Tools for climate change risk assessment and adaptation

Panel 1.5 Climate resilient infrastructure and coastal development

Dr. Steven Wade, Head of Scientific Consultancy, Met Office

4th Asia-Pacific Adaptation Forum 2014

Met Office

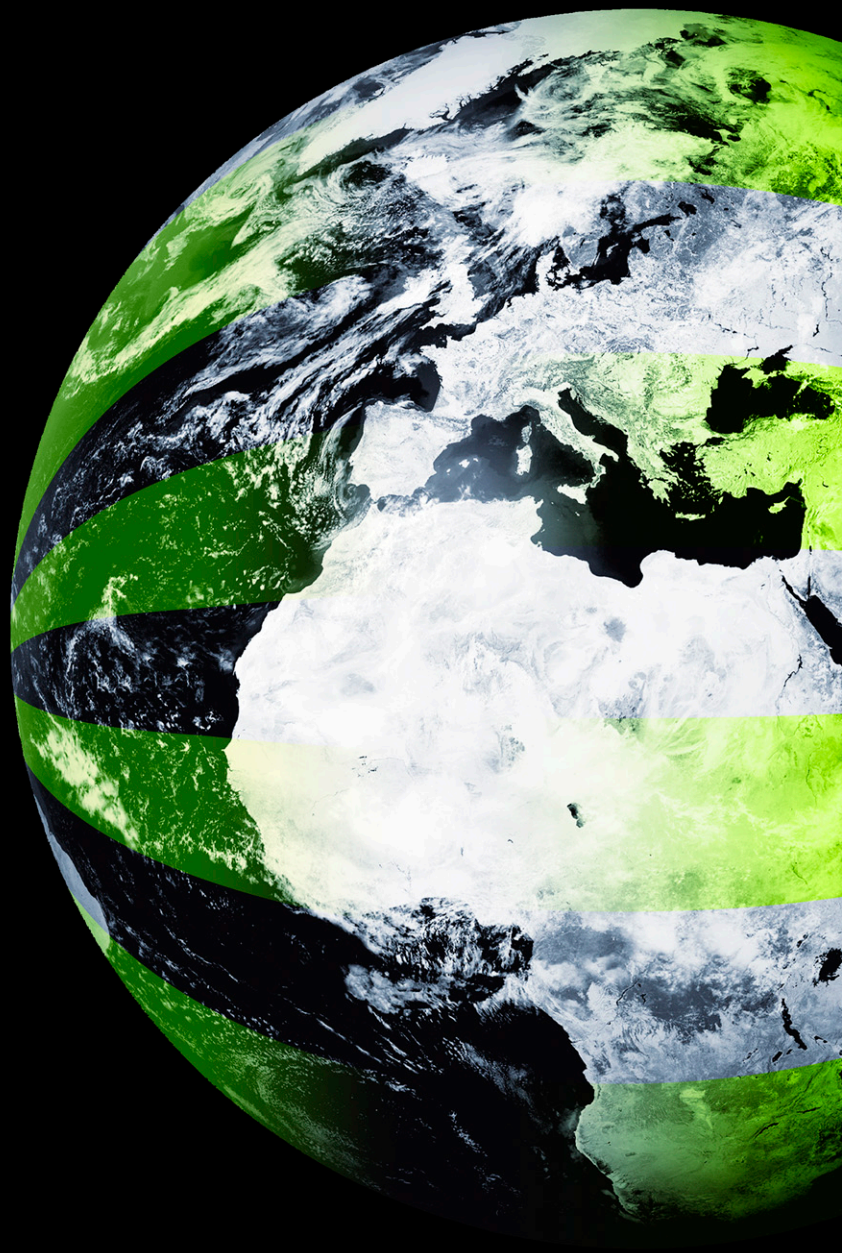
What I'll be covering....

- Climate risks to coastal systems
  - Sea level rise
  - Downscaling of climate models
  - Coastal flood risk

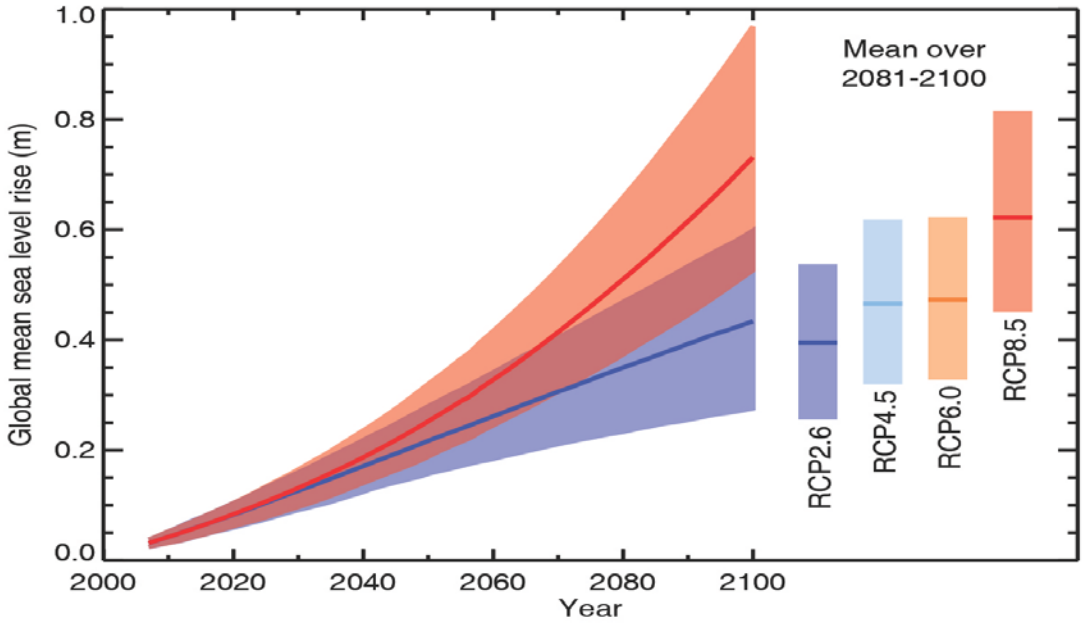
- Including climate change in coastal planning and policy
  - National risk assessment methods

- Coastal adaptation options
  - London Thames Estuary 2100

Illustrated with examples from Asia and the UK



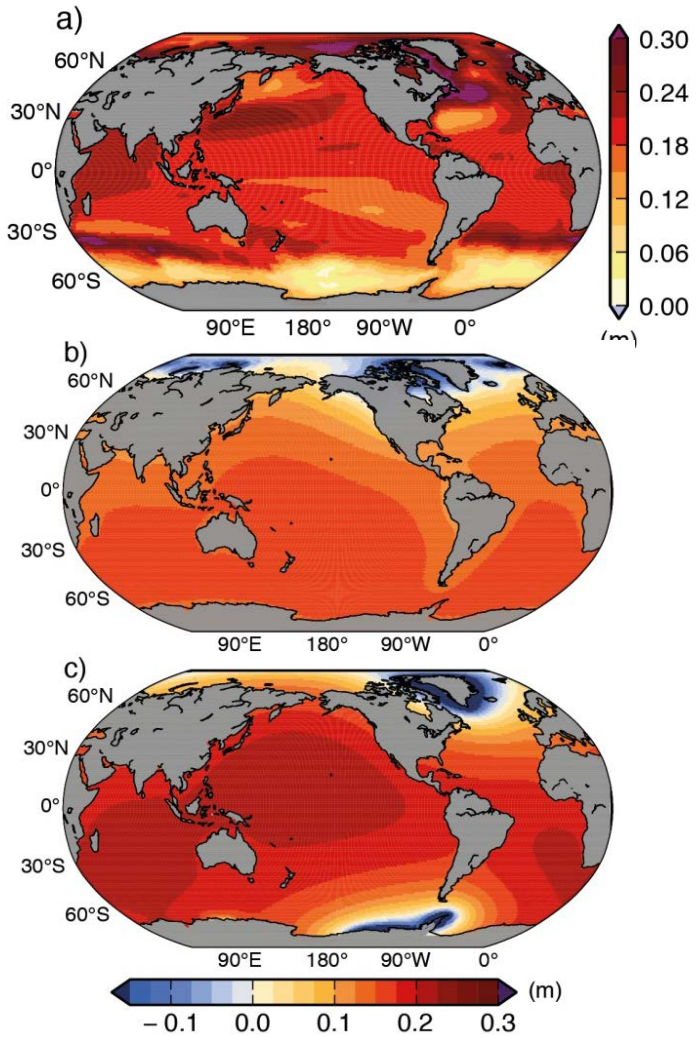
Sea-level rise will continue



- Global average sea level will rise during the 21st century, and it is *very likely* that it will rise faster than it has during the last 40 years.
- Thermal expansion accounts for 30-55% of the total, with melting of glaciers giving the second largest contribution.
- It is *likely* that reductions in the Greenland and Antarctic ice sheets will contribute to sea level rise by 0.03-0.20m by 2100.

Global and regional sea level rise

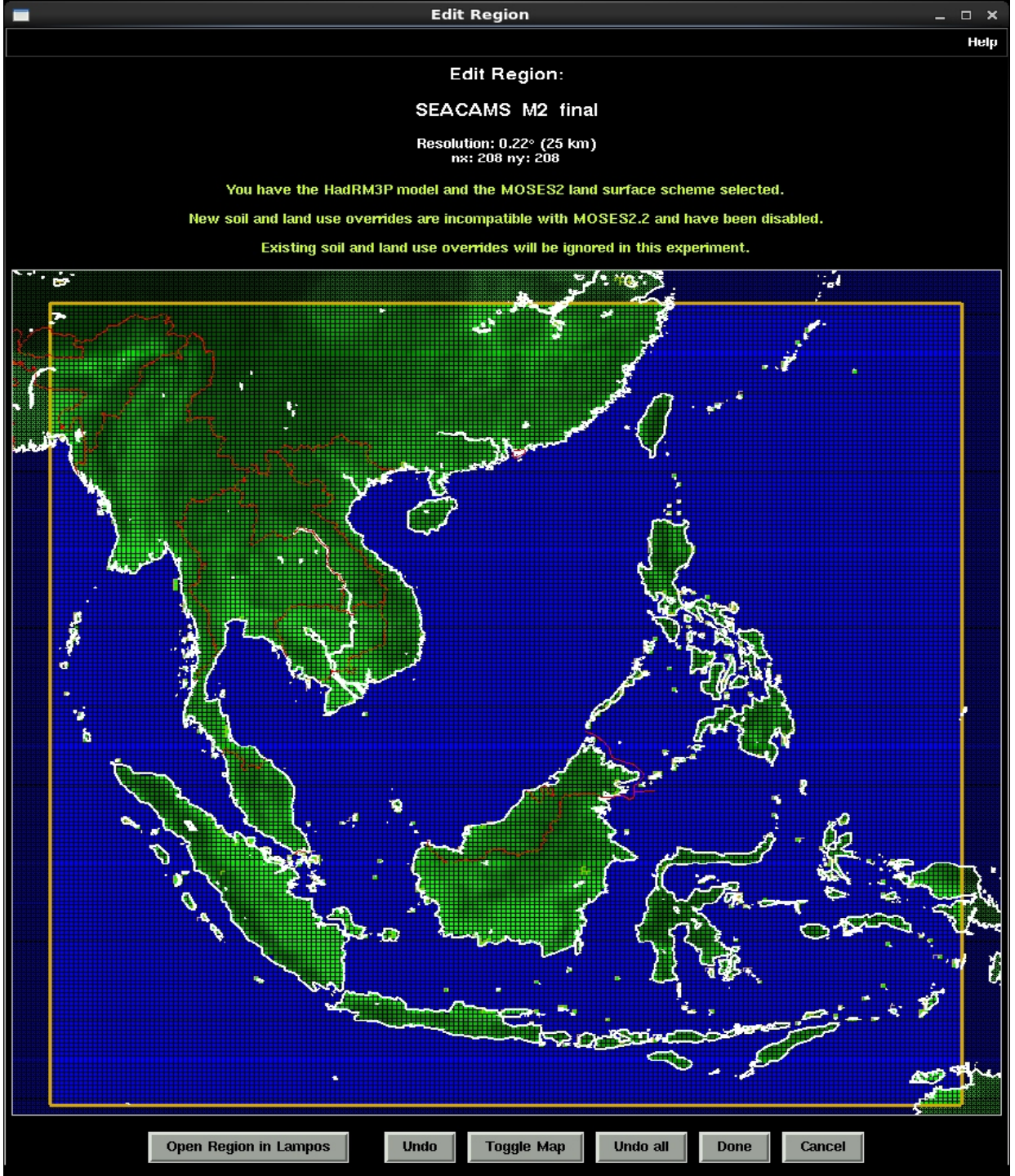
- Sea level rise projections include several components (a) dynamic and thermal (b) glaciers and (c) land ice
- Can not rule out sea level rise of up to around 2m, but such large rises considered to have a low probability, e.g. Hinkel *et al 2014* assumed a range 25-123 cm
- Due to these uncertainties monitoring of sea level should continue and physical model improvements are a scientific priority, especially ice sheet processes



Source: IPCC AR5 (Church et al., 2013) 1986-2005 to 2081-2100. Based on the RCP4.5 scenario.

The South East Asia Climate Analysis & Modelling project (SEACAM)

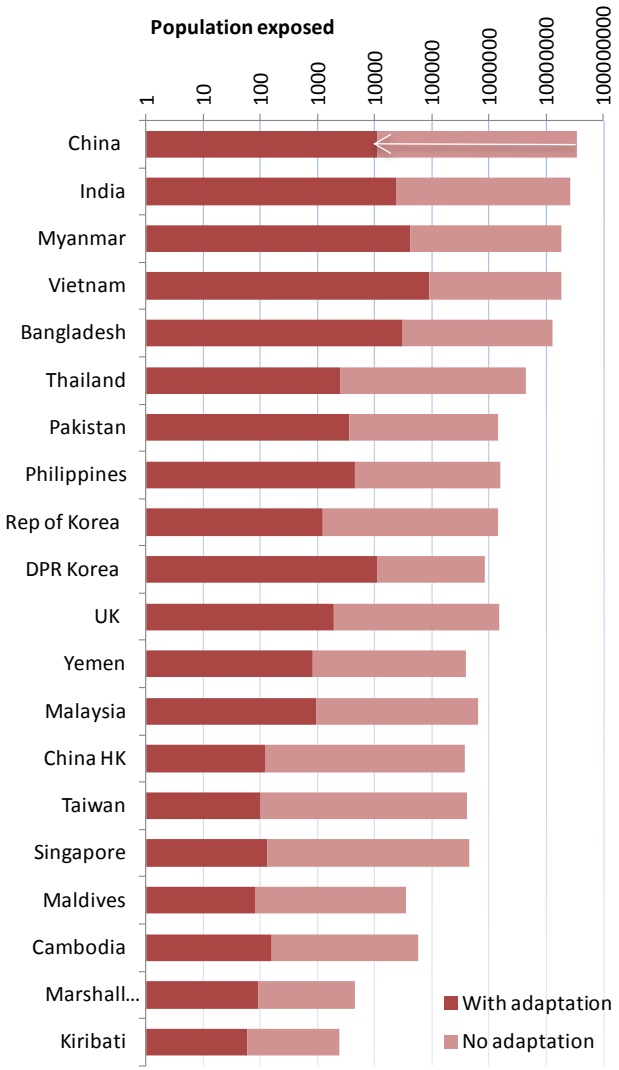
Resolution: 0.22° (~25km * 25km)
208 by 200 grid points
www.precisrcm.com/rcct

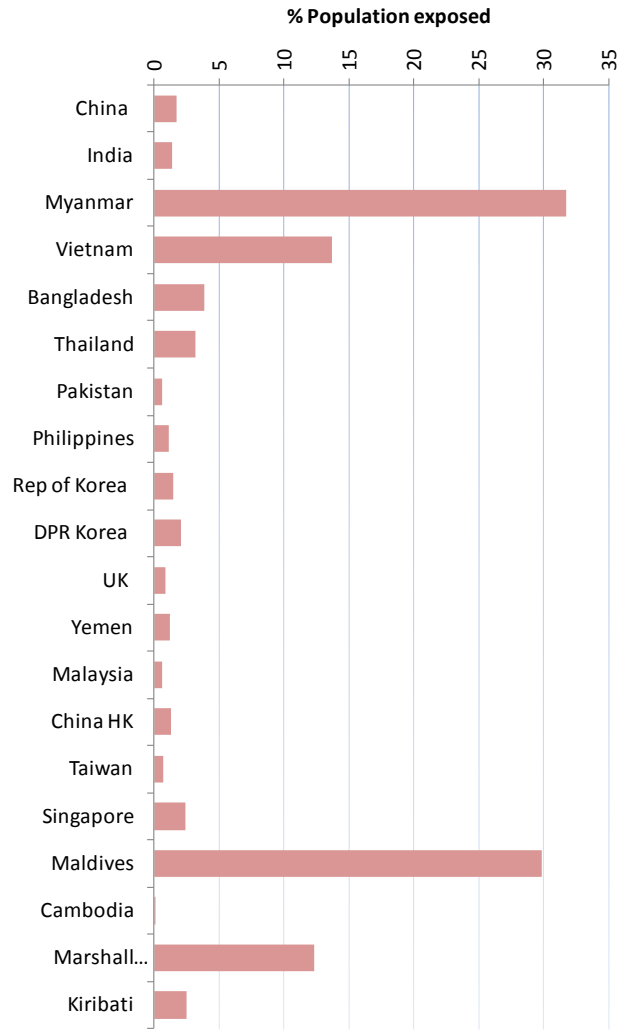


Coastal flood impacts: Average number of people flooded per year (2080s RCP8.5, high ice melt scenario) for selected countries

(based on Hinkel, 2014) and Richardson et al ., 2014)

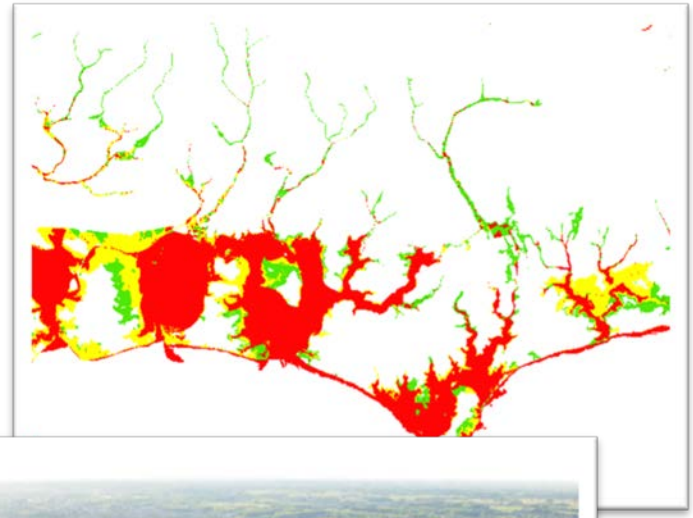
- Coastal flood risks are significant across Asia
- Large numbers may be affected (top 5)
- Large proportion of population affected in Myanmar, Vietnam and Pacific Islands
- Based on Hinkel et al., 2014 from Richardson et al., 2014





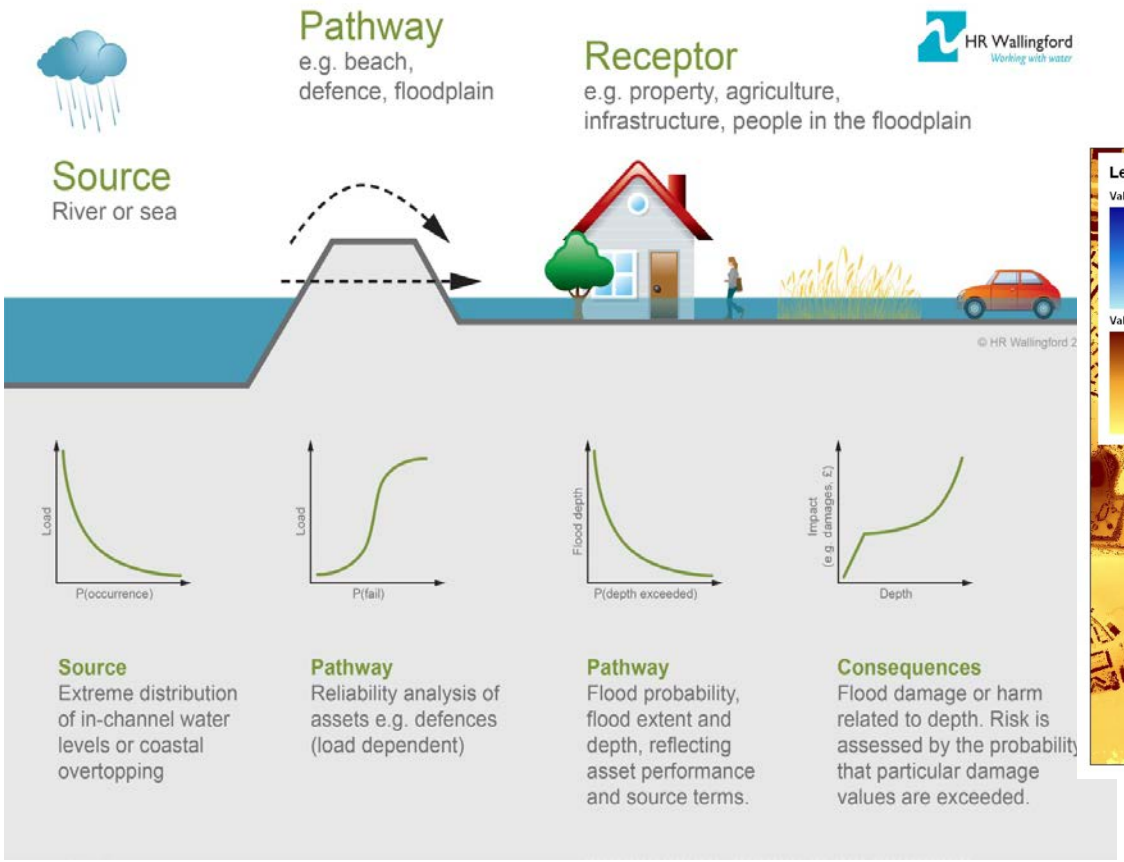
Adaptation

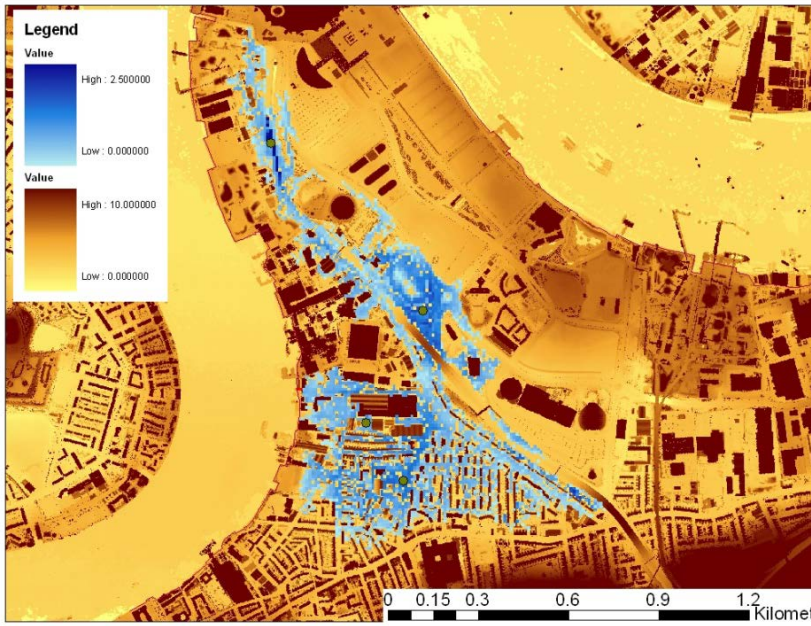
- Monitoring sea level rise, coastal impacts and vulnerability
- Managed realignment
- Coastal defences
- Tidal barrages
- Forecasting and warning systems
- Flood shelters
- Spatial planning



International Levee Handbook

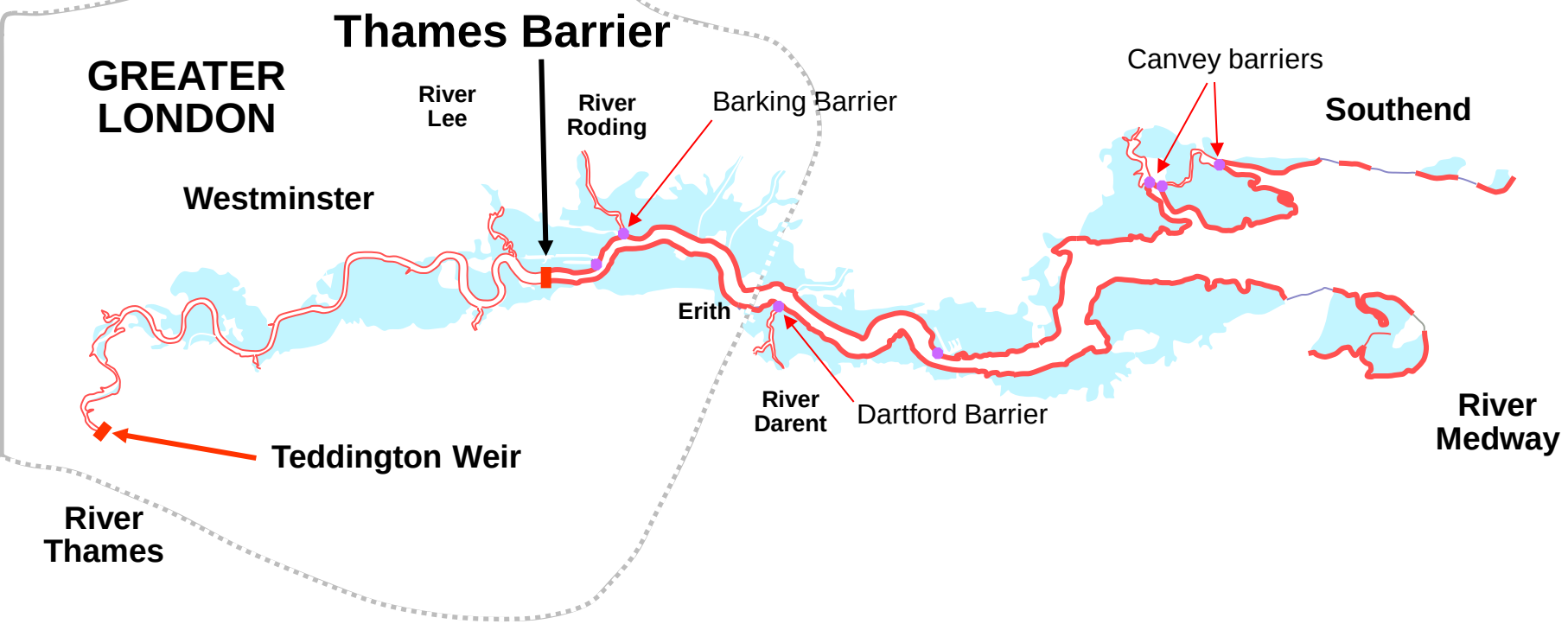
Understanding risks case study: UK National Flood Risk Assessment (NaFRA) tools





Source: HR Wallingford

Adaptation case study: The Thames Estuary

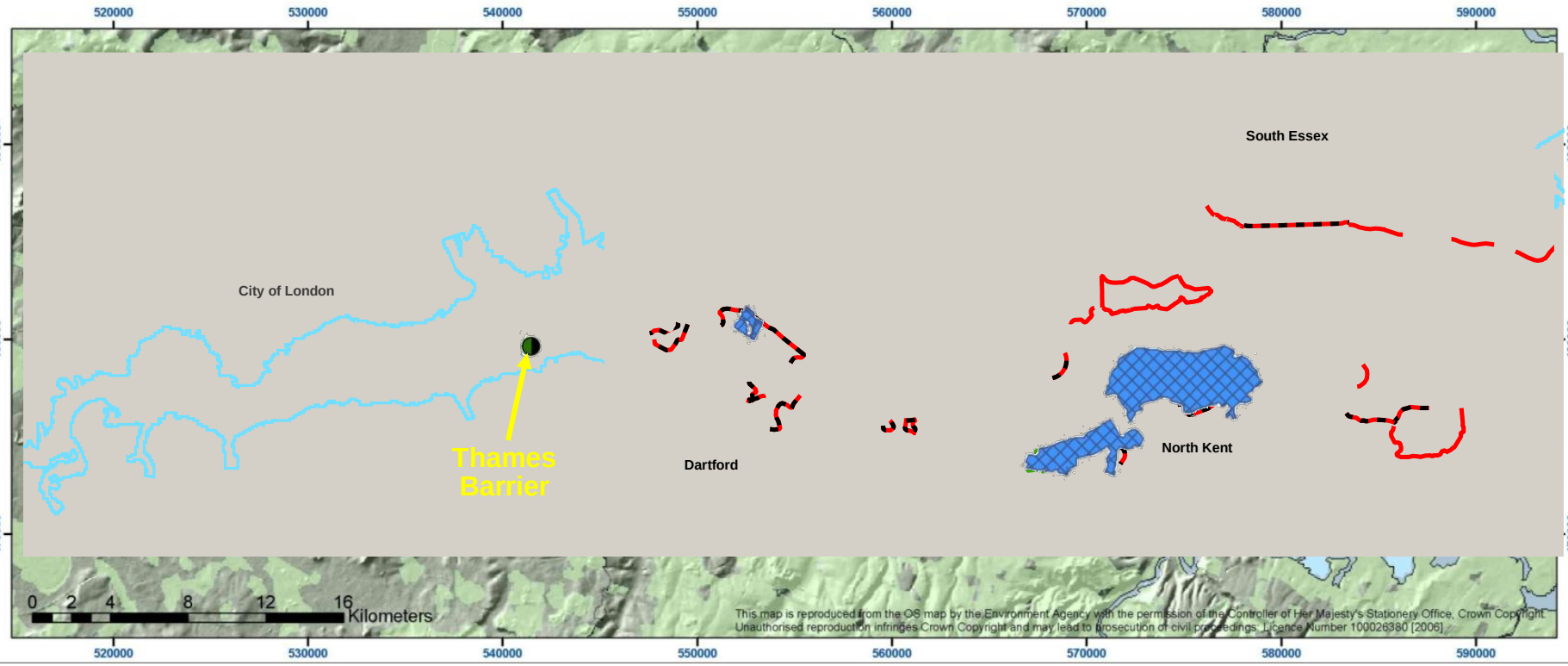


Length of estuary: About 100km
Length of defences: About 350km
Number of properties in floodplains: About 540,000

Primary defences
Secondary defences

Source: Environment Agency

HLO2 - Floodplain storage and raised defences (3 Climate Change Futures)



Time Line - Tidal Flood Management

(Dates apply to High +)

2015

2100

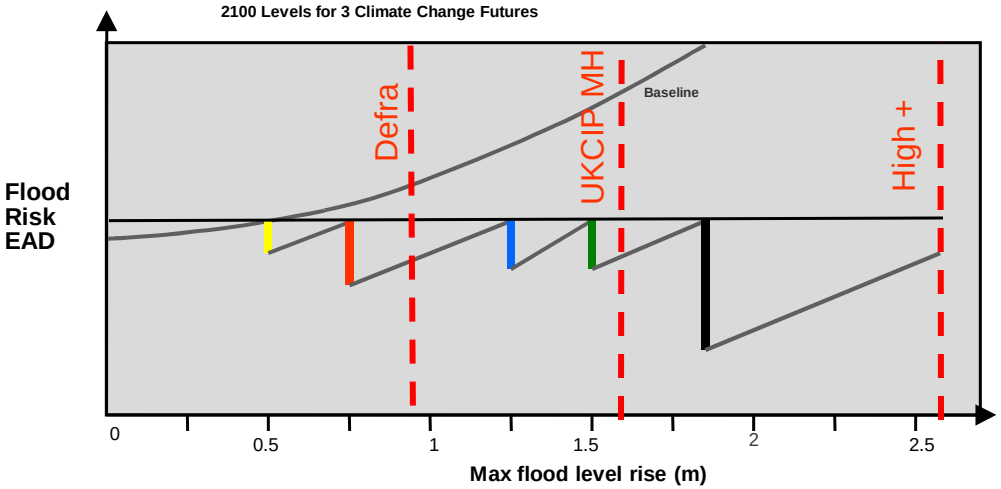
- Extreme Flood Extents
- Urban Area

2030
- Managed Realignment
- New Defence
- Raise downriver defences by 0.3m
- Flood Storage
- Flood Storage area if available

2050
- New Defence
- Raise downriver defences, Restore Interim defences
- Flood Storage

2060
- 2060, Over rotate Thames Barrier
- Raise downriver defences by additional 1.5m (

2075
- 2075, Raise upriver defences (total raise of 1m), Raise defences (but covered in 2060)
- 2075, Improve Barrier



Questions

Contact :
Email: **steven.wade@metoffice.gov.uk**
Telephone: **01392 886638**