



Open
Geospatial
Consortium

Unlocking the Value of Marine Information

2nd UN World Geospatial Information
Congress

Trevor Taylor, OGC
11 October 2022



The Open Geospatial Consortium (OGC)

Community – Innovation - Standards



230+ members from industry

120+ government agencies

185+ universities & research orgs

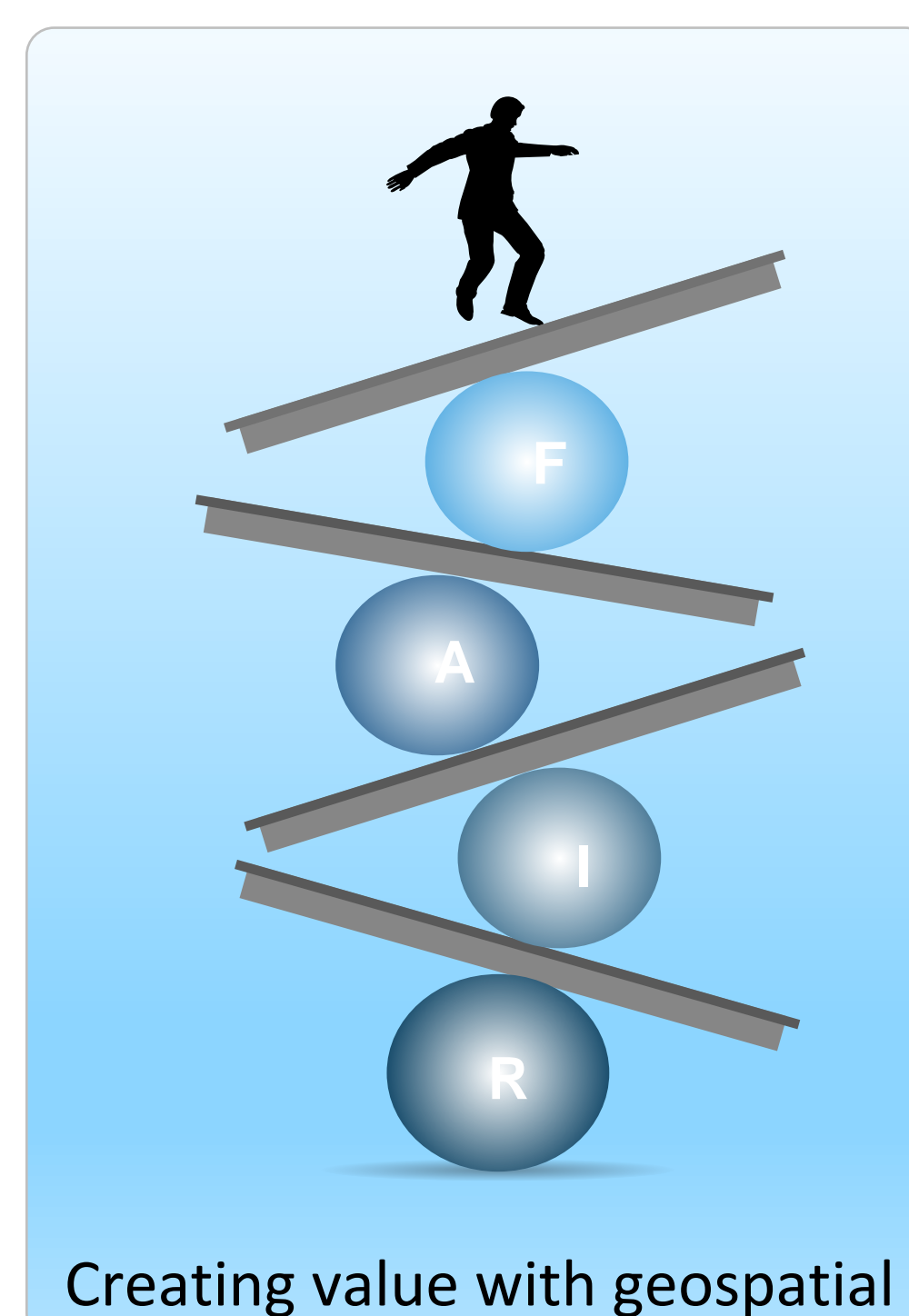
70+ standards

100+ working groups

The Open Geospatial Consortium (OGC)

Collective problem solving – Findable, Accessible, Interoperable and Reusable (FAIR)

Community: 550+ Members



Open Standards

Best Practices

Proof of Concepts

Deliverables to the world

Many Trends – Geospatial is Everywhere

- . New sensors
- . Small satellites
- . LIDAR
- . IoT
- . Drones
-



- . GNSS
- . 5G
- . Global grids
- . Indoor
- . Underground
-



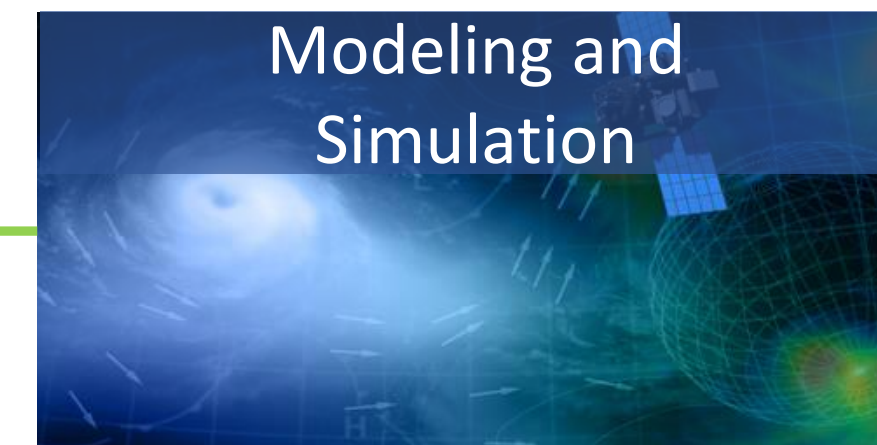
- . Cloud
- . Edge
- . Streaming
- . Internet
- . APIs
-



- . 3D
- . AR, VR, MR
- . Gaming & simulation
- . Maps on the web
- . Natural language
-



- . Artificial Intelligence
- . Machine Learning
- . Big data analytics
- . Linked data
- . Analysis Ready Data
-



- . Weather
- . Disaster risk
- . Pandemics
- . Human activity
- . Hydro/soil/air/etc
-

Requires Practical Collaboration



**Modernizing SDI:
Data Interoperability
for Cumulative Effects**
Data & services to study
cumulative effects
ogc.org/mod-SDI



Now Available: Engineering Reports documenting
method for simple cloud-based EO Applications **OGC**
ogc.org



**Smarter Cities Through
Use of Digital Twins**
The Location Powers
2021 Report Preamble
OGC
ogc.org



**OGC
APIs** | Building Blocks
for Location



OGC - IHO
Federated Marine SDI
Demonstration Pilot
Connecting Land and Sea Across Nations



Public Comment Requested on Proposal
for Revision to I3S Community Standard **OGC**
ogc.org



Public Comment Requested:
Recharter of GeoPackage SWG **OGC**
ogc.org



Leveraging Sensor Data
and the Internet of Things
SENSORUP | **OGC**
ogc.org



OGC
Seeking public comment on charter
for Artificial Intelligence
in Geoinformatics
Domain Working Group

Based on Building Blocks of the Future



Features

Approved Standard

OGC API - Features - Part 1: Core and Part 2: Coordinate Reference Systems by Reference are both publicly available.



Common

OGC API - Common provides those elements shared by most or all of the OGC API standards to ensure consistency across the family. The candidate standard will soon be released for public review.



Maps

OGC API - Maps offers a modern approach to the OGC Web Map Service (WMS) standard for provision map and raster content.



Tiles

OGC API - Tiles provides extended functionality to other OGC API standards to deliver tiled data, such as Map Tiles.



Styles

The OGC API - Styles defines a Web API that enables map servers, clients as well as visual style editors, to manage and fetch styles...



EDR

Environmental Data Retrieval (EDR) API provides a family of lightweight interfaces to access Environmental Data resources. Each resource addressed by an EDR API maps to a defined query pattern.



<https://ogcapi.org/>



Records

OGC API - Records updates OGC's Catalog Services for the Web by building on the simple access to content in OGC API - Features.



Processes

OGC API - Processes allows for processing tools to be called and combined from many sources and applied to data in other OGC API resources through a simple API.



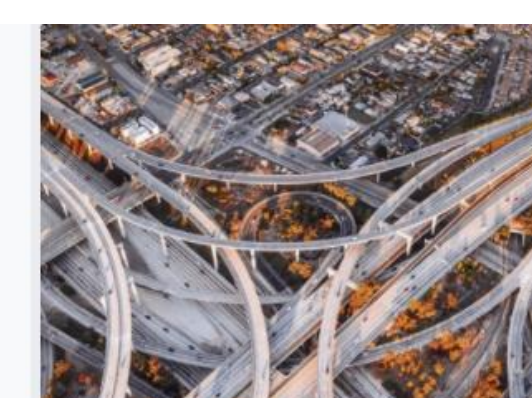
Coverages

OGC API - Coverages allows discovery, visualization and query of complex raster stacks and data cubes.



DGGS

Enables applications to organise and access data arranged according to a Discrete Global Grid System (DGGS).



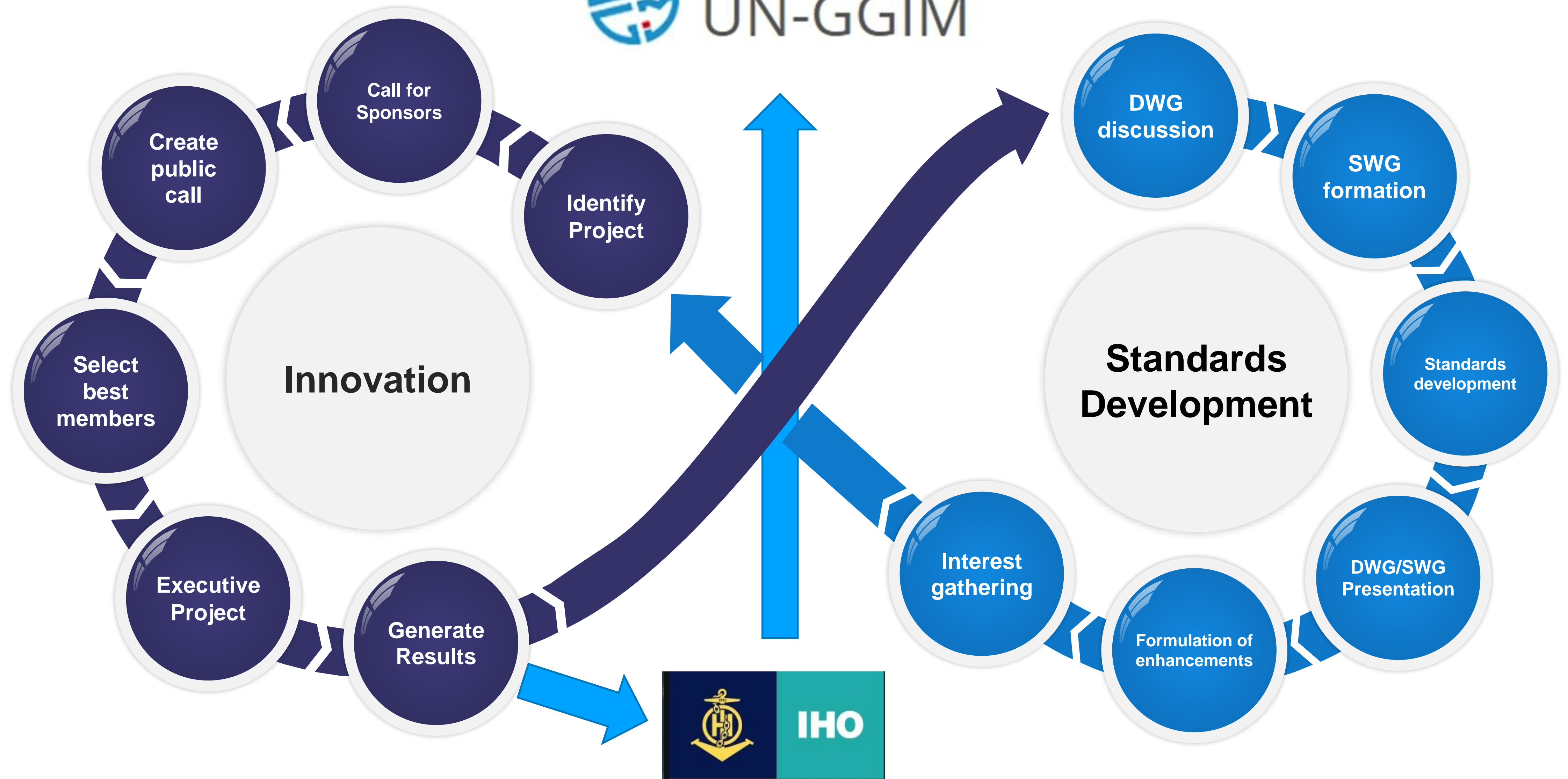
Routes

Enables applications to request routes in a manner independent of the underlying routing data set, routing engine or algorithm.

Close Collaboration - Marine

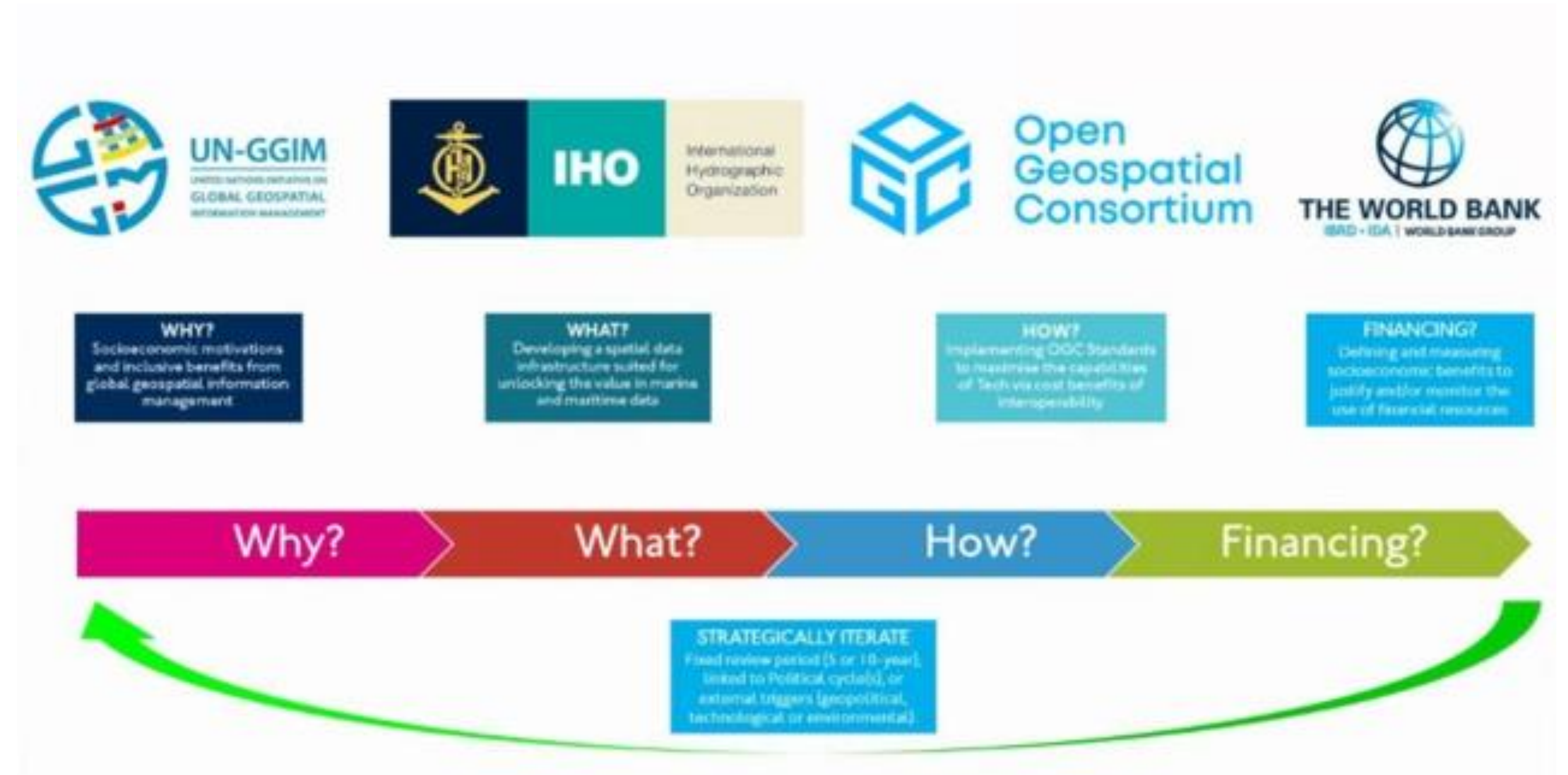


UN-GGIM



Partnerships – Critical!

- Collective Problem Solving – Innovation
- Multiplier effect + reduce redundant work
- Maximize Investments
- Long History on collaboration – which is accelerating



Slide Courtesy of UKHO –
Maturity Work Item example

Innovation in the Marine Domain



The IHO-OGC FMSDI Pilot

- Demonstrate multi-country/region , Federated Marine Spatial Data Infrastructure (SDI) to:
 - **Stakeholders** - inclusivity!
 - **Delivery** - Demonstrate how federated Marine SDI can provide simple, secure access using Modern Standards based approaches (OGC APIS, IHO S-1XX)
 - **Areas of interest** - Baltic and North Sea (potentially Arctic, South-East Asia, others)

Thanks to our Sponsors!

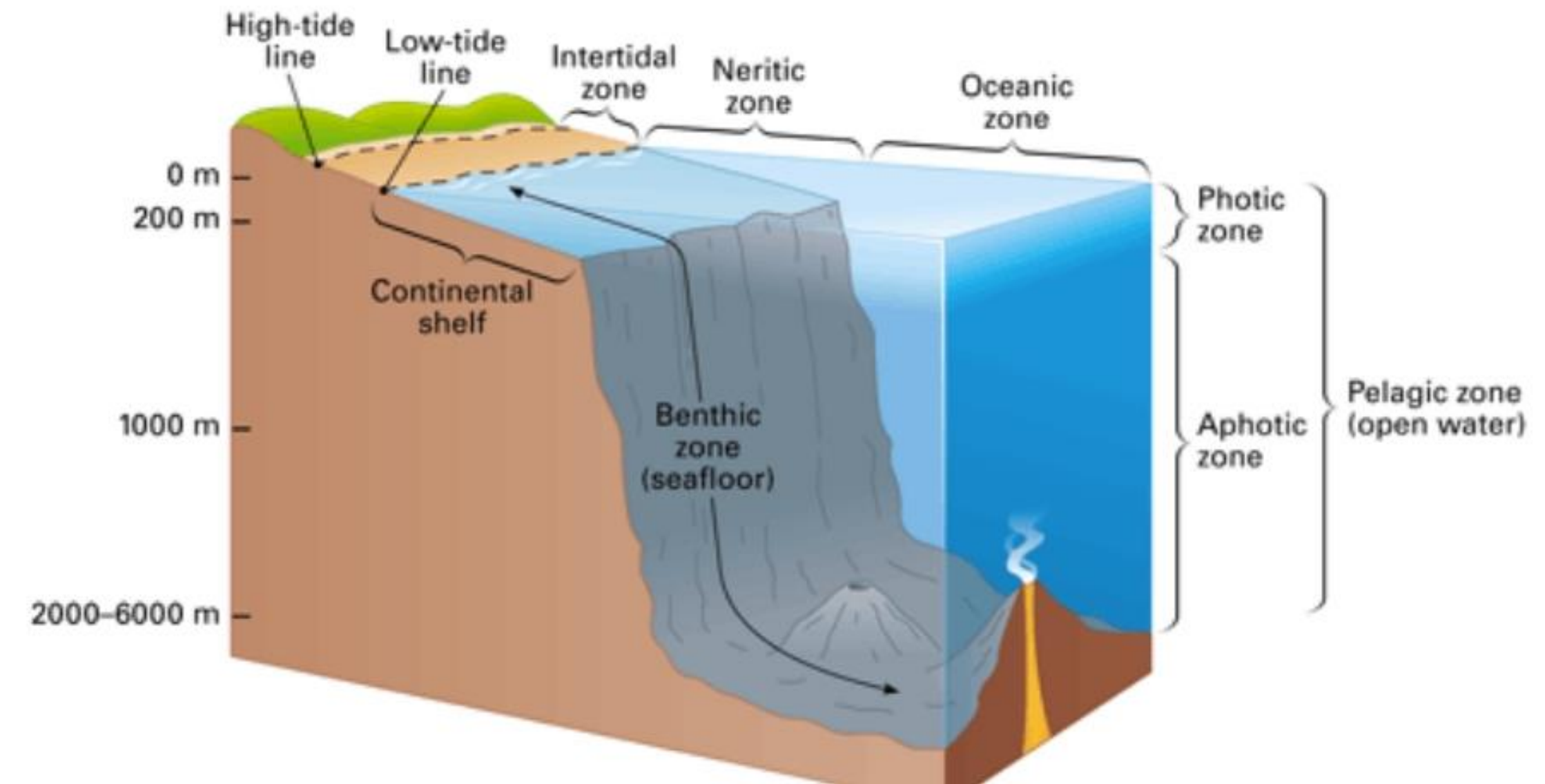


Background:

Coastal erosion at the land – sea interface:

Where the land meets the sea

- Demonstrating interoperability between land and marine data to understand coastal erosion (e.g. ocean currents, geology, permafrost characteristics, etc.) in the Arctic
 - Defining coastline (highest line) and transition zone.
 - Need to connect with national organisations working on the coastal transition zone.



(from
<https://bodell.mtchs.org/OnlineBio/BIOCD/text/chapter34/concept34.4.html>)

Digital Twin Challenge: Integration of Land and Marine data for Coastal Protection Planning, Critical Infrastructure Protection, and Resilience.

THE STRAITS TIMES

SINGAPORE

LOG

Pilot to help Singapore plan for better coastal protection against rising sea levels



As a low-lying island state, Singapore is threatened by rising seas caused by the planet's warming. PHOTO: LIANHE ZAOBAO



<https://www.straitstimes.com/singapore/pilot-to-help-singapore-plan-for-better-coastal-protection-against-rising-sea-levels>

Outcomes

- **Demonstrations** - Technology demonstration showcasing federated Marine SDI Land/Sea use cases
- **Impact on OGC Standards** - Lessons learned and gaps
- **Impact on IHO Standards** - Practical testing of relevant S-100 based IHO standards to help to inform the work of the IHO HSSC Working Group
- **Impact on Next Steps** – what is next (demonstrating creation and delivery of IHO S.1XX product specs using OGC standards? Data Management – data cubes, Discrete Global Grids) ?
- Advancing FAIR (and increasingly FAIR+) approaches

How do we unlock the ability to share the wealth of non-navigational marine data collected by the international community ?



FMSDI Initiative

Phase 1
(Sep-Dec 2021)

Phase 2
(Jan-June 2022)

Phase 3
(Jul-Dec 2022)

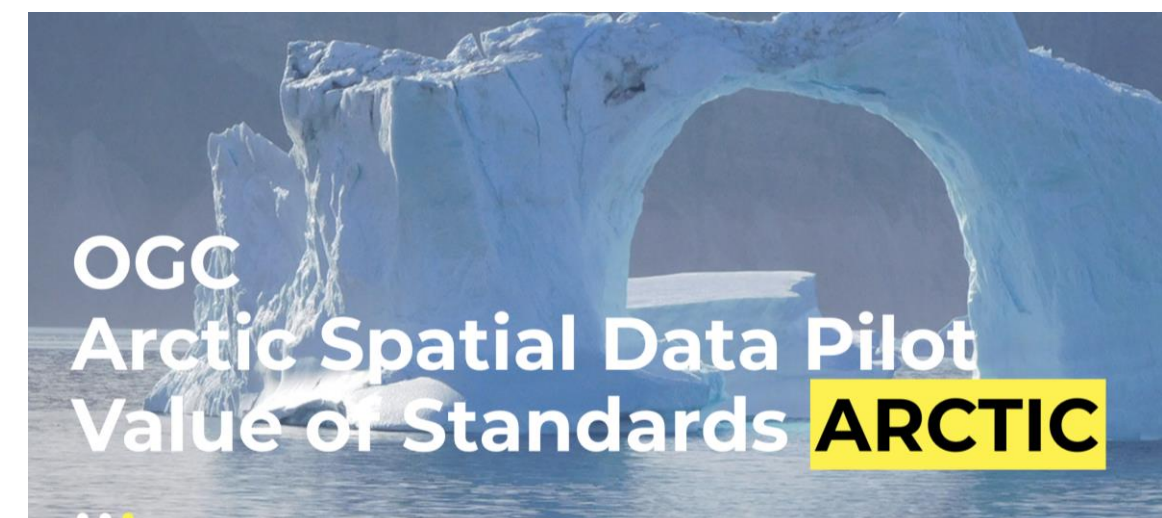
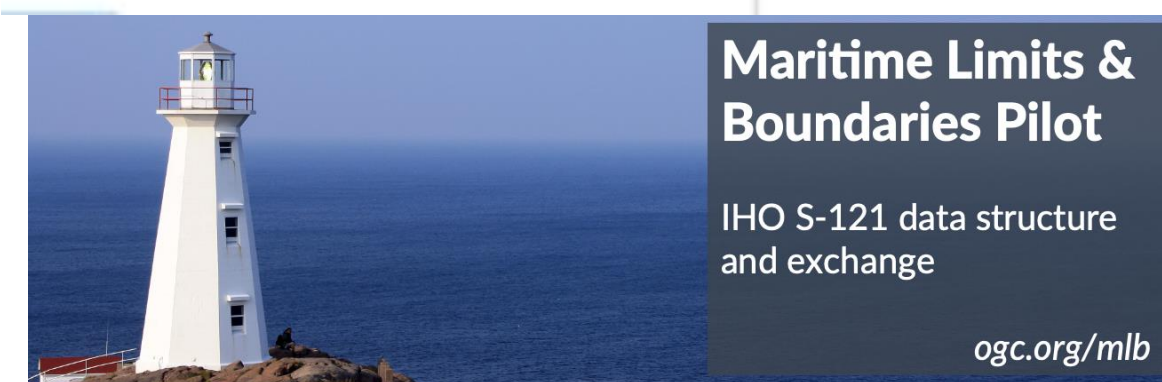
Understand
status quo

Demonstrate
marine protected
areas at OGC API
endpoints

Extend to new location:
Arctic

UNGGIM-IGIF derived
maturity model for
Marine SDIs

Add more data, more
services to address more
complex scenarios





Phase 1:

RFI on Marine Data Resources (Focus on Marine Protected Area)

Understand
status quo

RFI: Results and Summary

1. The need for international collaboration in the FMSDI is prominent
2. A regional approach for the FMSDI may be best
3. As these regional MSDIs become established, they can coordinate with neighboring regions to ensure interoperability and share best practices.



RFI is documented in Annex A of the [Engineering Report](#)



Phase 2: IHO and OGC Standards Applied to Marine Protected Areas

Demonstrate
marine protected
areas at OGC API
endpoints

UNGGIM-IGIF derived
maturity model for
Marine SDIs

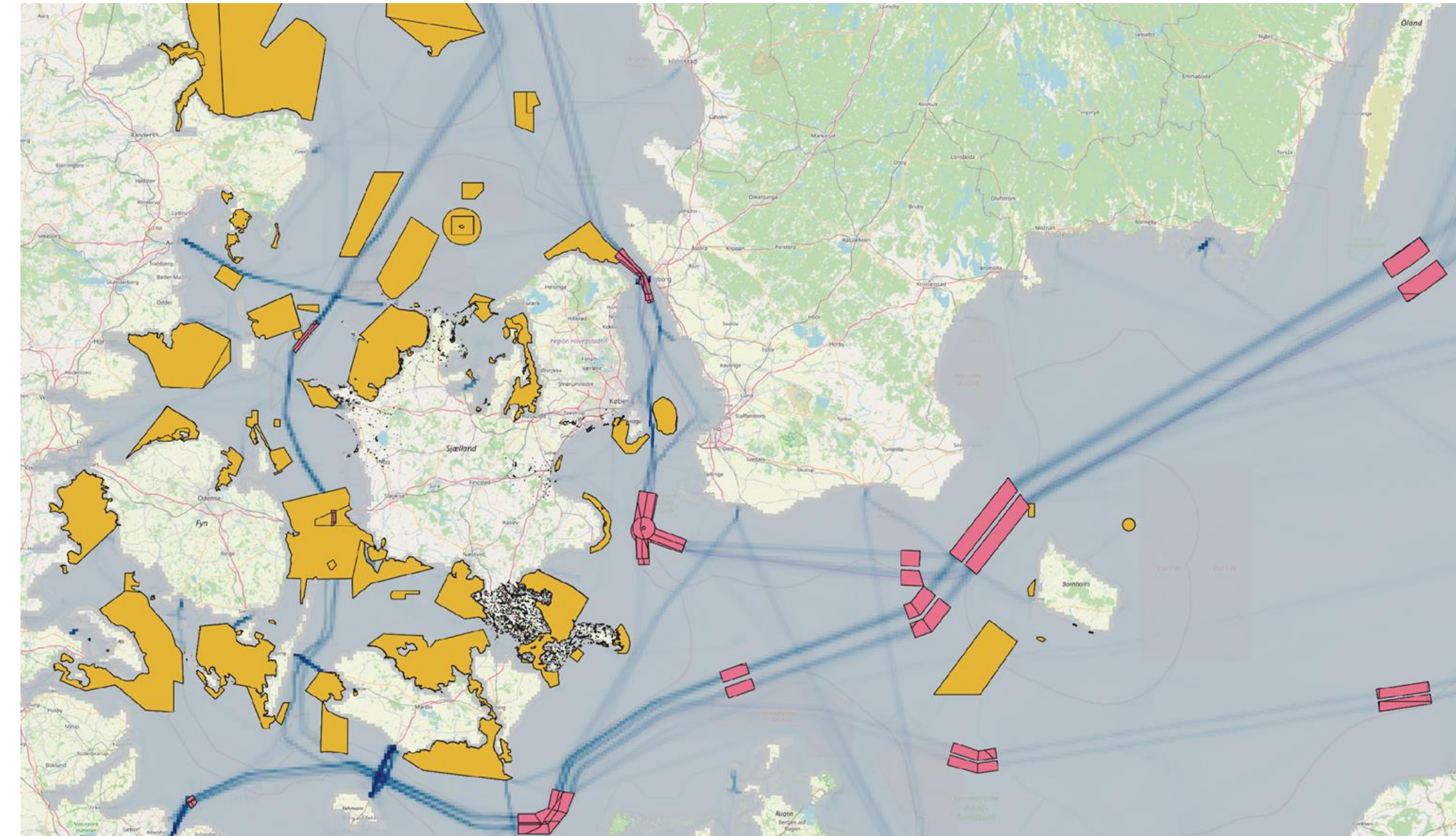
Phase 2: Summary & Participants

- Demonstrate access to **Baltic/North Sea Federated Marine Protected Area** (MPA) data for a wider **variety of end users** outside of the traditional MSDI domain.
- Demonstrate marine data infrastructure **beyond S-1xx data** (greater fidelity, mobility, and variety of data and standards (e.g. terrestrial, meteorological, earth observation, online sensors, etc.))
- Test and improve marine data accessibility and analysis with modern **OGC APIs**

Phase 2: Demo Result

IIC Technologies Server [\(Demo link\)](#)

- **OGC API Features** endpoint using open standards, open source tooling (HTML and GeoJSON endpoints with metadata).
- Proposed **enhancements to IHO S-122 model** to encompass broader uses of MPA data
- Query Endpoint supporting **complex queries on data**.
- **GeoJSON encoding of S-100 data**.
- Examples for multiple states within the Baltic region.

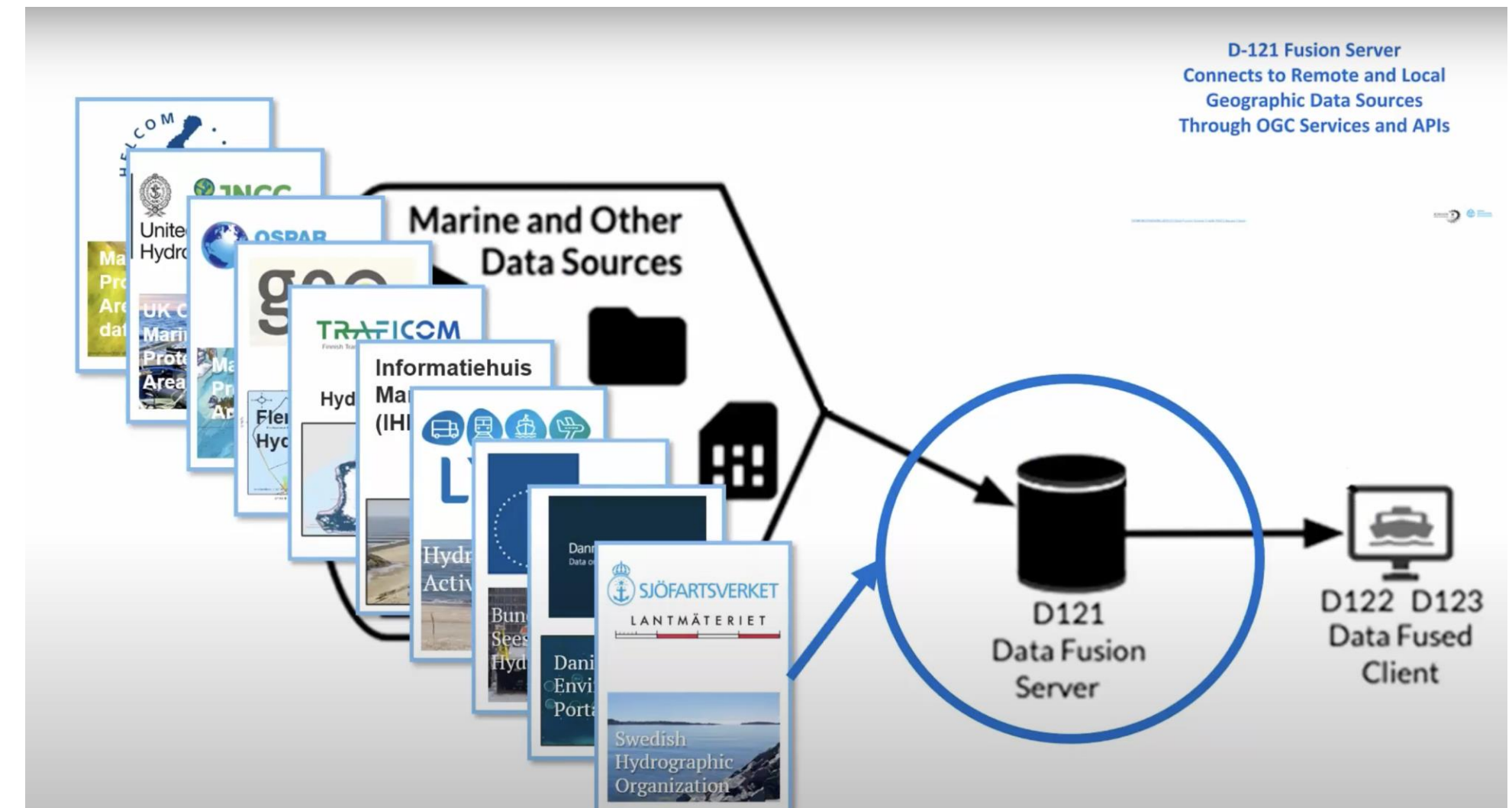


<https://youtu.be/vdc1EdIYMe0>

Phase 2: Demo Result

UCalgary Server [\(Demo link\)](#)

- Fusion server that integrates multiple data sets
- Uses DGGS with support for raster and vector data
- DGGS-powered server exposes OGC Environmental Data Retrieval (EDR) API



<https://drive.google.com/file/d/1mHlvNs-HTJASGnKb58U-eXu9xnLY09ze/view?usp=sharing>

Phase 2: Demo Result

Helyx Client [\(Demo link\)](#)

- Ingest MPA data from server
- DDIL (Disconnected, Disrupted, Intermittent, Low-bandwidth) viewpoint

Scenario

- Vessel at sea needs to query what MPA features exist within 5NM of a given route

Previous work addresses compensating mechanisms

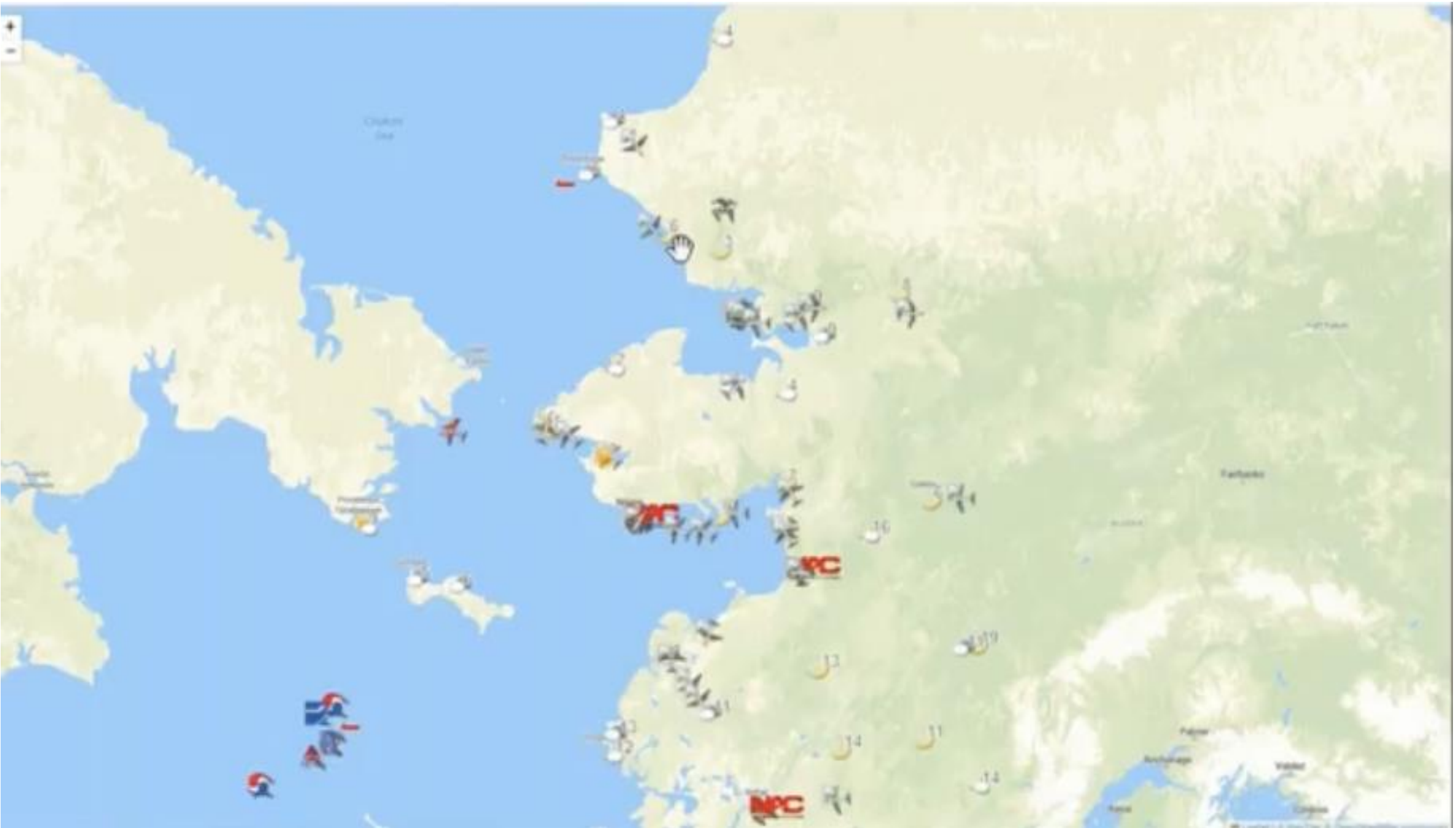
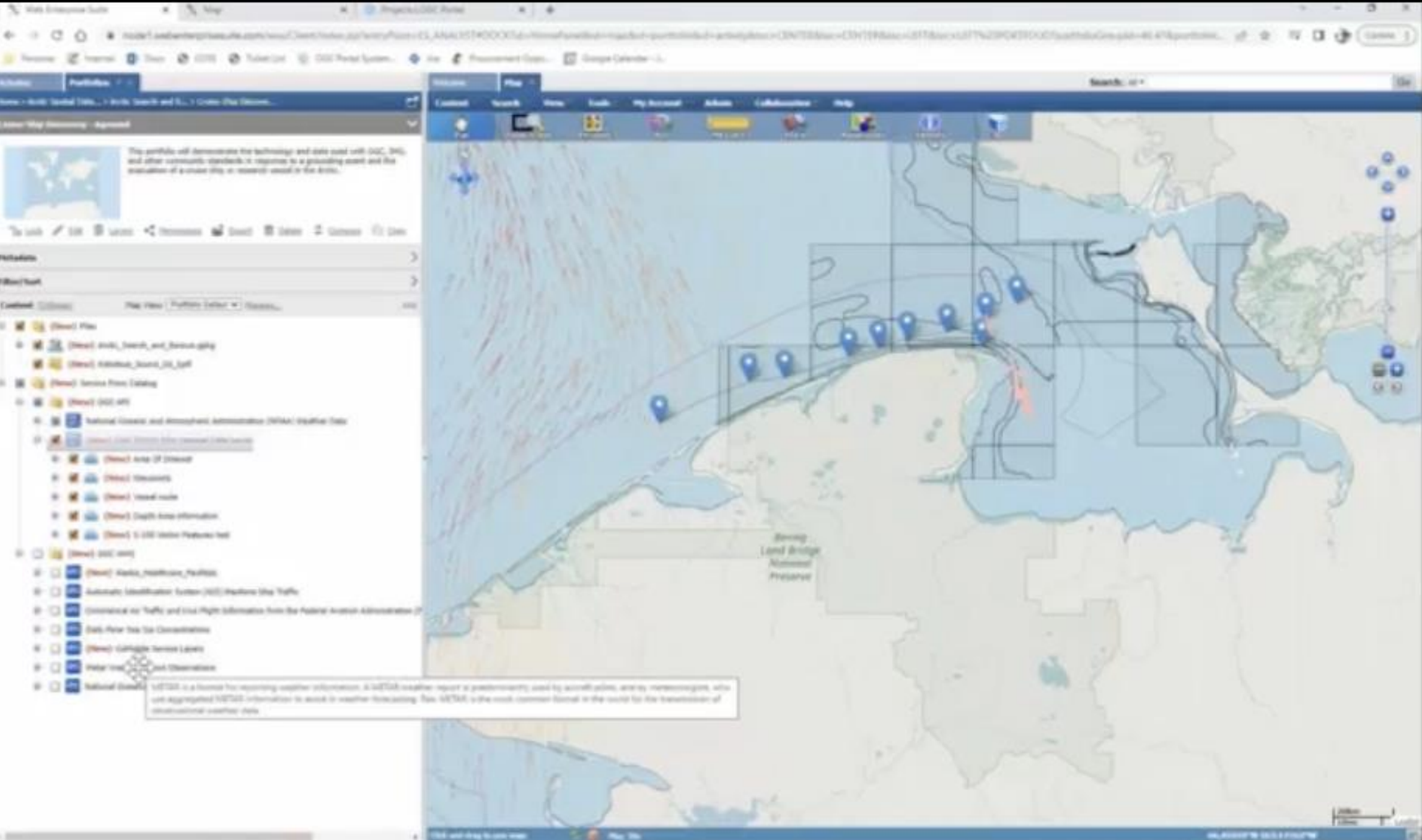
- Caching
- Data compression
- Geopackages



https://portal.ogc.org/files/?artifact_id=101603

Phase 2: Demo Result

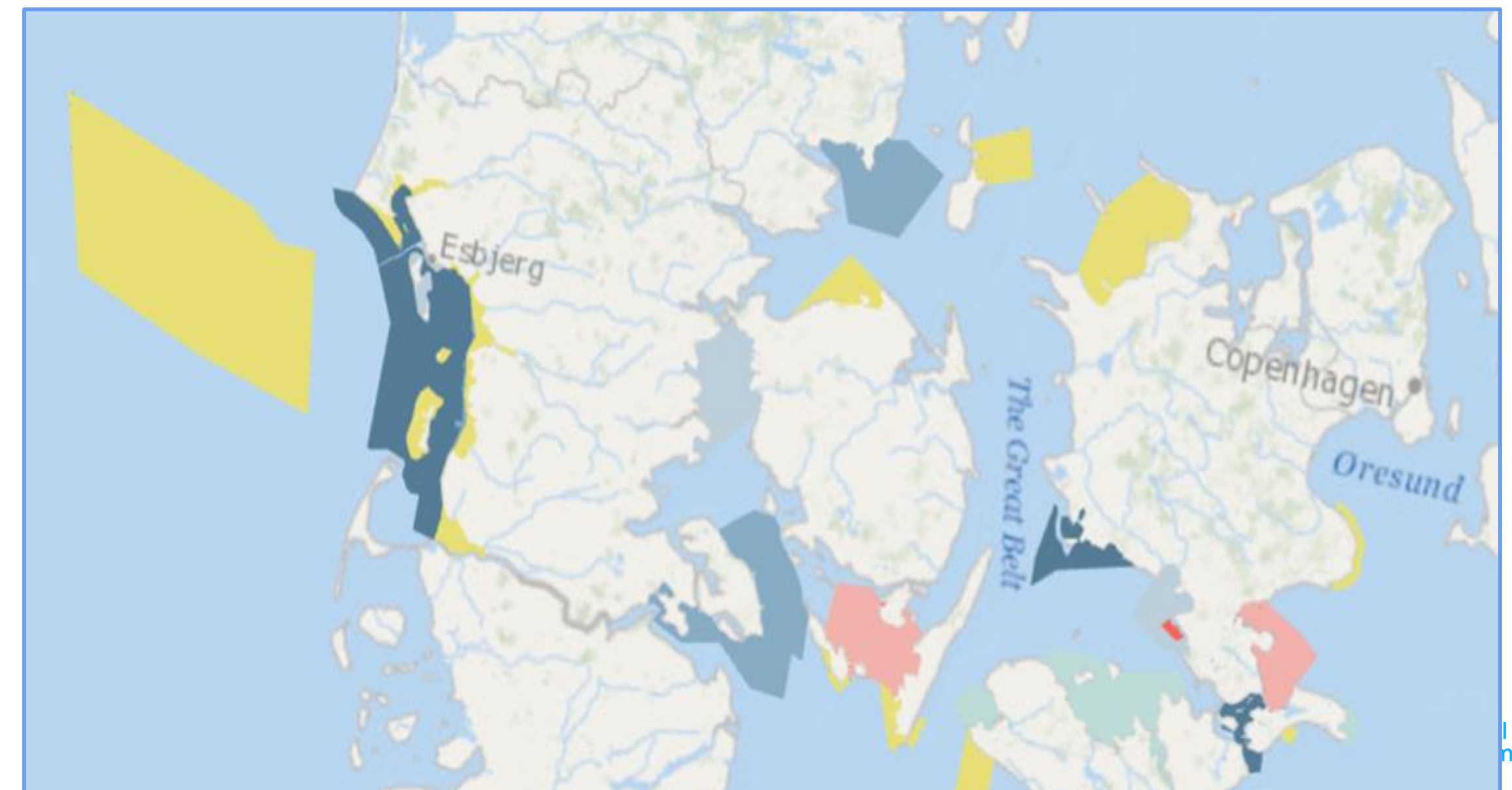
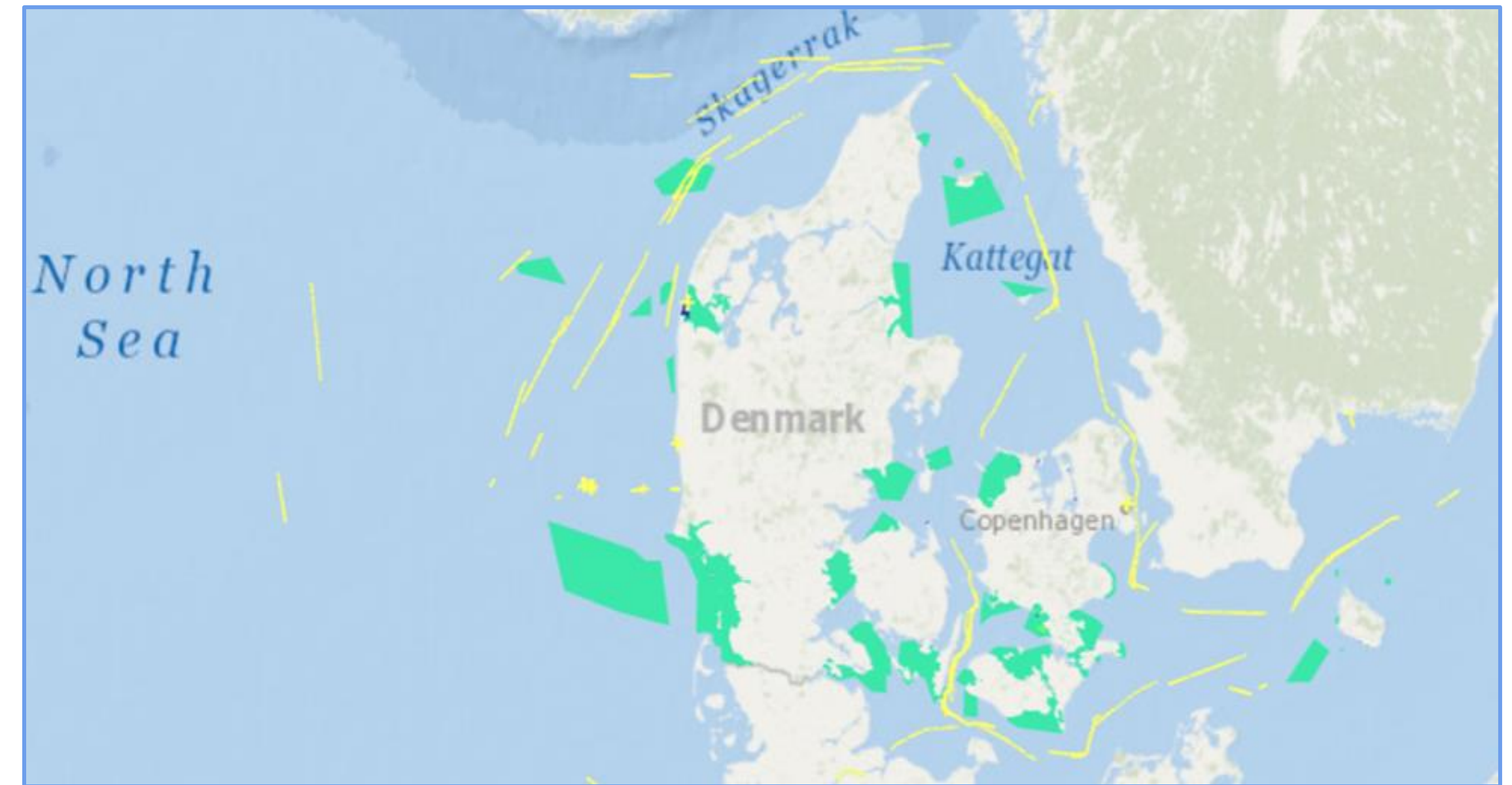
Compusult Client Demo [\(Demo link\)](#)




Phase 2: Demo Result

Pelagis Client

- Provided MPA server for Baltic and North Sea
- Integrates data from multiple agencies
- Focus was on different views on the data, represented as dedicated collections for direct consumption by consumers





Phase 3: Connecting Land and Sea to Protect the Arctic Environment

Extend to new location:
Arctic

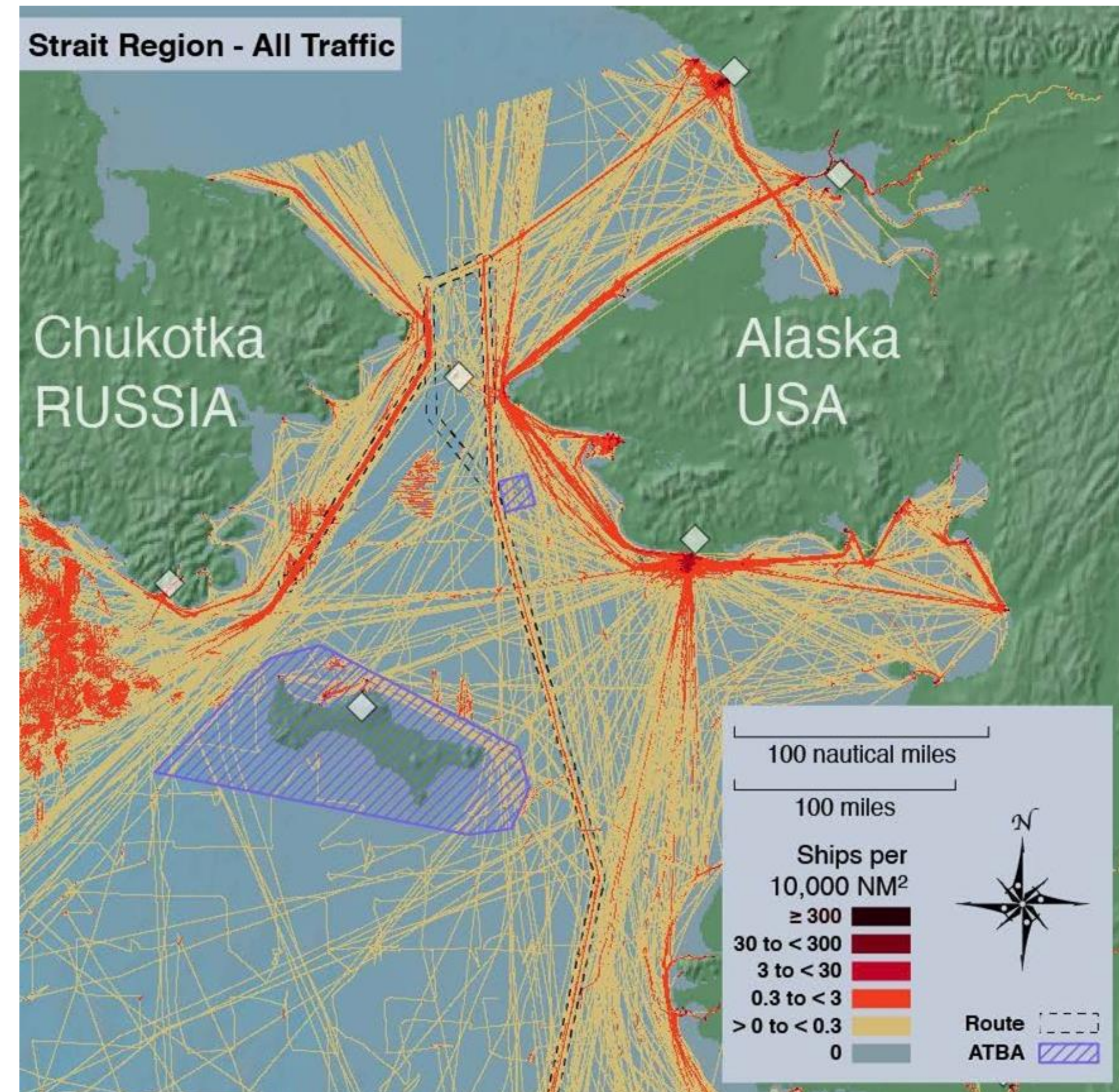
Add more data, more
services to address more
complex scenarios

Phase 3: Arctic

- To learn more about current capabilities and gaps of marine data & services offered by various Arctic Marine Spatial Data Infrastructures, Web portals, and directly accessible cloud/native data:
 - Test interoperability of international standards
 - Showcase the value of a data rich environment to stakeholders to further understand and respond to impacts of climate change and human activity
 - Support building a data rich Federated Marine/Arctic SDI
 - Allow for better informed decisions
 - Opportunity to build on past efforts and help advance technology and guide standards to increase interoperability

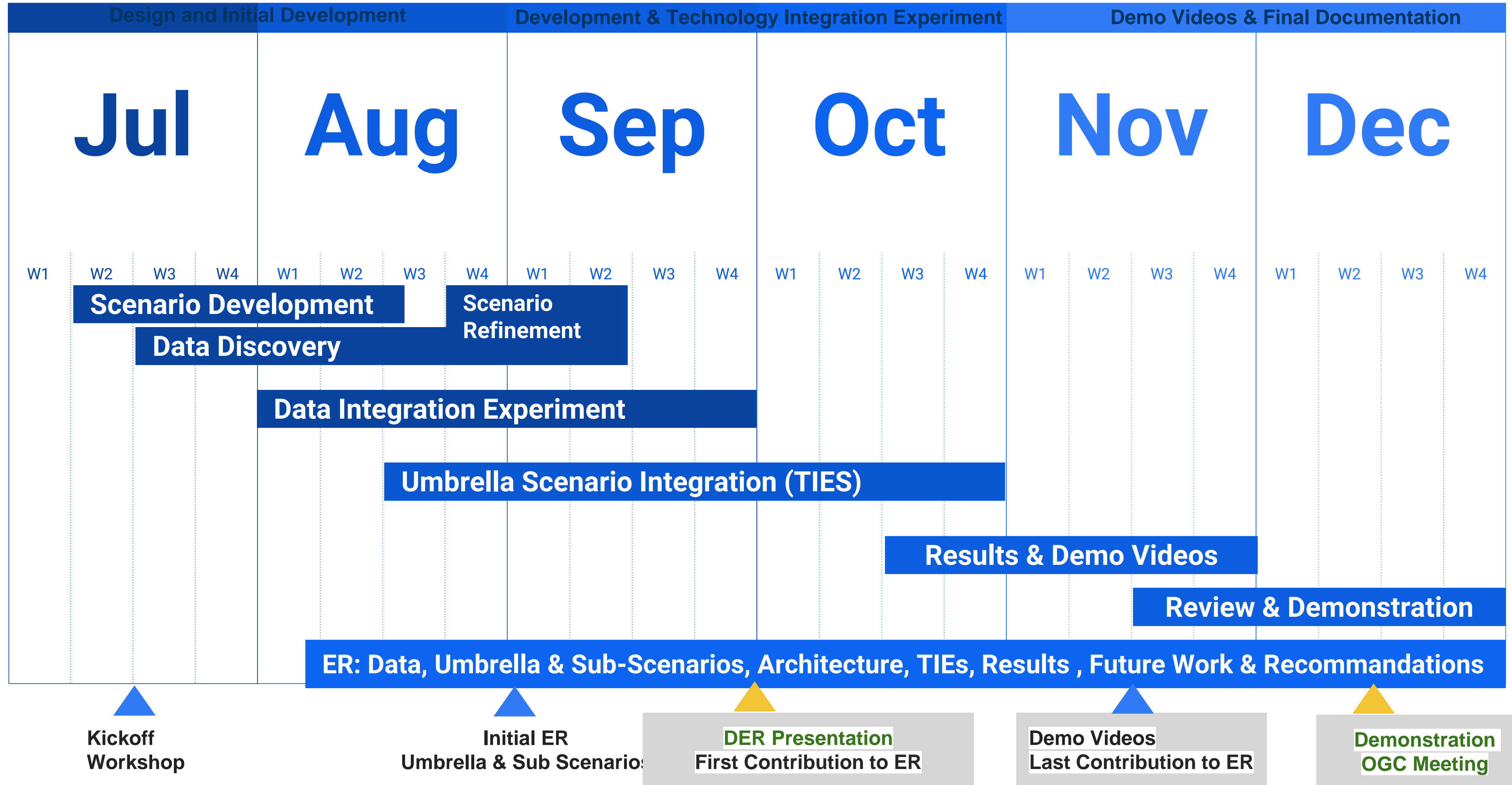
The Overarching Scenario

- In the last 12 years there have been a significant increase in shipping traffic (as is the risk of accidents)
- A sea-based, transportation, health and safety scenario incorporating the land/sea interface in Alaska
- Expedition ship runs aground in Kotzebue Sound, north of Nome Alaska
- It was on a voyage to Kangerlussuaq, Greenland, with approx. 200 passengers and crew on board
- Interoperability between land and marine data that is necessary to understand coastal erosion
- This area includes national parks and a number of Large Marine Ecosystems (LMEs) with challenging navigation conditions



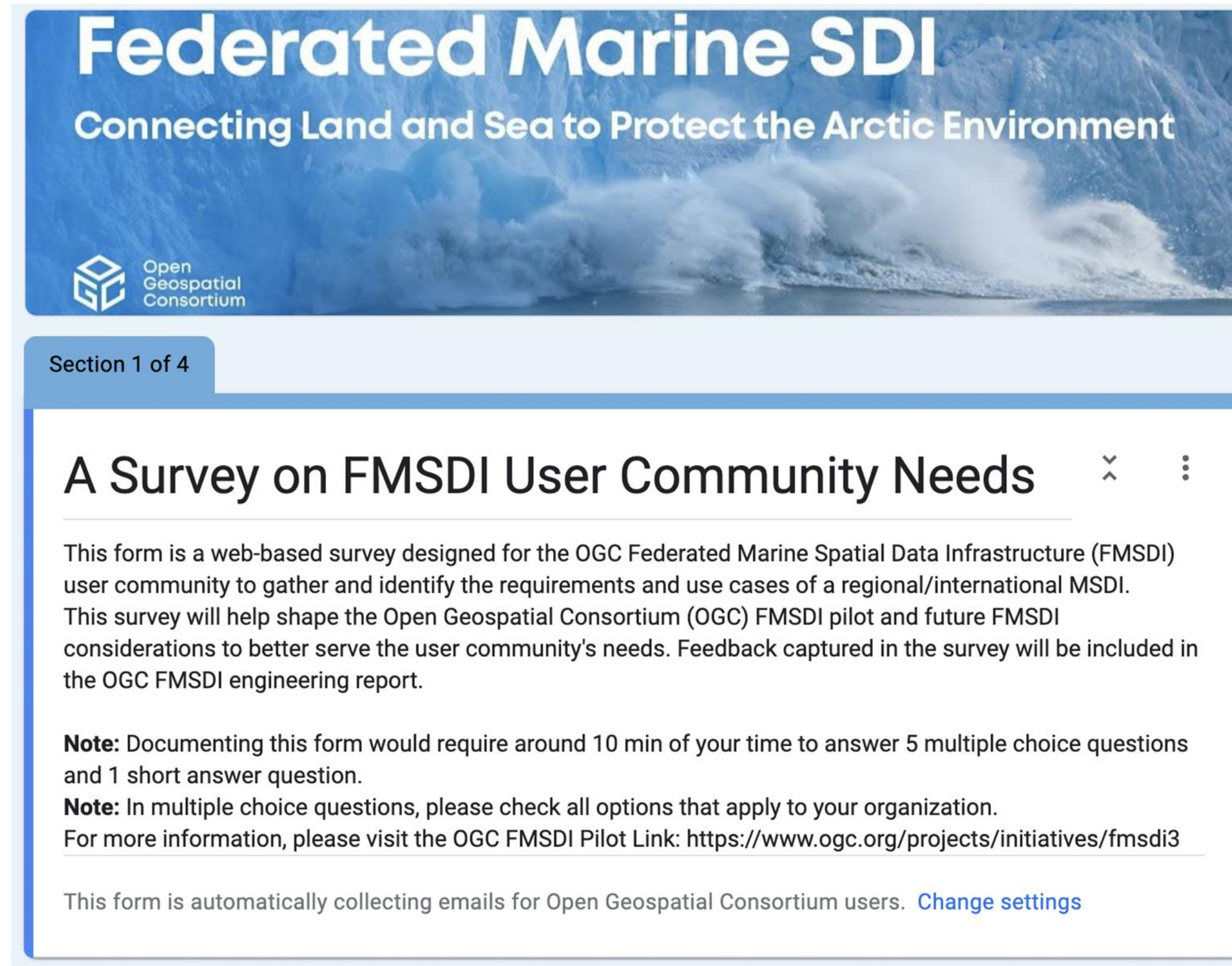
Map showing activity of all vessels, June to October 2019 Source: Nuka Research and Planning Group LLC, 2020

Phase 3: In Progress!



FMSDI- Survey on Marine User Community Needs

- OGC Seeking Information Concerning Regional and International Marine Spatial Data Infrastructure
- Responses are due by November 15, 2022.



Federated Marine SDI
Connecting Land and Sea to Protect the Arctic Environment

Open Geospatial Consortium

Section 1 of 4

A Survey on FMSDI User Community Needs

This form is a web-based survey designed for the OGC Federated Marine Spatial Data Infrastructure (FMSDI) user community to gather and identify the requirements and use cases of a regional/international MSDI. This survey will help shape the Open Geospatial Consortium (OGC) FMSDI pilot and future FMSDI considerations to better serve the user community's needs. Feedback captured in the survey will be included in the OGC FMSDI engineering report.

Note: Documenting this form would require around 10 min of your time to answer 5 multiple choice questions and 1 short answer question.

Note: In multiple choice questions, please check all options that apply to your organization.

For more information, please visit the OGC FMSDI Pilot Link: <https://www.ogc.org/projects/initiatives/fmsdi3>

This form is automatically collecting emails for Open Geospatial Consortium users. [Change settings](#)



OGC Press Release: <https://www.ogc.org/pressroom/pressreleases/4792>

Survey link is here: <https://forms.gle/BktC1ttY4HE1Nrem7>

Overall Initiative

- **European Coastal Waters** (Baltic and North Sea, with a focus on S122 and platform Interoperability – sponsored by Denmark/ and supported by UKHO - complete
- **MSDI Maturity Related work** (sponsored by UKHO and connected to IHO, OGC and UN-GGIM) - complete
- **Arctic**– Ship runs aground in the western Alaskan Arctic – multiple OGC and IHO standards - sponsored by NGA – in-progress
- **Digital Twins - Arctic** with a focus on Coastal Erosion likely between Canada / Greenland - under development with the Government of Canada
- **Singapore – Digital Twin Challenge**: Integration of Land and marine data for coastal protection planning, critical infrastructure protection and resilience.
- **Caribbean** – *Digital Twins – Connecting Land and Seas* - small Island state - under development
- Very early discussion is expanding to other areas, such Africa, other small island states

Thank You

Community

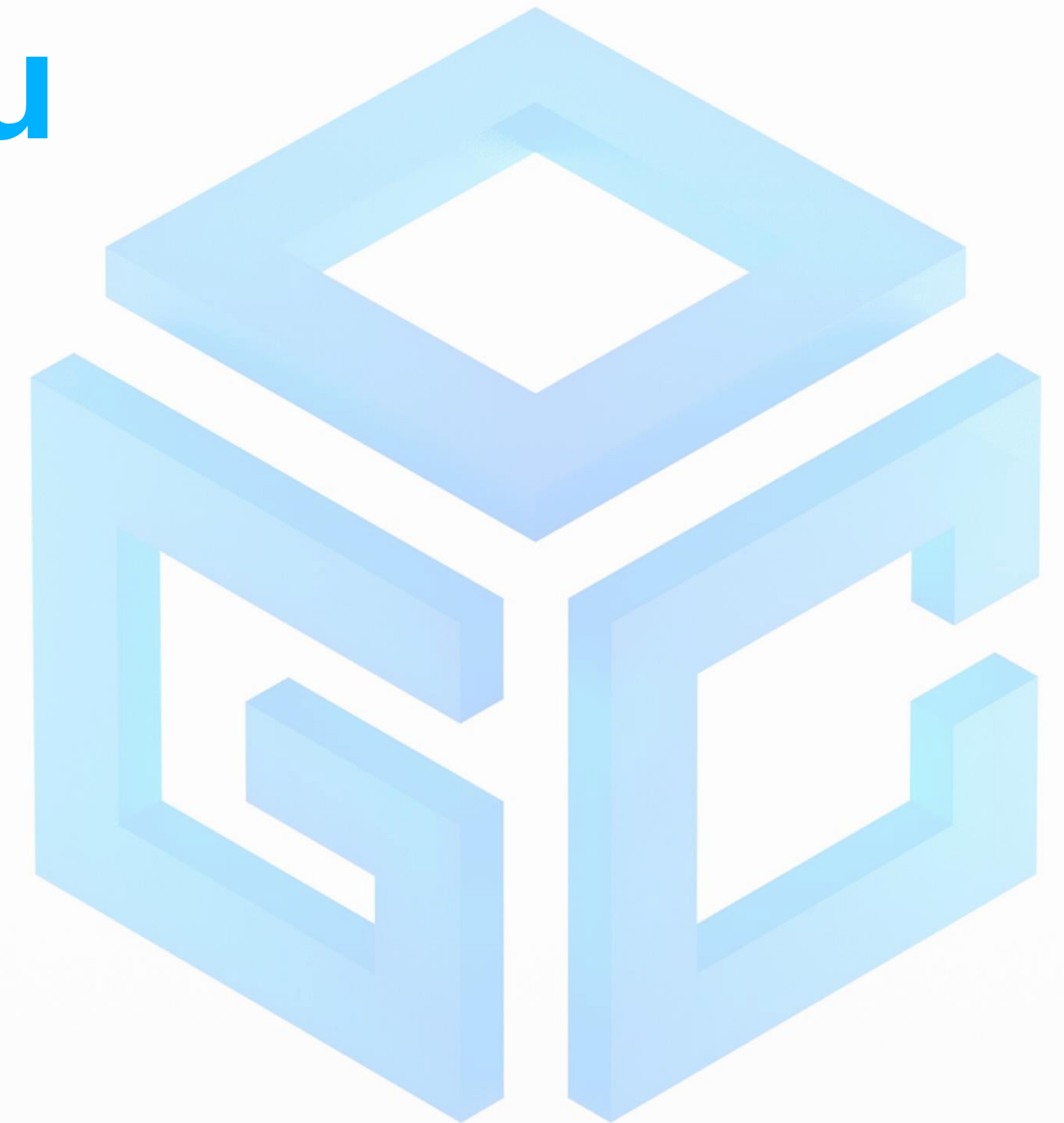
- 500+ International Members
- 110+ Member Meetings
- 60+ Alliance and Liaison partners
- 50+ Standards Working Groups
- 45+ Domain Working Groups
- 25+ Years of Not for Profit Work
- 10+ Regional and Country Forums

Innovation

- 120+ Innovation Initiatives
- 380+ Technical reports
- Quarterly Tech Trends monitoring

Standards

- 65+ Adopted Standards
- 300+ products with 1000+ certified implementations
- 1,700,000+ Operational Data Sets
- Using OGC Standards



Questions ?
ttaylor@ogc.org

