

The Case for a Marine Cadastre to help affirm Canada's sovereignty in the Arctic and enable integrated Marine Spatial Planning

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SUMMARY

Canada's oceans offer an enormous economic potential for the future of Canada, but as more stakeholders use different parts of the ocean environment, these stakeholders will increasingly come into conflict. A multi-purpose marine cadastre for Canada's oceans could be a core element for the effective governance of the marine region, and for an orderly sustainable development of ocean resources and realization of their full value.

Marine Cadastre is an integrated system of **registries** that allows for the systematic public recording of all recognized legal rights, responsibilities and restrictions related to the ocean space (legislative base, people, data infrastructure). (NRCan/DFO task group, 2010)

With the growing interest in ocean resources and rising public concern about the ocean environment, there is growing recognition around the world that states need modern land management systems to enable good governance over states' offshore areas. Implementing a marine cadastre in the Arctic could be a vital and effective element to demonstrate to all that Canada is building the essential basic infrastructures to support its claim and affirming its sovereignty in this region.

Key words: Cadastre, Arctic, Registries, Infrastructure, Management.

1. INTRODUCTION

On November 7, 2003, Canada ratified the UNCLOS, and since then, has been collecting data to outline the range of sovereign rights the country can exercise. It has until the end of 2013 to make its submission to [UN Commission on the Limits of the Continental Shelf](#)¹. UNCLOS submission will take place next year (2013). Because of the growing interest in the ocean resources and the rising public concern for the ocean environment, the extended territory will need to be protected and administered. With the introduction of UNCLOS, there is growing recognition around the world that states need modern land management systems to enable good governance over states' offshore areas.

Canada's oceans offer an enormous economic potential for the future of the country, but as many activities are taking place in the ocean environment, stakeholders will increasingly come into conflict. The increasing human activities in ocean space require an integrated approach to balance competing demands.

With the advent of the Spatial Data Infrastructure (SDI) as a tool to help coordinate access to spatial data across different jurisdictions, a multi-purpose marine cadastre for Canada's oceans could be a core element for the effective governance of the marine region, and for an orderly sustainable development of ocean resources and realization of their full value.

¹ According to Annex II, article 4 of UNCLOS, a coastal state has 10 years from the date UNCLOS is ratified to make a submission concerning the outer limits of its continental shelf beyond 200 nautical miles.

2. TOWARDS A FEDERAL STRATEGY FOR A MARINE CADASTRE

There is growing recognition that a multi-purpose cadastre covering the Ocean's space could become a core element of an integrated management system. Many federal departments and agencies have responsibilities in the offshore². They have expressed the need for such a system but the Federal Government lacks a cohesive strategic plan to address the issues. SGB (NRCan) is also leading – in a partnership with Fisheries and Oceans Canada (DFO) – a study into the need for a marine cadastre in Canada's offshore.

2.1 How could the implementation of a marine cadastre in the Arctic align with the Government's policy direction?

Prime Minister Harper was quoted saying: “**Canada has a choice when it comes to defending our sovereignty over the Arctic. We either use it or lose it.**”³ The government of Canada has made it clear to use the Arctic because of its central role in building the country national identity as a northern nation, and because of the tremendous potential of Canada's future.

An excerpt from the June 3rd, 2011 Speech from the Throne enounced the Canadian government commitment for the Arctic: “**Our Government has made Canada's North a cornerstone of its agenda. The strongest expression of our sovereignty comes through presence and actions, not words. Our Government will continue to exercise leadership in the stewardship of northern lands and waters.**”

To support the government of Canada's northern strategy, and pursuant to *Canada Lands Surveys*, NRCan is responsible for the survey system that supports all property and land management regimes in Canada's offshore area⁴. The Surveyor General Branch (of NRCan), is mandated to manage property and boundary survey programs for the Government of Canada to ensure Canada has the boundary certainty required to reduce risks and barriers for economic and social development, and exert its sovereignty and safeguard the economic value of the land and its natural resources⁵.

² Numerous government departments may be mandated to manage or administer some of the rights that are associated with our marine environment. For example:

Though the Surveyor General Branch, the role of NRCan in the offshore consists of setting standards and managing surveys for development on Canada Lands.

NRCan shares administrative responsibility with Aboriginal Affairs and Northern Development (AANDC) for oil and gas, and minerals. AANDC (Northern Oil and Gas, and Mining Directorates) has administrative responsibility to the North, and NRCan (Energy, and Mineral Policy Sectors) to the south of a line of administrative convenience. Pursuant to Oceans Act, Part 2 (section 29), DFO has the mandate to “...lead and facilitate the development and implementation of a national strategy for the management of estuarine, coastal and marine ecosystems in waters that form part of Canada or in which Canada has sovereign rights under international law”.

³ Announcement of new Arctic offshore patrol ships, July 9, 2007, Esquimalt, British Columbia.

⁴ *Canada Lands Surveys*, art 3. (1) The Minister has the administration, direction and control of surveys under this Act.

⁵ *Canada Lands Surveys*, art 3. (2), The Surveyor General, subject to the direction of the Minister, has the management of surveys under this Act and the custody of all the original plans, journals, field notes and other papers connected to those surveys.

NRCan has identified four key strategic priorities (2012 – 2015) of which *Unlocking Resource Potential through Responsible Development* consists of contributions to Northern strategy through Geo-mapping of Energy and Minerals (GEM) and support for UNCLOS submission in 2013, and GIS and decision-making tools for land-use planning (e.g. North), respectively as a short-term action and a already underway long-term policy⁶.

2.2 A marine cadastre definition

The necessity of building a multi-purpose marine cadastre is firmly anchored in the need to administer and exercise leadership in the stewardship of northern lands and waters. The question can be asked: what really is a marine cadastre? This concept can be difficult to understand for most people.

On the land, ‘cadastre’ refers to geometric description (size and location) of parcels that relate to different registries describing the nature of interests and ownership or control of those interests, and even the value of the parcels and their improvements (NRCan/DFO Task Group 2010)⁷.

In the offshore, the term ‘marine cadastre’ may be accessible to surveyors, but difficult to capture outside the profession. It can be understood as a puzzle where different components comprising rights, restrictions, and responsibilities from various jurisdictions have to be brought together in an organized way. A strict understanding of the term ‘cadastre’ may not be applicable. But marine boundaries such as oil and gas leases, aquaculture, marine protected areas (MPA), ocean disposal, etc. could be considered as an extension of the land based cadastral system.

With this in mind, a marine cadastre (as illustrated in Figure 1) can be defined as “an integrated system of registries that allows for the systematic public recording of all recognized legal rights, responsibilities and restrictions related to the ocean space (legislative base, people, data infrastructure)”, NRCan/DFO Task Group 2010⁸.

⁶ NRCan, 2012, ‘Looking Ahead – Priorities and Integrated Business Planning’, Internal Draft Document.

⁷ Calderbank, B et al., 2008, *Canada’s Offshore: Jurisdiction, Rights, and Management*. Trafford Publishing, Victoria, 3rd edition, p.220. This definition of cadastre is perceived as still based on a relatively narrow land administration paradigm centered on land registration and cadastral surveying and mapping. The Fédération Internationale des Géomètres (FIG) has developed a vision of what cadastral systems will look like in 2014:

“Cadastre 2014 is a methodically arranged public inventory of data concerning all legal land objects in a certain country or district, based on survey of their boundaries...” Kaufmann, J. and Steudler, D. (1998). *Cadastre 2014 - A Vision for a Future Cadastral System*. [Paper](#) and [Presentation](#) at Technical Session 7, XXI FIG-Congress, Brighton, July 1998.

⁸ Please note: Other marine cadastre definitions exist, with the same substance as defined above. For example:

- Robertson defines a marine cadastre as a system to enable the boundaries of maritime rights & interests to be recorded, spatially managed and physically defined in relationship to the boundaries of other neighbouring or underlying rights and interests (Robertson et al, 1999, ‘The Marine resource: Administration Infrastructure Requirements’, UN-FIG Conference on Land Tenure and Cadastral Infrastructures for Sustainable Development, Melbourne, Australia).
- Nichols defines it as a marine information system, encompassing both the nature & spatial extent of the interests and property rights, with respect to ownership of various rights and responsibilities in the marine jurisdiction (Nichols et al, 2000, ‘Good Governance of Canada’s Offshore and Coastal Zone: Towards an Understanding of the Marine Boundary Issues’, *Geomatica*, 54 (4) 415-424).

Figure 1: A Marine Cadastre Concept, SGB, NRCan, undated



As defined, this marine cadastre concept informs on land use planning which, by definition, requires parcels. The notions of zoning (to reduce negative externalities between non compatible marine activities), massing (to regulate public and emergency access, and aesthetics), and environmental considerations (to control marine pollution and protect fish habitat), etc., are all highlighted in this marine cadastre concept.

Such an integrated system of registries is essential to support good governance and stewardship of the northern lands and waters.

2.3 Marine cadastre: a core element for land-use planning and economic development

As suggests in figure 2 (land development), cadastre forms an essential part of the information required by private developers, land owners and public authorities to ensure that benefits are maximized and cost (economic, social and environmental) are minimized. The cadastre systems are therefore an essential component of the governance structure:

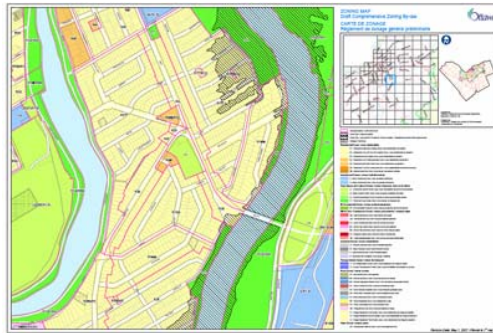
- They provide the foundation for securing interests in land,
- They are essential to orderly development, and
- They provide security to enable capital investment.

Cadastre systems have been a pillar of Canada's economic development. Cadastral surveys support economic development through local improvement and business taxes, licenses, commercial and industrial subdivisions, etc. Their preliminary end is to establish boundaries on the ground. A secondary end is to establish parcels on the ground. The ultimate end is to allow for the efficient, productive and economically viable use of land⁹.

⁹ Ballantyne et al (2010, pp. 7-8) linked parcels, tenure and economic development through four questions cadastral surveys deal with:

- Who has the right (person, family, and corporation)?
- What type of right exists (certificates of possession, long-term leases, short-term leases, licences, customary uses, fee simple, and Aboriginal title)?

Figure 2: Cadastre systems, ACLS web site, undated



In Canada's offshore area, there are no comprehensive cadastral systems being used¹⁰. But with the UNCLOS submission in 2013, Canada will need to establish management regimes and bodies for cooperation and collaboration to support oceans governance. The common unifying element to these various regimes is the geospatial component, a crucial key to a marine cadastre.

The choice of doing nothing for the ocean areas management is not without consequences. Among other penalties, Canada will continue to lack appropriate systems to support its integrated management prerogatives hindering its ability to fully tap into its ocean sector's enormous economic potential. This will induce the lack of investment that will hinder Canadian industries ability to compete in the global economy of the marine technology sector.

2.4 Marine cadastre challenges

The marine environment is a domain where wide application of the *precautionary approach* is required since not much is known about the conservation, management and exploitation of marine resources in order to protect and preserve resources¹¹. The running of a Marine Cadastre system is conditioned to the existence of critical factors as hypotheses for its success¹²:

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- How much is the right worth? What is its value? (cash is often used as a proxy for value, but land, of course has cultural value as well);
 - Where is the right? THIS is the role of the parcel – to locate the right, and to define the spatial extent of the right through boundaries.

¹⁰ To date, only the oil and gas management regimes have formally established a property rights infrastructure that contains all elements required to support good governance (See *Canada Petroleum Resources Act – Newfoundland Atlantic Accord Implementation Act*; *Canada – Nova Scotia Offshore Petroleum Resources Accord Implementation Act*; *Canada oil and Gas Land Regulations*).

¹¹ The *precautionary approach*, defined in the *Oceans Act* as “erring on the side of caution,” is a key principle to be applied in the management of ocean activities.

¹² From International workshop reports have supplied hints and they highlighted their importance in a Marine Cadastre implementation (see for example Report on the Outcomes of the UNB-FIG Meeting on the Marine Cadastre Issues, Fredericton, NB, September 2003; Workshop Report on Second Offshore Issues Consultation Workshop, 2003, <http://www.acls-aatc.ca/files/english/2nd%20Offshore%20Workshop%202003.pdf>; Report to PCGIAP, Kuala Lumpur, May 2004).

- Principles for a Marine Cadastre (multiple types of interests; participation from many stakeholders and from multiple levels of government; a core element of any marine geospatial infrastructure; rights-driven rather than boundary-driven).
- A Champion (An authority must be established to push the concept forward. Such authority would keep marine cadastre issues in the forefront of the minds of all potential stakeholders).
- Legislation as a trigger (laws, regulations or policies relevant to the management of a marine Cadastre system must be identified in order to activate the Marine Cadastre process¹³. A good fit of a marine cadastre system within the existing regulations would avoid long procedures of a new legislation and delay the Marine Cadastre implementation).
- An enabling technology (since the need for sharing various types of spatial data hosted by various stakeholders is required in a marine cadastre system, an enabling technology remains a critical factor to relate data to people. A consensus has been reached that the multipurpose nature of marine cadastre be supported by the development of Spatial Data Infrastructure (SDI)).
- A close stakeholder support (stakeholder participation is crucial to the success of a Marine Cadastre system. Collaboration and coalition with major key players, and a successful partnership with other levels of government and the Industry are vital to many steps in the Marine Cadastre process).
- A solid rationale (a set of reasons must be developed to justify why governance of marine space through a Marine Cadastre system is needed. This rationale should explain what a Marine Cadastre is, and how it would handle issues surrounding the marine space management).
- A Forum / platform for discussion (a multi-jurisdictional venue is necessary to communicate ideas about the marine cadastre to stakeholders).
- An Advisory Council (this Advisory Council would foster relationships between interested organizations, as well as coordinating and integrating all information relevant to the marine domain held by a number of stakeholders. It would also oversee all ocean activities through marine spatial planning performance (like North Sea Regional Advisory Council (NSRAC) in Europe or NOAA in the US)).

2.5 Marine cadastre benefits

Considered as a core element of the management system in the oceans, marine cadastre benefits can be appreciated through a wide ranging of impacts at different levels:

- **Legal/Institutional level:**
 - Provision of a mechanism to integrate the rights, restrictions and responsibilities of all constituents into a single system available for industries and governments;
 - Need for cooperation among stakeholders because of overlapping status of rights, restrictions and responsibilities;
 - Ability of legislation to effectively govern stakeholder activities in the marine environment;
 - Delineation of maritime boundaries in order to lower discrepancies that can affect many ocean related activities;
 - Stewardship through better government planning/decision/policy making.

¹³ NOAA Coastal Services Center in the US is a good example (www.csc.noaa.gov/legislativeatlas)

- **Environmental Level:**
 - Implementation of sustainable development measures to address issues of pollution depleted marine resources and increased threat by man through new approaches to multi-disciplinary and time varying marine and coastal area management and development;
 - Faster environmental assessment.

- **Socioeconomic Level:**
 - Certainty for Industry
 - Efficiency in approval process for all sectors, equitable assessments of offshore areas, and security of tenure because of lack of economic dead zones, and of quality and certainty of boundary and rights information;
 - Broader understanding of the requirements to use, manage and administer maritime spaces and marine spatial data;
 - Better access to information, and potential for leadership in electronic service delivery and administration of rights.

These benefits teach that coastal states would thwart their ability to fully assert their sovereignty if they miss to implement an integrated ocean management system. The implementation of such a system is conditional to certain critical factors for its effectiveness.

A marine cadastre with such benefits is not intended to be one large dataset held by one agency or level of government. As a registry of registries of various particular datasets, it will be integrated virtually to provide a comprehensive picture of interests offshore on an as needed basis.

2.6 International Experience

The ocean management system has gained huge importance around the world. Early plans and initiatives towards an ocean management system are being brought forward to establish marine protected areas. Some countries have moved from conceptual works, as seen in the previous section, to the implementation of a Marine Cadastre system.

In the USA, an experiment of a Marine cadastre has been implemented. To test the hypothesis of a marine cadastral information system, a prototype was developed in the south eastern part of the country. This project, called *Ocean Planning Information System* (OPIS), encompasses four states of North Carolina, South Carolina, Georgia, and Florida. Its objectives are to examine boundaries, spatial accuracy and see how these boundaries are used in offshore regulations¹⁴. From this project, the USA has developed what they call 'Multipurpose Marine Cadastre, a marine information system for the outer continental shelf and state waters'¹⁵.

¹⁴ <http://www.csc.noaa.gov/opis>; <http://www.csc.noaa.gov/mbwg/htm/multipurpose.html>

¹⁵ At the national level, the Federal Geographic Data Committee established an Interdepartmental Marine Boundary Working Group, which was undertaking to develop standards for a marine cadastre. The main area of interest was the grid boundaries for submerged land interests, such as for minerals, oil and gas resources. The scope of the project had been widened to include participation from other interest groups.

In Western Europe, four countries have completed the initial stage of implementing a marine governance system (Ehler and Douvère, 2007). Belgium, the Netherlands, and Germany in the North Sea, and the United Kingdom in the Irish Sea, have already completed preliminary sea use plans and zoning proposals for marine areas within their national jurisdictions. In these countries, the focus on the management of the multiple uses of the marine space is to strike the balance between the need for development and the conservation of natural resources.

In Australia, maritime boundaries have been delineated and are on-line via Australian Marine Spatial Information System (AMSIS)¹⁶. This is the result of a research project previously developed with the contribution of the University of Melbourne. The focus was on resolving ambiguities in the definition of the tidal interface. Issues in the use of natural rather than geometric boundaries to define jurisdictional limits were considered, as well as expanding the Australian Spatial Data Infrastructure to develop and support a marine cadastre. Another good example of ocean management system is the Great Barrier Reef Marine Park. Developed in response to the dynamic nature of both the marine environment and policy, this park permits various human activities, and protects the reef from damaging actions. To avoid the most sensitive areas, fishing is strictly regulated, and commercial shipping traffic must stick to certain specific defined shipping routes¹⁷.

These examples of offshore management system ensure that conservation objectives are not impaired by human activities, on one hand; and that conflicts amongst marine space users can be handled fairly, on the other hand.

2.5 Canadian Experience

In Canada, initiatives that would lead to a Marine Cadastre implementation have been experienced in east and west coasts at a regional level. Some initiatives have been brought forward to establish marine protected areas and provide vital information to ocean space users¹⁸. The most interesting initiative related to the marine management system is *The Scotian Shelf: an Atlas of Human Activities*, a project

¹⁶ AMSIS, as an interactive mapping and decision support system, contains over 80 layers of information including maritime boundaries, bathymetry, physical and environmental information, legal interests, fisheries and shipping. It also contains the offshore mineral locations data and has been developed using standards to support interoperability enabling integration with the National Oceans Portal and other on-line initiatives (<https://www.ga.gov.au/amsis/index.jsp>).

¹⁷ <http://www.gbrmpa.gov.au>

¹⁸ <http://coin.dmsolutions.ca/coinatlantic/>; <http://www.marinebiodiversity.ca/COINAtlantic/reference/user-needs/COINPacificBenefit%20Analysis030310Final1.pdf/view>; <http://www.bcmca.ca>

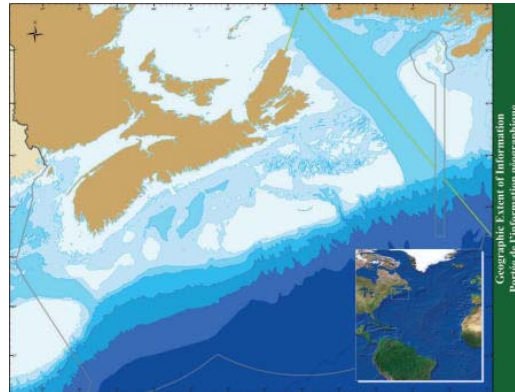
COINAtlantic is a collaborative project, as well as was *COINPacific*. They have been designed to make information about coastal and oceans spaces more accessible to the public. The British Columbia Marine Conservation Analysis (BCMCA) is a collaborative project intended to supply information with reference to marine biodiversity and human activity in British Columbia's marine waters.

For the Marine Cadastre Initiative, discussions at the national level (ACLS, CHS, NRCan) have been important steps forward. The Geomatics for Informed Decisions (GEOIDE) had conducted three case studies, with close relationship to the Marine Cadastre concept and related to Ocean Governance and Marine Boundaries Project (Musquash MPA, New Brunswick Administrative Boundaries and Nova Scotia-Newfoundland and Labrador Administrative Line).

For The Scotian Shelf: An Atlas of Human Activities Initiative, visit <http://www.mar.dfo-mpo.gc.ca/e0009630>

prepared by the Eastern Scotian Shelf Integrated Management (ESSIM) Planning Office, DFO, to show the extent of human activities and some of the management limits related to those activities¹⁹ (Figure 3).

Figure 3: The Scotian Shelf: An Atlas of human Activities



This map gives a hint of what a Marine Cadastre would be. It portrays data from the Maritimes Region including the Scotian Shelf to the full extent of Canada's 200-nautical mile exclusive economic zone (EEZ). This region also encompasses the Bay of Fundy and Canadian portions of the Gulf of Maine and George Bank. Therefore, main boundaries shown here are:

- The regional boundary, composed of the international and EEZ boundaries;
- The division between the Maritimes region of DFO and the Newfoundland and Gulf regions;
- The eastern boundary of the Eastern Scotian Shelf Integrated Management (ESSIM) initiative.

The question of offshore Management is undertaken in this project through the management of multiple human activities as major theme. Canada has demonstrated its expertise to clear the way towards an integrated oceans management if collaboration is offered by all stakeholders. Here are few examples:

The Canadian Hydrographic Service (CHS), DFO²⁰, has supported research at the University of New Brunswick (UNB), Geomatics Engineering Department to develop expertise on this topic. Many countries (USA, New Zealand, Australia and Malaysia) have benefited from Canadian research and knowledge on this issue in their process of implementing a marine cadastre.

¹⁹ Prepared by **Oceans and Coastal Management Division, Oceans and Habitat Branch, DFO (Maritimes Region)**, 2005. GIS layers were developed to make the atlas, linking text with each map to provide a better understanding of what is portrayed on the maps. Information provided, to be updated as data becomes available, is of help to managers, ocean users and other stakeholders.

²⁰ CHS is actively engaged in surveying and measuring Canada's inland navigable waterways to the edge of the continental shelf and beyond, the Great Lakes, and the Atlantic, Pacific and Arctic Ocean coasts. With rigorous, internationally-recognized standards and guidelines, hydrographic surveys capture water depths, geographical features, hazards to navigation, man-made and natural features that aid navigation, tides, currents and water levels, and sea bottom characteristics. The data collected by hydrographers is used to produce authoritative nautical charts and publications which support a broad range of marine activities. <http://www.charts.gc.ca/about-apropos/index-eng.asp>

The Association of Canada Lands Surveyors' (ACLS) Offshore Issues Committee, on which CHS and NRCan had sitting members, has conducted two consultation workshops with public and private attendees on the marine cadastre topic, in search of stakeholder interest on this matter. These workshops pointed out dissatisfaction with the status quo and called for alternative solutions. Reason why CHS and ACLS representatives went to testify twice to the Standing Committee on Fisheries and Oceans on issues surrounding a marine cadastre. These testimonies were to emphasise the importance of the issue and to seek support on the issue.

In 2010, NRCan and DFO joined efforts to start working together, in a bid to develop a business case for the commitment of sufficient resources to implement a national marine cadastre in support of the good governance of marine resources (living and non-living) and space²¹.

3 WHERE TO FROM HERE?

There is a need for consistent, accurate and up-to-date spatial information on all activities to be made available to all marine users, reducing time and cost constraints. However, for this to occur, a Canadian Geospatial data Infrastructure (CDGI) is to be in place to underpin the availability and reliability of spatial data. Because of the high demand for the 3D databases of merged topography and bathymetry, CHS and NRCan worked together and got GeoConnections, a national initiative led by NRCan, to fund a study on Canada's Arctic Spatial Data Infrastructure with Marine Cadastre.

3.1 Canada's Arctic Spatial Data Infrastructure with Marine Cadastre

GeoConnections has requested consulting services to provide analysis, assessment and recommendations to inform a strategic plan and roadmap for Canada's Arctic SDI and marine cadastre component. This will provide the essential natural resource knowledge, landmass knowledge and management systems to strengthen the safety of Canadians and the stewardship of Canada's natural resources, lands and offshore areas in the Arctic.

As a concept, an SDI is a structure intended to build an environment that will enable a wide variety of users to access and retrieve complete and consistent spatial datasets in an easy and secure way. It is an integrated, multi-levelled hierarchy of interconnected SDIs based on partnerships at local, provincial, national and global levels.

In terms of contents and in accordance with the International Hydrographic Organization (IHO) the Canadian Arctic SDI will include two types of data available marine and terrestrial information:

- Geospatial reference data: topographic, geodetic, cadastral (administrative and legal boundaries), and bathymetric (seabed topography).
- Thematic data: environmental (areas of conservation, marine habitats and oceanography), natural resources (currents, tides and certain physical properties of the sea water), and infrastructure (e.g.

²¹ A small inter-departmental team was to investigate and attempt to provide answers to the following questions:

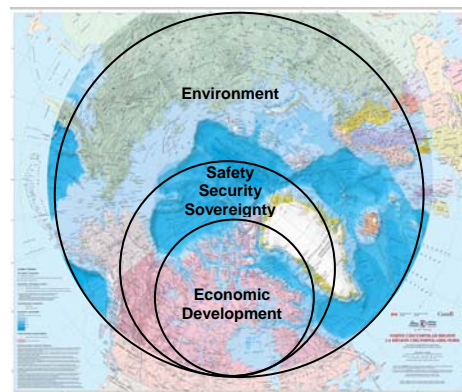
1. What problem(s) will be addressed by the establishment of a marine cadastre?
2. What are the business drivers that will lead to the establishment of a marine cadastre?
3. Who are the power users and the enablers?
4. What are the costs?

wrecks offshore installations, pipelines and cables, needs of safety of navigation and protection of the marine environment).

Under the supervision of GeoConnections, SGB and CHS of DFO, this study is awarded to Fujitsu Consulting (Canada) Inc. to develop a strategic plan and a roadmap for Canada's Arctic spatial data infrastructure and Marine cadastre²². The objectives for this study are as following:

- Establish a comprehensive account of policy priorities (Figure 4) and related initiatives and their possible links to SDI in order to provide further understanding of relevance as well as guide further analysis, strategic planning and action planning.

Figure 4: Proposed Priority Areas



- Establish a baseline indication of the status and quality of geospatial information required to support Arctic initiatives and identify gaps.
- Develop a strategy and roadmap required to address these gaps and develop an Arctic SDI with Marine Cadastre.
- Determine opportunities for pilot projects to support and justify broader implementation of an Arctic SDI and Marine Cadastre.

Outputs and lessons learned from this initiative will be re-used to expand Arctic SDI, marine SDI and marine cadastre initiatives for all Canada.

3.2 Drivers for Canada's Arctic Spatial Data Infrastructure with Marine Cadastre

Governance, demand for resources, changing climate, and geopolitical attention have led to an intense scrutiny of the circumpolar region. Nine countries have come up with an international vision driven by a

²² The purpose of the project is to provide Natural Resources Canada (NRCan) with consulting services to provide analysis, assessment and recommendations to inform a strategic plan and roadmap for Canada's Arctic spatial data infrastructure (SDI) and marine cadastre component. The strategic plan and roadmap will assist in identifying priorities, requirements, gaps and actions required to develop the Canadian Geospatial Data Infrastructure (CGDI) to meet the needs of Arctic stakeholders.

set of technology, policy and partnership capabilities to enable pan-Arctic science and societal decision support²³.

Based on sustainable co-operation between mandated national mapping organisations, the international Arctic vision is intended to provide access to **spatially-related reliable information** over the Arctic to facilitate monitoring and decision making. Successfully conservation of the natural environment and while allowing for economic development is among the objectives for a well functioning exchange of spatially referenced data, especially for cross boundary activities such as monitoring climate change, pollution, and changes in Arctic biodiversity. What's more is that spatial data can be used as a tool for integrated planning (for instance between oil and gas industry, environmental concerns and cultural heritage sites), helping to make planning efforts more cost effective.

In the Canadian context, considerable information has been generated which is **spatial/geographic** in nature. The approach to managing much of this information has largely been disparate within separate agencies or programs. As a result it is difficult to find a common environment where this diverse information can be combined and analysed together.

Challenges on the way towards Canada's Arctic SDI/Marine cadastre are numerous. A cooperative approach will help to conciliate and meet many priorities (economic, environmental, sovereignty, security...) of multiple diverse stakeholders (Northern Communities, YT, NWT & NU Territories, Industry and Science Community, Government of Canada, Arctic Council member nations). Resources have to be dedicated to allow for a substantial contribution of Canada to the international Arctic vision.

4 THE ASSOCIATION OF CANADA LANDS SURVEYORS (ACLS)

4.1 Mandate

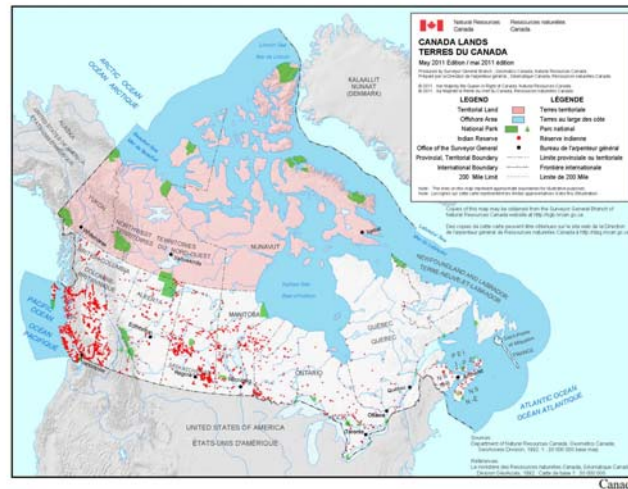
The Association of Canada Lands Surveyors (ACLS) is the national licensing body for professionals surveying in the three Canadian territories, in the National parks, on First Nations Reserves, on and under the surface of Canada's oceans.

The enabling legislations are the Canada Lands Surveys Act (R.S.C., 1985, c. L-6), the Canada Lands Surveyors Act (S.C. 1998, c. 14), the Canada Lands Surveyors Regulations (SOR/99-142), and various other federal and territorial acts and regulations. Individuals holding a commission with the ACLS have the title Canada Lands Surveyors (CLS).

The largest jurisdiction, in terms of geographic size for surveyors in Canada, is "Canada Lands" (Section 24 (1) Canada Lands Surveys act - Definition of "Canada Lands"), which covers a territory of approximately 10.9 million square kilometres, or about seven times the surface area of the Province of Quebec (Figure 5). About 60% of Canada Lands are covered by three oceans.

²³ These are: Canada, Denmark (and Faroe Islands), Finland, Greenland, Iceland, Norway, Russia, Sweden and USA). For more details, see Palmér, O. et al., 2011, The Arctic Spatial Data Infrastructure (Arctic SDI), www.arctic-sdi.org

Figure 5: Canada Lands, SGB, 2011



Canada has the world's longest coastline and one of the largest ocean estates on the planet. Its maritime zones, as defined by the Oceans Act, comprise internal waters, the territorial sea, the exclusive economic zone, and an extended continental shelf. Together they amount to a staggering 7.1 million square kilometres — a full 70 per cent of the size of our landmass.

The ACLS is a self-governing, multidisciplinary professional association with the responsibility to ensure that members have the competencies required to carry out legal or cadastral surveys on land or in the offshore. Members of the ACLS are the only professionals legally sanctioned to carry out cadastral surveying on Canada Lands. The ACLS has the responsibility to ensure that members are fully qualified to protect the public's interests in all parts of the Canada Lands jurisdiction.

Licensed surveyors are responsible for establishing and re-establishing legal boundaries, creating real property parcels for land development, transfer of property, property registration, infrastructure development and a multitude of other functions essential to effective land and resource administration. The surveyors' work provides a foundation for the property rights systems in Canada.

The definition of the ACLS exclusive field of cadastral surveying practice on Canada Lands is described as follows:

“Cadastral surveying” means surveying in relation to

- (a) The identification, establishment, documentation or description of a boundary or the position of anything relative to a boundary; or
- (b) The generation, manipulation, adjustment, custody, storage, retrieval or display of spatial information that defines a boundary.

4.2 The ACLS and the Offshore (WKS)

The Association of Canada Lands Surveyors has been concerned for many years that Canada lacks a comprehensive property rights system in offshore Canada Lands. The increasing human activities in the ocean space – navigation, oil and gas, pipelines, aquaculture, renewable energy, etc. – requires an integrated approach to balance competing demands.

The ACLS, for its part, has a unique body of expertise and credentials to help define boundaries manage the process of boundary and property rights disputes and integrate geospatial data from various sources and for use in a variety of functions. Perhaps most importantly, they have a significant role to play in protecting the public and advancing the interests of society to properly manage the real and tangible property assets that exist in Canada's ocean territories.

In short, while there is already much focus on exploration of Canada's ocean resources – and some activities underway to better manage those resources and the competing interests that exist in this territory – ACLS believes that stewardship of these resources and of all the other interests that exist in the ocean environment could be more effective if a fully integrated marine cadastre were developed.

5 CONCLUSION

The need for a marine cadastre in the Canadian Arctic complies with the Government of Canada strategic direction through leadership in the stewardship of northern lands and waters. As a decision-making tool for land-use planning, and driven to address the environmental, social and economic issues of sustainable development, a marine cadastre in the context of the Arctic SDI will be a fundamental component of spatial data and a layer in the CGDI.

With the outputs and lessons learned in the Canadian Arctic, the benefits of the marine cadastre will not be realized without a clear Government of Canada roadmap for the integrated management of Canada's oceans territories. Doing so will allow Canada to claim leadership on the world stage and to properly and appropriately manage competing interests in the offshore.

A marine cadastre in the North will rely on accurate and up-to-date spatial information concerning the administrative and legally definable boundaries of rights, restrictions and responsibilities of marine stakeholders. The task now is to develop an SDI and mobilize the cooperation of stakeholders to facilitate the implantation of such a multi-purpose marine cadastre in the North.

Since Canada Lands Surveyors are the federally regulated professionals and have the required expertise in spatial positioning and property rights systems, the Association of Canada Lands Surveyors has a key role to play in the process of developing and managing a marine cadastre for Canada. The ACLS is ready to partner with the Surveyor General Branch of NRCan and with DFO to make this happen.

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BIOGRAPHICAL NOTES

Jean-Claude Tétreault, C.L.S., a.-g., P. Eng., M.B.A. is the Executive Director, Registrar and Secretary Treasurer of the Association of Canada Lands Surveyors. Registered as a:

- Professional Civil Engineer in 1979,
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He obtained his Master's Degree in Business Administration in 2002. J.C. practiced as a land surveyor in the private industry for 16 years and was appointed ACLS Executive Director in 1999.

Jean Gagnon, CLS, NBLs, P. Eng. is the Deputy Surveyor General – East with Natural Resources Canada. He is a graduate of the University of New-Brunswick having received a B. Sc. Eng. in 1984. He is a member of:

- the Association of Canada Lands Surveyors (ACLS),
- the Association of New-Brunswick Land Surveyors and the Association of Professional Engineers and Geoscientist of New Brunswick.
- Jean is a past-chair the Offshore Issues Committee of the ACLS.

Jean brings over 25 years of experience in the geomatics engineering field specializing primarily in cadastral surveys and systems. He joined Natural Resources Canada in 1992 as the manager responsible for cadastral survey standards. Today, as the Deputy Surveyor General – East, he is responsible for overseeing the operations of the Surveyor General Branch in Quebec, the Atlantic Provinces, and the National Capital Region. In addition, Jean oversees cadastral modernization activities on Canada Lands including providing strategic leadership towards the adoption of a Marine Cadastre for Canada.

José M'Bala has recently joined Surveyor General Branch (SGB) to lead the marine cadastre initiative

among others responsibilities. He holds a Ph.D. in geography from the University of Ottawa where he has been a part-time professor in the department of Geography since his graduation in 2002. He also has a Masters' Degree from Université Laval (Quebec City) in Land-Use Planning and Regional Development; and he is an ingénieur technicien Géomètre-Topographe from Institut du Bâtiment et des Travaux Publics, IBTP (Kinshasa, DR Congo).

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