

# How can ocean and coastal observations inform National Adaptation Plans?

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## What are ocean and coastal observations?

Ocean and coastal observation is the gathering of physical, chemical and biological information about coastal and open-ocean areas through direct (or “in situ”) measurements and remote-sensing technologies. These data play a vital role for informed decision-making by governments, civil society and the private sector about sustainable development, ecosystem management, food security, ocean-resource utilization and natural disasters.

## How can ocean and coastal observations inform adaptation?

Ocean and coastal observations are required for adaptation planning for many coastal challenges related to climate change including coastal erosion, saltwater intrusion and ocean acidification. These observations can support assessments of risks and vulnerabilities, identify and assess options, and inform the development and success of National Adaptation Plans.

OBSERVATION APPLICATION	LINKS TO ADAPTATION OPTIONS	OBSERVATION APPLICATION	LINKS TO ADAPTATION OPTIONS
Optical water types for coastal water quality monitoring	<ul style="list-style-type: none"> <li>○ Food security, nutrition, sustainable agriculture</li> <li>○ Management of water, quality and quantity</li> <li>○ Sustainable use of ocean resources</li> </ul>	Optical water types for coastal water quality monitoring	<ul style="list-style-type: none"> <li>○ Food security, nutrition, sustainable agriculture</li> <li>○ Management of water, quality and quantity</li> <li>○ Sustainable use of ocean resources</li> </ul>
Species niche habitat distribution mapping	<ul style="list-style-type: none"> <li>○ Food security, nutrition, sustainable agriculture</li> <li>○ Sustainable consumption</li> <li>○ Sustainable use of ocean resources</li> <li>○ Temporal variations of carbon stocks for national carbon accounting</li> </ul>	Species niche habitat distribution mapping	<ul style="list-style-type: none"> <li>○ Food security, nutrition, sustainable agriculture</li> <li>○ Sustainable consumption</li> <li>○ Sustainable use of ocean resources</li> <li>○ Temporal variations of carbon stocks for national carbon accounting</li> </ul>
Complementary multi-platform coastal bathymetry	<ul style="list-style-type: none"> <li>○ Conserve and sustainably use the oceans, seas and marine resources for sustainable development</li> </ul>	Complementary multi-platform coastal bathymetry	<ul style="list-style-type: none"> <li>○ Conserve and sustainably use the oceans, seas and marine resources for sustainable development</li> </ul>
Coastal inundation mapping and prediction, and storm surge risk assessment	<ul style="list-style-type: none"> <li>○ Reduce risk to communities</li> <li>○ Maintain infrastructure</li> </ul>	Coastal inundation mapping and prediction, and storm surge risk assessment	<ul style="list-style-type: none"> <li>○ Reduce risk to communities</li> <li>○ Maintain infrastructure</li> </ul>

[Check out our case study examples on the following pages](#)

**Case of Korea's coastal adaptation plan: coastal erosion management zone**

**Dynamic Coast: Mapping the intertidal zone across the UK and Ireland to inform coastal adaptation**



# CASE OF KOREA'S COASTAL ADAPTATION PLAN: COASTAL EROSION MANAGEMENT ZONE

## Background

- Accelerated coastal erosion due to climate change and accumulated coastal development, threatening the safety of residents near the coast and increasing property damage.
- The necessity of securing the effectiveness of coastal management by including the whole coastal area (not only to coastal waters) and establishing a preventive erosion management system.

## Legal basis

- Coastal Management Act Article 20-2
  - The Minister of Oceans and Fisheries may designate as a coastal erosion management zone, which requires special management as serious damage has occurred or is likely to occur due to coastal erosion (hereinafter referred to as "management zone"), following the standards determined by Ordinance of the Ministry of Oceans and Fisheries.

## General outline

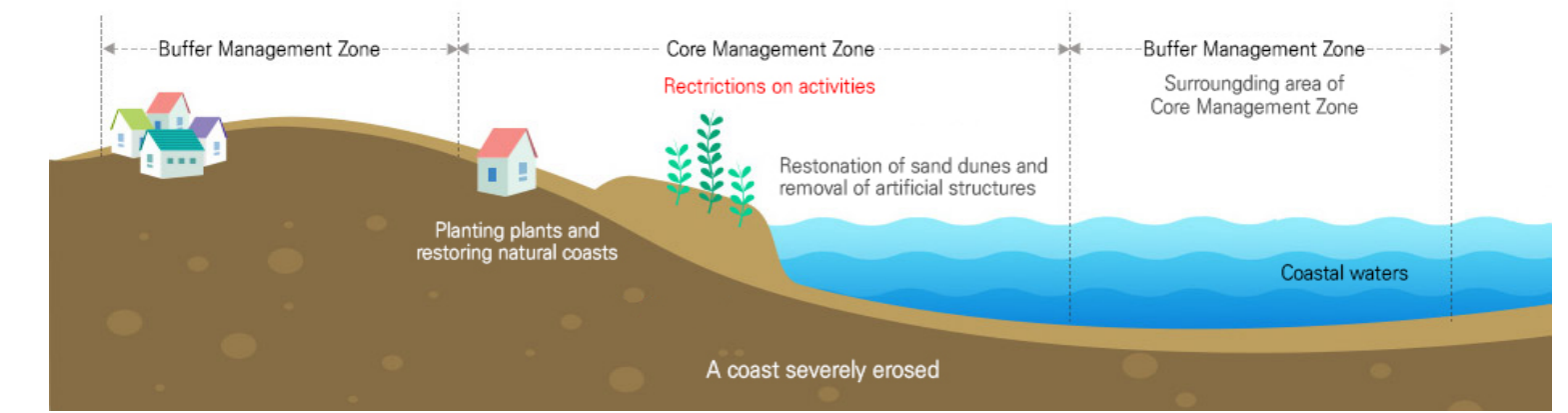
- Designating the coast that is feared to be eroded or in progress as a management zone (core management zone, buffer management zone) and establishing a management plan (dismissal of designation when the risk of erosion is reduced)
- Within the management zone, restrictions on actions (installation of artificial structures, prohibition of collecting sea sand, etc.) and securing management effectiveness through priority implementation of the annual security cost project.
  - Core management zone: an area where coastal erosion is rapidly progressing or the damage caused by this is serious, so urgent measures are required.
  - Buffer management zone: an area necessary for the management of the core management zone (i.e. surrounding area of each core management zone)

## Data & information for the designation

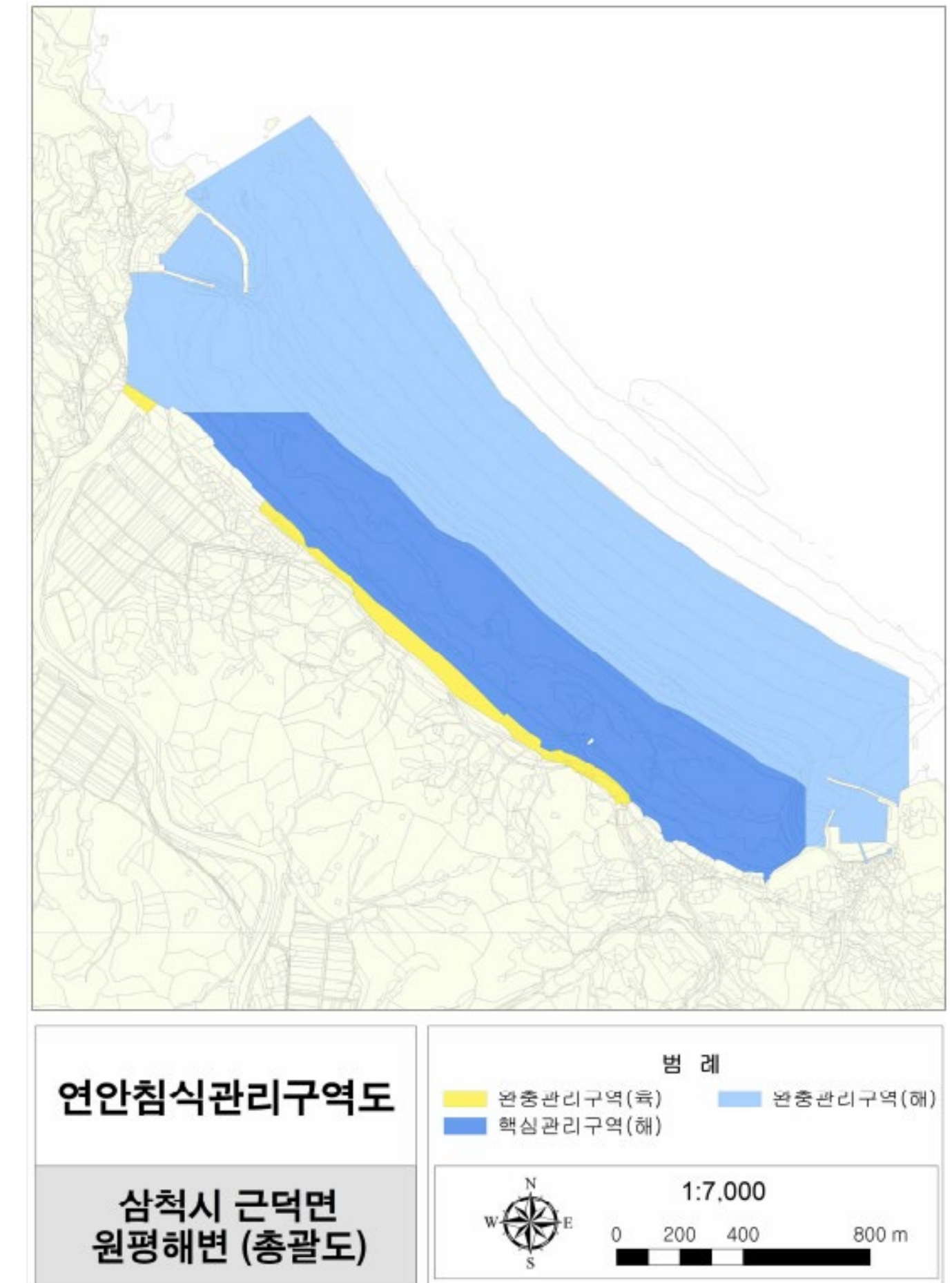
- Analysis of coastal erosion status using basic surveys related to coastal erosion across the country, such as national coastal erosion monitoring (Ministry of Oceans and Fisheries, local governments).
  - Survey of damage status by region and type according to coastal erosion.
- Status of use and development projects in coastal areas.
  - Analysis of the current status of use and development projects which might cause coastal erosion, such as fishing port development, port development, tourist attraction development, and sand collection.

## Current status (as of 2021)

- Designation and management of six places: Maengbang Beach (Gangwon Samcheok-si), Bongpyeon Beach (Jinjin-gun, Gyeongsangbuk-do), Daegwang Beach (Shinan-gun, Jeollanam-do), Wonpyeong Beach (Gangwon Samcheok-si), Geumeup Beach (Jinjin-gun, Gyeongsangbuk-do), and Kkotji Beach (Taeon-gun, Chungcheongnam-do).



Summary of Korea's coastal erosion management zone



Example of the basic map of Coastal Erosion Management Zone



# DYNAMIC COAST: MAPPING THE INTERTIDAL ZONE ACROSS THE UK AND IRELAND TO INFORM COASTAL ADAPTATION

## Introduction

The foreshore around the United Kingdom and Ireland is varied and complex with differing extents of intertidal area exposed during low tides. Many ecosystem services are provided by the intertidal zone; including wave attenuation that provides a reduction in flood risk and coastal erosion, significant carbon sequestration within habitats that support a range of internationally recognised habitats, and an extensive range of specialist species, many of which are rare and protected.

However, evidence is mounting that global intertidal extents have reduced over recent decades due to human activity and changing coastal processes. Developing and maintaining a national intertidal dataset to monitor coastal change, which is accurate and up to date, is both expensive and logistically difficult due to challenges with flying aircraft in optimal weather and tidal windows. Therefore, traditional methods are costly and difficult to implement to meet the demand for updated climate change risk assessments, resilience, and adaptation planning.

In response to this challenge, we developed a method, termed Coast X-Ray, that uses Sentinel-2 satellite images, in conjunction with the cloud-based platform Google Earth Engine (GEE) and an astronomical tidal model, to identify, at 10 m spatial resolution, the approximate extent and coarse geomorphological features of the intertidal zone, for the entire United Kingdom (UK) and the Republic of Ireland (ROI) coastline.

## Approach and Outputs

To map the intertidal zone 5 years of Sentinel 2 satellite images were obtained and analysed to extract the location of the water within the image. Each image captures the tide at a slightly different time, therefore, overtime, different parts of the intertidal zone are exposed. Each image was assigned a tide stage using a tidal model. Using this data and information a number of outputs were produced including:

- a Water Occurrence output (Figure 1);
- an Intertidal Tide Stage output (Figure 2);
- a true colour image representing the highest and lowest tidal stage observed;
- an estimate of the Mean High and Mean Low Water contours

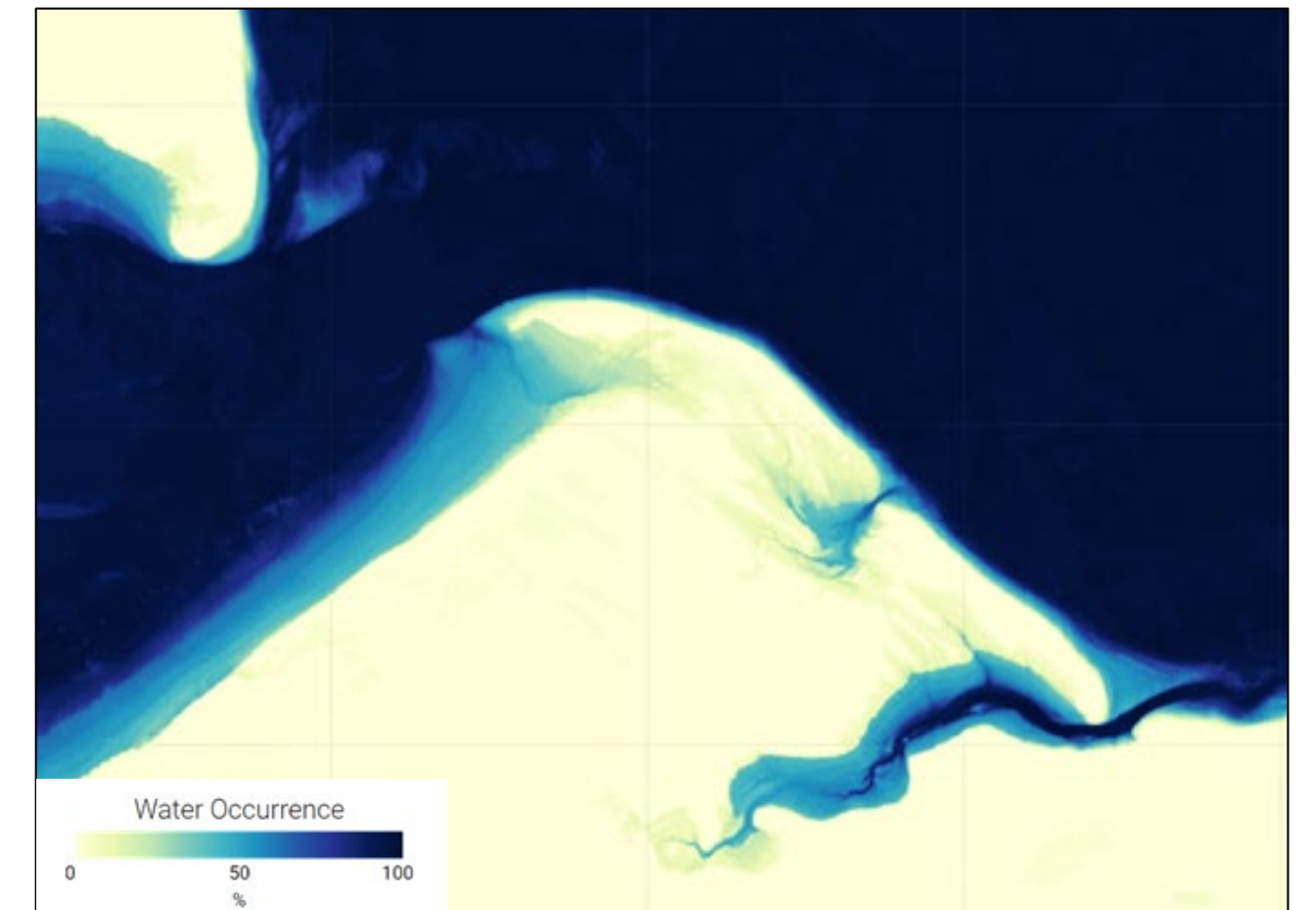
The outputs can be seen at [www.DynamicCoast.com/coastxray](http://www.DynamicCoast.com/coastxray).

## Informing Adaptation

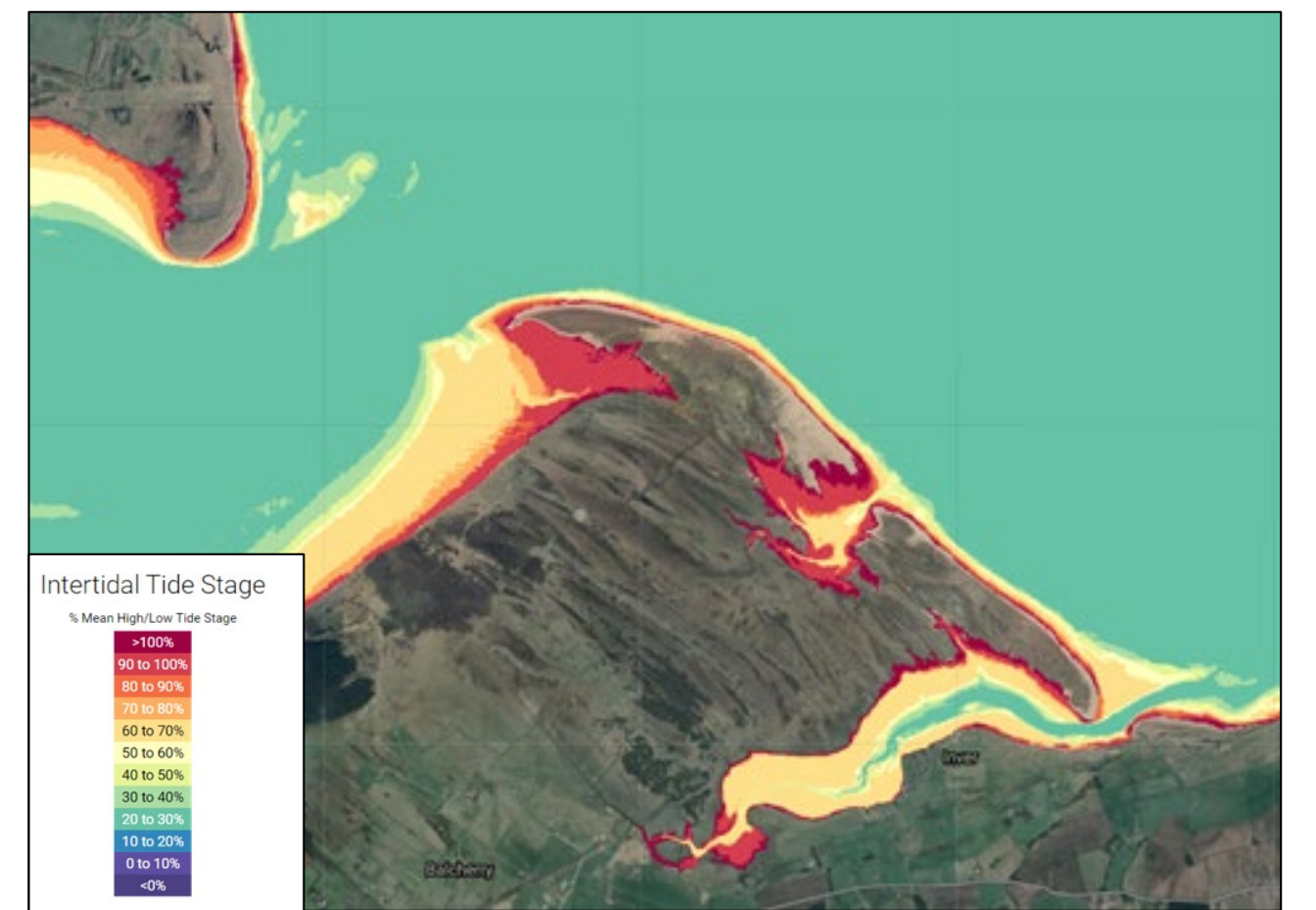
Coast X-Ray contributes to an enhanced understanding of the current and future behaviour of foreshore. The Scottish Government has recently announced £12 m (€14m, \$16.5m) to help local authorities take preventative measures to address coastal erosion issues. Coast X-Ray will form part of the supporting evidence to enable local authorities plan and monitor coastal adaptation.

Coast X-Ray also provides a novel cost-effective change intelligence tool to guide necessary re-survey schedule by the Ordnance Survey, the national mapping agency for Great Britain. This will allow the creation of more up to date data national mapping products, which are used by a whole suite of governmental and industry applications.

Knowing where the coastline is and how it is changing is crucial for coastal adaptation planning and implementation – earth observation provides a cost-efficient way to answer these fundamental questions.



**Figure 1: The water occurrence output around Morrich More, northeast Scotland.**



**Figure 2: The intertidal tide stage output around Morrich More, northeast Scotland.**



## ABOUT GEO BLUE PLANET

GEO Blue Planet is a voluntary thematic initiative of the Group on Earth Observations (GEO) that focuses on the use of ocean and coastal observations for societal benefit.

We are interested in working with countries to support the use of ocean and coastal observations in the development of National Adaptation Plans. If you are interested in working with us, please contact our Secretariat at [info@geoblueplanet.org](mailto:info@geoblueplanet.org).