UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

Pilot study report

Global Dialogue on Ocean Accounting
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Canada

Global Ocean Accounts Partnership

System of Environmental Economic Accounting

1. The policy context for the pilot

- Canada borders three oceans. Communities coast to coast to coast depend on the areas that are ecologically diverse and economically significant.
- Fisheries, fish processing, shipbuilding, and marine transportation have been the traditional industries dependent on the oceans. Tourism, aquaculture, biotechnologies, specialized manufacturing and offshore oil and gas have emerged as important economic activities.
- There is a convergence of international initiatives given the growing appreciation for the importance of marine and coastal ecosystems.
- Coherent information will help identify overlap and conflicts in the use of shared resources, both for industries and conservation efforts.

- Commitments further highlight importance of comprehensive, comparable data covering Canada's coastal and ocean regions for marine economy and ecosystem.

- Multiple jurisdictions and far flung regions mean much data exists already, but is held by numerous parties in varying forms.

- Fisheries and Oceans Canada and Statistics Canada have initiated an Ocean Accounts pilot project that will test and apply the Ocean Accounts Framework.

- The priority to date has been assessing and inventorying available data. Two main components have been identified:
  - Marine Economy Accounts (MEA), and
  - Ecosystem Accounts (EA)

2. Scoping the pilot

- The two elements are progressing in parallel, with frequent checks to ensure complementarity.
- The scope is broad for both and the objective is to publish a subset of results in 2020.
- On the MEA side, an overarching review of DFO's existing work on the Marine Economy reporting for alignment with the Ocean Accounts has been undertaken.
- On the EA side the focus is on building Extent, Condition and Service Accounts from existing data.
- For both, gaps and priority areas for further research are being assessed.

3. Pilot design

- Comprehensive data on the value of the marine economy and ecosystems and services is of crucial importance for informed decision making.

- Notable amounts of data exist, some of which is already publically available. However, what is available can be in obscure locations, and varies by type, granularity, format and searchability.

- This work will bring a library of existing data together, while prioritising areas for future work. Canada has committed to developing marine spatial planning for five priority bioregions over the next few years. The initial focus will be the physical data, and the next stage will be the economic layers.

- A primary study looking at the carbon sequestration capacity of eelgrass will show the potential of future studies to add to the existing layers of data, combining both the physical and economic data.

3. Pilot design

- Data sources
  - In addition to DFO and Statistics Canada, numerous federal, provincial and territorial stakeholders engage in ocean-related data collection, analysis and compilation.
  - Stakeholder include: governments, universities and NGOs and some private sector institutions.
  - The majority of the data assembled to date is from federal departments and publically available provincial and university data.

- Analytical outputs
  - Spatial maps of the assembled data for the ecosystem accounts.
  - Augmentation of the existing Marine Economy Accounts which DFO publishes.
  - Complete mapping of Canada's eelgrass beds, analysis of the carbon sequestration capacity and value.

4. Activities undertaken

- This project will be a year old as of December.
- Progress has been notable on the ecosystem accounting side, with the hexagon mapping structure established and considerable data incorporated.
- The review of the existing Marine Economy study and data has been completed and priorities for alignment and data gaps identified.
- Outreach efforts to federal partners have been prioritised, further outreach to other levels of government and university researchers is planned.
- The eelgrass carbon sequestration study has been launched. Fieldwork will begin this fall and continue through 2020. Analysis will be complete in 2021.

5. Pilot results – Data Assessment

- Marine Economy data: In a number of cases existing data aggregation and/or confidentiality concerns present barriers for full alignment with the Ocean Accounts.
- Similarly, further alignment between what is captured in direct contributions (fisheries, offshore oil and gas, marine transport) versus indirect (fish processing, support services) would be helpful.
- Tourism and Recreation at present is undercounted. Further details to the existing satellite account would allow for better separation from other place based tourism activities. and considered a good candidate for further efforts.
- Options to address issues include further discussion with experts and data holders. Some information to base estimates could be derived from existing sources. For substantial data gaps, questions could be added to existing surveys. Results would likely not be available within two years.

Canadian Marine Economy (CDN$M.)

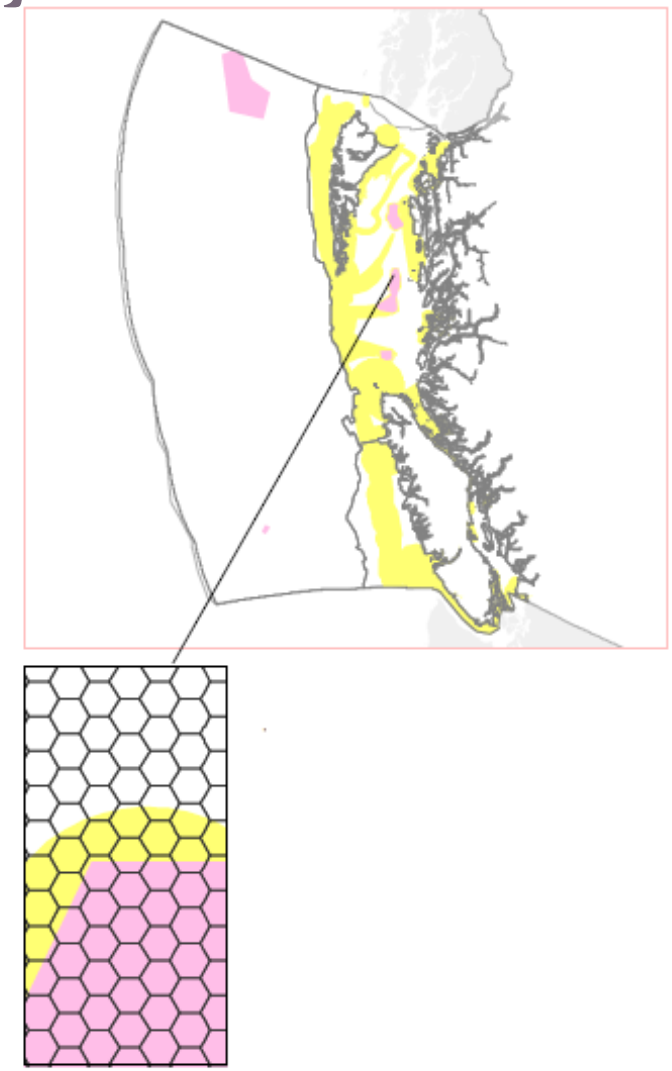
Industry	2012	2013	2014	2015
Private Sector				
Seafood				
Commercial Fishing	1,932	2,067	2,551	2,920
Aquaculture	843	1,178	1,079	1,246
Fish Processing	3,525	3,608	3,968	4,486
Sub-total Seafood	6,300	6,853	7,598	8,652
Offshore Oil & Gas				
Oil & Gas Exploration/Extraction	8,438	9,611	9,438	4,640
Transportation				
Marine Transportation	3,893	3,958	3,901	4,249
Support Activities	2,267	2,553	2,522	2,400
Sub-total Transportation	6,160	6,511	6,424	6,650
Tourism & Recreation				
Marine Tourism & Recreation	3,694	3,780	3,599	3,531
Manufacturing & Construction				
Ship and Boat Building	1,114	1,126	1,092	1,280
Ports and Harbours Construction	629	821	646	495
Sub-total Manufacturing & Construction	1,742	1,947	1,738	1,776
Sub-total Private Sector	26,334	28,702	28,797	25,248
Public Sector				
National Defence	2,611	2,762	2,316	2,246
Fisheries & Oceans	1,465	1,612	1,425	1,605
Other Federal Departments	710	615	625	609
Provincial/Territorial Departments	231	270	241	257
Universities	283	240	249	237
ENGOs	187	186	199	193
Sub-total Public Sector	5,487	5,684	5,056	5,147
Total Maritime Regions	31,821	34,386	33,853	30,395
Total Canada*	1,822,808	1,897,531	1,990,183	1,994,911

5. Pilot results – Ecosystem Accounts

Underlying structure

An underlying grid of 1 km hexagons.

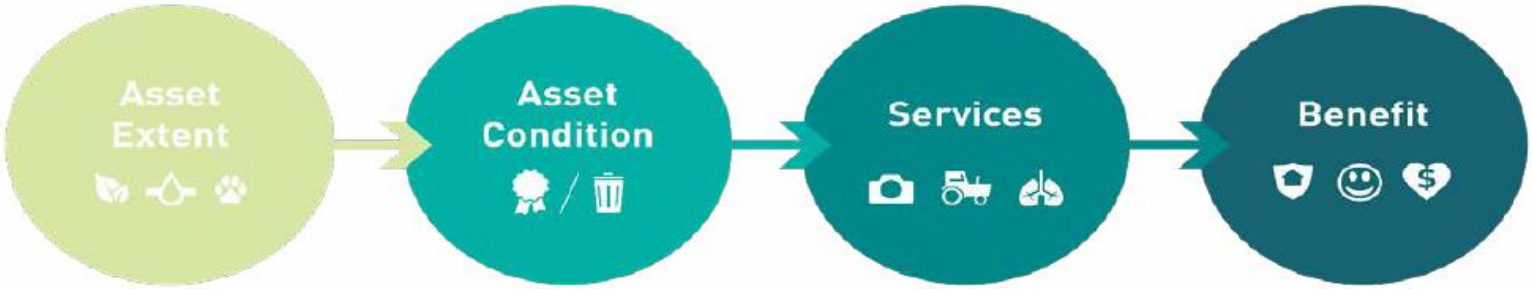
Adding the data gathered to this grid which will make it possible to create tables for the different marine ecoregions



5. Pilot results – Data Assessment

- Ecosystem accounts data assessment
  - Numerous data holders (within Canada and internationally) mean only a fraction have been inventoried and assessed for the project to date.
  - Where data has been identified coverage is typically partial, and with varying resolutions.
  - There is a need for spatial framework agreement among data holders.
  - The quality of the data is still being assessed. In the case of some elements (i.e. seagrasses) data is derived from multiple sources, and will require separate quality assessments.

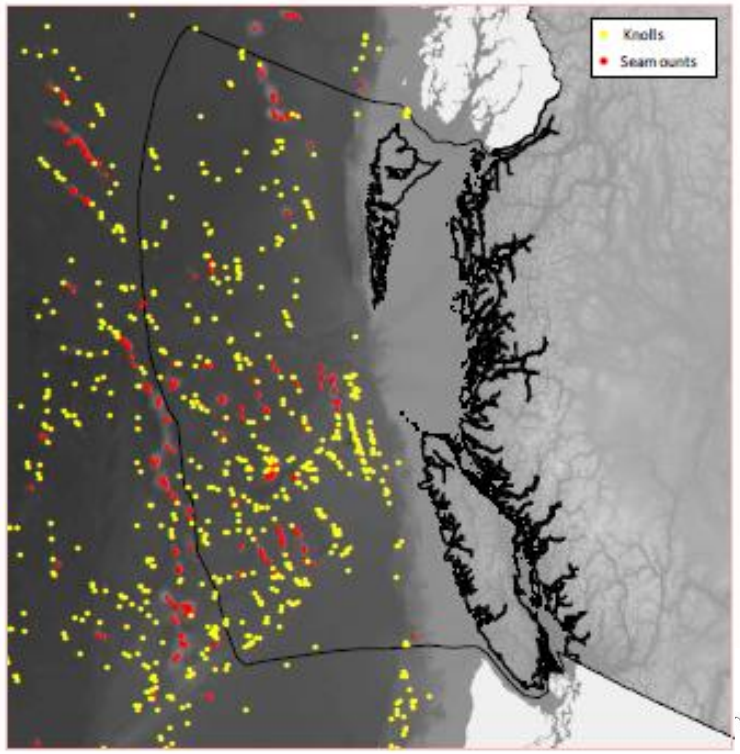
5. Pilot results – Ecosystem Accounts

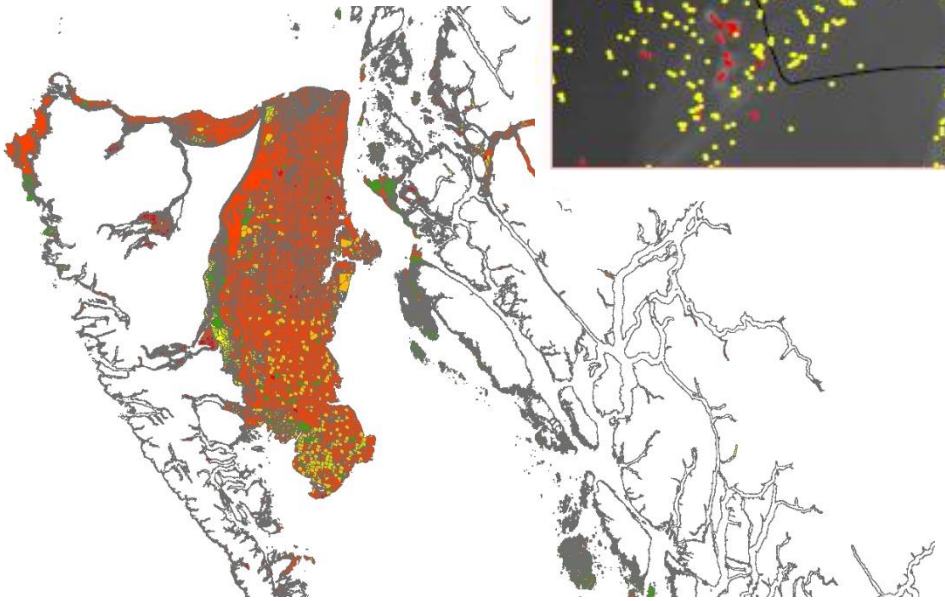


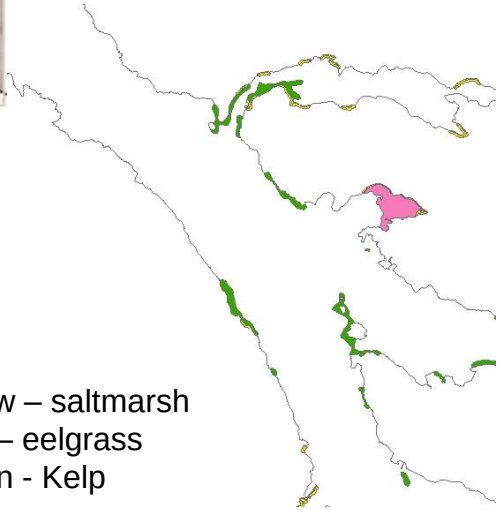
- Single asset framework applied to different landscapes and ecosystem types
- Assess impact of human activity on asset extent and condition
- Asset condition influences the production of ecosystem services
- Ecosystem services provide economic and social-wellbeing benefits

Marine Ecoregion (e.g. Northern Shelf)	Ecosystem Type 1 (Kelp Forest)	Ecosystem Type 2 (seagrass)	Ecosystem Type 3 (Coldwater Coral)	Bathymetric Zones				
				Coastal	Epipelagic	Mesopelagic	Bathypelagic	Abyssalpelagic
Opening stock	432.28	369	3912	23048	39200	24130	13060	0
+ Additions to stock								
Managed expansion								
Natural expansion								
Reclassifications								
Discoveries								
Reappraisals (+)								
TOTAL additions to stock								
– Reductions in stock								
Managed regression								
Managed expansion								
Reclassifications								
Extractions								
Reappraisals (-)								
TOTAL reductions in stock								
= Closing stock								

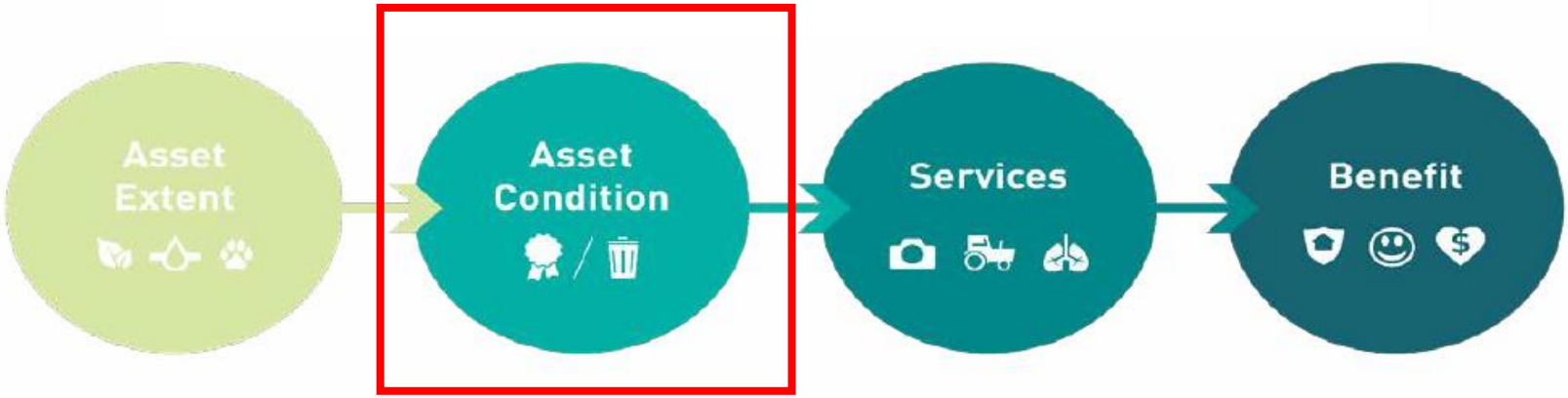
Extent





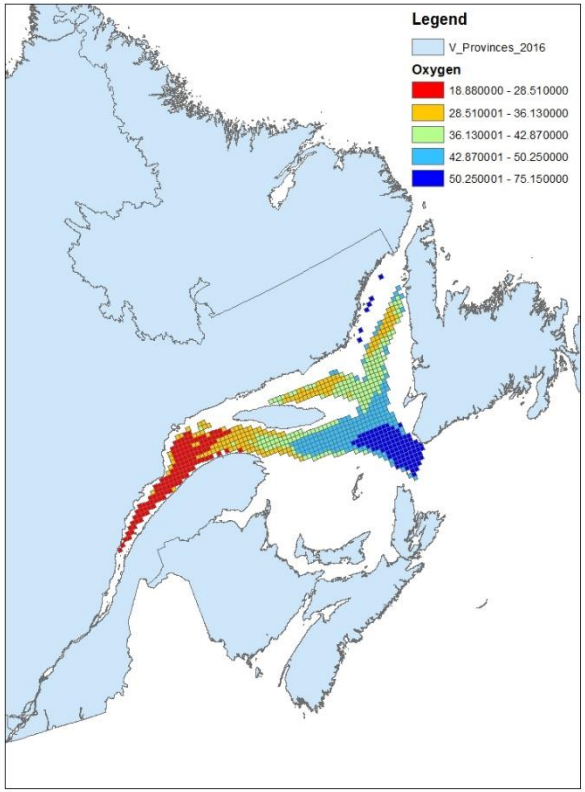


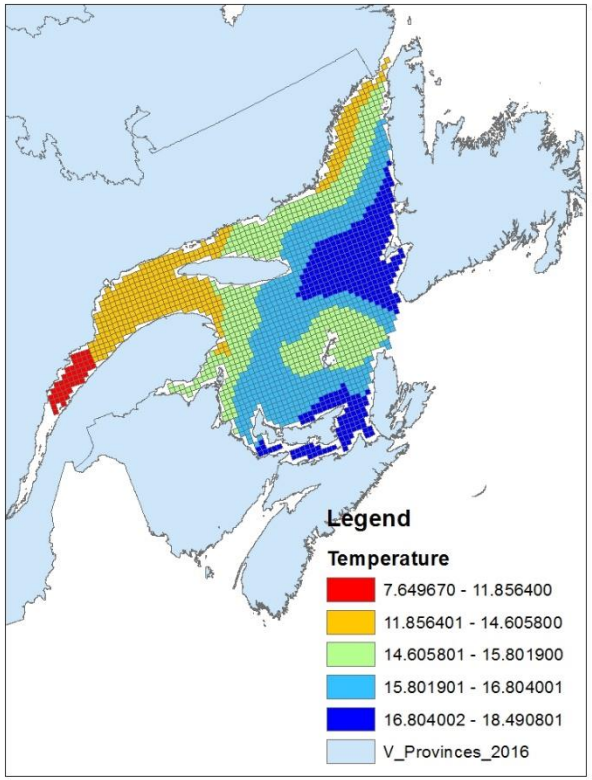
Yellow – saltmarsh
Pink – eelgrass
Green - Kelp

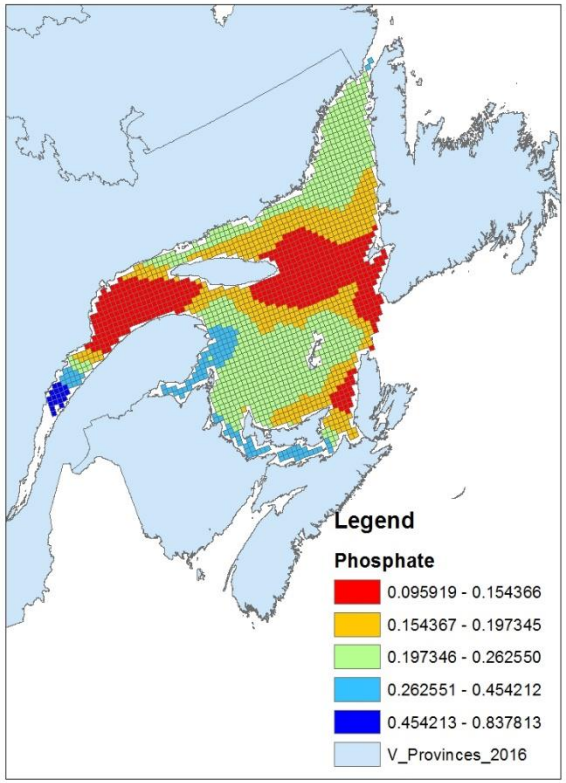


Marine Ecoregion (e.g. Gulf of St Lawrence)		Ecosystem Type 1 (Kelp Forest)	Ecosystem Type 2 (seagrass)	Ecosystem Type 3 (Coldwater Coral)	Bathymetric Zones				
					Coastal	Epipelagic	Mesopelagic	Bathypelagic	Abyssalpelagic
Area	Opening	?	238.7	43627	62086	107801	76095	0	0
	Closing								
Temperature	Opening								
	Closing								
Acidification	Opening								
	Closing								
Plastics	Opening								
	Closing								
Biodiversity	Opening								
	Closing								
Eutrophication	Opening								
	Closing								
Summer Sea Ice Extent	Opening								
	Closing								

Condition: St Lawrence gulf: temperature, phosphate, nitrogen, oxygen, salinity and silicate (2008-2017)

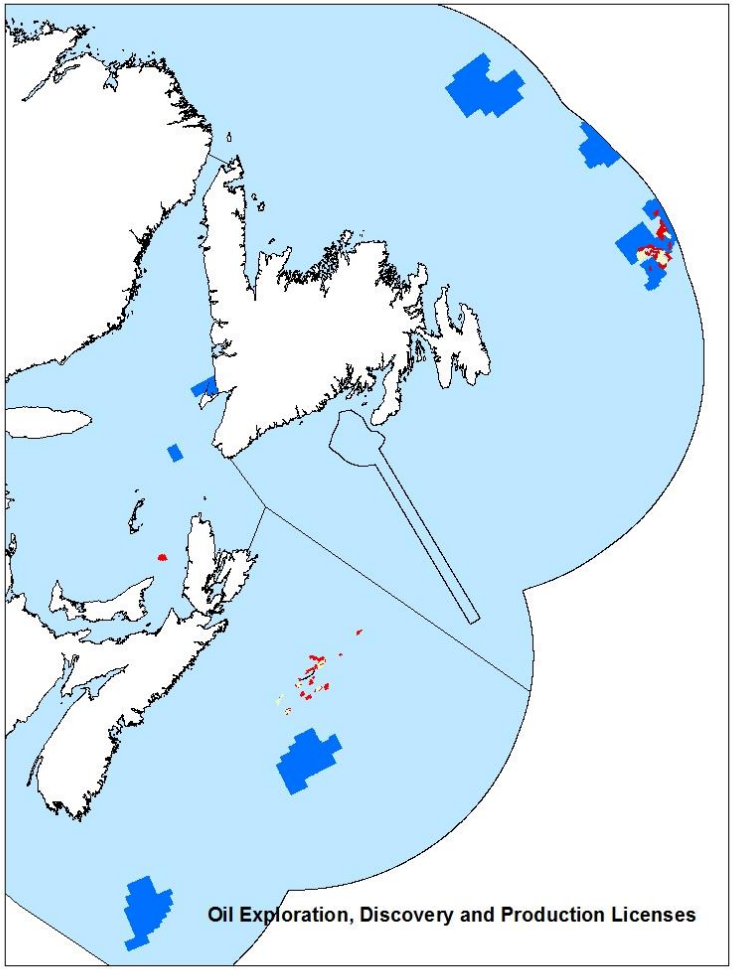


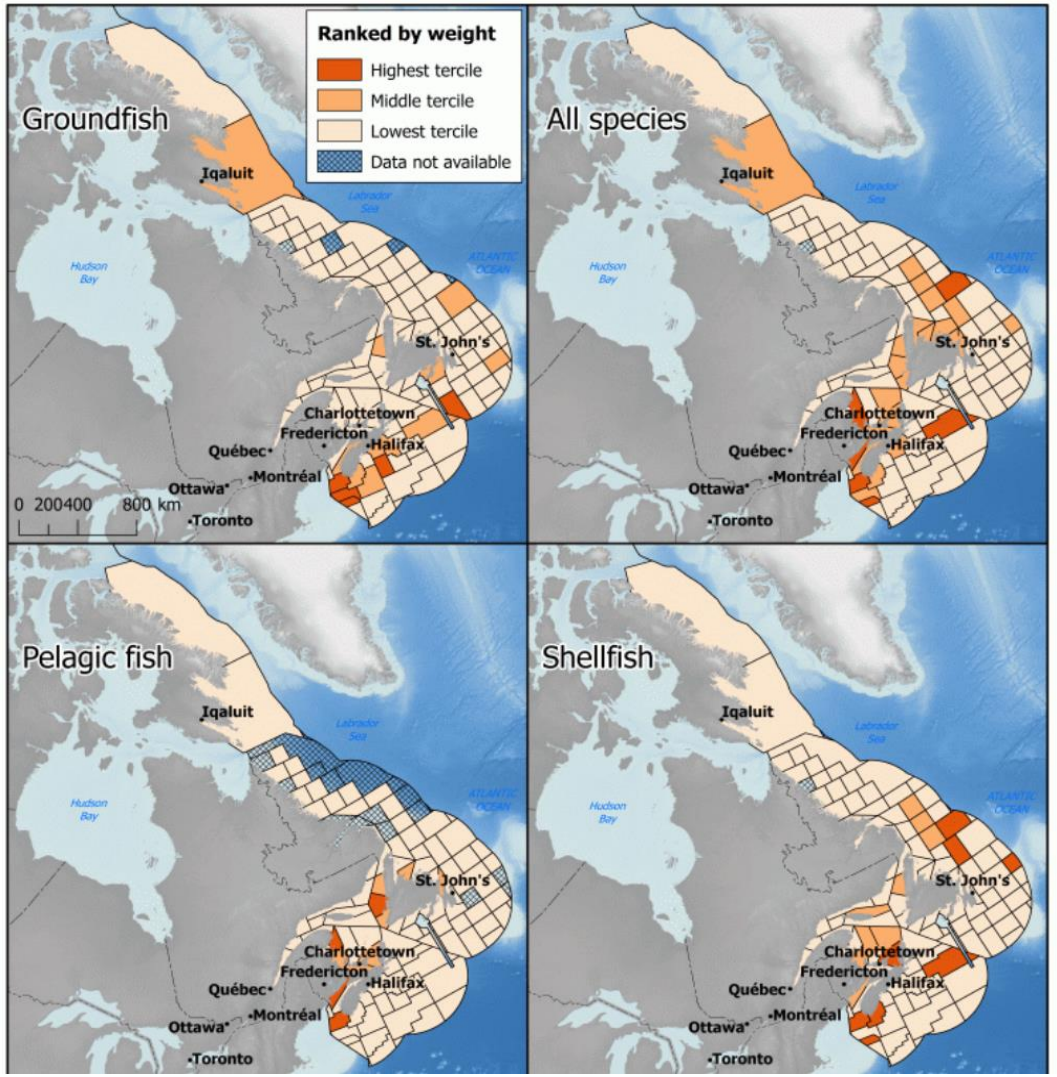


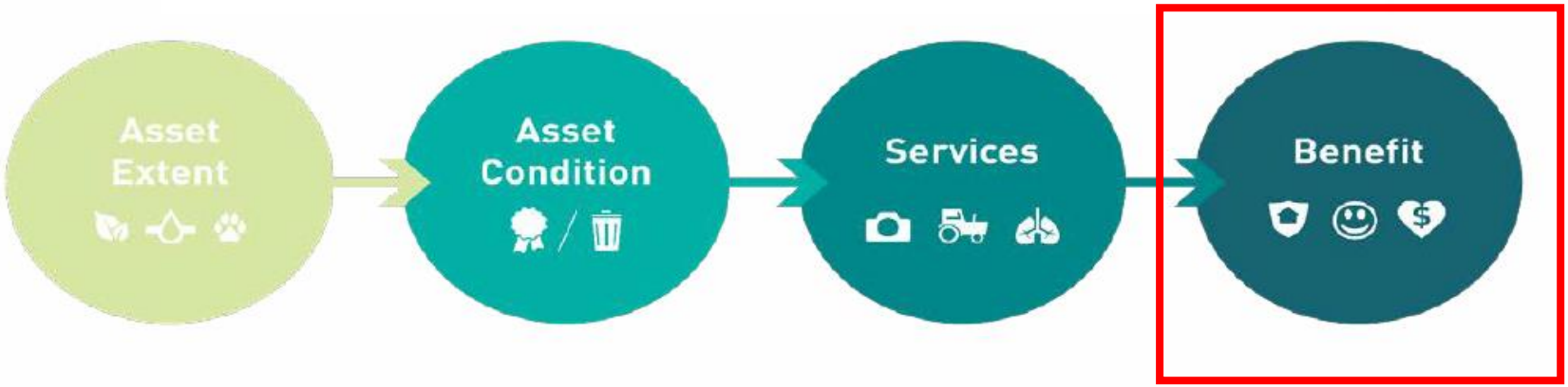


Marine Ecoregion	Ecosystem type 1	Ecosystem type 2	Ecosystem type 3	Bathymetric Region 1	Bathymetric Region 2	Total
Provisioning						
Fish (tonnes)						831980
Seaweed						
Regulating service						
Carbon Sequestr-ation						
Abiotic						
Petroleum						13769558

Services

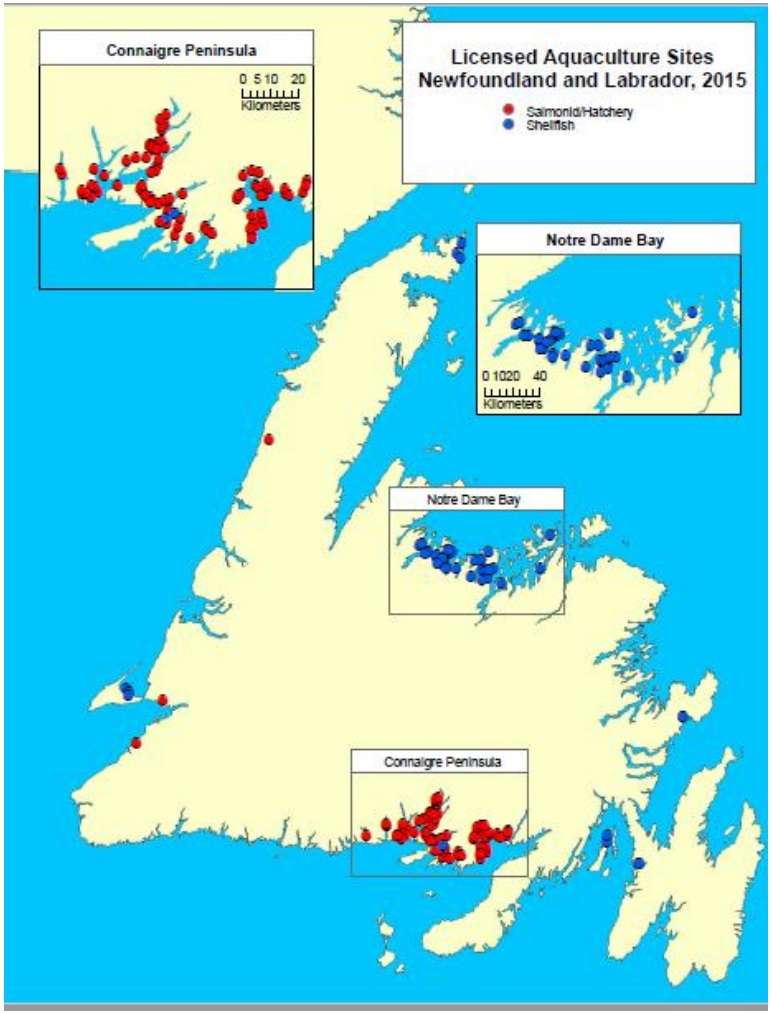

Oil Exploration, Discovery and Production Licenses

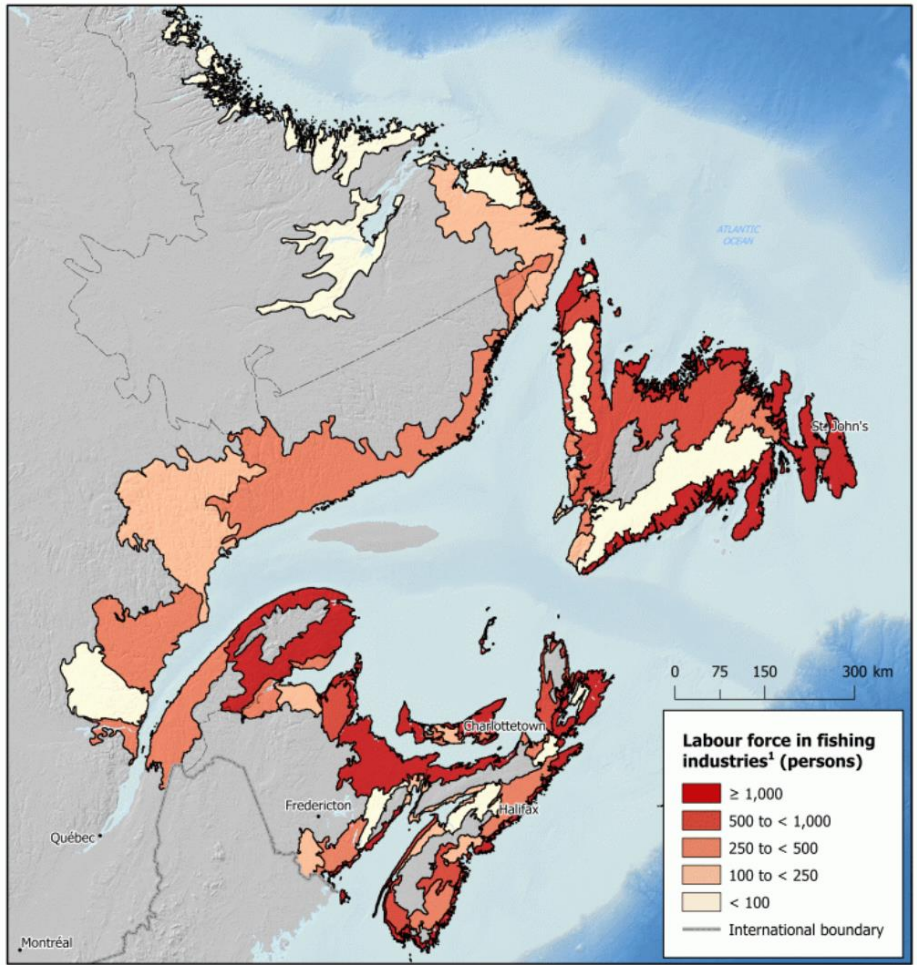

Ranked by weight
Highest tercile
Middle tercile
Lowest tercile
Data not available
Groundfish
All species
Pelagic fish
Shellfish
Iqaluit
St. John's
Charlottetown
Fredericton
Halifax
Québec
Montréal
Ottawa
Toronto
0 200400 800 km



Economic Unit		Govern-ment	Industry	Household	Rest of World	Total
Provisioning						
	Fish –commercial catch ($,000)					3285976
	Aquaculture ($,000)					1346578
Regulating service						
	Carbon Sequestration					
Abiotic						
	Petroleum					

Benefits


Licensed Aquaculture Sites
Newfoundland and Labrador, 2015
Salmonid/Hatchery
Shellfish
Connaigre Peninsula
0 5 10 20
Kilometers
Notre Dame Bay
0 10 20 40
Kilometers
Notre Dame Bay
Connaigre Peninsula


0 75 150 300 km
Labour force in fishing industries[1] (persons)
≥ 1,000
500 to < 1,000
250 to < 500
100 to < 250
< 100
International boundary
St. John's
Charlottetown
Fredericton
Halifax
Québec
Montréal

6. Main challenges and needs

- Acquiring data is an ongoing need, even where it currently exists.
- Locating data and integrating large volumes of spatial data.
- Assessing benefits of new data collection and/or changes in methodology.
- Agreement on key parameters both nationally and internationally would be extremely helpful as the accounts are developed.

7. Next steps for ocean accounts or policy

- Refining the spatial database will be an ongoing process.
- While initial tests are occurring, stakeholders engagement is a key goal, to agree on priorities, details and contributions.
- The spatial data inventory will continue to be expanded and consistently documented. For example, for each dataset, the source, variables, coverage, etc., could be documented.
- Develop a set of fact sheets (perhaps by early 2020) demonstrating the advantages of integrating ocean-related analysis along a common framework.

Thank you!

Questions?

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Appendix A

Ocean Accounts Data

Focussing on building Extent, Condition and Service Accounts. Below is data obtained or we are looking into obtaining*. Not all data is available nationally, time scales and granularity differ over Canadian waters

Extent:

Structure: Bathymetry, Sea Knolls and Mounts, Roughness, aspect, slope
Ecosystem: Kelp, seagrass, cold water coral, sediment, permanent Ice cover
Use: Protected, oil rigs and exploration, Aquaculture sites, shipping routes

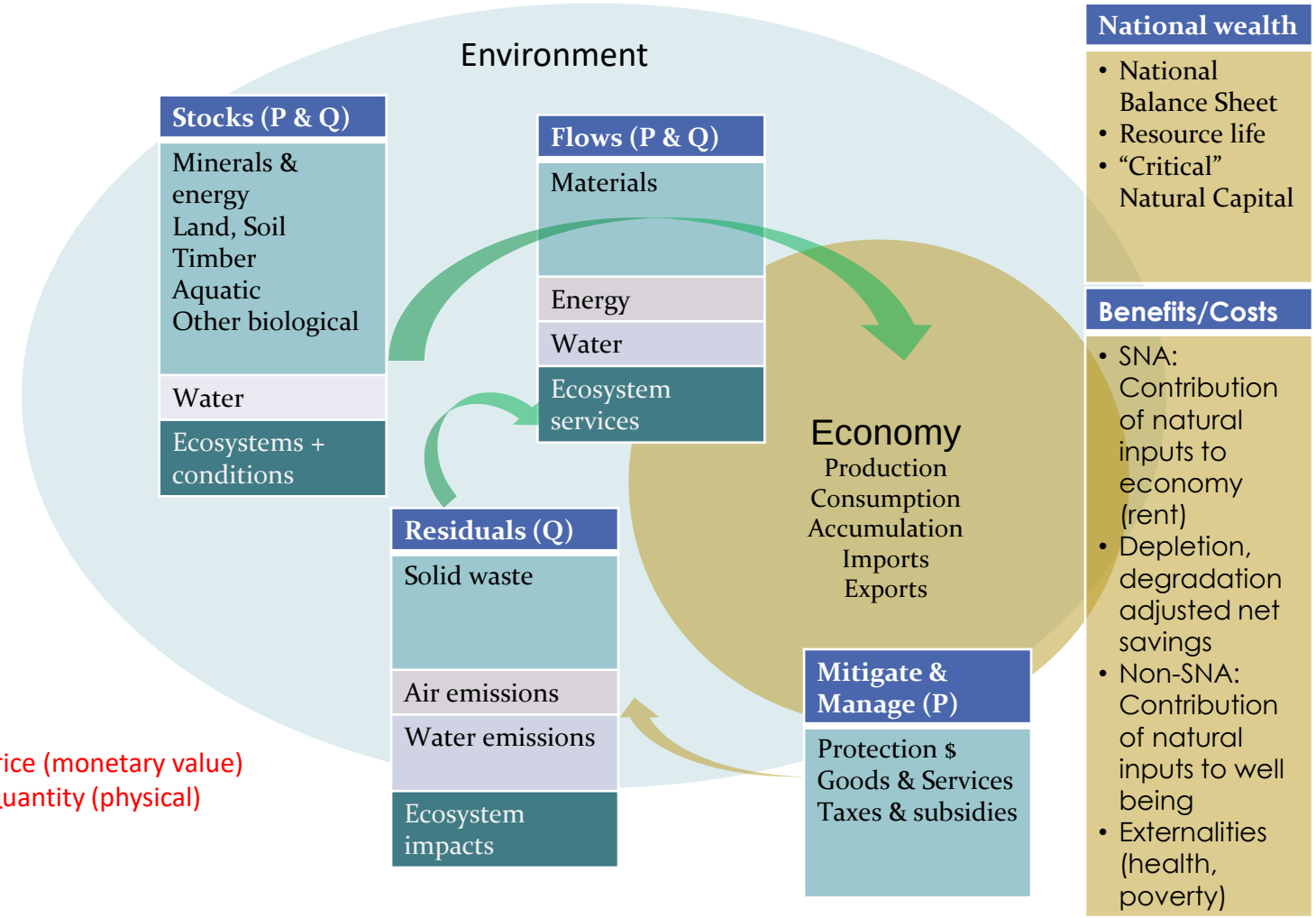
Condition:

Water quality: SST, salinity,oxygen, nitrogen, other chemical levels, sea ice cover anthropogenic noise levels*, maps of currents
Biodiversity: Fish, sea bird and mammal population levels, invasive species, zooplankton, stock status, endangered status, health of shellfish grounds
Human interventions: Changes in human usage, marine spills, sewage treatment levels, pollution released to water, SARA incidents, plastic pollution*

Services + Benefits:

Landings: Commercial fish, non commercial fish, spatial distribution of catches, seal landings
Oil: Volume gas, oil, water use
Aquaculture: Production and Value by province
Shipping: Value , Volume
Fishery Dependent Communities: communities where fishing activities account for at least 20% of employment income in 2016, and population change since 2001 using Census data

SEEA



P = Price (monetary value)
Q = Quantity (physical)

SEEA-Ecosystems