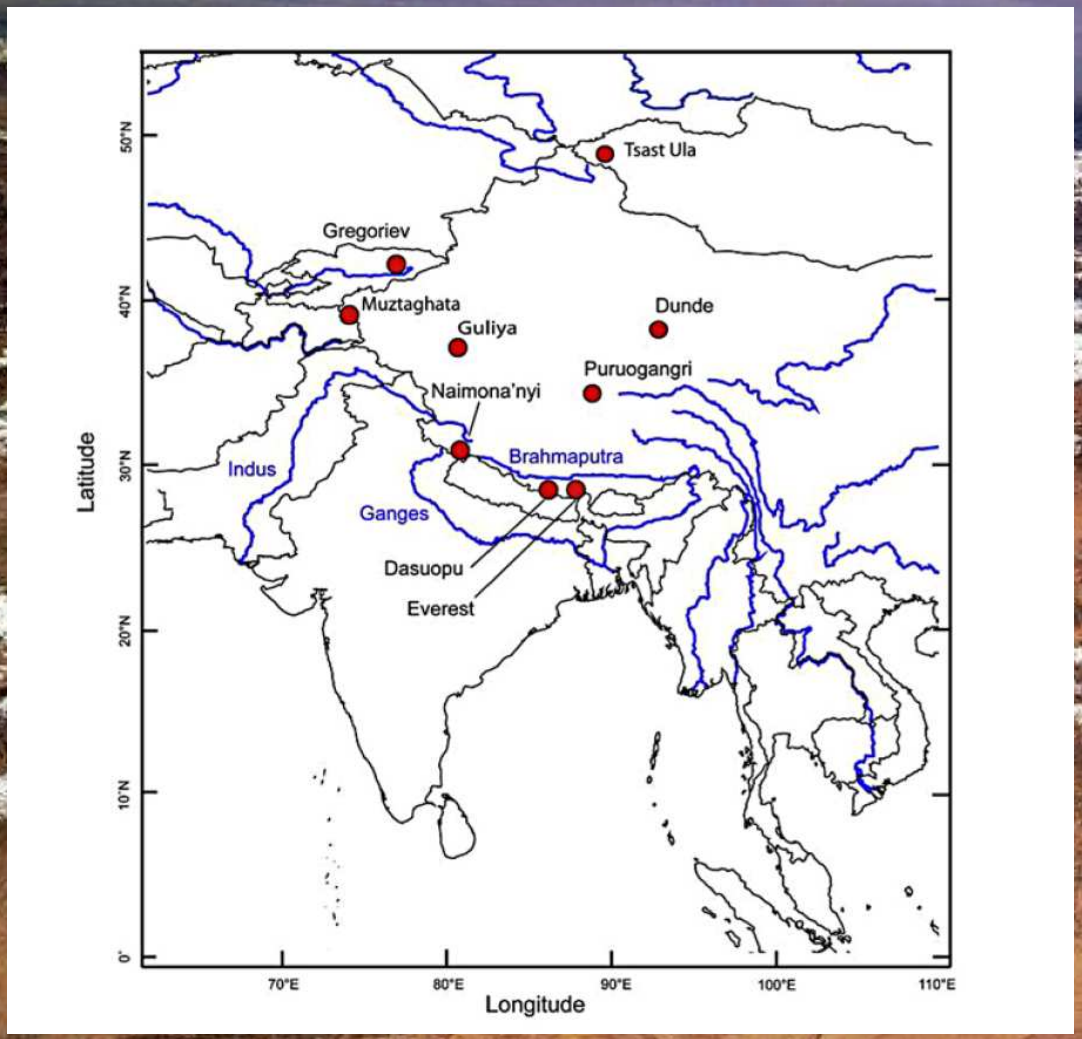
How Stable are Human Societies to Climate Change?

Úrsula Oswald Spring
CRIM-National University of Mexico
Universität Hamburg, 19-20 Novermber, 2009
Plenary Panel

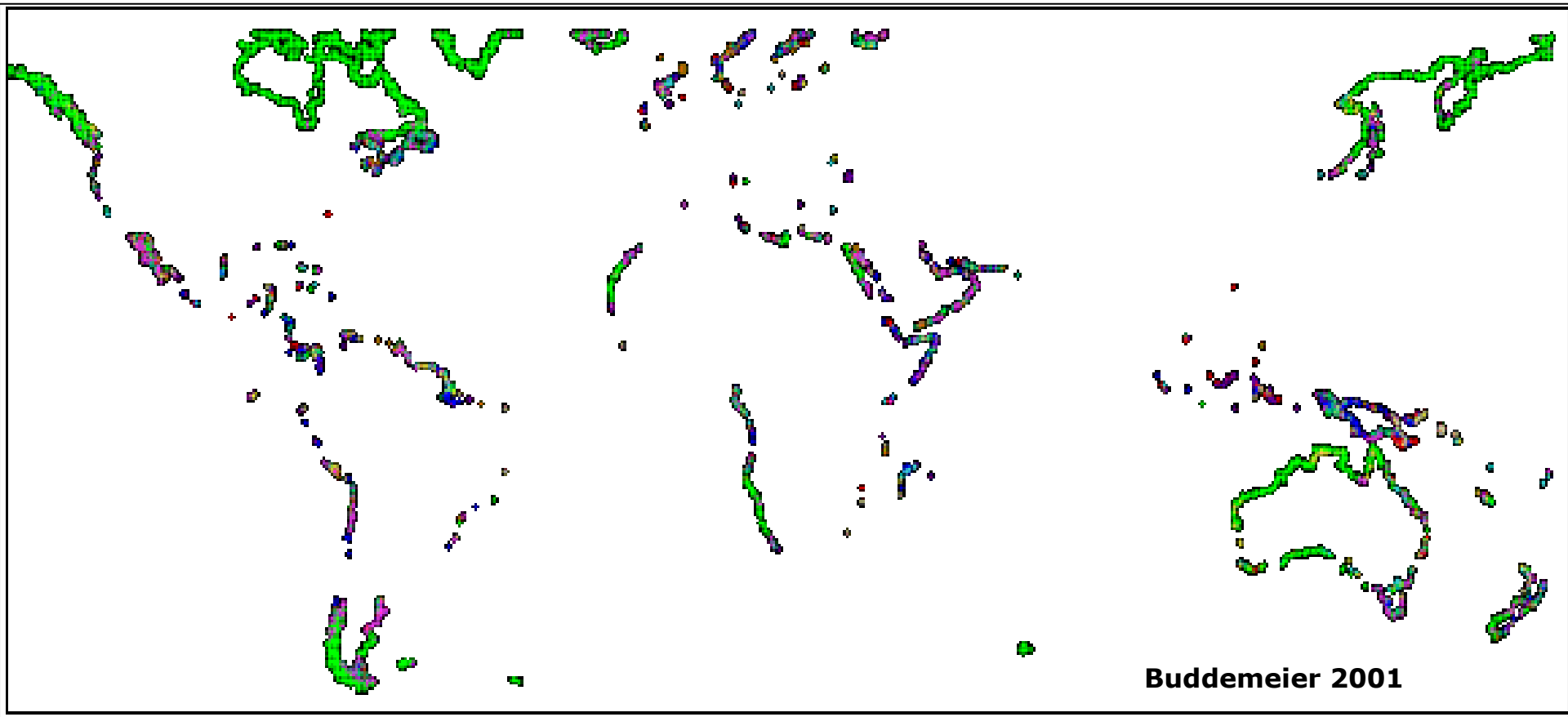
Characteristics of CC

1. Extreme temperatures: warmer and colder with CO2 rise
2. Alteration of precipitation patterns, water scarcity & pollution
3. Hydrometeorological events: greater frequency/higher impact
4. Desertification, drought and erosion (DLDD)
5. Loss of glaciers, sea level rise and flood of coastal areas
6. Deforestation, erosion, loss of biodiversity and ecosystems
7. Loss of rural livelihood, food production
8. Poverty and social inequality with population growth
9. Urbanization with slums, lack of sustainable development
10. Economic and environmental forced migration
11. New plagues and illnesses (avian, swine flue, Ebola)
12. Uncertain future with human suffering and natural destruction
13. Acidification, anoxia and stratospheric ozone depletion
14. Tipping points and their complex interrelation



„Mass loss on Himalayan glacier endangers water resources“ (Kehrwald et al. 2008 Geophys Res Lett)

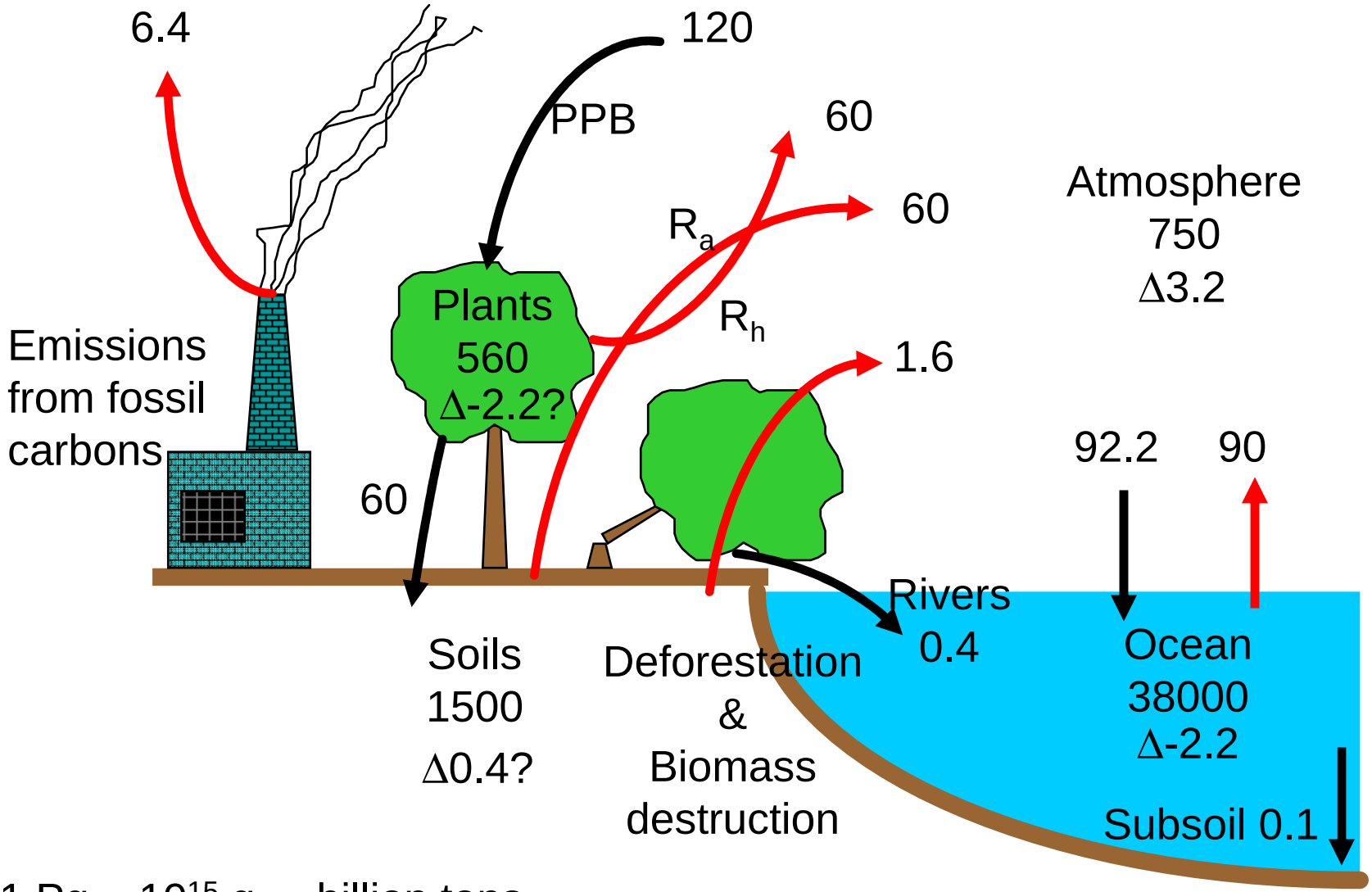
Sea level rise and desaparation of coastal zones



Pristine coasts defined as low (<10/km²) with people and los agricultural use (<5%)

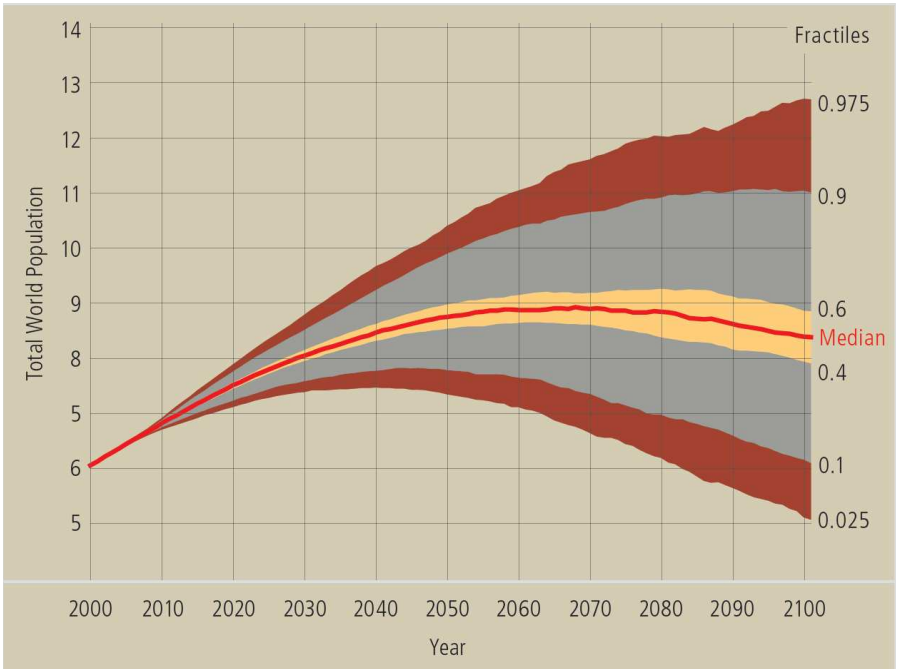
Alteration of Carbon Cycle

Modern 7 Global Cycle of Global (Pg C) based Schlesinger, 2003



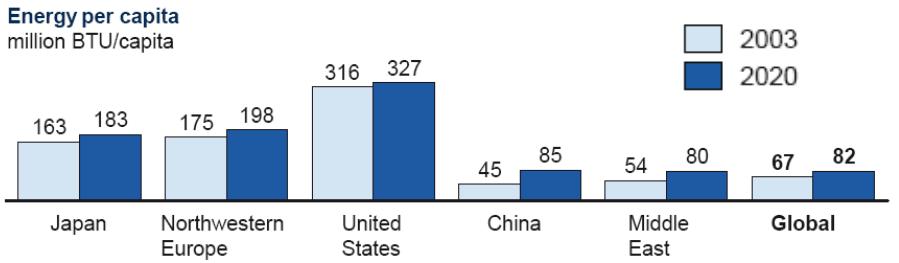
1 Pg = 10^{15} g = billion tons

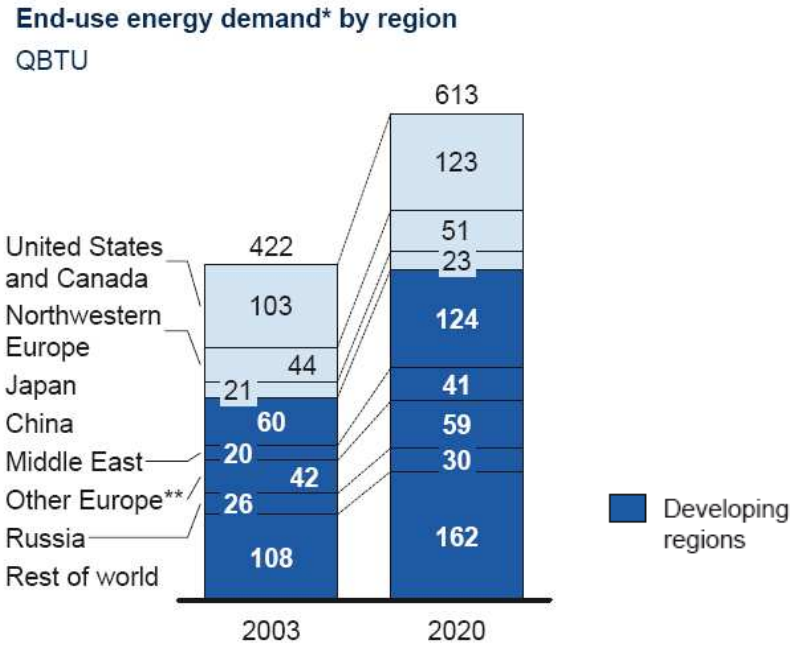
Population Growth/Energy Demand Projections



Uncertainty distribution of total world population in 2100, in billions

(Lutz et al. IIASA 2007)





(MGI Global Energy Demand Model 2007)

Tipping elements in the Earth's climate system

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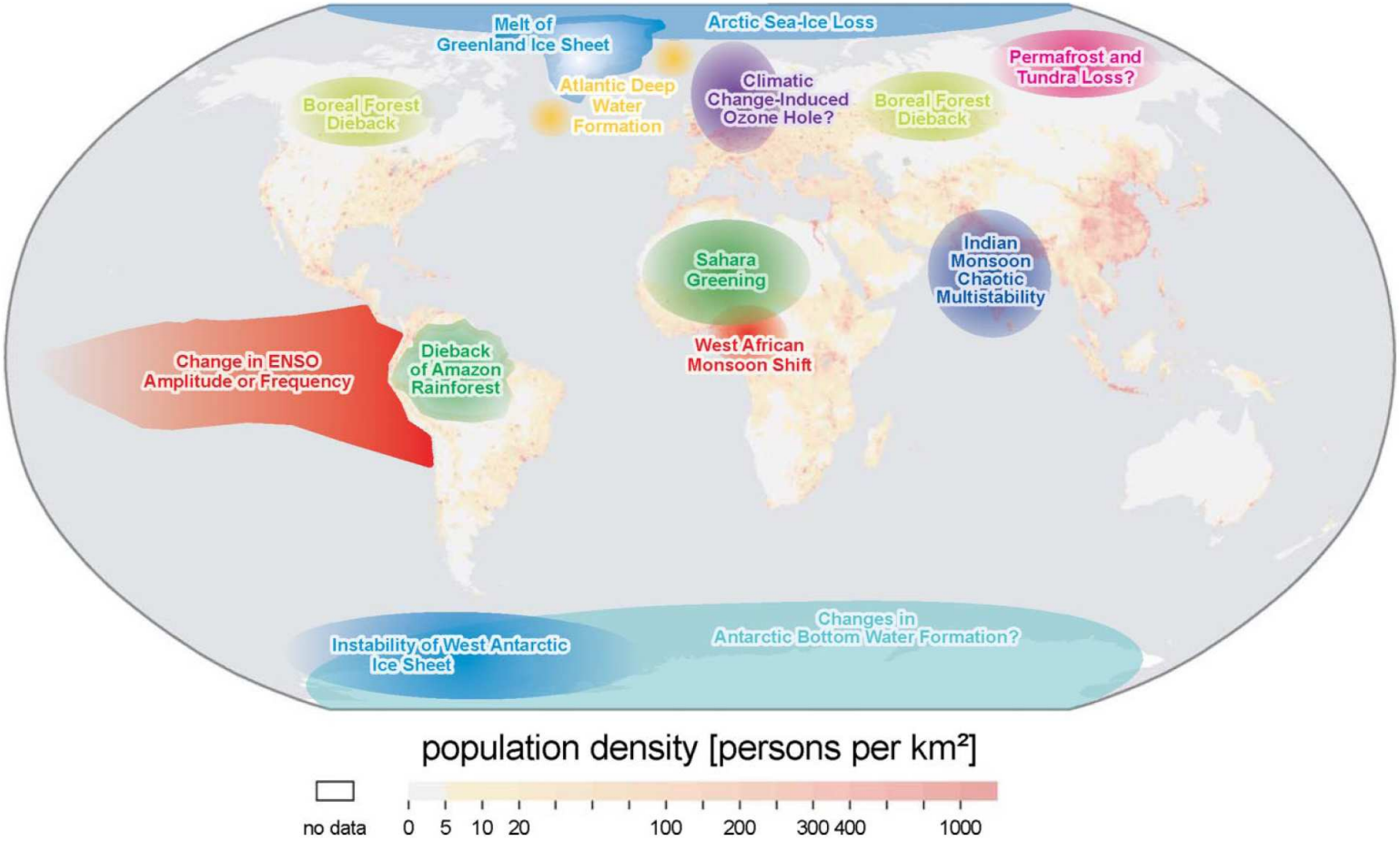
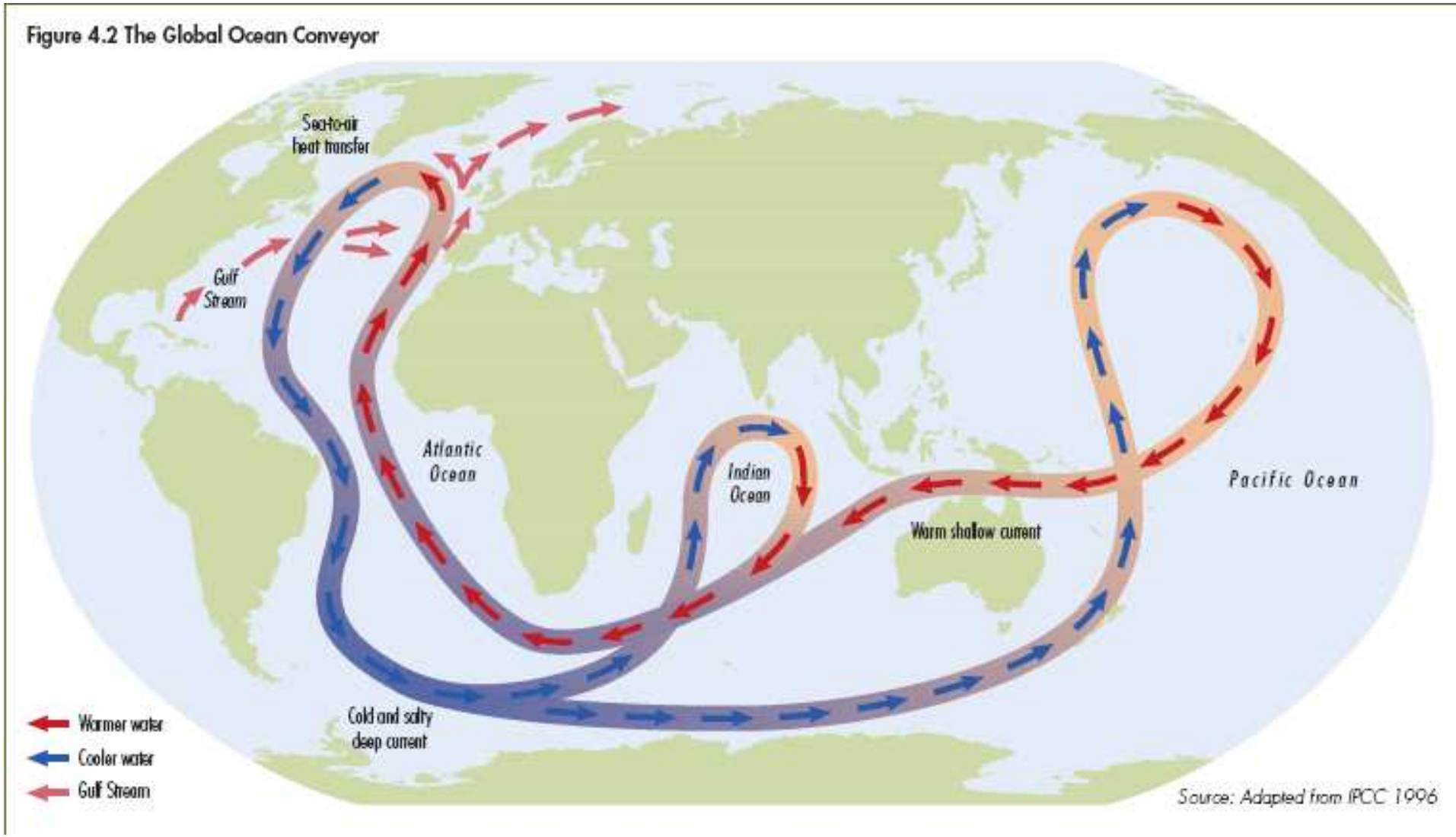
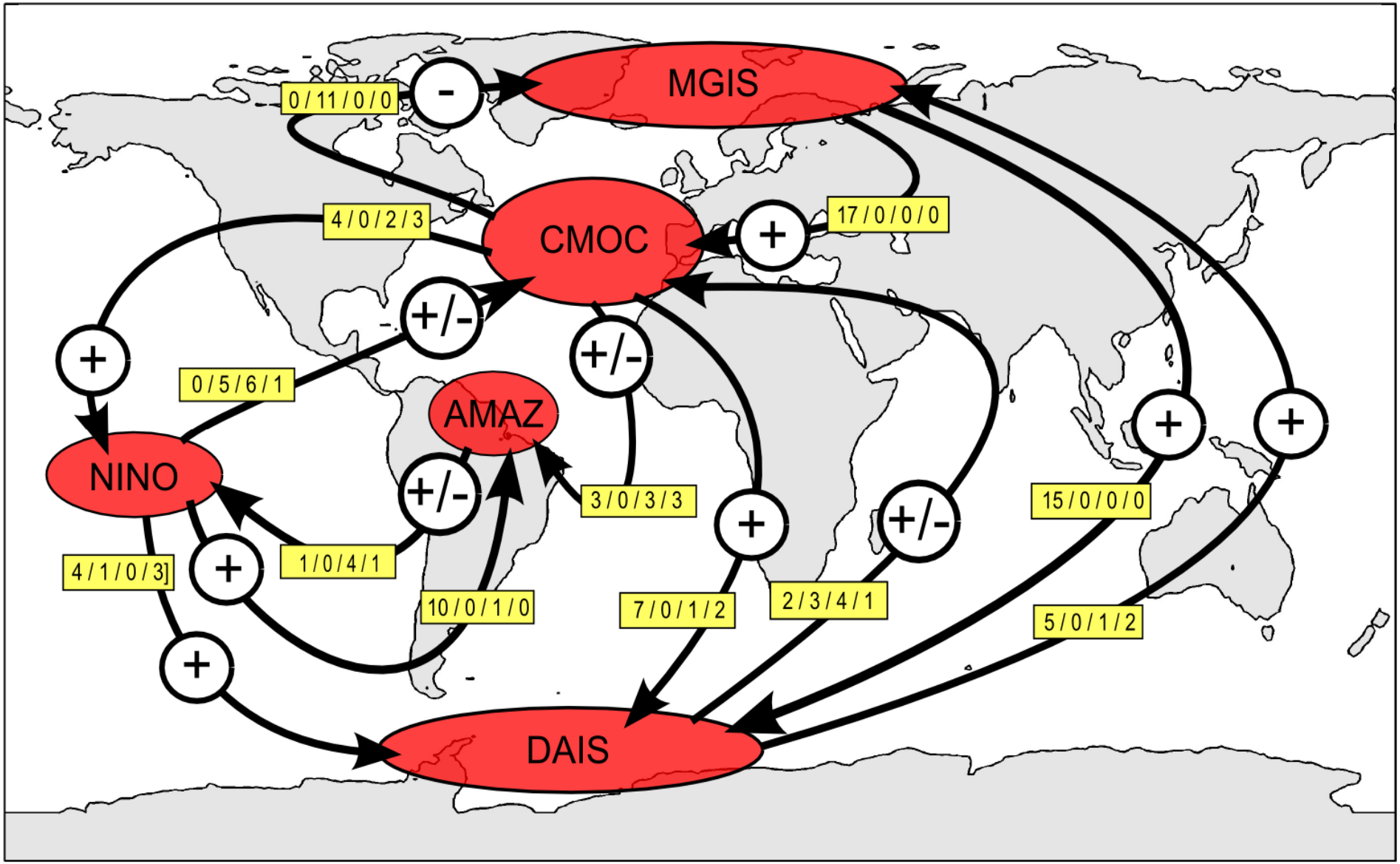


Global Ocean Conveyor



Source: GEO-4, 2007:119

Interdependency between tipping points

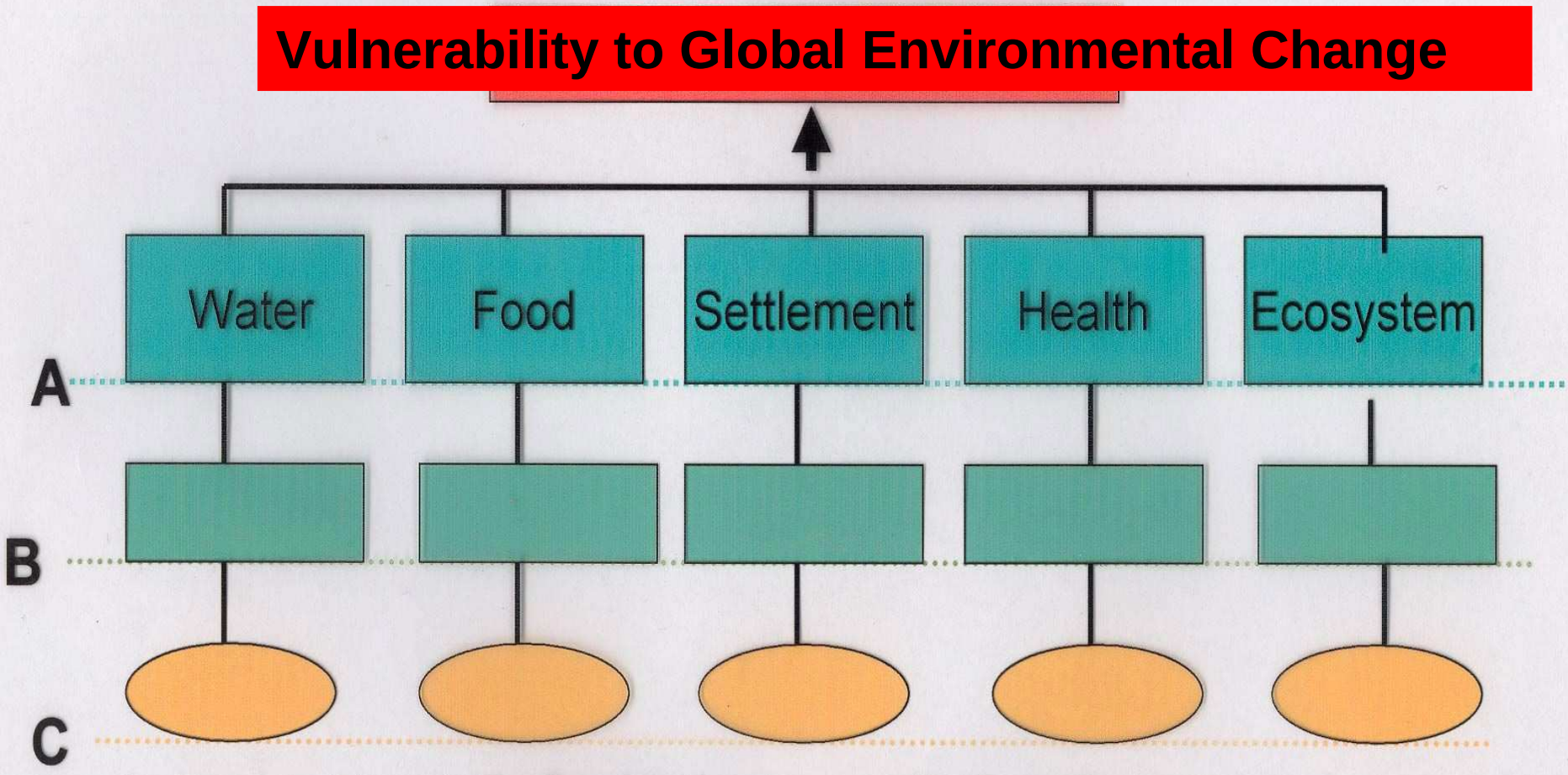


Kriegler et al., PNAS xx: x-y, 2009

Economic Impact of Climate Change

- UNFCCC: in 2030 between 1.1-1.7% of global investment: **67 -100 billion** USD/year
- Additional investment for reducing greenhouse gases: **200 to 210 billion** USD from now on
- Passivity (“doing nothing”) increases costs enormously
- Investment in prevention substantially reduces final costs
- Ethical business goes beyond immediate profit motives
- Sustainable related values, strategies and practices mitigate impact of CC-related disasters and social inequality, and reduce social vulnerability

Assessing Vulnerability (R.T. Watson, et al. 1998. IPCC)



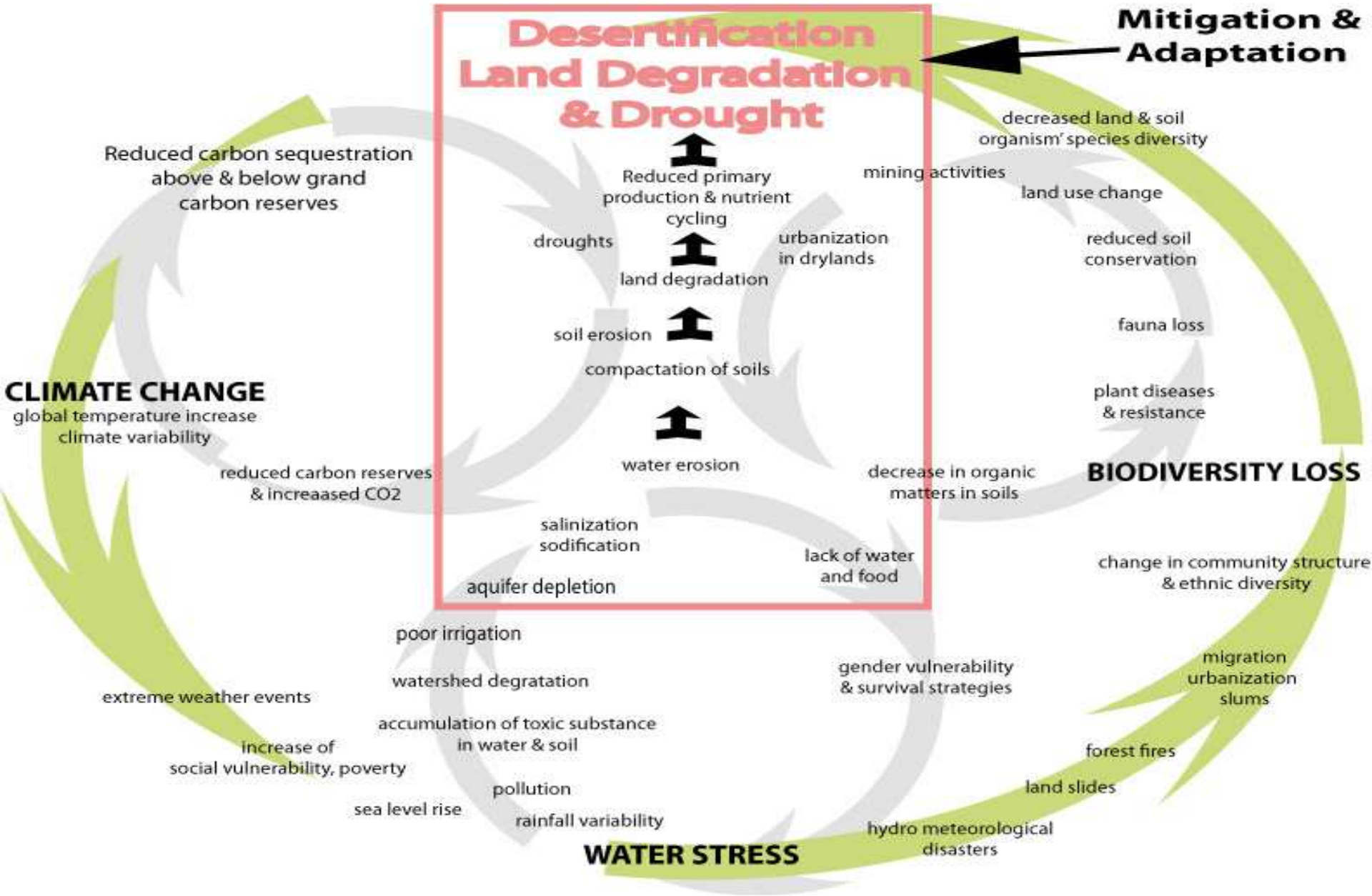
A: Sectoral level; B: Coping level; and C: Sensitivity level

Vulnerability = *f*(sensitivity, adaptability, exposure)

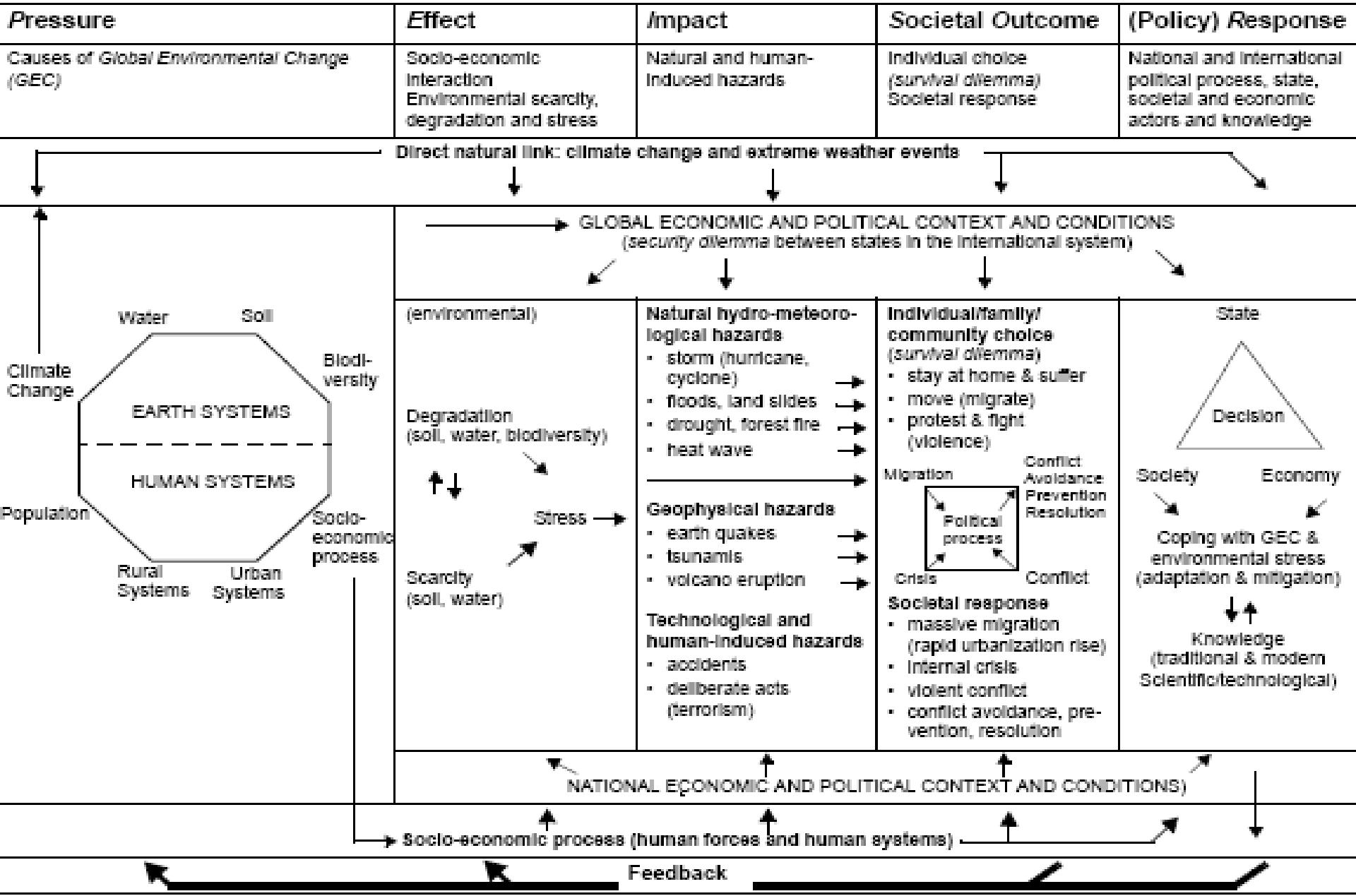
Obstacles: Social Vulnerability

- Social vulnerability is an historical and accumulative result of poverty and unequal access to material and cultural consumption and power.
- Increase susceptibility of a community or person confronted with hazard impacts.
- Poor women, heads of single household are at greater risks: **poverty has women's face**.
- Hazard impacts **can empower** affected people and prepare them to cope with disasters and new risks.

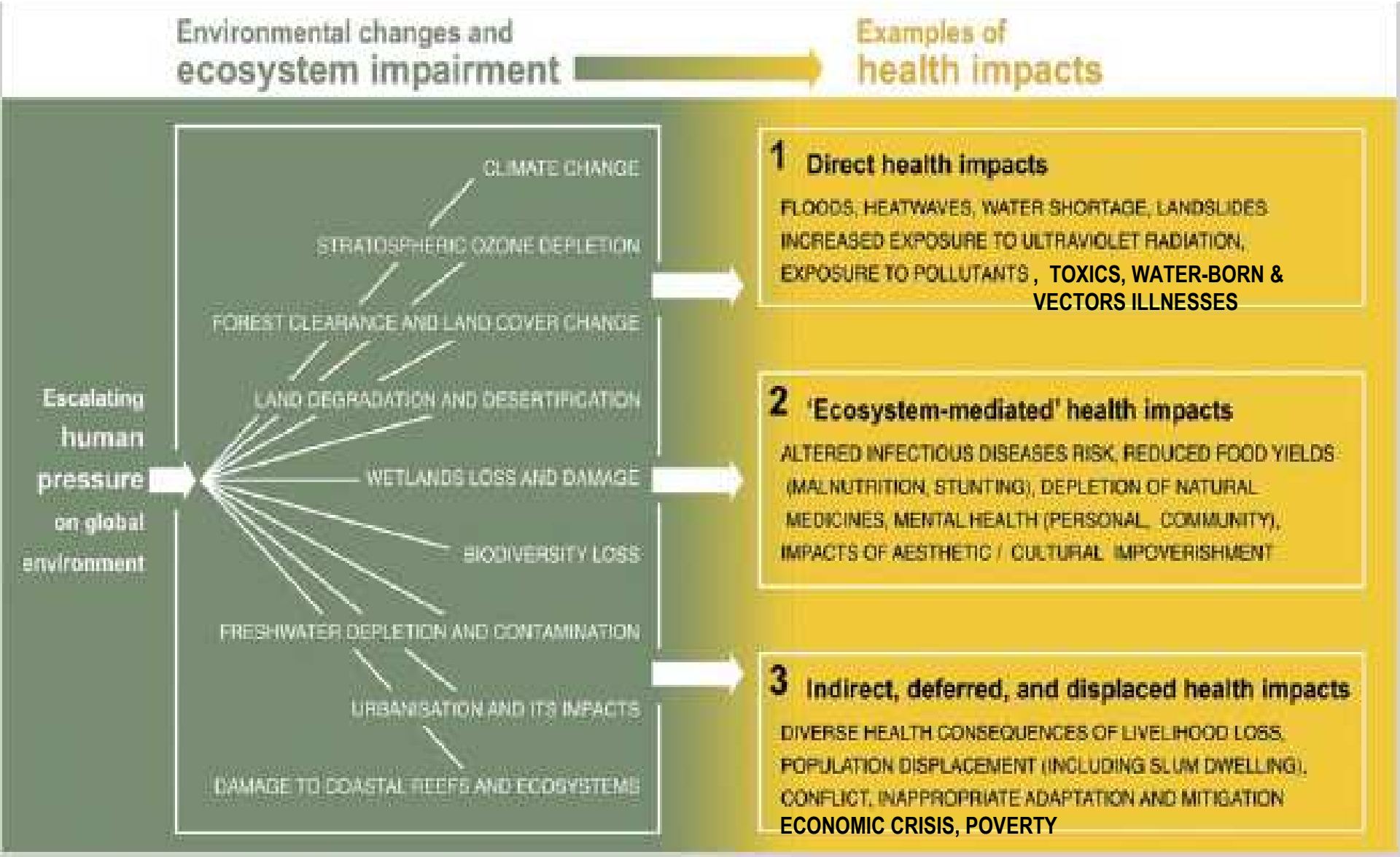
Interactions of GEC and health



PEISOR model & health impacts

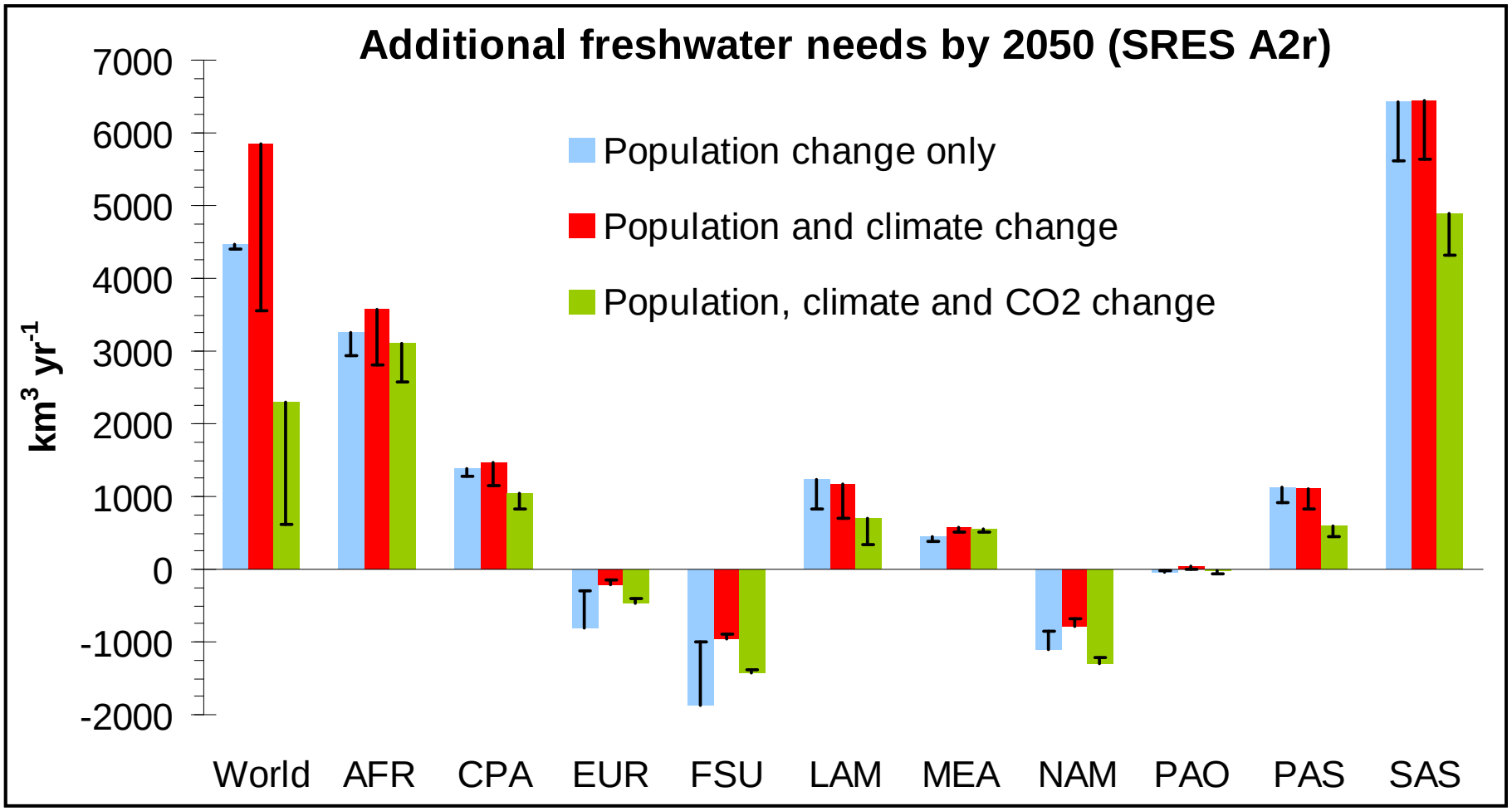


How could CC affect well-being & health?



This figure describes the causal pathway from escalating human pressures on the environment through to ecosystem changes resulting in diverse health consequences. Not all ecosystem changes are included. Some changes can have positive effects (e.g. food production).

Planetary Gaps in 2050?



(Gerten et al. in prep)

rainfed water management options

Stabilisation scenarios

Global mean temp. increase (°C)	Stabilization level (ppm CO_2-eq)	Year CO_2 needs to peak
2.0 – 2.4	445 – 490	2000 – 2015
2.4 – 2.8	490 – 535	2000 – 2020
2.8 – 3.2	535 – 590	2010 – 2030
3.2 – 4.0	590 – 710	2020 – 2060

Source: Pachauri, 2009, IPCC

Costs of mitigation in 2030

Stabilisation levels (ppm CO2-eq)	Range of GDP reduction (%)	Reduction of average annual GDP growth rates (percentage
445 - 535	< 3	< 0.12
535 - 590	0.2 – 2.5	< 0.1
590 - 710	-0.6 – 1.2	< 0.06

Mitigation measures would induce 0.6% gain to 3% decrease of GDP in 2030 (Source: Pachauri, 2009, IPCC)


Thank you for your attention
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