

Coastal Erosion from Space



Written feedback from broader End user community regarding the URD

Ref: SO-TR-ARG-003-055-009-PVP-A9

Customer: ESA
Contract Ref.: 4000126603/19/I-LG



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 **ARCTUS**



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Applicable and reference documents

Id	Description	Reference
AD-0	Product Validation Plan	SO-TR-ARG-003-055-009-PVP

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1 Written feedback template sent to broader end users community

README: Please fill in the overall feedback table and add any inputs, using word track-changes, to the requirements tables for each product. If we have completely missed any product/service that you might be interested in knowing its feasibility, please use the [service description table template provided](#) in the last page of this document. Once completed, please email it to Andres Payo (agarcia@bgs.ac.uk) **by no later than Monday 20th Jan 2020.**

YOURS CONTACT DETAILS:

Name: your name (i.e. Ruth Adams)

Role: your role (i.e. Programme Manager SWRCMP)

Email: your contact email (i.e. ruth.adams@Teignbridge.gov.uk)

OVERALL FEEDBACK

Degree of interest in the products to be developed (UK product from all listed in Table 2, page 15 on User Requirement Document _v2.pdf, Full Table 2 included for your consultation at the end of this document)

# Table	Product Name	Highly interest	Somehow interest	Not interested	Comments
6	Proxy tideline				
7	Datum tideline				
8	Seamless Topo-Bathy- Metric DEM				
9	Habitat map				

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Any other?	Your product?				
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SPECIFIC FEEDBACK & INPUTS

Using track-changes, add any specific feedback and inputs on the detailed service requirements described on each of the tables shown down below. I have intentionally left blank the descriptors on the [table shown on last page](#) for you to describe any other product that does not fit the one contained on the other tables.

Table 6: Product description BGS #1: Proxy-based Tidelines

Description of product no. 1	
General Description	A proxy tideline (a physical feature taken to represent the shoreline) at different tidal elevations
General service/product description:	<p>We would like to be able to produce proxy tidelines that are consistent with tidelines mapped by the UK Ordnance Survey (OS) on the County Maps.</p> <p>Tidelines on County Series maps usually came from measured line surveys with offsets [1]. A proxy tideline (a physical feature taken to represent the shoreline) was surveyed. High tide lines were captured by one of two methods:</p> <ol style="list-style-type: none"> 1. Objects were placed on the beach at the time of high water. The positions of the objects were surveyed and the surveyed points were joined to form the Mean High Water (MHW) or Mean Low Water (MLW) mark. 2. The mark left by high tide was surveyed. Winterbotham (1934) (ref in [1]) noted that high tide “generally leaves a clear mark ... there is not much difficulty in surveying this line”. <p>Different nations within UK use different definitions of MHW and MLW:</p> <p>In Scotland, Ordnance Survey (OS) maps consistently shows high and low water marks for ordinary spring tides, which “generally occur the third or fourth tide after new or full moon” as the main tidelines;</p> <ul style="list-style-type: none"> • The line reflecting the alignment of the mean spring high tide is attributed with a Function of ‘Mean High Water Spring Mark’ (MHWSM). • The line reflecting the alignment of the average mean spring low tide is attributed with a Function of ‘Mean Low Water Spring Mark’ (MLWSM). • If the alignments are coincident then the line is attributed with a function of ‘Mean High Water Spring Mark and Mean Low Water Spring Mark’. <p>In England and Wales, the tide lines mapped on the OS County Series maps has changed over time:</p> <ul style="list-style-type: none"> • Since 1879 are Low Water Mark of Ordinary Tides (LWMOT) and High Water Mark of Ordinary Tides (HWMOT) which are “those of high and low water of ordinary tides (i.e. tides half way between neaps and springs) which define the limit of the foreshore”. • The OS’s 1905 instructions to field examiners contained similar advice: surveys of Mean High Water (MHW) and Mean Low Water (MLW) were taken from “tides half way between a spring and a neap, and should generally be taken at the fourth tide before new and full moon”. The name changes from MHWOT to MHW and MLWOT to MLW are not significant as the definitions remained the same. Note, however, that MHW and MLW are not given in Admiralty Tide Tables, which is not a problem provided consistent calculations of MHW and MLW are performed.



	<ul style="list-style-type: none"> Since about the 1970s the OS has mainly provided tide line data from aerial surveys preferably using black & white infrared film as this shows the water/foreshore interface more clearly. Admiralty tide tables were examined to find high and low tides which were within ± 0.3metres of MHW and MLW. <p>In Northern Ireland, coast wide erosion mapping and extrapolation studies have not been undertaken as in the rest of UK. Historical maps (1832-1963) exists for but does not cover the entire shoreline and the level of detail included in the maps also varies, with some including high and low water contours and elevation contours [2].</p> <p>[1] Sutherland, James. "Error analysis of Ordnance Survey map tidelines." Maritime Engineering (2012).</p> <p>[2] DAERA & DFi, (2018). "Baseline Study and Gap Analysis of Coastal Erosion Risk Management NI" www.infrastructure-ni.gov.uk/</p>
Uses and benefits:	<p>County Maps are the only widespread source of information which can be used to quantify trends in coastal evolution over periods greater than about 70 years in the UK.</p> <p>Tidelines is of legal interest and also used as an indicator of standard of protection.</p> <p>This product allows management authorities of flood and coastal erosion risk to create a coastal erosion baseline from which other decisions can be made and priorities flow.</p> <p>Will allow coastal engineering practitioner and research community to better understand process of change and validate conceptual and numerical models used to assess coastal change and adaptation options.</p>
Product Specifications	
Spatial scale:	<p>1:2,500 in rural areas, 1:1,250 in urban areas and 1:10,000 in upland areas</p> <p>(Scales chosen to be consistent with the standard scales used by OS mapping as described by Olivier 2005)</p> <p>Oliver R (2005) Ordnance Survey maps: a concise guide for historians (2nd edition). The Charles Close Society, London, UK.</p>
Minimum cell size: (or mapping unit)	<p>To be consistent with OS MasterMap revision policy on the Coastal zone the minimum change mapped due to natural erosion and deposition in the coastal zone is the one resulting in a change of alignment of more than 10 m over a length of more than 100 m for the following coastal features when well defined; Top and bottom of cliffs; and Coastal slope limits.</p>
Information layers:	<p>Spatial Reference System (EPSG 277000 British National Grid)</p> <p>Tidelines; vector lines for different tide elevations (LWMOT, HWMOT, MLWSM, MHWSM)</p> <p>Error lines; Lines that have errors (for instance not closed rings or self-intersections)</p> <p>Date and time; of the image used to delineate the tideline</p> <p>Uncertainty in the elevation of the tide level</p>

	<p>Coastal Erosion from Space</p> <p>Written feedback from broader End user community regarding the URD</p>	<p>Ref.: SO-TR-ARG-003-055-009-PVP-A9</p> <p>Date: 29/08/2019</p> <p>Page : 8</p>
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	<p>Uncertainty in the elevation due to waves and atmospheric processes</p> <p>Uncertainty in the horizontal location of the tideline associated to uncertainty on vertical elevations</p>																				
Product format:	<p>Vector format;</p> <p>GML (Geography Markup Language)</p> <p>ESRI Shapefile</p>																				
Software platform compatibility:	<p>The products should be compatible with the following commercial and open source GIS: ArcGIS & ArcMap 10.3.1, Quantum GIS 2.18</p>																				
Product accuracy:	<p>To be consistent with OS accuracy definitions we define accuracy in three different ways:</p> <p>Absolute accuracy – how closely the coordinates of a point in the dataset agree with the coordinates of the same point on the ground (in the British National Grid reference system).</p> <p>Relative accuracy – positional consistency of a data point or feature in relation to other local data points or features within the same or another reference dataset.</p> <p>Geometric fidelity – the ‘trueness’ of features to the shapes and alignments of the objects they represent -when testing the data according to the dataset specification against the ‘real world’ or reference dataset.</p> <p>The following table represents the absolute and relative accuracy applicable to the scale at which the product was surveyed.</p> <table> <thead> <tr> <th><u>Survey scale</u></th> <th><u>RMSE*</u></th> </tr> </thead> <tbody> <tr> <td>1:1,250</td> <td></td> </tr> <tr> <td>Absolute Accuracy</td> <td>0.5 m</td> </tr> <tr> <td>Relative Accuracy</td> <td>+/- 0.5 m (up to 60 m)</td> </tr> <tr> <td>1:2,500</td> <td></td> </tr> <tr> <td>Absolute Accuracy</td> <td>1.1 m</td> </tr> <tr> <td>Relative Accuracy</td> <td>+/- 1.0 (up to 100 m)</td> </tr> <tr> <td>1:10,000</td> <td></td> </tr> <tr> <td>Absolute Accuracy</td> <td>4.1 m</td> </tr> <tr> <td>Relative Accuracy</td> <td>+/- 4.0 m (up to 500 m)</td> </tr> </tbody> </table>	<u>Survey scale</u>	<u>RMSE*</u>	1:1,250		Absolute Accuracy	0.5 m	Relative Accuracy	+/- 0.5 m (up to 60 m)	1:2,500		Absolute Accuracy	1.1 m	Relative Accuracy	+/- 1.0 (up to 100 m)	1:10,000		Absolute Accuracy	4.1 m	Relative Accuracy	+/- 4.0 m (up to 500 m)
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	*RMSE (root mean squared error) is the square root of the mean of the squares of the errors between the observations.
Service Specifications	
Years of interest:	Interested in years since 1970s until present

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Temporal range:	Not applicable
Updating frequency:	<p>It varies accordingly with OS MasterMap revision policy. https://www.ordnancesurvey.co.uk/about/governance/policies/os-mastermap-revision.html</p> <p>Today, major coastal and non-coastal defences designed to reduce the risk of flooding are in the OS Category A, which means they will be captured as part of a continuous revision process within six months of completion. Mean high and low water when affected by changes to other features (such as coastal defences or jetties) and significant changes to tidelines (when evident from aerial photography conducted as part of the national sweep or when notified by a customer) are classified as Category B and will be captured as part of a national sweep programme, which occurs every few years [1].</p>
Temporal baseline:	<p>1948* based on Defra interest on assessing property lost since data is available.</p> <p>*The baseline year correspond with the first Royal Air Force (RAF) aerial imagery.</p>
Ordering:	Web based ordering system
Delivery time required:	Within 6 months of ordering
Delivery format:	Web-based (http), ftp
Validation data	
Available at the end-user's premises:	<p>As a Public Sector Organization, BGS has access to;</p> <p>OS historic maps and MasterMap up to 2015 for the whole UK under OS/PSMA terms and conditions.</p> <p>Vertical Offshore Reference Frames (VORF) to provide the vertical correction from Chart Datum to Newlyn Ordnance Datum (reference datum used in UK for tides) for any location around UK and UKCS.</p>
Available elsewhere:	<p>Storm surge levels reports can be downloaded from: https://www.ntslf.org/storm-surges/monthly-surge-plots</p> <p>Registered tide levels can be downloaded from: https://www.bodc.ac.uk/data/hosted_data_systems/sea_level/uk_tide_gauge_network/processed_customise_time_selection/</p> <p>Admiralty Tide Tables are available from SelectPort.aspx">http://www.ukho.gov.uk/easystide/EasyTide>SelectPort.aspx</p>

	<p>Aerial Photography (oblique and orthophotography) are collected regularly and made publically available by DAERA, EA, SEPA</p> <p>Beach profiles for England can be downloaded from www.channelcoast.org</p> <p>Continuous measurements of wave energy fluxes (i.e. height, direction and wave period) for the entire UK can be downloaded from http://wavenet.cefas.co.uk/Map</p>
Planned collection and when:	<p>For planned OS MasterMap collection and publication see https://www.ordnancesurvey.co.uk/business-and-government/help-and-support/products/os-mastermap-refresh-dates.html</p> <p>For planned data collection of other auxiliary data indicated above, visit the indicated links.</p>

	<p style="text-align: center;">Coastal Erosion from Space Written feedback from broader End user community regarding the URD</p>	Ref.: SO-TR-ARG-003-055-009-PVP-A9 Date: 29/08/2019 Page : 12
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Table 7. Product description BGS #2: Datum-based Tidelines

Description of product no. 2	
General Description	A tideline obtained by extracting a contour at different tidal elevations
General service/product description:	<p>An increasing volume of beach level data (i.e. beach profiles, LiDAR surveys and RADAR flights) is being regularly and systematically collected along UK coastline, from which the positions of contours representing MHW, MLW and other datum elevations can be obtained. Proxy-based and datum-based shorelines might differ [1]. A series of shoreline repeatability and variability experiments as well as data from a beach monitoring program along the high-energy US Pacific Northwest coast, indicate total uncertainty estimates of the horizontal position of proxy-based shorelines to be approximately \pm 50-150 m for T-sheets and aerial photography and approximately \pm 15 m for datum-based shorelines derived from ground- or air-based topographic surveys. The differences between the two do not appear to have been analyzed in the UK [2].</p> <p>Datum-based tideline are therefore obtained from a Digital Elevation Model (DEM) of the coastal zone (backshore and foreshore) and an automatic contour extraction method. As end user we are interested on both, the datum-based contour and DEM derived from satellite imagery.</p> <p>[1] Ruggiero P, Kaminsky GM and Gelfenbaum G (2003) Linking proxy-based and datum-based shorelines on a High-Energy coastline: Implications for shoreline analyses. Journal of Coastal Research Special Issue 38: 57-82. [2] Sutherland, James. "Error analysis of Ordnance Survey map tidelines." Maritime Engineering (2012).</p>
Uses and benefits:	<p>Tidelines is of legal interest and also used as an indicator of standard of protection.</p> <p>This product allows management authorities of flood and coastal erosion risk to create a coastal erosion baseline from which other decisions can be made and priorities flow.</p> <p>Will allow coastal engineering practitioner and research community to better understand process of change and validate conceptual and numerical models used to assess coastal change and adaptation options.</p>
Product Specifications	
Spatial scale:	1:2,500 in rural areas, 1:1,250 in urban areas and 1:10,000 in upland areas (scales chosen to be consistent with the standard scales used by OS mapping)
Minimum cell size: (or mapping unit)	To be consistent with the methodology used recently in Scotland to assess the historical rates of coastal change [3] a minimum cell size of 10 m is desirable.

	[3] Fitton, J. M., J. D. Hansom, and A. F. Rennie. "Dynamic Coast-National Coastal Change Assessment: Methodology." (2017).
Information layers:	<p>Spatial Reference System (EPSG 277000 British National Grid)</p> <p>Tidelines; vector lines for different tide elevations (LWMOT, HWMOT, MLWSM, MHWSM)</p> <p>Digital Elevation Model; used to extract the different tide contours</p> <p>Error lines; Lines that have errors (for instance not closed rings or self-intersections)</p> <p>Date and time; of the image used to delineate the tideline</p> <p>Uncertainty in the elevation of the tide level</p> <p>Uncertainty in the elevation due to waves and atmospheric processes</p> <p>Uncertainty in the elevation of the DEM</p> <p>Uncertainty in the horizontal location of the tideline associated to uncertainty on vertical elevations</p>
Product format:	<p>Vector and Raster formats;</p> <p>Vector for the tidelines:</p> <p>GML (Geography Markup Language), ESRI Shapefile</p> <p>Raster for the DEM:</p> <p>ASCII, TIFF & GeoTIFF uncompressed and compressed (LZW, ZIP)</p>
Software platform compatibility:	The products should be compatible with the following commercial and open source GIS: ArcGIS & ArcMap 10.3.1, Quantum GIS 2.18
Product accuracy:	Same accuracy requirements as for proxy-based tidelines and to be consistent with OS accuracy definitions (see definitions and accuracy on proxy-based tidelines product description).
Service Specifications	
Years of interest:	Interested in years since 1970s until present
Temporal range:	Not applicable
Updating frequency:	Same updating frequency requirements as for proxy-based tidelines and to be consistent with OS accuracy definitions (see explanation on proxy-based tidelines product description).

	Frequency might varies from six months since change observed or work completion to few years.
Temporal baseline:	1948 (or as close as possible)
Ordering:	Web based ordering system
Delivery time required:	Within 6 months of ordering
Delivery format:	Web-based (http), ftp
Validation data	
Available at the end-user's premises:	<p>In addition to the data described on Proxy-based tideline product description, BGS as a Public Sector Organization, BGS has access to;</p> <p>NEXTMap® Britain provides users with highly accurate Digital Elevation Models which model the ground surface in great detail [Intermap Technolgies, 2009]. Produced by Intermap, was derived from airborne Interferometric Synthetic Aperture Radar (IFSAR). The dataset covers all of England, Wales and Scotland</p> <ul style="list-style-type: none"> ✓ An elevation point provided every five metres and a vertical accuracy of one metre ✓ Selected more densely populated areas are available with a vertical accuracy of 50 centimetres ✓ A digital orthorectified radar image (ORI) data set is also available providing a highly detailed grey scale image of the earth's surface ✓ Available as a DSM, DTM and Contours at 5m or 10m postings <p>Intermap Technologies (2009): NEXTMap British Digital Terrain (DTM) Model Data by Intermap. NERC Earth Observation Data Centre, date of citation. http://catalogue.ceda.ac.uk/uuid/998a28d8a5ed4564863a0daa0f731e8d</p>
Available elsewhere:	<p>In addition to the data described on Proxy-based tideline product description;</p> <p>LiDAR data (raw data and DTM and DSM at 1 m, 50 cm raster cell) along England, Wales, Scotland and Northern Ireland coastal zone are available from; EA for England and Wales and Scottish Natural Heritage (SNH) for Scotland and DAERA and OpenDataNI for Northern Ireland.</p>
Planned collection and when:	<p>For planned OS MasterMap collection and publication see https://www.ordnancesurvey.co.uk/business-and-government/help-and-support/products/os-mastermap-refresh-dates.html</p>



For planned data collection of other auxiliary data indicated above, visit the indicated links and Agencies web sites.

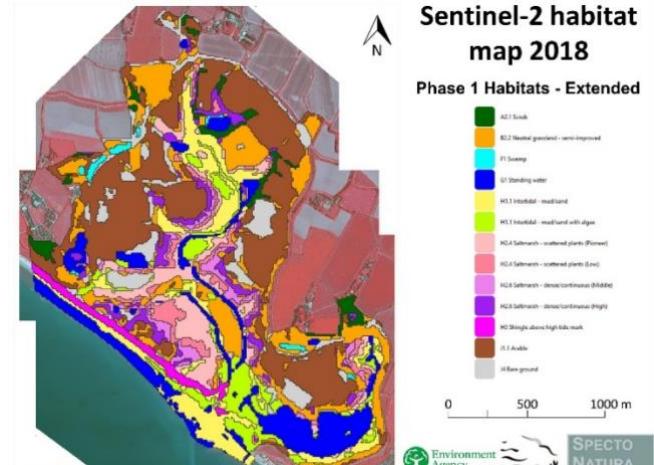
Table 8. Product description BGS #3: Seamless Topo-Bathy metric Digital Elevation Models

Description of product no. 3																																																																																				
General Description	Seamless (i.e. no data gaps between topography and bathymetry) Topography and Bathymetry Digital Elevation Model of the coastal zone (backshore, foreshore & nearshore)																																																																																			
General service/product description:	<p>Any policy for coastal erosion should increase coastal resilience by restoring the sediment balance and providing space for coastal processes (EUROSION, 2004). In this context, coastal managers have shifted their interest from coastline management (1D) to volume and space management (3D) over time (4D). This has created a demand on the surveyors to create seamless TPDEM of the coastal zone to allow them assess close sediment balance.</p> <p>This product is a raster product containing a time stamped Digital Elevation Model of the coastal zone (including backshore, foreshore and nearshore). This product will be delivered as both a Digital Surface Model (DSM) and Digital Terrain Model (DTM).</p>																																																																																			
Uses and benefits:	<p>Assess geomorphic change and volumes of sediment eroded and deposited by subtraction of two independent DTM surfaces to produce a DTM of Difference (DoD), with each grid cell value representing a measure of the vertical elevation difference.</p> <p>Extract information of a number of Coastal State Indicators used for coastal management [1]:</p>																																																																																			
<table border="1"> <thead> <tr> <th><u>CSI*</u></th><th><u>Quantity represented</u></th><th><u>Spatial separation</u></th><th><u>Time between measurements</u></th><th><u>Case Study</u></th></tr> </thead> <tbody> <tr> <td>Dune strength</td><td>SoP for storm</td><td>250 m</td><td>5 years</td><td>Dutch coast</td></tr> <tr> <td>Barrier width</td><td>SoP for storm</td><td>180 m</td><td>1 month</td><td>Pevensy, UK</td></tr> <tr> <td>Total barrier volume</td><td>SoP for storm</td><td>180 m</td><td>1 month</td><td>Pevensy, UK</td></tr> <tr> <td>Backshore width</td><td>SoP for storm</td><td>Mean 1.75 km</td><td>1 year</td><td>Black Sea</td></tr> <tr> <td>Dune zone width</td><td>SoP for storm</td><td>Mean 1.75 km</td><td>1 year</td><td>Black Sea</td></tr> <tr> <td>Dune zone height</td><td>SoP for storm</td><td>Mean 1.75 km</td><td>1 year</td><td>Black Sea</td></tr> <tr> <td>Momentary coastline</td><td>Position & boundary condition for SoP</td><td>250 m</td><td>1 year</td><td>Dutch coast</td></tr> <tr> <td>Beach width</td><td>Boundary condition for SoP of hard defence</td><td>100 m</td><td>6 months</td><td>Costa Brava, Spain</td></tr> <tr> <td>Barrier crest position</td><td>Position</td><td>180 m</td><td>1 month</td><td>Pevensy, UK</td></tr> <tr> <td>Shoreline position</td><td>Position</td><td>Few m</td><td>4 to 5 years</td><td>Black Sea</td></tr> <tr> <td>Shoreline position</td><td>Position</td><td>≤ 500 m</td><td>1 year</td><td>Hel peninsula, Poland</td></tr> <tr> <td>Coastline position</td><td>Perception of safety</td><td>Irregular</td><td>Event-driven</td><td>Inch Strand, Ireland</td></tr> <tr> <td>Coastal foundation</td><td>Rise with sea level</td><td>250m</td><td>Several years</td><td>Dutch coast</td></tr> <tr> <td>Shoreface volume</td><td>Flood and coastal erosion risk</td><td>500m</td><td>4 years</td><td>Hel peninsula, Poland</td></tr> <tr> <td>Coastal slope</td><td>Flood and coastal erosion risk</td><td>Mean 1.75km</td><td>4 to 5 years</td><td>Black Sea</td></tr> </tbody> </table> <p style="text-align: center;">SoP: standard of protection</p>					<u>CSI*</u>	<u>Quantity represented</u>	<u>Spatial separation</u>	<u>Time between measurements</u>	<u>Case Study</u>	Dune strength	SoP for storm	250 m	5 years	Dutch coast	Barrier width	SoP for storm	180 m	1 month	Pevensy, UK	Total barrier volume	SoP for storm	180 m	1 month	Pevensy, UK	Backshore width	SoP for storm	Mean 1.75 km	1 year	Black Sea	Dune zone width	SoP for storm	Mean 1.75 km	1 year	Black Sea	Dune zone height	SoP for storm	Mean 1.75 km	1 year	Black Sea	Momentary coastline	Position & boundary condition for SoP	250 m	1 year	Dutch coast	Beach width	Boundary condition for SoP of hard defence	100 m	6 months	Costa Brava, Spain	Barrier crest position	Position	180 m	1 month	Pevensy, UK	Shoreline position	Position	Few m	4 to 5 years	Black Sea	Shoreline position	Position	≤ 500 m	1 year	Hel peninsula, Poland	Coastline position	Perception of safety	Irregular	Event-driven	Inch Strand, Ireland	Coastal foundation	Rise with sea level	250m	Several years	Dutch coast	Shoreface volume	Flood and coastal erosion risk	500m	4 years	Hel peninsula, Poland	Coastal slope	Flood and coastal erosion risk	Mean 1.75km	4 to 5 years	Black Sea
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Shoreline position	Position	≤ 500 m	1 year	Hel peninsula, Poland																																																																																
Coastline position	Perception of safety	Irregular	Event-driven	Inch Strand, Ireland																																																																																
Coastal foundation	Rise with sea level	250m	Several years	Dutch coast																																																																																
Shoreface volume	Flood and coastal erosion risk	500m	4 years	Hel peninsula, Poland																																																																																
Coastal slope	Flood and coastal erosion risk	Mean 1.75km	4 to 5 years	Black Sea																																																																																
<p>[1] Payo et al., 2018. Geomorphic State Indicators for coastal management over decades and longer time scales. DOI: 10.13140/RG.2.2.27099.05923</p>																																																																																				
Product Specifications																																																																																				

Spatial scale:	Not applicable
Minimum cell size: (or mapping unit)	A minimum cell size of 5 m is desirable.
Information layers:	<p>Timestamp; date of data collection of images used to create TBDEM</p> <p>Spatial Reference System (preferred EPSG 277000 British National Grid)</p> <p>Datum (preferred for Great Britain is Ordnance Datum Newlyn and Belfast Ordnance Datum for Northern Ireland)</p> <p>Digital Surface Model; raster surface elevation model</p> <p>Digital Terrain Model; raster relief elevation (i.e. excluding structures and vegetation)</p> <p>Uncertainty in the elevation of DSM</p> <p>Uncertainty in the elevation of DTM</p>
Product format:	<p>Raster:</p> <p>ASCII, TIFF & GeoTIFF uncompressed and compressed (LZW, ZIP)</p>
Software platform compatibility:	The products should be compatible with the following commercial and open source GIS: ArcGIS & ArcMap 10.3.1, Quantum GIS 2.18
Product accuracy:	+/-15cm RMSE (to allow comparison with EA LiDAR data)
Service Specifications	
Years of interest:	Interested in years since 1970s until present
Temporal range:	Not applicable
Updating frequency:	Frequency might varies from one month to five years (see table on Uses description).
Temporal baseline:	1948 (or as close as possible)

Ordering:	Web based ordering system
Delivery time required:	Varies with updating frequency from 15 days for 1 indicators that have a 1 month updating frequency to 6 months for those with few years updating frequency.
Delivery format:	Web-based (http), ftp
Validation data	
Available at the end-user's premises:	Same as data described for Proxy-based tideline and datum-based tideline products description.
Available elsewhere:	In addition to the data described on Proxy-based tideline & Datum-based tideline products description: Bathymetries for the whole UKCS from the Admiralty Data Portal web site which includes Bathymetric surveys from various sources including over 4,000 bathymetry surfaces from 1970 to present day. The bathymetry data is updated every three months and a large number have been funded by the MCA, an executive agency sponsored by the Department for Transport, under the Civil Hydrography Programme. (https://data.admiralty.co.uk/portal/apps/sites/#/marine-data-portal)
Planned collection and when:	For planned OS MasterMap collection and publication see https://www.ordnancesurvey.co.uk/business-and-government/help-and-support/products/os-mastermap-refresh-dates.html For planned data collection of other auxiliary data indicated above, visit the indicated links and Agencies web sites.

Table 9. Product description BGS #4: Habitat map

Description of product no. 3	
General Description	Habitat map
General service/product description:	<p>This product is a vector polygon product containing a time stamped Habitat map of the coastal zone (including backshore, foreshore and nearshore). The size of the backshore area is defined by the end users preferred height values corresponding to tidal limits.</p> <p>The minimum level of classes to be identified are the Sentinel-2 based habitat map [1].</p> <p>An enlarged copy of the figure below showing the different classes can be found here https://sentinel.esa.int/documents/247904/3833380/Sentinel-2-Medmerry-habitat-map-full.jpg.</p> <p>This habitat map is a remotely sensed product which classify site relevant habitats visible at the time of satellite capture. The classification uses supervised classification techniques; these are techniques which are trained using ground data. The EA habitat descriptions for CASI and LIDAR habitat maps are proposed to be used [1] but we are aware that some modification might be needed [2] (Figure below).</p>  <p>[1]EA CASI and LIDAR Habitat Map. https://data.gov.uk/dataset/1707e638-6a2d-48f5-a534-1db0b240cc37/casi-and-lidar-habitat-map</p> <p>[2]https://sentinel.esa.int/web/sentinel/home-/journal_content/56/247904/3834405</p>
Uses and benefits:	Habitat creation achieved as part of coastal managed realignment schemes has been estimated to provide environmental benefits valued at between £680 and £2,500 per hectare, including carbon storage benefits. Furthermore, the Climate Change Committee (2013) ¹ advised that 6200 ha

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	<p>of coastal habitat created nationally by 2030 (costing £10-15M per annum) would save £180-£380M in capital and maintenance costs on coastal flood and erosion management over the long-term when compared to the cost of replacing/maintaining hard defences. The successful implementation of such schemes, however, requires trustworthy data and information from existing schemes and that, in turn, requires replicable, cost-efficient, and fit-for-purpose monitoring programmes of both existing and planned future schemes.</p>
Product Specifications	
Spatial scale:	Not applicable
Minimum cell size: (or mapping unit)	For a class to be mapped on site there must have been samples collected for it on site.
Information layers:	<p>Timestamp; date of data collection</p> <p>Spatial Reference System (preferred EPSG 277000 British National Grid)</p> <p>Vector polygon with the different habitats. Habitats types described in [1]</p>
Product format:	<p>Vector polygon</p> <p>GML (Geography Markup Language), ESRI Shapefile</p>
Software platform compatibility:	The products should be compatible with the following commercial and open source GIS: ArcGIS & ArcMap 10.3.1, Quantum GIS 2.18
Product accuracy:	Quantitative accuracy assessment carried out on them in the form of a confusion matrix using ground data set aside and not used in training the classifier
Service Specifications	
Years of interest:	Interested in years since 1970s until present
Temporal range:	Not applicable

Updating frequency:	Frequency might varies from one month to a year.
Temporal baseline:	1948 (or as close as possible)
Ordering:	Web based ordering system
Delivery time required:	Varies with updating frequency from 15 days for 1 indicators that have a 1 month updating frequency to 6 months for those with one year updating frequency.
Delivery format:	Web-based (http), ftp
Validation data	
Available at the end-user's premises:	Same as data described for Proxy-based tideline, Datum-based tideline, TBDEM products descriptions.
Available elsewhere:	<p>In addition to the data described on Proxy-based tideline, Datum-based tideline and TBDEM products description:</p> <p>CASI and LIDAR Habitat Map from EA. A habitat map derived from airborne data, specifically CASI (Compact Airborne Spectrographic Imager) and LIDAR (Light Detection and Ranging) data. The habitat map is a polygon shapefile showing site relevant habitat classes. Geographical coverage is incomplete because of limits in data available. It includes those areas where the Environment Agency, Natural England and the Regional Coastal Monitoring Programme have carried out sufficient aerial and ground surveys in England. Habitat maps generated by Geomatics are often derived using multiple data sources (e.g. CASI, LIDAR and OS-base mapping data), which may or may not have been captured coincidentally. In instances where datasets are not coincidentally captured there may be some errors brought about by seasonal, developmental or anthropological change in the habitat.</p> <p>URL: https://data.gov.uk/dataset/1707e638-6a2d-48f5-a534-1db0b240cc37/casi-and-lidar-habitat-map</p>
Planned collection and when:	<p>For planned OS MasterMap collection and publication see https://www.ordnancesurvey.co.uk/business-and-government/help-and-support/products/os-mastermap-refresh-dates.html</p> <p>For planned data collection of other auxiliary data indicated above, visit the indicated links and Agencies web sites.</p>

	<p style="text-align: center;">Coastal Erosion from Space Written feedback from broader End user community regarding the URD</p>	Ref.: SO-TR-ARG-003-055-009-PVP-A9 Date: 29/08/2019 Page : 22
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Table 10. Template for your product description #: your product name

Description of product no. #	
General Description	
General service/product description:	
Uses and benefits:	
Product Specifications	
Spatial scale:	
Minimum cell size: (or mapping unit)	
Information layers:	
Product format:	
Software platform compatibility:	
Product accuracy:	
Service Specifications	
Years of interest:	

Temporal range:	
Updating frequency:	
Temporal baseline:	
Ordering:	
Delivery time required:	
Delivery format:	
Validation data	
Available at the end-user's premises:	
Available elsewhere:	
Planned collection and when:	

Table 1.1. EO products name, champion user organization, link to table with detailed description and type of product. (Please notice that the Table links only work on the original URD doc)

<u>Name</u>	<u>Champion</u>	<u>Details</u>	<u>Type</u>
Proxy-based Tidelines	BGS	Error! Reference source not found.	1D
Datum-based Tidelines	BGS		1D
Table			
Topo-Bathymetric Digital Elevation Models	BGS		3D
Table			
Habitat map	BGS		2D
Table			
Bathymetric change in the nearshore	GSI	Error! Reference source not found.	3D
Coastal DEM	GSI	Error! Reference source not found.	3D
Waterlines to shorelines	GSI	Error! Reference source not found.	1D
Elevation transects	GSI	Error! Reference source not found.	3D
Land cover changes	GSI	Error! Reference source not found.	2D
Vegetation line	GSI	Error! Reference source not found.	1D
Bathymetry changes on beaches	MITECO	Error! Reference source not found.	3D
Shoreline changes on beaches	MITECO	Error! Reference source not found.	1D
Land cover changes	MITECO	Error! Reference source not found.	2D

Nearshore bathymetry	GoQ	Error!	Reference	3D
Sediment volume changes	GoQ	Error!	Reference	3D
Shoreline/Waterline	GoQ	Error!	Reference	1D
Land-Use and Land-Cover and habitat maps	GoQ	Error!	Reference	2D

GoQ: Government of Quebec; 1D: One dimensional geometries confined to points on a line; 2D: Two dimensional geometries expressed as flat planes with no depth; 3D: Three dimensional geometries that describes objects with volume

2 England broader End user community

2.1 Feedback from: East Riding of Yorkshire Coastal Engineering

YOURS CONTACT DETAILS:

Name: Emily Paterson

Role: East Riding of Yorkshire Coastal Engineering

Email: emily.paterson@eastriding.gov.uk

2.1.1 Overall feedback

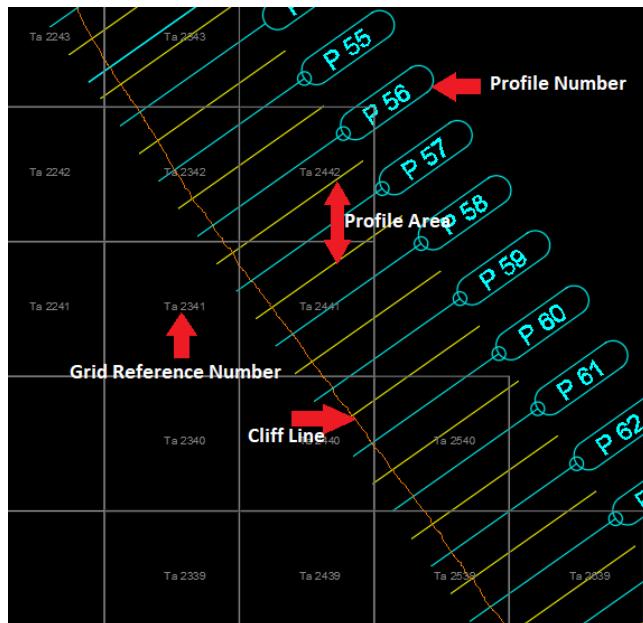
Degree of interest in the products to be developed (UK product from all listed in Table 2, page 15 on User Requirement Document_v2.pdf, Full Table 2 included for your consultation at the end of this document)

# Table	Product Name	Highly interest	Somehow interest	Not interested	Comments
<u>6</u>	Proxy tideline			X	Not needed
<u>7</u>	Datum tideline			X	Not needed
<u>8</u>	Seamless Topo-Bathy-Metric DEM	X			We would be interested but it would have to be competitively priced, match the quality we are currently getting and be the same or better than our current system. A major factor for us would be the accuracy levels it would need to be in the same tolerance or better than what we currently have as we use this data to accurately monitor our coastline.

9	Habitat map		X		As above.
Any other?	Your product?				

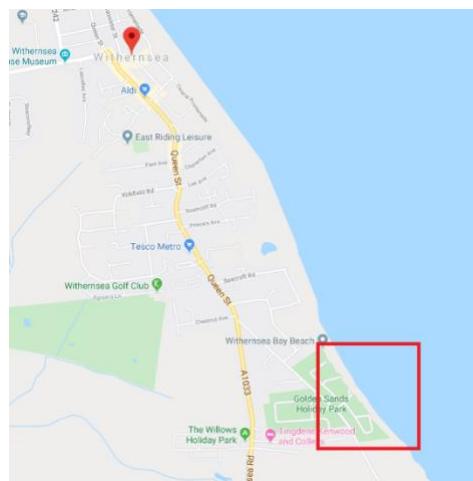
2.1.2 Specific Feedback & Inputs:

You currently base all your current mapping for the UK on Devon. Each region around the UK has different challenges for coastal erosion and methods for monitoring. For example in the East Riding of Yorkshire, we have the fastest eroding coastline in Europe. In our region we have split our coastline into 136 profiles as shown below, profiles are in light blue starting from Sewerby to Spurn each 500m (Yellow line to Yellow line). Each profile has a different erosion rate and predicted loss in m/yr based on historical erosion data. For example profile 56 the north end of Cowden: historic erosion 1852 to 1989 is 1.5m/yr, recent erosion 1989 to October 2019 is 2.45m/yr. The cliff height is 16.6m and the greatest maximum recorded individual loss was 12.65m in December 2013.



The majority of our with Flamborough being the exception with chalk cliffs which is why we do not use this area in our profiles as we lose mm instead of m a year here. A mixture of weak bolder clay cliffs and strong tidal pressures account for our rapid coastal erosion.

It would be interesting if you could map a more challenging area like the southern end of Withernsea as shown below to see if your predicted 25 year erosion data is correct. In the last six months we have witness record rates of erosion in Withernsea being around the 10m mark. The light blue line was drawn in March 2019, the dark blue in December 2019 and the orange in January 2020. The background image was taken in October 2019 during our Autumn Lidar survey.



We currently rely heavily on our topographic lidar data, this data is used to create contour maps to understand the changes and movement of sediment and to accurately draw a new cliff line. This new cliff line shows us the amount of erosion which has occurred in the past 6 months and allows us to keep an eye on properties which are at risk. The Lidar gets flown in the spring and autumn and takes approximately 12 weeks to be delivered to us the client. They can only fly on clear sunny days with no cloud cover. We currently get high resolution aerial photography as above and the data is supplied



in 1km by 1km tiles at 0.1m resolution. The East Riding is approximately 85km in length. The LIDAR accurately level is: elevational accuracy +/-0.1M and positional accuracy +/-0.2M.

We have done two Bathymetric surveys one full one in 2011 and a partial one in 2016. We have another one planned for this year 2020 and we would like to continue monitoring every 5 years if possible. This information is kept on the CCO website

Habitat survey again we have only ever done one in 2012 and would be interested in doing a second but for all our surveys it would have to be competitively priced, match the quality we are currently getting and be the same or better than our current system.

Hopefully this gives you a bit more insight. If I can be of anymore help please do get in touch.

2.2 Feedback from Coastal Channel Observatory

YOURS CONTACT DETAILS:

Name: Sam Pitman and Charlie Thompson

Role: GIS Analyst and Director at Channel Coastal Observatory

Email: Samuel.pitman@noc.soton.ac.uk and celt1@noc.soton.ac.uk

2.2.1 *Overall Feedback*

Degree of interest in the products to be developed (UK product from all listed in Table 2, page 15 on User Requirement Document_v2.pdf, Full Table 2 included for your consultation at the end of this document)

# Table	Product Name	Highly interest	Somehow interest	Not interested	Comments
<u>6</u>	Proxy tideline		x		Useful, although Datum tidelines will be of greater interest to our stakeholders.
<u>7</u>	Datum tideline	x			This is of great interest to the National Network of Coastal Monitoring Programmes (NNRCMP), as this is one of the key products used by our stakeholders to assess levels of protection, and for management of beach management sites. Due to limitations in funding, we are able to provide beach profiles on a risk-basis, which means that there are stretches of coastline which are only monitored on the ground every 5 years. This product would be incredibly useful in filling this gap in our data provision. The long term record in particular will be of interest to determine short-term response, longer term trends and allow

					incident management and long-term planning (e.g. Shoreline Management Planning).
8	Seamless Topo-Bathy-Metric DEM	x			This would be a huge benefit to the NNRCMP, for similar reasons to the above, but also to identify areas of change for higher resolution swath bathymetry, and allow us to prioritise our investment in this area. Of particular interest to local authorities with beach management sites who are interested in depth-of-closure and recycling of beach material post-storm and seasonally.
9	Habitat map	x			This is something which, due to the tidal restrictions of capturing aerial photography to MLWS we only carry out every 6 years, however, there is a real need for more frequent assessments of habitat, in particular where managed realignment or habitat recreation are being considered along the South East coastline.
Any other?	Your product?				

2.2.2 Specific Feedback & Inputs

Table 6. Product description BGS #1: Proxy-based Tidelines

Minimum cell size: (or mapping unit)	To be consistent with OS MasterMap revision policy on the Coastal zone the minimum change mapped due to natural erosion and deposition in the coastal zone is the one resulting in a change of alignment of more than 10 m over a length of more than 100 m for the following coastal features when well defined; Top and bottom of cliffs; and Coastal slope limits.
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Note that this is not sufficient for high-risk FCERM areas, but would be particularly useful for low-risk areas where general trends or large changes in shoreline position are key trigger points for management change.

We can also provide tide levels, aerial photography and wave parameters from

www.channelcoast.org.

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2.3 Feedback from: Environment Agency- Project Manager Anglian Coastal Monitoring Programme

YOURS CONTACT DETAILS:

Name: Becky Stanley

Role: Project Manager Anglian Coastal Monitoring Programme

Email: becky.stanley@environment-agency.gov.uk

2.3.1 Overall Feedback

Degree of interest in the products to be developed (UK product from all listed in Table 2, page 15 on User Requirement Document_v2.pdf, Full Table 2 included for your consultation at the end of this document)

# Table	Product Name	Highly interest	Somehow interest	Not interested	Comments
6	Proxy tideline	YES			<p>The programme partners are often interested in coastal change as demonstrated by the changing positions MHW, MLW, etc. we currently produce such products from our data. It would be interesting to see how a satellite derived product would compare to our own in terms of resolution, ease of use (including ability to make decisions from it, and how easy it was to generate), and how it would further our understanding of coastal change.</p> <p>Geomatics Interpretation team would be really interested in new tidelines for LAT/ HAT, MLWS etc, or updated heights for these as currently these are quite old. Are the UKHO/ OS involved as end users as they</p>

					are the subject matter experts here, and any product we would use we would want some verification for.
<u>7</u>	Datum tideline	YES			
<u>8</u>	Seamless Topo-Bathy-Metric DEM	YES			<p>The ACM would be very interested in this product specifically for the Wash area to study the sediment patterns and changes over time which is currently difficult to do with the extents of lidar/ aerial photography, and would be particularly difficult to capture in due to the size of the area and tidal and weather restrictions. Therefore a satellite approach could be helpful to understand the large scale processes operating in the area. Additionally, a satellite derived DEM at other locations around the Anglian coast may be able to provide a 'high level'/ broad scale assessment of coastal erosion/ accretion throughout the coastline at a relatively coarse resolution, which would enable us to then focus our higher resolution monitoring on areas highlighted by this data, and potentially provide a more sustainable approach to monitoring than frequent aircraft flights – particularly as the EA move towards net zero carbon by 2020. The temporal resolution of this data has great potential too. Though my concerns using the optical data would be the passing of the satellite at the correct tide and in good weather, though I understand this is where the SAR data is hoping to be developed to mitigate such issues.</p>

9	Habitat map	YES			<p>We undertake habitat mapping each phase in the ACM (once every 5 -6 years), using aerial photography and lidar, and digitising change from the previous habitat classification. It is an involved process which takes several months. It would be interesting to see what scale of habitat classification could be produced from satellite data, and how useful this may be to decisions made.</p> <p>We would be keen to see how this product would compare to our own high resolution product, and if there would be value in having the satellite data approach as an interim product. Certainly the prospect of being able to look at habitat change (significantly) more frequently than once every 5 years is appealing to us.</p> <p>In order for this to be a useful product however, it would have to be proven to be useful to decision making and also demonstrate a clear financial and time benefit than just repeating our high resolution interpretation more often.</p> <p>Geomatics team are concerned that the example methodology sentinel 2 habitat mapping project was quite a basic methodology attempt and is not a refined method that could be used in the same way that the current coastal monitoring programme's habitat mapping is used, as it lacked accuracy assessments, ground truthing etc.</p>
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					Further to this, we have some concerns as to how this tool would work in a 'geo viewer' as the process, even with an applied algorithm is not straight forward and would still require significant technical user input/interpretation. Who would be responsible for the QC of the outputs? Is there a danger of mis-information?
Any other?	General comments				<p>I am interested in how the findings of this project and development of the algorithms for monitoring coastal change from satellite data will be available to the end users such as local authorities, the EA and coastal monitoring programmes.</p> <p>A Web geo browser was mentioned that would contain the algorithms as 'tools' that could be applied to various satellite data which was already loaded into the browser, which you could add in ancillary data to make various products. This sounds like it would be a useful approach, particularly for the non-technical user who wouldn't know what to do with the algorithm itself. It would therefore require a download function, which would benefit in being in various formats to suit different organisations' own software systems etc. However, how would any of the outputs of such a system be QC'd? How would we have assurance in the data?</p> <p>Additionally who would maintain, own and operate this system? Who would update the algorithms as they were developed – would anyone? ESA?</p>

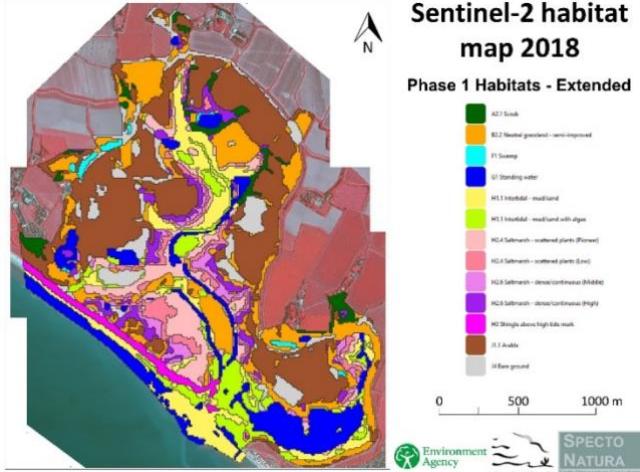
					I would certainly recommend that if this approach were to go forward, a series workshops with end users to develop and learn how to use the portal would be a valuable thing to do. On the other hand, I also think making the algorithms accessible to people to adapt and explore would be really helpful too, leading to continual developments and improvements to the outputs from satellite data.
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2.3.2 Specific Feedback & Inputs

Table 9. Product description BGS #4 : Habitat map

Description of product no. 3	
General Description	Habitat map
General service/product description:	<p>This product is a vector polygon product containing a time stamped Habitat map of the coastal zone (including backshore, foreshore and nearshore).</p> <p>The size of the backshore area is defined by the end users preferred height values corresponding to tidal limits.</p> <p>The minimum level of classes to be identified are the Sentinel-2 based habitat map [1].</p>

The methodology for the class level might need to be expanded and developed as there were concerns about the accuracy and ground trothing here.

General service/product description	<p>An enlarged copy of the figure below showing the different classes can be found here https://sentinel.esa.int/documents/247904/3833380/Sentinel-2-Medmerry-habitat-map-full.jpg).</p>
	<p>This habitat map is a remotely sensed product which classify site relevant habitats visible at the time of satellite capture. The classification uses supervised classification techniques; these are techniques which are trained using ground data. The EA habitat descriptions for CASI and LIDAR habitat maps are proposed to be used [1] but we are aware that some modification might be needed [2] (Figure below).</p> <div style="text-align: center;">  <p>Sentinel-2 habitat map 2018</p> <p>Phase 1 Habitats - Extended</p> <ul style="list-style-type: none"> AZ1 Scrub B2.2 Neutral grassland - semi-improved F1 Swamp G1 Shrubland H1.1 Intertidal - marshland H1.2 Intertidal - marshland with algae H2.1 Saltmarsh - scattered plants (Forest) H2.2 Saltmarsh - scattered plants (Lvs) H2.3 Saltmarsh - dense/continuous (Rhizome) H2.4 Shrubs above high tide mark J1.2 Available J2 Bare ground <p>0 500 1000 m</p> <p>Environment Agency SPECTO NATURA</p> </div> <p>[1]EA CASI and LIDAR Habitat Map. https://data.gov.uk/dataset/1707e638-6a2d-48f5-a534-1db0b240cc37/casi-and-lidar-habitat-map</p>

the EA LIDAR CASI habitat maps following the link below were a product specifically about one habitat type – Sand Dunes and it is more of an inventory of coastal sand dunes, which does not cover any other habitats.

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2.4 Feedback from: NW Regional Coastal Monitoring Programme Co-ordinator

YOURS CONTACT DETAILS:

Name: Andrew Martin

Role: NW Regional Coastal Monitoring Programme Co-ordinator

Email: Andrew.Martin@Sefton.Gov.UK

2.4.1 Overall Feedback

Degree of interest in the products to be developed (UK product from all listed in Table 2, page 15 on User Requirement Document_v2.pdf, Full Table 2 included for your consultation at the end of this document)

# Table	Product Name	Highly interest	Somehow interest	Not interested	Comments
<u>6</u>	Proxy tideline		x		
<u>7</u>	Datum tideline	x			Both tide lines would be of interest with an update in line with the one suggested would be fine. Would be good to get a calibrated MHWL for the country in one tidal frame
<u>8</u>	Seamless Topo- Bathy- Metric DEM		x		Depends on accuracy. We have murky waters here so bathy is unlikely to be possible currently, but if there are improvements then this would be a benefit, esp related to Morecambe Bay.
<u>9</u>	Habitat map		x		Interested but the would not need it as frequently as once a year, I would suggest

					every other year as the habitats will not change significantly on a shorter time scale.
Any other?	Your product?	X			<p>Interested in what the satellites can be used for when looking at Morecambe Bay, esp the movement of channels (River Kent) and how it influences erosion and accretion at Morecambe.</p> <p>The frequency of this would ideally be less than monthly at first to gain a better understanding, but it would potentially need to be checked with other none tidal data ie rainfall amounts and river levels in the Kent.</p> <p>Mapping of features of the bay at low water would be beneficial if the bathy element would work.</p>

2.5 Feedback from: NE Regional Coastal Monitoring Programme Co-ordinator

YOURS CONTACT DETAILS:

Name: your name Robin Siddle

Role: Project Manager North East Coastal Monitoring Programme

Email: robin.siddle@scarborough.gov.uk

2.5.1 *Overall Feedback*

Degree of interest in the products to be developed (UK product from all listed in Table 2, page 15 on User Requirement Document_v2.pdf, Full Table 2 included for your consultation at the end of this document)

# Table	Product Name	Highly interest	Somewhat interest	Not interested	Comments
<u>6</u>	Proxy tideline		Y		
<u>7</u>	Datum tideline			Y	
<u>8</u>	Seamless Topo- Bathy- Metric DEM	Y			
<u>9</u>	Habitat map		Y		
Any other?	Your product?				

2.5.2 Specific feedback & Inputs

Regarding the Proxy-based Tidelines products, the cliff line location is more important to us than the MHW or MLW. However we have predicted changes at key sites as to where the MHW and MLW will be in the future as we may lose some tourist beaches for large periods of the day or altogether. We could use this data over the long term to monitor the evolution as our tourist towns with their static coastal defenses are reliant on having good beach width in front of them.

Not really interested in tide lines as such. Although we can avoid MMO licences for works if we are doing the work above MHW therefore it is good to know where this line is as it can save us a lot of money in fees and time.

We have aerial photography of the NE coast from the 1940's on the website that can be downloaded, so this added to your data from the 1970's to our data starting again in the 1999 would be useful to fill a gap.

The accuracy is not better of the images as they are below the standard that we use to map our cliff lines and erosion. I guess this will improve over time. On the positive side I see the data being useful for incident response as it's quite hard sometimes to get a plane or drone up to capture data when needed quickly. This would be useful for helping to map or study the evolution of a large coastal landslide events or mapping the damage following a storm surge or breach of defenses.

Another plus side is the reduced carbon, by not using aircraft.

Uses and benefits: We have found a number of maps to be wrong compared to aerial photography. As mentioned our baseline from photography is from the 1940's, The East Riding programme use Luftwaffe photography as their baseline.

Software platform compatibility: ArcGIS is good for us.

Product accuracy: As mentioned not as accurate as the specifications we use for mapping but will be useful for incident response or a quick review following an event and between surveys.

Years of interest: Good to have data going back this far to add to the data we have from before this.

Regarding the Datum-based Tidelines products, could be used to monitor beaches that we don't monitor or focus on. We tend to focus our resources on beaches more prone to risk or have defenses or properties behind them, As a result we sometimes know little about certain sections of or beaches or small beaches that we don't really monitor levels for. We use LiDAR along with photography to map landslides along the coast.

Uses and benefits: It will help but it's not vital as we already collect the data we need as coastal engineers to build models and understand and protect the areas. We already have baselines! What may be useful is the data being free and collected more often than we currently do.

Delivery time required: If you order a capture to be done on your behalf I would say a few months is fine.

For Seamless Topo-Bathy metric Digital Elevation Models

Uses and benefits:

Will be useful for surveying the zone between the topo surveys/LiDAR surveys and the bathy surveys that sometimes can't be captured easily or missed.

I am worried that the bathy captured data will not work well in the north east due to the sediments. The issue again is the resolution of the data you collect really needs to be improved, but is better than nothing for areas we don't already monitor.

For the Habitat map products, as we currently map priority habitats this could be useful. One thing we have done in the north East is map priority habits from our 1940's data set and compare it the habitat mapping from the 2015

This has shown the lost and gains. Maybe your data could allow this for other areas of the UK, without the cost of seeking and rectifying 1940's data.

2.6 Feedback from EC Joint Research Centre

YOURS CONTACT DETAILS:

Name: George Breyiannis

Role: European Commission, Joint Research Centre, Floods Research

<https://ec.europa.eu/jrc/en/research-topic/floods>)

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2.6.1 Overall Feedback

Degree of interest in the products to be developed (UK product from all listed in Table 2, page 15 on User Requirement Document_v2.pdf, Full Table 2 included for your consultation at the end of this document)

# Table	Product Name	Highly interest	Somehow interest	Not interested	Comments
<u>6</u>	Proxy tideline	X			
<u>7</u>	Datum tideline	X			
<u>8</u>	Seamless Topo-Bathy-Metric DEM	X			
<u>9</u>	Habitat map	X			
27	Shoreline changes on beaches	X			

35	Land-Use and Land-Cover and habitat maps	X			
	Coastal structures (groins, dams, breakwaters)	X			
	Inundation maps of past events	X			

3 Spanish broader End user community

3.1 Feedback from AZTI

- Grado de coincidencia de vuestros intereses con lo expresado por los usuarios competentes del conjunto de países representados en el consorcio “Coastal Change From Space” sobre los siguientes aspectos de los productos a elaborar (apartado 3 del documento de resumen en español adjunto)

Tema	De acuerdo	En desacuerdo	Comentario
De la línea de costa (1D) a productos 2D y 3D.	si		Nos parece interesante sobre todo en zonas con poca o nula información previa y/o para extender series de datos actuales al pasado. De todas formas para nuestra zona de aplicación nos parece complejo que esta información pueda competir en resolución y cobertura temporal con otras fuentes de datos ya existentes (topografía y batimetría in situ, Lidar, videometría, fotogrametría aérea, etc.).
Alcance espacial centrado en el área costera	si		
Indicadores de la línea de costa	si		Series de datos de línea de pleamar y bajamar medias son los indicadores que estamos empleando más actualmente (de estos dos el de pleamar es el más importante). De todas formas para nuestra zona de aplicación en la misma línea de lo expresado en el punto 1, nos parece complejo que esta información pueda competir en resolución y cobertura temporal con otras fuentes de datos.
Alcance temporal más allá de 25 años	Si		Sin duda el punto que nos parece interesante es para extender series de datos actuales al pasado.
Indicadores del estado de la costa		No	

Precisión de los productos	si		Nos parece interesante sobre todo en zonas con poca o nula información previa y/o para extender series de datos actuales al pasado. De todas formas para nuestra zona de aplicación nos parece complejo que esta información pueda competir en resolución y cobertura temporal con otras fuentes de datos ya existentes (topografía y batimetría in situ, Lidar, videometría, fotogrametría aérea, etc.).
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- Grado de interés en los productos a desarrollar (apartado 4 del documento de resumen en español adjunto)

# Producto	Interés alto	Cierto interés	Sin interés	Comentario
1	x			Nos parece interesante sobre todo en zonas con poca o nula información previa y/o para extender series de datos actuales al pasado.
2		x		Nos parece interesante sobre todo en zonas con poca o nula información previa y/o para obtener datos históricos en zonas altamente modificadas.
3		x		Depende mucho de la cobertura y resolución temporal
4		x		Según la resolución y margen de error vertical.
5		x		Nos parece interesante sobre todo en zonas con poca o nula información previa y/o para obtener datos históricos en zonas altamente modificadas.
6		x		Nos parece complejo que esta información pueda competir en resolución y cobertura temporal con otras fuentes de datos ya existentes. Tal vez para en zonas con poca o nula información previa y/o para obtener datos históricos en zonas altamente modificadas.

7		x	Tal vez para en zonas con poca o nula información previa y/o para obtener datos históricos en zonas altamente modificadas.
8		x	
9		x	
10		x	Necesitaríamos mas información.
11		x	Nos parece complejo que esta información pueda competir en resolución y cobertura temporal con otras fuentes de datos ya existentes. Tal vez para en zonas con poca o nula información previa y/o para obtener datos históricos en zonas altamente modificadas.
12		x	Según la resolución y margen de error vertical.
13		x	
14		x	
15		x	
16		x	
17		x	Según la resolución y margen de error vertical.
18		x	

- Grado de coincidencia de vuestros intereses con los requerimientos de MITECO (apartado 5 del documento de resumen en español adjunto)

# Categoría	Interés alto	Cierto interés	Sin interés	Comentario
1		x		Nos parece complejo que esta información pueda competir en resolución y cobertura temporal con otras fuentes de datos ya existentes.
2	x			Fuente de datos que puede resultar interesante para obtener datos históricos en zonas altamente modificadas. No tanto como herramienta de seguimiento por resolución y cobertura temporal.
3	x			En nuestro ámbito de trabajo más cercano nos parece complejo que esta información pueda competir en resolución y cobertura temporal con otras fuentes de datos ya existentes. Tal vez para en zonas con poca o nula información previa y/o para obtener datos históricos en zonas altamente modificadas.

* Mencionando requerimientos por vuestra parte que no hayan sido incluidos

- Grado de interés en las áreas de interés seleccionadas en España y los productos requeridos en ellas por MITECO (apartado 6 del documento de resumen en español adjunto).

Producto	Área	Interés alto	Cierto interés	Sin interés	Comentario
Monitorización de cambios en la cobertura del suelo	Delta del Tordera				
	Playas de Sansebastian	x			
	Playa de Salinas				

	El Puntal de Santander			
	Maspalomas			

Mencionando otras áreas y/o productos que sean de vuestro interés y no hayan sido incluidos

Estuario de Urdaibai, playas del entorno de Bilbao, estuario del Txingudi, playa de Zarautz.

3.2 Feedback from IGN

Un comentario importante, es que se echa en falta en el documento una mención al nuevo producto Copernicus Land de monitorización de costas.

- Grado de coincidencia de vuestros intereses con lo expresado por los usuarios competentes del conjunto de países representados en el consorcio “Coastal Change From Space” sobre los siguientes aspectos de los productos a elaborar (apartado 3 del documento de resumen en español adjunto)

Tema	De acuerdo	En desacuerdo	Comentario
De la línea de costa (1D) a productos 2D y 3D.	2D		En qué medida se usan datos de referencia oficiales nacionales/regionales (datos in situ)
Alcance espacial centrado en el área costera		SI	No sólo costa, también aguas interiores grandes, zonas intermareales, marismas, humedales, etc. si fuera posible
Indicadores de la línea de costa		SI	Falta de conocimiento experto, pero la línea de costa no se determina por la cota, si no por el análisis periódico de las mareas, campo de la gravedad, etc.
Alcance temporal más allá de 25 años	SI		No interés concreto, mientras se haga históricamente desde la existencia de imágenes sería suficiente
Indicadores del estado de la costa		SI	Sin interés

Precisión de los productos	SI		Los errores admitidos en las geometrías deberían ser inferiores al metro, e idealmente cercano al decímetro. Con un valor de confianza en los resultados mayor al 90% para que fueran al menos útiles. A día de hoy se desconoce si esto pudiera alcanzarse por observación remota automática.
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- Grado de interés en los productos a desarrollar (apartado 4 del documento de resumen en español adjunto)

# Producto	Interés alto	Cierto interés	Sin interés	Comentario
1	SI			En consonancia con los dominios públicos y Catastro
2			SI	
3	SI			Interés en la integración de modelos digitales tierra-mar
4			SI	
5	SI			En consonancia con los dominios públicos y Catastro
6			SI	
7		SI		
8			SI	
9		SI		
10		SI		No tiene por qué ser de las mismas misiones. Ver concepto de Analysis Ready Data
11	SI			Batimetría por satélites
12			SI	
13	SI			Batimetría por satélites
14			SI	
15			SI	
16			SI	

17			SI	
18			SI	

- Grado de coincidencia de vuestros intereses con los requerimientos de MITECO (apartado 5 del documento de resumen en español adjunto)

# Categoría	Interés alto	Cierto interés	Sin interés	Comentario
1			SI	
2		SI		Se desconfía que por observación remota puedan recogerse bien el uso del suelo. Se necesitarán datos de referencia adicionales.
3			SI	

* Mencionando requerimientos por vuestra parte que no hayan sido incluidos

- Grado de interés en las áreas de interés seleccionadas en España y los productos requeridos en ellas por MITECO (apartado 6 del documento de resumen en español adjunto).

Producto	Área	Interés alto	Cierto interés	Sin interés	Comentario
Monitorización de cambios batimétricos en las playas	Playas al sur de Barcelona		SI		En general no interesan lugares específicos, pero si a podría interesar a nivel nacional.
	Playa de Mazagón		SI		
Monitorización de cambios en la posición de la línea de costa	Playas al sur de Barcelona		SI		
	Delta del Tordera		SI		
	Playas de la Bahía de Cádiz		SI		

Monitorización de cambios en la cobertura del suelo	Playa de Salinas		SI		
	Playas de San Sebastián		SI		
	El Puntal de Santander		SI		
	Maspalomas		SI		
	Playa de las Canteras		SI		
	Delta del Tordera		SI		
	Playas de Sansebastian		SI		
	Playa de Salinas		SI		
	El Puntal de Santander		SI		
	Maspalomas		SI		

3.3 Feedback from IHM

- Grado de coincidencia de vuestros intereses con lo expresado por los usuarios competentes del conjunto de países representados en el consorcio “Coastal Change From Space” sobre los siguientes aspectos de los productos a elaborar (apartado 3 del documento de resumen en español adjunto)

Tema	De acuerdo	En desacuerdo	Comentario
De la línea de costa (1D) a productos 2D y 3D.	x		
Alcance espacial centrado en el área costera	x		
Indicadores de la línea de costa	x		
Alcance temporal más allá de 25 años	x		
Indicadores del estado de la costa	x		
Precisión de los productos	x		

- Grado de interés en los productos a desarrollar (apartado 4 del documento de resumen en español adjunto)

# Producto	Interés alto	Cierto interés	Sin interés	Comentario
1	Batimetría derivada satélite.			Inferencia de batimetría no cartográfica con técnicas de teledetección remota
2	x			Línea de costa extraída de la marca de la pleamar
3	x			Línea de costa extraída de la línea de vegetación o de la presencia de obras (e.g. muros costeros, muelles...)
4	x			Línea de agua a partir de la interfaz entre el agua y la tierra en una imagen instantánea.
5	X			Perfiles topográficos en dirección transversal a la línea de costa (producto intermedio)
6	X			Línea de costa basada en la cota del nivel del mar, la línea de agua y la geometría del perfil transversal.

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7	X			Cambios topobatimétricos basados en la bathimetría derivada de satélite (respecto de un modelo digital del terreno de referencia)
8	X			Cambios topobatimétricos basados en los patrones de oleaje (respecto de un modelo digital del terreno de referencia)
9	X			Resultados de la fusión de los cambios topobatimétricos topobatimétricos basados en la bathimetría derivada de satélite y basados en los patrones de oleaje de un conjunto de datos de imágenes instantáneas de diferentes misiones de OT durante un cierto periodo de tiempo.
10	X			Cálculos derivados de series temporales de las topobatimetrías previas
11				
12				
13				
14				
15				
16				
17				
18				

- Grado de coincidencia de vuestros intereses con los requerimientos de MITECO (apartado 5 del documento de resumen en español adjunto)

# Categoría	Interés alto	Cierto interés	Sin interés	Comentario
1	X			
2	X			

3

X

* Mencionando requerimientos por vuestra parte que no hayan sido incluidos

- Grado de interés en las áreas de interés seleccionadas en España y los productos requeridos en ellas por MITECO (apartado 6 del documento de resumen en español adjunto).

Producto	Área	Interés alto	Cierto interés	Sin interés	Comentario
Monitorización de cambios batimétricos en las playas	Playas al sur de Barcelona	X			
	Playa de Mazagón	X			
Monitorización de cambios en la posición de la línea de costa	Playas al sur de Barcelona	X			
	Delta del Tordera	X			
	Playas de la Bahía de Cádiz	X			
	Playa de Salinas	X			
	Playas de San Sebastián	X			
	El Puntal de Santander	X			
	Maspalomas	X			
	Playa de las Canteras	X			
Monitorización de cambios en la cobertura del suelo	Delta del Tordera			X	
	Playas de Sansebastian			X	

	Playa de Salinas			X	
	El Puntal de Santander			X	
	Maspalomas			X	

3.4 Feedback from el Puerto de Barcelona

- Grado de coincidencia de vuestros intereses con lo expresado por los usuarios competentes del conjunto de países representados en el consorcio “Coastal Change From Space” sobre los siguientes aspectos de los productos a elaborar (apartado 3 del documento de resumen en español adjunto)

Tema	De acuerdo	En desacuerdo	Comentario
De la línea de costa (1D) a productos 2D y 3D.	X		
Alcance espacial centrado en el área costera	X		
Indicadores de la línea de costa	X		Mayor interés en los datos derivados de la curva de nivel asociada a una cierta cota que en indicadores visuales.
Alcance temporal más allá de 25 años	X		
Indicadores del estado de la costa		X	
Precisión de los productos	X		El interés real se centra en sistemas que garanticen mayor precisión que los métodos empleados actualmente. El posible interés por disponer de información de menor precisión estaría relacionado con su coste, en el sentido que éste permitiera compensar esa falta de precisión con un mayor número de estados de la costa que fuesen útiles para el seguimiento más cualitativo de la evolución de la misma.

- Grado de interés en los productos a desarrollar (apartado 4 del documento de resumen en español adjunto)

# Producto	Interés alto	Cierto interés	Sin interés	Comentario
1		X		
2			X	
3			X	
4	X			
5	X			
6			X	
7			X	
8			X	
9			X	
10	X			El interés estaría condicionado por la precisión que pudiera obtenerse. La APB, como usuario final, tiene interés en disponer de la información más precisa posible sobre la línea de costa y sobre los cambios topobatimétricos que sufra la misma pero no tiene planeado disponer de personal cualificado en remote sensing que pudiera tratar diversa información proveniente de diferentes análisis como son los provenientes de los productos 10 a 18.
11	X			Mismo comentario que el realizado para el producto 10.
12	X			Mismo comentario que el realizado para el producto 10.
13	X			Mismo comentario que el realizado para el producto 10.
14	X			Mismo comentario que el realizado para el producto 10.
15	X			Mismo comentario que el realizado para el producto 10.

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16	X			Mismo comentario que el realizado para el producto 10.
17	X			Mismo comentario que el realizado para el producto 10.
18	X			Mismo comentario que el realizado para el producto 10.

- Grado de coincidencia de vuestros intereses con los requerimientos de MITECO (apartado 5 del documento de resumen en español adjunto)

# Categoría	Interés alto	Cierto interés	Sin interés	Comentario
1	X			El interés se limitaría al primer punto (Parámetros objetivos para la cuantificación de la evolución de la costa en relación con los principales agentes de cambio: oleaje, cambio climático, construcción de infraestructuras en la costa....)
2	X			El interés se limitaría al primer punto (Herramienta para el análisis de la eficacia de acciones implementadas en el pasado para la protección de la costa y la monitorización de medidas recientemente implementadas).
3	X			El interés se limitaría a la observación sistemática de los procesos morfodinámicos y sedimentarios para disponer de datos de todo tipo más precisos y ajustar los modelos ya existentes que ya permiten un entendimiento suficiente de los procesos existentes.

* Mencionando requerimientos por vuestra parte que no hayan sido incluidos

- Grado de interés en las áreas de interés seleccionadas en España y los productos requeridos en ellas por MITECO (apartado 6 del documento de resumen en español adjunto).

Producto	Área	Interés alto	Cierto interés	Sin interés	Comentario
	Playas al sur de Barcelona	X			

Monitorización de cambios batimétricos en las playas	Playa de Mazagón				
	Playas al sur de Barcelona	X			
	Delta del Tordera				
	Playas de la Bahía de Cádiz				
Monitorización de cambios en la posición de la línea de costa	Playa de Salinas				
	Playas de San Sebastián				
	El Puntal de Santander				
	Maspalomas				
	Playa de las Canteras				
Monitorización de cambios en la cobertura del suelo	Delta del Tordera				
	Playas de San Sebastian				
	Playa de Salinas				
	El Puntal de Santander				
	Maspalomas				

Mencionando otras áreas y/o productos que sean de vuestro interés y no hayan sido incluidos

Podría analizarse la posibilidad de extender el ámbito de análisis a la playa de Sant Sebastià al norte del puerto de Barcelona e incluida en su zona de servicio. Por sus dimensiones y problemática está

lejos de ser un tema tan relevante como las playas del delta del Llobregat pero posiblemente por su ubicación podrían obtenerse economías de escala.

3.5 Feedback from UPC

- Grado de coincidencia de vuestros intereses con lo expresado por los usuarios competentes del conjunto de países representados en el consorcio “Coastal Change From Space” sobre los siguientes aspectos de los productos a elaborar (apartado 3 del documento de resumen en español adjunto)

Tema	De acuerdo	En desacuerdo	Comentario
De la línea de costa (1D) a productos 2D y 3D.	X		Los cambios en 2D no suponen ningún avance con respecto a los 1D ya que simplemente implican la integración con respecto a un borde interior y, pueden obtenerse fácilmente (trivial) siempre que se disponga del dato 1D. Sin embargo el disponer de datos 3D de alta resolución y precisión si que supone un avance significativo en cuanto al conocimiento que se tendría del comportamiento de la zona costera.
Alcance espacial centrado en el área costera	X		La disponibilidad de batimetrías de alta resolución (y previsión) de la zona costera sería un gran avance, sobre todo teniendo en cuenta su escasa disponibilidad actual. Asimismo, la alta dinámica de la zona hace que en muchos casos los datos queden obsoletos en muy poco tiempo, por lo que poder actualizarlos de forma eficiente sería de gran ayuda para muchas aplicaciones que requieren información actualizada.
Indicadores de la línea de costa	X		Más que decidir sobre indicadores, lo que se necesita es que cualquier medida seleccionada para la línea de costa quede perfectamente definida para poder ser comparada de forma precisa. En cualquier caso, dada la variabilidad en niveles de marea entre las distintas zonas costeras, sería conveniente aportar en cada caso cual es el nivel de marea en el momento de la foto (con

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			respecto al nivel medio de la zona) y tener también una idea de la pendiente de la playa (beachface) para poder determinar la precisión (o incertidumbre) del dato.
Alcance temporal más allá de 25 años	X		Fundamental para estimar el comportamiento futuro de las zonas dinámicas. Permite actualizar las tendencias evolutivas y detectar posibles cambios (y/o aceleraciones/desaceleraciones) en el comportamiento.
Indicadores del estado de la costa		X	Este tipo de indicadores son útiles para caracterizar procesos/variables específicas de interés focalizado. Por ello, su definición depende del interés en particular y, por lo tanto, más que ser derivados en este tipo de servicios, lo ideal es que se suministren los datos en una manera que puedan ser combinados a posteriori por los usuarios en función de sus necesidades. No se considera necesario invertir esfuerzos en este aspecto aunque si el poder obtener toda la información posible de los datos que pueda ser necesitada a posteriori para construir tales indicadores.
Precisión de los productos		X	La resolución necesaria dependerá del uso que se vaya a hacer de la información disponible. Aunque a priori solemos pedir muy altas resoluciones, el hecho es que muchas veces el uso que se da a la información no requiere de las mismas. Lo importante en cada momento es conocer la resolución real disponible que permita acotar la incertidumbre en el análisis realizado.

- Grado de interés en los productos a desarrollar (apartado 4 del documento de resumen en español adjunto)

# Producto	Interés alto	Cierto interés	Sin interés	Comentario
1	X			
2	X			

3	X			
4	X			
5	X			
6			X	
7	X			
8			X	
9		X		
10		X		
11		X		
12		X		
13		X		
14		X		
15		X		
16		X		
17		X		Aún siendo interesante para un usuario final, en nuestro caso preferimos disponer de los datos que nos permitan hacer el análisis por nosotros mismos para poder elegir tanto el método de análisis como los períodos a cubrir.
18		X		Aún siendo interesante para un usuario final, en nuestro caso preferimos disponer de los datos que nos permitan hacer el análisis por nosotros mismos para poder elegir tanto el método de análisis como los períodos a cubrir.

- Grado de coincidencia de vuestros intereses con los requerimientos de MITECO (apartado 5 del documento de resumen en español adjunto)

# Categoría	Interés alto	Cierto interés	Sin interés	Comentario
1	X			

2	X			
3	X			

* Mencionando requerimientos por vuestra parte que no hayan sido incluidos

- Grado de interés en las áreas de interés seleccionadas en España y los productos requeridos en ellas por MITECO (apartado 6 del documento de resumen en español adjunto).

Producto	Área	Interés alto	Cierto interés	Sin interés	Comentario
Monitorización de cambios batimétricos en las playas	Playas al sur de Barcelona	X			
	Playa de Mazagón			X	
Monitorización de cambios en la posición de la línea de costa	Playas al sur de Barcelona	X			
	Delta del Tordera	X			
	Playas de la Bahía de Cádiz			X	
	Playa de Salinas			X	
	Playas de San Sebastián			X	
	El Puntal de Santander			X	
	Maspalomas		X		
	Playa de las Canteras		X		
	Delta del Tordera	X			

Monitorización de cambios en la cobertura del suelo	Playas de Sansebastian				
	Playa de Salinas		X		
	El Puntal de Santander		X		
	Maspalomas	X			

Mencionando otras áreas y/o productos que sean de vuestro interés y no hayan sido incluidos

[Delta del Ebro](#)

3.6 Feedback from UPV

- Grado de coincidencia de vuestros intereses con lo expresado por los usuarios competentes del conjunto de países representados en el consorcio “Coastal Change From Space” sobre los siguientes aspectos de los productos a elaborar (apartado 3 del documento de resumen en español adjunto)

Tema	De acuerdo	En desacuerdo	Comentario
De la línea de costa (1D) a productos 2D y 3D.	0.7	0.3	Si bien es lógico buscar tres modelos de productos -1D, 2D y 3D--todos ellos están íntimamente relacionados y su obtención depende esencialmente de la obtención de productos 1D que tratados no de forma individual, sino como un conjunto -i.e., todos aquellos registrados en un mismo ciclo mareal o en un año y asignando a cada uno de ellos un valor de elevación altimétrica, podrá derivarse conclusiones sobre cambios superficiales y volumétricos. La deducción de cada una de las tres tipologías de información (1D, 2D y 3D) por tanto se sostiene en tres pilares esenciales: (i) la exactitud con que cada

línea de agua instantánea --coincidente con la captura de la imagen de satélite-- sea obtenida [ahora mismo en entornos mediterráneos esto se está consiguiendo con un error de entre 3 m RMSE para las imágenes Sentinel 2 y 3.5 m para las Landsat 8 (veáse Sánchez-García, 2019 y Sanchez-García et al (under review)) (ii) de la cantidad de registros de dichas líneas de agua, lo que está intrínsecamente unido tanto con la disponibilidad de imágenes del rango óptico sin cubierta de nubes como con la eficiencia técnica en obtener todas esas líneas de una forma completamente automática y (iii) de la posibilidad de asignar una elevación a cada línea de agua obtenida. Esto último resulta especialmente complicado ya que para ello habría que disponer de datos de elevación del nivel del mar en cada momento y en cada lugar (si bien en este campo hay avances muy interesantes en la bibliografía más reciente -véase Fernández-Montblanc et al. (2020) <https://doi.org/10.1016/j.envint.2019.105367>) debido al efecto de la marea astronómica y meteorológica, pero también y al runup del oleaje. Por todo ello el reconocimiento de la "isohipsa" deducida de la línea de costa deducida por satélite debe ser aceptado solo como un proxy que tendrá que ser evaluado para calibrar su potencialidad para estimar los cambios volumétricos.

Otros productos batimétricos que pueden obtenerse con imágenes Sentinel 2 son aquellos que se basan en las diferencias de reflectancia del fondo marino de las bandas de onda más corta en sectores

			<p>someros. Recientemente se han presentado algunos resultados sumamente interesantes en costas de aguas muy limpias. Caballero y Stumpf (2019) que usando las Sentinel 2 de 10 m de resolución espacial obtuvieron un error medio absoluto (MAE) de 0.5 m en tres sectores de las costas de Florida con profundidades de entre 0 y 18 m-</p>
Alcance espacial centrado en el área costera	0.7	0.3	Más aún, la progresiva actualización de la costa puede considerarse como un input esencial para generar cartografía de inundaciones de las zonas costeras y la evaluación de riesgo potencial para las poblaciones y las infraestructuras inmediatas.
Indicadores de la línea de costa	0.5	0.5	En el apartado primero ya hemos resaltado las posibilidades y dificultades de la obtención de una isohipsa aproximada partiendo de las SDS (Satellite Derived Shorelines) y por tanto entendemos que este producto –las isohipsas–una vez evaluadas podrían resultar de gran interés para cuantificar los fenómenos de erosión/acumulación que se verifiquen en las playas europeas y del resto del mundo. El uso de otras fuentes de señales más tradicionales –como las áreas de acumulación de desechos–solo pueden ser registradas utilizando imágenes de muy alta resolución (mejores a 1 m de pixel) que ahora mismo no están disponibles de forma general y sistemática para toda la costa europea. Desde nuestra perspectiva resulta esencial crear productos que se sostengan sobre imágenes adquiridas de forma sistemática y global y de libre disposición. Ello, ahora

			<p>mismo, implica aprovechar el inmenso recurso que suponen las imágenes Sentinel 2 y Landsat (5,7 y 8) fundamentalmente. También sería muy importante emplear las imágenes Sentinel 1, sobretodo para adquirir las posiciones de la orilla durante los momentos más críticos durante los temporales, si bien ello, ahora mismo, se está logrando con un grado de precisión sustancialmente peor al que se obtiene con las imágenes de resolución media en el rango óptico.</p>
Alcance temporal más allá de 25 años	0.5	0.5	<p>Es importante resaltar que actualmente el rango temporal que puede ser monitorizado con imágenes de satélite es de 35 años y no de 25 años. Desde marzo de 1984 disponemos de imágenes Landsat 5 que perfectamente pueden ser empleadas para registrar la dinámica evolutiva como ha quedado ya bien demostrado en distintos estudios (Sánchez-García et al., 2015; Almonacid-Caballer et al., 2016; Liu et al, 2017; Luijendijk et al., (2018)., Mentaschi et al., (2018), Do et al., 2019</p>
Indicadores del estado de la costa	0.7	0,3	<p>Además de todo lo expuesto, entiendo que al menos para las playas micromareales que dominan en toda la costa mediterránea española monitorizar la anchura de playa y detectar las áreas en las que el registro de anchuras no alcanza un umbral dado (por ejemplo, 30 m) puede ser una buena forma para detectar y categorizar las áreas con problemas. La disponibilidad de varias decenas de líneas de costa por año, como demuestran los</p>

			trabajos de Cabezas et al. (2019a, 2019b) evidencian que es posible y útil.
Precisión de los productos	0.3	0.7	<p>Sería importante repensar el concepto de precisión atendiendo no únicamente a la capacidad de registrar un rasgo morfológico instantáneo sino de caracterizar una forma del terreno –en este caso la playa–a lo largo de un periodo dado. El uso de herramientas de medición de alta precisión –levantamientos DGNSS, LiDAR, levantamientos fotogramétricos, ...) aportan mayor grado de exactitud a la hora de fijar una forma del terreno instantánea. Ahora bien, en un entorno dinámico –como la playa–la forma registrada se mantiene exacta muy poco tiempo. Dicha información se desactualiza rápidamente. Las SDS (Satellite derived shorelines) ciertamente ofrecen un nivel de precisión menor que los sistemas anteriores pero presentan la ventaja de su cubierta global y su elevada repetitividad temporal. Visto que ahora mismo, al menos en playas micromareales como las del Mediterráneo—el RMSE es de unos 3 m usando imágenes Sentinel 2 y de 3.6 m usando Landsat 8, se puede aceptar que determinados rasgos morfológicos clave – como sería la anchura de la playa—pueden ser monitorizados con una elevada frecuencia temporal y con coste asumible como no lo han podido hacerse nunca gracias a la capacidad de utilizar sistemas de extracción de la línea de costa a nivel subpixel y que funcionan de forma automática.</p>

- Grado de interés en los productos a desarrollar (apartado 4 del documento de resumen en español adjunto)

# Producto	Interés alto	Cierto interés	Sin interés	Comentario
1		x		Desde las imágenes Sentinel 2 es difícil detectar la línea de pleamar a no ser que la imagen se haya captado en ese instante. Estas líneas se pueden obtener de imágenes de muy alta resolución pero éstas no tienen un grado de repetitividad tan elevado y además tienen un coste económico considerable.
2		x		Veo prácticamente un problema similar al expuesto en el producto 1.
3	x			Entiendo que este producto se puede obtener aplicando sistemas de extracción automática subpixel y tendrían un enorme interés.
4	x			Es un producto de un enorme interés pero que actualmente requeriría de investigación para calibrar el grado de precisión con que se puede determinar.
5	x			Este resultado tendría un enorme interés pero también requeriría de una evaluación detallada del grado de precisión con que se puede obtener.
6		x		
7		x		
8		x		Quizá sería interesante no solo suavizar el efecto estacional sino justamente reconocer, si los hay, variaciones estacionales en estos ecosistemas de transición.
9		x		
10	x			Vería sumamente interesante la obtención de estadísticos y caracterizaciones métricas para poder establecer criterios de gestión sostenidos en métricas homogéneas sobre amplios segmentos costeros.
11	x			

12	x				
13	x				Estos resultados en que se combinen distintos tipos de información son especialmente interesantes. Sería, por otra parte, muy conveniente poderlos contrastar con mediciones in situ usando técnicas de mayor precisión para acotar el grado de certidumbre de los resultados.
14	x				
15	x				
16	x				
17	x				
18	x				

- Grado de coincidencia de vuestros intereses con los requerimientos de MITECO (apartado 5 del documento de resumen en español adjunto)

# Categoría	Interés alto	Cierto interés	Sin interés	Comentario

1	x			Además de todo lo indicado por el MITECO indicaría que es sería clave crear bases sistemáticas que analicen la variación sistemática de la anchura de playa por tramos de manera que se pudiera disponer de un sistema de monitorización sistemática para la detección de (i) el impacto de los temporales y los procesos de recuperación de la línea de costa, (ii) el seguimiento de la evolución de determinadas obras o actuaciones artificiales realizadas en playa (vertidos artificiales de arena para recuperar una playa, ...), (iii) el seguimiento de la evolución natural de mesoformas de playa (apuntamientos, ...) de manera que se pudieran relacionar con las condiciones de oleaje y nivel del mar, (iv) detección de posibles problemas causados por el alcance del oleaje sobre infraestructuras o áreas habitadas. Un ejemplo de la manera en que se podría hacer este seguimiento es el que aparece descrito en Cabezas Rabadán et al (2019).
2	x			Ya expuesto en 1
3	x			Ya expuesto en 1.

* Mencionando requerimientos por vuestra parte que no hayan sido incluidos

- Grado de interés en las áreas de interés seleccionadas en España y los productos requeridos en ellas por MITECO (apartado 6 del documento de resumen en español adjunto).

Producto	Área	Interés alto	Cierto interés	Sin interés	Comentario
Monitorización de cambios batimétricos en las playas	Playas al sur de Barcelona	x			
	Playa de Mazagón	x			

Monitorización de cambios en la posición de la línea de costa	Playas al sur de Barcelona	x			
	Delta del Tordera	x			
	Playas de la Bahía de Cádiz	x			
	Playa de Salinas	x			
	Playas de San Sebastián	x			
	El Puntal de Santander	x			
	Maspalomas	x			
	Playa de las Canteras	x			
Monitorización de cambios en la cobertura del suelo	Delta del Tordera	x			
	Playas de San Sebastián	x			
	Playa de Salinas	x			
	El Puntal de Santander	x			
	Maspalomas	x			

Mencionando otras áreas y/o productos que sean de vuestro interés y no hayan sido incluidos

Creo que resultaría muy interesantes monitorizar los cambios batimétricos y de posición de la línea de costa en sectores categorizados tradicionalmente como estables y incluso tengan elementos que le otorgan estabilidad –como alineaciones dunares—para vigilar el efecto de factores que potencialmente afectan a la estabilidad del sistema costero a largo plazo como son la disminución de los aportes sedimentarios de origen fluvial (por la regularización y incremento de cubierta vegetal en la cuencas de drenaje) y las alteraciones asociadas al cambio climático (progresivo incremento del nivel del mar y aumento del número y magnitud

de temporales). Sugiero para ello lugares como las playas de Oliva, en el sur de la provincia de Valencia.

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Mentaschi et al., (2018),

Do et al., 2019

Cabezas et al. (2019a, 2019b)



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