MEDIN

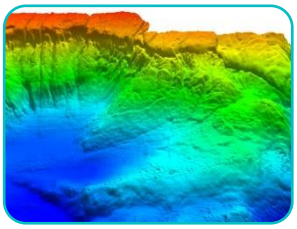
marine environmental
data & information network

Annual Report

2022-2023

'measure once, use many times'

Highlights of the year



Access to marine datasets

We provide a single place to find UK marine environmental data. In March 2022, the MEDIN portal described and provided access to over 17,300 marine datasets, owned or managed by over 600 public and private sector organisations. *Read more on page 16*.

Data managed by specialists

We coordinate a network of specialist Data Archive Centres (DACs) that provide long-term, interoperable access to UK marine data. Our data centres are working towards an international accreditation called Core Trust Seal and this year received over 5.4 million requests for marine data, over five times the total requests at the start of this Business Plan period. *Read more on page 12.*

Marine data standards

We provide a standardised way for the UK marine community to describe the data they collect. This year we delivered a suite of online training to explain how to use our metadata standard and data guidelines to make your marine data findable, accessible, interoperable and reusable. *Read more on page 14.*

Marine policy

We provide expert advice to government departments and agencies, supporting the UK Marine Monitoring and Assessment Strategy (UKMMAS) community. This year we developed an implementation plan for the UKMMAS data strategy to support transparent access to the data used in national and international reporting. *Read more on page 25.*

New technology

We provide opportunities for the UK marine data community to share knowledge of new technologies that may impact the ways that we manage marine data. This year we supported three of our data centres to be the first marine organisations globally to trial a new international standard for accessing data. *Read more on page 21.*

Performance

2022-23 was the fourth year of the Marine Environmental Data and Information Network's (MEDIN) ambitious five-year (2019-24) Business Plan. MEDIN is strengthening and evolving as the leading authority on the management of marine environmental data, albeit with a reduced level of funding, down from £763K per year before 2011 to £517K in the last year.

Our Key Performance Indicators (KPIs) show some areas of significantly increased performance, as well as helping us identify some areas that may benefit from more focus in the future. In particular, this year we saw increases of:

80% in the number of unique visitors to the MEDIN portal. The MEDIN portal is one of our key outputs, providing a wealth of information about datasets collected or owned by over 600 different UK organisations and it is fantastic to see this level of uplift in the number of users this year.

40% in the number of MEDIN data guidelines being downloaded this year. We believe this to be linked to a very welcome collaboration with the Department for Environment, Food and Rural Affairs (Defra) to include a data clause in the Fisheries Industry Science Partnership scheme.

29% in the requests for data from our network of accredited Data Archive Centres. With over 5.4 million requests for data, this was a greater than five-fold increase since the start of this Business Plan period.

Learning from our experiences in 2020-21, we continued to embrace virtual meetings and conferences, particularly for operational meetings. Recognising the benefits of networking for knowledge sharing with our community, we explored innovative ways to provide this within a hybrid setting, enabling more equitable access to our engagement activities and recognising the environmental drive to minimise travel.

MEDIN's reputation has continued to grow. This year our work to pilot a new international standard for accessing environmental data from multiple sources developed by the Open Geospatial Consortium (OGC), brought MEDIN international recognition. Both the OGC community and the international ocean data community recognised that MEDIN were the first marine organisation to apply this new technology globally. This is another example of MEDIN providing an international lead in this field.

The 2019-24 MEDIN Business Plan was developed around 3 strategic goals, which encompass MEDIN's vision for all UK marine data to be Findable, Accessible, Interoperable and Reusable (FAIR). MEDIN has defined seven KPIs based on these strategic goals. 2019-20 provided the baseline, towards which we compare the KPIs for 2020-21 and 2022-23. The KPIs are listed below.

Strategic Goal A: MEDIN delivers its vision for all of the UK marine community

by providing tools and services beneficial across the wide spectrum of the marine data community and the full data lifecycle; ensuring widespread archiving and open access to high-quality data to enable maximum use and security and to provide integration and coordination of services.

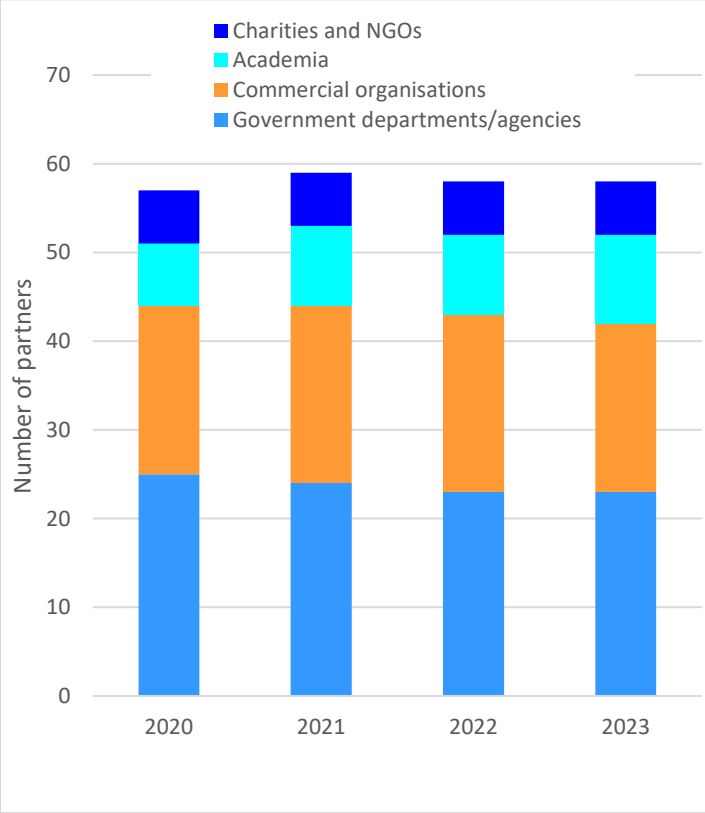
We have 2 Key Performance Indicators that measure progress against this goal:

KPI 1: Number of active MEDIN partners

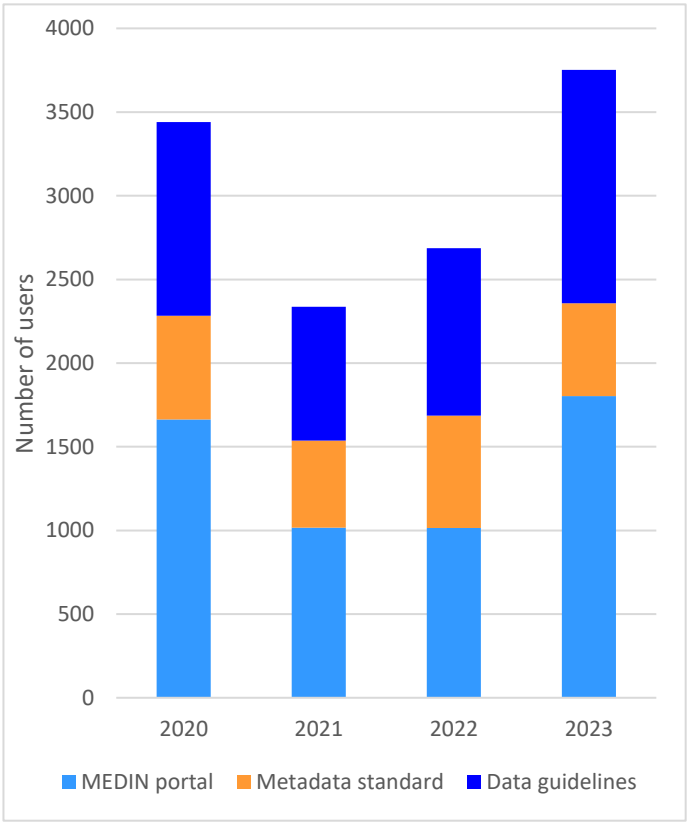
KPI 2: Number of users of MEDIN tools and services

How did we perform this year?

58 partner organisations



3752 users[1]



[1] We have not yet identified a robust way to capture the number of users of the Data Archive Centres, so this metric greatly underestimates the number of users of MEDIN tools and services. Nevertheless, it is useful to compare the change over time of the metrics we can measure.

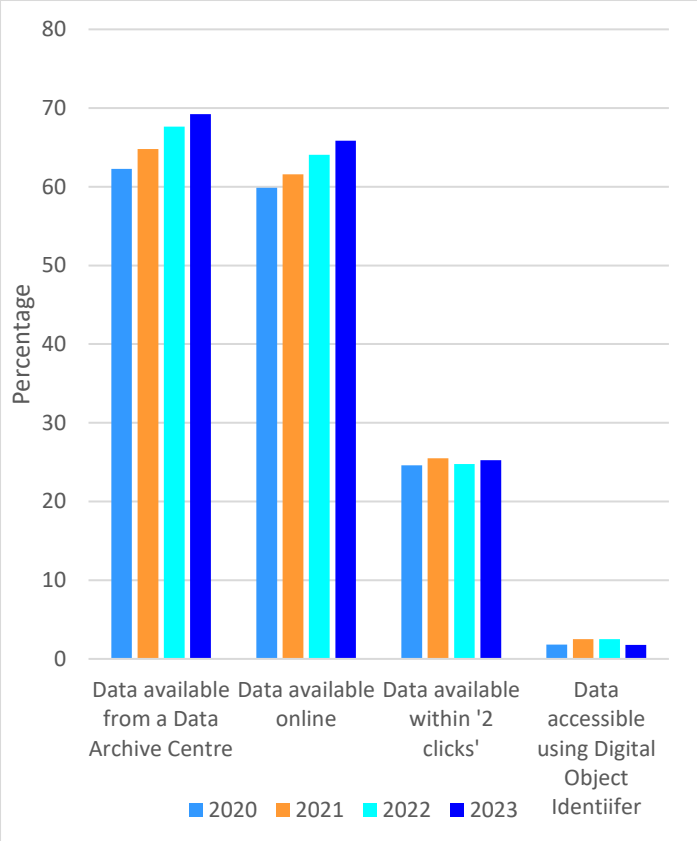
Strategic Goal B: MEDIN delivers the technical infrastructure required to ensure UK marine environmental data are Findable, Accessible, Interoperable and Reusable (FAIR) by providing: a coordinated network of marine Data Archive Centres, a single portal to access all UK marine data, and standards, tools and services to support the UK marine community.

We have 2 Key Performance Indicators that measure progress against this goal:

KPI 3: Summary of access to data described in the MEDIN portal
KPI 4: Number of requests for data at MEDIN Data Archive Centres

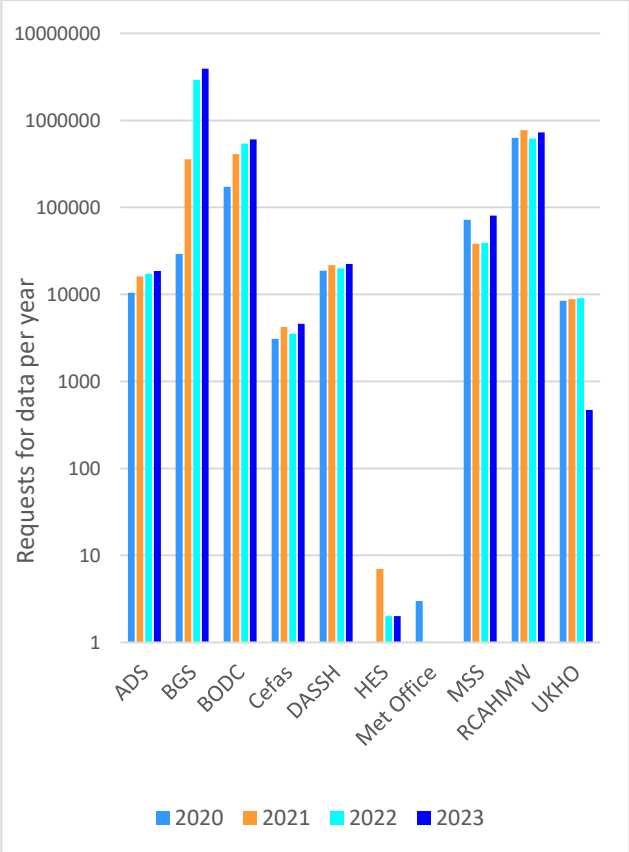
How did we perform this year?

69% data available from accredited Data Archive Centres



The percentage of data within the MEDIN portal that are available: from accredited Data Archive Centres; online; within '2 clicks' of finding them on the MEDIN portal and with a Digital Object Identifier

5.4 million requests for data



The number of requests for data in 2020, 2021, 2022 and 2023 at each MEDIN Data Archive Centre. Note the logarithmic scale on the y-axis.

Strategic Goal C: MEDIN delivers an open and constructive data management culture fostering global collaboration and partnerships; addressing skills gaps; providing training and education.

We have 3 Key Performance Indicators that measure progress against this goal:

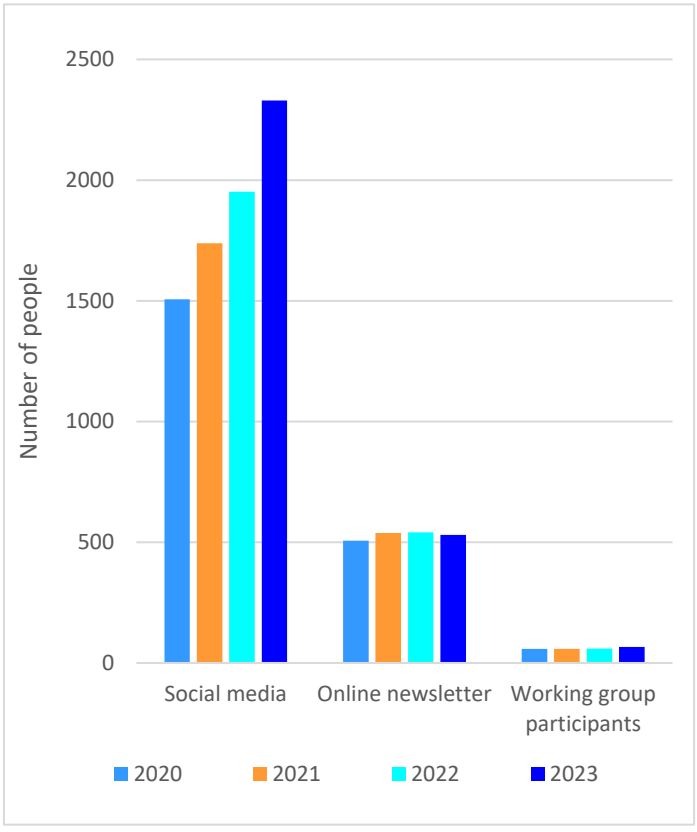
KPI 5: Number of people receiving regular MEDIN updates

KPI 6: Number of organisations receiving MEDIN data management training

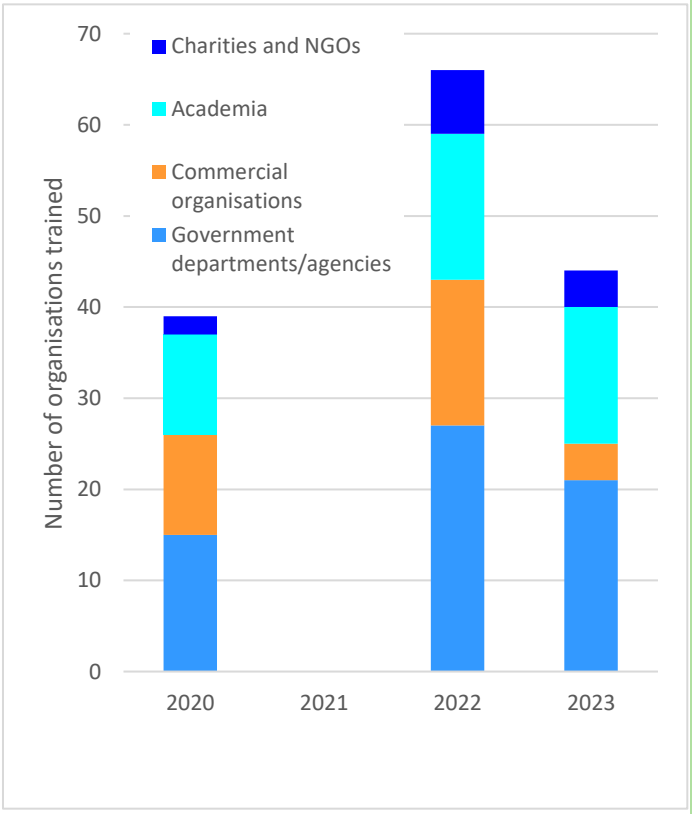
KPI 7: Number of national and international conferences or trade fairs where MEDIN is represented

How did we perform this year?

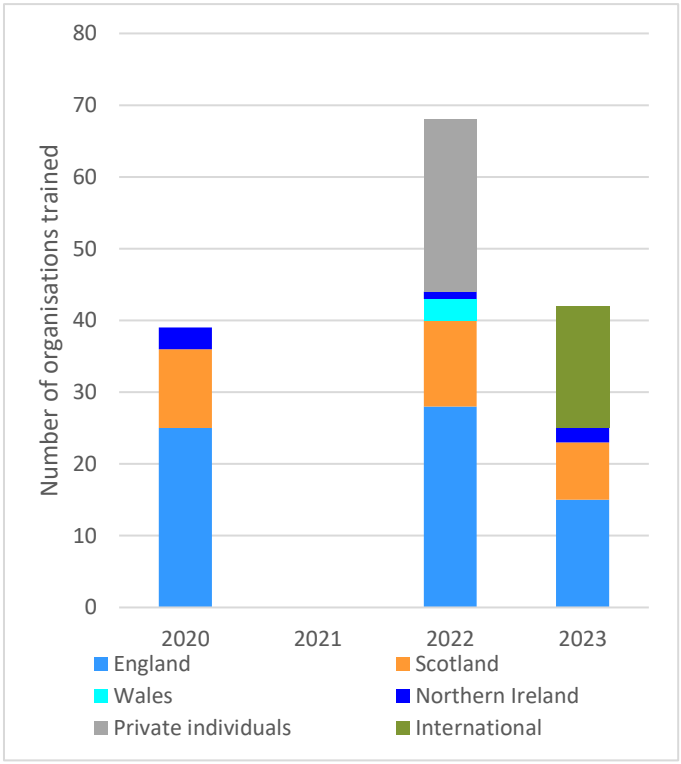
2927 update recipients



42 organisations receiving training



MEDIN represented at over 30 international events



Finance Summary

This year we raised £517,000 in sponsorship for MEDIN, an increase of 1.6% from last year

Available funds

MEDIN is a collaborative initiative that attracts sponsorship from like-minded organisations who recognise the scientific, environmental and financial benefits of providing a coordinated, national framework for managing the UK's valuable and unique marine data resources. £618,325 was available to fund MEDIN activities in 2022-23: £517,000 from the consortium of 15 sponsors, £75,808 carried over from previous years and £25,527[2] for specific development projects.

Sponsor Name	Funding level for 2022-23
DEFRA: Department of Environment Food and Rural Affairs	£175,000
NOC: National Oceanography Centre/ NERC: Natural Environment Research Council	£131,000
Scottish Government	£86,000
BEIS: Department of Business, Energy and Industrial Strategy	£30,000
UK Hydrographic Office	£19,000
Met. Office	£14,000
Cyfoeth Naturiol Cymru / Natural Resources Wales	£14,000
The Crown Estate	£10,000
Joint Nature Conservation Committee	£10,000
Maritime and Coastguard Agency	£7,000
AFBI: Agri-Food and Biosciences Institute	£6,000
OceanWise	£5,000
DAERA: Department of Agriculture, Environment and Rural Affairs, Northern Ireland	£5,000
Welsh Government	£5,000
TOTAL available to MEDIN from sponsorship funding	£517,000
Carry over from previous years	£75,808
Funding for special projects	£25,517
Final Total available for 2022-23	**£618,325**

Expenditure

MEDIN is split into seven Work Streams (WS), each with its own budget and project manager, to allow efficient delivery and management of MEDIN's programme of work. We spent £539,491 during 2022-23:

- £352,463 on the employment costs of the MEDIN project managers (the MEDIN Core Team) including all individual and organisational overheads
- £3,929 on travel and subsistence costs
- £157,655 on external contract costs required for the operation, maintenance and development of the MEDIN framework
- £25,444 on the externally-funded special projects

[2] £23,259 from Defra to fund project 'Solutions to measuring and managing economic risks and Opportunities in Sustainable ocean development (SOS) and £2,258 from UKRI Arts and Humanities Research Council to fund project 'Unpath'd waters'.

Expenditure category	Expenditure in 2022-23	Work Stream	Expenditure in 2022-23
Employment Costs of Core Team	£352,463	WS1: Data Archive Centres	£108,867
Travel and Subsistence	£3,929	WS2: Standards	£75,363
External Contracts	£157,655	WS3: Portal	£97,646
Special Projects	£25,444	WS4: International Links	£20,977
		WS5: Resources and Applications	£16,596
		WS6: Communications	£48,453
		WS7: Management and Coordination	£110,612
		Development Projects	£35,533
		Special Projects	£25,444
TOTAL expenditure	**£539,491**	**TOTAL expenditure**	**£539,491**

End of year balance

This year we saw an increase in funding from the Joint Nature Conservation Committee and the Agri-Food and Biosciences Institute. This, coupled with lower that planned expenditure on staff costs, travel and subsistence and external contracts along with a planned underspend of ~£30K, resulted in a total **end-of-year underspend of £78,834 for 2022-23**.

External expenditure

This year MEDIN spent £157,655 on external contract costs required for the operation, maintenance and development of the MEDIN framework.

Supplier	Item	Cost
BGS	DAC costs 2022-23	£11,000
BODC	DAC costs 2022-23	£11,000
DASSH	DAC costs 2022-23	£13,200
UKHO	DAC costs 2022-23	£11,000
Met Office	DAC costs 2022-23	£11,000
Fish DAC CEFAS	DAC costs 2022-23	£6,600
Historic Environment DAC ADS	DAC costs 2022-23	£6,000
Historic Environment DAC HES	DAC costs 2022-23	£5,000
Historic Environment DAC RCHAMW	DAC costs 2022-23	£5,000
Campus Kitchen Hospitality	Meeting Costs	£22
CoreTrustSeal	BODC CTS accreditation administration fee	£877
	Total WS 1 expenditure	**£80,699**
DASSH	Standards Working Group Support (April-Sept)	£4,878
DASSH	Upgrade to online metadata editor tool	£4,446
CMS	Advert for Online Workshop	£216
	Total WS 2 expenditure	**£9,540**
Maris	UKDMOS Portal Maintenance May 2022-April 2023	£1,500
NOC	Website hosting and support	£5,000
Maris	MEDIN portal and catalogue hosting and maintenance January 2023-Dec 2023	£8,100
MBA / DASSH	MEDIN Helpdesk (April 2022-September 2022)	£3,906
MBA / DASSH	MEDIN Helpdesk (October 2022-March 2023)	£3,600
Maris	Update to MEDIN portal (MEDIN Application Programming Interface)	£1,680
Campus Kitchen Hospitality	Meeting costs	£201
	Total WS 3 expenditure	**£23,987**
Printdesigns Limited	Banners x 5	£265
MASTS Annual Science Conference	MASTS conference registration and sponsorship	£200
Multiple suppliers	Postage and courier services	£77

CMS	Coastal Futures registration	£108
CMS	Advertise MEDIN Open Meeting	£216
	Total WS6 expenditure	**£866**
Oceanwise	Representing MEDIN at PSEG 22nd September 2022	£690
DASSH/MBA	Representing MEDIN at HBDSEG and BioDIG (April 2022-September 2022)	£2,916
DASSH/MBA	Representing MEDIN at HBDSEG and BioDIG (October 2022-March 2023)	£2,430
Prof Peter Liss	Chairing MEDIN meetings and representing MEDIN	£5,040
	Total WS7 expenditure	**£11,076**
BGS	Implementation of OGC EDR API Standard	£15,000
Cefas	Implementation of OGC EDR API Standard	£9,000
DASSH	Implementation of OGC EDR API Standard	£7,488
	Total development project expenditure	**£31,488**

Governance

Governing Body

MEDIN was established in 2008 as a collaborative, cross-sectoral initiative for the public good. Our governing body, the MEDIN Sponsors' Board, comprises one member from each funding organisation, ensuring each funder has the opportunity to influence our national and international work. The Board is responsible for defining the strategic direction of MEDIN, approving work programmes and budgets. Professor Peter Liss CBE FRS chairs the MEDIN Sponsors' Board, which met twice during 2022-23.

Sponsor Name	**Sponsors' Board member 2022-23**
DEFRA: Department for Environment Food and Rural Affairs	Jake Harvey/Rohan Allen
NERC / NOC: Natural Environment Research Council / National Oceanography Centre	Ian Moores
Scottish Government	Dr Jens Rasmussen
BEIS: Department of Business, Energy and Industrial Strategy	Saravanan Marappan
UKHO: UK Hydrographic Office	James Carey
Cyfoeth Naturiol Cymru / Natural Resources Wales	Barnaby Letheren
Met Office	Jon Turton
The Crown Estate	Chelsea Bradbury
Maritime and Coastguard Agency	Paula English
JNCC: Joint Nature Conservation Committee	Elly Hill
OceanWise	Dr Mike Osborne
DAERA: Department of Agriculture, Environment and Rural Affairs, Northern Ireland	Aoibheann Rooney
AFBI: Agri-Food and Biosciences Institute	Dr Matt Service
Welsh Government	Shelley Vince
Chair	**Professor Peter Liss CBE FRS**

Operational Groups

Our Board is supported by an Executive Team, which provides interim guidance and management of our operational work programme between Sponsors' Board meetings. The Executive Team is made up of four sponsor members (DEFRA, NERC/NOC, Scottish Government and a fourth member, currently UKHO, as voted by the Sponsors' Board), three subject experts (the chairs of the MEDIN Working Groups) and the MEDIN work stream managers. Our Executive team met four times in 2022-23.

Executive Team member	Sponsor/Expert member	**Executive Team member**	**MEDIN work stream member**
Rohan Allen (DEFRA) Jake Harvey (DEFRA)	Sponsor member since 2022 Sponsor member 2021-2022	Dr Clare Postlethwaite	Since 2012
Ian Moores (NOC/NERC)	Sponsor member since 2021	Dr Robin McCandliss	2017-2022
Dr Jens Rasmussen (Scottish Government)	Sponsor member since 2019	Dr Helen Snaith	Since 2022
James Cooke (UKHO)	Sponsor member since 2017	Dr Gaynor Evans	Since 2008
Dan Lear (MBA)	Expert member since 2020	Charlotte Miskin-Hymas	Since 2017
Graeme Duncan (JNCC)	Expert member since 2019	Roseanna Wright	Since 2018
Dr Mike Osborne (OceanWise)	Expert member since 2008	Colm Walsh	Since 2021
Professor Peter Liss CBE FRS	**Chair since 2008**		

The seven MEDIN work streams are project managed and supported by the MEDIN Core Team - seven part-time staff employed by the National Oceanography Centre within the British Oceanographic Data Centre. In addition to project management, the MEDIN Core Team provide leadership for the work streams and secretariat as well as administrative support to MEDIN. The MEDIN Core Team met monthly in 2022-23.

Core Team member	**Work Stream (WS) role**
Dr Robin McCandliss/Dr Helen Snaith	Lead on DACs WS
Roseanna Wright	Lead on Standards WS
Colm Walsh	Support to Standards WS
Dr Gaynor Evans	Lead on Portal, Products and Services WS
Dr Clare Postlethwaite	Lead on International; Resources and Applications; and Management and Coordination WS
Charlotte Miskin-Hymas	Lead on Communication WS and support to International WS
Paul McGarrigle	Administrative Support
Dr Clare Postlethwaite	**Coordinator since 2014**

Working Groups

Our partners help deliver our strategic goals by participating in our working groups, which met regularly throughout 2022-23.

DAC Working Group	Standards Working Group	Portal Steering Group	Communications Working Group
Archaeology Data Service (ADS)	BGS	DASSH	ADS
British Geological Survey (BGS)	BODC	Marine Scotland	BGS
British Oceanographic Data Centre (BODC)	Cefas	NRW	BODC
Centre for Environment, Fisheries and Aquaculture Science (Cefas)	DASSH	OceanWise	Cefas
DASSH	Joint Nature Conservation Committee (JNCC)	UKHO	DASSH
Department for Environment, Food and Rural Affairs (DEFRA)	Natural Resources Wales (NRW)	Edinburgh Parallel Computing Centre (EPCC)	HES
Historic Environment Scotland (HES)	OceanWise		Historic England
Marine Scotland	Scottish Association for Marine Science		Institute of Marine Engineering, Science and Technology (IMarEST)
Met Office	Nature Scot		Marine Scotland
Royal Commission for the Ancient and Historic Monuments of Wales (RCHAMW)	The Crown Estate		National Oceanography Centre (NOC)
The Crown Estate	UKHO		OceanWise
NatureScot			Scottish Environment Protection Agency (SEPA)
United Kingdom Hydrographic Office (UKHO)			Sussex-Inshore Fisheries and Conservation Authority (IFCA)
			The Crown Estate
			UKHO
Dan Lear (Marine Biological Association) **Co-chair since 2020**	Graeme Duncan (JNCC) **Co-chair since 2019**	Dr Gaynor Evans (MEDIN) **Chair since 2008**	Charlotte Miskin-Hymas (MEDIN) **Chair since 2022**
Dr Helen Snaith (MEDIN) **Co-chair since 2022**	Roseanna Wright (MEDIN) **Co-chair since 2019**		

Parent Body

The Marine Science Coordination Committee (MSCC) was the parent body for MEDIN, providing strategic direction, which MEDIN used to define its high-level goals. MEDIN reported to MSCC through this annual report and shorter progress updates as requested. During the year we understood that MSCC would be reformed in 2022-23 but late in the year, we were informed that it would be dissolved.

Administrative Body

The management and operation of MEDIN is administered by the National Oceanography Centre (NOC), on behalf of the MEDIN Sponsors Board (and MSCC prior to its dissolution in December 2022).

Network of Data Archive Centres

This year we received over 1.2 million more requests for data than last year

The MEDIN Data Archive Centres (DACs) provide the cornerstone for long-term management of UK marine data and the 'collect once, use many times' philosophy. Each DAC provides expertise for their designated area of activity, applying best practice in the fields of data management and archiving data from disparate source organisations, who are able to free up resource for other activity. Together, the DACs form a coordinated network that supports the reuse of data, helps to avoid duplication of primary data-gathering efforts and contributes to the drive towards making data Findable, Accessible, Interoperable and Reusable (FAIR). Currently 69% of the data accessible from the MEDIN portal are considered “archive quality”. In other words, they are managed, quality controlled and disseminated by one of our accredited Data Archive Centres.

Our DACs provide

- Secure, long-term curation of key marine data sets, according to best practice and to relevant national and international standards as demonstrated by their accredited status.
- Clear, searchable information on their data holdings by the generation and publication of metadata on the MEDIN portal.
- Open and easy access to their data, wherever possible.
- The first point of call for expertise in the management of marine data.

The DACs cover a wide spectrum of data within the marine environment, including bathymetry; fish and shellfish, fisheries, aquaculture and related samples; the historic environment; marine geology and geophysics; marine species and habitats; marine meteorology; water column oceanography. This network provides users from across the marine community with secure, long-term data archiving supported by domain expertise.

We provide direct access to UK marine data

We promote open and easy access to marine data. Our DACs continue to develop their systems and processes to make it as easy as possible to access the data they manage. This year we continued to improve direct access to data, whereby a user can access data from the MEDIN Portal within ‘2 clicks’. More than 95% of datasets available from our DACs are accessible online and seven of our DACs now provide online access to over 80% of their data holdings. 36% of the data held in our DACs are available to download or use within ‘2 clicks’ of finding them on the MEDIN portal, without needing to register, login or carry out additional searches.

This year, three of our DACs (Cefas, DASSH and BGS) trialled a new standardised approach to make it easier for users to access and use data from multiple data repositories. MEDIN funding, matched by that of each participating DAC, enabled the DACs to explore a new standard developed by an international consortium and designed to work across domains. This work supports one of MEDIN’s key objectives. Over the past decade, the MEDIN DACs have demonstrated the impact of working together to share metadata in a coordinated and standardised way and we hope that these pilot projects will enable a step change in sharing data from multiple repositories in a standardised way. The reports detailing the technical aspects of this work are available here (insert link).

MEDIN accredited Data Archive Centres

ADS	Archaeology Data Service
BGS	British Geological Survey
BODC	British Oceanographic Data Centre
Cefas	Centre for Environment, Fisheries and Aquaculture Science
DASSH	Archive for Marine Species and Habitats Data
HES	Historic Environment Scotland
MO	Met Office
MSS	Marine Science Scotland
UKHO	UK Hydrographic Office
RCAHMW	Royal Commission for the Ancient and Historical Monuments of Wales

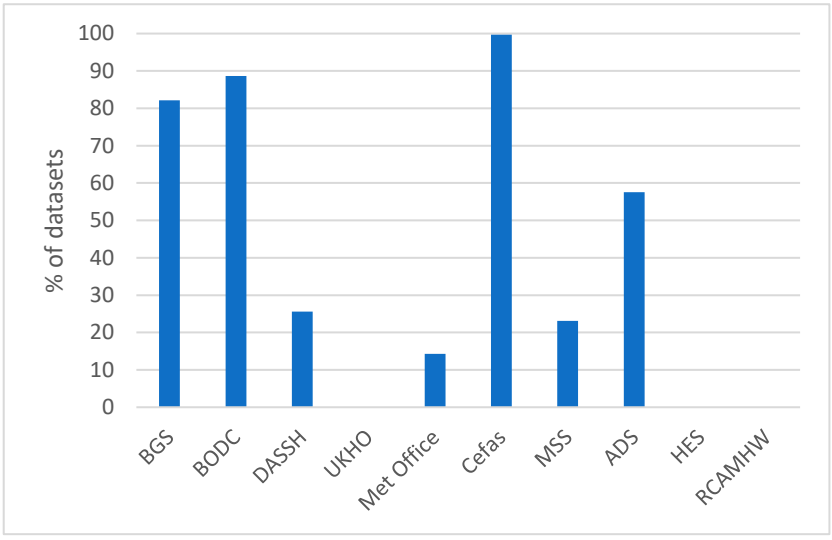


Figure 1: Percentage of each Data Archive Centre's datasets directly accessible within '2 clicks' of finding them on the MEDIN portal.

We move to international accreditation

The decision was taken in 2019 for MEDIN to transition to the Core Trust Seal (CTS), an internationally-recognised standard, as the required accreditation for MEDIN DACs. At the time, two of our DACs (BGS and ADS) had already achieved their CTS accreditation. During this year, applications are in process for DASSH, UKHO, the Met Office and BODC. The remaining DACs are now being supported in the process of applying for CTS as their MEDIN accreditations lapse, with RCAHMW and Cefas planning submission. CTS is a natural extension of MEDIN accreditation and allows our DACs to broaden their international reputations, further highlighting them as approved, trusted repositories.

We improve provenance of our data holdings

The provenance of data is a record of the people, organisations and activities involved in producing, influencing, or delivering that data. In particular, provenance is crucial in deciding whether data and information are to be trusted, how they should be integrated with other diverse information sources, and how to give credit to the originators when reusing them. This year, our DACs continue to explore ways to improve provenance within their data holdings and shared knowledge on the use of Persistent Identifiers to record different aspects of provenance.

We improve the user experience when submitting data

Increasingly, the data being collected and submitted for archive within MEDIN are cross-discipline and cross-DAC in nature. For a contributor, interacting with each DAC separately can be both time-consuming and counterproductive. During this year, the DACs have continued to develop and strengthen a triage process for archiving multidisciplinary datasets. This provides a clearing house and single point for data to be submitted to the DACs and is operated by DASSH on behalf of MEDIN.

Challenges and opportunities

This year our DACs noted some financial challenges that they will face in coming years. In particular, the water column oceanography and marine geology and geophysics DACs (BODC and BGS) received confirmation of a further 5 years funding as part of their Natural Environment Research Council (NERC) Data Centre National Capability evaluation and commissioning process. Although there was no reduction in funding, the funding is not inflation proofed, which will bring challenges. Another of our DACs, Historic Environment Scotland, receives additional revenue from its Commercial and Tourism arm. The impact of the Coronavirus pandemic has had a significant impact on income from this revenue, which is likely to impact on the wider organisation over the next couple of years.

Standards for marine data and metadata

This year our data guidelines were accessed 40% more often than last year

UK marine environmental data are collected or managed by over 600 different organisations. Our metadata standard and data guidelines are the backbone of our vision for all UK marine data to be Findable, Accessible, Interoperable and Reusable (FAIR). By providing consistent, standardised ways to describe datasets, we make sure that the wealth of UK marine data can be easily found, accessed, and reused.

We ensure marine data can be found

We developed the MEDIN Discovery Metadata Standard to ensure all relevant information about a marine dataset is readily available, to allow a potential user to make an informed decision about whether it is pertinent. MEDIN keeps the Discovery Metadata Standard and tools up to date to reflect updates to national (GEMINI) and international (EU INSPIRE and ISO) standards and working practices. Our two tools for creating MEDIN-compliant discovery metadata are Metadata Maestro and the MEDIN discovery metadata editor. Metadata Maestro downloads remained low this year (32 downloads) but is not surprising as the tool has not been upgraded for several years, so existing users did not need to download an updated version. In 2022-23, 84% of downloads were from the private sector with government (including devolved administrations and arms-length bodies), Non-Governmental Organisations (NGOs) and academic users accounted for 0%, 6% and 9% of downloads, respectively. Non-UK users accounted for 37.5% of downloads for 2022-23 and were from commercial organisations. The MEDIN discovery metadata editor, a tool hosted by DASSH on behalf of MEDIN, had 82 new registrants in 2022-23, bringing the total number of users to 1174; 98 of these users actively updated metadata records using the tool in 2022-23. DASSH recorded 341 new records created in the online MEDIN metadata editor in 2022-23, continuing the downward trend from 370 in 2021-22, 583 in 2020-21 and 815 in 2019-22.

We ensure marine data can be reused

MEDIN offers a suite of 30 data guidelines to help the marine community collect all relevant information to make data reusable. The MEDIN data guideline for bathymetry was the most downloaded guideline this year (Figure 2). Many guidelines have seen an increase in downloads this year compared to the previous year, with the video, ad-hoc sightings and trawl & dredge, and vertical profile guidelines each being downloaded almost twice as many times as last year, and the transect guideline being downloaded more than five times as often as in 2021-22. Many of these guidelines are relevant to fishery-related projects funded by DEFRA, who request MEDIN compliance as part of their funding contract and is a great illustration of the impact this step can have. A new guideline for cetacean data was published in August 2022, which was developed by the Joint Cetacean Data Programme (JCDP) in conjunction with MEDIN. The community have already shown immense support for this new guideline, and it demonstrates the success of MEDIN's adoption of guidelines developed in partnership with external organisations.

The MEDIN Discovery Metadata Standard and suite of data guidelines were downloaded throughout 2022-23 (Figure 3). The MEDIN discovery metadata standard was downloaded 556 times in total (compared to 672 in 2021-22), and the guidelines 1394 times (compared to 1001 in 2021-22). An updated version of the MEDIN discovery metadata standard (v3.1.2) that included minor updates was published in October 2022. The MEDIN standard maintains compliance with UK GEMINI v2.3. The number of downloads of MEDIN resources underestimates the number of users, as existing users may only download resources if they have been updated.

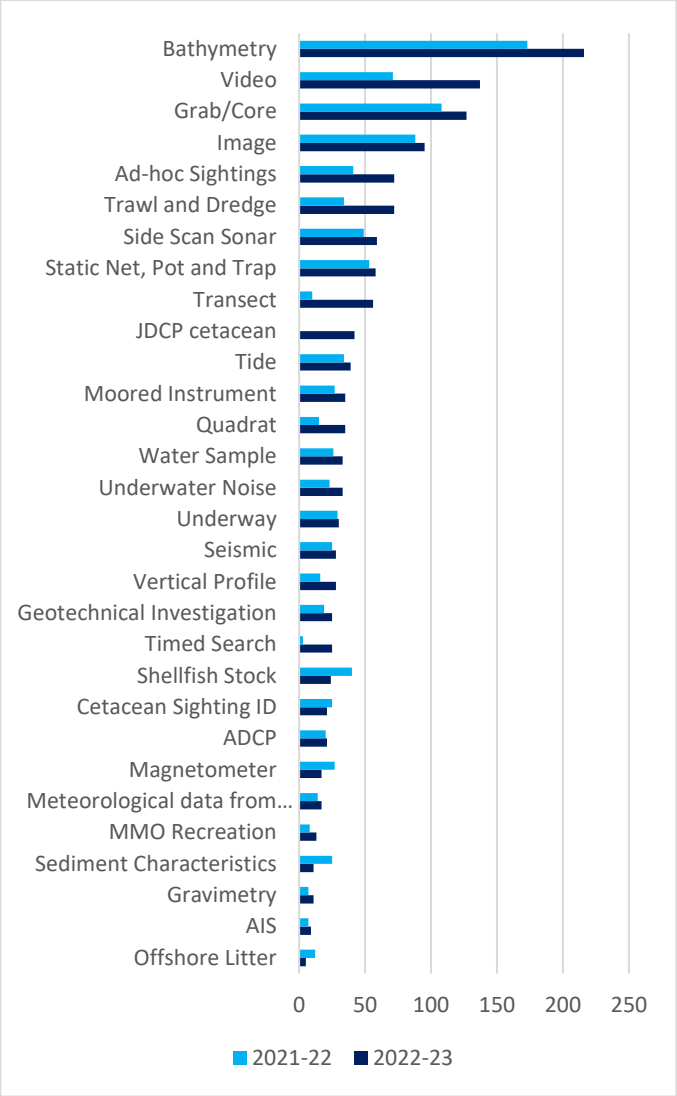


Figure 2: Number of downloads of each of the MEDIN data guidelines in 2021-22 (light blue) compared to 2022-23 (dark blue).

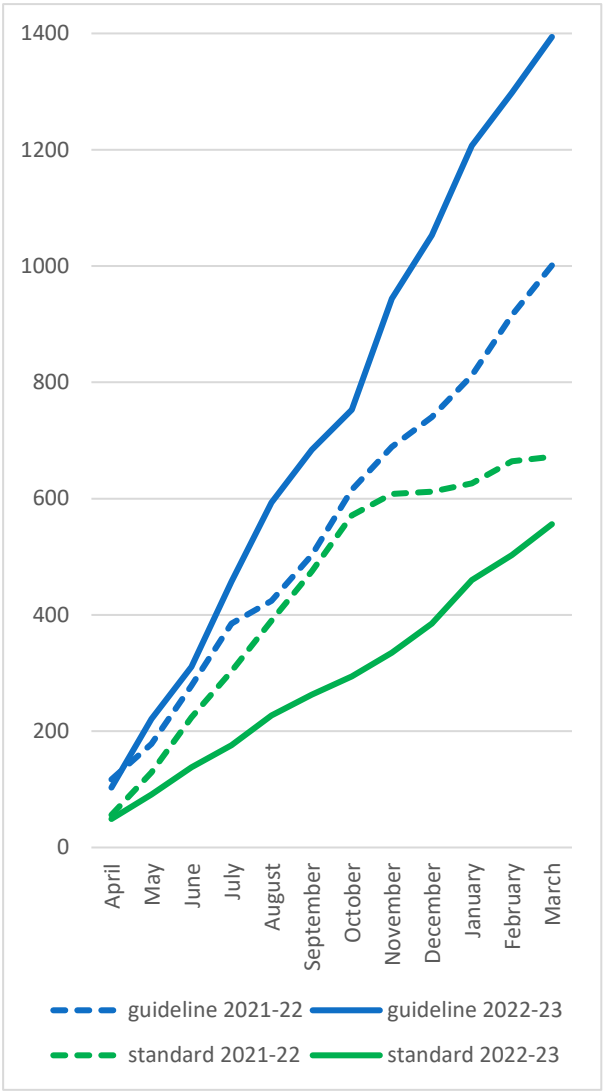


Figure 3: Cumulative number of times the MEDIN data guidelines (blue) and metadata standard (green) were downloaded per month during 2022-23 (solid) compared to 2021-22 (dashed).

We improve UK marine data management

Having developed a new online version of the MEDIN workshop in 2021, we were able to continue our programme of outreach and education to ensure our metadata standard and data guidelines are adopted across the marine sector. The modular online training course, hosted on the internationally-recognised platform OceanTeacher Global Academy, covers an introduction to data governance and MEDIN, controlled vocabularies, using the MEDIN data guidelines, and creating MEDIN-compliant discovery metadata, as well as general data management modules provided by MEDIN Sponsor OceanWise. During 2022-23 we held two online workshops in collaboration with OceanWise, providing the marine community with regular opportunities for data management training. These training workshops help the UK marine community adopt the MEDIN data guidelines and discovery metadata standard and introduce MEDIN to the international marine community as an example data governance framework. Additionally, we ran a bespoke workshop for MEDIN Partner organisation Cefas in November 2022, focussing on MEDIN guidelines and discovery metadata as well as the data lifecycle and the importance of data management planning. This year we welcomed 93 attendees in total from 45 organisations from the public sector, private sector and academia. There were 18 international attendees from 17 organisations, which can be attributed to the international reach of the OceanTeacher platform.

Web portal, products and services

This year we exposed our data to a wider audience

Effective online tools are key to providing users with access to marine data. The MEDIN discovery metadata portal is by far the most comprehensive online catalogue of UK marine environmental data available. We meet the needs of the marine community in finding marine data and information with two main tools: the MEDIN portal and the UK Directory of Marine Observing Systems (UKDMOS). Our users access UKDMOS to discover information about sustained monitoring programmes undertaken in the UK and access the MEDIN portal to search for actual data. The two search interfaces are distinct, allowing users to interrogate the metadata to answer different questions.

We help users find marine data

This year we took a significant step to open up our metadata holdings to a wider audience in an automated way. We did this by exposing the catalogue of metadata in the MEDIN portal using an Application Programming Interface (API). One of the drivers for this was to make it easier to access MEDIN metadata from other portals, allowing MEDIN to be a UK conduit for marine metadata into other systems. Another driver was to support interoperable links between portals, such as the MEDIN portal, UKDMOS and the MEDIN DACs. The MEDIN portal API[3] was completed in early 2023 and was almost immediately put to use by the Crown Estate for its Offshore Wind Evidence & Knowledge Hub (OWEKH), which will provide access to a range of data, including marine environmental data, relevant to the offshore energy sector.

We find out what our users need

This year we surveyed the marine data community to find out what our users need from the MEDIN portal. The feedback received from 23 respondents to the survey was collated with ad-hoc feedback received since the last time the portal was upgraded. In addition to improvements to the user interface and backend infrastructure, there will be a focus on enhancing the reference layers area of the MEDIN portal and improving their usability and prominence.

Overall, the headline figures for FY 2022-2023 were:

1,865 the average number of page views per month (using Google Analytics)

17,326 the total number of discovery metadata records in the MEDIN portal as of 31 March 2023

3 MEDIN DACs provide metadata conforming to version 3.1.1 of the MEDIN discovery metadata standard (Cefas, UKHO and BODC), which represents approximately **10,000** of the total metadata records.

2 new harvesting endpoints were made operational for UKHO and The Crown Estate

There was an upward trend in portal usage through the year (Figure 4)

3 https://portal.medin.org.uk/geonetwork?SERVICE=CSW&VERSION=2.0.2&REQUEST=GetCapabilities

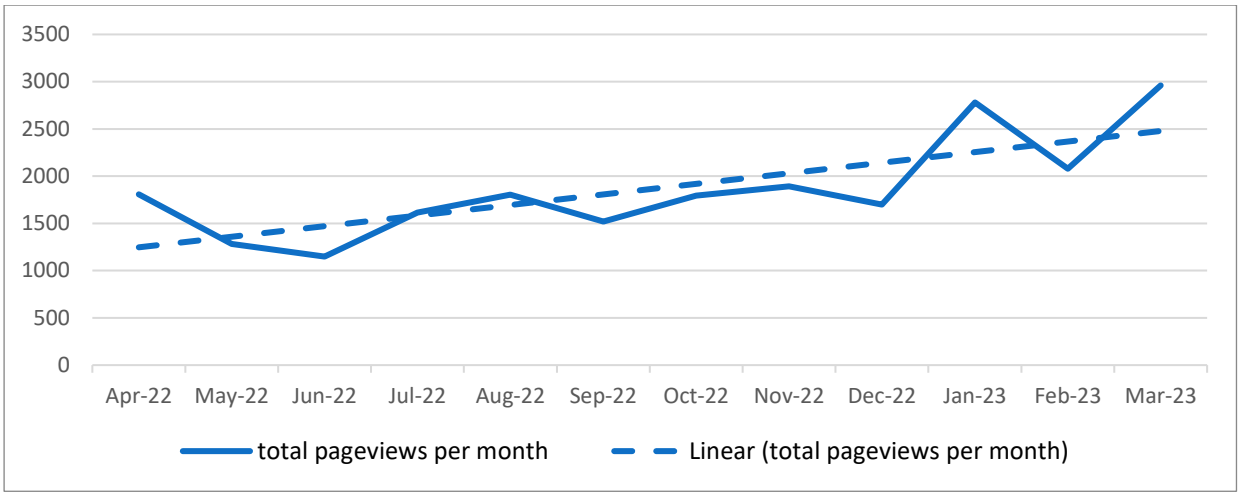


Figure 4: MEDIN Portal web traffic (total page views per month) from April 2022 to March 2023 (Source: Google Analytics)

We help users understand the UK's marine monitoring

This year's traffic to UKDMOS has been steady (Figure 5) with an overall increase from last year (the previous year's metrics for FY 2021/22 are in brackets below). We have updated the content of the metadatabase based on input from the people responsible for the monitoring programmes. This included the addition of 305 monitoring sites. This year we trialled MIKADO (an online SeaDataNet metadata creation tool) to create new programme metadata in UKDMOS, with the aim of providing a more efficient means to update UKDMOS.

Overall, the headline figures for FY 2022-2023 were:

573 the average number of unique visitors per month (455)

1,153 the average number of visits (=sessions or multiple pages accessed) per month (907)

4379 the average number of pages accessed per month (3923)

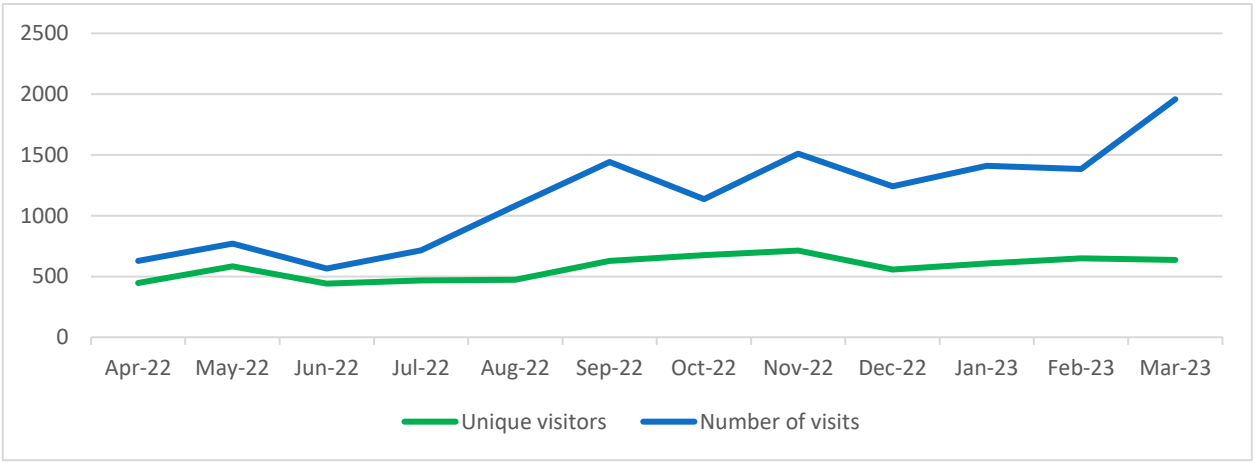


Figure 5: UKDMOS web traffic (total numbers per month) from April 2022 to March 2023 (source: AW Statistics)

We provide helpdesk support for our users

The MEDIN Metadata Helpdesk at DASSH is on hand to help metadata suppliers having technical difficulties generating metadata files. This financial year it received 56 requests for assistance, with a total of 250 follow-up e-mail correspondences. The Helpdesk continues to be a service in constant use.

International awareness and coordination

This year we continued to facilitate international knowledge and data exchange

The UK marine environment is a small part of an ever-changing global system that crosses national boundaries and influences (and is influenced by) conditions in distant regions. UK scientists and decision makers rely on marine data from global databases, as well as national ones, in order to take a wider view of our marine environment. It is therefore crucial that UK marine data can easily flow to global databases and that our Data Archive Centres keep their systems linked in, aligned to and interoperable with international data management initiatives. The key international drivers for ensuring a transparent and efficient flow of marine data are shown below. Many of these international drivers inform UK legislation for the marine environment.

International	**European**
OSPAR Quality Status Reports	Marine Strategy Framework Directive
United Nations Convention on the Law of the Sea	Water Framework Directive Assessment of Ecological and Chemical Status
United Nations Sustainable Development Goals	Common Fisheries Policy Annual Assessment
	Habitats and Birds Directive reporting
	INSPIRE Directive compliance
	European Environment Agency State of the Environment Reporting[4]
	Copernicus Marine Environment Monitoring Service

We facilitate international knowledge exchange

During 2022-23 we acted as a hub for promoting global developments in interoperability to the UK marine data community. We did this by facilitating knowledge exchange between UK experts and international initiatives such as the **International Council for the Exploration of the Sea** (ICES) Data and Information Group (DIG), and the **Intergovernmental Oceanographic Commission** (IOC) International Oceanographic Data and Information Exchange (IODE).

A key MEDIN contribution to ICES DIG has been the coordination of a review of ICES data guidelines, ensuring that these resources remain relevant and available to the wider ICES community. In March 2023, MEDIN also attended the 27th Session of the IODE Committee at UNESCO Headquarters in Paris – MEDIN's first Committee Session since acquiring IODE Associate Data Unit (ADU) status. This was an important event for networking with the global community, acquiring knowledge of existing and emerging global initiatives and helping to steer associated policies, such as the IOC Oceanographic Data Exchange Policy, which was under review at the meeting.
MEDIN Marine Data News was used during the year to disseminate information from the international community to the wider MEDIN community, for example an article to detail Marine Data Interoperability at the UN Ocean Decade Conference, appearing in the August 2022 edition[5].

[4] UK is no longer a member of the European Environment Agency
[5] https://mailchi.mp/f1ce47c8f604/marine-data-news-august-2022#MEDINFAIR

We deliver data to international systems

Our Data Archive Centres deliver their data holdings to international databases to support science, policy and sustainable development of our seas. For example, MEDIN Data Archive Centres (BODC, Cefas and Marine Scotland) deliver marine contaminants and fisheries data to the International Council for the Exploration of the Sea (ICES). These data are used to make regional assessments of the state of our seas by OSPAR. Similarly, DASSH, the MEDIN Data Archive Centre for marine species and habitats, is the UK node for submitting data to the Ocean Biodiversity Information System (OBIS), part of IODE.

During 2022-2023 MEDIN continued to facilitate data flow from BODC to the Global Ocean Acidification Observing Network (GOA-ON), in support of UN Sustainable Development Goal 14.3 ‘Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels’. This year's submission was from Western Channel Observatory Site E1 (2016-2019).

Fruitful technical discussions were held during the year between the ICES Data Centre and BODC with a view to resuming routine flow of data from BODC to the ICES Oceanography database, in the revised ICES format.

We reach global audiences

This has been a standout year for MEDIN reaching global audiences with MEDIN Data Archive Centres contributing to a wide range of international conferences, workshops and webinars, including those named below.

International

- Argo
- Bathymetric Chart of the Oceans, GEBCO
- DataCite Member Meeting
- GEOTRACES Data Management Committee
- Intergovernmental Oceanographic Commission (IOC) Oceanographic Data Exchange Policy Working Group
- IOC International Oceanographic Data and Information Exchange (IODE) Committee meeting
- IODE International Ocean Data Conference
- International Council for the Exploration of the Sea (ICES) Data and Information Group (DIG)
- ICES Annual Science Meeting
- International Digital Twins of the Ocean Summit
- International Hydrographic Organization (IHO) Crowdsourced Bathymetry (CSB)
- International Symposium Digital Transformation of Archaeological Data
- OceanOps Metadata webinar
- re3data COREF / CoreTrustSeal Workshop on Data Quality Management at Repositories
- Research Data Alliance (RDA) plenary
- Seabed 2030
- Ships Operations Team Task Team on Key Performance Indicators
- Surface Marine programme of the Network of European Meteorological Services, EUMETNET (E-SURFMAR)
- Workshop on Operational Measurements for Ocean Waves
- Open Geospatial Consortium (OCG) Data & Metadata Fall Roundtable
- World Meteorological Organization (WMO)

European

- Copernicus in situ thematic centres - Copernicus INSTAC European Geosciences Union (EGU) conference
- Digital Twin Ocean (DTO) BioFlow
- European Association of Archaeologists
- European Marine Obsevation and Data network (EMODnet) Biology Annual Meeting
- EMODnet Ingestion 3
- European Ocean Science Cloud FAIR-EASE kick-off meeting
- MARine Coastal BiOdiversity Long-term Observations MARCO-BOLO
- Oceanic Platform of the Canary Islands (PLOCAN) Glider School

A key highlight of the year was the delivery of a presentation on MEDIN's trial of the Open Geospatial Consortium's (OGC) API standards for environmental data during the Second International Ocean Data Conference (IODC-II). This was a conference organised for the IODE community, preceding the aforementioned 27th Session of the IODE Committee.

Challenges and Opportunities

IODE's Ocean Data Information System (ODIS) and associated Ocean InfoHub (OIH) project have emerged as important initiatives for global exchange of metadata and data. Exchange to ODIS/OIH is achieved by making metadata and data interoperable, therefore harvestable by machine. This opportunity therefore also presents an associated technical challenge for MEDIN. ODIS/OIH is a key contribution of IODE to the UN Decade of Ocean Science for Sustainable Development, thereby making it an important and high-impact opportunity for MEDIN.

Resources and applications development

This year we shared new marine data initiatives with our partners

Our users require access to a broad range of marine data, services and products, in addition to the raw data that forms the core of MEDIN's activities. We work closely with UK marine data holders to encourage and help them deliver on their data sharing and publishing objectives. This includes the role of the Data Archive Centres in delivering data products and services.

We facilitate access to reference data

The MEDIN portal provides access to a range of data, services and products. This year we asked our users how we can improve access to authoritative and reference data from the MEDIN portal. All the feedback we received will inform the next development cycle of the MEDIN portal, which is planned for the next financial year. The MEDIN portal is a key component of the UK's national framework for marine data.

We explore new technology for accessing data

A key objective for MEDIN is to support the UK marine sector to implement globally- and cross-domain **interoperable marine data services**. For example, machine-readable Application Programming Interfaces (APIs) for our Data Archive Centres (DACs) and others. This year we funded three MEDIN DACs (Cefas, DASSH and BGS) to implement and stress test the recently published Open Geospatial Consortium (OGC) Environmental Data Retrieval (EDR) API standard. This standard is part of the OGC suite of standards and is documented on Github. OGC API standards define modular API building blocks to spatially enable Web APIs in a consistent way. The three DACs participating in the pilot project used different technologies to implement the standard on some or all of their data holdings. The project revealed that the flexibility of the standard is both a strength and a weakness and that it is more applicable to some types of marine data than others. We believe that this is the first time that this OGC standard was tested on marine data globally and the work generated increased international interest in MEDIN. MEDIN's online workshop to share the results with key stakeholders was very well received.

We horizon scan for innovative technology

This year we continued our horizon-scanning exercise so that we can support the UK marine community adapt to advances in technology. We capture community input in an open forum and invite additional input throughout the year to inform future MEDIN development work. This year, we used our annual open meeting to develop on this theme, inviting partners to discuss their work in some of the areas highlighted during our horizon scanning, including digital twins of the ocean and standards for Application Programming Interfaces.

What is a digital twin?

At the MEDIN Open meeting 2023, Jon Blower (NOC) presented an overview of digital twins including a definition based on the Gemini Principles[6]. A digital twin is a realistic digital representation of something physical. What distinguishes a digital twin from any other digital model is its connection to the physical twin. Twins should be interoperable with each other across communities and support real-world decision making.

[6] Bolton, A., Butler, L., Dabson, I., Enzer, M., Evans, M., Fenemore, T., Harradence, F., Keaney, E., Kemp, A., Luck, A., Pawsey, N., Saville, S., Schooling, J., Sharp, M., Smith, T., Tennison, J., Whyte, J., Wilson, A., & Makri, C. (2018). Gemini Principles. CDBB. https://doi.org/10.17863/CAM.32260

Communications, outreach, forums and publicity

This year we developed an ambitious vision for communicating our work

The UK marine community is a large and varied group of organisations spanning government departments and agencies, academia, commercial and industrial partners, and non-governmental organisations, to name a few. It is only by working together that we can realise the full financial, scientific and environmental benefits of sharing our marine data. By bringing together the different sectors of the UK marine community, we share knowledge through different channels and provide opportunities for MEDIN Sponsors and Partners to communicate to audiences they may not otherwise be able to access. Communication with these varied stakeholders is key to developing a network that serves all our partners. We raise awareness of MEDIN and spread knowledge of our work throughout the network with high levels of outreach with the marine community and general public. This leads to greater awareness of the importance of marine data management and encourages the improvement of marine data management around the UK and internationally.

We raise the profile of MEDIN in the marine community

The MEDIN Communications Working Group was set up in April 2022 to share knowledge, exchange marine data management communication ideas and establish a MEDIN communications vision. This exciting new working group, consisting of the communication leads from our Sponsor and Partner organisations, aims to facilitate the widespread dissemination of information leading to the efficient exchange and reuse of marine data and information. Our communications vision is: **'to facilitate the communication of high-quality, up-to-date marine evidence and science to the global marine community'**.

National conferences and events are efficient ways to promote MEDIN services and resources and share marine data knowledge with a targeted audience. This year we hosted a trade stand and gave an oral presentation at the Marine Alliance for Scotland's Science and Technology Annual Science Meeting. Our presentation, "How MEDIN supports the marine community to address Scotland's Blue Economy Vision", outlined how the MEDIN tools and services support the Blue Economy Vision in terms of marine data accessibility and monetary benefits to the economy via the re-use of existing marine data. This outreach event resulted in invigorating conversations with stakeholders, some learning about MEDIN for the first time. MEDIN also attended the online Offshore Energy Technology 4.0 conference, which initiated further collaboration discussions with marine industries and the North Sea Transition Authority.

We reach new audiences

MEDIN uses multiple online platforms to promote services and marine data news to the global community. X (formerly Twitter) content posted by MEDIN was seen a total of 63,014 times this year. With over 2,200 MEDIN profile visits from other Twitter/X users, our followers increased by 116 to 1882. Since 2021, our follower count on LinkedIn has increased steadily, allowing our content to reach a wider global audience. At the end of March 2023 there were 300 followers on the MEDIN company page, and around 200 connections on the MEDIN profile page (Figure 6). Increasing audiences and engagement in this way generates more visitors to the MEDIN website, more registrations for MEDIN workshops and more awareness of marine data management best practice.

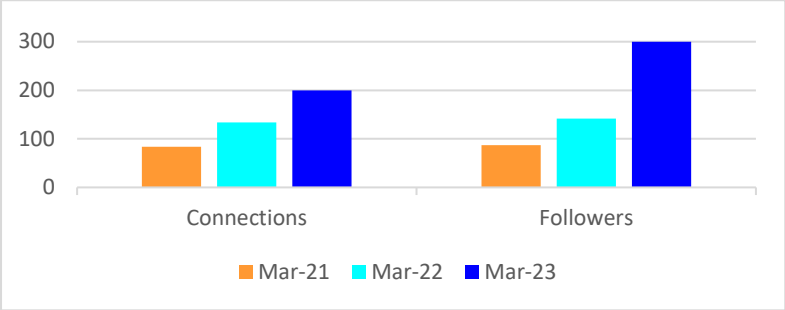


Figure 6: Bar chart showing the growth of MEDIN LinkedIn followers and connections since March 2021

We share marine data knowledge

This year we posted four editions of Marine Data News, our free online newsletter, to 540 recipients. Published in May, August and December 2022 and again in March 2023, Marine Data News has an international readership. Figure 7 shows the locations that the newsletter was opened most frequently for each edition published this year. As expected, the UK has the largest readership, but noting the logarithmic scale, it is interesting to see the geographic range of interest in our activities. Figure 8 shows that interaction inside the newsletter has been increasing since December 2021 - an increase in total clicks means that more users are following links to resources from the articles that we publish.

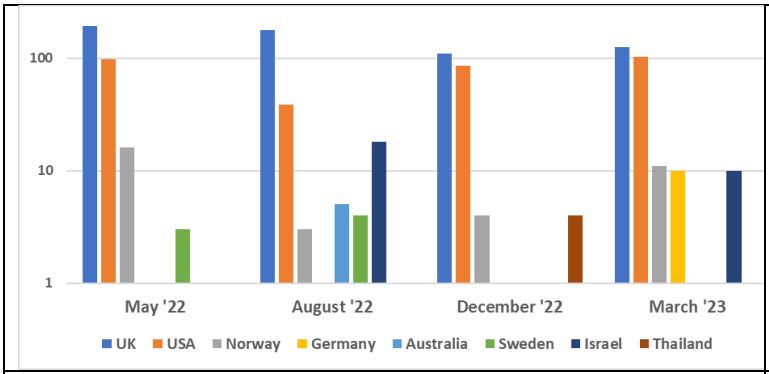


Figure 7: Bar chart showing the geographic distribution of frequent readers of each edition of Marine Data News published this year.

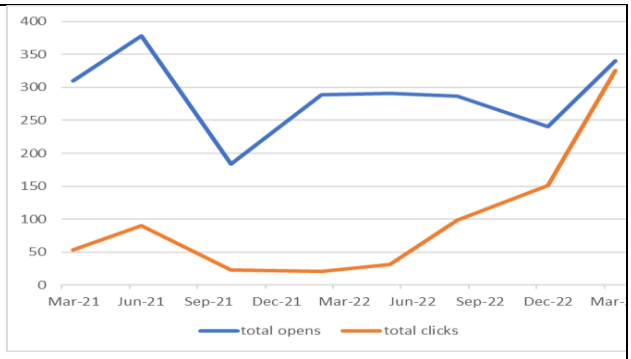
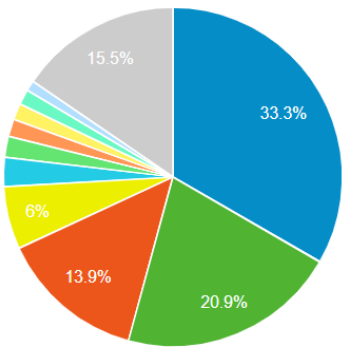


Figure 8: Plot of the number of times each edition of Marine Data News published this was opened (blue line) and interacted with (orange line)

Our website, www.medin.org.uk, continues to be a major source of information and resources for our users. Figure 9 shows the geographic breakdown of our website users this year. The grey portion, at 15.5%, are users without an identified location. There were a total of 53,101 page views during this period. An interesting spike in page views coincided with a hackathon that was taking place where attendees were using MEDIN to find open access data. Of the 22,026 users this year, roughly 11,000 reached the website directly, whilst nearly 7,000 arrived on the website through organic searches, 3,729 through referrals and only 297 from social media.



The top 5 webpages that users landed on:

- MEDIN homepage
- MEDIN portal
- MEDIN Discovery Metadata Standard
- MEDIN Data guidelines
- Data Standards pages

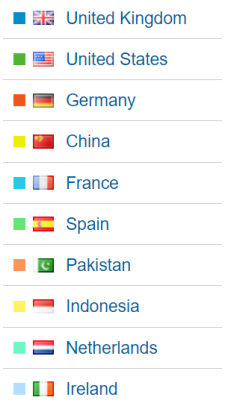


Figure 9: Pie chart showing the geographic breakdown of visitors to the MEDIN website

Management, planning and coordination

This year we continued to represent and support the marine data community

The seas and coasts surrounding the UK have a complex range of stakeholders who manage, monitor, explore, conserve and sustainably exploit the marine environment. We seek to provide tools and services that support all UK users of marine environmental data. This requires significant coordination to address the (sometimes conflicting) requirements of our users. This work stream provides our partners with overarching coordination, alignment and oversight of marine data management activities in the UK. Long-term strategic planning, annual operational planning and reporting, project and financial management, all essential for the success of MEDIN as a collaborative endeavour, are also covered by this work stream.

We inform data strategies

To support UK national and international marine reporting responsibilities, such as for the UK Marine Strategy and OSPAR, we provide marine data management advice and support to the key groups involved in marine assessments. In particular, during 2022-23 we supported the Marine Assessment and Reporting Group (MARG) and the four Evidence Groups that MARG coordinates (the Clean and Safe Seas Evidence Group (CSSEG); the Healthy and Biologically Diverse Seas Evidence Group (HBDSEG); the Productive Seas Evidence Group (PSEG); the Ocean Processes Evidence Group (OPEG)), by publishing a co-developed data strategy for the UK Marine Monitoring and Assessment Strategy (UKMMAS) community. This data strategy is a concise, high-level and ambitious summary of the expectations for collecting, using and managing marine data by the UKMMAS community. Its overarching aim is to ensure that the marine data produced by the activities falling under the UKMMAS community's remit are made available openly for long-term access and use. Moreover, we coordinated the development of an implementation plan for this data strategy, which has been submitted to MARG and its associated Policy Leads Group. This plan signposts tools and resources, including unified data management plans for people collecting marine data, to help them to manage these data effectively so that they are readily available for future assessments.

This year the UK Government's Geospatial Commission conducted a call for evidence to refresh the UK's Geospatial Strategy. As well as providing a coordinated response from the marine data community to the call, MEDIN supported our partners to submit their own response as well. This was to ensure that the views of the marine community were adequately considered and to reflect that we have specific priorities for a national geospatial strategy.

We expand our network

This year we successfully renewed four funding agreements that were coming to an end. Eleven of our sponsors have now committed to funding MEDIN until April 2024 or beyond, which provides financial stability, allowing longer-term planning and decreasing the administrative burden.

Our partners commit to best practice marine data management and contribute in-kind resources to delivering our vision. This year we welcomed AST Applied Telematics and Black Bawks Data as new partners, taking the total number of partners to sixty. Like all our partners, their logos are now displayed on the MEDIN website, and they have featured in Marine Data News. Representatives from both companies have been invited to join our Working Groups and are included in our communications with our partners. See the full list of our partners and contact enquiries@medin.org.uk if you are interested in sponsoring or partnering MEDIN.

We look to the future

As this year was the fourth year of our current five-year Business Plan period, our Sponsors requested the development of a new strategic plan to take MEDIN towards the end of the decade. For a collaborative partnership like MEDIN, it is vital we give our partners as many opportunities as possible to tell us what they need from the network. This year the key forum we planned for gathering stakeholder requirements was the MEDIN open meeting 2023, which was planned as an innovative, hybrid event for April 2023. We also gathered stakeholder requirements at our regular working group meetings throughout the year and capture community input in an open forum held on GitHub.

Challenges and opportunities

This year we faced changes to our governance structure as our parent body, the Marine Science Coordination Committee (MSCC), was dissolved in December 2022 without any consultation with the marine data management community. MSCC's inactivity over the past year meant we have operated in an autonomous way for quite some time and we will continue to do so. We will take this opportunity to revisit our links to Government and our governance structure, noting that we have a committed and engaged governing body in the MEDIN Sponsors' Board.

With thanks to our 2022-2023 sponsors

and our 58 partner organisations working with us to deliver MEDIN's vision

A list of all our 58 partners is available at https://medin.org.uk/about/sponsors-and-partners