

# Sea Level: A View from the Past

Dr Timothy Lane and Dr Jason Kirby

Globally, average sea level has risen by around 24cm since 1880 and will continue to rise for the foreseeable future. The consequences of this are already impacting on coastal communities and ecosystems, causing flooding, erosion, and soil contamination. At present, some 267 million people live less than 2m above sea level. By 2100 that will increase to 410 million.

Much like climate, sea level has fluctuated in the past. At times, it has been much higher than present and at other times it has been much lower than present. In the last few million years, this pattern of sea-level change has been broadly controlled by the growth and decay of huge ice sheets across the Northern Hemisphere. However, these natural ice-age climate change processes have now been overtaken by climate change caused by human activity. Our reliance on fossil fuels for energy, industry and travel, as well as unsustainable farming practices, have resulted in a world that is 1.2°C warmer than pre-industrial levels.

This global warming has caused enhanced melting of ice sheets and glaciers across the world and thermal expansion of the ocean. In combination with the human modification of coastlines, this has led to a situation where the global mean sea level is not only rising, but is accelerating. In 1901-1990 sea level rose at an already alarming rate of 1.4mm per year. Now, it is rising at a rate of at least 3.6mm per year, a figure that is only going to increase, and that will lead to an increase of 0.5-1m in sea level by 2100. From the Greenland Ice Sheet alone, we're now committed to at least 27cm of sea level rise, regardless of how much we reduce emissions.

These figures are a global average which is exacerbated locally by tides, coastline management, and flooding due to storms. To a non-sea-level specialist, globally averaged numbers are often abstract and mean little at a national or community scale. A few millimetres a year, or a metre by 2100 do not feel like large increases, but for billions of people across the world they are. The catastrophic changes that we and, more importantly, the world are facing are so huge that they are impossible to accurately visualize or comprehend. As Andri Snær Magnason comments in *On Time and Water*:

**We can comprehend the loss of something valuable, can comprehend when an animal is shot, when a project blows past its agreed-upon budget. But when it comes to the infinitely large, the sacred, to things that are fundamental to our lives, there's no comparable reaction. It's as if the brain cannot register at such a scale. 1**

Whilst some of this cognitive dissonance is intentional, often it is accidental. Despite living in an increasingly globalized world, we often find it hard to relate to something as large as 'global sea-level rise'. Instead, we need to find a way to remain linked to the local, and to view the potential local impacts and repercussions of a global phenomenon. As opposed to just shrugging in disbelief at upward trending lines on a graph produced by scientists, we can visualize rising sea levels in locations we have visited and developed memories, such as Birkenhead, Formby and Liverpool city centre. Alongside this, remaining linked to the local allows the public to think more deeply about sea-level change and its variable impact where they live. Liverpool is a city whose history is explicitly intertwined with the water. From the city's origin in the 12th century, named after the inlet flowing into the Mersey, to its major role in the transatlantic slave trade, to the (former) UNESCO World Heritage status of the docks, the link to the sea is unavoidable.

Despite our proximity and reliance on the sea, there remains an apathy to confronting the root cause of current and future sea-level rise. These totems will hopefully raise awareness and remind people of this issue. They are a visual reminder of where we'll be in 60 years, and the landscape we'll be giving to our children and grandchildren.

**Your time is the time of the people you know and love, the time that moulds you. And your time is also the time of the people you will know and love. The time that you will shape.**

**Andri Snær Magnason, *On Time and Water***

Whilst the impacts of sea-level rise across Merseyside are likely to be damaging, they pale in

comparison with what is already happening to lower lying areas of the world.

1. *Andri Snær Magnason and Lytton Smith, On Time and Water: A History of Our Future (London: Serpent's Tail, 2021).*

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**Dr Timothy Lane** is a Lecturer in Physical Geography at Liverpool John Moores University, and Programme leader for the BSc in Climate Change.

Lane's research primarily focuses upon glacial geomorphology, environmental change, and landscape development in formerly glaciated regions. In particular he is interested in the behaviour of the Greenland Ice Sheet and Greenlandic ice caps during the last glacial cycle. He uses a combination of field and laboratory techniques including: geomorphology, sedimentology, lake core analysis, and surface exposure (cosmogenic nuclide) dating.

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Kirby's research Interests include Holocene sea-level changes and coastal evolution, quaternary micropalaeontology (pollen, diatoms and foraminifera), sediments in coastal systems and vegetation history, palaeoecology, and the use of fungal spores as indicators of herbivory.