

*Adaptation Futures,
May 2015.*

 **Southampton** UNIVERSITY OF

Timing of adaptation to high-end sea-level rise: When to start?



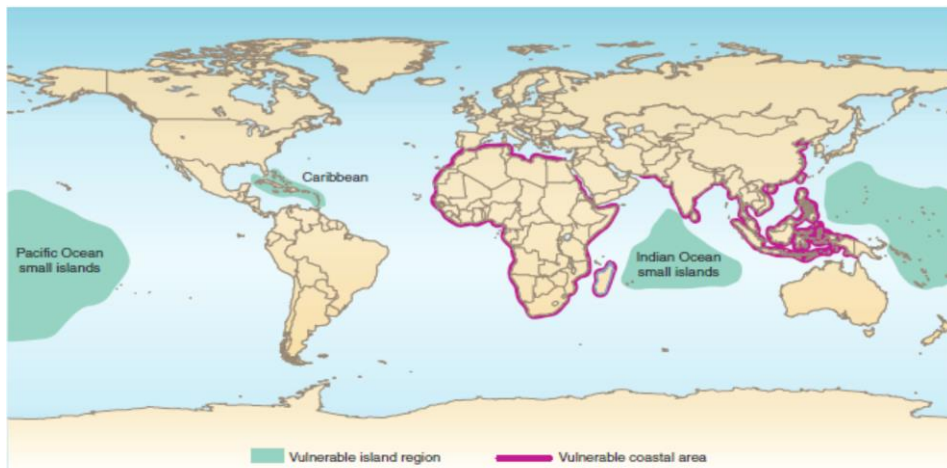
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***Daniel Lincke, Jochen Hinkel, Svetlana Jevrejeva, Ivan Haigh,
Robert J Nicholls, Nassos Vafeidis, Richard Tol***

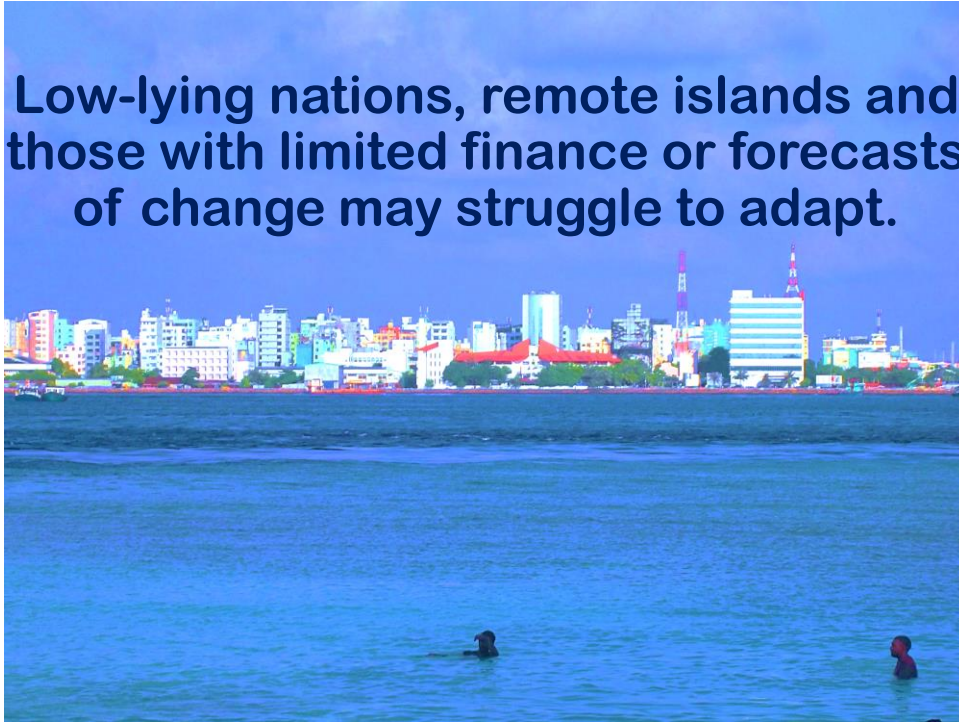
Photographs: Sally Brown, Laurens Speelman, Attila Lazar

Who is most at risk?



Nicholls and Cavenaze (2010). doi: 10.1126/science.1185782

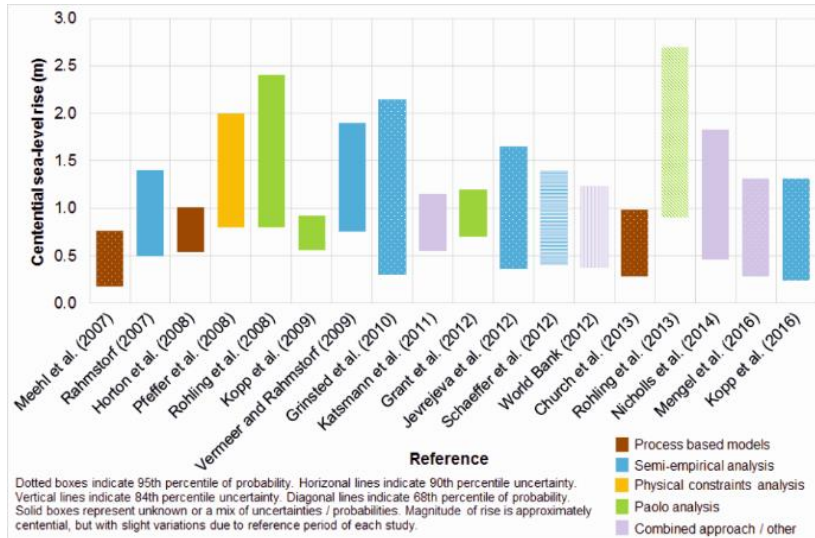
Low-lying nations, remote islands and those with limited finance or forecasts of change may struggle to adapt.



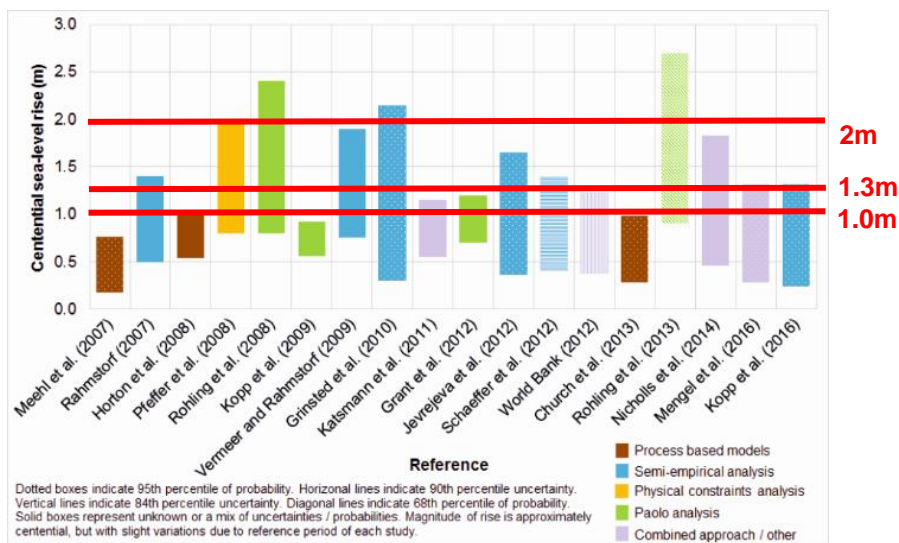
Structure

- How high is high-end sea-level rise?
- How can we model impacts and costs?
- What are the financial costs?
- Who is worse affected, and may struggle to adapt?

What are the projections for high-end sea-level rise?

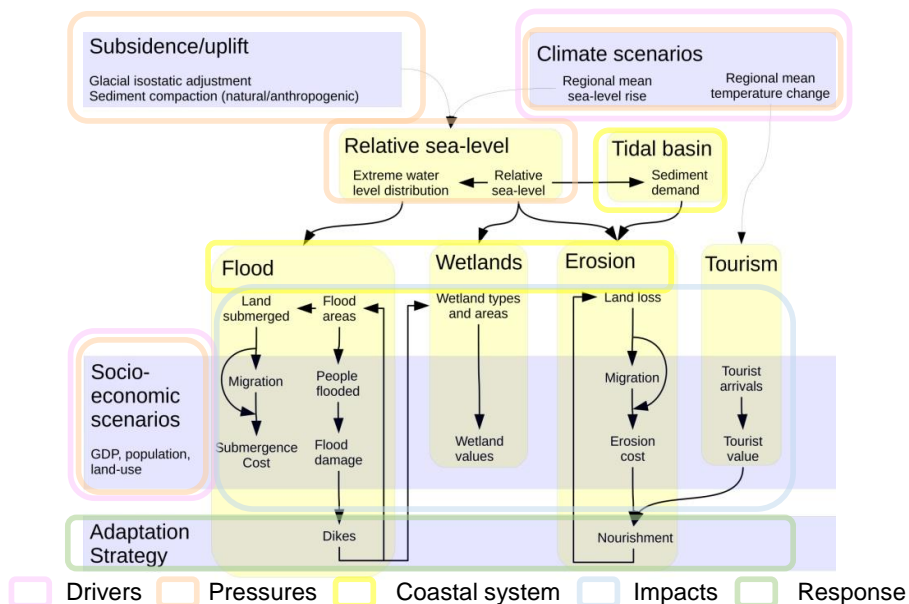


What are the projections for high-end sea-level rise?



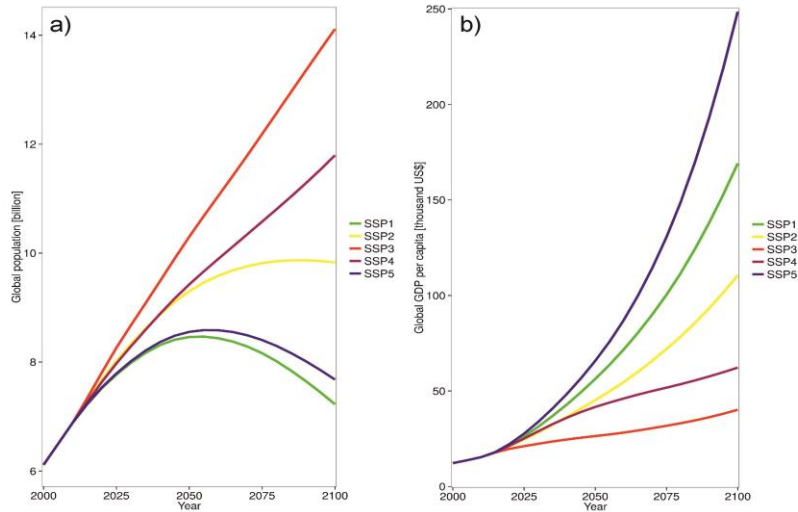
Sea-levels will keep on rising, even taking account of climate change mitigation. High-end sea-level rise remains a possibility.

DIVA model

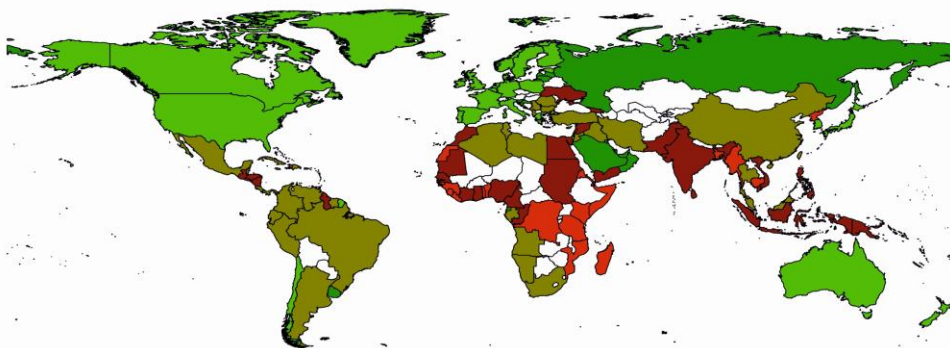


Socio-economic change

Population GDP/capita



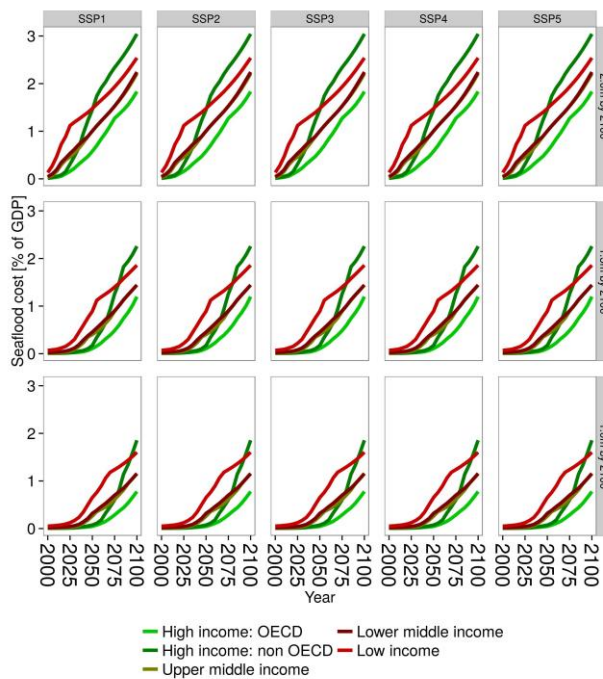
World Bank income groups



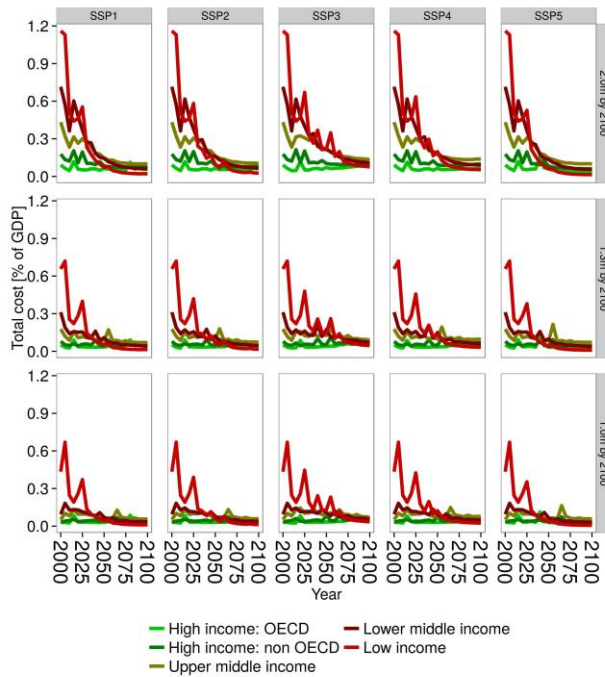
World Bank income group (2014)

- High income: OECD ($\$12,746 < \text{GDP}$). Contains 11% of the world's coastal countries and 58% of GDP.
- High income: non OECD ($\$12,746 < \text{GDP}$). Contains 3% of the world's coastal countries and 5% of GDP.
- Upper middle income ($\$4,125 < \text{GDP} < \$12,746$). Contains 53% of the world's coastal countries and 30% of GDP.
- Lower middle income ($\$1,045 < \text{GDP} < \$4,125$). Contains 27% of the world's coastal countries and 7% of GDP.
- Low income ($\text{GDP} < \$1,045$). Contains 6% of the world's coastal countries and <1% of GDP.
- Landlocked

Modelling takes account physical, social and economic changes.
Lower income countries tend to be in Asia and central/northern Africa.




Annual costs of sea floods without additional adaptation



**Total costs
= Residual
sea flood
costs +
dike
building
costs**

Spend now to adapt low income nations to high-end sea-level rise, or experience similar or higher damage costs after 2050.





Small islands will find adaptation particularly difficult and costly.





Conclusions

- Sea-levels will keep on rising, even taking account of climate change mitigation. High-end sea-level rise remains a possibility.
- Modelling takes account physical, social and economic changes. Lower income countries tend to be in Asia and central/northern Africa.
- Spend now to adapt low income nations to high-end sea-level rise, or experience similar damage costs after 2050.
- Small islands will find adaptation particularly difficult and costly.
- Areas of high risk require large-scale investment and forward planning, but this cannot be undertaken everywhere.
- Adaptation remains a matter of choice, guided by good governance, advice and financial help.



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