




# Report of PMSEIC Working Group, June 2007

## CLIMATE CHANGE IN AUSTRALIA

regional impacts and adaptation | managing the risk for australia



Source: Commonwealth of Australia, Bureau of Meteorology

June 2007

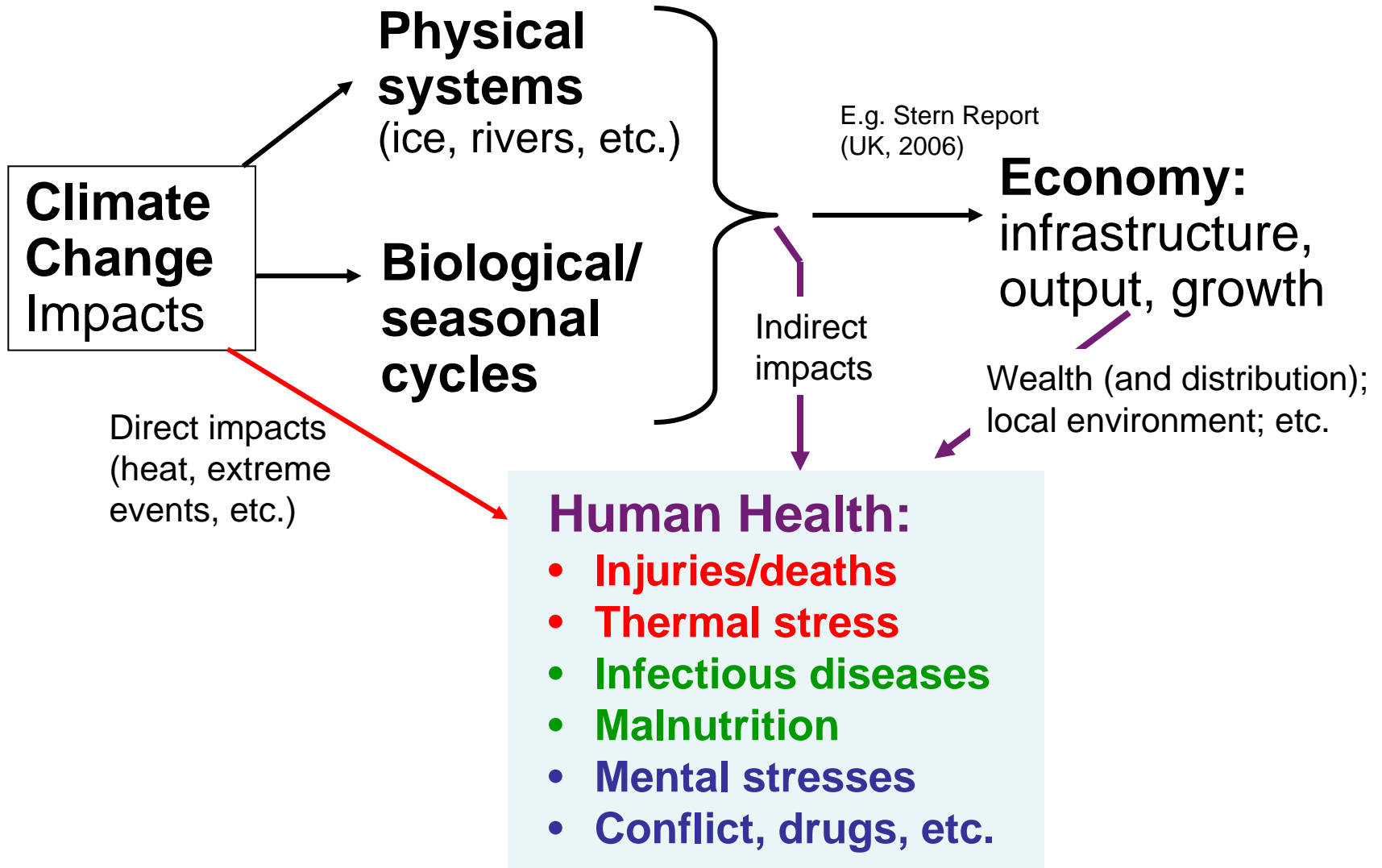
Professor Gerard  
Dr Chris Mitchell, Research Theme Leader, Climate, V  
Dr Deborah Rathjen, CEO and M

## who | what is at risk?

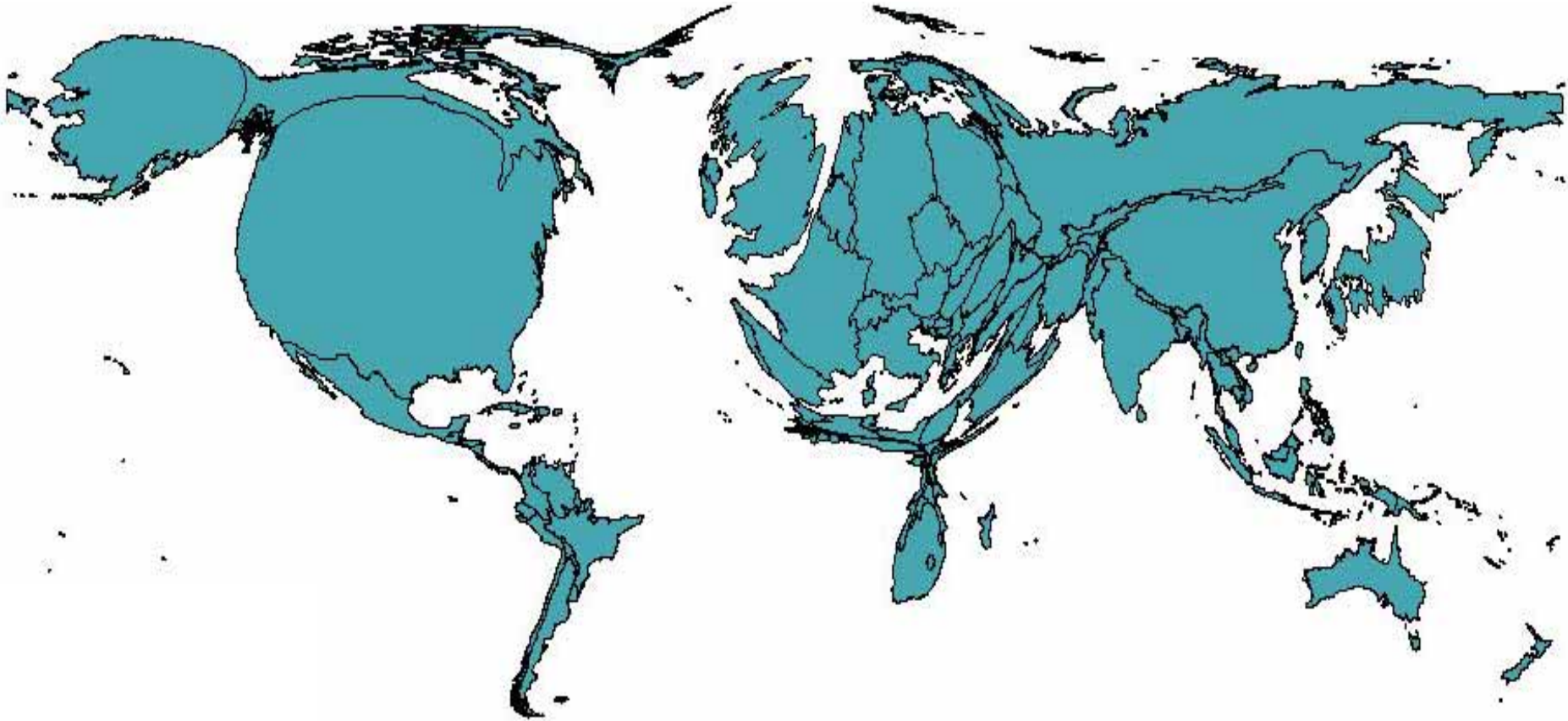


## CLIMATE CHANGE IN AUSTRALIA

# Climate Change & Health



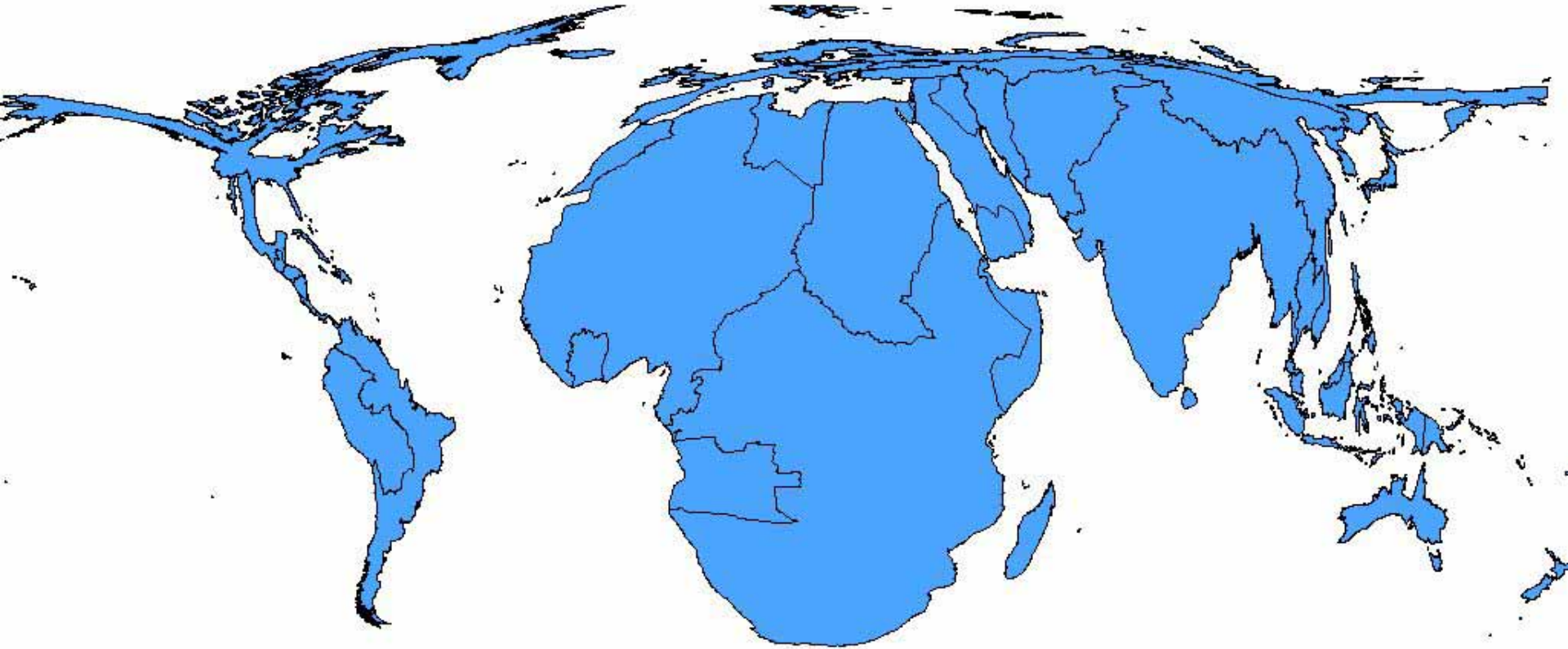
# Cartogram: Emissions of greenhouse gases



Density-equaling cartogram. Countries scaled according to cumulative emissions in billion tonnes carbon equivalent in 2002. Patz, Gibbs, et al, 2007

# Cartogram: Health impacts of climate change

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Density-equaling cartogram. WHO regions scaled according to estimated mortality (per million people) in the year 2000, attributable to the climate change that occurred from 1970s to 2000. Patz, Gibbs, et al, 2007.

# Climate Change: Faster than Expected in 1990s

IPCC Report 4 (2007) already looks conservative

Limited to science published by early 2006

Subsequent research shows increasing rates of:

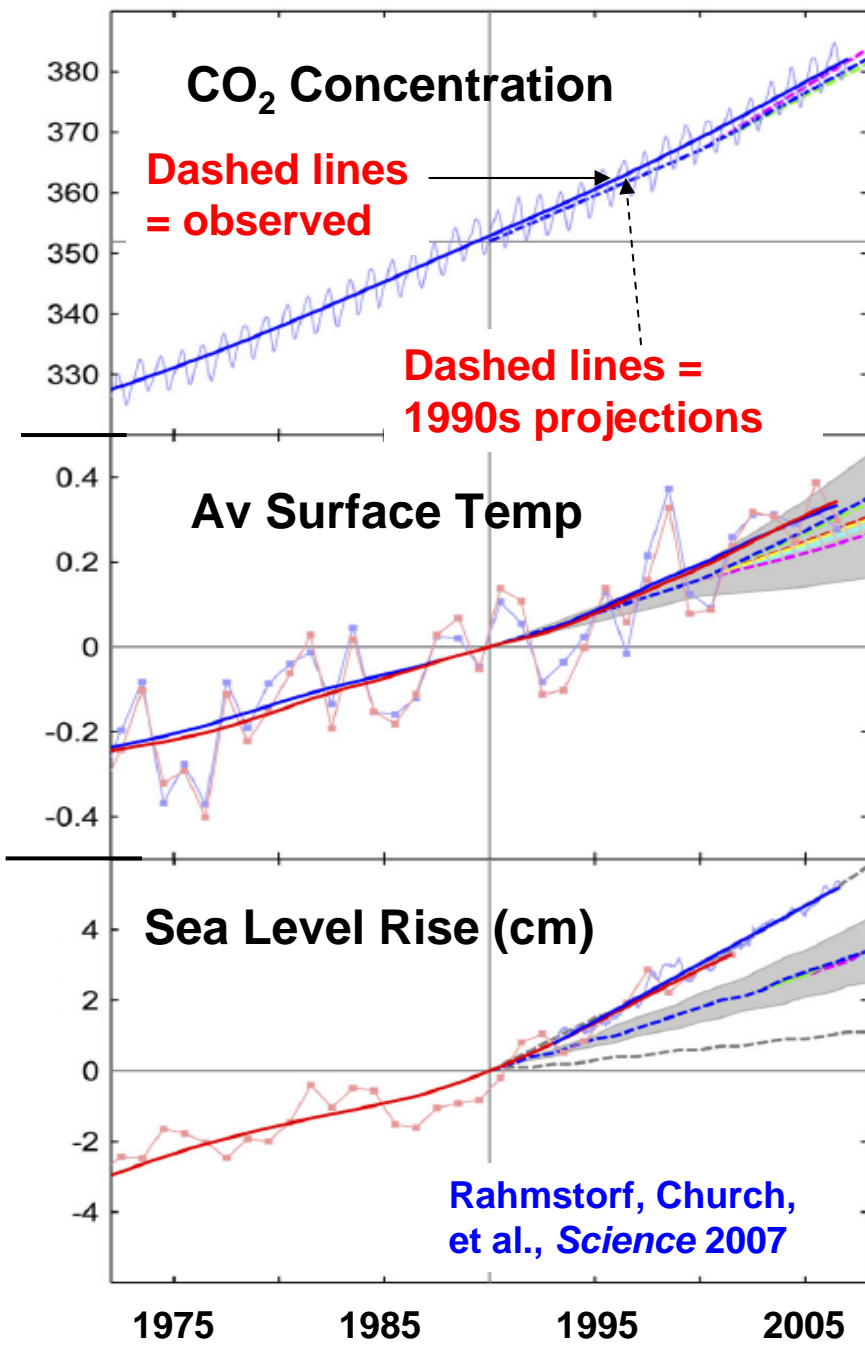
**Global GHG emissions**

**Temperature rise**

- esp in polar regions

**Ice melt** (Arctic: 40% loss since 1980, accelerating 2006-07)

**Sea-level rise**



# Recent Increase in Rate of CO<sub>2</sub> Emissions and Retention in Atmosphere

CO<sub>2</sub> emissions, annual rate of increase:

1990s = 1.3% → +1.5 ppm/yr

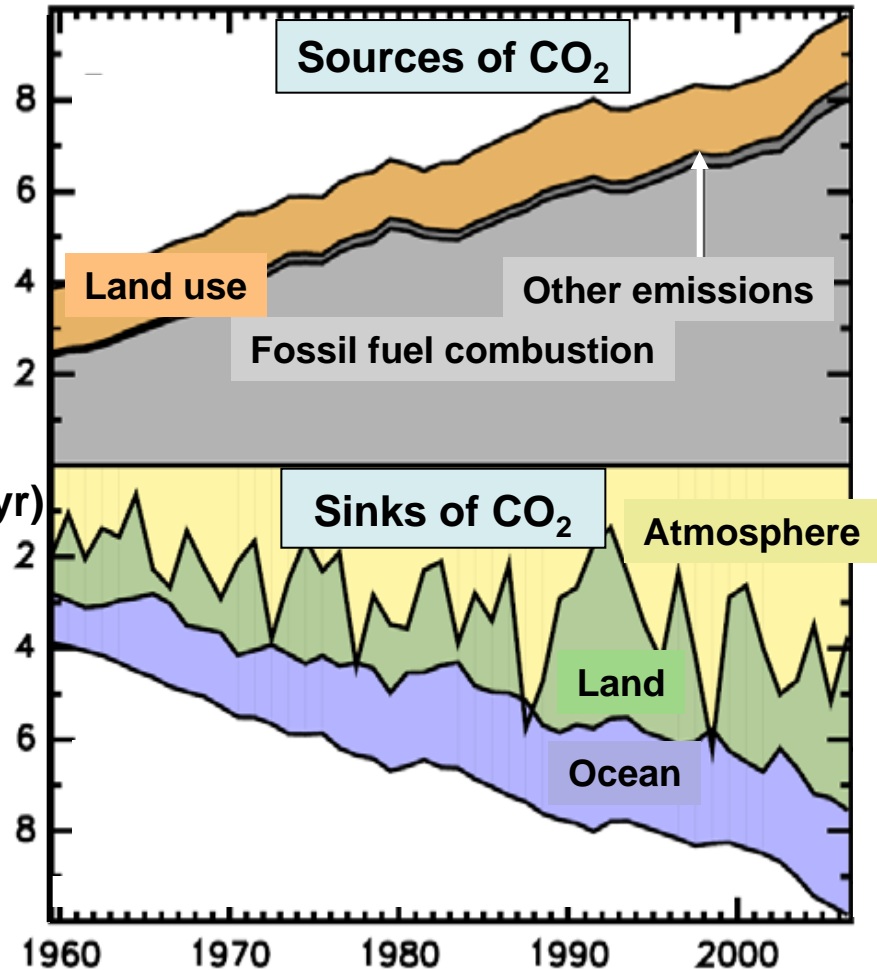
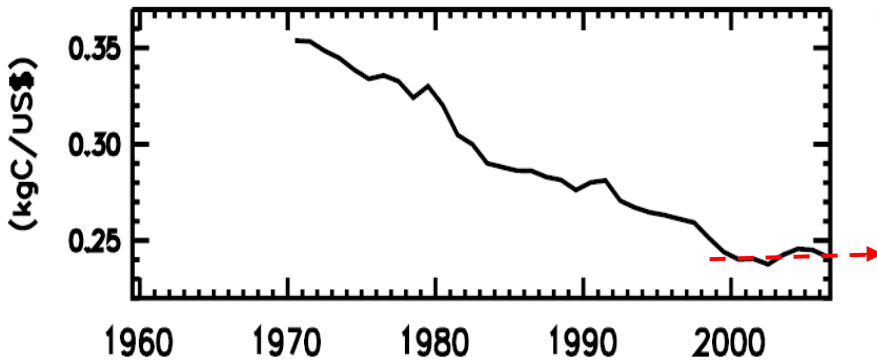
2000-06 = 3.3% → +1.9 ppm/yr

Atmospheric CO<sub>2</sub> increase since 2000 – due to increases in:

- Total emissions = ~65% of increase
- Carbon intensity of economies = ~17%
- Atmospheric retention = ~18%

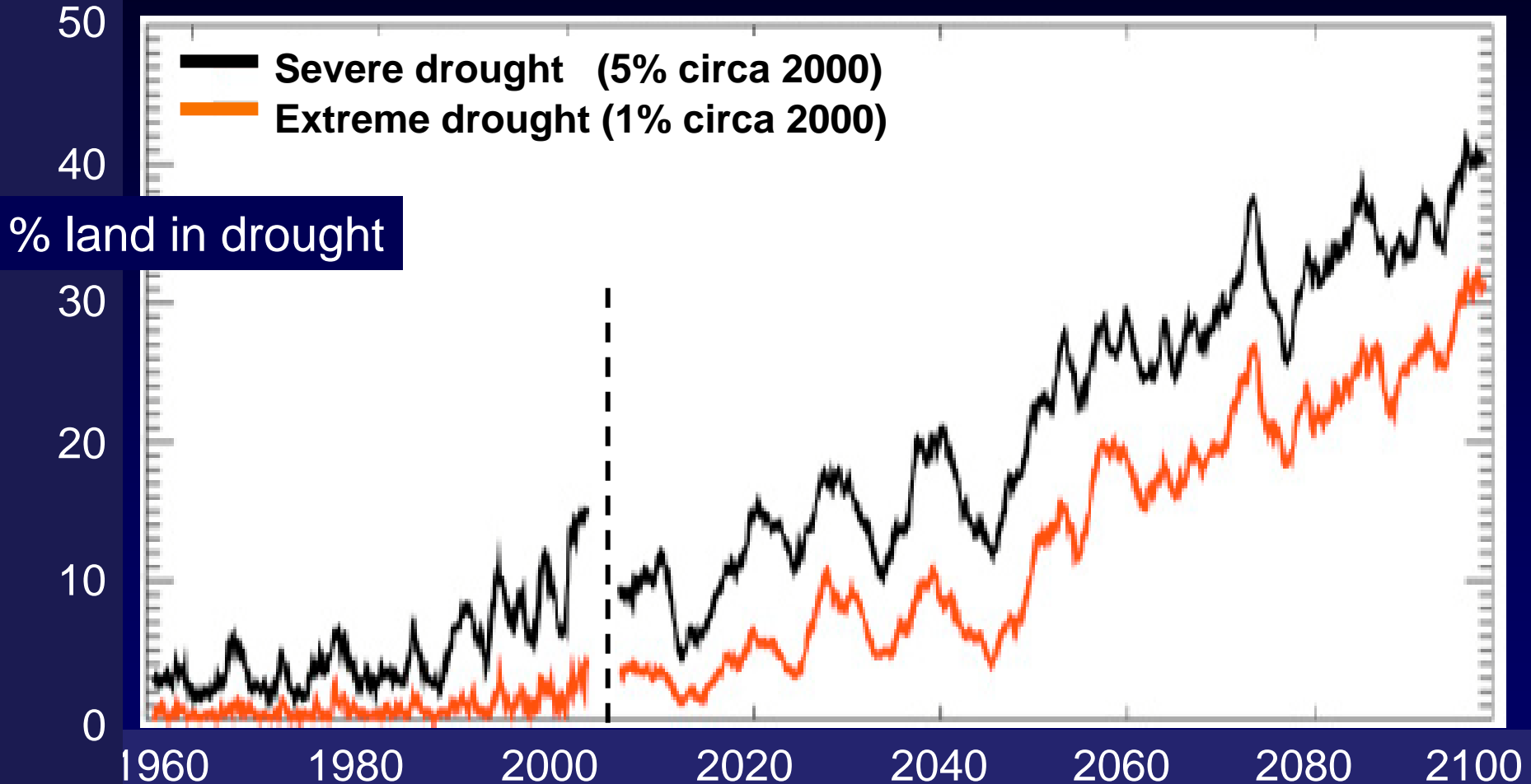
CO<sub>2</sub> Flux  
(Gigatonnes/yr)

## Fossil Fuel (C) Intensity of Economy



# Drought: Recent and likely future expansion under climate change

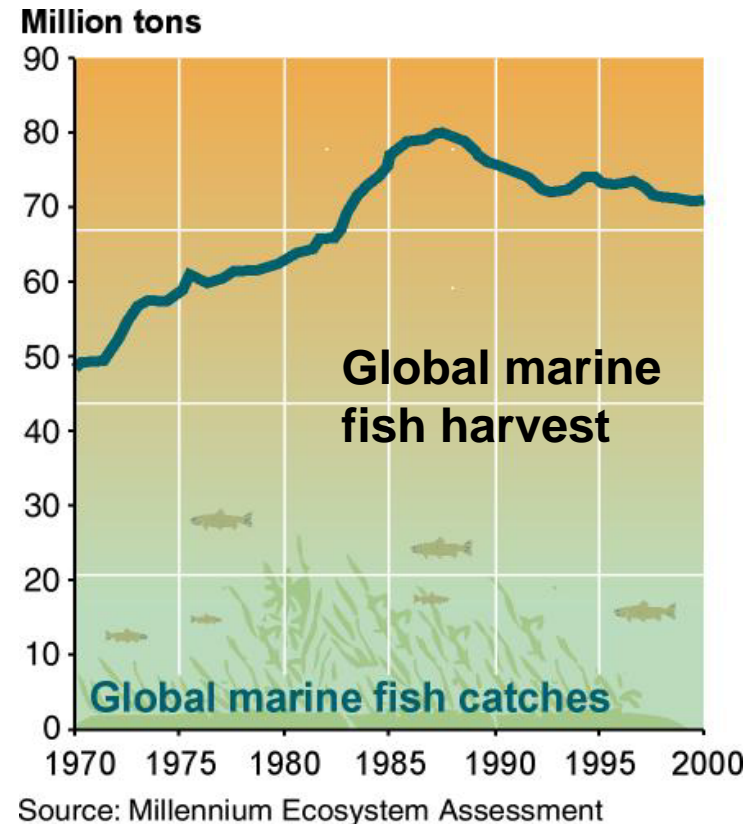
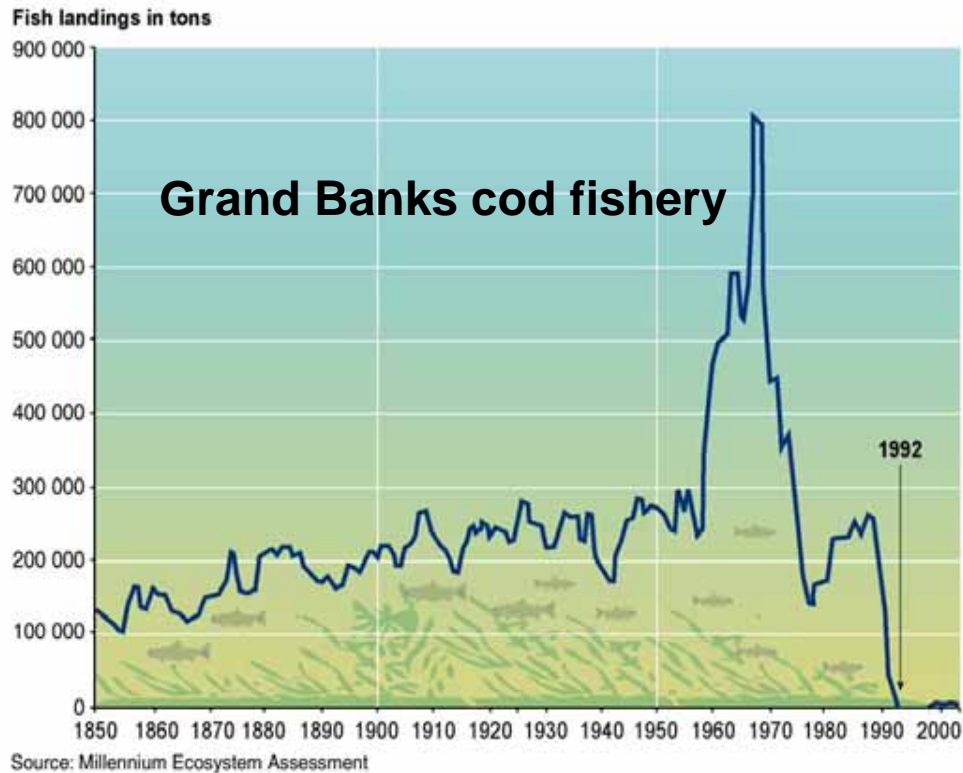
## Percentage of world's land area in drought



# Worldwide Capture-Fisheries

Fish account for a high proportion of **animal protein** in the world's diet – especially in many developing-country coastal communities.

25% of commercially exploited marine fish stocks are now seriously over-harvested  
(*Millennium Ecosystem Assessment, 2005*)



**Global fisheries harvest has declined since late '80s**



# Climate Change and Distribution Shifts in Marine Fishes

Allison L. Perry,<sup>1\*</sup> Paula J. Low,<sup>2†</sup> Jim R. Ellis,<sup>2</sup> John D. Reynolds<sup>1\*</sup>

“The distributions of exploited and non-exploited North Sea fishes have responded markedly to recent increases in sea temperature ...

Further temperature rises are likely to have profound impacts on commercial fisheries ...”

# Climate Change and Ocean Acidity

Report by (UK) Royal Society, 30 June 2005

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Increase in atmospheric carbon dioxide, from fossil fuel combustion, has already significantly increased ocean acidity.

Report Chair: "... yet another reason to be concerned about the CO<sub>2</sub> we are pumping into the atmosphere. Failure to cut CO<sub>2</sub> emissions may mean that there is no place in the oceans in future for many species and ecosystems that we know today."

**Calcification** (zooplankton, crustaceans, corals – the base of marine food web): Very sensitive to pH. Recent research indicates that 500 ppm CO<sub>2</sub> in atmosphere may cause ocean acidity that shuts off calcification. That level would be reached by around 2040, on current trends (390 ppm, now rising by 2 ppm pa).

See also IPCC website: Fourth Assessment Report, 2007: Wkg Group II.

# That is, in combination:

**Over-fishing,**

**Ocean warming, and**

**Ocean acidification**

**... are all impairing the marine food web  
and future productivity of ocean fisheries**

**A compelling case of global  
environmental non-sustainability!**

## Ruminating on Ruminants: Meat, Methane and Heat

Upsurge in world meat (esp ruminant) production poses a serious threat to both environment and climate.

New wealth and consumer preference in developing countries.

See FAO (website): *Livestock's Long Shadow* (2006)



The world's livestock sector, including feed-grain production, accounts for **almost one-fifth of global greenhouse gas emissions**. Methane, from ruminants, is a particular, and increasing, problem.

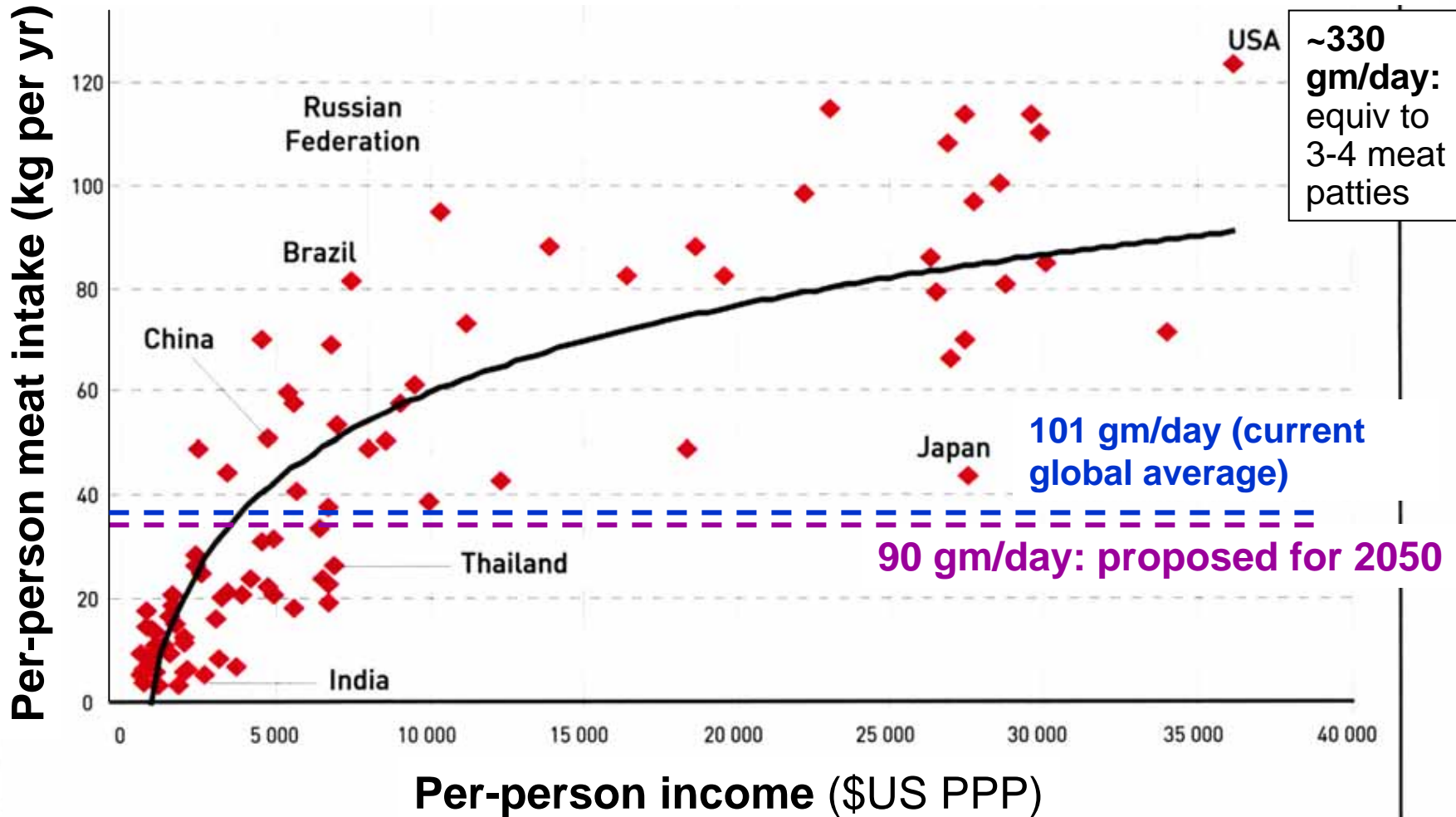
# Global annual greenhouse gas emissions from livestock

(Source: FAO, 2006: *Livestock's Long Shadow*)

Animal type	Carbon dioxide (m. tonnes, global, 2002)	Methane, enteric (m. tonnes, global, 2004)	Methane, manure (m. tonnes, global, 2004)
Cattle and buffaloes	1906	75* (buffaloes = 9)	8 (buffaloes = 0.3)
Small ruminants: sheep and goats	514	9	0.3
Camels	18	-	-
Horses	71	-	-
Pigs	590	1	8
Poultry	61	-	1
<b>Total</b>	<b>3161</b>	<b>86</b>	<b>18</b>

\* **Note:** Dairy cattle account for one-quarter of cattle enteric methane emissions

# Relationship between meat consumption and per capita income, in 2002



Note: National per capita based on purchasing power parity (PPP).

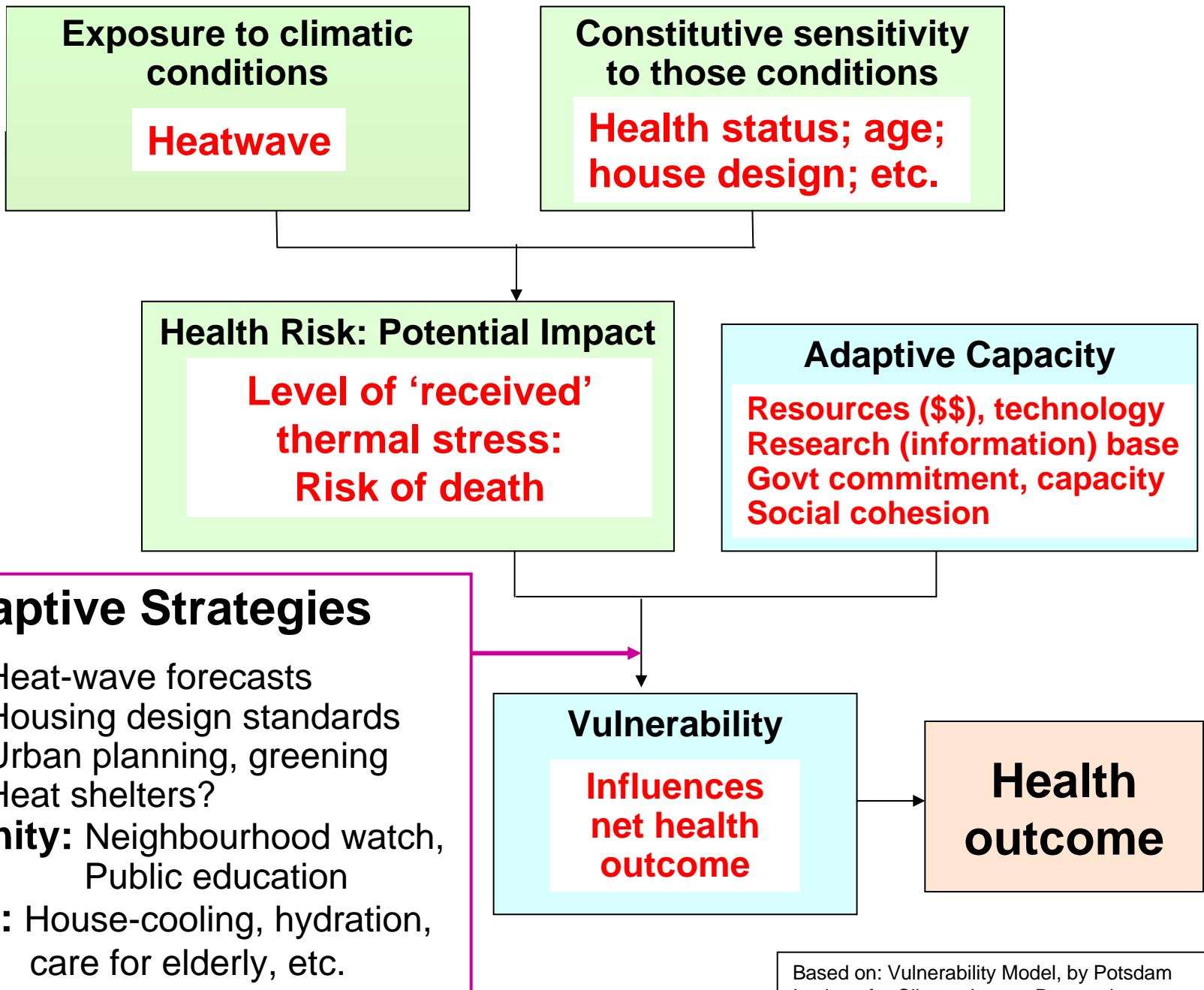
Source: World Bank (2006) and FAO (2006b).

Likely change in risk of meat-related diseases in (today's) high- and low-income populations, if achieve global standard of 90 gm meat/day per capita in all countries (<50 gm ruminant red meat)

	High-income countries	Low-income countries
Current approximate total meat consumption (g per day per person)	200–250	25–50
Change in		
Heart disease*	---	+
Stroke	No substantial effect	---
Colorectal cancer	---	++
Breast cancer	-- (?)	+
Childhood growth stunting	No substantial effect	----
Overweight/obesity	--	(+)

Risk shifts refer only to the effect of a change in meat consumption. Other associated dietary changes are not considered. \*Attributable mainly to saturated fat content.

(McMichael et al, *Lancet* 2007)



Based on: Vulnerability Model, by Potsdam Institute for Climate Impact Research.



# Health Co-Benefits from GHG Emissions

## Mitigation Actions: Revitalised Hlth Promotion?

### Reduced fossil fuel combustion:

Reduce cardio-respiratory deaths/hospitalisations from local air pollution (esp. fine particulates).

### Low-emission urban (public) transport system:

Increase physical activity (walking, cycling) → reduce over-weight, improve lipid/endocrine profiles, increase social contact and wellbeing.

Road trauma should decline.

### Reduced red (ruminant) meat consumption (livestock sector is major source of GHG emissions, esp. methane)

Reduce risks of some disease: large bowel cancer, ?breast cancer; also heart disease (meat fat content).

### More energy-efficient housing

Reduce family costs, and, especially for lower-income households, reduce thermal stresses – and debt-related mental stress.

Kiosk

JCDecaux

**Reduce  
carbon  
emissions.**

**Walk to  
the pub.**



Hand-made by the Cooper family. Est. 1862.

# Health Promotion

taking the long  
view

# Concluding Comment

## “What Do We Really Want to Sustain?”

Population health is not just an occasional ‘bonus’ side-benefit of public policy

It should not be viewed mainly as an economic resource

We form societies, build settlements, create institutions and governments primarily to achieve the fundamentals of human experience: security, wellbeing, health, survival

....Therefore: Population Health is the  
Real Bottom Line of Sustainability

**OK: that's all,  
folks – and  
remember ...  
the World is  
not like Me**



Australia's iconic Albert, the Magic (Sustainable) Pudding – a source of endless slices.

# Population Strategy to Improve Health

Population distribution for a specified risk factor

