

## Earth & Space

# Responding to sea-level rise: the importance of culture

by **Robert L. Barnett**<sup>1</sup> | Lecturer; **Sophie L. Ward**<sup>2</sup> | Research Fellow

doi.org/10.25250/thescbr.brk550

<sup>1</sup>: University of Exeter, Devon, South West England, UK

<sup>2</sup>: Bangor University, Bangor, Wales, UK

This Break was edited by Ayala Sela, Associate Editor - TheScienceBreaker

*Sea-level rise is one of today's most pressing global concerns and the response of coastal communities depends on social, cultural and environmental factors. But coastal inundation does not necessarily lead to coastline abandonment. A record of past sea level and landscape changes spanning 12,000 years reveals that widespread coastal reorganization can take place.*



*Today's Isles of Scilly from the air: 12,000 years ago this archipelago was one large island  
Image credits: Historic England Archive*

In the 21<sup>st</sup> Century, sea-level rise is one of the most pressing concerns for coastal communities worldwide. However, this is not the first time that humans have been forced to respond to rising sea levels. Sea level rise shapes coastlines, causes more frequent flooding events and forces coastal communities to either adapt their ways of life or to flee their coastlines. While current changes in sea level are mostly caused by anthropogenic influences (rather than from natural causes), there are lessons we can learn from the response of earlier communities to past sea-level rise.

The configuration of the [Isles of Scilly](#), in the southwest corner of Britain, has changed

dramatically during the Holocene period (12,000 years ago to present-day) in response to sea-level rise. This low-lying archipelago presents a perfect opportunity to study the response of both pre-historic humans and the wider landscape to past coastal changes. Our recent study has enabled us to ask the question: how important is human culture for responding successfully to sea-level rise, today and into the future?

Our study of the prehistoric inhabitants and landscape of the Isles of Scilly required multidisciplinary expertise and an interdisciplinary approach. We collected sediment cores from across the islands and offshore around the Isles of Scilly, as

this geological record provides archives of environmental change: pollen samples enabled us to reconstruct vegetation and environmental changes, charcoal fragments help identify past fire activity, and analysis of salt-marsh microorganisms help reconstruct past sea-levels. Dating the sediment provided a chronology, describing how the size and shape of the Isles of Scilly had changed throughout the Holocene. Archaeological records both from Scilly and the surrounding regions (southwest Britain and northwest France) provided information about the human activity through this period. Considering the environmental changes alongside human activity revealed remarkable results.

Twelve thousand years ago the Isles of Scilly were not isles, they were one large island. Sea level rose rapidly from 12,000 to 4,000 years ago, a response to the melting of large ice sheets over North America and northern Europe. During this time, large expanses of the coastal landscape had changed: the oak woodlands across the islands abruptly vanished around 7,000 years ago; open meadows were used for grazing from 5,000 years ago; and large swaths of the coast were transforming into intertidal wetlands from 4,000 years ago. Despite the slowing of sea-level rise 4,000 years ago, the land continued to be submerged since much of the coastal area was low-lying. The timings of these environmental changes coincided with the record of human activity in a surprising way.

There is limited evidence in the archaeological record for permanent human settlement on Scilly until 4,000 years ago. The environmental changes suggest some early land-use, and some flint artefacts imply at least seasonal visitors to the islands earlier than 4,000 years ago. However, starting 4000 years ago, the data suggest intensive human activity: there are over 600 recorded monuments across Scilly (entrance graves, standing stones, cairns, field

systems) that date to the Bronze Age (4,500 to 2,800 years ago). At this time, about 10,000 square meters of land were lost to the rising sea each year – yet, the human population appeared to flourish. Why?

Large-scale coastal changes were underway across the Isles of Scilly 4,000 years ago, during a time of relatively modest rates of sea-level rise. This leads to an important conclusion of the study. Sea-level rise across the globe is not uniform, and some areas experience higher rates of rise than others. The study reveals that it is not only the locations experiencing the highest rates of sea-level rise that are most vulnerable. Rather, low-lying regions such as island archipelagoes and large deltas may also be highly vulnerable, even if they are not experiencing the highest rates of sea-level rise.

How did the coastal communities respond to these coastal changes on the Isles of Scilly? The natural development of expansive intertidal environments would have offered new areas for wildfowl hunting, fishing and shellfish collection. At this time, the archeological record displays an abundance of artifacts (worked flints, ceramics and pottery) as well as the widespread development of monuments. Although abandoning the islands would have been a possibility, the drive to adapt to the changing environment was clearly greater.

The human response to sea-level rise and coastal change on the Isles of Scilly appears to focus on a cultural reaction as opposed to a physical departure. This suggests that cultural practices were important for responding successfully to coastal change, and this may be equally relevant today: there is already resistance to climate-migration in some island nations. To successfully adapt to future climate change, including sea-level rise, local societal and cultural perspectives need to be considered, respected and integrated into response strategies.