



## **Sustainable Management of UK Marine Resources (SMMR) Annual Conference**

### **Transdisciplinary use of coastal data workshop**

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## **Introduction and background**

Managing the coast in a sustainable way relies on a diverse range of stakeholders accessing, understanding and applying scientific data and evidence. Coastal environments are where land, rivers, oceans, the sea bed, atmosphere and humans all meet. As a result, needs and provision of coastal data span across environmental domains and disciplines. As an example, Shoreline Management Plans often rely on information on population and human health; flora and fauna; earth heritage, soils, and geology; air and climate; water; landscape character and visual amenity; historic environment, land use, infrastructure and material assets. Vast amounts of data and evidence are increasingly becoming available. This evolution combined with the complexity induced by the breadth across environmental domains and disciplines offers new challenges and opportunities. However, these are poorly explored and require a discourse across disciplines and environmental domains.

We held a workshop at the Sustainable Management of UK Marine Resources (SMMR) annual conference to initiate transdisciplinary discussions and gain a better understanding of the coastal data ecosystem. The workshop was open to all participants, encouraging diverse backgrounds across academic, policy and industry communities. Specific objectives of the workshop were to discuss (i) range and diversity of coastal data, (ii) challenges and opportunities from transdisciplinary use of coastal data, and (iii) how data and evidence are accessed, interpreted and used by stakeholders.

## **Workshop structure**

The workshop was hosted in a hybrid format with some people joining in person at the SMMR conference and others joining in online via Zoom. The programme is provided in appendix 1. In person attendance was variable throughout the morning due to conflicts with other workshops but we maintained a core group throughout the morning. Following an introduction, participants were asked to discuss and answer questions on Slido. Following the first Slido poll, participants were primarily from Higher Education Institutions (9/19 or 47%) and government departments (6/19 or 32%).

We used both notes from in person rapporteurs and Slido to draft the present document. Answers provided in Slido are provided in appendix 2 and notes from the rapporteurs have been merged in appendix 3.

## **Summary of discussions:**

### Range and diversity of coastal data.

Participants were asked to indicate what coastal data they were using with responses recorded on Slido (15 entries) and by rapporteurs. The responses have been used to generate the following word cloud, which confirms the diversity in data usage.



- Ensuring adequate design of data systems. Data may differ based on granularity, consistency, duration, spatial extent, comprehensiveness, maturity, sensitivity, etc. All of these aspects have to be considered when designing data systems.
- Technical challenges. New data streams offer new challenges with respect to interpretation, visualisation, integration. This is linked with developing new skills.
- Ethics. Data protection laws may limit some datasets, and data may be used in conflictual situations.
- Strategic thinking. Coastal data generally suffer from patchy funding, crossing over disciplines and environmental domains, lack of consistent definitions, and skills shortage.

There are, however, some important opportunities:

- More transdisciplinary interactions would be extremely beneficial to improve on current systems because good practice already exists in disciplinary pockets.
- New capabilities offered by more and more diverse coastal data would foster the conception of new data products, with a focus on environmental solutions.
- New legal framework could be very beneficial towards ensuring widespread FAIR-ness of all coastal data.
- Recent developments do imply a shift in expertise and skills required and there is a need and opportunity to provide new training to develop the required skillsets.

### Interpretation and impact.

The last discussion session focused on the interpretation and impact of data (see questions in appendix 1).

The groups mentioned that the main bottleneck between the wider scientific community and policy decisions occurs between evidence teams and policy teams, often within decision and policy bodies. There is a disconnect between the two with lack of clarity about how decisions are made. Decision making is largely reactive and a consequence is that data gaps are rarely addressed. Moving to a more proactive system would require more strategic thinking and funding. There have been a few examples of good holistic systems, such as Dynamic Coast.

Ocean and coastal literacy is a significant issue. Many decision and policy bodies lack sufficient ocean and coastal literacy due either to size of or expertise within teams. This can lead to mistrust in decisions. Evidence teams tend to remain disciplinary so there would be a need to provide more training on transdisciplinarity. Lack of literacy is not confined to policy bodies. For example, Environmental Impact Assessments regularly have data missing or misinterpreted.

Trust is critical and transparency in the decision-making process is key to maintaining it. Some of the challenges include the re-use of data for other purpose than original intent. It also has to be acknowledged that decisions can be influenced by external factors other than just scientific evidence: institutional / organisational values and higher political and market factors potentially are two examples potentially leading to tension between ideology and evidence.

Funding is an important issue. Co-funding of scientific projects can create a direct route for evidence to be used in the decision-making process. This highlights the importance of relationship between agencies/stakeholders and science programmes.

Technological and methodological advances have an important role to play. For example, advances in visualisation, glossaries and standards, and the development of narratives can all help with some of the issues highlighted.

### **Suggestions for additional next steps**

- Engage with professional membership bodies and learned societies.
- Develop a framework that would ensure a pipeline from data, to evidence, to knowledge, to policy, to action.
- Facilitate collaborations between tool developers
- Engage proactively with policy and management makers
- Deliver workshops about data types, data availability, data sharing for solving coastal challenges
- Facilitate data access by requesting policy change to promote the need to share with those who the data is of need.

### **References**

Wilkinson, M.D., et al., 2016, The FAIR Guiding Principles for scientific data management and stewardship, *Scientific Data*, 3, 160018. DOI: 10.1038/sdata.2016.18

## **Appendices:**

### **Appendix 1: Workshop programme**

**Wednesday 11 May 09:00-12:00**

#### **Background and objectives**

Managing the coast in a sustainable way relies on a diverse range of stakeholders accessing, understanding and applying scientific data and evidence. Vast amounts of data and evidence are increasingly becoming available. However, these span marine and terrestrial environments, as well as several distinct disciplines, resulting in a changing and complex data-scape. We will hold a workshop to initiate transdisciplinary discussions and gain a better understanding of the coastal data-scape. We welcome participants from diverse backgrounds across academic, policy and industry communities. We will discuss the range and diversity of coastal data, challenges and potential solutions in transdisciplinary use of coastal data, and how data and evidence are accessed, interpreted and used by stakeholders. After the meeting, we will summarise the outcomes of the discussions and circulate to the participants and the SMMR Net community.

**Expected Outcomes/Outputs:** better understanding of the coastal data-scape; output will be a brief report summarising the discussions to be circulated to participants and the SMMR Net community

#### **Programme details:**

Discussion slots to be 30 minutes breakout discussions + 15 minutes summary in plenary.

- 9:00 – 9:15 Introduction to the workshop: rationale and objectives
- 9:10 – 10:00 Range and diversity of coastal data.  
*What coastal data do you use? What are positives and strengths offered by a diverse data-scape? What are negatives and weaknesses?*
- 10:00 – 10:15 Break
- 10:15 – 11:00 Challenges and opportunities.  
*What challenges are you finding when using coastal data? What are opportunities and potential solutions to these challenges?*
- 11:00 – 11:45 Interpretation and impact.  
*How are data and evidence interpreted and used for management and policy making? How do data and evidence impact management and policy making?*
- 11:45 – 12:00 Next steps

## **Appendix 2: Slido Summary**

### **1. *Where are you from?***

Higher Education Institution: 9; Independent Research Organisation: 1; Public Sector Research Establishment: 1; Government Department: 6; Industry: 0; Other: 2

### **2. *What coastal data do you use?***

Environmental data; qualitative, but what is meant by data?; coastal typologies, coastal character assessments; Risk and vulnerability, CBA, historical sources; Remote sensing, aerial photography, geospatial data (Scottish saltmarsh survey, Dynamic Coast, assets and infrastructure, socio-economic vulnerability); Oceanographic; qualitative; demographics and socioeconomics data; Benthic Habitat Data; Essential fish habitat (mostly spawning grounds); Demographic, socio-economic & environmental; Lidar, satellite imagery, orthophotos, water levels (groundwater, tidal, river), waves, salinity, temperature; Marine traffic density; Environmental, Social, Economic

### **3. *What are positives and strengths offered by a diverse data-scape?***

- Possibility of cross-checking validity of data to check consistency across different datasets  
More opportunities to experiment and innovate  
Inclusion of diverse information and views
- Different data sets including socio-economic data and historical data can help create a narrative and through storytelling inform wider public
- by using a different types of data we can validate  
what date we use reflects on our values
- Mixing quantitative and qualitative social data can help offset the limitations of both. Diverse datascares stimulate deeper philosophical discussions about the underlying assumptions of different types of data collection. Even what is data and what is applicable in different scenarios.
- Over the last 30 years for the UK coast have more interoperable data structures (data repositories, websites where anyone can download data) with good data availability, rather than data which is stuck in each organisation and hard to get at.

We have the opportunity to create baseline locational maps on which to drape other layers of knowledge- in 2d and 3D- though maps and charts are hard to integrate in the coastal zone

- Allows meaningful decisions to be made if lowering the conflicts
- It allows to capture a broader range of information. There are inherent limitations in certain data-capturing methods which can be filled. Diverse data also allows for more creative and innovative developments of ways to synthesis diverse information, for instance 3D mapping.
- Better understanding of different facets of a question/challenge
- Ability to get historical data by using diverse sources to build long term datasets
- Enables a flow of information for maximum utilisation in marine and coastal management removing a layer of barriers against marine management and sustainable utilisation that doesn't need to be there. The more diverse and accessible a data pool, the more opportunities for analysis and studies and novel view points
- We can identify data gaps immediately.
- More readily able to experiment and innovate, and may make it more likely to have expert-advised data
- It allows for more meaningful management decisions with fewer conflicts

- Allows inter connectivity of data types to be identified and ensures a holistic approach
- Better support for management activities and understanding ecosystem processes from multiple perspectives.

#### **4. What are negatives and weaknesses of a diverse data-scape?**

- Storage capacity. Accuracy of the citizen science data. Change of species names. Change in recording methods over time.
- Data may not be accessible, not really properly catalogued. As a community, we need to think about how we use the funding and how do we make it tight and available. You may collect the data but we don't really make it accessible and properly quality controlled. We need accountability for funding. We need to think how data is stored, how will be made accessible and maintained. Moving on there is the request from journals to publish data, but what happens with historical data.

Frustration on not being able to access private data nor the way it was collected

Data in social sciences lived experiences, qualitative, is difficult to use to inform as an effective decision making tool.

New forms and methods of collecting data and we need to standardise it.

Inaccessibility of metadata: granularity and working across disciplines. Disciplines may use the same word but in different ways. For example coast may mean very different things for different people.

Easy to get into getting more information. We need to spend more time on the question we want to ask and then ask the detailed information. Tie data to a problem. Sometimes by getting on the phone and getting to people may help you getting the information you need.

There is a shortage of verifiers in marine and coastal. There have been people but there are no people joining. There is a shortage of this skill. We need data skill on collection and quality control

keeping up with data, there are data not accessible or the metadata is not accessible.

- Need the skills to be able to interpret and understand a range of different types of data. Need the training and understanding to be able to understand the values of diverse data. Need to be aware how data is translated as it is processed e.g. GIS. There is a danger that users don't understand the limitations of the data given the range of expertise involved.
- Information Overload! There are reams of data and it's hard to understand even the variety and possibility of types of data which could be used and how they could be used is difficult to comprehend personally and collectively- this is where a transdisciplinary approach can really help.

Mobilising the data. It is one thing to store the data- (data repositories, metadata and data custodians are all improving this)- but it is another thing to mobilise it and get it to the people who make decisions. This is beyond the question of datascares- it's part of the data-information-knowledge-wisdom pathway

- Interdisciplinary terminology



- Data hierarchies and privileging certain types of data over others. Transdisciplinary capacity building is needed to understand the holistic datascape to standardise and draw meaning from the data.
- Access, knowing what is available
- Differences and variations in interpretation of certain key terms leading to misinterpretation/misuse of data
- Riddled with risks and assumptions
- Standardisation issues
- The data-scape is only as strong as the data within it. Many high-quality data sources are held privately and not openly available, and also not therefore used as Best Available Evidence. Data is also very poor for the coastal, estuarine and marine environments due to long-term underinvestment in research and monitoring, and marine teams within competent authorities. How do you define “coast”?
- Difficulty in accessing data (open), difficulty in finding data (existence and geographical location), metadata, quality control.

### ***5. what challenges are you finding when using coastal data?***

- access, quality gaps,

terrestrial, socio-economic applied to the sea alongside, data is biased because related to a council so not collected from the point of view of the sea. People less favoured may be very close to the sea but actually may not be in contact with the sea. There will be also people that live by the sea but have no interest in the sea and then there will be people who were indigenous to the sea and have a link to the sea but have been moved away from the sea for socioeconomic reasons and will not be considered or registered by the sea. This all relates to the limit that we define for the coastal areas in relation to distance to the sea. The parameter used to define coast is distance and so this influences how and who are the beneficiaries because the assumption is that they live within 5miles. also rise of cost housing by coast is removing people from the coast that may actually be beneficiaries of the data

when working with communities, who use the sea

knowing where to find certain strains of data, there are no signposts. data may exist, but don't know where to find it. how do you signpost, maybe it is a question of not having all the data in one place, but having a signposting place where you can find where the data is. finding data on demographics is very tricky to find. does it exist and where to find it. there is a silo in the organizations, not knowing what is available in a organization. Need for signposting requirement.

granularity of the data that is needed, but it may not exist that level of detailed information or where to find it.

also data quality, being able to collect data and also keep in mind who is going that data. need for a very multidisciplinary mindset from the start of the collection/project. need to make links and having a mindset that we are part of a system

GDPR can cause huge problem because people using same stakeholders but cannot interact or engage with stakeholders properly. also data may not be for sharing and organisations may

have holding on data so data cannot be used by other organisations. what caveat can you use so that you can still use the data even if you don't use people's information. need to be thought about GDPR since beginning. learn from other areas like health so that data can be used if there is a certain level of risk

not use of data to derived other data. interretrial people desaggregate data to derive data.

danger of generating too much information. some data need to be thrown away because it has been turned into something more useful

move into transdisciplinarity and that require strategic thinking.

- The limitation of funding to continue garnering information. Lack of coherency or control in the dataset.
- Challenge of people wanting qualitative data to be quantitative data.

Challenge of interpreting interview data, communicating the depth.

No one is drawing not the data in their decisions. Don't know if decision makers are actually making use of this.

Funding to ensure long-term use of studies.

difficult to combine different data sets.

- The amount of data, what is relevant and how we use it. Open access and fairness, commercial sensitivity. Potential conflicts between users.
- For coastal typologies, the challenge has been that this dataset has not been used much by decision-makers- I am not sure if this is due to lack of awareness, that it is in the wrong format for decisions, or it is not included in thinking.

Combining the ordnance survey terrestrial maps and hydrographic charts at the coastal zone and draping them over terrain models to produce a combined COASTAL baseline map/visualisation is still hard to do well in my opinion.

- The consistency and granularity of data
- Lack of consistency and comprehensiveness (spatial extent), and duration.

## **6. What are opportunities and potential solutions to these challenges?**

- good practices already in practice altimetry GNSS data reprocessed into coordinates useful by centralising some steps you don't have people doing same steps to work with data

CEFAS wave data collates info from different sources and puts it into same formats so that accessible and again people don't repeat same procedures

change in approach in how we collate data 3 seas project. if industry/private companies uses data to show what they do has an impact, stakeholders request that data is accessible to government and agencies so that the regulators can have access to the best data. this should be made legal requirements this would require legal change

oil sector trail drilling has to lodge data in a central repository, we take oil exploitation

seriously but not so much environment. the process is in place but they only do it for oil drilling not for the environment. we have done it so we could do it also for environment. need to centralize data.

data not shared with the people who actually need it, and if data centralized and accessible for different disciplines/methods. need for learning from other disciplines. what is the level of risk and impact of not having the data.

actual collection and monitoring of research: huge deficit in research in areas where data is needed. should be required to the industry to get high-quality data if that not available. cost to every development in Severn estuary and then that pot of money is used to encourage research into data gaps and filling those gaps.

data easily collected could be used as indicators for things that we are interested like indicators of ecosystem functioning. missing links with land, there are things on land and on marine, perhaps question is whether they are relevant for the questions we want to reply and links land to marine.

On the note of standardisation - MEDIN has produced a system however the need to attend in-person training creates a barrier to engagement with this. Also, with data such as biotopes, there is standardisation of how this is stored and illustrated for terrestrial but not for coast/marine.

stewardship, if think on local decision making, bring together of all people collecting data in a place and work together

- The conception of data products, collaboratively drawing data together. Self-reflection, to interrogate internal processes and the recognition that adaptation and evolution of methodologies is necessary. Opportunities for boundary crossing and co-creation.
- Talk more about data products, different people coming together to make a thing that combines knowledge together in novel ways.

People need to talk about solutions.

empowering current and future researchers to cross boundaries.

bringing change to the table is progress so importance of transdisciplinary discussions

Disciplines are people, think about communication between people

Worried about on the shelf tools, need conversations with people who make the tools to understand them.

Critically reflect what data is and include conversations with arts-based researches as well as social scientists

- Standardisation across the disciplines and integration of all different data (socio-economical, environmental etc.). Legal frameworks for open access and fairness.
- Could organisations come together to produce new 'combined' data products- e.g. Ordnance survey and UK hydrographic office come together to produce combined coastal mapping product.

Transdisciplinary research projects provide a solution for data mobilisation! These should not only produce 'decision-support tools' but also come alongside/build relationships with the decision-makers and talk about the validity/uncertainties in the datasets and enter into a discussion about how it can be best used. Although the repositories help solve the data re-use problems, it is these relational solutions which best solve the mobilisation challenges.

- Collect data with a transdisciplinary mindset from project inception
- Good example is (<https://jncc.gov.uk/our-work/analysis-ready-data-ard/>) where value is added to existing data by making it more consistent so that many different analyses can be applied to a common quality assured dataset. This also adds efficiency as the data is processed into a format that is easier to use so prevents duplication of basic but time-consuming data processing steps. Similarly wave data is shared from different providers and made accessible (spatial and temporal search & download) via <https://wavenet.cefas.co.uk/map>
- Having a workshop which informs on the types of coastal data, and where to access it will be really helpful. The workshop can also and collect information from participants of which data they have or have access to.

### ***7. How are data and evidence interpreted and used for management and policy making?***

- issue at the interface between evidence and policy and understanding how evidence is used in policy. often policy requests are very reactive and so best available data is used, with gaps perhaps not being address. need to strategic thinking and on identifying gaps. need to think how this info in terms of policy needs and data needs is shared

there is an issue on how evidence needed gaps are shared and transferred to the wider community

how well do we understand how evidence is used by police. this is important because we need to recognise the limits of how the data is used. data can be collected and then used in a different way. e.g. fishermen gave data that then kind of used against them so not willing to collaborate again. need for memorandum of understanding but not too tight because then we cannot use data.

dynamic coast communicate very well data so well that policy makers identify gaps

EIAs often have data missing or misinterpretation of data and lack of knowledge across consultancy. how do we check this and ensure no misinterpretation of data.

need for adaptative government

consultation so that people can see the information can be seen but you may not see the level of data used or the data missing. there are also external review

often people have no money or time for training, also lack of ocean literacy in decision and policy bodies, and so this leads to mistrust in decisions. also size of marine teams much smaller than terrestrial equivalent and so teams are overworked and overstretched

- To identify effectiveness of policies made, and processes used to implement and adopt those policies in order to ascertain where changes need to be made and identify any groups/subjects that have been missed to improve the policy at the next refresh

### **8. *What else would you suggest as next steps?***

- Seek to develop a framework that would ensure a pipeline from data>evidence>knowledge>policy>action. As with climate change more data/evidence is not helpful unless it can be linked to action. Seeking to improve the collection, management, storage, dissemination & availability of data needs to be linked to political/societal goals (including helping to define and prioritize those goals).
- Ongoing collaboration between tool developers
- Bring policy and management makers actively into the conversation, and give them the understanding we feel they may need. Work closely with them in a transdisciplinary manner, where all sides can contribute equally.
- Workshops about data types, data availability, data sharing for solving coastal challenges
- Collaborate on interdisciplinary access of data resources by requesting policy change to promote the need to share with those who the data is of need.
- Talk to relevant professional bodies such as CIEEM

### **Appendix 3: Summary from notes of discussion chairs:**

#### ***2. What coastal data do you use?***

different types of coastal data – social, economic (socio-economic), environmental and commercial data from fisheries. Some of us used only one type of data, some, all the above mentioned.

#### ***3. What are positives and strengths offered by a diverse data-scope?***

- It helps identify trade-offs. An example was the natural capital approach and in particular, the presentation by Jo Bayes (Natural England) on the sand eel fishery in the North Sea. This showed that by looking at the diverse data including economic and environmental data, it is possible to find the most sustainable solution, which would not be possible if economic data alone would be used.
- Diverse data-scope can help create a narrative and inform communities and policymakers through storytelling. An example of this was the presentation by Kathryn Collins (Newcastle University) on the layered meanings of the Goodwin Sands. In this case, historical and cultural data/information was an important aspect as well.
- Generally, there are a lot of available open access data.

#### ***4. What are negatives and weaknesses of a diverse data-scope?***

- There is so much data available that often it is difficult to comprehend which database to use, when to use a particular one and how to use it.
- Citizen science data are valuable, yet it is difficult to assess their accuracy, especially when it comes to absent data. It is not known whether they have the same approach and absence means it was not there, or they did not look or there is another explanation.
- Storage capacity and open access – still a lot of data is not accessible.

Interesting points: Historical data should be considered as a contribution to the diverse data-scope, however, the challenge with that is it is not clear how to extract the historical data and how to standardise it.

#### ***5. What challenges are you finding when using coastal data?***

- Access to data: not all data is FAIR yet in spite of significant efforts within the academic communities. Metadata are not always available. There can be commercial sensitivity for some data (e.g. fishery data)
- Too much data: size of datasets has significantly increased and now often require specific sets of skills to analyse (e.g. big data), difficulty in knowing which database/data set/data type to use, when and how.
- Different maturity and sensitivity of data: data are disparate, there is a bias towards quantitative data, but newer types of data (e.g. social data) are now coming available
- Integration: lack of tools to integrate disparate datasets
- Consistency of the data.
- Conflicts between various user groups. For example, how commercial fishing data are used or how scientific data are used.

#### ***6. What are opportunities and potential solutions to these challenges?***

- For data consistency have data management guidelines and standards across all disciplines.
- For commercial sensitivity and open access have a legal framework and carrot and stick approaches.

### ***7. How are data and evidence interpreted and used for management and policy making?***

- Policymakers rarely have knowledge of coastal and marine science. The researchers at the institutions such as DEFRA mainly work for the evidence teams but are rarely included in the decision-making process. Thus, there has to be a clear way how to incorporate the data and make sure that it cannot be interpreted in a completely different way.
- If possible, train those who are using data as evidence for policy decisions, however, it should be acknowledged that such institutions might have limited time and/or resources for training.
- Evidence tends to remain within disciplines so there needs to be more transdisciplinary training.
- Marine Natural Capital Division of DEFRA has the vision to bring together all types of data sets (socio-economic, environmental, commercial etc.) to inform policy. There was also a suggestion to have some kind of geospatial tool to bring those different data together.
- Visualisation is important, it would be good to be able to routinely transfer data into GIS platforms.
- There is a need for glossaries and standards.
- Social data may not be as well included, there is a place for narratives.
- One of the discussions around this point was about trust – how data is used as evidence for some decisions that the data was not intended to be used initially.
- There are different levels of policy decisions – not on each level policy will be equally influenced by the evidence and some decisions will be influenced by higher political and market factors. Ideology vs evidence.
- Funding is an important issue. If a policy-making institution is co-funding the project in which certain data is collected/analysed, it creates a direct route for this evidence to actually be used in decision-making process. This highlights the importance of relationship between agencies/stakeholders and programmes.
- Institutions are value based so this will impact decisions