RESILIENT COASTS LTD

Coastal Monitoring Data Viewer Investigation and Scoping

Consultant report for Coastwise in support of scoping the potential to develop a novel coastal data viewer, or integration of data within an existing platform.

Department for Environment Food & Rural Affairs

Environment Agency

Coastal transition accelerator programme

Part of the £200m Flood and coastal innovation programmes

NORTH NORFOLK DISTRICT COUNCIL

COASTWISE

This document has been prepared for North Norfolk District Council by:

Resilient Coasts Ltd, Melville Building East, Royal William Yard, Plymouth, PL1 3RP.
https://resilientcoasts.com/

In association with:

- Coastwise
- North Norfolk District Council
- The Environment Agency

Project Steering Group:

- Chris Smith
- Alan Frampton
- Rob Goodliffe
- Chloe Suttle

Acknowledgements:

Resilient Coasts Ltd would like to thank the Project Steering Group for their direction and constructive comments in developing project outputs. We are grateful to Alan Frampton (South West Flood & Coastal), Ruth Adams (NNRCMP), Colin Bye (Coastal Partnerships East), Heather Bell (Rivers Trust), Sacha Neill (Coastal Partners), Dr Charlie Thompson (NNRCMP), Chris Hayes (Environment Agency), Kara Doran (US Geological Survey), Dr Helen Jay (National Trust) and Dr Robbi Bishop-Taylor (Geoscience Australia) for their valuable insights.

Citation:

Hunt, E., Rendle, E., Smith, C., Goodliffe, R., Frampton, A. and Suttle, C. 2025. Coastal Monitoring Data Viewer Investigation and Scoping. Consultant report for Coastwise in support of scoping the potential to develop a novel coastal data viewer, and/or integration of data within an existing platform. Resilient Coasts Ltd.

Produced by	Resilient Coasts Ltd		
Project manager	Emma Rendle emma.rendle@resilientcoasts.com		
Project team	Emily Hunt	Date	16/04/2025
Project code	2024_161_NOR_DAT	Version	Draft 1.0
Client	North Norfolk District Council		

Table of Contents

List of Figures

List of Tables

Executive summary

This report examines the feasibility of developing a novel coastal data viewer, and/or integrating coastal monitoring data into an existing platform. North Norfolk District Council commissioned Resilient Coasts Ltd to perform scoping work under the COASTWISE project funded by DEFRA as part of the £200 million Flood and Coastal Innovation Programmes, managed by the Environment Agency. These programmes drive innovation in flood and coastal resilience and adaptation to a changing climate. Resilient Coasts Ltd explored the need for improved coastal data accessibility, user requirements, and potential platform solutions. Through a combination of platform assessments, stakeholder engagement, and a targeted workshop, the findings highlight the importance of an intuitive, accessible, and integrated approach to coastal data visualisation.

A review of existing national and international coastal monitoring platforms revealed varying levels of usability, accessibility, and effectiveness. While several platforms provide valuable datasets, many lack intuitive interfaces, integrated multi-source data, or clear visualisations suitable for a diverse audience. To systematically assess their suitability, a scoring matrix was developed based on criteria such as usability, accessibility, scalability, and coastal literacy support.

Stakeholder engagement was a critical component of this study, involving structured interviews with key coastal professionals, platform developers, and local authority representatives. A survey was conducted to gather broader perspectives, receiving a total of 89 responses (57 technical, 32 non-technical), and a dedicated workshop with 13 coastal professionals provided deeper insights into user needs and technical considerations. Findings indicate strong demand for a data viewer that balances technical complexity with accessibility, ensuring both specialists and the general public can interact with coastal data effectively.

Key challenges identified include the need for a clear purpose; whether the platform should primarily serve as a visualisation tool or also function as a data repository. Sustainability considerations, including funding, long-term maintenance, and data governance, must be addressed to ensure continued platform viability. Additionally, stakeholders emphasised the importance of trustworthy, high-quality data with transparent metadata, alongside interactive features such as dynamic mapping, overlay functions, and real-time updates.

To ensure the platform meets user needs, key recommendations include centralising coastal data to improve accessibility and metadata transparency, prioritising a user-centric design with tiered interfaces for different audiences, and ensuring up-to-date data availability for time-sensitive decision-making. Intuitive visualisation tools should be integrated to enhance data interpretation, alongside interactive storytelling features to improve communication.

Three primary options emerged for platform development: (1) integrating with the National Network for Regional Coastal Monitoring Programme (NNRCMP) to use an existing framework with minimal development effort; (2a) developing an independent platform using TerriaJS, offering an interactive geospatial viewer with enhanced visualisation tools; or (2b) building a fully customised coastal data platform tailored to specific user needs. Each option presents trade-offs in cost, usability, scalability, and technical complexity. While NNRCMP integration offers a cost-effective and quicker solution, bespoke development allows greater control over features and data interactivity.

1 Introduction

Coastal data plays a crucial role in understanding and managing dynamic coastal environments, particularly in regions like North Norfolk, which face increasing challenges from coastal erosion, climate change, and shifting marine conditions. However, access to comprehensive, user-friendly coastal data remains a barrier for many stakeholders, including local authorities, environmental agencies, researchers, and the wider public. Existing data platforms often present technical hurdles, fragmented datasets, or a lack of clear visualisation tools, limiting their practical usability.

This study, commissioned by North Norfolk District Council and undertaken by Resilient Coasts Ltd in collaboration with Coastwise and the Environment Agency, seeks to evaluate the feasibility of either developing a dedicated coastal data viewer or integrating existing coastal monitoring data into an established platform. The primary objective is to enhance data accessibility, usability, and engagement, ensuring that key decision-makers and local communities can interact with coastal data effectively.

To achieve this, the study involved a review of current national and international coastal data platforms, a structured assessment of their capabilities, and extensive stakeholder engagement. Insights from local authorities, platform developers, and coastal professionals were gathered through interviews, surveys, and a focused workshop. The findings provide a foundation for recommending the most effective way forward: whether through the enhancement of an existing platform or the creation of a bespoke solution tailored to North Norfolk's needs.

The report begins by outlining the assessment approaches used in the study, detailing the methodologies for platform evaluation, stakeholder mapping, interviews, surveys, and the workshop. This is followed by the results, which present key findings from the platform assessment, stakeholder engagement, and survey analysis, highlighting common challenges and opportunities in coastal data accessibility. The discussion section synthesises these insights, examining potential pathways for improving coastal data integration and usability. A series of national and international case studies, located in Appendix 3, provide transferable lessons relevant to the CTAP/Coastwise initiatives, showcasing best practices and innovative approaches to coastal data management. The report concludes with strategic recommendations for future work, ensuring that lessons learned inform the development of an accessible and sustainable coastal data platform for North Norfolk.

The study utilised a multi-faceted approach to assess existing coastal data platforms, engage stakeholders, and evaluate technical and user requirements. This section details the approach, including platform assessment, stakeholder engagement (survey, interviews and a technical workshop) and subsequent data analysis.

2 Platform assessment

A comprehensive literature review and web search were conducted to identify relevant national and international open-access platforms for monitoring coastal change. Research tools such as Google, Google Scholar, Web of Science, and coastal databases were used to gather a broad list of existing coastal monitoring platforms, ensuring a comprehensive initial dataset for assessment.

All publicly available coastal and relevant data portals were identified, with a primary focus on UK-based platforms, supplemented by key international examples for comparison. Platforms were filtered to ensure that assessed platforms aligned with coastal monitoring objectives while eliminating those with different themes or focuses. Following this, platforms were roughly ranked based on first-glance assessment.

A scoring matrix (Appendix 1) was developed in Microsoft Excel to systematically assess each platform. The criteria were categorised into key aspects such as relevance, accessibility, data visualisation, ease of use, technical specifications, performance metrics, audience engagement, innovative features, coastal literacy support, and scalability. Each criterion was assigned a weighting based on its importance to the Coastwise project, emphasising accessibility, intuitive design, and applicability to both general users and coastal practitioners.

The scoring scale ranged from 0 to 10, where:

- **0** indicated the feature was not present or applicable.
- **1-3** represented minimal implementation, with significant gaps or poor usability.
- **4-5** signified below-average to average performance, where the feature existed but had limitations.
- **6-7** indicated a well-developed and functional feature that met expectations.
- **8** represented excellence in design and usability, performing at a high standard.
- **9-10** were reserved for platforms that excelled specifically in coastal data presentation and usability, making them particularly valuable for the Coastwise project.

Each platform was evaluated against the established criteria. The scoring process involved an initial assessment based on available documentation and platform features, followed by a technical evaluation using tools such as Google Lighthouse to assess site performance, security, and accessibility. Hands-on testing was conducted to gauge usability, interactivity, and overall effectiveness. The final weighted scoring was then computed based on category importance.

Based on the weighted scores, the top 20 platforms (

Table 1) were shortlisted for further analysis. These selected platforms demonstrated high relevance and functionality for coastal monitoring and were considered potential models or benchmarks for the Coastwise project.

Table 1. Details of the top 20 platforms shortlisted for further analysis. ** refers to platforms that are in a Beta stage, hence results for these platforms may not be entirely comparable, weblinks are for the Beta sites and/or examples, therefore are likely to change or require unique access.

Site Name	Region	International/ UK	Link
NSW - Coastal Storm Early Warning System	WA & NSW, Australia	International	NSW - Coastal Storm EWS
DEFRA review of coastal in 2021**	England	UK/England	https://coastalchange.maploom.com/node/main
Catchment Based Approach (CaBA) Data Hub (Coastal Data Explorer)	England	UK/England	https://data.catchmentbasedapproach.org/pages/explore-data
Dynamic coast Scotland	Scotland	UK - regional	https://www.dynamiccoast.com/
DEA Coastlines	Australia	International	https://maps.dea.ga.gov.au/story/DEACoastlines
Cornwall Coastal Data Hub	Cornwall, UK	UK - regional	https://cornwall-coastal-data-hub-cwtrust.hub.arcgis.com/
British Geological Survey (BGS) Geoindex	UK	UK/England	BGS GeoIndex
Wales coastal monitoring	Wales, UK	UK - regional	https://www.wcmc.wales/data
USGS Total Water Level and Coastal Change Forecast Viewer	East coast, USA	International	https://coastal.er.usgs.gov/hurricanes/research/twlviewer/
Blue Earth Global	Global	Global	https://blueearthdata.org/data
SMP explorer and NCERM	England	UK/England	https://environment.data.gov.uk/shoreline-planning
Scottish Environment Protection Agency (SEPA) National Flood Risk Assessment (NFRA)	Scotland, UK	UK - regional	https://informatics.sepa.org.uk/NFRA2018/
SWCMP	Southwest, UK	UK - regional	https://southwest.coastalmonitoring.org/
NZ Coastlines Data Service	New Zealand	International	https://data.coastalchange.nz/
Coastal Futures Viewer (Global)	Global	Global	https://coastal-futures.org/
USGS Coastal Change Hazards Portal	USA	International	https://marine.usgs.gov/coastalchangehazardsportal/
Coastal England Small Area (CESA) data portal**	England	UK/England	Beta/testing version. Link not available to share.
National Network of Regional Coastal Monitoring Programmes (NNRCMP); Map Viewer	England	UK/England	https://coastalmonitoring.org/cco/
National Network of Regional Coastal Monitoring Programmes (NNRCMP); Realtime Data	England	UK/England	https://coastalmonitoring.org/cco/
National Network of Regional Coastal Monitoring Programmes (NNRCMP); SWEEP	England	UK/England	https://coastalmonitoring.org/ccoresources/sweep/

The final rankings of the coastal monitoring platforms (Table 2) were determined using the platform assessment matrix (Appendix 1). The South West Coastal Monitoring Programme (UK) emerged as the top platform with a weighted score of 67.3%. This platform ranked highly due to its strong alignment with coastal monitoring needs, dataset coverage (including critical information such as erosion rates and profile volumetric analysis), and user accessibility. The platform's clear and interactive data visualisations also contributed to its high ranking.

Table 2. Final weighted scoring (%) and rank, determined using the platform assessment marix (Appendix 1). ** refers to platforms that are currently in a beta version, so caution should be taken with regards to a direct comparison. Platforms in grey were selected to be carried forward as case studies (top 10).

Platform	Location	Weighted Score	Rank
South West Coastal Monitoring Programme	Southwest, UK	67.3	1
Digital Earth Australia Coastlines	Australia	61	2
Dynamic coast Scotland	Scotland	60.6	3
USGS Total Water Level and Coastal Change Forecast Viewer	East coast, USA	60.5	4
National Network of Regional Coastal Monitoring Programmes (NNRCMP); Map Viewer	England	59.8	5
Blue Earth Global	Global	59.8	6
National Network of Regional Coastal Monitoring Programmes (NNRCMP); Realtime Data	England	59.4	7
National Network of Regional Coastal Monitoring Programmes (NNRCMP); SWEEP	England	58.6	8
USGS Coastal Change Hazards Portal	USA	55.6	9
NSW - Coastal Storm EWS	WA & NSW, Australia	55.2	10
British Geological Survey (BGS) Geoindex	UK	53.2	11
Catchment Based Approach (CaBA) Data Hub (Coastal Data Explorer)	England	52.9	12
NZ Coastlines Data Service	New Zealand	52.6	13
Wales coastal monitoring	Wales, UK	52.2	14
Cornwall Coastal Data Hub	Cornwall, UK	51.6	15
SMP explorer and NCERM	England	51.3	16
DEFRA review of coastal in 2021**	England	50.3	17
Coastal Futures Viewer (Global)	Global	50.3	18
Coastal England Small Area (CESA) data portal**	England	48.7	19
Scottish Environment Protection Agency (SEPA) National Flood Risk Assessment (NFRA)	Scotland, UK	47.5	20

Digital Earth Australia Coastlines followed closely with a score of 61%, driven by its advanced features, such as innovative tools for communication to non-technical audiences. Its accessibility makes it a valuable resource for both general and technical users alike.

Platforms in the top 10 also performed well due to their combination of comprehensive datasets, user-friendly interfaces, and strong data visualisation capabilities. These platforms not only supported coastal practitioners but also engaged the public with clear and interactive displays of coastal data. The platforms ranked in the top 10 were selected as case studies for further insight (Appendix 4), as they demonstrated exemplary features in all the evaluation criteria. The platforms that ranked lower in the list, such as Coastal Futures Viewer (ranked 18th) and Scottish Environment Protection Agency (SEPA) National Flood Risk Assessment (ranked 20th), still provide important services but fell short in terms of aligning with Coastwise requirements.

3 Stakeholder engagement and assessment

3.1 Stakeholder mapping

To develop a comprehensive understanding of coastal monitoring platforms, a structured approach was taken to identify and engage relevant stakeholders.

An initial contact list was compiled using known contacts from Resilient Coasts Ltd and the project steering group. Further contacts were identified based on their involvement in selected coastal monitoring platforms, partnerships, and relevant research groups. This process ensured the inclusion of individuals with direct experience in either using or developing coastal data viewers.

Fifteen key technical contacts were selected based on their expertise, involvement in platform development, or significant use of monitoring tools. These individuals were invited for interviews, with the aim of securing at least ten in-depth discussions. All other identified stakeholders received the survey, which was also distributed via social media and LinkedIn to encourage wider participation.

3.2 Workshop

A stakeholder workshop took place on 27/02/2025 09:00-16:00, located in an Environment Agency office at the address: Dragonfly House, 1 Gilders Way, Norwich. The stakeholder workshop was a key component of the study, designed to gather qualitative insights from coastal professionals, local authorities, and platform developers. The workshop aimed to explore user needs, technical considerations, and potential solutions for an improved coastal data platform. The session was structured to maximize engagement, facilitate discussion, and capture actionable insights.

The primary objectives of the workshop were to:

- Identify the key challenges and gaps in existing coastal data access and visualisation.
- Explore user requirements and preferences for an ideal coastal data platform.
- Assess the feasibility of integrating existing platforms versus developing a new tool.
- Gather insights on data visualisation preferences, user engagement strategies, and accessibility needs.
- Understand stakeholder concerns related to governance, funding, and long-term maintenance.

A total of 12 coastal professionals attended the workshop, including representatives from local councils, the Environment Agency and data specialists. This diverse group ensured that the discussion incorporated a range of perspectives, from technical data handling to community accessibility needs.

The workshop followed a structured yet flexible format to encourage engagement. It began with an overview of existing coastal data platforms, followed by live demonstrations of platforms and a comparative review. Participants engaged in breakout discussions focused on user experience, technical integration, and requirements. These discussions were synthesised in a plenary session, where key insights and priorities were identified. The session concluded with a summary of findings and next steps.

Table 3. Workshop attendees, their associated organisation and role.

Name	Organisation	Role
Emma Rendle	Resilient Coasts Ltd	Director, workshop leader
Emily Hunt	Resilient Coasts Ltd	Marine Process Scientist, workshop leader
Rob Goodliffe	North Norfolk District Council	Coastal Transition Manager
Chris Smith	Environment Agency	Advisor
Fiona Keenaghan	North Norfolk District Council	Assistant Coastal Engineer
Chloe Suttle	North Norfolk District Council	Coastal Transition Programme Assistant
Thomas Walker	North Norfolk District Council	Coastal Management Support Officer
Colin Bye	Coastal Partnership East	Senior Coastal Advisor North
Francesca Evans	Environment Agency	Coastal Processes Scientist (Anglian Coastal Monitoring Programme)
Philip Staley	Environment Agency	Coastal Senior Technical Advisor
Poppy Mylroie	National Network of Regional Coastal Monitoring Programme (NNRCMP)	Senior Coastal Process Scientist
Rebecca Bromley	National Trust	Coast and Marine Advisor for East of England

The workshop focused on evaluating the strengths, weaknesses, and interesting features of various coastal monitoring platforms. Several recurring themes emerged from the discussions.

One of the most valued aspects was the ability to access up-to-date data. Participants emphasised the importance of having current information readily available, as well as the ability to upload and integrate personal data. However, there was also a call for historical data, such as aerial imagery, maps, and past projections, which were often noted as missing or insufficient. This gap in historical context makes it harder for users to assess long-term trends or understand past coastal conditions.

Another key point was the user accessibility of platforms. A recurring theme was for platforms to cater to both technical and non-technical users. Many noted the importance of simple, user-friendly interfaces, with clear explanations, especially for those who are not familiar with coastal monitoring. There was concern that some platforms, particularly those with advanced features, were overwhelming due to too many layers and options presented upfront. Simplified views and gradual layering of data were suggested as solutions.

The workshop also highlighted the importance of data clarity. Clear labelling of datasets, including metadata and information about the methods used to collect data (such as LiDAR), was frequently mentioned as crucial for helping users understand what they are working with. Some platforms lacked high-level summaries or overviews, which would make it easier for users to get a quick understanding of the coastal situation without delving into detailed technical reports.

There was considerable interest in features that promote community engagement and citizen science, such as platforms that allow for contributions from local users or involve schools and public stakeholders. This type of engagement is seen as valuable, particularly in platforms that offer tools for photography-based citizen science, like the CoastSnap element. However, the way data is presented to the public was a concern, especially when it comes to more complex

topics like future projections and vulnerability data, which could be misunderstood without proper context or explanation.

In terms of future development, there was strong support for integrating different platforms into a single, comprehensive space that brings together diverse types of coastal data. Platforms that clearly define their narrative were seen as more effective. Finally, participants suggested that story maps and case studies could be powerful tools for communicating complex data to a broader audience, making the information more accessible and relatable.

The overall takeaway was the need for a balanced approach that provides rich, contextual data while remaining easy to use and accessible, especially for the general public.

Figure 1. Images of some breakout activities during the Coastwise Workshop in Norwich, 27/02/2025.

3.3 Interviews

A set of semi-structured interview questions (Appendix 2) was developed to align with the survey, ensuring consistency in data collection. The interviews focused on understanding data needs, access challenges, key drivers for data use, and desired platform features. Additional questions were tailored for platform developers to gain insights into their design processes, technical considerations, and challenges faced during development. The full set of interview questions covered topics such as:

- Crucial data needs and update frequencies.
- Challenges in accessing and using coastal data.
- Drivers for data access by technical users and communities.
- Preferred tools and platforms for coastal monitoring.
- Desired features in an ideal coastal data viewer.
- Communication strategies for improving public engagement with coastal data.
- Technical considerations for platform development, including interoperability and scalability.

All interviews were hosted on MS Teams and recorded for future reference.

Table 4. List of interviewees, and their respective role and association.

Name	Role	Association
Alan Frampton	Strategy, Policy & Environment Manager for FCERM	South West Flood & Coastal
Ruth Adams	Programme Manager	South West Coastal Monitoring Programme, National Network of Regional Coastal Monitoring Programme (NNRCMP)
Colin Bye	Senior Coastal Advisor (Norfolk)	Coastal Partnerships East
Heather Bell	GIS analyst and Coastal Data Lead	The Rivers Trust
Sacha Neill	Senior Coastal Scientist	Coastal Partners (East Solent)
Charlie Thompson	Director Associate Professor	National Network of Regional Coastal Monitoring Programme (NNRCMP) University of Southampton
Chris Hayes	Senior coastal change advisor	Environment Agency
Kara Doran	Supervisory physical scientist (Oceanography)	US Geological Survey (USGS)
Helen Jay	Senior National Consultant - Coast	National Trust
Robbi Bishop-Taylor	Coastal Earth Observation Scientist	Geoscience Australia

The interview data was analysed using a qualitative thematic approach to identify key insights, challenges, and recommendations. Responses were manually reviewed, and key statements and themes categorised to determine recurring themes across participants. The frequency with which each theme was mentioned was manually recorded to assess its prominence within the dataset.

ChatGPT/AI was also used to assist in drawing out additional key insights and key themes; however, all AI-generated outputs were manually reviewed, interrogated, and refined to ensure accuracy.

The ten conducted interviews provide insights into the challenges, successes, and limitations of existing coastal data platforms. Experts emphasised key aspects such as data accessibility, interoperability, user experience, and technical considerations for future development or integration.

Coastal Visualisation and Accessibility

A widely recognised theme was the need for clear, visual representations of coastal change. Several experts emphasised that images and simplified visuals are more effective for public engagement than complex datasets. As Ruth Adams noted, "People are keen to see pictures - they understand this better." "Less is more." "I'd love to show the past better than we currently do." Providing historical shoreline visualisations could improve comprehension of coastal dynamics.

Another concern was balancing accessibility with technical complexity. While GIS platforms offer powerful tools, they can be overwhelming for some users. Ruth Adams pointed out, "Keen people will get their heads around the GIS, but some will find it too complicated." This

suggests that platforms should cater to varying levels of expertise, providing both simplified and detailed data access options.

Data Integration and Platform Efficiency

Data fragmentation was a common issue across interviews. Several interviews highlighted the inefficiency of having multiple platforms and datasets scattered across different sources. Alan Frampton praised the Southwest dashboard for its centralised access, stating, "Everything is accessible in one place - not multiple pages." “Glossary, short videos (1-minute max), and animations alongside text are useful." This supports the argument for a consolidated, user-friendly system.

Heather Bell emphasised the need for a strong database foundation, stating that "Platforms and names come and go, we need data to be in a managed place." Instead of relying on a single platform, experts suggested an integrated approach where responsible organisations host their own data while a central platform aggregates and directs users to relevant sources. Heather also stressed that “Database underpinning is more important than the platform”. One of the key challenges described was ensuring that the data is in a processed, consistent format to be easily pulled into a platform.

Data Fragmentation and Uncertainty

A recurring challenge is the duplication and inconsistency of data across multiple platforms. Sacha Neill pointed out the difficulty in determining whether new data sources contain unique information or redundant datasets, stating, "There are always new platforms appearing – it’s unknown if it’s duplicated of data or new data.” “It’s time-consuming downloading all of the data and comparing." The lack of a streamlined way to check coverage before downloading data further complicates usability.

Colin Bye reinforced this concern, noting that coverage is often inconsistent, particularly when trying to track long-term beach changes: "Coverage not always at the point we want to describe, i.e., building up of the beach as well as the storm erosions." This suggests a need for better metadata and clearer indicators of dataset coverage.

Accessibility and Usability

Many experts stressed that even when data is available, it is not always easy to access or use. As Kara Doran highlighted, "Downloading data requires map visualisation, meta-data” and “clean user-friendly visualisation." Users need intuitive interfaces that allow for easy data retrieval and interpretation.

Chris Hayes emphasised the lack of standardised vulnerability mapping, stating that existing platforms do not provide a comprehensive view of coastal risks: " We’re missing a vulnerability map that might be useful to specific end users that includes cliffs, floods, beaches, intertidal zone’. ‘How do we understand where the vulnerable areas are?" This highlights the need for integrated risk assessments that combine various data layers.

Data Transparency and Usability

A strong consensus emerged around the need for clearer data presentation and transparency. Charlie Thompson warned about the risk of misinterpretation when presenting data visually: "It can give misleading information if providing quick visualisations that aren't intended for the correct purpose. People don’t read stuff." This underscores the importance of providing clear metadata, source information, and clear explanations alongside visualisations.

Helen Jay emphasised the need for better public understanding of coastal change, noting that we need to better communicate that “coastal change is natural. It has always occurred. We can talk about climate change and impacts, but we need to normalise change." This suggests that platforms should integrate educational resources to improve stakeholder awareness.

Improved Data Integration and Collaboration

Several experts supported a nested approach to data integration that caters to different user needs. Robbi Bishop-Taylor suggested that "A platform that allows integration with other datasets could be valuable - we won’t know applications until option is there for users." Enabling users to combine datasets (e.g., aerial photography or ecological/infrastructure data with beach surveys) could enhance insights and decision-making.

Experts also called for more collaboration between agencies, ensuring consistent data standards and avoiding duplication. Heather Bell suggested that platforms should act as aggregators rather than replacing existing databases, stating that it’s "Better to have responsible organisations hosting their own data, and then have a platform (e.g., CaBA) pull it in using APIs." This approach would maintain data integrity while ensuring accessibility.

Platform development

During the interviews, three distinct options for integrating coastal monitoring data into existing platforms emerged: Terria (software behind the Digital Earth Australia platform), the National Network of Regional Coastal Monitoring Programmes (NNRCMP), and the Catchment Based Approach (CaBA). Each option has its strengths and considerations, depending on the scope of the datasets and the desired level of integration.

Charlie Thompson expressed a strong preference for Coastwise data to be hosted on the NNRCMP site, ensuring all coastal data is available centrally. They emphasised that data should be managed transparently and with the same open governance standards, which could help ensure data consistency and accessibility for all users.

Heather Bell mentioned existing partnerships with Coastal Partnerships within CaBA, and stated that it would be possible to have organisations hosting their own data, which is then pulled into CaBA using APIs. It was mentioned that being recognised by the government would enable funding within the charity.

Robbi Bishop-Taylor explained that the Digital Earth Australia Coastlines portal was developed using Terria, an open-source framework which enables significant flexibility, allowing platforms to adapt to specific needs. The option to use Terria software would enable development of a platform that mimics the DEA portals. These options are further discussed in Sections 4 and 5.

3.4 Survey

A single survey was designed to accommodate three distinct stakeholder groups: general users, technical users, and platform developers. Respondents were directed to relevant sections based on their answers to initial screening questions, to identify their technical capacity. The survey was developed within Google Forms, and distributed via email, social media, and mailing lists.

The survey assessed respondents’ familiarity with coastal monitoring, their data needs, platform usage, and feature preferences. Questions included a mix of multiple-choice, Likert scale, and open-ended formats to capture both quantitative and qualitative insights.

Additionally, visual elements such as screenshots of example data viewers were incorporated to gather feedback on interface usability and design preferences.

Key topics covered in the survey included:

- Awareness and perception of coastal monitoring.
- Data needs and update frequencies.
- Preferred formats and visualisation methods.
- Challenges with existing platforms.
- Desired improvements and features for future data viewers.
- Accessibility and usability considerations.
- Demographic information to contextualise responses.

The full survey can be found in Appendix 5.

The survey responses were analysed through a two-step process involving quantitative and qualitative analysis. For quantitative analysis, data from multiple-choice, Likert scale, and other structured question formats were extracted and processed using Excel and Power BI. These tools enabled the generation of summary statistics, visualisations, and trends across the different respondent groups. Key metrics, such as response frequencies and averages, were calculated to highlight patterns in stakeholders' data needs, platform usage, and feature preferences.

For qualitative analysis, responses to open-ended questions and feedback on platform usability were manually reviewed to identify recurring themes. Each theme was coded and categorised, and the frequency with which each theme appeared across the dataset was manually calculated. Additionally, ChatGPT/AI was utilised to assess key themes, with the results manually interrogated and validated to ensure accuracy. This combination of AI-assisted and manual analysis ensured that significant insights, particularly those related to challenges, desired improvements, and usability considerations, were accurately captured and thoroughly evaluated.

By combining both quantitative and qualitative approaches, the analysis provided a comprehensive understanding of stakeholder needs and perceptions, which formed the basis for the subsequent analysis and recommendations.

Closed survey responses

The survey participants (N = 89) were categorised as technical (N=32) or non-technical (N=57) based on whether they had downloaded coastal monitoring data. In the technical group, 30.5% identified as experts, 47.5% as very familiar, 17.0% as familiar, and 5.1% as somewhat familiar with coastal hazards. The non-technical group had fewer experts (3.3%), with 40.0% very familiar, 16.7% familiar, and 40% somewhat familiar. The technical group was predominantly male (71.9%), whereas the non-technical group had a more balanced gender distribution (53.3% male, 46.7% female). Most participants were from England (75% technical, 93% non-technical). Within England, the technical group was mainly from the Southwest (25%), followed by the East (21.9%) and Southeast (9.4%), while the non-technical group had 61.4% from the East, 15.8% from the Southwest, and 12.3% from the Southeast.

Among technical users, the ‘most valued’ resource was interactive maps (27 responses), followed by graphs and charts (22 responses), photographs (14 responses), and fixed maps (12 responses) (Figure 5; Appendix 6). For non-technical users, interactive maps (22 responses) and graphs and charts (12 responses) were also highly rated. However, they

placed greater emphasis on photographs (16 responses) compared to technical users, suggesting a preference for more visual, easily interpretable data. Videos (5 responses non-technical, 2 responses technical) and written summaries (4 responses non-technical, 3 responses technical) were less frequently cited as useful. This suggests that while these formats are valuable, respondents tend to prioritise spatial and graphical representations over textual descriptions.

An evaluation of five coastal data platforms was based on user feedback after they were presented with screenshots of different platforms. Users were asked to grade aspects of the data viewer interface, focusing on clear graphics, visual appeal and design, accessibility or user-friendliness, and usefulness (whether the functions met their needs). Users provided scores ranging from 1 (very poor) to 5 (very good). The results were split into two categories: technical users and non-technical users (Table 5; Figure 2). Each platform's scores were averaged, and the platforms were then ranked based on these averages (Table 5).

Table 5. Users evaluated screenshots of five coastal data platforms based on graphics, accessibility, and usefulness, rating them from 1 (Very Poor) to 5 (Very Good). Scores were averaged separately for technical and non-technical users, with rankings assigned accordingly. Ranks are colour coded from highest (green) to lowest (red) rank.

Platform	Technical Score	Technical Rank	Non-technical Score	Non-technical Rank
Digital Earth (Australia)	3.66	4	3.22	3
USGS (USA)	3.71	3	3.66	1
Dynamic Coast (Scottish)	3.84	1	3.39	2
SEPA (Scottish)	3.17	5	3.09	4
SWCMP (Southwest)	3.73	2	3.05	5

The platform Dynamic Coast received the highest technical score of 3.84, reflecting its strong performance and functionality from the technical users' perspective. It was also ranked second by non-technical users with a score of 3.39. This suggests that while technical users found the platform to be highly effective, non-technical users considered it somewhat less user-friendly. Despite this, Dynamic Coast emerged as the highest-ranked platform overall. The USGS Total Water Level and Coastal Change Forecast Viewer platform ranked third for technical users, with a score of 3.71, but stood out for its high non-technical user rating, earning a top score of 3.66. This indicates that the USGS platform was particularly well-received by non-technical users, suggesting it is easier to use and more accessible for a general audience, even though it did not perform as well on the technical side. The Southwest Coastal Monitoring Platform (SWCMP) ranked second with technical users, and fifth with non-technical users. This disparity indicates that while the platform performs well for users with technical expertise, it may not be as intuitive for those with less technical knowledge.

In summary, Dynamic Coast emerged as the best-performing platform overall, thanks to its strong technical capabilities, while USGS excelled in non-technical user satisfaction. SWCMP and Digital Earth Australia showed strengths and weaknesses across different user groups, and SEPA lagged behind in both categories.

Figure 2. Box and whisker plots demonstrating the opinion of technical (upper) and non-technical (lower) survey respondents to screenshots of five coastal data platforms based on accessibility ("Accessibility or user-friendliness"; blue), graphics ("Clear graphics, visual appeal and design"; green) and usefulness ("Usefulness - functions seem to meet with my needs"; pink), rating them from 1 (Very Poor) to 5 (Very Good).

In terms of features that respondents would like to see in a future platform, survey responses indicate that interactive maps are the most requested feature, with technical users favouring them slightly more than non-technical users (25 technical, 20 non-technical) (Figure 6; Appendix 6). Visualisations, such as maps and photos, are also highly valued, particularly among technical users (22 technical, 17 non-technical). Clear navigation was highlighted as a key factor for usability, with similar importance placed on it by both groups (16 technical, 17 non-technical). A simplified interface was another commonly requested feature, preferred by more technical users than non-technical ones (17 technical, 13 non-technical). Similarly, search functionality for quick access to data was prioritised by both groups, though slightly more by technical users (14 technical, 10 non-technical). Tutorials and guides were equally important to both technical and non-technical users (13 each), reflecting a broad need for accessible support materials. Other notable features include a mobile-friendly design, which was more important to non-technical users (9 technical, 12 non-technical), as well as the use of non-technical language to aid comprehension (9 technical, 11 non-technical). Tooltips for easy guidance were also seen as useful, with a higher preference among technical users (9 technical, 7 non-technical).

Open survey responses

The survey results highlight a range of challenges (Table 6) and improvement priorities (Table 7) for coastal monitoring data platforms. Several recurring themes emerged, emphasising the need for enhanced accessibility, data availability, usability, and stakeholder engagement. These findings provide critical insights for designing an integrated and user-friendly data viewer that caters to the diverse needs of coastal researchers, policymakers, and the public.

Concerns regarding accessibility were frequently mentioned, with respondents citing difficulties in locating relevant data, navigating multiple sources, and encountering restricted access due to paywalls. One participant noted, "Ideally, I'd like to access pretty much all data in one portal simply and easily, not jumping around different websites". The demand for a centralised data portal was evident, as fragmented data sources currently hinder efficient information retrieval, with one respondent stating that there “needs to be central location for coastal data similar to Medin for marine. A lot of scientific and industry research is going on but not collated and interpreted in an easy to access manner”. Data availability and quality also emerged as a significant issue, particularly in terms of missing data for specific locations and the need for higher-resolution and up-to-date data. One respondent said they "struggle to find up-to-date information from reliable sources at times."

Table 6. Key challenges identified through open survey responses, and the frequency of mentions.

Topic	Challenge	Mentions
Accessibility Issues	Difficulty finding relevant information	8
	Paywalls restricting access to data	3
	Need for a centralised portal instead of multiple sources	6
	Limited mobile accessibility	2
Data Availability & Quality	Limited or missing data for specific locations	9
	Need for higher-resolution data and real-time updates	7
	Concerns about processed data accuracy (e.g., LiDAR smoothing)	3
	Historical and predictive shoreline change data gaps	5
User Interface & Navigation Issues	Poor UI/UX across existing platforms	10
	Complex navigation	6
	Slow performance/loading times	3
	Difficulty for non-experts to use current tools	4
Data Interpretation & Usability	Hard to understand or apply data	5
	Need for easier ways to integrate data into reports/business cases	4
	Lack of guidance on framing queries and interpreting results	3
Stakeholder Engagement & Communication	Difficulty sharing data with the public and decision-makers	5
	No clear public communication strategy or updates (e.g., social media presence)	3
	Demand for better coastal risk communication	4

Concerns regarding the accuracy of processed data, such as LiDAR smoothing, and gaps in historical and predictive shoreline change data were also noted. Usability issues, especially poor UI/UX and complex navigation, were commonly reported. Many users found existing platforms difficult to navigate, with slow performance and inadequate accessibility for non-experts. Additionally, respondents expressed difficulties in interpreting and applying the data, highlighting a need for analysed data that can be better integrated into reports, business cases, and decision-making frameworks.

Stakeholder engagement and communication challenges further reinforced the need for a more user-friendly approach. Sharing data with the public and decision-makers was often described as difficult, with a lack of clear communication strategies, such as social media updates or accessible summaries.

Table 7. Most requested improvements to existing platforms, identified through open survey responses, and the frequency of mentions.

Category	Key Needs & Features	Mentions
Better Access & Integration	Centralised portal for all coastal data	7
	Open access to government-funded data	5
	Integration with other tools (e.g., FCERM reports, SBMT)	4
	Easier data-sharing and download capabilities	6
Enhanced User Experience	Simple, intuitive UI with easy navigation	10
	Faster load times and mobile accessibility	3
	Easier ways to compare coastal change over time	5
More Comprehensive Data & Features	Real-time data on coastal changes, erosion, hazards	9
	Interactive mapping with multiple layers	8
	Clear timestamps for datasets	4
	Data visualisation tools (aerial imagery, graphs, etc.)	7
Support for Decision-Making & Engagement	Easy-to-understand summaries for non-experts	5
	Tools to track shoreline change and assess risks	7
	Overlaying different datasets for land-use planning	4
	More engagement with coastal communities	5

In response to these challenges, respondents requested better access and integration. The most requested improvement was the development of a centralised portal for all coastal data, ensuring access to government-funded data and integration with existing tools. Enhanced user experience was another priority, with strong demand for an intuitive UI, easy navigation, faster load times, and improved mobile accessibility. Additionally, respondents emphasised the importance of tools that facilitate coastal change comparisons over time. One respondent wanted the "ability to understand coastal changes, compare and contrast" to offer "assistance with describing ongoing change to others", with another respondent stating that "for changing information I would want to see indicators of change, for at risk sites I would want to understand trends and triggers of change". This theme was repeated across numerous survey responses.

The need for comprehensive data and advanced features was widely recognised. Real-time data, along with interactive mapping capabilities, clear timestamps, and more effective data visualisation tools, such as aerial imagery and cross-sectional views ranked among the most requested features. Support for decision-making and community engagement was also a key

area for improvement. Respondents highlighted the necessity of easy-to-understand summaries for non-experts, tools for tracking shoreline change and assessing risks, and the ability to overlay multiple datasets for land-use planning. "An overlap with environmental data sets, landscape designations, historic environment records, etc. This combined tool would be useful when assessing new development, proposed change in land use, nature-based solutions etc." suggested one interviewee.

The results indicate that an ideal coastal monitoring data viewer should prioritise accessibility, real-time data availability, intuitive design, and enhanced visualisation capabilities. Ensuring open access to government-funded data and providing integration with other datasets will be essential for improving efficiency and usability. Addressing stakeholder engagement through improved communication strategies, such as social media updates and accessible summaries, will enhance the platform’s impact. Given the strong interest in decision-support tools, features that simplify complex data interpretation and facilitate evidence-based policymaking should be considered. Overall, the findings highlight the need for a comprehensive and user-centric approach to coastal data visualisation and analysis.

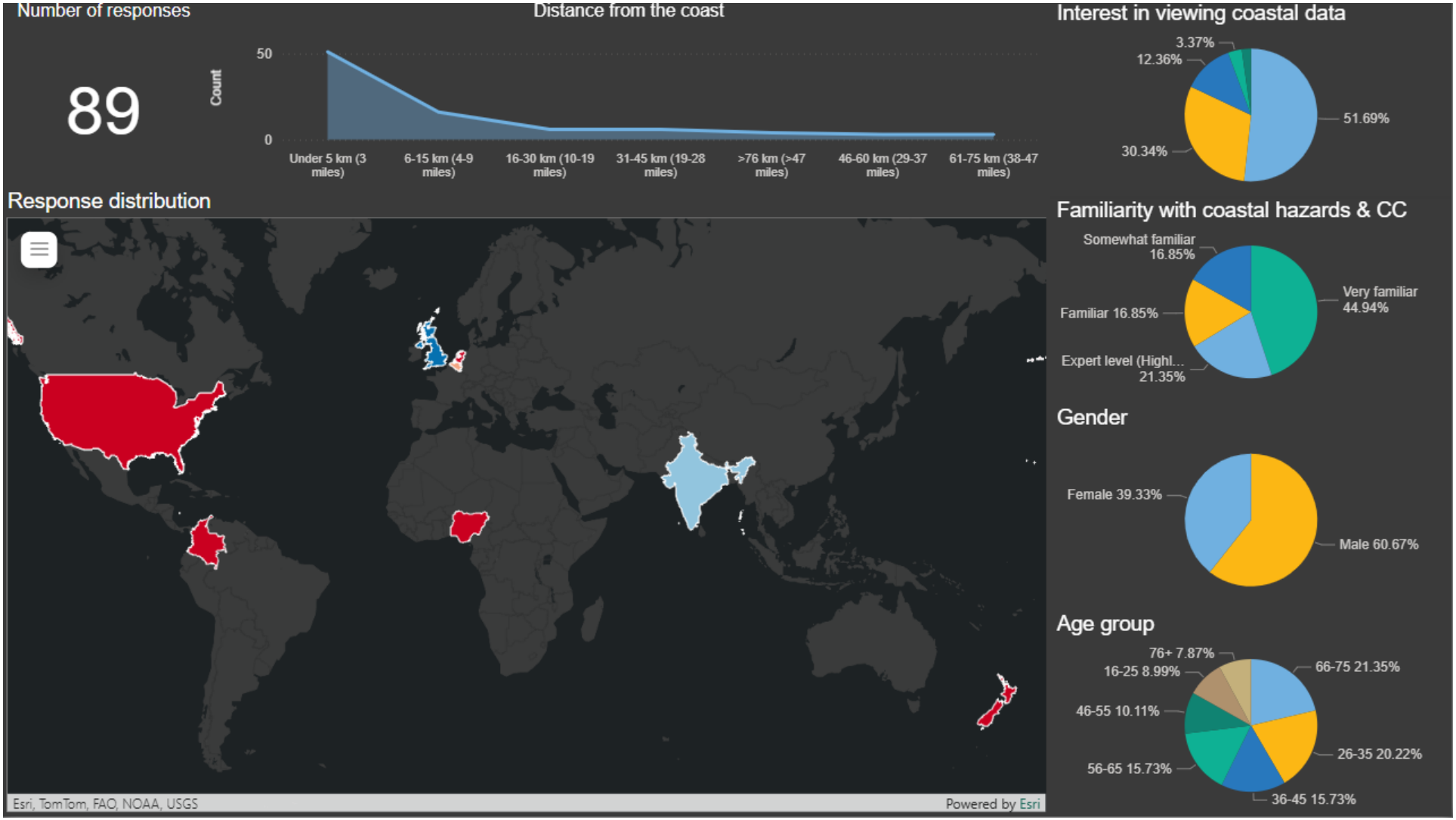


Figure 3. Demographics from survey responses. CC refers to ‘climate change’.

4 Discussion and recommendations

The results highlight key challenges and opportunities for improving coastal data platforms, with recurring themes emerging across the platform assessment, expert interviews, and survey responses. This discussion contextualises these findings, focusing on data accessibility and integration, platform usability, and the need for a collaborative approach to coastal data management.

The platform assessment ranked existing coastal data platforms, identifying the top ten for further examination as case studies. The highest-scoring platforms, such as the South West Coastal Monitoring Programme and Digital Earth Australia Coastlines, demonstrate strong data accessibility, comprehensive coverage, and effective visualisation tools. However, several platforms in beta versions or with limited geographic scope present challenges in making direct comparisons. The ranked results suggest that while many platforms provide valuable insights, variability in data presentation, update frequencies, and community interactive-ness remains a key concern.

Both expert interviews and survey responses underscore the difficulties users face in accessing and interpreting coastal data. Many platforms are fragmented, requiring users to navigate multiple sources to obtain relevant information. Experts repeatedly emphasised the need for a centralised system that consolidates data while maintaining metadata transparency and provenance. The survey responses reinforce these concerns, with a significant number of users citing difficulties in finding relevant information, paywall restrictions, and a lack of mobile-friendly access.

The importance of user-friendly interfaces also emerged as a critical theme. While technical users can navigate GIS-based platforms, many stakeholders require simpler visualisations. As one expert noted, “People are keen to see pictures - they understand this better.” This suggests that platforms need to balance technical depth with accessibility, providing clear yet detailed representations of coastal change.

A major challenge identified in both interviews and survey responses is data fragmentation and redundancy. Experts highlighted the inefficiency of multiple platforms housing overlapping datasets without clear indicators of uniqueness or coverage. The survey responses further validate this, with frequent mentions of missing or incomplete datasets, inconsistencies in data formats, and difficulties in integrating different sources.

A suggested solution is a nested data integration model, where responsible organisations host their data while a centralised platform provides an interface for users to access and compare information seamlessly. As one expert noted, it’s "better to have responsible organisations hosting their own data, and then have a platform pull it in using APIs." This approach would address concerns around data management sustainability while improving accessibility.

Survey respondents and interviewees identified several critical improvements for coastal data platforms. The highest priorities include real-time data availability, enhanced visualisation tools, and more comprehensive risk assessment frameworks. The lack of an integrated vulnerability map incorporating coastal hazards, erosion, and flood risks was a recurring concern. Users also expressed a strong need for historical shoreline visualisations to better understand long-term coastal dynamics.

Education and public engagement were also highlighted as areas requiring further development. Misinterpretation of data remains a risk, particularly when platforms provide quick visualisations without adequate context. Experts emphasised the importance of

normalising coastal change and improving public awareness of natural shoreline evolution. This aligns with survey feedback suggesting that better communication strategies, such as interactive tools and social media updates, could enhance the impact of coastal monitoring platforms.

Integration into the CaBA site (The River's Trust) was carefully considered but ultimately discounted. While the platform itself offers valuable tools, it did not strongly align with the overall theme of coastal data and is at a developmental stage. Evident during the workshop, the CaBA site did not receive strong support from participants. Additionally, the platform does not adequately meet the needs of a centralised system, particularly in terms of data hosting, as it would require external data hosting and does not offer the flexibility needed for seamless integration with other platforms (i.e. NNRCMP). Its current development stage does not yet allow for the level of integration or data accessibility required for a comprehensive coastal data management system. As such, despite its potential, the CaBA site was deemed unsuitable for the project's goals.

Recommendations for platform development

The key principles outlined below are drawn from the platform assessment, workshop, interviews, and survey responses. These principles reflect the recurring themes and priorities identified throughout the evaluation process, focusing on the need for a centralised, user-friendly, and efficient coastal data management system. The recommendations aim to address the challenges faced by users while ensuring that the platform meets the diverse needs of both technical experts and the broader public.

- Centralisation of Data: Implement a centralised platform to consolidate coastal data, ensuring metadata transparency. This will reduce fragmentation and improve user access to consistent information.
- User-Centric Design: Prioritise a user-friendly interface, offering visualisations that are simple for non-technical users while maintaining the depth required by experts. Consider tiered interfaces for different user groups (e.g., stakeholders, technical users).
- Real-Time and Up-to-date Data Accessibility: Ensure real-time and up-to-date data availability for time-sensitive decision-making, particularly for platforms focused on monitoring coastal hazards, erosion, and flood risks.
- Visualisation: Focus on intuitive and clear visualisation tools to help users easily interpret coastal changes.
- Communication: Enhance the narrative around the data through interactive storytelling tools or educational content.

5 Scope

Through a combination of stakeholder engagement, technical evaluation, and comparative analysis, three final recommended options emerged as the most viable solutions:

1. Integrating with the National Network for Regional Coastal Monitoring Programme (NNRCMP) – Utilising an existing regional platform to incorporate new data without requiring extensive development.
2. Developing a new bespoke platform using;
    a. TerriaJS – Creating an independent, user-friendly geospatial viewer with interactive capabilities, and/or
    b. Developing a fully customised platform from scratch – Building a tailored coastal data platform with full control over design, features, and integration.

Each option presents distinct advantages and challenges, ranging from cost-effectiveness and ease of implementation to advanced functionality and long-term sustainability. Table 8 summarises the key features for each option.

Table 8. Comparison of core features across the three scoped options for a Coastal Monitoring Data Platform.

Feature	1. Integration with NNRCMP	2 a. Bespoke platform: Terria	2 b. Bespoke platform: tailored
Platform Structure	Integrated into NNRCMP's website or main viewer	Independent web-based platform using TerriaJS framework	Fully custom web-based platform
Development Approach	Use existing NNRCMP structure with modifications. NNRCMP developers to hand.	Utilise open-source tools or professional package with assisting developers (extra cost associated)	Built from scratch using preferred software stack
Data Accessibility	Open access via NNRCMP with existing update mechanisms	Open access, with potential for user authentication	Open or restricted access based on requirements
Usability for General Users	Moderate; users must navigate NNRCMP interface	High; intuitive navigation and interactive elements	High; fully customised user experience
Usability for Technical Users	High; familiar interface for coastal practitioners	High; supports complex geospatial queries and analysis	High; tailored analytical tools and advanced functionalities
Visualisation Capabilities	Basic mapping, overlays, and resource links	3D/4D mapping, time-series data, and dynamic overlays	Custom mapping, 3D/4D visualisation, interactive dashboards
Interactivity	Medium; toggle layers, interactive map	High; Storymap features, interactive map, advanced data filters and layers, dynamic content	High; fully configurable data filters, overlays, and dynamic content
Technical Performance	Aligned with NNRCMP's existing infrastructure	Optimised for geospatial data handling	Optimised based on chosen technology stack

Data Update Frequency	Aligned with NNRCMP's update schedule	Supports real-time and scheduled updates	Fully controlled update mechanisms, real-time integration possible
Scalability	High; constrained by NNRCMP's technical framework (England scale)	High; can expand datasets and integrate with other platforms	Very high; adaptable to future needs and datasets
Development Cost	Low; minimal integration costs	Moderate; free version available, professional version has cost	High; requires dedicated funding for development and maintenance
Implementation Timeline	Short-term; integration possible within months	Medium-term; setup and configuration required	Long-term; extensive development required
Sustainability	High; maintained under NNRCMP governance	Dependent on long-term funding for maintenance	Requires long-term funding and dedicated management team

5.5 Option 1: Integration with NNRCMP

This option involves integrating coastal monitoring data into the existing NNRCMP framework. This approach ensures continuity, using an existing platform and its established user base. The NNRCMP platform is already set up with established standards of transparency and compliance, including the open government data license, ensuring that all data is publicly accessible and managed appropriately. Developers within the NNRCMP team are fully capable of handling the integration of the coastal monitoring data, and there's flexibility to meet any specific requirements. This allows for customisation without the need to hire external software developers, as in-house developers are available to implement the integration according to the desired specifications.

NNRCMP offers two primary ways to integrate coastal data:

- **Integration via a resources page:** Individual datasets or pages that do not fit within the main viewer can be included on a dedicated resources page. This option allows developers to work within an existing framework without disrupting the core user experience of the main platform. However, this method has limitations in terms of user engagement, as it is somewhat isolated from the primary interface.
- **Full integration into the main viewer:** This approach allows coastal data to be integrated directly into the platform's main viewer, enabling access to all available data in one place. While this integration provides a unified user experience, it comes with limitations, as data must adhere to the same standards, formatting and transparency required for the core platform.

The NNRCMP team expressed a strong preference for this data to be hosted on the NNRCMP site, ensuring all coastal data is available centrally.

5.6 Option 2: Develop bespoke platform

2a. TerriaJS

This option involves developing a standalone platform using TerriaJS, an open-source framework for geospatial data visualisation. Users can explore datasets interactively, with

options to overlay multiple layers, track real-time changes, and export data. The free version offers basic mapping, while the professional version includes advanced customisation and support. TerriaJS can provide a user-friendly interface with a professional appearance, especially useful for showcasing coastal data to a broader audience, including the general public, coastal practitioners, and researchers.

The main advantage of using TerriaJS is its flexibility, without the requirement to develop a platform from scratch. The platform can be customised to meet specific requirements, allowing for the inclusion of unique datasets and specialised functionalities without the need for extensive development work. Its open-source nature ensures that the platform can be continuously updated and adapted by the development team to meet evolving needs, with support from an active community of users and developers.

The open-source version, while functional, would require an in-house software developer to implement and update the platform. The professional version, which includes personalised support, requires a financial investment. Utilising the professional version, bug fixes and major updates will be implemented by a Terria software developer, while data uploads and customisation can be easily implemented by anyone with a level of technical expertise.

The primary benefit of the TerriaJS approach is the ability to mimic successful features seen in platforms like Digital Earth Australia, which has been built using this framework. This means that key features, such as interactive maps, storymaps and customisable data layers, are already tested and refined, making the development process smoother.

2b. Fully custom platform

This option involves developing a fully bespoke coastal data viewer from scratch using tools such as Mapbox, Esri/ArcGIS, or custom web development frameworks. This approach provides the highest level of control over the design, functionality, and integration of the platform, allowing the development team to tailor every aspect to specific needs. This could include features such as highly customised user interfaces, specific data visualisations, or integrations with external data sources that may not be easily accommodated by off-the-shelf solutions.

A fully custom platform offers flexibility, as it allows for the creation of a platform that fully aligns with the unique requirements of Coastwise. This approach ensures that the platform can be designed to scale, adapt, and incorporate any necessary features, such as advanced analytical tools, complex geospatial data visualisations, or specialised export options.

However, there are significant challenges associated with this option. Developing a fully custom platform requires considerable investment in both development and long-term maintenance. Building the platform from the ground up involves a detailed design and planning phase, followed by extensive coding, testing, and implementation. Additionally, ongoing maintenance and support are crucial for ensuring the platform remains functional, secure, and up-to-date with emerging technologies. Depending on the scope of the project, this option can be resource-intensive, requiring dedicated teams of developers, designers, and IT support staff.

While the fully custom platform approach offers control and flexibility, it is not the most efficient or cost-effective solution, especially if the required features can be achieved using existing tools or frameworks. The investment in time, resources, and maintenance costs must be carefully considered in relation to the specific needs of the coastal monitoring program.

Appendix 1. Platform assessment matrix

Table 9. Platform assessment matrix results for the top 20 selected platforms. The category, assessment criteria and associated description are detailed, along with the weighting (%) associated with each criteria. Scores out of 10 for each platform are presented, colour coded whereby red = 0 and dark green =10. The weighted scores are presented at the bottom, utilised to determine the overall platform ranking. ** refers to platforms that are currently in a beta version, so caution should be taken with regards to a direct comparison.

#	Category	Criteria	Description	Weight (%)	01a_NNRCMP_Map	01b_NNRCMP_realtime	01c_NNRCMP_SWEEP	)2_NSW_EWS	**05_DEFRA	04_CaBa	5_DynCo_Scot	06_DEA_Aus	07_Cornwall	08_BGS	09_Wales	10_USGS	11_BlueEarth	12_NCERM	13_SEPA_FRA	14_SWCMP	15_NZ	16_CoastalFutures	_USGS_Hazards	**23_CESA
1	Relevance	Alignment with Coastal Monitoring	Does the platform directly address coastal monitoring needs?	3	9	7	7	7	7	5	7	7	4	4	8	7	7	8	7	9	6	7	7	4
2		Coverage of Relevant Datasets	Does the platform include key datasets like erosion rates, tide levels, etc.?	3	9	6	6	9	6	4	6	6	3	4	7	7	6	5	3	9	6	5	6	4
3	Accessibility	Open Access	Is the platform publicly accessible without restrictions?	3	9	9	9	9	4	9	9	9	9	9	9	9	9	9	9	9	9	9	9	3
4		Usability for General Users	How easy is it for the general public to navigate and use?	6	5	5	7	7	6	5	7	7	7	4	7	7	8	7	5	6	5	6	6	4
5		Usability for Technical Users	How well does it support coastal practitioners and technical users?	6	8	8	8	7	6	6	7	7	6	6	6	7	7	6	6	9	5	5	7	6
6	Data Visualisation	Clarity of Visualisations	Are visualisations (maps, charts, etc.) clear and informative?	6	6	6	7	8	7	7	8	8	6	6	7	7	7	5	6	9	4	6	8	4
7		Interactivity	Are there interactive features like map layers, filters, or customisation?	6	6	5	4	6	6	7	5	7	7	7	6	6	7	4	5	8	6	5	8	6
8		Quality of Graphical Design	Is the platform visually appealing and professionally designed?	3	7	7	6	7	6	7	8	7	7	7	5	5	8	5	5	7	7	4	6	4
9	Ease of Use	Intuitive Navigation	Can users find data and tools efficiently?	6	4	7	7	7	6	4	9	7	6	5	6	7	7	7	6	7	5	6	6	5
10		Documentation or Help Tools	Are there tutorials, guides, or FAQs to assist users?	4	7	3	7	6	2	7	6	10	6	7	6	8	7	6	7	7	7	5	7	7
11	Technical Specifications	Load Speed	Does the platform load quickly and handle large datasets efficiently?	3	7	7	5	6	5	3	7	6	5	7	5	7	7	5	5	5	6	5	4	4
12		Site Performance	Measure speed and responsiveness of the platform.	3	5	6	7	5	7	2	5	6	4	6	6	6	4	5	5	5	3	4	4	6
13		Data Update Frequency	How often is data updated, and are updates timely?	3	6	9	8	4	4	5	6	6	6	6	4	9	5	5	5	7	7	6	6	4
14		Best practices	Assess adherence to web development best practices.	3	5	5	5	7	6	7	6	7	6	4	4	5	5	5	7	5	7	7	4	7
15		SEO	Measure the platform's optimisation for search engines.	3	5	6	7	7	6	7	6	5	8	6	7	5	7	5	7	7	6	7	7	7
16	Performance Metrics	Uptime	Is the platform reliable and consistently available?	3	7	8	7	5	5	3	7	7	6	6	7	7	5	7	6	7	6	7	6	5
17		Responsiveness	Does the platform perform well across devices and screen sizes?	3	7	8	8	7	4	3	7	8	3	7	3	9	6	7	4	7	7	5	7	7
18	Audience Engagement	Community Engagement Tools	Are there features like forums, comment sections, or collaborative tools?	3	1	1	2	0	0	6	5	1	2	2	2	1	0	1	1	1	1	1	1	1
19		Social Media or Sharing Integration	Can users share data or findings easily through social media or other means?	3	1	2	3	1	1	2	6	7	5	5	2	2	1	1	1	3	6	1	6	1
20	Innovative Features	Real-Time Data Integration	Does the platform offer live or real-time data feeds?	3	3	8	8	4	0	0	0	0	0	0	0	8	0	0	0	3	0	0	0	0
21		Advanced Export Options	Can users export data in various formats (CSV, GIS layers, etc.)?	3	9	9	0	0	0	0	0	6	7	7	4	7	0	0	0	5	6	0	7	5
22	Coastal Literacy Support	Educational Features	Are there tools or information to enhance understanding of coastal processes (or other relevant topic)?	6	4	3	7	6	4	6	9	7	5	2	6	6	7	5	7	6	7	4	6	6
23		Accessibility for Different User Groups	Is the platform inclusive and accessible to diverse audiences (e.g., visually impaired)?	3	6	6	5	6	6	6	7	6	7	6	7	7	7	5	4	7	7	7	4	4
24	Scalability and Adaptability	Potential for Expansion	Can the platform scale to include new datasets or regions?	3	9	6	4	5	9	9	7	5	4	7	5	5	7	6	5	8	6	7	5	6
25		Flexibility for Customisation	Can users or developers modify or tailor the platform for specific needs?	3	6	6	3	5	7	7	5	5	4	5	5	5	6	6	5	7	6	6	5	6
26			If yes, relatively easy/low cost?	3	7	4	3	0	7	6	0	0	0	6	0	0	6	6	0	7	0	5	0	7
27		Restrictions	Specific data set restricts - law	3	6	6	3	0	5	6	0	0	0	4	0	0	8	4	0	7	0	4	0	6
			Total	**100**																				
			Weighted Score		59.8	59.4	58.6	55.2	50.3	52.9	60.6	61	51.6	53.2	52.2	60.5	59.8	51.3	47.5	67.3	52.6	50.3	55.6	48.7

Appendix 2. Structured interview questions

Table 10. Structured questions utilised to guide each expert interview.

Category	Question
	Name
	Position
	Experience
	Link?
Data & Needs	What data is crucial for your work, and what purposes do you use it for?
	How often do you need this data updated?
	What are the biggest challenges you face in accessing and using coastal data?
	What do you understand to be the main drivers for technical users and /or communities accessing monitoring data?
Using the data	What tools or platforms do you currently use for coastal monitoring data?
	What features are most important to you in a data viewer?
	How do you currently analyse coastal data?(e.g., software, methods, visualisation, analysis tools, downloads)
Future & improvements	What are your biggest frustrations with current data platforms/viewers?
	If you could design your ideal coastal monitoring platform, what would it look like? What key features would you prioritise?
	For developers: What was your involvement in developing XXX portal? Can you take us through your development process, including any successes and unexpected difficulties or limitations.
	For developers: What technical considerations would you say are crucial for a successful and user-friendly coastal data platform? (e.g., data interoperability, scalability, security)
	For developers: Are there any reports or supporting documents which outline the platform? - are you able to share these, for our reference?
	How can we improve the communication of coastal data to the public?
	What communication tools/widgets are you aware of that might be neat on a coastal platform?
	What would you like to communicate, or help people better understand exactly?
	Prompt: coastal change or management
Snowballing	Do you have any recommendations of technical experts that would provide valuable insight into this study? We'd like to invite them to complete an online survey.
	Would you be able to share the survey link by email or SM with your colleagues or any relevant groups of people? (we will email you with everything you'll need)
	Anything missed/other comments?

Appendix 4. Case Studies

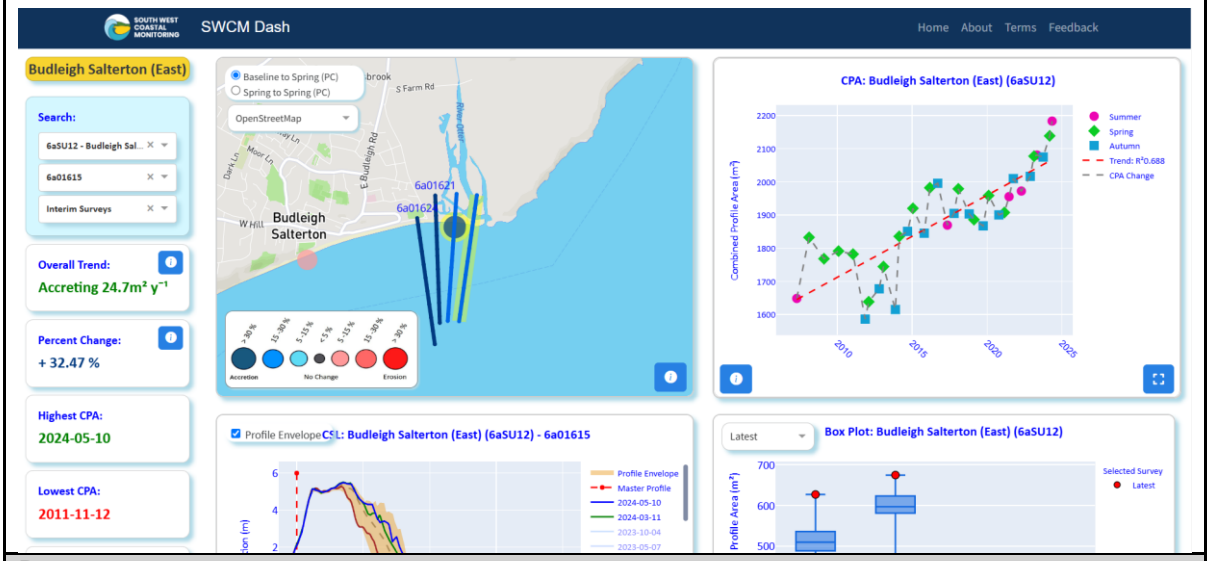
South West Coastal Monitoring Platform (SWCMP)

Platform title	South West Coastal Monitoring Platform (SWCMP)	**Link**	https://southwest.coastalmonitoring.org/
Status and date launched	Live, July 2024	**Location**	South West, UK
Implementing organisation	Southwest Coastal Monitoring. Funded by Defra, administered by the Environment Agency.	**Scale**	Regional

Executive summary

The South West Coastal Monitoring (SWCM) platform is a comprehensive, long-term coastal monitoring system designed to support Flood and Coastal Erosion Risk Management (FCERM) and coastal research. It provides high-quality, standardised data on coastal changes, including topographic surveys, LiDAR, aerial photography, and real-time wave and tide measurements. The platform features an interactive Map Viewer for exploring datasets and a Dashboard for in-depth analysis of beach profile changes over time.

Platform image



Purpose

The SWCM platform is designed to provide high-quality, standardised, and long-term coastal monitoring data to support Flood and Coastal Erosion Risk Management (FCERM) and wider coastal research. The platform enables stakeholders, including government agencies, scientists, engineers, and the public, to access, analyse, and interpret coastal data.

Description of the platform's interface and navigation

The platform provides a comprehensive, interactive interface for accessing and analysing coastal monitoring data. It is structured into two primary tools:

Map Viewer – A GIS-based visualisation tool that allows users to explore various coastal datasets, including topographic profiles, LiDAR, aerial photography, and survey records. Users can:

- Enable/disable multiple map layers (e.g., latest data, control networks, LiDAR, topographic profiles).
- Interact with clickable shapefiles to access metadata and attribute details.
- View and compare latest and historical profile charts directly from the map.
- Locate wave buoys, meteorological stations, and tide gauges, with access to real-time data via the National Coastal Monitoring website.
- Use basic navigation tools (zoom, toggle basemap, reset view, open in a larger window).

Dashboard – A dynamic analytical tool for visualising beach profile changes over time. The Dashboard's visual analytics tools provide clear data representations, reducing the need for manual data interrogation.
It provides:

- Map-based navigation for selecting a region or specific profile of interest.
- Graphical tools, including:
- Cross-sectional profile graphs (showing elevation changes over time).
- Box-and-whisker plots (for analysing variation in beach profiles).
- Total volumetric change statistics (indicating sediment loss/gain trends).
- Automated survey report generation, replacing static annual reports with real-time data analysis.

Additional interactive tools (map viewer):

- Location search bar
- Layer search bar
- Filter layers from attribute table
- Measurement tool (length, area)
- Print to PDF
- Information/'About' pop up box
- Tool tips/pop-ups (can also be disabled by the user)
- 'Zoom to layer'
- Set layer transparency, visibility range and order

Technical specifications

The map viewer is built using ArcGIS-based web mapping services. The interactive dashboard is run through Amazon Web Services App Runner.

Survey datasets are updated at regular intervals (e.g., annual topographic surveys, LiDAR flights, and aerial photography updates).

Identification of the primary target audience	Coastal managers and users with some technical knowledge.	**Platform accessibility and experience for different user groups (technical and general public)**	The interface is structured to balance complexity with accessibility. Users can quickly find and visualise relevant datasets without requiring GIS expertise. Color-coded shapefiles and basemap options enhance readability. Clear tooltips, labels, and menus make it easy to navigate between datasets, charts, and reports. The dashboard requires more technical knowledge, and is more suited to coastal managers/technical experts.

Real-time data integration	Links are provided to the NNRCMP site, which provides real-time data from wave buoys, meteorological stations and tide gauges.	**Data export options**	Users can download raw survey data from an external site (NNRCMP), reports, and GIS-compatible files.
Integration with external tools or platforms	Direct integration with the National Coastal Monitoring website for data downloads.	**Community engagement tools**	Educational resources are provided, including downloadable case studies and lesson plans for KS3, GCSE, and A-Level students (developed in collaboration with Geography Southwest). Informational pages explain coastal processes, survey methods, and ongoing projects.

Digital Earth Australia

Platform title	DEA Coastlines	**Link**	https://maps.dea.ga.gov.au/story/DEACoastlines
Status and date launched	Live, March 2020	**Location**	Australia
Implementing organisation	Developed by Data61 CSIRO for Geoscience Australia, an Australian government agency.	**Scale**	National

Executive summary

DEA Coastlines is a component of Digital Earth Australia (DEA) Maps, a web-based platform providing access to DEA's geospatial products. DEA Maps uses satellite data to detect physical changes across Australia, including coastal erosion, soil degradation, crop growth, and urban expansion. DEA Coastlines specifically focuses on tracking shoreline changes across Australia since 1988. By combining satellite imagery with tidal modelling, the platform offers detailed visualisations and statistics on coastal erosion and growth at 30-meter intervals along the entire coastline. This enables policymakers, scientists, and the public to understand long-term coastal trends and potential environmental risks.

Platform image

Purpose

Digital Earth Australia (DEA) Maps is an interactive web platform designed to provide access to satellite-derived geospatial data that helps monitor and analyse environmental changes across Australia. DEA Maps supports informed decision-making in areas such as agriculture, water management, urban planning, and disaster response. By leveraging satellite imagery, the platform enables users to track soil erosion, vegetation changes, water quality, coastal shifts, and urban expansion. DEA Maps is aimed at policymakers, researchers, industry professionals, and the public by offering a user-friendly interface for visualising and interpreting complex spatial data, ultimately contributing to sustainable land and resource management.

Description of the platform's interface and navigation

DEA Coastlines features an interactive web-based map allowing users to explore coastal changes visually.
Clear data visualisation with color-coded coastal change indicators.
Interactivity Features:

- Users can zoom into specific coastal regions.
- Analyse historical shoreline positions.
- Access to time-series data.

<table>
<tr><td colspan="4">

Filter/focus on specific data points, coastline segments.
Download raw data.
Split screen view/comparison.
Measuring tool.
Pan to current location.
Print screen/share URL to current view.
Ability to upload data or add additional layers from the searchable DEA data catalogue.

</td></tr>
<tr><td colspan="4">Technical specifications</td></tr>
<tr><td colspan="4">Built on TerriaJS, an open-source platform developed by Data61 CSIRO. Hosted on Digital Earth Australia Maps infrastructure. Uses data caching to enhance load speed and responsiveness. Annual updates with new satellite data integrated alongside tidal modelling outputs.</td></tr>
<tr><td>Identification of the primary target audience</td><td>Technical Users: Scientists, researchers, and policymakers needing coastal change data.
General Public: Coastal communities, citizen scientists, and local councils concerned with shoreline erosion and growth.</td><td>Platform accessibility for different user groups (technical and general public)</td><td>Designed for both experts and non-experts with an intuitive interface and guided explanations. Plain English summaries provides easy-to-understand descriptions of coastal changes at selected locations.</td></tr>
<tr><td>Real-time data integration</td><td>No real-time data integration. Near real-time layers (past 72hours) of hotspots, water levels,</td><td>Data export options</td><td>Users can download detailed coastal change data directly from the platform, available formats include CSV for further analysis in GIS or statistical software.</td></tr>
<tr><td>Integration with external tools or platforms</td><td>Data pulled in from external sites into the data catalogue – layers can be added to the DEA map.</td><td>Community engagement tools</td><td>Interactive Story Maps guide users through coastal changes with step-by-step explanations.

Users can share interesting coastal changes via Twitter using #DEACoastlines. Users can contact the team via email (dea@ga.gov.au).</td></tr>
</table>

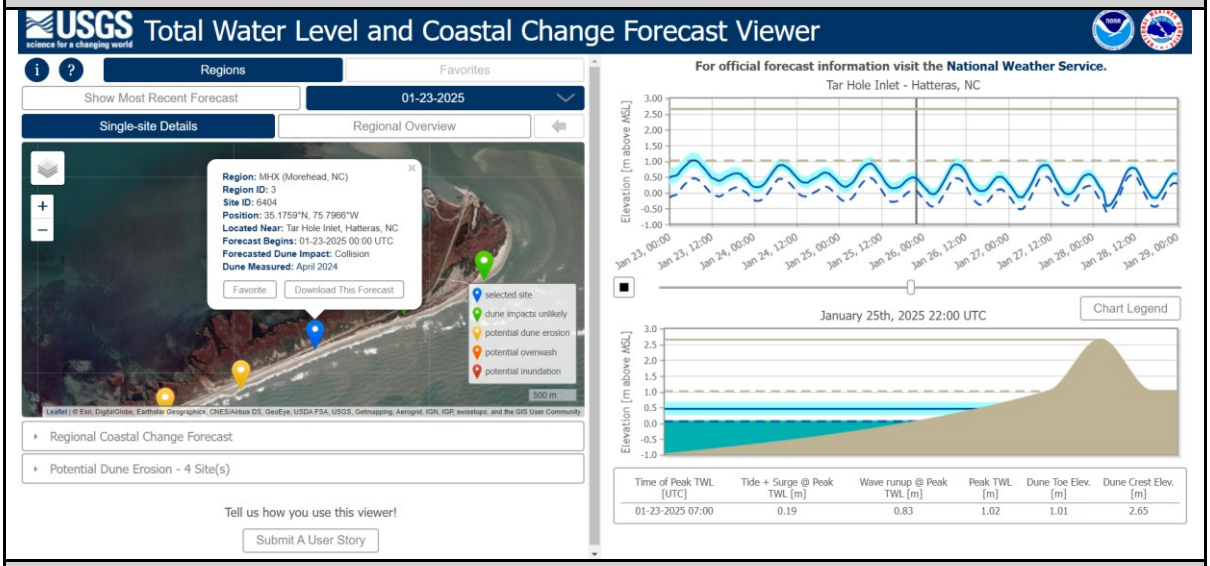
USGS Total Water Level and Coastal Change Forecast Viewer

Platform title	USGS Total Water Level and Coastal Change Forecast Viewer (TWL)	**Link**	https://coastal.er.usgs.gov/hurricanes/research/twlviewer/
Status and date launched	Live, July 2023	**Location**	Gulf of Mexico and Atlantic coastlines, USA
Implementing organisation	USGS, in collaboration with the National Oceanic and Atmospheric Administration (NOAA)/National Weather Service (NWS) and the National Centers for Environmental Prediction (NCEP).	**Scale**	Regional

Executive summary

The USGS Total Water Level & Coastal Change Forecast Viewer is an interactive web platform that provides real-time and forecasted data on total water levels and coastal changes for select regions of the U.S. coastline. The platform combines satellite-derived beach morphology data with NOAA's wave and water level predictions to generate detailed forecasts of coastal hazards, including dune erosion, overwash, and inundation. This tool is designed to support coastal managers, emergency responders, scientists, and the general public in monitoring and mitigating risks related to storm-induced coastal changes.

Platform image



Purpose

The USGS Forecast Viewer is an advanced coastal hazard assessment tool that predicts potential coastal erosion, overwash, and flooding events based on real-time and forecasted total water levels. By utilising tide, surge, and wave runup data, the platform enables informed decision-making for emergency response, infrastructure protection, and coastal zone management. The viewer is tailored for:

- Scientists & Researchers: To analyse coastal dynamics and improve predictive models.
- Government & Emergency Planners: To assess risks before and during extreme weather events.
- Coastal Residents & General Public: To stay informed about potential flooding and erosion risks in their communities.

Description of the platform's interface and navigation

<table>
<tr><td colspan="4">Interactive map-based interface with color-coded site markers for different forecasted coastal hazards. Satellite imagery overlays, tide and wave forecast integrations, and real-time data visualisation.
Interactive features:
• Select regions.
• Zoom
• View historical forecasts
• Analyse site-specific data trends.
• Save favourite locations
• Toggle different forecast layers.
• Select preferred basemap.</td></tr>
<tr><td colspan="4">Technical specifications</td></tr>
<tr><td colspan="4">Web-based GIS mapping platform integrating USGS, NOAA, and NWS data, hosted on USGS coastal hazard forecasting infrastructure. Forecasts updated daily, with historical data available.</td></tr>
<tr><td>Identification of the primary target audience</td><td>Technical Users: Scientists, researchers, and policymakers analysing coastal hazards.
Coastal Planners & Emergency Managers: Decision-makers planning disaster response and mitigation strategies.
General Public: Coastal communities and residents concerned about storm impacts and long-term erosion trends.</td><td>Platform accessibility for different user groups (technical and general public)</td><td>Designed for professionals and the public, with clear navigation and guided explanations. Forecast descriptions and hazard warnings are presented in user-friendly language.</td></tr>
<tr><td>Real-time data integration</td><td>The platform integrates NOAA's tide, surge, and wave forecasts with USGS coastal elevation data for near-real-time hazard predictions.</td><td>Data export options</td><td>Users can download forecast and historical data in CSV, JSON, and XML formats for further analysis.</td></tr>
<tr><td>Integration with external tools or platforms</td><td>API access for programmatic data retrieval and custom analytics.</td><td>Community engagement tools</td><td>Users can submit data inquiries and bug reports to USGS developers and scientists.
A terminology guide features definitions for key terms such as total water level, dune erosion, and overwash.</td></tr>
</table>

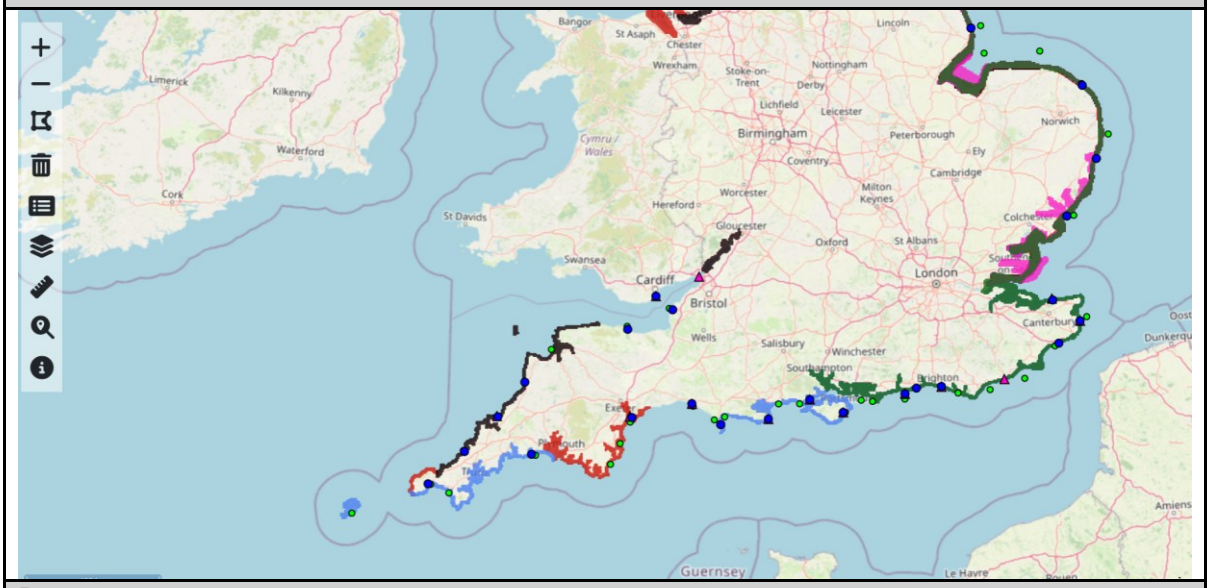
National Network of Regional Coastal Monitoring Programmes (NNRCMP)

Platform title	National Network of Regional Coastal Monitoring Programmes (NNRCMP): Realtime Data and Map Viewer & Catalogue	**Link**	https://coastalmonitoring.org/cco/.
Status and date launched	Live, 2015.	**Location**	England, UK.
Implementing organisation	National Network of Regional Coastal Monitoring Programmes (NNRCMP). Funded by DEFRA, in partnership with Local Authorities and the Environment Agency.	**Scale**	National.

Executive summary

The NNRCMP offers a unified approach to coastal process monitoring across England. By providing real-time data, interactive maps, and a comprehensive data catalogue, the platform supports the development of strategic shoreline management plans, coastal defence strategies, and the operational management of coastal protection and flood defence. Users can access a both real-time and historic data, including tidal data, wave measurements, and bathymetric/topographic surveys, facilitating informed decision-making for coastal management and resilience planning.

Platform image



Purpose

The primary aim of the NNRCMP is to deliver consistent and up-to-date coastal monitoring data to inform and enhance coastal management practices across England. The platform serves as a central repository for data collection, analysis, and dissemination, enabling stakeholders to access critical information for effective coastal planning and response.

Description of the platform's interface and navigation

The NNRCMP features an intuitive and user-friendly interface designed to cater to both technical experts and the general public.
Map Viewer: GIS based tool for visualising available data. Enables toggling of multiple layers (e.g. topographic survey units, LiDAR, bathymetry data extent). Ability to zoom (manually or to user-defined coordinates/location), pan, query layers, select/draw extent of interest, measure tool. Selected extent can be utilised to download available data of interest for the region.
Realtime Data: GIS visualisation of wave buoy, tide gauges and met stations. Data tips available with live information. Ability t look at site-specific dashboard, providing in depth wave,

meteorological and tidal data (tabulated and scatter plots). Ability to filter by date and data of interest. Data can be downloaded. Statistical summary of data available on an annual basis (combination of tables, bar charts and rose diagrams).			
Technical specifications			
ArcGIS-based web mapping services. Continuous updates from real-time sensors and periodic coastal surveys.			
Identification of the primary target audience	Coastal managers, engineers, and policymakers. Researchers in coastal and climate sciences. Local authorities responsible for flood risk management. General public and community groups with an interest in coastal change.	**Platform accessibility for different user groups (technical and general public)**	Technical Users: Advanced GIS functions for coastal managers and researchers. Large range of available data to download and further analyse. General Public: Clear visualisations, intuitive navigation, and simplified data summaries for real-time data. Limited likely use of data catalogue.
Real-time data integration	Wave buoys, tide gauges, and meteorological stations for real-time monitoring.	**Data export options**	Downloadable datasets in GIS-compatible formats (CSV, shapefiles, geodatabases). Reports created annual for each region, summarising coastal trends.
Integration with external tools or platforms	API key available to directly access data.	**Community engagement tools**	Educational resources explaining coastal processes and monitoring methods.

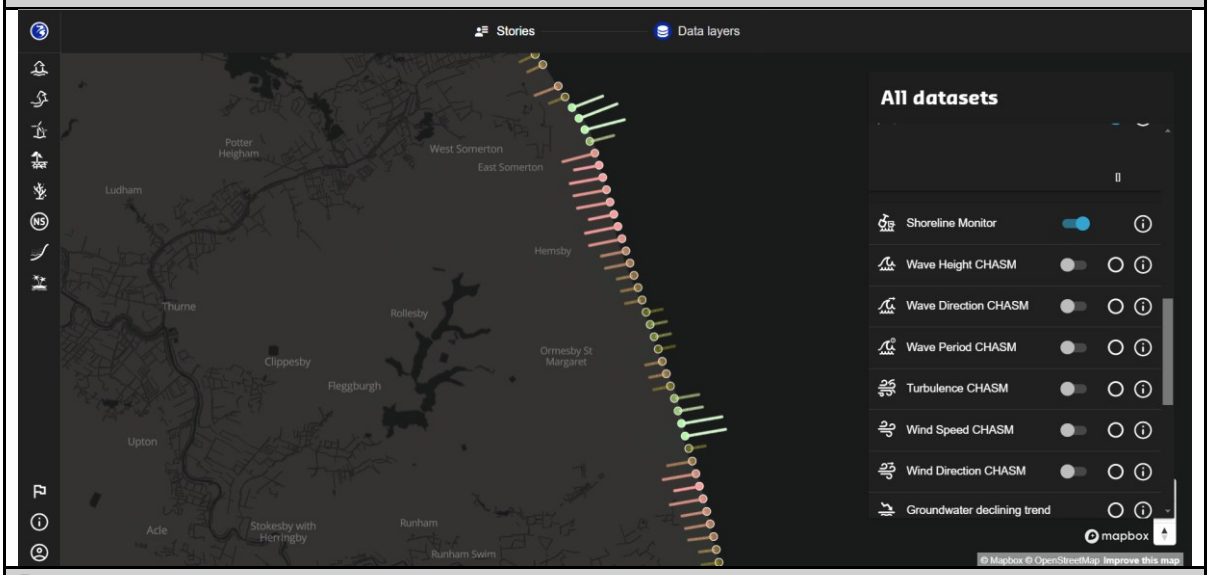
Blue Earth Global

Platform title	Blue Earth Global	**Link**	https://blueearthdata.org/data
Status and date launched	Beta release, April 2020	**Location**	Worldwide
Implementing organisation	Deltares	**Scale**	Global

Executive summary

BlueEarth Data is a free, web-based platform developed by Deltares to facilitate the study and sharing of integrated water and subsoil-related data. The platform offers global datasets across themes such as Flooding, Coastal Management, and Offshore. It provides indicative data primarily intended for professional specialists and researchers, enabling them to visualise, analyse, and download information related to global shoreline changes, bathymetry, river discharge, storm surge forecasts, and metocean conditions. By integrating diverse datasets into a single accessible platform, BlueEarth Data aims to support informed decision-making in environmental research and management.

Platform image



Purpose

The primary purpose of BlueEarth Data is to support the study and dissemination of integrated water and subsoil-related data on a global scale. The platform aims to assist researchers and professionals in analysing environmental changes, assessing risks, and making informed decisions in areas such as flood forecasting, coastal erosion, and offshore planning.

Description of the platform's interface and navigation

BlueEarth Data features an interactive multi-data map viewer that allows users to explore global water and subsoil-related datasets visually. The platform organises datasets into themes, accessible through a selection menu on the left side of the screen.
Interactive features:

- Zoom and pan.
- Toggle layers on/off.
- Select date of interest.
- Select a datapoint for more information – currently not working. A known bug.

Technical specifications

The platform is built using Mapbox, compatible with modern browsers such as Google Chrome, Firefox, Opera, and Chromium-based Edge, hosted on infrastructure managed by Deltares.			
Identification of the primary target audience	The platform provides indicative data primarily intended for professional specialists and researchers	**Platform accessibility for different user groups (technical and general public)**	Designed with an intuitive interface that caters to both experts and non-experts, facilitating easy navigation and data exploration. Provides accessible descriptions and metadata for each dataset, aiding users in understanding the context and applications of the data. Offers comprehensive assistance through a dedicated Wiki-space, enabling users to find information and interact with the community.
Real-time data integration		**Data export options**	Registered users can download selected datasets directly from the platform for offline analysis and application.
Integration with external tools or platforms		**Community engagement tools**	Encourages users to provide suggestions, feedback, and requests via email. Stories are provided, giving background information through text and figures in a storymap style output.

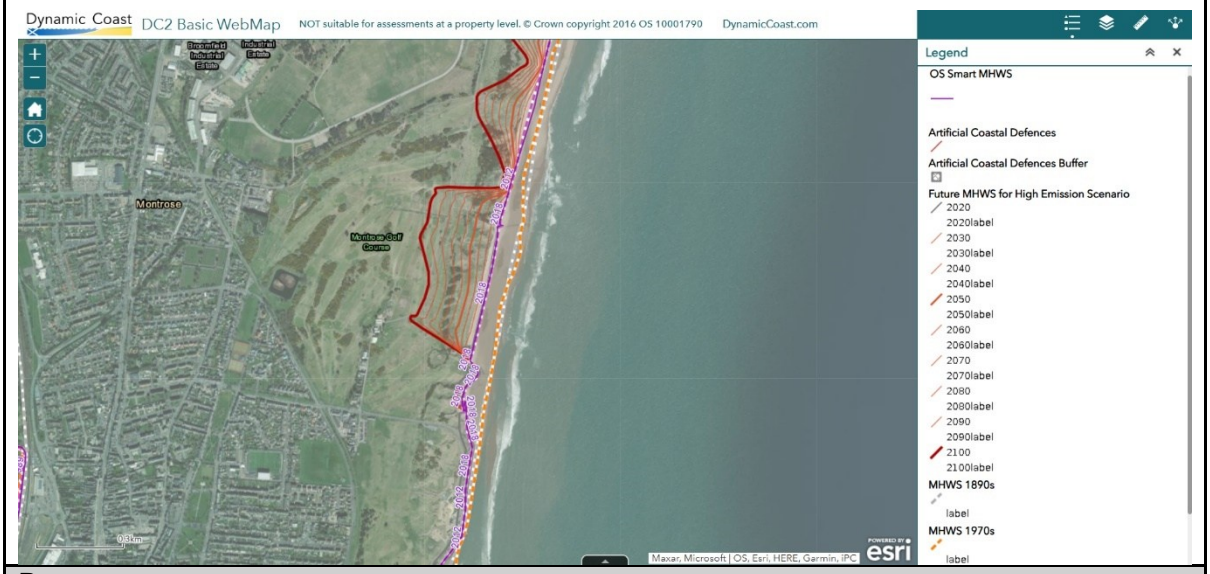
Dynamic Coast Scotland

Platform title	Dynamic Coast Scotland	**Link**	https://www.dynamiccoast.com/
Status and date launched	Live, 2017	**Location**	Scotland, UK
Implementing organisation	The Dynamic Coast project, funded by the Scottish Government, Centre of Expertise for Waters, NatureScot, and the St Andrews Links Trust.	**Scale**	National

Executive summary

Dynamic Coast is a comprehensive initiative aimed at assessing and addressing coastal erosion in Scotland. The project provides a strategic evidence base on the extent of coastal changes, supporting policymakers, researchers, and communities in understanding and adapting to these changes. Through a series of interactive web maps and tools, Dynamic Coast show insights into historical shoreline positions, projected future changes, and the socio-economic impacts of coastal erosion. The platform emphasises the importance of coordinated efforts across sectors to manage the growing risks associated with climate-induced coastal changes.

Platform image



Purpose

Dynamic Coast aims to enhance the understanding of coastal change in Scotland by:

- Improving the Evidence on Coastal Change: Utilising historical data and modern techniques to map shoreline changes over the past century.
- Raising Awareness: Providing accessible tools and resources to inform the public and stakeholders about coastal erosion and its implications.
- Supporting Decision-Makers: Offering data-driven insights to guide policies and actions that ensure Scotland's coasts and assets can adapt to future climatic conditions.

Description of the platform's interface and navigation

Dynamic Coast features a suite of interactive web maps, each tailored to specific aspects of coastal change and different users. Users can easily navigate through various tools to explore data relevant to their interests. The platform uses clear visualisations, including color-coded indicators and overlays, to represent different data layers such as historical shorelines, projected erosion zones, and areas of social vulnerability.

There are multiple maps, as described below:

Basic webmap: Provides an overview of Scotland's key coastal erosion data. Displays past and projected shoreline contours. Users can toggle layers, zoom, pan, and measure distances. Option to adjust layer order and transparency, view attribute table and filter data from the attribute table. Layers can be searched. Option to share or embed the current view. Best starting point for general exploration.
Advanced webmap: Includes all features of the Basic Webmap. Provides additional technical layers for more in-depth analysis. Suitable for researchers and professionals needing detailed data.
Compare your Future Coasts: Interactive split-screen map for comparing coastal erosion under different climate change scenarios. Shows projected shoreline changes in both high-emission and low-emission futures. Zooms simultaneously on both maps for direct comparisons.
Coast X-Ray: Satellite-based intertidal mapping tool. Complements Dynamic Coast's analysis by visualising detailed shoreline changes.
Lidar Availability for Monitoring: Displays LiDAR coverage and asset data across Scotland's coast.
Coastal Erosion Disadvantage Map: Highlights areas where social vulnerability and coastal erosion risks intersect. Uses the Social Vulnerability Classification Index (SVCI). Shows both erosion areas and erosion influence zones.
Coastal Erosion Reporter: Allows users to report real-time coastal erosion events. Clicking on red dots provides information about past incidents, including date, location, assets at risk, and government response. Includes multimedia links, such as news reports and photos.

Technical specifications			
Maps are built utilising ArcGIS Online.			
Identification of the primary target audience	There are different pages and viewers for both technical and non-technical audiences.	**Platform accessibility for different user groups (technical and general public)**	Designed to be user-friendly, with intuitive navigation and clear instructions, making it accessible to both experts and laypersons. Provides concise explanations and summaries to help non-technical users grasp complex coastal processes and data interpretations. Offers comprehensive support through guides, tutorials, and frequently asked questions to assist users in navigating and using the platform effectively.
Real-time data integration	Primarily focussed on analysis of historical data and projections. The Coastal Erosion Reporter tool shows up-to-date instances of reported erosion events.	**Data export options**	
Integration with external tools or platforms		**Community engagement tools**	Enables users to share maps and findings through social media platforms. Incorporates features like the Coastal Erosion Reporter, allowing users to report observed erosion events, contributing to a collective understanding and response to coastal changes.

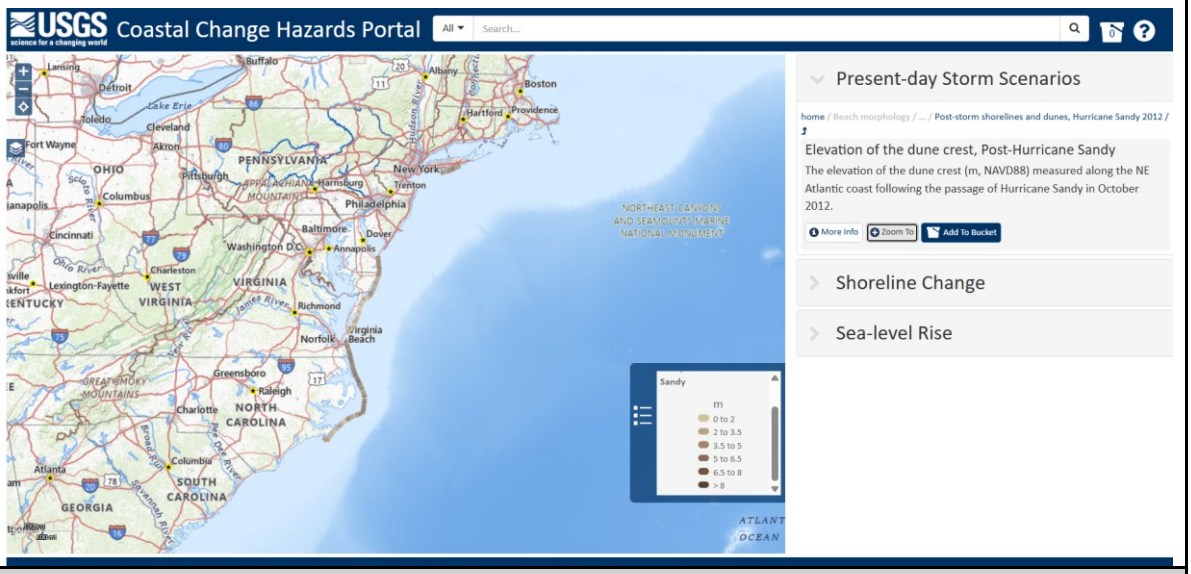
USGS Coastal Change Hazards Portal

Platform title	USGS Coastal Change Hazards Portal	**Link**	https://marine.usgs.gov/coastalchangehazardsportal/
Status and date launched	Live, 2012.	**Location**	USA
Implementing organisation	US Geological Survey.	**Scale**	National

Executive summary

The USGS Coastal Change Hazards (CCH) Portal is an interactive, web-based tool that provides projected and historical data on coastal hazards such as extreme storms, shoreline changes, and sea level rise. It serves as a key resource for researchers, planners, and policymakers who need reliable data for coastal management and adaptation strategies. The portal integrates multiple datasets and GIS-based tools to enhance coastal resilience and risk assessment.

Platform image



Purpose

The CCH Portal is designed to offer users an interactive way to explore coastal change data. It supports decision-making in land use planning, storm response, and infrastructure management by providing access to scientific data and visualisations.

Description of the platform's interface and navigation

The CCH Portal features an intuitive interface that enables users to:

- Search for data by location or within predefined hazard themes (extreme storms, shoreline change, and sea level rise).
- Use an interactive map to visualise and compare different datasets.
- Customise views by toggling data layers on and off.
- Access detailed metadata and additional information about each dataset.
- Download datasets for independent analysis.
- Share map views and data selections via short URLs.

Technical features include:

- Simple navigation with clearly labelled tools and icons.
- Bucket feature allows users to collect, manage, and download datasets.
- Side-by-side comparison of maps for analysing changes over time.
- Zoom and pan functionality to focus on specific regions.

<table>
<tr><td colspan="4">• Toggle visibility and reorder layers for custom visualisations.
• Integration of multiple basemap options.</td></tr>
<tr><td colspan="4">Technical specifications</td></tr>
<tr><td colspan="4">GIS-based web mapping technologies used. Hosted on USGS servers with high-availability cloud infrastructure. Data updates are triggered by research findings and USGS assessments.</td></tr>
<tr><td>Identification of the primary target audience</td><td>The platform is aimed at both the general public and technical users, with a slight focus on technical users.</td><td>Platform accessibility for different user groups (technical and general public)</td><td>Technical Users: Can access GIS layers and download data for further analysis.
General Public: Can easily visualize and explore key datasets with user-friendly tools.
Accessibility: Designed with clear labels, a guided tour, and minimal technical prerequisites.</td></tr>
<tr><td>Real-time data integration</td><td>No real-time data integration.</td><td>Data export options</td><td>Download GIS map layers.
Export data tables.
Generate shareable links for selected datasets.</td></tr>
<tr><td>Integration with external tools or platforms</td><td>Maps can be embedded within external websites/platforms.</td><td>Community engagement tools</td><td>Users can share customised maps and data selections through short URLs.
The portal features educational resources aimed at increasing public awareness of coastal change hazards.
Guided tours help users understand how to navigate and use the portal effectively.
Historical and future scenario visualisations allow users to see past trends and projected changes.</td></tr>
</table>

NSW – Coastal Storm Early Warning System

Platform currently under maintenance

Platform title	Australian Beach Erosion and Coastal Flooding EWS	**Link**	https://coastalews.wrl.unsw.edu.au/region/nsw/
Status and date launched	Pilot, 2024	**Location**	WA and NSW, Australia. To be expanded.
Implementing organisation	University of New South Wales (UNSW), Bureau of Meteorology (BoM), and other research partners	**Scale**	Regional.
Executive summary			
The Australian Beach Erosion and Coastal Flooding Early Warning System (EWS) is a pioneering coastal hazard forecasting platform designed to predict beach erosion and flooding impacts caused by coastal storms. Developed by engineers at UNSW, this system delivers seven-day forecasts in near real-time, helping coastal managers and emergency response agencies mitigate risks associated with severe weather events. The system categorises hazards using a Storm Hazard Matrix, providing localised impact predictions every 100 meters alongshore at identified hotspots.			
Platform image			
Purpose			
The EWS aims to improve preparedness for coastal storms by providing real-time, localised forecasts of erosion and flooding risks. It enables proactive management strategies for vulnerable coastal communities and infrastructure.			
Description of the platform's interface and navigation			
Interactive web-based portal delivering rolling seven-day forecasts. Hazard categorisation matrix for quick assessment of erosion and flooding risks. Searchable by location and hazard severity. Visualisation tools displaying wave forecasts, coastal changes, and potential impact zones. • User-friendly interface accessible to technical experts and general users. • Geospatial hazard mapping with zoom-in function. • Color-coded hazard alerts for intuitive risk assessment. • Live updates integrating wave forecasts and historical storm impact data.			
Technical specifications			
GIS and high-resolution wave modelling systems. Hosted by UNSW servers with support from government agencies. Real-time data feeds and model simulations.			
Identification of the primary target audience	Coastal managers and emergency response agencies. Researchers and policymakers. Local councils and planning authorities	**Platform accessibility for different user groups (technical and general public)**	Accessible to both technical and non-technical users.
Real-time data integration	Near real-time forecasting using experimental high-resolution wave modelling. Seven-day rolling forecasts based on government and research data inputs.	**Data export options**	Downloadable GIS layers and hazard maps. Shareable risk reports for emergency planning.
Integration with external tools or platforms		**Community engagement tools**	*Any features aimed at enhancing coastal literacy*

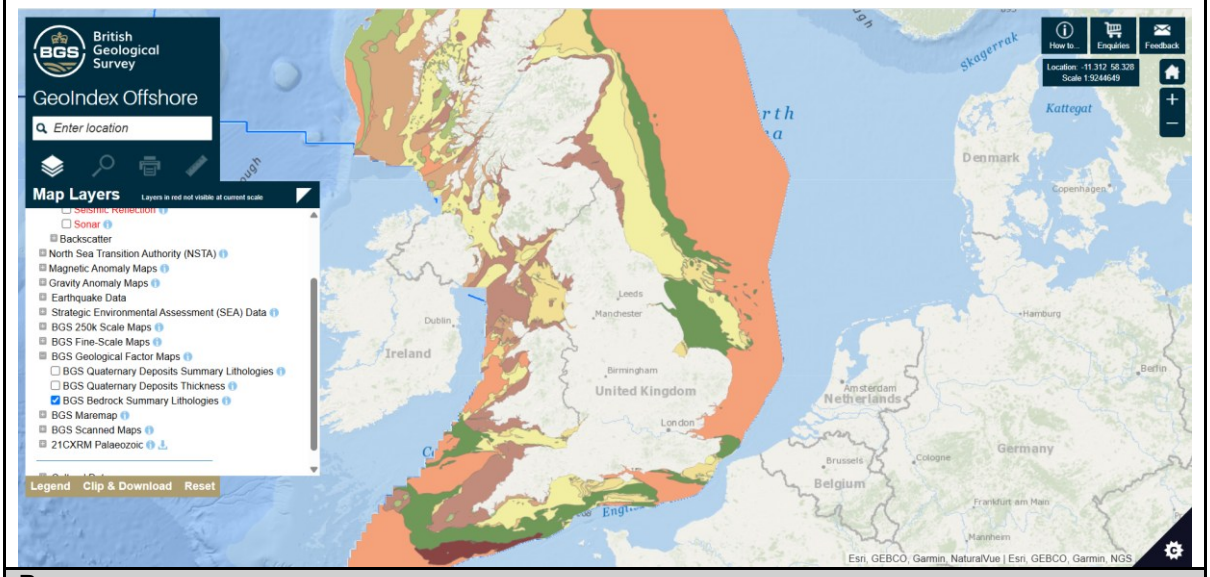
British Geological Survey: GeoIndex Offshore

Platform title	British Geological Survey: GeoIndex Offshore	**Link**	https://www.bgs.ac.uk/map-viewers/geoindex-offshore/
Status and date launched	Live, unknown.	**Location**	UK
Implementing organisation	British Geological Survey (BGS).	**Scale**	National

Executive summary

The Offshore GeoIndex is an interactive marine geoscience data platform managed by the British Geological Survey. It provides access to various marine geology and geophysics datasets, including shallow geology, geochemical, and geotechnical data. The platform serves as a key resource for researchers, policymakers, and industry professionals involved in marine spatial planning, resource assessment, and environmental monitoring.

Platform image



Purpose

The Offshore GeoIndex provides a comprehensive visualisation and query system for offshore geoscience data, aiding in decision-making for marine spatial planning, environmental assessments, and resource exploration.

Description of the platform's interface and navigation

- Web Map Service (WMS): Enables viewing of offshore marine information products.
- API Access: Users can retrieve open data using OGCAPI-Features standards.
- Filtering & Querying: Retrieve specific datasets based on parameters such as bounding box, depth, or survey attributes.
- Search & Navigation: Users can pan, zoom, and input locations to refine their data search.
- Layer Control: Toggle map layers on/off, adjust visibility, and access metadata for each dataset.

Key interactive features:

- Simple navigation tools for spatial searches by polygon, rectangle, or radius.
- Dynamic map layers that update based on zoom level and selection.
- Exportable search results in tab-delimited text format for Excel compatibility.
- Measurement tools for distance and area calculations.
- Printable maps generated as PDFs with embedded legend.

Technical specifications			
GIS-based web mapping technology. Hosted by BGS, with data stored within the National Geoscience Data Centre (NGDC).			
Identification of the primary target audience	Researchers & Marine Scientists for spatial analysis of geoscience data. Government Agencies for environmental monitoring and policy-making. Industry Professionals.	**Platform accessibility for different user groups (technical and general public)**	Technical Users: Advanced GIS capabilities for in-depth analysis. General Public: Simplified visualisation tools for non-specialists. User-friendly design with clear instructions.
Real-time data integration	No real-time data integration.	**Data export options**	Clip & Download function for extracting data within a selected area. Attribute-based searches for specific data filtering. Excel-compatible downloads for structured data analysis.
Integration with external tools or platforms	Supports Web Map Service (WMS) & OGC API Standards for interoperability. Links with MEDIN (Marine Environmental Data and Information Network) as a data archive center (DAC). Integration with external GIS software for advanced geospatial analysis.	**Community engagement tools**	Step-by-step tutorials on using search and download tools. Historical survey records to compare past and present marine data.

Catchment Based Approach (CaBA)

Platform title	Catchment Based Approach (CaBA): CaBA Data Hub and Coastal Data & Restoration Hub.	**Link**	https://data.catchmentbasedapproach.org/ https://coastal-data-hub-theriverstrust.hub.arcgis.com/
Status and date launched	Live	**Location**	UK
Implementing organisation	The Rivers Trust, in collaboration with CaBA partnerships, supported by various funding bodies (e.g., Championing Coastal Coordination).	**Scale**	National

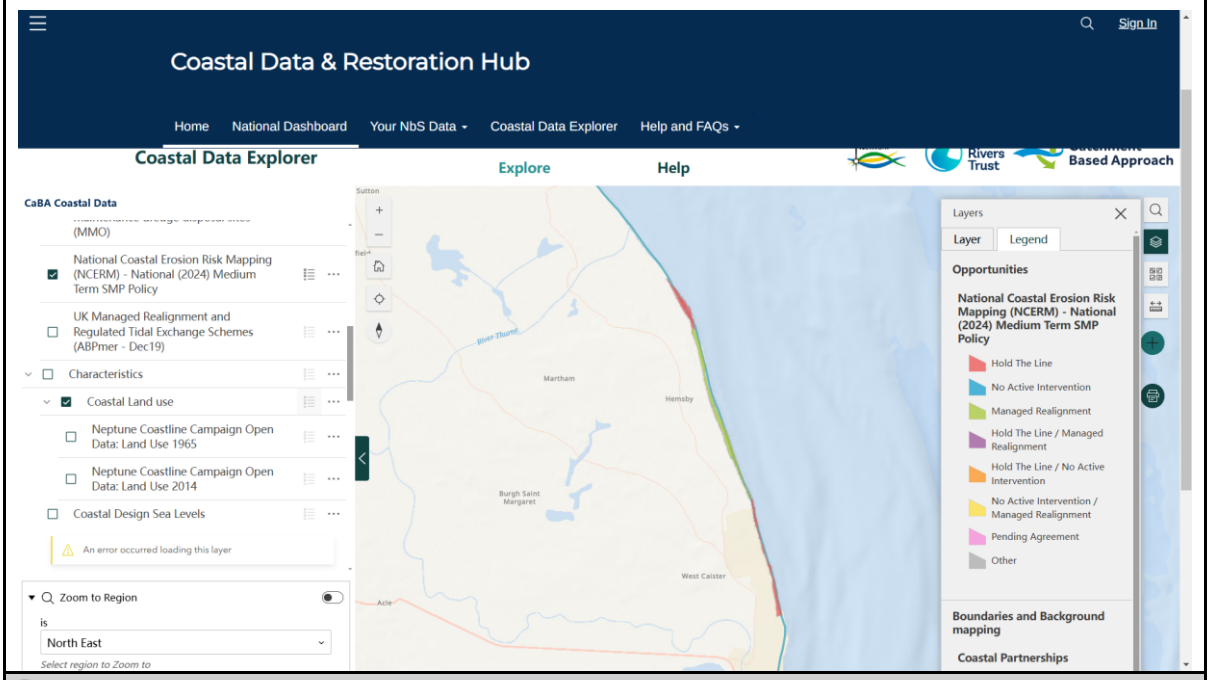
Executive summary

The Catchment Based Approach (CaBA) Data Hub and the Coastal Data & Restoration Hub provide interactive, data-driven platforms to support catchment management and coastal restoration in England.

- CaBA Data Hub offers a comprehensive GIS-based data catalogue, aiding partnerships in evidence-based decision-making for catchment management.
- Coastal Data & Restoration Hub facilitates the mapping and monitoring of nature-based solutions (NbS) in coastal restoration projects.

Both platforms support community engagement, scientific research, and policy development by providing interactive visualisation, analysis, and collaboration tools.

Platform image



Purpose

The CaBA Data Hub and Coastal Data & Restoration Hub aim to:

- Support data-driven decision-making for environmental management
- Facilitate collaboration among stakeholders (government agencies, researchers, NGOs, and communities)
- Provide real-time and historical data for monitoring catchments and coastal ecosystems
- Enhance accessibility to GIS-based environmental datasets

<table>
<tr><th colspan="4">Description of the platform’s interface and navigation</th></tr>
<tr><td colspan="4">CaBA Data Hub: GIS map viewer, whereby users can navigate grouped datasets under opportunities (Identifying potential actions), issues (Recognised environmental challenges), characteristics (Key catchment features), causes (Drivers of environmental issues), actions (Existing conservation projects) and monitoring (Data on ongoing ecosystem assessments). Users can toggle between data layers, filter results, and download datasets. Ability to add own datasets to map.

Coastal Data & Restoration Hub:
Project Mapping Tool: Users can add their own NbS projects & interventions to the platform.
Coastal Data Explorer: Interactive GIS tool to explore restoration projects and environmental datasets. Customisable Dashboard whereby users can select marine plan areas and visualise site-specific metrics.</td></tr>
<tr><th colspan="4">Technical specifications</th></tr>
<tr><td colspan="4">ArcGIS-based web mapping services. Users can create an account to access an ArcGIS online licence.</td></tr>
<tr><td>Identification of the primary target audience</td><td>Catchment Managers & Coastal Planners, Researchers & NGOs.
Local Authorities & Policymakers.
Community Groups & Public Users.</td><td>Platform accessibility for different user groups (technical and general public)</td><td>User-friendly GIS interface for both technical and non-technical users.
Community participation tools to allow local groups to contribute data
Educational resources & guides to enhance environmental literacy</td></tr>
<tr><td>Real-time data integration</td><td></td><td>Data export options</td><td>Links to original data source, whereby data may be exported if available.</td></tr>
<tr><td>Integration with external tools or platforms</td><td>API access for data integration with external platforms.</td><td>Community engagement tools</td><td>Public project submissions to track restoration progress
Dashboard visualisation to enhance coastal awareness
Guides & tutorials for new users to navigate the platform.</td></tr>
</table>

Appendix 5. Survey

Section 1 of 9 Coastal monitoring - public data viewers

Thank you for your interest in this research

Your responses to this survey will help ensure this research accurately reflects the needs and priorities of the community.

About the survey

The survey will take around 15 minutes for non-technical users to complete and 30 minutes for technical users or developers. It is mostly multiple-choice questions with space for written responses, if you'd like to share more detail. You can skip any questions that are not relevant to you.

About the project

Resilient Coasts Ltd is evaluating national and international coastal monitoring data viewers to identify best practices for presenting data to both technical and non-technical audiences. This includes gathering feedback from coastal practitioners, the general public, and developers of data viewers to assess existing UK data viewers' technical capacity and user requirements.

The Coastwise initiative, led by North Norfolk District Council and funded through the Coastal Transition Accelerator Programme (CTAP), aims to develop a local Strategic Coastal Transition Plan and explore national options for addressing these challenges. This project is funded by DEFRA as part of the £200 million Flood and Coastal Innovation Programmes which is managed by the Environment Agency. The programmes will drive innovation in flood and coastal resilience and adaptation to a changing climate.

The ultimate goal is to determine whether the Coastwise initiative's monitoring data can be integrated into an existing platform, or if a new platform should be developed to ensure long-term support for coastal monitoring and management.

Thank you in advance for your time and valuable insights, we appreciate your participation.

Resilient Coasts Ltd and COASTWISE

Data regulations: *Data collected from online surveys will contribute to the Coastwise initiative. By completing the survey and providing further information, you consent to us utilising this information for our analysis. Your name and contact details, if provided under the platform developer section, will be retained for the purposes of follow up queries. These will not be shared further and retained by Resilient Coasts Ltd on our secure systems.*

Section 2 of 9: Your perception of coastal hazards

Coastal hazards are natural or human-induced events, such as storms, erosion, tsunamis, and sea-level rise, that pose risks to coastal environments and communities.

How familiar do you feel with the concepts of coastal hazards and climate change? Not familiar at all, Somewhat familiar, Familiar, Very familiar, Expert level (Highly knowledgeable).

What are the coastal processes and/or hazards in your area that you'd like more information about? Coastal change, Coastal accretion (accumulation of sand or sediments), Coastal erosion (removal or scour of sand or sediments), Landslides or cliff falls, Floods (from rainfall,

river or sea), Storm surge (low pressure systems that cause elevated sea levels), Water quality issues (e.g., pollution events, algal blooms), Climate change impacts (e.g. sea level rise, extreme weather events), Tsunami (tectonic activity or cliff falls causing long waves), Other…

How concerned are you about the following RISKS relating to coastal hazards? *Risk is the chance that a hazardous event will happen and how bad it could be.* Coastal erosion, Coastal accretion, Coastal flooding, Combined flooding (from rain, river and/or sea), Water contamination, Risk to wildlife populations, Emergency services, Climate change, Loss of access, Risk of damage to infrastructure, Services interruption. *Please select one response from 'not concerned' to 'highly concerned'.* Not concerned, Slightly concerned, Moderately concerned, Concerned, Highly concerned.

How VULNERABLE do you feel you and/or your community are to the following? *Vulnerability is how likely you or your community are to be affected by coastal hazards, based on exposure and preparedness.* Erosion, Coastal flooding, Water contamination, Wildlife impact, Climate change related impacts, Lack of transport access, Disruptions in supply services. *Please select one response from not vulnerable to highly vulnerable.* Not vulnerable, Slightly vulnerable, Moderately vulnerable, Vulnerable, Highly vulnerable.

What specific concerns do you have regarding the coastal space and/or challenges you face? *Please use this space to add any details you would like to share. We would welcome as much written text as you feel you can provide about your concerns.*

Do you know where to find clear and reliable information about coastal hazards? Yes, No, Not sure.

Have you ever faced challenges in accessing information about coastal hazards? Yes, No, Not sure.

If yes, please use this space to elaborate on the challenges that you've faced in accessing information.

Where do you typically get information and/or data regarding the environment? Newspaper, Online articles (e.g., blogs, news sites), Social media, Journals and research publications, Interactive tools (e.g., story maps, data visualisation), Data portals, Mobile apps, Government or local authority websites, Other…

Have you accessed any websites or tools to view coastal monitoring data? *This data is the output of the one-off or regular surveys that scientists and engineers collect in the coastal space for observing and recording change to our shorelines and their assets (natural and human).* Yes, No.

Section 3 of 9 Data viewer user survey

How easy is it for you to access coastal monitoring data and information? Very Difficult, Difficult, Neutral, Easy, Very Easy.

What type of information presentation have you found most useful to date? Fixed maps (data shown is fixed), Interactive maps (where you select the data layers), Graphs and charts, Photographs, Videos, Written summaries, Short stories, News articles, Other…

What tools or functions would make a data viewer easier for you to use? Tutorials or guides, Mobile-friendly design (apps), Visualisations (e.g., maps, photos), Simplified interface, Clear navigation, Search bar for quick access, Pre-set data filters, One-click access to key features, Interactive maps, Tooltips for easy guidance, Non-technical language, Other…

Have you ever downloaded data from a coastal monitoring data viewer for further analysis? *Whether for work or personal research purposes.* Yes, No.

Section 4 of 9 Technical user survey

What types of coastal monitoring data are most important for your work? Weather related data/information, Climate related data/information, Ocean related (Wave, tide, surge etc) data/information, Sediment transport, Sediment redistribution, Erosion (loss) rates, Cliff erosion (loss), Beach erosion (loss), Accretion (gain) rates, River flooding data, Coastal flooding data, Other…

How frequently do you need data updates? Historic, Real-time, Daily, Weekly, Monthly, Annual, Other…

What format/s do you prefer for coastal data? Photos (e.g., satellite, aerial and drone imagery), Narrative data (e.g., stories, case studies), Narrative data (e.g., technical reports), Raw data (e.g., XYZ, csv, json), Processed data (e.g., statistics, analysed & visualised data, charts, graphs), Modelled data (e.g., projections, simulations), GIS data (e.g., shapefiles, GeoJSON), Mapped data (e.g., pdf, png, jpeg), Mapped data (e.g., interactive maps), Other…

Which data viewers or tools do you currently use? Dynamic Coast Scotland, Wales Coastal Monitoring, Shoreline Management Plan (SMP) Explorer, Shoreline And Nearshore Data System (SANDS), Anglian Coastal Monitoring Programme, National Network of Regional Coastal Monitoring Programmes (NNRCMP, was CCO), National Coastal Erosion Risk Mapping (NCERM), Catchment Based Approach (CaBA) Data Hub (Coastal Data Explorer), South West Coastal Monitoring Programme (SWCMP), Cornwall Coastal Data Hub, British Geological Survey (BGS) Geoindex, Scottish Environment Protection Agency (SEPA) National Flood Risk Assessment (NFRA), Other…

Rate the importance of the following features: Interactive maps, Downloadable data, Predictive modelling, Real-time updates, Definitions, Explanation. Unimportant, Not a priority, Important, Very important, Essential.

What is the biggest challenge with current data viewers? *Select the top issue you face.* Limited data availability, Poor user interface, Lack of integration with other tools, Slow to get required information, Complex navigation, Difficult to understand data, Slow performance or loading times, Limited accessibility on mobile, Inaccurate or outdated data, Lack of user support, Not user-friendly for non-experts, Poor visualisations, Limited customisation options, Other…

What improvements would make the biggest difference to your work?

Have you ever built or been involved with the development of a coastal data viewer? Yes, No.

Section 5 of 9 Developer survey

This is a chance to share insights for a case study (one or more). If you're short on time, a quick summary would still be greatly appreciated, as you're best placed to highlight key lessons, challenges, and principles from your work. You can skip any questions that are not relevant and provide as much detail as possible. If you'd prefer to share your thoughts via an interview, you have the opportunity to share your contact details below and we will set up a call. Thank you for your time and input here.

Please provide details of the data viewer(s) you helped develop. *These details could include: Data viewer/platform name and website link. Current status (In development, live, archived).*

Development/launch date. The primary geographical focus of the platform (e.g., location, region, country). The primary target audience. The organisation or team that led the development of the platform.

What technologies, software, or tools were used to develop the data viewer?

Can you indicate how much the setup was and/or ongoing maintenance costs are?

How is data managed and updated? How frequently does this occur?

What were the key challenges faced during the development and/or maintenance of the data viewer, and how were they resolved? *This could include: Limitations in technology. Costs. Technical expertise. Ideas, features, or approaches that were considered but ultimately discarded due to complexity, technical challenges, or other constraints.*

Are there any unique functionalities or standout aspects of this data viewer? Anything else you'd like to share? *This could include any specific features or design considerations that were implemented to ensure accessibility or usability for different user groups. You might include your experience personally and/or wider comments about how well (or not!) it is being used.*

Would you be open to a follow-up interview to discuss your experience further? Yes, No *If yes, please add your contact details in the next question*

Please provide your name:

Please provide your email address

Section 6 of 9 Future Preferences

How interested are you in viewing coastal data? Not Interested, Slightly Interested, Moderately Interested, Interested, Very Interested.

What data would you like to be able to access and/or view easily? Erosion rates, Wave data/information, Water quality, Weather/meteorological, Sea level rise, Coastal flooding, Ecosystem data (habitat, population, etc.), Combined flooding (from rain, river and/or sea), Not interested, Other…

How do you personally prefer to learn and understand information? *Select up to 3 options.* Text descriptions, Charts and graphs, Maps, Visualisations, Video, Interactive tools, Animation, Applications (Apps), Other…

What are you hoping to learn/gain from ease of viewing coastal data?

How do you envision using a coastal monitoring data viewer?

What are the features or functions you would like to see in a coastal monitoring data viewer?

Section 7 of 9 Visual survey

We appreciate these 5 examples are small images - please use the zoom function on your device to see more clearly.

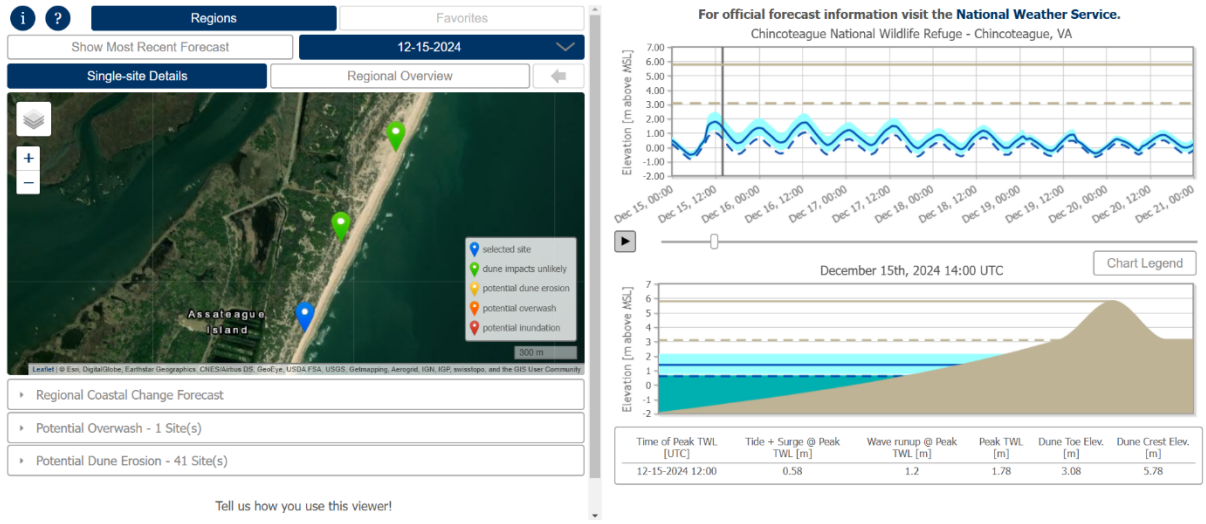
Screenshot 1: Digital Earth Australia Platform*. This is a screenshot of an interactive map demonstrating coastal change information, with options to select data layers, zoom, and interrogate the data.*

Please grade the following aspects of the example 'data viewer' above: *If you are unsure, select "Neutral".* Clear graphics, visual appeal and design, Accessibility or user-friendliness, Usefulness - functions seem to meet with my needs. Very poor, Poor, Neutral, Good, Very good.

Any other thoughts or feedback?

What do you like/dislike about this tool, what could be improved, and/or what additional features might make it more useful to you?

Screenshot 2: USGS Total Water Level and Coastal Change Forecast Viewer. *This is a screenshot of an interactive map demonstrating water level and coastal change forecasts, with options to select forecast dates, zoom, and interrogate the data.*

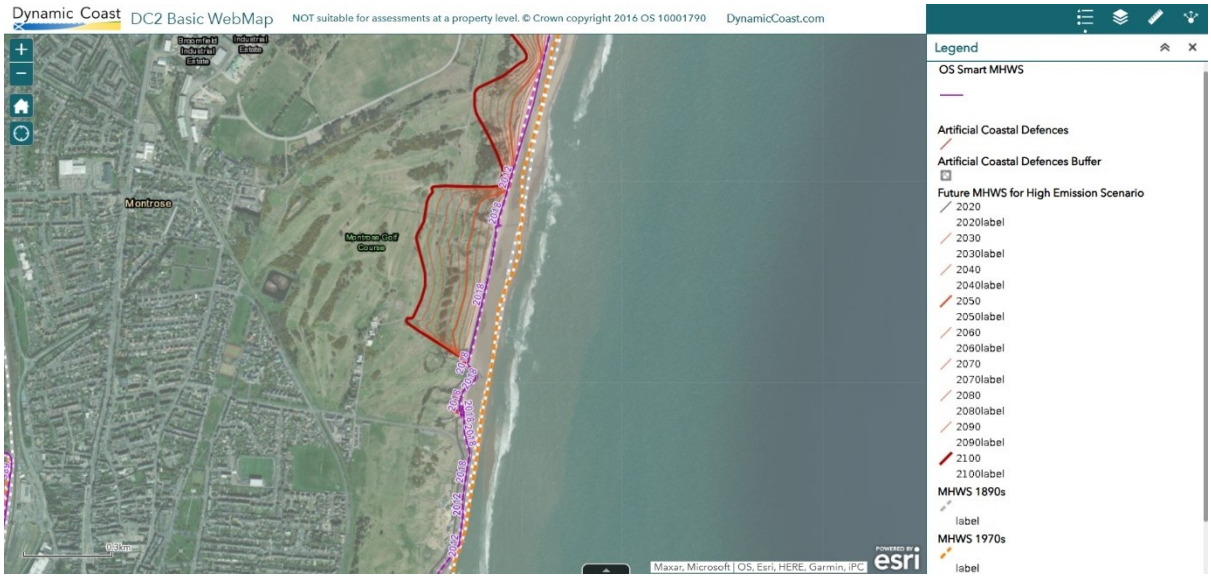


Please grade the following aspects of the example 'data viewer' above: *If you are unsure, select "Neutral".* Clear graphics, visual appeal and design, Accessibility or user-friendliness, Usefulness - functions seem to meet with my needs. Very poor, Poor, Neutral, Good, Very good.

Any other thoughts or feedback?

What do you like/dislike about this tool, what could be improved, and/or what additional features might make it more useful to you?

Screenshot 3: Dynamic Coast Platform. *This is a screenshot of an interactive map demonstrating coastal change, with options to select data layers, zoom, and interrogate data.*

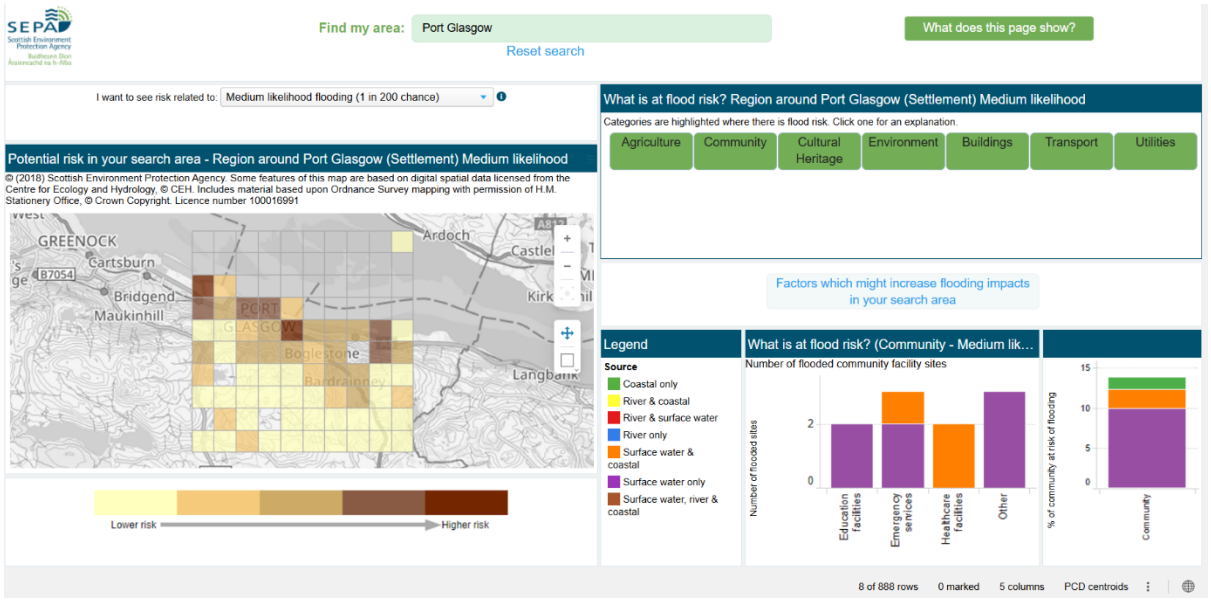


Please grade the following aspects of the example 'data viewer' above: *If you are unsure, select "Neutral".* Clear graphics, visual appeal and design, Accessibility or user-friendliness, Usefulness - functions seem to meet with my needs. Very poor, Poor, Neutral, Good, Very good

Any other thoughts or feedback?

What do you like/dislike about this tool, what could be improved, and/or what additional features might make it more useful to you?

Screenshot 4: SEPA Data Dashboard. *This is a screenshot of dashboard that displays charts, graphs, and summary statistics for flood risk data.*

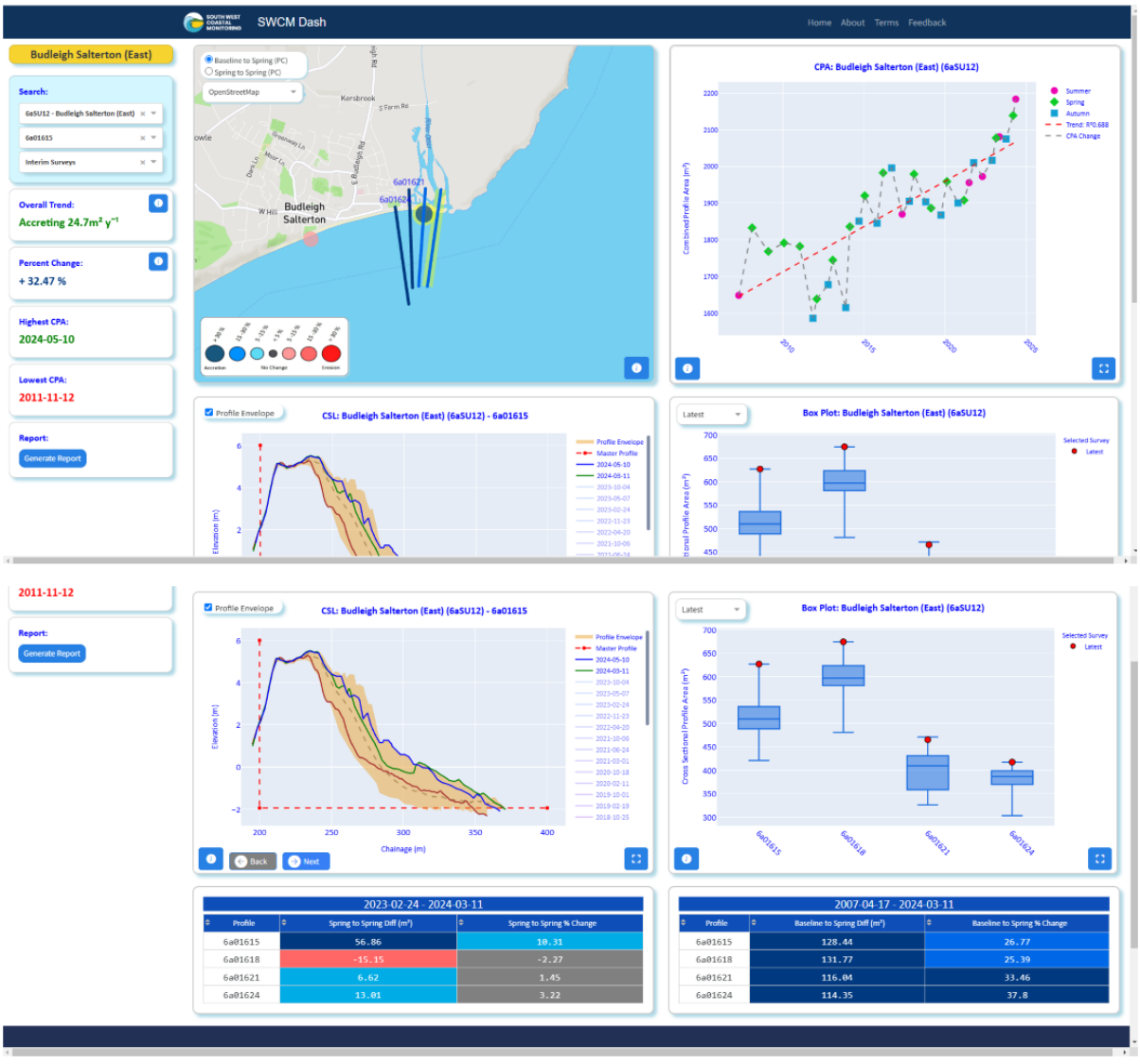


Please grade the following aspects of the example 'data viewer' above: *If you are unsure, select "Neutral".* Clear graphics, visual appeal and design, Accessibility or user-friendliness, Usefulness - functions seem to meet with my needs. Very poor, Poor, Neutral, Good, Very good.

Any other thoughts or feedback?

What do you like/dislike about this tool, what could be improved, and/or what additional features might make it more useful to you?

Screenshot 5: SWCM Data Dashboard. *This is a screenshot of an interactive dashboard demonstrating coastal change, with options to select different regions, zoom, and interrogate data. Note that there are 2 screenshots included below to capture the full dashboard.*



Please grade the following aspects of the example 'data viewer' above: *If you are unsure, select "Neutral".* Clear graphics, visual appeal and design, Accessibility or user-friendliness, Usefulness - functions seem to meet with my needs. Very poor, Poor, Neutral, Good, Very good.

Any other thoughts or feedback?

What do you like/dislike about this tool, what could be improved, and/or what additional features might make it more useful to you?

Section 8 of 9 Demographics

Which country do you live? *If you live outside of the UK, please specify your country in the "Other" field.*England, Wales, Scotland, Northern Ireland, Other…

If England, what area do you live in? Northeast, East, Northwest, West, Central, South coast, Southeast, Southwest, Other…

How near to the coast do you live? *Please approximate the shortest direct distance, and round up to the nearest km or mile.* Under 5 km (3 miles), 6-15 km (4-9 miles), 16-30 km (10-19 miles), 31-45 km (19-28 miles), 46-60 km (29-37 miles), 61-75 km (38-47 miles), >76 km (>47 miles).

What do you class as your association to the coast? Resident - I live at or near the coast (under 5 km or 3 miles), Business owner/operator, Employee at/near the coast, Regular visitor to the coast, Tourist to the coast, Professional in coastal management, Engineer, scientist or consultant, Other…

How do you use the coast? Walking/hiking, Angling, Dog walking, Power boating, Sailing, Diving, Surfing, Swimming, Other water sports (e.g., windsurfing, kitesurfing, paddleboarding, kayaking), Cycling, Camping, Wildlife watching, Photography, Environmental activities (e.g., beach cleanups, conservation work), Tourism/sightseeing, Other…

What is your gender? Male, Female, Other…

What is your age group? Under 16, 16-25, 26-35, 36-45, 46-55, 56-65, 66-75, 76+.

Section 9 of 9 Thanks and snowballing

Thank you for supporting our investigation. Your opinions and perceptions will help drive this initiative and directly impact the design scope for the coastal monitoring data viewer.

Please feel free to distribute the survey link to colleagues, friends and any community groups that would be interested in providing their unique perspectives. We are open for response submission throughout February 2025.

Appendix 6. Survey results

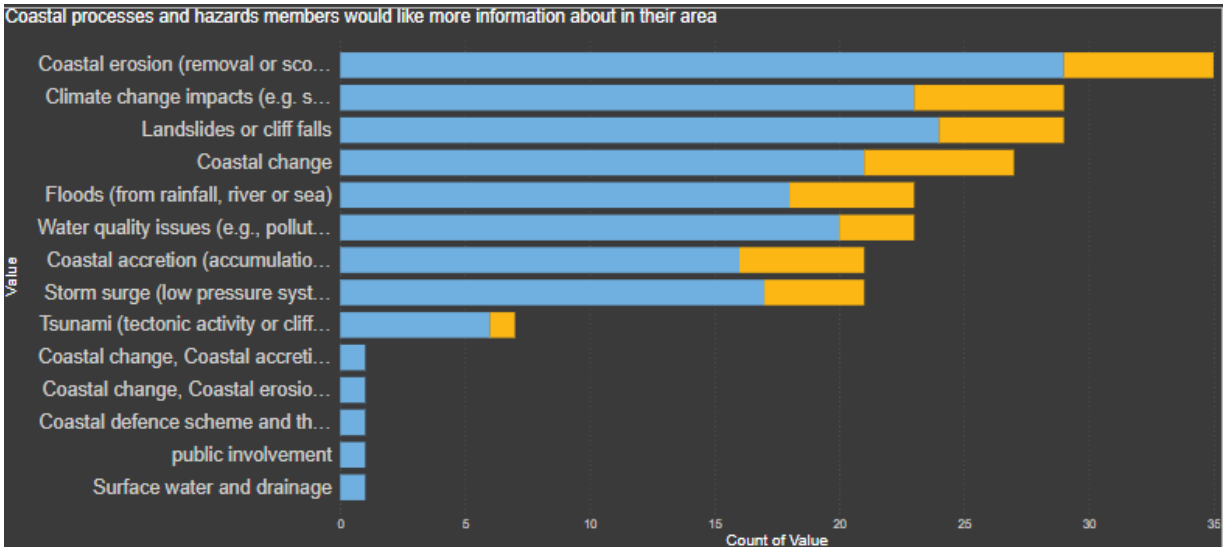


Figure 4. Frequency of coastal processes and hazards that respondents would like more information about in their area, represented as a stacked bar chart, colour coded by self-assessed familiarity with the concepts of coastal hazards and climate change. Yellow and blue represents technical and non-technical users, respectively.

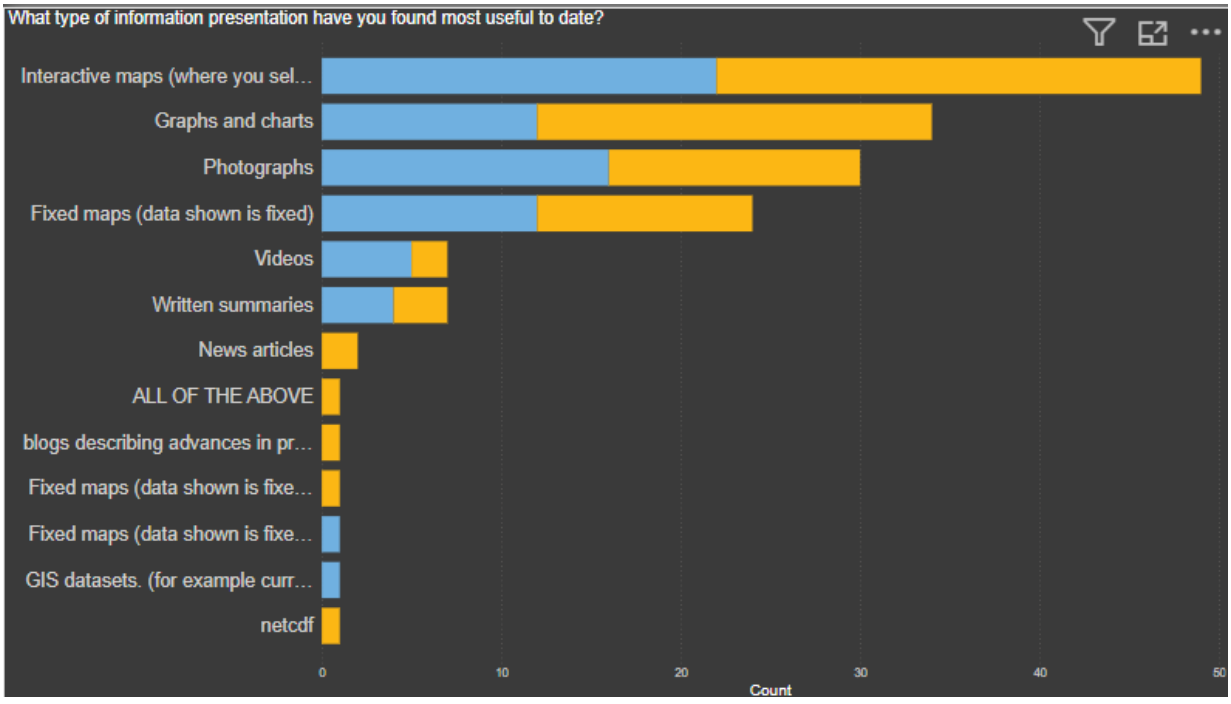


Figure 5. The type of information that respondents have found the most useful to-date. Yellow and blue represents technical and non-technical users, respectively.

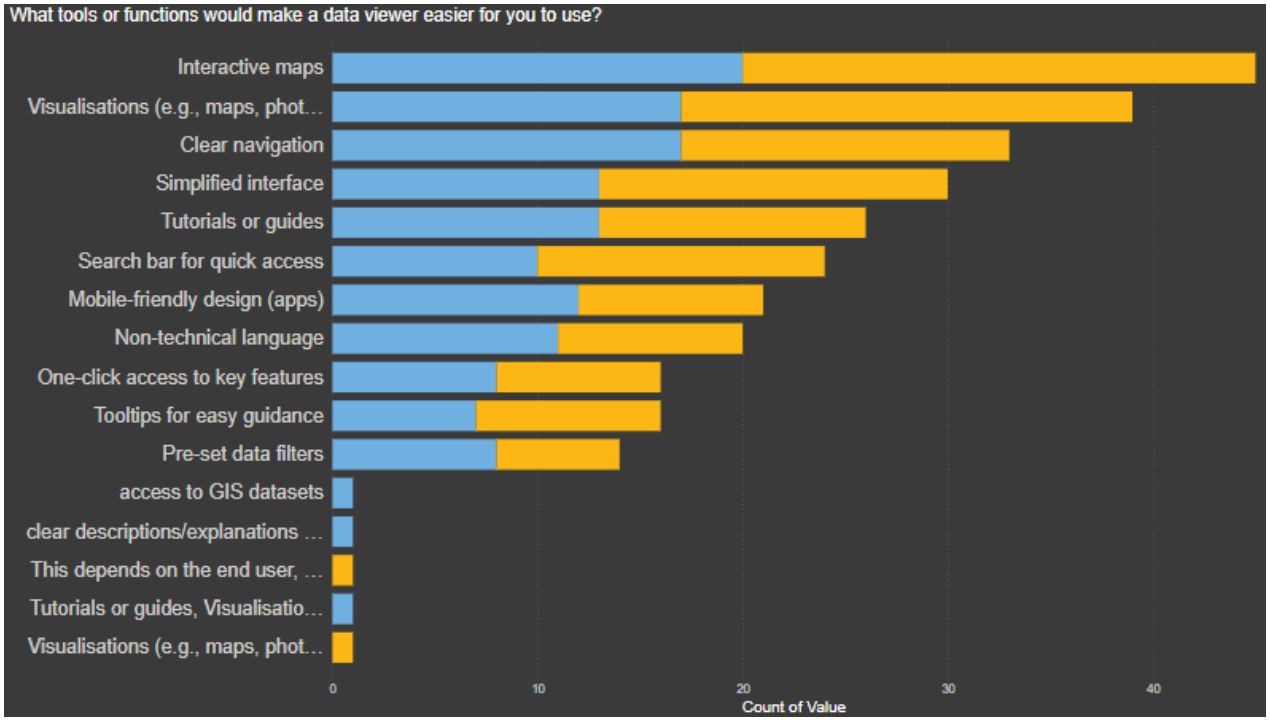


Figure 6. Preferred tools/functions to increase ease of use of data viewers. Yellow and blue represents technical and non-technical users, respectively.