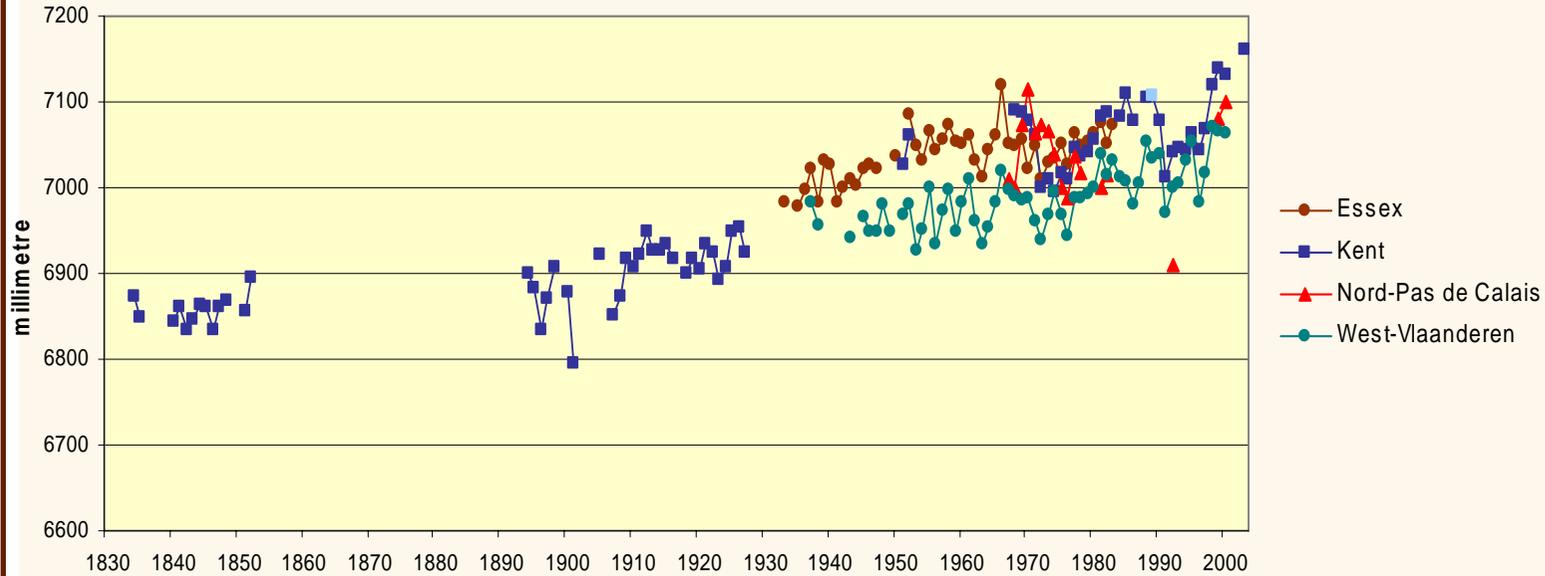
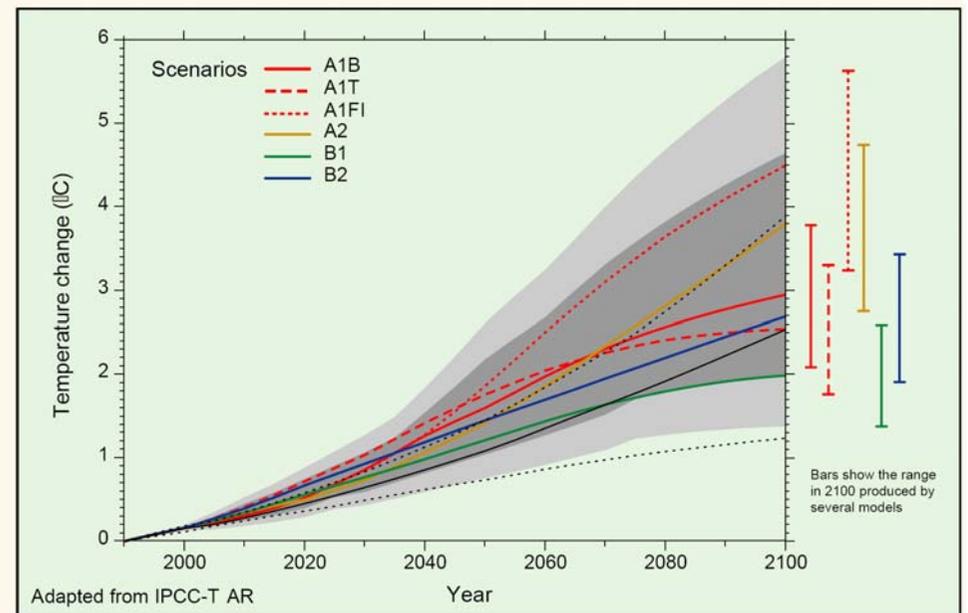


Indicator 25 Sea level rise

Sea level relative to land in Essex, Kent, West-Vlaanderen and Nord-Pas de Calais
Permanent Service for Mean Sea Level (PSMSL) stations with longest time series



Predicted global mean sea level rise by 2100 (IPCC)



Adapted from IPCC-T AR

Year

Key Message

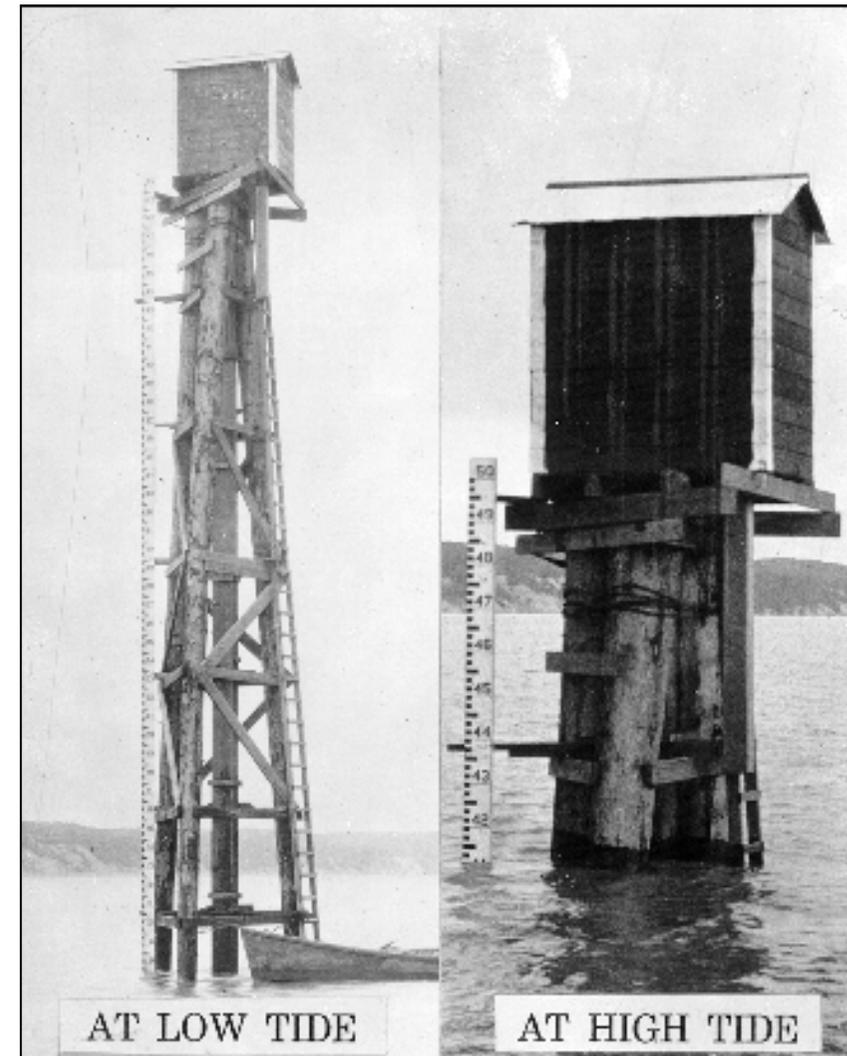
- Each of the longest time series for the sub-regions in the Southern North Sea indicate that the sea has risen relative to land over the last century with values ranging locally from 0.14mm/yr in Nord-Pas de Calais (Dunkerque) to 1.65mm/yr in Kent (Sheerness), depending on the vertical land movement.
- Differences between stations of the same sub-region can be considerable: in Essex averages range from 0.96mm/yr (Harwich) up to 5mm/yr (Walton on the Naze).

Why monitor sea level rise?

It is anticipated that climate change will lead to a rise in global (mean) sea level, primarily because of thermal expansion of ocean water and melting of ice sheets. Coastal areas could face a significant risk of increased flooding, inundation and erosion as a result. An increase in storm frequency, along with climate change, could add to the risk of flooding from sea level rise. In addition, downward or negative vertical land movements in the region add to the threat of flooding from the sea.

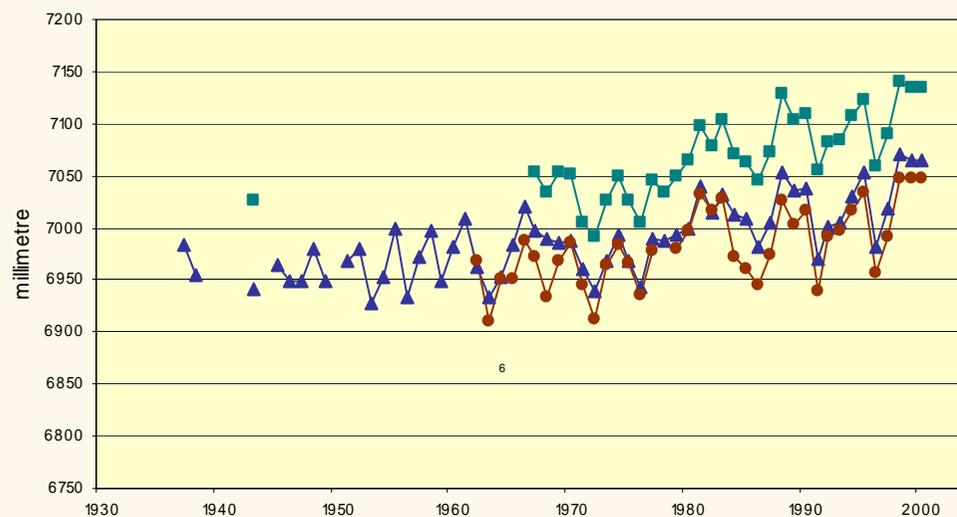
Where do the data come from?

The Permanent Service for Mean Sea Level (PSMSL) receives monthly and yearly mean values of sea level from a global network of tide gauges. Datasets collected and presented here only refer to the 'Revised Local Reference' type (or RLR) because they allow the construction of time series. The RLR data are reduced to a common datum, approximately 7,000mm below mean sea level in order to enhance global comparability. In The Netherlands, data are collected according to a different methodology. RWS/RIKZ monitors sea level rise relative to the *Normaal Amsterdamsch Peil* or NAP.

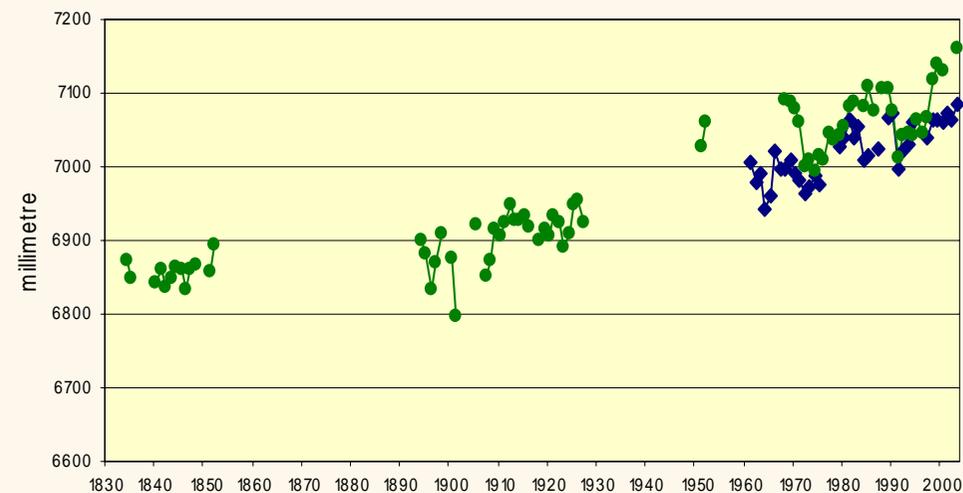


Historic tide gauges

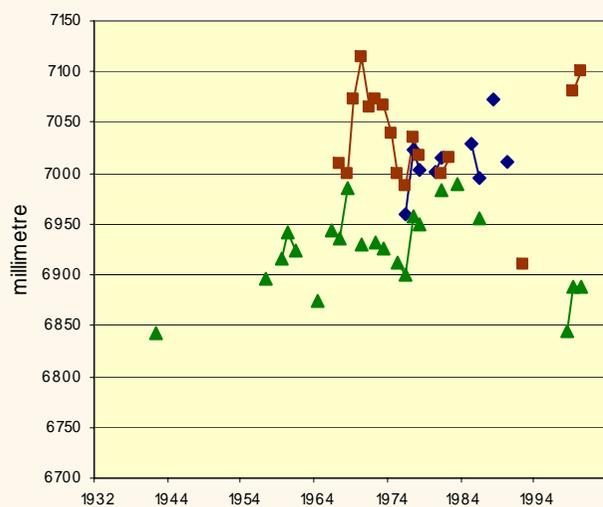
Sea level relative to land in the SAIL sub-regions



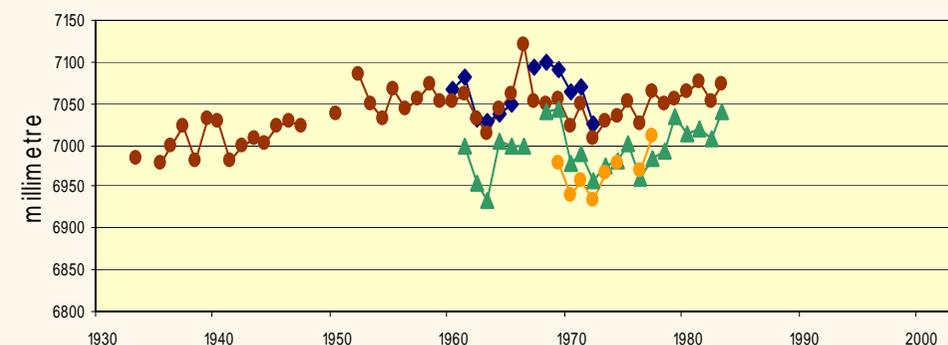
- West-Vlaanderen - Nieuwpoort
- ▲ West-Vlaanderen - Oostende
- West-Vlaanderen - Zeebrugge



- ◆ Kent - Dover
- Kent - Sheerness



- ◆ Nord-Pas de Calais - Boulogne
- Nord-Pas de Calais - Calais
- ▲ Nord-Pas de Calais - Dunkerque



- ◆ Essex - Harwich
- Essex - Southend
- ▲ Essex - Tilbury
- Essex - Walton on the Naze

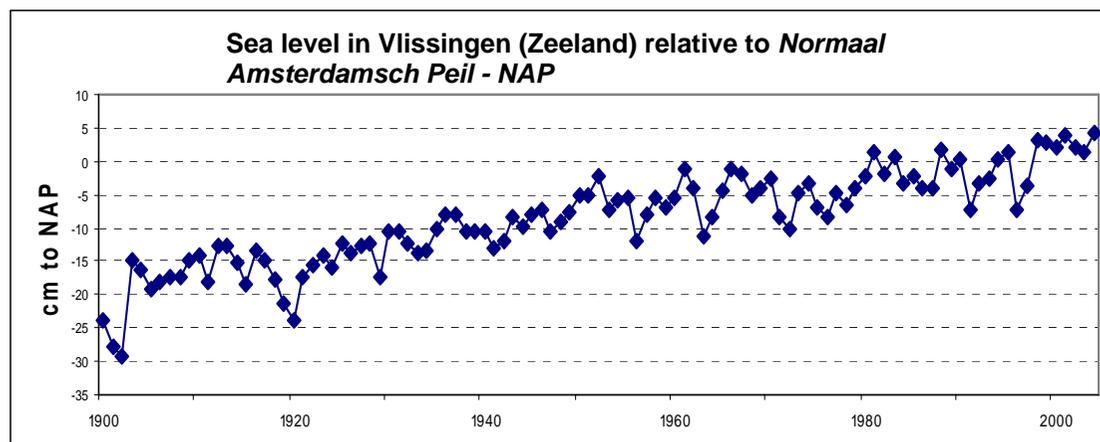
What does the indicator show?

For more than one hundred years, tide gauge stations in the Southern North Sea region have been monitoring tides and sea level relative to land. Data from reliable and relevant time series (RLR) indicate rising sea levels at the longest active gauging station in all 4 subregions. For those stations, relative sea level rise is highest in Sheerness (Kent) with 1.65mm/yr since 1834 and lowest in Dunkerque (Nord-Pas de Calais) with 0.14mm/yr since 1942. Oostende in West-Vlaanderen and Southend in Essex experienced a rise of 1.44mm/yr and 1.2mm/yr respectively since measurements started. Some stations like Boulogne in Nord-Pas de Calais registered highly fluctuating mean sea levels over a relatively short time. In Essex, considerable differences are recorded between the stations of Harwich (0.96mm/yr) and Walton on the Naze (5mm/yr) which are explained partly by local differences in vertical land movement.

According to the measurements in Vlissingen, sea level has been rising steadily since 1900 by an average of 2mm/year in relation to the NAP.

What are the implications for planning and managing the coast?

Global mean sea level has increased by 1.0-2.0mm per year during the 20th century. The Intergovernmental Panel on Climate Change (IPCC) predicts that it will rise further between 14-80cm by the year 2100 as a result of thermal expansion and melting of ice sheets. Coastal areas could face an increasingly significant risk of flooding, inundation and erosion as a result of sea level rise, with or without more frequent and severe storm surges. At present it is not possible to predict the effect of global warming on the storm surge regime affecting SAIL coasts.



Prognosis, adaptive planning and mitigation are increasingly important tools to deal with change and feed into a long-term strategy. A long-term programme of education is to be implemented in those areas where the strategy is to allow for inevitable change.



How reliable is the indicator?

Sea level data has been recorded at tide gauge stations over the world for a long time, primarily for tide measurements. Although individual stations are responsible for the quality of the data provided, the PSMSL performs additional quality checks and follows up on each of the stations. For Zeeland no 'RLR' data were available because datasets in The Netherlands are expressed relative to the national level system *Normaal Amsterdamsch Peil (NAP)*.

Data source: Permanent Service for Mean Sea Level (PSMSL): <http://www.pol.ac.uk/psmsl/datainfo/>

