Sea&Shore SOLUTIONS



Oregon Nearshore Data Needs

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Table of Contents

Introduction **4**

Approach **4**

Nearshore Data Needs Assessment Survey 4

Data Hub Metareview 5

Nearshore Data Needs **5**

Crowded Data Sharing 8

Long-term Support and Funding 9

Data Sovereignty 10

Confidentiality and Data Misuse 10

Challenges with Data Access 11

Existing Resources **11**

Recommendations **13**

1. LEVERAGE: Leverage Existing Resources for Optimal Data Sharing 13

2. MANAGE: Incorporate Best Management Practices for Data Sharing and Open Data 14

3. SUPPORT: Provide Technical Assistance and Long-Term Funding 16

4. DESIGN: Enhance Useability and Awareness 16

Conclusion **17**

Resources **18**

Appendix A: Nearshore Data Needs Assessment Survey Questionnaire **19**

Appendix B: Data Hub Metareview List **27**

Appendix C: Nearshore Data Needs Survey Results **29**

Introduction

The Oregon Ocean Science Trust (OOST) is a body of coastal and marine experts, focused on promoting increased knowledge and understanding of the Oregon coast through peer-reviewed, competitive research and monitoring. OOST allocates grants to support regionally-relevant research on the Oregon coast, such as investigating sea otter reintroduction and associated nearshore habitat-species dynamics and ocean acidification and hypoxia. These projects will produce a wealth of state-funded data, adding to an ever-growing library of nearshore research and data collected by other entities (e.g., academia, non-profits, other state agencies). In recognition of these multiple streams of related data, OOST has identified the need to enhance storage, dissemination, and archival capabilities for nearshore data, with a special focus on data collected through OOST-funded research.

To achieve this, OOST is considering the development of a new open access data repository, the Oregon Open Ocean Database (OOOD), to house and disseminate coastal and ocean research, with a special focus on OOST-funded research. The preliminary goal of this repository is to provide a simple, user-friendly process for data collectors and users to share and access data and other research products. In these early stages of consideration, OOST recognized the need to assess the current state of data sharing in the Oregon coastal field. There are several competing approaches and technologies that may be applied to the OOOD, and OOST recognized that identification of the best path forward was best led by the data sharers and users themselves. With this understanding, OOST brought on Sea & Shore Solutions (S&S), a team of data experts and coastal professionals, to help assess nearshore data needs.

Approach

S&S, in coordination with OOST and the Oregon Coastal and Ocean Information Network (OCOIN), completed a needs assessment to **identify the most scientifically sound and effective approach for enhancing data access, storage, dissemination, and archiving for Oregon nearshore ocean data.** The needs assessment was completed through two approaches: an online survey and a data hub metareview. These complementary studies formed a robust foundation for understanding the diverse needs and challenges within the nearshore ocean data landscape, which can then inform OOST's approach to any new database development.

The online survey gathered insights directly from data creators and users, capturing their perspectives on existing data practices, accessibility gaps, and technological preferences. Concurrently, the data hub metareview provided a comprehensive overview of existing infrastructure and practices, enabling a comparative analysis against industry standards and identifying potential areas for optimization.

Nearshore Data Needs Assessment Survey

S&S developed an online survey using GoogleForms to gather expert knowledge, preferences, and resources from possible data contributors and users (e.g., Tribes, ocean managers, planners, industry, communities, etc.). The survey also provided data contributors the opportunity to share their datasets,

particularly formerly OOST-funded project participants. Prior to survey distribution, OCOIN provided expert feedback and recommendations to strengthen the survey (full survey available in Appendix A).

In coordination with OCOIN and OOST, S&S developed a full outreach list of 132 nearshore researchers, managers, and community members with an interest in Oregon's nearshore data. S&S distributed the survey to this audience through email outreach, personal networks, and listservs. Respondents had just under 2 months to complete the survey, and received numerous reminders to encourage participation. Tribes, indigenous communities, and Tribal members were included in the distribution of this survey. The survey adhered to the concepts of "Cause No Harm", "Free, Prior, and Informed Consent", and "Knowledge Sovereignty", in efforts to gather Tribal perspectives with care and consideration.[1]

Although this survey was developed to assess data needs directly related to possible OOOD development, survey results uncovered a broad range of challenges related to data sharing in Oregon, some of which may not be relevant for OOST. The results shared below are framed in terms of OOST considerations, but may also be helpful for other data sharing platforms in Oregon.

Data Hub Metareview

S&S built upon previous work conducted by the OCOIN Network to holistically research existing coastal/ocean data hubs. The review used Best Available Science, such as peer-reviewed publications and mainstream science data sets and repositories. We also leveraged existing data resources, including but not limited to the West Coast Ocean Data Portal, Oregon Spatial Data Library, Oregon Coastal Atlas, Oregon Department of Fish and Wildlife's (ODFW) Data Dashboard, Data Basin, Coastal Research Explorer, TSP Part Five Data Catalog, and numerous data.gov ocean datasets (full list available in Appendix B). For each resource, we assessed the technology used, geographic range, type of data included, data access, good qualities, and areas for improvement. Results from this meta-review provide a baseline understanding of the technical capabilities currently employed by similar resources.

Nearshore Data Needs

The survey was completed by 54 individuals, ranging in affiliation and relationship to nearshore data. We asked participants for both their primary and secondary affiliations, to allow for the full range of people's connections to nearshore data. State agency staff were the largest group to participate in the survey (37%), followed by academia faculty and non-governmental organizations (both 16.7%) (Table 1). Just over 25% (14) respondents shared that they are community members as a secondary affiliation.

Table 1. Percent of respondents that self-identified as each primary affiliation type. Total responses are indicated in parentheses.

Primary Affiliation	Percent of Responses (Total Responses)
State Agency	37% (20)
Academia (Faculty)	16.7% (9)
Non-Governmental Organization	16.7% (9)
Non-Profit	13% (7)
Community Member	5.6% (3)
Academia (Student)	3.7% (2)
Industry	1.9% (1)
Private Consulting	1.9% (1)
Citizen Scientist	1.9% (1)
Other	1.9% (1)

The vast majority of respondents identified themselves as both data creators and users (72.2%), with much smaller segments identifying as solely a data creator (7.4%) or a data user (16.7%). Across all user types, respondents primarily created and/or used survey data, field data, community/citizen science, qualitative data, journal articles, imagery data, economic data, and traditional ecological knowledge. They reported that the most common data formats created and/or used include spreadsheets (29%), PDFs (19%), Microsoft Word documents (18%), shapefiles (18%), and raster layers (11%) (full results in Appendix C). This finding is particularly interesting as it reveals that 66% of data formats are non-spatial, indicating that a non-spatial data library function will be needed to encompass the full range of nearshore data. The data reveals that academia, community members, industry, and non-profits tend to develop/use non-spatial data formats, while state agencies utilize more spatial data formats (Table 2).

Table 2. Reported creation and/or use of non-spatial (spreadsheets, PDFs, Word documents, technical coded files, databases, graphics, photography) and spatial (shapefiles, raster layers) data formats by primary affiliation.

Primary Affiliation	Non-Spatial Data Formats	Spatial Data Formats
Academia (Faculty)	18%	10%
Academia (Student)	4%	3%
Citizen scientist	2%	0%
Community member	6%	3%
Industry	2%	0%
NGO	16%	17%
Non-Profit	12%	10%

Other	2%	3%
Private consulting	2%	3%
State agency	37%	48%

A pivotal aspect of understanding Oregon's nearshore data landscape is recognizing the resources that data creators and users rely on to access and share essential information. Through our comprehensive needs assessment survey, we gained invaluable insights into the key resources that play a central role in supporting data-related activities within the Oregon nearshore space. Several resources emerged as prominent focal points for data creators and users in Oregon's nearshore domain (Table 3).

Table 3. Reported use of existing data sharing resources in percent of total responses. Total responses are indicated in parentheses.

Resource	Percent of Responses (Total Responses)
State agency websites	89% (222)
NOAA Northwest Fisheries Science Center	65% (162)
Federal Websites	65% (162)
University website/library	60% (150)
Oregon Coastal Atlas	58% (144)
Oregon Explorer	48% (120)
NGO Website	46% (114)
ODFW Data Dashboard	46% (114)
West Coast Ocean Data Portal	41% (103)
Oregon Spatial Data Library	27% (66)
OCOIN Coastal Research Explorer	15% (37)
Data Basin	7% (18)
Direct Communication	1% (2)

The motivations behind the selection of these resources are multifaceted, reflecting a blend of user preferences and functional attributes. Respondents expressed several compelling reasons for their resource preferences:

- **Ease of Access:** A recurring sentiment highlights the user-friendliness and accessibility of these platforms. They are selected because they are easy to find, navigate, and interact with, streamlining the data discovery process, not necessarily because they have the best data.
- **Familiarity and Trust:** Users gravitate toward these resources due to familiarity and trust. This includes a perception of authenticity and quality control associated with the data. The presence

of robust metadata and the potential for further consultation with data creators contribute to this trust.

- **Direct Referrals:** Recommendations from colleagues and staff further bolster the selection of these resources, underlining their reputation within the nearshore data community.

Our survey participants revealed that a significant portion of Oregon's nearshore data remains unshared, which stifles the potential for collaborative progress. Even data collected through public funding initiatives, including those supported by OOST, often remains unpublished. This gap has critical implications, as untapped data has the potential to catalyze projects of pressing public interest, unlocking new avenues for research, conservation, and decision-making. One participant shared: "*Just knowing what exists is sometimes the biggest challenge.*" This sentiment underscores the fundamental importance of effective communication as a catalyst for meaningful advancements in research.

An organization does already exist to help address this need. OCOIN was first created in 2013 in response to a survey that found this exact same result.[2] They developed the Coastal Research Explorer (CRE), an online tool for sharing information about new, ongoing, or completed research projects.[3] However, it's important to acknowledge that while the CRE holds promise, its current utilization stands at 15% among survey respondents. Recognizing this potential, continued refinement of the CRE to better fulfill this need may be a valuable avenue to support nearshore data sharing.

The survey also revealed data creators' and users' preferences for data sharing platform, with the majority of users preferring a website that combines data library and collection of web maps (Table 4). This aligns with other survey results indicating that data creators and users want functionality to share both raw data (e.g., spreadsheets) and processed data (e.g., interactive tools).

Table 4. Percent of respondents' preferred platforms for an online data sharing tool.

Preferred Platform	Percent of Responses
Website that combines data library and collection of web maps	34%
No preference	19%
Interactive web map	14%
Online data library	14%

Crowded Data Sharing

A prominent theme that emerged from our survey participants is the concern surrounding crowded data sharing within Oregon's nearshore data landscape. Among survey respondents, a resounding 48% echoed the need for a centralized location dedicated to data sharing. This plea for centralization reverberates strongly, with data creators expressing a willingness to contribute more readily if such a single repository were established. A participant articulated the sentiment, stating, *"**nearshore data are typically accessible from the original sources, so there is not necessarily a need for additional copies of such data to be shared by other means besides retrieval from the original sources. The original sources should have the most up-to-date data, so sharing copies of data risks the potential for out-of-date information to be shared.**"*

Survey participants, particularly data creators, voiced the importance of optimizing and strengthening the existing platforms. The sentiment resonates: "***People need to make what exists more robust and interconnected,***" encapsulating the collective desire for enhancing the efficacy of current resources and building more integration between existing platforms. This approach, guided by a vision of interconnectedness, acknowledges that leveraging existing platforms can alleviate redundancy and fragmentation, fostering a more cohesive data ecosystem. This approach may also enhance data sharing, as 44% of data creators said they would be more likely to share data to a web repository if there was only 1 repository to share data to.

A substantial 50% of data users reported feeling overwhelmed by the sheer number of options available. Participants highlighted the potential of a single repository to alleviate this challenge: "***A single repository would be very helpful. Given the different vintages and archival nature of some of the existing repositories it is hard to quickly determine which are the most up-to-date data to use.***" However, it's noteworthy that some respondents also voiced contentment with the current array of platforms, stressing that the focus should be on reducing redundancy and aggregating disparate sites.

Long-term Support and Funding

Surveyed participants, including both data creators and users, have identified that successful data sharing platforms require long-term support and funding. An overwhelming 67% of data creators have underlined the need for financial support, recognizing it as an essential pillar for the durability and efficacy of these platforms.

Sustainability is also dependent on the provision of technical support resources. Notably, 32% of respondents pinpoint the need for technical assistance, acknowledging its pivotal role in facilitating seamless data access and utilization. A substantial 47% of data creators believe that expanding capacity is pivotal for unlocking the potential of nearshore data sharing. An additional 42% express their readiness to share data if augmented capacity or support were provided. This underscores the pragmatic impact of equipping creators and users with the tools and resources needed to foster a culture of sharing.

This call for sustainability extends beyond financial and technical support to encompass the necessity for clear delineation of roles and responsibilities. A significant 49% of respondents emphasized the critical nature of establishing structured frameworks that empower data creators to contribute effectively, fostering an environment of shared commitment and coordinated efforts. Additionally, 40% of participants advocated for regular data maintenance schedules, and 35% highlighted the significance of data quality metrics and thresholds. 53% of data creators said that maintenance/stewardship agreements are necessary for sustainable data sharing platforms. OOST may look to several examples of data stewardship agreements, such as:

- Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO)
- Arctic Demographic Shorebird Network
- Multi-Agency Rocky Intertidal Network (MARINe)
- U.S. Forest Service (USFS) uplands study of plant phenology
- Northwest Association of Networked Ocean Observing Systems (NANOOS)

Data Sovereignty

Of note, one tribal member participated in the survey and highlighted the pivotal theme of data sovereignty in the context of Tribal perspectives and their inherent connection to data. This participant elevated the incorporation of Traditional Ecological Knowledge as a distinct form of data, showcasing the richness of Indigenous knowledge systems.

The response noted urgency regarding data sovereignty, with explicit endorsements for both FAIR and CARE principles (see details in Recommendations #2). These principles serve as essential foundations for ensuring equitable access, control, and ethical handling of Tribal data. Additionally, the responses delve into the intricate challenge of addressing data sovereignty not only for data creators but also for data users. This perspective acknowledges the multifaceted considerations essential for promoting responsible and respectful engagement with Tribal data rights, aligning with both community needs and ethical imperatives.

Confidentiality and Data Misuse

Within the context of Oregon's nearshore data landscape, there is a complex dialogue concerning the balance between fostering data sharing and mitigating confidentiality and data misuse concerns. This highlights the need for data sharing that safeguards against potential misuse, particularly within the realm of human dimensions data.

- **Data Confidentiality:** Among data creators, 51% highlight hesitancy in sharing data due to confidentiality concerns. This apprehension is amplified within Oregon's close-knit nearshore community, where participants can be easily identified. One participant shared, "***Concerns over confidentiality of qualitative data and protection of community members. Despite practices to de-identify participants, the coast is a small place and study participants are still easy to identify.***" Establishing mechanisms that ensure sensitive information remains secure while cultivating an atmosphere of trust and collaborative engagement is necessary.
- **Data Misuse:** Data misuse, identified by 40% of data creators, emerges as a tangible concern. The potential for data to be utilized in unintended, and potentially harmful, ways necessitates the development of stringent protocols and frameworks to proactively address these apprehensions.
- **Intellectual Property:** 35% of data creators acknowledge intellectual property's potential impact on data sharing. This is particularly complex within the realm of human dimensions data, where individual rights and ownership add layers of complexity.

Navigating human dimensions data requires ethical considerations and confidentiality. The Institutional Review Board (IRB) is crucial in ensuring appropriate safeguards are in place to protect participants and their data. Recognizing this, a participant shared, "***there may be components that need to be included in IRB applications to allow social data to later be shared through portals like this one. Support for how to do that would be critical to ensuring data sharing happens.***"

Challenges with Data Access

Data users shared several challenges with accessing nearshore data (Table 5).

Table 5. Percent of respondents that reported themselves as challenged by the following issues related to data access.

Data Access Challenges	Percent of Responses
There are too many places to look; I am overwhelmed with options	50%
Existing data resources are confusing and hard to navigate	46%
Data are often incomplete for my area of interest (data gaps)	33%
It can be difficult to ensure that data is robust and high quality	27%
Data is not openly accessible or stuck behind a paywall	27%
Sometimes I am not sure exactly what search terms to use	25%
Existing data resources are shared in a format I cannot access	8%

Data users also shared the need for clear data organization within the data sharing tool, and highlighted the necessity of a systematic approach to data management and updates.

Existing Resources

To explore possible ways of addressing these concerns and structuring future data hub research, we conducted an extensive review and characterization of existing state and regional ocean data management systems. This analysis aimed to identify software, portals, and hubs capable of effectively supporting the archiving and dissemination of crucial information within the nearshore domain. Our assessment encompassed a diverse spectrum of technologies, each varying in technical intricacy and intended purpose. When compared with the needs reported by Oregon's nearshore data creators and users, three key options emerged as high-quality and pertinent technologies warranting further in-depth examination for potential integration. Each of these options allows for seamless integration of a data library and interactive map feature, both of which were revealed as necessary components by the needs assessment.

1. **DataHub.io (CKAN):** DataHub.io emerges as a compelling data sharing solution that seamlessly combines comprehensive features with an intuitive user interface.[4] The tool itself runs on CKAN, The Comprehensive Knowledge Archive Network, an open-source open data portal. Its design philosophy revolves around simplicity, empowering users with user-friendly tools while ensuring robust performance. Notable examples of its implementation include Data.gov, Integrated Ocean Observing System, and the European Data Portal.[5,6,7] A prominent advantage of DataHub.io lies in its clean and organized user interface, enhancing accessibility for both data creators and users. However, it's important to note that DataHub.io lacks native mapping functionalities, potentially necessitating additional tools for mapping and geospatial analysis.

2. **Esri Hub:** The Esri Hub stands out as a versatile option with inherent data visualization capabilities, closely aligning with geographic information system (GIS) principles.[8] Noteworthy implementations of Esri Hub include Atlanta GIS, Oregon GEOHub, and The City of Virginia Beach Open Data.[9,10,11] Its merits encompass native data visualization through Esri tools, facilitating seamless connections to the Esri ecosystem for enhanced user experiences. Additionally, Esri Hub boasts discovery metadata, ensuring ease of search and navigation. A significant strength lies in its scalability and capacity to accommodate future functionalities. However, prospective considerations include the potential cost implications and long-term maintenance efforts, which should be weighed against the benefits.
3. **Custom-Built Solution**: An alternative avenue involves crafting a tailor-made solution, drawing upon technologies such as Leaflet, Socrata Open Data API, Java, Dojo, ShinyApps, and MapTiler. This approach is leveraged by existing data sharing tools such as the mWater Portal, NASA Open Data Portal, and North American Environmental Atlas.[12,13,14] This approach offers the advantage of heightened control over user experience and functionality, enabling the alignment of the platform with specific nearshore data needs. However, it's imperative to acknowledge that such a solution may entail higher upfront costs and demand more substantial maintenance commitments over time.

The review also revealed several components of a successful data sharing platform, many of which were also echoed through the nearshore needs assessment survey:

- Mixture of data library and interactive mapping features
- Clean, simple interface
- Connections to data stories, events, and projects
- Detailed user guide and FAQ resources
- Integration of feedback form to report data gaps and issues with the tool
- Prominent metadata and other data standards
- Support for multiple topics and data formats

Recommendations

Four overarching recommendations were developed based on key takeaways from review of existing data sharing platforms and the survey of Oregon's nearshore data creators and users community (Figure 1).

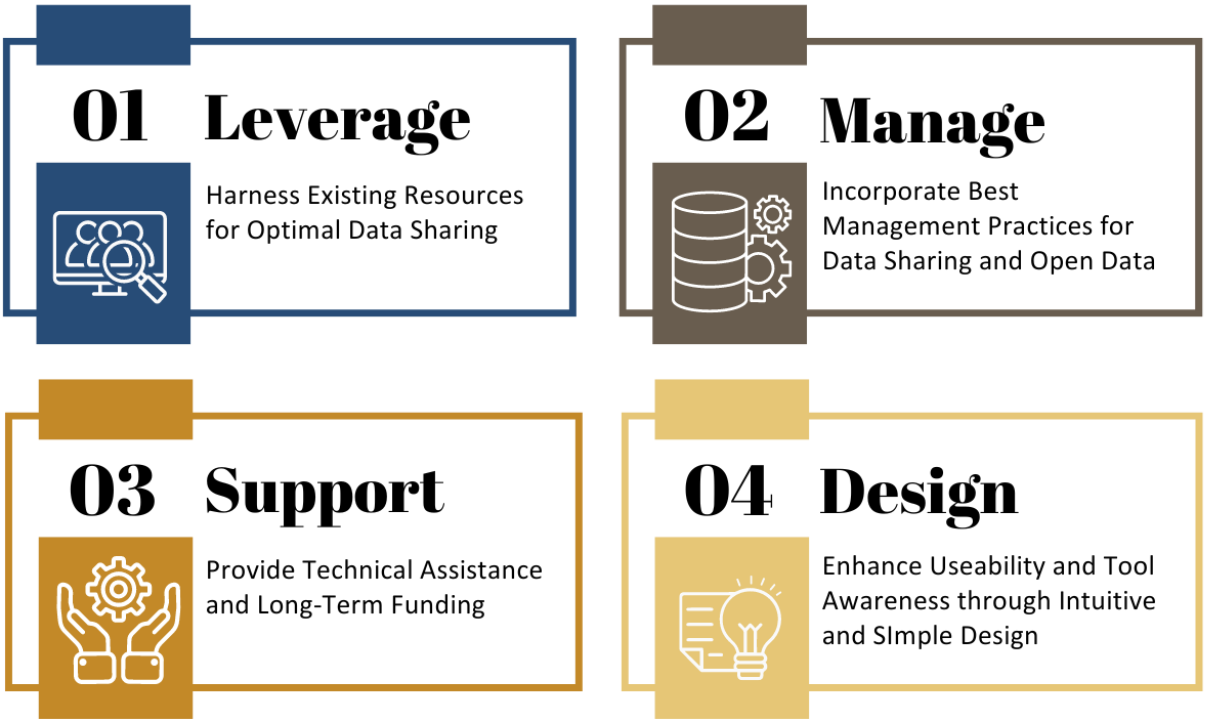

Figure 1. Recommended actions for OOST consideration when developing the OOOD.

1. LEVERAGE: Leverage Existing Resources for Optimal Data Sharing

When it comes to sharing data in Oregon's nearshore area, there are many existing resources and platforms that can be leveraged to reduce duplication. Rather than creating something entirely new, data creators can integrate new features into existing platforms that are already working well. This approach streamlines the system and avoids the clutter created by too many separate tools. In addition, many people already use websites such as State agency websites, Oregon Explorer, and the Oregon Coastal Atlas to find data. By sharing data on these popular sites, we make it more accessible to everyone. By thoughtfully incorporating new features and leveraging what's already available, we simplify data sharing and build trust. This approach helps everyone working with data feel more confident and enables data creators and users to move forward together.

2. MANAGE: Incorporate Best Management Practices for Data Sharing and Open Data

The review uncovered expansive documentation on existing and recommended best management practices to sustainably manage an open-source nearshore data portal. These practices encompass an array of strategies and guidelines designed to ensure the integrity, accessibility, and optimal utilization of data within the portal's ecosystem. These practices also underscore the imperative of balancing data openness and accessibility with security considerations, catering to diverse user needs, and nurturing a collaborative environment that fosters the exchange of valuable insights and knowledge.

FAIR Principles

The FAIR Guiding Principles were developed to enhance the accessibility and utility of scientific data.[15] These principles address Findability, Accessibility, Interoperability, and Reusability (FAIR) by emphasizing machine-actionable data handling. These principles are:

- **Findable**: The initial step is making data easy to discover for both humans and computers. This includes assigning unique identifiers, rich metadata descriptions, explicit links between metadata and data identifiers, and registering data in searchable resources.
- **Accessible**: After discovery, users need clear access methods, including authentication and authorization processes. This involves retrievability via standardized communication protocols, universally implementable open protocols, and accommodating authentication needs. Metadata should also remain accessible if the associated data becomes unavailable.
- **Interoperable**: Data often needs to integrate with other datasets or applications. This requires using a common, shared language for knowledge representation, employing vocabularies aligned with FAIR principles, and providing references to related metadata.
- **Reusable**: Optimizing data reuse is the final aim. To achieve this, well-described data and metadata are crucial, enabling replication and integration in various contexts. Comprehensive metadata descriptions, transparent data usage licenses, detailed data origins, and adherence to relevant community standards enhance data reusability.

These principles pertain to data, metadata, and infrastructure, meaning that both metadata and data should be indexed in searchable resources, which form part of the infrastructure supporting FAIR data. The process for achieving FAIR data involves a FAIRification Framework, with the goal to make data easy to find, use, and combine with other data.[16] The FAIRification process framework includes:
Get the Data: Get the data you want to improve.

- **Study the Data**: Look closely at the data's content and how it's organized.
- **Describe the Data's Meaning**: Make a clear and computer-friendly description of what the data means and how things in the data are related. This helps others understand and use the data better.
- **Make Data Connectable**: Change the data so that it can easily connect with other data using special technologies. This helps different types of data work together.

- **Give Data a License**: Clearly state what others can and can't do with the data. This ensures that people use the data responsibly.
- **Add More Information:** Provide extra information about the data that helps others know what it's about.
- **Share Improved Data**: Put the improved data online so that people can find it easily. This makes the data more useful and available to everyone.

CARE Principles

The existing principles of the open data movement, such as FAIR (findable, accessible, interoperable, reusable), primarily prioritize data-sharing characteristics without addressing power dynamics and historical contexts. This approach creates tension with Indigenous Peoples who seek control over their data and knowledge for collective benefit, aligned with Indigenous worldviews. The CARE Principles for Indigenous Data Governance emphasize people and purpose, recognizing data's role in promoting Indigenous innovation and self-determination.[17] These principles are:

- **Collective Benefit:** Data ecosystems that support Indigenous Peoples' benefit, inclusive development, citizen engagement, and equitable outcomes through innovation, governance, transparency, and value generation.
- **Authority to Control:** Recognize and empower Indigenous Peoples' authority over Indigenous data, encompassing representation, rights, and self-governance, through recognition of rights, informed consent, relevant data access, and cultural governance protocols.
- **Responsibility:** Those working with Indigenous data hold the responsibility to transparently demonstrate support for Indigenous self-determination, maintain respectful relationships, ensure accountability through evidence of benefits, and advance capacity building, language preservation, and cultural alignment.
- **Ethics:** Uphold Indigenous rights and wellbeing throughout the data life cycle by promoting data ethics that respect cultural values, avoid harm, ensure justice, incorporate Indigenous perspectives, and anticipate future considerations for responsible data governance.

OOST can use these principles to complement FAIR principles, urging open data initiatives to incorporate both people and purpose into their efforts.

Organizational Infrastructure

Identified best management practices highlighted the importance of a purposeful and strategic organizational framework and infrastructure for data use and management. As OOST begins development of the OOOD, they may benefit from reviewing and leveraging the following resources:

- Technical Standards Manual (New York): This manual clearly outlines roles, responsibilities, and procedures for sharing and maintaining open data.[18] Development of a resource such as this would address several of the needs shared by Oregon’s data creators and users.

- Open Data Values (New York): This web page shares New York's open data values, which serves to align data creators and users with their vision.[19] OOST may benefit from adopting a similar page on their website.
- Ethical Data Management Policies (Virginia Beach): This resource addresses data sovereignty, confidentiality, licensing, and governance, many of the topics that Oregon's nearshore data community identified as key needs for a successful data sharing platform.[20]
- Clear data publication process from (EDI): Clear guidelines for data contribution may help alleviate some of the data creators' concerns about lack of capacity to upload data.[21]
- Metadata standards from (OGIC): Oregon's Geographic Information Council provides high-quality, state-sponsored guidelines about data management.[22] This metadata standards document can serve as an important resource for OOST to ensure that state-funded research and data is shared in accordance with identified best practices for metadata.
- California Ocean Science Trust Data Management Plan: The California Ocean Science Trust is also committed to enhancing open ocean data. In 2016, they made a large step toward this goal by completing their own data management plan, which incorporates several elements from above, including technical standards, publication process, metadata standards, and policies for handling sensitive data.[23] Development of a resource such as this would be an extremely helpful next step for OOST as they embark on creating a data sharing tool.
- Mechanisms to Govern Responsible Sharing of Open Data: The Sage Bionetworks Team has developed a fantastic resource for open data initiatives, offering clear guidance on governance structures, types of data licenses, and data collection and integration methods.[24] Their guidelines on data licenses may be particularly helpful for OOST to consider when building out data management infrastructure, since the nearshore data community was particularly concerned about data confidentiality and licensing.

3. SUPPORT: Provide Technical Assistance and Long-Term Funding

Long-term funding and technical assistance emerged as critical components for a successful data sharing platform. A robust and reliable tool needs secure and predictable funding mechanisms. With the expansive list of existing data sharing tools, users will not devote the time and resources to learn a new system without security that the tool will be around for the long haul. Additionally, by offering guidance on data formatting, metadata creation, and platform navigation, OOST can effectively streamline the intricate process of data integration.

4. DESIGN: Enhance Useability and Awareness

Enhancing usability is crucial for effective implementation of any data sharing platform. This can be achieved through intuitive navigation design, clear data organization, and the creation of comprehensive user resources such as user guides, frequently asked questions (FAQs), and instructional videos. By curating featured content, users can quickly access essential datasets, fostering efficiency in data exploration. Moreover, connecting data with narratives can provide the contextual background necessary to interpret the numbers effectively, thus bridging the gap between raw data and practical insights.

A critical aspect of integration lies in establishing a clear linkage between data and publications. This ensures that data sources are properly cited and that users can trace data origins back to their reliable sources. Such transparency reinforces data credibility and encourages collaborative research.

Lastly, a robust outreach strategy is critical in ensuring the visibility of the resource. It is imperative that potential users are well-informed about the existence and utility of the platform. Familiarity breeds confidence, and an engaged user base is more likely to return to platforms they are comfortable with and acquainted with.

Conclusion

Through dual methods of surveying Oregon's nearshore data creators and users and reviewing existing online data repositories, a large amount of information was gathered that will be useful for OOST to consider when building the OOOD. Notably, Oregon's nearshore data community needs dual functionality of a data library and an interactive web mapping tool to fully integrate the multiple formats and types of nearshore data. Oregon already has a wealth of data resources, and OOST should consider the best way to leverage those resources and avoid duplication. OOST can also build off of existing open data resources, such as the FAIR Principles and organizational documentation from a range of similar data efforts. To support integration of qualitative data, social science, local knowledge, and Tribal science, OOST can consider application of the CARE Principles. Long-term support and resources through funding and technical support will drastically increase tool utilization. Lastly, prioritizing the user experience and promoting education and outreach are likely to build confidence in the platform. As OOST moves forward with OOOD development, consideration of these factors will help support creation of a tool that is useful for the community, aligned with existing data needs, and sustainable through time.

Resources

1. https://www.noaa.gov/sites/default/files/2023-07/NOAA_IK_Guidance_FINAL_2023.pdf
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18. https://opendata.cityofnewyork.us/wp-content/uploads/NYC_OpenData_TechnicalStandardsManual.pdf
19. https://opendata.cityofnewyork.us/overview/
20. https://data.virginiabeach.gov/documents/2949ba73014d49fba67bb7717280a8aa/explore
21. https://edirepository.org/resources/resources-for-data-authors
22. https://www.oregon.gov/geo/FIT%20Documents/FINAL_OR_Metadata_standard_ver_2.04.pdf
23. https://www.oceansciencetrust.org/wp-content/uploads/2016/11/DataManagementPlan_Full_v_March_2016.pdf
24. https://sage-bionetworks.github.io/governanceGreenPaper/

Appendix A: Nearshore Data Needs Assessment Survey Questionnaire

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The Oregon Ocean Science Trust (OOST) supports a wide range of research projects that create nearshore data and collaborates with other data creators and users across the state. With these projects expected to produce a wealth of data, OOST has identified the need to enhance storage, dissemination, and archival capabilities for data, especially data collected through state funded research.

The following survey will gather information about the current state of nearshore data and assess the needs of data creators and users. Results will be analyzed and shared with OOST through a Needs Assessment, which OOST can use to determine best approaches to support nearshore data sharing.

Consent and Confidentiality Statement

The survey will take 5-20 minutes, and is fully accessible online through a computer or your mobile device. Your participation is completely voluntary. Your responses will be used for analysis purposes; Any public materials will protect your privacy, unless you have provided written permission for us to use a direct quote with attribution. By continuing with the survey, you consent to providing your perspective and participating in this needs assessment.

Please direct any questions or comments to Adrian Laufer at adrian@sea-shoresolutions.com.

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1. What is your primary affiliation in ocean/coastal affairs in Oregon? (select one)
    a. State agency
    b. Local government
    c. Industry
    d. Community Member
    e. Tribe
    f. Federal Agency
    g. Academia (Faculty)
    h. Academia (Student)
    i. Private consulting
    j. Citizen Scientist
    k. Other:
2. Do you identify as any additional affiliations? (select multiple)
    a. State agency
    b. Local government

    c. Industry
    d. Community Member
    e. Tribe
    f. Federal Agency
    g. Academia (Faculty)
    h. Academia (Student)
    i. Private consulting
    j. Citizen Scientist
    k. Other:
3. Are you a data creator or a data user? (select one)
    a. Data creator [takes user to data creation section after Q7]
    b. Data user [takes user to data user section after Q7]
    c. Both data creator AND user [takes user to data creator and user section after Q7]
    d. Neither data creator NOR user [takes user to neither data creator nor user section after Q7]
4. In 1-2 sentences, please explain your connection to nearshore data in Oregon. (long answer text)
5. What type(s) of data do you primarily create and/or use? (select multiple)
    a. Imagery data
    b. Survey data
    c. Qualitative data
    d. Economic data
    e. Field data
    f. Models
    g. Non-spatial quantitative data (e.g., laboratory data)
    h. Community/Citizen Science
    i. Traditional Ecological Knowledge
    j. Journal Articles
    k. Not sure
    l. Other
6. What format of data do you primarily create and/or use? (select one)
    a. PDFs
    b. Word documents
    c. Spreadsheet
    d. Shapefiles
    e. Raster layers
    f. Not sure
    g. Other
7. For which nearshore topic(s) do you create and/or use data? (select one)
    a. Aquaculture
    b. Climate
    c. Conservation
    d. Culture

e. Energy
f. Fisheries
g. Habitat
h. Hazards
i. Planning & Management
j. Pollution
k. Recreation & Tourism
l. Society & Economics
m. Species & Biodiversity
n. Oceanography, Tides & Currents
o. Urbanization
p. Water Quality
q. None of the above
r. Other

8. In your opinion, what are the most pressing needs for Oregon nearshore data? (ranked)
    a. Access to existing datasets
    b. Communication of new, ongoing, or completed data projects so that others are aware of existing work
    c. Centralized location for data sharing
    d. Missing or lost metadata or data context
    e. Long-term data management
    f. Technical support resources to assist with locating and accessing data
    g. Representation of qualitative data
    h. Archiving

Data Creator

You are seeing the questions below because you self-identified as a data creator. Please answer the questions below to the best of your knowledge and experience with sharing nearshore data in Oregon.

9. On a scale of 1 to 5, how do you feel about data sharing? (Linear scale)
    a. (1) Very negative
    b. (5) Very positive
10. What resources do you currently use or have previously used to share data? (select one)
    a. State agency websites
    b. Oregon Explorer
    c. NOAA Northwest Fisheries Science Center
    d. NGO website
    e. West Coast Ocean Data Portal
    f. Oregon Spatial Data Library

g. University website/library
h. OCOIN Coastal Research Explorer
i. Oregon Coastal Atlas
j. Oregon Department of Fish and Wildlife's Data Dashboard
k. Data Basin
l. Federal websites
m. I have never shared data online
n. Other

11. Why do you choose to use these resources? (Long answer text)
12. What do you believe limits nearshore data sharing?
    a. Data creators are unsure of how/where to effectively share data
    b. Data creators lack of capacity to share data through known data sharing platforms
    c. Data creators are hesitant to share data because of confidentiality concerns
    d. Data creators have concerns about misuse of data
    e. Intellectual property limits data sharing
    f. Concerns about data quality
    g. Other
13. What is your preferred platform for shared nearshore data? (select one)
    a. Online data library
    b. Interactive web map
    c. Website combining a data library and collections of web maps
    d. Not sure
    e. I don't have a preference
    f. Other
14. What would increase your likelihood to share data to a web repository? (select one)
    a. Having only one repository to share data to
    b. Technical support
    c. Additional capacity or support
    d. Incentive
    e. Easy update process
    f. Simpler metadata requirements
    g. Nothing would increase my likelihood to share data
    h. Other
15. Based on your experience, which of the following factors are necessary for the sustainable, long-term management of data sharing platforms? (select multiple)
    a. Endorsed management agreement
    b. Clear delineation of roles and responsibilities
    c. Long-term, reliable funding
    d. Maintenance/stewardship agreement
    e. Data quality metrics and thresholds
    f. Routine data maintenance schedule
    g. Other

16. Do you participate in any other data sharing agreements? If so, please briefly describe the agreement below. (text)
17. If you have any data you would like to share, please upload files here or email adrian@sea-shoresolutions.com.

Data User

You are seeing the questions below because you self-identified as a data user. Please answer the questions below to the best of your knowledge and experience with accessing and using nearshore data in Oregon.

18. On a scale of 1 to 5, how do you feel about accessing/using data? (Linear scale)
    a. (1) Very negative
    b. (5) Very positive
19. What resources do you currently use or have previously used to access data? (select one)
    a. State agency websites
    b. Oregon Explorer
    c. NOAA Northwest Fisheries Science Center
    d. NGO website
    e. West Coast Ocean Data Portal
    f. Oregon Spatial Data Library
    g. University website/library
    h. OCOIN Coastal Research Explorer
    i. Oregon Coastal Atlas
    j. Oregon Department of Fish and Wildlife's Data Dashboard
    k. Data Basin
    l. Federal websites
    m. I have never accessed data online
    n. Other
20. Why do you choose to use these resources? (Long answer text)
21. What challenges have you faced in accessing nearshore data? (select one)
    a. There are too many places to look: I am overwhelmed with options.
    b. It can be difficult to ensure that data is robust and high quality.
    c. Sometimes I am not sure exactly what search terms to use.
    d. Data I have found is not openly accessible or stuck behind a paywall.
    e. Existing data resources are confusing and hard to navigate.
    f. Existing data resources are shared in a format I cannot access.
    g. Data is often incomplete for my area of interest (data gaps)
    h. Other

Data Creator and User

You are seeing the questions below because you self-identified as a data creator AND user. Please answer the questions below to the best of your knowledge and experience with sharing and using nearshore data in Oregon.

22. On a scale of 1 to 5, how do you feel about **sharing** data? (Linear scale)
    a. (1) Very negative
    b. (5) Very positive
23. On a scale of 1 to 5, how do you feel about **accessing** data? (Linear scale)
    a. (1) Very negative
    b. (5) Very positive
24. What resources do you currently use or have previously used to share/access data? (select one)
    a. State agency websites
    b. Oregon Explorer
    c. NOAA Northwest Fisheries Science Center
    d. NGO website
    e. West Coast Ocean Data Portal
    f. Oregon Spatial Data Library
    g. University website/library
    h. OCOIN Coastal Research Explorer
    i. Oregon Coastal Atlas
    j. Oregon Department of Fish and Wildlife's Data Dashboard
    k. Data Basin
    l. Federal websites
    m. I have never accessed data online
    n. Other
25. Why do you choose to use these resources? (Long answer text)
26. What do you believe limits nearshore data **sharing**?
    a. Data creators are unsure of how/where to effectively share data
    b. Data creators lack of capacity to share data through known data sharing platforms
    c. Data creators are hesitant to share data because of confidentiality concerns
    d. Data creators have concerns about misuse of data
    e. Intellectual property limits data sharing
    f. Concerns about data quality
    g. Other
27. What would increase your likelihood to **share data** to a web repository? (select one)
    a. Having only one repository to share data to
    b. Technical support
    c. Additional capacity or support
    d. Incentive

e. Easy update process
f. Simpler metadata requirements
g. Nothing would increase my likelihood to share data
h. Other

28. If you have any data you would like to share, please upload files here or email adrian@sea-shoresolutions.com.
29. Based on your experience, which of the following factors are necessary for the sustainable, long-term management of data sharing platforms? (select multiple)
    a. Endorsed management agreement
    b. Clear delineation of roles and responsibilities
    c. Long-term, reliable funding
    d. Maintenance/stewardship agreement
    e. Data quality metrics and thresholds
    f. Routine data maintenance schedule
    g. Other
30. Do you participate in any other data sharing agreements? If so, please briefly describe the agreement below. (text)
31. What challenges have you faced in **accessing** nearshore data? (select one)
    a. There are too many places to look: I am overwhelmed with options.
    b. It can be difficult to ensure that data is robust and high quality.
    c. Sometimes I am not sure exactly what search terms to use.
    d. Data I have found is not openly accessible or stuck behind a paywall.
    e. Existing data resources are confusing and hard to navigate.
    f. Existing data resources are shared in a format I cannot access.
    g. Data is often incomplete for my area of interest (data gaps)
    h. Other
32. What is your preferred platform for **accessing** nearshore data? (select one)
    a. Online data library
    b. Interactive web map
    c. Website combining a data library and collections of web maps
    d. Not sure
    e. I don't have a preference
    f. Other

Neither Data Creator Nor User

You are seeing the questions below because you self-identified as neither a data creator nor user. Please answer the questions below to the best of your knowledge and experience with sharing and using nearshore data in Oregon.

33. How do you interact with nearshore data in Oregon? (Long answer text)

34. What do you hope to achieve from nearshore data in Oregon? (Long answer text)
35. Why have you never shared or used nearshore data in Oregon? (select one)
    a. I have no need for data to complete my work.
    b. I do not produce any data.
    c. I have been hesitant to share my data with others.
    d. I have tried to access data unsuccessfully.
    e. I have tried to share my data unsuccessfully.
    f. Other
36. What would increase your likelihood to share and/or use data? (select one)
    a. Having only one repository to share data to
    b. Technical support
    c. Additional capacity or support
    d. Incentive
    e. Easy update process
    f. Simpler metadata requirements
    g. Nothing would increase my likelihood to share data
    h. Other

Finishing Up

37. Do you have any resources that you can offer to support nearshore data sharing/access in Oregon (e.g., capacity, technical infrastructure, enthusiasm to help, knowledge of a platform outside of Oregon that you appreciate, etc.)? Please detail below. (Long answer text)
38. Would you be interested in beta testing any new data sharing platforms in development? (select one)
    a. Yes
    b. No
    c. Maybe
39. Please share your email address if you have resources to share or would like to be included for beta testing. (Long answer text)
40. Is there anything else you would like us to know about nearshore data in Oregon? (Long answer text)

Appendix B: Data Hub Metareview List

The following table identifies the existing data sharing platforms that were reviewed during the metareview.

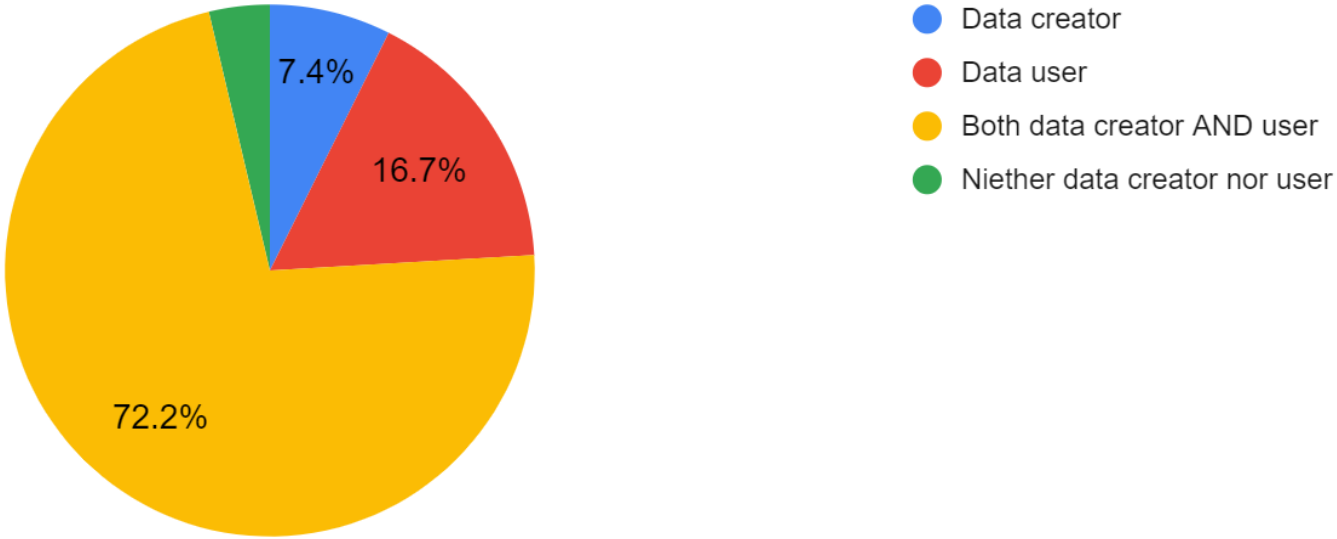
Title	Responsible Organization	Geographic Range
Data.gov	U.S. Government	International
Datos Abiertos de México	Mexican Government	National
European Data Portal	European Commission	International
World Bank Data	World Bank Group	International
mWater Portal	Independent (mWater)	International
NYC Open Data -	NYC Gov	State
Chicago Data Portal	City of Chicago	Local
Atlanta GIS	City Planning Atlanta	Local
MOA GIS	Municipality of Anchorage	Local
The City of Virginia Beach Open Data	City of Virginia Beach	Local
EDI Data Portal	Environmental Data Initiative	International
NASA Open Data Portal	NASA	National
West Coast Ocean Data Portal	West Coast Ocean Alliance	Regional
Oregon Explorer	OSU Libraries, Institute for Natural Resources	State
Northwest Fisheries Science Center Data Products and Tools	NOAA Fisheries	National
Oregon GEOHub	State of Oregon	State
Oregon Spatial Data Library	State of Oregon	State
Coastal Research Explorer	OCOIN	State
Oregon Coastal Atlas	Oregon Coastal Management Program	State
ODFW Marine Reserves Program Data Dashboard	Oregon Department of Fish and Wildlife	State
Data Basin	Conservation Biology Institute	International
North American Environmental Atlas	Commission for Environmental Cooperation	International

Sea Level Rise and Coastal Flooding Impacts	NOAA	National
West Coast Estuaries Explorer	PMEP	Regional
Puget Sound Seagrass Monitoring	Washington Department of Natural Resources	Regional
Maps & Tools | Surging Seas: Sea level rise analysis by Climate Central	Climate Central	International
USGS Coastal Change Hazards Portal	USGS	National
Coastal Resilience Evaluation and Siting Tool (CREST)	National Fish and Wildlife Foundation	National
Coastal Carbon Atlas	Smithsonian Environmental Research Center	International
NANOOS Visualization System	NANOOS	Regional

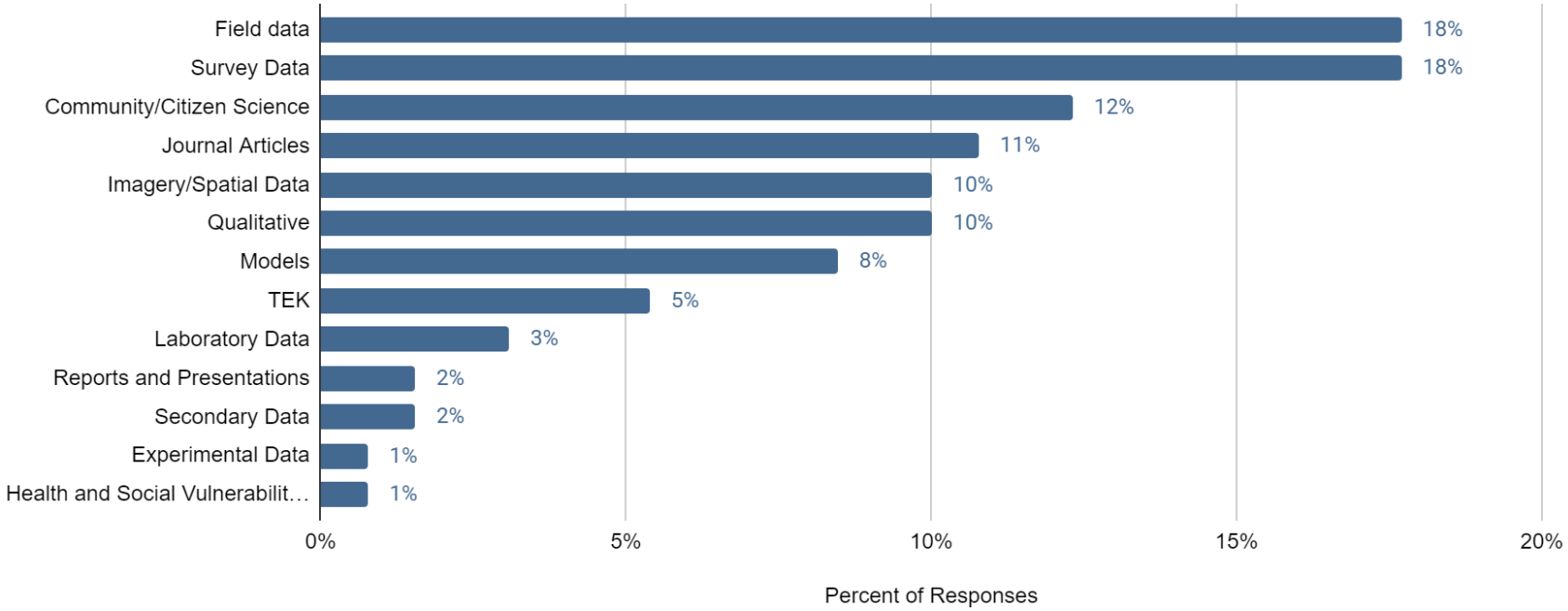
Appendix C: Nearshore Data Needs Survey Results

The following charts illustrate results from the Nearshore Data Needs Assessment survey.

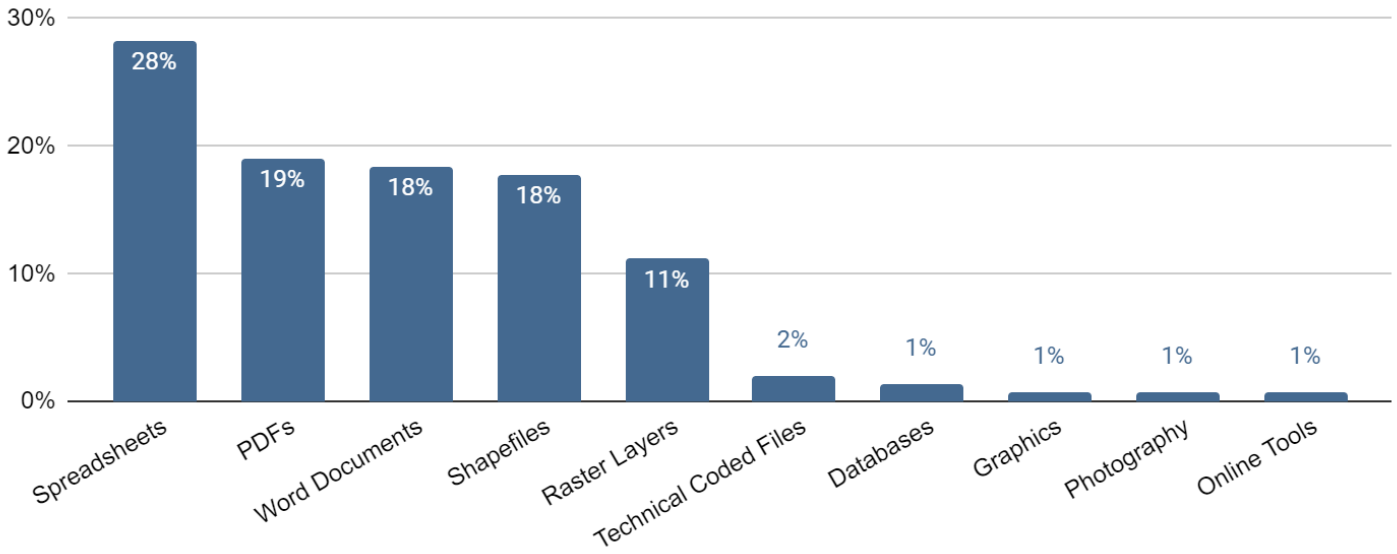
Are you a data creator or a data user?



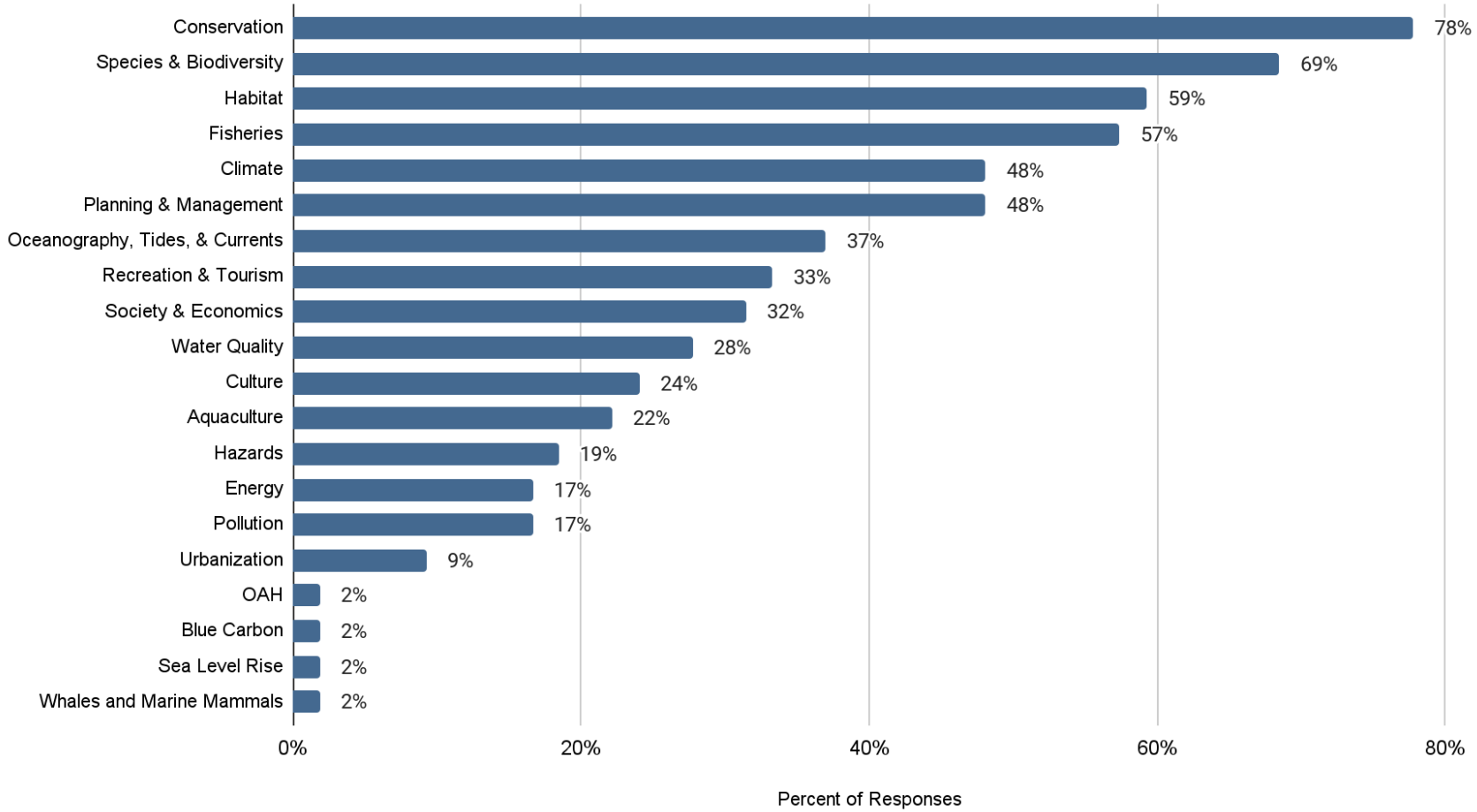
What type(s) of data do you primarily create and/or use?



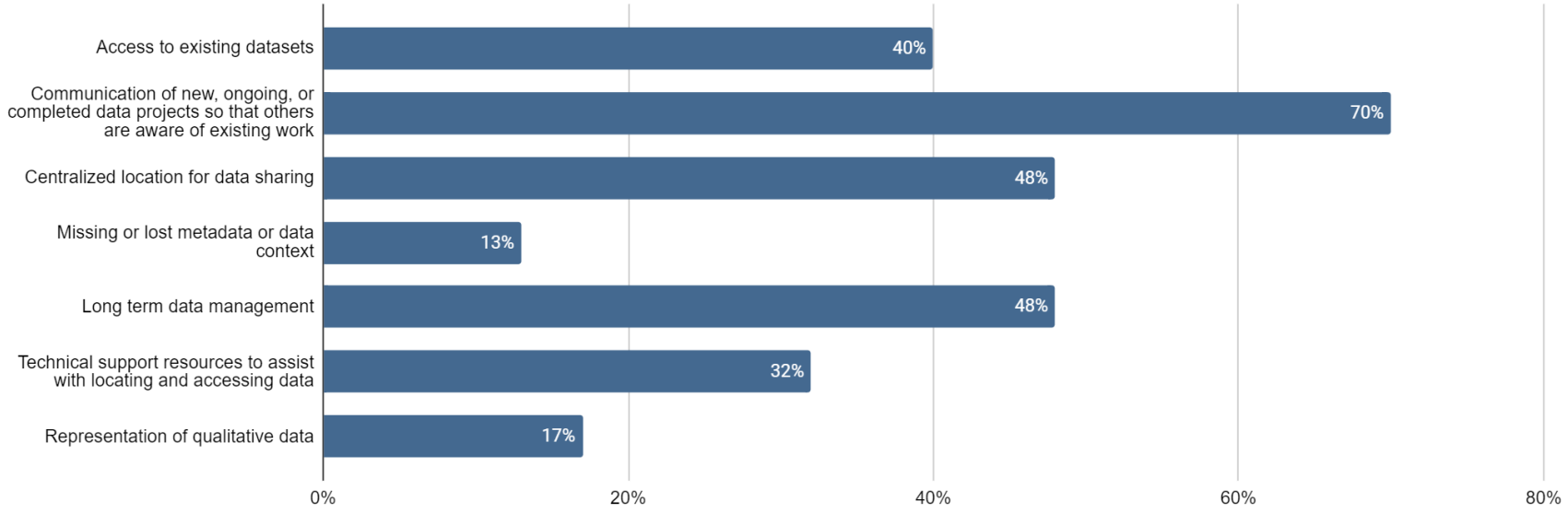
What format of data do you primarily create and/or use?



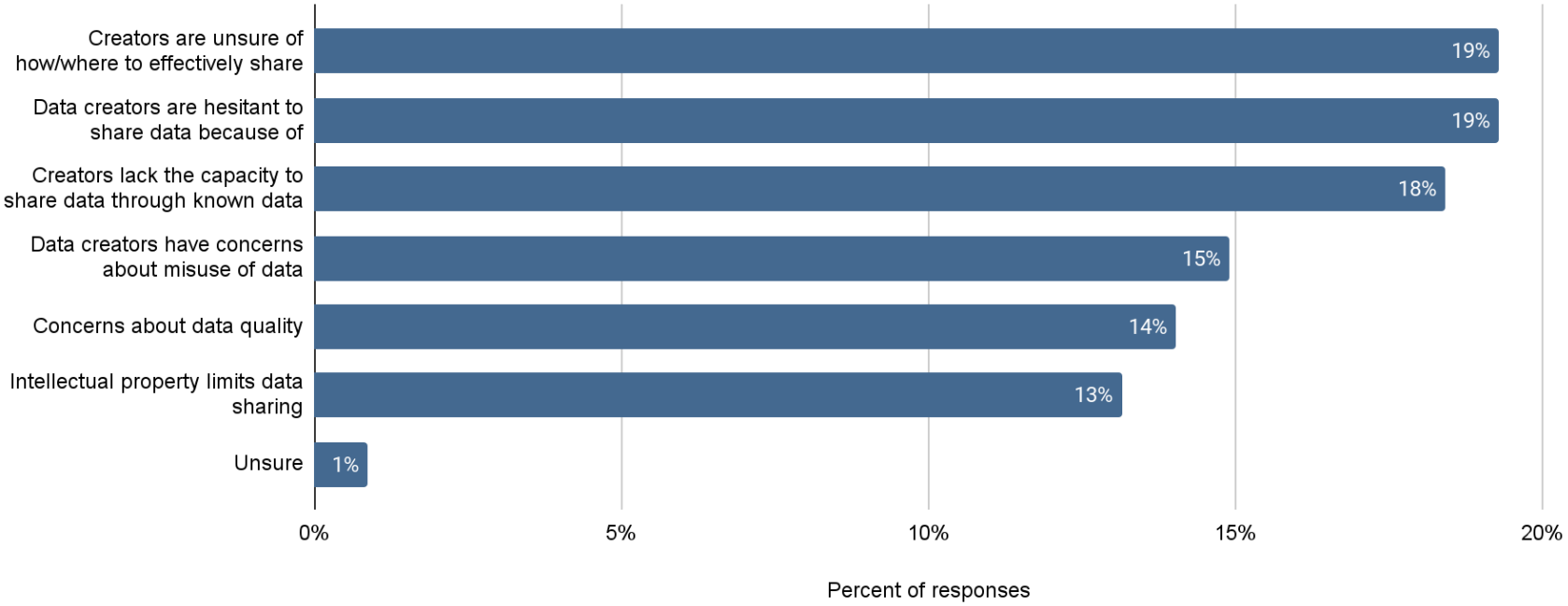
For which nearshore topic(s) do you create and/or use data?



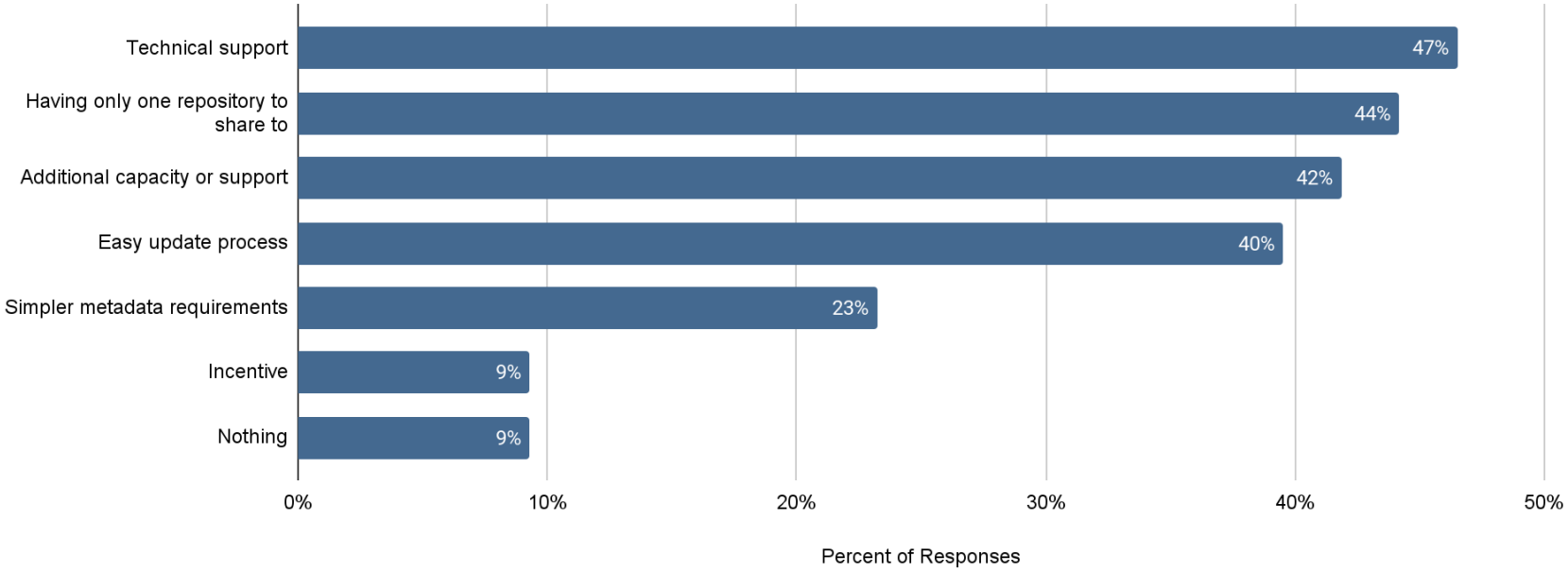
In your opinion, what are the most pressing needs for Oregon nearshore data?



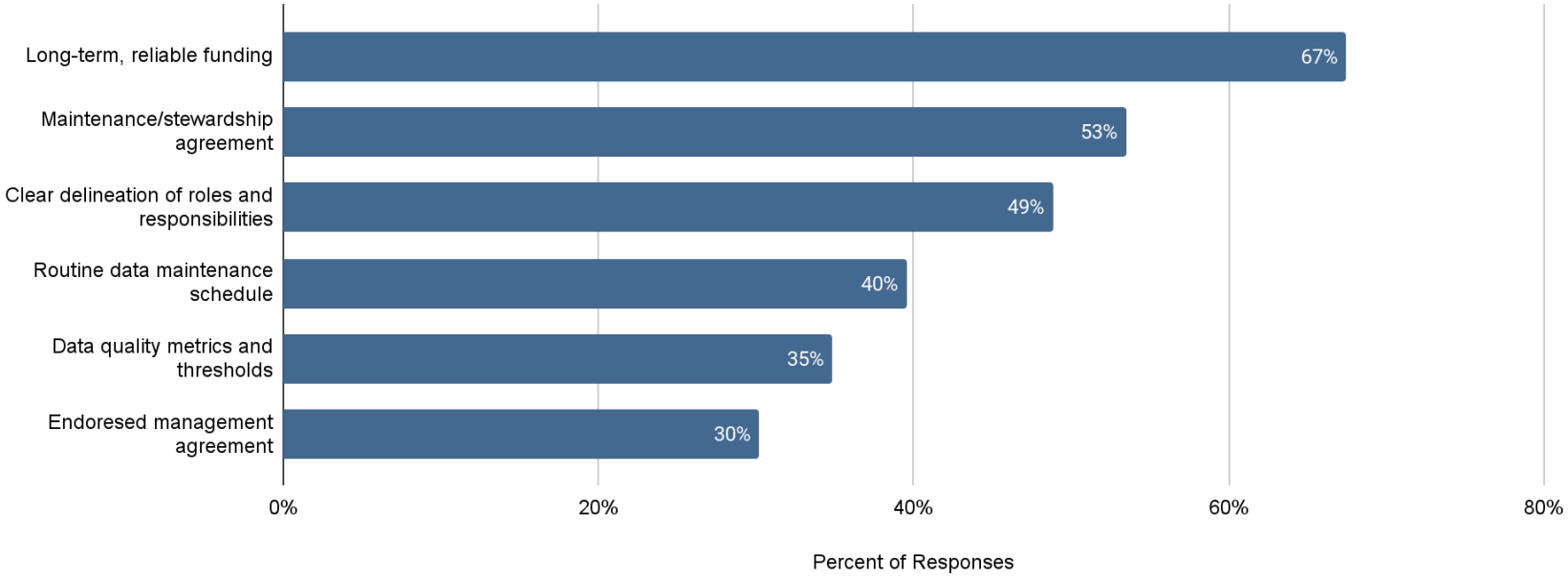
What do you believe limits data sharing?



What would increase your likelihood to share data to a web repository?



Based on your experience, which of the following factors are necessary for the sustainable, long-term management of data sharing platforms?



What challenges have you faced in accessing nearshore data?

