



**Project Integrated effects of climate change on coastal extreme sea levels**

**Funding** DEFRA - Contract FD1204

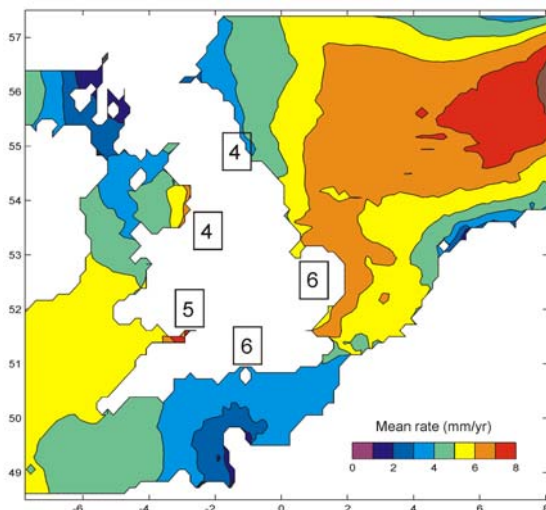
**Summary**

The project objective was to derive guidance on changes/trends in extreme sea levels from *existing* information

Changes in extreme sea level at the coast may result from a combination of:

- a) global mean sea level (MSL) change + regional variations
- b) regional land movements
- c) tidal changes due to increased mean sea level (MSL)
- d) changes in storm surges due to changes in "storminess"

The approach was to first review existing knowledge and estimates of based on observations. Future projections were then constructed from model estimates of change in each of the above components.



Computed rate of change (mm/yr) in extreme SL *relative* to the land, assuming the changes occur between 1990 and 2075. Corresponding values from current DEFRA guidance are shown in boxes.

Corrected for local land movements, the "absolute" MSL trend is about +1mm/y = 10cm/century. IPCC predicts that global MSL will increase by +47cm by 2100 or about 35cm by 2075.

Land subsidence or uplift can result from: post-glacial rebound, water extraction, sediment compaction etc.. Changes in land elevation for the UK were taken from the Lambeck & Johnston (1995) post-glacial rebound model.

Tides are modified by MSL rise. Increased water depth implies longer tidal wavelength and possibly reduced energy dissipation. This results in changes in mean high water of up to  $\pm 10\%$  of the assumed SL rise.

Changes in 50-year extreme surge elevation by 2075, due to climate induced changes in "storminess", were estimated from 30-y runs

of surge models forced by met data from ECHAM4 climate model in STOWASUS-2100 (EU ENV4-CT97-0498)

Combining these estimates gives the mean rate of change (1990-2075) shown in the Figure. Each component has substantial uncertainty so this distribution, like all similar estimates, is subject to large uncertainty and should be treated with caution. It does, however, give an indication of the possible variability in rates along the coast.

Results suggest that present UK guidance is good on the E coast, under-estimates in the Irish Sea & Bristol Channel and over-estimates on the S coast

Further work is required to resolve the aspects of uncertainty, leading to useful quantitative estimates for the UK and other vulnerable coasts.