CMAC : WCMC

Canolfan Monitro Arfordirol Cymru
Wales Coastal Monitoring Centre

Annual Report

2023/24

VALE of GLAMORGAN
BRO MORGANNWG

CYNGOR GWYNEDD COUNCIL

CLlLC
WLGA

CONWY
CYNGOR BWRDEISTREF SIROL
COUNTY BOROUGH COUNCIL

Contents

Strategic Direction

Purpose

Monitoring coastal change for informed risk management decisions, while promoting continuous learning and education for all stakeholders.

Vision

The vision for 2026 is to be a role model monitoring centre that provides an accessible platform of understandable coastal process data.

Mission

Delivering a dynamic evidenced programme, optimising access to coastal process data and engaging stakeholders.

Values

Our values, developed by our team, are at the core of all our decisions.

Foreword

As we reflect on another year of progress at the Wales Coastal Monitoring Centre, we are reminded of the critical role our work plays in providing evidence to manage the coastline for our communities. The challenges posed by climate change, sea level rise, and increased storm frequency make it more important than ever to monitor and understand the dynamic processes shaping our coasts. Through our comprehensive survey programme, innovative use of technology, and strong collaborations, we continue to provide vital data and insights that inform decisions for management of our natural and built environments.

This year, we have expanded our efforts to enhance the accuracy and efficiency of our surveys, embracing new technologies like UAV LiDAR and artificial intelligence. Our collaborations with academic institutions, including Aberystwyth University and British Geological Survey, have yielded valuable research and practical tools that directly support coastal management. We are particularly proud of our growing educational initiatives, which aim to equip the next generation with the knowledge and skills needed to face future coastal challenges.

As we look ahead, we remain committed to refining our techniques, expanding our educational outreach, and strengthening our partnerships. Our work is not just about measuring and monitoring; it's about making a real difference for the people and places we serve. Together with our partners stakeholders and continued support from the Welsh Government, we will continue to build resilience along the Welsh coast, ensuring that our communities are well-prepared for whatever the future may bring.

Thank you for your continued support and collaboration as we navigate the complexities of coastal change, and work towards a safer, more sustainable future for all.

2023/24
AT A GLANCE

223 Survey Units along the Welsh coastline

Total frontage surveyed 342 **km**

Total profiles surveyed **2418**

18 Locations being surveyed with coastal capital works sites already under construction or in the business case development stages.

2023/24 In More Detail

Coastal Change

Coastal erosion and accretion are natural processes shaping Wales' beautiful coastline. Erosion involves the wearing away of land by waves, tides, and currents, while accretion is the build-up of sand and sediment. These processes are influenced by various factors, including sea level rise, storm frequency and intensity, human activities, and natural sediment supply. Understanding these changes is crucial for effective flood and coastal erosion risk management.

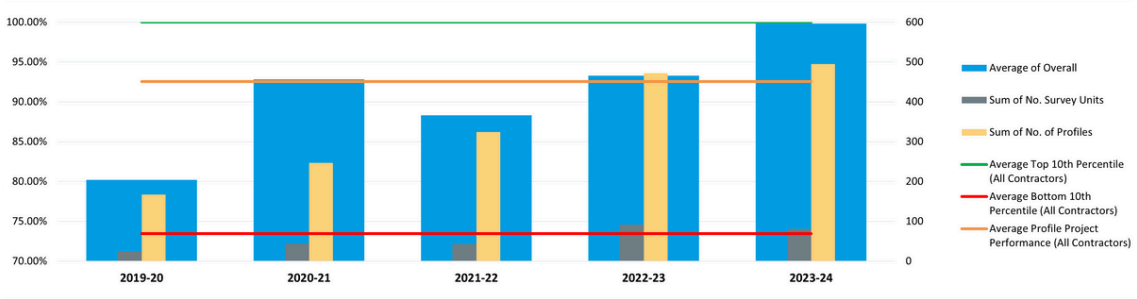
At the Wales Coastal Monitoring Centre, we conduct regular beach surveys to track these dynamic changes. By analysing this data, we can learn about past trends, to inform communities, and build resilience at our coastlines. This information helps local authorities make informed decisions about coastal management and adaptation.

Survey Progress

Topographic surveys are essential for monitoring coastal change. These surveys provide detailed information about the coastline's position and elevation, and when compared over time, the data can identify trends such as areas of erosion and accretion. This information is crucial for informing future management plans of our coastlines.

This year, the budget provided by the Welsh government for procuring topographic surveys was increased by contributions from Carmarthenshire Council. Contractors were procured through the Dynamic Purchasing System, ensuring cost-effective and quality surveys conducted in a fair manner. In the past year, 15 projects were managed across five organisations, collecting 223 survey units. A total Welsh frontage of 342 km was surveyed, and 100% of the data is accessible on our data portal, free for all. This includes public sector survey teams from Gwynedd and Conwy Council who continue to be high performing surveyors.

We extend our gratitude to our contractors, whose continued improved performance led to their best year to date for profile surveys, measured against contract KPIs. Their dedication ensures we have the most accurate and up-to-date information to make informed decisions about flood and coastal erosion risk management. This collaborative effort is vital for safeguarding our communities and natural landscapes from the impacts of coastal change.



Community Engagement

CoastSNAP Update

Over the past year, 3000 public-contributed photos have flooded in, helping us to monitor our dynamic coastlines. We now have nearly 40 locations on the Welsh coastline. These snapshots serve as vital puzzle pieces, validating coastal surveys and informing our understanding of change in the face of rising sea levels. From storm events to the condition of coastal defense assets, CoastSNAP empowers us to monitor our coastline collectively. Join the movement—snap, share, and help us provide data for local authorities to manage our coastline.

Educating the Next Generation

If communities in the past had known about climate change, sea level rise, and coastal flooding and erosion, we might have avoided building properties and infrastructure in high-risk areas. This insight drives our commitment to educate the next generation, helping them avoid the mistakes of the past. We introduce students to the impacts of climate change in a way that removes anxiety by providing practical tools, such as flood risk maps, and encouraging proactive measures to reduce the rates of climate change.

Our primary school programme has grown significantly. This year, we reached the milestone of our 1,000th pupil completing the 12-lesson programme, with the total number of pupils now standing at 1,091. Developed in collaboration with teachers and aligned with the Welsh Curriculum 2022, the programme aims to empower students with knowledge and inspire them to take action to protect our environment. By equipping young minds with this understanding, we hope to build a more resilient and informed future.

Technology and Innovation

UAV LiDAR - L2 Trials

Over the winter months, we trialled the latest laser survey sensor from the drone manufacturer DJI – the 'L2'. During the trial, we tested the L2 sensor's capabilities in various coastal environments, assessing its performance, whilst also fine tuning the system set up and flight planning details to improve the data accuracy. The rapid and comprehensive data collection along with promising accuracy results led us to attempt our first baseline survey using the L2 sensor at Newgale. We aim to stay at the forefront of technological advancements, ensuring that our coastal monitoring efforts remain precise, efficient, and impactful.

Artificial Intelligence (AI)

Bill Gates said, "*Generative AI has the potential to change the world in ways that we can't even imagine*."

Setting aside the answers to some of the worlds' biggest problems, such as climate change, the WCMC have been making effective use of AI to automate repetitive processes, design workflows and data architecture that previously would have been outside of the realms of our capabilities.

Python - In House Programming

As a small team, we embody our value of 'Resourcefulness' by constantly seeking efficiencies, automation, and streamlining processes. Leveraging artificial intelligence as both a guide and a teacher, we've been able to develop Python coding capabilities that would have otherwise been unattainable in such a short time. This expertise has empowered us to successfully deliver a range of projects, including the Data Platform, the CoastSnap database, survey data quality control, and the incorporation of historical data.

Collaborations

British Geological Society (BGS) and National Oceanographic Centre (NOC)

We are pleased to support BGS and NOC in their research on gravel beaches and barrier systems, which act as natural coastal defenses in the UK. These parallel projects aim to enhance our understanding of gravel barrier systems to promote more sustainable coastal management. By contributing our coastal data, we will support the development of advanced datasets and proven modeling tools. Our goal is to improve the understanding of how gravel barriers respond to sea level rise and storm events, ultimately ensuring more resilient coasts for the future.

Aberyswyth University

This year, we continued our successful collaborations with Aberystwyth University, working closely with the Robotics team and the Computer Science department. Our KESS2-funded researcher successfully completed their placement, developing an autonomous tool to monitor coastal change in front of sea defences. Additionally, another student created a program to process our public-supplied CoastSnap images, enabling direct comparisons over time by overlaying the photos. We extend our gratitude to the Aberystwyth researchers and look forward to continuing our fruitful partnership in the future.

University Kings College London

We are collaborating with Owen James of Kings College London to use a low-cost, novel approach to monitor beaches at high temporal resolution using webcams, with Tenby North selected as the test site. We taught Owen how to validate his models using his survey equipment and our survey methodology.

Cardiff University

Collaborating with Alex Minnigin at Cardiff University, we are teaching Alex survey methods, and techniques, using our profile locations and collecting UAV LiDAR and photogrammtery data at Sker (Bridgend). This data can be used to inform on both morhpological and ecological interests.

Successes this Year

Will and Ben the 'Data Platform' Men

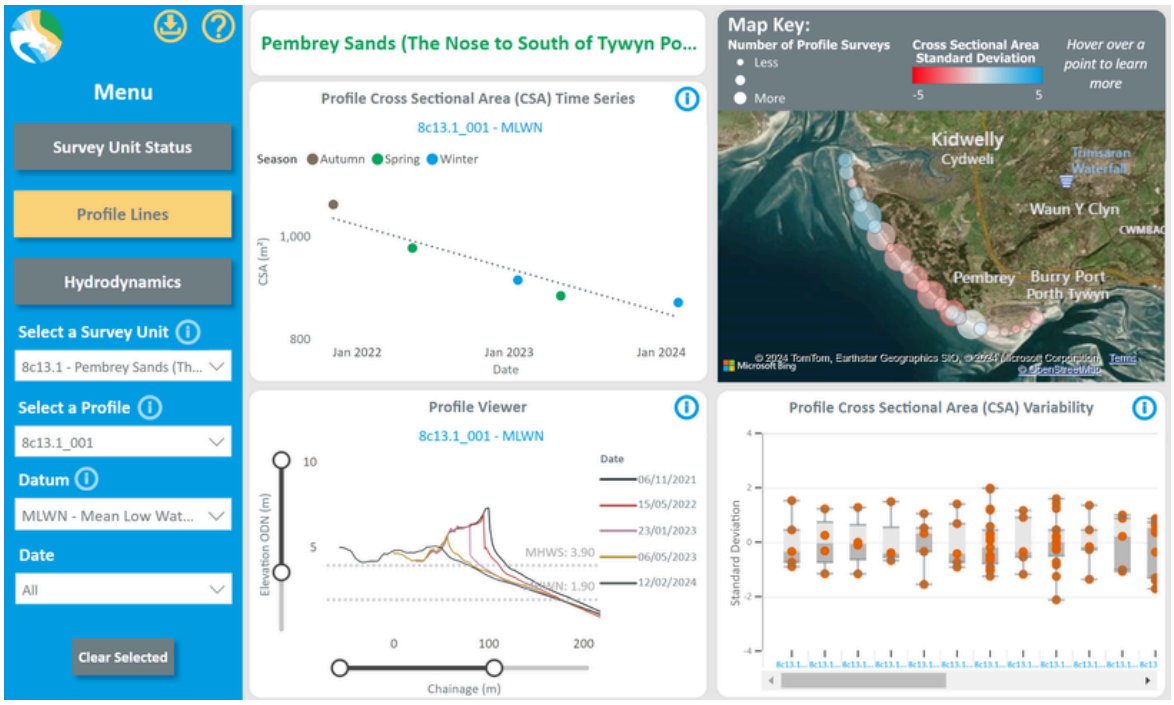
One of our largest projects over the last year has been developing our online dataplatform, which improves access to our survey data to compare trends over time.

What inspired you to create this data platform for coastal monitoring in Wales?

Will: "Our vision for 2026 is to be a role model monitoring centre that provides an accessible platform of understandable coastal process data."

What partnerships or collaborations have been crucial to the success of your platform?

Ben: "We won a place on the Office for National Statistics (ONS) Data Visualisation Programme. This offered us the chance to work with a specialist for 12 weeks to develop our data platform. The expertise and guidance from the tutor were fundamental to what we have created today."

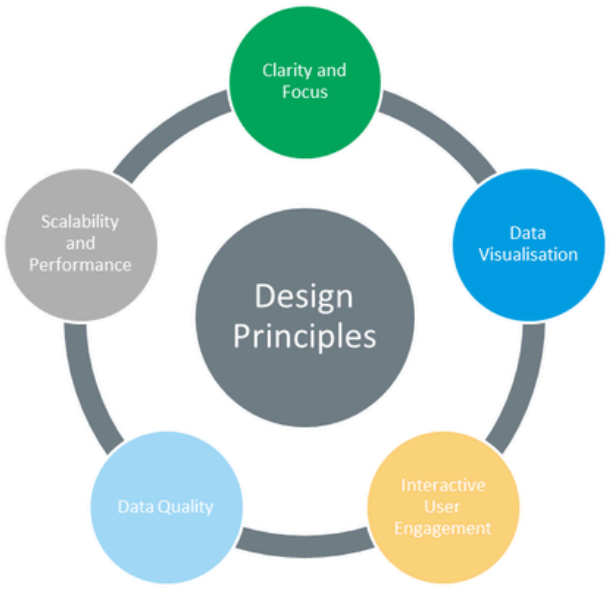


Can you explain how your platform works and what kind of data it collects?

Ben: "We can now automatically process, quality check and publish survey data within a day of receiving it from the surveyors. The data platform focuses on cross-shore beach profiles and provides measures of change against previous surveys. We have also incorporated hindcast re-analysis wave data from the Copernicus Marine Database."

What feedback have you received from users, and how has it influenced the platform's evolution?

Will: "The data platform approach was approved in 2023 at our annual stakeholder event. From there we consulted with our 'Consortium', an expert working group and Welsh Risk Managers. A combined approach of presentations, workshops and webinars, all with feedback channels allowed us to re-design and include recommendations for improved user experience and scientific approach."



How does your platform help local communities and authorities in managing coastal areas?

Will: "The data platform is designed to be user-friendly for everyone, regardless of coastal knowledge. Users can visit the homepage and immediately see if a coastline section was in a 'normal,' 'moderate,' or 'extreme' state at the last survey. Interactive features allow users to explore specific locations for details such as shoreline management policies, survey dates, and schedules. Further exploration provides insights into cross-shore dynamics along the coast. This knowledge empowers Welsh risk management authorities to take a proactive approach to coastal management and make informed decisions when hiring services to model or design coastal schemes."

Ocean Hackathon

The Ocean Hackathon is a non-stop, 48-hour event where teams develop prototypes and explore their practical applications using marine data. Our Senior Coastal Scientist, Will, led a team of four, that were tasked with developing a novel approach to quantify sediment levels using CoastSnap data. The team included specialists in computer science, coastal engineering, machine learning, and coastal ecology. After winning the regional competition, the team advanced to the finals in Brest, France. The team pitched the 'CoastTrack' prototype to the judges and were faced with incredible ideas and polished pitches from other finalists.

The cross pollination of innovative ideas and thinking showcased by the team could lead to a breakthrough in CoastSnap data analysis, harnessing the power of citizen science to revolutionise the field. These projects give the monitoring centre a seat at a global table which is fantastic for exposure and also keeps us at the cutting edge of advancements in coastal technology and practises.

Forward Look

As we move forward, we will continue to enhance our survey programme, refining surveying and processing techniques in collaboration with our contractors and local authority survey teams. We plan to deepen our engagement with local authorities by offering more training on our data platform and developing additional tools tailored to their needs.

We will also work closely with Natural Resources Wales to produce coastal reports that support their Coastal Squeeze National Habitat Creation Programme. Additionally, we are advancing techniques to integrate external aerial LiDAR datasets, enhancing our understanding of large intertidal areas.

Our commitment to academic collaboration remains strong, as we continue to support research projects with organisations like the British Geological Society and the National Oceanography Centre, along with our ongoing undergraduate work placements.

Looking ahead, we aim to expand our primary school programme, creating materials for secondary schools that incorporate our data platform. We will also develop our CoastSnap project further, providing quantitative insights and educating the public on Flood and Coastal Erosion Risk Management issues.

There is still lots to be done!

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