Fish Gotta Swim, Birds Gotta Fly: Valuing Ecosystem Services for Marine Protected Areas in Canada

by

Claire Havens

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Name:	**Claire Havens**
Degree:	**M.P.P.**
Title of Thesis:	**Fish Gotta Swim, Birds Gotta Fly: Valuing Ecosystem Services for Marine Protected Areas in Canada**

Examining Committee:

Chair: Nancy Olewiler
Director, School of Public Policy, SFU

Nancy Olewiler
Senior Supervisor
Director, School of Public Policy, SFU

Maureen Maloney
Supervisor
Professor, School of Public Policy, SFU

John Richards
Internal Examiner
Professor, School of Public Policy, SFU

Date Defended/Approved: February 29, 2012

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Abstract

Marine Protected Areas (MPAs) are crucial to the conservation of the ocean's biodiversity and the recovery of global fisheries. Cost-benefit analysis can help policymakers evaluate the expected economic outcomes of regulatory amendments. However, there is too little assessment of the value of ecosystem goods and services in decision making for MPA proposals in Canada, thus the benefits of marine planning initiatives are often not properly estimated. This research examines the barriers to conducting benefits valuations for federal MPAs. From semi-structured interviews with policymakers, academics and non-profit practitioners potential policy solutions are revealed. Following further analysis a policy suite is recommended which couples education and partnerships. Education includes i) developing materials for structured decision-making models, tutorials, webinars and case studies and ii) workshops and training in cost-benefit analysis or internal certification programs for policymakers and planners. Partnerships include i) fostering more academic-government partnerships and ii) increasing funding for graduate and co-op students conducting research on economic and policy analysis.

Keywords: Marine Protected Areas; ecosystem services; ecosystem goods; Cost-Benefit Analysis; marine planning; oceans management; natural capital valuation

For my parents, who ensured that my first breath was that of salty air, my first swim was in the Pacific Ocean and my first adventure was on a sailboat.

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CBA   Cost-Benefit Analysis

MPA   Marine Protected Area

EG&S   Ecosystem Goods and Services

DFO   Department of Fisheries and Oceans

EC   Environment Canada

PC   Parks Canada

TBS   Treasury Board (of Canada) Secretariat

CWS   Canadian Wildlife Service

EPA   Environmental Protection Agency (US)

NOAA   National Oceanic and Atmospheric Association (US)

NASA   National Aeronautics and Space Administration (US)

FAO   Food and Agriculture Organization

IUCN   International Union for the Conservation of Nature (and Natural
                Resources)

TEEB   The Economics of Ecosystems and Biodiversity

NRCNA   National Research Council of the National Academies

LOMA   Large Ocean Management Area

NWA   National Wildlife Area

NMCA   National Marine Conservation Area

SARA   Species at Risk Act

EEZ   Exclusive Economic Zone

PCBs   Polychlorinated biphenyls

TEV   Total Economic Value

WTP   Willingness-to-pay

InVEST   Integrated Valuation of Environmental Services and Tradeoffs

CVM   Contingent Valuation Method

Executive Summary

Marine ecosystems provide goods and services to humankind that have shaped our societies and sustained our populations for millennia (IUCN, 2010a). Millions of coastal communities are dependent upon the food, navigation and climate regulation that the ocean provides. The ocean is a public good, one which lends itself easily to exploitation as ocean circulation and species migration make protection difficult for any one nation. Marine ecosystems are vulnerable to numerous threats: coastal development, pollution, climate change and the overexploitation of fisheries resources (Boersma, 1999). Although there is little that conservationists and the government can do with respect to climate change and its effects on marine ecosystems at the local level, Ecosystem Based Management and integrated decision making in marine spatial planning can develop strategies to mitigate the negative effects of coastal development, pollution and fishing. Marine protected areas (MPAs) are a key piece of this management framework.

In the process leading up to the establishment of a federal MPA it is common practice to use the *Treasury Board Secretariat (TBS) Canadian Cost-Benefit Analysis Guide: Regulatory Proposals* when conducting a socio-economic analysis of the impact of designation. The TBS guidelines are clear in their recommendation for a full accounting of both the costs borne by the public and the benefits accruing to the public from a change in regulation or legislation. It is, however, rare that a full accounting of the benefits is carried out in a manner as detailed as that of the costs for any given marine protected area proposal in Canada. This research examines the barriers that policymakers, planners and economists face when conducting benefits valuations in the federal government for MPA proposals. The policy recommendations from this research are meant to be helpful for regional branches of federal departments with an oceans mandate.

This research presents a mixed methodological approach to policy analysis including a small case study comparison, thematic analysis from interviews and a brief jurisdictional scan for best practices. A preliminary screening process was employed to narrow policy options that were gleaned from 17 interviews with government

policymakers, academics and non-profit experts working on natural capital valuation or marine conservation issues. The emerging policy approaches were then evaluated by interviews with government participants for the criterion *Effectiveness – the extent to which the policy approach will meet the objectives of the research*. The research objectives are:

- to efficiently prioritize and allocate the federal government's scarce resources for oceans management, and;
- to encourage best practices in conducting cost-benefit analysis and socio-economic studies for marine protected areas.

I also assessed the policy approaches according to three other criteria (*Cost, Administrative Feasibility, Alignment*). While Cost and Administrative Feasibility are relatively straightforward, Alignment was evaluated according to the number of key informants who recommended the policy approach as an effective tool to achieve the objectives. Three policy suites emerge from this analysis:

Policy Suite A: Education and Standardization

- Development of interactive materials and an educational campaign including workshops and training in cost-benefit analysis (CBA) and/or internal certification programs for policymakers and planners.
- Standardization of CBA principles for government and contracting.
- Move socio-economic assessment up candidate site timelines and define the boundary/proposed change and expected environmental improvement early on to allow for a thorough benefits valuation.

Policy Suite B: Education and Partnerships

- Development of interactive materials and an educational campaign including workshops and training in cost-benefit analysis and/or internal certification programs for policymakers and planners.
- Increase of funding opportunities for academic-government partnerships and the provision of channels for academic communication with high level officials and government executives.

Policy Suite C: Education and Reorganization

- Development of interactive materials and an educational campaign including workshops and training in cost-benefit analysis and/or internal certification programs for policymakers and planners.
- Transfer of economists to the Science and Technology branch of each federal department to redefine them as research scientists.

Upon further analysis of each potential approach this paper recommends **Policy Suite B: Education and Partnerships** as the policy option most likely to achieve the research objectives. In addition to the policy recommendation, a number of best practices for MPA benefits valuation are discussed. When conducting a CBA study for a Treasury Board Secretariat submission in order to evaluate the socio-economic impacts of a new marine policy or regulation policymakers should:

- consider conducting benefits valuations of various potential MPAs well before Area of Interest selection as part of the scoping and screening process in MPA network analysis;
- recognize that academic timelines do not always coincide with government timelines and plan for socio-economic assessments at the beginning of the AOI evaluation process;
- consider socio-economic information as "best available science" when evaluating MPA proposals;
- incorporate traditional ecological knowledge and First Nations perspectives when conducting socio-economic studies. This sometimes requires the omission of monetizing cultural values and allowing for qualitative descriptions to provide context for other values;
- insist on adhering to international best practices with examples available in the literature such as The Economics of Ecosystems and Biodiversity (TEEB) reports, Millennium Ecosystem Assessment reports, Sustainable Prosperity publications, etc.; and,
- encourage academic consultation with senior management to foster high level support for socio-economic research.

1. Introduction: Marine Protected Areas in Canada and Internationally

Marine ecosystems provide goods and services to humankind that have shaped our societies and sustained our populations for millennia (IUCN, 2010a). Millions of coastal communities are dependent upon the food, navigation and climate regulation that the ocean provides. The ocean is also the largest carbon sink on the planet, absorbing carbon dioxide that would otherwise contribute to global warming. Phytoplankton provide half the oxygen produced by plant life, thereby sustaining life on land (NASA, 2005). The ocean provides sustenance for nearly 50% of all species on Earth and contributes five percent of the total protein and 20% of the animal protein in the human diet (NOAA, 2011). Marine ecosystems are intricately linked with the social and economic well-being of people worldwide.

1.1. Marine Ecosystems in Decline

The ocean is a public good, one which lends itself easily to exploitation as ocean circulation and species migration make protection difficult for any one nation. Marine ecosystems are vulnerable to numerous threats: coastal development, pollution, climate change and the overexploitation of fisheries resources (Boersma, 1999).

Coastal development may include the dredging and channelizing of rivers, the creation of dikes and seawalls and reinforcement of beaches. These activities can modify nutrient, water and sediment flows, destroy the seabed and intertidal ecosystems and reduce the habitat available for marine species (Katsanevakis et al., 2011). The worldwide coastal population is expected to double by 2050 (Coral Reef Alliance, 2010). In highly populated regions such as Europe it has been estimated that up to 70% of coastline is critically threatened due to direct and indirect human impacts (Bryant et al., 1996). For North America, where coastal populations are growing rapidly, the European

example of devastating habitat, cultural and biodiversity loss and decrease in water quality (Humphrey et al., 2000) is evidence of how rampant waterfront development can lead to irreversible environmental damage.

Pollution, both chemical and biological is another major threat to marine ecosystems worldwide. Bioaccumulation and biomagnifications of heavy metals, polychlorinated biphenyls (PCBs) and other chemicals can be detrimental to the reproductive success of populations, particularly marine mammals and large commercially harvested species. Toxins such as organochlorines (including PCBs) have been found to be present across the globe in tuna populations suggesting widespread contamination of fish stocks globally (Zheng et al., 2003). Herbicides, pesticides, oil from bilge water of ships as well as spills from accidents, phosphates and nitrates from sewage and agricultural run-off and industrial chemicals such as chorine are all pollutants that have various lethal and sub-lethal effects on marine populations (Kenchington, 1990).

Climate change and its associated increase in temperature, changes in the salinity and acidity of sea water and storm surges can all have a negative impact on ocean ecosystems as well (Boersma, 1999). Ocean acidification has become a significant concern to scientists and a well-publicized threat to marine ecosystems over the past few years. The physiological effects of decreasing pH in ocean water include the inhibition of calcite or aragonite formation, the process which molluscs and other invertebrates, as well as algae, depend on to make their skeletons (NRCNA, 2010). While the exact effects that ocean acidification will have on marine trophic relationships remain unknown, the North American oyster aquaculture industry is already reporting problems related to this issue (NRCNA, 2010).

Commercial fishing can have a significant negative impact on marine ecosystem structure and processes. Habitats can be altered by gear, such as bottom trawl technology, and depleted through the bycatch and overfishing of species that are integral to the health of the bioregion. Changes in adult abundance, larval and juvenile survival rates, and total biomass can be detrimental and result in species collapse (Auster et al., 1996). Researchers at Dalhousie University estimate that large predatory fish biomass has been overfished to the point where it represents only about 10% of pre-

industrial levels globally (Worm, 2003). This is but one example of the potentially catastrophic mass extinction that many marine biologists believe the ocean could experience in the next few decades. It is estimated that 25% of global fish stocks are overexploited or fully depleted (FAO, 2007). Despite this, countries around the world continue to subsidize their respective fishing industries. Through reduced fuel prices Canada provides over $90 million USD in subsidies to fisheries each year (Sustainable Prosperity, 2011). These subsidies are perverse; they result in overfishing as they reduce the marginal private cost of fishing effort and are economically inefficient.

Although there is little that conservationists and the government can do with respect to climate change and its effects on marine ecosystems at the local level, Ecosystem Based Management and integrated decision making in marine spatial planning can develop strategies to mitigate the negative effects of coastal development, pollution and fishing. Marine protected areas (MPAs) are a key piece of this management framework.

1.2. A brief overview of Marine Protected Areas

There is mounting evidence that marine reserves and protected areas are crucial to the conservation of marine biodiversity and the recovery of global fisheries (Boersma, 1999; IUCN, 2010a). The International Union for the Conservation of Nature defines a Marine Protected Area (MPA) as "[a]ny area of intertidal or sub-tidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment." The rise of Ecosystem Based Management and Marine Spatial Planning has provided policymakers with a range of options to consider when designating a MPA. Zoning of protected areas to incorporate multiple and often conflicting stakeholder objectives has led to the use of an integrated and adaptive management approach in many countries. Integrated management is a collaborative approach to developing and protecting marine resources and involves the participation of all stakeholders with an interest in the region through consultation, working groups, conferences and other opportunities for public comment. Adaptive management allows

for continued consultation with scientists and stakeholders to ensure that the decision-making process is constantly being informed by the best available research.

Some MPAs are strictly for scientific research, while others permit limited resource extraction and commercial activities. Some MPAs are funded through eco-tourism ventures while others prohibit visitors from traveling in the region. A government agency might protect marine biodiversity through a variety of different policy tools. These include regulations to limit transportation, imposition of quotas on fishing or no-take zones, prohibition of mining, oil and gas exploration, and other adaptive management approaches to monitor commercial activity in the region.

There are currently more than 5,880 MPAs that cover approximately 1.17% of the world's ocean area (IUCN, 2010b). In 2002, the World Summit on Sustainable Development and the Convention on Biological Diversity proposed a goal to "effectively conserve at least 10% of each of the world's marine and coastal ecological regions" by 2012. Unfortunately, too few marine protected areas exist around the world and short-term international designation goals are unlikely to be met[1]. Although the total global marine area designated as an MPA has increased by 150% since 2003, there are numerous eco-regions and habitats without protected status anywhere in the world (IUCN, 2010b) and many MPAs are weakly enforced. It has recently been reported that less than 0.1% of the world's oceans ecosystems are highly protected within 'no-take' zones where fishing is strictly prohibited (Cullis-Suzuki and Pauly, 2010; Wood et al., 2008). Canada has committed to the Convention on Biological Diversity but, to date, only protected approximately 1% of a possible 5.7 million square kilometres of its oceans and Great Lakes (Fisheries and Oceans, 2011b). Figure 1.1 illustrates the breakdown of federal MPAs by size (in square kilometres). In total, existing MPAs cover over 61,000 square kilometres of Canada's oceans and Great Lakes, with Parks Canada being responsible for the largest share at 22,529 square kilometres (Fisheries and Oceans, 2011b).

[1] The 2012 commitments have been revised. Global MPA coverage still remained well below 2% in 2010, thus the CBD Secretariat extended the deadline to 2020.

Figure 1.1: Marine Protected Areas by Agency (in square kilometres)
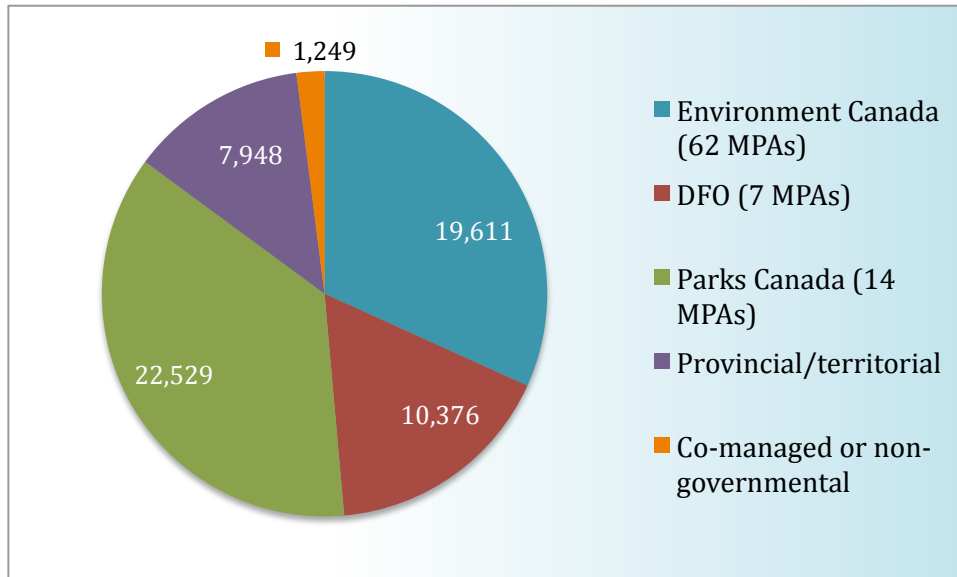
Pacific Canada has over 450,000 square kilometres of internal and offshore marine waters dotted with over 6,500 islands. This coast is one of the most biologically productive in the world and provides countless ecosystem goods and services to the people of British Columbia. Environmental stressors such as climate change, ocean acidification and overfishing pose significant threats to the coastal economy and biodiversity. BC currently has 187 MPAs covering 2.8 percent of Pacific Canada's Exclusive Economic Zone (EEZ) and 28% of the province's coastline. Although my research predominantly examines cases and interviews in the context of Pacific Canada, I provide recommendations that may be used for any MPA proposal in Canada, as well as the Large Ocean Management Areas (LOMAs). For a map of the LOMAs and federal MPAs in each region see Appendix A.

1.3. Defining the Problem

Through my masters program at SFU I was fortunate to have the opportunity to work at Environment Canada as a co-op Policy Analyst over the course of a year. For the first four months, I worked at the Canadian Wildlife Service (Pacific and Yukon region) conducting a 'willingness-to-pay' contingent valuation survey for the Scott Islands marine National Wildlife Area. Through the design, distribution and analysis of the

contingent valuation survey, I encountered numerous bureaucratic obstacles. It soon became apparent to me that the federal system has not been well-designed to tackle the rigorous economic analysis required for a cost-benefit analysis (CBA) of a MPA proposal. Of fifteen recently established federal MPAs, only two (including the one I was working on) had attempted to quantify the benefits of designation. Upon learning that conducting a CBA according to best practices is almost never done, I decided to research the barriers that policymakers, planners and economists face when conducting benefits valuations in the federal government. From my experience at Environment Canada I was able to observe the frustrations of dedicated employees and the constraints that the current system places on them, which in turn affects the quality of the socio-economic evaluations that should be central to the decision-making process for any major environmental project. This led me to my public policy problem:

There is too little assessment of the value of ecosystem goods and services to inform decision making for marine protected area proposals in Canada.

In the process leading up to the establishment of a federal MPA it is common practice to use the *Treasury Board Secretariat (TBS) Canadian Cost-Benefit Analysis Guide: Regulatory Proposals* when conducting a socio-economic analysis of the impact of designation. The TBS guidelines are clear in their recommendation for a full accounting of both the costs borne by the public and the benefits accruing to the public from a change in regulation or legislation. It is, however, rare that a full accounting of the benefits is carried out in a manner as detailed as that of the costs for any given marine protected area proposal in Canada. This is problematic for two main reasons: First, to contrast quantitative costs with qualitative benefits fails to recognize the short-comings of both methodological approaches and their interpretation by decision-makers. Describing costs in dollar terms and benefits in words or with incomplete information may favour the consideration of costs over benefits. Industry stakeholders often point to the high cost of conservation as evidence as to why an MPA should not be designated. Environmental non-profits and government usually do not have solid numbers to demonstrate the benefits in response. Second, society has scarce resources to allocate to marine conservation and the federal government should prioritize accordingly. Determining where and when a marine protected area should be designated should be

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an exhaustive effort with all possible information put forward for public and stakeholder consultation. The failure to conduct a comprehensive benefits valuation could lead to decision makers proposing the establishment of MPAs that do not make good economic sense, as well as taking MPAs that do make good economic sense off the table.

Despite international and national commitments, MPAs require political support and this is often in the form of environmental non-profit campaigns and industry endorsement, or at the very least consultation (Glenn et al., 2010). Socio-economic information is gathered to build a case for each MPA and to satisfy the requirements of a cost-benefit analysis study. This information is best presented in quantifiable units, that is, dollars (Glenn et al., 2010). An MPA proposal must also outline financing for the monitoring, research and enforcement needed for protection, that is, the costs in dollar terms. A failure to properly estimate both values can lead to misinformation and flawed decision making. MPA proposal processes are vulnerable to competing interests and politicians and policymakers often compromise on key decisions. This 'watering down' of MPA proposals can lead to (i) a lack of political and legal endorsement, (ii) ineffective support and resourcing, and (iii) compromised and ineffective design and management (Glenn et al., 2010). A narrow evaluation of costs and benefits can lead to policies that benefit special interests, rather than society as a whole (Costanza, 2006).

The IUCN (2010b,39) posits that "factoring in ecosystem services or other socio-economic considerations into MPA design may be a critical part of MPA priority setting and network design." The drafting of regional frameworks for MPA network strategies should therefore define best practices for evaluating ecosystem services and incorporate that data into the decision-making process. While it is not suggested that socio-economic evaluations such as cost-benefit analysis necessarily be the deciding factor in the designation of an MPA, there should be recognition of the risks of omitting a good estimate of the benefits. Without an understanding of the services marine ecosystems truly provide us with, there is greater potential for degradation of these resources and the possibility of losing them forever.

2. Socio-economic Considerations for MPAs

The establishment of an MPA will inevitably produce winners and losers. It may be that restrictions on activities in the region will result in opportunity costs for industry but these may be balanced by the benefits to the public or tourism operators for improvements in environmental quality. Determining which sectors will be affected by the designation of an MPA, and how, is crucial to the planning process. The more socio-economic information the federal government can provide for local residents and businesses, the better stakeholders can understand the trade-offs necessary to achieve the goal of marine protection.

2.1. Policy Dimensions

The application of techniques from economics provides policymakers with specific tools to evaluate the costs and benefits of projects that affect the environment. Operating within a 'full earth' system, recognizing that the economy relies on an external natural system, is a conceptual framework that needs more acceptance in policy circles:

> "In seeking to increase human well-being solely by maximizing the monetary value of market goods (built capital), our current economic system may be doing more to undermine our sustainable well-being than to improve it" (Costanza and Farley, 2007, p. 249).

The failure to conduct evaluations of ecosystem services in Canada may be leading to decisions that might have been very different if complete data were available. Canada is falling behind in this field and the consequences could be dire (Sustainable Prosperity, 2011). As Olewiler (2004) states, "the goods and services provided by natural areas are not precisely known, despite the fact that recent studies outside of Canada suggest that the economic value of these natural areas to society far outweighs any gains from converting them for human uses" (p. 2). Taking stock of Canada's natural capital is not just to protect biodiversity and this country's stunning scenery. It is

also about planning for a world in which reserves of natural commodities will become increasingly valuable. A Sustainable Prosperity report states that,

> "the economy of the future is likely to reward countries (and companies) that are low polluting and make productive use of scarce natural capital. Given the increasing array of threats to biodiversity, it is important that governments, resource managers and landowners better understand the real economic value of the life-supporting services provided by nature" (p. 54).

So why is Canada not conducting valuations of the costs and benefits for every project and policy that has potential environmental impacts? There are clearly barriers to conducting a full evaluation of the benefits of a particular conservation project. This research will attempt to define what those barriers are and what can be done to overcome them in the field of marine conservation. In order to fully understand those barriers, the governance structures and processes for establishing federal MPAs will be discussed in the next section.

2.2. Governance and protection of marine ecosystems

There are three federal agencies with the authority to create and manage marine protected areas (Table 1.1). Fisheries and Oceans Canada can designate MPAs under the *Oceans Act (1996)* and fisheries closures under the *Fisheries Act (1985)*. The *Canada Wildlife Act (1985)* empowers Environment Canada to create marine National Wildlife Areas. Migratory bird sanctuaries can be established under the *Migratory Birds Convention Act (1994)*. As well, the *Canada National Parks Act (2000)* allows Parks Canada to form National Marine Conservation Areas for recreation and tourism. All three agencies also use the *Species at Risk Act (2002)* to protect and recover critical habitat on federal lands. Table 2.1 presents an overview of the legislation governing each federal department and their respective mandates.

Table 2.1: Federal, Provincial and Territorial Legislation or Regulations for Marine Protected Areas.

Legislation/ Regulation	Type of Area	Federal Department	Purpose
Oceans Act, 1996, c. 31	Oceans Act Marine Protected Area (OAMPA)	Fisheries and Oceans Canada (DFO)	To conserve and protect fish, marine mammals, and their habitats; unique areas; areas of high productivity or biological diversity
Fisheries Act, 1985, c. 43	Fishery closure	Fisheries and Oceans Canada (DFO)	To conserve and protect fish and fish habitat; to manage inland fisheries
Canada National Marine Conservation Areas Act, 2002, c.18	National Marine Conservation Area (NMCA)	Parks Canada (PC)	To conserve and protect representative examples of Canada's natural and cultural marine heritage and provide opportunities for public education and enjoyment
Canada National Parks Act, 2000, c.32	National Park	Parks Canada (PC)	To protect representative examples of Canada's natural heritage for the benefit, education and enjoyment of Canadians
Canada Wildlife Act, R.S., 1985, c.W-9	National Wildlife Area (NWA)	Environment Canada (EC)	To conserve and protect habitat for a variety of wildlife, including migratory birds and species at risk
Migratory Birds Convention Act, 1994	Migratory Bird Sanctuary (MBS)	Environment Canada (EC)	To conserve and protect habitat for migratory bird species
Species at Risk Act, 2002	Protected critical habitat	DFO, PC and EC	To protect and recover wildlife species at risk in Canada
Canada Shipping Act, 2001, art 136. (1), f)	Vessel Traffic Services Zone	Transport Canada	To regulate or prohibit the navigation, anchoring, mooring or berthing of vessels for the purposes of promoting the safe and efficient navigation of vessels and protecting the public interest and the environment

Source: National Framework for Canada's Network of Marine Protected Areas

There are currently multiple integrated management processes for marine protection in Canada. Fisheries and Oceans Canada (DFO) has identified five Large Ocean Management Areas (LOMAs) including the Pacific North Coast, Beaufort Sea, Gulf of St. Lawrence, Eastern Scotian Shelf and Placentia Bay/Grand Banks. These areas are hundreds of square kilometres in size and have been chosen according to ecological and administrative criteria (Fisheries and Oceans, 2011a). Outside of the LOMAs there are numerous MPAs being planned for both the west and east coasts of

Canada with the *National Framework for Canada's Network of Marine Protected Areas* as the guiding document for best practices and ensuring the designation of representative eco-regions. The network strategy stems from the IUCN position that "networks are more effective at protecting and sustaining the full range of habitats and species on which ecosystem services depend, particularly when complemented with better management outside the MPAs" (IUCN, 2010b, p. 64). However, choosing which MPAs are to be designated and which are too costly to manage due to a lack of identifiable benefits is a complex task.

Figure 2.1 outlines the six steps required to achieve MPA designation and management for an *Oceans Act* MPA. Both Parks Canada and Environment Canada follow similar processes, with DFO being the lead agency for MPA designation and management. An Area of Interest (AOI) can be nominated by the public, stakeholder groups, government departments or First Nations and is often identified according to specific bio-geographic criteria. The AOI is then subject to a screening process to determine whether it would further the objectives of Section 35 of the *Oceans Act*. A brief description of the site, the proposed boundary and regulations, biophysical characteristics and a socio-economic profile are provided by the lead group or agency for consideration. The AOI is then evaluated according to its potential ecological, technical and socio-economic merits by the DFO. The socio-economic assessment considers how the designation of an MPA may affect:

- fishing and aquaculture uses;
- community and Aboriginal uses;
- economic and transportation uses, and;
- cultural, recreation, and tourism values and uses.

Figure 2.1: Framework for Establishing and Managing MPAs under the Oceans Act. Adapted from the National Framework for Establishing and Managing Marine Protected Areas
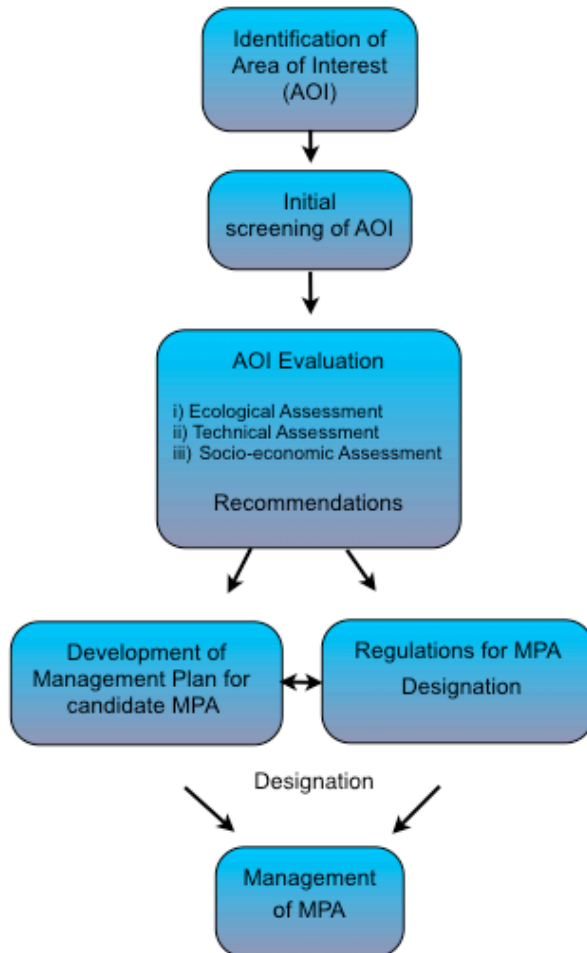
After an AOI is evaluated it can be recommended as an MPA candidate site, referred to another agency with more appropriate legislation for protection measures, or dismissed. Once a potential MPA is identified as a successful candidate site, interim protection may be employed to protect particularly vulnerable or threatened ecological communities. The candidate site then undergoes the development of a management plan, which outlines the rationale for the MPA, the goals and objectives, as well as how they are to be achieved and measured. The management plan is then implemented, often in partnership with other organizations or government agencies, and the MPA is

designated. Management of the MPA is an ongoing process including research, monitoring and enforcement as well as public education and awareness. The MPA is evaluated periodically to determine whether changes to the regulations or management plan are needed. Often the use of adaptive management, that is aligning management tools with the recommendations from best available science, requires subsequent regulatory amendments to ensure that marine populations are being properly protected.

2.3. Regulatory impact and Cost-Benefit Analysis

Each DFO, Parks Canada and Environment Canada MPA proposal requires the completion of a cost-benefit analysis to be submitted with the Regulatory Impact Analysis Statement to the Treasury Board Secretariat. The evaluation of the benefits for each particular project stems from a requirement in the TBS guidelines which were developed as part of the *Cabinet Directive on Streamlining Regulation* which took effect in April, 2007. According to the Treasury Board, best practices in evaluating the costs and benefits of a change in regulation are:

"To improve accountability and transparency, departments and agencies should prepare an accounting statement to report on the quantifiable and non-quantifiable costs and benefits of significant proposals."

While these guidelines encourage a full accounting of both the costs and benefits to society, they are not strictly adhered to. Good management of environmental resources should theoretically produce a net gain, this is the basis of cost-benefit analysis in which Pareto-efficiency is the goal of any policy direction (Katsanevakis et al., 2011).

2.4. Core Concepts

The following core concepts are crucial to understanding benefits valuation for marine ecosystem services:

Natural capital valuation: An estimate of the value of the goods and services provided by marine and terrestrial ecosystems.

Ecosystem goods and services: The flow of goods and services provided by ecosystems. Ecosystem goods usually have a market price (e.g., fish, timber) and ecosystem services are usually intangible, non-market services (e.g., climate regulation, flood prevention, recreational benefits).

Cost-Benefit (economic) Analysis: A decision-making tool used to assess the expected economic costs and benefits of a project over a set period of time.

Benefits valuation: The process to monetize the positive impacts of a particular project or policy. In CBA this represents the benefit side.

Use value: the value people assign to an ecosystem good or service that can be used directly (e.g., fish stocks) or indirectly (e.g., carbon sequestration).

Non-use value: a value that does not require any consumption of the good by the people who are willing to pay for it. Existence and bequest values are types of non-use value. **Existence value:** represents the value people assign to an ecosystem good or service just knowing that it exists in the world (e.g., the existence of orca whales). **Bequest value:** the value people assign to an ecosystem good or service that can be passed on to future generations (e.g., the value of the existence of orca whales for future generations).

Consumer surplus: a measure of the welfare or utility that people gain from the consumption of goods and services. It is measured as the difference between what consumers are willing to pay for a good and the price they actually pay for it.

Producer surplus: a measure of welfare or utility that a producer gains from the sale of goods and services. It is measured as the difference between the price for which producers are willing to supply a good for and the price they actually receive for it.

Robust policy analysis requires a good estimation of the incremental benefits and incremental costs resulting from the establishment of a MPA. This allows policymakers to evaluate the economic efficiency of the project in order to better make trade-off decisions. The incremental net benefits (total benefits minus total costs) are the net benefits of protection through designation with the MPA versus without it. As each MPA can differ in size, location and biodiversity, the benefits of designating marine protected areas differ for each particular case. Costs generally consist of research, monitoring and enforcement costs to the federal agency and opportunity costs as well as revenue losses for industries that have their activities restricted through designation. Benefits that may apply to a marine protected area consist of economic, social or cultural values that are protected or enhanced through the creation of an MPA. Benefits that stem from the natural environment are generally referred to as ecosystem services.

Table 2.2 presents the potential benefits and costs of designation with respect consumer surplus and producer surplus.

Table 2.2: Costs and Benefits of MPAs

Costs		Benefits	
C1	Forgone producers' surplus from prohibited commercial activity (e.g., loss of fishing)	B1	Producers' surplus from commercial activities that gain from MPA designation (e.g., spillover fish stock increases outside MPA boundaries)
C2	Forgone consumers' surplus from prohibited non-commercial activity (e.g., loss of recreational fishing)	B2	Consumers' surplus from non-commercial activities that gain from MPA designation (e.g., recreation improvements from enhanced environmental quality)
C3	Research, monitoring and enforcement costs to government	B3	Consumers' surplus from the incremental non-use value (e.g., existence value of conservation of whale populations)

In cost-benefit analysis an economist will compare the aggregated costs and benefits of a project, often determining the long term value over a projected timeline, discounting

the future flow of costs and benefits. When the present value of the net benefits is greater than zero, then from an economic point of view the project is an efficient use of society's resources.

2.5. Marine Ecosystem Services

There is a wealth of evidence that points to the central role that natural systems play in human well-being. Earth's provision of non-market ecosystem services may account for an annual value that may in fact be larger than global GDP (Costanza et al., 1997). Additionally, it is estimated that over three quarters of the value of global ecosystem services are provided by coastal systems, which also sustain 21 of the world's 33 mega-cities and 41% of the global human population (Sutton et al., 2007).

Figure 2.2: Annual Economic Activity Attributable to BC's Ocean Sector (in millions of dollars)
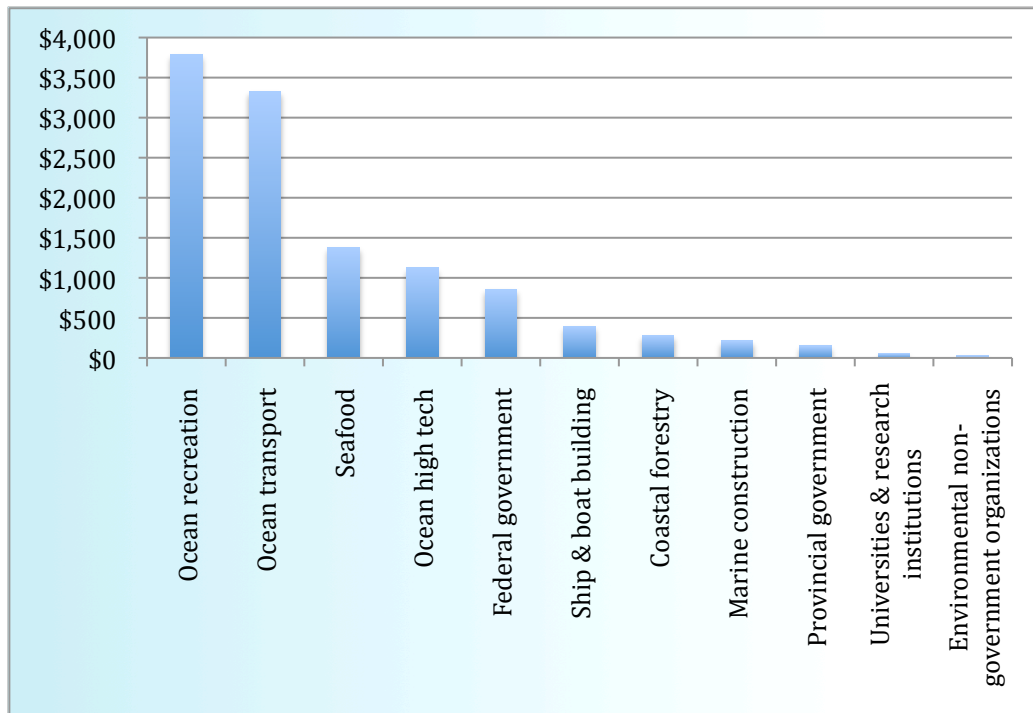
Figure 2.2 presents the economic activity generated by the ocean sector in BC. In 2005 the economic contribution of the ocean sector was $11.1 billion in GDP, or 7-8% of the total provincial economy (Canada/BC Oceans Coordinating Committee, 2007).

This sum surprised the marine policy community and the consultants contracted to do the study. The relative contribution that marine ecosystems make to the Northern and Atlantic region economies is likely similar if not greater than in BC. In fact, the economic impact of marine related activities generated an estimated $17.7 billion in direct GDP in Canada in 2006, creating over 171,340 direct jobs in Canada in 2006. In that year the ocean sector accounted for 1.2% of the Canadian GDP, and when indirect impacts are included the relative importance of marine activities increases to 1.9% of national GDP and 2.0% of total employment (Fisheries and Oceans, 2009).[2] While both national and provincial figures are substantial, it is important to note that economic activity does not necessarily equate benefit. Figure 2.2 represents the value of the inputs and outputs of each activity – wages, products, and materials used, but not the consumer or producer surpluses. It also excludes non-market valuation and thus is an incomplete representation of the benefits marine ecosystems provide us with. Nevertheless, Figure 2.2 illustrates the diverse array of economic activity that the marine environment generates, and the magnitude of this sector cannot be ignored. The ocean is important to our national economy, and even more important to our coastal economies. Marine ecosystem services provide us with the means to recreate, transport goods, fish commercially and recreationally, generate energy, attract tourists and conduct research, among other things. There are also numerous marine ecosystem services that cannot easily be detected or summarized in an oceans sector report such as cultural values that coastal people attribute to living close to the sea.

The 2003 Millennium Ecosystem Assessment report defines ecosystem services as "the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other nonmaterial benefits." According to the report, ecosystem services are divided into four

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[2] Reported figures for BC and Canada are not entirely comparable as the methodology differs for each study.

categories: provisioning services (food, clothing, medicines, tools), cultural services (recreation, spiritual value, artistic inspiration), regulating services (pest control, decomposition) and supporting services (nutrient cycling, pollination, water purification). Although this report's definition of ecosystem services is widely accepted for natural capital valuation studies around the world, there is still debate around what services can be quantified and to which type of ecosystems each category can apply (Bartelmus 2010, Farley and Costanza 2010).

Although Canada is well endowed with natural capital and enjoys a large supply of ecosystem services, the depletion of natural resources leads over time to decreased revenues in their related industries. Well-managed and monitored MPAs can protect biodiversity and ensure a flow of ecosystem services to society in perpetuity (Lubchenco et al., 2003). The IUCN (2010b) asserts that "restoring and maintaining the ecological services of coastal habitats and populations is essential to the economic prosperity of most nations" (p. 44). Knowing the value of those services, some of them seemingly invisible, is crucial to making good decisions in marine planning and policy. The failure to invest in natural capital can lead to its rapid destruction, representing huge and unseen losses that disproportionately affect those that rely on natural resources (TEEB, 2009).

Ecological benefits can include protection of biodiversity and adequate genetic pools, facilitation of ecosystem functioning and recovery of endangered or extirpated species. Social and economic benefits can include the protection of carbon sinks and improved resilience to climate change, maintenance of nurseries and refuges for commercially harvested species, preservation of important spiritual and cultural places and enhancement of recreational opportunities (Fisheries and Oceans, 2011b). Many ecosystem goods and services can be bought and sold on the market. An example of a market ecosystem good is a filet of wild salmon purchased from your local supermarket, or the value obtained by both the tourist and the tour operator from the scenic views and whales spotted on a whale watching tour. For both of these examples there is a market value for the end product and a clear link between the livelihood of the fisherman or tour operator and the marine ecosystem. There are many benefits from MPAs that can easily be quantified and aggregated, such as recovery of fish stocks and increases in commercial fish harvests in bordering regions. Recreation and tourism are also easily quantifiable when data are available to determine how much visitors and tourists spend

on travel, accommodation and access to marine parks and ecological reserves, although there is the added value of the recreational experience itself which is difficult to include in the equation (consumer surplus).[3] However, some MPAs on Canada's Pacific Coast are inaccessible for tourism or have been designated to protect species that are not easily marketed to potential eco-tourists. One such example is the Glass Sponge Reef MPA candidate site in Hecate Strait. The glass sponges are hundreds of metres below the surface of the ocean and cannot be visited. While technological advancements may one day allow for direct consumption of underwater exploration and education for the public, the values of this marine ecosystem that accrue to the typical Canadian are bequest and existence values.

Existence value is a type of non-use value that suggests people receive a benefit (are willing to pay) simply knowing that a certain species or habitat is protected and continues to exist, regardless of whether they will ever visit the habitat or see the species. Bequest value represents the benefits current generations receive from protecting natural capital today so that future generations may also benefit from sustaining the ecosystem (Katsanevakis, 2011). Existence and bequest values are 'intangibles', that is, they are difficult to quantify or to describe in measurable terms. As a result these values are often left out of benefits valuations and are either ignored in the socio-economic analysis or described qualitatively. Nevertheless, ecosystem services have value for Canadians; many are willing to pay for the continued existence of certain species or intact ecosystems. This fact is not lost on environmental non-profit organizations, but often their calls for protection of these intangible public goods go unheeded by other stakeholders. The concept of Total Economic Value, the sum of all market and non-market values in the environment, is one way to classify ecosystem values (Pearce, 1989) and Figure 2.3 displays a simplified version of this framework

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[3] It is important here to distinguish between expenditures on environmental goods and consumer surplus derived from them. For example, the expenditures on tourism do not imply a benefit in a CBA if the labour and capital could be reallocated elsewhere, that is, to other industries. The consumer surplus derived by tourists over and above what they pay for the experience is what constitutes their benefit.

(also see Figure 1.1, Appendix B). Care must be taken in using this framework empirically as it may be difficult to distinguish between and measure the different types of use.

Figure 2.3: Total Economic Value of an Ecosystem
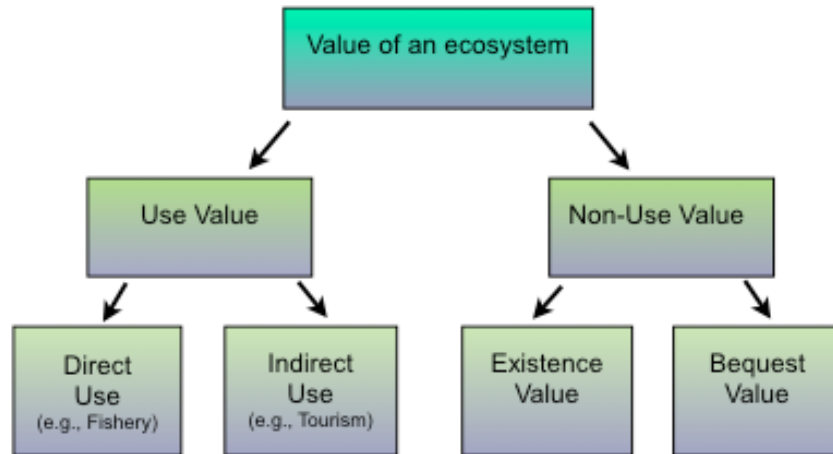
In economic terms, we speak of the utility of a good or service. Utility is a measure of satisfaction or well-being that a person obtains from consuming, whether they are buying shoes, purchasing a vacation or taking part in an activity such as hiking. Utility can be measured by a person's willingness to pay or willingness to accept. A person is willing to pay some amount in order to gain a good or service. They are also willing to accept some kind of compensation if that good or service is unavailable or taken away.

There are numerous valuation techniques for monetizing non-use (non-market) ecosystem goods and services. These include (i) Revealed Preference and (ii) Stated Preference methods, both of which are commonly employed by economists for environmental protection projects. The Revealed Preference methods obtain a dollar value from the actual consumer behaviour people exhibit when traveling, recreating or purchasing goods that indicate the value they place on the environment. Stated Preference methods use survey questionnaires and trade-off exercises to elicit the value the public places on ecosystem goods and services in a hypothetical market. These two

approaches are not perfect and even with the assumptions of rational consumer behaviour and perfect information, often only partial values can be determined (Katsanevakis, 2011). Common valuation techniques for environmental conservation projects include Travel Cost Methodology, Hedonic Pricing, Contingent Valuation and Choice Modelling. In addition the Benefits Transfer technique can be used to apply values derived from one of these methodologies at one site to a different site with similar characteristics.

Contingent valuations and choice experiments are the tools used by most economists to elicit the value that the public assigns to biodiversity. The usual form of delivery is a survey and the complexity of the questions can vary greatly from outright asking for an individual's willingness to pay to setting thresholds and asking participants to weigh options and select preferences from a number of choices. The more complex the survey, the more difficult it is for policymakers to interpret. Depending on the biogeography of the ecosystem, the proposed change in environmental quality, and socio-economic trade-offs, analysis of the surveys can be quite complex, requiring sophisticated econometric techniques.

It is the responsibility of the government to obtain and disseminate all the information necessary for making informed policy decisions. The failure to do an estimate of the benefits of ecosystem services can lead to inadequate information being used for Cost-Benefit Analyses and other socio-economic requirements. To summarize, the two methods of benefits estimation most commonly used to evaluate marine ecosystem services are travel cost methodology and contingent valuation surveys. These are, respectively, examples of revealed preference and stated preference techniques to measuring willingness to pay for ecosystem services. As some marine sites lend themselves easily to recreational visitors (kayakers, boaters, sports fishermen, scuba divers) it is possible to quantify how much people will pay to access and use a particular area. This can be evaluated using the travel cost methodology. Additionally, marine habitats often support unique and charismatic species including mega-fauna that the public is willing to pay to protect for present and future generations. The use of contingent valuation surveys can be employed to obtain a value for individual species as well as entire ecosystems that reflects society's desire to protect them.

3. Methodology

The methods employed for this research include a review of both academic literature and government documents, key informant interviews and a case study comparison. The key questions that guided my research are: (1) *What are the barriers to carrying out benefits valuation for MPAs?* (2) *Do lead policymakers believe it is important to include benefits valuation in cost-benefit analysis or other socio-economic analyses of MPAs?* (3) *If so, how might federal departments overcome the barriers to conducting benefits valuation for future MPA proposals?* A case study comparison will determine whether it is indeed true that federal departments have largely failed to do a benefits valuation prior to recent MPA designations. In order to answer the research questions, the semi-structured interview relies on the knowledge and experience of policy analysts, marine planners, academics and experts from environmental non-profit organizations. To determine whether other jurisdictions could offer potential support for the recommended policy direction a brief jurisdictional scan was also carried out and is outlined in the Policy Recommendations section.

3.1. Scope

This study examines federally established or identified marine protected areas. The federal government has the constitutional authority on matters pertaining to the sea coast and inland fisheries and consequently has the lead on developing a national framework for a network of marine protected areas and the guidelines that are to be in accordance with international best practices. The three federal departments with a mandate to protect Canada's oceans (Environment Canada, DFO and Parks Canada) are easily identifiable and their criteria for MPA establishment are well-defined. Five Large Ocean Management Areas have been identified across the nation and the recommendations of this study are intended to be useful for the evaluation of future MPAs in those regions. The policy recommendations from this research are meant to be

helpful for regional branches of federal departments with an oceans mandate. This is not a high level policy report, it is instead meant for managers and policymakers in the region who have the opportunity to push for these changes in order to improve the quality of their work.

3.2. Literature Review

A literature review of academic articles on marine protected area management and the valuation of marine ecosystem services provided information on current best practices. I evaluated a range of publications from non-governmental organizations, federal government policy frameworks, regulations and international guidelines. In addition, I considered a variety of analytical criteria from the public policy literature to evaluate the policy options revealed through this research.

3.3. Case study comparisons

A preliminary case study comparison is included in the methodology for this research. I examined the benefits valuation for 15 of the most recently established or identified federal MPAs and categorized them according to the type and extent of the analysis conducted. This exercise allowed me to identify the successes or shortcomings of past MPA proposals in order to probe why some projects chose to conduct a full benefits valuation and others did not.

3.4. Interviews

The main methodology for this study is the analysis of key informant interviews. Key informants for the purposes of this research are defined as government policymakers, academics and non-profit experts working on natural capital valuation or marine conservation issues. I investigated candidates and selected those who might have insight into oceans management and marine policy due to their position in their organization, research published in the field and participation in conferences (opportunity

sampling). The government respondents were from Fisheries and Oceans Canada, Environment Canada and Parks Canada. The independent experts were key informants from the environmental non-profit organizations, academia and First Nations organizations. Most of the interviewees reside and work in Pacific Canada although an attempt was made to ensure that voices from Atlantic Canada were also included. Some interviewees had experience working on MPAs in Canada's northern or remote regions, an important attribute for gaining insight into the national context.

I chose to conduct semi-structured interviews in order to acquire information on the experiences, opinions and recommendations of the key informants that are central to the understanding of the challenges of benefits valuation and to the formation of potential solutions. Prior to the interviews I provided each participant with a description of the research, a copy of the interview guide and a confidentiality statement. Each interviewee was given the opportunity to reject the invitation or discontinue participation at any point. After reviewing the interview questions five of the 22 potential key informants declined to participate, could not participate within a reasonable timeline, or failed to respond. I conducted the remaining 17 interviews in person or over the telephone and sent follow-up questions via email. The interviews were recorded and then loosely transcribed in order to define the key concepts and recommendations from each participant. The participants in this study are referred to anonymously, although confidentiality could not be guaranteed for phone and email interviews. The interviews were short, each lasting between thirty minutes and one hour.

The semi-structured interview design allowed for the discussion and recording of a variety of experiences and anecdotal information. To clarify a respondent's position, I repeated both the question and the answer given to avoid misinterpretation. In some cases following an interview, I sent the participant the transcript of our discussion to ensure that the responses given were accurate.

I asked the interviewees a series of twelve questions (see Appendix C) probing their knowledge of benefits valuation, existing guidelines and frameworks and their opinion on the use of ecosystem services valuation in marine conservation. Through thematic analysis – the cataloguing of patterns and sub-themes – and the use of a

ranking system for potential policy options, I summarized the key findings from 17 different interviews.

4. Examining Benefits Valuation for Federal MPAs: Key Findings

The objective of this research is to understand the barriers to conducting benefits valuation of federal MPAs and to examine the potential policy approaches that could improve the capacity of departments in order to achieve best practices in socio-economic analysis. This section outlines the findings from the case study comparison and the interviews.

4.1. Case Comparison of Benefits Valuation for Canada's MPAs

A review of all federal MPAs revealed that rigorous quantitative analysis of the benefits of designation was undertaken for only two of the fifteen, or 13%, of the designation processes most recently completed or currently underway (Table 4.1).

Table 4.1: Case Comparison of Benefits Valuation for Canada's MPAs

Marine Protected Area	Designation /Candidacy Date	Federal Department	Benefits Valuation
Basin Head Marine Protected Area	2005	*Fisheries and Oceans*	Qualitative.
Bowie Seamount (Sgaan Kinghlas) MPA	2008	*Fisheries & Oceans Canada*	Qualitative. Benefits expected to outweigh costs, NPV stated as positive but not calculated.
Eastport Marine Protected Area	2005	*Fisheries and Oceans Canada*	Qualitative.
Endeavour Hydrothermal Vents MPA	2003	*Fisheries and Oceans Canada*	Qualitative.
Lake Superior National Marine Conservation Area	2005*	*Parks Canada*	Qualitative. Not yet designated.

Gilbert Bay Marine Protected Area	2005	*Fisheries and Oceans Canada*	Qualitative.
The Gully Marine Protected Area	2004	*Fisheries and Oceans Canada*	Qualitative. Benefits expected to outweigh costs.
Gwaii Haanas National Marine Conservation Area Reserve and Haida Heritage Site	2010	*Parks Canada*	Quantitative. Benefit transfer method, increased tourism revenue. NPV= $70 million +
Hecate Strait/Queen Charlotte Sound Glass Sponge Reefs Area of Interest	2010*	*Fisheries and Oceans Canada*	Qualitative. Not yet designated.
Ninginganiq, Akpait and Qaqulluit National Wildlife Areas	2010	*Environment Canada*	Qualitative.
Lake Superior National Marine Conservation Area	2002*	*Parks Canada*	Qualitative.
Race Rocks Area of Interest	1998*	*Fisheries and Oceans Canada*	Not yet designated.
Saguenay–St-Lawrence Marine Park	1998	*Parks Canada*	No. Although WTP of different levels of marine mammal recovery in the park was found to be $77 to $229 per year (Boxall and Adamowicz et al., 2011).
Scott Islands marine National Wildlife Area	2012*	*Environment Canada*	Quantitative, contingent valuation method. Not yet designated.
Southern Strait of Georgia National Marine Conservation Area Reserve	2011*	*Parks Canada*	Candidate site.

* Candidate/Area of Interest site under interim management or undergoing consultations, not yet fully designated.

Parks Canada conducted a benefits valuation study for the Gwaii Haanas National Marine Conservation Area Reserve and Haida Heritage Site through an in-depth analysis of the benefits to each stakeholder, including the intangible benefits accruing to the public using the benefit transfer method. In the summer of 2011, I carried out a benefits valuation for the Scott Islands marine National Wildlife Area to determine the added value of designation for the Canadian public. As this site receives few tourists

and does not have a revenue-generating program, the benefits are expected to consist of only the existence and bequest value of the biodiversity being protected in the region. Nevertheless, an attempt was made to estimate a direct use value through the inclusion of a question gauging the public's willingness-to-pay for a seabird viewing "app" or entrance to an ecological interpretation centre focusing on the ecology of the Scott Islands seabird species (for a summary of the questions and preliminary results of this study see Appendix D).

Table 4.2: Quantitative Benefits Valuation for Federal MPAs

Gwaii Haanas National Marine Conservation Area Reserve and Haida Heritage Site Stakeholder	Benefits valuation methodology	Benefits ($)
Canadian Public	Benefit Transfer: WTP study from the Tubbataha Reefs National Marine Park in the Philippines	Between $3.90 and $14.29 (CAD 2010) annually for five years or Aprox. $66 million (CAD 2010)
Parks Canada	Revenues from entrance fees for Non-Canadians	$20 day passes, value over the next 10 years is approx. $85,000
Local tourism operators and coastal communities	Projected increases in revenues from all visitors (Canadian and foreign)	PV value benefit of approx. $200,000 from foreign tourists or Almost $1.5 million annually from all tourists (by 2019)
Visitors	Benefit transfer of travel cost methodology and contingent valuation from a proposal for increased protection of a marine reserve in the Florida Keys in 2003	Aprox. gain in benefits of over $10 million (CAD 2010)
Scott Islands marine National Wildlife Area Stakeholder	**Benefits valuation methodology**	**Benefits ($)**
Canadian Public	Contingent Valuation through an online survey of the general public	$30-40 per person annually* *yet to be aggregated

Parks Canada's cost-benefit analysis statement in the *Order Amending Schedule 2 to the Canada National Marine Conservation Areas Act* estimated the conservative net present value of the Gwaii Haanas National Marine Conservation Area Reserve to be over $70 million in 2010. The perpetual protection of the ecosystem and all of its component parts as well as the natural and cultural features of the area for the Haida First Nation, the Canadian public, local tour operators, visitors, and fishermen is clearly a

project that is worthy of investment. Similarly, as the costs of designating the Scott Islands marine NWA are expected to be low both for industry and for government administration (Environment Canada, 2011), the present value of the MPA will be high with benefits far outweighing costs. These two examples demonstrate how conducting a benefits valuation study can provide valuable information to decision-makers, and perhaps more importantly to stakeholders who stand to gain from the regulatory change.

But what of the other MPAs? They were designated or are on their way to designation without the aid of a benefits valuation study. Completing a study of the benefits of an MPA is clearly not a pre-requisite for successful designation. However, a proper accounting of both the costs and benefits provides valuable information to stakeholders and allows for comparisons of candidate sites. It may be that some of the federal MPAs are producing insufficient benefits for the Canadian public in contrast with high research, monitoring and enforcement costs as well as foregone economic activities. It may also be the case that potential candidate sites that are overlooked, perhaps due to political infeasibility, could result in substantial benefits realized by society.

4.2. Semi-structured Interviews

The interview participants consulted for this study were from a variety of backgrounds; all had extensive experience working on environmental policy issues. The following table outlines the breakdown of the key informant interviewees.

Table 4.3: Interviewees and their Respective Positions and Sectors

	Policy Analyst/Planner	Manager/Superintendent	Economist/Social Scientist	Total
Federal Government	6	2	2	10
Non-government (ENGO, First Nations)	1	1	1	3
University	--	--	4	4

More than half of the interviewees were from the federal government. As the main focus of the study is investigating the barriers to conducting benefits valuation within the federal system, it was beneficial to have a majority of interviewees who are government

policymakers, planners and economists with a wealth of knowledge to share with respect to internal processes. It was equally constructive to have a significant number of external key informants who could share information about how the government is performing in the field of natural capital valuation and what areas need to see more adherence to best practices.

4.2.1. Knowledge and Importance of Benefits Valuation

Each key informant was asked to indicate their familiarity with the terms *natural capital valuation*, *cost-benefit analysis*, *ecosystem goods and services* and *benefits valuation*. Fifteen of the 17 respondents (88%) were familiar with all of the terms and a definition was provided to those who were not. Additionally, most (14/17) respondents indicated that they had worked on a project that included some sort of benefits valuation or an evaluation of ecosystem goods and services. The most common methodologies employed included willingness-to-pay studies (contingent valuation), choice modelling, benefit transfer and qualitative benefits description.

When asked whether they thought a benefits valuation is important to include in a proposal for marine protected area designation, 13 out of 17 respondents (76%) said unequivocally "Yes" and the remaining four respondents replied that "it depends on the project." For those respondents who asserted that the necessity of benefits valuation depends on the parameters of the specific MPA, two rationales were given. Some interviewees indicated that benefits valuation is more important for MPAs where local populations rely on the marine environment for their livelihood (i.e. tourism, fishing) while others noted that conflict among stakeholders can lead to the need for describing the benefits of a marine planning initiative. The concept of "conflict" among stakeholders was brought up repeatedly as a reason for conducting a proper evaluation of both the costs and the benefits of a protected area.

There was a range of reasons why respondents felt that benefits valuation should be an important component of a MPA proposal. Some respondents noted that official federal policy is to abide by the TBS guidelines on cost-benefit analysis, despite the fact that this directive has not been effective in encouraging quantitative studies. To do a proper accounting of the benefits was considered "best practices" by the majority of

interviewees. In addition, most respondents pointed to the fact that coupled with costing data, benefits valuation provides impartial evidence for decision-makers and often provides rationale for MPA designation. As one respondent noted, "benefits valuation brings balance to the debate."

Many respondents mentioned that if there is conflict between stakeholders prior to establishment, and use values hold up the debate, it is best practices to show non-use values as well. It was indicated by a few interviewees that much of the resistance to MPAs stems from the perceived economic hardship that marine industries may face after designation. Thus, the virtues of providing an alternative perspective to counter the arguments from resource users and alerting local residents to the daily benefits they receive from their marine environment was a repeated theme in many of the interviews. One interviewee noted that benefits valuation "allows for a way to look at, and I guess balance out costs to make a certain decision or conservation action. It provides a counter-balance." Additionally, respondents pointed to the need to prove to the Canadian public that the investment in conservation of marine ecosystems is worth it. Encouraging proper and careful allocation of resources is a duty of responsible government; if society has limited resources, benefits valuation can prioritize which MPAs are most advantageous to invest in. This naturally requires an evaluation of the trade-offs of MPA designation at local, regional and national scales.

Clearly the majority of respondents thought that conducting benefits valuation for a MPA is in accordance with best practices. One respondent noted that benefits valuation,

> "can help inform the decision-makers if you have a credible, in-depth valuation well-founded on research and the methodology is sound, it's been tested elsewhere. It gives you a lot of credibility… [Benefits valuation is important] especially for the federal government who has the mandate for making decisions on the health of the oceans."

Some respondents also provided reasons as to why policymakers might choose not to do a benefits valuation for a particular MPA. These included methodological uncertainty and lack of familiarity and confidence in the process. In addition, one respondent pointed out that "if you can accomplish the MPA without doing the study and

there aren't stakeholder conflicts, then why do you need it?" MPAs with no impact on industry may not need benefits valuation and some interviewees suggested that a qualitative trade-off analysis may be sufficient. One respondent asserted that in many cases an in-depth cost-benefit analysis would not make a difference, particularly if there is significant political will promoting designation. Investing in benefits valuation can therefore be a waste of time and money if a potential MPA does not have naysayers.

4.2.2. Advantages and Disadvantages of Quantitative Benefits Valuation

I asked respondents what they perceive to be the advantages and disadvantages of doing in-depth quantitative benefits valuation (in dollar amounts). A recurring answer was that it is inappropriate to contrast qualitative descriptions of benefits with monetary estimates of costs; a project needs to have quantitative benefits valuation if costs are to be described quantitatively. One respondent described how quantitative benefits valuation allows policymakers to compare "apples to apples." Another interviewee exclaimed, "yes I think you have to do quantitative… I think it's appalling that [more quantitative benefits valuation] doesn't happen… It needs to be quantitative, qualitative valuation is really just an excuse to get out of the process." Indeed, for cost-benefit analysis many interviewees insisted that it is necessary to quantify the benefits, especially when non-market ecosystem goods and services exist. One interviewee gave an example of how subsistence fishing values are often overlooked when considering the costs and benefits to fisheries that come about from MPA designation, yet once calculated they can often overshadow commercial sales. These socio-economic and ecological relationships and their value are reflected through benefits valuation. There is often misconception about the presence or absence of certain species that reside in, or activities that take place in, a marine ecosystem. Benefits analysis can establish a baseline for these elements and how they can be improved upon.

As one respondent put it,

"the benefit in terms of the ecological benefit or spiritual benefit may get lost. Sometimes I've heard you just can't put a dollar value on that… People don't want to put a money value to or a dollar value to [nature] but that doesn't make them necessarily less important. It could give more credence to the cost side."

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Some participants mentioned how the process can be more important than the result as it forces policymakers to put the proposed environmental change through a rigorous evaluation and to determine what the trade-offs are and who the winners and losers will be after designation. Similarly, a number of interviewees suggested that benefits valuation could have a role to play in MPA network analysis. Quantification of the benefits of our marine ecosystem could be used for regional MPA comparisons. These data may allow bureaucrats looking at overall economic impacts to make comparative valuations of different regions and could alert policymakers to where resources should be allocated and concentrated.

Many respondents mentioned that describing the benefits of an ecosystem in dollar amounts is politically expedient. They explained that quantitative values are looked upon more favourably by decision-makers. Reporting on the benefits of a marine ecosystem can help illustrate long-term (present value) concepts to resource users such as fishermen and local residents. These concepts, if well-explained, can convince resource users that conserving stocks of resources now will ensure economic stability for future generations. In this way, many respondents noted that benefits valuation aids in making the link between economic development, sustainability and the environment. Educating the public about the value of nature's services puts proposed environmental change in a positive light (hence "benefits"), and supports the move towards an economy that recognizes that natural capital is scarce (and built capital is abundant).

Respondents brought up a number of disadvantages to conducting quantitative benefits valuation. A few interviewees suggested that CBA often makes no difference as to whether a site is designated or not. Some interviewees voiced their concern that a dollar value does not describe the benefits to the public in a way that many people, such as First Nations, respond to positively. One respondent asserted that natural capital valuation is always challenged by people who do not understand environmental economics and there are very few efforts to educate stakeholders and the public about these concepts. Another respondent pointed out that people do not understand long-term thinking, such as a 50-100 year time frame, and that society needs to start thinking in terms of budgeting; future fish stocks are "like money in the bank." Another interviewee said, "it is methodologically impossible to attach a true dollar value to the environment." This same interviewee insisted that qualitative descriptions of benefits can

be just as powerful as dollars and attaching a value to an ecosystem signals to industry that biodiversity has a price and could result in the "sale" of natural capital. Yet another respondent noted that "there will always be push-back against the commodification of nature."

Other methodological issues can plague the process. The word "subjective" was repeatedly used by some respondents to describe the valuation of non-market goods and services. The majority of interviewees mentioned bias, inconsistency and other methodological issues as major disadvantages to conducting benefits valuation. There was general consensus that many of the methods are nascent and still being developed. One interviewee pointed out that valuation is ultimately a snapshot in time and data must be updated regularly to reflect economic changes. Another commented that valuation can only ever be as good as the data that feed into it and significant data gaps in GIS, ecology and economics can lead to issues such as double-counting and under or over-estimated values. One respondent asserted that benefits valuation is more useful for tropical MPAs than temperate ones due to the significant reliance on tropical MPAs for livelihood and tourism revenues. As a result, resource users in temperate regions where extractive industries are more prominent have plenty of ammunition when rejecting the results of a benefits study.

4.2.3. Awareness of Federal Government Guidelines and Best Practices

The majority of respondents (10/17) were aware of the TBS cost-benefit analysis guidelines and had either used them in their own work or come across them when reviewing a Regulatory Impact Analysis Statement (RIAS) or economic impact assessment. Other frameworks and processes that require socio-economic analysis were identified by the 17 interviewees and can be found in Table 4.4.

***Table 4.4: Interviewee Awareness of Federal Government
Guidelines and CBA processes***

Department	Legislation/Document	Policy
All	Species at Risk Act	• For action plans/recovery strategies CBA is recommended but quantitative analysis is not required • MPAs can be recovery strategies • Any regulatory change should be subject to CBA
Parks Canada	NMCA Act	• The Act recommends the use of CBA but the policy is not yet fully developed
CEAA	Canadian Environmental Assessment Act	• Strategic EAs require qualitative socio-economic analysis
Parks Canada	N/A	• State of the Park Reports require reporting of socio-economic indicators (e.g., visitation increases, visitor satisfaction)
EC	N/A	• The protected areas strategy encourages valuation of EG&S
All	N/A	• Canada's Ocean strategy encourages valuation of EG&S for MPAs

When asked about agencies or organizations that routinely use some form of benefits valuation consistent with best practices, a variety of examples were given. There was a general consensus that of the three federal bodies with an oceans management mandate, the DFO produces the best socio-economic analyses, particularly with respect to non-market value surveys overseen by external academic economists. Other examples of agencies that are perceived to produce high quality economic analyses included:

- Australia's Directorate of National Parks
- UK's Joint Nature Conservation Committee

- BC Marine Conservation Analysis records of human use data for MARXAN analysis
- University of British Columbia Fisheries Centre
- Ecotrust natural capital valuation projects
- David Suzuki Foundation
- Health Canada/Environment Canada studies on the costs and benefits of air quality regulations
- US National Oceanic and Atmospheric Association
- US Environmental Protection Agency

4.2.4.   Benefits Valuation Techniques for MPA Assessment

Participants were asked to identify which quantitative methodologies are most suitable for use in MPA assessment. Most respondents commented that the method used depends on the data available and the resource limitations of the project. As one respondent noted,

> "It depends on the site, and I don't know all the methodologies, but I think there is probably work, if the purpose of the site is protecting a fisheries resource you could really look at the fisheries benefit, you would value the actual benefit of fish… I think that there is value to the willingness-to-pay approach because especially for sites where there isn't necessarily a direct use benefit like fisheries or tourism, where you can do travel cost methodology, but in areas where there is a tourism element you would want to do that. But for sites where there isn't …. willingness-to-pay is one of the few ways we can gauge it."

Some methodologies were considered more favourable than others including:

- fish stock recovery in no-take MPAs (spillover effects)
- Stated Preference methods such as Contingent Valuation Method (CVM) when there is no market proxy/shadow price
- Revealed Preference methods such as travel cost methodology
- Replacement Cost (the value of depletion of resources)
- Avoided Costs (the consequences of not setting up an MPA)

While the above methods were considered well-suited to benefits valuation for MPAs, many respondents mentioned the benefit transfer technique as being a poor choice for policymakers. Benefit transfer is typically chosen due to time or cost constraints. While some respondents noted that it can be used properly, it requires the availability of recent data rigorously gathered or data from other studies in similar bio-geographic zones. As Canada has done so few quantitative valuations of marine ecosystem goods and services, the benefit transfer method cannot be applied with a high degree of confidence. A few interviewees noted that the Gwaii Hanaas NMCA benefit transfer study conducted by the Treasury Board Secretariat was not considered rigorous. The value was adapted from a willingness-to-pay study from the Tubbataha Reefs National Marine Park in the Philippines and submitted with the RIAS before the park was gazetted. The transfer of a value from a tropical MPA in a developing country to a MPA in the Northwest of British Columbia was considered problematic by a number of respondents.

While the benefit transfer method for the Gwaii Hanaas NMCA was not considered to be rigorous, the techniques most identified as consistent with best practices were the valuation of fish stock increases in no-take MPAs, followed by travel cost methodology. There was some reticence around endorsing willingness-to-pay (CVM) studies for biodiversity, but it was generally agreed that this is the best and only way to estimate non-use values for MPAs.

4.2.5. Barriers to Conducting Benefits Valuation

Most respondents felt that the federal government should carry out more detailed benefits valuation for MPA proposals. When referring to the state of benefits valuations for federal protected areas, one interviewee asserted that "in Canada that line of policy is very weakly developed." There were a variety of potential barriers cited for the lack of rigorous valuations. These included the expense of carrying out an evaluation, the time (and thus capacity) required for the research, the lack of in-house expertise and knowledge of this methodologically complex field, and the difficulty of communicating results internally and to the public and stakeholders. The lack of technical expertise both nationally and internationally in the field of environmental economics was also mentioned as a major hurdle to advancing the use of benefits valuation in government.

One interviewee noted, "there is a lack of expertise at virtually every level of government in this area. So it's a question of human capital."

4.2.6. Policy Directions

From the interviews there was a range of recommended policy directions including CBA workshops and tutorials, academic-government partnerships, increased academic involvement in high-level decision-making, the transfer of economists to the Science and Technology branch and increasing joint appointments of academic economists to allow them to submit results for peer review and publish papers. What was clear from the interviews was that the status quo is not ideal and that a change is necessary to ensure that benefits valuations for MPAs are conducted according to best practices. Participants were unanimous in their frustrations with the sub-standard benefits valuations currently being conducted by the three federal departments. Sixteen of the 17 respondents expressed their concern about the lack of quantification of benefits for federal MPA proposals.

5. Pinpointing the Best Options

This section discusses the range of preliminary policy recommendations emerging from the interviews along with the screening process I employed to select the most appropriate policy options from the array of suggestions received. I then describe the criteria that will be used for the evaluation of the preliminary policy approaches and determine which ones should be considered for further analysis.

5.1. Policy Recommendations from the Interviews

During the interview process it became clear that interview participants could offer an abundance of policy recommendations. Given the differing mandates of each federal department as well as the interests of academic and non-profit representatives, the diverse array of suggested approaches is understandable. Policy recommendations ranged from detailed, targeted potential solutions to suggestions for altering greater societal priorities. To be included the potential policy options were to be directly applicable to the three federal departments with an oceans mandate and applicable to regional branches. The rationale for this is that providing policy recommendations to DFO, Environment Canada and Parks Canada that they cannot act upon without significant interference from other government agencies is impractical. Within this constraint, the interviews revealed sixteen potential solutions to the policy problem. Table 5.1 lists the barriers policymakers face when attempting benefits analysis along with the suggested policy recommendations. Each barrier is also given an intensity score indicating the number of interview respondents who mentioned it. Some policy recommendations were made for more than one barrier; thus repetition is deliberate.

Table 5.1: Policy Recommendations and Barriers from the Interviews

Barrier	Policy Recommendations	Intensity ranking (of 17)
Lack of knowledge and expertise, experimental design issues	• Standardization of guidelines. • Development of materials including structured decision-making models, tutorials, webinars and case studies to accompany the TBS guidelines. • Development of generally accepted multiple account CBA principles for government and contracting. • Hiring of more economists and social scientists. • Academic-government partnerships including advisory committees, funding for graduate and coop students, contribution agreements. • Workshops and executive training in CBA. • Internal certification programs to improve capacity and increase the number of CBA practitioners. • Transfer economists to the science (and technology) branch of each federal department and re-classify them as research scientists. Increase joint appointments between academia and government and encourage publishing and peer-review of all economic studies. • Use of and training in InVEST, Marxan and other conservation planning tools to integrate social sciences values.	15
Constraints on budget and time	• Standardization of guidelines. • Socio-economic assessment should be moved up MPA Area of Interest evaluation timeline. Clearly define the boundary/proposed change and environmental improvement early on. • Workshops and executive training in CBA. • Academic-government partnerships and funding for graduate students/coop opportunities. • Internal certification programs to improve capacity and increase the number of CBA practitioners.	11
Lack of accurate, accessible and applicable data	• A central agency such as StatsCan could take the lead on providing/maintaining data and conducting CBA. • Use of and training in InVEST, Marxan and other conservation planning tools to integrate social sciences values.	7
	• Internal certification programs to improve capacity and increase the number of CBA practitioners.	7

Lack of human capital/capacity in government	• Workshops and executive training in CBA. • Academic-government partnerships including advisory committees, funding for graduate students, contribution agreements. • Transfer economists to the science (and technology) branch of each federal department and re-classify them as research scientists. Increase joint appointments between academia and government and encourage publishing and peer-review of all economic studies.	
Lack of political will and antagonistic departmental culture	• Top-down policy of a national requirement for quantitative CBA for all regulatory changes. • Emphasize integrated management. Giving local governments and First Nations a greater role in marine planning will lead to more understanding of the benefits of MPAs and the need to describe them. • Improve academic communication with high-level officials and government executives. Provide channels for economists and other social scientists to submit briefing notes and presentations to enhance policy analysis.	6

The most widely cited barrier was lack of knowledge and expertise in experimental design issues. Fifteen of 17 interviewees identified methodological complexity and the related issue of the scarcity of practitioners in the federal government as a major hurdle to conducting benefits valuations. Constraints on budget and time were the next most important barriers with 11 of 17 key informants noting that benefits valuations are time-consuming and can be prohibitively expensive. A number of interviewees lamented that justifying the funding and time needed to conduct a proper cost-benefit analysis is difficult and quickly falls off the priority list. There was less consensus with respect to the remaining barriers, but data issues, lack of political will and lack of capacity were all identified as critical problems for nearly half of the respondents.

5.2. Screening Potential Policy Approaches

The detailed policy recommendations derived from the key informant interviews have been categorized according to whether they require a regulatory approach, educational program, reorganization, standardization or development of external partnerships. As there are far too many options to be considered in further depth, a

screening process will determine which policy approaches are the most robust. They have been evaluated according to the following criteria:

Table 5.2: Screening Criteria

Criterion	Question
Flexible	Does the option address more than one barrier?
Complexity of Implementation	Are there relatively few steps and decision makers required to implement the option? Does the option allow for quick adoption (e.g., less than 2 years)?
Cost	Could the policy option be implemented with a reasonable budget (e.g., less than $1 million CDN annually for each regional branch)?

To keep the analysis manageable, I have chosen the threshold that the policy must meet two of the three screening criteria to be considered for further analysis. The criterion '*Flexible*' is included to ensure that the policy option will address more than one barrier to conducting benefits valuation. '*Complexity of Implementation*' is a criterion to assess the number of steps and decision makers, as well as time needed to develop and implement the policy. '*Cost*' assesses whether a policy option could be carried out with a reasonable budget. The time period of two years and budget of $1 million are somewhat arbitrary components of the latter two criteria but have been chosen as a realistic threshold for assessing what is feasible within current budget constraints. They are not meant to be rigid benchmarks but instead represent relative costs and complexity.

The policy recommendation to emphasize integrated management was taken out of the analysis as it is already official policy to undertake consultation with stakeholders and First Nations in marine planning initiatives. Whether that policy is effective or not is beyond the scope of this study.

Table 5.3: Screening Potential Policy Approaches

Policy option	Flexible	Ease of Implementation	Cost	Pass?
Regulatory Approach				
Top-down policy of a national requirement for quantitative CBA for all EC, DFO and PC regulatory changes.	✓	✗	✗	No
Education Program				
Development of materials including structured decision-making models, tutorials, webinars and case studies to accompany the TBS guidelines. Workshops and executive training in CBA and/or internal certification programs.	✓	✓	✓	Yes
Reorganization and Process				
Hiring of more economists and social scientists.	✓	✗	✗	No
Centre of Excellence model: a central agency such as StatsCan could take the lead on providing/maintaining data and conducting CBA.	✓	✗	✗	No
Transfer economists to the S&T branch of each federal department and re-classify them as research scientists. Increase joint appointments between academia and government and encourage publishing and peer-review of all economic studies.	✓	✓	✗	Yes
Standardization				
Standardization of guidelines. Development of generally accepted multiple account CBA principles for government and contracting. Socio-economic assessment moved up MPA Area of Interest evaluation timeline. Clearly define the boundary/proposed change and environmental improvement early on.	✓	✓	✓	Yes
Partnerships				
Academic-government partnerships including advisory committees, funding for graduate and co-op students, contribution agreements. Improve academic communication with high-level officials and government executives. Provide channels for economists and other social scientists to submit briefing notes and presentations to enhance policy analysis.	✓	✓	✓	Yes

Four policy approaches and eight policy options pass the screening process. The Centre of Excellence model and top-down regulatory options have been screened out, largely because they would require significant research and regulatory changes that cannot be completed within a fiscal year, and they pose political and legal hurdles. Statistics Canada already provides and maintains data that can be used for cost-benefit analysis of protected areas; however they have neither the capacity nor the mandate to conduct socio-economic analyses for other agencies. The top-down regulatory approach would also do little to address the barriers policymakers face; requiring quantitative analysis in the TBS guidelines will not solve the problem of constrained resources and time. As well, the hiring of more economists and social scientists is not considered to be a viable policy option in the short term. It would be difficult to implement largely due to the current workforce adjustments in the federal government and the related hiring freeze expected to be in place for the next few years. The three policy options that were screened out are also beyond the influence of policy analysts and managers working on the oceans mandate in the regions. The remaining four policy approaches will now be evaluated in more detail.

6. Opportunities for Improving Benefits Valuation for Marine Protection

Four policy approaches (in addition to the status quo) have been identified and are outlined below. Each individual policy option will be evaluated separately in the next section, however it may be that two or three options that are expected to complement each other could form a policy suite to maximize the effectiveness of the recommended approach.

6.1. Status Quo

As has previously been established, two of fifteen recently established or identified federal MPAs were found to have conducted quantitative benefits valuations. The first policy approach is to maintain the status quo and continue to focus on cost analysis with limited resources available for benefits valuation and cost-benefit analysis.

6.2. Education Program

The second policy approach is an education program to train employees in the public service how to either conduct simple CBA studies or how to evaluate the work of external experts such as consultants and academics.

1) Develop materials including structured decision-making models, tutorials, webinars and case studies to accompany the Treasury Board cost-benefit analysis guidelines.
2) Provide workshops and training in cost-benefit analysis and/or internal certification programs for policymakers and planners.
3) Target cost-benefit analysis training to management level and above, much like business training for executives.

6.3. Reorganization and Process

The third policy approach is an internal reorganization and change in the role of government economists. The expected outcome of encouraging publication and/or joint appointments for economist positions is the production of rigorous and peer-reviewed benefits valuations for protected areas.

1) Transfer economists to the Science and Technology branch of each federal department and re-classify them as research scientists. As with academic/CWS biologists, allow for publishing and dedicated expertise to multiple projects.
2) Increase joint appointments between academia and government and encourage publishing and peer-review of all economic studies.

6.4. Standardization

The fourth policy approach is the standardization of guidelines and processes to improve the quality of benefits valuation. Allowing more time for socio-economic research in the Area of Interest evaluation timeline and/or developing clear and accepted principles for cost-benefit analysis is expected to result in improved benefits valuations.

1) Standardize benefit and cost valuation guidelines. Develop generally accepted multiple account benefit-cost analysis principles for government and contracting.
2) Move socio-economic assessment up the MPA Area of Interest evaluation timeline (DFO). Clearly define the boundary/proposed change and environmental improvement early on to allow for the time needed for a thorough benefits valuation.

6.5. Partnerships

The fifth policy approach is encouraging partnerships between academia and government in order to ensure that benefits valuations are carried out according to best

practices and subject to peer review or scrutiny. Government-academic collaborations for cost and benefit valuations have been proven to be successful in the past but were reported to be less common in recent years. A revival of partnerships could lead to enhanced methodological approaches and improved national capacity in the field.

1) Foster more academic-government partnerships. Increase funding for graduate and coop students conducting research on economic analysis and policy.

2) Improve academic communication with high level officials and government executives. Provide channels for economists and other social scientists to submit briefing notes and presentations to enhance policy analysis.

3) Require academic advisory committees for all CBA statements and socio-economic studies for MPA proposals.

4) Enhanced contribution agreements: emphasize partnerships between academia and government that clearly outline the deliverables of a project, the specifics of intellectual property and publishing rights and compensation for expertise.

7. Policy Analysis

The public policy problem is that there is **too little assessment of the value of ecosystem services to inform decision making for marine protected area proposals in Canada.**

7.1. Policy Goals and Objectives

The goal of the study is to help conserve and protect the flow of marine goods and services that are most valuable to Canadians.

The objectives are:

- to efficiently prioritize and allocate the federal government's scarce resources for oceans management, and;
- to encourage best practices in conducting cost-benefit analysis and socio-economic studies for marine protected areas.

7.2. Evaluation and Criteria

Each policy approach is measured and evaluated according to the criteria defined below:

Cost: the dollar value of human resources (salary and benefits) and of delivery (time, complexity, uncertainty) required to implement the policy approach. It is presented in annual ranges.

Administrative Feasibility: the number of steps required by a government agency to implement the policy approach. Administrative feasibility is measured as *highly feasible, moderate or low*.

Alignment: the number of key informants who recommended the policy approach as an effective tool to achieve the objectives. Alignment is measured by the categories *highly recommended*, *recommended*, *not recommended*.

Effectiveness: the extent to which the policy approach will meet the objectives. Effectiveness is measured on a ranking scale of 1-5. The average has been calculated from the responses of government interviewees who evaluated each option according to this criterion.

7.3. Assessment of the Policy Options

The following matrix details the preferred policy options reviewed by the interview participants. For the Effectiveness criterion, policy options that had passed the screening process were sent back to 10 government interviewees. Seven responses with completed ranking matrices were received and have been summarized in this table.

Table 7.1 Policy Approaches and Options Matrix

Policy Option	Effectiveness (Rank 1-5)	Cost	Administrative Feasibility	Alignment
Status Quo				
Quantitative benefits valuations rarely conducted for federal MPAs prior to designation.	--	$0	High	Not recommended
Education Program				
Develop materials including structured decision-making models, tutorials, webinars and case studies to accompany the TBS CBA guidelines.	3.29	$50,000 - $100,000	High	Highly recommended
Provide workshops and training in CBA and/or internal certification programs for policymakers and planners.	3.14			
Target CBA training to management level and above, much like business training for executives.	2.57			

Reorganization				
Transfer economists to the S&T branch of each federal department and re-classify them as research scientists. As with academic/CWS biologists, allow for publishing and dedicated expertise to multiple projects.	3.29	$100,000 - $500,000	Low	Recommended
Increase joint appointments between academia and government and encourage publishing and peer-review of all economic studies.	3.00			
Standardization				
Standardize benefit and cost valuation guidelines. Develop generally accepted multiple account CBA principles for government and contracting.	3.86	$50,000 - $100,000	Moderate	Highly Recommended
Move socio-economic assessment up the MPA Area of Interest evaluation timeline. Clearly define the boundary/proposed change and environmental improvement early on to allow for the time needed for a thorough benefits valuation.	3.42			
Partnerships				
Foster more academic-government partnerships. Increase funding for graduate and coop students conducting research on economic analysis and policy.	3.57	$50,000 - $100,000	Moderate	Highly recommended
Improve academic communication with high-level officials and government executives. Provide channels for economists and other social scientists to submit briefing notes and presentations to enhance policy analysis.	3.00			
Require academic advisory committees for all CBA statements and socio-economic studies for MPA proposals.	2.71			
Enhanced contribution agreements: emphasize partnerships between academia and government that clearly outline the deliverables of a project, the specifics of intellectual property and publishing rights and compensation for expertise.	2.42			

Each criterion has been evaluated and colour coded from favourable (green) to unfavourable (red). The Education Program scores the highest with the Standardization and Partnerships policy approaches coming in a close second. Within these broader categories six policy options score the highest (above 3.00) for effectiveness and were highly recommended in the interviews. Interview participants were largely in agreement that more than one policy option would be needed to effectively address the problem. Education was the most popular and highly recommended option, and as educational programs are easily coupled with other policies, I have recommended the following policy suites:

Policy Suite A: Education and Standardization

- Development of interactive materials and an educational campaign including workshops and training in cost-benefit analysis and/or internal certification programs for policymakers and planners.
- Standardization of CBA principles for government and contracting.
- Move socio-economic assessment up Area of Interest timelines and define the boundary/proposed change and expected environmental improvement early on to allow for a thorough benefits valuation.

Policy Suite B: Education and Partnerships

- Development of interactive materials and an educational campaign including workshops and training in cost-benefit analysis and/or internal certification programs for policymakers and planners.
- Increase of funding opportunities for academic-government partnerships and the provision of channels for academic communication with high level officials and government executives.

Policy Suite C: Education and Reorganization

- Development of interactive materials and an educational campaign including workshops and training in cost-benefit analysis and/or internal certification programs for policymakers and planners.

- Transfer of economists to the S&T branch of each federal department to redefine them as research scientists.

The next section will address the specifics of each policy suite and expected benefits if implemented.

8. Policy Recommendations and the Way Forward

All three policy suites have multiple benefits; the following section seeks to determine whether one could be more effective than the others. As all three approaches include an educational program, the merits of training and materials development will first be discussed. Education is often used in policy suites due to its potential to be cost-effective and easy to implement. The federal government is generally receptive to workshops, webinars, training programs and the development of online toolkits for capacity building and knowledge sharing. Training is a priority for every department and public service employees are routinely given opportunities to update their skills. While there are difficulties with providing information on internal processes to the public and transferring data from one department to another, integrating best practices and new methodologies is relatively straightforward.

The addition of an educational component as part of each policy suite is expected to have significant positive outcomes. The implementation of an educational program was repeatedly recommended by interview participants and has been cited in other research as a possible solution to closing the knowledge gap between practitioners and government managers. A recent Sustainable Prosperity (2011) report recommends the use of training programs to improve the use of Economic Instruments (EIs):

> "training courses could be developed for departments to build up their experience and expertise with EIs (if that is a source of the problem). This could be done by Environment Canada alone, or in combination with other departments. Such courses could draw in experts from other countries with greater experience using EIs, such as Australia or the Netherlands" (p. 52).

Training public service employees in the use of EIs for biodiversity protection is a natural progression from developing workshops and tutorials for cost-benefit analysis for protected areas.

Drawing on expertise from other countries identified as being proficient in economic analysis for protected areas could be an effective tactic. From the interviews it was suggested that I look at other jurisdictions for best practices and further research. A brief jurisdictional scan revealed best practices in Australia, UK and US (Table 8.1).

Table 8.1 Socio-economic Analysis Education and Information Sharing Best Practices in the UK, US and Australia

Country	Key Document(s)	Education and Information Sharing Best Practices
Australia	*Socio-economic impact assessment toolkit - A guide to assessing the socio-economic impacts of Marine Protected Areas in Australia, Department of the Environment and Heritage (2005)* *Introduction to cost-benefit analysis and alternative evaluation methodologies, Department of Finance (2006)* *Handbook of CBA, Department of Finance (2006)* *Best practice regulation handbook, Australian Government (2007)*	• Use of economic analyses for assessment of Marine Bioregional Plans (MPA networks) and no-take zoning prior to policy decisions. Areas for Further Assessment reports include CBA. • Materials such as toolkits are tailored to socio-economic assessment of MPAs. Specific guides to methodology and information sources, options for assessing social and economic impacts, and recommendations on appropriate methods for particular MPAs. • Introductory document provides step-by-step non-technical advice to policymakers and more detailed CBA methodology can be found in the Handbook. • Best practices are not just recommended, compliance with these procedures and processes is mandatory for all Australian Government agencies that assess or develop regulations.
UK	*The Green Book - Appraisal and Evaluation in Central Government, UK Treasury (2003)*	• The Green Book is a broad framework that provides guidance to promote efficient policy development and resource allocation across government. • Supplementary guidance documents are available for the Environment and methodological issues such as Stated Preference Techniques.
US	*Guidelines for preparing economic analysis, Environmental Protection Agency (2000)* *A Framework for the economic assessment of ecological benefits, Environmental Protection Agency (2002)*	• US EPA economic analysis guidelines establish a framework for assessing environmental regulations and policies. Recent advances in the field of environmental economics are incorporated regularly. • Guidelines provide information on how to define baseline conditions, examine environmental justice concerns in economic analyses and locate available data sources. • A common framework for the economic analysis of ecological benefits is used to conduct ecological risk assessment and economic benefit analysis.

A few important aspects of each country's approach to socio-economic analysis for regulatory amendments can be highlighted. UK has one key document, which centralizes the appraisal and evaluation of all policies, programs and projects. This is similar to the Canadian Treasury Board CBA guidelines; however the UK document offers supplementary guidance on policy areas and methodological techniques. Both the US and Australia have specific guidelines that provide tailored advice to policymakers conducting socio-economic assessments of protected areas or conservation projects. Information sources and methodological specifics are presented as 'toolkits' and practitioners have access or direct links to data that are updated regularly. Both governments have clearly made it a priority to provide educational guidance materials to policymakers to ensure that CBA and socio-economic reports are properly scoped and conducted. From looking at the Australian studies, most CBA studies are conducted by consultants; nevertheless the guidelines and toolkits are undoubtedly valuable for government employees reviewing reports. The fact that both Australia and US have a wealth of material available for the public, private and academic sectors speaks volumes about the use of economic valuation for environmental regulatory amendments such as MPA designation.

What is being recommended in the Canadian context is to draw upon the following best practices from these international examples. Potential implementation of these could include:

- tailoring CBA guidelines to marine conservation projects through the addition of supplementary materials;[4]
- developing CBA toolkits outlining specific methodologies for particular MPA scenarios with case studies and examples;
- designing guidelines with the flexibility to incorporate new advances in environmental economics, and;

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[4] The Treasury Board CBA guidelines do not have sufficient detail on non-market benefit estimation for natural areas. The guide is at a high level of generality and it also does not contain the most up-to-date methodologies for benefit estimation.

- providing links, databases and other information sources to improve accessibility.

The development of educational materials to complement the TBS CBA guidelines could easily provide solutions for the knowledge gaps that exist in the Canadian context. All the policy suites gain strength from the inclusion of an educational program which, if properly targeted to policy analysts and planners, could encourage understanding of the need for improved benefits valuations, and natural capital valuation in general.

8.1. Policy Suite A: Education and Standardization

There is general consensus that CBA is not regarded as a decision-making tool at the beginning of a process for regulatory change, but as a requirement often left to the last minute. Moving the socio-economic assessment up the MPA Area of Interest evaluation timeline would allow for more in-depth analysis and the inclusion of socio-economic data along with ecological data for AOI evaluation. Additionally, through the development of educational materials, standard multiple account benefit-cost analysis principles could be refined. The main objective of this approach would be to train policy analysts and planners to understand the basics of environmental economics and its application in the creation of new regulations. Policy makers could then request funding for socio-economic analyses and be able to provide sound arguments to high level officials in support of best practices. In addition, through the standardization of deliverables and training for how to evaluate reports from in-house economists or consultants, the quality of CBAs would be improved. For this policy suite it is recommended that all three federal departments with an oceans mandate (Environment Canada, Parks Canada and Fisheries and Oceans) as well as the Treasury Board Secretariat strive to build up their respective in-house expertise. There is a wealth of CBA "How to" guides produced by consultants to help clarify how to do a cost and benefits study in accordance with the TBS guidelines for individual projects, but no specific standards from the top-down. A number of key informants consulted for this research commented that everything is currently done on an ad-hoc basis, which results in inefficient processes and systematic repetition. The expected benefits of this policy suite are:

- clarification of expected methodologies and outcomes for CBA studies and their use as decision-making tools for MPA Area of Interest evaluation;
- increased support from managers and high level officials for rigorous CBA;
- expanded knowledge of the economic concepts behind natural capital valuation;
- enhanced capacity for policy makers to review and evaluate CBA reports provided by in-house economists or consultants; and,
- improved quality of benefits valuation and their incorporation into Treasury Board submissions.

8.2. Policy Suite B: Education and Partnerships

There are multiple benefits to an approach that couples an education program and partnerships. Academic-government partnerships can be dynamic and encourage a variety of collaborations including agreements to provide training and workshops, provision of graduate and doctoral students as external experts and consultation services. These partnerships can facilitate networking and encourage both internal and external capacity-building in the field of environmental economics. Many key informants lamented that Canada has very few experts in this particular field; a coordinated joint program to give graduate students the opportunity to work on practical public policy problems through their studies in economics would provide numerous spin-off benefits including:

- improved methodological robustness of results through academic consultation;
- development of national capacity in the field of environmental economics;
- reduced cost for what is typically an expensive labour market with limited domestic supply;
- collaboration with universities around the world to identify best practices and key lessons from other jurisdictions;
- increased support from managers and high level officials for rigorous CBA; and,
- enhanced capacity of the labour pool for future economists and policymakers joining the federal public service.

8.3. Policy Suite C: Education and Reorganization

Numerous interviewees, particularly the economists working internally in the federal government, mentioned the need for reorganization to improve economic valuations. Transferring economists to the S&T branch of each federal department with an oceans mandate and re-classifying them as research scientists will encourage publishing and foster dedicated expertise to multiple projects. Although the idea of re-classifying economists was initially recommended by external interviewees, the ranking matrix in Section 6 confirms that government employees are also supportive of this policy option. The expected benefits of this policy suite are:

- increased support from managers and high level officials for rigorous CBA;
- improved methodological robustness of results through peer review;
- enhanced capacity for policy makers to review and evaluate CBA reports provided by in-house economists; and,
- improved quality of benefits valuation and their incorporation into Treasury Board submissions.

8.4. Policy Recommendation

While it would be ideal to implement all of the approaches (Education, Standardization, Partnerships, Reorganization), there are drawbacks to relying solely on in-house solutions to fix this complex problem. There are currently very few economists operating in the Atlantic and Pacific and Yukon regions, where the bulk of work on federal MPAs takes place. From the interviews it was reported that in the Pacific and Yukon region there are a total of two economists at Environment Canada, five at Fisheries and Oceans and one at Parks Canada. There is clearly a problem of internal capacity; managers are reportedly unclear about the role social scientists can, and indeed need to play in the analysis of MPAs. While there is more capacity for socio-economic analysis of environmental projects and policies in the National Capital Region, much of the groundwork (knowledge-sharing, interviews, data collection) must be carried out in the regions. With the current workforce adjustments and the expectation that the federal government is in a decade of constrained budgets, it is hardly practical to recommend

hiring a dozen more economists for each department. Nevertheless, it is not the recommendation of this paper that this methodologically complex work be passed off to policy analysts or planners who have little background in conducting economic analyses. Indeed, one potential reason that the barriers to conducting benefits valuation exist is that it is difficult to categorize ecosystem services. Costanza (2008) recognizes that categorizing ecosystem services is reductive and that "ecosystems are complex, dynamic, adaptive systems with non-linear feedbacks, thresholds, hysteresis effects, etc." (p. 351). Understanding all of the feedback loops and linkages among ecosystem services can be overwhelming and it may be that this complexity prevents policymakers from attempting to put any value on the intangible benefits at all. It is therefore recommended that economists with sufficient backgrounds in environmental economics do this work. Whether they are in-house economists, consultants or academics is not important; a keen understanding of the methodologies is a necessary requisite for results that will be scrutinized by industry and non-profit stakeholders, many of whom have their own environmental economists on staff.

The advantage of collaborating with academia, however, is that expertise can be provided in a relatively inexpensive and dynamic manner. The delivery of services from a consulting company is usually in the form of a report (a cost analysis or a CBA) which is often produced with the minimum collaboration necessary to provide results. In contrast, a collaboration with an academic research group necessitates the use of in-depth methodologies as graduate students become experts in their respective field. In addition, the expense of consulting contracts can sometimes be prohibitive so that cost analyses are far more common requests than benefit valuations. Academic partnerships can be sound fiscal investments, particularly if research groups can be developed with significant time horizons to allow for external grants and fellowships. Graduate students, whether they are being paid through the federal government's co-op program or through an academic fellowship, are an inexpensive source of labour.[5] More importantly, they are

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[5] A typical Social Sciences and Humanities Research Council grant to cover the cost of an academic year of research (8 months) is $17,500 and the average salary for a coop student in the federal government is approximately $25,000 for the same period.

a solid investment in future economists and policy leaders who will contribute to the field for the extent of their careers. For these reasons **I recommend Policy Suite B: Education and Partnerships as the policy option most likely to achieve the objectives of this research**.

8.5. General Recommendations

While the policy analysis conducted in the preceding section is the goal of this study, it is also important to summarize the general recommendations from this research. Below are a number of best practices for MPA benefits valuation stemming from the interviews. When conducting a CBA study for a Treasury Board Secretariat submission in order to evaluate the socio-economic impacts of a new marine policy or regulation policymakers should:

- consider conducting benefits valuations of various potential MPAs well before Area of Interest selection as part of the scoping and screening process in MPA network analysis;
- recognize that academic timelines do not always coincide with government timelines and plan for socio-economic assessments at the beginning of the AOI evaluation process;
- consider socio-economic information as "best available science" when evaluating MPA proposals;
- incorporate Traditional Ecological Knowledge and First Nations perspectives when conducting socio-economic studies. This sometimes requires the omission of monetizing cultural values and allowing for qualitative descriptions to provide context for other values;
- insist on adhering to international best practices with examples available in the literature such as The Economics of Ecosystems and Biodiversity (TEEB) reports, Millennium Ecosystem Assessment reports, Sustainable Prosperity publications, etc.; and,
- encourage academic consultation with senior management to foster high level support for socio-economic research.

While there are numerous lessons from the interviews and it is hoped that the conclusions of this study prove useful to regional policymakers, the limitations of the work are discussed in the next section.

8.6. Limitations of this Study and Further Research

There are some notable limitations to this study. First, the majority of key informants were government employees working in the Pacific and Yukon region. Further research might usefully consider consulting key informants from the Atlantic region or the North where there are a number of federal MPAs and policymakers with extensive experience in oceans management. In addition, with more time and resources it would have been ideal to evaluate the best practices and governance structures of international jurisdictions through in-depth case study analysis. Building on the information in Table 8.1, further research could focus on Australia, New Zealand, the UK, the US and the Netherlands as potential case studies; these jurisdictions were identified by interview participants as being "shining examples" of MPA assessment. This study is also limited due to the relatively small number of environmental non-profit and First Nations informants who participated in the research. While an effort was made to contact more practitioners in this field there was a small number of experts in the non-profit sector to begin with, and a lack of response from a few potential participants resulted in a slight bias towards government and academic respondents. Nevertheless, it is hoped that the wealth of information revealed by the 17 key informants proves useful for improving benefits valuation in marine planning circles on all three coasts, the west, east and north.

8.7. Concluding Remarks

Policymakers should not ignore the necessity of conducting cost-benefit analyses in adherence to best practices. In fact, the allocation of ever scarcer government analytic resources requires a re-doubling of efforts to ensure that public investments are being used to protect the natural capital that coastal Canadians have relied on for generations and First Nations since time immemorial. Benefits evaluation will not independently solve

the problems that pose a threat to our marine ecosystems. Uncertainty in scientific and socio-economic data and changing conditions due to climate change, invasive species and biodiversity loss can all confound results. Political decisions may ultimately trump the recommendations from policymakers when economic pressures, legal constraints, the public or stakeholder groups alter policy directions. Though it is both methodologically and conceptually difficult to monetize our natural surroundings, a failure to conduct a full accounting of the benefits of our marine ecosystems will threaten their survival. With gaps in our understanding of the socio-economic realities of marine regions, special interests can emphasize costs over intangible benefits and governments will undoubtedly make concessions, often choosing the economy over the environment. What has been missing from this tired and repetitive Canadian public policy debate is that for many coastal residents the economy is the environment. Without truly understanding how much of our wealth flows from our marine ecosystems we will never be able to mobilize the resources needed to protect nature's most productive bank: the ocean.

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Appendices

Appendix A. Map of Large Ocean Management Areas
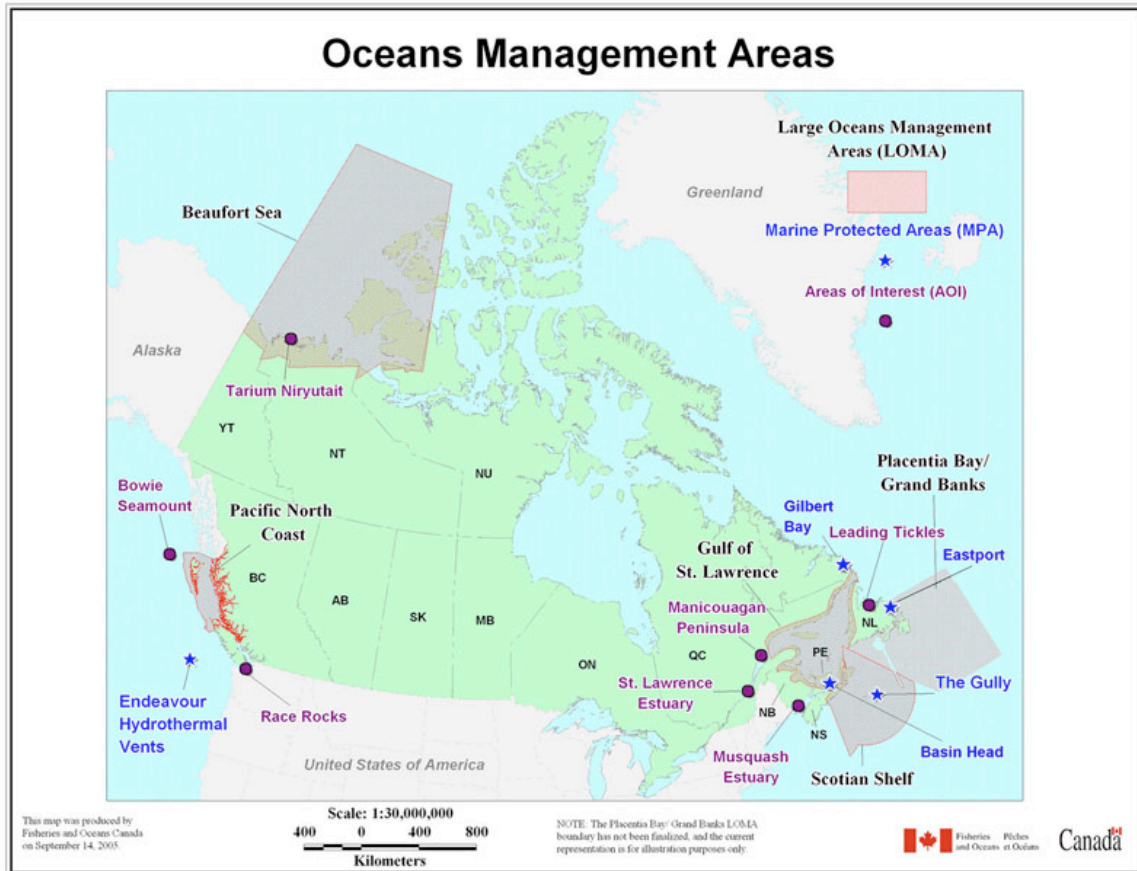
Map of Canada's Large Ocean Management Areas. Source: Fisheries and Oceans, 2006.
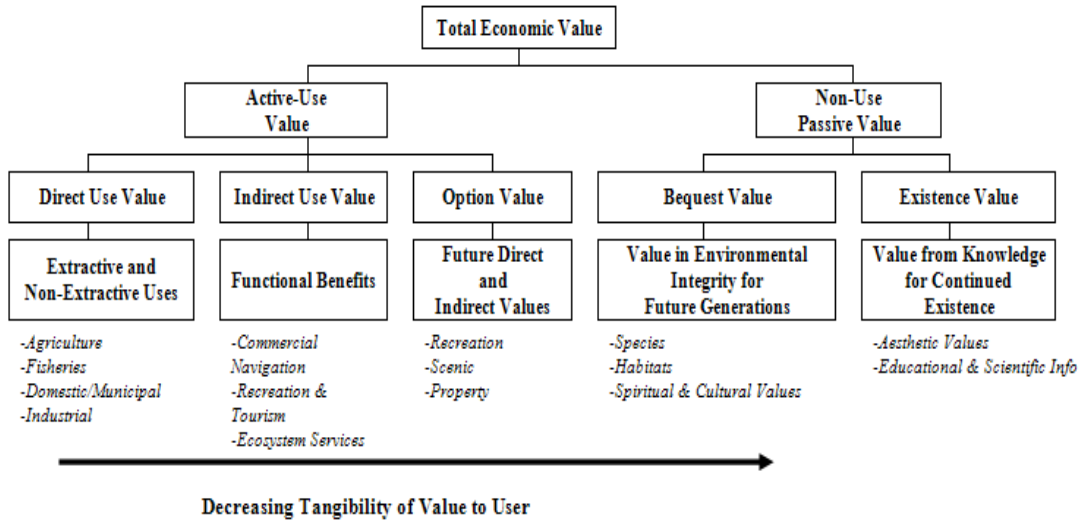
Appendix B. Total Economic Value Framework

Figure 1.1 Total Economic Value including use and non-use (passive) values.
Source: Environment Canada.

Appendix C. Marine Protected Area Benefits Valuation Interview Guide

1. What is your position and role in the organization you work for?

2. Are you familiar with the concepts of natural capital valuation? Cost-benefit analysis? Ecosystem goods and services? Benefits valuation? (*if needed provide definition of the four*)

3. Have you ever worked on a project that included a benefits valuation or evaluation of ecosystem goods and services? If yes, what was the project and what type of methodology was used for the benefits valuation?

4. Do you think a benefits valuation is important to include in a proposal for marine protected area designation? Why or why not?

5. What do you think are the advantages of doing an in-depth, quantitative benefits valuation (*in dollar amounts*)? What are the disadvantages?

6. Are you aware of any government documents or frameworks that require or encourage policymakers to conduct a full accounting of the benefits of an environmental project?

7. What, in your view are the valuation techniques that would be best suited to use in MPA assessment? (*if more than one, rank and explain*)

8. Do you know of any agencies/organizations that routinely use some form of benefits valuation that is consistent with best practices?

9. Do you think the federal government (DFO, Environment Canada, Parks Canada) should carry out more detailed benefits valuations for marine protected area proposals? Why or why not?

    If yes:

10. What do you think are the barriers that policymakers face when they are considering doing a benefits valuation for a marine protected area proposal?

11. What could be some potential solutions to removing those barriers and ensuring that rigorous benefits valuations are carried out? Can you translate these into policy recommendations?

12. Do you have any other comments about benefits valuation (or natural capital valuation in general and its use for marine conservation) that you would like to be recorded?

Barrier	Potential way to overcome it	Intensity ranking	Further comments
1)			
2)			
3)			

Appendix D. Scott Islands Benefits Analysis Results

The survey was active for a little over a month and a half (beginning of July to the third week of August, 2011) and received responses from across Canada. The final tally for the survey was 826 responses but after entries from non-Canadians were removed, 809 responses remained. All regions of the country including BC, the Prairie provinces (Alberta, Manitoba, Saskatchewan), Ontario/Quebec, the North (Yukon, Nunavut and Northwest Territories) and Atlantic Canada, as well as the local community of Mount Waddington Regional District, were represented in the survey. A significant percentage of responses were from Quebec and Ontario (28%), however responses from BC far outweighed the others with 56% of respondents coming from that province. Further weighting and analysis may be used to correct for demographic and geographic differences.

The survey comprised eighteen *(18)* questions. A summary of the questions and the results are synthesized below. As of time of writing the staff economists at Environment Canada were analyzing the raw data in order to inform the socio-economic piece for the Scott Islands marine NWA Regulatory Impact Analysis Statement (RIAS). The benefits valuation will be put in the context of the proposed marine National Wildlife Area's designation in 2012.

Scott Islands Survey Results Summary	
Question	*If the Scott Islands marine National Wildlife Area were to be implemented to conserve and protect habitat that sustains important seabird species, how much would you be willing to pay annually through a not-for-profit organization of your choice to support scientific research, monitoring and enforcement?*
Results	An average was computed for the WTP question and was found to be $43, the median WTP was $25 and the mode was $100. There was a wide range of responses for this question, 13% (103/809) of survey-takers reported a WTP of $0, while conversely 14% (112/809) reported a WTP of $100.*

	WTP responses from those who did not identify themselves as members of a conservation organization differed markedly from those that did. The average WTP for non-conservationists was found to be $32 (median $20) and for conservationists it was $47 (median $25).**
Question	*Which of the following values reflect what is important to you and would influence your willingness to pay for the establishment of a National Wildlife Area in the Scott Islands marine ecosystem? Please select all that apply.*
Results	The survey revealed that existence (700/809) (87%), bequest (697/809) (86%) and scientific knowledge and education (678/809) (84%) values were the most important when respondents considered their willingness to pay.* This suggests that conserving wildlife that may not have use value but that contributes to biodiversity and healthy ecosystems is a shared goal and one that most respondents of this survey think is important both for the present and the future. It is also telling that scientific knowledge and education is such a popular non-use value; it appears there is significant support for continued research and outreach with regards to the Scott Islands seabirds.
Question	*If a mid-water video camera were to be installed to record seabirds diving to catch small fish, would you be willing to pay for an application ('app') that you could download on an electronic device in order to view the seabirds live?*
Results	The highest percentage of survey respondents (401/809) (50%) would be willing to pay for the 'app', however most of these respondents (169/401) (42%) would only be willing to pay between $0 and $1.99. While a majority of participants would be willing to pay for the 'app' a significant portion of these would only be willing to pay a small amount.* This is important information for the Scott Islands marine NWA communications strategy and outreach programs that may expand after designation.
Question	*If the local communities on the northern tip of Vancouver Island decided to build an ecological interpretation centre to educate visitors about the Scott Islands seabirds, and if you happened to be in the area on holiday or business, would you be willing to pay to visit the centre?*
Results	Seventy-seven per cent (626/809) of respondents would be willing to pay $5 or more to visit a Scott Islands seabird ecological interpretation centre. Twenty per cent of respondents would be willing to pay more than $11 to visit the centre.*

	Willingness to pay data for an ecological centre could be important information for the North Vancouver Island communities which might look at the possibility of generating tourism revenue from such an initiative.
Question	*How much thought have you given to the health of Canada's oceans over the past few years?*
Results	The majority of respondents (460/809) (57%) have given a great deal of thought to the health of Canada's oceans over the past few years.* This question may also be pertinent to larger goals of marine protection and provides important insight into Canadians' concern for our ocean resources and biodiversity.

* These reported results are preliminary only and subject to further evaluation and analysis.