

Climate Stabilisation and Impacts of Sea-Level Rise

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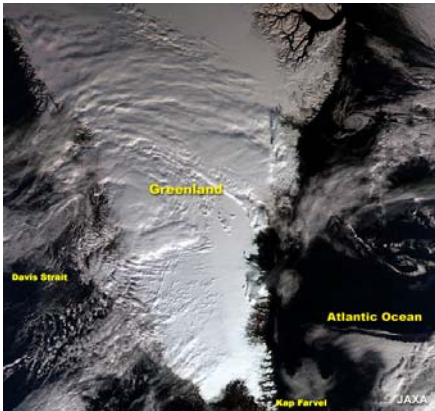
Acknowledgements: Jason Lowe, Hadley Centre

International Scientific Symposium: Avoiding Dangerous Climate Change
Hadley Centre, Exeter, 1 to 3 February 2005

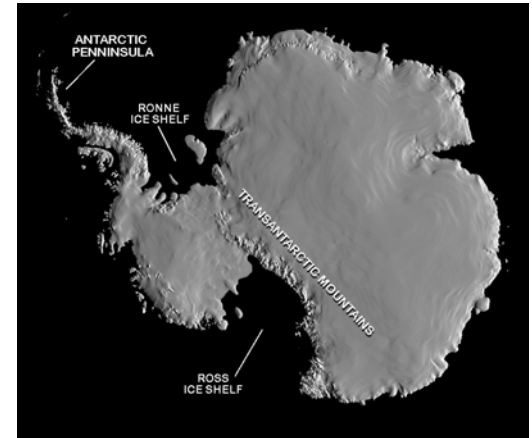
Plan

- Introduction
- Sea level and climate stabilisation
- Impacts (coastal flooding due to surges) under stabilisation scenarios
 - Sea-level rise
 - Development pathways
 - Adaptation
- Concluding remarks

Possible Sources of Global-Mean Sea-Level Rise



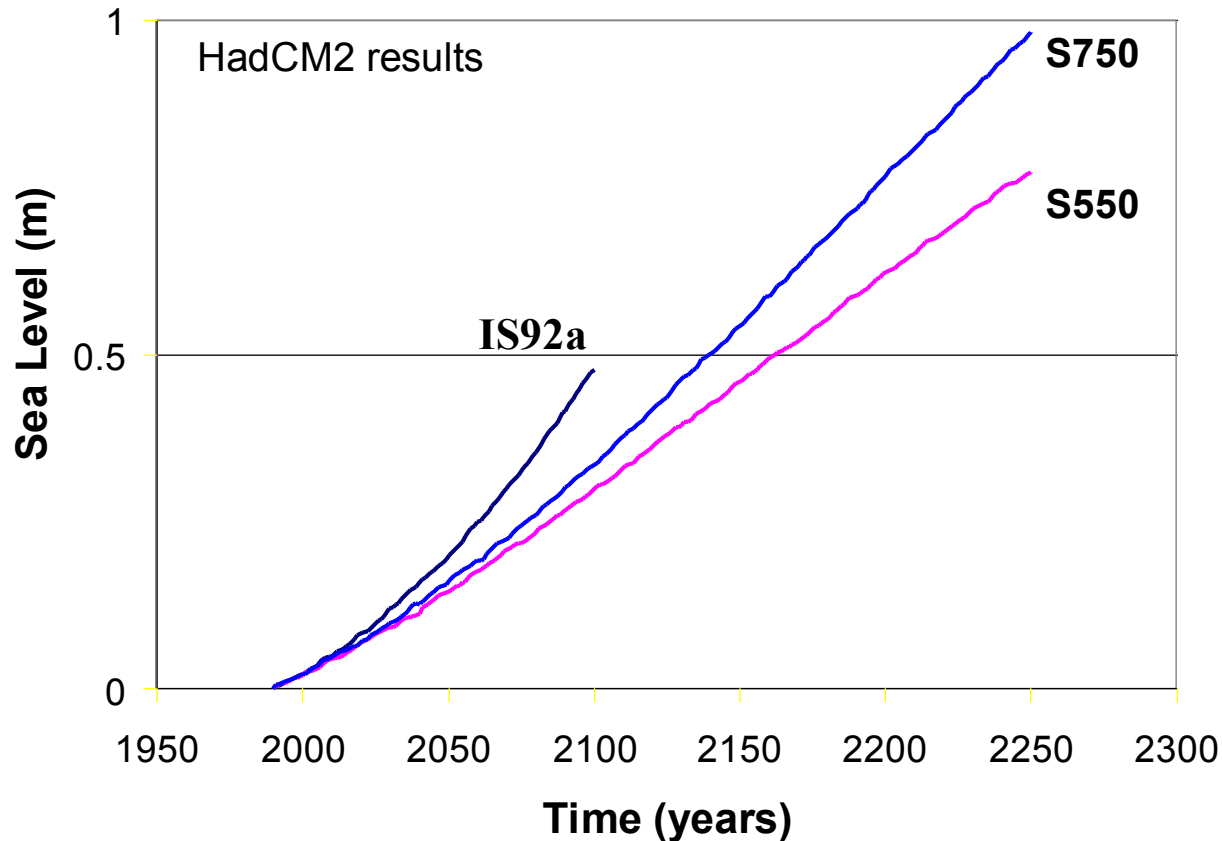
- Small Glaciers
- Thermal Expansion
- Greenland ice sheet



- Antarctic Ice Sheet
 - especially West Antarctic Ice Sheet
- Others
 - e.g., changes to the hydrological cycle

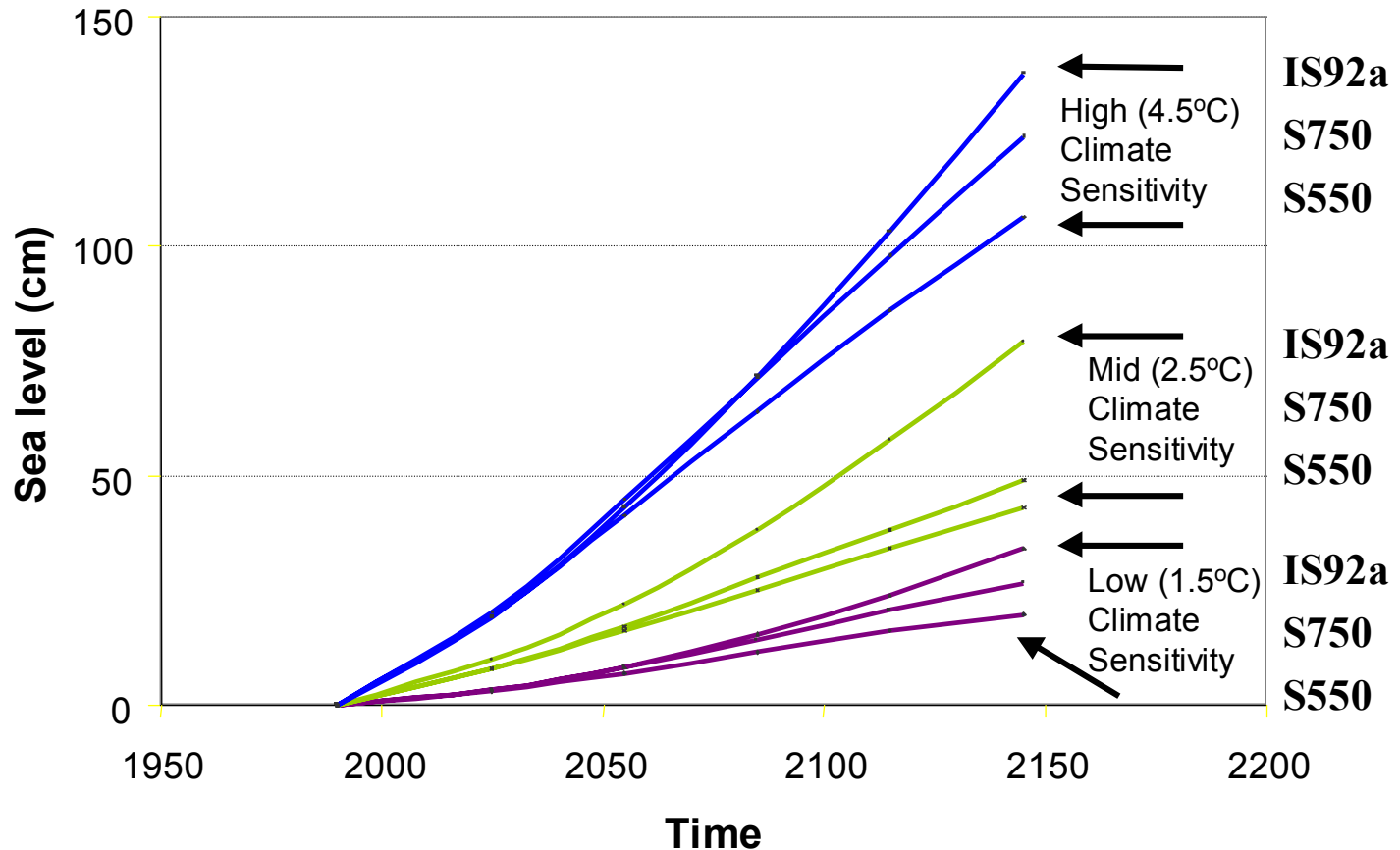
The 'Commitment to Sea-Level Rise'

Unmitigated (IS92a) and stabilised scenarios (S750 and S550) compared.



Sea-Level Rise and Climate Sensitivity

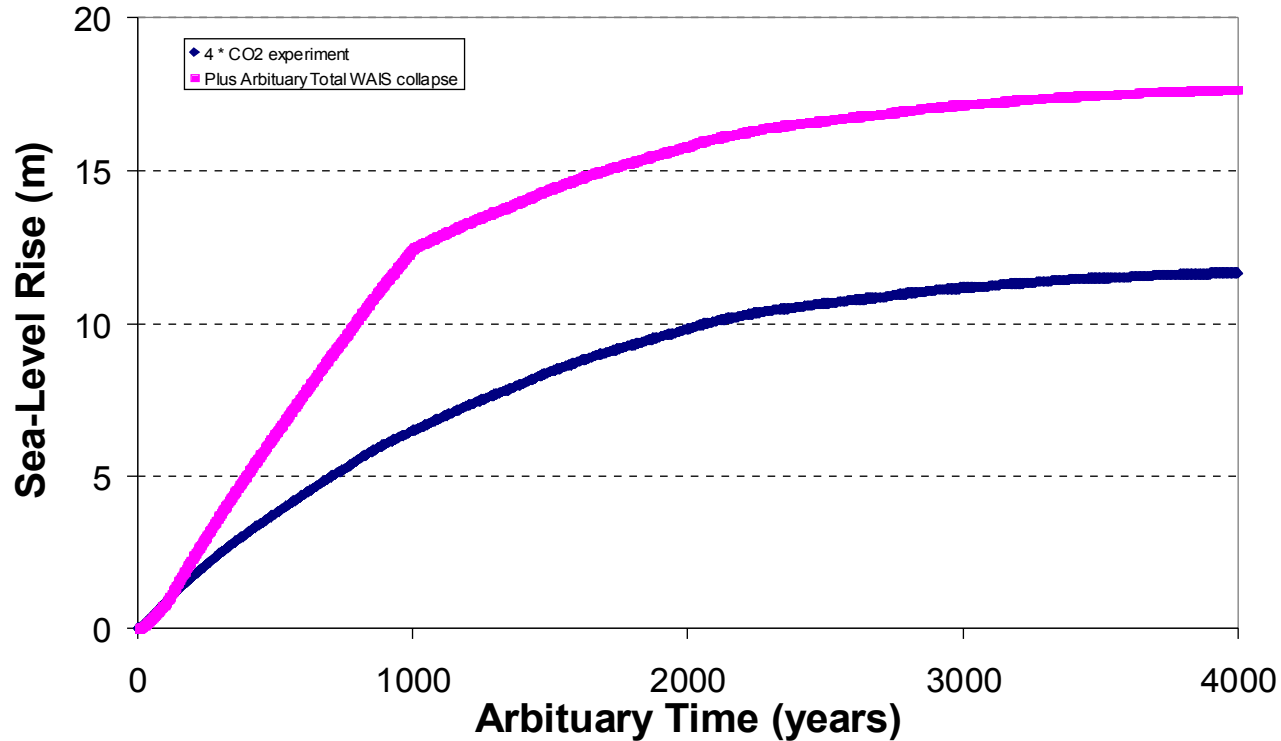
Unmitigated (IS92a) and Stabilisation Scenarios (S750 and S550)



Long-Term Sea-Level Rise

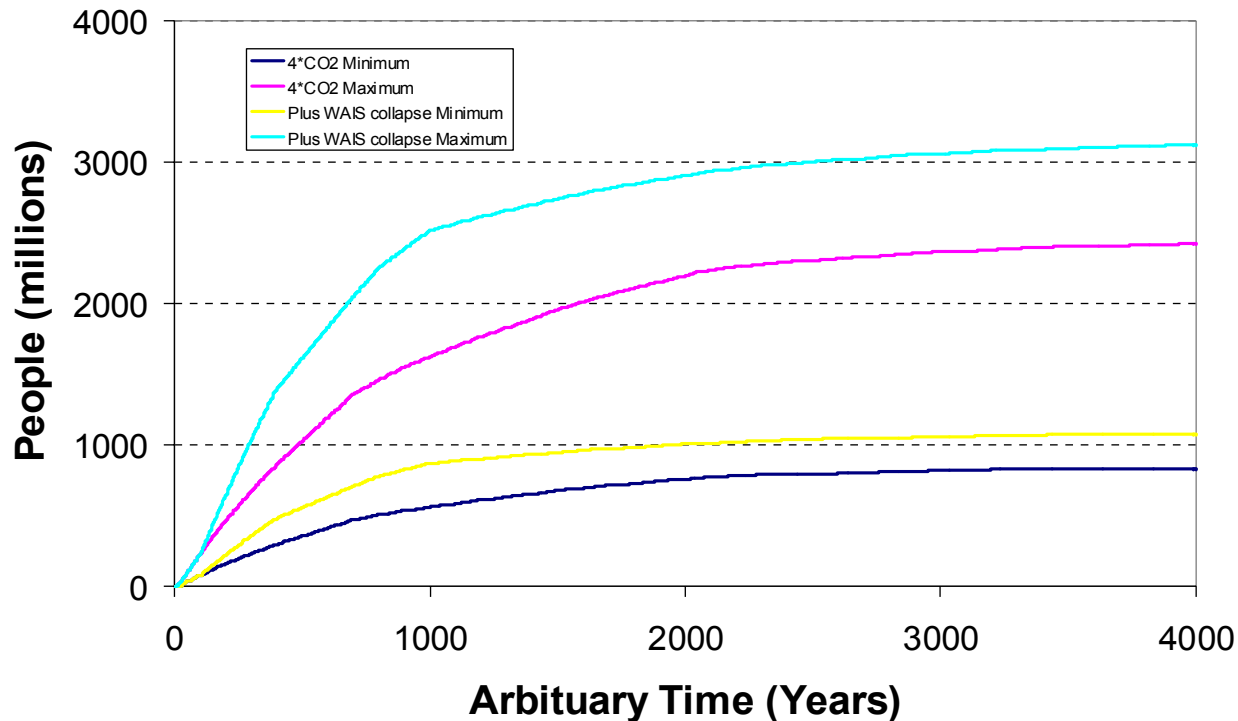
4 x CO₂ experiment¹ and arbitrary WAIS collapse scenario

1. Source: Jason Lowe, the Hadley Centre



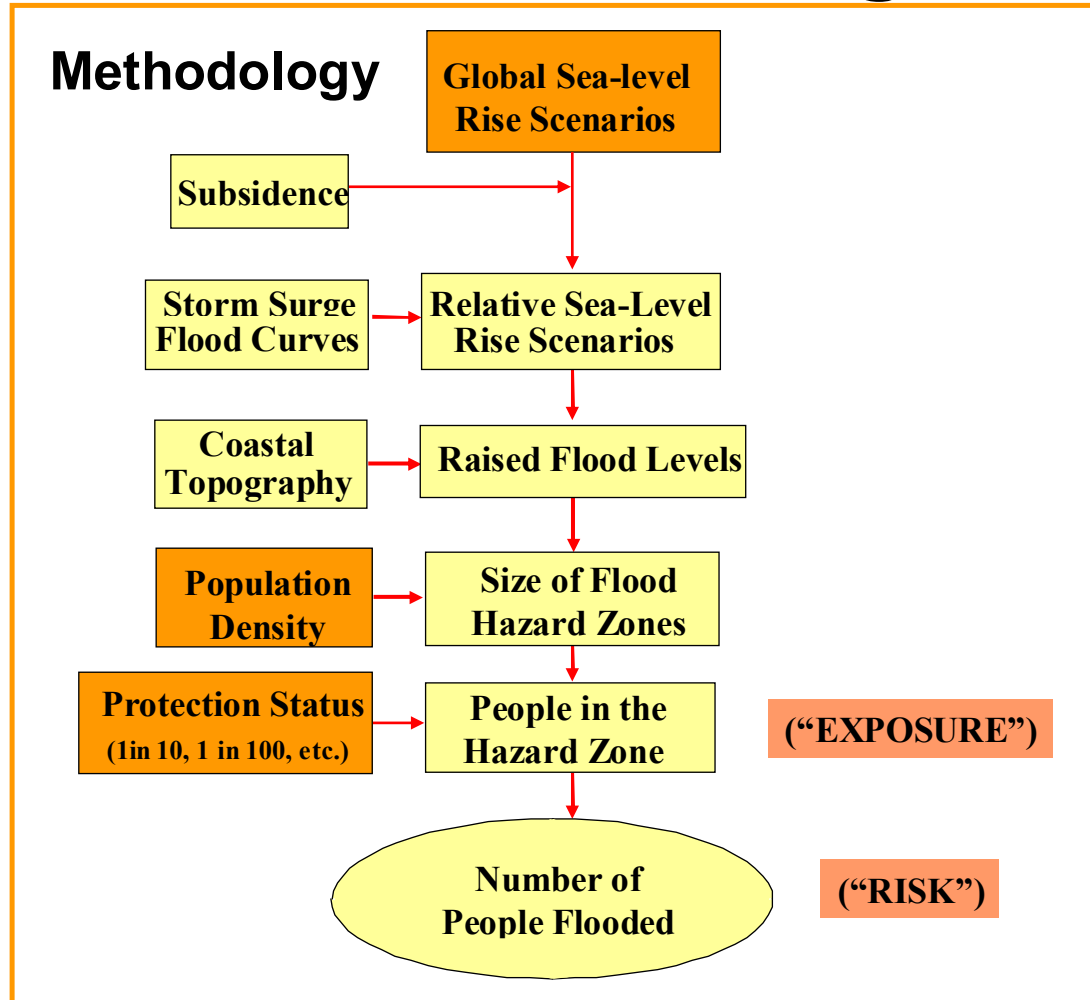
to Long-Term Sea-Level Rise

Populations based on SRES 2080s populations (Nicholls, 2004)



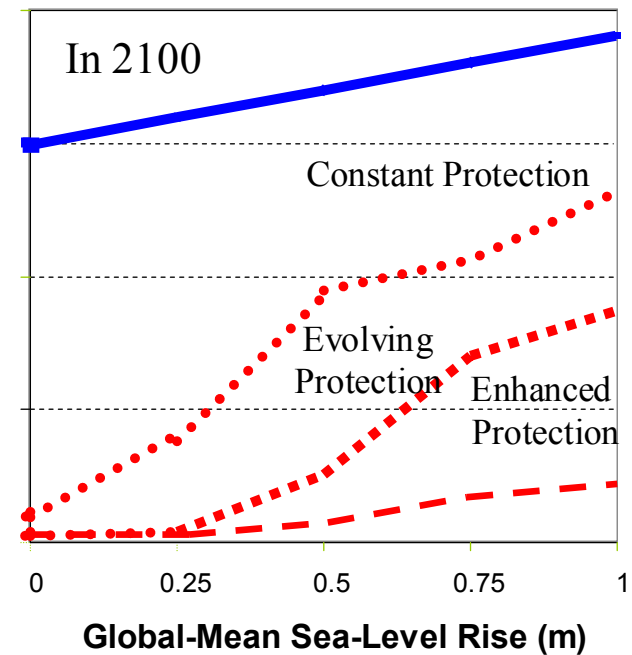
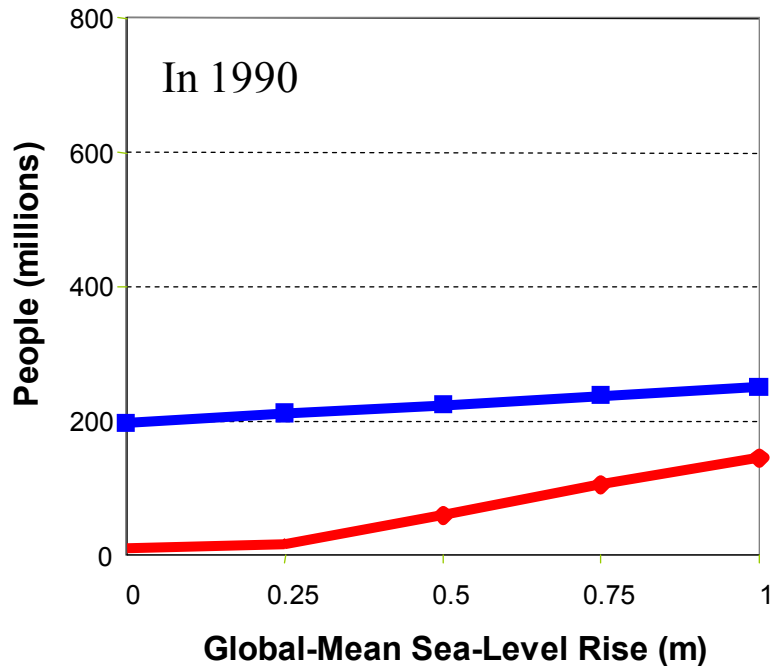
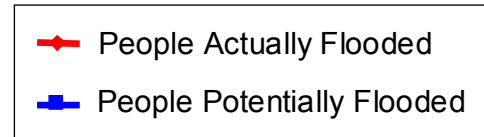
1. People below mean sea level

Coastal Flooding



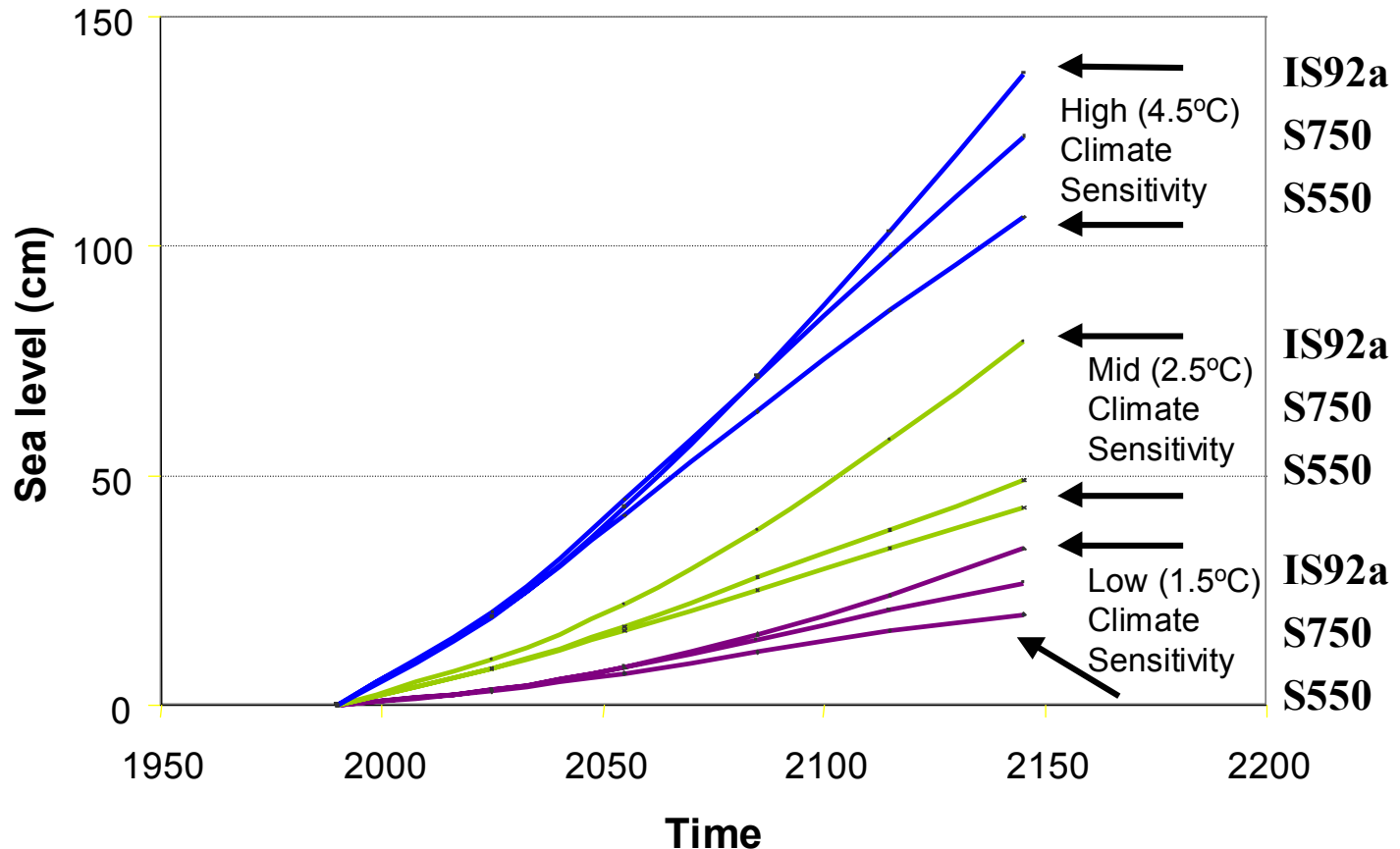
Response Surfaces: 1990 and 2100

IS92a Socio-Economic Scenarios



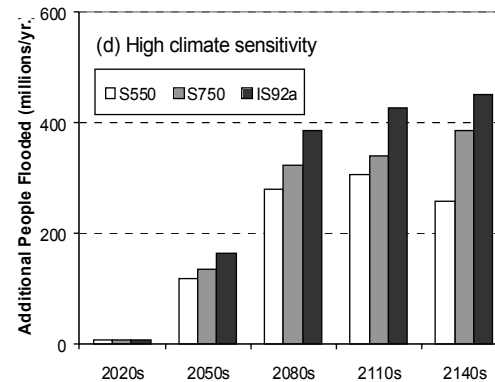
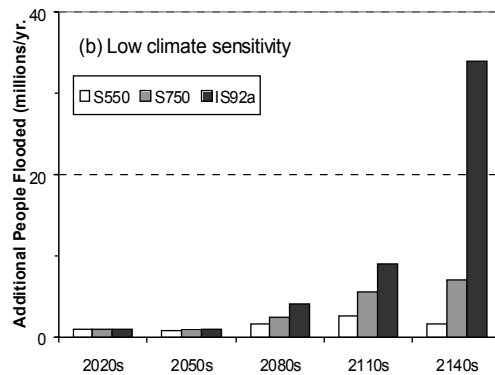
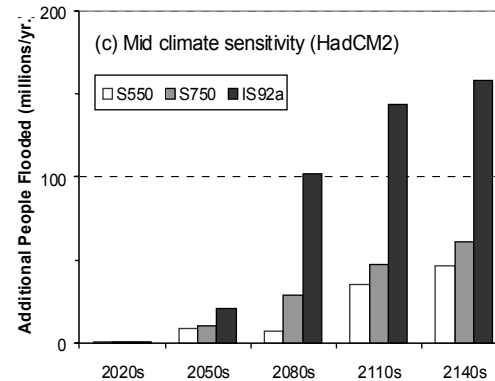
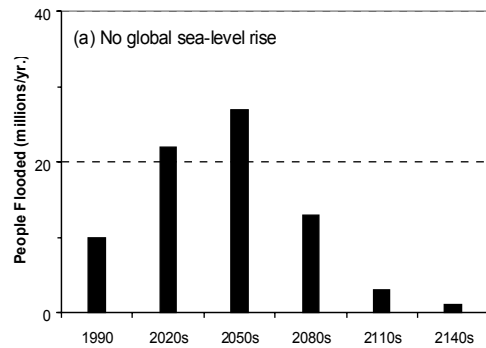
Sea-Level Rise and Climate Sensitivity

Unmitigated (IS92a) and Stabilisation Scenarios (S750 and S550)



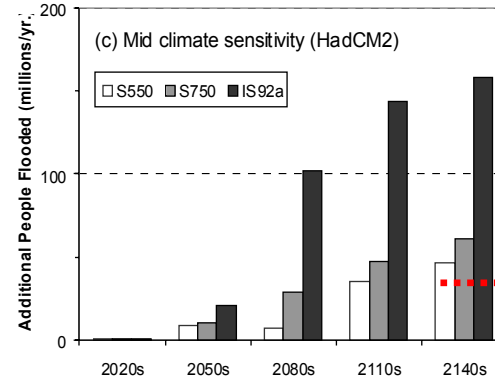
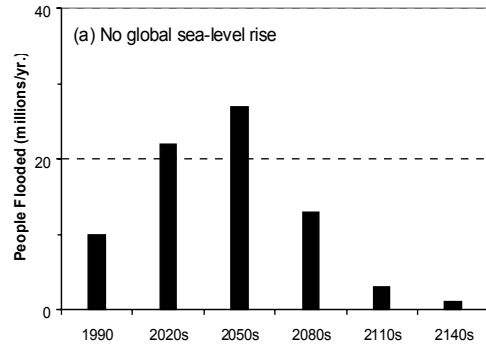
'IS92a World'

Additional People Flooded under Evolving Protection (millions/year)

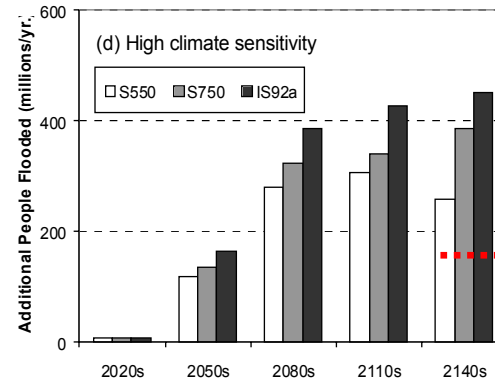
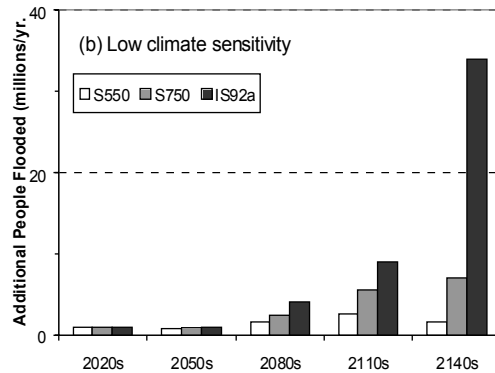


'IS92a World'

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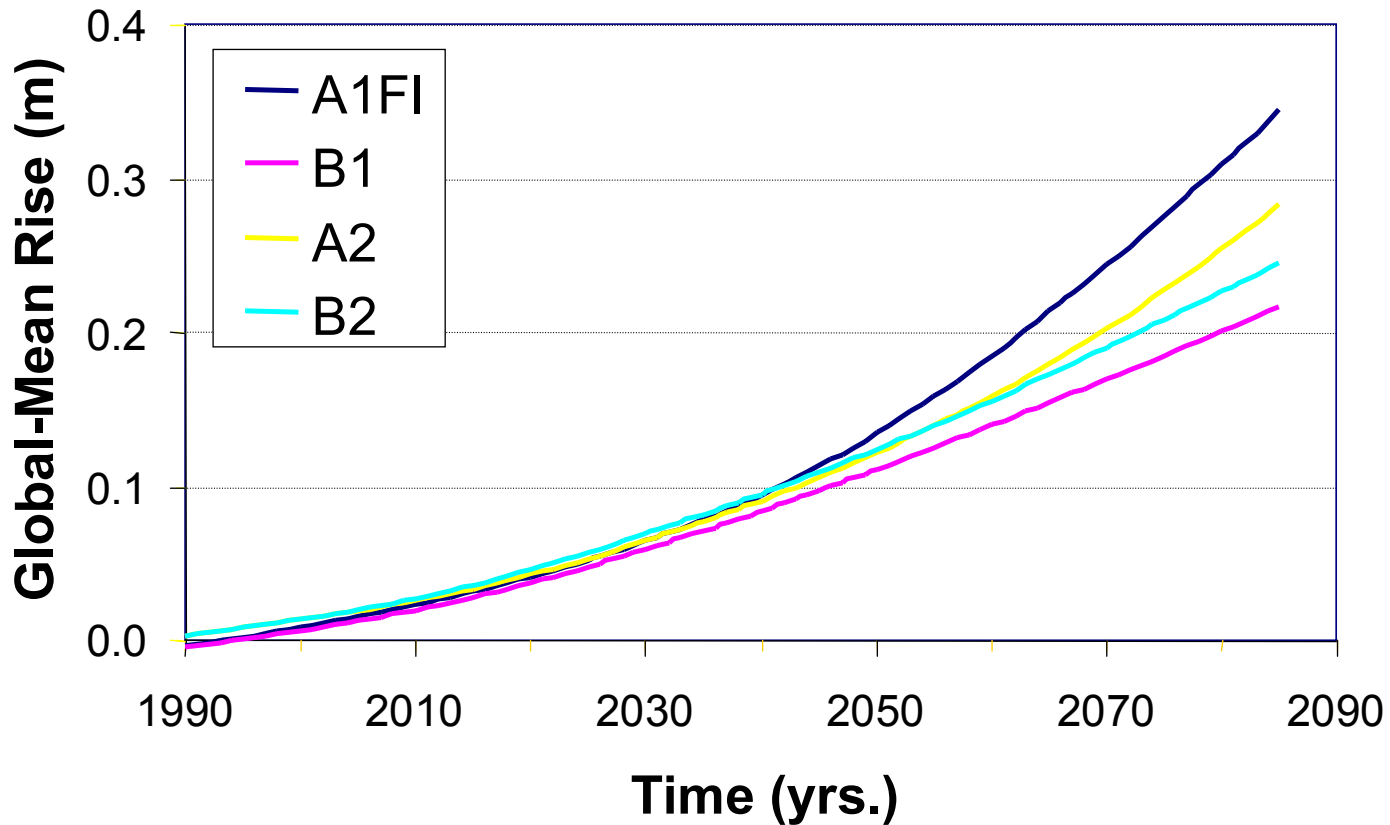
S450



S450

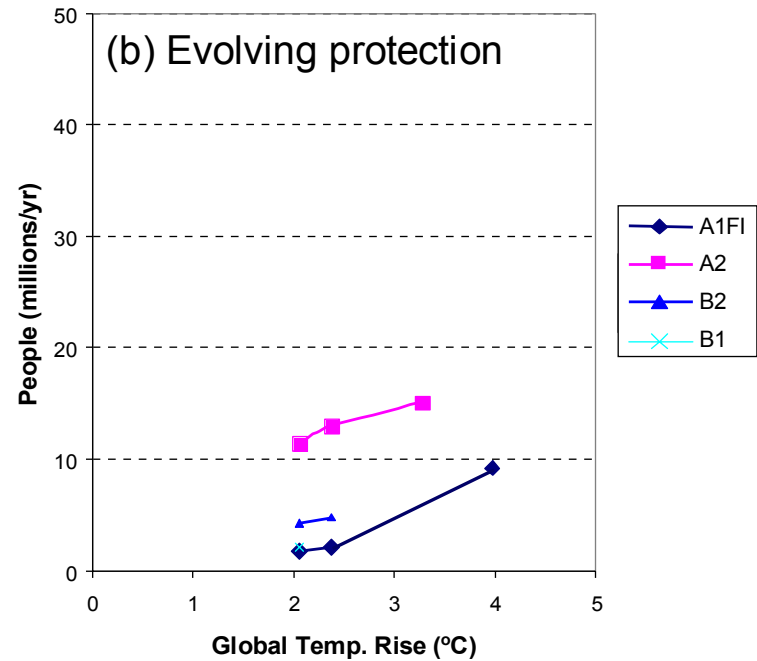
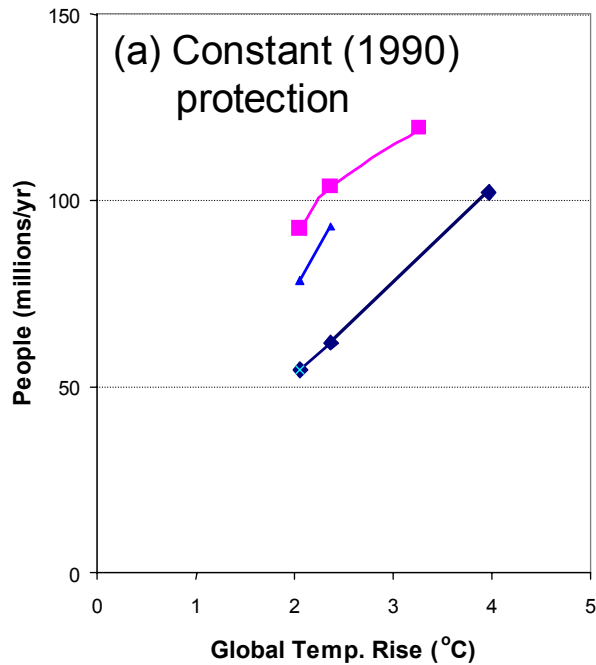
Sea-Level Rise Scenarios

HadCM3 Model -- Climate Sensitivity Constant



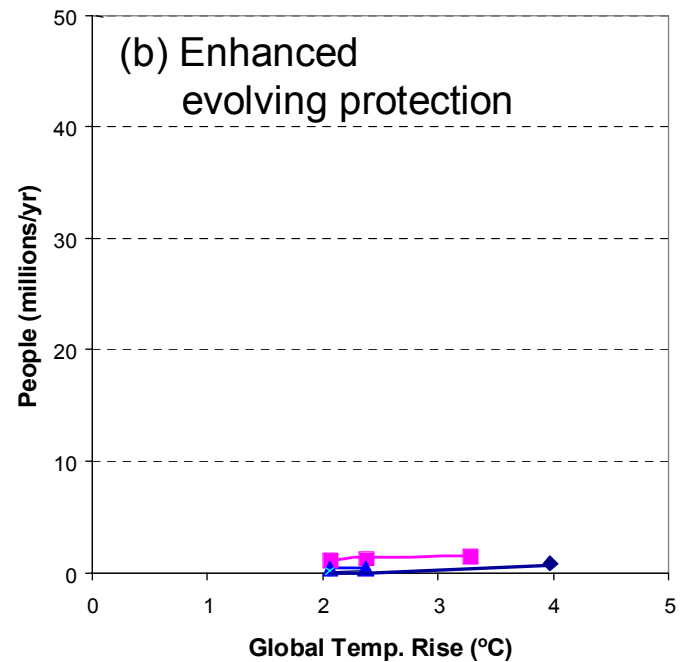
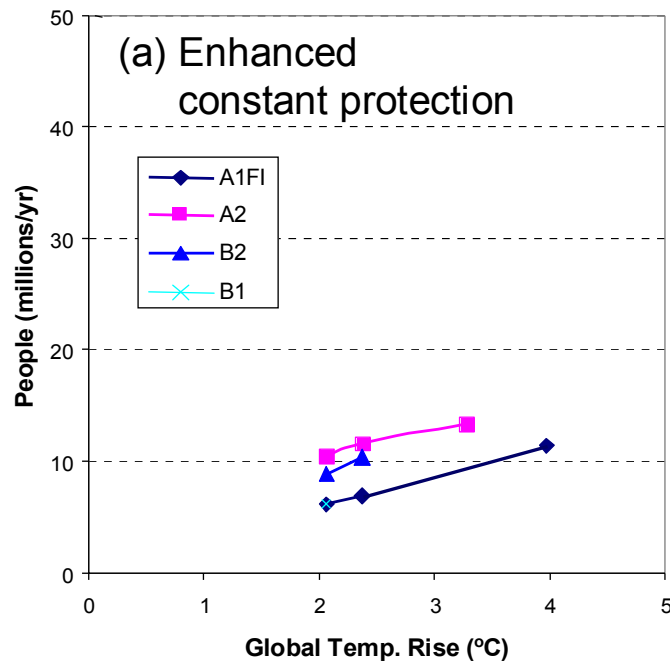
SRES stabilisation

following Swart et al (2002)
No protection for sea-level rise



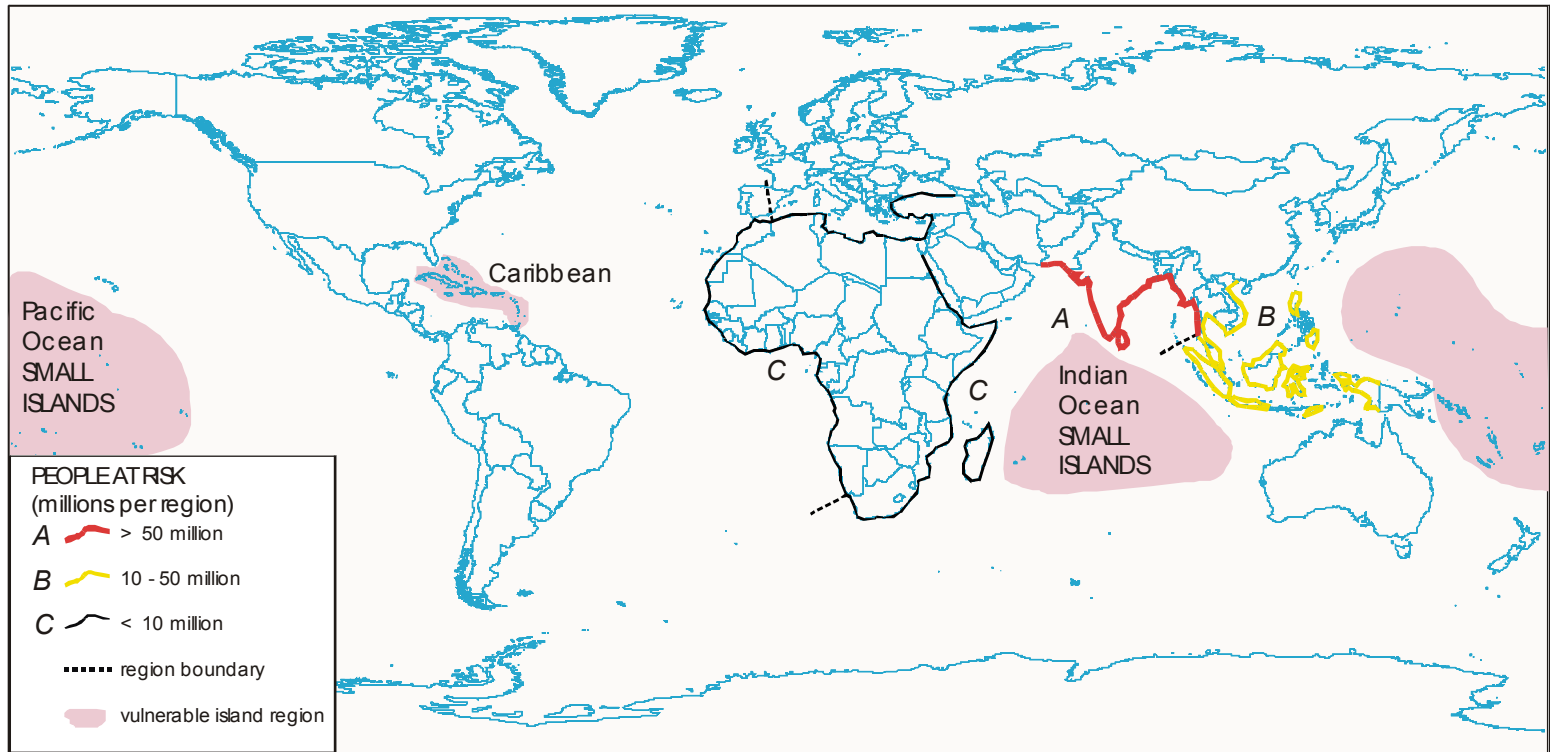
SRES stabilisation

following Swart et al (2002)
Enhanced protection for sea-level rise



Vulnerable Regions

Coastal Flooding: IS92a mid estimate 2080s



Concluding Remarks (1)

- Potential impacts of sea-level rise are significant
- Stabilisation slows but does not stop sea-level rise which continues for many centuries
- Hence many impacts are delayed rather than avoided
- Therefore, adaptation and mitigation need to be considered together
- But the timescales of sea-level rise are challenging for policy

Concluding Remarks (2)

- Adaptation can successfully manage many of the risks – but what are its limits?
- Small islands have special problems
- Changes in storm track, frequency and intensity could exacerbate flood impacts.

Further Work

- Risks and rates of Greenland deglaciation and especially West Antarctic Ice Sheet collapse
- The strengths and weakness of coastal adaptation/reasons for coastal abandonment
- Integration of all climate change factors and other human-induced stresses for coastal areas (Global change models of coasts)
- Dealing with long timescales.