

CLIMATE CHANGE IN INTEGRATED MARINE PLANNING

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SUSAN DEAN

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EXECUTIVE SUMMARY

This report reviews marine planning processes from around the world with the goal of informing the Pacific North Coast Integrated Management Area (PNCIMA) Initiative on the incorporation of climate change content into its planning process. Five marine planning initiatives were selected on the grounds that each effectively demonstrates a different element of integrated oceans management. Using a two-part framework, the structure and approach of each planning process as well as the nature of each plan's climate change-related content were summarized and reviewed.

The five plans selected for review are from the United States, Canada, Norway, Australia, and South Africa. The reviewed plans were published between 2006 and 2010, and were developed over periods of between 1.5 to 4 years. They apply to a range of marine management areas, including state and federal waters, marine parks, and a biodiversity hotspot (i.e., the richest and most threatened plant and animal reservoirs on earth). A diversity of planning bodies produced the plans, including state and federal governments, an independent consultant, and a marine park authority. The plans apply to areas from 5,549 km² to 1,750,000 km² in size.

The planning elements that this report provides guidance in include science networking (*Massachusetts Ocean Management Plan*), co-management and stakeholder participation (*Integrated Ocean Management Plan for the Beaufort Sea: 2009 and beyond*), communication of scientific concepts (*Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands*), climate change objectives and actions (*Great Barrier Reef Climate Change Action Plan (2007-2012)*) and plan structure and governance (*Garden Route Integrated Management Plan (Marine)*). Refer to the Summary at the end of this report for greater detail on how the reviewed plans address these areas.

INTRODUCTION

Climate change is projected to profoundly impact coastal and marine ecosystems around the world over the next century (IPCC 2007a). Sea level rise, increased coastal flooding, oceanic acidification, and changes in ocean and atmospheric circulation (e.g., increasing storm frequency and intensity) are anticipated to influence activities within the ecological, social, and economic spheres. Marine managers, planners, coastal communities, organizations and industries are tasked with developing solutions to address these new and often uncertain challenges.

Climate change mitigation, adaptation, and monitoring provide tools to identify and tackle climate change impacts. Mitigation measures aim to moderate future climate change impacts through reduced greenhouse gas emissions (GHGs) and increased GHG sinks, while adaptation actions aim to address current impacts by managing risk and adjusting social and economic activities to reduce vulnerability. These strategies are grounded in monitoring programs, which facilitate the identification and measurement of changes in the marine environment (e.g., sea level rise, increased seawater temperature), the creation of relevant and strategic actions, and the assessment of the effectiveness of these actions.

Integrated management (IM) provides a means to comprehensively apply climate change adaptation, mitigation and monitoring processes. IM planning is intended to minimize conflicts among marine users as well as protect and enhance environmental, social and economic wellbeing. It is flexible and transparent, and is guided by such principles as sustainable development, conservation, shared responsibility, and inclusiveness (Fisheries and Oceans Canada 2002a, b). With the goal of advancing collaborative marine management, Canada initiated a series of IM planning processes through the identification of five Large Ocean Management Areas (LOMAs).

The LOMAs are located in the Pacific (Pacific North Coast), Central and Arctic (Beaufort Sea), and Atlantic (Gulf of St. Lawrence, Eastern Scotian Shelf, and Placentia Bay/Grand Banks) regions. The planning process within PNCIMA, a planning area encompassing 88,000 km² in British Columbia's central and north coast areas, is currently assessing how best to address climate change. This report establishes a framework for summarizing and assessing the climate change-related content of marine IM plans, and reviews a range of marine IM plans from around the world with the goal of informing the PNCIMA Initiative.

PART 1: METHODS

This section outlines the theoretical (i.e., plan selection) and empirical (i.e., framework for evaluating marine planning processes) methods applied within this report.

Plan Selection

Each plan reviewed within this report was selected on the grounds that it (1) addresses climate change, (2) strongly demonstrates an aspect of planning within the marine environment (i.e., as identified within the framework described below), and (3) addresses public participation and stakeholder engagement. The five plans were purposefully selected to represent a range of geographical areas (i.e., United States, Canada, Norway, Australia, and South Africa), management area types (e.g., state and federal waters, marine parks), and governing bodies (i.e., a range of bodies were responsible for plan development, including a private consulting company, government departments, and an independent government authority).

Framework for Evaluating Marine Planning Processes

A framework for evaluating marine planning was developed to provide a clear, consistent means for summarizing, assessing and comparing planning processes from around the world (Table 1). The framework is two-part as it addresses the structure and approach of planning processes as well as the nature of climate change-related content. This is necessary as a successful response to climate change must include both an effective process to implement actions as well as a substantive commitment to addressing climate change. The framework is applied by qualitatively assessing the degree to which marine plans exhibit (1) ecosystem-based co-management and (2) climate change-related content. An explanation of the elements of the framework is provided below.

Unless noted otherwise, all information summarized in this report is available within the planning documents reviewed (see the Resources section of this document for links to the electronic copies of each of the plans).

Structure and Approach: Ecosystem-based Co-management

Environmental and resource management practices have traditionally focused on single issues or resources, assumed that change is gradual and incremental, and disregarded interactions across spatial and temporal scales (Folke et al. 2005). It is now recognized that narrow approaches that ignore the complex relationships between the social, economic and environmental spheres often lead to policy misfits (i.e. policies that address specific issues while creating new challenges external to the areas of focus) (Bunce et al. 2010). It is anticipated that periods of abrupt change will increase in frequency, duration, and magnitude (Steffen et al. 2004), while, at the same time, in many places ecosystem resilience (i.e., the capacity of ecosystems to absorb disturbances and reorganize while still retaining function, structure, identity, and feedbacks) has been reduced as a consequence of human actions (Folke et al. 2004, Walker et al. 2004).

Novel forms of governance and policy are necessary to overcome the limitations of past management practices (Bunce et al. 2010). Ecosystem-based co-management provides an innovative governance¹ approach that addresses the issues of traditional management practices. It combines the dynamic learning of adaptive management with the multilevel, polycentric nature of co-management. Ecosystem-based co-management relies on collaboration between stakeholders and the creation of social networks to generate and transfer knowledge and develop legal, political, and financial support for ecosystem management initiatives. It is an ideal process for

¹ Governance refers to the structures and processes used by people to make decisions and share power (Lebel et al. 2005).

addressing the challenges posed by climate change because it provides a process that is effective in the context of complex ecosystems and periods of abrupt, disorganizing, or turbulent change (Folke et al. 2005).

Nature of Climate Change Content

Integrated marine plans that effectively address climate change need to recognize that climate change is a real and critical issue. But, they cannot stop there. To affect appropriate responses to climate change impacts, integrated marine plans must outline goals, objectives and actions to both mitigate future impacts and adapt to current challenges. Effective monitoring, through data collection, is necessary to operationalize climate change mitigation and adaption actions, while binding legal frameworks and the identification of bodies responsible for climate change actions improve the likelihood of success of climate change initiatives.

Table 1 Framework for evaluating integrated marine plans

Integrated Marine Plan Structure: Adaptive Governance operationalized through ecosystem-based co-management		
Indicator	Description	Justification
Adaptive co-management	<p>Adaptive co-management strategies are</p> <ul style="list-style-type: none"> • applied within ecologically-defined and not politically-defined boundaries, • multi-level and polycentric (i.e., management rights and power are shared between a range of organizations that are connected by bridging organizations), • adaptive (i.e., institutional arrangements and ecological knowledge are tested and revised in a dynamic, ongoing, self-organized process of learning by doing), and • flexible (i.e., flexibility is provided by the establishment of formal and informal relationships, access to a diverse range of skills and tools embodied within co-management partners, and by constant evolution and change due to the adaptive nature of ecosystem-based management). 	<ul style="list-style-type: none"> • Complex ecosystems are self-organizing so an adaptive management approach that is also flexible and continuously updated and adjusted is necessary (Carpenter and Gunderson 2001) • Multi-level of organizational interactions (e.g., municipal, regional, national) facilitate “scale matching” (i.e., the ability to use institutions at organizational levels appropriate to the ecological scale of the issue under study) (Ostrom 2005, Lee 1993) • Multilevel networks can stimulate collaboration, build trust, and encourage the development of common perspectives on policy issues (Folk et al. 2005) • Stakeholder networks can provide arenas for novelty and innovation, improve ability to absorb disturbance and diffuse risk in times of rapid change (i.e., climate change), build social capital, and increase the public legitimacy of planning processes (Schneider et al. 2003, Low et al. 2003) • Collaboration between a range of organizations and individuals improves social resilience by bringing a range of skills for allowing rapid and large change (i.e., people can play a diverse range of roles, including knowledge retainers, interpreters, facilitators, visionaries, inspirers, innovators, experimenters, followers, and reinforcers) (Folke et al. 2003, Gladwell 2000) • Members of informal networks can feel less scrutiny and obligation and, as a result, can be more comfortable with developing alternative policies, dare to learn from each other, and think creatively about the resolution of resource problems (Folke et al. 2005). • Flexible institutions enable bridging organizations (e.g., non-governmental organizations), which can bring in resources, knowledge, and other incentives for collaboration and ecosystem management; communicate, translate, and mediate scientific knowledge; provide arenas for building trust, sense making, learning, vertical and/or horizontal collaboration, and conflict

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		resolution; and, mobilize knowledge and social memory in turbulent times to help deal with uncertainty and shape change (Folke et al. 2005).
Continuous Capacity building	<p>Continuous capacity building leads to ongoing learning that:</p> <ul style="list-style-type: none"> • develops adaptive expertise (i.e., ability to accept uncertainty, be prepared for change and surprise, and deal with disturbance), • enables processes of sense making (i.e., taking interpretations seriously, inventing and reinventing a meaningful order and then acting upon it), and, • accepts different types of knowledge as valid and relevant (e.g., scientific knowledge, local ecological knowledge) 	<ul style="list-style-type: none"> • Developing capacity for dealing with change increases resilience, reduces the vulnerability of systems to external pressures, and creates opportunities to use disturbances as opportunities to transform into more desired states (Folke et al. 2005). • Local knowledge systems and scientific knowledge can be combined to enhance capacity for dealing with complex adaptive systems and uncertainty (Ludwig et al. 2001, Riedlinger and Berkes 2001, Berkes et al. 2000) • Capacity building for monitoring and translating signals (feedback) from ecosystem dynamics into knowledge that can be used in social systems builds social and environmental resilience (Folke et al. 2005).
Participatory Processes	<p>Participatory processes (e.g., stakeholder meetings, workshops that engage a range of actors) involve the building of social capital, which includes:</p> <ul style="list-style-type: none"> • trust building through dialogue • mobilization of social networks across scales • collaborative learning • creation of social memory (i.e., the shared retention of communal experiences with change and successful adaptation that is expressed through community decision-making processes that result in appropriate strategies for dealing with ongoing change (Abel 2003)) 	<ul style="list-style-type: none"> • Social capital constitutes relations of trust, reciprocity, common rules, norms, sanctions, and connectedness in institutions, and is the glue for adaptive capacity and collaboration (Adger 2003, Pretty and Ward 2001). • Trust makes social life predictable, creates a sense of community, and makes it easier for people to work together (Shannon 1990). • Social capital and social memory provide sources of social resilience (Folke et al. 2005) • Social memory of experiences with resource and ecosystem management enables individuals to navigate turbulent phases and perform using diversification, novelty, innovation, and experimentation rather than simplification (Folke et al. 2005, Low et al. 2003) • Combining different individual's skill sets with the diversity, overlapping functions, and redundancy of multilevel participation enhances adaptive capacity in the face of disturbance and crisis by increasing resilience (i.e., ability to reorganize) (Folke et al. 2005)

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Integrated Marine Plan Content: Climate Change		
Indicator	Description	Justification
Recognition of climate change	<ul style="list-style-type: none"> Acknowledgement of climate change as a salient issue that warrants attention 	<ul style="list-style-type: none"> Acceptance of climate change as both real and a threat is the first step in taking action
Goals and objectives	<ul style="list-style-type: none"> Identification of what types of responses are necessary to effectively address climate change in the marine environment 	<ul style="list-style-type: none"> Goals and objectives provide a means to organize and understand what types of responses are necessary
Actions	<ul style="list-style-type: none"> List of actions outlining specific steps that will be taken to address climate change 	<ul style="list-style-type: none"> Until specific actions are identified, goals and objectives are difficult to implement and review
Data collection and monitoring	<ul style="list-style-type: none"> On-going research programs 	<ul style="list-style-type: none"> Successful management is characterized by continuous testing, monitoring, and reevaluation to enhance adaptive responses, acknowledging the inherent uncertainty in complex systems (Folke et al. 2005). Detecting and responding to environmental feedback in a fashion that contributes to resilience require ecological knowledge and understanding of ecosystem processes and functions (Folke et al. 2005) All policies are ongoing learning experiments that need to be monitored, evaluated, and adapted over time (Folke et al. 2005).
Legal Framework	<ul style="list-style-type: none"> Legal requirement to take action on climate change 	<ul style="list-style-type: none"> Legal responsibility for climate change action demonstrates a commitment to addressing climate change and a progressive governance system as well as increases accountability and the probability of follow-through
Responsible Body	<ul style="list-style-type: none"> Clear body responsible for ensuring that commitments related to climate change are met 	<ul style="list-style-type: none"> Similar to having a legal framework, having a body responsible for climate change actions increases accountability and the probability of follow-through

PART 2: SUMMARIES OF IM PLANS

This section provides examples of how integrated ocean management (IM) plans have addressed climate change. The IM plans summarized here include the *Massachusetts Ocean Management Plan* (MOMP) (United States), *Integrated Ocean Management Plan for the Beaufort Sea: 2009 and beyond* (Beaufort IM plan) (Canada), *Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands* (Barents Sea – Lofoten Area Plan) (Norway), *Great Barrier Reef Climate Change Action Plan (2007-2012)* (Action Plan) (Australia), and the *Garden Route Integrated Management Plan (Marine)* (Garden Route Plan) (South Africa).

Each of the summaries includes (1) a context statement, (2) a summary of the planning process, climate change content, and model planning element (i.e., how the plan can be used to inform the PNCIMA planning process), (3) a discussion of funding, (4) identification of progress following implementation of the planning process, and (5) a discussion of the strengths and weaknesses of the review process.

Massachusetts Ocean Management Plan

Context Statement

In May of 2008, the Governor of Massachusetts signed the Massachusetts Oceans Act (the Act) in response to increasing development pressure. The Act required the state-level Executive Office of Energy and Environmental Affairs (EEA) to develop an IM plan for Massachusetts's marine waters. In December 2009, after a year and a half of development, the EEA released its two-volume Massachusetts Ocean Management Plan

(MOMP) (i.e., Volume 1 provides a process for marine planning management and administration, Volume 2 provides a baseline assessment and a science framework).

The planning area of the MOMP covers 5,549 km² off the east coast of the United States. As mandated by the Act, the MOMP extends approximately 0.5 km from Mean High Water to the seaward extent of Massachusetts' state jurisdiction, and includes both waters and submerged lands of the ocean (i.e., seabed, subsoil).

Plan Assessment

Structure and Approach

Until recently, the management of Massachusetts' ocean resources has been piecemeal (EEA 2010). The MOMP is the State's first comprehensive science-based planning process aimed at ensuring the long-term protection and sustainable use of ocean resources. It applies a flexible, multi-level and adaptive co-management process to address a range of social, environmental, and economic marine-related issues (Table 2). Participatory processes were used during its development and continue to inform its implementation, while capacity building in the form of knowledge generation and data collection is emphasized throughout. However, it should be noted that capacity building within the MOMP focuses on mainstream science-based information and does not incorporate a range of knowledge types (e.g., traditional ecological knowledge, indigenous knowledge).

Climate Change Content

The MOMP identifies climate change as an important issue and outlines climate change-related goals, objectives and actions, as well as provides a clear process for the collection and monitoring of climate change-related variables (Table 2). The plan designates a responsible body for ensuring that climate change actions are undertaken, and, most importantly, is legally binding (i.e., the MOMP is legally required to address climate change and sea level rise under the Oceans Act of 2008).

Strongest Element Demonstrated by Planning Process

The MOMP is a comprehensive report that addresses a range of issues within a clear and thorough planning process. While the legally binding framework within which it was created is the most notable aspect of Massachusetts' overall planning process, the most impressive element of the MOMP itself is the alliances it has cultivated with existing state and government agencies, public-private partnerships, and academic institutions for the collection and monitoring of climate change information. In connecting with existing bodies, the MOMP (1) takes advantage of preexisting expertise and structures thereby saving both money and time, (2) accesses long-term monitoring data necessary for understanding the current impacts and rate of change of climate change (e.g., oceanographic institutions have been collecting data relevant to climate change monitoring for decades), and (3) develops a network of experts capable of advising the planning process on how best to proceed in the context of long-term and unpredictable changes in climate.

Table 2 Assessment of the Massachusetts Ocean Management Plan

IM Planning Process		
Indicator	Included in Planning Process?	Example(s)
Adaptive Co-management	Yes	<ul style="list-style-type: none"> • <u>Ecosystem-based</u>: The MOMP recognizes that the planning area straddles two major biogeographic regions (i.e., the Gulf of Maine and the Southern New England-New York Bight), and is required by the Oceans Act of 2008 to respect the interdependence of ecosystems. • <u>Multi-level co-management</u>: A number of bodies across jurisdictional levels have been and continue to be responsible for developing and implementing the MOMP. These include Regional Planning Agencies, Federal agencies, (e.g., US Environmental Protection Agency, National Marine Fisheries Service), representatives of First Nations (e.g., Mashpee Wampanoag Tribe, Wampanoag Tribe of Gay Head (Aquinnah)), and independent organizations (e.g., Massachusetts Ocean Partnership). • <u>Adaptive</u>: An explicit goal of the MOMP is to “<i>Incorporate new knowledge as the basis for management that adapts over time to address changing social, technological, and environmental conditions.</i>” As required by the Oceans Act 2008, the MOMP will be reviewed and revised every five years to reflect the development of better information and science, the evolution of policy goals, and experience gained during its application. • <u>Flexible</u>: The MOMP recognizes that there are regional distinctions within the planning area that require flexibility and that amendments may be necessary to address these distinctions. A bridging body (i.e., Ocean Advisory Commission) was created specifically for the MOMP process, and provides a forum for discussions of plan implementation and policy issues, as well as facilitates stakeholder engagement.
Continuous Capacity Building	Yes	<ul style="list-style-type: none"> • <u>Develops adaptive expertise</u>: An advisory council (i.e., Ocean Science Advisory Council) was established to prioritize science and data acquisition tasks to better understand the marine environment, and issue-specific committees will be formed to address science-related challenges requiring expertise. • <u>Enables processes of sense making</u>: Different value systems and approaches to sense making have been explored (e.g., alternative approaches to defining ecological value of ocean resources was discussed during plan development). • <u>Accepts different types of knowledge</u>: N/A
Participatory Processes	Yes	<ul style="list-style-type: none"> • <u>Trust building</u>: The Oceans Act of 2008 specifically directs that the MOMP encourage public participation in decision-making. Development of the final MOMP involved 18 public listening sessions, five public workshops, five formal public hearings, and hundreds of meetings with stakeholders (e.g., pilots, fishermen,

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		<p>nongovernmental organizations, academia). Finally, the Oceans Act includes several process-related provisions.</p> <ul style="list-style-type: none"> • <u>Mobilization of social networks</u>: N/A
Climate Change Content		
Indicator	Included in Planning Process?	Example(s)
Recognition of Climate Change	Yes	<ul style="list-style-type: none"> • The MOMP identifies climate change as an important large-scale driving force influencing the abundance, distribution, and condition of physical and natural marine resources. • The MOMP explains that enhancing understanding of drivers, such as climate change, enables the creation of strategies to address predictable changes and plan for unpredictable events, thereby enhancing management of existing and future ocean resources.
Goals and Objectives	Yes	<ul style="list-style-type: none"> • A five-year goal within the MOMP is <i>“Increasing human understanding of the ramifications of climate change upon the ocean ecosystem in Massachusetts.”</i> • An objective within the MOMP is to <i>“Increase the understanding of climate change effects on marine and coastal systems and the resulting implications and considerations for management actions.”</i>
Actions	Yes	<ul style="list-style-type: none"> • The MOMP commits to monitoring climate change variables across Massachusetts coastal waters, developing a performance evaluation framework to help assess the potential effects of climate change, and conducting research on species’ sensitivity to oceanographic changes associated with climate change.
Data Collection and Monitoring	Yes	<ul style="list-style-type: none"> • The science framework of the MOMP focuses on data acquisition for indicators of climate change (i.e., seawater temperature, sea level).
Legal Framework	Yes	<ul style="list-style-type: none"> • The Ocean Management Act 2008 requires that the MOMP address climate change and sea level rise. • The Oceans Management Act 2008 requires that approvals for development within the planning area be consistent with the MOMP.
Responsible Body	Yes	<ul style="list-style-type: none"> • The MOMP identifies the EEA’s Office of Coastal Zone Management (CZM) as the lead body for monitoring climate change across Massachusetts’ coastal waters. • As the responsible body, the CZM has partnered with other state government agencies (e.g., Massachusetts Division of Marine Fisheries (DMF)), federal government agencies (i.e., National Data Buoy Center (NDBC)), a public-private partnership (i.e., Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS)), and academic institutions (e.g., Woods Hole Oceanographic Institution (WHOI)).

Funding

Resources for the development of the MOMP were provided by the Massachusetts' Office of Coastal Zone Management (CZM) and the Massachusetts Ocean Partnership (MOP) (i.e., a privately-funded, independent public-private partnership of ocean stakeholders). The CZM provided staff time equal to approximately \$2.5 million US (i.e., approximately \$2.6 million CA), while the MOP provided \$2 million US (i.e., approximately \$2.1 million CA) for scientific research, data collection, and public outreach.² Prior to the development of the MOMP, a number of coastal and ocean scientists and policy specialists were conducting ongoing research on the environmental health and economic importance of Massachusetts's coastal waters. As such, development of the MOMP was supported by pre-existing research programs.

Implementation of the MOMP is funded by an Ocean Resources and Waterways Trust Fund (ORWTF). The ORWTF was created by the Act as a dedicated funding source for the MOMP with the goal of ensuring a budget for (1) restoring and enhancing marine habitat, (2) improving public navigation, (3) conducting fisheries restoration and management programs, and (4) addressing environmental enhancement, restoration, and management of ocean resources. The ORWTF is funded by mitigation fees, grants, Legislative appropriations, and income from investments. In addition, funding for the implementation and continuation of climate change monitoring projects is provided by

² J. Webber, Ocean Services Manager, Massachusetts Office of Coastal Zone Management, personal communication, November 23, 2010.

the state government (i.e., DMF, MWRA), federal government (i.e., NDBC, USGS), a public-private partnership (i.e., NERACOOS), and academic institutions (e.g., WHOI).

Progress

The CZM is involved in regional efforts to develop ocean observing systems, as well as efforts to obtain data to measure sea level rise and model sea level rise implications. It has participated in issue scoping and tool development exercises and is currently active in organizations undertaking climate change-related monitoring programs (e.g., Gulf of Maine Ocean Observing System, Northeast Regional Association for Coastal Ocean Observing Systems). Most recently, the CZM completed a study on the changing ecology of Buzzard Bay (i.e., the study found that warm water fish are appearing in the bay and that commercially important cool water fish are disappearing). The study, which is still under review, and other similar studies will guide Massachusetts' marine planning process and influence the next version of the MOMP.²

The continued application of the MOMP will involve the advocacy of tools to help managers utilize ocean monitoring information, and the support of monitoring efforts related to climate change impacts (e.g., monitoring sea level rise through data development, modeling, and other efforts).

Strengths and Weaknesses of Review Process

The MOMP is a comprehensive document that clearly summarizes both the process through which it was developed (e.g., how the public was involved in plan formation, the issues and political framework that shaped plan creation, etc.) as well as its goals, objectives, and intended actions. As such, this report's review of the development

and content of the MOMP is also comprehensive. At the same time, it was challenging to effectively identify the MOMP's full funding (i.e., sources and amounts) and progress to date as it builds on a number of pre-existing projects. In particular, a definitive funding amount for plan development is not available because creation and implementation of the plan were facilitated by a wide range of academic and government programs that were initiated well before plan development. For example, the Gordon and Betty Moore Foundation awarded a three-year \$8.2 million (US) grant to the University of Massachusetts for development of information and tools to improve the integration of natural and social science with ocean management. The grant, awarded in 2008, was explicitly intended to aid state-level ocean management planning.

Integrated Ocean Management Plan for the Beaufort Sea: 2009 and beyond

Context Statement

With the introduction of its Oceans Act (Act) in 1997, Canada became the first country in the world to have comprehensive oceans management legislation. The Act directs the federal Minister of Fisheries and Oceans (DFO) to collaborate with a range of interests (e.g., Aboriginal groups, industry organizations, environmental and community groups, academia) to develop and implement integrated management of the nation's coastal and marine waters as well as estuaries. With the finalization of its national Oceans Strategy in 2002, Canada defined a vision, principles and objectives for modern ocean governance. Several years later, it identified five Large Ocean Management Areas (LOMAs) and, as one of these LOMAs, the Beaufort Sea was identified to receive

funding. Following two years of development, the *Integrated Ocean Management Plan for the Beaufort Sea: 2009 and Beyond* (Beaufort Sea IM Plan) was completed.

The planning area of the Beaufort Sea IM Plan extends over 1,750,000 km² in Canada's western Arctic, and is defined by the marine portion of the Inuvialuit Settlement Region (ISR) (i.e., a region established by the *Inuvialuit Final Agreement* 1984). As the Arctic environment is shared by several nations, Canadian planning processes must consider circumpolar interests and work to ensure that Canadian goals, objectives and guiding principles remain aligned with those of other circumpolar nations.

Plan Assessment

Structure and Approach

The Beaufort Sea IM Plan moves away from the traditional approach of single-species and single-industry management towards a broader, more inclusive process (Table 3). It embraces an adaptive co-management scheme that recognizes the sovereignty of First Nations (i.e., the overarching planning body for the planning process, the Regional Coordination Committee (RCC), is co-chaired by First Nations and the Federal government), as well as emphasizes capacity building that employs traditional and local knowledge. The core of the planning process is built on stakeholder participation and the primary forum for stakeholder engagement has extensive stakeholder representation. This forum contains 82 members from 37 organizations and is open for membership to all groups who are active or have an interest in the Beaufort Sea LOMA, making the Beaufort IM Plan a truly participatory, community-based process.

Climate Change Content

The Beaufort IM Plan recognizes climate change as an issue and provides a goal, objectives, a strategy, and actions to address climate change-related impacts (Table 3). A body responsible for climate change action is identified (i.e., the Regional Coordination Committee); however, it serves as the overarching planning body for the entire LOMA. As a result, it potentially lacks the time to seriously prioritize and tackle climate change issues. Delegation of responsibility to a more specialized working group would indicate a greater commitment to action. Further, the plan states that affecting climate change is beyond its scope and that attention should be focused on fostering resiliency to enable climate change adaptation, thereby unnecessarily dismissing climate change mitigation. The Beaufort IM Plan is not legally binding (i.e., it serves to coordinate various management partners), and does not identify how information and data for monitoring and responding to climate change will be collected and used over the long term. As such, the planning process shows potential for effective climate change action but may lack the legal structure and political will to effectively bring about a concerted climate change response.

Strongest Element Demonstrated by Planning Process

Canada is internationally recognized for the high priority it places on stakeholder participation within integrated oceans management planning (Report No. 8 to the Storting, 2005-2006). Undoubtedly, the most important element demonstrated by the Beaufort Sea planning process is its extensive stakeholder engagement and effective co-management. Development of the plan was cooperatively undertaken by Aboriginal,

Federal and Territorial governments and co-management interests, and was informed by industry, coastal communities and other interested parties. As the process addresses First Nations as an autonomous government (i.e., as opposed to an interest or stakeholder), it recognizes Aboriginal rights and titles, thereby establishing a relationship of respect and reconciliation between the federal government and First Nations.

Implementation of the planning process will be carried out by all Beaufort Sea resource users with the goals of increasing cooperation across departments and governments and creating greater accountability. Throughout the planning process, decision-making by consensus (i.e., agreement in opinion reached by a group as a whole) has been and will be used. In order to facilitate the success of this approach, mechanisms for dispute resolution are provided for. The continued inclusion of all parties that are active or interested in the Beaufort Sea will help to facilitate effective plan implementation over the long-term as it will engender a shared sense of responsibility and a constantly evolving common vision for Beaufort Sea oceans management.

Table 3 Assessment of the Integrated Management Plan for the Beaufort Sea: 2009 and Beyond

IM Planning Process		
Indicator	Included in Planning Process?	Example(s)
Adaptive Co-management	Yes	<ul style="list-style-type: none"> • <u>Ecosystem-based</u>: The planning process aims to understand the Beaufort Sea ecosystem, and recognizes the planning area's diverse ecological features. Ecologically and Biologically Significant Areas (EBSAs) were recognized early in the planning process and are guiding plan implementation. • <u>Multi-level co-management</u>: Aboriginal, Federal and Territorial governments and co-management interests, as well as industry, coastal communities and other interested parties agreed to work together on the development of the Beaufort IM Plan. Implementation of the planning process by all Beaufort Sea resource users and managers is anticipated to increase cooperation across departments and governments as well as create greater accountability for management of shared responsibilities. • <u>Adaptive</u>: As new knowledge is gathered and circumstances change, the objectives of the Beaufort IM Plan will evolve to accommodate and address these changes. • <u>Flexible</u>: The overarching planning body for the planning process, the Regional Coordination Committee, serves as a forum to ensure that initiatives are known to all stakeholders and are coordinated with other ongoing industry or sector-specific initiatives.
Continuous Capacity Building	Yes	<ul style="list-style-type: none"> • <u>Develops adaptive expertise</u>: N/A • <u>Enables processes of sense making</u>: N/A • <u>Accepts different types of knowledge</u>: The Beaufort IM Plan promotes the value, credibility and use of Traditional Knowledge (TK) and Local Knowledge (LK) to current and future generations. Decisions and recommendations are based on the best available information, including Traditional Knowledge and Science.
Participatory Processes	Yes	<ul style="list-style-type: none"> • <u>Trust building</u>: The Beaufort IM Plan was created over several years by dozens of people representing Aboriginal, Territorial and Federal government departments, management bodies, and northern coastal community residents with interests in the Beaufort Sea, and was influenced by Industry and a range of other interested parties. Decisions and recommendations within the process are made by consensus, and mechanisms for dispute resolution are provided for. Decisions and recommendations are made openly, with information and results shared with all stakeholders. • <u>Mobilization of social networks</u>: The planning process contains a body (i.e., the Beaufort Sea Partnership) that

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		<p>serves as a forum for stakeholder engagement and networking. Community tours, workshops, and meetings were hosted to facilitate relationship-building during plan development, and a Beaufort Sea e-Forum (i.e., online site) offered stakeholders the opportunity to ask questions and provide feedback on draft documents. Since the Arctic environment is shared by several nations, the planning process considers circumpolar interests and aims to remain aligned with circumpolar nations.</p>
Climate Change Content		
Indicator	Included in Planning Process?	Example(s)
Recognition of Climate Change	Yes	<ul style="list-style-type: none"> The Beaufort IM Plan recognizes that climate change necessitate an immediate response (e.g., the warming climate has increased discussion and concerns over the possible impacts on wildlife and the traditional way of life that is likely to occur as a result of increased shipping).
Goals and Objectives	Yes	<ul style="list-style-type: none"> An objective of the Beaufort IM Plan is to “[a]ssess and develop an adaptive management response to climate change.”
Actions	Yes	<ul style="list-style-type: none"> The plan’s strategy for meeting its climate change related objective is to “[p]repare the communities for anticipated social and economic changes.” The actions associated with this strategy are to (1) model the impacts of climate change on species and the human communities that rely upon them and (2) develop strategies for adapting to anticipated changes.
Data Collection and Monitoring	No	<ul style="list-style-type: none"> The Beaufort IM Plan does not outline a clear process for climate change-related data collection and monitoring.
Legal Framework	No	<ul style="list-style-type: none"> The Beaufort Sea IM plan is a collective approach to oceans management that cannot be forced on anyone. It is not legally binding and is dependent on users of the Beaufort Sea for its implementation.
Responsible Body	Yes	<ul style="list-style-type: none"> The overarching planning body for the planning process, the Regional Coordination Committee (RCC), is identified as the body responsible for implementing climate change goals.

Funding

A total of \$15 million was provided by the federal government under the Oceans Action Plan to help advance IM oceans planning across Canada (i.e., the Oceans Action Plan serves as the overarching umbrella for coordinating and implementing sustainable development and management of Canada's oceans). Funding for the specific development of the Beaufort IM Plan was not provided in one lump sum, and was incrementally pulled from the federal budget each year by the Department of Fisheries and Oceans. As such, a clear figure on the total funding for plan development is not available. A budget for plan implementation has not been established but meetings are currently taking place to assess funding.³

Progress

The Beaufort IM Plan has not yet been implemented but meetings are currently underway to establish a process and timeline.³

Strengths and Weaknesses of Review Process

As with the MOMP, the Beaufort IM Plan clearly outlines the context and process through which it was created as well as the goals and objectives it is intended to address. As such, this report's summary of the Beaufort IM Plan and its planning process is comprehensive. However, as the Minister of Fisheries and Oceans signed off on the Beaufort IM Plan as recently as August of this year, a shortcoming of the review process

³ L. Dow, District Manager, Department of Fisheries and Oceans Inuvik, personal communication, November 2, 2010.

is that it does not review plan implementation or effectiveness (i.e., there has not yet been an opportunity for plan implementation). In addition, because funding for the development of the plan was incremental, a total cost for plan development could not be ascertained.

Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands

Context Statement

In 2002, the Norwegian government produced a bill on the marine environment with the goal of initiating management practices grounded in the principles of sustainable development (Report No. 12 (2001–2002) to the Storting, Protecting the Riches of the Sea). Due to its clean and rich nature and its anticipated development, the Barents Sea – Lofoten area was selected as the first location for integrated management planning. Over four years, the federal Ministry of the Environment shaped the “*Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands*” plan (Barents Sea–Lofoten Area Plan). On its completion in 2006, the Barents Sea–Lofoten Area Plan represented Norway’s first integrated, ecosystem-based management process. The plan has attracted international attention, and now serves as the basis for integrated management plans for other Norwegian sea areas.

The Barents Sea–Lofoten Area Plan applies to the Barents Sea and the sea areas off the Lofoten Islands, and covers a management area of almost 1,400,000 km². As the Barents Sea is recognized as a continuous Large Marine Ecosystem (LME) and the plan only applies to the Norwegian portion of the Barents Sea, the Norwegian Government is

seeking to work with Russia to ensure an integrated management regime for the entire Barents Sea.

Plan Assessment

Structure and Approach

The Barents Sea–Loften Area Plan strives to implement ecosystem-based management, employs different types of knowledge (i.e., indigenous and western science), and is adaptive as well as flexible (Table 4). A transparent process was used during its development and a range of stakeholders were consulted for their input. The plan employs trust building as it aims to create a common understanding of management goals between a diversity of interests (e.g., business and environmental organizations, government authorities, interest groups), and successfully provides scientific concepts in a manner that is understandable to a layperson.

However, the plan applies a traditional governance approach in which various government ministries coordinate with one another as well as academic institutions to create a top-down initiative that includes stakeholder consultation more for plan review than for plan development and implementation. It fails to bring about changes in the traditional spheres of authority and responsibility, thereby consigning stakeholders to a passive as opposed to an active role. As such, the Barents Sea–Loften Area planning process does not fully introduce a novel governance approach and falls short of introducing an IM process that is truly progressive.

Climate Change Content

The Barents Sea–Lofoten Plan projects that climate change will be the most important environmental pressure on ecosystems beyond 2020 and that climate change will significantly influence IM practices. However, it anticipates that no major changes in key climate parameters will take place before 2020 (i.e., it states that the period up to 2020 is too short for any significant changes to become apparent within long-term climate modeling). As the background studies and assessments for this plan are based on scenarios for the period up to 2020, the plan addresses a period where climate change is not yet recognized as a key priority relative to other more immediate pressures (e.g., pollution, conflicts between marine uses). Despite recognition of the need to identify the likely future impacts of climate change, the plan states that a detailed description of the general challenges relating to knowledge gaps regarding climate change is outside of its scope. As such, the plan defers responsibility for climate change-related action and does not provide goals, objectives, or actions specific to tackling climate change impacts (e.g., the plan places responsibility for climate change action with NORKLIMA, a national programme aimed at understanding and responding to climate change) (Table 4). As the plan does not specifically target climate change, it also fails to identify a specific body responsible for climate change initiatives and is not legally binding with regard to climate change actions.

Strongest Element Demonstrated by Planning Process

The Barents Sea–Lofoten Area Plan excels at conveying difficult scientific concepts in a language that is accessible to individuals who may not be familiar or

comfortable with scientific theory. Information on ecosystems and ecological interactions, the relationship between socio-economic conditions and the environment, and the pressures and impacts of current activities in the planning area are expressed in laymen's terms. Potentially challenging concepts are visually expressed through a range of means, including diagrams, pictures, maps, and flowcharts. This is relevant as, in order for IM planning to be successful, both the public and those responsible for implementing planning processes must understand why planning is taking place and how their actions make a difference. This is emphasized by the Millennium Ecosystem Assessment (MEA) (i.e., a report of the United Nations that assesses the consequences of ecosystem change for human well-being and the scientific basis for action needed to enhance the conservation and sustainable use of those systems and their contribution to human well-being). The MEA highlights the essential role played by ecosystem services in the welfare of humanity and stresses that knowledge of the workings of ecosystems and the importance of natural assets is essential for the sustainable management of natural resources.

Table 4 Assessment of the Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands
IM Planning Process

Indicator	Included in Planning Process?	Example(s)
Adaptive Co-management	No	<ul style="list-style-type: none"> • <u>Ecosystem-based</u>: The planning area is defined by administrative as well as ecological considerations. The plan explicitly identifies the ecosystems within the planning area and recognizes that a range of measures should be used to address the characteristic features of these ecosystems. However, while the plan aspires to ecosystem-based management, it acknowledges that narrow, sectoral approaches are currently still in place (e.g., the management of single stocks within fisheries). • <u>Multi-level co-management</u>: The Barents Sea–Lofoten Area Plan does not entail any changes in spheres of authority or responsibility. However, it does emphasize the importance of cross-sectoral planning, and involves cooperation between a range of academic institutions and Norwegian ministries (e.g., Norwegian Polar Institute, Ministry of the Environment, Institute of Marine Research). Further, the plan includes proposals for strengthening international IM planning between Norway and Russia, and has been shaped by consultation with Indigenous interest groups and Norway’s autonomous Indigenous Parliament (i.e., Sami Parliament). • <u>Adaptive</u>: Regular assessments will be used to update the plan and adapt it to changing conditions. Based on these regular assessments as well as ongoing monitoring and research, an updated version of the whole management plan will be available in 2020. • <u>Flexible</u>: The Barents Sea–Lofoten Area Plan will be implemented and followed up systematically and flexibly on the basis of new knowledge, changes in activity levels, trends in the state of the environment and other developments.
Continuous Capacity Building	No	<ul style="list-style-type: none"> • <u>Develops adaptive expertise</u>: N/A • <u>Enables processes of sense making</u>: The plan presents scientific concepts in a clear, comprehensive language that is accessible to a layperson (i.e., as noted in the United Nations’ Millennium Ecosystem Assessment, (a) ecosystem services play an essential role in the welfare of humanity, and (b) knowledge of the workings of ecosystems is essential for the sustainable management of natural resources). • <u>Accepts different types of knowledge</u>: Indigenous interest groups (i.e., Sami) provided input for the scientific basis of the plan.
Participatory	Yes	<ul style="list-style-type: none"> • <u>Trust building</u>: The plan is intended to develop a common understanding of management goals between business interests, local, regional and central authorities, environmental organizations and other interest groups.

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Processes		<ul style="list-style-type: none"> <u>Mobilization of social networks</u>: Transparent procedures were followed during development of the plan, and a diverse range of parties were drawn into the work (e.g., local authorities, indigenous interest groups, environmental organizations, business and industry, research institutions).
Climate Change Content		
Indicator	Included in Planning Process?	Example(s)
Recognition of Climate Change	Yes	<ul style="list-style-type: none"> The plan states that climate change is expected to be the most important environmental pressure on all key parts of ecosystems beyond 2020.
Goals and Objectives	No	<ul style="list-style-type: none"> No climate change goals or objectives are outlined.
Actions	No	<ul style="list-style-type: none"> No climate change actions are identified.
Data Collection and Monitoring	No	<ul style="list-style-type: none"> The Norwegian Government considers it important to gain a better understanding of the impacts of climate change in the Barents Sea– Lofoten area, and will take the initiative for an impact assessment. It will be closely linked to existing research and monitoring programmes.
Legal Framework	No	<ul style="list-style-type: none"> The plan is not legally binding.
Responsible Body	No	<ul style="list-style-type: none"> A body responsible for climate change initiatives is not identified.

Funding

Norway's Ministry of the Environment allocates joint funding to a range of marine-related programs and, as such, an exact figure for the development and ongoing implementation of the Barents Sea–Lofoten Area Plan is not available (e.g., funding for the implementation of the plan from 2008 to 2011 is shared with programs addressing marine pollution and seabird monitoring).⁴

Progress

A review of the Barents Sea–Lofoten Area Plan is currently underway and an updated version of the plan will be presented to the Norwegian Parliament in 2011. Information on the progress of the planning process will be available at that time.⁴

Strengths and Weaknesses of Review Process

The Barents Sea–Lofoten Area Plan nicely outlines the process through which it was created and the legislative framework that initiated its development. It even goes so far as to identify its own weaknesses and challenges. For example, it acknowledges that it (1) does not thoroughly address climate change (i.e., it explains that it does not anticipate major changes in key climate parameters before 2020), (2) strives for ecosystem-based management while recognizing that current governance structures are strongly rooted in a sectoral approach, and (3) fails to bring about changes in the traditional spheres of authority and responsibility. The challenges associated with reviewing the Barents Sea–

⁴ G. Klaveness, Senior Advisor, Department of Nature Management, Ministry of Environment, personal communication, November 22, 2010.

Lofoten Area Plan were associated with (1) identifying specific funding amounts for plan development and implementation (i.e., these were not available because funding is shared with a range of other programs) and (2) assessing plan implementation (i.e., information on the progress of the plan will be available in 2011).

Great Barrier Reef Climate Change Action Plan (2007-2012)

Context Statement

In 1975, the Great Barrier Reef Marine Park (GBRMP) was established to protect the ecological wellbeing of the Great Barrier Reef (GBR) as well as coordinate a range of sustainable industries within the reef ecosystem (e.g., tourism, marine transportation, fisheries) (GBRMP Act, 1975). The GBRMP Authority (the Authority) was concurrently created to serve as the principal advisor to the Australian Government on the control, care, and development of the GBRMP (GBRMP Act, 1975). To coordinate stressors associated with activities in the marine environment and to address land-based pollution sources, the Authority adopted a Zoning Plan (Zoning Plan 2003) as well as a Reef Water Quality Protection Plan (RWQPP). While these plans have been effective, climate change is now recognized as the most significant long-term threat to the Great Barrier Reef.

Accordingly, the Authority, in partnership with the Australian Government's Greenhouse Office (now the Department of Climate Change and Energy Efficiency), produced the "*Great Barrier Reef Climate Change Action Plan*" (Action Plan) in 2007. The Action Plan, which took three years to produce, is intended to further the management capabilities of the Authority by supplementing the Zoning Plan and RWQPP. Through a resilience-based management approach (i.e., management that aims to maintain or restore

the ability of a system to (1) absorb or buffer disturbances and still maintain core attributes, (2) self-organize, and (3) learn and adapt in the context of change)⁵, the Action Plan focuses on facilitating climate change adaptation activities over a five-year period (i.e., 2007 to 2012).

The Action plan applies to an area of over 345,000 km² along a 2,300 km stretch of Australia's north-east coast. It encourages management agencies both within and adjacent to the plan area to increase the resiliency of the GBR by (1) protecting water quality, (2) improving biodiversity, and (3) ensuring sustainable fishing.

Plan Assessment

Structure and Approach

The Action Plan is a narrow, focused report that is intended to bring about specific, substantive activities particular to climate change adaptation and mitigation. While it was not created using participatory methods and does not constitute an ongoing flexible and adaptive planning process (i.e., it is intended to be implemented within a five-year period) (Table 5), its implementation will result in the introduction of public engagement strategies (i.e., trust building and the mobilization of social networks), the development of continuous capacity building (i.e., development of adaptive expertise and sense-making as well as the use of different types of knowledge), and the introduction of novel governance structures (i.e., review and revision of existing initiatives and structures, including management plans, regulations, policies and guidelines). As such,

⁵ Refer to Berkes et al. (2003).

the Action Plan serves as a precursor for the elements of progressive governance, and serves as the foundation for ongoing strategies and long-term community engagement.

Climate Change Content

The Action Plan outlines a comprehensive, coordinated response to the threat of climate change within the GBRMP (Table 5). It lays out well-organized, clear and obtainable objectives and actions aimed at increasing the resilience of the GBR to climate change and providing direction on how to both adapt to current climate change impacts as well as mitigate future impacts. In order to facilitate the successful uptake and implementation of these objectives and actions, the Action Plan includes steps to raise awareness of climate change and the GBR to motivate individuals, communities, organisations and industries. As the developer of the Action Plan, the Authority is responsible for plan implementation. While the Action Plan is not legally binding, the strong political will and progressive management practices of the Authority instil confidence that the Action Plan will be successfully applied.

Strongest Element Demonstrated by Planning Process

As the Action Plan is a climate change document, it comes as no surprise that it provides a strong example to inform the PNCIMA Initiative on climate change content. The Action Plan lays out four clear objectives, which include (1) targeted science, (2) a resilient Great Barrier Reef ecosystem, (3) adoption of industries and communities, and (4) reduced climate footprints. Each of these objectives is supported by relevant strategies as well as a range of appropriate and achievable actions to implement these strategies. The Action Plan focuses on climate change adaptation but also provides actions to

implement climate change mitigation. In outlining actions related to scientific research and monitoring, stakeholder participation, and industry education and engagement, the Action Plan provides a holistic approach that embraces the social, ecological, and environmental spheres.

Table 5 Assessment of the Great Barrier Reef Climate Change Action Plan (2007-2012)

IM Planning Process		
Indicator	Included in Planning Process?	Example(s)
Adaptive Co-management	No	<ul style="list-style-type: none"> • <u>Ecosystem-based</u>: The Action Plan employs a resiliency-based management approach, which is different from, but consistent with, the objectives of ecosystem-based management. • <u>Multi-level co-management</u>: The Action Plan outlines a program of actions that Great Barrier Reef managers can take in collaboration with stakeholders and other partners to minimise the damage caused by climate change (e.g., working with local communities to increase the recovery potential of damaged reefs), as well as calls for the identification and support of initiatives to reduce emissions and increase sustainability of reef-related activities. Its objectives are coordinated with the objectives of other relevant academic, local government, and business initiatives to facilitate cooperation and co-management. • <u>Adaptive</u>: N/A • <u>Flexible</u>: N/A
Continuous Capacity Building	Yes	<ul style="list-style-type: none"> • <u>Develops adaptive expertise</u>: The Action Plan aims to fill critical knowledge gaps to improve the resilience of the Great Barrier Reef to climate change and to help reef-based industries and regional communities adapt to unavoidable impacts. • <u>Enables processes of sense making</u>: The Action Plan endeavors to enhance the relevance and uptake of information about the implications of climate change for industries and communities, assist industries to understand the risk to their business from climate change, and to enable local governments and other organisations to provide local communities with the guidance, information and practical examples they need to adapt to the impacts of climate change. • <u>Accepts different types of knowledge</u>: The Action Plan is based on scientific research conducted for an expert-based, peer-reviewed vulnerability assessment (i.e., <i>Climate Change and the Great Barrier Reef: A Vulnerability Assessment</i>) that is grounded in traditional western science. At the same time, the Action Plan calls for the government to work with Great Barrier Reef industries and communities to develop an understanding of how stakeholders can improve resilience to climate change, thereby incorporating local knowledge into the planning process.
Participatory	Yes	<ul style="list-style-type: none"> • <u>Trust building</u>: The Action Plan calls for the development of information packages for stakeholders, industry, educators and community leaders to use to inform staff, peers and the community (e.g., developing

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Processes		<p>communication strategies specific for industry and community to build understanding and trust).</p> <ul style="list-style-type: none"> • <u>Mobilization of social networks</u>: The Action Plan lists partnering with stakeholder groups to understand climate change implications, reduce climate footprint, and prepare adaptation plans.
Climate Change Content		
Indicator	Included in Planning Process?	Example(s)
Recognition of Climate Change	Yes	<ul style="list-style-type: none"> • The Action Plan identifies climate change as the greatest long-term threat to the Great Barrier Reef.
Goals and Objectives	Yes	<ul style="list-style-type: none"> • Goal: The Action Plan aims to establish a program of practical actions that will build the long term resilience of the Great Barrier Reef to climate change. • Objective 1: Targeted Science – This objective aims to provide critical knowledge for improving the health of the Great Barrier Reef, and for helping industries and regional communities adapt to unavoidable climate change impacts within the marine park. • Objective 2: A Resilient Great Barrier Reef Ecosystem – This objective aims to reduce stresses on the ecosystem and facilitate natural adaptation to climate change. It builds on Objective 1 as it uses emerging knowledge of resilience and the risks posed by climate change and other stresses. • Objective 3: Adaptation of Communities and Industries – This objective focuses on understanding social and economic resilience. It aims to assess and raise awareness of community and industry vulnerability to climate change as well as identify and support relevant adaptation strategies. • Objective 4: Reduced Climate Footprint – This objective aims to raise awareness of climate change to motivate individuals, communities, organizations, and industries to reduce their greenhouse gas emissions. It focuses on building support among local communities, businesses and key decision-makers for protecting the marine environment from climate change impacts.
Actions	Yes	<p>The Action Plan identifies specific measures to enhance resilience of the Great Barrier Reef ecosystem and support adaptation by regional communities and industries. The actions are organized by the objectives listed above and include the following:</p>

		<ul style="list-style-type: none"> • Objective 1 Actions: <p><u>Address Knowledge Gaps</u></p> <ul style="list-style-type: none"> • Partner with research institutions and coordinate research projects (e.g., identify species sensitive to climate change, assess stresses such as declining water quality and reduced biodiversity) • Map areas of existing high and low resilience to guide future management efforts • Assess where climate change adaptation measures will complement other management strategies <p><u>Identify Thresholds, Improve Monitoring, and Evaluate Strategies</u></p> <ul style="list-style-type: none"> • Identify thresholds beyond which climate change will cause irreversible damage to species and processes (e.g., productivity, connectivity) • Work with partners to develop improved tools for predicting, measuring, and monitoring climate change impacts (e.g., operational remote sensing products, regional projections) • Evaluate improvement of resilience over time (i.e., assess whether management strategies are effective) <p><u>Create Management Actions</u></p> <ul style="list-style-type: none"> • Coordinate and synthesize scientific knowledge to ensure its accessibility and relevance during management decision-making processes • Use cost-benefit analyses to select management responses that maximize ecological resilience and minimize social and economic costs • Partner with stakeholder groups (e.g., learn about climate change implications, jointly prepare adaptation plans) • Objective 2 Actions: <p><u>Maximize Resilience of the GBR to Climate Change</u></p> <ul style="list-style-type: none"> • Identify key threats to water quality (e.g., contaminant hotspots) as a basis to target future management efforts • Identify and protect transition or alternative habitats that will facilitate shifts in distribution or abundance of species and habitats (e.g., corridors between habitats, potential nesting/reproduction zones) • Assess sustainability of fishing practices (i.e., prevent loss of biodiversity) • Protect species and habitats that are highly vulnerable to climate change from non-climate stressors (e.g., human disturbance, physical damage) <p><u>Adapt Existing Management to Address Climate Change</u></p> <ul style="list-style-type: none"> • Consider climate change impacts when developing management guidelines (e.g., water quality
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		<p>targets, ecosystem health guidelines)</p> <ul style="list-style-type: none"> • Ensure existing registers of threatened and endangered species contain information on species and habitats vulnerable to climate change • Work with state fisheries management agencies to evaluate climate change threats to fisheries sustainability and help build climate change issues into fisheries management plans <p><u>Implement Local and Regional Management Actions</u></p> <ul style="list-style-type: none"> • Undertake regional case studies to assess management impacts on species of concern (i.e., in British Columbia these could include salmon, halibut, etc.) • Test strategies aimed at reducing the vulnerability of habitats to climate change (e.g., limiting human activities) <ul style="list-style-type: none"> • Objective 3 Actions: <p><u>Identify Factors that Increase Community and Industry Resiliency in the Context of Climate Change</u></p> <ul style="list-style-type: none"> • Collect social and economic information on industries and communities to understand risk and resilience to climate change • Develop a social resilience guidebook that regional and local planning organizations can use to inform management decisions • Improve the relevance of climate change impact information to communities and industries to increase understanding and uptake <p><u>Maximize Resilience of Communities and Industries to Climate Change</u></p> <ul style="list-style-type: none"> • Review planning and permitting regulations, policies, and guidelines to support adaptation by industries and communities • Assist industries in understanding their climate change risk and preparing adaptation responses • Work with local governments and other organizations to provide local communities with the guidance and information they need to adapt to the impacts of climate change (e.g., case studies, summaries of best management practices) • Objective 3 Actions: <p><u>Increase Knowledge and Involvement of Stakeholders in Climate Change Responses</u></p> <ul style="list-style-type: none"> • Include community members, industries, and indigenous people in climate change monitoring at the regional scale (e.g., beach erosion, return of migratory species, water quality) • Create information packages for stakeholders, educators, industry, and community leaders as tools to inform their staff, peers, and communities on climate change (i.e., tailor information to meet the needs and interests of particular groups)
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		<ul style="list-style-type: none"> Develop engagement strategies to help communities, industries, and stakeholders better understand climate change impacts at the regional level <p><u>Partner with Organizations and Work with Individuals to Reduce their Climate Footprint</u></p> <ul style="list-style-type: none"> Expand existing programs to include energy and sustainability initiatives Showcase existing initiatives aimed at reducing climate footprints (i.e., draw attention to strategies that are already in effect and are working) Identify and support initiatives to reduce emissions and increase sustainability in management area (e.g., energy and water efficiency, alternative power)
Data Collection and Monitoring	Yes	<ul style="list-style-type: none"> See Objectives and Actions above.
Legal Framework	No	<ul style="list-style-type: none"> While the GBRMP Act (1975) delegates management powers over the GBRMP to the Authority, the Authority does not provide a clear legislative framework for the implementation and enforcement of its Action Plan.
Responsible Body	Yes	<ul style="list-style-type: none"> The GBRMP Authority is responsible for implementation of climate change actions.

Funding

The Action Plan is a \$9 million (AU) (i.e., approximately \$9.1 million CA) program funded by the Council of Australian Governments (i.e., the peak intergovernmental forum in Australia, comprising the Prime Minister, State Premiers, Territory Chief Ministers and the President of the Australian Local Government Association). The funding is split fairly evenly across the five financial years of the program (i.e., 2007 to 2012), with approximately half of the money allocated to project expenditure and half to staff and administration.⁶

Progress

Efforts to gather traditional knowledge and apply it to the issue of climate change are currently underway, and community engagement on climate change has been successfully applied through a range of programs (e.g., Reef Guardian Schools, eco-certification programs within the tourism industry). Partnerships to reduce carbon footprints and increase stewardship are being developed with the fishing industry, and pilot programs are being applied to capture lessons that can be used elsewhere (GBRMPA 2009). Most recently, the Climate Change Group at the Authority commissioned an independent mid-program review of the Action Plan program, which is now being peer reviewed. The document will provide the most complete overview of the Action Plan's progress to date and will be available in early 2011.⁶

⁶ R. Beeden, Manager of Ecosystem Resilience, Great Barrier Reef Marine Park Authority, personal communication, November 15, 2010.

Strengths and Weaknesses of Review Process

The Action Plan clearly lays out climate change goals, objectives, strategies, and actions. As such, effective review of its content was simple and straight forward. In contrast, the Action Plan provides little information on its development, likely reflecting the traditional governance structure within which it was created (i.e., its lack of discussion on its creation indicates that public participation and co-management were not part of the development process). As such, it was difficult to ascertain and summarize how the plan was developed.

Garden Route Integrated Management Plan (Marine)

Context Statement

The Garden Route is a scenic stretch of coastal land situated in South Africa's Cape Floristic Region (CFR), an area recognized as one of the world's biodiversity hotspots (i.e., the richest and most threatened plant and animal reservoirs on earth).⁷ In 2004, a Garden Route Initiative (GRI) was established to improve the coordination of conservation actions of Garden Route organizations and to identify common management goals. To help meet the objectives of the GRI, the World Wide Fund for Nature - South Africa (WWF-SA) partnered with Cape Action for People and the Environment (CAPE) (i.e., a partnership of government and civil society aimed at conserving and restoring the biodiversity of the Cape Floristic Region and the adjacent marine environment) to contract a specialist consulting company (i.e., Enviro-Fish Africa (Pty) Ltd. (EFA)) to

⁷ Conservation International. 2010. Biodiversity Hotspots. Accessed online at: http://www.biodiversityhotspots.org/xp/hotspots/cape_floristic/Pages/default.aspx, accessed November 1, 2010.

develop an IM plan for the marine portion of the Garden Route. Completed in 2010, the “*Garden Route Integrated Management Plan (Marine)*” (Garden Route Plan) provides a framework aimed at strengthening conservation and sustainable use of marine biodiversity and resources, and ensuring sustainable socio-economic benefits to coastal communities in the CFR.

The boundaries for the management area are still under discussion. As such, the size of the plan’s management area is currently unknown. The planning process does not cover the entire Garden Route Marine area, but is structured so as to facilitate its integration with other management and planning initiatives.

Plan Assessment

Structure and Approach

As the Garden Route Plan was prepared by a third-party consultant, it provides a broad management framework that truly operates outside of traditional governance structures (Table 6). The legal power and responsibility for developing marine planning initiatives is often delegated to existing government ministries through conventional legislative measures (e.g., bills, acts). As the implementation of planning processes is frequently undertaken by the same bodies responsible for developing the processes (although powers may be delegated to third-party bodies at some point), marine planning is regularly undertaken within traditional governance structures. In contrast, the Garden Route Plan was initiated by bodies outside of South Africa’s government (i.e., WWF-SA and CAPE). As a result, one of the first steps in plan implementation involves the creation of a representative stakeholder body responsible for plan implementation (i.e.,

the plan calls for a local or district authority or non-governmental organization to create the body). While this stakeholder group will coordinate with government ministries and initiatives, it will operate outside of national and state government regimes, thereby introducing a truly novel governance structure.

In addition, the Garden Route Plan is adaptive and flexible as it is a living document that will be reviewed and revised once every five years to ensure it meets the needs of both the planning area and stakeholders. It employs ecosystem-based principles (e.g., the plan calls for the development of planning area boundaries defined by ecosystem as opposed to political elements), as well as involves participatory processes and ensures continuous capacity building.

Climate Change Content

The Garden Route Plan recognizes climate change as a specific threat to biodiversity conservation, water quality and quantity, and land use and infrastructure (Table 6). As such, it establishes a range of actions to address the climate change impacts threatening these areas (e.g., sea level rise, reduced annual rainfall, and increase in sea temperature). In this context, climate change actions constitute tools to address conservation, water, and land use and infrastructure priorities and serve as means to address other issues as opposed to ends in and of themselves. As a result, goals and objectives specific to climate change are not identified. This approach does not display a reduced commitment to addressing climate change impacts, and simply frames climate change action within a different framework.

The plan's commitment to addressing climate change is demonstrated by its identification of bodies responsible for climate change actions as well as legislation that calls for and enables these actions. In addition, the plan not only outlines monitoring processes to ensure that the plan is effective in restricting climate change impacts on conservation, water, and land use and infrastructure objectives but also identifies a long-term climate change monitoring scheme.

Strongest Element Demonstrated by Planning Process

The Garden Route Plan provides a first-rate example of effective plan layout and structure. It begins by identifying the context within which it was initiated and the terms of reference it was developed to address, and then outlines the integrated management plan framework that guided its creation. It provides a space to state a vision (this will be determined as the process is implemented), mission, and strategic objectives, and identifies the management institutions that will be involved as well as their roles and responsibilities. The Garden Route Plan summarizes the threats to the planning area and outlines how it will address these threats, as well as establishes a framework for monitoring and evaluation. Most notably, the structure of the plan involves the creation of a new stakeholder-driven body for its implementation. As such, the Garden Route Plan introduces a novel governance structure that sincerely involves public participation and adaptive co-management.

Table 6 Assessment of the Garden Route Integrated Management Plan (Marine)

IM Planning Process		
Indicator	Included in Planning Process?	Example(s)
Adaptive Co-management	Yes	<ul style="list-style-type: none"> • <u>Ecosystem-based</u>: The proposed boundaries of the planning area are defined by biological as opposed to political structures. • <u>Multi-level co-management</u>: The Garden Route Plan is intended to enable the relevant spheres of government and civil society to cooperatively manage the Garden Route marine area. The plan will be the responsibility of a stakeholder body, referred to as the Coastal Management Committee (CMC). The process of establishing the CMC will be initiated by a local or district authority or non-governmental organization. The CMC will be responsible for keeping all stakeholders informed of the progress and effectiveness of the plan, identifying areas of concern and making recommendations that may need to be incorporated into future versions of the plan, liaising with government departments to ensure they fulfill their mandates, and interacting with tertiary and research institutions to help coordinate research programmes. The CMC may also be directly involved with monitoring programmes and law enforcement authorities. • <u>Adaptive</u>: A feedback system involving a regulated monitoring programme and detailed plan assessments once every five years allows for changes to be made to regularly improve the Garden Route's efficacy. • <u>Flexible</u>: The Garden Route Plan is a living document that is intended to be adapted according to the changing requirements of the planning area and the needs of stakeholders.
Continuous Capacity Building	Yes	<ul style="list-style-type: none"> • <u>Develops adaptive expertise</u>: The plan calls for the introduction of an educational programme for schools and stakeholders that informs them of environmental issues and their responsibilities and roles. • <u>Enables processes of sense making</u>: Through research and education, the Garden Route Plan aims to create an awareness of the (1) value of the Garden Route marine area, (2) legal context and management obligations of the plan and those involved in its implementation, and (3) need for integrated, informed and cooperative management that ensures the maintenance of ecosystem functioning and services. • <u>Accepts different types of knowledge</u>:
Participatory Processes	Yes	<ul style="list-style-type: none"> • <u>Trust building</u>: During plan development, workshops were held for all relevant authority and management institutions as well as key stakeholder groups. The workshops were followed by surveys or questionnaires. • <u>Mobilization of social networks</u>: The plan provides a business model (i.e., rationale) for co-operation between

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		various role players as well as an Awareness Raising and Communication Strategy.
Climate Change Content		
Indicator	Included in Planning Process?	Example(s)
Recognition of Climate Change	Yes	<ul style="list-style-type: none"> The Garden Route Plan recognizes climate change as a threat to biodiversity conservation (i.e., due to reduction in annual rainfall, increased sea temperature, and sea level rise), water quality and quantity (i.e., due to reduced annual rainfall), and land use and infrastructure (i.e., due to sea level rise).
Goals and Objectives	No	<ul style="list-style-type: none"> The plan does not establish specific climate change goals or objectives (i.e., climate change actions are included within the plan as tools to support objectives related to biodiversity conservation, water quality and quantity, and tourism).
Actions	Yes	<p>The Garden Route Plan identifies specific climate change-related actions with the goal of meeting objectives in the areas of biodiversity conservation, water quality and quantity, and tourism. These actions (or, in some cases, deferral of action to outside bodies) are as follows:</p> <p>Biodiversity conservation-oriented climate change actions</p> <ul style="list-style-type: none"> Issue: Reduced annual rainfall – Actions required to remedy this would need to be done on a National level, with bulk water transfer schemes from sources where water is abundant. The scope of such undertakings is massive and outside the scope of implementation for this plan. Issue: Increase in sea temperature – Initiate long-term monitoring programmes to determine changes in community structures (i.e., loss or addition of species) and the life-history traits of any new additions. Issue: Sea level rise – Initiate long-term monitoring programmes to determine changes in distribution of species along the tidal gradient. <p>Water quality and quantity-oriented climate change actions</p> <ul style="list-style-type: none"> Issue: Reduction in freshwater availability – Determine the water quantity necessary for individual estuary systems and provide for contingencies during periods of drought when freshwater resources are scarce. <p>Tourism-oriented climate change actions</p> <ul style="list-style-type: none"> Issue: Disaster management – Develop and implement a Disaster Management Plan (DMP) that covers flood and storm damage and incidents at sea involving recreational users. The DMP should take into account extreme storm and flood events and the projected sea-level rise due to climate change.
Data Collection and Monitoring	Yes	The Garden Route Plan identifies specific climate change-related monitoring schemes with the goal of improving management actions in the areas of biodiversity conservation, water quality and quantity, and tourism. It also proposes

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		<p>a long-term monitoring scheme specific to climate change. These schemes are as follows:</p> <p>Biodiversity conservation-oriented climate change monitoring</p> <ul style="list-style-type: none"> • Issue: Reduced annual rainfall – Monitoring would identify whether water supply schemes aimed at supplementing freshwater requirements in drought stricken areas are effective (i.e., whether sufficient water amounts are available). • Issue: Increase in sea temperature – Monitoring would establish a base-line data set of what currently exists so that changes can be tracked. • Issue: Sea level rise – Monitoring would establish a base-line data set of where the existing intertidal zone is and its component fauna and flora. It would involve recording changes in community distribution along the tidal gradient and the subsequent loss of species in newly inundated coastal areas. <p>Water Quality and quantity-oriented climate change monitoring</p> <ul style="list-style-type: none"> • Issue: Reduction in freshwater availability – Monitoring would involve collecting data on water quality and quantity to assess the effectiveness of management practices. <p>Tourism-oriented climate change monitoring</p> <ul style="list-style-type: none"> • Issue: Disaster management – Monitoring would involve the use of practice drills to assess the state of readiness or efficacy of response (i.e., studies would assess the time taken to respond, presence and coordination of all role players and operational capacity of equipment). <p>Long-term climate change monitoring</p> <ul style="list-style-type: none"> • The Garden Route Plan outlines sampling procedures (i.e., methods, spatial and temporal scales) for monitoring sea temperature, sea level, and storm events. It notes that sea-level recordings in particular can validate coastal set-back lines and town planning schemes in terms of no-go areas for development.
Legal Framework	Yes	<p>The Garden Route Plan identifies existing legislation, or lack thereof, to support climate change actions aimed at meeting objectives within the areas of biodiversity conservation, water quality and quantity, and tourism. Available legislation is as follows:</p> <p>Biodiversity conservation-oriented climate change legislation</p> <ul style="list-style-type: none"> • Issue: Reduced annual rainfall – Lead legislation would be the National Water Act (NWA); however, given the extent of the proposed actions, a host of additional legislation would also apply (e.g., National Environmental Management Act, Conservation of Agricultural Resources Act, National Environmental Management: Biodiversity Act, National Environmental Management: Protected Areas Act). • Issue: Increase in sea temperature – Not applicable • Issue: Sea level rise – Not applicable

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		<p>Water Quality and quantity-oriented climate change legislation</p> <ul style="list-style-type: none"> • Issue: Reduction in freshwater availability – National Water Act (NWA) <p>Tourism-oriented climate change legislation</p> <ul style="list-style-type: none"> • Issue: Disaster management – Disaster Management Act and Municipal Systems Act
Responsible Body	Yes	<p>Biodiversity conservation-oriented responsible bodies for climate change actions</p> <ul style="list-style-type: none"> • Issue: Reduced annual rainfall – Various departments would be responsible for actions within the National Government. • Issue: Increase in Sea Temperature – A range of management authorities would be responsible for motivating and initiating research programmes, including bodies within the federal government (e.g., Department of Environmental Affairs) and public institutions (e.g., CapeNature). • Issue: Sea level rise – As noted above with regard to increasing sea temperatures, a range of management authorities would be responsible for motivating and initiating research programmes, including bodies within the federal government (e.g., Department of Environmental Affairs) and public institutions (e.g., CapeNature). <p>Water Quality and quantity-oriented responsible bodies for climate change actions</p> <ul style="list-style-type: none"> • Issue: Reduction in freshwater availability – The federal Department of Water Affairs would be responsible for actions related to freshwater availability. <p>Tourism-oriented responsible bodies for climate change actions</p> <ul style="list-style-type: none"> • Issue: Disaster management – In accordance with the federal Disaster Management Act, municipalities within the planning area would be responsible for creating Disaster Management Plans. <p>Long-term climate change monitoring responsible bodies</p> <ul style="list-style-type: none"> • The Coastal Management Committee would be responsible for ensuring that monitoring programmes are beneficial to the effective implementation of the Garden Route Plan, while federal government departments (e.g., the Department of Water Affairs and the Department of Environmental Affairs) and any tertiary and research institutes they delegate work to (e.g., academic institutions, research networks) would be responsible for the implementation of monitoring programs.

Funding

The cost of the spatial assessment on which the planning process was based totaled approximately \$90,000 CA (i.e., 600,000 South African Rand), while development of the plan cost approximately \$35,000 CA (i.e., 250,000 South African Rand).⁸ Table 7 outlines the anticipated costs and manpower for the implementation of the plan's proposed climate change actions.

Table 7 Summary of the costs and anticipated manpower for climate change actions within the Garden Route Plan

Planning Objective Addressed	Climate Change Issue Addressed	Climate Change Action	Proposed Cost (approximate Canadian Dollars/South African Rands)	Anticipated Manpower
Conservation	Reduction in rainfall	No action is identified (i.e., responsibility for action is delegated to Federal government bodies).	Unknown.	Unknown.
	Increase in sea temperature	Initiate long-term monitoring programmes to determine changes in community structures (i.e., loss or addition of species) and the life-history traits of any new additions.	<ul style="list-style-type: none"> \$3,000 CA/R20,000 to \$7,000 CA/R50,000 <p>The cost of running long-term monitoring programmes will vary depending on the methods used. The lower limit is based on intertidal transects while the upper limit is based on underwater surveys or boat-based marine mammal surveys.</p>	<ul style="list-style-type: none"> Suitably qualified staff within marine protected areas Students and scientists from research and tertiary institutes.
	Sea level rise	Initiate long-term monitoring programmes to determine changes in distribution of species along the tidal gradient.	<ul style="list-style-type: none"> \$3,000 CA/R20,000 <p>Costs will vary depending on the methods used (i.e., this amount assumes intertidal monitoring).</p>	<ul style="list-style-type: none"> Suitably qualified staff within marine protected areas Students and scientists from research and tertiary

⁸ P. Chadwick, Manager, WWF Honda Marine Parks Programme WWF South Africa, personal communication, November 8, 2010.

				institutes.
Water quality and quantity	Reduction in freshwater availability	Determine the water quantity necessary for individual estuary systems and provide for contingencies during periods of drought when freshwater resources are scarce.	<ul style="list-style-type: none"> • \$145,000 CA/R1,000,000 per estuary <p>Contingencies during times of drought will be addressed at a National scale</p>	<ul style="list-style-type: none"> • Government staff • Consultants to perform the Reserve study
Tourism	Disaster management	Develop and implement a Disaster Management Plan (DMP) that covers flood and storm damage and incidents at sea involving recreational users.	<ul style="list-style-type: none"> • \$9,000 CA/R60,000 <p>Funding will be provided by the Federal Government). The costs of implementation are unknown but it is anticipated that practice drills will cost approximately \$1,500 CA/R10 000 each.</p>	<ul style="list-style-type: none"> • Government staff for plan development • A host of rescue services (e.g., fire, Ambulance) and government bodies for plan implementation

Progress

The Garden Route Plan has not yet been implemented.

Strengths and Weaknesses of Review Process

As it was created by a third-party consultant, the Garden Route Plan serves as the foundation for the ongoing formation of a planning process as opposed to a complete planning process in and of itself. The plan innately identifies the steps involved in its development as well as the roles and responsibilities of those involved (e.g., the plan outlines how the independent governing body responsible for plan implementation should be formed). As a result, the plan and its development process were easy to summarize and review. At the same time, it must be acknowledged that the review of the Garden Route Plan within this report does not apply to a complete project and that, on implementation,

the planning process may look very different than what is actually proposed within the plan (e.g., the management area is still under discussion, the body responsible for the whole process is not yet formed).

PART 3: SUMMARY

Coastal areas are anticipated to be exposed to increasing risks due to the combined forces of climate change and intensifying human-induced pressures (IPCC 2007b). Integrated oceans management (IM) planning provides a means to holistically address these challenges. Through participatory processes, IM planning employs adaptive co-management and continuous capacity building to engage and empower decision-makers and stakeholders, thereby generating lasting commitment to effective oceans management.

This report summarizes five marine planning processes from around the world with the goal of informing the Pacific North Coast Integrated Management Area (PNCIMA) Initiative on addressing climate change in marine planning. A two-part framework addressing the structure and approach of planning processes (i.e., assessing whether plans use an ecosystem-based co-management approach) as well as the nature of climate change-related content was applied to assess each of the five plans. This approach was used because successful responses to climate change require effective processes to implement actions as well as a commitment to addressing climate change.

Within the framework, the indicators of an effective planning process (i.e., ecosystem-based co-management) are the (1) use of adaptive co-management (i.e., adaptive, flexible, multi-level, and polycentric ecosystem-based management), (2) introduction of initiatives for continuous capacity building (i.e., learning that develops adaptive expertise, enables processes of sense making, and accepts different types of knowledge as valid), and (3) the inclusion of participatory processes (i.e., stakeholder

engagement that leads to trust building, mobilization of social networks, collaborative learning, and the creation of social memory). The framework's indicators for planning processes that are committed to addressing climate change include the (1) recognition of climate change as a stressor that warrants attention, (2) establishment of goals and objectives for addressing climate change impacts, (3) identification of actions to meet climate change-related goals and objectives, (4) description of data collection and monitoring processes to ensure that climate change actions are effective and relevant, (5) identification of a binding framework legally requiring climate change actions, and (6) the delegation of responsibility for climate change actions to a specific body or bodies.

As shown in Table 8, the *Massachusetts Ocean Management Plan* (MOMP) constitutes a thorough planning process as it successfully addresses each of the planning indicators within the framework. In contrast, the *Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands* (Barents Sea–Lofoten Area Plan) addresses only two of the indicators (i.e., participatory processes and recognition of climate change). As such, it fails to provide both a progressive governance structure as well as effective steps to address climate change impacts. The *Garden Route Integrated Management Plan (Marine)* (Garden Route Plan) only falls short of providing explicit climate change goals and objectives and, as such, is still relatively comprehensive. Particularly because, as noted above, climate change actions are still incorporated into the Garden Route planning process (i.e., they are included as a means to address objectives within the areas of biodiversity conservation, water quality and quantity, and land use and infrastructure). The *Integrated Ocean Management Plan for the Beaufort Sea: 2009 and beyond* (Beaufort IM Plan) misses only two indicators (i.e.,

data collection and monitoring, legal framework) and, as such, provides a relatively good example of a planning document that provides climate change actions and an effective framework within which to apply them. The *Great Barrier Reef Climate Change Action Plan (2007-2012)* (Action Plan) also only misses two indicators, but these are the relatively important indicators of adaptive co-management and legal framework. While the Action Plan does not demonstrate a progressive planning approach, it should be noted that it serves as a targeted resource to tackle climate change as opposed to a comprehensive integrated management plan (i.e., the Action Plan is intended to supplement pre-existing planning documents that address conflicts between marine users and land-based pollution).

All of the plans selected for review strongly demonstrate one particular aspect of marine planning that is applicable to the PNCIMA planning process (i.e., the examples are relevant to British Columbia's social climate and natural environment). The MOMP provides strong guidance on science networking, while the Beaufort IM Plan demonstrates exemplary co-management and stakeholder participation. The Barents Sea–Lofoten Area Plan is a prime example of effective communication of scientific concepts, and the Action Plan demonstrates clear and achievable climate change objectives and actions. Lastly, the Garden Route Plan exhibits an excellent plan structure and governance framework. Table 9 provides further detail on each of these model planning elements.

Table 8 Summary of the planning indicators successfully addressed by the marine planning processes (indicators that are included within planning processes are denoted by an 'x')

Marine Planning Processes	IM Planning Process Indicators			Climate Change Content Indicators					
	Adaptive Co-management	Continuous Capacity Building	Participatory Processes	Recognition of Climate Change	Goals and Objectives	Actions	Data Collection and Monitoring	Legal Framework	Responsible Body
<i>Massachusetts Oceans Management Plan</i>	x	x	x	x	x	x	x	x	x
<i>Integrated Ocean Management Plan for the Beaufort Sea: 2009 and Beyond</i>	x	x	x	x	x	x			x
<i>Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands</i>			x	x					
<i>Great Barrier Reef Climate Change Action Plan (2007-2012)</i>		x	x	x	x	x	x		x
<i>Garden Route Integrated Management Plan (Marine)</i>	x	x	x	x		x	x	x	x

Table 9 Model Planning Elements

Marine Plan	Country of Origin	Model Planning Element
<i>Massachusetts Oceans Management Plan</i>	United States	<p>Science networking</p> <ul style="list-style-type: none"> The planning process cultivates alliances for scientific research and monitoring with existing state and government agencies, public-private partnerships, and academic institutions. <p>Benefits:</p> <ul style="list-style-type: none"> The development of a strong science-based network is advantageous as it allows the planning process to: <ul style="list-style-type: none"> take advantage of preexisting expertise and structures thereby saving money and time, access long-term monitoring data necessary for understanding the current impacts and rate of change of climate change, and develop connections with experts capable of advising the planning process on how best to proceed in the context of long-term and unpredictable changes in climate.
<i>Integrated Ocean Management Plan for the Beaufort Sea: 2009 and Beyond</i>	Canada	<p>Co-management and stakeholder participation</p> <ul style="list-style-type: none"> Development of the plan was cooperatively undertaken by Aboriginal, Federal and Territorial governments and co-management interests. The planning process was informed by industry, coastal communities and other interested parties. The plan will be implemented by all Beaufort Sea resource users with the goals of: <ul style="list-style-type: none"> increasing cooperation across departments and governments and creating greater accountability. Decision-making by consensus (i.e., agreement in opinion reached by a group as a whole) is applied throughout the planning process. Mechanisms for dispute resolution are provided within the planning process. <p>Benefits:</p> <ul style="list-style-type: none"> As First Nations were included as an autonomous government, the planning process: <ul style="list-style-type: none"> recognizes Aboriginal rights and titles and establishes a relationship of respect and reconciliation between the Federal government and First Nations. The active participation of a range of stakeholders in the planning process develops a sense of responsibility and accountability within interested individuals and parties, thereby improving the probability of successful implementation of the planning process
<i>Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands</i>	Norway	<p>Communication of scientific concepts</p> <ul style="list-style-type: none"> Information on ecosystems and ecological interactions, the relationship between socio-economic conditions and the environment, and the pressures and impacts of current activities in the planning area are expressed in easy-to-understand laymen's terms. Potentially challenging concepts are visually expressed through a range of means (e.g., diagrams, pictures, maps, and flowcharts). <p>Benefits:</p> <ul style="list-style-type: none"> The presentation of difficult scientific concepts in a language that is accessible to individuals uncomfortable with scientific theory helps the public and those implementing the plan to understand why planning is taking place

		and how their actions make a difference. As such, it improves the likelihood that the plan will be successfully implemented.
<i>Great Barrier Reef Climate Change Action Plan (2007-2012)</i>	Australia	<p>Climate change objectives and actions</p> <ul style="list-style-type: none"> • The plan lays out clear objectives and supports each of the objectives with relevant strategies as well as a range of appropriate and achievable actions to implement these strategies. • The plan addresses climate change adaptation, mitigation, and monitoring. <p>Benefits:</p> <ul style="list-style-type: none"> • The plan provides a clear process that is comprehensive and achievable.
<i>Garden Route Integrated Management Plan (Marine)</i>	South Africa	<p>Plan structure and governance</p> <ul style="list-style-type: none"> • The Garden Route Plan provides a first-rate example of effective plan layout and structure by: <ul style="list-style-type: none"> • identifying the context within which it was initiated and the terms of reference it was developed to address, • outlining the integrated management plan framework that guided its creation, • providing space for a plan vision, mission, and strategic objectives, • identifying the management institutions that will be involved in plan implementation as well as their roles and responsibilities, • projecting the costs that will be involved in management actions, • summarizing the threats to the planning area and outlining how it will address these threats, and • establishing a framework for monitoring and evaluation. • The structure of the plan involves the creation of a new stakeholder-driven body for implementation. <p>Benefits:</p> <ul style="list-style-type: none"> • The clear layout of the plan makes it easy to understand. • As the plan introduces a new planning body entirely formed of stakeholders, it introduces a novel governance structure that sincerely involves public participation and adaptive co-management.

As the impacts of climate change are currently affecting ecosystem health and human wellbeing, actions to address climate change are a necessary component of IM planning processes. The identification of goals and objectives as well as the establishment of binding legislation and responsible bodies will contribute to the success of IM planning responses to climate change. The continued evaluation of the effectiveness of the plans reviewed here as they age and evolve, and of newly developed plans, will provide further insight into what elements of planning processes contribute to successful climate change responses within the marine environment. Some degree of global

warming is inevitable, and how we adapt to it in coastal areas is a test for both governments and citizens (Vasey-Ellis 2009).

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