

AVOIDING DANGEROUS CLIMATE CHANGE

A Scientific Symposium on Stabilisation of Greenhouse Gases

1 – 3 February, 2005

Met Office, Exeter, United Kingdom

Climate change and water resources: a global perspective

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University of Southampton



Outline

Characterising water resources

Estimating the future

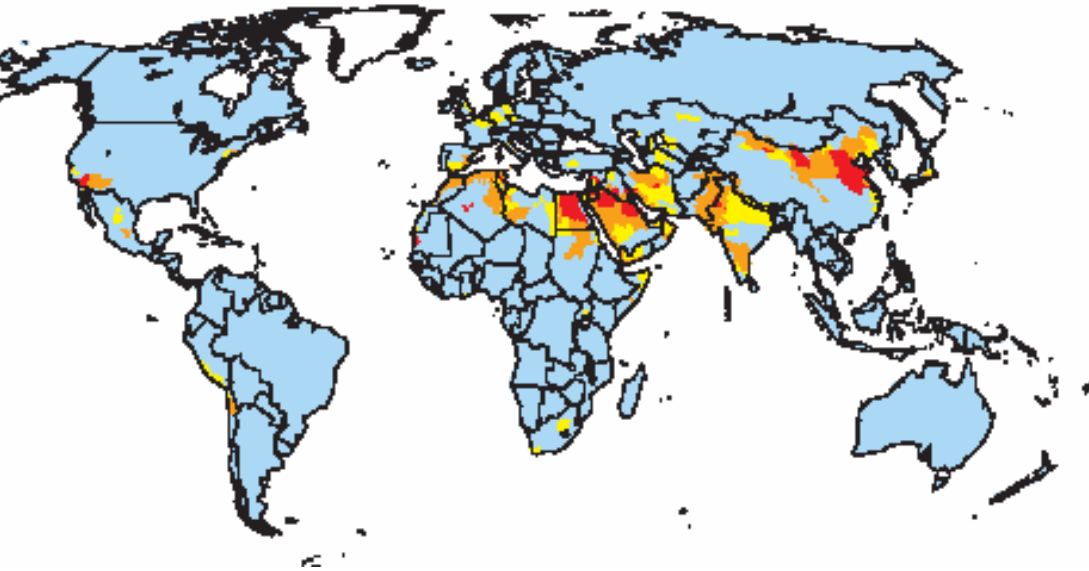
Impacts of climate change with no mitigation

Effects of mitigation on the impacts

Conclusions



The current situation



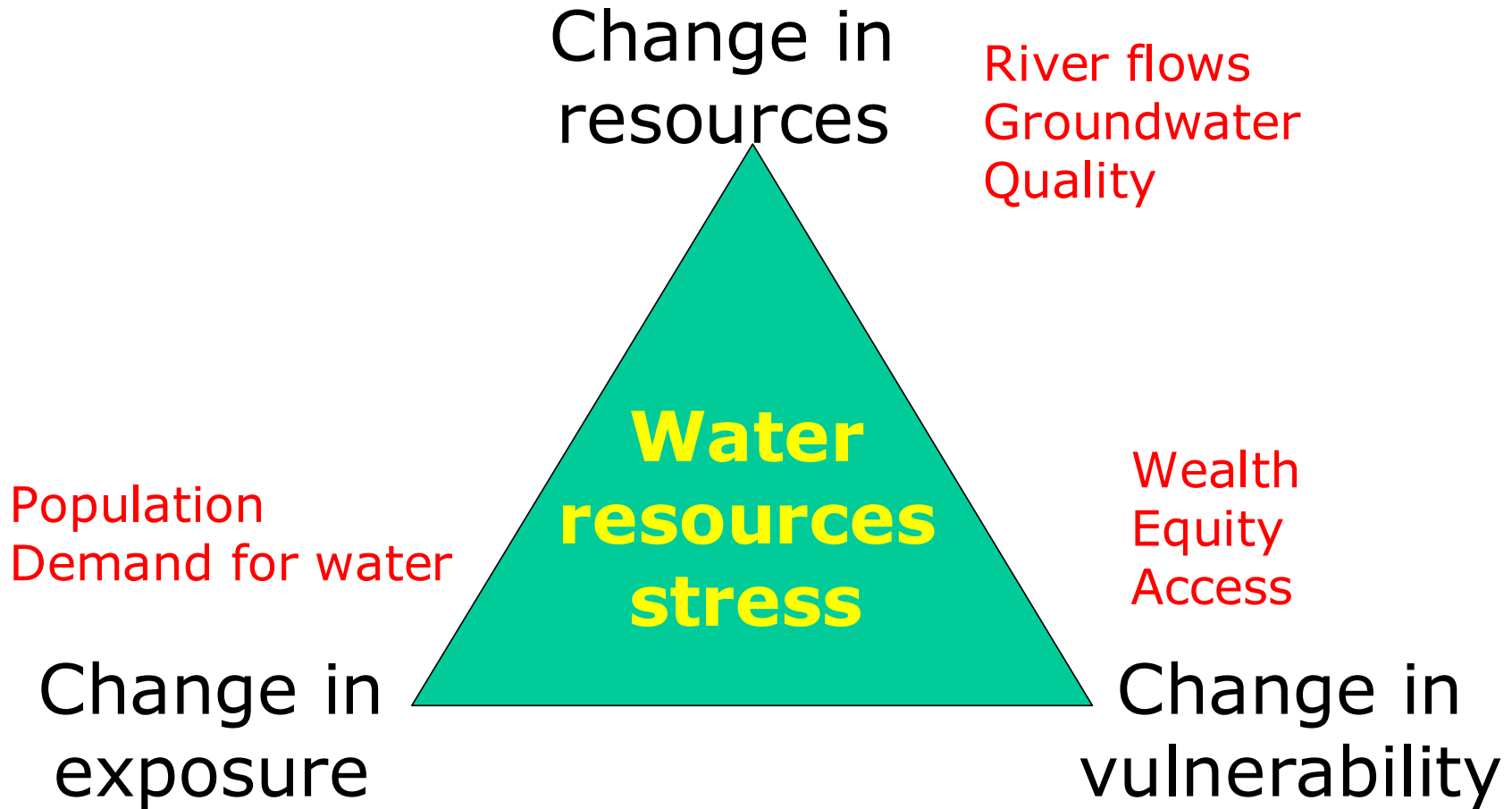
1.4 billion people in watersheds with < 1000m³/capita/year

1 billion people without access to safe drinking water

2.4 billion people with poor sanitation

 >1700 m³/capita  1000-1700 m³/capita  500-1000 m³/capita  <500 m³/capita

Drivers of change



Measures of stress

Indicators of exposure

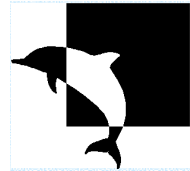
- numbers affected by flood / drought

Indicators of access

- numbers with access to safe water

Indicators of availability

- resources per capita



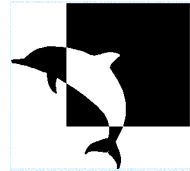
Estimating the future

Future impacts depend on future climate and future exposed population

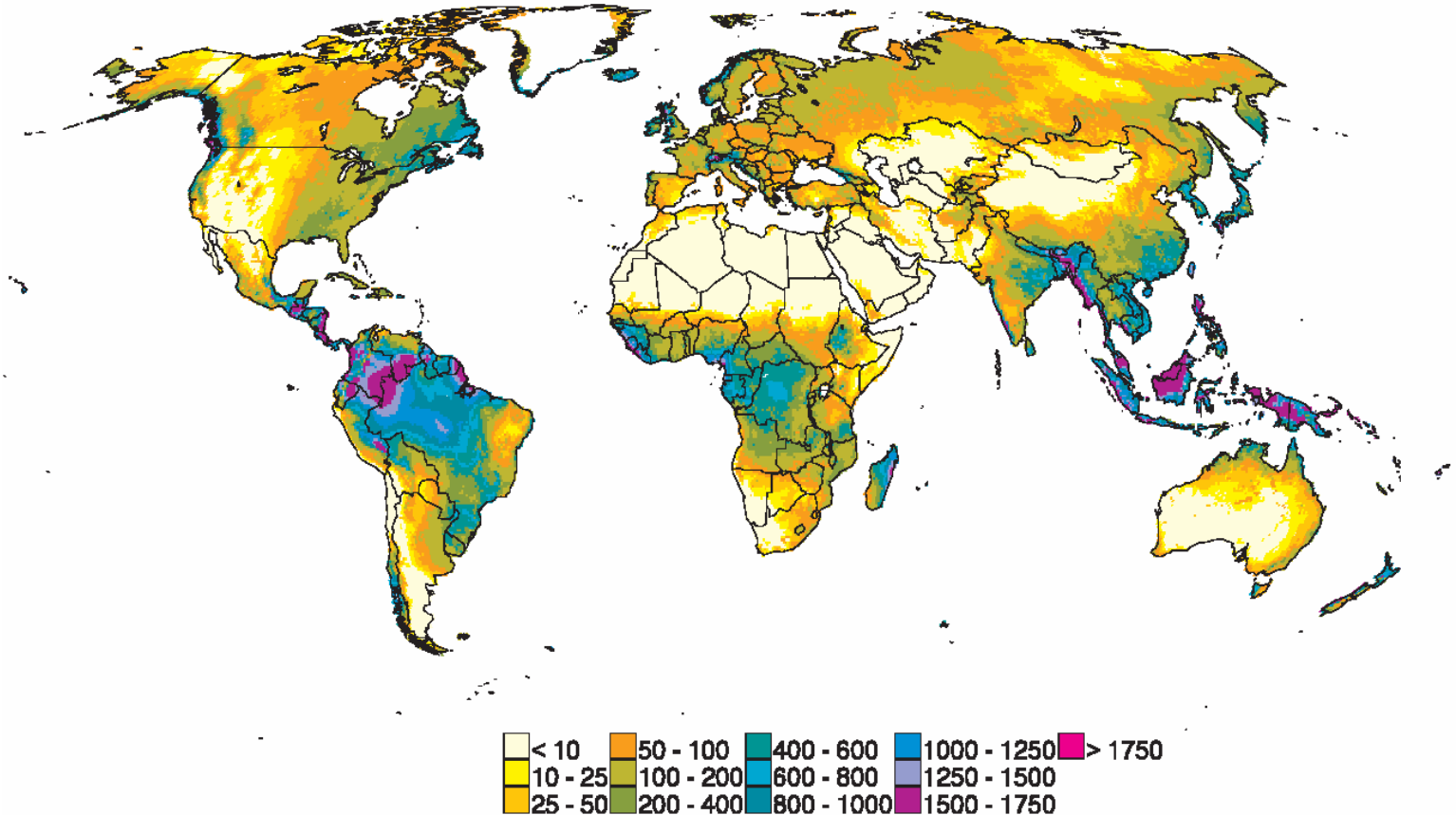
Simulate water availability using a macro-scale hydrological model

Construct climate change scenarios from global climate models

Construct consistent scenarios for change in exposed population

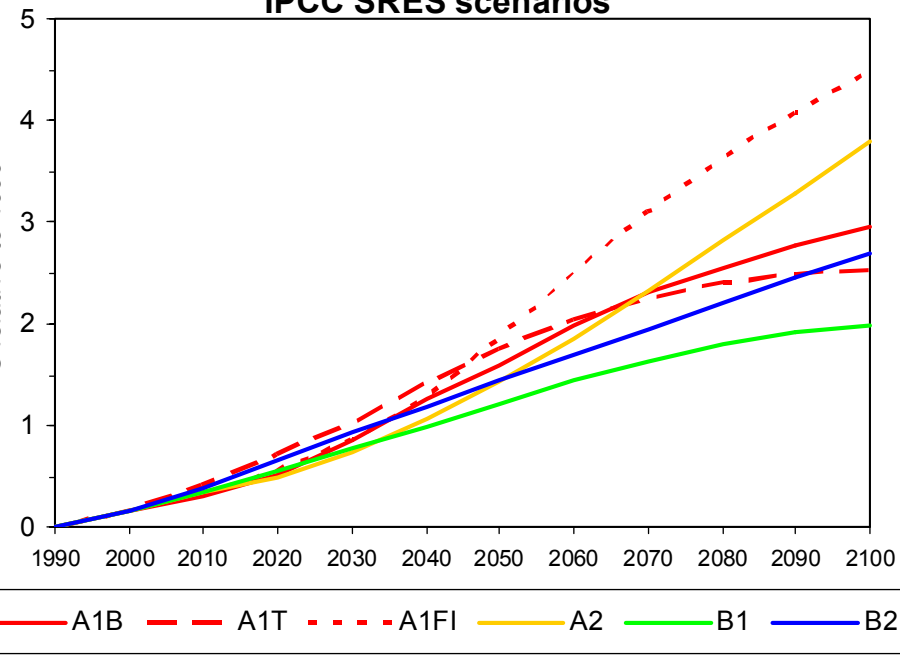


Simulating runoff

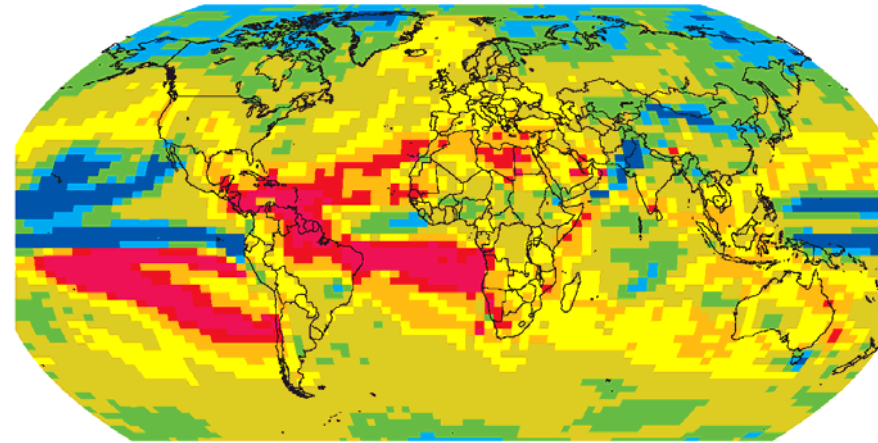


Future climate

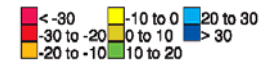
Temperature change:
IPCC SRES scenarios



Precipitation change: HadCM3 A2a

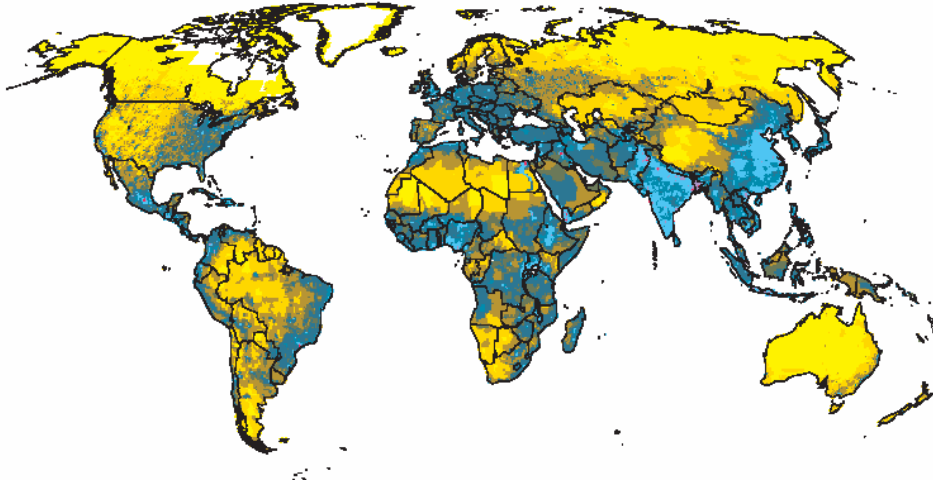
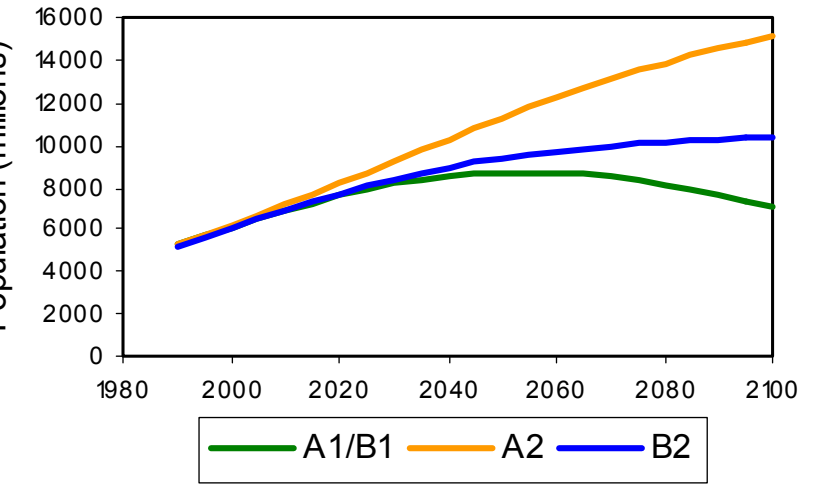


HadCM3: % change compared to 1961-1990



Future population

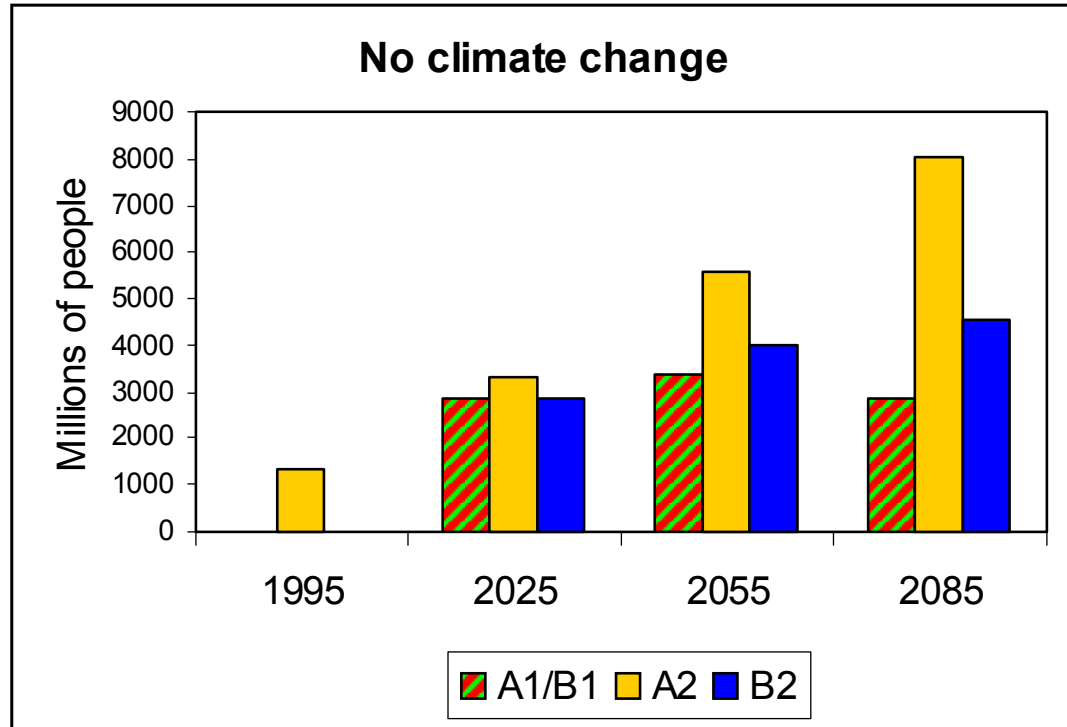
WORLD



A2 2050

Stresses in the absence of climate change

Millions of people living in water-stressed watersheds

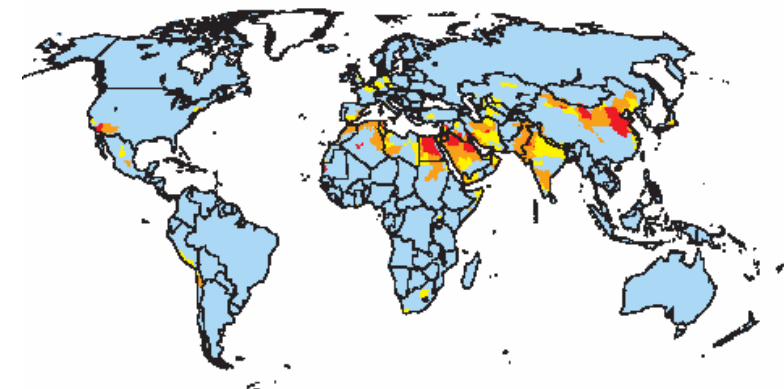


< 1000 m³/capita/year

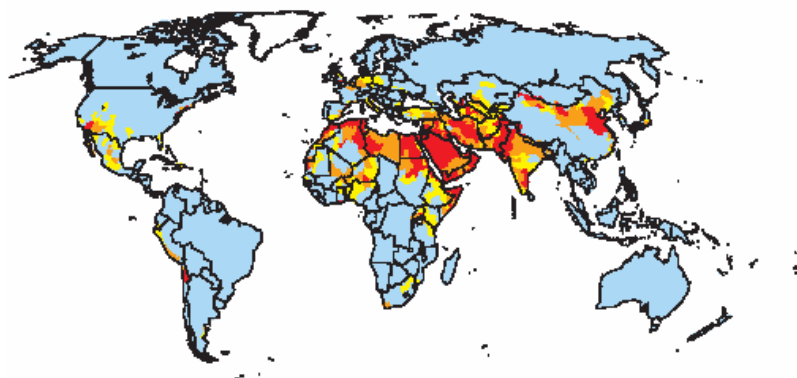


Stresses in the absence of climate change

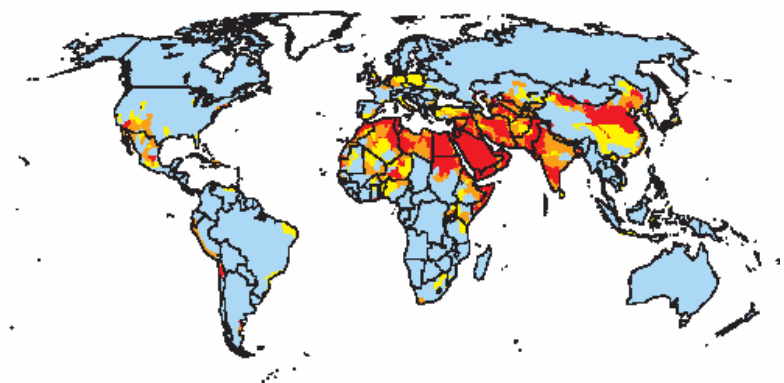
1995



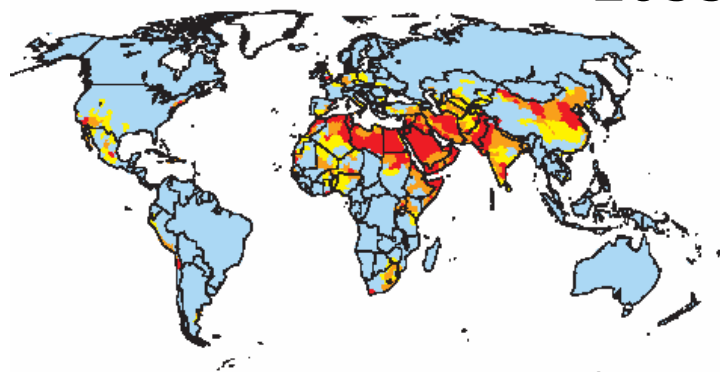
A1/B1



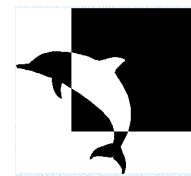
A2



B2



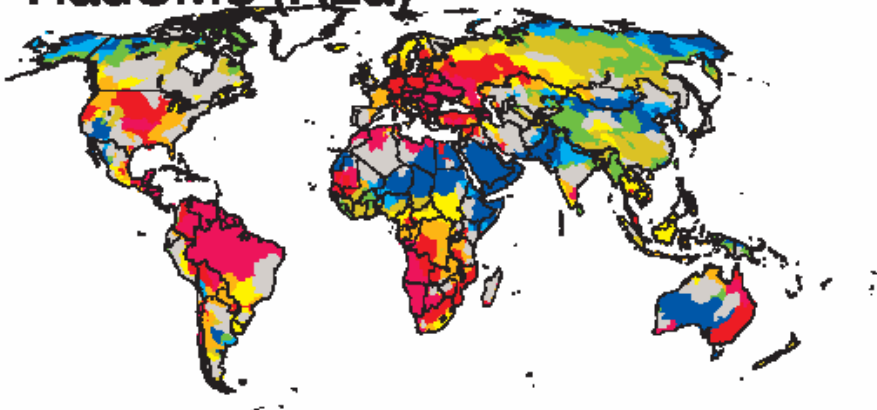
2055



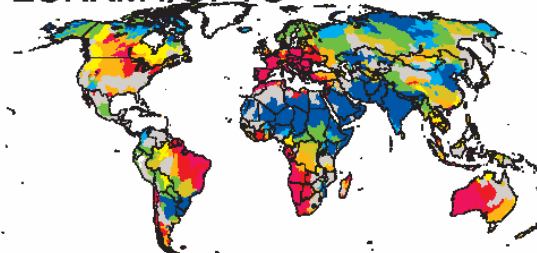
Unmitigated emissions: change in runoff

2050s

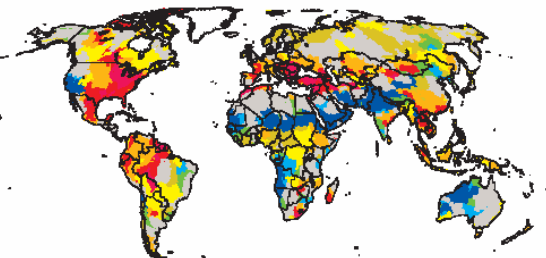
HadCM3 (A2a)



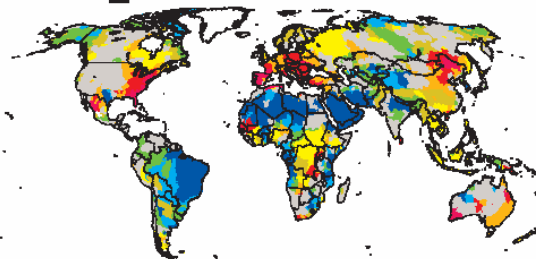
ECHAM4/OPYC



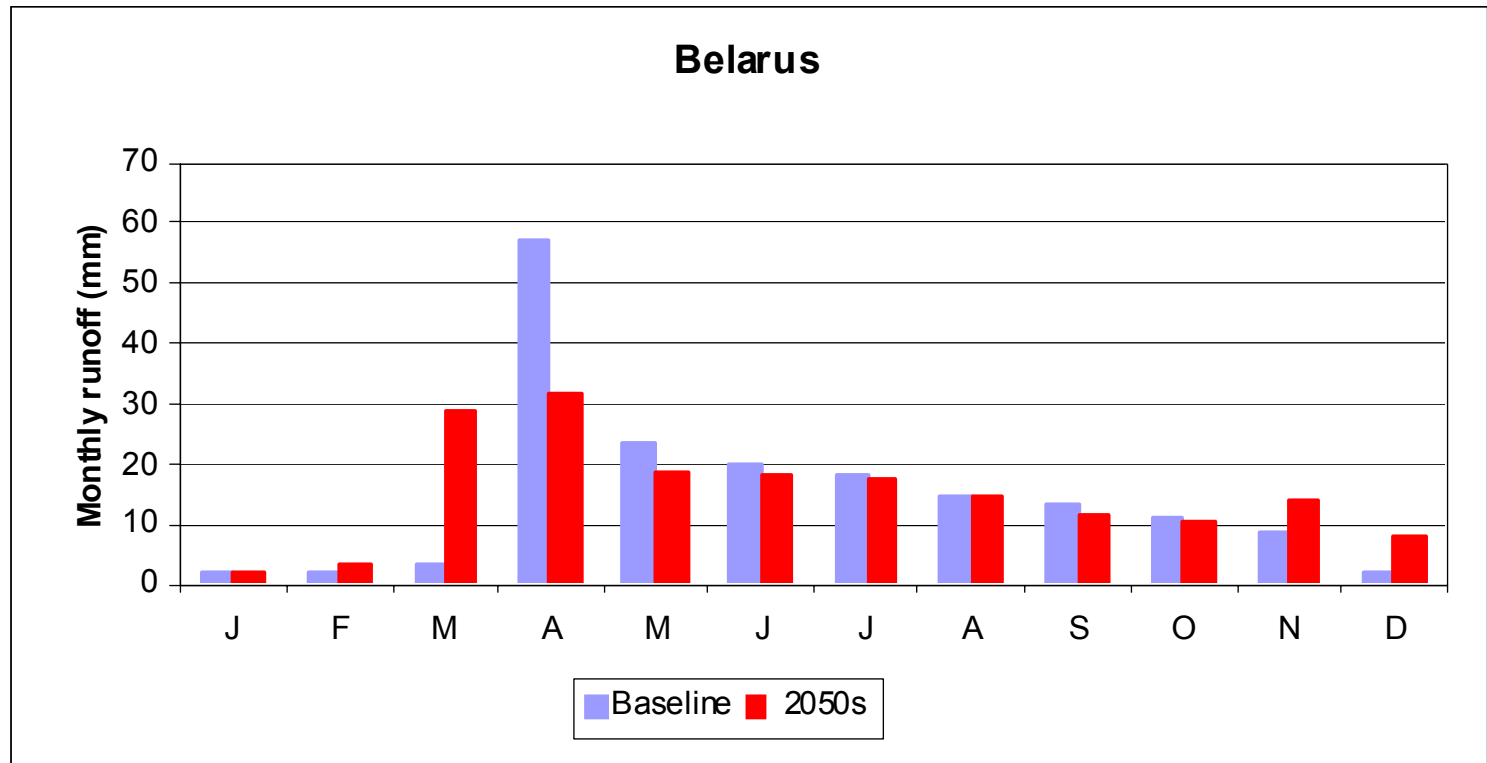
CGCM2



GFDL_R30

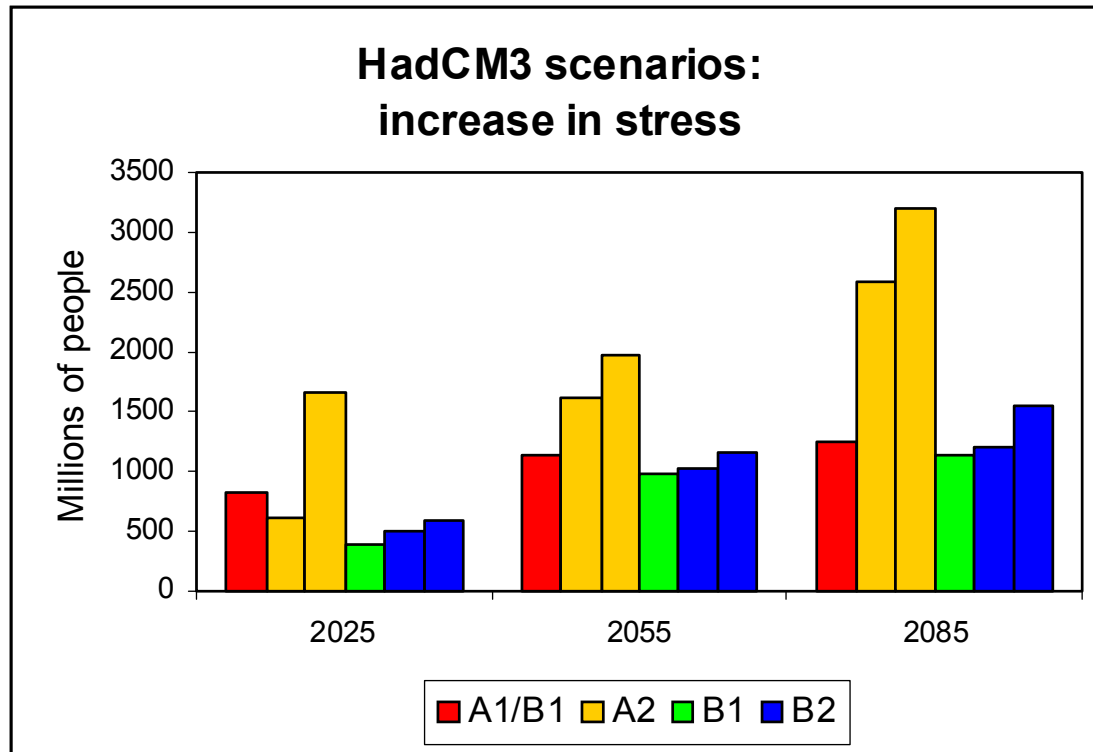


Unmitigated emissions: change in timing of runoff



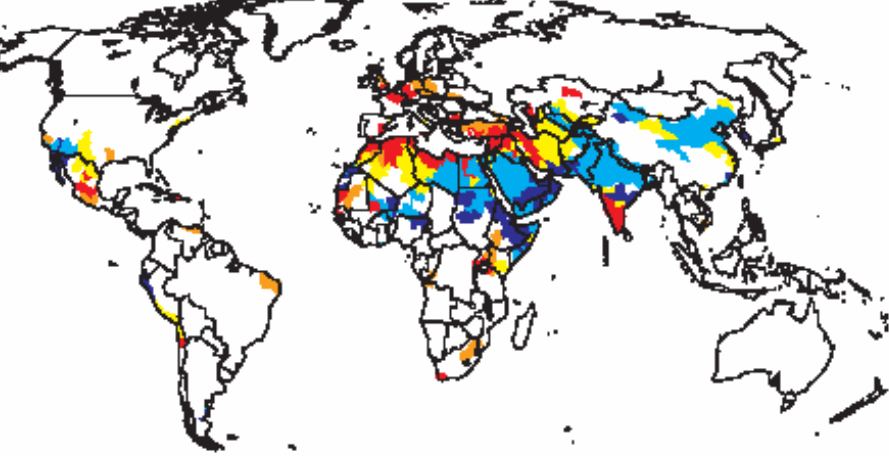
Unmitigated emissions: water resources stresses

Millions of people with increase in stress

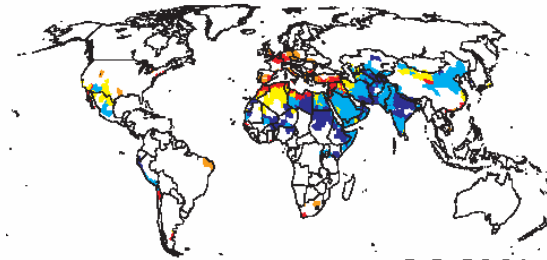


Unmitigated emissions: water resources stresses

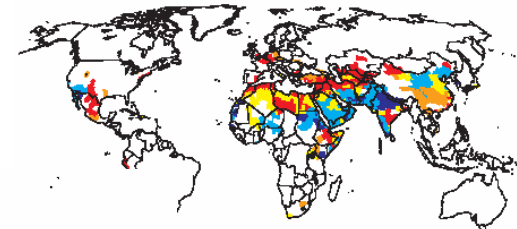
HadCM3 A2a



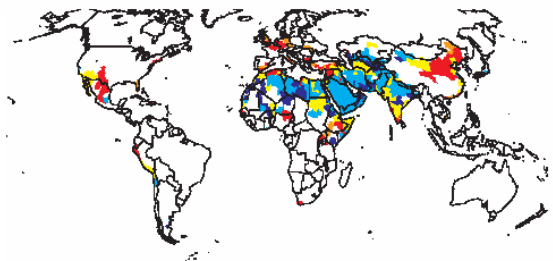
ECHAM4/OPYC



CGCM2



GFDL_R30



- Increase in stress
- Become stressed
- No change in stress
- Reduction in stress
- Stop being stressed

Effects of climate policy

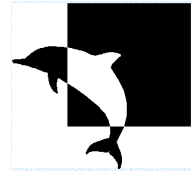
Rescale changes in runoff to different global temperature changes

Calculate water stress indicators for different temperature increases

“2°C target”

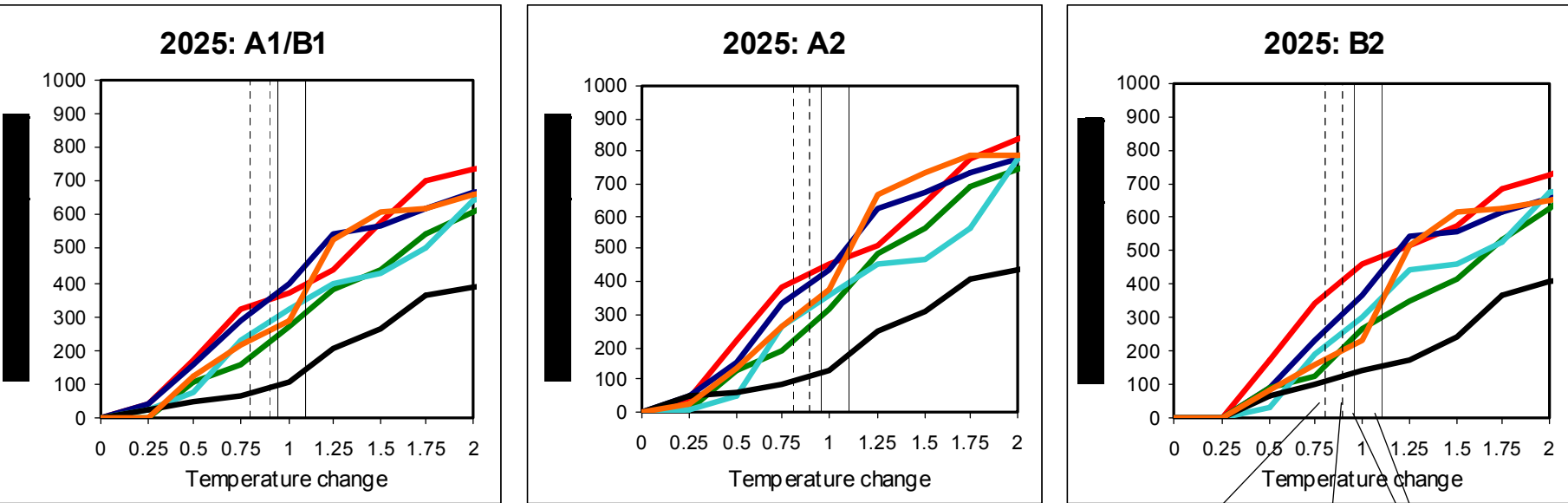
~ 0.8°C above 1961-1990 mean by 2020

~ 1.2°C above 1961-1990 mean by 2050



Effect of climate policy on water resources stresses: 2025

Millions of people with increase in stress



Different colours = different climate models

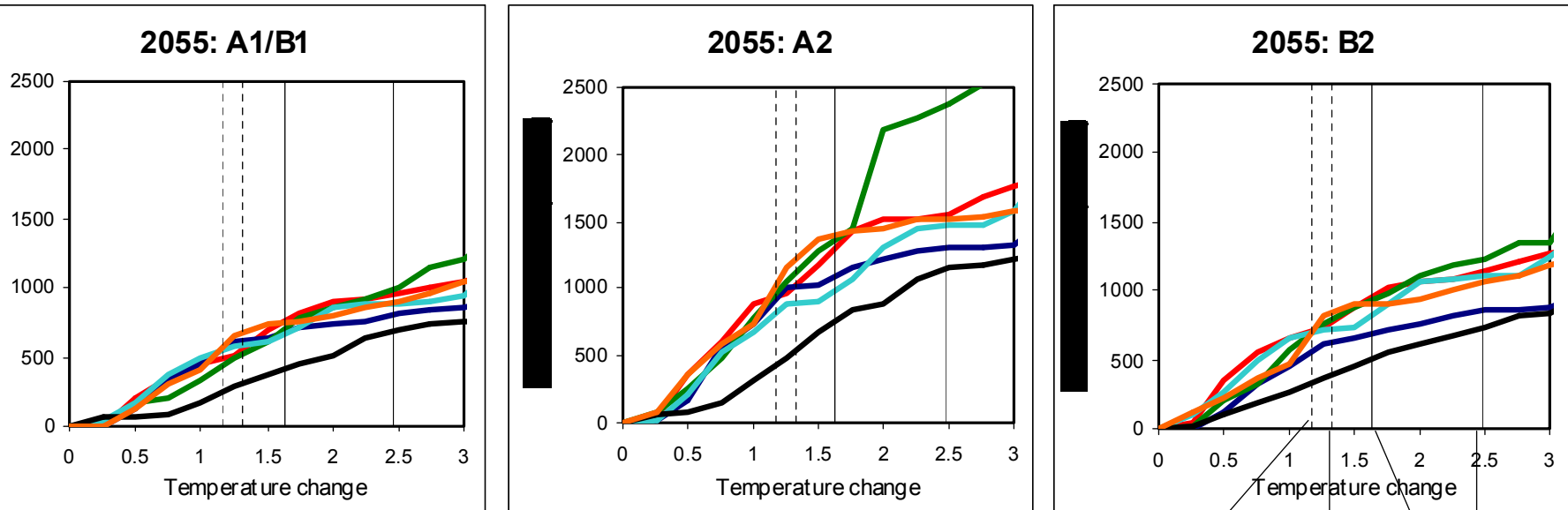
550ppmv

750ppmv

unmitigated

Effect of climate policy on water resources stresses: 2050

Millions of people with increase in stress

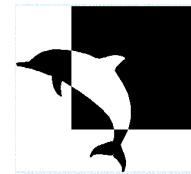


Different colours = different climate models

550ppmv

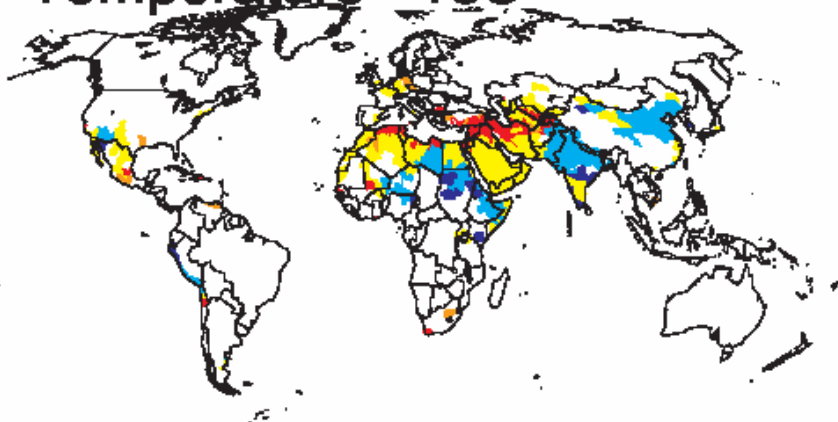
750ppmv

unmitigated

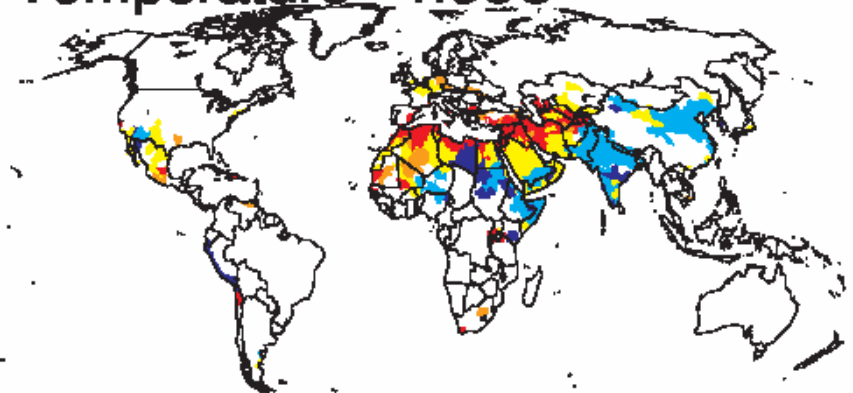


Effect of climate policy on water resources stresses: 2050

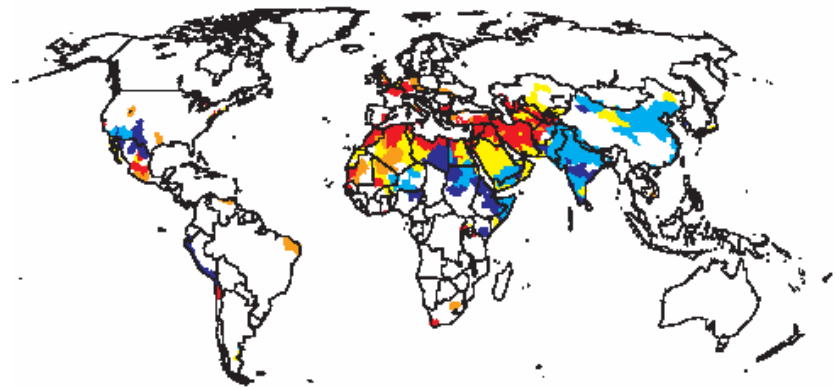
Temperature +1.0C



Temperature +1.50C



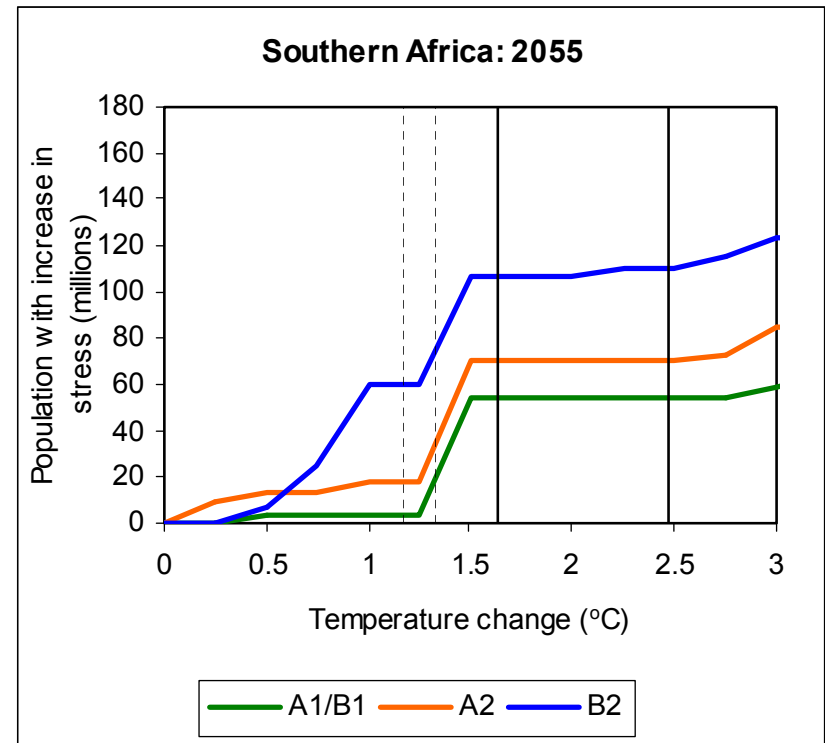
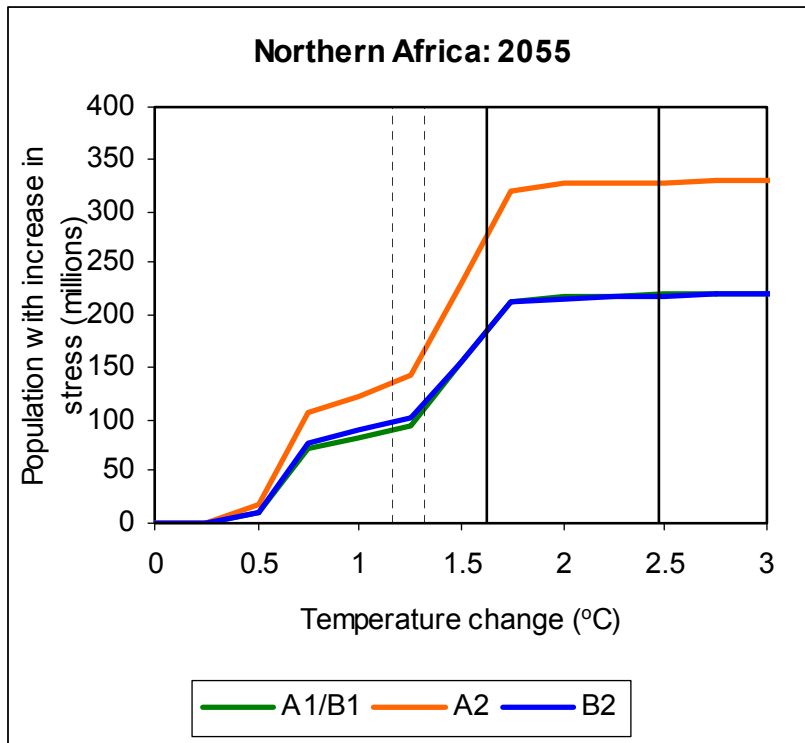
Temperature +2.0C



- Increase in stress
- Become stressed
- No change in stress
- Reduction in stress
- Stop being stressed

Effect of climate policy on water resources stresses: 2050 by region

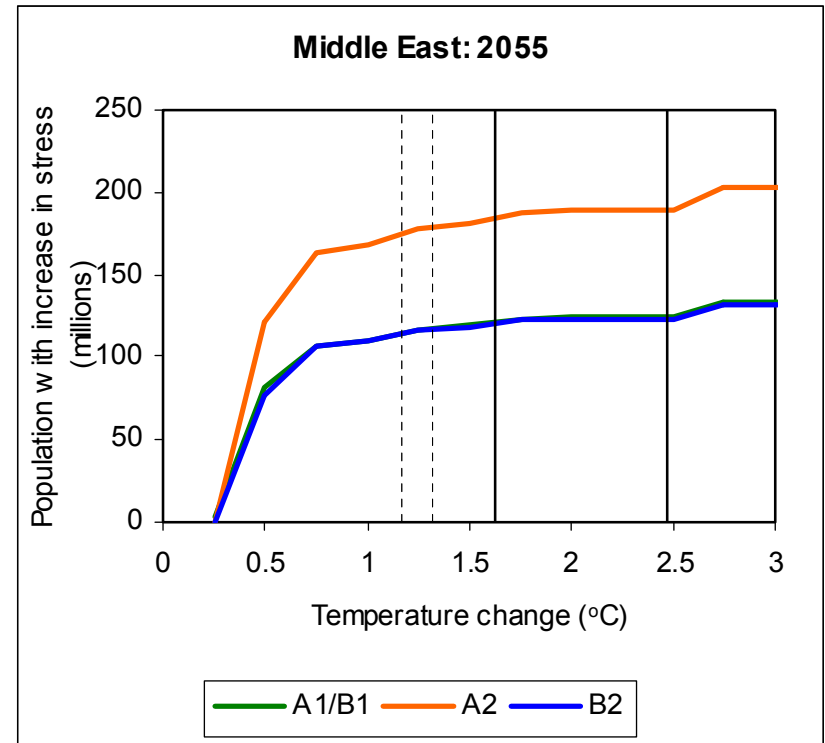
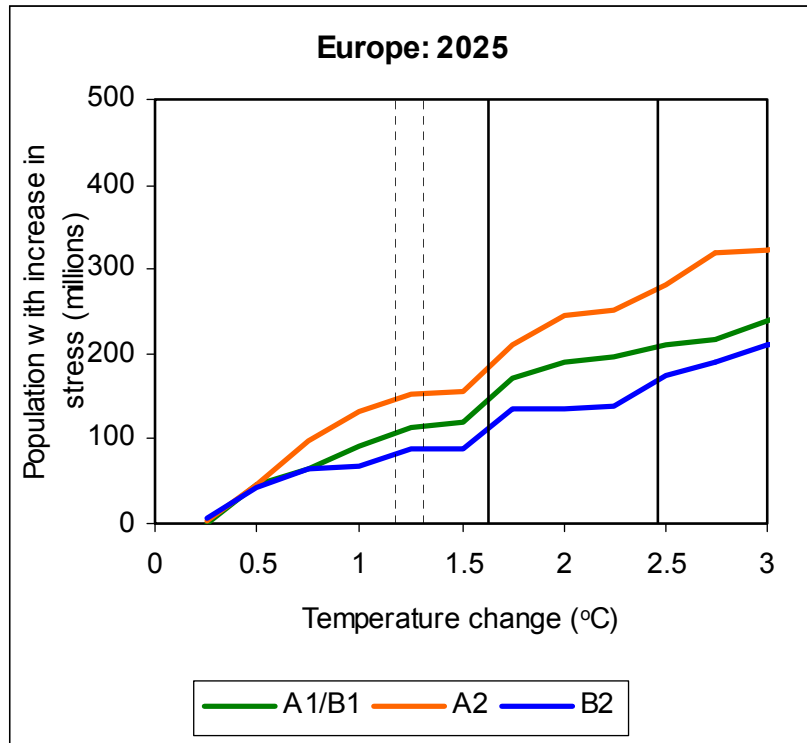
Millions of people with increase in stress



adCM3

Effect of climate policy on water resources stresses: 2050 by region

Millions of people with increase in stress



adCM3

Conclusions

Impacts of climate change depend on degree of change and state of the world

Climate policies reduce, but do not eliminate impacts

- 2°C target reduces numbers of people adversely affected by climate change by 30-50%



Next steps..

Exploring other indicators

- exposure to hazard
- access to resources

How do the other drivers of change affect the impacts of climate change?

What are the limits to adaptation?

