The Ocean Data Connector Series with Canada's Ocean Supercluster

CANADA'S OCEAN SUPERCLUSTER

CIOOS ATLANTIC
Regional Association of the
Canadian Integrated Ocean Observing System

CIOOS
CANADIAN INTEGRATED
OCEAN OBSERVING SYSTEM

The Canadian Integrated Ocean Observing System (CIOOS) Atlantic chapter partnered with Canada's Ocean Supercluster (OSC) to offer the Ocean Data Connector Discussion Series to explore how data sharing drives coastal and marine collaboration and innovation.

OSC is creating opportunities to grow the ocean economy in new and innovative ways. Collaborations across organizations, sectors and regions create synergies that are essential to addressing ocean challenges, fostering long-term growth, and supporting economic recovery. A key factor to enable collaboration is the exchange of information.

CIOOS is a national collaboration to share high-quality data and information, in both English and French, on the state of our coasts and oceans. The ability to discover and access high-quality spatial data underpins sustainable development and an improved understanding of our coasts and oceans that can drive economic innovation. Before organizations can begin making better operational decisions, realizing strong commercial outcomes and building capacity across sectors, they must have the ability to share, manage, access, and visualize data.

The Discussion Series consisted of three sessions occurring over a three week period.

Session One provided insights from both organizations on approaches to open data and data exchange and how they contribute to coastal and marine collaboration and innovation. Breakout sessions following the presentations focused on exploring barriers and challenges to exchanging sensitive or restricted data that provided insights from a variety of sectors for consideration and discussion.

Session Two explored ways organizations can discover, access, share, manage and visualize data from multiple sources to support informed operational decision making in marine environments. An interactive panel discussion and follow-on breakouts offered perspectives from a variety of sectors and gave members the opportunity to collectively discuss approaches to key industry challenges that coastal and ocean data exchange can support.

Session Three featured national and international guest speakers who shared their experiences and success stories using data exchange as a powerful tool for driving collaboration and innovation across sectors. Follow-on breakouts continued to build on these talks to explore solutions and strategies for collaboratively continuing this work going forward.

Session One:

Exploring Data Exchange with Canada's Ocean Supercluster and the Canadian Integrated Ocean Observing System

November 30, 2020

Session One brought together OSC members from across Canada to learn more about data exchange models, the value of open data, and the recently announced VITALITY project through informative presentations from the OSC and CIOOS. An interactive group activity gave everyone in attendance the chance to provide input on where their organization is situated on the "Data Spectrum" (between open access and fully restricted), considering factors that determine their organization's approach to data exchange. These factors were further explored in breakout groups that explored barriers and challenges to exchanging sensitive or restricted data.

Event Highlights

Presentation: *Data, Collaboration and the OSC*

OSC's Ralph Eldridge (Indigenous Engagement Lead) began the Series with an inclusive land acknowledgement. Susan Hunt (Chief Technology Officer) and Melody Pardoe (Chief Engagement Officer) then provided an overview on the OSC's approach to data exchange, and the potential opportunities for creating a cross-sectoral data hub to drive industrial growth and positive economic impact in Canada.

- Data sharing is a powerful way for OSC project participants to advance their own operations and the greater oceans ecosystem, with the varying levels of complexity that result from cross-sectoral partnerships being considered in the development of the OSC's data strategy.
- Project participants will establish the terms defining their respective rights to own, use, or license data that is generated through project activities.
- Within this structure, is an opportunity to apply the OSC's cluster building framework to preserve and protect data but also facilitate access as much as possible without compromising commercial interests.
- The work of VITALITY will leverage CIOOS' infrastructure to develop a data registry, recommendations for a data trust, and data management training resources to increase national capacity and lower the cost of entry for commercial entities to utilize previously inaccessible data.
- Ultimately this will result in strong collaborations and cost savings through more efficient sharing of data.

Presentation: *Data Exchange and the Blue Economy - The Value of CIOOS to Industry (CIOOS)*

Lydia Ross (Engagement Specialist), Kelley Santos (Engagement Specialist), Scott Bruce (Ocean Data Specialist) and Jeff Cullis (Technical Director) with CIOOS Atlantic discussed the significance of the blue economy to Canada's ocean sectors and the potential for greater collaboration, innovation, and commercial growth through the power of open data. CIOOS' data platforms:

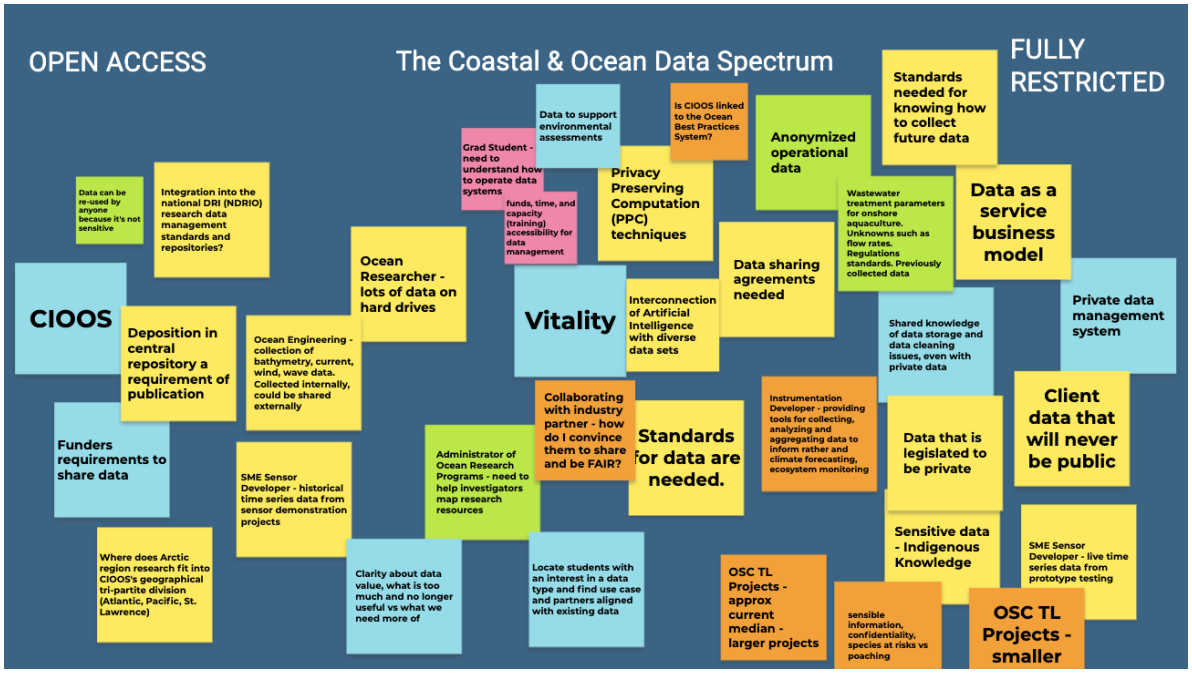
- Foster coordination and collaboration among diverse data contributors.
- Improve access to bilingual coastal and ocean information for decision-making.
- Enable discovery and access to coastal and ocean data that supports a variety of applied and theoretical research efforts to better understand, monitor, and manage activities in Canada's marine regions.

CIOOS' three Regional Associations, based in the Pacific, St. Lawrence and Atlantic, are working with their local coastal and oceanographic communities to promote collaboration across sectors and respond to data and information needs. Ways that both data users and contributors could engage with CIOOS were illustrated, along with a demonstration of the platform including the national and regional asset maps and data catalogues.

Key Takeaways: Data Spectrum Exercise & Breakout Discussions

- Diverse responses were provided across the spectrum that highlight a number of challenges and opportunities for data exchange identified by participants.
- Terms and conditions for data access and use are often determined by the end-clients that data companies are working for; therefore data companies have limited to no ability to engage directly with CIOOS and contribute data.
- There is a need to increase public understanding of how ocean data collected by academia, government and industry is translated into public knowledge and critical services for decision-making. A better understanding of where this data is coming from and how it is being used, may result in greater support for data exchange.
- Projects are often multilayered involving multiple types of data from different sources, some of which can be made openly available and some of which is restricted. Varying levels of accessibility within projects make data exchange challenging.
- Interoperability across sectors is challenging. Harmonizing proprietary formats should be considered in VITALITY.

- Data accessibility is often determined by the source of funding: government and academic funding tends to be more open VS. industry owned data which tends to be associated with more complex levels of restriction.
- The 'Data as a Service' business model is gaining traction in other parts of the world and should be further explored for the Canadian ocean data landscape.
- Although the Data Spectrum exercise focused on accessibility, the responses indicate a number of additional areas for consideration in data exchange, including data management training and resources.



The completed Data Spectrum activity

Watch the Interactive Data Spectrum exercise here. The activity had audience members weighed in on the factors that determine their organization's or company's approach to data exchange.

Session Two

Innovative Approaches to Data Tools and Applications Using Data Exchange

December 7, 2020

Session Two focused on exploring ways organizations can discover, access, share, manage and visualize data from multiple sources to support operational decision making in marine environments. Susan Hunt, Chief Technology Officer with Canada's Ocean Supercluster, facilitated a panel discussion that provided insights on innovative ways organizations are integrating and interpreting data into their day to day operations as well as some of the limitations and challenges currently being faced. These insights were further explored in breakout groups focused on operational planning decisions that require data, and the general use or knowledge of visualization tools and applications.

Event Highlights

Panel Discussion: *Transforming data into information: exploring approaches for using data applications, tools and visualizations to support operational decisions*

Laura Dwyer, R&D Manager, Grieg NL, outlined their work towards achieving "egg to plate" traceability in their aquaculture operations through increased information sharing across their operation and the Placentia Bay region. Grieg NL is currently working with several partners from aquaculture and other sectors to improve communications and monitoring infrastructure to connect systems and measurable parameters into a single data hub that will allow Grieg's operators to use real-time analytics and visualize and connect all aspects of their operation to improve decision-making. Beyond Grieg NL's operations, all data collected will be made openly available, supporting enhanced regional communications, safety and research efforts.

Julie Angus, Co-founder and CEO of Open Ocean Robotics, stressed the importance of properly managing data into consistent interoperable formats to be able to compare and contrast different data types easily. The work of her team is very end user focused; providing the most effective data allows clients to make more informed decisions around sustainability and cost effectiveness. The potential to access and share greater amounts of data will allow users to draw further insights and advance greater data applications in the future. Further development of data analytics across the country will allow Canada to compete on a global scale.

Terry Bullock, Principal Meteorologist with Wood, and his team are focused on weather and oceanographic forecasting, primarily for the oil and gas sector. The science of forecasting is complex due to the large volume and diversity of data sources integrated by Wood's daily models that produce easy to interpret decision support tools for their clients, i.e. risk dashboards. Significant investments have been made in visualization tools and cloud based data management systems to support this work. Satellite and remote sensing systems will play a more significant role but will need to be validated with in-situ ocean observing infrastructure.

James Munroe, Associate Professor, Physics and Physical Oceanography, Memorial University of Newfoundland highlighted the ability of platforms like Ocean Navigator and CIOOS to provide users with access to large volumes of data without requiring the infrastructure to download and store the information they need. Users can leverage the cloud technology, common frameworks and consistent formats offered by these platforms to build project specific tools, such as multi-ensemble forecasting, saving time and resources.

Joel Culina, Physical Oceanographer with FORCE focused on site characterization and environmental monitoring for tidal stream technology in a geographically limited space. Greater access to standardized 2D GIS tools to overlay shapefiles and visualization layers through platforms like CIOOS would greatly support their work. Moving into 3D and eventually 4D visualizations that account for a time variable is a priority.

Breakout Discussions – Major Themes and Key Takeaways

Human Aspects

- Opportunities for creating relationships through data exchange, through social licensing and data collaborations that expand outside of specific projects.
- Many visualizations such as dashboards still require human judgment calls for decision-making.
- Distributed workforce from pandemic. Virtual collaborations are increasing (Jira, Slack, Google calendars, GitHub, etc.).

Value Proposition

- Value for companies integrating other data sources to create richer, more robust end products, creating added value for clients through gained insights.
- Beyond using data for own applications, access to additional data extends the functionality of a company's applications/tools.

Functionalities

- Visualizations with interactive layers are helpful for community members
- Visualizations that address risk and threshold analysis are of interest

- A reporting tool activated by drawing a bounding box around a geographic area is of interest

Needs

- Organizations are interested in more data for their tools. Some companies have their own modelling software and are looking for data from CIOOS, not visualizations. Site specific data is especially important for validating new technology.
- A need to create in-situ visualizations to reduce the need to send large amounts of data via satellite.
- For industry-led initiatives, ocean data can be very expensive, and the sharing of data can be difficult.
- Industry needs data for decision-making, in particular, analyzing impacts. Raw data is less important than how an operation is impacted.
- Data visualizations can help scientists understand operational decisions, and in turn, their support for those decisions.

Challenges

- Managing and sharing data becomes a significant challenge when companies are growing, and the depth and breadth of their data is expanding quickly.
- Very little financial incentive for companies to share the data, there must be a policy incentive
- Once details around ownership are sorted, oil and gas industry have environment data used for planning, marine operations, emergency response, etc., that would be widely valuable.
- Limited relevance of visualization tools that are designed in response to highly specific questions or clients needs. Ocean data is only one component of the decisions that SMEsmake. Therefore, one benefit of these visualizations is CIOOS' data standards that enable greater use of the data from these visualizations.
- Wide range of capacities for visualizing data; from building, buying, adapting, to 'don't know'
- Focusing on interactivity in visualizations may oversimplify the complexity of the dataset, creating liability issues.

Technological Considerations

- Need apps to be able to access the different data types. ERDDAP allows for multiple data formats to be downloaded, along with multiple ways to display. Useful / multi-functional; used by Wood, CIOOS, NOAA.
- Create visualizations built through open-source software like CIOOS that do not rely on clients to own licenses (such as MatLab) to view the results. Improves relations and usability of visualizations.
- Running applications in the cloud can be faster, as the data does not need to be downloaded first
- Important to have comprehensive metadata; data is collected for one use, but could be re-used for many other applications. Metadata key for interoperability.
- Automation must be used to our advantage, used as a tool to assist humans. Ever changing landscape of automation. Smartphones and mobile apps are trending past web apps.
- Microsoft Excel is very flexible, and much can be done with a limited budget for visualizing complex sources of information.

Watch the Session Two panel discussion here. The panel discussion was moderated by Susan Hunt, Chief Technology Officer with Canada's Ocean Supercluster, this cross-sectoral panel focused on transforming data into information by exploring approaches for using data applications, tools and visualizations to support operational decisions.

Session Three

Solutions and Strategies for Data Exchange

December 14, 2020

Session Three focused on solutions and strategies for marine data exchange from the perspectives of national lead speakers, Brian Burke and Dr. Mike Smit, and international keynote, Steven Adler, who each shared profound insight on the real and potential value of making marine science data discoverable to others. Speakers shared examples of how open data exchange is a powerful tool for driving collaboration and innovation across marine industries and sectors. Messages closely aligned with CIOOS' own solutions and strategies for marine data exchange including the national and regional open data platforms, tools, and resources as well as the VITALITY project. To continue to explore ways that CIOOS can add value to marine industries, OSC members participated in an interactive Mentimeter activity and submitted responses to live poll questions focused on current and future priorities of CIOOS. Final reflections on the overall series were delivered by OSC and CIOOS.

Event Highlights

Presentation: The Nunavut Fishery - The Requirement for Data Collection and Sharing

Brian Burke, Executive Director, Nunavut Fisheries Association (NFA)

The NFA represents a common voice for Nunavut stakeholders and rights-holders on issues including increased share of resources, maximizing employment, securing funding, ensuring Inuit consultation, and translating data into better decision making. The 100% Inuit owned Association undertakes research programs such as offshore surveys, tracking studies, inshore and offshore fisheries development, and reducing environmental impacts. The Association faces a number of challenges in the North, including a huge region and coastline, data scarcity for both offshore and inshore fisheries, and the effects of climate change creating more storms and extreme events. They face challenges with data availability due to ownership and privacy issues. NFA joined OSC because of the development of innovative approaches and technologies to address data challenges and collaborations within and across ocean sectors. Access to more/ better data and knowledge through collaboration on data collection and sharing can contribute to a number of priority areas for the Association, including better understanding of offshore habitat and sensitive benthic areas, and more sustainable fishing practices using technologies and AI to improve harvest, reduce bycatch, reduce environmental impacts etc.

Presentation: Schrödinger's Data - Why Your Data is Worthless and Priceless at the Same Time

Dr. Mike Smit, Project Lead, CIOOS Atlantic; Associate Professor, Dalhousie School of Information Management

Data has enormous and very little value at the same time. Individual data collection efforts convey limited information on a very narrow part of the ocean, however, combined with data collected by other projects, infrastructure, etc., this data has much greater value as it provides a more comprehensive picture of an area. Once data is made available in a system, there are many different options for re-use: data as a service, data products, informed decisions, monetary value, forecasting, collaborations, etc. While companies know the cost of collecting data, it is difficult to add a dollar value to data discoverability. When data is inaccessible, its value is diminished, particularly over time. Many organizations only use the most current data and stash their historical data. If data has no competitive value, its potential value could be unlocked by making it discoverable to others. Data is grounds for relationships. More can be achieved if we share data as no one has a complete understanding of the ocean. The value of data discoverability is realized by extending the long-term value of otherwise unimportant data, and as a means to build strategic partnerships based on open data collaborations.

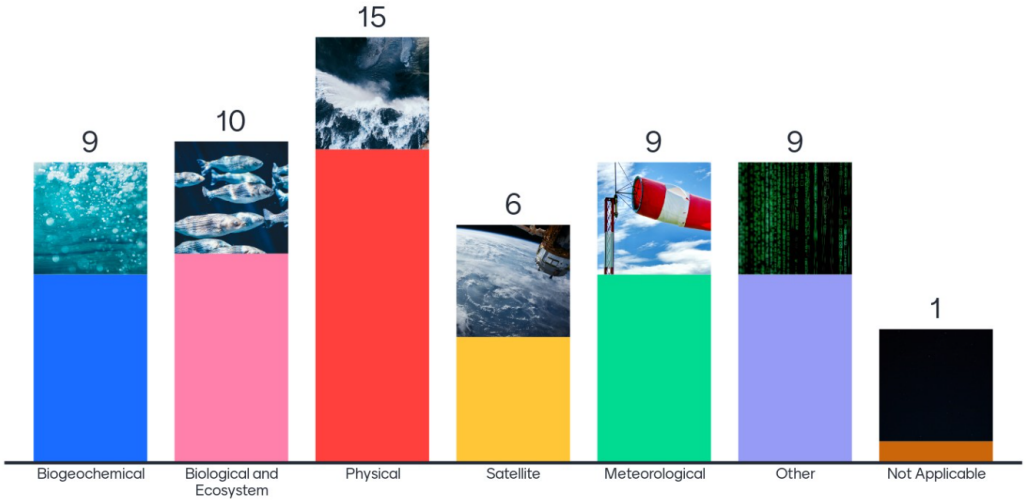
Presentation: A Digital Ocean Transformation

Steven Adler, CEO, Ocean Data Alliance

In reaching a digital ocean transformation, certain challenges must be acknowledged. The ocean is largely unmapped, the calibration of sensors used to collect ocean data varies widely, and little to nothing is known about the humans who collect the data, with very little of the large amounts of ocean data being collected, being shared openly. Mr. Adler contrasted the lack of ocean data sharing against the ways in which people love to share stories and experiences, including through social media. The difference is that people are rewarded for sharing on social media with 'likes', with no similar reward for sharing ocean data. Similarly, scientists receive recognition, financial rewards and job security for publishing papers, however there is no incentive for publishing ocean data. IBM has created an internal reward system for employees that file patents; this has resulted in IBM being the #1 producer of patents in the US for over 20 years. Individuals who contribute to ocean data collection (scientists, tech designers, crew members) must also receive proper attribution using concepts like Internet Resource Locators for missions and surveys. Data is not a traditional asset, like gold, where its value is based on scarcity; its value is purely transactional and based on use. The longer data sits unpublished, the less likely anyone is to discover and use it. Audiences were challenged to commit to sharing data openly where possible, to stimulate growth, creativity, and innovation in more powerful ways than if data was kept private.

Mentimeter Poll Responses

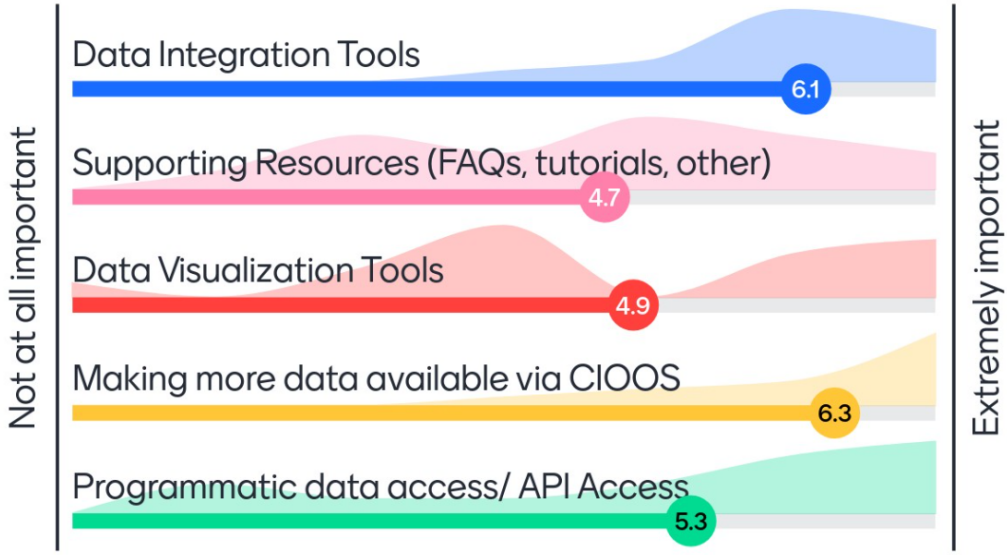
What data type(s) does your organization or company collect/ manage/ use?



Are there coastal and ocean geographic areas that you need data for?

Bay of Fundy; Minas Basin; Coastal Nova Scotia; Scotia Shelf Bioregion; Cabot Strait; Southwest Grand Banks; Atlantic Canada; Aquaculture sites on East and West Coast; Baffin Bay; Davis Strait; Ungava Bay; Qikiqtani region; Land-sea interactions; Tidal rivers; and Seagrass beds.

How important are these CIOOS priorities for your company/ organization?



What comes to mind when you think of CIOOS and data exchange?

Mentimeter Reflections

Respondents were asked to reflect on answers to the Mentimeter poll questions in small breakout groups. Generally, respondents were surprised by the diversity of data types being collected/ managed/ used. Physical data was noted for benefiting engineering analysis for site suitability. Biological data was identified as useful for invasive species monitoring, North Atlantic Right Whale presence, and eDNA studies. “Other” data included AIS, managerial, and metadata. Real data gaps for offshore operations were noted, with an added interest in data for coastal regions, particularly in support of aquaculture operations (a recurring Series theme). Overall, respondents were interested in the “total ocean”. Interest was expressed for CIOOS expansion into the Arctic, so long as this is undertaken in close partnership with existing initiatives in those regions. Digital twins, virtual tools that match physical environments, were discussed. A strong potential for partnering digital twin initiatives with CIOOS was noted. Some respondents valued making more data available through CIOOS more than visualizations, to enable API access through their work.

Watch the Session Three presentations here.

Final Remarks

Across all three sessions, numerous opportunities have been identified for greater collaboration through data exchange. CIOOS is designed as a platform to support these opportunities by fostering coordination and collaboration among diverse data contributors in support of coastal and ocean stewardship, economic innovation, and marine safety and navigation, by providing access to high quality coastal and ocean information and data through our online platform. CIOOS' data platform and staff can support many aspects of OSC's vision, such as realizing the potential of Canada's ocean economy by facilitating cross-sectoral engagement and collaborations and supporting commercial outcomes through open data.

Thank-you for taking the time to join us for this event! We look forward to working with OSC members and associates in the future to support their ocean data initiatives.