TASK SPECIFIC COASTAL INFORMATION AND SOURCES FOR CUSTOMIZING SEARCH RESULTS

by

Jennifer Weldon

Submitted in partial fulfillment of the requirements
for the degree of Master of Library and Information Studies

at

Dalhousie University
Halifax, Nova Scotia
August 2011

DALHOUSIE UNIVERSITY

SCHOOL OF INFORMATION MANAGEMENT

The undersigned hereby certify that they have read and recommend to the Faculty of Graduate Studies for acceptance a thesis entitled "TASK SPECIFIC COASTAL INFORMATION AND SOURCES FOR CUSTOMIZING SEARCH RESULTS" by Jennifer Weldon in partial fulfilment of the requirements for the degree of Master of Library and Information Studies.

Dated: August 15, 2011

Supervisor: _____

Readers: _____

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DALHOUSIE UNIVERSITY

DATE: August 15, 2011

AUTHOR: Jennifer Weldon

TITLE: Task Specific Coastal Information and Sources for Customizing Search Results

DEPARTMENT OR SCHOOL: School of Information Management

DEGREE: MLIS CONVOCATION: May YEAR: 2012

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Signature of Author

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ABSTRACT

"Getting an overview" is a common task performed by coastal professionals in the early phases of management activities. This task involves collecting a variety of information about an area or topic to generate a first impression. This exploratory study examined this single task in detail so as to make recommendations about customizing search results to support that task through the use of an e-Card. Using a structured questionnaire, 20 coastal managers selected coastal characteristics that they would use to generate that first impression. Analysis of the data revealed fifteen core coastal characteristics that were used for the task. The work role that the professional was involved in emerged as a factor that influences characteristic selection. Fieldwork, such as scientific data collection, and management activities, such as drafting management plans, required different coastal characteristics to generate an overview. A prototype e-Card was designed as a proposed task-based search tool.

LIST OF ABBREVIATIONS USED

COM	Coastal and Ocean Management
GOMC	Gulf of Maine Council
ICM	Integrated Coastal Management
ICOM	Integrated Coastal and Ocean Management
ICZM	Integrated Coastal Zone Management
ISS	Information Seeking Strategy

ACKNOWLEDGEMENTS

I would like to thank the many people who have contributed to the production of this thesis. First, I would like to thank the members of my thesis committee, Peter Wells and Luanne Freund who provided many helpful and insightful comments. I would particularly like to thank my supervisor Elaine Toms who provided much appreciated encouragement, support, and guidance through the entire process.

Members of the iLab also provided support and valuable insight along the way. Lori McCay-Peet and Sandra Toze freely gave input and encouragement regardless of their own busy schedules, and Sarah Gilbert and Samantha Dutka were a constant source of moral support and good advice.

I would like to thank the 27 anonymous people who participated in this study for being so generous with their time, input and expertise.

I would also like to thank my parents, my brother, and my partner Paul for supporting me in my decision to go back to school, and having patience with the extensive time requirements associated with my studies.

This research was supported by NCE GRAND, NSERC, CFI and CRC grants to Elaine Toms.

CHAPTER 1 INTRODUCTION

1.1 THE PROBLEM

Collecting information about a specific location, topic or problem to get a general overview is often the first step when presented with a new situation. For example, an individual who is moving to a new city will likely collect information about the new location to get an idea of what to expect in their new home. Job opportunities, housing prices or rental listings, locations of grocery stores, and public transit options may all be of interest. Alternatively, in a professional setting, an environmental manager who needs to make a decision about whether or not to approve a new development on the shoreline may need to consider a wide range of information, for example, what fish species live in the area, what habitat will be affected, and the range of the tides. While each individual has a different goal for collecting information, each is essentially performing the same task: *gathering information to generate a broad overview of a particular subject*.

Both examples illustrate a challenging problem: how to simplify the process of acquiring that overview perspective. At present, one would need to collect information on a variety of topics, but these pieces of information may be distributed amongst many sources, and each source may need to be accessed separately. If the location of the information is not known, then the user will need to make precise queries, depend on the search engines to rank the necessary information accordingly, and may need to perform multiple searches in multiple repositories. The purpose of this research is to examine this particular type of task – the "gain an overview" task – in detail, so as to understand the structure of the task,

and its core components. This will be done with respect to a particular task domain for which this task is core, that of integrated coastal and ocean management (ICOM), which involves considering economic, environmental and social concerns when making decisions. By exploring a task in detail, we can understand how to design information systems to support the information requirements associated with this task.

1.2 A Task Based Approach

Collecting information to generate an overview of a subject is an example of a specific information task. In information search and retrieval research, user task has emerged as a key concept that may be used to both understand information seeking behaviour and to inform the design and evaluation of information systems. A user's task may be considered an activity performed in pursuit of a goal (Hackos & Redish, 1998), as a component of their work responsibilities (Li, 2009), or the response to a problem that causes information seeking to begin (Marchionini, 1995). As these definitions illustrate, a task is a combination of actions and outcome and is tied to the work environment; however work in this case may be considered either as professional work activities or everyday activities. Task may also be applied at many different levels, using one of the earlier examples; a task may be the act of making a decision on the approval of a coastal development, or it may be the gathering of information to get an overview of the proposed development site. The relationship between the larger work task and the resulting sub-tasks and search tasks has been modeled hierarchically (Bystrom & Hansen, 2005; Toms, 2011), with the larger work related task influencing the parameters of each of the sub-tasks. This model provides a framework for studying information search

problems, where understanding the task environment becomes a key component of understanding the dimensions of a user's information seeking process, and its associated information search tasks.

The concept of task may be applied to the information retrieval problem described earlier. If two different users were gathering information about an area to generate an overview of a topic, understanding the context of their search, such as their goals and desired outcomes, would allow an information system to return a set of search results tailored to the needs of the user. The concept of task is a framework by which to understand both the work environment and the information seeking and searching activities performed, and it may also be used for information retrieval system development. This research seeks to explore information searching in a target domain, ICOM, using the framework of user task. By investigating the kinds of information used by professionals in the ICOM domain to generate a preliminary characterization of a local area, we can begin to develop customized search tools for these professionals.

1.3 Coastal Management Context

The ICOM domain is an ideal area for this research because solving problems in this area requires access to reliable, accurate but very diverse coastal data and information. Coastal regions are often densely populated areas, contain many important natural resources and habitats, and provide economic benefits for residents through the development of these coastal resources (Masalu, 2008). The value of coastal areas for a diverse number of stakeholders, and the need to manage coastal resources sustainably has influenced the

movement towards ICOM, so that these areas are managed to balance human social and economic needs with those of the environment (United Nations, 1992). For integrated management of coastal areas to be successful, it is important for management decisions to be based on accurate and accessible coastal data and information (Masalu, 2008). The breadth of information required to implement ICOM spans many different domains and is distributed among many different sources, which makes it a challenging area for this research.

1.4 Presentation of Task Content

The challenge is how to design tools that allow coastal managers to find the necessary information, easily and effectively. In exploring the details of the types of information and information sources used by coastal managers for a particular task, we can effectively design a system to deliver information targeted not only to the topic, but also to the context of their search.

Contextualized search has been recognized as a long-term challenge of information retrieval (Allan et al., 2002). The term 'context' has been addressed in several ways in information retrieval research. Some approaches use the query as context, by presenting automatically generated summaries showing the sentences surrounding each word in the query (White et al, 2003). Other systems reorganize the set of search results by generating clusters of topically similar documents, or dividing them according to predetermined facets (Cutting, 1993; Dumais, Cuttrell & Chen, 2001). Context in these systems is determined by the similarity of the retrieved documents to one another and is

provided to the user through the grouping mechanism. The individual user's preferences and interests, which may be provided explicitly by the user or collected automatically by the system, can also be used as context and, when used to re-rank a set of search results, are commonly known as a 'personalized search'. However, often in personalized search, the task is not the core element influencing the results.

Research into information seeking behaviour takes an even broader view of context by taking the work environment and information needs into account. The connections between the external forces that initiate information seeking in an individual, the resulting information searching activities, and the subsequent need for an information retrieval system has been well documented and modeled (Wilson, 1999; Leckie, 1996). Investigating user tasks allows researchers to understand the broader context of search goals and desired outcomes that are not provided through user context or inter-document similarity. This research can be used to design information systems that support specific activities within different work environments and deliver information targeted to a user's task. One potential element of such a system is explored in this study, which is called an "e-Card". This is based on the instant answers concept used by Microsoft's Bing search engine, which extracts information from the search results pertinent to the user's query and displays it near the top of the page (Microsoft, 2009). The e-Card would instead extract task specific information and present it along with the usual search results.

In summary, this study seeks to investigate, in detail, a single information task performed in the coastal and ocean management domain, creating an overview of local factors

relevant to a coastal management activity. The findings will contribute to a novel approach to providing contextualized searches by describing the requirements for a task specific search tool.

1.5 Overview of the thesis

Chapter two consists of a review of the importance of information in the coastal and ocean management domain, reviews of information behaviour models, the application of task in information behaviour studies, and discusses the presentation and personalization of search results. Chapter 3 outlines the research questions and the two-phase research design of the study. Phase I is reported in chapters 4 – 6 and Phase II is reported in chapters 7-10. Chapter 4 describes the methodology used for the data collection of Phase I, including the research variables, the data collection instrument, and a description of the participants. Chapter 5 presents the results from data analysis of Phase I. Chapter 6 includes both the discussion of the results and the conclusions reached for Phase I. Chapter 7 describes the methods used for collecting data for Phase II, including research variables, data collection instrument and a description of the participants. Chapter 8 reports the results from the data analysis of Phase II. Chapter 9 discusses the implications of the data, and chapter 10 presents the conclusions drawn from the results of Phase II.

CHAPTER 2 LITERATURE REVIEW

2.1 TASK IN THE COASTAL MANAGEMENT CONTEXT

The focus of this research is a detailed investigation of a single task, which will be explored in the ICOM domain. This is a complex decision-making environment as management problems frequently involve multiple factors and require an interdisciplinary approach. This requires the integration of information from a variety of sources, which must be quickly assessed so that coastal management problems may be understood.

2.1.1 Integrated Coastal and Ocean Management

Coastal zones are often densely populated and are frequently the source of many important economic activities, which renders coastal areas susceptible to environmental degradation (Masalu, 2008; Van Kouwen, 2008; GESAMP, 2001a; GESAMP 2001b). The economic, social, and environmental value of coastal areas for a large and diverse number of stakeholders has influenced the movement towards integrated management principles involving all stakeholders, so that these areas can be managed in a sustainable way so as to balance human social and economic needs with those of the environment (United Nations, 1992). This concept is widespread globally, builds on the concept of sustainable development, and is known by several names, all of which refer to the same management approach: integrated coastal and ocean management (ICOM), integrated coastal management (ICM), and integrated coastal zone management (ICZM). For the purposes of this study, all of the above will be referred to as ICOM.

The connection between informed decision-making and access to the necessary information is made clear in the literature concerning data and information management in the ICOM domain. The successful application of ICOM principles requires access to an array of accurate and reliable data and information from environmental, social and economic sectors (Masalu, 2008). While vast amounts of data and information are being generated (Masalu, 2008; Canessa et al., 2007), a selection from such an array of information may be challenging to find, and due to the diversity and quantity of information needed may require multiple searches. There is a clear need for information to support good decision making, which makes accessing such dispersed information an important part of ICOM.

2.1.2 Coastal Information

Current literature proposing solutions to facilitating access to dispersed coastal information often recommend collecting data and information into digital repositories like information warehouses, or spatial data infrastructures. The literature on information requirements and use in the ICOM domain does not form a cohesive body of research, but tends to report on individual projects or initiatives that are designed to manage and/or make accessible a variety of coastal data and information. Nevertheless, the literature consistently makes a strong statement about the importance of accurate and reliable data and information for effective ICOM, particularly with respect to its role in decision-making.

International Oceanographic Data and Information exchange (IODE)

Masalu (2008) reports on the role of the International Oceanographic Data and

Information Exchange (IODE) in data and information management, capacity building and integrated coastal management. Masalu (2008) draws a direct relationship between access to information and Integrated Coastal Management (ICM). "[S]uccessful ICM should be supported by reliable and readily available data and information", which will not only bring sectoral activities together but "allow decision-makers to make informed decisions". The paper describes the ODINAFRICA project that helped many coastal countries in Africa to manage their coastal and oceanographic data through providing basic equipment, training and establishing National Oceanographic Data Centres to serve as a deep archive for the collected data. The value of data and information to coastal management is emphasized, and Masalu notes that since its inception the ODINAFRICA project has assimilated ICM into its program.

CoastBase

The role of information in coastal management was explored in a thematic study conducted as part of the European Demonstration Programme on Integrated Coastal Zone Management (ICZM). The results indicated that information plays a central role in promoting integration between the different levels of government involved in coastal management, but there were significant problems in the way that information was made available to those who made policy and management decisions (Doody, 2003). The essential information for decision-making was distributed between many coastal institutions and organizations and was not always readily accessible. The study concluded that these individuals not only needed to have relevant, accessible information, but it was also important for the information to be seen 'in context' with information from other

domains so that the interaction between different factors could be understood (Doody, 2003). As a means of correcting these problems, the European Union has implemented the CoastBase project to create a marine data and information warehouse, that would function as a 'gateway' to aggregated European coastal and marine information (Doody, 2003).

The CoastBase project is intended to "improve European coastal and marine information search and exchange by the development of a distributed data warehouse" that would be available online (Eleveld, Schrimpf & Siegert, 2003). One of the objectives of the CoastBase project was to provide easy Internet access to information for all stakeholders, so a user requirements study was undertaken to describe the potential users, data contributors and the type of data and information that would be required. This user-centred approach identified different user groups, including researchers, policy advisors/managers and decision-makers, with each group requiring different types of data at different levels of aggregation and interpretation (Eleveld et al., 2003).

The studies conducted for the CoastBase project have identified several key points for research into information requirements and use in ICOM. First, the distributed nature of coastal information may be a barrier to effective decision-making, as the information needs to be seen in context. Facilitating access to distributed information is necessary to support the information needs of coastal and ocean managers. Second, there are distinct user-groups that require coastal information, but each group has different information requirements. The differences between these groups make it unlikely that a 'one-size-

fits–all' approach to designing information system tools will be sufficient.

Marine Spatial Information Infrastructure

Spatial data is consistently mentioned as a key need for ICOM activities, and Canessa et al. (2007) make the case for the creation of marine spatial information infrastructure in Canada to "support informed decision-making regarding the sustainable use, development and protection of coastal and marine areas and resources that is the goal of ICOM". They review the spatial information initiatives in Canada from the 1970's through to the present and emphasize that many of the barriers to the exchange of spatial information are institutional and attitudinal rather than technological. Advances in data collection and geographic information systems to display, manipulate and use spatial information provide the means to integrate the breadth of both environmental and socio-economic information that is integral to ICOM.

2.1.3 Earlier Study

The information tasks performed by coastal managers are currently being explored as part of the Next Generation Information Appliance (nGAIA) project (Toms, in progress). Through the analysis of data from interviews with coastal managers, the researchers compiled a taxonomy of information search tasks. These tasks describe actual activities performed by ICOM professionals, and form a basis for research into customized tools to support these activities. One task commonly performed in the early phases of work activities was the gathering of relevant information about the work location to generate an overview of the topic. The general description of this task, according to preliminary findings, indicates that it may be accomplished through gathering many different pieces

of easily summarized data and facts. This collection of information puts the work activity into a general local context before moving on to other phases of the work task (Toms, in progress). Due to the distributed nature of coastal information, this task may be time consuming or difficult, and could be supported by a search tool emphasizing the needed information based on the context of the task at hand.

2.1.4 Summary

The need for accurate and reliable data and information for ICOM is well established, however accessing the needed information can be difficult because it is distributed among many sources. A review of the available literature did not reveal any studies that are attempting to improve access to existing ICOM information on the web, however some solutions to accessing distributed information have been proposed including the development of spatial information infrastructures and digital repositories, which take advantage of advances in database and network technologies. An earlier study that characterized information tasks performed by coastal managers identified "getting an overview" as a task commonly performed by coastal managers in the early phases of their work.

2.2 Information Seeking Models

To begin thinking about how to support information seeking in any domain, it is important to understand the forces that cause individuals to look for information in the first place. It is generally understood that people begin to seek information in response to some kind of *information need*, which has been described in several ways including an anomalous state of knowledge (Belkin, 1982), or uncertainty (Kuhlthau, 1991).

Essentially, individuals seek information to resolve some perceived difference between the current state of knowledge or understanding and the desired state. The information seeking behaviour of users has been modeled in a variety of ways to understand their actions and processes, and these models have been applied in many information seeking studies. Modeling information behaviour, as noted by Wilson (1999), provides a framework for looking at information problems in terms of causes and consequences. While not exhaustive, the following section reviews several models to illustrate the different ways in which information seeking models have been developed and how they serve as frameworks for thinking about information problems.

2.2.1 Ellis

Ellis (1989) conducted an empirical study where he studied the information seeking patterns of social scientists. From categories derived from the data, he created a model consisting of six features: Starting, Chaining, Browsing, Differentiating, Monitoring and Extracting. The model was not presented as a diagram because these features were intended to be flexible and not necessarily a linear process, where Starting may lead to Chaining, but different combinations of features in different orders could be applied to describe any of the patterns exhibited by the social scientists. Ellis went further to make recommendations for applying each feature in the model to information retrieval system design. In a later study the features Verifying and Ending were added (Ellis, Cox and Hall, 1993).

2.2.2 Kuhlthau

In contrast to Ellis' non-linear model, Kuhlthau's (1991) model of the information

seeking process consists of a series of stages and was developed by examining a single complex task: the writing of a term paper. In a series of empirical studies on secondary and post-secondary students, Kuhlthau developed a six-phase model of the research and writing process that consists of Initiation, Selection, Exploration, Formulation, Collection and Presentation. The affect, or emotions, associated with each phase was also modeled, and earlier stages are characterized by uncertainty, which begins to be resolved after the Formulation stage. Kuhlthau admits that in reality the process is more iterative than the stages suggest, but the model provides a summary of experiences that users can recognize. Kuhlthau concludes that information systems are better designed for the well-defined questions that happen in later stages, rather than the unfocused questions that occur in earlier stages. The merging of Ellis and Kuhlthau's models was explored by Wilson (1999) who posits that Ellis' browsing, chaining, monitoring and differentiating features are activities that may be performed within Kuhlthau's selection/exploration phases, with extracting and verifying occurring after the formulation phase.

2.2.3 Wilson

In addition to reflecting on Kuhlthau and Ellis' information seeking models, Wilson reviewed a variety of models, both for information seeking behaviour and information searching, and developed a nested model to illustrate the relationships between the two research areas (1999). Information search is a sub-set of information seeking which in turn is a sub-set of information behaviour. Because of these relationships, Wilson suggests that the nested model be used as a reminder that the study of a topic must take the context of the surrounding field into account. Wilson also describes the information need as a "problem" and presents a unified model of the information seeking and

searching process, which is presented as a series of four stages. It begins with Problem Identification and then moves from Problem Definition to Problem Resolution and ends with a Solution Statement. When moving forward through the stages, uncertainty is resolved, however if uncertainty fails to be resolved, a feedback loop may occur and the user may return to an earlier stage. Wilson concludes that models of information seeking and information searching are complementary and identifies several questions for future research, including investigating how an understanding of information *seeking* behaviour aids in understanding information *searching* behaviour.

2.2.4 Leckie et al.

In a review of the literature on the information seeking behaviour of Engineers, Health Professionals and Lawyers, Leckie, Pettigrew & Sylvain (1996) developed a generalized model of information seeking of professionals. Many earlier models had been developed through observing scholars, but where the outcomes of scholarly work are knowledge based, the outcomes for professionals are more service based, and a new model was needed. The basic premise of the model is that information needs are generated by the work roles and work related tasks of professionals. Each professional may fill different roles and their information needs are determined by a combination of their job function and work environment. These needs then give rise to an information seeking process. This model is different than the previous three in that it includes the external forces that cause the information seeking behaviour, in this case, the work environment. Acknowledgement that the work tasks and work roles are the driving forces behind information needs is an important factor to consider, especially when researching information seeking in a professional setting.

2.2.5 Summary

The various models of information seeking behaviour describe how individuals respond to an information need or problem. Many of these models were developed through studying academics or students. Only Leckie et al. looked at professionals, and their model was based on a literature review. Leckie's model places information seeking in the broader context of the work place and posits that information needs will change based on the professional's role. The models of Ellis, Kuhlthau and Wilson operate at a much finer scale and detail the phases and activities involved in information seeking. Both Kuhlthau and Ellis draw conclusions about the ability of interactive information systems to support the various model elements. However, making the connection between behavior and system design is challenging because the research is at a very high level, describing generalized behaviours. To solve information problems in a specific work domain, it is necessary not only to study the individuals within the domain, but also to do so using a framework that gets down to a sufficient level of detail.

2.3 Task

Information seeking behaviour research has investigated how people go about resolving their information needs but has yet to translate the behaviours into recommendations for an information system. Research into user tasks has emerged as an approach that seeks to bridge that gap because task frameworks not only take the work environment into account, but can also operate at a fine enough level of detail to inform system design.

2.3.1 Work Tasks and Search Tasks

A task may be simply defined as "an activity to be performed to accomplish a goal"

(Hackos & Redish, 1998), "an activity people perform to fulfill their responsibility for their work" (Li, 2009), or "the manifestation of an information seeker's problem and what drives information seeking actions" (Marchionini, 1995). The three definitions can help in understanding the concept of task, particularly for research into the information behaviour of professionals. As in Marchionini's definition, the task is the stimulus that creates the information need and puts the information seeking process into motion. The accomplishment of a goal is also important because it provides context for the task activities, and the connections between tasks and work activities make task an appropriate framework in which to research information behaviour in professional settings.

Work tasks are performed as part of an individual's professional duties, and form the context in which information seeking and information search occur (Bystrom & Hansen, 2005). The hierarchical nature of information-intensive tasks has been modeled, with the work task generating one or many information seeking tasks, each of which in turn generate information search tasks (Bystrom & Hansen, 2005). The connections between the work environment and the information search task make it necessary to understand the work environment when attempting to understand and explain information searching (Vakkari, 2003).

2.3.2 Conceptualization of a Task

Building on Bystrom and Hansen's model, Toms (2011) elaborates on the concept of the work task. In Toms' hierarchical model, the work function gives rise to different tasks that may have one or many sub-tasks, which eventually result in search tasks when

information is needed for their completion. All of the tasks, sub-tasks and search tasks occur within a work domain, which will have an effect on the activities and functions of all levels of tasks, including the search tasks where users interact with information retrieval systems (Toms, 2011).

Toms (2011) also describes the basic components that make up a task or subtask where the starting point is an objective or goal, the end point is a desired outcome, and the activities and actions in between, make up the bulk of the task. These activities are conducted through various actions, may involve using tools that are used on information gathered from sources, and may have conditions that must be met in order to successfully complete the task. The goal of the task is dictated by the work function, which will have an effect on all of the elements that make up the rest of task, including the outcome, activities, tools, information, sources, conditions and actions. Investigating task at this level of detail would allow researchers to specify, for various goals and outcomes, what information is needed and from which sources, whether there are constraints on the information and sources that are acceptable for completion of the task, and what actions are taken during completion of the task.

2.3.3 Applications of Task in User Behaviour Studies

The concept of task can be thought of in two different ways; as a *process* where the task is a series of actions that accomplish an objective or goal, or a *description* that defines an item of work (Bystrom & Hansen, 2005). The two different ways of thinking about task affect their utility for different kinds of studies (Bystrom & Hansen, 2005), which causes tasks to appear in information search and retrieval research in two ways. Task can either

be the vehicle of research, or the object of research (Toms, 2011). When task is used as a vehicle of research, it becomes an independent variable for testing an information system, or observing information behaviour (see White et al, 2005; Kim, 2009). The development of the *simulated work task* (Borlund, 2000) has furthered research using this concept, as findings indicated that user behaviours were no different when performing searches based on simulated work task scenarios and when performing searches based on their own information needs. This opened up the potential for using simulated work tasks to evaluate information systems, which would maintain a controlled experimental setting but would allow evaluation of the system in a way that closely approximates real-world information seeking and information retrieval processes.

Examples of studies that use task as a vehicle of research include the modeling of information seeking strategies (ISS) on the web (Kim, 2009) and the evaluation of query-biased search results (White et al, 2005). Kim assigned 30 library and information studies (LIS) students three different search task types, a factual task, an interpretive task and an exploratory task, and observed the different ISS employed during the completion of each task type. This approach is based on the premise that there are different information needs and different information behaviours associated with the different stages of a task, and that both information needs and behaviours will be shaped by the characteristics of a task. White et al. (2003) used four different simulated work tasks as variables to test whether a system that created query-biased search results would improve user performance for different kinds of tasks.

The classification of the different levels of tasks, including work tasks and search tasks, involves task as the object of research. In recent years, several studies have examined the relationships between work task and information search tasks. Relationships between work tasks and search tasks have been examined through an empirical study that used a faceted classification system to conceptualize both work tasks and search tasks (Li, 2009). The study interviewed 12 participants and used the critical incident technique to elicit details about three work tasks and the associated information search tasks. The work tasks and search tasks were classified according to the classification system developed by Li and Belkin (2008), and results showed that work task shapes the different facets of its associated search tasks to different degrees. The facets most strongly affected by work task were the length of time, objective task complexity and subjective task complexity. Li and Belkin (2010) went further and explored the relationships between work task and interactive information search behavior. This study demonstrated that work task was a significant influential factor on search task, and different work tasks cause users to exhibit different behavior patterns and engage in different search tasks.

2.3.4 Summary

Tasks can be defined in many different ways, but can be distilled down to a goal or objective, with an intended outcome that has certain conditions or requirements for completing the task (Toms, 2011). The concept is important for information search and retrieval research because it places the search activities and information behaviours into a recognizable and describable context. Task may be used to understand information behavior, to evaluate information systems, or for translating that behaviour into

information system recommendations. While there have been studies that examine the relationships between work tasks and information searching activities (Li & Belkin, 2008; Li & Belkin, 2010), there has yet to be movement towards using task in the design of information retrieval systems. To successfully support information searching by ICOM managers using a task based approach, it becomes necessary to understand both the work activities that generate the need for information searching, and the requirements for completing that task, including the information needed, the sources consulted and any restrictions on the information that may be used.

2.4 Improving the presentation of search results

Once an information task has been described, the question becomes how to support the information searching required to complete it. A common way to support searching on the web is by improving the way that search results are either generated or presented. There has been plenty of research into different ways of using *context* to make these improvements on the simple ranked list of search results. Two different ways in which context can be used to modify search results are: 1) providing information about the items in the list of results in the form of text summaries or by grouping the results in a meaningful way, and 2) using contextual information gathered about the user to personalize the search results according to their preferences. While these methods both use context to enhance search results, they do it in different ways. The first approach provides context about the contents of the documents to assist the user in evaluating the results of their search, and the second approach re-ranks the results based on what the system thinks the user needs. The following section reviews different ways of providing

document context, while section 2.4.2 reviews the use of user context.

2.4.1 Document Context

Query-biased search results

Building on work that demonstrated the benefits of providing summaries biased towards the user's query, White et al (2003) conducted a user study to test the hypothesis that user search effectiveness will be improved by using an interface that automatically generated query biased summaries. They compared searches using the interface against those without the interface on two search engines, Google and AltaVista, and concluded that summaries generated by the system in response to the user's query allowed users to gauge document relevance more effectively, based on time spent and user input, than a traditional ranked title and abstract. However, query-biased summaries may not be useful for all tasks. An experimental study found that for open-ended browse tasks, generic summaries performed better, but query-biased summaries were more useful for specific search tasks (McDonald & Chen, 2006). These findings demonstrate that the context of the search is important, particularly the user's search task.

Grouping results

Users have expressed interest in search results that are not simply ranked, but are presented in meaningful groups. Two methods are commonly used for this kind of categorization: clustering, and categorization or faceting (Hearst, 2006). An example of a system for clustering search results is Scatter/Gather (Cutting, 1993), which organizes retrieved and ranked results into topically–coherent groups and produces text summaries similar to a table of contents to help the user evaluate each cluster. Scatter/Gather bases

the clusters on a function of the documents retrieved as part of a query. The system was tested in a user study (Hearst & Pederson, 1996), and the results revealed that participants most often chose the cluster with the highest number of relevant documents. The authors conclude that the Scatter/Gather approach is an improvement on similarity search ranking, due to their approach of basing the clusters on the context of the user's query. Thus, the same set of documents may be clustered differently for different searches. The drawback to clustering algorithms, though, is that the results can sometimes be unpredictable or illogical (Hearst, 2006; Hearst, 2009).

The division of search results into categories can serve a number of purposes, including narrowing the results, which allows a subset of documents to be selected, or by dividing results into a series of subsets that may overlap, but all documents remain visible (Hearst, 2009). An experimental study compared list search results to various category interfaces and found that all category interfaces were faster than list interfaces. Like clustering, categorizing search results places them in a larger context, thus allowing the user to more effectively evaluate the results and find the information that they need (Dumais, Cuttrell & Chen, 2001). While categorization is commonly associated with browsing, faceted category navigation can not only organize results, but allows users to narrow results through filtering (Hearst, 2009).

Instant Answers

The provision of extracted information relevant to the query in addition to a list of retrieved documents is another way of augmenting search results. Microsoft's search

engine, Bing uses this approach in what they call *Instant Answers*. For certain queries, such as looking up a sports team, the search engine automatically generates a box at the top of the search results that provides a selection of information extracted from web pages (for a sports team it would include recent game scores, ranking, etc.) based on the search terms (Microsoft, 2009). This concept is based on anticipating what information the user wants based on the query terms, but is restricted to information that can be looked up and easily displayed, and is not suitable for conveying more complex information.

2.4.2 User Context

The personalization of search results moves away from treating all users the same and delivers different results based on the individual user or group of users. Two ways of accomplishing such tailored results are through determining user preferences either explicitly or implicitly. Explicit methods present search results based on information that users provide about themselves such as through providing feedback or making relevance judgments, while implicit methods infer user preferences from their actions (Hearst, 2009). Both of these methods aim to understand more about the user's context so as to provide more appropriate search results on an individual basis. Both methods have their drawbacks, as explicitly providing information may be seen as too time-consuming and users may not take advantage of the personalization features, and implicit methods may be inaccurate in their predictions (Hearst, 2009).

Implicit methods

Ontological profiles can be developed implicitly to model users and their search context

for personalized search. Mohammed, Duong & Jo (2010) used an ontological user profile describing the user's context to personalize search results in an empirical study that generated profiles based on users' search histories gathered over a period of time. This included such information as time spent on particular pages, frequency of visiting a particular page and tracing how users moved from page to page. The profile also used a reference ontology that was created to understand how documents were related conceptually. Through aligning the search history profile and the reference ontology, the system returns personalized search results. Other approaches use browsing history and collaborative filtering, which weights the active user in comparison to past users as part of its algorithm (Sugiyama et al., 2004).

Explicit methods

Explicit personalization requires purposeful input from the user, and has been explored in the context of web interfaces and search engines. The customization of web portals allows users to specify the information they would like to see on their home page, such as weather reports, sports team's updates or news (Manber, Patel & Robison, 2000). Personalized search that incorporates relevance feedback from users was shown to improve the quality of search results for individual users as compared to the normal web ranking (Teevan, Dumais & Horvitz, 2007). While these results were promising, explicit personalization may not be practical. A study on user customization of the Yahoo! web portal found that few users actually used the customization features, and may not have understood the benefit of customizing the interface (Manber, 2000).

2.4.3 Summary

As described in the two earlier sections, search results can be improved in several ways including adding context about the document to allow the user to more readily choose relevant items, extracting information based on the query, or by using information about the user to preferentially rank search results according to their preferences or interests. While these methods have been shown to improve user performance, they do not address the context in which the user is operating. As mentioned in section 2.3.4, user tasks bridge the gap between the behavioural aspects of information searching and the system aspects of information retrieval. Customizing search results based on task is a novel approach to helping users to navigate the large amounts of information available on the web. Because the task examined in this study involves gathering many pieces of data and information, designing a task specific e-Card that would extract the necessary information and present it at the top of a set of conventional search results may be an appropriate way to support this task.

2.5 Conclusions

This research explores the idea of task-based search results through analyzing a single task performed in the coastal and ocean management domain. Previous research shows that there is a need for information from many domains to satisfy the economic, environmental, and social requirements of ICOM; however this information is often distributed among many sources. Management decisions in this domain require information from multiple domains, and there is a need for access to reliable and accurate data and information to facilitate effective decision-making. Solutions to the problem of

accessing a variety of distributed information have frequently taken the form of digital repositories and are focused on spatial data. Improving access to ICOM-related information available on the web has yet to be explored.

Information seeking behaviour models have provided frameworks about how to think about solving information problems in specific domains, but they operate at such a high level that they are not specific enough for information system design. Additionally, they are frequently developed by studying students or academics and may not be applicable to professional settings. An alternative approach is to understand user tasks. Information task frameworks are embedded in both the information seeking behaviour models and information searching models, are tied to the work activities of a professional, and operate at a fine enough scale to provide enough detail to make recommendations for information systems. Elements of a task that could be used in information design include the information required to complete the task, the information sources consulted, and any conditions that must be satisfied.

Once the information task is understood, supporting the information search activities that it causes may be addressed. Customizing search results can be used to support web-based searching activities, and the information, sources and conditions of the task can be used to create a set of rules that the system may then use to generate a task-based search. Generating task-based search results is a novel concept that has not been explored much to date.

In this research, understanding the elements associated with the task of "getting an overview" that is performed by ICOM managers will not only create a set of rules that may be used in the design of a customized search tool, but will also work towards solving a more generalized problem of accessing distributed topic-specific information on the web. In light of the characteristics of this task, an adaptation of the "instant answers" concept used by Bing will be explored, which for the purposes of this study is called an *e-Card*. The e-Card would be presented along with normal search results and contain relevant extracted information about a local area for the purposes of giving the user an overview with respect to a particular topic. These results would be linked to their source documents and provide a way of quickly accessing more in depth information on the extracted elements. In this way it would bring together distributed information from a variety of sources in support of a particular task.

CHAPTER 3 RESEARCH QUESTIONS AND DESIGN

3.1 OVERVIEW

3.1.1 Research Questions

The relationships between the work context, information-seeking behaviour and information searching have been well established in the literature, but there have been few attempts to put theory into practice and explore the components and requirements that make up a real-world task. By examining the context surrounding a single information-centric task, we will better understand the information requirements, information sources, and conditions ICOM managers use to generate an overview of a topic to identify the detailed elements of a specific task. This research used the ICOM domain as a real-world example because of the importance of geographically specific information, and the variety of information needed for integrated coastal and ocean management. In order to support this task, it was necessary to understand both the context of the larger work task and the conditions of the search task. As described in earlier research, the *getting an overview* task requires a variety of facts and basic information from several different sources. For this study, an e-Card was proposed as a customized search tool to support this task. This investigation sought to identify a suite of coastal characteristics that were used by coastal managers to generate an overview of a topic or geographic area as well as reliable sources where these characteristics may be found. These characteristics would become the content of the e-Card, and the sources would be used by an information system to provide that information. The e-Card is thus based both on the task at hand, and on the expertise of a set of professionals.

The research was designed to address the following questions:

1) What information is required to perform the task of *getting an overview* in the ICOM domain, and do different professional roles require different information?
2) What sources are consulted when performing this task?
3) Can information from other areas be an acceptable substitute for local information?
4) How could an e-Card be designed in order to support this task?

3.1.2 Research Overview

The approach taken for answering these questions involved simulating the task by asking participants to identify the characteristics of a coastal area that they would use to get an overview of a specific topic. The research took place in two phases due to the need to validate both the list of topics and a list of coastal characteristics for participants to pick from. The first phase (Phase I) involved developing a list of topics and characteristics, which were then reviewed and expanded upon by participants in a focus group. The second phase (Phase II) answered the research questions through the use of a questionnaire delivered in person and on the web. The questionnaire for Phase II explored several variables including the coastal topics and characteristics from Phase I, as well as information sources, information types, possible substitutes for local information and professional roles. The variables are discussed in detail in section 3.2.

3.2 VARIABLES

In the process of responding to the research questions, selected variables were examined:

Coastal topic

Coastal topics were investigated as an independent variable for both Phase I and Phase II. Coastal management is a broad field that may encompass many different occupations that deal with any number of coastal management issues. The coastal topics selected were drawn from the emerging issues identified by the Gulf of Maine Council (2011), and Nova Scotia's Priority Coastal Issues (Province of Nova Scotia, 2007), and they were meant to reflect actual topics addressed by coastal management professionals in their work lives. This variable is described in greater detail in sections 4.2.1 and 7.2.1.

Coastal characteristic

Coastal characteristics were investigated as dependent variables for both Phase I and Phase II. Coastal characteristics are individual pieces of information about a particular coastal area, and they were defined as facts (measurements or other basic information) that could be presented as a value, in a list, or on a map. Coastal characteristics were divided into eight thematic categories to help participants to conceptualize the different types of characteristics being investigated, and to think of additional characteristics that would fit into each category. This variable is described in greater detail in sections 4.2.2 and 7.2.2.

Information types

This was examined as a dependent variable to understand if different information types were more suitable for different topics. Through analysis of the interview data from a previous study (Toms, in progress), a list of types of information used by coastal managers was compiled, and included items such as maps, real-time data, journal articles, fact sheets and grey literature (see Appendix G). This variable is explained in greater detail in section 4.2.3.

Role type

Role type was used as an independent variable in Phase II. Eleveld et al. (2003) conducted a user requirements study as part of the establishment of a coastal and marine data warehouse, and found that professionals with different functions had different of information needs in terms of aggregation and interpretation. Additionally, Leckie et al. found that one professional may occupy different roles as part of their job and this has an influence on the work tasks that they undertake. The results from Phase II were analyzed to investigate whether there were differences in the coastal characteristics selected between different role types.

After selecting a topic, the questionnaire asked participants to describe a memorable activity that they had worked on with respect their chosen topic, including describing their role and the output. Through secondary analysis of the role and activity described, the participants were divided into two different groups: those who were mainly focused on a fieldwork activity, and those who were mainly focused on a management activity.

Fieldwork roles involved actively collecting data in the field, managing those who were actively working in the field, or supervising a fieldwork based project. *Management roles* involved making decisions, planning, policy development and analysis, or interactions with stakeholders.

Information Sources

Information sources were investigated as a dependent variable in Phase II. Participants were asked about the information sources that they used, in two separate questions. First, in the demographics questionnaire, they were asked which sources were consulted most often. Second, when participants were selecting coastal characteristics, they were asked to provide any sources that they might consult to find this information.

Substitute Information

Substitute information was investigated as a dependent variable in Phase II. Local information may not always be available, so it is important to find out if there are acceptable substitutes, whether through different levels of aggregation, or from regions with similar ecologies. Three alternatives to local information were proposed in the questionnaire: regional information, provincial/state information, and information from a similar geophysical area (geology and climate). Participants were also encouraged to identify new sources of substitute information.

3.3 Research Phases

3.3.1 Overview

The research took place in two phases:

Phase I:

The objective was to validate the characteristics of the task, and confirm the topics that would be used in Phase II. A focus group assessed and augmented a preliminary list of coastal topics and coastal characteristics.

Phase II:

The objective of this phase was to collect data from a group of environmental managers to answer the research questions. A survey was delivered using two methods: in person and through the web.

An application to the Dalhousie Social Sciences Research Ethics Board for both phases was submitted in early December 2010, and final approval was obtained on December 15th, 2010 (see Appendix A).

3.3.2 Phase I

Phase I had three objectives:

1) To develop a comprehensive list of coastal management topics that would be relevant to the experience of a wide range of ICOM professionals.

2) To compile a comprehensive list of coastal characteristics that could be used to describe a coastal area with respect to the aforementioned ICOM topics

3) To explore whether certain types of information were used more commonly for different ICOM topics.

The data in Phase I was collected through an informal focus group, and participants were drawn from a coastal management graduate program at Dalhousie University. The methods, results, discussion and conclusions for Phase I are described in Chapters 4 -6. The output from Phase I reduced the list of coastal topics from nine to seven, created a more comprehensive list of coastal characteristics by adding 6 characteristics, ten others were added after reviewing earlier research, and some characteristics were moved to other categories after reviewing the expanded list. The results from Phase I also contributed to a condensed list of information types, and were incorporated into the decision to limit the questionnaire to a single topic.

3.3.3 Phase II

The objective of this phase was to use the instruments refined in Phase I to address the research questions identified in 3.1

The methods, results, discussion and conclusions of Phase II are presented in Chapters 7-10. The data collection instrument used in Phase II was a questionnaire that asked participants to identify which local coastal characteristics would give them a general overview of a coastal management topic, which sources they would use to access this

information, and whether there was an acceptable substitute for local information. Participants in Phase II were coastal management professionals who answered the questionnaire either on-the-web or in person.

The location of the chapters reporting on each phase, and the appendices containing the consent forms, demographics questionnaires, and primary data collection instruments for Phase I and Phase II, are summarized in Table 1.

Table 1 Location of thesis sections for Phase I and Phase II

Data collection documents and thesis chapters	**Section**
Ethics Approval	Appendix A
Ethics application	Appendix B
Phase I	
Methodology	Chapter 4
Results	Chapter 5
Discussion and Conclusions	Chapter 6
Recruitment Letter	Appendix C
Consent form	Appendix D
Demographics questionnaire	Appendix E
Questionnaires	Appendix G
Focus group script	Appendix F
Phase II	
Methodology	Chapter 7
Results	Chapter 8
Discussion	Chapter 9
Conclusions	Chapter 10
Recruitment Letter	Appendix H
Consent form	Appendix I
Demographics questionnaire	Appendix J
Online questionnaire	Appendix K
In-person participant questionnaires	Appendix L
Researcher script for in-person questionnaire	Appendix M

CHAPTER 4 PHASE I METHODS

4.1 PHASE I OVERVIEW

The first phase of the study employed a focus group of seven individuals (i.e. N=7). They were asked questions addressing a list of coastal topics and coastal characteristics compiled by the principal investigator. Comments from participants also assisted in assessing how many topics could be considered simultaneously during Phase II. Quantitative and qualitative data were collected. The results from this phase were incorporated into the design of the data collection instrument for Phase II.

A web-based questionnaire was attempted initially, but after the first week only one partial response had been logged, which made it necessary to adapt the questionnaire to be delivered orally in a group setting. The web-based questionnaire was active between February 17-28, 2011 and the focus group was interviewed on March 9, 2011.

4.2 INITIAL DEVELOPMENT OF COASTAL TOPICS AND CHARACTERISTICS

To accomplish the objectives for Phase I (see section 3.3.2), three key variables were examined:

a) coastal topic as an independent variable, and

b) coastal characteristics and information type as dependent variables.

The variables were described in detail in section 3.2. The following three sections describe how the initial list of coastal topics, characteristics and information types were developed for the questionnaire.

4.2.1 Coastal Topics

Coastal topics needed to be general enough to allow for a broad range of participants, but also needed to be relevant to current and future coastal management scenarios. The selection of coastal topics and coastal characteristics began by consulting the literature and web-based ICOM resources, and reviewing the results of a previous study on the information behaviours of coastal and ocean managers conducted in the summer of 2010. Coastal topics were drawn from the emerging issues identified by the Gulf of Maine Council (Wells, 2010), and Nova Scotia's Priority Coastal Issues (CBCL & Nova Scotia, 2009). A combined list of topics that would permit a wide variety of coastal professionals to respond was compiled and included:

1. Water quality
2. Coastal and marine habitat protection
3. Coastal and marine development
4. Sea level rise and storm events
5. Contaminants
6. Fisheries management
7. Biodiversity
8. Eutrophication
9. Ecosystem health

4.2.2 Coastal Characteristics

Coastal characteristics were individual pieces of information that could be collected about a given coastal area that had the potential for quick overviews, and thus were simple to display. As such, they were defined as facts, measurements, or other basic information that could be presented as simple values, in list format or on a map. The initial list of characteristics was generated from the analysis of interview data from a previous study (Toms, in progress), websites of regional coastal management organizations (Gulf of Maine Council, 2011; Chesapeake Bay, 2010; Province of Nova

Scotia, 2010, Fisheries and Oceans Canada, 2007), and a paper on significant habitats of Nova Scotia (McCullogh et al., 2005).

The final list of characteristics consisted of 55 items that were divided into eight thematic categories to assist participants in assessing the list of items (see Table 2). The eight categories included: general information, climate and weather, biological and chemical, physical measurements, species and habitat, human activity, legal, regulatory, and policy, and fisheries information. The general information category contained any information that did not readily fit into the other categories (Table 2). The initial list of coastal topics and characteristics was shown to a local subject expert for review. The expert assessed the list of topics and added two characteristics.

Table 2 Eight thematic categories and associated coastal characteristics used during Phase I.

Category	Coastal characteristics	
General	• Latitude/Longitude • Map of the area • List of municipalities in the area • Ecodistrict type of land area	• Area of the water body • Mean depth of the water body • Watershed size • Relief of land area
Climate and Weather	• Wind speed • Wind direction • Air temperature	• Ice coverage • Precipitation • Storm patterns
Biological and Chemical	• Wildlife and fish species present • Endangered species present • Microbial pathogens	• Nutrient levels • Plankton measurements • Contaminant levels
Physical Measurements	• Sea surface temperature • Salinity • pH • Current measurements • Tidal range of an inlet/bay • Tidal volume of an inlet/bay	• Sediment data • Water levels • Water conductivity • Dissolved Oxygen • Volume of outflow • Erosion rates • Secchi depth
Species and Habitat	• Population estimate • Predators • Mortalities	• Map of species distribution in area • Salt marshes • Eelgrass
Legal and Regulatory	• Level of government and department with regulatory power • List of applicable legislation and regulations	• Marine/Coastal protected areas • Park boundaries
Human Activity	• Population demographics • List of fisheries operating in the area • List of coastal community groups in the area • Aquaculture sites	• Wharves • Average income • Population density • Employment density
Fisheries	• Regulatory limits of harvest • Annual landings of a specific fishery	• Number of fishing licenses • Season open and closure dates

4.2.3 Information Types

Through analysis of the interview data from a previous study (Toms, in progress), a list of types of information needed by coastal managers was compiled. To get an idea of whether there were types of information that were clearly useful for different topics, a table that allowed participants to check which information they would use to explore each topic. The information types used were:

- Real-time Data
- Aggregated Data
- Statistics
- Journal Articles
- Grey Literature
- Research Reports
- News Articles
- Laws or Statutes
- PDF or paper maps
- GIS layers
- Fact sheet

4.3 Instrument and Protocol

The following describes the content of each of the five sections of the research instrument.

4.3.1 Demographics Questionnaire

Each participant was given a demographics questionnaire to fill out (see Appendix E). Participants provided information on their age, level of education, and work experience. The completed form was placed in the participant's folder.

4.3.2 Coastal Topic Questionnaire

This section of the questionnaire consisted of a sheet containing a list of 9 coastal topics (see section 4.2.1) and space for participants to write down additional topics. Participants

were instructed to review the list and add missing topics. The sheet given to participants may be found in Appendix G.

4.3.3 Single-theme Questionnaire: Parts A and B

The single-theme questionnaire asked participants to select one of the 9 coastal topics from the previous questionnaire, or provide a new one. Participants were then instructed to imagine that they were beginning a new project involving their chosen topic in an area unfamiliar to them and that they wanted to get a preliminary understanding of the local area with respect to their topic.

The questionnaire consisted of two sets of eight checklists. Each checklist contained the characteristics from one category, such as Climate and Weather (Table 2). Participants went through the first set of checklists and selected the characteristics that would help them to get a preliminary understanding of the local area with respect to their topic and the natural environment (see Figure 1). The second set of checklists contained the same categorized lists, but the participants selected the characteristics to help them understand their topic with respect to the human impacts. The complete questionnaire presented to participants is found in Appendix G.

Which of the following would you need to gather to get a baseline understanding of the natural environment with respect to your chosen issue on the local area? Please check all characteristics that you would need for each.

General	Natural Environment
Latitude/Longitude	☐
Map of the area	☐
List of municipalities in the area	☐

Figure 1 Sample checklist from one-theme questionnaire. The other 7 checklists had the same format but contained their own characteristics.

4.3.4 Two-theme Questionnaire

The two-theme questionnaire asked participants to select a different topic than they had chosen for the one-theme questionnaire, but participants were allowed to provide a new topic. They then were asked to imagine that they were beginning a new project involving their chosen topic in an area unfamiliar to them, for which they wanted to get a preliminary understanding with respect to their topic.

They were presented with the same question and eight categorized checklists of characteristics found in the single theme questionnaire, but were asked to simultaneously consider the human impacts and the natural environment (See Figure 2) when selecting characteristics. The complete questionnaire used for the focus group is found in Appendix G.

Which of the following would you need to gather to get a baseline understanding of the natural environment and the human impacts with respect to your chosen issue on the local area? Please check all characteristics that you would need for each.

General	Natural Environment	Human Impacts
Latitude/Longitude	☐	☐
Map of the area	☐	☐
List of municipalities in the area	☐	☐

Figure 2 Sample checklist of the two-theme questionnaire. The other 7 checklists had the same format but contained different characteristics.

4.3.5 Information Type by Topic

This section of the questionnaire consisted of a table of information types by topic (see Appendix G). Participants would use check marks to indicate which types of information would be suitable for which topics. The purpose of this part was to see if there were any obvious types of information that were unsuitable for understanding coastal management topics.

4.4 PARTICIPANTS

4.4.1 Recruitment

Participants were recruited from a graduate program at Dalhousie with a curriculum that focuses on Coastal and Ocean Management (COM). The program was chosen because of the ICOM focus, and because its students frequently have professional experience in the

field in addition to the experience gained through their studies. Students were contacted via an email distributed on the student listserv, which invited the students to attend a pilot study where lunch would be provided and an honorarium would be given for participation (see Appendix C).

4.4.2 Description of Participants

Seven individuals participated in the focus group. The participants included two males and five females. Six participants (86%) were between the ages of 20 and 29, and one participant (14%) was between the ages of 30 and 39.

Participants provided their level of education and major areas of study. Six participants (86%) had been awarded Bachelor's degrees and one participant (14%) had been awarded a Masters degree. Four of the seven participants indicated the major area of study for their completed degrees. Two had majored in marine biology, one had majored in chemistry, and one had majored in history and English.

Six of the seven participants specified their relevant employment history as researchers, managers of resources, managers of teams, support staff and policy-makers. Three of the participants had been employed as researchers, one had been employed as support staff, and two had no experience in any of the listed roles. One of the participants who had experience as a researcher had also managed a team and been employed as support staff. Three of the four participants who had work experience indicated the duration of their employment, two with 2 to 5 years of work experience, and one with less than one year of experience. Participants also indicated where their work experience had occurred,

which across all participants included Atlantic Canada, British Columbia, Central America and Europe.

4.5 Procedure

The original data collection instrument was a web-based questionnaire available online from February 17 - 28, 2011. One partial response was recorded during this time, so the survey was adapted for verbal delivery in a focus group setting. All data reported is from the focus group.

4.5.1 Pre-Focus Group

Prior to the focus group, a numbered paper file for each participant was created. These files contained two copies of the consent form, one demographics questionnaire, one coastal topic questionnaire, one single-theme questionnaire, one two-theme questionnaire, and one table of information type by topic.

4.5.2 Focus Group

The focus group was conducted in a structured fashion and had five sections:

Presentation and Consent Form

Participants listened to a brief 10 minute presentation and read and signed the consent form (see Appendix D).

Demographics Questionnaire

Participants filled out the demographics questionnaire (Appendix E).

Coastal Topic Questionnaire

Participants were given instructions on how to complete the coastal topic questionnaire as described in section 4.3.2 and in Appendix G. After participants filled out the questionnaire, the principal investigator facilitated a discussion about the list of topics and the answers provided by the group.

Coastal Characteristics Questionnaires

Participants were given instructions on how to complete the single-theme questionnaire as described in section 4.3.3 (Appendix G). Immediately afterwards, participants were given instructions on how to complete the two-theme questionnaire as described in section 4.3.4 (Appendix G). After participants had filled out both questionnaires, the principal investigator facilitated a discussion about the list of characteristics and the answers provided by the group. Participants were also asked to comment on whether the two-theme questionnaire was significantly more difficult to complete than the one-theme questionnaire.

Information Types

Participants were presented with the table of information types by topic (see Appendix G). They were asked to indicate, using check marks, which types of information would be suitable for which topics.

4.5.3 Data Analysis

The objective of this phase was to create comprehensive and understandable lists of

coastal topics and characteristics. After the focus group, the data from the completed questionnaires and the notes from the discussion were entered into Microsoft Excel spreadsheets, including additional characteristics and comments on the coastal topics. Tables reporting the selection of individual topics and characteristics were created, and characteristics provided by participants were added to the tables to complete the list. The table summarizing the information types used for different topics was also created. Key points relevant to each objective from the discussion were identified and summarized.

CHAPTER 5 PHASE I RESULTS

5.1 INTRODUCTION

This chapter presents the results of Phase I in three sections. The data from this Phase was used to inform the design of the survey for Phase II. The results are presented as summaries and key points, as the main goal of this phase was to validate and complete the lists of coastal topics and coastal characteristics, and test the administration of the instrument.

5.2 COASTAL MANAGEMENT TOPICS

5.2.1 Topic Selection

Participants were presented with a list of nine coastal management topics and were asked to select two topics that they were familiar with, as the topics would be used to frame participants' selection of characteristics for both the one-issue and two-theme questionnaires. Because each participant chose two topics, there were 14 instances of topic selection. Participants were allowed to use a topic that was not on the list if it better reflected their personal experience. The topics selected by participants are summarized in Table 3. Fisheries management was selected by the highest number of participants. Only four of the eight topics selected (50%) were on the original list of topics (shown in bold), the remaining four being generated by the participants.

Table 3 Topics selected by participants.

Topics	**#**
Coastal development	**2**
Coastal erosion	1
Fisheries management	**4**
Marine conservation of species	1
Public Access	1
Sea level rise	**1**
Water quality	**3**
Wind energy	1
Total	**14**

*The number column indicates the number of participants who selected a topic.

5.2.2 Topic Group Discussion

Participants reviewed the list of nine coastal management topics and were asked if the list of topics was complete. They were instructed to add any topics that they thought were missing. Afterwards, a discussion was held about the list of topics, and whether or not the topics were sufficiently broad to apply to a diverse group of respondents. The key items discussed during the session were:

- There were questions about what the scope of the topics were (i.e. how general they were supposed to be), and some participants expressed concern that selecting characteristics for a topic that was too broad would be difficult.
- There was discussion among participants about whether some topics were actually subtopics of others. For example, eutrophication could be considered a subtopic of water quality.
- One participant suggested that a list of topics which included more specific subtopics would help participants to choose the topic that best reflected their experience, and also help them in selecting characteristics by allowing them to

focus on a smaller scale topic when choosing characteristics. For example, Coastal development could include coastal setbacks, tidal power and wharf construction as subtopics.

5.2.3 Summary

The discussion focused on how general the topics were meant to be. One participant suggested using broad topics, but including subtopics for each one, which would allow participants to focus on a subtopic when choosing characteristics, and would prevent the need for coding participant generated topics during data analysis.

5.3 Coastal Characteristics

5.3.1 Coastal Characteristic Selection

This phase validated and expanded the list of characteristics that might apply to those topics. The selection frequencies for both themes, i.e., whether it applies to the natural environment or has human impacts are reported in Table 4. For both the one-theme and two-theme questionnaires, participants were asked to choose a coastal management topic, and then to select characteristics from a list that would help them to understand that topic with respect to the natural environment and the human impacts. The frequencies of selection of each characteristic for understanding the Natural Environment and the Human Impacts across all topics are summarized in Table 4. Participants chose two different topics for the one-theme and two-theme questionnaires, so each characteristic had the potential to be selected a maximum of 14 times for the Natural Environment theme (N=14 in Table 4.). One participant did not fill out the section of the questionnaire for human impacts for one topic, so the characteristics could be selected a maximum of

13 times for the Human Impacts theme (N=13 in Table 4).

Table 4 Characteristic selection frequencies for the Natural Environment and Human Impacts themes.

Characteristic	Natural environment (N=14)		Human Impacts (N=13)		Natural Environment and Human Impacts (N=27)	
	N	%	N	%	Total N	Total %
CLIMATE AND WEATHER						
Wind speed	6	43%	0	0%	6	22%
Wind direction	6	43%	0	0%	6	22%
Air temperature	7	50%	2	15%	9	33%
Ice coverage	6	43%	2	15%	8	30%
Precipitation	8	57%	1	8%	9	33%
Storm patterns	14	100%	5	38%	19	70%
LEGAL AND REGULATORY						
Level of government and department with regulatory power	9	64%	10	77%	19	70%
List of applicable legislation and regulations	9	64%	11	85%	20	74%
Marine/Coastal Protected Areas	9	64%	8	62%	17	63%
Park Boundaries	9	64%	8	62%	17	63%
BIOLOGICAL AND CHEMICAL						
Wildlife and Fish species present	11	79%	5	38%	16	59%
Endangered species present	10	71%	6	46%	16	59%
Microbial pathogens	7	50%	5	38%	12	44%
Nutrient Levels	9	64%	8	62%	17	63%
Plankton measurements	7	50%	1	8%	8	30%
Contaminant Levels	12	86%	11	85%	23	85%
HUMAN ACTIVITY						
Population demographics	6	43%	6	46%	12	44%
List of fisheries operating in the area	5	36%	6	46%	11	41%
List of coastal community groups in the area	5	36%	6	46%	11	41%
Aquaculture sites	8	57%	8	62%	16	59%

Characteristic	Natural environment (N=14)		Human Impacts (N=13)		Natural Environment and Human Impacts (N=27)	
	N	%	N	%	Total N	Total %
Wharves	5	36%	6	46%	11	41%
Average income	2	14%	1	8%	3	11%
Population density	5	36%	7	54%	12	44%
Employment density	2	14%	2	15%	4	15%
FISHERIES						
Regulatory limits of harvest (Total allowable catch)	4	29%	5	38%	9	33%
Annual landings of a specific fishery	3	21%	4	31%	7	26%
Number of fishing licences (per species)	3	21%	4	31%	7	26%
Season open and closure dates	4	29%	4	31%	8	30%
SPECIES AND HABITAT						
Population estimate	7	50%	6	46%	13	48%
Predators	6	43%	4	31%	10	37%
Mortalities	8	57%	6	46%	14	52%
Map of species distribution in area	10	71%	6	46%	16	59%
Salt marshes	5	36%	6	46%	11	41%
Eelgrass	4	29%	5	38%	9	33%
PHYSICAL						
Sea surface temperature	8	57%	6	46%	14	52%
Salinity	6	43%	4	31%	10	37%
pH	7	50%	6	46%	13	48%
Current measurements	9	64%	2	15%	11	41%
Tidal range of an inlet/bay	8	57%	1	8%	9	33%
Tidal volume of an inlet/bay	6	43%	0	0%	6	22%
Sediment data (concentration, load, particle size)	7	50%	3	23%	10	37%
Water levels	8	57%	3	23%	11	41%
Water conductivity	4	29%	0	0%	4	15%
Dissolved Oxygen	8	57%	4	31%	12	44%
Volume of outflow (river/estuary)	7	50%	2	15%	9	33%
Erosion rates	6	43%	5	38%	11	41%
Secchi depth	3	21%	0	0%	3	11%

Characteristic	Natural environment (N=14)		Human Impacts (N=13)		Natural Environment and Human Impacts (N=27)	
	N	%	N	%	Total N	Total %
GENERAL						
Latitude/Longitude	5	36%	1	8%	6	22%
Map of the area	11	79%	5	38%	16	59%
List of municipalities in the area	7	50%	6	46%	13	48%
Ecodistrict type of land area	6	43%	2	15%	8	30%
Area of the water body	7	50%	1	8%	8	30%
Mean depth of water body	6	43%	2	15%	8	30%
Watershed size	5	36%	3	23%	8	30%
Relief of land area	4	29%	3	23%	7	26%
ADDITIONAL CHARACTERISTICS PROVIDED BY PARTICIPANTS						
Industrial activities						
Recreational activities						
Coastal access points						
Sewage treatment facilities						
Beaches						
Thematic maps						

*The Total Selected column is the sum of the Selected columns for the Natural Environment and Human Impacts headers. Total Percent column is the Total Selected value divided by the Combined N (27)
**The N for Human Impacts is 13 because one participant did not fill out that part of the questionnaire for one of their chosen topics.

5.3.2 Coastal Characteristic Group Discussion

A discussion was held after participants had completed both questionnaires. Participants were asked whether there were any additional characteristics that they would need, and were given the opportunity to comment on the comprehensiveness and usefulness of the list of characteristics. The key points that were raised during the completion of the questionnaires and in the discussion were:

- There were many questions about what was meant by the human impacts, and many participants appeared unsure of how to choose characteristics for that question.

- The participants found it helpful to understand their task if it was described as generating a "first impression" of the area because this clarified that the characteristics were meant to provide a preliminary characterization of the area rather than an in-depth description.
- Participants felt that the suite of characteristics was appropriate for coastal management and added several characteristics: industrial activities, recreational activities, coastal access points, sewage treatment facilities, beaches and thematic maps (Table 4).

5.3.3 Simultaneous Consideration of Two Themes

Participants were asked after completing both the one-theme and two-theme questionnaires whether it was reasonable to select characteristics for two topics simultaneously based on their experience with each questionnaire.

- All participants expressed the opinion that considering two topics at the same time was somewhat confusing and that they would prefer to think about topics one at a time.

5.3.4 Summary

All characteristics were selected for at least one coastal management topic. Six new characteristics, 4 of which involved human activity were added by participants. All participants felt that it was easier to choose characteristics for one topic at a time.

5.4 Information Type Selected by Topic

Participants were presented with a blank table that had eleven different information types

in the Y axis, and eight different topics in the X axis (see Appendix G). They were instructed to indicate with a check mark which types of information were suitable for use in each topic. The responses of participants (N=7) who selected each type of information for each topic are summarized in Table 5. Information types that were selected by 50% or more of the participants (>3) are starred. All information types were selected for all topics, with the exception of real-time data, which was not selected by any participants for coastal development. Journal articles, grey literature, research reports, aggregated data and fact sheets were chosen by >50% of the participants for seven or more of the eight topics. These information types are highlighted in grey in Table 5. Participants chose a variety of information types for each topic. For most topics, at least seven of the information types were selected by >50% of the participants, however ecosystem health and eutrophication had only 5 and 6 information types, respectively, that fit this criteria.

Table 5 Information type suitable for each topic

Type of information	Topic			
	Coastal Development	**Water Quality**	**Fisheries Management**	**Wildlife or Fish Habitat**
Real-time Data	0 (0%)	3 (43%)	5 (71%)*	1 (14%)
Aggregated Data	3 (43%)	7 (100%)*	6 (86%)*	4 (57%)*
Statistics	3 (43%)	4 (57%)*	6 (86%)*	3 (43%)
Journal Articles	6 (86%)*	6 (86%)*	5 (71%)*	5 (71%)*
Grey Literature	7 (100%)*	7 (100%)*	7 (100%)*	6 (86%)*
Research Reports	4 (57%)*	7 (100%)*	7 (100%)*	7 (100%)*
News Articles	4 (57%)*	2 (29%)	3 (43%)	2 (29%)
Laws or Statutes	7 (100%)*	5 (71%)*	6 (86%)*	4 (57%)*
PDF or Paper maps	3 (43%)	3 (43%)	4 (57%)*	5 (71%)*
GIS layers	5 (71%)*	3 (43%)	3 (43%)	4 (57%)*
Fact sheet	6 (86%)*	6 (86%)*	5 (71%)*	5 (71%)*

Table 5 Information type suitable for each topic (cont'd)

Type of information	Topic			
	Contaminants	**Ecosystem Health**	**Eutrophication**	**Sea Level Rise / Storm Events**
Real-time Data	4 (57%)*	2 (29%)	3 (43%)	3 (43%)
Aggregated Data	6 (86%)*	4 (57%)*	6 (86%)*	4 (57%)*
Statistics	5 (71%)*	2 (29%)	4 (57%)*	5 (71%)*
Journal Articles	5 (71%)*	4 (57%)*	6 (86%)*	5 (71%)*
Grey Literature	6 (86%)*	5 (71%)*	6 (86%)*	6 (86%)*
Research Reports	6 (86%)*	6 (86%)*	7 (100%)*	6 (86%)*
News Articles	4 (57%)*	1 (14%)	2 (29%)	2 (29%)
Laws or Statutes	4 (57%)*	3 (43%)	3 (43%)	1 (14%)
PDF or paper maps	3 (43%)	1 (14%)	3 (43%)	6 (86%)*
GIS layers	2 (29%)	2 (29%)	2 (29%)	4 (57%)*
Fact sheet	6 (86%)*	5 (71%)*	5 (71%)*	6 (86%)*

CHAPTER 6 PHASE I DISCUSSION AND CONCLUSIONS

6.1 Overview

The intent behind Phase I was to validate and complete the lists of coastal management topics and coastal characteristics. Input from participants on the completeness of the lists of topics and characteristics, and the design of the questionnaire was gained through group discussion and review of the data from the questionnaire. The original lists of coastal topics and characteristics were modified somewhat on the basis of this initial work.

6.2 Coastal Topics

There were four instances where participants provided their own topic rather than choosing from the list. This added to the number of topics that were examined in this phase. Analyzing characteristic selection for different topics was planned for Phase II, and increasing the number of topics could interfere with this analysis, so it was advisable to limit the potential number of topics. The group discussion about the range of selected topics focused on how broad the topics needed to be to allow a diverse group of professionals to participate in the study, but also be narrow enough so that the selected characteristics were meaningful. Because some topics were encompassed by other topics, the original list needed to be revised so that there was as little overlap as possible. This potentially increased the likelihood that differences in characteristics needed for each topic would be more discernible. The suggestion made by one participant of using broad

general topics and including lists of subtopics seemed to be the best option because it would allow the researcher to define a finite number of topics, provide the participant with some examples to help with their selection, allow them to focus on a subtopic when choosing characteristics, and prevent the need for coding participant generated topics during data analysis.

The original and revised list of coastal management topics is found in Table 6. Two topics were removed because eutrophication was considered by participants to be a subtopic of water quality and ecosystem health could be considered a subtopic of biodiversity or habitat protection. Biodiversity was expanded in scope to include species management.

Table 6 Coastal management topics for Phase I and Phase II

Phase I Coastal Management Topics	**Phase II Coastal Management Topics**
Water quality	Water quality
Coastal and marine habitat protection	Coastal and marine habitat protection
Coastal and marine development	Coastal and marine development
Sea level rise and storm events	Sea level rise and storm events
Contaminants	Contaminants
Fisheries management	Fisheries management
Biodiversity	Biodiversity and species management
Eutrophication	
Ecosystem health	

6.3 Coastal Characteristics

All characteristics were selected for at least one coastal management topic, so none of the characteristics from the original group were removed from the list. The group discussion after the characteristic selection questionnaires focused on whether the current list was

adequate. While participants indicated that they thought the characteristics were appropriate for coastal managers, they also provided additional characteristics that they felt they would use to understand a topic. The characteristics suggested by participants primarily involved human activities, and were more oriented towards land uses and less oriented towards facts than many of the characteristics initially selected for the study, which indicates that there is a need to revisit the list of characteristics by consulting the sources used to compile the original list, and perhaps re-categorizing some characteristics.

Despite the general confusion over what was meant by "understanding the human impacts with respect to the chosen topic", participants were able to complete both the one-theme and the two-theme questionnaires. However, when asked to compare their experiences with the two questionnaires, there was a consensus among participants that selecting characteristics for two themes at once was challenging and that it was easier to think of one theme at a time.

The revised list of characteristics that was developed for use in Phase II is found in Table 7. The 20 new characteristics that were added to the list are in bold, three characteristics that were moved from another category are italicized and four characteristics that were inadvertently omitted from the in-person questionnaire in Phase II are starred. The omitted characteristics were removed from analysis.

Table 7 Revised list of coastal characteristics after analysis of the results from Phase I

Category	Coastal characteristics	
General	• Latitude/Longitude • Map of the area • List of municipalities in the area • Ecodistrict type of land area • **Rivers** • **Map of the area by use or activity** • **Contact information for subject expert**	• Area of the water body • Mean depth of the water body • Watershed size • Relief of land area • **Beaches** • **Contact information for local expert** • **Buoy locations**
Climate and Weather	• Wind speed • Wind direction • Air temperature	• Ice coverage • Precipitation • Storm patterns
Biological and Chemical	• Microbial pathogens • Contaminant levels	• Nutrient levels • Plankton measurements
Physical Measurements	• **Bathymetry** • Sea surface temperature • Salinity • Water pH • Current measurements • Tidal volume of an inlet/bay • Tidal range of an inlet /bay* • Erosion rates	• Sediment data • **Wave data** • Water levels • Water conductivity • Dissolved oxygen • Volume of outflow of a river or estuary • Secchi depth
Species and Habitat	• *Wildlife species present* • **Fish species present** • Population estimate • Predators* • Mortalities • **Migration patterns**	• Map of species distribution in area • Salt marshes • Eelgrass • *Endangered species present*
Legal and Regulatory	• Level of government and department with regulatory power • List of applicable legislation and regulations • **Wetland policies**	• Marine/Coastal protected areas • Park boundaries • **Water management strategies**
Human Activity	• Population demographics • Community groups with coastal mandates • **Coastal access points** • **Shipping lanes** • **Sewage treatment facilities** • **Agricultural activities**	• Wharves • Average income • Population density • Employment density • **Industrial activities** • **Recreational activities** • **Waterfront property ownership**
Fisheries	• *List of fisheries operating in the area* • Regulatory limits of harvest • Aquaculture sites	• Number of fishing licenses • Season open and closure dates* • Annual landings of a specific fishery • **Annual revenue generated by a fishery***

6.4 Information Types

Fewer information types were selected least for use in the ecosystem health and eutrophication than for other topics. However, all of the information types appear to be suitable to some degree for coastal management topics in general. Journal articles, grey literature, research reports, aggregated data, and fact sheets were selected most frequently across all topics. This suggests that interpreted information, such as a report or a summary, is often used by coastal managers for understanding coastal management topics.

6.5 Conclusions

Phase I was designed to validate and complete lists of coastal management topics and coastal management characteristics. Findings indicated that the list of topics should be revised to reduce overlap, that subtopics should be included in the description of each topic and that participants should not be permitted to provide their own topics. Every characteristic was selected at least once, so none of the characteristics were eliminated from the list. The additional characteristics provided by participants often involved human activities, so the sources used to generate the initial list of characteristics were reexamined to identify additional items that may have been overlooked the first time and the list was expanded by 20 characteristics. The number of topics requested in Phase II was limited to one topic because participants agreed that choosing characteristics for two themes at once was confusing. All of the information types were useful to some degree for coastal management topics, but interpreted information, such as reports or summaries, was used more frequently than other types of information.

CHAPTER 7 PHASE II METHODOLOGY

7.1 PHASE II OVERVIEW

This phase of the study employed a questionnaire that was administered both online and orally. Oral questionnaires were administered either in person or by phone. Six participants completed the online questionnaire and 14 participants completed the oral questionnaire. Both qualitative and quantitative data were collected. The oral nature of the questionnaires delivered in person and over the phone generated more qualitative data than the online surveys, which was analyzed as well. The web-based questionnaire was active between March 15, 2011 and May 31, 2011 and oral questionnaires were administered between April 26, 2011 and June 10, 2011.

7.2 VARIABLES

7.2.1 Coastal Topics

The list of coastal topics used in Phase II was a condensed version of the list used in Phase I (see section 6.2) and consisted of seven topics:

1) Water quality
2) Coastal or Marine Development
3) Coastal or Marine Habitat Protection
4) Sea Level Rise and Storm Events
5) Contaminants
6) Fisheries Management
7) Biodiversity and Species Management

7.2.2 Coastal Characteristics

The list of coastal characteristics used in the questionnaire for Phase II was expanded from the original list of characteristics used in Phase I (see section 6.3). Six

characteristics provided by the participants in Phase I were added, and 14 more characteristics were added after reviewing the sources used to generate the list for Phase I. Three characteristics used in the online questionnaire were inadvertently omitted from the oral questionnaire so they were removed from the overall analysis. The eight categories used to present the characteristics in Phase I were also maintained. The complete list of 71 characteristics used in Phase II is found in Table 8.

Table 8 List of categories and associated coastal characteristics used in Phase II.

Category	Coastal characteristics	
General	• Latitude/Longitude • Map of the area • List of municipalities in the area • Ecodistrict type of land area • Rivers • Map of the area by use or activity • Contact information for subject expert	• Area of the water body • Mean depth of the water body • Watershed size • Relief of land area • Beaches • Contact information for local expert • Buoy locations
Climate and Weather	• Wind speed • Wind direction • Air temperature	• Ice coverage • Precipitation • Storm patterns
Biological and Chemical	• Microbial pathogens • Contaminant levels	• Nutrient levels • Plankton measurements
Physical Measurements	• Bathymetry • Sea surface temperature • Salinity • Water pH • Current measurements • Tidal volume of an inlet/bay • Erosion rates	• Sediment data • Wave data • Water levels • Water conductivity • Dissolved oxygen • Volume of outflow • Secchi depth
Species and Habitat	• Wildlife species present • Fish species present • Population estimate • Predators • Mortalities • Migration patterns	• Map of species distribution in area • Salt marshes • Eelgrass • Endangered species present
Legal and Regulatory	• Level of government and department with regulatory power • List of applicable legislation and regulations • Wetland policies	• Marine/Coastal protected areas • Park boundaries • Water management strategies
Human Activity	• Population demographics • Community groups with coastal mandates	• Wharves • Average income • Population density

Category	Coastal characteristics	
	• Coastal access points • Shipping lanes • Sewage treatment facilities • Agricultural activities	• Employment density • Industrial activities • Recreational activities • Waterfront property ownership
Fisheries	• List of fisheries operating in the area • Regulatory limits of harvest • Aquaculture sites	• Number of fishing licenses • Season open and closure dates • Annual landings of a specific fishery

7.2.3 Information Sources

Participants were asked where they would find the data or information on the characteristics they selected in the questionnaire in an open ended question which would then be used to generate a list of sources for coastal information. Content analysis of the sources provided by participants identified eight general source types: organizations, search engines/search utilities, people, specific websites, databases, personal collections, libraries and self collected data.

7.2.4 Substitute Information

The options of *Regional* information, *Provincial or State* information, or information from a *similar area*, were developed through discussion with a local coastal management expert.

7.3 Questionnaire Protocol

Both the web-based questionnaire and the in-person questionnaire had the same components. The questionnaire was comprised of six parts; a consent form, a demographics questionnaire, topic selection and relevant project description, a sample e-Card, characteristic selection, and substitute information selection. The web-based

questionnaire was designed using Opinio software. The images presented below were taken from the web-based questionnaire. The in-person questionnaires looked different, but the content was the same.

7.3.1 Informed Consent

Participants were provided with a consent form that described the study, informed them that their responses would be confidential and anonymized, and made it clear that they were under no obligation to complete the questionnaire (Appendix I).

7.3.2 Demographics Questionnaire

Each participant was given a demographics questionnaire to fill out (see Appendix J). The questionnaire asked them to provide several pieces of information including their age, gender, level of education, general place of employment, current position, information sources consulted and country where they were currently employed.

7.3.3 Coastal Topic Selection and Relevant Project Description

Participants were asked to select one topic from the list of seven topics that they had experience with in a professional capacity. They were then asked to briefly describe a memorable project or activity that they had worked on with respect to that topic, as well as their role and the outcome of the project (see Appendices K and L). They were then presented with a list of different information types and asked to indicate which information types they had used for the project, and were given the opportunity to provide additional information types they had used (Figure 3).

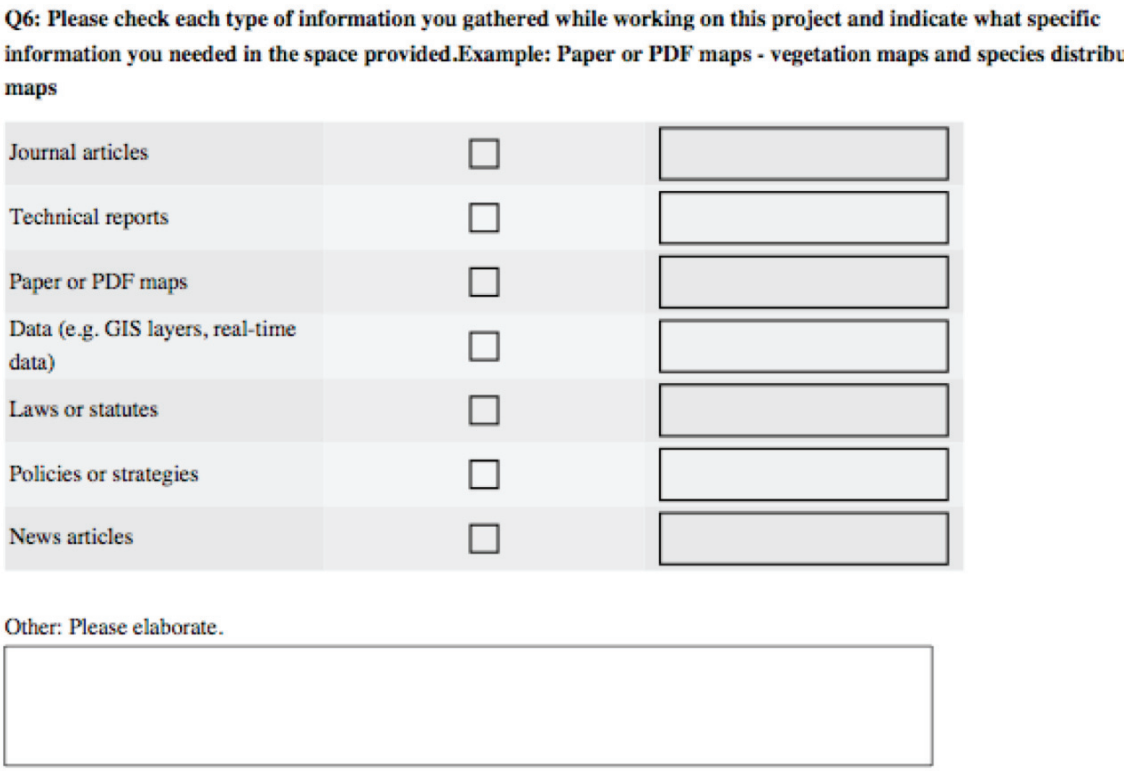

Figure 3 Screen capture from web-based survey listing the information types that may have been gathered for the project.

7.3.4 E-Card Example

The participants were shown an example e-Card, which was presented as a sample set of search results with the e-Card embedded. A brief explanation outlined the hypothetical application of the e-Card (Figure 4).

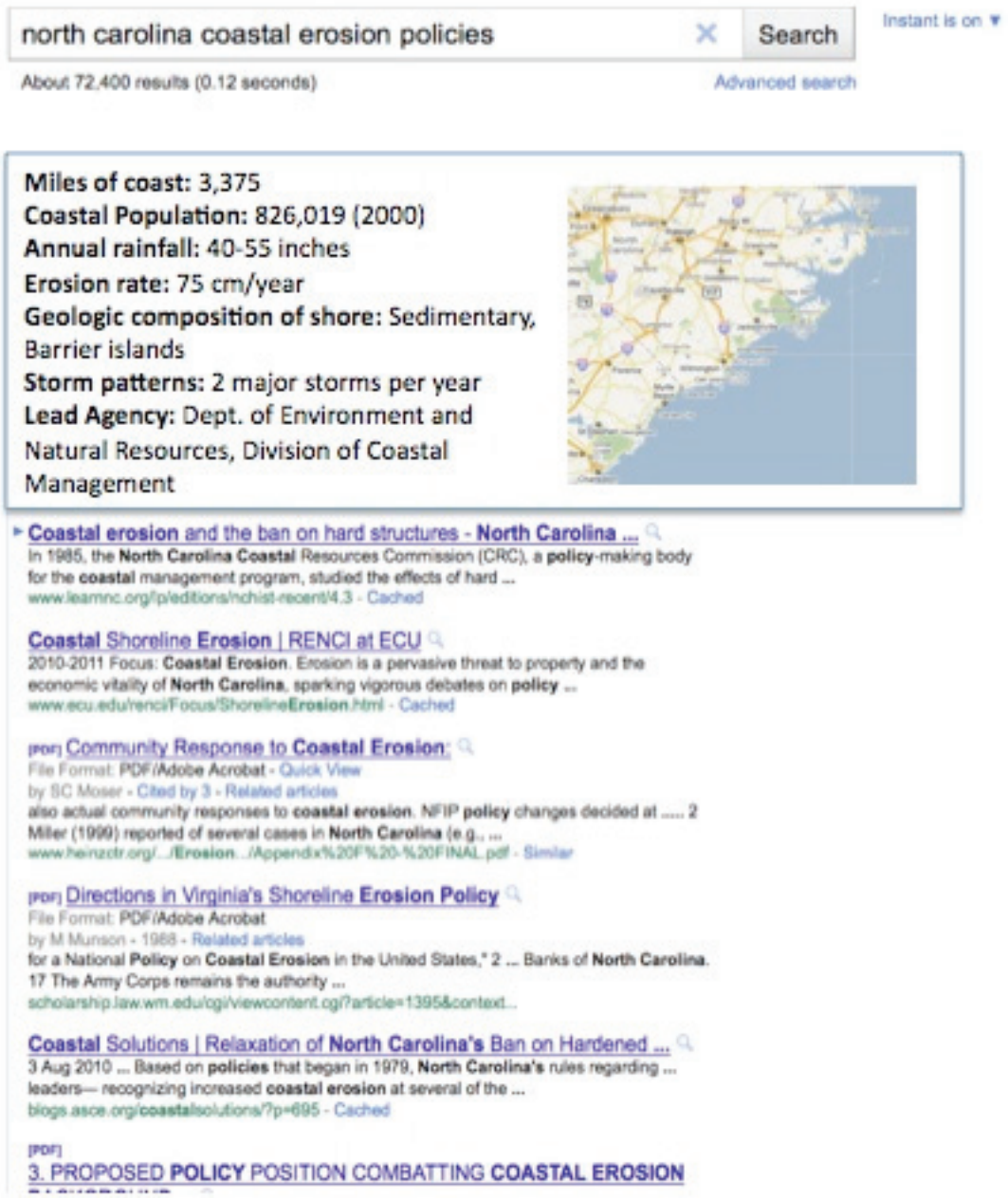

Figure 4 Sample e-Card embedded in search results

7.3.5 Coastal Characteristic Selection

Participants were asked to consider that they were beginning a new project involving their chosen topic in a geographic area unfamiliar to them and that they wanted to get a preliminary understanding of the local area with respect to their topic. They were then

directed to look at the eight categorized checklists of characteristics (see Table 9 for complete list) and select which ones they would choose to generate that preliminary understanding of the local area with respect to their topic (see Appendices K and L). Participants were asked to provide sources for the coastal characteristics that they chose, and to provide additional coastal information that they would want for a first impression of the area after each category of characteristics. Participants who responded to the questionnaire in person or over the phone were prompted to provide sources and additional information as the questionnaire progressed. A sample page of the web-based questionnaire containing a checklist from the General category, and the spaces for participants to provide sources and additional characteristics is presented in Figure 5. The seven remaining categories of characteristics appeared on separate pages in the same format.

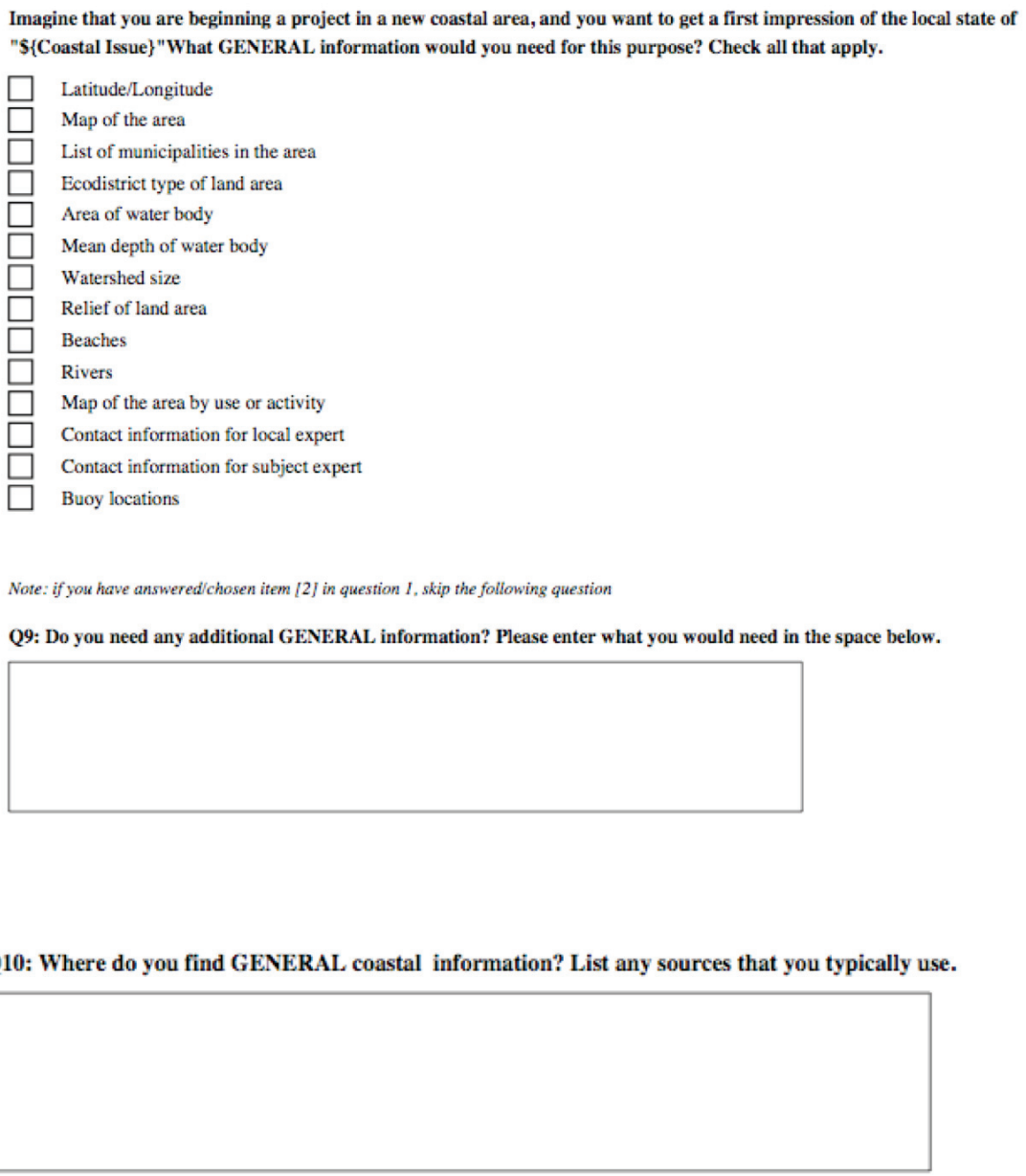

Figure 5 Sample characteristic selection page from web-based questionnaire.

7.3.5 Substitute Information

Participants were presented with the same eight categorized checklists of characteristics and asked to indicate whether other information would be suitable as a substitute for local information. They were able to choose from regional information, provincial or state

information, and information from a similar geophysical area – defined as having similar geology and climate. Participants were asked to provide any other sources of substitute information that came to mind (see Appendices K and L). A sample page from the web-based survey that contains the checklist for the General category and the space for participants to provide other sources of substitute information is presented in Figure 6. The seven remaining categories of characteristics appeared on separate pages in the same format.

Q32: GENERAL INFORMATION

If information was unavailable at the local level, would information at another level be acceptable to understand ${Coastal Issue}? Check all that apply.Regional = county or large bay (e.g. Bay of Fundy) Similar geophysical area = location with similar geology and climate

GENERAL INFORMATION	Regional	Provincial/State	Similar geophysical area
Latitude/Longitude	☐	☐	☐
Map of the area	☐	☐	☐
Municipalities in the area	☐	☐	☐
Ecodistrict type of land area	☐	☐	☐
Area of the water body	☐	☐	☐
Mean depth of the water body	☐	☐	☐
Watershed size	☐	☐	☐
Relief of land area	☐	☐	☐
Beaches	☐	☐	☐
Rivers	☐	☐	☐
Map of the area by use or activity	☐	☐	☐
Contact information for local expert	☐	☐	☐
Contact information for subject expert	☐	☐	☐
Buoy locations	☐	☐	☐

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q33: Is there a substitute for missing local information other than the three options presented above? Please specify.

Figure 6 Sample page from web-based survey for participants to indicate any suitable substitutes for local information.

7.3.6 Conclusion and Thank You

Participants were thanked for their participation and given instructions on how to access the results of the study when it was finished. Phone interview participants were given the opportunity to indicate that they would like to be notified by email where they could access the results.

7.4 PARTICIPANTS

7.4.1 Recruitment of Participants

Participants were recruited via two coastal newsletters, a presentation at a coastal management training program, and by email to a list of participants from a previous study that surveyed coastal management professionals. The recruitment email asked the recipients to participate in the study, and also asked if they would pass the invitation along to colleagues who might be interested in taking part (see Appendix H). No honorarium or compensation of any kind was offered during the recruitment process.

Online participants proceeded directly to the web survey from the e-mail, while participants who chose to be surveyed by phone or in person were sent follow up e-mails to arrange a mutually convenient time to administer the questionnaire. Participants from the training session made arrangements to be surveyed through a sign-up sheet distributed at their classroom. Participants who were surveyed by phone were sent an additional package containing the consent form (see Appendix I), a demographics questionnaire (see Appendix J), and a pdf containing the pages that they would need to look at during the phone call (see Appendix L).

7.4.2 Description of Participants

Twenty individuals participated in the Phase II, six through the online survey, and 14 through the in-person questionnaire. The participants included fourteen males, five females, and one participant preferred not to indicate their gender. Eight participants (40%) were between the ages of 20 and 39, and twelve participants (60%) were between

the ages of 40 and 69. Fifteen participants were currently employed in Canada, and five were employed outside of Canada.

Participants provided their level of education. Eight participants (40%) had been awarded Bachelor's degrees, fourteen participants (70%) had been awarded a Masters degree, and five had been awarded doctorates (25%).

The participants indicated the role that best described their current position. Six participants (30%) were researchers, three participants were policy-makers (15%), one participant was a policy advisor, four (20%) participants were managers of a team, and five participants (25%) were managers of resources. One participant did not think that as an EIA officer, any of the roles best described her position.

Participants were asked to indicate the geographic scope of the projects that they most frequently worked on, and were able to choose as many options as was applicable. The numbers of participants who addressed projects at each level are summarized in Table 9.

Table 9 The geographic scope of projects addressed by participants (N=20)

Scope	#	**%**
Local	12	60%
Regional	11	55%
Provincial/State	12	60%
National	10	50%
International	7	35%
Other	3	15%

7.5 Questionnaire Procedure

7.5.1 Pre-questionnaire: In person and by telephone

Prior to the administering the oral questionnaires, a numbered paper file for each participant was created. These files contained two copies of the consent form, one demographics questionnaire, one participant questionnaire, and one interviewer questionnaire. Participants who participated by phone were e-mailed the consent form (Appendix I), the demographics questionnaire (Appendix J) and the participant questionnaire (Appendix L) ahead of time.

7.5.2 Questionnaire

Individuals who participated online indicated their responses using the web-based survey. Those who participated in-person or over the phone referred to the participant sheets that provided lists of topics, information types, the sample e-Card and lists of coastal characteristics (Appendix L) and answered all questions verbally. Each session was recorded using a digital audio recorder, and characteristic selections were noted in checklists on the interviewer script (Appendix M)

Informed Consent:

The online questionnaire began with the consent form. If the participant clicked "I agree to participate", they would proceed to the rest of the questionnaire. During in person questionnaires, the participant was given a consent form to read and sign (see Appendix I). They were provided with a copy for their records, and the signed form was placed in their folder. Phone interview participants were emailed the consent form ahead of time,

and were asked to fill it out and either e-mail or fax it back to the principal investigator.

Demographics Questionnaire:

The online demographics questionnaire was filled out at the end of the questionnaire, but in-person and telephone participants were given a demographics questionnaire to fill out at the beginning of the session (see Appendix J). The completed form was placed in the participant's folder. Phone interview participants were e-mailed the demographics questionnaire ahead of time, and the participant was asked to fill it out and either e-mail or fax it back to the principal investigator.

Coastal Topic Selection and Relevant Project Description

Participants selected one topic from the list of seven coastal management topics. Based on the chosen topic, they described a memorable project, their role in the project, the outcome, and the kind of information types they gathered for the project.

Sample e-Card

Participants were provided with the sample e-Card to illustrate the focus of the research. In-person participants could ask questions if they wished.

Coastal Characteristic Selection

Participants reviewed the eight categorized checklists of coastal characteristics and indicated which characteristics they would choose to get an overview of the area when working on their selected topic. Participants also indicated any additional information

they would need, and where they would look for this kind of information.

Substitute Information

Participants reviewed the same eight categories of characteristics and indicated whether information from the region, the province/state, or from a similar area would be an acceptable substitute. Some in-person and phone interview participants had limited time and were unable to answer this portion of the questionnaire.

Conclusion and Thank You

Participants were thanked for their participation and given instructions on how to access the results of the study when it was finished. Phone interview participants were given the opportunity to indicate that they would like to be notified by email where to access the results.

7.5.3 Data Analysis

Data from the online questionnaire was downloaded into Microsoft Excel spreadsheets. Quantitative data from the completed paper questionnaires was entered directly into Microsoft Excel spreadsheets, and merged with the data from the online questionnaire. The audio recordings for each in-person participant's questionnaire were transcribed into Microsoft Word, and then transferred into Excel. The additional coastal characteristics and information sources provided by the participants were drawn directly from the transcripts and online survey for summarization and analysis using predetermined categories. Other codes emerged from the data through content analysis (See coding manual – Appendix N). Counts and percentages were the only calculations performed.

CHAPTER 8 PHASE II RESULTS

8.1 Introduction

This chapter presents the results of Phase II in six sections. Five key variables were investigated: coastal characteristics, roles, information sources, substitutes for local information and method of display.

8.2 Topics and Jobs

Each participant was required to choose a coastal management topic with which they had professional experience. The topic was then used to frame several of the subsequent questions. Participants were also required to indicate in the demographics questionnaire which role BEST described their current position. The topics selected are summarized in Table 10. Water quality was selected by two researchers. Coastal and marine habitat protection was selected by two researchers, three resource managers and one manager of a team. Coastal and marine development was chosen by one resource manager, one manager of a team and one Environmental Impact Assessment Officer. Sea Level rise or Storm Events was selected by two researchers and two policy makers. Fisheries management was selected by two managers of a team. Biodiversity and Species Management was selected by a policy maker, a policy advisor and a resource manager. Interestingly, no participants selected contaminants as a topic of interest.

Table 10 Topics selected by participants based on their professional experience

Topic	Researcher	Policy-maker	Policy-Advisor	Manager of a resource	Manager of a team	Other (EIA Officer)	# partcipants / topic
Biodiversity or species management		1	1	1			3
Coastal or marine development				1	1	1	3
Coastal or marine habitat protection	2			3	1		6
Contaminants							0
Fisheries management					2		2
Sea level rise or storm events	2	2					4
Water quality	2						2
Total participants /position	6	3	1	5	4	1	20

8.3 CHARACTERISTIC SELECTION

8.3.1 Coastal Characteristics

From the list of 71 items, the 20 participants selected the characteristics they would choose to generate a first impression, or overview, of a geographic area with respect to their chosen topic. The numbers (N) and percentages (%) of participants and that selected each characteristic are summarized in Table 11. The characteristics are sub-divided into eight categories. Fifteen (15) characteristics were selected by 15 (75%) or more of the 20 participants (grey highlights in Table 10). The 15 characteristics are distributed across six of the eight categories. None of the characteristics from either the Climate and Weather category or the Biological and Chemical category were selected by more than 12 (60%) of the participants.

Table 11 Selection of coastal characteristics across all participants (N=20).

Characteristic	N	%
General (n=14)		
Area of the water body	17	85%
Beaches	12	60%
Buoy locations	5	25%
Contact information for local expert	17	85%
Contact information for subject expert	13	65%
Ecodistrict type of land area	11	55%
Latitude/Longitude	15	75%
Map of the area	20	100%
Map of the area by use or activity	16	80%
Mean depth of the water body	12	60%
Municipalities in the area	13	65%
Relief of land area	12	60%
Rivers	13	65%
Watershed size	13	65%
Climate and Weather (n=6)		
Air temperature	8	40%
Ice coverage	7	35%
Precipitation	12	60%
Storm frequency	12	60%
Wind direction	11	55%
Wind speed	9	45%
Biological and Chemical (n=4)		
Contaminant levels	12	60%
Microbial pathogens	4	20%
Nutrient Levels	11	55%
Plankton measurements	5	25%
Physical (n=14)		
Bathymetry	16	80%
Current measurements	12	60%
Dissolved oxygen	6	30%
Erosion rates	8	40%
Salinity	10	50%
Sea surface temperature	13	65%
Secchi depth	5	25%
Sediment data	9	45%
Tidal volume of inlet or bay	9	45%
Volume of outflow for a river or estuary	11	55%
Water conductivity	6	30%
Water levels	8	40%

Characteristic	N	%
Water pH	9	45%
Wave data	10	50%
Species and Habitat (n=9)		
Eelgrass	10	50%
Endangered species/ species at risk	16	80%
Fish species in the area	16	80%
Map of species distribution	15	75%
Migration patterns	9	45%
Mortalities (rates, annual totals)	10	50%
Population estimates	14	70%
Salt marshes	12	60%
Wildlife species in the area	14	70%
Legal, Regulatory and Policy (n=6)		
Applicable legislation and regulations	19	95%
Government department with regulatory power	17	85%
Marine or coastal protected areas	14	70%
Park boundaries	12	60%
Water management strategies	10	50%
Wetland policies	14	70%
Human Activity (n=13)		
Agricultural activities	14	70%
Average income	9	45%
Coastal access points	12	60%
Community groups with coastal management mandates	17	85%
Employment density	10	50%
Industrial activities	16	80%
Population demographics	11	55%
Population density	12	60%
Recreational activities	17	85%
Sewage treatment facilities	11	55%
Shipping lanes	13	65%
Waterfront property ownership	13	65%
Wharves	10	50%
Fisheries (n=5)		
Annual landings per fishery	13	65%
Aquaculture sites	13	65%
Fisheries operating in the area	17	85%
Number of fishing licenses per fishery	9	45%
Regulatory limits of harvest (Total allowable catch)	8	40%

To examine whether individual categories of coastal characteristics were selected more frequently than others, a weighted percent was calculated for each category (Table 12). The *Total Possible* column contains the maximum score possible for each category and was calculated by multiplying the number of participants (20) by the number of characteristics in each category. The *Total Selected* column is the sum of the number of participants who chose each characteristic within each category, and the percentage was calculated by dividing the value in the *Total Selected* column by the *Total Possible* column. Legal, Regulatory and Policy had the highest weighted percentage (71.7%), and the Fisheries, Human Activity, Species and Habitat, and General categories all had scores of > 60%. The remaining categories, Biological and Chemical, Climate and Weather, and Physical all had less than 50% selection.

Table 12 Average selection frequency of coastal characteristics within a category

Category	Total possible	Total selected	%
General	280	189	67.5%
Climate and Weather	140	59	42.1%
Biological and Chemical	80	32	40.0%
Physical	280	132	47.1%
Species and Habitat	180	116	64.4%
Legal, Regulatory and Policy	120	86	71.7%
Human Activity	260	165	63.5%
Fisheries	100	60	60.0%

8.3.2 Additional Characteristics Supplied by Participants

Participants were given the opportunity to list additional information that they would use to generate an overview of their chosen topic. Individuals who participated through the online survey were asked to provide additional information after every category of

characteristics, and the in-person participants were asked at the end of the questionnaire. The additional information was combined into a single list and then grouped into the original eight categories.

The characteristics provided by participants were compared to the original characteristics to see if participants were providing characteristics that were related to the originals, or if they were providing new characteristics (Table 13). If the original characteristic encompasses a new characteristic, the name of the original appears in the *Original Characteristic- broader* column. For example, the new characteristic *types of vegetation* might be found in the description of the original characteristic *ecodistrict*, and is thus not necessarily a new characteristic. If an original characteristic may be considered a sub-characteristic of a characteristic provided by participants, then the name of the original appears in the *Original characteristic-narrower* column. For example, the original *waterfront property ownership* would be an aspect of *land ownership,* which was provided by a participant. The characteristics provided by participants may be sub-characteristics of multiple original characteristics, but only one is provided for illustration. The seven new characteristics are highlighted in grey. Tidal range is starred because it was one of the characteristics that were inadvertently removed from the oral questionnaire, so it wasn't considered to be a new characteristic. There were eleven characteristics where the participant's meaning is unclear, or they wanted complex information and these are indicated with an X in the *Unknown* column (Table 13).

Nine of the characteristics added by participants were in fact part of the questionnaire,

and these are listed in Table 14. Forty-five characteristics provided by participants were sub-characteristics of the original set. Eleven characteristics provided by participants were broader than characteristics in the original set.

Table 13 Additional coastal characteristics provided by participants.

Characteristics provided by participants	**ORIGINAL CHARACTERISTICS**		**Unknown**
	Broader	**Narrower**	
General			
Barrier beaches (static & dynamic)	Ecodistrict		
Biological surveys	Ecodistrict		
Geology	Ecodistrict		
Shoreline types	Ecodistrict		
Soil profiles	Ecodistrict		
Types of vegetation	Ecodistrict		
Vegetative surveys	Ecodistrict		
Size of islands	Map of the area		
Canadian Hydrographic Service charts	Map of the area		
Geological features	Map of the area		
Air photos	Map of the area		
Length of coastline,	Map of the area		
Estuaries	Rivers		
High tides	Tidal range*		
Historical tide data	Tidal range*		
Ocean tides		Tidal range*	
Range of the tides	Tidal range*		
Tide flux/amplitude	Tidal range*		
Backcasting data			X
Bare earth DEM gridded at 2m			X
Transects			X
Property information (quota distributions)			X
Environmental assessment surveys			X
Description of area before flooded			X
Water regime			
Substrate types			
Climate and Weather			
Ice forces	Ice coverage		

Characteristics provided by participants	ORIGINAL CHARACTERISTICS		Unknown
	Broader	Narrower	
Cyclones	Storm patterns		
Historical storm surge data	Storm patterns		
Storm surge impact forecasting,	Storm patterns		
Physical			
Total alkalinity of the water	Water pH		
Trend data for each of the parameters described	All characteristics within physical category		
Tide gauge	Water levels		
Chlorophyll a			
Legal, Regulatory and Policy			
Legal decisions	Applicable legislation and regulations		
Federal and provincial information all legal elements	Applicable legislation and regulations		
Municipal land use policies, by-laws and land use zoning	Applicable legislation and regulations		
Jurisdictional conflicts	Government department with regulatory power		
Landownership		Waterfront property ownership	
Government owned property and parcel data		Waterfront property ownership	
Adjacent landowners (how many)		Waterfront property ownership	
Species and Habitat			
Significant species	Wildlife/Fish species in the area		
Native species	Wildlife/Fish species in the area		
Maps of feeding areas	Map of species distribution		
Maps of breeding areas	Map of species distribution		
Salt marsh elevation	Saltmarshes		
Significant habitat		Saltmarshes, eelgrass	
Quality of habitat		Saltmarshes, eelgrass	
Diversity of habitat		Saltmarshes, eelgrass	
Habitat characteristics		Saltmarshes, eelgrass	
Human Activity			
Boat launches	Coastal access points		

Characteristics provided by participants	ORIGINAL CHARACTERISTICS		Unknown
	Broader	**Narrower**	
Groups with restoration priorities identifies	Community groups with coastal management mandates		
NGOs in area + locations, contacts, mandate/expertise	Contact information of local/subject experts		
On the water tourism operations	Recreational activities		
Tourism			
Local users			
Coastal community economic structure		Average Income, Employment density	
Socio-economic information		Average Income, Employment Density	
First nations locations and contacts			
Presence of oil tanks on a property			
Solid wastes			
Impacts of managed activities			X
Fisheries			
Fishing zones	Fisheries in the area		
Fishing organizations in the area	Fisheries in the area		
Fish pop'ns/Fisheries	Fisheries in the area		
Where fishers in the area come from	Fisheries in the area		
Abandoned fisheries	Fisheries in the area		
Stock assessments	Fisheries in the area		
First Nations fisheries	Fisheries in the area		
Aquaculture production densities	Aquaculture sites		
Fisheries landings over time		Total allowable catch	
First Nations fisheries interests			

***** Even though online participants were able to provide additional characteristics for each category, because they could only see one category at a time, it was common for some of the additional characteristics provided to be part of the questionnaire in later categories, or for the characteristics provided to be from a different category. This table was constructed by pooling all additional characteristics provided by all participants and then grouping them according to how well they fit with the characteristics in the original eight categories.

Table 14 Coastal characteristics provided by participants that matched the original characteristics from the questionnaire

Characteristics provided by participants	**Original characteristics**
Bottom characteristics	Bathymetry
Ocean currents	Current measurements
Ocean temperatures	Sea surface temperature
Specific statutes, regulations, bylaws for various gov'ts responsible	Applicable legislation and regulations
Species distributions	Map of species distribution
Species at Risk	Endangered species
Sea grass (2)	Eelgrass
Human use maps	Maps by use or activity
Aquaculture sites	Aquaculture

Summary

The 15 characteristics that were selected by 75% or more of the participants were clustered in five categories: General, Species and Habitat, Human Activity, Legal, regulatory and policy, and Fisheries. The additional characteristics supplied by participants were mostly sub-characteristics of the original set.

8.4 Differences in Coastal Characteristic Selection

This section examines differences in characteristic selection based on role. Differences in characteristic selection by professions and by coastal management topic are reported in section 8.4.2 and 8.4.3.

8.4.1 Characteristic Selection by Role

Through secondary analysis of the topic specific roles and activities described for the questionnaire, the participants were coded according to their role and focus of their work. Participants could be classified as performing *Fieldwork* roles*,* which involved actively collecting data in the field, managing those who were actively working in the field, or

supervising a fieldwork based project. Participants could also be classified as performing *Management* roles, which involved making decisions, planning, policy work, or interactions with stakeholders (see Appendix N – coding manual). The coding scores were confirmed through inter-rater analysis. A second coder analyzed the activities and roles described by the participants using the coding manual, and the resulting *Fieldwork* and *Management* codes were compared to those scored by the principal investigator. There were six instances where the second coder differed from the principal investigator, and after discussion, the two coders came to an agreement, which resulted in maintaining four of the original codes and changing two to match the second coder.

There were ten participants in each of the *Management* and the *Fieldwork* categories. The characteristic selection frequencies (N) and percentages (%) were calculated for each role (Table 16). The difference between the percentages for the *Fieldwork* and *Management* roles were calculated by subtracting the *Management* percentage from the *Fieldwork* percentage. Negative numbers in the *Difference* column indicate that the characteristic was chosen by higher numbers of participants who described *Fieldwork* roles, and positive numbers indicate that the characteristic was chosen by higher numbers of participants who described *Management* roles. The 15 characteristics chosen by 75% or more of all participants are highlighted in grey for reference. Five characteristics that differed between the activity types by 50% or more (either positive or negative) are highlighted in bold. Current measurements, watershed size, and the volume of outflow of a river or estuary were chosen much more frequently by participants who described field-work. Shipping lanes and sewage treatment facilities were chosen much more frequently

by participants who described management activities. The characteristics that were selected by eight (80%) or more of the participants within each role are starred in the N columns. There are 20 characteristics selected by 80% of those in management roles and 15 characteristics selected by 80% of those in fieldwork roles. There are only seven characteristics in common between these groups, which makes up less than half of the characteristics for either group.

Using the values in the *Difference* column of Table 16, the characteristics were classified as either primarily selected by those in *Fieldwork* roles, primarily selected by those in *Management* roles, or evenly selected by *Both* roles. The classifications for each characteristic are marked by an X in the three far right columns of Table 16. The criteria for classification are summarized in Table 15. Twenty-nine (41%) characteristics fell into the *Management* group, 29 (41%) characteristics fell into the *Both* group, and 13 (18%) characteristics fell into the *Fieldwork* group.

Table 15 Coastal characteristic classification criteria for Table 16

Category	**Value in *Difference* column from Table 16**
Both	-10% to 10%
Fieldwork	Less than -10%
Management	Greater than 10%

Table 16 Coastal characteristic selection by role

Characteristics	Management		Fieldwork		Difference	Management	Fieldwork	Both
	N	%	N	%				
General								
Area of the water body	9*	90%	8*	80%	10%			X
Beaches	7	70%	5	50%	20%	X		
Buoy locations	1	10%	4	40%	-30%		X	
Contact information for local expert	8*	80%	9*	90%	-10%			X
Contact information for subject expert	6	60%	7	70%	-10%			X
Ecodistrict type of land area	5	50%	6	60%	-10%			X
Latitude/Longitude	7	70%	8*	80%	-10%			X
Map of the area	10*	100%	10*	100%	0%			X
Map of the area by use or activity	8*	80%	8*	80%	0%			X
Mean depth of the water body	5	50%	7	70%	-20%		X	
Municipalities in the area	7	70%	6	60%	10%			X
Relief of land area	4	40%	8*	80%	-40%		X	
Rivers	5	50%	8*	80%	-30%		X	
Watershed size	4	40%	9*	90%	-50%		X	
Climate and Weather								
Air temperature	4	40%	4	40%	0%			X
Ice coverage	4	40%	3	30%	10%			X
Precipitation	4	40%	8*	80%	-40%		X	
Storm frequency	7	70%	5	50%	20%	X		
Wind direction	4	40%	7	70%	-30%		X	
Wind speed	3	30%	6	60%	-30%		X	
Biological and Chemical								
Contaminant levels	8*	80%	4	40%	40%	X		
Microbial pathogens	2	20%	2	20%	0%			X
Nutrient Levels	6	60%	5	50%	10%			X
Plankton measurements	2	20%	3	30%	-10%			X
Physical								
Bathymetry	8*	80%	8*	80%	0%			X

Characteristics	Management		Fieldwork		Difference	Management	Fieldwork	Both
	N	%	N	%				
Current measurements	3	30%	9*	90%	-60%		X	
Dissolved oxygen	3	30%	3	30%	0%			X
Erosion rates	5	50%	3	30%	20%	X		
Salinity	6	60%	4	40%	20%	X		
Sea surface temperature	8*	80%	5	50%	30%	X		
Secchi depth	3	30%	2	20%	10%			X
Sediment data	4	40%	5	50%	-10%			X
Tidal volume of inlet or bay	3	30%	6	60%	-30%		X	
Volume of outflow for a river or estuary	3	30%	8*	80%	-50%		X	
Water conductivity	2	20%	4	40%	-20%		X	
Water levels	3	30%	5	50%	-20%		X	
Water pH	5	50%	4	40%	10%			X
Wave data	5	50%	5	50%	0%			X
Species and Habitat								
Eelgrass	7	70%	3	30%	40%	X		
Endangered species/ species at risk	9*	90%	7	70%	20%	X		
Fish species in the area	9*	90%	7	70%	20%	X		
Map of species distribution	7	70%	8*	80%	-10%			X
Migration patterns	6	60%	3	30%	30%	X		
Mortalities (rates, annual totals)	6	60%	4	40%	20%	X		
Population estimates	8*	80%	6	60%	20%	X		
Salt marshes	6	60%	6	60%	0%			X
Wildlife species in the area	9	90%	5	50%	40%	X		
Legal, Regulatory and Policy								
Applicable legislation and regulations	10*	100%	9*	90%	10%			X
Government department with regulatory power	10*	100%	7	70%	30%	X		
Marine or coastal protected areas	8*	80%	6	60%	20%	X		
Park boundaries	6	60%	6	60%	0%			X
Water management strategies	5	50%	5	50%	0%			X
Wetland policies	7	70%	7	70%	0%			X

Characteristics	Management		Fieldwork		Difference	Management	Fieldwork	Both
	N	%	N	%				
Human Activity								
Agricultural activities	8*	80%	6	60%	20%	X		
Average income	5	50%	4	40%	10%			X
Coastal access points	7	70%	5	50%	20%	X		
Community groups with coastal management mandates	9*	90%	8*	80%	10%			X
Employment density	6	60%	4	40%	20%	X		
Industrial activities	10*	100%	6	60%	40%	X		
Population demographics	7	70%	4	40%	30%	X		
Population density	8*	80%	4	40%	40%	X		
Recreational activities	10	100%	7	70%	30%	X		
Sewage treatment facilities	8*	80%	3	30%	50%	X		
Shipping lanes	9*	90%	4	40%	50%	X		
Waterfront property ownership	7	70%	6	60%	10%			X
Wharves	7	70%	3	30%	40%	X		
Fisheries								
Annual landings per fishery	9*	90%	4	40%	50%	X		
Aquaculture sites	7	70%	6	60%	10%			X
Fisheries operating in the area	10*	100%	7	70%	30%	X		
Number of fishing licenses per fishery	6	60%	3	30%	30%	X		
Regulatory limits of harvest (Total allowable catch)	5	50%	3	30%	20%	X		

8.4.2 Characteristic Selection by Topic

Due to the low numbers of participants that selected each topic, analysis of the differences in characteristic selection according to topic was not performed. A table that summarizes the numbers of participants that selected each characteristic for each of the coastal management topics can be found in Appendix O for reference purposes.

8.4.3 Characteristic Selection by Job

There were low numbers of participants in each job category so analysis of the differences in characteristic selection between jobs was not performed. The numbers and percentages in each category are reported in Appendix P for reference purposes.

Summary

Secondary analysis that classified each participant into either a *Fieldwork* or *Management* role based on participant descriptions of their role within a topic specific project divided the participants into two equal groups of 10. Further analysis of the differences in characteristic selection between the two groups allowed the characteristics to be divided into three categories, those associated with fieldwork roles, those associated with management roles and those associated with both. Less than half of the characteristics selected most frequently by each group are in common.

8.5 Information Types and Sources

8.5.1 Information Types

When participants were asked to describe a memorable project they had worked on with respect to their chosen topic, they were also asked to indicate whether they had gathered any of the following types of information over the course of the project: journal articles, technical reports, pdf and paper maps, data, laws and statutes, policies and news articles. The frequencies and percentages of information gathered for all participants (Total N and Total %), and for both the fieldwork and management role types are summarized in Table 17.

Most information types were used by high percentages of participants, however news articles were used distinctly less than the other types and policy information was slightly less frequently used overall. The most notable difference in information types gathered between the two roles was that participants in management roles were more likely to gather policies, news articles and technical reports.

Table 17 Information gathered across all participants.

Type of Information	Total N	Total %	Management (n=10)		Fieldwork (n=10)	
			N	%	N	%
Journal Articles	17	85%	8	80%	9	90%
Technical Reports	17	85%	10	100%	7	70%
PDF and Paper maps	17	85%	8	80%	9	90%
Data	17	85%	8	80%	9	90%
Laws and Statutes	15	75%	8	80%	7	70%
Policies	12	60%	9	90%	3	30%
News Articles	5	25%	4	40%	1	10%

8.5.2 Information Sources: General

Participants were asked to indicate which information sources they used most frequently during their work life. The numbers and percentages of all participants who selected each information source (Total N and Total %) are summarized in Table 18. Information sources are also broken down by fieldwork and management roles. Internet searches, government websites and personal reference collections were used by 70% or more of the all participants, while Google scholar, online databases, personal data and internal databases were used by 45% or less of the participants. The only notable differences in information sources used between the management and fieldwork roles were for Google

Scholar, journal databases and internal databases, all of which were used more frequently by those in management roles.

Table 18 Coastal information sources used most often across all participants (N=20).

Information Source	Total N	Total %	Management (n=10)		Fieldwork (n=10)	
			N	%	N	%
Google scholar	9	45%	6	60%	3	30%
Online databases	9	45%	5	50%	4	40%
Personal contacts	14	70%	7	70%	7	70%
Personal data	9	45%	4	40%	5	50%
Journal databases	12	60%	7	70%	5	50%
Internet searches	15	75%	8	80%	7	70%
Government websites	17	85%	9	90%	8	80%
Personal reference collection	17	85%	8	80%	9	90%
Internal databases	6	30%	4	40%	2	20%

8.5.3 Information Sources: Supplied by Participants

Participants were asked to provide the information sources that they would use to find the characteristics that they selected to perform a preliminary characterization of a new area. The online participants were asked to provide sources after each category of characteristics, while the in-person participants were asked at the end of the questionnaire. The sources were combined into a list and grouped according to eight General Sources that emerged from the data: Organizations, Search Engines and Utilities, People, Websites, Databases, Personal collections, Libraries and Self Collected Data. The Specific Sources provided by participants are summarized in Table 19 and grouped according to their General Source. If more than one participant provided the source, the number of participants is indicated in brackets. Canadian sources from both the Federal government and from the Nova Scotia provincial government were heavily represented,

as was Google, particularly the spatially oriented Google maps and Google Earth. Self-collected data was also reported.

Table 19 General and specific information sources provided by participants.

General Source	Specific Sources	
Organizations	• Atlantic Zonal Monitoring program (AZMP) • Businesses • Canadian Centre for Science Advice • Canadian Hydrographic Service (2) • Environment Canada (3) • Federal Government • Fisheries and Oceans Canada (3) • Government Departments (2) • Halifax Regional Municipality (2) • Intergovernmental Panel on Climate Change • Internal Resources/Datasets (3) • Local governments or municipalities (2)	• Local planning authorities • Meteorological department (federal government) • National Oceanic and Atmospheric Administration • Natural Resources Canada • Natural Resources Canada (2) • NGOs • Nova Scotia Department of Environment • Nova Scotia Department of Natural Resources • NSAF • Oil and gas industry • Private companies • Provincial government: • Universities (2)
Search Engines/ Search Utilities	• COIN Atlantic • Google (4) • Google Earth (5)	• Google Maps (2) • Google Scholar (3) • Internet (6)
People	• Advisory committees • Co-workers • Community groups • Community members (2) • DFO personnel • Economic development groups	• Environment Canada personnel • Experts • Local coordinators • Local experts • Local knowledge • NGO personnel • Personal Contacts
Websites	• Aquaculture industry group websites • Environment Canada website (2) • EPA websites • Fishing organization websites • Gulf of Maine Council and Ecosystem Indicator Partnership • Government websites (3) • Journal websites	• MPA websites • Nova Scotia Department of Natural Resources Wet Area mapping website • Nova Scotia minerals: maps • Parks Canada websites • Provincial websites of landownership
Databases	• Atlantic Canada Conservation Data Centre databases • DNR Forest inventory database: agricultural areas, urban areas, forests and wetlands	• Federal lands database • Internal databases • Oil spill response database • Provincial databases: park size • Provincial topographic database: watershed size
Personal Collections	• Personal book collection	

General Source	Specific Sources	
Libraries	• DFO library: ecological descriptions of the area	• University library (2): ecological descriptions of the area
Self collected data	• Diving surveys • Habitat assessments • Nutrient level measurements	• Physical surveys • Site measurements/visits (3) • Water sampling

* The number in brackets indicates how many participants provided the source. The absence of a number in brackets indicates that the source was provided by one participant.
** There is some overlap between the Organization category and some of the other categories. Specific sources were grouped into the Organization category if the participant did not explicitly state that they used the organization's website, database or library.

Comments by participants –Because their answers were given orally, the participants who responded to the questionnaire in person would frequently make unrequested comments about the sources that they used as they answered the questions, some of which are reported here for elaboration. Participants 103 and 110 both commented that Google Earth was particularly useful to get a closer view of an unfamiliar area prior to making a site visit. Participant 110 commented that the street view option has been useful to get a virtual view of an area.

Summary

There was little variation in information types gathered by the participants as a whole group, although news articles were gathered less frequently than the others. Participants in management roles gathered policies, technical reports and news articles more frequently than those in fieldwork roles. When participants were asked generally what sources they used most often, Internet searches, government websites and personal reference collections were most frequently selected. An extensive list of specific sources consulted by participants was compiled (Table 19). Among the specific sources that were provided by participants, federal and provincial government departments and services were heavily represented. Google services such as Google maps and Google Earth were

also mentioned frequently, and participant commentary indicated that they were useful for getting a preliminary visual of the area.

8.6 Substitutions for Local Information

Participants were asked to indicate whether, in the absence of local information, information from other areas would be suitable. Participants were presented with three alternatives for local information: information for the larger region, information for the province or state, or information from a similar geophysical area. Participants did not have to answer the question for every characteristic, and could select from zero to 3 options if they wished. For each characteristic, the total responses for each characteristic (Total N), the number of participants who selected each of the three options, and the number of participants who selected none of the options are summarized in Table 20. There are too few responses to calculate significant differences between the options, or to compare between management and fieldwork roles so those analyses were not performed. For most characteristics, regional information is selected by the greatest number of participants, with the exception of all legal characteristics (provincial/state) and bathymetry where the greatest proportion of the participants selected none of the options.

Table 20 Acceptable substitutes for local information

Characteristic	Region		Prov/ State		Similar area		None		Total N
	N	%	N	%	N	%	N	%	
General									
Area of the water body	6	50%	2	17%	2	17%	2	17%	12
Beaches	6	50%	3	25%	1	8%	2	17%	12
Buoy locations	4	57%	0	0%	0	0%	3	43%	7
Contact information for local expert	6	55%	2	18%	2	18%	1	9%	11

Characteristic	Region		Prov/ State		Similar area		None		Total N
	N	%	N	%	N	%	N	%	
Contact information for subject expert	5	56%	1	11%	1	11%	2	22%	9
Ecodistrict type of land area	6	43%	3	21%	3	21%	2	14%	14
Latitude/Longitude	5	42%	3	25%	2	17%	2	17%	12
Map of the area	5	36%	3	21%	2	14%	4	29%	14
Map of the area by use or activity	5	42%	2	17%	2	17%	3	25%	12
Mean depth of the water body	6	55%	2	18%	1	9%	2	18%	11
Municipalities in the area	5	56%	0	0%	0	0%	4	44%	9
Relief of land area	5	42%	3	25%	1	8%	3	25%	12
Rivers	6	50%	3	25%	1	8%	2	17%	12
Watershed size	5	45%	3	27%	0	0%	3	27%	11
Climate and Weather									
Air temperature	5	63%	1	13%	0	0%	2	25%	8
Ice coverage	3	43%	2	29%	0	0%	2	29%	7
Precipitation	5	56%	2	22%	0	0%	2	22%	9
Storm frequency	5	56%	2	22%	0	0%	2	22%	9
Wind direction	6	67%	1	11%	0	0%	2	22%	9
Wind speed	6	60%	2	20%	0	0%	2	20%	10
Biological and Chemical									
Contaminant levels	5	63%	0	0%	0	0%	3	38%	8
Microbial pathogens	5	50%	1	10%	2	20%	2	20%	10
Nutrient Levels	4	44%	1	11%	0	0%	4	44%	9
Plankton measurements	5	45%	1	9%	1	9%	4	36%	11
Physical									
Bathymetry	3	25%	2	17%	1	8%	6	50%	12
Current measurements	4	40%	1	10%	1	10%	4	40%	10
Dissolved oxygen	3	30%	2	20%	1	10%	4	40%	10
Erosion rates	4	44%	2	22%	0	0%	3	33%	9
Salinity	5	45%	2	18%	1	9%	3	27%	11
Sea surface temperature	7	64%	2	18%	0	0%	2	18%	11
Secchi depth	3	33%	1	11%	1	11%	4	44%	9
Sediment data	3	30%	2	20%	1	10%	4	40%	10
Tidal volume of inlet or bay	4	33%	2	17%	1	8%	5	42%	12
Volume of outflow for a river or estuary	3	27%	2	18%	1	9%	5	45%	11
Water conductivity	3	33%	2	22%	0	0%	4	44%	9
Water levels	6	55%	2	18%	1	9%	2	18%	11
Water pH	5	50%	2	20%	0	0%	3	30%	10
Wave data	7	64%	2	18%	0	0%	2	18%	11
Species and Habitat									
Eelgrass	6	55%	1	9%	1	9%	3	27%	11

Characteristic	Region		Prov/ State		Similar area		None		Total N
	N	%	N	%	N	%	N	%	
Endangered species/ species at risk	6	55%	2	18%	1	9%	2	18%	11
Fish species in the area	7	58%	1	8%	2	17%	2	17%	12
Map of species distribution	6	46%	2	15%	3	23%	2	15%	13
Migration patterns	8	57%	3	21%	2	14%	1	7%	14
Mortalities (rates, annual totals)	7	54%	3	23%	2	15%	1	8%	13
Population estimates	7	54%	3	23%	2	15%	1	8%	13
Salt marshes	6	50%	1	8%	2	17%	3	25%	12
Wildlife species in the area	7	50%	2	14%	3	21%	2	14%	14
Legal, Regulatory, and Policy									
Applicable legislation and regulations	6	35%	7	41%	3	18%	1	6%	17
Government department with regulatory power	6	35%	7	41%	3	18%	1	6%	17
Marine or coastal protected areas	4	31%	5	38%	2	15%	2	15%	13
Park boundaries	3	30%	4	40%	0	0%	3	30%	10
Water management strategies	5	36%	6	43%	2	14%	1	7%	14
Wetland policies	5	36%	6	43%	2	14%	1	7%	14
Human Activity									
Agricultural activities	4	44%	2	22%	1	11%	2	22%	9
Average income	5	56%	2	22%	0	0%	2	22%	9
Coastal access points	6	60%	2	20%	0	0%	2	20%	10
Community groups with coastal management mandates	5	63%	2	25%	0	0%	1	13%	8
Employment density	5	56%	2	22%	0	0%	2	22%	9
Industrial activities	5	50%	3	30%	0	0%	2	20%	10
Population demographics	4	44%	2	22%	0	0%	3	33%	9
Population density	5	56%	2	22%	0	0%	2	22%	9
Recreational activities	4	36%	4	36%	1	9%	2	18%	11
Sewage treatment facilities	4	40%	3	30%	1	10%	2	20%	10
Shipping lanes	5	50%	3	30%	1	10%	1	10%	10
Waterfront property ownership	3	38%	3	38%	0	0%	2	25%	8
Wharves	5	63%	2	25%	0	0%	1	13%	8
Fisheries									
Annual landings per fishery	7	64%	3	27%	0	0%	1	9%	11
Aquaculture sites	7	64%	3	27%	0	0%	1	9%	11
Fisheries operating in the area	7	64%	3	27%	0	0%	1	9%	11
Number of fishing licenses per fishery	7	64%	3	27%	0	0%	1	9%	11
Regulatory limits of harvest (Total allowable	6	55%	3	27%	0	0%	2	18%	11

Characteristic	Region		Prov/ State		Similar area		None		Total N
	N	%	N	%	N	%	N	%	
catch)									

Comments by participants- Because their answers were given orally, the participants who responded to the questionnaire in person made several unrequested comments about the sources that they used as they answered the questions, some of which are reported here for elaboration. Participant 114, who participated by phone, indicated that it was highly important that accurate, site-specific data was used for coastal construction projects, and that the majority of the data was self-collected from the site, so substitute information was not acceptable. Participant 313992, who participated in the online survey, made a specific note expressing doubts that there was a reliable substitute for local information, as generalized information would not help with estimating local impacts for sea level rise.

Summary

Overall, regional information is preferred as a substitute for local information, with the exception of legal information and bathymetry. Provincial/state information was more often chosen as a substitute for local legal information. Bathymetry was unique in that most participants selected none of the options. Participant commentary indicated that some projects were not suitable for generalized information.

8.7 How Coastal Characteristics Can Be Displayed

To understand how coastal characteristics would be displayed visually in search results, all characteristics were coded according to how they would most likely be displayed if

presented in an e-Card. The three options were: as data (numerical value), as text (such as in a list), or on a map (See Appendix N for coding criteria). A second coder went through the data and followed the coding manual. The results from both coders were compared and instances where the coding differed were discussed and both coders came to an agreement on which code was appropriate. Each characteristic had three points where codes could agree or disagree for a total of 231. There were 31 instances where the coders differed, and after discussion 24, of the original codes were maintained, and seven codes were changed.

Table 21 summarizes the display types for each characteristic. An X in the appropriate column designates the most likely mode of display for each characteristic. The column labeled *N(%)* indicates the percentage of the total number of participants who selected the characteristic and was taken from Table 11). Characteristics could be coded in more than one category if that seemed appropriate. Characteristics that were classified into two display types always consisted of a combination of the map type and one of the other two.

Three of the categories were dominated by characteristics that fell into the Data display type: Physical, Biological and Chemical, and Climate and Weather. The characteristics in the remaining categories were more evenly distributed between the display types. The average selection percentage for the data, map and text categories was calculated. The 15 characteristics selected by 75% or more of the participants are highlighted in grey. Of these 15, four are likely to be displayed as text, and four are likely to be displayed on a

map. Two characteristics were likely to be displayed as data and/or on a map, and five may be displayed as text and/or on a map.

Table 21 Coastal characteristic selection according to likely mode of presentation

Characteristic	N (%)	Data	Text	Map
General				
Area of the water body	17 (85%)	X		X
Beaches	12 (60%)		X	X
Buoy locations	5 (25%)			X
Contact information for local expert	17 (85%)		X	
Contact information for subject expert	13 (65%)		X	
Ecodistrict type of land area	11 (55%)		X	X
Latitude/Longitude	15 (75%)	X		X
Map of the area	20 (100%)			X
Map of the area by use or activity	16 (80%)			X
Mean depth of the water body	12 (60%)	X		
Municipalities in the area	13 (65%)		X	X
Relief of land area	12 (60%)			X
Rivers	13 (65%)		X	X
Watershed size	13 (65%)	X		X
Climate and Weather				
Air temperature	8 (40%)	X		
Ice coverage	7 (35%)			X
Precipitation	12 (60%)	X		
Storm frequency	12 (60%)	X		
Wind direction	11 (55%)	X		
Wind speed	9 (45%)	X		
Biological and Chemical				
Contaminant levels	12 (60%)	X		
Microbial pathogens	4 (20%)	X		
Nutrient Levels	11 (55%)	X		
Plankton measurements	5 (25%)	X		
Physical				
Bathymetry	16 (80%)			X
Current measurements	12 (60%)	X		X
Dissolved oxygen	6 (30%)	X		
Erosion rates	8 (40%)	X		
Salinity	10 (50%)	X		

Characteristic	N (%)	Data	Text	Map
Sea surface temperature	13 (65%)	X		X
Secchi depth	5 (25%)	X		
Sediment data	9 (45%)	X		
Tidal volume of inlet or bay	9 (45%)	X		
Volume of outflow for a river or estuary	11 (55%)	X		
Water conductivity	6 (30%)	X		
Water levels	8 (40%)	X		
Water pH	9 (45%)	X		
Wave data	10 (50%)	X		
Species and Habitat				
Eelgrass	10 (50%)			X
Endangered species/ species at risk	16 (80%)		X	X
Fish species in the area	16 (80%)		X	X
Map of species distribution	15 (75%)			X
Migration patterns	9 (45%)			X
Mortalities (rates, annual totals)	10 (50%)	X		
Population estimates	14 (70%)	X		
Salt marshes	12 (60%)			X
Wildlife species in the area	14 (70%)		X	X
Legal, Regulatory and Policy				
Applicable legislation and regulations	19 (95%)		X	
Government department with regulatory power	17 (85%)		X	
Marine or coastal protected areas	14 (70%)		X	X
Park boundaries	12 (60%)			X
Water management strategies	10 (50%)		X	
Wetland policies	14 (70%)		X	
Human Activity				
Agricultural activities	14 (70%)		X	X
Average income	9 (45%)	X		
Coastal access points	12 (60%)			X
Community groups with coastal management mandates	17 (85%)		X	
Employment density	10 (50%)	X		
Industrial activities	16 (80%)		X	X
Population demographics	11 (55%)	X		
Population density	12 (60%)	X		
Recreational activities	17 (85%)		X	X
Sewage treatment facilities	11 (55%)		X	X
Shipping lanes	13 (65%)			X

Characteristic	N (%)	Data	Text	Map
Waterfront property ownership	13 (65%)		X	X
Wharves	10 (50%)		X	X
Fisheries				
Annual landings per fishery	13 (65%)	X		
Aquaculture sites	13 (65%)		X	X
Fisheries operating in the area	17 (85%)		X	X
Number of fishing licenses per fishery	9 (45%)	X		
Regulatory limits of harvest (Total allowable catch)	8 (40%)	X		

*The percentages in the columns indicate the percentage of participants (n=20) that selected each characteristic (see table 11).

Summary

Characteristic selection tended to differ between characteristics that would be displayed in different ways. Of the 15 characteristics selected by 75% or more of the participants, 11 were likely to be displayed as a map, two of which may also be displayed as data, and five of which may also be displayed as text. Four characteristics would be likely displayed as simply text.

CHAPTER 9 DISCUSSION: PHASE II

9.1 OVERVIEW

This study investigates a single task in the ICOM domain: gaining an overview of a topic or geographic area of concern. This task is particularly complex in this domain due to the need to consider economic, environmental and social concerns, as information is required from all three areas. From a set of 71 characteristics, fifteen core characteristics were identified as critical to supporting the task, and a comprehensive list of sources was compiled. There were differences in the characteristics selected by those in fieldwork roles and those in management roles, and less than half of the characteristics that were selected most frequently by each group were the same. The characteristics selected more frequently by those in management roles were often related to human activities, fisheries and species/habitat information, and there were far fewer characteristics in general that were associated with fieldwork roles. The additional characteristics provided by participants were often related to the original set of characteristics used for this study, and tended to be more detailed than the original set. The participants identified an extensive set of sources that they used to find coastal information and these sources form the basis of a trusted list of resources for coastal management information. In the absence of local information, regional information was generally an acceptable substitute, but some participants felt that certain activities required site specific information. A prototype e-Card was designed to assist in visualizing how this custom search result presentation might look.

9.2 Research Questions

9.2.1 Coastal characteristic selection

Research Question 1: What information is required to complete this task, and does it vary by professional role?

9.2.1.1 Characteristic selection for all participants

This study found that fifteen (15) core characteristics might be used to give coastal managers, regardless of role, a general overview of an area across different professional roles and topics. Five categories of information were clearly important for coastal management purposes: General; Legal, Regulatory, and Policy; Species and Habitat; Human Activity and Fisheries. All but one of the 15 core characteristics were found within these categories and the average selection frequencies for the characteristics within each category were above 60%. These characteristics might be favoured by coastal managers because of the high value placed on stakeholders in ICOM (Masalu, 2008), the requirements of the Fisheries Act and Species At Risk Act in Canada, and the need for using maps to get a visual sense of the area. Topic selection may add another dimension to the characteristics selected for use in this task, but this was not analyzed as part of this study.

9.2.1.2 Characteristic selection by role

There were differences in characteristic selection by participants whose roles were primarily *Fieldwork* oriented and participants whose roles were primarily *Management* oriented, which suggests that they have different needs for generating an overview of an area. Overall, many characteristics were selected relatively equally by participants in both

roles. When looking at the characteristics most frequently chosen by each group, the two groups chose sets of characteristics that had seven characteristics in common. One of the most noticeable differences between the two roles was that when characteristics were categorized based on whether they were more frequently chosen by the two groups, relatively few characteristics were selected more frequently by those in *Fieldwork* roles. Characteristics in the *Fieldwork* group totaled less than half of those in the *Management* group. This may be because the characteristics used in the study were not as suitable for fieldwork roles, or because those in management roles simply need a broader range of information. These two groups use overlapping sets of characteristics, but they likely need different core sets of information. The findings suggest that role does play a factor in determining the information needed for this task. The fifteen core characteristics may thus be sufficient for the two roles, but not optimal.

Roles were identified in an earlier study as a key difference in coastal information requirements (Eleveld et al, 2003), which suggested that researchers, policy makers/advisors and data managers need different types of information both in the level of aggregation and level of interpretation. These findings however, show that a professional's role, defined not simply by their job title but by understanding their role within a particular work activity, may also be a factor. This supports the point made by Leckie et al. (1996) that different professionals may play many roles within their organization and these roles may have different information needs.

Implications for design

Because an individual may shift between both roles depending on the project they are working on, simply defining a user based on their job description may be insufficient. Information retrieval systems may need to profile users based on their activity and the role they occupy within that activity rather than simply determining the user's job. This would be true of the e-Card as well, which may need to include the option to toggle back and forth between roles, and present different characteristics accordingly.

9.2.1.3 Additional characteristics

Many additional coastal characteristics were provided by participants. Most characteristics were related to the existing group in some way, with the majority being more specific sub-characteristics of the original set. Only seven of the characteristics provided by participants were identified as truly additional characteristics, and this indicates that the list of characteristics was relatively complete, but there may be a need for more specific information to be provided. Many of characteristics used in this study, particularly those likely to be displayed as a list, were deliberately kept broad because the sub-characteristics would be part of that list. For example, a list of fish species in an area could distinguish between (endangered) native species and invasive species.

Implications for design

With respect to the e-Card, these results suggest that there may be a need for more detailed information than can be summarized in a small box, which makes it important for extracted information to be linked to the source document where more details may be found.

9.2.2 Information sources

Research Question 2: What sources are consulted when performing this task?

The specific sources that participants indicated in the questionnaire that they would use for finding the coastal characteristics provided more insight into the types of sources used for the task than the general sources. Unlike the general sources consulted, personal reference collections were not often mentioned as a potential source for these characteristics. The specific sources leaned heavily towards both federal and provincial government sources, both directly from departments and from specific programs or tools associated with these departments.

The heavy representation of Canadian information sources, particularly those from Atlantic Canada, is likely due to the study population being primarily from Nova Scotia and the surrounding areas. Nevertheless, the reliance on government sources may be due to the use of a network of personal contacts, and the general perceived reliability and availability of government resources. Google maps and Google Earth also stood out as tools that were commonly used by participants. These tools were primarily used to get a first glance at the area, and highlight the need for spatial information tools to visualize local areas.

Implications for design

The list of specific sources provided by the participants forms a list of key resources that may be used to create customized search results for the "generate an overview" task of

coastal managers. Existing ways of personalizing search results infers which pages are most relevant to the user based on browsing history, and prioritizes search result accordingly (Sugiyama et al., 2004; Mohammed et al., 2010). Defining key information sources to support task-based search is novel in that it does not use automation or explicit information, but rather the list of resources is compiled through the collective experience of a group of experts. An information system could automatically draw from these sources, or if there were multiple sources of information rank results from these sources higher than others. Participant 101 mentioned at the end of the questionnaire that he liked the idea of an e-Card because it was drawing data from everywhere and presenting it as an intentional piece of information that incorporated the knowledge of other people. The value of the e-Card is that the search algorithm would prioritize information based on the collective expertise of a group of professionals, rather than ranking the results based only in content, typically called the "bag of words" approach. Grounding the customization of search in a user's task also avoids the somewhat unpredictable nature of personalization through implicit methods, and the lack of participation that can occur with explicit methods.

9.2.3 Substitutions for local information

Research Question 3: Can information from other areas be an acceptable substitute for local information?

The answer to the question of whether there is an acceptable substitute for local information was hampered by low response rates, which also prevented analyzing the responses by fieldwork and management roles. However some predictable, yet potentially

useful, patterns emerged from the responses that were received. For most coastal characteristics, regional information is an acceptable substitute for local information. There are two exceptions to this general result. The first is that substituting provincial or state information is preferred for all characteristics in the legal, regulatory and policy category. This may be because most relevant legislation is passed at the provincial or federal level, with the exception of some municipal by-laws, for example building guidelines or building codes. The second exception to regional information was for bathymetry, where most participants selected none of the options. This may be due to the need for a high degree of site specificity in this type of data. Two participants were explicit that for their projects, local information was critical and no substitutes were acceptable. These results suggest that information from the larger region is likely useful for coastal managers, but certain projects are highly dependent on site-specific information.

Implications for design

These results suggest that substituting regional information for local characteristics in an e-Card may be acceptable. However, given some participants' reservations about using non-local information, it may be more prudent at this point to avoid presenting information from other areas. It will also depend on the individual characteristic under consideration, as some may not change much over the larger area, while others may vary from location to location (e.g. water depth vs. sea surface temperature). If information from a larger area is presented, it should be explicitly indicated so that users can decide whether the information is suitable for their particular activity.

9.2.4 Task context

The findings from the first three research questions describe the information and sources associated with this coastal management task. These correspond to two of the elements of the generic task described by Toms (2011), and they provide the groundwork for describing enough details for a task-based approach to coastal information retrieval. Because decision making for ICOM requires accurate, reproducible, and reliable information, these sources could also be considered to address one of the conditions associated with the task by identifying a list of resources that search engines could use to provide information with the required accuracy and reliability. The task elements described in this study make up the content and sources required for the design of a task-specific e-Card.

9.2.5 Customized Search Results

Research Question 4: How could an e-Card be designed in order to support this task?

The customization of search results has been approached in several ways and usually involves providing some kind of context about the searcher, whether through generating profiles based on browsing history or using information provided directly by the user. The elements of task provided here can serve as the basis of customizing search results based on the user's task, by identifying the information needed for the task and the sources that coastal managers use in practice to find this kind of information.

The e-Card concept for customizing search results in this study was informed by a design used by the Bing search engine called *Instant Answers*, which extracts information from

relevant web pages and inserts it into the search results (Microsoft, 2009). The fifteen core characteristics identified in this study may be used to form a basic e-Card that would help coastal managers to get a quick overview of an area. These characteristics would be primarily displayed as either maps or text. Maps are clearly an important aspect of the e-Card, as four of the fifteen core characteristics are explicitly map based, i.e. they have geographic context. Representing four separate maps at once is not practical or helpful, but toggling between maps of an area as can be done on Google maps (maps.google.com) between the map, satellite, and terrain views, seems like a simple solution to accommodating several different maps. Modeling the method of switching between maps after Google Maps has the added benefit of being familiar to coastal managers. While such tools do not have the power of GIS applications, they do provide a general overview of the geographic area and are already in use by many coastal managers.

A prototype e-Card, which is not meant to represent an actual place, has been drafted to illustrate the concept (Figure 7). This e-Card would appear at the top of a set of search results. Each piece of extracted information would be a link to the source that it was drawn from, and any maps would link to source maps, or the original documents that they were extracted from. This allows the user to verify the source of the information and delve deeper into the topic that they are exploring. By providing a quick but reliable picture within the search results, the user may be able to locate and evaluate information more quickly.

Figure 7 Prototype version of e-Card.

9.3 Research Design Issues

This study was originally designed as an online survey with the intention of obtaining enough respondents to examine the variation in information required for the task using topics and between professional roles as independent variables. While studies involving students often have over one hundred participants (Gilbert, 2011), getting sufficient response rates from a study population of professionals has proven to be much more difficult. It was easier to recruit participants for the in-person questionnaires, than for the online questionnaire. This study population may be more inclined to participate in research involving person-to-person data collection methods, than web-based surveys.

The study design made it difficult to generalize the fifteen core characteristics as a central set beyond the study population and the e-Card concept. In order to make comparisons in selection frequencies between different roles, participants needed to select characteristics

from the same list. While a rigorous process was used to ensure that the list of coastal characteristics was complete, it also needed to be of a length that would allow the participants to complete the questionnaire in a reasonable amount of time. Likely, some characteristics were missed. The characteristics in the questionnaire were chosen partially to fit within the e-Card concept so that they displayable in a small space and suitable for quick scanning. It is possible that other characteristics containing information not included in the study might also be suitable, or that more complex information is actually needed for this task.

9.4 Contributions of the Research

Theoretical Contributions

The theoretical contributions of this research are in three areas: investigating a task in detail, using a task-based approach for information retrieval, and identifying role as an element that affects information tasks.

Studies on information tasks have typically operated at a high level, identifying elements that describe the nature of the tasks (Li, 2009,) but they have not investigated the actual components of a real-world information task. This research identified such a task and described two key elements required to complete it: the *information* needed and the *sources* used to access it. Characterizing this task makes it possible to operationalize the task through information system design. This research used a specific task to understand the details required for a task-based approach for information retrieval, and these findings, although limited by the small sample size, provide details that may be used for

the design of a an e-Card. To date, there has been only a small amount of research that bridges the gap between understanding information seeking behaviour and designing information systems, and it has typically focused on structured tasks (Bartlett, 2005). The emergence of a professional's role, a function of both work activity and their role within that activity, as a factor that affects the information used for this task, supports information seeking models where information needs are generated by the work tasks (Leckie et al., 1996; Bystrom and Hansen, 2005). As a whole, the research contributed to the application of task-based research to support information retrieval by demonstrating how task elements can be explored and used to design customized search results.

Practical Contributions

This study has identified fifteen core characteristics used for a specific task in the coastal and ocean domain, as well as highlighted differences in information needed by professionals in different roles. A comprehensive list of the sources used by these professionals to access the information they need has been compiled. These characteristics and sources may be used to inform the design of an e-Card to customize search results as a means of facilitating access to a variety of distributed information tailored to a specific coastal management task. Putting these findings into practice would also support an initial attempt at using a task-based approach to solve information search and retrieval problems.

CHAPTER 10 PHASE II CONCLUSIONS

The ICOM domain is a complex decision-making environment that must take a wide variety and quantity of information into account. This information is usually distributed among many sources and challenges in accessing these sources can become a barrier to effective management. An earlier study that described a suite of information tasks performed by coastal managers identified "getting an overview" as a common task performed in the early phases of management activities, which involves collecting a variety of information about an area or topic to generate a first impression.

This exploratory study examined this single task in detail so as to make recommendations about customizing search results, in the form of an e-Card, to support that task. Fifteen core characteristics that would be useful to generate an overview for all topics were identified. Information about fisheries, human activity, species and habitat, as well as general information and legal regulatory and policy information were selected most frequently for this task. Differences in characteristic selection between the participants in fieldwork and management roles emerged, with management roles requiring more and broader information. A comprehensive list of coastal information sources was compiled; it was heavily oriented towards government sources at both the federal and provincial level. Online mapping tools, like Google maps and Google Earth, were also key tools used by coastal managers. A prototype e-Card was designed to illustrate how these results could be applied to create a task-specific search result. This study is the first step in the development of task-based customized search tools for ICOM.

Future research may involve building on the results from this study to obtain a deeper understanding of how coastal management topics affect the information coastal managers use to get an overview. Investigating this task so as to describe all of the task elements (see Toms, 2011) would continue to work towards describing the task, that would then inform the design of information retrieval systems. Once this has been accomplished, the results could be used in the design of an e-Card that could be tested in user studies to refine the design and confirm the findings. Similar exploration of other tasks performed by coastal managers would contribute to the compilation of a suite of tools that would support task-based information retrieval for coastal ICOM professionals.

BIBLIOGRAPHY

Allan, J., Aslam, J., Beikin, N., Buckley, C., Callan, J., Croft, B., Dumais, S., ... Zhai, C. X. (January 01, 2003). Challenges in Information Retrieval and Language Modeling. *Sigir Forum, 37,* 1, 31.

Bartlett, J. C. (2005). *Connecting bioinformatics analysis to scientific practice: An integrated information behaviour and task analysis approach*. Ottawa: Library and Archives Canada = Bibliothèque et Archives Canada.

Belkin, N. J., Oddy, R. N., & Brooks, H. M. (June 01, 1982). ASK for information retrieval: Part I. Background and theory. *Journal of Documentation, 38,* (2), 61-71.

Borlund, . P. (January 01, 2000). Experimental components for the evaluation of interactive information retrieval systems. *Journal of Documentation, 56,* 1, 71-90.

Bystrom, K., & Hansen, P. (January 01, 2005). Conceptual framework for tasks in information studies. *Journal of the American Society for Information Science and Technology : Jasist, 56,* 10, 1050.

Canessa, R., Butler, M., Leblanc, C., Stewart, C., & Howes, D. (January 01, 2007). Spatial Information Infrastructure for Integrated Coastal and Ocean Management in Canada. *Coastal Management, 35,* 1, 105-142.

CBCL Limited, & Nova Scotia. (2009). *Our coast: Live, work, play, protect : the 2009 state of Nova Scotia's coast*. Halifax: Dept. of Fisheries and Aquaculture.

Chesapeake Bay Program. (2010). *Nutrients – Bay pressures – Chesapeake Bay Program*. Retrieved from http://www.chesapeakebay.net/nutrients.aspx?menuitem=14690

Cutting, D. R., Karger, D. R., & Pedersen, J. O. (January 01, 1993). Constant Interaction-Time Scatter/Gather Browsing of Very Large Document Collections. *Sigir Forum, 27,* 126.

Doody, J. P. (January 01, 2003). Information required for Integrated Coastal Zone Management: Conclusions from the European Demonstration Programme. *Coastal Management, 31,* 2, 163-173.

Dumais, S., Cutrell, E., & Chen, H. (January 01, 2001). Optimizing Search by Showing Results in Context. *Chi Conference-,* 277-284.

Eleveld, M. A., Schrimpf, W. B., & Siegert, A. G. (January 01, 2003). User requirements

and information definition for a virtual coastal and marine data warehouse. *Ocean and Coastal Management, 46,* 487-505.

Ellis, D. (September 01, 1989). A Behavioural Approach to Information Retrieval System Design. *Journal of Documentation, 45,* 3, 171-212.

Ellis, D., Cox, D., & Hall, K. (January 01, 1993). A comparison of the information seeking patterns of researchers in the physical and social sciences. *Journal of Documentation, 49,* 4, 356-369.

Fisheries and Oceans Canada. (2007). *DFO Classification of maritime inlets*. Retrieved from http://www2.mar.dfo-mpo.gc.ca/science/ocean/ceice/ceice.html

(GESAMP) UN Joint Group of Experts on the Scientific Aspects of Marine Pollution. (January 01, 2001a). A Sea of Troubles, Report Study GESAMP No. 70. 35 pp.

(GESAMP) UN Joint Group of Experts on the Scientific Aspects of Marine Pollution. Protecting the Oceans from Land-based Activities. (2001b). Report Study GESAMP No. 71. 162 pp.

Gilbert, S. (2011) Supporting the Student Research-Paper Writing Process: Activities, Technologies, and Sources. Ottawa: Library and Archives Canada = Bibliothèque et Archives Canada.

Gulf of Maine Council on the Marine Environment. (2011). *Ecosystem indicator partnership (ESIP).* Retrieved from http://www.gulfofmaine.org/esip/factsheet-01.php

Hackos, J. A. T., & Redish, J. (1998). *User and task analysis for interface design*. New York: Wiley.

Hearst, M. A. (January 01, 2006). Supporting exploratory search - Clustering versus faceted categories for information exploration. *Communications of the ACM, 49,* 4, 59.

Hearst, M. (2009). *Search user interfaces*. Cambridge: Cambridge University Press.

Hearst, M. A. and Pedersen, J. O. (1996) Reexamining the cluster hypothesis: Scatter/gather on retrieval results. *Proceedings of the 19th Annual International ACM SIGIR Conference on Research and development in information retrieval (SIGIR'96)*, Zurich, Switzerland. 76-84

Kim, J. (2009). Describing and predicting information behaviour on the web. *Journal of the American Society for Information Science and Technology*. *60,* (4), 679-693

Kuhlthau, C. C. (*June* 01, 1991). Inside the search process: Information seeking from the user's perspective. *Journal of the American Society for Information Science, 42,* 5,

361-71.

Leckie, G. J., Pettigrew, K. E., & Sylvain, C. (April 01, 1996). Modeling the Information Seeking of Professionals: A General Model Derived from Research on Engineers, Health Care Professionals, and Lawyers. *Library Quarterly, 66,* 2, 161-93.

Li, Y. (February 01, 2009). Exploring the Relationships between Work Task and Search Task in Information Search. *Journal of the American Society for Information Science and Technology, 60,* 2, 275-291.

Li, Y. & Belkin, N. J. (November 01, 2008) A faceted approach to conceptualizing tasks in information seeking. *Information Processing and Management, 44*, 6, 1822-1837

Li, Y., & Belkin, N. J. (September 01, 2010). An exploration of the relationships between work task and interactive information search behavior. *Journal of the American Society for Information Science and Technology, 61,* 9, 1771-1789.

Manber, U., Patel, A., & Robison, J. (January 01, 2000). The business of personalization - Experience with personalization on Yahoo!. *Communications of the ACM, 43,* 8, 35.

Marchionini, G. (January 01, 1995). Information Seeking in Electronic Environments. *Cambridge Series on Human Computer Interaction,* 9.)

Masalu, D. C. P. (July 01, 2008). Coastal data and information management for integrated coastal management: The role of IODE. *Marine Policy, 32,* 4, 544-550.

McCullough, D.M., P.A. Doherty, H.L. Schaefer, C. Deacoff, S.K. Johnston, D.R. Duggan, B.D. Petrie & V.V. Soukhovtsev. (2005). Significant Habitats: Atlantic Coast Initiative (SHACI). Halifax Regional Municipality - Units 4-6. *Canadian Manuscript Report of Fisheries and Aquatic Sciences.* 2724: xvii + 501 pp.

McDonald, D. M., Chen, H. (2006). Summary in context: Searching versus browsing. *ACM Transactions on Information Systems, 24*, 1, 111-141.

Microsoft. (2009). About bing – Instant answers – Tech & gadgets – MSN CA. Retrieved from http://www.microsoft.com/canada/msn/bing/features/instant_answers/

Mohammed, N., Duong, T. H., & Jo, G. S. (January 01, 2010). Contextual Information Search Based on Ontological User Profile. *Lecture Notes in Computer Science,* 6422, 490-500.

Province of Nova Scotia. (2010). *Surface water quality monitoring network data – Surface water – Nova Scotia Environment*. Retrieved from http://www.gov.ns.ca/nse/surface.water/automatedqualitymonitoringdata.asp

Sugiyama, K., Hatano, K., Yoshikawa, M., & Uemura, S. (January 01, 2004). User-Oriented Adaptive Web Information Retrieval Based on Implicit Observations. *Lecture Notes in Computer Science,* 3007, 636-643.

Teevan, J., Dumais, S. T., & Horvitz, E. (2007) Characterizing the value of personalizing search. *Proceedings of the 30th Annual International ACM SIGIR Conference on Research and development in information retrieval (SIGIR'07)*, Amsterdam, Netherlands. Poster

Toms, E. G. (2011, In Press). Task-based information searching and retrieval. In I. Ruthven, D. Kelly (Ed.) *Interactive information seeking behaviour and retrieval*. London: Facet Publishing. 320 pp.

Toms, E. G. (In progress). Coastal and ocean management: User tasks and archetypes when searching for information. *Unpublished data.*

United Nations. (1992). Agenda 21. Rio de Janeiro, Brazil: UN. 351p.

Vakkari, P. (January 01, 2003). Task-Based Information Searching. *Annual Review of Information Science and Technology (arist), 37,* 413-64.

Van Kouwen, F., Dieperink, C., Schot, P., & Wassen, M. (January 01, 2008). Applicability of Decision Support Systems for Integrated Coastal Zone Management. *Coastal Management, 36,* 1, 19-34.

Wells, P. G. (2010). Emerging issues – circa 2010: State of the Gulf of Maine report. Retrieved from Gulf of Maine Council website: http://www.gulfofmaine.org/state-of-the-gulf/docs/emerging-issues.pdf

White, R. W., Jose, J. M., & Ruthven, I. (September 01, 2003). A Task-oriented Study on the Influencing Effects of Query-biased Summarization in Web Searching. *Information Processing & Management, 39,* 5, 707-33.

Wilson, T. D. (June 01, 1999). Models in information behaviour research. *Journal of Documentation, 55,* 3, 249-270.

APPENDIX A ETHICS APPROVAL

DALHOUSIE UNIVERSITY
Inspiring Minds

Social Sciences and Humanities Research Ethics Board
Letter of Approval

Date: January 6,2011.

To: Jennifer Weldon , School of Information Management
Dr. Elaine Toms, School of Business Administration

The Social Sciences Research Ethics Board has examined the following application for research involving human subjects:

Project # 2010-2368

Title: A User-Based E-Card Design for Coastal and Ocean Management

and found the proposed research involving human subjects to be in accordance with Dalhousie Guidelines and the Tricouncil Policy Statement on *Ethical Conduct in Research Using Human Subjects*. This approval will be in effect for 12 months from the date indicated below and is subject to the following conditions:

1. Prior to the expiry date of this approval an annual report must be submitted and approved.
2. Any significant changes to either the research methodology, or the consent form used, must be submitted for ethics review and approval *prior to their implementation.*
3. You must also notify Research Ethics when the project is completed or terminated, at which time a final report should be completed.
4. Any adverse events involving study participants are reported immediately to the REB

Effective Date: December 15,2010. signe
Expiry Date: December 15,2011. Dr SSHREB)

IMPORTANT FUNDING INFORMATION - *Do not ignore*

To ensure that funding for this project is available for use, you must provide the following information and FAX this page to RESEARCH SERVICES at 494-1595

Name of grant /contract holder _____ Dept. _____
Signature of grant / contract holder _____
Funding agency _____
Award Number _____ Dal Account # (if known) _____

Dalhousie Research Services • Research Ethics • 5248 Morris Street • Halifax, NS, Canada • B3J 1B4
Tel: 902-494-1462 • Fax: 902-494-1595 • Email: Patricia.Lindley@dal.ca • www.dal.ca/~research

APPENDIX B APPLICATION FOR ETHICS REVIEW

APPLICATION FOR SUBMISSION TO THE DALHOUSIE UNIVERSITY SOCIAL SCIENCES AND HUMANITIES RESEARCH ETHICS BOARD

SECTION 1. ADMINISTRATIVE INFORMATION

Project Title **A user-based e-card design for coastal and ocean management.**

1.1 Local Principal Investigator [Lead researcher affiliated with Dalhousie University]			
Name	Jennifer Weldon		
Department	School of Information Management , School of Resource and Environmental Studies		
		Phone	494-8392
Email	jenweldon@dal.ca	Fax	494-1503
For student submissions	Supervisor's Name/Department	Elaine Toms/ School of Business Administration	
	Degree Program	Masters of Library and Information Studies Masters of Resource and Environmental Management	

Co-investigator(s) Names and affiliations	N/A

1.2 Signature of Local PI attesting that:
a. All co-investigators have reviewed the ethics submission and are in agreement with it. b. All investigators have read the TriCouncil Policy Statement *Ethical conduct for Research* *Involving Humans* and agree to abide by these guidelines
Signature ---------- Date ----------

Other ethics reviews (if any)		Where	N/A		
		Status	N/A		
Funding (if any)	Agency		NCE GRAND		
	Award Number		N/A		
Peer review (if any)	N/A				
Planned start date	January 2011		Planned end date	August 2012	
Contact person for this submission (if not PI)	Name	N/A			
	Email	N/A		Phone	N/A

SECTION 2. PROJECT DESCRIPTION

[Complete all parts, referring to the Guidance Document corresponding to this form]

2.1 INTRODUCTORY SUMMARY [250 words max]

2.1.1 briefly describe the rationale, purpose, study population and methods

2.1.1 The search for information is currently limited to a one-size fits all search box into which a number of keywords are entered and a list of results is generated, as exemplified by the Google search engine. While this approach may be sufficient for recreational searching, a professional environment requires a more tailored approach that provides a set of pertinent, and highly useful results.

Effective decision-making in coastal and ocean management uses a combination of environmental, economic and social information that is needed by a variety of people including policy-makers, research scientists and environmental managers. Each of these groups may work in the same domain, such as fisheries or environmental protection, but the information needed by a policy-maker may not be the same as that needed by a scientist.

One important task performed by coastal managers is understanding the ecological status of a geographic area prior to addressing a specific coastal problem. For example, to understand how erosion needs to be factored into a new coastal development project, a manager needs to know, among many variables, the average rainfall per year, the geological composition of the shoreline, and the types of human activity in the area. To acquire all of that data involves finding, scanning and extracting information from a variety of documents which is a time consuming task. But the manager needs that baseline data in order to get a sense of the problem.

The overall goal of this project is to extract those core coastal characteristics from those documents and present them in a format that can be quickly digested by coastal managers. This is a multi-step process: first, we must understand what core coastal

issues these individuals deal with, and what are those critical characteristics that they need to know to understand the background of the problem; second, we need to design a summarization of relevant information based on geographic location and the problem at hand to accompany search results. That, is we need to design an "e-card" (not unlike a specialized business card) of facts to support this task which would then become the first ranked item on a search results list; and finally we need to develop the algorithms that will extract those elements from a document. The first two steps are integral to this protocol; the last will be performed later.

To do the first step, individuals with experience in the coastal and ocean domain will be surveyed first to identify core coastal issues and characteristics of the geographical area. This is to create a comprehensive list of core issues and characteristics. In the second step, those who are active in the field will be surveyed to match those characteristics to specific coastal issues, and to determine whether different groups of professionals (e.g. policy-makers and research scientists) have different information needs.

2.2 BACKGROUND AND PURPOSE - In this section discuss **[3 pages max, not including references]**

2.2.1 why there is a need to undertake the study (including a brief literature review)
2.2.2 what new knowledge is anticipated as an outcome of the study
2.2.3. if this is intended to be a pilot study, or a fully developed project

2.2.1

Introduction

Management of coastal areas is undertaken by a wide variety of professionals including policy-makers, research scientists and managers. Management strategies for coastal areas have increasingly moved toward an integrated approach, where decisions need to balance competing interests such as environmental health, human welfare and economic growth (Van Kouwen, Dieperink, Schot & Wassen, 2008). Because coastal managers need to have access to a wide variety of information to address coastal issues, the simple search interface may be insufficient to provide access to and use of necessary information for environmental problem solving.

The broader objective of this project is to design a tool that would function as a customized information appliance for coastal management, in essence create a specialized interface for information retrieval and use. The concept of an "information appliance" was introduced by Raskin in 1978 and popularized by Norman (1998) who maintained that there was a need for specialized information devices that were designed to support specific functions. In order to design an appropriate information appliance we need to understand how it will be used and the functionality it will need to support information search activities in a coastal management context.

Goal of the Project

The focus of this research study is to understand one common information seeking

activity performed by coastal managers prior to beginning work on a coastal problem: collecting background information on the ecological status of a specific area, which they do now by searching for specific details on a variety of physical, biological and social characteristics that are found in many different sources (Dutka, et al. 2010). We propose that designing a simple summary, an "e-card", of geographically and topically relevant ecological information will supplement the normal search results and support this information problem.

Understanding the Information Problem

All information problems are generated by the larger work task and identifying the common information behaviour of professional groups is essential in the development of information systems. Thus we need to take the work environment into account when researching the information seeking and retrieval needs of professionals (Bystrom & Hansen, 2005). By identifying the work scenarios that lead coastal managers to search for information, we can begin to understand the range of environmental problems and the critical characteristics of each that inform coastal managers about the information problem. Understanding the connection between the coastal problem, and the required background information will help us to understand the functionality and potential use cases for a specialized tool to support managers' search activities.

Presenting the Solution

Once we understand the coastal issues and background information necessary for a specialized search tool, we will need to develop a design to integrate it into the search results. Some search engines, like Microsoft's Bing, anticipate the user's needs and provide an "instant answers" feature which presents snippets of information based on the context within which the search terms exist; this is in addition to the actual search results (Microsoft, 2009). For example, searching for a sports team will bring up a list of recent games and the final scores, which are hyperlinked to the news article the score was extracted from (Fig. 1). This integrated form of presenting relevant facts based on search terms is an approach that could be adapted to for coastal management by providing a simple summary of geographically and topically specific ecological information in the form of an "e-card" along with the usual search results.

Applying this concept to coastal and ocean management requires understanding what "answers" would be relevant for various scenarios. By understanding the topics and background information coastal managers search for, we will be able to design an effective "e-card" to reduce the initial background searching required to understand a new coastal issue.

Figure 1. Example of "instant answers" provided by Bing.

Bystrom, K., & Hansen, P. (January 01, 2005). Conceptual framework for tasks in information studies. *Journal of the American Society for Information Science and Technology : Jasist, 56,* 10, 1050.

Dutka, S. Weldon, J., Toms, E. (2010). An nGAIA for coastal zone management. In *Proceedings of the Graphics Animation and New Media Annual Conference, Ottawa, Canada, 2-4 June.*

Microsoft. (2009). About bing – Instant answers – Tech & gadgets – MSN CA. Retrieved from http://www.microsoft.com/canada/msn/bing/features/instant_answers/

Norman, D.A. 1998. *The Invisible Computer*. MIT Press, Cambride, MA.

Van Kouwen, F., Dieperink, C., Schot, P., & Wassen, M. (January 01, 2008). Applicability of Decision Support Systems for Integrated Coastal Zone Management. *Coastal Management, 36,* 1, 19-34.

2.2.2 The ultimate outcome of this project is the design of an "e-card" to supplement search results when users are looking for information on a specific coastal management topic. This requires an understanding of the relevant coastal issues, the information needed to address these issues, and an optimal way to present the information. This work is part of a larger project that is identifying tools to assist with coastal and ocean management decision-making.

2.2.3 This is intended to be a fully developed project.

2.3 STUDY DESIGN – In this section

2.3.1 state the hypotheses or the research questions or research objectives

2.3.2 describe the general study design and how it will address the hypotheses / questions /
objectives
2.3.3 describe how many participants are needed and how this was determined
2.3.4 describe the plan for data analysis in relation to the hypotheses/questions/objectives
2.3.5 if a phased review is being requested, describe why this is needed for this study and
which phases are contained in this application

2.3.1 Research Questions:

1. Which are the core coastal issues that are dealt with by coastal managers?

2. What is the set of core characteristics that are required to understand the local status of these issues, and how will the information be used?

3. Do different types of coastal management professionals need different information for the same issue?

4. What is the most useful way to display coastal information on an "e-card"?

2.3.2 This is an exploratory study to characterize the information needed by coastal managers when addressing coastal management problems. This information will be used to design an "e-card" that will provide a summary of geographically and topically relevant information based on the work task at hand.

The data will be collected through a two phase web-based survey (see Appendices C and F). Phase one will be used to answer RQ#1 by validating which coastal issues are dealt with by coastal managers and the ecological characteristics that are relevant to understanding coastal issues in general.

The results from phase one will be used to populate the survey for phase two which will identify which ecological characteristics are needed for a given coastal issue, what the information will be used for, and how different characteristics should be presented to answer RQ#2 and RQ #4. The demographics questionnaire from phase two will allow comparisons of the characteristics needed for a given coastal issue between groups of professionals to answer RQ#3.

2.3.3 Both phases of the survey will be distributed on the Web. We are anticipating 50 respondents for phase one and 100 respondents for phase two.

2.3.4 The data from phase one will be aggregated and used to identify which coastal issues and which characteristics will be included in the survey for phase two. The data from phase two will be aggregated and analyzed to the identify necessary characteristics for each coastal issue., how the characteristics should be displayed, how groups of characteristics will be used, and if there are differences in characteristics required for different groups of professionals.

2.3.5 N/A

2.4 RECRUITMENT – In this section, for each type of participant to be recruited, describe

2.4.1 the study population
2.4.2 any social / cultural / safety considerations
2.4.3 and justify all specific inclusion / exclusion criteria of participants
2.4.4 any recruitment instruments (attach copies)
2.4.5 who will be doing the recruitment and what actions they will take
2.4.6 any screening measures, and how they will be used (attach copies)
2.4.7 any permissions that are needed and attach letters

2.4.1 The study population for both surveys will be individuals with experience in the coastal and ocean management field. Participants will be asked to confirm that they have experience in this area before completing the survey. These may be graduate students, or working professionals.

2.4.2 N/A

2.4.3 N/A

2.4.4 See Appendices A and D for a copy of each recruitment letter.

2.4.5 The primary investigator will be responsible for recruiting respondents and will send the recruitment letter via the email newsletters and listservs of coastal organizations. Depending on response numbers, a secondary reminder email may be sent out.

2.4.6 N/A

2.4.7 N/A

2.5 INFORMED CONSENT PROCESS – In this section

2.5.1 describe the informed consent process (attach a copy of all consent forms)
2.5.2 if oral consent is desired, describe why it is necessary and how it will be done (attach a copy of the script)
2.5.3 if a waiver of informed consent is sought, explain why and describe how the four criteria needed for this are met
2.5.4 for third party consent (with or without assent), describe how this will be done

2.5.5 describe plans (if any) for on-going consent
2.5.6 if community consent is needed, describe how it will be obtained

2.5.1 Respondents who click on the link in the recruitment letter will be presented with the consent form (see Appendices B and E). The Consent Form outlines the conditions and invites them to email for more information, or continue with the survey by clicking the "I Consent" button, or not participate by clicking the "I do not wish to participate" button.

2.5.2 N/A

2.5.3 N/A

2.5.4 N/A

2.5.5 N/A

2.5.6 N/A

2.6 DETAILED METHODOLOGY - In this section describe

2.6.1 where the research will be conducted
2.6.2 what participants will be asked to do and the time each task will take (plus total time)
2.6.3 what data will be recorded and what research instruments will be used (attach copies)
2.6.4 the roles and qualifications of the study investigators / research staff
2.6.5 how long the participants will be involved in each part of the study

2.6.1 The research will be conducted at Dalhousie University. The survey is mounted on a Dalhousie server, and all data collected will be stored on that server. However, because the data collection process is via an online survey, respondents will be able to complete the survey wherever there is an Internet connection and a computer.

2.6.2
Phase one: The respondents will be asked to complete an online survey, which will take no longer than 10 minutes (but the exact time will be confirmed in pilot testing in house before the survey is advertised externally).

The survey (see Appendix C) will be divided into 6 parts.

Section 1. Introduction and Consent Form
This will take approximately two minutes to read and review. Willing respondents will select the "I agree" button and will be directed to the survey.

Section 2. Demographics
This asks respondents about age, gender and area of experience. This data is used to provide a profile of the respondent group when reporting results. Completion of this section should take approximately one minute.

Section 3. Coastal Issues
Respondents will be presented with a list of coastal issues to review. They will then be asked to select the top 5 issues, and will be given the opportunity to list any other issues that they think are missing.

Section 4. Coastal Characteristics
Respondents will be presented with groups of characteristics divided into several categories. They will be asked to review the list of characteristics for each group and will be able to add any that they think are missing.

Section 5. Selection of Characteristics for Categories of Coastal Issues
Respondents will be presented with a list of all of the characteristics from section 3.They will be asked to indicate the ten most important characteristics, and the ten least important characteristics for two categories of coastal management issues.

Section 6. Thank you.
This section will thank respondents for their participation and will provide the URL where the final report will be presented.

Phase two: The respondents will be asked to complete an online survey, which will take no longer than 20 minutes (but the exact time will be confirmed in pilot testing in house before the survey is advertised externally).

The survey (see Appendix F) will be divided into 5 parts.

Section 1. Introduction and Consent Form
This will take approximately two minutes to read and review. Willing respondents will select the “I agree” button and will be directed to the survey.

Section 2. Demographics
This asks respondents about age, gender and educational background and work role. This data is used to provide a profile of the respondent group when reporting results. Completion of this section should take approximately one minute.

Section 3. Coastal Issues and Characteristics
Respondents will be presented with five coastal topics accompanied by a brief description of a hypothetical work-related scenario. Each coastal topic scenario will include a selection of ecological characteristics, and the respondents will be asked to indicate which characteristics they would want to have under those circumstances. Once they have made their selection, they will be asked to provide a brief description of how the characteristics would be used.

Section 4. Display of Coastal Characteristics
The selected characteristics from each completed scenario would be presented within the context of the coastal issue and respondents would be asked to identify the most effective way to display each characteristic.

Section 5. Thank you.
This section will thank respondents for their participation and will provide the URL where the final report will be presented.

2.6.3 Data will be gathered through two online surveys. The surveys are included in Appendices C and F.

2.6.4 The PI is a student in her second year of the combined MLIS/MREM program who is conducting research for her master's thesis (MLIS). She has worked as a research assistant for her supervisor for six months, four of which were full-time. She was a member of a study team that conducted interviews with individuals working in the coastal and ocean management field during the summer of 2010. These interviews make up part of the foundation on which the problem scenarios are built, and the PI is familiar with the environmental management domain and concepts associated with this research. The supervisor is a research chair who is an expert in human computer interaction and information science, with expertise in the research domain and the methodology.

2.6.5 Respondents will only be involved in completing the survey.

2.7 DECEPTION / INCOMPLETE DISCLOSURE (if applicable) - In this section describe

2.7.1 what misdirection will be used (if any) and discuss its justification
2.7.2 what information will not be disclosed to participants and discuss its justification
2.7.3 how participants will be debriefed and given the opportunity to withdraw

2.7.1 There will be no misdirection used in this study

2.7.2 N/A

2.7.3 Respondents will be briefed on the introductory page and in the Consent Form. They withdraw by closing their browser window or by selecting the "I do not wish to participate" button.

2.8 RISK ANALYIS – In this section describe

2.8.1 what risks or discomforts are anticipated for participants
2.8.2 the estimated probability of these risks (e.g., low, medium, high or more precisely if possible)

2.8.3 what steps will be taken to mitigate the risks
2.8.4 what risks might exist for communities that are involved in the study

2.8.1 There are no known risks.

2.8.2 N/A

2.8.3 N/A

2.8.4 N/A

2.9 BENEFITS - In this section describe

2.9.1 the direct benefits (if any) of participation to participants (not compensation)
2.9.2 the indirect benefits of the study (i.e., contribution to new knowledge)

2.9.1 There are no direct benefits to respondents except the outcome of the research.

2.9.2 Benefits will be in the outcome of the research.

2.10 CONFIDENTIALITY and ANONYMITY - **I**n this section describe

2.10.1 whether the data to be collected is of a personal or sensitive nature
2.10.2 how the data will be collected, stored and handled in a confidential manner
2.10.3 how long the data will be retained, and what the plans are for its destruction
2.10.4 if it is possible for participants to remain anonymous, and how it will be achieved
2.10.5 how a 'duty to disclose' abuse or neglect of a child, or adult in need of protection, will be handled
2.10.6 if a waiver of confidentiality is to be sought from participants, and why

2.10.1 No sensitive data will be collected.

2.10.2 Data will be collected by distributing an online survey. The survey will be distributed using an open source survey package that is installed on a server at Dalhousie University. The survey responses will be stored on the same server.

2.10.3 Data will be retained for five years, and the files destroyed after that period.

2.10.4 No identifying information will be collected. Reported data will be aggregated.

2.10.5. N/A

2.10.6 N/A

2.11 USE OF QUOTATIONS – In this section describe

2.11.1 whether participants will be quoted in the final report, and if so
2.11.2 describe how permission will be obtained for this
2.11.3 describe whether the quotes be attributed, how permission for this will be obtained and
how participants will be given the chance to see how the quotes are used

2.11.1 Respondents may be quoted in the final report.

2.11.2 Permission will be obtained in the Consent Form (Appendices B and E).

2.11.3 Any quotations will be anonymized through the use of a randomly assigned participant ID. Given the general nature of the data, participant job function would not be identifiable. Respondents will be informed of this in the Consent Form (Appendices B and E). Since there is no way to connect a participant to a quote, no request for permission can be obtained.

2.12 COMPENSATION - In this section describe

2.12 1 what compensation will be offered to participants (if any), how it will be done and how
it will be handled for participants who do not complete the study
2.12.2 whether participants are likely to incur any additional expenses

2.12.1 Participants will not be offered compensation

2.12.2 Respondents will incur no expenses, except for the use of their time.

2.13 PROVISION OF RESULTS TO PARTICIPANTS - In this section, describe

2.13.1 plans to provide results of the study to participants
2.13.2 whether individual results will be provided to study participants, and how
2.13.3 how participants will be informed of results that may indicate they may be

at risk

2.13.1 The results of this study will be posted on the iLab website. The URL will be included on the final page of the survey.

2.13.2 Individual results will not be provided to study respondents.

2.13.3 N/A

2.14 COMPLIANCE WITH PRIVACY LEGISLATION – In this section,

2.14.1 state what software (if any) you will use to collect (e.g. survey software), store (e.g., database software) or analyze your data.
2.14.2 state whether a survey company will be used to assist in data collection, management storage or analysis
2.14.3 describe what provisions (if any) of the University policy on the *Protection of Personal Information from Access Outside Canada* apply and how they have been met.

2.14.1 LimeSurvey is an open-source survey software, installed on a Dalhousie University computer and will be used as the survey software to collect data. The data will be stored on a secure server located at Dalhousie University.

2.14.2 N/A

2.14.3 N/A

2.15 CONFLICT OF INTEREST – In this section

2.15.1 whether any conflict of interest exists for any member of the research team in relation to the sponsor of the study
2.15.2 whether any conflict of interest exists for any member of the research team with respect to their relationship to the potential research respondents (e.g., teacher / student)

2.15.1 N/A

2.15.2 N/A

SECTION 3. INFORMED CONSENT

Consult Section 3 of GUIDANCE FOR SUBMITTING AN APPLICATION FOR RESEARCH ETHICS REVIEW

3.1 CONSENT FORM CHECKLIST

Please complete this checklist and submit with the application.

YES	N/A	Have you included the following in your consent form / process?
X		Identification of document as CONSENT FORM
X		Title of study
X		Identity and affiliation of researchers
X		Contact information of individual conducting the study
X		Invitation to participate in research
X		Assurance of voluntariness and right to withdraw without repercussions
X		Short description of the purpose of the study
X		Short description of the study design and how many participants are involved
X		Inclusion and exclusion criteria
X		Description of what the participant is being asked to do
X		Estimate of the participant's time commitment
X		Description of where the research will take place
	X	Description of special clothing or other preparations required of the participant
X		Description of how anonymity will be handled
X		Description of how confidentiality of the data will be assured
X		Description of any necessary limitations of confidentiality protections
X		Description of the nature and probability of risks for participants
X		Description of the benefits for participants
	X	Declaration of any researcher conflict of interest
	X	Description of any possible commercial outcomes of the research
	X	Description of how participants will review transcripts of interviews
X		Description of how study results will be provided to participants
	X	Permissions requested for audio/video taping
X		Permissions requested for use of quotations
X		Permission for future use of data in specified studies
	X	Permission to recontact participant for participation in future studies
	X	Permissions related to transportation/use of data outside of Nova Scotia
	X	How assent of participant will be sought when 3rd parties give consent
		Signature statement indicating that information has been provided
		Signatures of participant and person obtaining consent

YES	N/A	Have you addressed the following in your Consent Form / Process ?
X		Appropriate Reading comprehension level (Grade 8)
X		Avoidance of technical language
X		Formatting: font size (min 12 pt), headings, page numbering
	X	Clear distinction between clinical care / research procedures
	X	No waiver of rights is sought

APPENDIX C RECRUITMENT LETTERS PHASE ONE

Focus Group Recruitment E-mail

To all Marine Affairs Program students:

We are investigating the information requirements of professionals working in coastal and ocean management.

Your education and expertise can help us to design an effective survey by identifying current coastal management issues and the information needed to address them.

Please come to lunch @ 1:15 on Wednesday March 9 at the iLab in Suite 2010. We will ask you to complete a quick survey, and then participate in a discussion about the upcoming study. We will provide the pizza, and an honorarium of $15 for your time! The session should take 1 to 1.5 hours.

To participate, RSVP to hci@dal.ca by March 7 and please let us know if you have any allergies or other dietary considerations.

Thank you.

Jennifer Weldon
MLIS/MREM Candidate
iLab, Dalhousie University
Halifax, NS.

APPENDIX D CONSENT FORM PHASE ONE

Consent form

DALHOUSIE UNIVERSITY
Inspiring Minds

What coastal information do you need?

We are investigating what information is needed to understand several coastal management topics. The research will assist in designing a system to support coastal managers when doing their work.

The survey will take approximately 20 minutes. Your participation in this survey is voluntary. You will not be asked to provide any identifying information. You may withdraw from the study at any time. There are no known risks to participating. *We will aggregate all responses, and may use your written comments as anonymized direct quotes in our papers. We will retain the data indefinitely and may use it to compare with similar data collected in later studies.*

If you have any questions or would like to learn more about this research, please contact Jennifer Weldon, MLIS/MREM student or Dr. Elaine Toms, Canada Research Chair in Management Informatics at the iLab at hci@dal.ca

In the event that you have difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Patricia Lindley, Director of Dalhousie University's Office of Human Research Ethics Administration: (902) 494-1462.

Principal Investigator/

Contact Person:

Jennifer Weldon

MLIS/MREM Candidate
iLab, School of Information Management
Dalhousie University

Supervisor:
Dr. Elaine Toms
Canada Research Chair in Management Informatics
iLab, Faculty of Management
Dalhousie University
Do you have experience with coastal and ocean issues, either through education or professionally? If so, and if you consent to participate in this study, please sign below.

_____	_____	_____
Participant Name	Signature	Date
_____	_____	_____

APPENDIX E DEMOGRAPHICS QUESTIONNAIRE PHASE ONE

SECTION 1

DALHOUSIE UNIVERSITY
Inspiring Minds

Demographics Profile

1) What is your gender?
   a. ___Female
   b. ___Male
   c. ___Prefer not to say
2) What is your age?
   a. ___20-29 years
   b. ___30-39 years
   c. ___40-49 years
   d. ___50-59 years
   e. ___60-69 years
   f. ___70 or more

3) Please check the box beside each degree or diploma that you have been awarded. Please indicate your major area of specialization in the space provided.

Degree/Diploma	Awarded	In progress	Specialization
a) College Diploma	☐	☐	
b) Bachelor's degree	☐	☐	
c) Master's degree	☐	☐	
d) Doctoral Degree	☐	☐	
e) Professional Degree	☐	☐	
f) Other...	☐	☐	

4) Have you ever been employed in a full time position, for one year or more, in a field related to coastal and ocean management in any of the following roles? Please circle all that apply.
   a. ___Researcher
   b. ___Manager of a resource
   c. ___Manager of a team
   d. ___Policy-maker
   e. ___Support staff
   f. ___None of the above

5) What was the title of your position? Please express it generally so as to preserve anonymity.

6) How long were you, or have you been employed in this position?

7) Indicate the geographic region where the bulk of your work experience has taken place. Please be general so as to preserve anonymity (Atlantic Canada, Eastern US, Caribbean, etc.).

APPENDIX F FOCUS GROUP SCRIPT

Welcome and thank you all for participating in this survey/brainstorm session. My name is Jennifer Weldon and I am a graduate student doing the combined MLIS/MREM degree. This session is part of the research for my Master's thesis on Coastal Management Information Requirements, and it's funded by NCE GRAND, one of the networks of centres of excellence. Today is going to be broken up into two general activities. I'm going to walk you through a survey about coastal issues and coastal information. After that, we will have a discussion about some elements of my upcoming survey so I can get your input and further develop my survey questions.

**********BREAK FOR FOOD **********

I'm going to be distributing a survey to various professionals who are active in coastal and ocean management, and I want to make sure that the survey is relevant to them, and makes sense. The survey you are about to do is designed to get a preliminary sense of what kind of answers we may get back, and to give you an idea of what I have so far, so that you can tell me if I'm missing anything.

Some parts will be repetitive, but bear with me, I will explain at the end and ask for feedback. So please give real answers. Your answers will be anonymized, so please don't write your name on any of the sections of the survey. You'll notice that I have given each one a random code.

We are going to start with the consent form, so please read it and I can answer any questions. If you are comfortable with what it says, please sign it and pass it down to me.

CONSENT FORM

Next, Please fill out the demographics form. If you have any questions please ask.

SECTION 1 - DEMOGRAPHICS PROFILE

We are going to start with coastal issues, so please take out the sheet that says SECTION 2 at the top. As it says on your sheet, we are trying to compile a list of current coastal issues. Please review the list that we have generated, and add any others that come to mind.

SECTION 2 – COASTAL ISSUES

DISCUSSION

This next part has two very similar sections. Please take out the sheets with SECTION 3 at the top. I want you to take one of the issues that you are at least somewhat familiar

with and imagine that you have been asked by a supervisor to begin a new project to address the issue in a coastal region that you haven't worked in before. You want to get a general sense of the current state of your chosen issue in the area, and you can have instantaneous access to all of the items that are listed on your sheet. Which of the items would you choose to gather in order to give you that general understanding?
The first part of your sheet asks you to select the information that would help you to understand the issue with respect to the natural environment, and the second part of the sheet asks you to select the information that would help you to understand the issue with respect to the human impacts.
Please tick the boxes next to your choices.

SECTION 3 – COASTAL INFORMATION – One theme

Now, I want you to take out the sheet with SECTION 4 at the top, and select a different coastal issue, you may use one of the issues that you wrote down earlier if there are no other issues on the whiteboard that you are familiar with. The instructions here are the same, but the two aspects: the checkboxes for the natural environment and the human impacts are side by side.

SECTION 4 – COASTAL INFORMATION – Two theme

**********Next Section Input on previous survey**********
So that's it for the survey part, please close your folders and pass them down to me. Now I want to ask you some questions about the survey structure. In the last section of the survey, were you able to keep the natural environment and the human impacts separate in your mind? Or was it easier to do it one at a time, as in section three?

Record survey structure input

Now I want to ask you about the survey content, and I have two questions.

1. Is the information provided here useful? Is there anything missing in any of the categories?
2. Do the eight category labels make sense, or are there better ways to group the information?

Record coastal information input

**********Next Section Input on Second Survey**********
As I said earlier, I'm going to be distributing a survey to various professionals who are active in coastal and ocean management, and I want to make sure that the I can provide options in the survey that are meaningful to them.

1) What are the primary sources of information that are consulted?

2) Are different types of information suitable for different topics?

3) Are different types of information suitable for different outputs?

APPENDIX G PARTICIPANT QUESTIONNAIRE SHEETS

SECTION 2

Coastal Issues

We are compiling a comprehensive list of coastal management issues that are important to managers, policy-makers, researchers and communities. We have identified the following issues thus far:

1. Biodiversity
2. Contaminants
3. Coastal or Marine Development
4. Ecosystem Health
5. Eutrophication
6. Fisheries Management
7. Sea Level Rise and Storm Events
8. Water Quality
9. Wildlife/Fish Habitat

Which issues are missing from the list above?

SECTION 3

Please select ONE issue from the whiteboard that you are relatively familiar with and enter it in the space below.

Coastal Issue:_____

Imagine that you are asked by your supervisor to begin a project in a coastal area that you have not worked in before, and you want to get a preliminary understanding of the local state of the above issue with respect to the natural environment.

PART A

Which of the following would you need to gather about the local area to get a baseline understanding of the natural environment with respect to your chosen issue? Please check all characteristics that you would need for each.

Climate and Weather Information	Natural Environment
Windspeed	☐
Wind direction	☐
Air temperature	☐
Ice coverage	☐
Precipitation	☐
Storm patterns	☐

Legislative/Regulatory information	Natural Environment
Level of government and department with regulatory power	☐
List of applicable legislation and regulations	☐
Marine/Coastal Protected Areas	☐
Park Boundaries	☐

Biological and Chemical Characteristics	Natural Environment
Wildlife and Fish species present	☐
Endangered species present	☐
Microbial pathogens	☐
Nutrient Levels	☐
Plankton measurements	☐
Contaminant Levels	☐

Human activity information	Natural Environment
Population demographics	☐
List of fisheries operating in the area	☐
List of coastal community groups in the area	☐
Aquaculture sites	☐
Wharves	☐
Average income	☐
Population density	☐
Employment density	☐

Fisheries information	Natural Environment
Regulatory limits of harvest (Total allowable catch)	☐
Annual landings of a specific fishery	☐
Number of fishing licences (per species)	☐
Season open and closure dates	☐

Species and Habitat data	Natural Environment
Population estimate	☐
Predators	☐
Mortalities	☐
Map of species distribution in area	☐
Saltmarshes	☐
Eelgrass	☐

Physical measurements	Natural Environment
Sea surface temperature	☐
Salinity	☐
pH	☐
Current measurements	☐
Tidal range of an inlet/bay	☐
Tidal volume of an inlet/bay	☐
Sediment data (concentration, load, particle size)	☐
Water levels	☐
Water conductivity	☐
Dissolved Oxygen	☐
Volume of outflow (river/estuary)	☐
Erosion rates	☐
Secchi depth	☐

General	Natural Environment
Latitude/Longitude	☐
Map of the area	☐
List of municipalities in the area	☐
Ecodistrict type of land area	☐
Area of the water body	☐
Mean depth of water body	☐
Watershed size	☐
Relief of land area	☐

SECTION 3

PART B (ONE THEME)

Coastal Issue:_____

Which of the following would you need to gather to get a baseline understanding of the human impacts with respect to your chosen issue on the local area? Please check all characteristics that you would need for each.

Climate and Weather Information	Human Impacts
Windspeed	☐
Wind direction	☐
Air temperature	☐
Ice coverage	☐
Precipitation	☐
Storm patterns	☐

Legislative/Regulatory information	Human Impacts
Level of government and department with regulatory power	☐
List of applicable legislation and regulations	☐
Marine/Coastal Protected Areas	☐
Park Boundaries	☐

Biological and Chemical Characteristics	Human Impacts
Wildlife and Fish species present	☐

Endangered species present	☐
Microbial pathogens	☐
Nutrient Levels	☐
Plankton measurements	☐
Contaminant Levels	☐

Species and Habitat data	Human Impacts
Population estimate	☐
Predators	☐
Mortalities	☐
Map of species distribution in area	☐
Saltmarshes	☐
Eelgrass	☐

Human activity information	Human Impacts
Population demographics	☐
List of fisheries operating in the area	☐
List of coastal community groups in the area	☐
Aquaculture sites	☐
Wharves	☐
Average income	☐
Population density	☐
Employment density	☐

Fisheries information	Human Impacts
Regulatory limits of harvest (Total allowable catch)	☐
Annual landings of a specific fishery	☐
Number of fishing licences (per species)	☐
Season open and closure dates	☐

Physical measurements	Human Impacts
Sea surface temperature	☐
Salinity	☐
pH	☐
Current measurements	☐
Tidal range of an inlet/bay	☐
Tidal volume of an inlet/bay	☐
Sediment data (concentration, load, particle size)	☐
Water levels	☐
Water conductivity	☐
Dissolved Oxygen	☐

Volume of outflow (river/estuary)	☐
Erosion rates	☐
Secchi depth	☐

General	Human Impacts
Latitude/Longitude	☐
Map of the area	☐
List of municipalities in the area	☐
Ecodistrict type of land area	☐
Area of the water body	☐
Mean depth of water body	☐
Watershed size	☐
Relief of land area	☐

SECTION 4

Please select from the whiteboard a DIFFERENT ISSUE from the one you selected earlier and enter it in the space below.
Imagine that you are researching two different aspects of a local area with respect to _____:

1) The natural environment
2) The human impacts on the area

Which of the following would you need to gather about the local area to get a baseline understanding of the natural ecosystem and the human impacts with respect to your chosen issue? Please check all characteristics that you would need for each.

Climate and Weather Information	Human Impacts	Natural Environment
Windspeed	☐	☐
Wind direction	☐	☐
Air temperature	☐	☐
Ice coverage	☐	☐
Precipitation	☐	☐
Storm patterns	☐	☐

Legislative/Regulatory information	Human Impacts	Natural Environment
Level of government and department with regulatory power	☐	☐
List of applicable legislation and regulations	☐	☐

Marine/Coastal Protected Areas	☐	☐
Park Boundaries	☐	☐

Biological and Chemical Characteristics	Human Impacts	Natural Environment
Wildlife and Fish species present	☐	☐
Endangered species present	☐	☐
Microbial pathogens	☐	☐
Nutrient Levels	☐	☐
Plankton measurements	☐	☐
Contaminant Levels	☐	☐

Human activity information	Human Impacts	Natural Environment
Population demographics	☐	☐
List of fisheries operating in the area	☐	☐
List of coastal community groups in the area	☐	☐
Aquaculture sites	☐	☐
Wharves	☐	☐
Average income	☐	☐
Population density	☐	☐
Employment density	☐	☐

Fisheries information	Human Impacts	Natural Environment
Regulatory limits of harvest (Total allowable catch)	☐	☐
Annual landings of a specific fishery	☐	☐
Number of fishing licences (per species)	☐	☐
Season open and closure dates	☐	☐

Species and Habitat data	Human Impacts	Natural Environment
Population estimate	☐	☐
Predators	☐	☐
Mortalities	☐	☐
Map of species distribution in area	☐	☐
Saltmarshes	☐	☐
Eelgrass	☐	☐

Physical measurements	Human Impacts	Natural Environment
Sea surface temperature	☐	☐
Salinity	☐	☐
pH	☐	☐
Current measurements	☐	☐

Tidal range of an inlet/bay	☐	☐
Tidal volume of an inlet/bay	☐	☐
Sediment data (concentration, load, particle size)	☐	☐
Water levels	☐	☐
Water conductivity	☐	☐
Dissolved Oxygen	☐	☐
Volume of outflow (river/estuary)	☐	☐
Erosion rates	☐	☐
Secchi depth	☐	☐

General	Human Impacts	Natural Environment
Latitude/Longitude	☐	☐
Map of the area	☐	☐
List of municipalities in the area	☐	☐
Ecodistrict type of land area	☐	☐
Area of the water body	☐	☐
Mean depth of water body	☐	☐
Watershed size	☐	☐
Relief of land area	☐	☐

Information type by Topic

Information Type	Coastal Development	Water Quality	Fisheries Management	Wildlife/ Fish Habitat	Contaminants	Ecosystem Health	Eutrophication	Sea Level Rise and Storm Events
Real-time Data								
Aggregated Data								
Statistics								
Journal Articles								
Grey Literature								
Research Reports								
News Articles								
Laws or Statutes								
Static maps (pdf or paper)								
GIS layers								
Fact sheet								

APPENDIX H RECRUITMENT LETTERS PHASE II

Online survey recruitment letter

Dear X.

We are investigating What types of information coastal and ocean managers need in order to understand a specific coastal issue. This research builds on research that we conducted last summer which you may have participated in.

This phase is a questionnaire that takes approximately 25 minutes. The questionnaire will be available until April 15 and can be accessed at:

https://surveys.dal.ca/opinio/s?s=11000

We are looking for experts who actively work on coastal issues such as researchers, managers and policy makers. Could you please pass this message on to others and particularly to distribution lists that are internal so that the right people will be reached?

This research will support master's thesis research at Dalhousie University and is funded by the GRAND Networks of Centres of Excellence.

Thank you in advance. If you have any questions, please contact us at the iLab at Dalhousie University: hci@dal.ca, or (902)494-8392.

Jennifer Weldon, Principal Investigator
MLIS Candidate
School of Information Management

Dr. Elaine Toms, Supervisor
Canada Research Chair in Management Informatics
Director, iLab, Faculty of Management

Oral survey recruitment letter

Dear X.

In the last few weeks I sent you an invitation to fill out a survey on coastal management. If you haven't already completed the survey, may I make an appointment to ask you the questions in person? This will take approximately 25 minutes, and I am happy to come to your office if you are in Halifax, or speak with you by phone.

The questions will be based on your professional experience with your choice of one of the following coastal management topics:

1) Water quality
2) Coastal or marine habitat protection
3) Coastal or marine development
4) Sea level rise and storm events
5) Contaminants
6) Fisheries management
7) Biodiversity or species management

This research will support master's thesis research at Dalhousie University and is funded by the GRAND Networks of Centres of Excellence.

Thank you in advance. If you have any questions or wish to participate in person or over the phone, please contact us at the iLab at Dalhousie University: hci@dal.ca, or (902)494-8392.

Jennifer Weldon, Principal Investigator
MLIS Candidate
School of Information Management

Dr. Elaine Toms, Supervisor
Canada Research Chair in Management Informatics
Director, iLab, Faculty of Management

APPENDIX I CONSENT FORM PHASE II

What coastal information do you use?

DALHOUSIE UNIVERSITY
Inspiring Minds

We are investigating what information is needed for various coastal management issues, what information is needed by different professionals, and what information is needed at different geographic scales. The research will assist in the design of a search system to support coastal managers when doing their work.

The survey will take approximately 25 minutes. Your participation in this survey is voluntary and anonymous. You will not be asked to provide any identifying information. You may withdraw from the study at any time.

There are no known risks to participating. We will aggregate all responses, and may use your comments as anonymized direct quotes in our papers. We will retain the data indefinitely and may use it to compare with similar data collected in later studies. If you would like to be provided with the final results of the study, please leave your email address with us at the end of the survey.

If you have any questions or would like to learn more about this research, please contact Jennifer Weldon, MLIS/MREM student or Dr. Elaine Toms, Canada Research Chair in Management Informatics at the iLab at hci@dal.ca

In the event that you have difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Patricia Lindley, Director of Dalhousie Universitys Office of Human Research Ethics Administration: (902) 494-1462.

Principal Investigator/Contact Person:
Jennifer Weldon
MLIS/MREM Candidate
iLab, School of Information Management
Dalhousie University

Supervisor:
Dr. Elaine Toms
Canada Research Chair in Management Informatics
iLab, Faculty of Management
Dalhousie University

Do you have professional experience in any field related to coastal and ocean management? If so, and if you consent to participate in this study, please sign below.

_____	_____	_____
Participant Name	Signature	Date
_____	_____	_____
Principal Investigator	Signature	Date

APPENDIX J DEMOGRAPHICS QUESTIONNAIRE PHASE II

Demographics Profile

DALHOUSIE UNIVERSITY
Inspiring Minds

1. **What is your gender?**

   ___Male
   ___Female
   ___Prefer not to say

2. **What is your age?**

   ___20-29 years
   ___30-39 years
   ___40-49 years
   ___50-59 years
   ___60-69 years
   ___70 years or more

3. **Please indicate which of the following degrees/ diplomas you have been awarded. For each, specify your major or the area of interest.**

Degree		Major/ Area of Interest
College Diploma	☐	
Undergraduate Degree	☐	
Masters Degree	☐	
Doctoral Degree	☐	
Professional Degree	☐	
Other:	☐	

4. **Where are you employed?**

   ___Federal Government
   ___Provincial Government
   ___Municipal Government
   ___Non-governmental Organization
   ___University or other academic institution
   ___Consultant Firm
   ___other:_____

5. **What type of job do you have? Please be general so as to preserve anonymity**

6. **What role BEST describes your current position?**

___Researcher
___Policy-maker
___Policy advisor
___Manager of a Resource
___ Manager of a team
___Other_____

7. **What influences your decision-making the most? For example: Scientific methods, your education, or your current job experience.**

8. **What is the geographic scope of the projects you work on MOST of the time? Check all that apply.**

___Local (e.g. municipality, or an estuary)
___ Regional (e.g. Bay of Fundy or a county)
___Provincial/State
___National
___ International
___Other_____

9. **Where do you find information MOST often? Check all that apply.**

___Government websites
___Personal reference collection (books, journal articles)
___Internal database
___Google Scholar
___ Online databases (e.g. WAVES)
___Personal contacts
___Personal data collection
___Journal databases
___Internet searches

Add any additional sources in the space below.

10. **If you do not work in Canada, please indicate what country you currently work in.**

APPENDIX K ONLINE SURVEY PHASE II

What Coastal Information Do You Use?

We are investigating how people who work in coastal and ocean management find information pertinent to their work. This research will assist in the design of a search system to help professionals find relevant coastal information quickly. If you work on coastal issues in any capacity, please fill out this 25 minute survey.

Jennifer Weldon
MLIS Candidate 2011
School of Information Management
MREM Candidate 2011
School for Resource or Environmental Management

Elaine Toms
Canada Research Chair in Management Informatics
Director, iLab, Faculty of Management

Informed Consent

Q1: What coastal information do you use?

We are investigating what information is needed for various coastal management issues, what information is needed by different professionals, and what information is needed at different geographic scales. The research will assist in the design of a search system to support coastal managers when doing their work.

The survey will take approximately 25 minutes. Your participation in this survey is voluntary and anonymous. You will not be asked to provide any identifying information. You may withdraw from the study at any time by closing the browser window. There are no known risks to participating. We will aggregate all responses, and may use your comments as anonymized direct quotes in our papers. We will retain the data indefinitely and may use it to compare with similar data collected in later studies.

If you have any questions or would like to learn more about this research, please contact Jennifer Weldon, MLIS/MREM student or Dr. Elaine Toms, Canada Research Chair in Management Informatics at the iLab at hci@dal.ca

In the event that you have difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Patricia Lindley, Director of Dalhousie Universitys Office of Human Research Ethics Administration: (902) 494-1462.

Principal Investigator/Contact Person:
Jennifer Weldon
MLIS/MREM Candidate
iLab, School of Information Management
Dalhousie University

Supervisor:
Dr. Elaine Toms
Canada Research Chair in Management Informatics
iLab, Faculty of Management
Dalhousie University

Do you have professional experience in any field related to coastal and ocean management? If so, and if you agree with the preceding statements, please select I Agree". If not, please select I do not wish to participate or close the browser

window.

- ◯ I agree to participate in the survey
- ◯ I do not wish to participate

Coastal Issue Selection

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q2: What kind of information do you need to work on coastal issues? Please choose one of the following seven areas with which you have had experience with in any capacity, such as research, policy, or management.Water quality (e.g. eutrophication, shellfish closures, oxygen depletion, water quality monitoring)Coastal or marine habitat protection (e.g. conservation of species, habitat restoration, habitat alteration, destruction or disturbance, biodiversity loss, salt marsh restoration, invasive plants, marine protected areas, ecosystem health, ecosystem initiative development)Coastal or marine development (e.g. coastal construction, wharves, oil rigs, land use, marine energy, public access, beach access, degradation and destruction of habitat, environmental impact assessments, coastal or land use planning, coastal setbacks)Sea level rise and storm events (e.g. wetland restoration or protection, coastal erosion, adaptive strategies for climate change, coastal planning)Contaminants (e.g. biomagnification, coastal health, groundwater contaminiation, marine pollution, watershed contamination, pollution sources) Fisheries management (e.g. aquaculture, quota setting, stock depletion, ecosystem-based fisheries management, sustainable fisheries, aboriginal fishing rights, fisheries co-management)Biodiversity or species management (e.g. invasive species, loss of biodiversity, species recovery planning, species collapse/depletion, species at risk/endangered species, species conservation) Please select one coastal issue. We will be asking questions regarding your selection for the remainder of the survey.

- ◯ Water quality
- ◯ Coastal or marine habitat protection
- ◯ Coastal or marine development
- ◯ Sea level rise and storm events
- ◯ Contaminants
- ◯ Fisheries management
- ◯ Biodiversity or species management

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q3: What is one memorable project that you worked on with respect to your selected coastal issue?

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q4: Briefly describe your role in that project.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q5: Briefly describe the outcome of the project. Example: a briefing note, an internal report, a research paper, an external report, a news release...

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q6: Please check each type of information you gathered while working on this project and indicate what specific information you needed in the space provided.Example: Paper or PDF maps - vegetation maps and species distribution maps

Journal articles	☐	
Technical reports	☐	
Paper or PDF maps	☐	
Data (e.g. GIS layers, real-time data)	☐	
Laws or statutes	☐	
Policies or strategies	☐	
News articles	☐	

Other: Please elaborate.

Example

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q7: The objective of our research is to provide a summary of core characteristics about an issue. For example, consider the following scenario which has been provided to illustrate the point.

Imagine that you are developing coastal erosion policies and you research policies that have been implemented in other coastal areas. You decide to start with North Carolina, and search for information. Along with the usual search results, the first result contains a summary of selected information about North Carolina that may be relevant to coastal erosion.

How could we create a similar summary for other coastal issues? What would it contain? The above example is

hypothetical. The remainder of this survey is designed to understand how you approach coastal issues so that we can tailor examples like this to specific coastal problems.

Coastal Information - General

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q8: The following pages contain coastal information divided into the following 8 categories, with each category appearing on a separate page.

1) General Information
2) Climate and Weather Information
3) Biological and Chemical Information
4) Physical Measurements
5) Species and Habitat information
6) Legal, Regulatory, and Policy Information
7) Fisheries Information
8) Human Activity Information

Imagine that you are beginning a project in a new coastal area, and you want to get a first impression of the local state of "${Coastal Issue}"What GENERAL information would you need for this purpose? Check all that apply.

- [ ] Latitude/Longitude
- [ ] Map of the area
- [ ] List of municipalities in the area
- [ ] Ecodistrict type of land area
- [ ] Area of water body
- [ ] Mean depth of water body
- [ ] Watershed size
- [ ] Relief of land area
- [ ] Beaches
- [ ] Rivers
- [ ] Map of the area by use or activity
- [ ] Contact information for local expert
- [ ] Contact information for subject expert
- [ ] Buoy locations

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q9: Do you need any additional GENERAL information? Please enter what you would need in the space below.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q10: Where do you find GENERAL coastal information? List any sources that you typically use.

Coastal Information - Climate and Weather

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q11: Imagine that you are beginning a project in a new coastal area, and you want to get a first impression of the local state of "${Coastal Issue}"What CLIMATE and WEATHER information would you need for this purpose? Check all that apply.

- ☐ Wind speed
- ☐ Wind direction
- ☐ Air temperature
- ☐ Ice coverage
- ☐ Precipitation
- ☐ Storm frequency

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q12: Do you need any additional CLIMATE AND WEATHER information? Please enter what you would need in the space below.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q13: Where do you find CLIMATE and WEATHER information? List any sources that you typically use.

Coastal Information - Biological and Chemical

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q14: Imagine that you are beginning a project in a new coastal area, and you want to get a first impression of the local state of "${Coastal Issue}"What BIOLOGICAL and CHEMICAL information would you need for this purpose? Check all that apply.

- ☐ Microbial pathogens
- ☐ Nutrient levels
- ☐ Plankton measurements
- ☐ Contaminant levels

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q15: Do you need any additional BIOLOGICAL AND CHEMICAL information? Please enter what you would need in the space below.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q16: Where do you find BIOLOGICAL or CHEMICAL information? List any sources that you typically use.

Coastal Information - Physical Measurements

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q17: Imagine that you are beginning a project in a new coastal area, and you want to get a first impression of the local state of "${Coastal Issue}"What PHYSICAL information would you need for this purpose? Check all that apply.

- ☐ Bathymetry
- ☐ Sea surface temparature
- ☐ Salinity
- ☐ pH
- ☐ Current measurements
- ☐ Wave data
- ☐ Tidal range of an inlet or bay

- [ ] Tidal volume of an inlet or bay
- [ ] Sediment data (concentration, load, particle size)
- [ ] Water levels
- [ ] Water conductivity
- [ ] Dissolved oxygen
- [ ] Volume of outflow for a river or estuary
- [ ] Erosion rates
- [ ] Secchi depth

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q18: Do you need any additional PHYSICAL information? Please enter what you would need in the space below.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q19: Where do you find PHYSICAL coastal information? List any sources that you typically use.

Coastal Information - Species and Habitat

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q20: Imagine that you are beginning a project in a new coastal area, and you want to get a first impression of the local state of "${Coastal Issue}"What SPECIES and HABITAT information would you need for this purpose? Check all that apply.

- [ ] Wildlife species in the area
- [ ] Fish species in the area
- [ ] Population estimates
- [ ] Mortalities (rates, annual totals)
- [ ] Species migration patterns
- [ ] Endangered species/ species at risk
- [ ] Map of species distribution in the area
- [ ] Eelgrass
- [ ] Saltmarshes

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q21: Do you need any additional SPECIES AND HABITAT information? Please enter what you would need in the space below.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q22: Where do you find SPECIES and HABITAT information? List any sources that you typically use.

Coastal Information - Legal, Regulatory and Policy

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q23: Imagine that you are beginning a project in a new coastal area, and you want to get a first impression of the local state of "${Coastal Issue}"What LEGAL, REGULATORY or POLICY information would you need for this purpose? Check all that apply.

- ☐ Government department with regulatory power
- ☐ Applicable legislation ane regulations
- ☐ Marine or coastal protected areas
- ☐ Park boundaries
- ☐ Water management strategies
- ☐ Wetland policies

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q24: Do you need any additional LEGAL, REGULATORY AND POLICY information? Please enter what you would need in the space below.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q25: Where do you find LEGAL, REGULATORY or POLICY information? List any sources that you typically use.

Coastal Information - Human Activity

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q26: Imagine that you are beginning a project in a new coastal area, and you want to get a first impression of the local state of "${Coastal Issue}"What HUMAN ACTIVITY information would you need for this purpose? Check all that apply.

- ☐ Population demographics
- ☐ Fisheries operating in the area
- ☐ Community groups with coastal management mandates
- ☐ Wharves
- ☐ Average income
- ☐ Population density
- ☐ Employment density
- ☐ Coastal access points
- ☐ Waterfront property ownership
- ☐ Shipping lanes
- ☐ Industrial activities
- ☐ Recreational activities
- ☐ Sewage treatement facilities
- ☐ Agricultural activities

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q27: Do you need any additional HUMAN ACTIVITY information? Please enter what you would need in the space below.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q28: Where do you find HUMAN ACTIVITY information? List any sources that you typically use.

Coastal Information - Fisheries

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q29: Imagine that you are beginning a project in a new geographic area, and you want to get a first impression of the local state of "${Coastal Issue}"What FISHERIES information would you need for this purpose? Check all that apply.

- ☐ Aquaculture sites
- ☐ Regulatory limits of harvest (total allowable catch)
- ☐ Number of fishing licences per fishery
- ☐ Annual landings of a fishery
- ☐ Annual revenue generated by a fishery
- ☐ Season open and closure dates for a fishery

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q30: Do you need any additional FISHERIES information? Please enter what you would need in the space below.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q31: Where do you find FISHERIES information? List any sources that you typically use.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q32: GENERAL INFORMATION
If information was unavailable at the local level, would information at another level be acceptable to understand ${Coastal Issue}? Check all that apply.Regional = county or large bay (e.g. Bay of Fundy) Similar geophysical area = location with similar geology and climate

GENERAL INFORMATION	Regional	Provincial/State	Similar geophysical area
Latitude/Longitude	☐	☐	☐
Map of the area	☐	☐	☐
Municipalities in the area	☐	☐	☐
Ecodistrict type of land area	☐	☐	☐
Area of the water body	☐	☐	☐
Mean depth of the water body	☐	☐	☐
Watershed size	☐	☐	☐
Relief of land area	☐	☐	☐
Beaches	☐	☐	☐
Rivers	☐	☐	☐
Map of the area by use or activity	☐	☐	☐
Contact information for local expert	☐	☐	☐
Contact information for subject expert	☐	☐	☐
Buoy locations	☐	☐	☐

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q33: Is there a substitute for missing local information other than the three options presented above? Please specify.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q34: CLIMATE AND WEATHER INFORMATION
If information was unavailable at the local level, would information at another level be acceptable to understand ${Coastal Issue}? Check all that apply.Regional = county or large bay (e.g. Bay of Fundy) Similar geophysical area = location with similar geology and climate

CLIMATE AND WEATHER INFORMATION	Regional	Provincial/State	Similar geophysical area
Windspeed	☐	☐	☐
Wind direction	☐	☐	☐
Air temperature	☐	☐	☐
Ice coverage	☐	☐	☐
Precipitation	☐	☐	☐
Storm frequency	☐	☐	☐

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q35: Is there a substitute for missing local information other than the three options presented above? Please specify.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q36: BIOLOGICAL AND CHEMICAL INFORMATION
If information was unavailable at the local level, would information at another level be acceptable to understand ${Coastal Issue}? Check all that apply.Regional = county or large bay (e.g. Bay of Fundy) Similar geophysical area = location with similar geology and climate

BIOLOGICAL AND CHEMICAL INFORMATION	Regional	Provincial/State	Similar geophysical area
Microbial pathogens	☐	☐	☐
Nutrient Levels	☐	☐	☐
Plankton measurements	☐	☐	☐
Contaminant levels	☐	☐	☐

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q37: Is there a substitute for missing local information other than the three options presented above? Please specify.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q38: PHYSICAL INFORMATION

If information was unavailable at the local level, would information at another level be acceptable to understand ${Coastal Issue}? Check all that apply.Regional = county or large bay (e.g. Bay of Fundy) Similar geophysical area = location with similar geology and climate

PHYSICAL INFORMATION	Regional	Provincial/State	Similar geophysical area
Bathymetry	☐	☐	☐
Sea surface temperature	☐	☐	☐
Salinity	☐	☐	☐
Water pH	☐	☐	☐
Current measurements	☐	☐	☐
Tidal range of inlet or bay	☐	☐	☐
Tidal volume of inlet or bay	☐	☐	☐
Sediment data (concentration, load, particle size)	☐	☐	☐
Wave data	☐	☐	☐
Water levels	☐	☐	☐
Water conductivity	☐	☐	☐
Dissolved oxygen	☐	☐	☐
Volume of outflow for a river or estuary	☐	☐	☐
Erosion rates	☐	☐	☐
Secchi depth	☐	☐	☐

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q39: Is there a substitute for missing local information other than the three options presented above? Please specify.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q40: SPECIES AND HABITAT INFORMATION

If information was unavailable at the local level, would information at another level be acceptable to understand ${Coastal Issue}? Check all that apply.Regional = county or large bay (e.g. Bay of Fundy) Similar geophysical area = location with similar geology and climate

SPECIES AND HABITAT INFORMATION	Regional	Provincial/State	Similar geophysical area
Wildlife species in the area	☐	☐	☐
Fish species in thea rea	☐	☐	☐
Endangered species/ species at risk	☐	☐	☐
Population estimates	☐	☐	☐
Mortalities (rates, annual totals)	☐	☐	☐
Map of species distribution	☐	☐	☐
Eelgrass	☐	☐	☐
Saltmarshes	☐	☐	☐
Migration patterns	☐	☐	☐

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q41: Is there a substitute for missing local information other than the three options presented above? Please specify.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q42: LEGAL, REGULATORY or POLICY INFORMATION

If information was unavailable at the local level, would information at another level be acceptable to understand ${Coastal Issue}? Check all that apply.Regional = county or large bay (e.g. Bay of Fundy) Similar geophysical area = location with similar geology and climate

LEGISLATIVE, REGULATORY AND POLICY INFORMATION	Regional	Provincial/State	Similar geophysical area
Government department with regulatory power	☐	☐	☐
Applicable legislation and regulations	☐	☐	☐
Marine or coastal protected areas	☐	☐	☐

Park boundaries	☐	☐	☐
Water management strategies	☐	☐	☐
Wetland policies	☐	☐	☐

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q43: Is there a substitute for missing local information other than the three options presented above? Please specify.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q44: HUMAN ACTIVITY INFORMATION
If information was unavailable at the local level, would information at another level be acceptable to understand ${Coastal Issue}? Check all that apply.Regional = county or large bay (e.g. Bay of Fundy) Similar geophysical area = location with similar geology and climate

HUMAN ACTIVITY INFORMATION	Regional	Provincial/State	Similar geophysical area
Population demographics	☐	☐	☐
Community groups with coastal management mandates	☐	☐	☐
Wharves	☐	☐	☐
Average income	☐	☐	☐
Population density	☐	☐	☐
Employment density	☐	☐	☐
Coastal access points	☐	☐	☐
Shipping lanes	☐	☐	☐
Industrial activities	☐	☐	☐
Recreational activities	☐	☐	☐
Sewage treatment facilities	☐	☐	☐
Agricultural activities	☐	☐	☐
Waterfront property ownership	☐	☐	☐

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q45: Is there a substitute for missing local information other than the three options presented above? Please specify.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q46: FISHERIES INFORMATION
If information was unavailable at the local level, would information at another level be acceptable to understand ${Coastal Issue}? Check all that apply.Regional = county or large bay (e.g. Bay of Fundy) Similar geophysical area = location with similar geology and climate

FISHERIES INFORMATION	Regional	Provincial/State	Similar geophysical area
Fisheries operating in the area	☐	☐	☐
Aquaculture sites	☐	☐	☐
Regulatory limits of harvest (Total allowable catch)	☐	☐	☐
Annual landings per fishery	☐	☐	☐
Number of fishing licenses per fishery	☐	☐	☐

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q47: Is there a substitute for missing local information other than the three options presented above? Please specify.

Demographics Profile

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q48: What is your gender?

- ◯ Female
- ◯ Male
- ◯ Prefer not to say

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q49: What is your age?

- ◯ 20-29 years
- ◯ 30-39 years
- ◯ 40-49 years
- ◯ 50-59 years
- ◯ 60-69 years
- ◯ 70 or more

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q50: What degree(s) have you been awarded? Please indicate your area of specialization in the space provided.

College Diploma	☐	
Bachelor's Degree	☐	
Master's Degree	☐	
Doctoral Degree	☐	
Professional Degree	☐	
Other:	☐	

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q51: Where are you currently employed?

- ◯ Municipal Government
- ◯ Provincial Government
- ◯ Federal Government
- ◯ University
- ◯ Non-Governmental Organization
- ◯ Consultant Firm
- ◯ Other:

If you have chosen "other", please specify:

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q52: What type of job do you have? Please be general so as to preserve anonymity.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q53: What role BEST describes your current position?

- ◯ Researcher
- ◯ Policy maker/policy advisor
- ◯ Manager of a resource
- ◯ Manager of a team
- ◯ Academic
- ◯ Other:

If you have chosen "other", please specify:

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q54: What influences your decision-making the most?For example: scientific methods, your education, or your current job experience.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q55: What is the geographic scope of the projects you work on MOST of the time? Check all that apply.

- ☐ Local (e.g. municipality, or an estuary)
- ☐ Regional (e.g. Bay of Fundy or a county)
- ☐ Provincial/State
- ☐ National
- ☐ International
- ☐ Other:

If you have chosen "other", please specify:

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q56: Where do you find information MOST often? Check all that apply.

- [ ] Government websites
- [ ] Personal contacts
- [ ] Personal reference collection (books, journal articles)
- [ ] Personal data collection
- [ ] Internal database
- [ ] Journal databases
- [ ] Google scholar
- [ ] Internet searches
- [ ] Online databases (e.g. WAVES)

Add any additional sources in the space provided.

Note: if you have answered/chosen item [2] in question 1, skip the following question

Q57: If you do not work in Canada, please indicate the country that you work in.

APPENDIX L ORAL SURVEY PARTICIPANT SHEETS PHASE II

- PAGE 1 -

north carolina erosion policies

Miles of coast: 3,375
Coastal Population: 826,019 (2000)
Annual rainfall: 40-55 inches
Erosion rate: 75 cm/year
Geologic composition of shore: Sedimentary, Barrier islands
Storm patterns: 2 major storms per year
Lead Agency: Dept. of Environment and Natural Resources, Division of Coastal Management

About 3,870,000 results (0.28 seconds)

State of the Beach/State Reports/**NC**/**Erosion** Response - Beachapedia
Jump to **Policies** and Guidance: **North Carolina** uses oceanfront setbacks as a response to known **erosion** hazards. NCAC 7H .0306(a) establishes the setback ...
www.beachapedia.org/State_of_the.../**NC**/**Erosion**_Response - Cached

Coastal Shoreline **Erosion** | RENCI at ECU
Erosion is a pervasive threat to property and the economic vitality of **North Carolina**, sparking vigorous debates on **policy**, mitigation, and adaptation. ...
www.ecu.edu/renci/Focus/Shoreline**Erosion**.html - Cached

[PDF] It is hereby declared that the general welfare and public interest ...
File Format: PDF/Adobe Acrobat - Quick View
15A NCAC 07M .0202 **POLICY** STATEMENTS. (a) Pursuant to Section 5, Article 14 of the **North Carolina** Constitution, proposals for shoreline **erosion** response ...
dcm2.enr.state.**nc**.us/rules/Text/t15a-07m.0200.pdf

Coastal **erosion** and the ban on hard structures - **North Carolina** ...
In 1985, the **North Carolina** Coastal Resources Commission (CRC), a **policy**-making body for the coastal management program, studied the effects of hard ...
www.learnnc.org/lp/editions/nchist-recent/4.3 - Cached - Similar

[PDF] **Erosion** and Sediment Control During
File Format: PDF/Adobe Acrobat - Quick View
NRCS Engineering Field Handbook http://**policy**.nrcs.usda.gov/. **North Carolina Erosion** Control and Sediment Control Planning and Design Manual ...
ftp://ftp-fc.sc.egov.usda.gov/**NC**/.../**Erosion**SedimentControlTemplate.pdf - Similar

North Carolina Coastal Federation: Advocacy

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1. **Water quality**
   (eutrophication, shellfish closures, oxygen depletion, water quality monitoring)

2. **Coastal or marine habitat protection**
   (conservation of species, habitat restoration, habitat alteration, destruction or disturbance, biodiversity loss, salt marsh restoration, invasive plants, marine protected areas, ecosystem health, ecosystem initiative development)

3. **Coastal or marine development**
   (coastal construction, wharves, oil rigs, land use, marine energy, public access, beach access, degradation and destruction of habitat, environmental impact assessments, coastal or land use planning, coastal setbacks)

4. **Sea level rise and storm events**
   (wetland restoration or protection, coastal erosion, adaptive strategies for climate change, coastal planning)

5. **Contaminants**
   (biomagnification, coastal health, groundwater contamination, marine pollution, watershed contamination, pollution sources)

6. **Fisheries management**
   (aquaculture, quota setting, stock depletion, ecosystem-based fisheries management, sustainable fisheries, aboriginal fishing rights, fisheries co-management)

7. **Biodiversity or species management**
   (invasive species, loss of biodiversity, species recovery planning, species collapse/depletion, species at risk/endangered species, species conservation)

- PAGE 3-

1. Journal articles
2. Technical reports
3. Paper or PDF maps
4. Data (e.g. GIS layers, real-time data)
5. Laws or statutes
6. Policies or statutes
7. News articles

1. GENERAL
1. Latitude/Longitude
2. Map of the area
3. Municipalities in the area
4. Ecodistrict type of land area
5. Area of the water body
6. Mean depth of the water body
7. Watershed size
8. Relief of land area
9. Beaches
10. Rivers
11. Map of the area by use or activity
12. Contact information for local expert
13. Contact information for subject expert
14. Buoy locations

2. CLIMATE/WEATHER
1. Wind speed
2. Wind direction
3. Air temperature
4. Ice coverage
5. Precipitation
6. Storm frequency

3. BIOLOGICAL / CHEMICAL
1. Microbial pathogens
2. Nutrient Levels
3. Plankton measurements
4. Contaminant levels

4. PHYSICAL
1. Bathymetry
2. Sea surface temperature
3. Salinity
4. Water pH
5. Current measurements
6. Sediment data
7. Tidal volume of inlet or bay
8. Wave data
9. Water levels
10. Water conductivity
11. Dissolved oxygen
12. Volume of outflow for a river or estuary
13. Erosion rates
14. Secchi depth

5. SPECIES AND HABITAT
1. Wildlife species in the area
2. Fish species in the area
3. Endangered species/ species at risk
4. Population estimates
5. Mortalities (rates, annual totals)
6. Map of species distribution
7. Eelgrass
8. Saltmarshes
9. Migration patterns

6. LEGAL , REGULATORY, POLICY
1. Government department with regulatory power
2. Applicable legislation and regulations
3. Marine or coastal protected areas
4. Park boundaries
5. Water management strategies

6. Wetland policies

- PAGE 6-

7. HUMAN ACTIVITY

1. Population demographics
2. Community groups with coastal management mandates
3. Wharves
4. Average income
5. Population density
6. Employment density
7. Coastal access points
8. Shipping lanes
9. Industrial activities
10. Recreational activities
11. Sewage treatment facilities
12. Agricultural activities
13. Waterfront property ownership

8. FISHERIES

1. Fisheries operating in the area
2. Aquaculture sites
3. Regulatory limits of harvest (Total allowable catch)
4. Annual landings per fishery
5. Number of fishing licenses per fishery

APPENDIX M ORAL SURVEY INTERVIEWER SHEETS PHASE II

Script:

I am researching what kind of location-specific information coastal managers use to understand various coastal topics. I want to know what kind of information about a local area is most useful to give you a first impression of the environmental state with respect to a coastal issue of your choice. The results of this research will work towards customized search results for coastal issues.

[Show participant example sheet and discuss, or ask participant to look at the search results image at the beginning of the file]

[Hand participant page 1, or if on the phone, ask participant to look at page 1]

Page 1

1. **Please choose one of the following seven areas with which you have had experience with in any capacity, such as research, policy, or management.**

   ☐ Water quality
   ☐ Coastal or marine habitat protection
   ☐ Coastal or marine development
   ☐ Sea level rise and storm events
   ☐ Contaminants
   ☐ Fisheries management
   ☐ Biodiversity or species management

2. **What is one memorable project that you worked on with respect to your selected coastal issue?**

3. **Briefly describe your role in that project.**

4. **Briefly describe the outcome of the project. Example: a briefing note, an internal report, a research paper, an external report, a news release…**
   [Hand participant Page 2, or ask participant to scroll down to page 2]

5. **Which of the following types of information did you gather while working on the project? You may be as specific as you like.**

Journal articles	☐
Technical reports	☐
Paper or PDF maps	☐
Data (e.g. GIS layers, real-time data)	☐
Laws or statutes	☐
Policies	☐
News articles	☐

6. **Were there any other kinds of information that you gathered?**

[Hand participant pages 3 to 5, or if on the phone ask participant to scroll down to page 3]
Script:

The next 3 pages contain categorized lists of information that can be gathered about a coastal or marine area. Please go through the lists in order, and tell me which items you would choose to give you a first impression of a coastal area with respect to _____. The lists are not meant to be exhaustive so please mention any additional information you would want, and feel free to ask questions or make comments. You may wish to check your choices on the paper because I have two or three follow up questions.

1. GENERAL		Acceptable Substitute?			
		Region	Prov/State	Similar area	No sub
1. Latitude/Longitude	☐	☐	☐	☐	☐
2. Map of the area	☐	☐	☐	☐	☐
3. Municipalities in the area	☐	☐	☐	☐	☐
4. Ecodistrict type of land area	☐	☐	☐	☐	☐
5. Area of the water body	☐	☐	☐	☐	☐
6. Mean depth of the water body	☐	☐	☐	☐	☐
7. Watershed size	☐	☐	☐	☐	☐
8. Relief of land area	☐	☐	☐	☐	☐
9. Beaches	☐	☐	☐	☐	☐
10. Rivers	☐	☐	☐	☐	☐
11. Map of the area by use or activity	☐	☐	☐	☐	☐
12. Contact information for local expert	☐	☐	☐	☐	☐
13. Contact information for subject expert	☐	☐	☐	☐	☐
14. Buoy locations	☐	☐	☐	☐	☐

2. CLIMATE/WEATHER		Acceptable Substitute?			
		Region	Prov/State	Similar area	No sub
1. Wind speed	☐	☐	☐	☐	☐
2. Wind direction	☐	☐	☐	☐	☐
3. Air temperature	☐	☐	☐	☐	☐
4. Ice coverage	☐	☐	☐	☐	☐
5. Precipitation	☐	☐	☐	☐	☐
6. Storm frequency	☐	☐	☐	☐	☐

3. BIOLOGICAL / CHEMICAL		Acceptable Substitute?			
		Region	Prov/State	Similar area	No sub
1. Microbial pathogens	☐	☐	☐	☐	☐
2. Nutrient Levels	☐	☐	☐	☐	☐
3. Plankton measurements	☐	☐	☐	☐	☐
4. Contaminant levels	☐	☐	☐	☐	☐

4. PHYSICAL		Acceptable Substitute?			
		Region	Prov/State	Similar area	No sub
1. Bathymetry	☐	☐	☐	☐	☐
2. Sea surface temperature	☐	☐	☐	☐	☐
3. Salinity	☐	☐	☐	☐	☐
4. Water pH	☐	☐	☐	☐	☐
5. Current measurements	☐	☐	☐	☐	☐
6. Sediment data	☐	☐	☐	☐	☐
7. Tidal volume of inlet or bay	☐	☐	☐	☐	☐
8. Wave data	☐	☐	☐	☐	☐
9. Water levels	☐	☐	☐	☐	☐
10. Water conductivity	☐	☐	☐	☐	☐
11. Dissolved oxygen	☐	☐	☐	☐	☐
12. Volume of outflow for a river or estuary	☐	☐	☐	☐	☐
13. Erosion rates	☐	☐	☐	☐	☐
14. Secchi depth	☐	☐	☐	☐	☐

5. SPECIES AND HABITAT		Acceptable Substitute?			
		Region	Prov/State	Similar area	No sub
1. Wildlife species in the area	☐	☐	☐	☐	☐
2. Fish species in the area	☐	☐	☐	☐	☐
3. Endangered species/ species at risk	☐	☐	☐	☐	☐
4. Population estimates	☐	☐	☐	☐	☐
5. Mortalities (rates, annual totals)	☐	☐	☐	☐	☐
6. Map of species distribution	☐	☐	☐	☐	☐
7. Eelgrass	☐	☐	☐	☐	☐
8. Saltmarshes	☐	☐	☐	☐	☐
9. Migration patterns	☐	☐	☐	☐	☐

6. LEGAL , REGULATORY, POLICY		Acceptable Substitute?			
		Region	Prov/State	Similar area	No sub
1. Government department with regulatory power	☐	☐	☐	☐	☐
2. Applicable legislation and regulations	☐	☐	☐	☐	☐

3. Marine or coastal protected areas	☐	☐	☐	☐	☐
4. Park boundaries	☐	☐	☐	☐	☐
5. Water management strategies	☐	☐	☐	☐	☐
6. Wetland policies	☐	☐	☐	☐	☐

7. HUMAN ACTIVITY		**Acceptable Substitute?**			
		Region	**Prov/State**	**Similar area**	**No sub**
1. Population demographics	☐	☐	☐	☐	☐
2. Community groups with coastal management mandates	☐	☐	☐	☐	☐
3. Wharves	☐	☐	☐	☐	☐
4. Average income	☐	☐	☐	☐	☐
5. Population density	☐	☐	☐	☐	☐
6. Employment density	☐	☐	☐	☐	☐
7. Coastal access points	☐	☐	☐	☐	☐
8. Shipping lanes	☐	☐	☐	☐	☐
9. Industrial activities	☐	☐	☐	☐	☐
10. Recreational activities	☐	☐	☐	☐	☐
11. Sewage treatment facilities	☐	☐	☐	☐	☐
12. Agricultural activities	☐	☐	☐	☐	☐
13. Waterfront property ownership	☐	☐	☐	☐	☐

8. FISHERIES		**Acceptable Substitute?**			
		Region	**Prov/State**	**Similar area**	**No sub**
1. Fisheries operating in the area	☐	☐	☐	☐	☐
2. Aquaculture sites	☐	☐	☐	☐	☐
3. Regulatory limits of harvest (Total allowable catch)	☐	☐	☐	☐	☐
4. Annual landings per fishery	☐	☐	☐	☐	☐
5. Number of fishing licenses per fishery	☐	☐	☐	☐	☐

7. **Would you need any additional information?** *(only ask if they haven't volunteered any)*

8. **Where would you find this information if you were to look for it yourself?**

9. **For the items you selected, if local information were unavailable, would information from the regional level, provincial level, or from a similar area be an acceptable substitute.**

APPENDIX N CODING MANUAL

Worksheet	Column	Instructions	Codes/Definitions
Add_by_participant	Add_1 through Add_16	Go through Add_cumulative column in Add_by_participant sheet, and copy each piece of additional information suggested by participant into the Add_X columns, starting with column Add_1 and placing each unique item in the remaining Add_X columns. One item per column. Repeat for each participant.	
Add_info	Add_info	Take all the additional items in the Add_X columns from the Add_by_participant shee and place into a single column. Arrange items into original 8 categories (general, fisheries, human activity, physical, biological and chemical, climate and weather, species and habitat and legal, regulatory and policy). Evaluate each characteristic to see whether it is related to the original set. Identify whether the related original characteristics are broader or narrower than those provided by participants. Highlight additional information that was one of the 71 characteristics from the questionnaire.	general fisheries human activity physical biological and chemical climate and weather species and habitat legal, regulatory and policy

Worksheet	Column	Instructions	Codes/Definitions
Data_Text_Map	Data Text Map	Go through the Characteristics column and classify each characteristic as data, Text, or map according to the way in which it would be most logically presented. Each characteristic may occupy more than one category. For the purposes of this analysis, if a characteristic should be displayed as a GIS layer, classify it as data	**Data = most logically presented as a simple numerical value, and may include a unit (20 km/h, or a pair of coordinates)** **Text = most logically presented as text, such as a list.** **Map = most logically presented on a map (some characteristics are explicitly identified as maps)**
Find_Info	Organization Search_engine Person Website Database Self	Review combined list in the Find_cumulative column of Find_info and identify sources by highlighting text red. Copy the red text into the appropriate column.	**Search_engine = Google, Google maps or Google earth, references to inernet searches** **Self = any reference to collecting data themselves** **Website = specific mention of a website (government or NGO websites or just in general.)** **Person = any mention of a person, or expert.** **Organization = Any other organization (gov or NGO) or program associated with a government department (ex. AZMP) that does not specifically refer to website or database**

Worksheet	Column	Instructions	Codes/Definitions
			Database = specific mention of a database
Find_summary	Organization Search_engine Person Website Database Self	Reduce any items in the columns in the Find_info sheets that are sentences into a single source name, combining similar terms into one term. If an item occurs more than once, reduce it to one entry and put the total number of occurrences in brackets after the source name (e.g. Google (5)). Arrange list of sources into a table separated into the coded categories.	
Activity_Type	Activity_Type	Go through the Project, Role and Outcome columns, and classify the activity that the participant describes as primarily "field work" or "management", use the participant's role to help with the decision as most activities have some element of field work to them. If the participant actively collected data, was the manager of a team that collected data from the field, or oversaw a project that was mainly in the field, that would be field work. If the participant was drafting management documents,	**1 = Field work (If the primary activities done by the participant are field work oriented)** **2 = Management (If the primary outcome of the activities involve making management decisions, policies, or interacting with people rather than collecting data and being in the field)**

Worksheet	Column	Instructions	Codes/Definitions
		or policies, or reviewed documents and dealt with stakeholders, and the primary output was a document, plan or decision it would be a management activity.	

APPENDIX O CHARACTERISTIC SELECTION BY TOPIC

Characteristics	Water quality (n=2)		Coastal or marine habitat protection (n=6)		Coastal or marine development (n=3)		Sea level rise or storm events (n=4)		Fisheries management (n=2)		Biodiversity or species management (n=3)		Totals (n=20)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Latitude/Longitude	2	100 %	4	67%	2	67%	3	75%	1	50%	3	100%	15	75 %
Map of the area	2	100 %	6	100 %	3	100%	4	100 %	2	100%	3	100%	20	100 %
Municipalities in the area	2	100 %	4	67%	2	67%	3	75%	1	50%	1	33%	13	65 %
Ecodistrict type of land area	2	100 %	4	67%	1	33%	3	75%	0	0%	1	33%	11	55 %
Area of the water body	2	100 %	3	50%	3	100%	4	100 %	2	100%	3	100%	17	85 %
Mean depth of the water body	1	50%	2	33%	2	67%	3	75%	2	100%	2	67%	12	60 %
Watershed size	2	100 %	4	67%	1	33%	2	50%	2	100%	2	67%	13	65 %
Relief of land area	2	100 %	5	83%	1	33%	3	75%	1	50%	0	0%	12	60 %
Beaches	1	50%	2	33%	3	100%	3	75%	1	50%	2	67%	12	60 %
Rivers	2	100 %	3	50%	3	100%	3	75%	1	50%	1	33%	13	65 %
Map of the area by use or activity	2	100 %	5	83%	2	67%	3	75%	2	100%	2	67%	16	80 %
Contact information for local expert	1	50%	6	100 %	2	67%	4	100 %	2	100%	2	67%	17	85 %
Contact information for subject expert	1	50%	4	67%	2	67%	3	75%	1	50%	2	67%	13	65 %
Buoy locations	1	50%	0	0%	1	33%	3	75%	0	0%	0	0%	5	25 %
Wind speed	1	50%	1	17%	1	33%	4	100 %	1	50%	1	33%	9	45 %
Wind direction	2	100 %	2	33%	1	33%	4	100 %	1	50%	1	33%	11	55 %
Air temperature	1	50%	2	33%	0	0%	3	75%	1	50%	1	33%	8	40 %
Ice coverage	0	0%	1	17%	1	33%	3	75%	0	0%	2	67%	7	35 %
Precipitation	2	100 %	3	50%	1	33%	4	100 %	1	50%	1	33%	12	60 %
Storm frequency	1	50%	3	50%	2	67%	4	100 %	0	0%	2	67%	12	60 %
Microbial pathogens	0	0%	0	0%	1	33%	1	25%	1	50%	1	33%	4	20 %
Nutrient Levels	1	50%	5	83%	1	33%	1	25%	1	50%	2	67%	11	55 %
Plankton measurements	1	50%	2	33%	0	0%	1	25%	0	0%	1	33%	5	25 %
Contaminant	2	100	4	67%	3	100%	1	25%	0	0%	2	67%	1	60

Characteristics	Water quality (n=2)		Coastal or marine habitat protection (n=6)		Coastal or marine development (n=3)		Sea level rise or storm events (n=4)		Fisheries management (n=2)		Biodiversity or species management (n=3)		Totals (n=20)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
levels		%											2	%
Bathymetry	2	100 %	5	83%	3	100%	3	75%	0	0%	3	100%	16	80 %
Sea surface temperature	1	50%	4	67%	1	33%	4	100 %	0	0%	3	100%	13	65 %
Salinity	1	50%	4	67%	1	33%	2	50%	0	0%	2	67%	10	50 %
Water pH	2	100 %	3	50%	0	0%	2	50%	1	50%	1	33%	9	45 %
Current measurements	2	100 %	5	83%	1	33%	3	75%	0	0%	1	33%	12	60 %
Sediment data	1	50%	3	50%	2	67%	2	50%	0	0%	1	33%	9	45 %
Tidal volume of inlet or bay	0	0%	4	67%	1	33%	3	75%	0	0%	1	33%	9	45 %
Wave data	0	0%	3	50%	2	67%	4	100 %	0	0%	1	33%	10	50 %
Water levels	0	0%	4	67%	1	33%	3	75%	0	0%	0	0%	8	40 %
Water conductivity	2	100 %	2	33%	0	0%	1	25%	1	50%	0	0%	6	30 %
Dissolved oxygen	1	50%	3	50%	0	0%	1	25%	1	50%	0	0%	6	30 %
Volume of outflow for a river or estuary	1	50%	4	67%	1	33%	2	50%	1	50%	2	67%	11	55 %
Erosion rates	0	0%	3	50%	1	33%	3	75%	0	0%	1	33%	8	40 %
Secchi depth	0	0%	3	50%	0	0%	1	25%	0	0%	1	33%	5	25 %
Wildlife species in the area	0	0%	6	100 %	3	100%	1	25%	1	50%	3	100%	14	70 %
Fish species in the area	2	100 %	5	83%	3	100%	1	25%	2	100%	3	100%	16	80 %
Endangered species/ species at risk	2	100 %	5	83%	3	100%	1	25%	2	100%	3	100%	16	80 %
Population estimates	1	50%	5	83%	3	100%	1	25%	2	100%	2	67%	14	70 %
Mortalities (rates, annual totals)	1	50%	3	50%	1	33%	1	25%	2	100%	2	67%	10	50 %
Map of species distribution	2	100 %	6	100 %	2	67%	1	25%	2	100%	2	67%	15	75 %
Eelgrass	0	0%	3	50%	3	100%	1	25%	1	50%	2	67%	10	50 %
Salt marshes	0	0%	4	67%	1	33%	3	75%	1	50%	3	100%	12	60 %
Migration patterns	1	50%	3	50%	1	33%	1	25%	1	50%	2	67%	9	45 %
Government department with regulatory power	1	50%	5	83%	3	100%	4	100 %	1	50%	3	100%	17	85 %

Characteristics	Water quality (n=2)		Coastal or marine habitat protection (n=6)		Coastal or marine development (n=3)		Sea level rise or storm events (n=4)		Fisheries management (n=2)		Biodiversity or species management (n=3)		Totals (n=20)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Applicable legislation and regulations	1	50%	6	100 %	3	100%	4	100 %	2	100%	3	100%	19	95 %
Marine or coastal protected areas	2	100 %	3	50%	2	67%	3	75%	1	50%	3	100%	14	70 %
Park boundaries	2	100 %	2	33%	2	67%	3	75%	0	0%	3	100%	12	60 %
Water management strategies	0	0%	3	50%	1	33%	3	75%	1	50%	2	67%	10	50 %
Wetland policies	0	0%	5	83%	2	67%	3	75%	1	50%	3	100%	14	70 %
Population demographics	1	50%	3	50%	1	33%	3	75%	1	50%	2	67%	11	55 %
Community groups with coastal management mandates	2	100 %	6	100 %	3	100%	3	75%	1	50%	2	67%	17	85 %
Wharves	2	100 %	2	33%	1	33%	3	75%	1	50%	1	33%	10	50 %
Average income	1	50%	3	50%	0	0%	3	75%	1	50%	1	33%	9	45 %
Population density	1	50%	3	50%	1	33%	3	75%	1	50%	3	100%	12	60 %
Employment density	1	50%	3	50%	1	33%	3	75%	1	50%	1	33%	10	50 %
Coastal access points	2	100 %	3	50%	1	33%	3	75%	1	50%	2	67%	12	60 %
Shipping lanes	0	0%	4	67%	3	100%	3	75%	1	50%	2	67%	13	65 %
Industrial activities	2	100 %	4	67%	2	67%	3	75%	2	100%	3	100%	16	80 %
Recreational activities	1	50%	5	83%	3	100%	3	75%	2	100%	3	100%	17	85 %
Sewage treatment facilities	0	0%	2	33%	2	67%	3	75%	1	50%	3	100%	11	55 %
Agricultural activities	2	100 %	4	67%	1	33%	3	75%	2	100%	2	67%	14	70 %
Waterfront property ownership	2	100 %	3	50%	2	67%	3	75%	1	50%	2	67%	13	65 %
Fisheries operating in the area	2	100 %	5	83%	2	67%	3	75%	2	100%	3	100%	17	85 %
Aquaculture sites	2	100 %	3	50%	2	67%	2	50%	2	100%	2	67%	13	65 %
Regulatory limits of harvest (Total allowable catch)	1	50%	4	67%	0	0%	1	25%	1	50%	1	33%	8	40 %

Characteristics	Water quality (n=2)		Coastal or marine habitat protection (n=6)		Coastal or marine development (n=3)		Sea level rise or storm events (n=4)		Fisheries management (n=2)		Biodiversity or species management (n=3)		Totals (n=20)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Annual landings per fishery	2	100 %	4	67%	2	67%	2	50%	1	50%	2	67%	13	65 %
Number of fishing licenses per fishery	1	50%	3	50%	1	33%	1	25%	1	50%	2	67%	9	45 %

APPENDIX P CHARACTERISTIC SELECTION BY JOB

Characteristic	Researcher (n=6)		Policy maker/ advisor (n=4)		Manager of a resource (n=5)		Manager of a team (n=4)	
	N	%	N	%	N	%	N	%
General								
Area of the water body	5	83%	4	100%	3	60%	4	100%
Beaches	3	50%	3	75%	3	60%	2	50%
Buoy locations	3	50%	1	25%	0	0%	1	25%
Contact information for local expert	5	83%	3	75%	4	80%	4	100%
Contact information for subject expert	4	67%	2	50%	3	60%	3	75%
Ecodistrict type of land area	4	67%	3	75%	2	40%	2	50%
Latitude/Longitude	4	67%	3	75%	5	100%	3	75%
Map of the area	6	100%	4	100%	5	100%	4	100%
Map of the area by use or activity	5	83%	3	75%	3	60%	4	100%
Mean depth of the water body	4	67%	2	50%	2	40%	4	100%
Municipalities in the area	5	83%	2	50%	3	60%	2	50%
Relief of land area	5	83%	2	50%	2	40%	3	75%
Rivers	5	83%	3	75%	2	40%	2	50%
Watershed size	5	83%	3	75%	2	40%	3	75%
Climate and Weather								
Air temperature	2	33%	3	75%	1	20%	2	50%
Ice coverage	1	17%	3	75%	1	20%	2	50%
Precipitation	5	83%	3	75%	1	20%	3	75%
Storm frequency	3	50%	3	75%	4	80%	2	50%
Wind direction	4	67%	3	75%	1	20%	3	75%
Wind speed	3	50%	3	75%	0	0%	3	75%
Biological and Chemical								
Contaminant levels	4	67%	1	25%	4	80%	2	50%
Microbial pathogens	1	17%	1	25%	0	0%	2	50%
Nutrient Levels	3	50%	1	25%	4	80%	2	50%
Plankton measurements	3	50%	1	25%	0	0%	1	25%
Physical								
Bathymetry	6	100%	3	75%	4	80%	2	50%
Current measurements	6	100%	2	50%	2	40%	2	50%
Dissolved oxygen	3	50%	0	0%	1	20%	2	50%
Erosion rates	2	33%	3	75%	1	20%	2	50%
Salinity	4	67%	3	75%	1	20%	1	25%
Sea surface temperature	4	67%	4	100%	3	60%	1	25%
Secchi depth	2	33%	1	25%	1	20%	1	25%
Sediment data	3	50%	2	50%	2	40%	2	50%

Characteristic	Researcher (n=6)		Policy maker/ advisor (n=4)		Manager of a resource (n=5)		Manager of a team (n=4)	
	N	%	N	%	N	%	N	%
Tidal volume of inlet or bay	3	50%	3	75%	1	20%	2	50%
Volume of outflow for a river or estuary	4	67%	3	75%	2	40%	2	50%
Water conductivity	4	67%	0	0%	1	20%	1	25%
Water levels	4	67%	1	25%	1	20%	2	50%
Water pH	4	67%	2	50%	1	20%	2	50%
Wave data	3	50%	3	75%	2	40%	2	50%
Species and Habitat								
Eelgrass	2	33%	1	25%	4	80%	2	50%
Endangered species/ species at risk	4	67%	2	50%	5	100%	4	100%
Fish species in the area	5	83%	2	50%	4	80%	4	100%
Map of species distribution	5	83%	1	25%	5	100%	4	100%
Migration patterns	2	33%	1	25%	3	60%	3	75%
Mortalities (rates, annual totals)	2	33%	1	25%	3	60%	4	100%
Population estimates	3	50%	1	25%	5	100%	4	100%
Salt marshes	3	50%	4	100%	3	60%	2	50%
Wildlife species in the area	3	50%	2	50%	5	100%	3	75%
Legal, Regulatory and Policy								
Applicable legislation and regulations	5	83%	4	100%	5	100%	4	100%
Government department with regulatory power	5	83%	4	100%	4	80%	3	75%
Marine or coastal protected areas	4	67%	4	100%	3	60%	2	50%
Park boundaries	4	67%	4	100%	2	40%	1	25%
Water management strategies	2	33%	4	100%	2	40%	2	50%
Wetland policies	3	50%	4	100%	5	100%	2	50%
Human Activity								
Agricultural activities	5	83%	3	75%	3	60%	2	50%
Average income	3	50%	3	75%	2	40%	1	25%
Coastal access points	4	67%	3	75%	2	40%	2	50%
Community groups with coastal management mandates	5	83%	3	75%	5	100%	3	75%
Employment density	3	50%	3	75%	3	60%	1	25%
Industrial activities	4	67%	4	100%	4	80%	3	75%
Population demographics	3	50%	3	75%	4	80%	1	25%
Population density	3	50%	4	100%	3	60%	1	25%
Recreational activities	4	67%	4	100%	4	80%	4	100%
Sewage treatment facilities	1	17%	4	100%	4	80%	2	50%
Shipping lanes	2	33%	3	75%	4	80%	3	75%
Waterfront property ownership	4	67%	3	75%	3	60%	2	50%
Wharves	3	50%	2	50%	3	60%	1	25%
Fisheries								
Annual landings per fishery	4	67%	2	50%	4	80%	2	50%

Characteristic	Researcher (n=6)		Policy maker/ advisor (n=4)		Manager of a resource (n=5)		Manager of a team (n=4)	
	N	%	N	%	N	%	N	%
Aquaculture sites	4	67%	2	50%	3	60%	3	75%
Fisheries operating in the area	4	67%	4	100%	5	100%	3	75%
Number of fishing licenses per fishery	3	50%	1	25%	3	60%	2	50%
Regulatory limits of harvest (Total allowable catch)	3	50%	1	25%	2	40%	2	50%