

# Introduction

Changes to the regional climate of the Severn Estuary will have impacts on its social, economic and natural environment and it is important to understand these changes for effective adaptation. Current research and evidence for the estuary suggests that air and sea temperatures are rising in line with global trends. Local impacts include coastal flooding and erosion.

# Trends

Severn Estuary winter air temperature has increased by between 1.4 and 2.2°C since 1961.

Severn Estuary summer air temperature has increased by between 1 and 1.8°C since 1961.

Heavy winter precipitation events have increased, whilst heavy summer precipitation events have decreased in frequency across the Severn Estuary.

UK relative sea level rose by about 1mm/year during the 20th century, but this rate increased during the 1990s and 2000s.

Severe wind storms have increased in frequency, although the causes are still unclear and not greater than storm levels experienced during the 1920s.

# Projections

By 2080, winter mean land air temperature is projected to rise by about 2.8°C and summer mean temperature by about 3.9°C\*.

By 2080, an average increase in winter mean precipitation of about 23% is projected whilst during the summer a decrease of about 24% is projected.

Relative sea level is rising and is projected to be about 30-40cm higher in Cardiff by 2080\*\*.

# Impacts

Both milder, wetter winters and warmer, drier summers could create both negative and positive implications for coastal communities, local industry and the natural environment around the Severn Estuary. It is important to note that, regardless of the greenhouse gas emissions scenario used, all projections for the future local climate show significant changes and some level of adaptation will be necessary.

# Uncertainties

Climate modelling due to incomplete understanding of the climate system.

Natural climate variability.

Greenhouse gas emissions and difficulties in predicting future amounts.

Issues with downscaling data and translating it to regional/local scales.

Extreme scenario projection.

Note: Refer to full report cards on 'Climate Change on the Severn Estuary' for complete findings and reference list.  
\*Compared to the 1961-1990 baseline level (assuming a medium greenhouse gas emissions scenario central estimate)  
\*\*Compared to the 1990 baseline level (based on a medium greenhouse gas emissions scenario central estimate)



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The marine environment of the Severn Estuary is one of the most dynamic in Europe and sea level, waves and storms all play their part in shaping this coastline. Historical records show that the Severn Estuary coastline has suffered severe flooding and erosion events and modern research suggests such events are likely to occur again. Rising sea levels coupled with a severe storm event could intensify the effects of coastal erosion and flooding and cause significant issues for coastal planners, engineers and communities.

## Sea level

It is estimated that by 2080 sea levels at Cardiff will be 30-40cm higher, compared to the 1990 baseline level. Local research supports this.

## Wave climate

Seasonal mean and extreme waves are generally projected to increase slightly to the south west of the UK, including the Bristol Channel and Severn Estuary, which is consistent with rising sea levels. Models suggest that coastal squeeze, habitat loss, coastal erosion and steepening of intertidal (beach) profiles will all increase in the future because of further sea level rise and possible changes to wave conditions.

## Storminess

UK severe wind storm numbers have increased since 1960, but not above levels recorded during the 1920s (a particularly stormy period). Recent local research has supported this trend. Projections are very uncertain, but it is possible severe storms will increase in frequency in the future, particularly affecting the west coast of the UK.

## Storm surges

The Bristol Channel and Severn Estuary are likely to see the largest increase in storm surge height of about 0.8mm/year. Although this is a small increase, when taking into account sea level rise and potential increased storminess, flooding and erosion impacts could become more severe.

## Uncertainties

As well as key uncertainties associated with climate modelling and local scale interpretation of data, marine climate projections are even more difficult to interpret at regional and local scales. This is because huge knowledge limitations surround ice melt contribution to sea level rise and future wave impacts at the coast. There is also a lack of consistent local marine observations to use in climate models.

*Note: Refer to full report cards on 'Climate Change on the Severn Estuary' for complete findings and reference list .*

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The nature of rainfall over the Severn Estuary has changed over the last 30 years. Rainfall patterns are projected to continue showing changes, with seasonality of rainfall becoming more important. This has potential consequences for river and groundwater levels and possible issues related to catchment management and land use in the future. However, the UK exhibits high levels of year on year changeability in storm and rainfall patterns and, as yet, there are no clear trends of change in annual mean rainfall levels identified.

# Trends

Total precipitation has shown a decrease of 15-20% in the summer between 1961-2006, which is statistically significant.

Winter mean precipitation trends have shown a general increase by about 10-15% between 1961-2006.

All regions of the UK have seen an increase in the precipitation contribution from heavy rainfall events during winter.

# Projections

By 2080, projections for the Severn Estuary area show decreasing mean summer precipitation amounts of about 24% and increasing mean winter precipitation of about 23% (compared to the baseline period 1961-1990, under a medium emissions scenario, central estimates). This could cause warmer, drier summers and milder, wetter winters.

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