

Marine Protected Areas: Potential Tools for Sustainable Community Development

By

Joana Costa

Submitted in partial fulfillment of the requirements for the degree
of
Master of Marine Management

at

Dalhousie University
Halifax, Nova Scotia

December 2017

© Joana Costa, 2017

Table of Contents

List of Figures	ii
Abstract.....	iii
Chapter 1: Introduction.....	1
1.1. General Introduction	1
1.2. The Concept of Sustainable Community Development.....	2
1.3. United Nations Sustainable Development Goals	4
1.4. The Convention on Biological Diversity and the Aichi Biodiversity Targets	4
1.5. Marine Protected Areas.....	5
1.5.1. Ecological Effectiveness.....	6
1.5.2. Marine Protected Areas in Canada	7
1.5.3. Sambro Ledges Ecologically and Biologically Significant Area	8
Chapter 2: Methodology	10
2.1. Research Question and Research Objectives	10
2.2. Research Strategy.....	10
2.3. Survey.....	11
2.3.1. Design	11
2.3.2. Dissemination and Response Collection.....	12
2.4. Analytical Frameworks	13
2.4.1. DPSIR	13
2.4.2. Community Capital Framework	16
Chapter 3: Survey Results	24
Chapter 4: Analysis	34
4.1. DPSIR Analysis	34
4.1.1. Drivers	34
4.1.2. Pressure	35
4.1.3. State Change	36
4.1.4. Impact.....	37
4.1.5. Response.....	39
Chapter 5: Discussion.....	41
5.1 Community Mobilization and The Importance of Social Capital	49
5.2 Balancing Community Capital for Sustainable Community Development	50
5.3 Limitations.....	52
Chapter 6: Conclusion	54
References Cited	55
Appendix.....	62

List of Figures

Figure 1: DPSIR Framework.....	16
Figure 2: Community Capital Framework.	19
Figure 3: Survey Respondent Categories.....	25
Figure 4: Use of Sambro Marine Area.	25
Figure 5: Income Derived from Use of Sambro Ledges.....	26
Figure 6: Relationship Between Use of The Sambro Marine Area and Income Derived From its Use..	26
Figure 7: Support for Sambro Ledges Marine Protected Area.	28
Figure 8: Expected Impact of a Sambro Ledges Marine Protected Area.....	29
Figure 9: Relationship Between Support for Sambro Ledges Marine Protected Area and Income Derived From its Use.	29
Figure 10: Relationship Between Support for a Sambro Ledges Marine Protected Area and its Expected Impact..	30
Figure 11: Relationship Between Income Derived from Use of The Sambro Ledges and its Expected Impact..	30
Figure 12: Ecological Importance of Sambro Ledges.....	31
Figure 13: Primary Goal of a Marine Protected Area.....	32
Figure 14: Activities Permitted in a Marine Protected Area.....	33

Abstract

While the ecological benefits of marine protected areas (MPAs) are widely accepted, the non-ecological benefits of MPAs are still debated. Furthermore, environmental protection tools like MPAs are often considered to be anti-development. This study looks at the potential use of a coastal MPA as a tool for sustainable community development. An online survey was conducted to better understand public perceptions surrounding the potential establishment of a MPA off of Sambro, Nova Scotia, as well as the possible effects it could have on local user groups. An analysis of the effects that a coastal MPA could have on the Sambro community was also conducted through the lens of the seven forms of community capital essential for sustainable development: natural, built, financial, political, social, cultural, and human. Possible changes in community capital are discussed and the overall balance needed for sustainable development assessed.

Keywords: marine protected areas; sustainable development; community capital; public perceptions

Chapter 1: Introduction

1.1. General Introduction

The predominant “frontier economics” paradigm that ruled most societies until the late 1960s saw the world solely through the lens of economic growth; the environment did not have a role within the economic model because it was thought to be limitless as both a source of resources and as sink for by-products and wastes (Colby, 1991). Nature was effectively treated as a separate entity from people, to be endlessly exploited and changed for their benefit. This view is sometimes considered to be a necessary part of development, and environmental consequences are pushed aside until there are the means to address them (Colby, 1991).

In contrast to this economically-driven way of thinking, the concept of environmental protection emerged as an approach that focused on the mitigation and safeguarding of the environment (Colby, 1991). This was a step forward in the direction of an environmentally conscious development model, however, it did not look to better how development is achieved. There is the same boundless exploitation of the natural world for economic growth, with the addition of environmental protection and remediation strategies (Colby, 1991). Furthermore, it can perpetuate the notion that humans are separate from nature (Roseland, 2005). By drawing lines between people and the environment to protect it from human influence, there is an inherent failure to take responsibility for the impact that resource-exploitive lifestyles continue to have on the environment. There is a dissonance that arises from the belief that if a natural area is protected from human access or use, it is therefore safe from this lifestyle and convenient throw-away culture that is so deeply entrenched in western

society. But is it indeed the current method of development that has the greatest impact on the environment, regardless of attempts to protect or remedy the consequences (Roseland, 2005). The analogy that Mark Roseland gives in the book *Toward Sustainable Communities* explains the danger of relying on environmental protection practices to support faulty development practices:

“Environmental protection is like foam padding — it offers some protection from a fall. We congratulate ourselves if we double our spending to double the thickness of the foam, because we assume thicker foam means more protection. However, we only get more protection if we fall the same distance. Meanwhile, unsustainable development constantly increases the distance we’re likely to fall” (Roseland, 2005, p.4).

Recognizing that humans and human actions are part of nature is a crucial step in changing how we view and interact with the environment. By failing to integrate development and environmental management, negative environmental consequences will persist and negative social and economic consequences will arise. Just as focusing solely on development can lead to environmental degradation, focusing solely on environmental protection without addressing the social and economic wellbeing of the people that rely on the environment can also be damaging. Therefore, not only does development need to be done differently, but there is also a need to integrate development and environmental protection.

1.2. The Concept of Sustainable Community Development

To properly discuss the concept and application of sustainable community development, we must first define these terms. A community can be defined as a group of people that are geographically bounded and have a collective destiny, such as a town or a city (Roseland, 2005).

Sustainability, however, is a term that is often misused. It is sometimes mistaken to mean environmental protection, or a trade-off between economic and environmental objectives, both of which are inaccurate representations of the term (Roseland, 2012). At its most basic level, something that is sustainable has the capacity to maintain itself at its current level (Roseland, 2012). However, within the context of sustainable development, it must take on a proactive significance because our current system of development is not one that should or can be maintained. Therefore, sustainability within the context of sustainable development refers to the improvement of the system so that future generations can derive the same benefits from the environment that current generations have enjoyed (Roseland, 2012). Building on this, sustainable development goes beyond protecting the environment or trying to preserve our current economic system, but rather it involves a shift in social and economic systems so that environmental protection policies become less and less needed, and human wellbeing is improved upon (Roseland, 2012). It is these three factors (social, economic, and environmental) that are the foundation for sustainable development (Roseland, 2012).

A key component of sustainable development is equity. Social equity requires that the needs of the majority of the global population be balanced with the needs of the planet (Roseland, 2012). The WCED report states that for there to be sustainable development, everyone must have access to their basic needs and to the opportunity for improving their life (WCED, 1987). However, the majority of the global population is without means, and for everyone to attain their basic needs, we cannot allow development to continue the way it has for the last two centuries with material growth as the main objective (Roseland, 2012). Social equity is not just in the sense of wealth and resource distribution between developed and

undeveloped regions, but also the equitable distribution of environmental costs and benefits across generations (Roseland, 2012). For sustainable development to be achieved, there must be a transition away from the current lifestyle of the wealthier global population, to a lifestyle that can be sustained within the ecological limits of the planet (WCED, 1987). Therefore, the 1987 World Commission on Environment and Development's (WCED) report *Our Common Future* defines sustainable development as "meet[ing] the needs of the present without compromising the ability of future generations to meet their own needs."

1.3. United Nations Sustainable Development Goals

In 2015, the United Nations General Assembly adopted the resolution entitled Transforming our world: the 2030 Agenda for Sustainable Development. This document outlines 17 sustainable development goals (SDGs) with 169 targets for sustainable development that aim to complete and build on the Millennium Development Goals (United Nations, 2015). The success of the agenda depends on the integration of these goals, which are rooted in the balance between social, economic, and environmental factors (United Nations, 2015). Goal 14 of the Agenda aims to "conserve and sustainably use the oceans, seas and marine resources for sustainable development", by tackling problems such as marine pollution, ocean acidification, marine protection, overfishing, and illegal fishing. (United Nations, 2015, p. 28).

1.4. The Convention on Biological Diversity and the Aichi Biodiversity Targets

The Convention on Biological Diversity (CBD) is an international agreement that was established in 1993 as a global commitment towards sustainable development (CBD, n.d.a). In 2010, during the tenth meeting of the Conference of the Parties held in the Aichi Prefecture of Japan, the Aichi Biodiversity Targets for 2011-2020 were adopted as part of the updated

Strategic Plan for Biodiversity (SPB) (CBD, n.d.b). The Plan consists of 5 Strategic Goals with 20 Targets (the Aichi Targets) overall (SCBD, n.d.). Of relevance to this project is Strategic Goal C and Target 11 (SCBD, n.d.). Strategic Goal C is to “improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity”, while target 11 aims to protect ten percent of coastal and marine waters by 2020 through “effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider [seascapes]” (SCBD, n.d.). The SPB provides a flexible international framework on biodiversity for policy development and biodiversity management that individual countries are to adapt into national strategies and action plans (CBD, n.d.b). The CBD also created a list of criteria to provide guidance in the design of marine protected area networks: representation, connectivity, ecologically and biologically significant areas (EBSAs), viable and adequate location, and replication of ecological features (CBD, 2009). However, a marine area does not necessarily have to meet all these criteria in order to be a MPA (CBD, 2009).

1.5. Marine Protected Areas

According to the International Union for Conservation of Nature (IUCN), a protected area is defined as “a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values” (Day et al., 2012). For a marine space to be considered a marine protected area (MPA), it too must meet this definition. Additionally, its primary goal must be the conservation of nature, it must prevent or eliminate practices that are

detrimental to reaching the primary goal, and the primary goal determines the category associated with its level of protection (Day et al., 2012).

1.5.1. Ecological Effectiveness

The basis for the use of MPAs as marine management tools is the ecological benefits that they provide to marine ecosystems. They are globally useful conservation tool when the management objectives relate to species richness, size of individuals, biomass, or density (Lester et al., 2009). A global meta-analysis of marine reserves by Lester et al. (2009) found that, on average, organism biomass increased 446% within reserves, density increased 166%, individual size increased 28%, and species richness increased 21%. In fact, half of all the reserves they assessed experienced an increase in density greater than 60% and a biomass increase greater than 200% (Lester et al., 2009). Another global meta-analysis of MPAs by Edgar et al. (2014) found that effective MPAs had more sharks, higher numbers of large fish, and greater fish biomass. Additionally, abundance of fish also increased by 66% within reserves as compared to outside (Molloy, McLean & Côté, 2009). These results translate into benefits for fisheries through the migration of adult and juvenile fish out of protected areas (the spillover effect), and through the export of eggs and larvae (Gell & Roberts, 2003). Spillover has been observed in various studies around the world, where the areas directly outside of a MPA either experienced no change or an increase in biomass, suggesting that these areas may be benefitting from MPAs through the spillover of adults and larvae over time (Lester et al., 2009). Furthermore, the ecological benefits of marine reserves can be observed across all latitudes. A meta-analysis that compared temperate and tropical reserves found that they performed similarly in terms of species richness and size of individuals, however temperate reserves

tended to have slightly greater biomass and density than tropical reserves (Lester et al., 2009). Additionally, reserve size does not impact the effectiveness of MPAs in either tropical or temperate reserves, since even small reserves can result in increased average size of individuals (Lester et al., 2009). However, reserve age does impact MPA effectiveness, which was found to increase with the age of the reserve in a meta-analysis of marine reserves all over the world (Molloy, McLean & Côté, 2009).

1.5.2. Marine Protected Areas in Canada

Canada made an international commitment to protect ten percent of its marine and coastal areas by 2020 under the CBD Aichi Target 11 (DFO, 2017a). Additionally, in a Ministerial Mandate released in August of 2016, the Prime Minister made a national commitment to reach the ten percent goal that Canada agreed to internationally, and set a domestic goal of five percent by 2017 (Trudeau, 2016). To reach these goals, the government is following three principles: transparency, science-based decision making, and advancing reconciliation with Indigenous groups (DFO, 2017c). Canadian MPAs can be *Oceans Act* MPAs created by Fisheries and Oceans Canada (DFO), National Marine Conservation Areas by Parks Canada, and National Wildlife Areas made by Environment and Climate Change Canada (DFO, 2017c). *Oceans Act* MPAs are established by DFO for the conservation of ecologically important or unique marine habitats and species. These MPAs usually permit human activities with certain zones as long as they are compatible with the primary conservation goals of the MPA (DFO, 2017c). The government is creating a national MPA network that consists of 13 smaller networks within three distinct biogeographic regions (bioregions) of Canada (Pacific, Gulf of St. Lawrence, and Scotian Shelf) (DFO, 2017b). An MPA network consists of a group of MPAs that work together to

preserve marine biodiversity and ecologically significant areas (DFO, 2017e). Each of the 13 networks are to be designed and managed separately and each will have particular objectives tailored to the biophysical and ecological characteristics of that area (DFO, 2017e). Together, these networks will be more effective at protecting marine biodiversity than individual MPAs. The networks will be designed with the following considerations: areas that are ecologically or culturally important to Canadians, areas that are representative of different habitats in the bioregion, consideration of international guidelines, and protection of Ecologically and Biologically Significant Areas (EBSAs) (DFO, 2017e).

1.5.3. Sambro Ledges Ecologically and Biologically Significant Area

The 9th Conference of the Parties on the Convention on Biological Diversity (CBD) defined EBSAs as “geographically or oceanographically discrete areas that provide important services to one or more species or populations of an ecosystem, or to the ecosystem as a whole, compared to other surrounding areas or areas of similar ecological characteristics, or otherwise meet the criteria...” (UNEP, 2008 p.11). This list of criteria includes uniqueness, areas of importance for a species life history stages, areas of importance for species or habitats that are threatened or endangered, areas that are vulnerable, fragile, sensitive, or slow to recover, areas that are biologically productive or diverse, and areas that display a high degree of naturalness (UNEP, 2008). Following these international guidelines, DFO has developed their own list of criteria to identify EBSAs: uniqueness, aggregation of a species or ecological process, fitness consequences, resilience, and naturalness (Hastings et al., 2014).

The Sambro Ledges EBSA sits directly off the coast from Sambro and the neighbouring communities of Duncan’s Cove, Herring Cove, West Pennant, Ketch Harbour, and Bald Rock, on

the Chebucto Peninsula of Nova Scotia. It has been identified by DFO as an EBSA based on two criteria: aggregation (of blue-fin tuna, cod, common eider, and several sea and shore birds) and fitness consequences (for fin whales feeding and overwintering in the waters off Chebucto Head, overwintering herring, great black-backed gull colonies, and nesting Roseate Terns) (Hastings et al., 2014). Transect surveys conducted between 2012 and 2016 allowed for benthic mapping of the area and found that about 43% consisted of three different types of biogenic habitats (Filbee-Dexter, 2016). The first was rocky habitat composed of communities of ascidians, sponges, and soft corals. The second type was bedrock or boulder substrates with highly productive kelp beds that were associated with large schools of Pollock. The third type of biogenic habitat consisted of bedrock and boulder substrates with dense aggregations of the tunicate *Boltenia ovifera*. This biogenic habitat covered about 10% of the EBSA and Pollock, redfish, red algae, soft corals, sponges, and bryozoans were often found here. In addition to the criteria that identifies this area as an EBSA, dense aggregations of *Boltenia ovifera* are rare in Nova Scotia, therefore its inclusion in a MPA would offer representation of this habitat in the network (Filbee-Dexter, 2016).

Chapter 2: Methodology

2.1. Research Question and Research Objectives

The usefulness of MPAs as management tools often focuses on their biophysical impacts. However, it is essential that the implications of MPAs at the community level be considered alongside the biophysical effects. Therefore, this project aims to understand whether a MPA in the coastal marine waters off of Sambro, Nova Scotia, is appropriate from a community standpoint. As such, the research will try to answer: Can a Sambro Ledges MPA contribute to sustainable community development?

To answer this question, there are two main research objectives:

1. To understand the impacts of a Sambro Ledges MPA beyond the biophysical.
2. To find examples where MPAs have contributed to sustainable community development.

2.2. Research Strategy

This study utilized the Drivers-Pressures-States-Impacts-Responses (DPSIR) framework. This framework was used to analyze the effects of a MPA on the Sambro community by looking at the interactions between the five factors that give this framework its name. This analysis was focused using the community capital framework (CCF) to understand the DPSIR in terms of the effects on the seven different forms of capital that are necessary for sustainable community development. The primary source of information used for the DPSIR analysis and CCF came from a survey that was designed and delivered during a 15-week long internship at World Wildlife Fund-Canada (WWF-Canada). The survey was used to determine what people that use

the marine area off Sambro think about MPAs and how one in this area might impact them.

Secondary sources of information on the communities near Sambro and other MPA examples were obtained through a desktop review, and included sources such as primary and secondary literature, Statistics Canada, community group websites, and news articles.

2.3. Survey

2.3.1. Design

The survey consisted of a total of 13 questions, 9 of which were multiple-choice or select-all-that-apply. Four questions were short answer to allow for participants to explain their selection on some of the multiple-choice questions if they so desired, or to provide additional comments on the subject of marine protection for the marine area off Sambro. This survey was conducted on behalf of WWF-Canada to inform their programs, and to support this graduate research.

A preamble was included to provide context, as well as a map showing the subject area. In this preamble, MPAs were defined as marine areas of ecological importance that are specifically managed to reduce the negative impacts of human activities. This section also placed MPAs within the context of the national marine protection goal of 10% by 2020, and explained that several ecologically important areas off Nova Scotia are being considered as potential sites, including the marine waters off Sambro and extending to the waters around Ketch Harbour, Pennant, Duncan's Cove, Terrence Bay, and Prospect. WWF-Canada's interest in community supported environmental protection was explained, providing the rationale for why they wanted to know what locals and user groups of this area think about MPAs and how a

MPA in this area might impact them. The use of the term “group” in the survey questions was also defined here as “organization, association, company, society, or agency”.

All survey questions were optional. Respondents could opt to skip any question they did not wish to respond to since it would not prevent them from proceeding to subsequent questions. The survey was also anonymous so that participants would feel comfortable providing their opinions without the fear of it being tracing back to them. However, to understand the survey results within the context of the different sectors and user groups, respondents were asked to identify with one of the following categories: commercial fishing, community group, indigenous community or organization, tourism, research, or other (with the option here to enter a different category that they identify with). Survey respondents were provided the option to enter the name of the group to which they belong to gain a better understanding of which groups participated and how they responded, and to provide an opportunity for WWF-Canada staff to follow up with these groups as needed. For a copy of the survey, please see Appendix.

2.3.2. Dissemination and Response Collection

An online survey method was selected for dissemination due to its far-reaching accessibility. Google Forms was the platform chosen to carry this out because it supported the survey design, provided the results as preliminary graphical representations as well as in a downloadable comma-separated values (CSV) format for further analysis, and it was the most cost-effective option. Additionally, Google is a highly used online platform which was expected that many people would be comfortable with using. Lastly, Google Forms is user-friendly and

the stylistic design of the survey is displayed consistently across different browsers and devices (computers, tablets, and smart phones).

Surveys were distributed to stakeholders via email, and were identified by Nexus Coastal Resource Management in previous work conducted for WWF-Canada. These stakeholder groups included fishing industry groups, community groups, tourism and recreation groups, and others such as researchers, environmental groups, shipping interests and port authorities. The email contained an invitation to take part in the survey, the link to the survey, an explanation on the purpose of the survey, and asked the main contact of the group to participate and share the link with their colleagues and other group members. Two weeks following the initial invitation to participate, stakeholder groups that had been emailed were contacted via phone call to follow up on whether they had received the email or had any questions regarding the survey. Those that had yet to fill out the survey were invited to take part once again. Stakeholder groups for whom we did not have an email were contacted via phone, where they were introduced to the purpose of the survey and invited to take part. Those that were interested were given the option to answer the survey questions over the phone, or to provide an email to send the survey link. The survey was available online for eight weeks (June 28th – August 23rd 2017).

2.4. Analytical Frameworks

2.4.1. DPSIR

The first framework that will be used to assess the effects of a Sambro Ledges MPA is the DPSIR framework (Figure 1). This framework assesses the relationships between society and nature by looking at the causes of, and the impacts and responses to, a state change in the

system (Atkins, Burdon, Elliott, & Gregory, 2011). This framework helps to understand the impact of policy changes before or after they have been made (Kristensen, 2004), and is useful for communicating environmental research within the context of policy (Atkins et al., 2011).

Drivers are societal demands (Atkins et al., 2011) or needs (Kristensen, 2004). There are basic human needs, like food and shelter, but there can also be the needs of economic sectors such as profitability, or national level needs like managing unemployment rates (Kristensen, 2004). These will vary according to the scope of the system being assessed. *Pressures* are created by the human activities that take place to meet these needs (Kristensen, 2004). There are three main categories of pressures: changes in the use of environmental resources, overuse of environmental resources, and wastes released into the environment (be they physical, chemical, energy or noise pollution) (Kristensen, 2004). Pressures can be endogenic managed pressures or exogenic unmanaged pressures (Atkins et al., 2011). Endogenic managed pressures are the pressures that happen within the system boundaries and both the causes and the effects can be managed locally, regionally, or internationally. For example, production of industrial wastes or overfishing are endogenic pressures. Exogenic unmanaged pressures are those that occur outside of the system boundaries and therefore cannot be managed locally or regionally, so responses to these pressures must be directed to the state changes or impacts rather than the pressures themselves. These include things like climate change or foreign species introduction (Atkins et al., 2011). The pressures lead to an environmental *state change* (Kristensen, 2004). That is, the quality of the environment is affected, be it biologically, physically, or chemically. This includes things like changes in ecosystem composition, water or air quality, or even changes to human health. In turn, these state changes lead to economic or

environmental *impacts* that affect human wellbeing and ecosystem functions, and have social and economic implications on society. These impacts bring about a response, which can be directed at any of the different stages of the cycle, be it drivers, pressures, state change, or impacts, and can come in the form of societal or policy changes (Kristensen, 2004).

An important feature of the DPSIR framework is the delineation of a boundary that separates the system from the external environment (Atkins et al., 2011). This system is made up of the relationship between social and natural systems. The boundary must be clear because it determines what should be included in the assessment, which is especially important when looking at the marine realm where there are various sectors that can influence each other due to shared common resources. However, a single DPSIR cycle on, for example marine protection, will inevitably be linked to other DPSIR cycles of other marine sectors, such as fisheries, aquaculture, or energy development since the responses to the drivers and pressures in the marine protection sector can impact the drivers and pressures of the other cycles (Atkins et al., 2011).

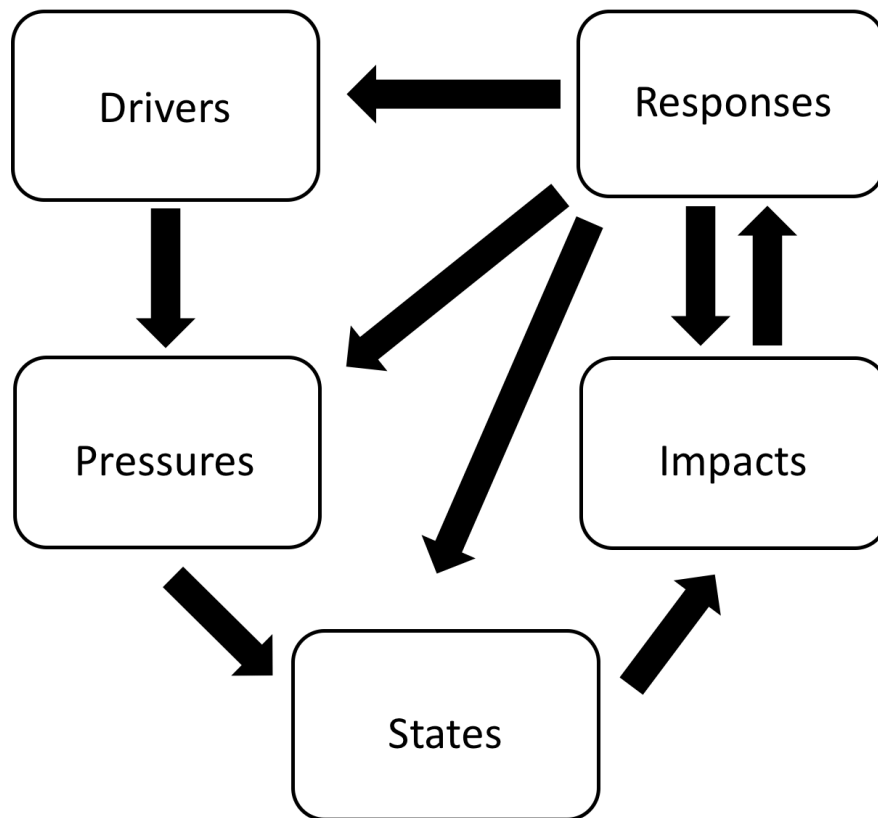


Figure 1: DPSIR Framework. Visual representation of the interactions between drivers, pressures, states, impacts, and responses (DPSIR) within a system. The causal relationships between these factors are assessed in a DPSIR framework.

2.4.2. Community Capital Framework

The second framework that will be used in the analysis is the community capital framework (CCF). Capital refers to the resources that communities or people have, which when invested can create more resources (Gutierrez-Montes et al., 2009). There are two main groups of capital. There are human factors, which are intangible; these include

- cultural capital,
- social capital,
- human capital, and
- political capital.

The second group are material factors that are tangible, consisting of

- financial capital,
- built capital, and
- natural capital.

These various forms of capitals, while different, are all interdependent. The depletion of one form of capital can negatively impact the other forms of capital, resulting in the reduced sustainability and overall wellbeing of a community (Gutierrez-Montes et al., 2009).

Conversely, investment of one form of capital can lead to an increase in the other forms of capital, effectively creating an upward spiral that supports sustainable community development (Gutierrez-Montes et al., 2009). This means that communities can start developing with the capital they already possess and through its use and investment they can multiply it, regardless of their starting socioeconomic state. It emphasizes that rather than focusing on the what is lacking in a community, the focus is placed on the existing resources and how they can be applied to beget further resources (Gutierrez-Montes et al., 2009).

CCF helps to understand how decision-making impacts each of the different forms of capital by looking at the community as a system, and each type of capital as a sub-system, thereby providing a holistic assessment of the community's capacity for development and the implications that a particular initiative may have on the system (Roseland, 2012). Furthermore, it aims to achieve a balance in the different forms of capital, since sustainable community development relies on the improvement of all forms of capital. Favouring one form of capital above others creates an imbalance in resources and that can be detrimental to the environment, to building social equity, and to the economy, which are the three main factors

that the SDGs are rooted in (Gutierrez-Montes et al., 2009). Therefore, we can use CCF it to assess whether a proposed action will benefit all types of capital and therefore lead to sustainable development (Roseland, 2012).

There are variations on the CCF, where either six or seven forms of community capital form the basis for analysis. This project used the seven forms of community capital proposed by Emery and Flora (2006) that were listed above. The additional type of capital included here that is not in the CCF outlined by Mark Roseland (2012) is political capital. Rather, Roseland uses the concept of community mobilization in place of political capital. However, since political capital is an important community asset, it was included to make for a truly holistic and balanced analysis. The seven forms of capital used are described in the following section.

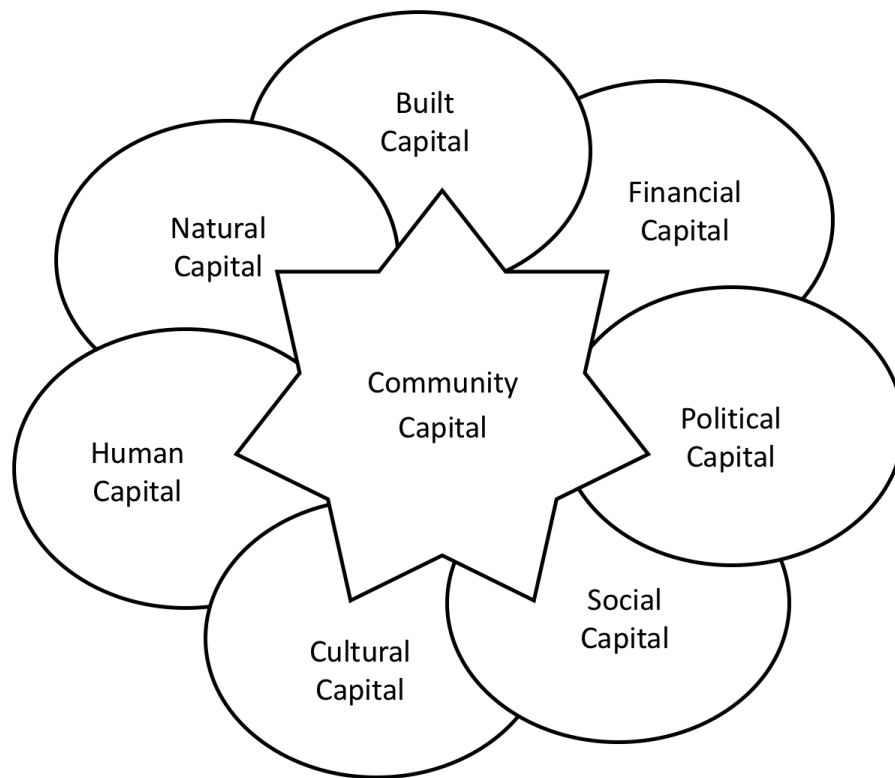


Figure 2: Community Capital Framework. Visual representation of the community capital framework (CCF) and the balanced interactions of the seven forms of capital that make up community capital (built, financial, political, social, cultural, human, and natural).

2.4.2.1 Seven Forms of Capital

Natural Capital

Natural capital consists of the resources of a particular place, which may include natural resources, natural beauty, weather, and geography (Emery & Flora, 2006). They can be renewable resources that can continue to provide the goods and services indefinitely if they are used sustainably and within the limits of the environment, or they can be nonrenewable resources that have a finite limit (Roseland, 2012). The benefits that are obtained from natural capital are therefore called natural income. Natural capital also relates to ecosystem health because ecosystem services are dependent on the integrity of the ecosystem (Roseland, 2012). Thus, natural capital increases when less of it is used or touched since that translates into

greater ecosystem health and integrity (Roseland, 2012). In essence, natural capital answers the question “what does the planet give us?” Additionally, it can also strongly influence a community’s cultural capital that is associated with place. (Emery & Flora, 2006).

Built Capital

Built capital is the physical infrastructure that allows people to attain their basic needs, be productive, and supports human activities (Roseland, 2012; Emery & Flora, 2006). It consists of the material resources used to produce other goods (Roseland, 2012). These material resources are often closely linked with human capital because limited built capital places a higher strain on human capital. For example, a lack of school buildings can restrict education. To enhance built capital, there must be an investment of other forms of capital into built resources like adequate housing, public facilities, transportation, and sanitation (Roseland, 2012).

Financial Capital

Financial capital, sometimes called economic capital, are the economic resources that support current and future community development and entrepreneurship (Emery & Flora, 2006). There are two types of resources that make up financial capital. The first type are financial resources, which are things such as money and loans that are used by individuals to generate goods and services to gain wealth and wellbeing (Roseland, 2012). The second type are business resources, which are what create income and employment in a community, like locally owned and run companies (Roseland, 2012). Financial capital can be increased with the diversification of the local economy, sourcing from local producers rather than relying on

importing goods and services, and through access to loans and technical capacity to support the development of local initiatives (Roseland, 2012).

Human Capital

Human capital are the skills and knowledge that people possess that help them to develop their resources and achieve wellbeing on a personal, economic, and social level (Emery & Flora, 2006; Roseland, 2012). This includes things such as education, leadership, health (Roseland, 2012). Human capital can be acquired through experience, or through more conscious efforts to develop it with education and training. However, to maintain a particular level of human capital, it must be continually invested in. Increasing human capital requires investing social, economic, physical, and cultural capital, and it can be lost if basic human needs, like shelter, food, and education, are not met (Roseland, 2012).

Social Capital

Social capital refers to the “social glue” between people that drives action (Emery & Flora, 2006). It is the “community cohesion, connectedness, reciprocity, tolerance, compassion, patience, forbearance, fellowship, love, commonly accepted standards of honesty, discipline and ethics and commonly shared rules, laws and information” (Roseland, 2012, p.15). It can take the form of informal social connections, or formal institutions, like laws and policies (Roseland, 2012). There are also different forms of social capital. Bonding social capital are the close overlapping connections that increase cohesion, while bridging social capital are the looser connections that link communities and organizations together (Emery & Flora, 2006).

Social capital is unique from other forms of capital in that it is limited only by imaginative constructs rather than by physical or material boundaries; it cannot be depleted by

use, in fact, it quickly weakens if unused; it can't be created by force and it takes time to develop; and, it can't be transferred (Roseland, 2012). Social capital is increased through the collaboration, communication, and interaction of individuals within the community, as well as through their access to information and participation in planning, and through representativeness in the local government. An increase in social capital translates into a higher degree of trust and unity between individuals, while a decrease in social capital can lead to suspicion and violence (Roseland, 2012).

Cultural Capital

Cultural capital refers to the traditional resources created through sharing a common history, identity, customs, values, and heritage (Roseland, 2012). It is how people "know the world" and act in it, including their languages and traditions (Emery & Flora, 2006). It can be intangible or tangible in nature, such as food, dance, music, art, spirituality, ceremonies and rituals, and stories (Roseland, 2012).

Cultural capital also dictates who holds influence and leadership, it fosters innovation and creativity (Emery & Flora, 2006), and it effects communication and decision-making within a community (Roseland, 2012). Because cultural capital is shared through sociality, it is limited by the degree of social capital present in the community (Roseland, 2012). The more social capital there is, the more cultural capital will increase. It can also increase social and human capital by contributing to wellbeing (Roseland, 2012).

Political Capital

Political capital refers to people's access to power, or the empowerment of people to take action in improving their community's wellbeing, or vocalizing their opinion (Emery & Flora, 2006). It is about the ability of individuals to take control of how resources are distributed in their community (Flora & Flora, 2013). Additionally, political capital is often dictated by cultural capital, and can be strongly influenced by bonding social capital through the strengthening of the status quo and preventing the advent of change (Flora & Flora, 2013).

Chapter 3: Survey Results

The online survey received a total of 43 responses. Respondents were asked to self-identify with a category of user group: community group members (n=14) and local scuba divers (n= 12) made up over half of the respondents (Figure 3). The remaining respondents identified as tourism (n=3), commercial fishing (N=4), and recreation (n=3), as well as one respondent that chose to identify as “individual”.

The majority of respondents (86%) indicated that they use the waters around Sambro, Duncan’s Cove, Ketch Harbour, Pennant, Terrence Bay and Prospect, while 7% indicated that they do not use this area, and another 7% were unsure (Figure 4). Only 5% of respondents reported that the entirety of their income is earned from the use of the marine area around Sambro, while 19% said part of their income comes from the use of this area (Figure 5). Those who claimed none of their income is dependent on this marine area made up the majority (71%) of respondents, and an additional 5% were unsure. It should be noted that one of the survey respondents did not answer this question, bringing the sample number to 42 in this case. Of the respondents that said they use this marine area (86% of those surveyed), 68% do not earn any income from its use, 22% earn part of their income from it, and only 5% (n=2) indicated that they rely on this area for all of their income (Figure 6).

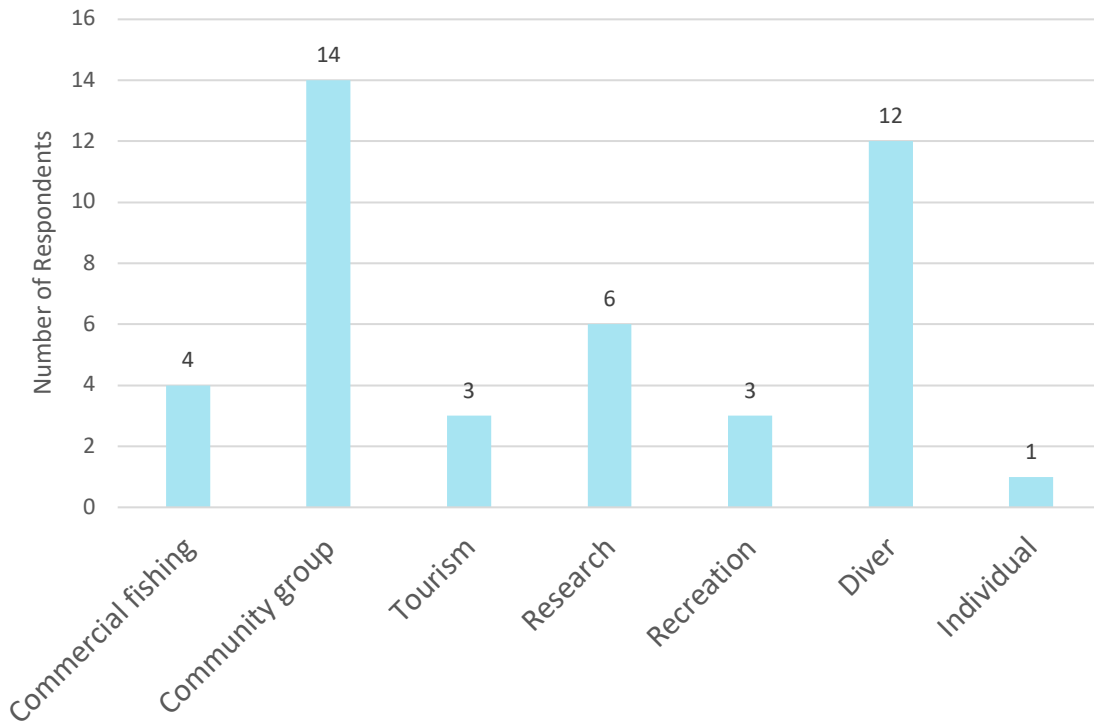


Figure 3: Survey Respondent Categories. Survey respondents indicated which category their group belongs to. N=43

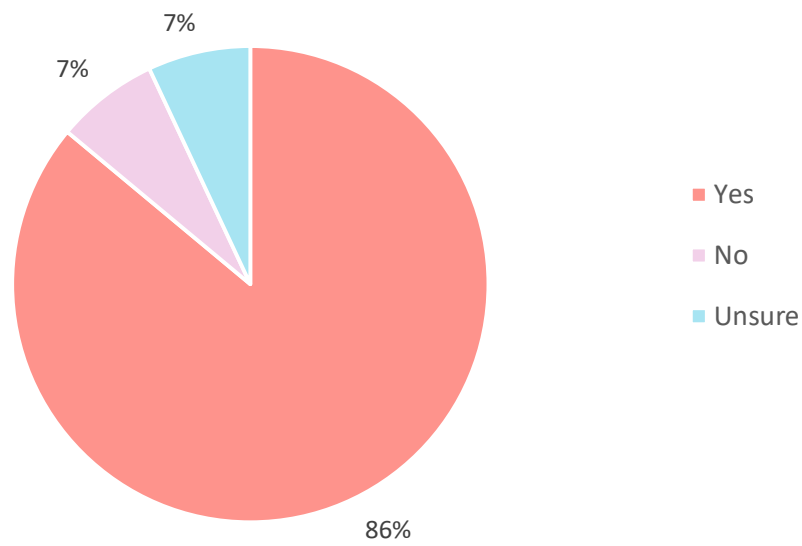


Figure 4: Use of Sambro Marine Area. Proportion of respondents that use the marine waters surrounding Sambro, Duncan's Cove, Ketch Harbour, Pennant, Terrence Bay and Prospect (n=43).

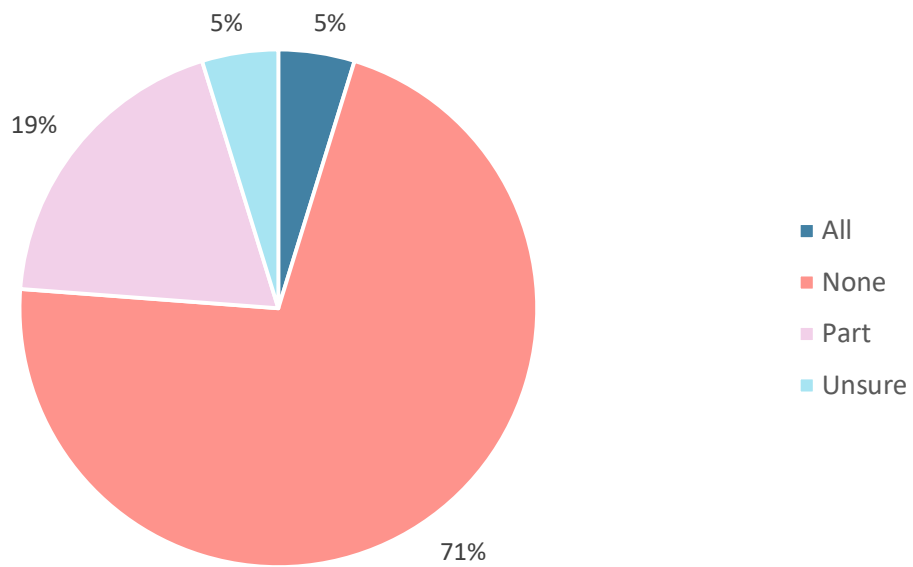


Figure 5: Income Derived from Use of Sambro Ledges. Proportion of survey respondents that earn all, part, or none of their income from the use of the marine waters surrounding Sambro, NS (n=42).

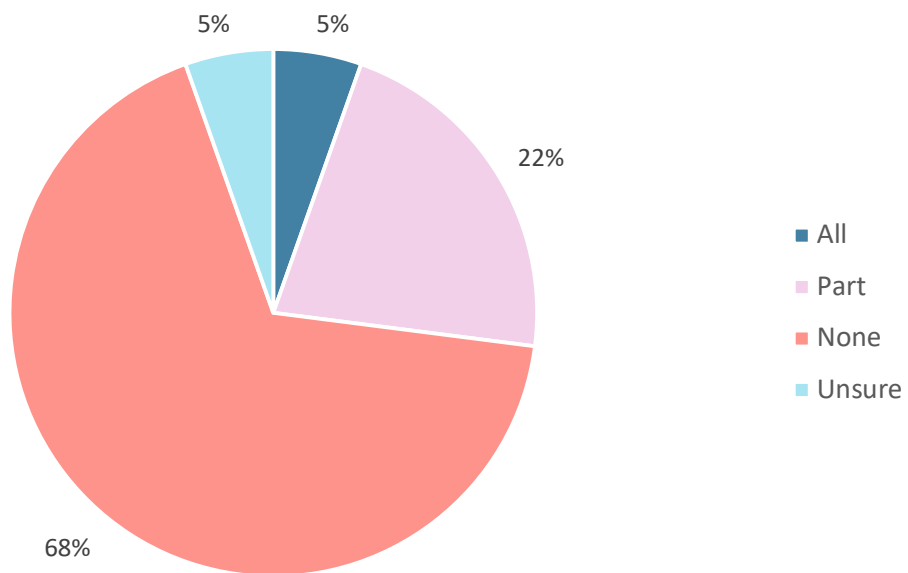


Figure 6: Relationship Between Use of The Sambro Marine Area and Income Derived From its Use. Proportion of survey respondents that use the marine waters off of Sambro, NS, and who earn all, part, or none of their income from this use (n=37).

When asked if they thought the marine area around Sambro should become a marine protected area, including the marine waters surrounding Duncan’s Cove, Ketch Harbour, Pennant, Terrence Bay and Prospect, 65% of respondents selected “yes”, 14% said it should not

become a marine protected area, and 21% were unsure (Figure 7). This question was accompanied with a disclaimer that a MPA in this area could lead to the restriction of certain activities that may have a negative impact on the marine habitat or species that are found here, such as aquaculture, fishing, and oil and gas development.

Respondents were also asked what effect they thought a MPA off Sambro would have on their group. Over half (56%) indicated that it would have a positive impact on their group, while 16% said it would negatively impact their group and another 16% were unsure as to how it would affect them (Figure 8). There were five responses (12%) that indicated a MPA here would have no impact on their group.

The relationship between the support for a MPA off Sambro and respondent income dependency on the use of this area was assessed. Of the respondents that indicated their support for a MPA off Sambro, the majority (78%) do not earn any income from the use of this marine area, but 14% do rely on it for part of their income (Figure 9). None of those that support the implementation of a MPA in this area are fully dependent on this area for income.

Another relationship that was assessed was the one between the support for a MPA off Sambro and the impact that people believe it would have on them. Of the individuals that indicated their approval of a Sambro Ledges MPA (n=28), the majority believe it would either positively impact them (75%) or have no impact on them (18%) (Figure 10). Conversely, of the six individuals that indicated that they did not approve of a MPA around the Sambro ledges, four believe it would negatively impact them and two believe it would positively impact them.

The relationships between income derived from the Sambro Ledges and the expected impact of a Sambro Ledges MPA were assessed. Of those who do not derive any income from

this area (n=30), 63% believe that a Sambro Ledges MPA would have a positive impact on them, 2% anticipate a negative impact, 13% expect there to be no impact, and 17% were unsure (Figure 11). However, of those that do derive part or all of their income from the use of this area (n=10), half expect an MPA here to negatively impact them, 40% think it would positively impact them, and one individual was unsure.

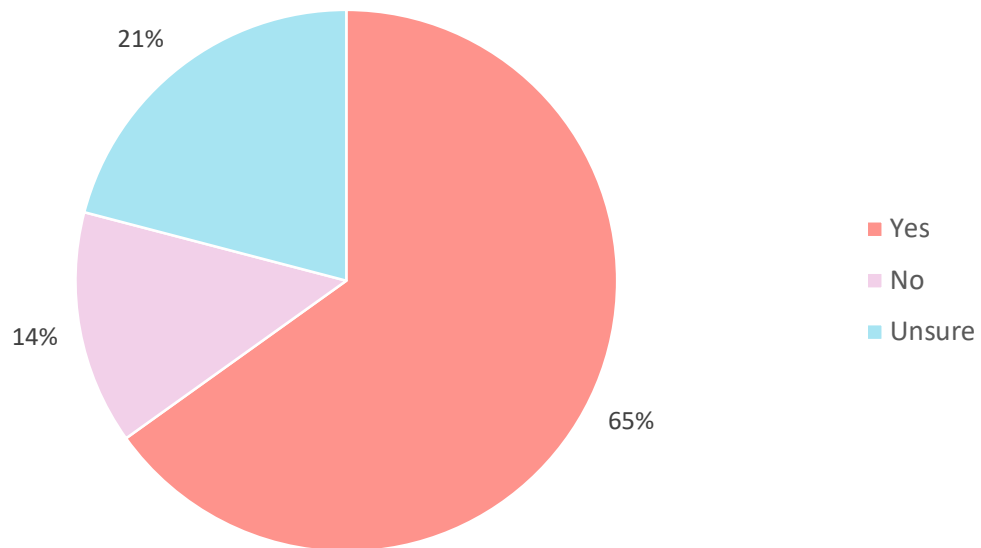


Figure 7: Support for Sambro Ledges Marine Protected Area. Proportion of survey participants that think the marine area surrounding Sambro should become a marine protected area (n=43).

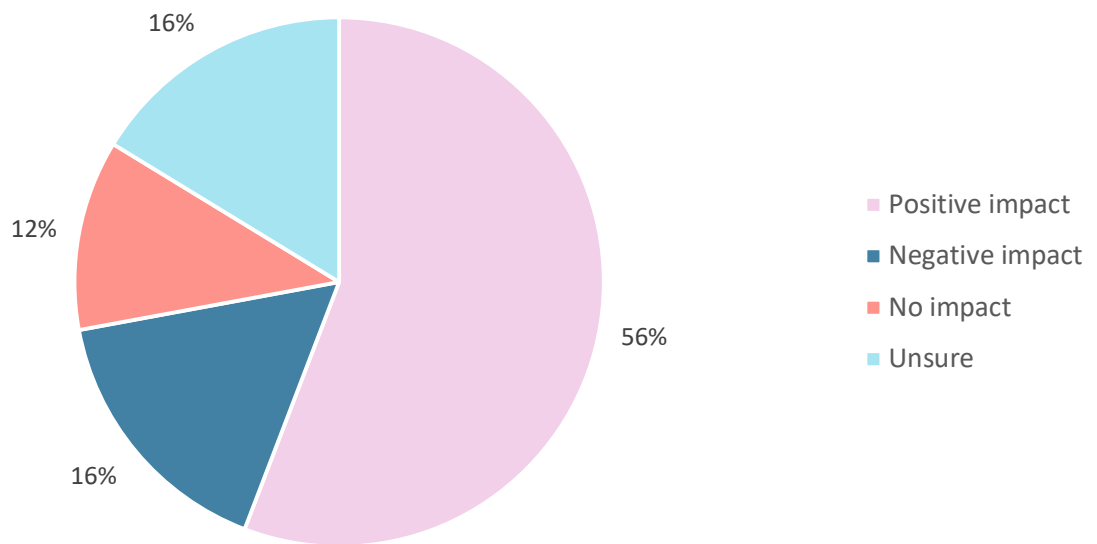


Figure 8: Expected Impact of a Sambro Ledges Marine Protected Area. Proportion of survey respondents that think a Sambro Ledges marine protected area would have a positive effect on their group, negative effect on their group, or no impact at all (n=43).

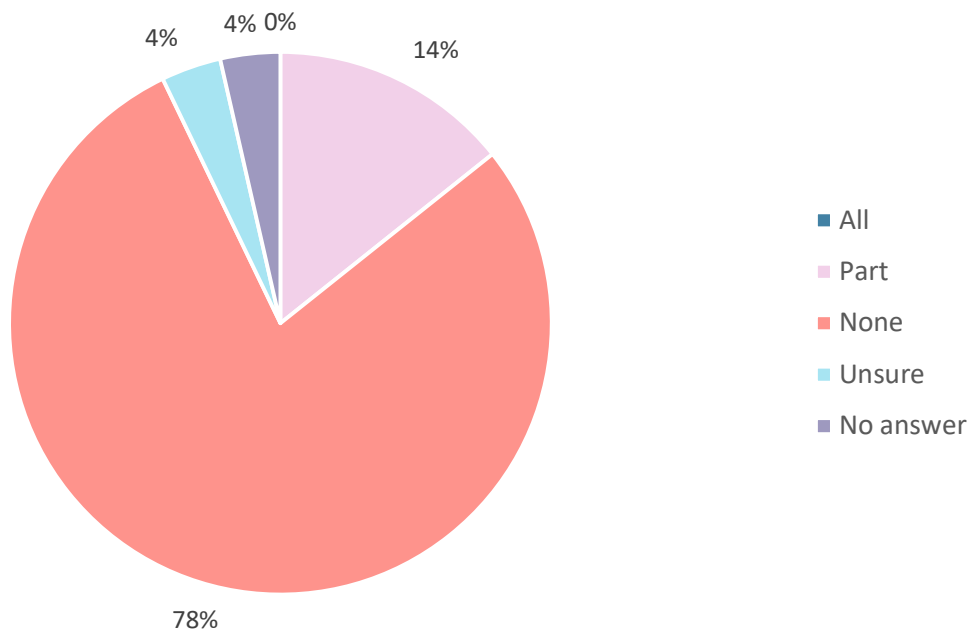


Figure 9: Relationship Between Support for Sambro Ledges Marine Protected Area and Income Derived From its Use. Proportion of survey respondents that derive all, part, or none of their income from the use of the marine waters off Sambro, and who think that this

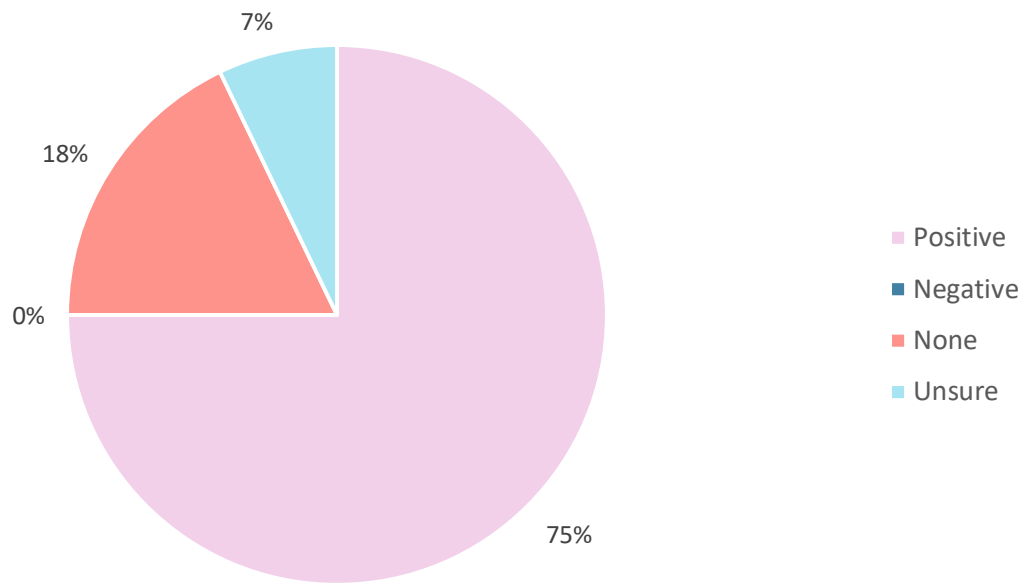


Figure 10: Relationship Between Support for a Sambro Ledges Marine Protected Area and its Expected Impact. Of the survey respondents who think there should be a Sambro Ledges marine protected area, the proportion of respondents that it would have a positive effect.

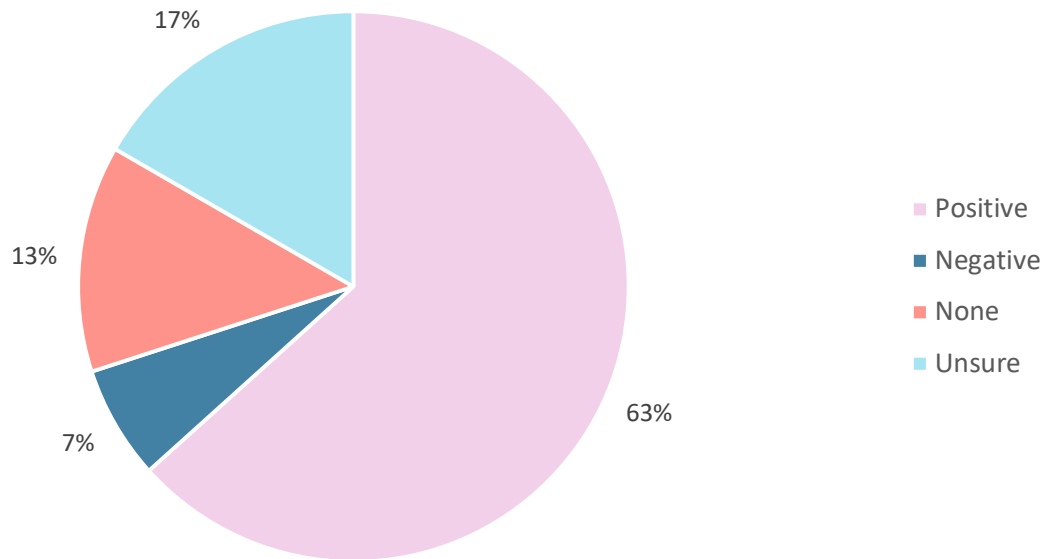


Figure 11: Relationship Between Income Derived from Use of The Sambro Ledges and its Expected Impact. Of the survey respondents who do not earn any income from use of the Sambro Ledges, the proportion that think it will have a positive effect on their group, negative effect on their group, or no effect at all.

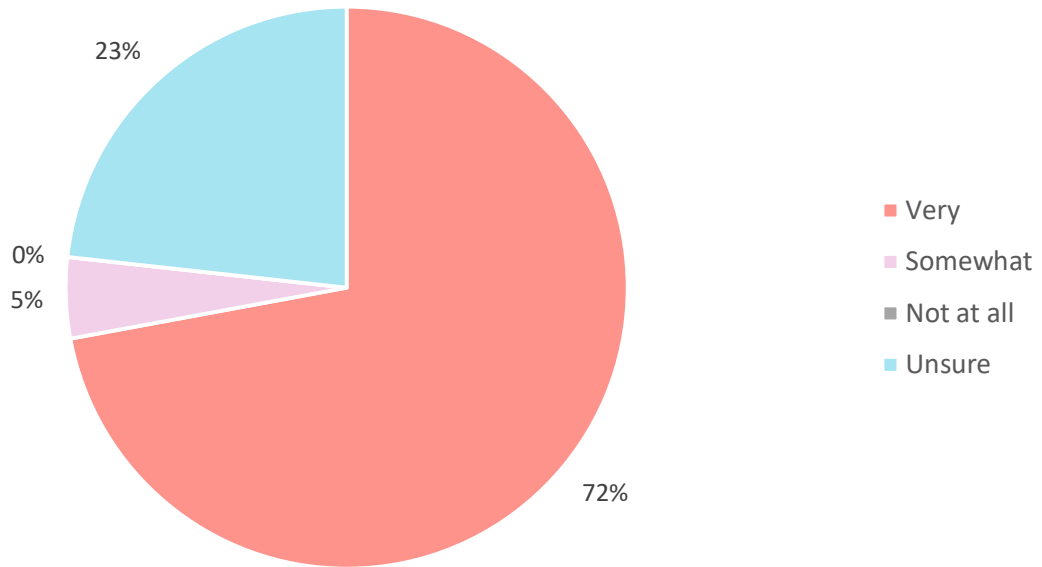


Figure 12: Ecological Importance of Sambro Ledges. Proportion of survey respondents that think the Sambro marine area is very ecologically important, somewhat ecologically important, or not at all ecologically important (n=43).

Most survey participants said they think the Sambro marine area is very ecologically important (72%), while 5% said they think it is somewhat ecologically important, and 23% were unsure (Figure 12). None of the respondents indicated that they felt the marine area had no ecological importance. When asked to select what the most important goal should be for the creation of a MPA among a list of 7 options (including “all of the above”), the most selected was “conservation of marine life and habitat” (n=17), followed by “protection for future generations”, and “enhancement of tourism and recreational activities” (n=7 each), “protecting coastal cultural resources” (n=5), “protection from future adverse uses” (n=2), and “protecting fisheries” (n=1) (Figure 13). Another two individuals selected the option for “all of the above”. It should be noted that only 41 out of 43 survey participants responded to this question.

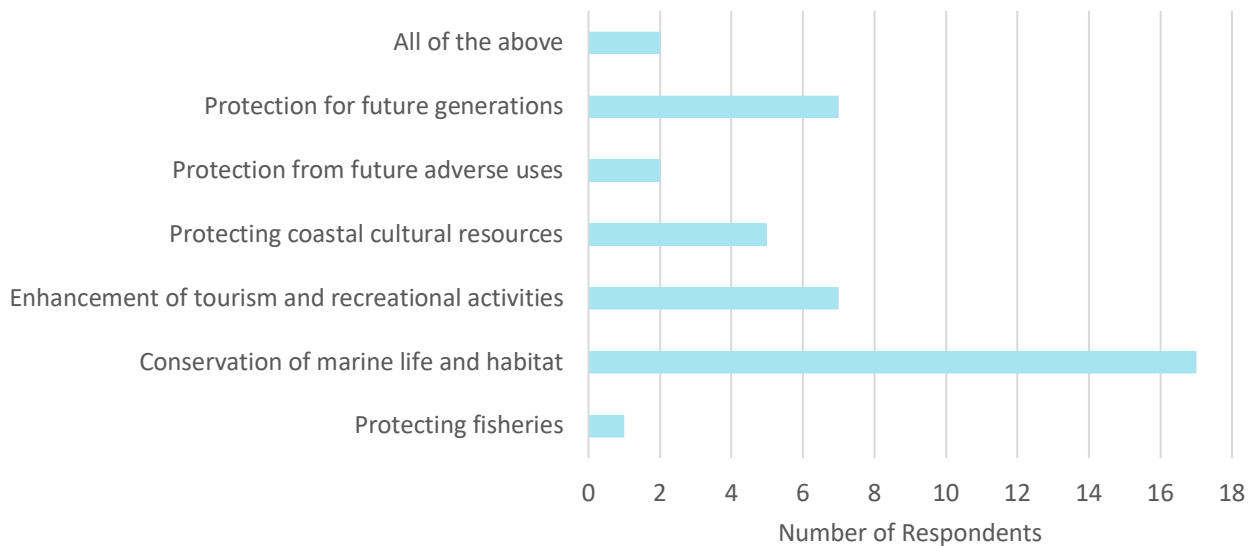


Figure 13: Primary Goal of a Marine Protected Area. Survey respondents indicated what they think should be the most important goal for creating a marine protected area around Sambro (n=41).

Survey participants were asked to indicate which activities they think should be allowed in a marine protected area, with the option to select as many of the listed activities as they wished and make use of the blank “other” category (Figure 14). More than half of the survey respondents selected the following activities: diving and snorkeling, non-motorized water activities (eg. sailing, kayaking, surfing), motor boating, eco-tourism, scientific research, recreational fishing, and commercial fishing with pots and traps (e.g. for lobster). Additionally, more than a quarter of respondents also selected commercial fishing with hook and line and First Nations food, social, and ceremonial fisheries. The “other” category was selected by one of the respondents, and they described this addition activity as “education programs”. This same question also highlighted which activities respondents felt had no place in a MPA, including dumping of wastes, laying of submarine cables, commercial shipping, oil and gas extraction and

the use of mobile fishing gear such as trawls. All 43 survey participants responded to this question.

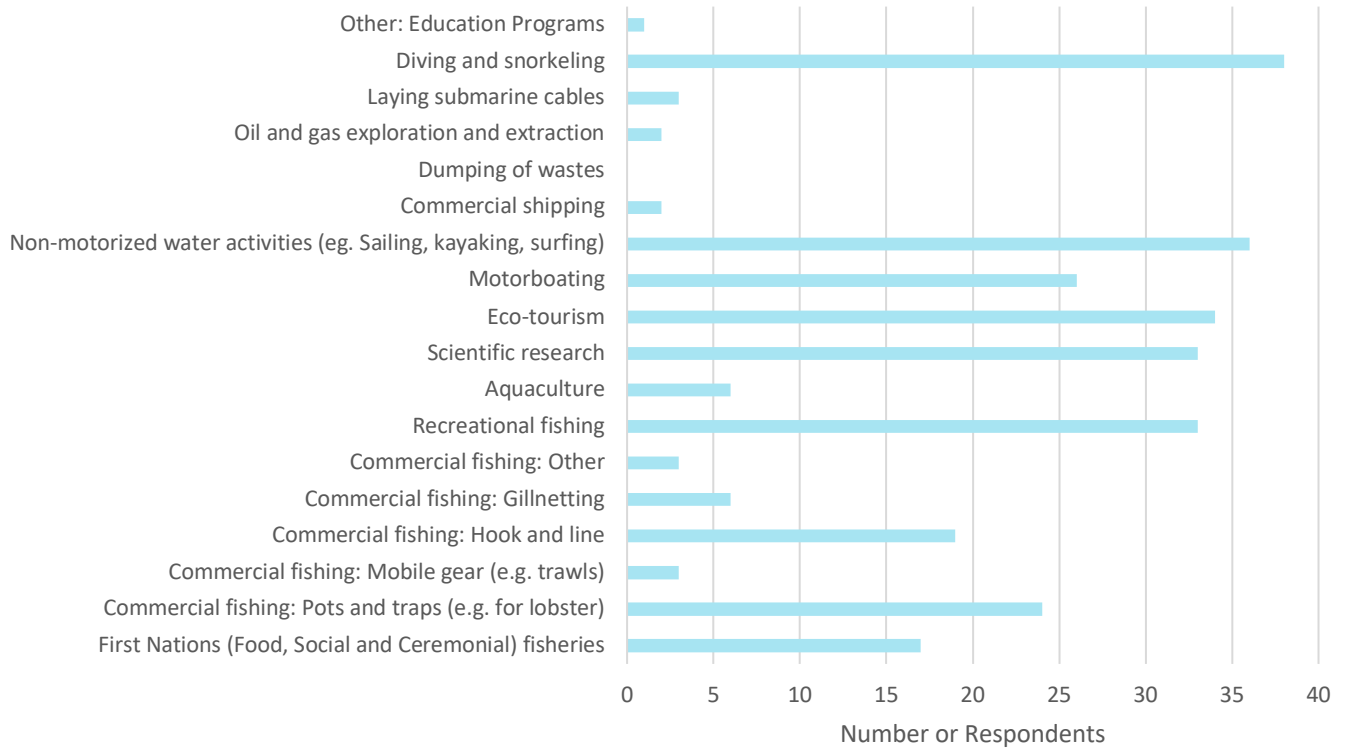


Figure 14: Activities Permitted in a Marine Protected Area. Survey respondents indicated which activities they think should be allowed in a marine protected area (n=43).

Chapter 4: Analysis

4.1. DPSIR Analysis

The following DPSIR analysis is of a hypothetical but potential situation where a MPA is established in the coastal marine waters off of Sambro, Nova Scotia, encompassing the Sambro Ledges EBSA.

4.1.1. Drivers

The need that is being met in this situation is one on a national level, whose actions create pressures at the community level. On an international level, Canada has committed to protecting ten percent of coastal and marine areas by 2020 under the 2010 CBD Aichi Target 11 (DFO, 2017a). Driven by the urge to uphold Canada's reputation internationally, as well as the recognition of the importance of safeguarding national marine resources, the current government made a domestic commitment on their platform to achieve these goals and make up for the inaction of the previous government by also pledging to protect 5% of its coastal and marine areas by 2017 (Liberal Party of Canada, 2017). Furthermore, they promised to funnel \$8 million each year into science and consultation process, as well as restore the \$40 million federal ocean science funding that the previous government had cut (Liberal Party of Canada, 2017). Also under these goals is the need to develop MPA network plans, of which one of the of the biogeographical regions is the Scotian Shelf, where the Sambro EBSA is located (DFO, 2017b). Additionally, there is another need being addressed: that of the Liberal Government itself, who must appeal to certain political demographics to remain in favour.

This driver and ensuing activity has an influence on political capital. Since the goals originate from an international convention, and the mandate to create MPA networks and

increase marine protection comes from the federal government, there is loss in political capital at the community level. It is essentially a top-down driven process, with decisions coming from authorities outside of the community that will be affected. However, as part of the current government's platform, they promised to improve the level of co-management of marine spaces, stating "Together, we will develop plans that make the best use of our marine resources and give coastal communities more say in managing the resources around them" (Liberal Party of Canada, 2017). Therefore, despite the loss of political community capital through a top-down approach, there may still be an opportunity for an increase in the political capital of the community through the consultation process. The consultation process for the Scotian Shelf Bioregion MPA network ramped up in 2016 during the gathering of data and network design stages and will last through the release of the draft plan in late 2017 until the final plan is announced in 2019, and again through the implementation and monitoring stages of the plan (DFO, 2017b). This would provide the opportunity for community members to voice their opinions and contribute their ideas and knowledge in the design, implementation, and monitoring of the MPA.

4.1.2. Pressure

Now imagine that in the development of the MPA network plan, the Sambro Ledges EBSA is selected as a new MPA. This means there would be restrictions in place with regards to some of the human activities in the marine area off Sambro. This pressure takes the form of a change in the use of an environmental resource, that resource being marine space. Some human activities would be prohibited in the MPA, while others would still be permitted (vanKampen, 2016). The range of activities that would be permitted within the MPA would

depend on their level of impact on the conservation objectives (5). For example, certain fixed-gear fishing practices typically are allowed within at least a subset of a MPA (vanKampen, 2016). However, the possible exclusion of any type of fishing from the MPA would potentially reduce the financial capital within the community.

The implementation of a Sambro Ledges MPA presents an opportunity for community members to increase their political capital by taking an active role in deciding how resources will be allocated within the community. More than half of survey respondents support the creation of a Sambro Ledges MPA (Figure 7), and the most selected activities to allow in a MPA were of potentially low impact to the environment (Figure 14). One such low-impact activity that was selected by more than half of the respondents was commercial fishing with pots and traps. These are important points that indicate how users of this marine area would like to see the area managed. If community members and the various stakeholder groups have the opportunity to effectively voice their opinions during the consultation process, it could significantly impact the design of the MPA and the development of the conservation objectives, such that it can support the wellbeing of the community while providing protection for the marine environment.

4.1.3. State Change

Restricting human activities that are highly impactful to marine ecosystems could lead to a change in the natural state of the Sambro Ledges marine environment, in the form of a healthier marine ecosystem. Various studies around the world have found that when fishing mortality and habitat degradation was reduced through the implementation of MPAs, particularly those offering some degree of full protection (where little or no human use is

allowed), there was an increase in abundance, productivity, and diversity of marine life (Lubchenco et al., 2003; Lester et al., 2009; Molloy et al., 2009). Not only do species live longer within MPAs, but in doing so they can achieve larger sizes, which translates into higher reproductive output (Gell, & Roberts, 2003). This state change towards a healthier marine ecosystem reflects an increase in natural capital for the local community, since the more it is left alone the better it is able to carry out its ecosystem functions.

When asked what the most important goal for a Sambro Ledges MPA should be, conservation of marine life and habitat was the most commonly selected option (Figure 13), and the majority of respondents also consider the Sambro marine area to be of very high ecological importance (Figure 12). This data suggests that people are appreciative of the natural capital that exists in the Sambro Ledges and they view its conservation to be of importance.

4.1.4. Impact

An increase in ecosystem health of the Sambro Ledges would have social, environmental, and economic implications. As previously mentioned, western society has a tendency to view themselves as something outside of nature, and tools like MPAs can sometimes reinforce this view through the restriction of human activities and sometimes the exclusion of human access altogether. But if the situation is looked at from an ecosystem approach, it can be seen that people are very much a part of the ecosystem, using the services it provides and influencing its various cycles. Therefore, the improved ecosystem health of a MPA would impact human health and wellbeing, which represents an increase in human capital. There was some support for this in the survey responses. Of the individuals that indicated their support for a Sambro Ledges MPA (65% of respondents), most believed that a

MPA in the area would positively impact them (Figure 10), but the same percentage of respondents do not rely on this marine area for their income (Figure 9). Additionally, of the individuals who do not derive their income from the use of this marine area, over 60% believe that a MPA would positively impact them (Figure 11). Taken together, these results suggest that this area confers non-financial benefits and value to the wellbeing of survey respondents.

In terms of the environmental impacts, a healthy ecosystem with high biodiversity and abundance of marine life would add to or preserve the natural beauty of the region, which would be an increase in natural capital since natural beauty is a component of natural capital. Additionally, there would also be an increase in natural capital outside of the MPA boundaries due to the spillover effect in areas adjacent to the MPA. Although this increased natural capital would be outside of the MPA, if it is still within an area that benefits community members, it would contribute to an increase in the natural capital of the community.

There are also economic impacts that could come of the increased health of the marine ecosystem, most notably the benefits to fisheries operating immediately outside of the MPA boundaries. Studies have found that local fisheries benefit from MPAs through the spillover of large mature individuals and the export of eggs and larvae into the adjacent marine areas (Gell et al., 2003; Lester et al., 2009). Assuming that local fishers whose fishing grounds were within the MPA continue to fish just outside of the MPA boundaries, there would be an increase in community financial capital since higher catches due to MPA spillover means greater profits, and therefore financial capital entering into the local economy. Another economic impact would be the increased interest in the local area from outsiders since this could bring additional financial capital into the community.

4.1.5. Response

In response to the potential loss of fishing grounds within the MPA (the pressure), as well as to the increase or preservation of natural beauty and increased interest from non-locals (impacts), there is an opportunity for other sectors to expand in this area, particularly relating to tourism and recreation. Recreational activities were the most commonly selected by survey respondents in regard to what activities they believe should be allowed within a MPA, with over 75% of respondents saying eco-tourism, non-motorized water activities such as kayaking and surfing, recreational fishing, and diving and snorkeling should be permitted (Figure 14). The enhancement of tourism and recreational activities was also tied for second highest goals chosen for a Sambro Ledges MPA by survey respondents (Figure 13), and over 40% of respondents identified with tourism and recreation groups (including diving) (Figure 3), suggesting that Sambro Ledges is already important to the tourism and recreation industry and its persistence of and expansion would be welcome. By increasing the presence of these activities in this marine space, there would be the opportunity for the increase in financial capital through the advent of local businesses that facilitate these activities in this area, as well as through indirect financial benefits to the restaurant and hospitality industries that would benefit from increases in tourism.

However, the potential decrease in fishing presence and potential increase in tourism and recreation may create shifts in cultural capital. Communities that have a high degree of both natural and cultural capital can have cultural capital dictate the demand and management of natural resources (Roseland, 2012). Fishing may be an important part of this community's

identity and so restrictions on fishing in the Sambro Ledges might reduce cultural community capital through the erosion of this identity. However, if local fisheries can persist by continuing to fish just outside of the MPA, or within sections of the MPA, there may not be such a loss in identity. Furthermore, cultural capital can be important in the conservation of natural resources and the promotion of tourism, helping to increase both financial and natural capital (Roseland, 2012). As such, focusing on the financial and human capital that the natural capital can provide, in terms of opportunities for tourism and increased wellbeing, may foster an increase in cultural capital through the bolstering of pride in the non-fishing-related qualities that the community has to offer.

Another response to the increase in non-local interest would be an increase in infrastructure development to support more people visiting the area. This could include improved transportation and transit systems, and more public resources such as public bathrooms, informative signs indicating natural, cultural, and historic significance of the area, parking lots, picnic tables, public garbage and recycling receptacles, and coastal walking trails. Not only would this infrastructure represent an increase in built capital, but it would also foster an increase in social capital through the common use of these public resources.

In response to increased wellbeing and natural beauty, there may also be an increase in people wanting to live in this area, be that through more people moving into the community or fewer people leaving the community. This translates into an increase in human capital since people bring skills and knowledge with them into the community. There would also be an increase in built capital in the form of housing developments, buildings to support local small businesses, and schools.

Chapter 5: Discussion

There is a real possibility of a loss in financial capital due to the exclusion of some fishing activities from the MPA. While low-impact fishing practices are generally compatible with the conservation objectives of MPAs, some forms of destructive fishing practices and other incompatible fishing practices may be prohibited were the area to become protected (Day et al., 2012). Fishers have voiced their concerns in the media regarding the impact that the creation of more MPAs in general would have on the fishing industry and their fear of exclusion from access to their livelihood (vanKampen, 2016). Some comments in the survey also reflected this view, stating that a Sambro Ledges MPA would “interfere with historic and needed fishing rights in the area”. One respondent went as far as to explain “Should the area afore mentioned were protected and the lobster fishery potentially closed would be fiscally devastating to the community. Not every fisherman has the means to fish lobster outside and with small boats and gear fish the inshore are dependent on the fishery for their income”.

While the economic risk on the local fisheries is real, the degree to which it will affect them may be limited. The MPA network plans that the Government of Canada is developing are based on an integrated management approach that bridges the conservation objectives of MPAs with broad scale environmental, economic, cultural, and social factors (DFO, 2017b). Therefore, it should be expected that the design of a new MPA will consider these various factors in conjunction with the biophysical support for its establishment. For example, the cost-benefit analysis for the St. Anns Bank MPA off Eastern Cape Breton indicated that there would be a loss of \$161,700 in commercial fishing landings per year for the entire 4,364km² area that the MPA encompasses (Government of Canada, 2016), an amount that represents less than one

percent of the total value of the fisheries of Eastern Cape Breton (McMillan, 2017). Considering the large expanse of St. Anns Bank and its relatively low economic impact in the region, it follows that a much smaller coastal MPA in the marine waters off Sambro would see an almost negligible loss in economic activity. This is especially true considering that low-impact fishing practices, such as lobster fishing, may very well be permitted in some, if not all, of the area. Furthermore, this loss in financial capital may be offset by the increased financial capital derived from the spillover effect of the MPA. That being said, a MPA here could still greatly impact individual fish harvesters that may not have the means (in terms of travel costs) to fish outside of the MPA, as pointed out by one of the survey respondents.

The spillover effect of MPAs is often discussed in the context of a major benefit to local fisheries. While it has been observed in MPAs all over the world, it is important to look at an example that is comparable to the environmental and economic situation of Nova Scotia. One such example was seen in Georges Banks off the coast of Maine in the United States, where there was a groundfish fishery closure for five years (Murawski, Wigley, Fogarty, Rago, & Mountain, 2005). This closure, which was a response to depleted fish stocks, led to a spillover of yellowtail flounder and haddock into the 4km of marine area adjacent to the closure. The increase in fish stock led the average revenue per hour trawled to double (Murawski et al., 2005). This is a case where the increase in natural capital within the protected area led to an increase in financial capital as well.

Additionally, since the lobster fishery is of significance to the Sambro community, we can look at how MPAs have affected lobster in other places. A MPA in Spain found that the catch per unit effort of lobsters within its boundaries increased between 6-58 times relative to

outside of the MPA (Gell et al., 2003). In regard to the spillover of eggs and larvae, lobster egg production was found to have increased 9.1% per year since protection in a MPA in New Zealand (Gell et al., 2003). These increases in natural capital showcase the potential for increase of financial capital through the increased abundance of available catch.

Increased natural capital also influences human capital through improved health and wellbeing. Maller et al. (2005) explains that “to seek human health and sustainability without considering the importance of environmental sustainability is to invite potentially devastating consequences for the health and well-being of whole populations (Maller et al., 2005, p. 49). Nature has been shown to have various healing effects on individuals, be it physiological or psychological (Maller et al., 2005), and given the connection between human health and terrestrial ecosystems, it follows that the marine environment would also provide benefits to human health. Depledge & Bird (2009) argue that regular interaction with coastal areas can aid in reducing stress and promoting greater physical activity. This statement is reflected in a comment left by one survey respondent that said, “I enjoy hiking on the trails around Duncan's cove, and find doing so quite therapeutic.” Additionally, a study conducted in Australia found that people that lived near the coast had statistically significant higher levels of physical activity even when corrected for other variables like education level, employment, age, sex, and birth country (Bauman, Smith, Stoker, Bellew, & Booth, 1999). In fact, people that lived near the coast were 23% less likely to be inactive, 27% more likely to engage in adequate activity, and 38% more likely to be highly active (Bauman et al., 1999). This concept has inspired the Blue Gym project in the UK which promotes physical activity along the coast and in the water to improve physical and mental health and wellbeing (Depledge & Bird, 2009). Similarly, the

enhancement of natural capital in both beauty and biophysical characteristics through the establishment of a Sambro Ledges MPA may serve to stimulate more recreational activities in this coastal area and therefore promote increased human health and wellbeing.

The increase in recreational activities that a MPA can promote provides the opportunity to expand tourism in the area, and contributes to financial capital, built capital, social capital, and cultural capital. Tourism is an important industry in Nova Scotia that brings new money into the local economy, and contributes more to Nova Scotia's Provincial Gross Domestic Product than the agriculture, forestry, and mining industries combined (Tourism Nova Scotia, 2017). Tourism revenues in 2016 totaled \$2.6 billion, which was a 28% increase from 2010 levels; the Halifax metro region alone accounted for over half of those revenues (Tourism Nova Scotia, 2017). The tourism industry enables job creation in both rural and urban settings, and supports the growth of other sectors such as the restaurant, retail, transportation, and construction sectors. It also promotes new businesses and entrepreneurs, and fosters a sense of pride amongst residents (Tourism Nova Scotia, 2017). According to the 2014 Report of the Nova Scotia Commission on Building Our New Economy (the Ivany Report), tourism is expected to remain a key sector for the province into the next decade, with the goal of reaching \$4 billion in revenue by 2024 (Ivany, d'Entremont, Christmas, Fuller, & Bragg, 2014).

In light of this expected increase in tourism, and the proximity of Sambro to Halifax, a Sambro Ledges MPA could provide a valuable opportunity to expand tourism in the communities of this area. The Ivany Report states: "rural communities now understand that the environment is itself a valuable resource for tourism and for attracting people to live and locate businesses. Protecting vital eco-systems and promoting sustainable resource use will therefore

be central to strategies to revitalize Nova Scotia's rural economy" (Ivany et al., 2014, p. 19). A MPA would not only contribute to the revitalization of the rural communities in and around Sambro, it would also help further the aims of the Ivany report to increase Nova Scotia's Tourism revenues in general. For example, the Olympic Coast National Marine Sanctuary (OCNMS) on Washington State's coast brought \$101.6 million in visitor expenditures from recreational activities in 2014 (Leeworthy & Schwarzmann, 2014). Additionally, recreation in this marine sanctuary provided \$46.1 million in income for employees and business owners, and nearly 1200 part-time and full-time jobs in the tourism and recreation sectors within 2km of the sanctuary (Leeworthy & Schwarzmann, 2014). Most of the recreational activities that occur there are non-consumptive, activities such as camping, sightseeing, wildlife watching, beach going, and kayaking (Leeworthy & Schwarzmann, 2014). Wildlife or nature tours also provide a non-consumptive economic alternative that can support local economies. An Australian study found that 42% of visitors to the Brisbane area reported that they would not have come if there weren't wildlife tours, and of those that would have come, 22% would not have stayed as long in the area (Wilson & Tisdell, 2003). This would represent a large loss of income for the region since the wildlife tours bring in about \$30 million Australian in expenditures (Wilson & Tisdell, 2003). Sambro Ledges users also reflected this view that healthy environments are important for tourism. Of the 43 respondents, 34 selected eco-tourism as an activity that should be allowed in a MPA (Figure 14), and the enhancement of tourism and recreation was tied for second most selected goal for the Sambro Ledges MPA (although this only represented 7 of the 43 responses) (Figure 13).

It should be noted, however, that it is not just tourism in itself that is beneficial, but how tourism is carried out. As stated in the Ivany Report: “It is not a question of whether we will continue to depend on [tourism ...] but rather, whether we can pursue [it] in new ways to add significant value to our products and reach higher value markets” (Ivany et al., 2014, p.19). The terrestrially protected Crystal Crescent Provincial Park in Sambro Creek already draws visitors to the area for the hiking trails and white sand beaches. With the creation of a coastal Sambro Ledges MPA adjacent to this coastal terrestrial park, the added value that the Ivany Report calls for could be provided by tours and recreational activities that encompass both terrestrial and marine environments. This could create a greater market appeal for ecotourism operations that offer this combination, for example, through combined sea kayaking and hiking tours that go through the coastal MPA and come onto land in the provincial park. Not only would such tourism ventures provide economic capital to the local community, but also cultural capital through the bolstering of pride and the sharing of local history, bonding social capital through the collaboration of community members in eco-tourism ventures, bridging social capital via the new connections made during involvement in recreational ecotourism activities, and human capital through the promotion of physical activity and increased wellbeing experienced through exposure to natural environments. There is already precedence for this type of outdoor recreational tourism in the Halifax Metro Region. For example, East Coast Outfitters is a community based eco-tourism company located in Lower Prospect that started as an economic alternative to the collapsed groundfish fishery (East Coast Outfitters, 2017). They provide educational sea kayaking tours where the cultural and natural history of the area is explained to visitors (East Coast Outfitters, 2017). Another example is Kayak Halifax, a local eco-

tourism company that runs kayak tours out of Halifax Harbour and promotes healthy active living (Kayak Halifax, 2017). These local businesses provide financial, cultural, and human capital to the areas they serve, while sustainably using the natural capital that they're based on. Given the successful ecotourism model that these companies utilize, it bodes well for a similar operation in Sambro.

With an increase in tourism, there's an expected increase in built capital to support the economic growth. Already there have been steps taken to improve infrastructure that supports access to recreation in coastal rural communities such as Sambro. In 2016, a bike lane, that also serves pedestrians, was constructed along the provincial road connecting Herring Cove to Duncan's cove (Berry, 2017). This was the first part of an ongoing project that is set to create a route from Herring Cove, down Ketch Harbour road to Sambro, and then loop back to Spryfield (Berry, 2017). Not only does this bike lane provide a safe channel for cyclists, but it also extends along roughly 60km of beautiful scenic roads (CBC News, 2015). This promotes access to Sambro for not only Halifax Regional Municipality (HRM) residents, but will also support bicycle tourism and bring more people to Sambro, where they can contribute to the local economy. There have, however, been public access challenges that Sambro community members have had to face, and which would limit tourism and economic growth in Sambro. In August of 2017, the only direct HRM bus route to Sambro was discontinued despite local residents rallying against this decision (Irish, 2017). Not only do Sambro community members want a direct bus route to this area, they also want for the route to provide access to Crystal Crescent Beach during the summer months (Irish, 2017). But with the enhanced recreational, natural beauty, and wellness benefits that a Sambro Ledges MPA could provide, there would be even greater

demand for this transportation system, as well as the previously mentioned bike lanes, which would serve not just current residents, but also tourists and recreationists. Furthermore, a direct and consistent public transit route to Sambro could act as an incentive to increase the population in this rural community.

A rural community is one that has a low population density and is a far distance from a densely populated area (Lauzon, Bollman & Ashton, 2015). Historically, human populations were typically located in rural settings. However, in the last few decades there has been a global shift away from rural communities to more urban centers (United Nations, 2014). In 2014, half of all countries had 60% of their populations in urban centers (United Nations, 2014). Over half of the world's population is now urban and this is expected to increase to two-thirds by 2050 (United Nations, 2014). This shift towards urbanized populations is seen in Nova Scotia as well (Gibson, Fitzgibbons & Nunez, 2015). Additionally, a greater portion of Nova Scotia's population is over the age of 65 years, largely due the migration of youth out of the province (Gibson, Fitzgibbons & Nunez, 2015). There is also a general decrease in total population, a trend which is expected to continue into the next few decades, as well as a decline in coastal rural economies (Gibson, Fitzgibbons & Nunez, 2015). While Sambro is part of the HRM, it is categorized as a rural community (Capital Health, 2014). It, and many of the other rural communities on the Chebucto Peninsula of the HRM are an exception to the trend of rural population decrease. Sambro's population is actually expected to increase by 8% by 2024; however, that growth corresponds with a 123% increase in seniors and 11% decline in youth. For perspective, in 2014, only 10% of the population of Sambro was between the ages of 20-29 (Capital Health, 2014). This change in demographics mirrors the general trends seen throughout

the province. Nevertheless, living near accessible outdoor recreation and a healthy environment is becoming a more common choice among people (Thompson & Peepre, 2000). A coastal MPA can spur economic development in rural regions by providing employment opportunities which could encourage young people to stay. Not only would this MPA benefit Sambro, it would benefit neighboring communities as well. And given Sambro's proximity to Halifax, it would allow people to reap the benefits of living in a rural area without forgoing the resources and opportunities of an urban center.

5.1 Community Mobilization and The Importance of Social Capital

Fundamental to the achievement of sustainable community development is the idea of community mobilization (Roseland, 2012). It is a context dependent process, therefore how it is achieved will be different between communities. Key to this concept is the involvement of community members in both the decision-making process and the development process that will then shape the many aspects of their lives. There needs to be action taken to bring about a balanced increase in the different forms of capital (this relates to political capital). Roseland (2012) argues that "sustainable community development is thus about the quantity and quality of empowerment and participation of people" (p.17). This sense of mobilization or political capital is demonstrated by Sambro community members through their empowerment in rallying against the HRM's decision to discontinue the Sambro bus route (Irish, 2017).

Community group members had the highest level of participation in the survey, which indicates their desire to be involved in the decisions that affect their community (Figure 3). It follows that should the Sambro Ledges EBSA be selected for the MPA network, community members would likely be inclined to participate in the MPA development, and the development of their

community. A strong level of participation was seen in the creation of the Eastport MPA in Newfoundland, which was first initiated by the community as a voluntary fisheries closure to conserve the lobster population in this area (Collins & Lien, 2002). One of the main benefits that came out of this project was the empowerment and pride associated with having played such a large role in developing and implementing a conservation plan whose objectives were aligned with those of community members (Collins & Lien, 2002). With the effective use of the consultation process, Sambro community members may benefit similarly through their participation in the creation of a Sambo Ledges MPA.

Another key aspect of sustainable community development is the spiraling-up process, where capital is accumulated and the resulting wellbeing and opportunities of each form of capital reinforces another so that the cycle is promoted in an ever-increasing direction (Emery & Flora, 2006). Emery & Flora (2006) found that a high degree of social capital was the essential factor that initiated the upward spiral. This can be achieved by increasing bridging social capital by providing opportunities for adults and youth to come together, and by increasing the leadership roles available (Emery & Flora, 2006). The high level of survey participation from community group members also indicates that there is certain degree of social capital present in the community. The essential step will be tapping into that social capital and mobilizing financial capital to commence an upward spiral towards sustainable community development.

5.2 Balancing Community Capital for Sustainable Community Development

The DPSIR analysis provided a framework to understand how the decision to implement a MPA off Sambro might impact each of the different forms of community capital. The CCF holds that sustainable community development depends on the balanced enhancement of all

forms of capital (Roseland, 2012). Therefore, there must be an assessment of the balance between the expected changes of the different forms of capital.

To begin with, there is a loss in political capital due to the nature of MPA implementation being a top-down process. However, there is the potential to increase political capital through the involvement in the consultation process and in the opportunity for community members to decide how to reallocate community resources. Financial capital may potentially decrease if any fishing is excluded from the MPA, but it may also increase due to the potential spillover effect of the MPA and from outsider interest in the area following MPA establishment. There is also the potential for financial capital increase from tourism and recreation opportunities, as well as from associated industries (e.g. restaurant and hospitality). It is likely that the loss in financial community capital due to fishing exclusion would be small, although the impact may be quite significant to individuals directly affected by an exclusion. However, it is also possible that financial capital derived from MPA spillover may balance out this loss. In terms of changes to natural capital, it is expected to increase with the implementation of a MPA, from the preservation or increase in natural beauty, and from spillover into areas adjacent to the MPA that are used by community members. Human capital may potentially increase due to the benefits to human health and wellbeing incurred from the increase or preservation of natural capital, as well as due to the potential increase in population since people bring skills and knowledge with them into a community. Built capital would also be expected to increase in response to the increase in financial, human, and social capital, to support their enhancement. Cultural capital has the potential to decrease or increase as a result of MPA establishment. If there is a loss of fishing in the MPA, there may be a decrease in

cultural capital due to loss of identity. However, if fishing is permitted in the MPA, or if local fishers continue to fish outside of the MPA, the fishing identity would be able to retain their cultural identity. On the other hand, cultural capital may increase due to the enhancement of local pride in other non-consumptive community traits. Finally, there is social capital, which would potentially increase through collaboration in the mobilization of financial capital (e.g. starting alternative economic business ventures), as well as through the new connections made from new economic ventures. Social capital is also the underlying force holding the community together, and so an increase in other forms of capital would potentially contribute to the enhancement of social capital. Generally, it appears that the implementation of a Sambro Ledges MPA might have an overall increase in all forms of capital such that they would create an upward spiral, enabling each other to multiply. Investment in human, financial, and social capital has been seen to increase other types of capital (Emery & Flora, 2006). Therefore, it is recommended that there be a focus on these the forms of capital early on in the development process, particularly on social capital since it is so important for initiating the process and mobilizing political capital.

5.3 Limitations

There were several limitations to this study that warrant acknowledgement. The first is that there was a fairly small sample size of the survey due to low response rates. This eliminates potential for testing statistical significance and therefore the reliability of the results are only inferred. Despite the low sample size, the responses are still valuable to help understand what different user groups think about a Sambro Ledges MPA and how it might affect them. Since much of the consultation that DFO undertakes is with fisheries groups, survey responses from

different user groups may help to inform them during the network planning stage. Additionally, while there was low input from fishery groups (4 responses) in the survey (Figure 3), the comments and responses left by respondents of this category were considered in light of their low representation in the survey. There was also a lack of input from First Nations groups, which hinders the analysis since they are a major stakeholder in this area. Due to a lack of ethics approval, it was not possible to incorporate First Nations perspectives into the survey. This does, however, present an opportunity for future research on whether a MPA can potentially contribute to sustainable community development from a First Nations perspective.

Lastly, according to the survey results, many of those who indicated their support for a Sambro Ledges MPA do not derive income from the use of this area (Figure 9) and many also believe it will positively impact them (Figure 10). This suggests that they derive other forms of capital from this marine area beyond financial capital and that this marine area is of value to them and their wellbeing. However, it should be acknowledged that it may be difficult to expect a positive impact from a MPA when one feels their livelihood will be threatened by it. Since there were few survey responses from the fishing industry, it is hard to infer with any degree of certainty, but there is the possibility that those who do derive income from the Sambro Ledges may have their wellbeing effected due to loss of income, depending on the MPA regulations on what is allowed within the protected area.

Chapter 6: Conclusion

Relying solely on an economically-driven development model to meet the growing demands of society, and trusting environmental protection strategies to mitigate the consequences of increased economic development, will continue to create more and more environmental and socioeconomic problems. A global shift towards sustainable development that integrates environmental, social, and economic objectives is needed. Rather than use environmental protection as a strategy to remediate consequences of development, environmental protection strategies like marine protected areas should be considered as tools to contribute towards sustainable development. Marine protected areas have the potential to improve a community's natural capital, which can create new opportunities for communities to enhance their political capital, as well as opportunities to increase their financial capital through new business ventures that rely on natural income rather than on the depletion of natural capital. In turn, these opportunities may bring about an increase in social, human, cultural, and built capital. The potential result is that these different types of capital reinforce and build upon each other so that there is sustainable community development.

It is important to remember that sustainability is not about ceasing development, rather it is about changing how development is done. It is about the integration of environmental consciousness with social and economic development. And it is about "a world that can still dream bigger than what it is, and strive for greatness beyond" (Wood, 2013), but the key is in *how* this is done.

References Cited

- Atkins, J. P., Burdon, D., Elliott, M., & Gregory, A. J. (2011). Management of the marine environment: integrating ecosystem services and societal benefits with the DPSIR framework in a systems approach. *Marine pollution bulletin*, 62(2), 215-226.
- Bauman, A., Smith, B., Stoker, L., Bellew, B., & Booth, M. (1999). Geographical influences upon physical activity participation: evidence of a 'coastal effect'. *Australian and New Zealand journal of public health*, 23(3), 322-324.
- Berry, S. (2017, January 26). Bike lane to be installed along Ketch Harbor Road. *CBC News*. Retrieved from <http://www.cbc.ca/news/canada/nova-scotia/bicycle-lanes-halifax-sambro-1.3953593>
- Capital Health. (2014). *Community Profile*. Retrieved from <https://www.cdha.nshealth.ca/system/files/sites/123/documents/community-health-network-2-halifax-peninsulachebucto.pdf>
- CBC News. (2015, September 2). Crystal Crescent Beach bike route paving project applauded by cyclists. *CBC News*. Retrieved from <http://www.cbc.ca/news/canada/nova-scotia/crystal-crescent-beach-bike-route-paving-project-applauded-by-cyclists-1.3211672>
- CBD. (2009). *Azores scientific criteria and guidance*. Retrieved from <https://www.cbd.int/marine/doc/azores-brochure-en.pdf>
- Colby, M. E. (1991). Environmental management in development: the evolution of paradigms. *Ecological Economics*, 3(3), 193-213.

- Collins, R., & Lien, J. (2002). In our own hands: community-based lobster conservation in Newfoundland (Canada). *Biodiversity*, 3(2), 11-14.
- Convention on Biological Diversity (CBD). (n.d.a) *History of the Convention*. Retrieved from <https://www.cbd.int/history/>
- Convention on Biological Diversity (CBD). (n.d.b). *Strategic plan for biodiversity 2011-2020, including Aichi biodiversity targets*. Retrieved from <https://www.cbd.int/sp/>
- Day, J., Dudley, N., Hockings, M., Holmes, G., Laffoley, D. D. A., Stolton, S., & Wells, S. M. (2012). *Guidelines for applying the IUCN protected area management categories to marine protected areas*. IUCN.
- Depledge, M. H., & Bird, W. J. (2009). The Blue Gym: health and wellbeing from our coasts. *Marine pollution bulletin*, 58(7), 947.
- DFO. (2017a). *Canada reaches 5% marine conservation target*. Retrieved from <http://www.dfo-mpo.gc.ca/oceans/publications/mct-ocm/five-cinq-eng.html>
- DFO. (2017b). *Marine protected area (MPA) network development*. Retrieved from <http://www.dfo-mpo.gc.ca/oceans/networks-reseaux/development-developpement-eng.html>
- DFO. (2017c). *Meeting Canada's marine conservation targets*. Retrieved from <http://www.dfo-mpo.gc.ca/oceans/conservation/plan-eng.html>
- DFO. (2017d). *What is an MPA?* Retrieved from <http://www.dfo-mpo.gc.ca/oceans/mpa-zpm/info-eng.html>
- DFO. (2017e). *What is the network?* Retrieved from <http://www.dfo-mpo.gc.ca/oceans/networks-reseaux/info-eng.html>

- East Coast Outfitters. (2017). *About ECO*. Retrieved from <http://www.eastcoastoutfitters.com/about/>
- Edgar, G. J., Stuart-Smith, R. D., Willis, T. J., Kininmonth, S., Baker, S. C., Banks, S., ... & Buxton, C. D. (2014). Global conservation outcomes depend on marine protected areas with five key features. *Nature*, *506*(7487), 216-220.
- Emery, M., & Flora, C. (2006). Spiraling-up: Mapping community transformation with community capitals framework. *Community development*, *37*(1), 19-35.
- Filbee-Dexter, K., Bedford Institute of Oceanography, Canada, & Department of Fisheries and Oceans. (2016). *Distribution and abundance of benthic habitats within the Sambro Ledges ecologically and biologically significant area*. Retrieved from http://publications.gc.ca/collections/collection_2017/mpo-dfo/Fs97-6-3190-eng.pdf
- Flora, C. B., & Flora, J. L. (2013). *Rural Communities: Legacy and Change*. Boulder, CO: Westview Press.
- Gell, F. R., & Roberts, C. M. (2003). Benefits beyond boundaries: the fishery effects of marine reserves. *Trends in Ecology & Evolution*, *18*(9), 448-455.
- Gibson, R., Fitzgibbons, J., Nunez, N. R. (2015). *State of rural Canada report: Nova Scotia*. Retrieved from <http://sorc.crrf.ca/ns/>
- Government of Canada. (2016). *St. Anns Bank marine protected area regulations*. Retrieved from <http://www.gazette.gc.ca/rp-pr/p1/2016/2016-12-17/html/reg1-eng.php>
- Gutierrez-Montes, I., Emery, M., & Fernandez-Baca, E. (2009). The sustainable livelihoods approach and the community capitals framework: The importance of system-level approaches to community change efforts. *Community Development*, *40*(2), 106-113.

Hastings, K., King, M., Allard, K., Canada, Department of Fisheries and Oceans, Maritimes Region, & Bedford Institute of Oceanography. (2014). *Ecologically and biologically significant areas in the Atlantic coastal region of Nova Scotia*. Retrieved from http://publications.gc.ca/collections/collection_2015/mpo-dfo/Fs97-6-3107-eng.pdf

Irish, D. (2017, August 12). Community rallying to save Halifax transit route serving Sambro area. *CBC News*. Retrieved from <http://www.cbc.ca/news/canada/nova-scotia/efforts-still-underway-to-save-route402-1.4245210>

Ivany, R., d'Entremont, I., Christmas, D., Fuller, S., & Bragg, J. (2014). The Report of the Nova Scotia Commission on Building Our New Economy. *Halifax, Nova Scotia: ONE Nova Scotia*. Retrieved from <https://onens.ca/img/now-or-never.pdf>

Kayak Halifax. (2017). *Kayak Halifax*. Retrieved from <https://www.kayakhalifax.com/>

Kristensen, P. (2004). The DPSIR framework. *National Environmental Research Institute, Denmark, 10*. Retrieved from

Lauzon, A., Bollman, R., & Ashton, B. (2015). *State of rural Canada report: Introduction*. Retrieved from <http://sorc.crrf.ca/intro/>

Leeworthy, V. R., & Schwarzmann, D. (2014). *Socioeconomics of Washington's outer coast and Olympic Coast National Marine Sanctuary: Economic contributions from recreation*. Retrieved from <https://nmssanctuaries.blob.core.windows.net/sanctuaries-prod/media/archive/science/socioeconomic/olympiccoast/pdfs/rec-economic-factsheet.pdf>

- Lester, S. E., Halpern, B. S., Grorud-Colvert, K., Lubchenco, J., Ruttenberg, B. I., Gaines, S. D., ... & Warner, R. R. (2009). Biological effects within no-take marine reserves: a global synthesis. *Marine Ecology Progress Series*, 384, 33-46.
- Liberal Party of Canada. (2017). *Water*. Retrieved from <https://www.liberal.ca/realchange/water/>
- Lubchenco, J., Palumbi, S. R., Gaines, S. D., & Andelman, S. (2003). Plugging a hole in the ocean: the emerging science of marine reserves. *Ecological applications*, 13(1), S3-S7.
- Maller, C., Townsend, M., Pryor, A., Brown, P., & St Leger, L. (2006). Healthy nature healthy people: 'contact with nature' as an upstream health promotion intervention for populations. *Health promotion international*, 21(1), 45-54.
- McMillan, E. (2017, June 8). DFO finalizes marine protected area off Cape Breton. *CBC News*. Retrieved from <http://www.cbc.ca/news/canada/nova-scotia/st-anns-bank-protected-area-cape-breton-1.4151602>
- Molloy, P. P., McLean, I. B., & Côté, I. M. (2009). Effects of marine reserve age on fish populations: a global meta-analysis. *Journal of applied Ecology*, 46(4), 743-751.
- Murawski, S. A., Wigley, S. E., Fogarty, M. J., Rago, P. J., & Mountain, D. G. (2005). Effort distribution and catch patterns adjacent to temperate MPAs. *ICES Journal of Marine Science*, 62(6), 1150-1167.
- Roseland, M. (2005). *Toward sustainable communities: Resources for citizens and their governments*. New Society Publishers. Canada.
- Roseland, M. (2012). *Toward sustainable communities: Solutions for citizens and their governments* (Vol. 6). New Society Publishers.

Secretariat of the Convention on Biological Diversity (SCBD). (n.d.). *Strategic plan for biodiversity 2011-2020 and the Aichi Targets*. Retrieved from <https://www.cbd.int/doc/strategic-plan/2011-2020/Aichi-Targets-EN.pdf>

Thompson, J. & Peepre, J. (2000). *Economic benefits of protected areas*. Retrieved from http://cpaws.org/uploads/pubs/report_economic-benefits-of-protected-areas.pdf

Tourism Nova Scotia. (2017). *Nova Scotia tourism industry snapshot*. Retrieved from <https://tourismns.ca/sites/default/files/2017-01/Tourism%20Impacts%20Fact%20Sheet%20FINAL%20February%208%2C%202017.pdf>

Trudeau, J. (2016). *Minister of Fisheries, Oceans and the Canadian Coast Guard mandate letter*. Retrieved from <https://pm.gc.ca/eng/minister-fisheries-oceans-and-canadian-coast-guard-mandate-letter>

UNEP. (2008). *Decision adopted by the conference of the parties to the convention on biological diversity at its ninth meeting*. Retrieved from <https://www.cbd.int/doc/decisions/cop-09/cop-09-dec-20-en.pdf>

United Nations. (2014). *Our urbanizing world*. Retrieved from http://www.un.org/en/development/desa/population/publications/pdf/popfacts/PopFacts_2014-3.pdf

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. Retrieved from <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>

vanKampen, S. (2016, September 22). Proposed marine protected areas concern Nova Scotia fishermen. *CBC News*. Retrieved from <http://www.cbc.ca/news/canada/nova>

-scotia/proposed-marine-protected-areas-concerns-ns-fishermen-1.3773449

Wilson, C., & Tisdell, C. (2003). Conservation and economic benefits of wildlife-based marine tourism: sea turtles and whales as case studies. *Human Dimensions of Wildlife*, 8(1), 49-58.

Wood, B. (2013). *Mara* [Graphic Novel]. Berkeley, CA: Image Comics.

World Commission on Environment and Development (WCED). (1987). *Report of the World Commission on Environment and Development: Our common future*. Retrieved from <http://www.un-documents.net/our-common-future.pdf>

Appendix

11/26/2017

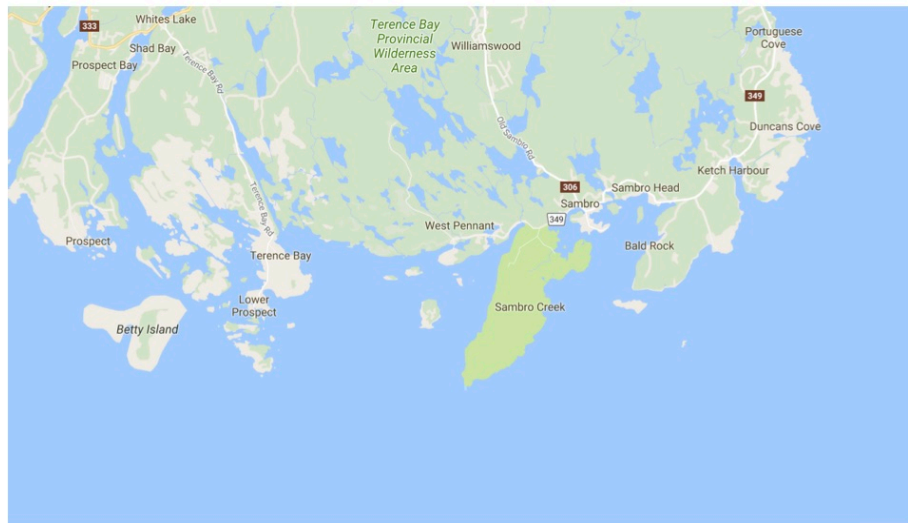
Community Survey of Potential Protected Area Near Sambro

Community Survey of Potential Protected Area Near Sambro

Marine protected areas, similar to National Parks or Nature Reserves on land, are sites where human activities that can negatively impact the environment are minimized, while often still allowing for low-impact activities to continue. These areas are selected because of their high ecological value and therefore require special management consideration.

Canada has a goal to protect 10% of its marine and coastal waters by 2020 and Fisheries and Oceans Canada is considering several ecologically important sites in Nova Scotia to potentially protect in the near future. The marine area off Sambro, which could also possibly include waters surrounding Duncan's Cove, Ketch Harbour, Pennant, Terrence Bay, and Prospect, is one such area of ecologic importance that is being considered. WWF-Canada wants to ensure that environmental protection measures provide benefit to local communities and that these measures are community supported. As such, WWF-Canada is interested in knowing what local groups in this area think about marine protected areas in general, and how a marine protected area in the area may impact them.

For this survey, "group" means organization, association, company, society, or agency.



1. Name the group(s) that you are a member of.

2. In which category is your group?*Mark only one oval.*

- Commercial fishing
- Community group
- Indigenous community or organization
- Tourism
- Research
- Other: _____

3. Fisheries and Oceans Canada is considering several sites that could potentially become marine protected areas in the future. One of the places being considered are the waters off Sambro, which could also potentially include waters around Duncan's Cove, Ketch Harbour, Pennant, Terrence Bay and Prospect. Does your group use the waters surrounding the areas mentioned above? This use could include (but is not limited to) things such as fishing, recreation, tourism, or research.*Mark only one oval.*

- Yes
- No
- Unsure

4. How frequently does your group use the Sambro marine area?*Mark only one oval.*

- Daily
- Weekly
- Monthly
- Seasonally
- Other: _____

5. What part of your income is earned from the use of the Sambro marine area?*Mark only one oval.*

- All
- None
- Part
- Unsure

6. In your opinion, how ecologically important is the Sambro marine area?*Mark only one oval.*

- Very
- Somewhat
- Not at all
- Unsure

7. In your opinion, with full and appropriate community participation, should the marine area surrounding Sambro* become a marine protected area? If it were protected it could potentially limit certain activities such as some types of fishing, aquaculture, oil and gas development, etc. if the activity has the potential to negatively impact important species or habitats.

* which could also potentially include waters around Duncan's Cove, Ketch Harbour, Pennant, Terrence Bay and Prospect

Mark only one oval.

- Yes
- No
- Unsure

8. Please explain your previous answer.

9. In your opinion, would creating a marine protected area around Sambro have an effect on your group?

Mark only one oval.

- Yes, I think it would positively impact my group.
- Yes, I think it would negatively impact my group.
- No, I do not think it would impact my group.
- I'm not sure if it would impact my group.

10. If you would like to explain your answer, please do so here.

11. In your opinion, what should be the most important goal for creating a marine protected area around Sambro?

Mark only one oval.

- Protecting fisheries
- Conservation of marine life and habitat
- Enhancement of tourism and recreational activities
- Protecting coastal cultural resources
- Protection from future adverse uses
- Protection for future generations
- Other: _____

12. In your opinion, which activities do you think should be allowed in a marine protected area? Please select all that apply.

Check all that apply.

- First Nations (Food, Social and Ceremonial) fisheries
- Commercial fishing: Pots and traps (e.g. for lobster)
- Commercial fishing: Mobile gear (e.g. trawls)
- Commercial fishing: Hook and line
- Commercial fishing: Other
- Recreational fishing
- Aquaculture
- Scientific research
- Eco-tourism
- Motorboating
- Non-motorized water activities (eg. Sailing, kayaking, surfing)
- Commercial shipping
- Dumping of wastes
- Oil and gas exploration and extraction
- Laying submarine cables
- Diving and snorkeling
- Other: _____

13. Do you have any other suggestions or comments about considering a marine protected area for the waters surrounding Sambro?

