



PO Box 1749
Halifax, Nova Scotia
B3J 3A5, Canada

Item No. 1
Halifax Regional Council
April 6, 2010

TO: Mayor Kelly and Members of Halifax Regional Council

SUBMITTED BY:

A handwritten signature in blue ink, appearing to read "P. Townsend".

Phillip Townsend, Director, Infrastructure and Asset Management

DATE: 23 March 2010

SUBJECT: Coastal Management and Climate Change Adaptation

INFORMATION REPORT

ORIGIN

January 12, 2010 Motion of Regional Council:

11.3.2 Councillor Barkhouse - Request for Report re: Climate Change Adaptation

Motion passed that Halifax Regional Council request a report from staff on the various actions being taken, by HRM and other levels of government, to incorporate Climate Change Adaptation actions and mitigation of the risk and vulnerability to our infrastructure and community from the impacts of extreme weather events to our municipal planning, design, management and operational activities.

BACKGROUND

Following the January 2, 2010 weather event, which resulted in significant coastal damage in Nova Scotia, staff have been requested to provide a report on the Climate Change Adaptation work that is happening at HRM.

Specific recent examples from the January Storm Surge are described below. As per the technical explanation in Attachment One, on January 2, 2010, HRM realized a storm in conjunction with an astronomical tide called a perigean syzygy (siz' I-gee) which resulted in some significant impacts to the community.

Herring Cove Breakwater / Wharves Impact: January Storm Surge

As a result of the storm surge coupled with the syzygy, the coast in Herring Cove suffered extensive damage including damage to the Pilotage Authority Breakwater and individual private wharves and docks. The damage is demonstrated in Attachment Two, labeled photographs supplied by local photographer Roy P. Dempsey.

Eastern Passage / Cow Bay Impact: January Storm Surge

Eastern Passage / Cow Bay is an area of great vulnerability to storm surge and sea level rise. The impacts of the January 2 event caused a number of problems to property owners such as shown in Attachment Three.

There were a number of reported impacts of this storm surge event, affecting individual residents, business owners all over the municipality, and government organizations

DISCUSSION

The immediate reaction of many staff, residents and the media to the devastating, and costly, impacts resulting from the January 2, 2010 storm surge was to talk about Climate Change Adaptation.

Following a brief period to review the event, it may be inappropriate to label this storm surge devastation as a Climate Change event. On January 2, a relatively "normal" storm in conjunction with an astronomical tide collectively resulted in an extreme weather event. In isolation, either of those occurrences would not have made a significant impact to the community - it was the combination that caused the devastation. Reflecting on this, staff are putting forth that HRM residents and Regional Council may want to consider measures such as Coastal Management (adapting to the current reality of living on an ocean coast) as well as Climate Change Adaptation (adapting to future predicted realities). Staff would propose that this event is an example of events that will happen more frequently in the future as a result of Climate Change.

Coastal Management

In 2008, the Province of Nova Scotia, Department of Fisheries and Aquaculture, announced a Coastal Management Framework to protect the coast while maintaining its prosperity. The Coastal Management Framework lays out six strategic activities that will accelerate action on priority coastal issues:

1. Sustainable Coastal Development Strategy, including the 2009 State of the Coast Report (Attachment Four: <http://www.gov.ns.ca/coast/>)
2. Coastal Web Portal
3. Public Education and Awareness
4. Coastal Research Network
5. Memorandum of Understanding with Federal Government on an integrated planning approach
6. LiDAR Mapping (Halifax Regional Municipality, as part of collaborative Climate Change Adaptation projects, has extensive LiDAR data to support Coastal Research and study).

The 2009 State of the Coast Report is a key piece of information for the public and Regional Council for information on Coastal Management. The overview of the identified six priority Coastal Issues are:

1. Coastal Development
2. Working Waterfronts
3. Public Access
4. Sea Level Rise and Storm Events
5. Coastal Water Quality
6. Sensitive Coastal Ecosystems

In addition to this report, staff have arranged for the Provincial Lead on the State of the Coast Report to provide an overview of the Coastal Management Framework at either an upcoming Committee of Whole or informal information session for Regional Council. It is anticipated that HRM staff will work collaboratively with Provincial staff on this initiative.

The events of January 2 clearly demonstrate the importance of a Coastal Management Strategy.

Question from Council: What does The Regional Plan tell the public about development close to the water?

The Regional Plan is a guide for future development of the municipality. It is a framework that outlines how future sustainable growth should take place in HRM, in a way that preserves the environment while at the same time maintaining a strong economy. The overarching goal is to achieve a shared vision of the future of HRM, a vision of healthy, vibrant and sustainable communities, without taking away from the character that makes HRM a distinct and attractive place to be.

In Regional Plan, Under Chapter 2 (Environment):

2.2.5 Coastal Inundation

Sea level has slowly risen along the Atlantic Coast, accelerated by global warming. Expected increases in the frequency and severity of storm events related to climate change is an additional concern. Rising sea levels and storm surges can result in increased damage to coastal communities and have significant impacts on coastal infrastructure, environmental assets, utilities, property and community economic development. The following policy mitigates the potential impact that coastal inundation and storm surge events could have on human safety. It is intended as an interim measure pending the completion of the Potential Hazards to Development Functional Plan.

Policy E-16 HRM shall, through the applicable land use by-law, prohibit all residential development on the coast within a 2.5 metre elevation above the ordinary high water mark, except for lands designated Halifax Harbour on the Generalized Future Land Use Map and industrial lands within the port of Sheet Harbour. Provisions shall be made within the by-law to permit residential accessory structures, marine dependant uses, open space uses, parking lots and temporary uses within the 2.5 metre elevation.

In addition to Regional Plan, the Eastern Passage / Cow Bay Municipal Planning Strategy (http://www.halifax.ca/planning/documents/EasternPassageCowBay_MPS.pdf) calls for 200 foot setbacks.

EP-7 It shall be the intention of Council, through the land use by-law, to establish a building setback and buffer of two hundred (200) feet for those coastal lands as shown on Map 4 - Environmental Constraints. No structure, excavation, infilling or grade alteration shall be permitted to occur within the setback/buffer area and the retention of natural vegetation within the area shall be part of these requirements. The land use bylaw shall contain provisions to reduce this requirement to one hundred (100) feet for those lots in existence on the effective date of this planning strategy and if otherwise development would be prohibitive.

Climate Change Adaptation

In 2005, as a result of the increasing number of extreme weather events that the Municipality was experiencing, and the impacts they were having on the organization and the community, HRM partnered with a number of governmental and private sector stakeholders to develop ClimateSMART (Climate Sustainable Mitigation and Adaptation Toolkit), a fully integrated planning approach that addressed the impacts of climate change.

Global climate change is expected to have significant impacts on coastal communities, such as Halifax Regional Municipality (HRM), due to projected rise in sea-level and increase in intensity and frequency of extreme events (floods, droughts, heat-waves, storms). As well, projected changes in precipitation patterns and an increasing temperature will challenge residents, businesses, and governments in the years to come to minimize the social, economic and environmental impacts.

In HRM, specifically, these impacts are projected to include:

- increase in damage to coastal infrastructure, roads, wharves and property

- increased incidence of storm and sanitary sewer overflows.
- increased disruption to critical utilities such as power and telephone lines.
- increase in vector-borne diseases such as Lyme's disease and West Nile virus.
- decreased availability of ground water for homes and businesses
- increased risk of forest fires.

Question from Council: What are HRM departments are doing to protect the municipality and the public from the impacts of extreme weather events?

HRM Departments are: Taking policy and planning actions; Incorporating Climate Change within the work of their functional disciplines; And, examining the impacts of Climate Change on their Business Activities.

In addition to: 2.2.5 Coastal Inundation and Policy E16, Precautionary Principle, and the Eastern Passage / Cow Bay Municipal Planning Strategy, Under Regional Plan, Chapter 2, Environment, staff are to develop:

2.4.4 Potential Hazards to Development Functional Plan

There are numerous potential hazards in HRM that may be encountered wherever development of land takes place throughout the Municipality. These hazards may present substantial risk to life and property when not fully addressed. Hazard planning should consider potential threats such as the effects of climate change, coastal inundation and storm surge events, wildland fire, contaminated sites, abandoned mines, pits and quarries, abandoned land fill and disposal sites, dam failure and radon gas.

The Potential Hazards to Development Functional Plan should consider:

- 1. identifying areas, such as the location of contaminated sites, abandoned mines, pits and quarries, and areas at high risk for radon exposure through cooperation and collaboration with the Province;*
- 2. preparing an Historical Land Use Map to identify sites that may have been contaminated through former land uses;*
- 3. developing guidelines to protect the public from potential hazards, as listed above;*
- 4. developing guidelines to educate the general public about potential hazards to human life and property; and*
- 5. developing management plans for climate change, coastal inundation and storm surge events, wildland/urban interface fires and emergency preparedness for dam failure.*

Policy E-21 states: HRM shall prepare a Potential Hazards to Development Functional Plan to seek measures to mitigate risks to life and property associated with development.

Precursors to this Functional Plan, from a Climate Change perspective, are the Water Quality Monitoring Functional Plan, Waste Water Management Functional Plan, and Storm Water Functional Plan. In addition, the ClimateSMART project, and the adaptation projects (such as the Halifax Harbour / Sea Level Rise project) that have been completed are fundamental cornerstones that will fit into the climate change hazards element of the functional plan. In addition to the Climate Change Risk Management Strategy, the ClimateSMART project enabled the Greenhouse Gas Emissions Local Action Plan and Community Local Action plan. It also enabled the Community Energy Plan that helps provide us with a holistic view of how we can meet our energy needs. More importantly, it will help us to identify cleaner energy sources including renewables, and more efficient ways to use energy. The Halifax Regional Municipality (HRM) has identified these as key strategies to benefit the environment and reduce energy costs.

The Sea Level Rise Model and Adaptation Planning project is an important component of the Halifax Harbour Plan Initiative, as directed in Sections 5.2 and 5.5.2 of the Regional Plan. On February 9, 2010, Council approved a Motion to accept in principle a sea level rise and storm surge scenario for Halifax Harbour over the next 100 years, and to use this as a basis for undertaking more study. This will include further stakeholder consultation, modeling of potential effects of wave run-up impacts associated with extreme storm events, determining the vulnerability of all harbourfront properties to sea level rise/storm surge and preparing a range of appropriate adaptation strategies to be implemented over time. Council will be kept apprised as this work progresses and the results will be incorporated into a policy and regulatory framework of the Halifax Harbour Plan. Council also requested that staff begin to address sea level rise/storm surge impacts and adaptation strategies for the balance of coastal areas within HRM.

In 1990, Municipal Council enacted By-Law E100, Emergency Measures Act, which lead to the creation of the Emergency Measures Office. The goals of the EMO are to promote emergency preparedness and coordinate emergency management within the Halifax Regional Municipality. The EMO website (<http://www.halifax.ca/emo/>) provides information on how to plan for an emergency, what to do during an emergency and what to do after an emergency.

Halifax Regional Municipality is a member of the Transportation Association of Canada (TAC). TAC, as a response to the impacts of extreme weather events, has created a Climate Change Task Force. The objectives of the Task Force are to:

- Raise awareness
- Provide coordination and leadership to enable collaboration
- Highlight implications of climate change
- Address climate change in TAC products, especially technical guidelines and best practices.

The TAC Innovations and Practices database can be seen at:

<http://library.tac-atc.ca/CPIDBsearch.htm>

Many of HRM Community Development staff are members of the Canadian Institute of Planners. CIP understands that climate change is happening now and will affect all areas of the planning profession for the foreseeable future. As a part of the Institute's commitment to advocacy and the development of best practices, they are proud to present CIP's Policy on Climate Change. The launch of this policy is a proactive measure by CIP to inform and engage its members across Canada, as well as key stakeholders, governments, and the public on the planning profession's response to climate change. On February 26th, Planning staff attended the Atlantic Planning Institute Climate Change Forum in Halifax and presenting on some of HRM's efforts to dates.

Approximately 300 HRM staff have received training in The Natural Step, a systems based, scientific approach to sustainability. This training from the Natural Step is enabling decisions and functions to be made in a manner that incorporate the systems conditions for a healthy environment, including identifying adaptation measures to climate change.

In 2007, HRM staff in Legal Services and Risk Management and Design and Construction Services participated in the Public Infrastructure Engineering Vulnerability Committee. To meet the climate change challenge, Engineers Canada and its partners established the Public Infrastructure Engineering Vulnerability Committee. Co-funded by Natural Resources Canada (NRCan) and Engineers Canada, the Vulnerability Committee was a major Canadian initiative involving all three levels of government and non-governmental organizations. It was looking broadly and systematically at infrastructure vulnerability to climate change from an engineering perspective. The Committee's work resulted in the First National Engineering Vulnerability Assessment:

http://www.pievc.ca/e/doc_list.cfm?dsid=4

Question from Council: What is the status of ClimateSMART?

ClimatSMART was the catalytic project that initiated a broad range of activities at HRM related to Climate Change Mitigation and Adaptation. The key enablers that were identified in ClimateSMART were:

- innovative and responsive funding;
- community outreach and HRM inreach;
- hazard and risk mapping;
- integration of climate change as a risk into business plans;
- take a life-cycle approach to decision making;
- improved intergovernmental collaboration, communication and coordination; and
- tools to assist in decision making.

A \$35,000 in-kind contribution leveraged over \$500,000 in funding from FCM, Federal Government, NRCan, Nova Scotia Department of Energy and Nova Scotia Department of Environment to enable completion of ClimateSMART.

ClimateSMART continues to play a key role in ongoing HRM work. It will provide a foundational piece related to climate change required in the upcoming Hazards to Potential Development Functional Plan. It has enabled ongoing project work with other stakeholders, such as the Regional Adaptation Collaborative. The LiDAR Mapping work completed is enabling substantial efforts around modeling and studying the various impacts of climate change on the municipality.

Our well executed Greenhouse Gas Emissions Reduction and Community Energy Plans are additional deliverables from ClimateSMART.

Question from Council: How is the municipality working with other levels of government?

Firstly, when it comes to Climate Change Adaptation, collaboration with Federal and Provincial partners is critical and essential. Much of the adaptation work, such as studying the impacts of sea level rise, is extremely technical, using unique and expensive data. In order to access this knowledge and data, HRM has been extremely fortunate to partner with and continue to partner with other levels

of government. The best example of this collaboration is the recently approved Atlantic Regional Adaptation Collaborative.

Federal Government Initiatives

Within Natural Resources Canada (NRCan), is the Climate Change Impacts and Adaptation Division. Since 1998, Natural Resources Canada's Climate Change Impacts & Adaptation Division has funded more than 300 impacts and adaptation research projects. These projects emphasized local decision-maker participation to facilitate the uptake of new data and information on climate change impacts and adaptation. However, while these projects have done much to increase knowledge of both impacts and our ability to adapt to them, it is not feasible to conduct detailed research projects at every location in Canada for all issues of concern. Building on the research knowledge and experience, the Division recognizes the importance of acting *now* to effectively respond to climate-related risks and opportunities. Thus, the Climate Change Impacts and Adaptation Division now encompasses two main activities:

The Regional Adaptation Collaboratives (RACs) Program — This program will provide a mechanism for collaboration between different levels of government, private sector entities, and community organizations on complex adaptation issues that address federal, sectoral, or regional priorities. The objective of this initiative is to equip decision-makers with the information and advice that they need to make policy, operational, and management changes that respond to regional opportunities and threats from a changing climate.

Tools for adaptation — This program will develop adaptation tools to support decision-making on whether and how to adapt to a changing climate. An *adaptation tool* is a method that guides non-climate change experts through a series of analytical steps to examine the implications of climate impacts on their policies, plans, and operations. And determine appropriate response options. There is a need to make climate change information relevant and useful to potential users from a variety of different sectors. An efficient way to meet this need is to develop tools tailored to meet user needs.

Provincial Government Initiatives

As a deliverable related to the Environmental Goals and Sustainable Prosperity Act, The Province of Nova Scotia released a Climate Change Action Plan in January 2009. Under the action plan (<http://climatechange.gov.ns.ca/doc/ccap.pdf>), The Province committed to the following actions related to Climate Change adaptation:

- Create an Adaptation Fund within Nova Scotia Environment to encourage adaptation research and development starting in 2009.
- Develop statements of provincial interest on adaptation by 2010 to provide guidance on land-use planning. This is a formal tool, established under the Municipal Government Act, to protect the province's interest in such areas as land use, water resources, and community planning.

- Incorporate climate change impacts and adaptation response plans into the strategies and initiatives of all provincial departments by 2012.
- Establish criteria in 2009 for the consideration of climate change during Nova Scotia Environment's environmental assessment process and develop a guide to climate change for project proponents.
- Launch a web-based clearinghouse of information and tools to support adaptation to climate change in Nova Scotia in 2009.
- Begin work on a provincial vulnerability assessment and progress report on adaptation to climate change in Nova Scotia. This report, which will be updated biannually, will provide updates on the latest climate research, review critical information gaps, and provide policy direction for the province.
- Continue to work with the other Atlantic provinces on common adaptation goals.
- Create an interdepartmental steering committee and external advisory committee responsible for coordinating adaptation efforts and providing adaptation policy advice, in 2009.
- Ensure that design standards and plans for new provincial construction, and for the renewal of existing provincial infrastructure, reflect projected climate trends, not historical records, by 2010.
- Release a Sustainable Coastal Development Strategy by 2010. A major part of the strategy will focus on strengthening our resiliency to climate change impacts along our coast.
- Take sea-level rise into consideration and place priority on conserving coastal wetlands in preparing a policy to prevent net loss of wetlands. The Environmental Goals and Sustainable Prosperity Act requires that this policy be developed by 2009.
- Develop a strategy to ensure the sustainability of the province's natural capital in forests (forestry), minerals (mining), parks, and biodiversity by 2010. This strategy will be led by the Department of Natural Resources.
- Develop a comprehensive water resource management strategy by 2010. As a key priority, the strategy will consider climate change impacts on water quality and quantity.
- Lead, through the Department of Natural Resources, an interdepartmental and forest industry working group on forest carbon management and forest adaptation to climate change.

Of particular interest, for this report, is the development of the Coastal Development Strategy. In December 2009, the Department of Fisheries and Aquaculture released the State of Nova Scotia's Coast Report (<http://www.gov.ns.ca/coast/>).

Halifax Regional Municipality staff continue to collaborate, support, and contribute to all these actions.

Summary of HRM Regional Adaptation Collaborative Proposed Project Elements

Goal: Develop a systems based approach to climate change adaptation.

Projects:

- Digital Elevation Model in 1m, 2m, 5m grids. Join and clean approximately 1400 LiDAR data tiles
- Wave runup and seiche modeling for extent of wave runup and seiche in Halifax Harbour
- Watershed, sub-watershed, wetland, ephemeral stream, vernal pond GIS modeling. Correction of Halifax Harbour Watersheds and GPS culverts for flow correction
- Sackville Floodplain Modeling
- Tree Canopy, 3D building model GIS
- Impervious surface, stormwater, sediment modeling
- Develop local meteorological projections for stormwater model inputs
- Halifax Harbour Land use vulnerability assessment
- Develop climate change adaptation strategy for HRM Northwest Arm seawalls and coastal structures
- Land use vulnerability assessment for Eastern Shore
- Develop climate change adaptation strategy for the Salt Marsh Trail in Cole Harbour

These projects are dependent on a number of variables, including finding graduate or post doc students interested in the project, scheduling of HRM and NRCan staff time, RAC funding, and sequencing of data / information required to complete the task. Generally the costs are comprised of in-kind HRM staff time, in-kind NGO / NRCan / other time, student research time, HRM funding, NRCan RAC funding, and third party funding (other grants or scholarships). The intent of sharing this list is to demonstrate the inter-connectedness of the efforts between HRM, academic institutions, Province of Nova Scotia, Environment Canada, NRCan, and NGO personnel. Also the various sources of information required in the progression of adaptation work. This work is not able to be reasonably executed by municipal staff in isolation.

Question from Council: Who at HRM is working on adaptation?

Under ClimateSMART, it is clear that virtually all HRM departments have adaptation responsibilities.

As an ongoing resource, Infrastructure and Asset Management recently re-tooled the organization chart in the Sustainable Environment Management Office, using existing budget, to hire an Environmental Performance Officer, Corporate Environmental Due Diligence. Within her mandate will be duties as the lead for SEMO on Climate Change Adaptation efforts and updating ClimateSMART, participating in the Hazards to Development Functional Plan, and assisting with the development of protocol for HRM and the Community to respond to environmental impacts. She will be a critical piece in the municipality's ability to communicate actions related to adaptation to the community. Anticipated communications avenues will include: www.halifax.ca, Naturally Green Newsletters, and co-ordinated efforts with other partners and stakeholders. Other duties include environmental assessment on HRM facilities and coordination of protocol to third party impacts to HRM infrastructure.

On the Atlantic Regional Adaptation Collaborative Projects, there are staff working on these projects from HRM, NRCan, Dalhousie, NSCC (AGRG), and Province of Nova Scotia. There are also very important contributions required from NGO's such as the Sackville River Association and other community and environmental and interest groups.

Question from Council: What resources are HRM providing the public?

Through The Regional Plan, HRM is providing the public a plan for future development that will help in selection of property locations.

ClimateSMART delivered a Community Action Guide to Climate Change (<http://www.halifax.ca/climate/documents/CommunityActionGuideforClimateChange.pdf> and as per Attachment 5). Within this tool is information and resources enabling communities to take mitigative and adaptative actions related to extreme weather events.

EMO provides information and support for the public before, during and after emergencies. Those resources can be found at www.halifax.ca/emo or by calling 490-5400. External to HRM's organization, Nova Scotia Emergency Measures Organization, amongst other activities and duties administers the Disaster Financial Assistance program. The DFA program is not intended to be an alternative or a substitute for adequate insurance coverage. In the event of a natural disaster, individuals are expected to bear the initial responsibility for their losses. If the losses are so extensive that individuals cannot cope on their own the DFA is intended to provide financial support. Details and criteria can be found at: <http://emo.gov.ns.ca/content/disaster-financial-assistance-1>

For Developers, ClimateSMART delivered a Climate Change: Developers Risk Management Guide: <http://www.halifax.ca/climate/documents/DevelopersGuidetoRiskManagment.pdf>

SEMO staff are available to attend community meetings to discuss HRM sustainability, climate change, and environmental strategy, policies and initiatives. As an example, on March 24th, SEMO staff participated at the Rockingham United Church on a discussion on Climate Change as a supporting speaker at the event. For requests for speakers, please contact Richard MacLellan at 490-6056 or maclelri@halifax.ca

Question from Council: Is HRM responsible for identifying risks?

Halifax Regional Municipality is not responsible for either identifying specific property risks or protecting and restoring private property from the impacts of extreme weather events. HRM is responsible for planning for future development and as such, is indeed identifying and communicating risks related to climate change and things like sea level rise. Discussions are ongoing as to who will be responsible for the planning recommendations that unfold relative to climate change.

Question from Council: Have we previously done things to prevent building in risky places?

Yes. The Regional Plan and the Precautionary Principle, E-16, prohibits residential development on the coast within a 2.5 metre elevation above the ordinary high water mark.

The budget implications of Climate Change Adaptation are enormous, presenting extreme financial risks to both the municipality and the public.

Currently much progress on Climate Change Adaptation is being funded by the Federal Government through NRCan and actions through the Regional Adaptation Collaborative. It is generally anticipated in future budget years that development of adaptation resources at HRM will be required. However, at this time, staff is not seeking any new money to build this capacity.

The Municipality does not have the financial capacity, mandate, nor responsibility to affect adaptation projects to climate change for private homes and businesses. Municipal Infrastructure Adaptation and resiliency projects are included as manageable and appropriate through the execution of the 5 year capital plan.

Halifax Regional Municipality has 2400 kilometers of coast line. Projects to add rock reinforcement or seawalls around this entire coastline would be virtually an impossible undertaking for any municipality.

BUDGET IMPLICATIONS

There are no immediate budget implications as a result of this report, however climate change will have a significant impact on the cost of future municipal operations and infrastructure plans which is not measurable at this time.

FINANCIAL MANAGEMENT POLICIES/BUSINESS PLAN

This report complies with the Municipality's Multi-Year Financial Strategy, the approved Operating, Capital and Reserve budgets, policies and procedures regarding withdrawals from the utilization of Capital and Operating reserves, as well as any relevant legislation.

ATTACHMENTS

Attachment One: Technical explanation of storm surge, January 2, 2010

Attachment Two: Pictures, Herring Cove coastal impacts

Attachment Three: Pictures, Cow Bay / Eastern Passage Impacts

Attachment Four: Province of NS, State of the Coast Summary Report

<http://www.gov.ns.ca/coast/>

Attachment Five: Community Action Guide for Climate Change:

<http://www.halifax.ca/Climate/documents/CommunityActionGuideforClimateChange.pdf>

A copy of this report can be obtained online at <http://www.halifax.ca/council/agendasc/cagenda.html> then choose the appropriate meeting date, or by contacting the Office of the Municipal Clerk at 490-4210, or Fax 490-4208.

Report Prepared by: Richard MacLellan, Acting Manager, Sustainable Environment Management Office, 490-6056

Financial Approval by:



Cathie O'Toole, CGA, Director of Finance, 490-6308

13 January, 2010

Astronomical tides in the Halifax Region

Michael H. Davies, Ph.D., P.Eng.

mdavies@coldwater-consulting.com

The January 2nd 2010 storm coincided with very high astronomical tides. At Halifax, the peak astronomical tide on January 2nd, 2010 was 2.03m above Chart Datum at 8:42 am EST. This is a large spring tide. At the end of January another peak spring tide is predicted (2.07 m above chart datum at 8:27 am 2010-Jan-31).

These are part of the normal, but complex, variation in tides that come from the interplay of the earth, the moon, the sun and (to a lesser extent) the other planets.

Spring and neap tides refer to the monthly variation in tidal amplitude: The moon and the sun are aligned (or, in syzygy) every two weeks at the time of a new moon and a full moon. It is around these times of the month, when the moon and the sun are in line that spring tides occur. Neap (smaller) tides occur at quadrature, when the sun and the moon are at right angles to each other.

The moon's orbit around the earth is elliptical meaning that at some times in its 28-day orbit it gets it's closest to the earth (its perigee). This causes an increase in tidal ranges. When the moon is furthest from the earth (apogee), smaller than average tidal ranges are experienced.

When the perigee and the new/full moon lines up, Perigean Spring Tides occur. These occur three or four times a year and create large tidal ranges often associated with coastal flooding.

The following plot shows predicted astronomic tide levels at Halifax for January and February 2010 showing a cyclical pattern of spring and neap tides including three high (perigean) spring tides peaking around January 2nd and again at January 31st and at the end of February.

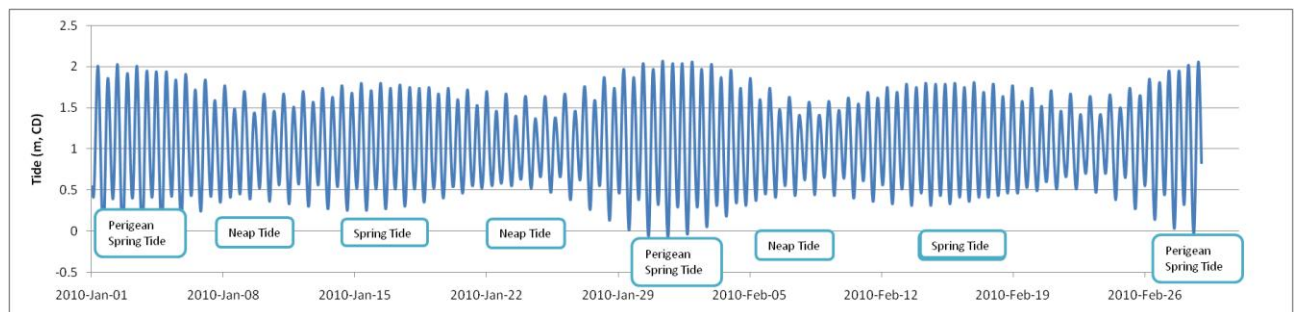


Figure 1 Time series of predicted astronomical tides at Halifax for Jan-Feb 2010

Figure 2 shows predicted high water levels for the period 2000 to 2018. This shows a repeating annual pattern of high tides during January-March, lower tides during the summer with higher tides again during the autumn.

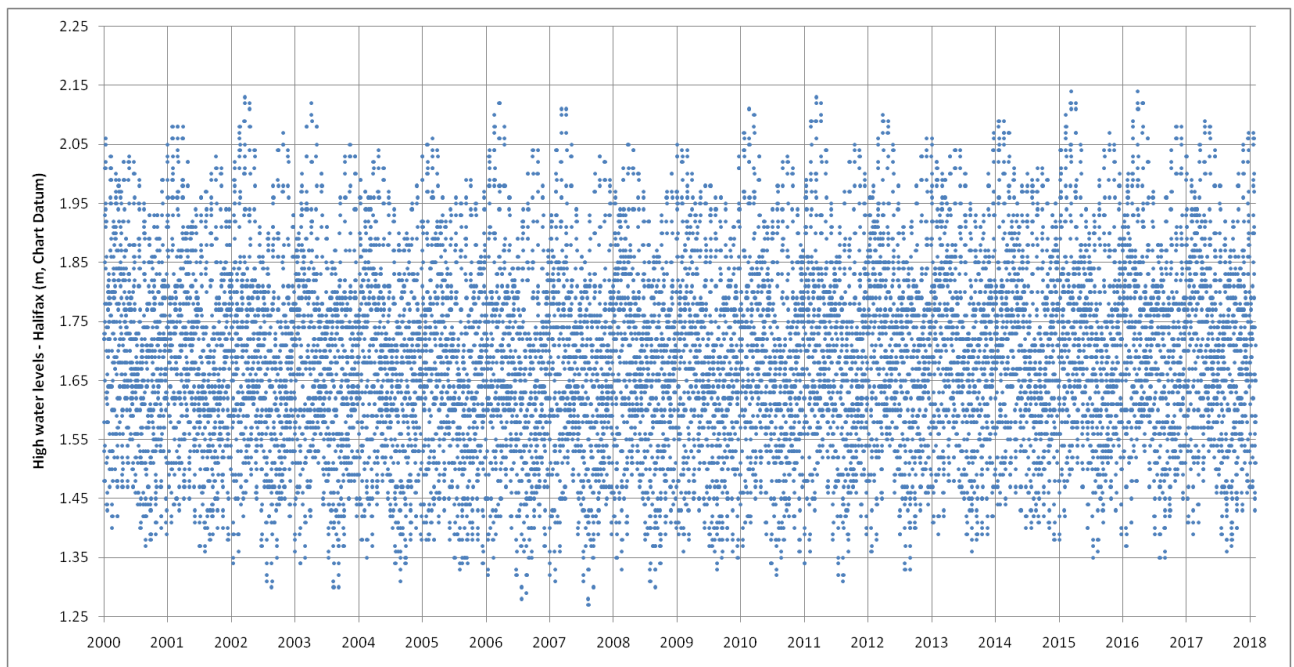


Figure 2 Predicted high water levels from astronomical tides at Halifax 2000-2018

Figure 3 shows the same dataset focussing in on 2009-2013. From these plots we can see that the highest tides of the year are these perigean spring tides during January-March. The magnitude of the perigean spring tides varies year-to-year on an 18.6 year cycle. The peak tides in 2010 and again in 2011 will be close to the largest tides in the entire 18.6 year cycle. The occurrence of storms during these times of large astronomical tides can be particularly devastating in low-lying coastal areas.

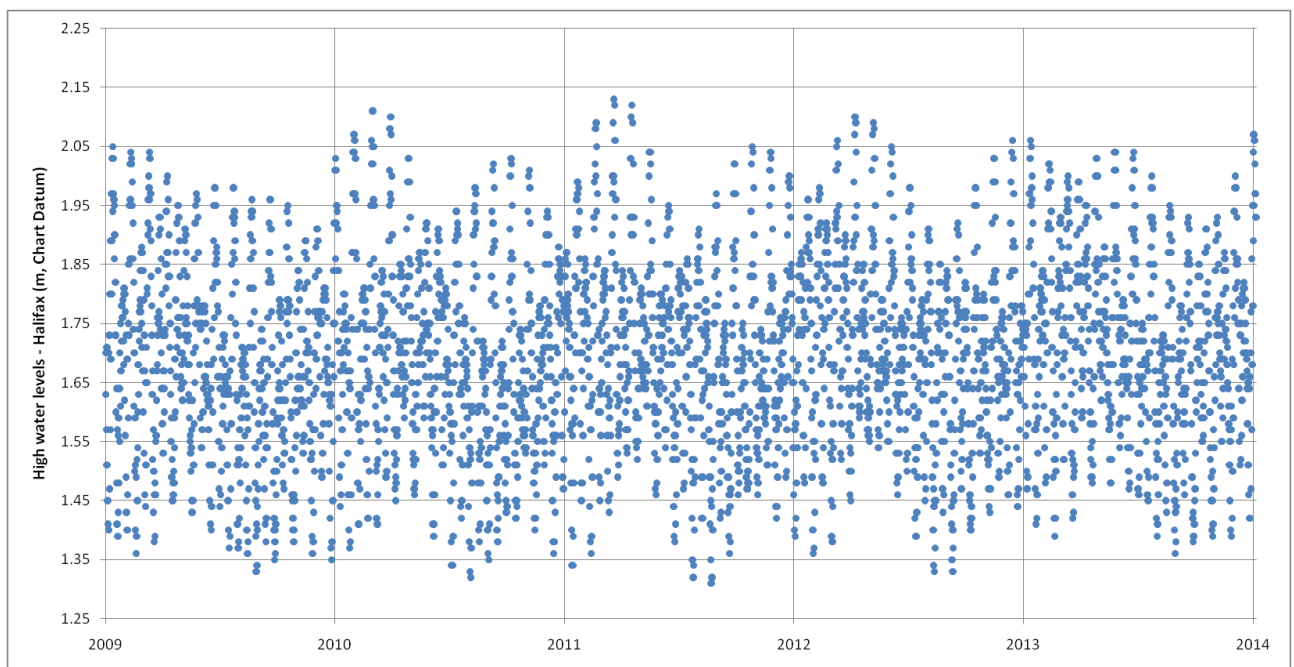


Figure 3 Closeup of predicted astronomical high waters for 2009-2013

Attachment 2

Photos and Description of Damage: Courtesy of Roy P. Dempsey

Photo 1: Taken looking towards the Herring Cove breakwater (ownership APA) after the storm surge event, there is a large piece missing from the breakwater resulting, water is currently able to flow through this damage. Also visible is the relocated stones (up on grassy area) as a result of this event. During the storm, the water was above both the breakwater and the wharf.



Photo 2: Picture is taken from the Herring Cove wharf (ownership APA) looking at a damaged private wharf. This wharf has shifted and collapsed; boards are missing out of a large section. Also shown is debris that washed into Herring Cove. The debris includes boards from damaged property, drift wood, and lamp poles that were currently on the shore. During the storm surge event, Mr. Roy Dempsey has indicated that the water was so high all of this (including the lamp posts) was below the water.



Photo 3: This is a picture of a privately owned Fish Store that collapsed in Herring Cove as a result of the event. Also, visible in the background is a collapsed dock.



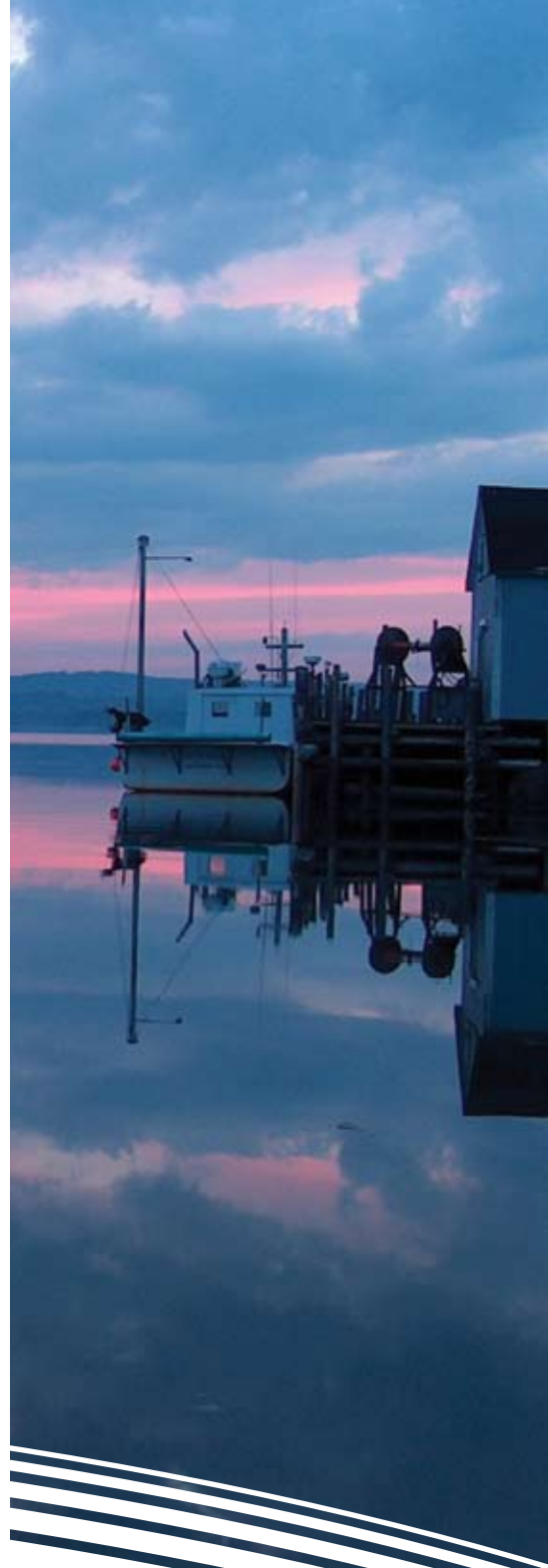
Photo 4: Another view from APA wharf, providing a closer look at the resulting debris. During the storm surge some local residents in the area gathered in the grey house in the distance and watched one wharf that had been dislodged moving in and out of the cove with the waves. You can also see in the distance the Herring Cove breakwater and the resulting damage.



Attachment 3

Attachment Three: Storm Surge Pictures Eastern Passage Area





Our Coast

Live. Work. Play. Protect.

THE 2009 STATE OF NOVA SCOTIA'S COAST SUMMARY REPORT

Table of Contents

1	WHAT IS THE STATE OF NOVA SCOTIA'S COAST REPORT?
	<i>Background</i>
3	<i>Nova Scotia's Coastal Management Framework</i>
6	IDENTIFYING THE PRIORITY COASTAL ISSUES
7	SETTING THE SCENE
8	<i>Nova Scotia's Physical and Ecological Character</i>
	<i>Society and the Economy</i>
	<i>Nova Scotia and the Law</i>
9	OVERVIEW OF THE SIX PRIORITY COASTAL ISSUES
	<i>Coastal Development</i>
10	<i>Working Waterfronts</i>
12	<i>Public Coastal Access</i>
13	<i>Sea Level Rise and Storm Events</i>
15	<i>Coastal Water Quality</i>
16	<i>Sensitive Coastal Ecosystems and Habitats</i>
18	FACTORS TO BE TAKEN INTO ACCOUNT
	<i>Complexity of Nova Scotia's Coast and its Natural Environment</i>
19	<i>Balancing a Service-based Economy with a Natural Resources Economy</i>
	<i>Zones of Influence and Zones of Impact</i>
	<i>Demographic Trends</i>
20	<i>The Importance of Heritage and Cultural Resources</i>
	<i>Multiple and Conflicting Jurisdictions</i>
	<i>Appropriate Land-use Planning and Management</i>
	<i>Management of Knowledge and Information</i>
21	<i>Integrating Coastal Zone Management and Measuring its Progress and Effectiveness</i>
	WHAT HAPPENS NEXT?
	MORE INFORMATION
	REFERENCES

THE 2009 STATE OF NOVA SCOTIA'S COAST SUMMARY REPORT

The 2009 State of Nova Scotia's Coast Summary Report ISBN: 978-1-55457-328-8; Crown copyright, Province of Nova Scotia, 2009; Author, Draft: CBCL Limited. 2009; Editing: Judy Adamson Communications, Tim S. Conrad, Justin Huston, David Mitchell, and Sean Weseloh McKeane; Design and illustrations: Christine Bennett Design; Cover photos: Front, left to right – Province of Nova Scotia, Tim S. Conrad (Copyright 2009), Tim S. Conrad (Copyright 2005); Back, left to right – Tim S. Conrad (Copyright 2009), Province of Nova Scotia, Province of Nova Scotia; Photos not credited throughout report: Province of Nova Scotia.

www.gov.ns.ca/coast

WHAT IS THE STATE OF NOVA SCOTIA'S COAST REPORT?

What is The State of Nova Scotia's Coast Report?

Our coastal areas and resources have played an essential role in making Nova Scotia what it is today. The coast is where we live, work and play. It's vital to the character and way of life that is valued by Nova Scotians. If we want to pass this coastal legacy on to our children and grandchildren, we must take action now to better understand our coast and to ensure its sustainability for future generations.

The provincial government recognized it needed a way to focus efforts to tackle complex coastal issues that threaten the sustainability of our coast. To do this, it established the *Coastal Management Framework*. It is a document that describes how the government will work to address these important issues. The ultimate goal is to ensure the sustainable development and conservation of Nova Scotia's valuable coastal areas and resources. The first step is to get a good idea of the current state of the coast.

The State of Nova Scotia's Coast Report gives an overview of the condition of our coastal areas and resources. This allows us to create a baseline to determine future trends. It describes physical, ecological, and socio-economic characteristics of the coast, and examines in more detail six priority coastal issues. The report recognizes gaps in information that need filling if we want to manage the coast effectively. It also discusses several key factors that must be considered as we develop more unified approaches to coastal management.

Using this report and feedback from public consultations, the government will develop a blueprint called the *Sustainable Coastal Development Strategy*. Once completed, the strategy will act as the road map for addressing the coastal issues that matter most to Nova Scotians.

This summary report is a complete overview of *The 2009 State of Nova Scotia's Coast Technical Report*. For more detailed information on anything presented in this summary report, please refer to the full report on our website at www.gov.ns.ca/coast.

BACKGROUND

Sustainable use means that Nova Scotians can fulfil their needs today without affecting the ability of future generations to fulfil their own needs. We must find a way to sustainably use Nova Scotia's coastal and ocean resources if the province is to remain a healthy and vibrant place to live. To keep this balance, we must consider that the environment, the economy, and society are all linked together.

Nova Scotia's identity is strongly linked to its coastal location – our province is surrounded on all sides by the sea. About 70 per cent of the province's population live in coastal communities. Figure 1 shows the coastlines of the province. The Northumberland Strait and the Gulf of St. Lawrence lie to the north, the open Atlantic Ocean to the east, and the Gulf of Maine and the Bay of Fundy to the south and west.



Figure 1: Map of Nova Scotia. ▲

Relative to other parts of the world, we are fortunate to have a coastline that is largely unspoiled by industrial pollution and other human pressures. But change is taking place and Nova Scotians have expressed concerns about the use of coastal areas and resources.

Over the last 30 years, people around the world have been growing concerned about the degradation of the planet's coastal areas and resources. As a truly coastal province, Nova Scotians have long depended upon the coast to make a living, relax, and raise their families. If we are to maintain the high quality of life we've come to expect, we must work together to address the threats facing the future of our coast.

Issues raised by Nova Scotians include

- increased development and more intensive human use of land in coastal areas
- degraded habitats and loss of biodiversity, which is the number and variety of plants and animals within an area
- unsustainable harvesting of resources
- increased land-based pollution
- loss of traditional access to the coast

- non-resident ownership of coastal properties
- poor water quality
- uncoordinated legislation
- sea level rise and flooding

NOVA SCOTIA'S COASTAL MANAGEMENT FRAMEWORK

The provincial government recognized that it needed a way to focus its efforts on the issues identified. As an important first step, it established a *Coastal Management Framework* (see Figure 2), which describes how the government will work to address priority coastal management issues. The goal is to ensure Nova Scotians develop and protect our valuable coastal areas and resources in a way that sustains them for the future.

The province formed an interdepartmental organization called the Provincial Oceans Network (PON) to develop a more coordinated and strategic approach to coastal management. PON developed the *Coastal Management Framework* and will oversee its operations. Although PON is based with the Nova Scotia Department of Fisheries and Aquaculture (NSDEA), it is really a combined effort of many departments and agencies with a role in coastal management.

PON has two main functions, which are to help coordinate the management of the coasts and oceans within the provincial government, and to provide advice and expertise in carrying out the framework and its activities.

PROVINCIAL DEPARTMENTS AND AGENCIES PARTICIPATING IN THE PROVINCIAL OCEANS NETWORK (PON)

Aboriginal Affairs	Agriculture
Economic and Rural Development	Emergency Management Office
Energy	Environment
Finance	Fisheries and Aquaculture
GeoNOVA (a division of SNSMR)	Intergovernmental Affairs
Natural Resources	Policy and Priorities Committee
Service Nova Scotia Municipal Relations (SNSMR)	Tourism, Culture, and Heritage
Transportation and Infrastructure Renewal	

Over an 18-month period starting in 2006, PON worked with its associated departments and agencies to design the *Coastal Management Framework*. The province released the framework in June 2008. The first of its kind in Canada, it guides the province's approach to coastal management. The framework builds on existing commitments, mandates, and capacities. It recognizes that other levels of government, stakeholders, and interest groups must all work together. In particular, it follows the government of Nova Scotia's long-term vision and policy for sustainable development.

You can read more about PON and the *Coastal Management Framework* on our website at www.gov.ns.ca/coast.

COASTAL MANAGEMENT FRAMEWORK

The Government of Nova Scotia has committed to developing a coordinated and strategic approach to coastal ocean management. The *Coastal Management Framework* will guide the Government of Nova Scotia in working towards achieving this task. Provincial priority coastal issues include: coastal development, public coastal access, sea-level rise and storm events, working waterfronts, coastal water quality, and sensitive coastal ecosystems and habitats.

THE WHAT: THE VISION

A healthy, safe and vibrant coast that sustains the highest quality of life for current and future generations.

THE VISION DESCRIBES THE GOVERNMENT OF NOVA SCOTIA'S LONG-TERM DESIRED OUTCOMES FOR COASTAL MANAGEMENT.

THE MISSION

To address coastal issues in Nova Scotia through effective leadership, coordination and collaboration.

THE MISSION DESCRIBES THE LONG-TERM ORGANIZATIONAL APPROACH FOR ACHIEVING THE VISION.

THE HOW: THE GOALS

1. Coastal and ocean issues in Nova Scotia are addressed through collaboration and integrated approaches.
2. Nova Scotia derives ongoing optimal benefit from its coastal and ocean areas and resources.
3. Nova Scotia's ecosystems are fully functioning now and in the future.

THE GOALS DESCRIBE WHAT IS REQUIRED TO ACHIEVE THE VISION.

THE STRATEGIC THRUSTS

1. Develop and maintain an ongoing understanding of Nova Scotia's coastal and ocean issues.
2. Facilitate the collection, research, management and exchange of coastal and ocean information.
3. Coordinate effective decision making on coastal and ocean issues.
4. Increase the opportunity and capacity of the public to engage in coastal and ocean issues.

STRATEGIC THRUSTS DESCRIBE THE OVERARCHING DIRECTION NEEDED TO ACHIEVE THE GOALS STATEMENTS, AND THUS THE VISION.

THE SHORT-TERM OBJECTIVES

1. Municipal, provincial and federal governments have a shared understanding of Nova Scotia's priority coastal and ocean issues
2. Relevant provincial stakeholders have a shared understanding of Nova Scotia's coastal and ocean issues

COASTAL MANAGEMENT FRAMEWORK *cont.*

3. A provincial mechanism exists to integrate emerging coastal and ocean issues and opportunities into coastal management processes
4. The majority of Nova Scotians are aware of and have an understanding of Nova Scotia's coastal and ocean issues
5. The Government of Nova Scotia is recognized locally, nationally and internationally as the most comprehensive source for coastal information related to Nova Scotia
6. Public and private research and monitoring programs are addressing Nova Scotia's coastal and ocean issues
7. The Provincial Oceans Network is the key provincial body for information exchange
8. The Provincial Oceans Network is the key provincial body for coordinating decision making on coastal and ocean management issues
9. The Government of Nova Scotia has a clear understanding of stakeholders' interests and concerns related to coastal and ocean issues
10. The Government of Nova Scotia has a clear understanding of the various roles, responsibilities and priorities of municipal, provincial, federal and aboriginal governments as they relate to coastal management
11. The Government of Nova Scotia is able to respond to public inquiries on coastal management through a multi-departmental frontline process
12. The Government of Nova Scotia is supporting community-based initiatives to address priority coastal and ocean issues
13. Emerging coastal and ocean management policies are shared proactively with key coastal stakeholders
14. The public has a clear understanding of the various roles, responsibilities and priorities of municipal, provincial, federal and aboriginal governments as they relate to coastal management

SHORT-TERM OBJECTIVES (1-6 YEARS) ARE SEEN AS NECESSARY TO ACHIEVE THE STRATEGIC THRUSTS.

THE PATH FORWARD:

STRATEGIC ACTIVITIES

- Assess the state of Nova Scotia's coast and establish a Sustainable Coastal Development Strategy.
- Develop a coastal web portal.
- Establish a coastal research network.
- Sign a MOU with the Government of Canada to coordinate the coastal and ocean management efforts.
- Identify and expand public education and awareness related to priority coastal issues.
- Inventory and coordinate LIDAR mapping initiatives in Nova Scotia.
- Strengthen provincial leadership and coordination on integrated coastal management initiatives.

THE STRATEGIC ACTIVITIES DESCRIBE THE IMMEDIATE ACTIONS THAT THE GOVERNMENT OF NOVA SCOTIA WILL UNDERTAKE TO ACHIEVE THE SHORT-TERM OBJECTIVES.

Figure 2: Nova Scotia's Coastal Management Framework. (Source: Nova Scotia Provincial Oceans Network Secretariat, 2008)

IDENTIFYING THE PRIORITY COASTAL ISSUES

The main priority under the framework is to develop the *Sustainable Coastal Development Strategy*. The strategy will determine what we need to do to ensure that the health of our coastal areas and resources is maintained and enhanced for current and future generations. These actions aren't just by the government. The coast is a resource shared by all Nova Scotians and we all have a role to play as coastal stewards to make the coast a better place.

To develop the strategy, PON needs to do three things

1. Publish *The State of Nova Scotia's Coast Report*, which provides information on the coastline's current condition and the issues at stake.
2. Hold consultations with the public and stakeholders, which centres on the report's content and other issues of concern.
3. Use the report and feedback to develop the *Sustainable Coastal Development Strategy*.

Identifying the Priority Coastal Issues

The State of Nova Scotia's Coast Report asks the following five basic questions

1. What are the main issues to be dealt with?
2. What is happening and what is the rate of change?
3. Why is it happening?
4. Are the changes significant?
5. What is, or could be, the response to manage it?

The report focuses on six priority coastal issues that the province identified.

1. COASTAL DEVELOPMENT

- *to identify the extent and distribution of coastal development, both rural and urban*

2. WORKING WATERFRONTS

- *to examine the status of sites, facilities, and related infrastructure that provide physical access to the sea for ocean-dependent uses and businesses*
- *to examine the status of communities that depend economically on such waterfronts*

3. PUBLIC COASTAL ACCESS

- *to examine the ability of the public to reach, use, or view the shoreline of coastal waters or nearby islands*

4. SEA LEVEL RISE AND STORM EVENTS

- *to examine the factors that determine sea level rise in Nova Scotia*
- *to examine the social, economic, and ecological implications of the hazards associated with sea level rise and storm events*

SETTING THE SCENE

5. COASTAL WATER QUALITY

- to describe the factors that influence the physical, chemical, and biological characteristics of Nova Scotia's coastal waters
- to determine the extent to which water quality conditions influence the uses of coastal waters

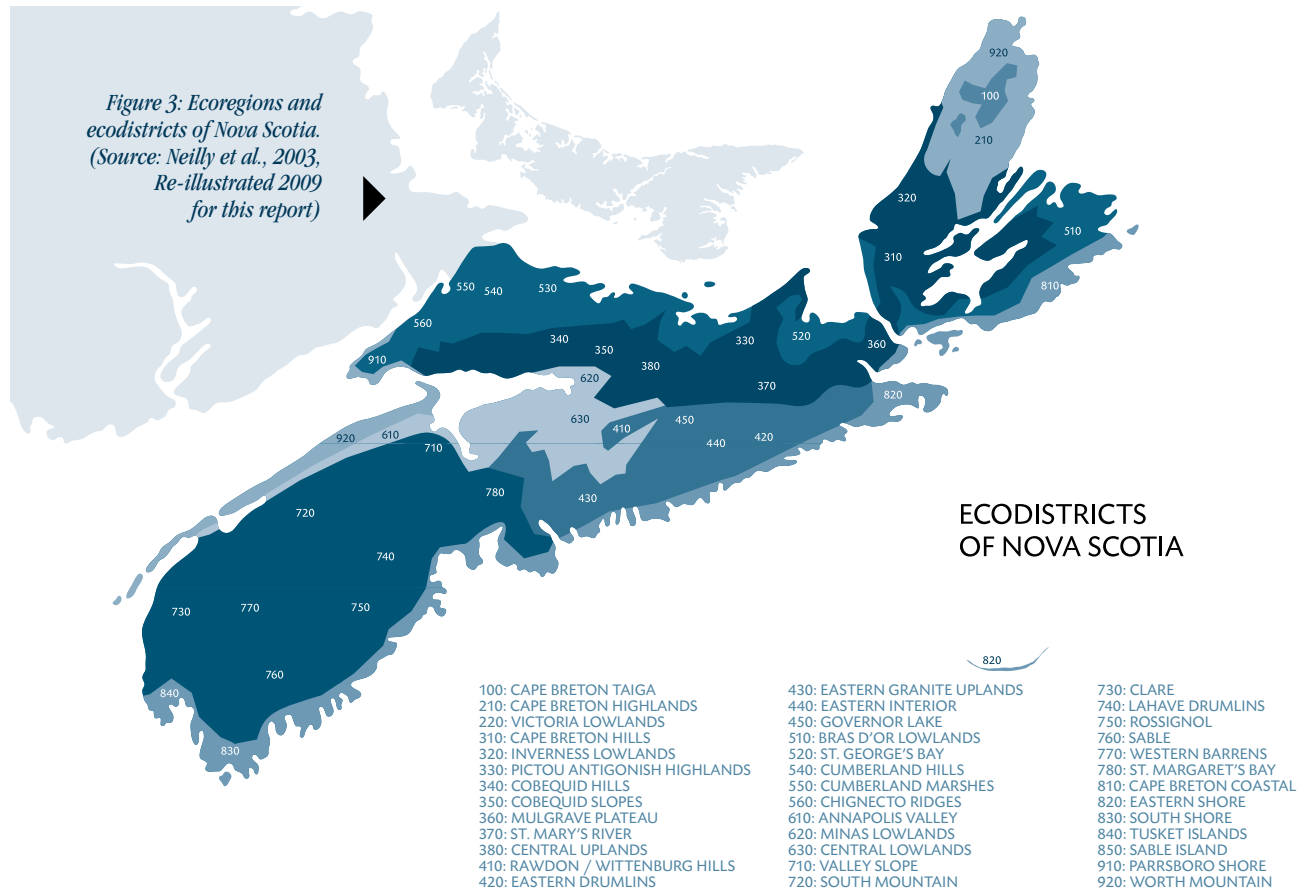
6. SENSITIVE COASTAL ECOSYSTEMS AND HABITATS

- to examine the range of coastal ecosystems and habitats that are sensitive to human influences

Setting the Scene

To fully understand the six priority coastal issues, we need to have some understanding about Nova Scotia in a general sense. This includes the province's natural features and ecology, society, economy, and governing administration and legislation. This general understanding about our past and present relationship with the coast gives us a setting within which we can more easily assess the priority coastal issues and determine future management tools and responses.

Figure 3: Ecoregions and ecodistricts of Nova Scotia.
(Source: Neilly et al., 2003, Re-illustrated 2009 for this report)



NOVA SCOTIA'S PHYSICAL AND ECOLOGICAL CHARACTER

The province has physical and ecological characteristics that can be described as

- a variable climate influenced by the jet stream and ocean currents
- a landscape that is highly influenced by the province's geological and glacial history
- a very complex ecological system (*see Figure 3 for more details*)
- 13,300 km of jagged coastline that includes islands, bays, and estuaries, which are the parts of rivers that interact with the tide

SOCIETY AND THE ECONOMY

The settlement pattern in Nova Scotia evolved as transportation and communication networks developed along the coasts. This is shown in the pattern of today's cities, towns, and villages. But there's also a rich and varied supply of coastal heritage resources that include archaeological sites, lighthouses, and shipwrecks. Ports and harbours provided the initial point for development. Some have developed into substantial cities while others have declined in economic importance over time. The change continues.

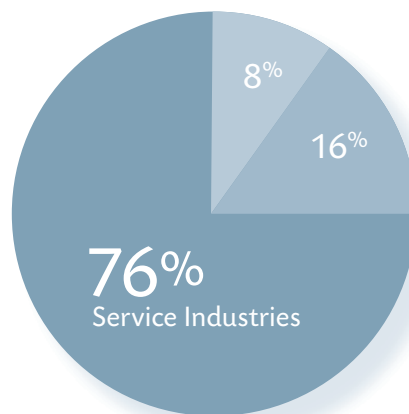
The fisheries and forestry were originally the main natural resources that helped develop the region's economy. They also influenced where people decided to live, work, and raise families. Today, the provincial economy is largely service based, with 76 per cent of its gross domestic product (*GDP*) generated by service industries, shown in Figure 4. Only 8 per cent of the *GDP* is generated from natural resources.

Figure 4: Nova Scotia's GDP by industry type.

Service Industries:	76%
Goods-producing Industries:	16%
Resource-based Industries:	8%

Other key facts include the following

- The province had a real *GDP* of \$28.8 billion in 2007.
- The economy of the province grew by 4.9 per cent between 2003 – 2007.
- The population of Nova Scotia was an estimated 934,100 in 2007.
- The population grew slightly between 1996 – 2006.
- Population migration continues from coastal rural to more centralized areas, particularly to urban Halifax Regional Municipality (*HRM*).



NOVA SCOTIA AND THE LAW

Of the province's land area, 452,581 ha or 8.2 per cent is legally protected either federally or provincially. Almost half of that land, or 223,058 ha, is wholly or partially within two kilometres of the coast.

A complex array of laws and agreements has evolved to regulate the development and use of the province's coastal lands and waters. These include international, federal, and provincial legislation and agreements. The supreme law of Canada,

OVERVIEW OF THE SIX PRIORITY COASTAL ISSUES

the *Constitution Act of 1982*, defines the powers of the federal and provincial governments. Both governments have regulatory responsibilities for different aspects of coastal zone management.

The federal government is more involved with offshore activities, such as the fisheries, shipping, the coast guard, and defense. It also looks after federal Crown land and land covered by the *Indian Act*. The province owns and manages the remainder of public lands. The province has assigned most land-use planning to municipalities, which also has primary responsibility for local infrastructure.

The federal and provincial governments and Nova Scotia's Mi'kmaq are currently negotiating to resolve issues related to treaty and aboriginal rights. These include aboriginal title and Mi'kmaq governance. Nova Scotia is also taking a coordinated approach in its duty to consult with aboriginal people.

Overview of the Six Priority Coastal Issues

PON identified six priority coastal issues that are important to Nova Scotians. The following sections are highlights and key findings of those issues.

1: COASTAL DEVELOPMENT

Most human development in Nova Scotia is centred along its coastlines. Within high-density urban areas, most development is strip-like. It extends along the shorelines of the coast, including bays, rivers, and estuaries. This type of development pattern has a high potential for affecting the coastal environment because it may interrupt natural connections between land and sea.

In Nova Scotia, there's a wide range in the intensity of coastal development, although overall the province doesn't have a highly developed coastline. Eighty per cent of the two km-wide coastal land strip has little or no development, while 11 per cent has intensely developed urban and industrial areas. Development in Nova Scotia tends to be clustered, with a higher intensity of residences along the coast. Figure 5 shows examples of different development intensities.

Thomas Raddall Provincial Park



Mabou



Hall's Harbour



Halifax



LESS INTENSE >

< MORE INTENSE

▲ *Figure 5: Range of development intensity in coastal areas.*

Between 1950 and 2000, the rate of housing subdivision and registration increased dramatically. This rate seems to have peaked, mainly because most of the choice land has already been subdivided. The most densely developed coastal areas are associated with ports and harbours. These include service centres such as Halifax, Antigonish, Yarmouth, and the New Glasgow and Sydney areas. Inland, development is found along the commuter corridors between Halifax and Truro, and through the agricultural Annapolis Valley. Coastal development is thin on the northwestern and southeastern sides of Cape Breton, in Guysborough County, along Chignecto Bay in Cumberland County, and in Queens County.

There isn't much information available on categories of development, and we don't know the type of development on 77 per cent of the coastal land strip. In the remaining percentage where we know the type, there are several kinds of land use. The largest is residential land use at 76 per cent. This is followed by industrial use at 8.7 per cent, protected areas at 6.2 per cent, and commercial lands at 5.7 per cent.

Pressure from future development will probably continue to be greatest along the coast, but there's little control across most of the coastal areas. The province has delegated land-use, or zoning powers, to the municipalities through the *Municipal Government Act* and the *Halifax Regional Municipality Charter*. These powers allow municipalities to develop planning strategies and bylaws to regulate land use. In spite of this, only about 45 per cent of provincial land has comprehensive municipal plans or land-use bylaws in place. Another factor affecting control over development is that approximately 86 per cent of the coastline is privately owned.

2: WORKING WATERFRONTS

Working waterfronts are sites or facilities that provide physical access to the sea for ocean-dependent uses and businesses. Three broad types of working waterfronts are found in Nova Scotia.

Types and numbers of working waterfronts (see figure 6)

TYPE A] CANADA PORT AUTHORITY PORTS

Halifax is the only one in the province. It is operated by Halifax Port Authority but is overseen by Transport Canada.

TYPE B] LOCAL AND REGIONAL PORTS

There are 25 of these ports, such as Mulgrave Marine Terminal, Strait of Canso. They are managed by harbour authorities, which are either private corporations or municipalities.

TYPE C] SMALL CRAFT HARBOURS

There are 247 small craft harbours, such as Clark's Harbour. They are managed mainly by community or private groups called Small Craft Harbour Authorities.

Over a period of 15 years, the federal government divested many of these facilities, either by selling them or by handing over their management. The federal government sold some of the larger ports in the province outright, as well as some of the smaller harbours, but it retained ownership of many of these smaller harbour facilities. While the federal government

continues to own and fund many of these small craft harbours, it has given the day-to-day operations and maintenance of these facilities to municipalities, local community groups, and the private sector.

Local management of harbour facilities has its benefits, but it can also pose major challenges for the local groups responsible for operating and maintaining the facilities. Adding to these challenges are the significant changes taking place in many coastal communities across the province. These include changes in demographics such as age and household income, and in population due to migration from rural to urban areas. These trends have had major social and economic effects on the communities and their ability to support their working waterfronts.



▲ *Figure 6: Images, left to right: Types of working waterfronts. Canada Port Authority Port: Container Terminal, Port of Halifax; Local or regional port: Port of Bridgewater, Bridgewater (Source: Port of Bridgewater Inc., 2005); Small Craft Harbour: Digby.*

Statistics show changes have occurred in some of the smaller rural waterfronts since 1991. We examined social and economic statistics on income per household, housing repair, labour force participation, and population change. Using this information, we created a simple classification system to identify four types of working waterfront communities.

Types of working waterfront communities

TYPE 1] HEALTHY

These communities are well-off and demographically strong, such as Musquodoboit Harbour, HRM in 2006.

TYPE 2] TRANSITIONAL

These communities are moderately well-off but show a significant decline in population. In 2006, no communities were in transition. For example, LaHave, Lunenburg County rose from transitional to healthy from 1991 to 2006.

TYPE 3] DECLINING

These communities are less well-off and are showing a significant decline in population, such as Weymouth, Digby County in 2006.

TYPE 4] OTHER

Eskasoni, Cape Breton, is a community that doesn't fit in with the other classification types. It was not well-off but showed a significant increase in population in 2006.

Evidence shows a general decline in the well-being of those communities associated with the small working waterfronts. We examined 93 coastal communities that support the small craft harbours for the period between 1991 and 2006. We found that the number of communities in the healthy category remained almost the same, at approximately 30 per cent. However, the number of transitional communities declined from 29 per cent to almost zero, while the opposite happened in declining communities. They increased in number to about 65 per cent by 2006.

3: PUBLIC COASTAL ACCESS

Public coastal access is about people's ability to view, reach, and move along the shoreline of the mainland and islands of Nova Scotia. Economic, legislative, or physical barriers can contribute to the loss of this ability. For example, barriers to access can be the high price of coastal property or laws that protect the rights of private property owners. Physical barriers can be created by weather, terrain, or structures. Access to the coast has changed significantly over time, mostly because of shifting land-use patterns and property ownership.

There's currently no federal or provincial legislation that ensures universal access to the coast. Laws deal mainly with preventing trespassing, regulating economic activities, restricting the use of vehicles, and building infrastructure such as wharves and ramps. These laws can all contribute to restricting public access.

On the other hand, the government promotes coastal access in other ways, such as by having public wilderness trails, parks, protected areas, and tourist sites. Crown land, which is a public asset, may also provide access. Unfortunately, free access to the coast isn't always guaranteed because there are often restrictions within these public areas.

With the information that we have right now, it isn't possible to determine the area or length of the Nova Scotia coast that is reachable by the public. Land ownership, however, is one way to tell how much land could provide access. Approximately 1,500 km of coastal frontage is owned by the federal, provincial, or municipal governments – in other words, publicly owned. The rest is privately owned and isn't legally accessible to the public without permission from land owners.

The public's perception of access to the coast varies. However, people seem most concerned about the ownership of coastal frontage, the lack of good coastal planning, and the need to designate and maintain coastal frontage for public use. As a result, the purchase of land by government and other institutions is a good way to help achieve public access to the coast. For example, in the past five years, the provincial trail network has grown by approximately 1,500 km. Although much of this network isn't located directly on the coast, some parts are strongly linked to it and provide access to ocean scenery and viewpoints.



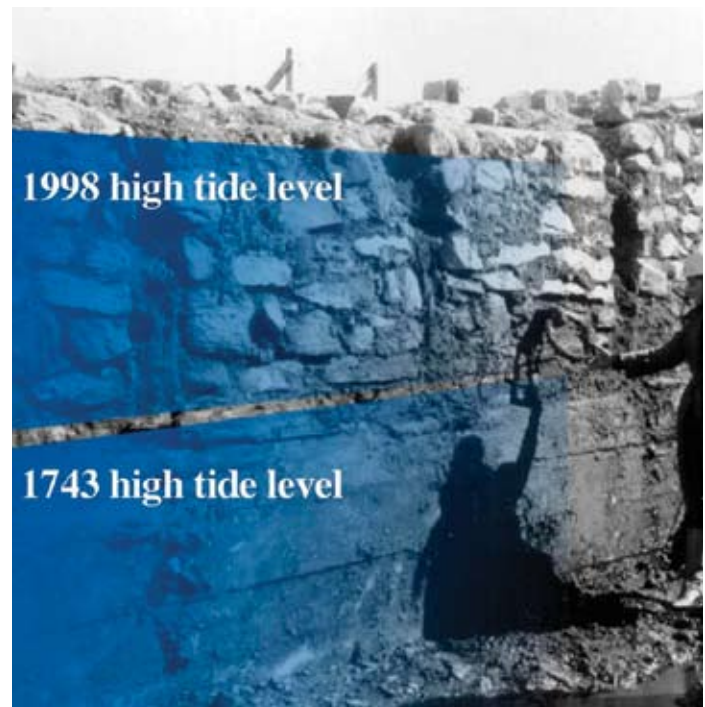
▲ *Figure 7: Images, left to right: Some popular places to access the coast in Nova Scotia. Cape Breton Highlands National Park; Boardwalk in Lunenburg (Source: CBCL Limited); West Mabou Beach*

4: SEA LEVEL RISE AND STORM EVENTS

Sea level is rising long term in Atlantic Canada for a combination of reasons. These include a general rise in average sea level since the last ice age, regional subsidence, or sinking of land relative to the sea, and global warming associated with climate change.

The present rates of sea level rise are different over the length of the Nova Scotian coast, because land isn't subsiding at the same rate across the province. For example, in Halifax water level readings already show a relative sea level increase of 30 cm per century, mainly due to land subsidence. This is a trend that is expected to continue at varying levels across the province for centuries to come. On top of this, additional increases in global sea level as a result of global warming means that Nova Scotia will see a total rise of 70 to 140 cm over the next century. Figure 8 shows how sea level has changed at Louisbourg.

We can expect this rise in sea level to have many effects, both on the biological and physical environment, as well as on the human environment. Research shows that much of Nova Scotia's coast will feel the effects of sea level rise, with the Atlantic-facing shoreline being particularly sensitive.



► *Figure 8: Sea level rise at Fortress of Louisbourg. (Source: Taylor et al., 2000)*

Nova Scotia is subjected to a wide range of storms, including extra-tropical and tropical cyclones and hurricanes. Such storms can cause enormous social and economic harm by damaging and destroying property and infrastructure, and even human life. Figure 9 shows examples of recent substantial storm damage in the province.

The phenomenon of storm surge is particularly important, because it causes waves to pile water onshore, creating a higher possibility of damage. Storm surges occur when seawater is driven onshore by a storm's high winds and low pressure. The highest storm surges tend to occur along the province's Northumberland Shore, along western Cape Breton, and at the head of the Bay of Fundy.

Projections by researchers show that because of climate change, tropical storms in the Northern Hemisphere will get more intense and track farther north than before. This result, combined with the rise in sea level, means that a storm's consequences to the coast will be much greater than before. We can identify many potential effects on our land and communities, but there isn't enough information to measure their cost. These would include economic, social, and ecological costs. Estimates do show that one of the most recent storms, Hurricane Juan, caused a total of \$130 million in losses to Nova Scotia.



▲ *Figure 9: Images, left to right: Recent storm damage in Nova Scotia. Large waves from Hurricane Bill at Cherry Hill Beach, Queens County (Source: Tim S. Conrad, 2009); Damage in Prospect, HRM, from Hurricane Juan (Source: Doug Mercer, 2003); Debris across road at Lawrencetown Beach due to Hurricane Bill, Lawrencetown, HRM.*

The areas at greatest risk include

- areas that are low lying, such as Acadian dykelands
- areas with frequent storm conditions and high storm-surge potential
- areas with coastal infrastructure and property
- areas of sensitive ecology
- areas of rapid coastal erosion

Generally, coastal risks need to be dealt with at the municipal level, with support from the provincial and federal governments, particularly with research. There are many programs currently underway. However, there are some gaps in information. For example, there's no current method to define socio-economic values of natural systems and human structures at risk. We also need more detailed information for better flood-risk mapping.

5: COASTAL WATER QUALITY

Coastal water quality is influenced by natural geological and oceanographic processes, and by human activities. Human threats to coastal water quality come from land, shoreline, and marine activities.

Examples of human-created impacts to water quality can include

- municipal discharge from wastewater treatment plants
- failing domestic septic systems
- industrial discharge
- petroleum-refining wastes
- nutrient loading from fish processing plants, aquaculture operations, and farms
- sediments from land-based activities such as forestry and agriculture
- heat-generating wastes
- mining wastes
- dredging
- ocean dumping
- ballast water discharged from ships
- activities by shipyards
- activities by the offshore oil and gas industry

We can't determine an overall picture of the condition of Nova Scotia's coastal waters because there isn't a single source of information that shows this. But we can determine the water quality in certain areas of the province where the quality is monitored.

Monitoring is undertaken to ensure waters are safe for a variety of users or because the areas have known contamination or the potential for contamination. These include public beaches, shellfish harvesting regions, and waters showing increased algal blooms. Many of these areas are close to urban development. For example, several harbours and estuaries show high levels of contaminants, including organics and heavy metals. These are found in water, sediment, and biological material.

If we examine the closures of public beaches, we can find evidence of poor water quality. For example, some public beaches have closed because of elevated levels of bacteria, which pose a health risk. Rain storms increase water flow from land, emptying high organic loads into coastal waters. This flow can cause contamination from bacteria. These closures are of particular concern in more highly developed areas where beaches are popular for recreational use.

Restricted harvesting in shellfish areas is an indicator of poor coastal water quality in Nova Scotia. Between 1985 and 2000, the number of closures has doubled. In 2000, there were 278 shellfish closures along 3,314 kilometres of coastline, covering 939 square kilometres. This trend seems to have continued. *(Correction – As the result of a news report, we*

have recognized an error in the presentation of one piece of statistical data in the 2009 *State of Nova Scotia's Coast Report*. The error is in the statistics reported for total shellfish catch on page 188 of the Report and page 16 of the Summary Document. Overall, shellfish landings for 2003 were 155,338 metric tonnes not 317,556 metric tonnes. The 317,556 number is total landings of all fish and shellfish combined. The 2006 stats (127,969 metric tonnes) do show a decrease in the total quantity of shellfish landings; however, the number is not as significant.)

Figure 10 shows the trend of closures from both Nova Scotia and Atlantic Canada over a 60-year period.

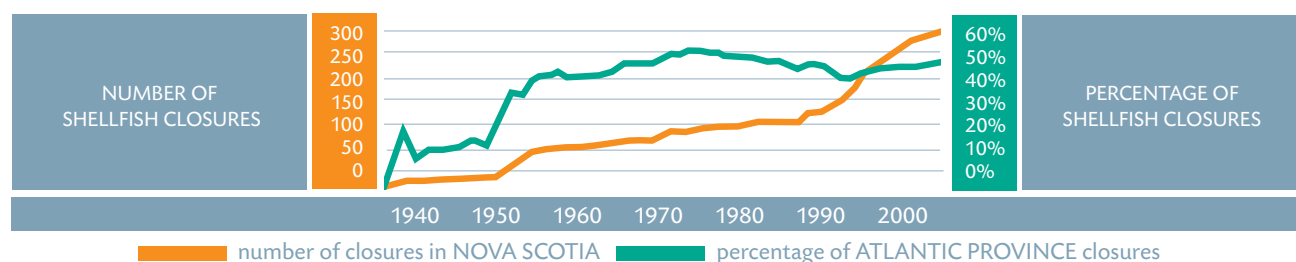


Figure 10: Shellfish closures, Nova Scotia. 1940–2000

We can determine another important water quality problem in the unwanted growth of algae. Land-based sources of nutrients, such as nitrogen released from failing or inadequate septic systems, can encourage excessive growth of algal blooms in coastal waters. These blooms lower the oxygen content in water, which can cause massive deaths of other marine organisms. Monitoring shows that coastal waters off parts of Cumberland, Pictou, Antigonish, Inverness, Colchester, Kings, Annapolis, and Digby counties may be at an increased risk for algal blooms.

Another concern is a lack of knowledge of the water quality and its effect on nearshore areas such as estuaries, salt marshes, the intertidal zone, or area between high and low tide, and open water areas.

People assume that because a large percentage of Nova Scotia's coastline remains undeveloped or has only light residential development, the overall quality of the province's coastal waters must be good to excellent. However, several factors show poor water quality in some areas. We haven't been able to determine coastal water quality provincewide, because current monitoring or reporting only covers specific areas in the province. Several monitoring initiatives for water quality are underway, but we must broaden and unite coverage and reporting.

6: SENSITIVE COASTAL ECOSYSTEMS AND HABITATS

The ecosystems and habitats of Nova Scotia are in relatively good condition. But it is important to continue to learn how the different coastal ecosystem types interact with one another and how the individual systems work together as a whole. That way we can get an overall picture of the ecological health of the province.

We can discuss the province's coastal ecosystems only in general terms in *The State of Nova Scotia's Coast Report*. Most scientific studies have gathered data on aspects of individual ecosystems rather than on how these ecosystems interact as a

whole. As a result, there's currently no way to quantitatively assess or agree upon their degree of sensitivity relative to each other. While we can make some qualitative assessments about the levels of risk that they face, we need to improve how we monitor and evaluate their condition. Only then can we understand the nature of the changes that are taking place in our coastal ecosystems and how human development and activities are contributing to this change.

The coast can be broken into 13 coastal ecosystems, as shown in Figure 11 and Table 1.

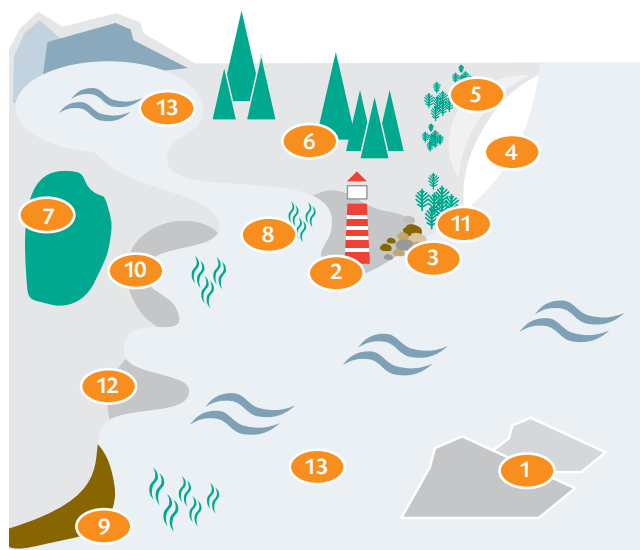


Figure 11: Coastal ecosystems of Nova Scotia.
See Table 1 for numeric legend.

The main way that we conserve sensitive ecosystems and habitats today is by designating federal and provincial protected areas and parks. Nova Scotia currently has 452,581 hectares of land that is protected, or 8.72 per cent of the province. But only some of these designated protected areas are located on or near the coast and are positioned to provide specific protection to coastal ecosystems. In Table 1 we identify some potential threats to each ecosystem.

ECOSYSTEM TYPE	RISK LEVEL	POTENTIAL THREAT
1. Coastal Islands	moderate	sea level rise and shoreline development
2. Rocky Shore	low	human disturbance through residential and industrial development
3. Boulder / Cobble Shore		
4. Sandy Shore	high	sand and gravel extraction, recreational all-terrain vehicle (ATV) use and the construction of roads, buildings, and coastal structures
5. Dune System		
6. Coastal Forest	low	forest harvesting, road building, ATV use, and the construction of buildings and coastal structures
7. Coastal Barren		
8. Estuaries	high	industrial and commercial development, invasive species, and agriculture and forestry practices
9. Mud Flats		
10. Coastal Wetlands	high	infilling and development, construction of dams, and changes to natural tidal influences
11. Tidal Marsh		
12. Dykelands	low	climate change and sea level rise
13. Open Water / Bras d'Or Lakes	high	large area subject to ecological, recreational, industrial, and cultural activities

Table 1: Risk level and potential threat to each coastal ecosystem type in Nova Scotia.

FACTORS TO BE TAKEN INTO ACCOUNT

Nova Scotia's coastal ecosystems occur intermittently along the length of the coast, providing the shores with a rich variety of flora and fauna. One example of the diversity is the Bras d'Or Lakes area, a large body of water dominating the centre of Cape Breton Island. The lakes, considered almost an inland sea, are one of the most unique and ecologically important open water systems in the province. They form a series of linked estuarine water bodies, considered unique because of their brackish waters yet protected inland nature. Figure 12 shows photos of three types of ecosystems, including coastal islands, coastal barrens, and open water systems.



▲ *Figure 12: Images, left to right: Some coastal ecosystems in Nova Scotia. Coastal islands: Great and Selig Islands, Queens County; Coastal barrens: Canso, Guysborough County; Open water system: Bras d'Or Lakes, Richmond County.*

The Bras d'Or Lakes area is just one example of the importance of Nova Scotia's coastal ecosystems. Given the great value of our coastal ecosystems, we must ensure their conservation and sustainable use for generations to come.

Factors to be Taken into Account

When we draft the strategy to address each of the six priority coastal issues, we must take into account several important factors. These factors, which are briefly dealt with below, will play a strong role in its development.

COMPLEXITY OF NOVA SCOTIA'S COAST AND ITS NATURAL ENVIRONMENT

Nova Scotia has a complex natural environment, even though the province is relatively small in comparison with the rest of Canada and the North American continent. This complexity means that Nova Scotians must adapt in order to establish and operate infrastructure, businesses, and economic activities that are affected by the environment. Some human occupations that may be influenced by the natural environment include municipal infrastructure, utilities, tourism, recreation, transport, fisheries, agriculture, and forestry.

Natural features of Nova Scotia include

- a unique geological structure
- a coast of 8,000 km that increases to more than 13,300 km when bays, estuaries, coastal rivers, and coastal islands are considered
- a complex ecology, broken into nine distinct ecoregions with 25 smaller ecodistricts

- a climate that varies greatly over time and space, as shown by the nine distinct areas of climate in the province
- 46 primary watersheds which all discharge into the marine environment
- a landscape consisting of a network of different-sized terrestrial and aquatic corridors, dominated by forestry and wetland vegetation with associated fauna

BALANCING A SERVICE-BASED ECONOMY WITH A NATURAL RESOURCES ECONOMY

Nova Scotia's present economy is largely service based. 76 per cent of its 2007 real GDP came from service industries while only eight per cent came from natural resource-based industries. Service industries continue to contribute more to the economy, while natural resources contribute less. If this trend continues, we must ensure that coastal natural resources are not neglected, because these are important economic drivers, especially in rural and coastal areas.

ZONES OF INFLUENCE AND ZONES OF IMPACT

When we examine a specific issue in relation to a coastal zone, it is difficult to define the specific physical boundaries of that zone. There isn't currently a universal scientific system in place that does that. This is because each issue relates to a part of the coast that may be different in physical size, depending on the issue.


We can consider a coastal section in terms of two zones, a zone of influence, based on where a problem originates, and a zone of impact, where the problem becomes noticeable. This means that a coastal zone will change in physical dimensions depending on the issue we are examining.

The zone of influence is generally greater than the zone of impact. For example, the water quality of a small estuary may be impacted by any number of land-based activities occurring within the watershed that drains into the estuary. In this example, the zone of impact is the estuary and the zone of influence is the entire watershed. It's better to find the source of the problem rather than just treating the impacted area, much like discovering what allergies a person has rather than treating the symptoms.

The development of a strategy for a particular issue must take into account the physical dimensions of these two zones and how they interrelate. Effective management of the coastal zone will require strategies that include consideration of the physical dimensions of these zones, and how they integrate with the ecological and socio-economic characteristics of that part of the province.

DEMOGRAPHIC TRENDS

The total population of Nova Scotia hasn't changed much over the last 10 years, but people have migrated to central Nova Scotia, especially HRM. Over 40 per cent of the province's population now lives in HRM, which is an 8.7 per cent increase. Population has also grown in Hants County, Colchester County, and Kings County, although at lower rates. Other counties in the province have decreased in population. For example, Lunenburg County lost one per cent of its population, while Guysborough County lost 17 per cent.



Another demographic change is the aging of the population. 40- to 60-year-olds form the largest age group, and about 15 per cent of Nova Scotians are older than 65. As the baby boomers get older, the population of seniors is expected to increase by 70 per cent within the next 20 years.

THE IMPORTANCE OF HERITAGE AND CULTURAL RESOURCES

Modern Nova Scotia is a mix of many cultures. People's origins include Mi'kmaq, British, French, Acadian, African, Middle Eastern, German, other European, and many other cultures. Each of these cultures has its own special history of colonization and development. Many coastal resources, areas, and sites have special importance to each of these cultures, as they represent their heritage in the province. Conservation of cultural heritage resources is an important part of comprehensive coastal management and will need to be included in the strategy development.

MULTIPLE AND CONFLICTING JURISDICTIONS

Nova Scotia has at least 45 pieces of international, federal, provincial, and municipal legislation that deal with its coastal areas and resources. These multiple laws and mandates are needed by governments. However, they can be one of the biggest stumbling blocks to achieving an integrated approach to coastal management and sustainable development.

APPROPRIATE LAND-USE PLANNING AND MANAGEMENT

Nova Scotian communities have tended to develop from settlements that were established along the coast. Over the years, development has mostly increased gradually in an add-on fashion, such as along existing roadways. On the coast especially, residential development has occurred in a linear fashion along shoreline roadways, and waterfront property has become extremely desirable. This pattern of sprawling coastal development often affects the coast negatively, and it may not be the best way to sustain an area's communities and resources over the long-term.

Planning and management of coastal land fall within different jurisdictions. They are subject to various community interests, policies, regulations, and laws. This situation does little to promote integrated management and can be confusing or conflicting. A more integrated and comprehensive approach could help to better understand the various coastal issues and the policies and practices needed for effectively managing them.

MANAGEMENT OF KNOWLEDGE AND INFORMATION

Good management decisions are made when the involved parties are well informed about the issues. *The State of Nova Scotia's Coast Report* highlights the complex social, economic, and natural environment relating to the Nova Scotia coast. It also highlights the many unknowns and areas where decision makers don't have enough information. This means that current knowledge, opinions, and decision making often must be based on observations rather than hard facts. Because of these issues, knowledge management must be included when developing, planning, carrying out, and evaluating any future coastal strategy.

Knowledge management includes activities such as

- research and education
- guidelines and standards, or accepted values
- processing of information, including communication and reporting
- inventory and stocktaking
- monitoring and evaluation
- databases

WHAT HAPPENS NEXT?

INTEGRATING COASTAL ZONE MANAGEMENT AND MEASURING ITS PROGRESS AND EFFECTIVENESS

Integrated coastal zone management is an extremely complicated and involved process. It requires the coordinated participation of stakeholders from many government, non-government, industrial, academic, and community organizations. Worldwide, many coastal management programs have had challenges getting the necessary cooperation from the various stakeholders. One of the main reasons these programs have had problems is that the right governance systems didn't exist. Setting up good governance systems for government and stakeholder groups can help ensure the groups are accountable for the decisions and plans they make. A good system will also ensure that groups can monitor progress and performance.

Integrated management programs can't be effective without taking specific factors into account, including the following

- identifying agreed-upon goals for society
- defining workable and achievable goals
- identifying responsibilities and accountability
- dividing resources appropriately
- measuring and evaluating progress and performance

What Happens Next?

The provincial government will hold a series of public consultations to hear what Nova Scotians have to say about managing the priority coastal issues. Staff will take that feedback, along with the information in *The 2009 State of Nova Scotia's Coast Technical Report*, and draft the *Sustainable Coastal Development Strategy*. Following additional feedback, the provincial cabinet will determine when a final strategy will be released. Using the strategy as a guide, the province's coastlines can be managed in a way that will protect this vital asset for future Nova Scotians.

More Information

This summary report is based on the complete *The 2009 State of Nova Scotia's Coast Technical Report* and six fact sheets on the priority coastal issues. To read more about the state of the province's coast, visit our website at www.gov.ns.ca/coast.

References

Figure 3; *page 7*: Ecoregions and ecodistricts of Nova Scotia. (Source: Neilly et al., 2003, Re-illustrated 2009 for this report)
Figure 8; *page 14*: Sea level rise at Fortress of Louisbourg. (Source: Taylor et al., 2000)




NOVA SCOTIA

www.gov.ns.ca/coast

HRM Climate SMART Community Action Guide to Climate Change and Emergency Preparedness

September, 2006



Table of Contents

INTRODUCTION	1
Why a HRM Climate SMART Community Guide to Climate Change?.....	1
What Can We Do?.....	2
What Are the Key Elements of the Climate SMART Community Action Guide to Climate Change?.....	2
What is Climate Change? What is Global Warming?	3
Why Should We Be Concerned About Global Climate Change?.....	3
How Do We Deal With This?.....	6
WE CAN BE CLIMATE SMART!.....	7
Mitigation: REDUCE GREENHOUSE GAS EMISSIONS.....	7
Adaptation: TAKING ACTION TO REDUCE THE RISKS FROM CLIMATE CHANGE IMPACTS.....	11
CLIMATE CHANGE RESOURCES AND EMERGENCY LINKS.....	22
REFERENCES AND LINKS	23

Cover Page Photo Credits

Flooded Road Sign	Courtesy Jerry Watson
Snowstorm	Courtesy Halifax Regional Municipality
Satellite Impage	Courtesy National Oceanic and Atmospheric Administration

ACKNOWLEDGEMENTS

The Halifax Regional Municipality (HRM) is pleased to offer this *HRM Climate SMART Community Guide to Climate Change* to the HRM community.

This practical Guide was made possible through the generous funding of Natural Resources Canada's (NRCan) Climate Impact & Adaptation Program (CCIAP), the Federation of Canadian Municipalities (FCM) Green Fund, and the Nova Scotia Department of Energy (DOE).

Special thanks to the Nova Scotia Department of Environment & Labour (NSEL), and Environment Canada Atmospheric Science Division, Atlantic Region, for their technical and resource support to bring this Guide to fruition.

Technical advice and professional content development was provided by participating member agencies of the ClimAdapt network www.climadapt.com.

Thanks to the Lake Echo Volunteer Fire Station for their participation in a focus group that helped validate the benefits and practicality of Guide. Thank you also to HRM Fire and Emergency and Halifax Regional Police for their feedback.

Inspiration for development of this Guide came from the UNESCO/CDERA *Community Emergency Plan*, & *Family Emergency Plan*: <http://www.cdera.org/preparedness/>.



Halifax Regional Municipality



Peter J. Kelly
Mayor

1841 Argyle Street
PO Box 1749
Halifax, Nova Scotia
Canada B3J 3A5

Tel: (902) 490-4010
Toll free: 1-800-835-6428

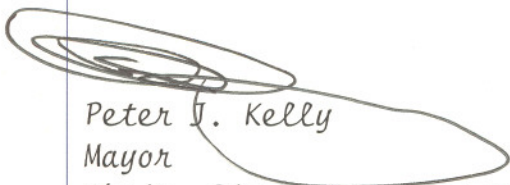
Fax: (902) 490-4012
Email: kellyp@halifax.ca
Website: www.halifax.ca

Mayor's Message for the Community Guide

Climate change and its impacts on our community are one of the most important issues the Halifax Regional Municipality faces in being a healthy, sustainable, vibrant Community. In fact, our leadership approach to climate change has received both national and international recognition.

The Climate SMART project team in collaboration with the HRM's Sustainable Environment Management Office; Fire and Emergency Services; Emergency Measures; and Regional Police has prepared this Community Climate Change Guide to help each of us address climate change at an individual and community level. Responding to climate change is a shared responsibility between governments, businesses and residents. This Guide provides residents with simple steps to reduce their impact on global warming, but more importantly, how to adapt, prepare and respond to the potential impacts of climate change on our community. This Guide serves as an important resource for each of us to use to be prepared for climate change and its impacts on our Region.

Respectfully, I remain



Peter J. Kelly
Mayor

Chair, Big City Mayors Working Group on
Public Safety, Security and Emergency Preparedness



Printed on recycled paper

From Our Project Partners

The Nova Scotia Department of Energy is pleased to support the development of the Climate SMART community guide. We all have a role to play in helping slow climate change, and it's important that we learn how to deal with the effects of a changing climate on our environment.

We can reduce greenhouse gas emissions by changing the way we consume energy. More renewable power, increased emphasis on energy efficiency, and smart transportation choices can all help; however, the biggest challenge is changing our behaviour and understanding that small changes create big differences - like driving less and converting to energy efficient lighting. Remember, it starts with each of us.

Bill Dooks
Minister, Nova Scotia Department of Energy

“We have supported the Climate SMART project from the beginning because it is an important resource for individuals and communities”, said Environment and Labour Minister Mark Parent. “The project is consistent with our Green Plan which ensures cleaner air, reduction in greenhouse gases and better understanding of the impact of climate change.”

Mark Parent
Minister, Nova Scotia Environment and Labour

The Nova Scotia Environmental Industry Association has been an on-going partner and supporter of the ClimAdapt and Climate Canada Atlantic networks and we have strongly supported HRM in the Climate SMART initiative.

The Halifax Regional Municipalities’ unique approach to climate change was of major interest to participating municipalities, agencies and groups who participated in the COP11/MOP1 conference in Montreal in 2005. We have received many inquiries since that time on the project through the ClimAdapt website.

This practical guide helps bring both aspects of climate change-reducing greenhouse gases and adapting to a changing climate-to the community and individual levels as well as providing guidance on how to be prepared for and what to do in the event of a climate related emergency.

NSEIA is proud to be associated with this unique and dynamic approach to dealing with climate change.

Rick Joseph
Executive Director NSEIA & ClimAdapt host

INTRODUCTION

Why a HRM Climate SMART Community Guide to Climate Change?

One of the greatest challenges facing the world is from global climate change.

In 2003 and 2004, Nova Scotians and we in HRM experienced several extreme weather events - an ice storm, torrential rains and flooding, Hurricane Juan, and the Blizzard of '04 (also known as White Juan). In response to concerns about global climate change and the impacts from such extreme events, which are associated with climate variability brought about from increased emissions of green-house gasses, HRM initiated Climate SMART (Sustainable Mitigation and Adaptation Risk Toolkit). Climate SMART is a leading edge partnership between HRM, the Province of Nova Scotia, the Government of Canada, and private companies. Its goal is to develop management and planning tools to prepare for climate change impacts, and to develop strategies to reduce practices that contribute to global warming in the first place - primarily by reducing greenhouse gas emissions.



After Hurricane Juan
Photo from HRM



Blizzard of '04
Photo from HRM

HRM is making major contributions towards improving air quality and reducing greenhouse gas emissions through sustainable land use planning through its Regional Planning process. HRM is also presently working on a *Clean Air Strategy*, a comprehensive, "all in one place" document or framework to help guide HRM towards clean air for all its residents. As part of the Climate SMART initiative, in 2005 Regional Council unanimously approved a plan to reduce greenhouse gas emissions from municipal operations by 20% from 2002 levels by 2012. HRM is now incorporating measures to reduce GHGs from its buildings and vehicle fleets. In 2006, HRM Council unanimously approved a plan for challenging and supporting the HRM community

to reduce GHGs generated by residents, commuters, businesses and industry by 20% below 2002 levels by 2012. These plans include HRM's Corporate Greenhouse Gas Emissions Reduction Plan, Community Greenhouse Gas Emissions Reduction Plan and the Climate SMART strategy. Copies of these plans are available at <http://www.halifax.ca/climate/index.html>.

HRM recognizes that effective action to address this global problem can only be achieved through a consolidated effort by all stakeholders, including public and private sectors, and community groups. This ***Community Guide to Climate Change*** has been prepared as one of the tools to assist the HRM community to do its part to minimize climate change and to adapt to its consequences.



Flooding in 2003
Photo Courtesy of Claude Barbeau

What Can We Do?

As residents and businesses in HRM:

- We can **reduce the greenhouse gas emissions** that cause climate change and its unwanted impacts! This is referred to as “mitigation”.
- We can **be prepared for changes in our climate** by taking steps that will help us to cope with likely impacts. This is referred to as “adaptation”.

This Climate SMART Community Action Guide compliments existing Provincial and Municipal disaster preparedness and response resources. Please note that emergency response is the responsibility of local authorities, such as the local fire department, Nova Scotia Community Services, HRM Emergency Management Operations (EMO), the Red Cross, police (Halifax Regional and RCMP), and other community authorities. However, the community can be prepared to respond to emergency events, until help arrives from local authorities. Our community can also assist when and where Provincial and Municipal EMO resources are stretched thin, such as during Hurricane Juan or the Great Maritime Blizzard, events which are *likely to increase in frequency as a result of global climate change*!

What Are the Key Elements of the Climate SMART Community Action Guide to Climate Change?

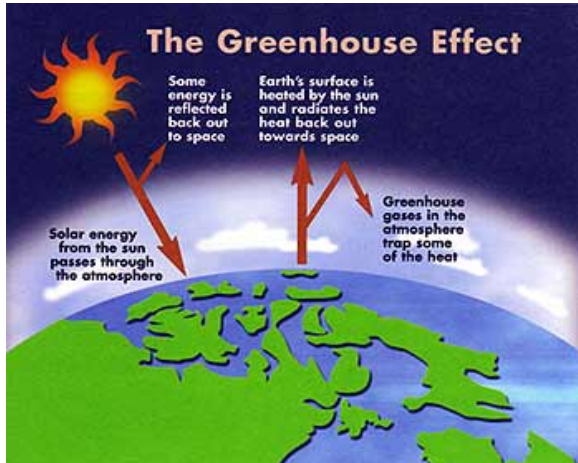
- The Guide provides information on climate change and its risks.
- The Guide suggests actions we can all take to reduce greenhouse gas emissions that cause climate change.
- The Guide provides the knowledge and the tools to help us organize our neighbourhoods to prepare for extreme weather events.
- The Guide will help us to develop a **Climate SMART Community Action Plan**.

Realistically, because of considerable maritime risk from climate variability and extreme weather events, the HRM community will not be able to adequately respond to these threats without incorporating risk management (“adaptation”), emergency preparedness and response, and greenhouse gas emissions reduction (“mitigation”) actions into their regular activities.

We hope this Guide will equip you (families, schools, community groups) with some minimum risk skills and practices to make your community and surrounding environment a safer, more resilient, and more climate ‘adaptive’ place to live.

What is Climate Change? What is Global Warming?

As you can see from the image below, a natural “blanket” of gases protect the earth from the sun’s more harmful rays, and acts like a greenhouse by trapping heat and keeping the earth at a temperature suitable for sustaining human, plant and animal life. This process is called the **Greenhouse Effect**.



Source: Government of Canada

What are Greenhouse Gases?

These are gases caused by the burning of fossil fuels (petroleum, coal) as well as agricultural and industrial activities. Greenhouse gases include carbon dioxide, methane, nitrous oxide, and chlorine-based gases. These gases affect our ozone layer and remain in the atmosphere for hundreds of years after they have been emitted.

However, while the greenhouse effect occurs naturally, carbon dioxide and other gases generated by human activity (called **Greenhouse Gases** or GHGs) have thickened this “blanket” of gases so that the Earth is warming up. This is **Global Warming**. The warming of the atmosphere is projected to drive other climate factors such as extreme weather events; therefore, the term **Climate Change** is being increasingly used to describe the full effects of increased carbon dioxide in the atmosphere.

Why Should We Be Concerned About Global Climate Change?

As a result of global warming, glaciers have been melting, sea levels have risen, and climate zones are shifting. While warmer temperatures may sound like good news to us, with our cool Maritime climate, climate change is more than a warming trend. Increasing temperatures will lead to changes in many aspects of weather. Some regions will experience more extreme heat, while others may cool slightly. Flooding, drought, and intense summer heat could result. Violent storms and other extreme weather events could also result from the increased energy stored in our warming atmosphere. Such climate change could have far-reaching and unpredictable environmental, social and economic consequences.¹

Over the present century, the increase in average temperatures in some regions of Canada, particularly the Far North, could be as much as 7°C. That may not sound like a big difference, but when we consider that today's average global temperatures are only about 5°C warmer than they were during the last Ice Age, we realize that even small changes can have a major impact. In North America, that 5°C change in global average temperatures was enough to melt the vast sheets of ice that once covered much of the continent.

Source: Government of Canada Climate Change website

¹ A more detailed explanation of climate change is provided on the HRM Climate SMART website (<http://www.halifax.ca/climate/index.html>)

- Climate change may cause severe weather events – hurricanes, thunderstorms, ice storms, hail, floods and droughts – to occur more often and be more intense.



- Changes in wind and weather patterns can change the amount of plant pollen and mould spores in the air, making conditions worse for people with allergies.

- As climate change brings warmer weather to higher latitudes, warmer weather diseases and pests - like the West Nile virus and the Japanese beetle - will follow.



- Changes to our ecosystem may make the outbreak of water-borne diseases more likely, and hotter weather may cause more outbreaks of illnesses at lakes and beaches.

- As climate change pushes temperatures higher, we can expect more smog days. More smog and more air pollution will cause increases in respiratory problems. The very young, the elderly, and those with chronic lung diseases, such as asthma, are at the greatest risk.

- Lakes and rivers can become contaminated during heavy rainstorms and floods from storm sewer overflows and contaminants picked up and carried by storm runoff.

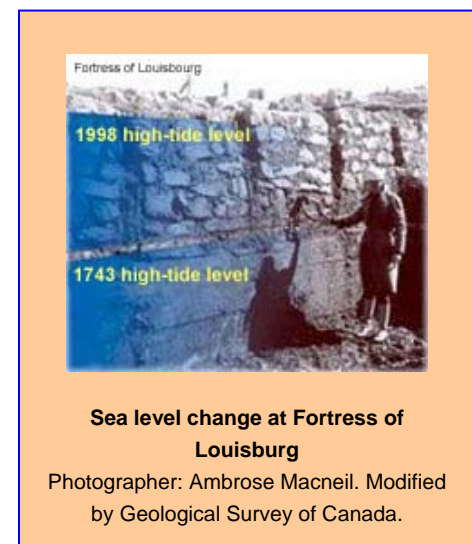


- Higher temperatures, if not balanced by higher precipitation, would lead to greater evaporation of our lakes and rivers. This could result in lower flows of water that could, in turn, lead to an increase in water-borne diseases and to poor water quality due to increased concentrations of pollutants.

- As temperatures warm, the oceans will expand, and ice caps and glaciers will melt, releasing much more freshwater into our oceans, causing sea levels to rise. Canadian research suggests that sea levels on the Atlantic coast of Nova Scotia could rise by 70 cm by 2100. Storm surges will be able to flood areas never before flooded. Low-lying coastal areas will be the most threatened.

- The majority of the Atlantic coast of Nova Scotia, including HRM, is highly sensitive to rising sea levels. The most sensitive areas are low-lying salt marshes, barrier beaches, and lagoons. Higher sea levels will cause increased erosion, smaller or disappearing beaches, and flooding of coastal freshwater marshes, and will affect coastal homes, cottages, bridges, wharves, breakwaters, and roads.

- Sea level rise will also increase the risk of saltwater intrusion into wells near the coast.



- Fish, including valuable commercial species such as salmon and cod, are very sensitive to temperature. Changes in water temperature in the oceans, lakes and rivers would likely impact fish growth, health and distribution, with potentially serious impacts on commercial and recreational fishing.
- Climate change may increase the range and extent of the organisms responsible for toxic algae blooms, such as red tides, requiring closure of fishing areas.
- Climate change may increase the risks to forests in Nova Scotia. For example, warmer winter temperatures may allow invasive insects, such as the gypsy moth, to become more pervasive, while warmer, drier summers would increase the threat of forest fires. Forest type may also be affected by climate change. As temperatures increase, our boreal forests may gradually be replaced by temperate forests.
- Higher temperatures, dryer soil and increased insect infestation are expected to reduce crop yields.



Source: A variety of sources including the Intergovernmental Panel on Climate Change, Government of Canada and others.

Use this HRM link to find a detailed summary of climate change impacts expected in the HRM area:

<http://www.halifax.ca/climate/index.html>.

How Do We Deal With This?




- **Be informed** about the risks from climate change.
- **Take action** to reduce green house gas emissions that cause climate change.
- **Organize** our neighbourhoods to **prepare** for extreme weather events and climate related emergencies.

We can do this in seven steps.

Mitigation: REDUCE GREENHOUSE GAS EMISSIONS

1. Step One: Inventory sources of greenhouse gas emissions in our homes and communities.
2. Step Two: Reduce our greenhouse gas emissions.

Adaptation: MANAGE THE RISKS AND PREPARE FOR CLIMATE RELATED EMERGENCIES

1. Step One: Be aware of how our community may be at risk from climate change.
2. Step Two: Know our vulnerabilities and resources.
3. Step Three: Minimize our risks through adaptation actions.
3. Step Four: Prepare a Climate SMART Action Plan to address climate related emergencies:
 -  What to Do Before
 -  What to Do During
 -  What to Do After
5. Step Five: Publicize, test & evaluate the Climate SMART Community Action Plan.

WE CAN BE CLIMATE SMART!

Mitigation: REDUCE GREENHOUSE GAS EMISSIONS

We can do our part to *mitigate* or lessen climate change by taking actions to reduce our greenhouse gas emissions. We can accomplish this through two steps.

The average Canadian consumer generates over 20 tonnes per year in greenhouse gases, mostly from driving our cars, heating our homes, and using electricity (David Suzuki Foundation: The Science of The Challenge).

Climate change and air quality problems (e.g., smog, acid rain) are largely caused by the same activity – namely, the burning of fossil fuels. In fact, burning fossil fuels such as coal, oil, gasoline and natural gas is the source of the majority of greenhouse gas emissions and air pollutants. Reducing the use of fossil fuels helps to combat both climate change and air pollution, while achieving other benefits. Burning less fossil fuels helps to protect biodiversity, saves money, addresses energy security issues, and saves our nonrenewable fossil fuels for more critical future needs.

STEP ONE **Inventory sources of greenhouse gas emissions** **in our homes and community**

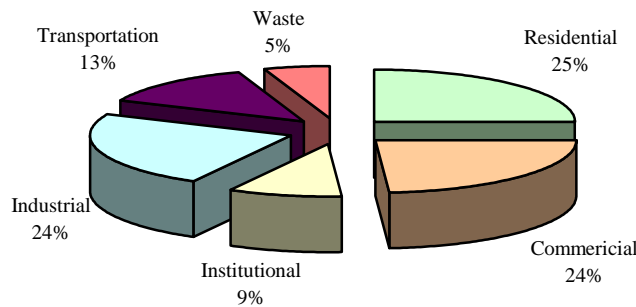
Sources of greenhouse gases include:

- Gas/diesel powered engines – which are found in cars, trucks, ATVs, snowmobiles, boats, etc.
- Heating equipment – including oil or gas furnaces and hot water tanks, and electric baseboard heating systems.
- Cooling equipment – including air conditioners.
- Fueled appliances – including BBQs, camping stoves and gas lights, which use propane, butane or other gases/fuels.
- Open-air burning of garbage.
- Electric appliances and equipment – stoves/ovens, microwaves, refrigerators, computer equipment, televisions, light fixtures, washers and dryers, etc.



In 2002, the residential sector was the largest contributor to greenhouse gases in HRM (through home heating and power use)². The transportation sector, which includes commuter travel, generated another 13% of total greenhouse gases.

² ICLEI Energy Services, 2005. Greenhouse Gas Emissions Inventory, Forecast & Target. Prepared for HRM.



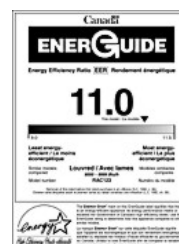
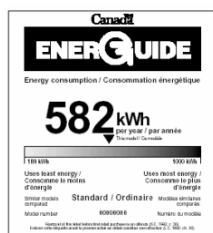
Greenhouse Gas Sources²

You can calculate the greenhouse gas emissions you produce in a year and learn how to reduce them at: <http://www.onelesstonne.ca/>

STEP TWO Reduce greenhouse gas emissions

Reducing greenhouse gas emissions means conserving energy, using energy more efficiently and using greener forms of energy. There are many things we can do to reduce the greenhouse gas emissions we produce individually and as a community, including:

- Use the information provided by two national programs when purchasing energy-using products to ensure that they are the most energy efficient. **EnerGuide** compares the energy efficiency of products, including different models of household appliances, etc. For some of these products, **ENERGY STAR®** goes one step further and identifies those models that meet or exceed premium levels of energy efficiency. The ENERGY STAR® symbol may even appear on an EnerGuide label. When you see ENERGY STAR® on an EnerGuide label, you can be sure that the product is among the most energy efficient available.



- When building or renovating your home, choose an ENERGY STAR® home, windows, sliding glass doors; install a new energy efficient furnace. (It can save you up to 25% of your home heating costs each year.)

- If available, switch from oil to natural gas for heating and appliances (this will reduce greenhouse gases and pollutants). At a minimum, have your furnace checked and maintained annually so that it operates as efficiently as possible.

- Install programmable thermostats and turn down the temperature by two degrees. (This will save approximately 500 pounds of carbon dioxide [a greenhouse gas] per year. You will also save money.)



- Keep blinds, curtains and windows closed during the day in summer. This helps keep your home cooler.

- Ensure you have proper caulking and weather stripping around doors and windows.

- Switch two standard incandescent light bulbs to more efficient ENERGY STAR®-qualified compact fluorescent light bulbs. (A savings of 424 kilograms of greenhouse gases/year.)



- Select the no-heat option on your dishwasher's drying cycle.
- Turn off lights and electrical equipment when you don't need it.
- Walk, bike and take the bus/ferry wherever possible.



Photo Courtesy of HRM



Photo Courtesy of HRM

- Purchase fuel-efficient vehicles. A car that averages 8 litres/100 km rather than one that gets 12 litres/100 km could save 2 tonnes of greenhouse gases per year (based on a savings of 4 litres/100 km and an average of 20,000 km traveled per year).
- Don't idle – when you let your vehicle idle longer than 10 seconds, you burn more fuel than you would restarting the engine. Even during our cold winters, a vehicle needs no more than 30 seconds of idling to “warm up” – driving your car will warm it up. For more information on idling, check the Natural Resources Canada website at: <http://oee.nrcan.gc.ca/communities-government/transportation/municipal-communities/articles/idling-myths.cfm?attr=8>.
- Maintain your vehicle properly – a poorly maintained vehicle can increase fuel consumption by up to 50 percent and greenhouse gas emissions by even more. Maintain proper tire pressure; operating a vehicle with just one tire under-inflated by 6 psi (40 kPa) can reduce the life of the tire by 10 000 km and increase the vehicle's fuel consumption by 3 percent. Virtually all of your vehicle's mechanical systems can affect fuel efficiency if not properly maintained. Follow the manufacturer's recommendations for checking the engine, cooling and ignition system, brakes, drive train and emission-control system. For more information, check the Natural



Resources Canada website at: <http://oee.nrcan.gc.ca/transportation/personal/maintaining/vehicle-maintenance.cfm?attr=8>

- Grow a healthy lawn naturally, and preserve/plant trees. Green areas act as “carbon sinks” - trees, other plants and the soil soak up carbon dioxide and temporarily store the carbon in wood, roots, leaves and the soil. By providing shade to homes and backyards, trees also have a natural cooling effect.
- Water conservation is linked to energy use. Typically, 15 percent of an energy bill goes to heating water. If you're keeping an older hot water appliance, insulate the heater itself and at least the first metre of piping. The insulation prevents the loss of valuable energy into thin air. If you're planning to buy or rent a new water heater, here's a tip that could save you up to \$100 per year: Bigger isn't necessarily better. Look at ways to reduce your hot water use. A low-flow showerhead can cut your water use in the shower by more than 30 percent. Fix leaky taps and install tap aerators that provide the same pressure with less water flow. Using low flow taps and toilets and replacing your showerhead with a low-flow model can save 127 kilograms of greenhouse gases/year. For more information, check the Natural Resources Canada website at: <http://oee.nrcan.gc.ca/residential/personal/water-conservation.cfm?attr=4>
- Start replacing fossil-fuel dependent devices with solar-powered ones, such as solar garden lights and solar powered camping generators.



For more tips on how to conserve energy, cut greenhouse gas emissions and save money, check Natural Resources Canada's Office of Energy Efficiency website:

<http://oee.nrcan.gc.ca/english/index.cfm> or Nova Scotia's Department of Energy's Quick Tips:

<http://www.gov.ns.ca/energy/AbsPage.aspx?ID=1509&siteid=1&lang=1>

Adaptation: TAKING ACTION TO REDUCE THE RISKS FROM CLIMATE CHANGE IMPACTS

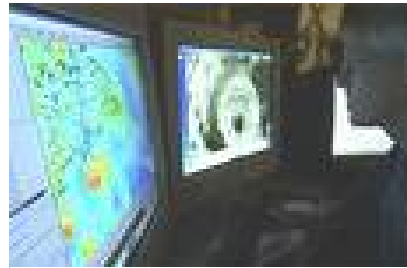
We can do our part to *adapt* to Climate Change by taking action to help communities and ecosystems cope with changing climate conditions. Adaptation measures come in many forms and include changing how we build homes and develop properties. Adaptation also includes emergency planning.

The following four steps describe how your community can adapt to climate change and be prepared for climate related emergencies.

Global climate change will likely increase the frequency and intensity of extreme events affecting HRM, including: tropical storms, hurricanes, coastal storm surges, flash floods, smog alerts, ice storms, and drought.



Blizzard of '04
Photo Courtesy of HRM



Hurricane Juan
Photo Courtesy of Government of Canada



Smoggy day in Halifax
Photo Courtesy of Government of Nova Scotia



Flood of '03
Photo Courtesy Claude Barbeau



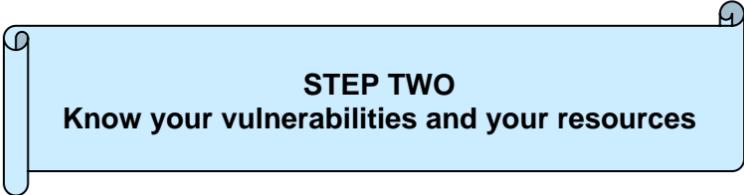
STEP ONE
**Be aware of how your community may be at risk
from climate change**

A Hazard is:
**A situation with the potential for human injury or death, damage to
property, damage to the environment, or some combination of these.**
From: HRM Master Emergency Plan

To understand which specific natural and human hazards can create an emergency in our local community, we need to:

- Be familiar with the damage (impacts) from past emergencies associated with natural weather events. Identify specific areas, buildings or activities that during past weather events have been affected by emergencies such as:
 - hurricanes and winter storms
 - storm surge
 - flooding
 - downed trees (and powerlines)
 - severe coastal erosion (undermining)
 - sewage overflows
 - water supply contamination
- Be familiar with climate change projections and expected extreme weather.
- We need to know our community – we need to involve a wide range of residents and business operators from our neighbourhood in planning for emergencies.

Details on the risks from climate change that are likely to affect HRM can be found at <http://www.halifax.ca/climate/change1.html>.



STEP TWO
Know your vulnerabilities and your resources

To determine your potential vulnerability, let's answer the following questions:

- Are there specific residents that are especially vulnerable to weather emergencies?
 - elderly neighbours
 - single parent families
 - neighbours that are disabled or less mobile
 - people who live far from other neighbours

- Are there specific residents/buildings/facilities that are particularly exposed to hazards?
 - In low lying areas and at risk from flooding
 - Near lakes/rivers and at risk from flooding
 - On the coast and at risk from storm surge
 - In exposed high elevation areas and at risk from wind and lightening
 - Located along forested/grassland areas and at risk from fire
 - Rely on shallow or coastal wells that may be impacted from severe weather events such as torrential rains, flooding and storm surges
 - Roads with large trees located next to overhead power lines that may be brought down by high winds, ice storms or hurricanes
- Are there any sensitive natural environments in our neighbourhood that are vulnerable to weather emergencies?
 - Wetland/pond that receives storm runoff (water flows may be excessive or contaminated during torrential rains, hurricane, etc)
 - Lakes, rivers, coastal areas that receive treated or untreated sewage discharges (where contaminants may spread to adjacent properties during storm surges, flooding)
 - Saltmarsh with nesting birds, which may be inundated by storm surge
 - Beach with nesting birds, which may be inundated by storm surge

Next, let's determine what resources are available in your community.

What is our capacity to face an emergency, adapt to it to reduce our risk, and prevent future damage?

A resource inventory informs us of the availability of community resources in an emergency. It also helps us determine: where the risks are; our ability to organize; what information is available; and how prepared we are to respond to emergencies.

Community Resources:
places, things and people that can be used to prepare for
and respond to emergencies.

To understand our potential capabilities for dealing with emergency events, let's identify:

- What volunteer base do we have? (How many individuals, what skills and equipment do they have?)
- What resources do we have available for managing a Climate SMART Community Action Plan (office space/equipment, meetings areas, neighbourhood website, community association)?
- What potential safe places are there within and near our community?
- What kind of equipment is available for sharing within our community (sump pumps, chain saws)?
 - Are we able to assemble basic emergency kits for volunteers?
 - What other useful resources do we have in the community for responding to weather related emergency events?



STEP THREE

Minimize risks through adaptation actions

We can minimize our risk of personal injury and property damage by taking action to adapt to Climate Change:

Minimize your risks:

- Don't build in high-risk locations such as low areas prone to flooding and coastal areas vulnerable to storm surge and erosion.
- Remove dead, damaged or dying trees and replant with new trees.
- Plant local varieties of trees, shrubs and flowers to reduce incidents of invasive pests and exotic species that may be more tolerant to changing climate regimes.
- Support green belts, parks and conservation areas in your neighborhood – they act as carbon sinks (which absorb greenhouse gases) and they help to manage stormwater runoff.
- Ensure the timely professional removal of any tree limbs from overhead power and telephone lines.
- Where possible, bury electrical and telephone cables underground on the property when building a new home.
- Organize community re-forestation activities to minimize erosion, flash floods and landslides.
- Recognize the value of water catchment areas, such as swales, wetlands, streams and ponds on your property - they handle stormwater flows.



Prevent stress to natural ecosystems so that they may be more resilient to floods, droughts, storms, and infestation:

- Do not discharge untreated sewage from homes and cottages into coastal areas, rivers or streams.
- Use natural fertilizers to reduce pollution of coastal areas and freshwater.

Adapt to increased risk for disease (West Nile in the future) from a northward drift of tropical parasites:

- Remove cans, bottles, old tires or other articles in your garden that may collect water and become breeding grounds for mosquitoes.

Adapt to risks to water supplies from storm events and from a changing climate (drier, hotter, flooding):

- Water gardens in the morning or evening to reduce evaporation.
- Respect water conservation orders.
- Recycle water – 'grey water' from sinks can be used to water gardens.
- Mend leaking water pipes; turn off water taps when not in use.
- If drinking water is supplied from a well, install a water treatment system.

STEP FOUR

Prepare a Climate SMART Community Action Plan

Plan what your community will do to prepare for and respond to climate related emergencies. Prepare a Climate SMART Community Action Plan using this Guide. A Climate SMART Community Action Plan has three phases:

1. Before the Emergency
2. During the Emergency
3. After the Emergency

Phase 1

BEFORE THE EMERGENCY - PREPARE

1. Establish a Climate SMART Community Action Team made up of community volunteers.

- Define the skill set available from your volunteers.
- Select a leader.
- Assign responsibilities.
- Assemble a list of team members, with contact information, and distribute amongst the group.
- Develop communication protocols (email, cell phones, order of contact).
- Determine support resources available to the team (secretarial, support from local community associations, meeting place, website access).
- Become educated on liability issues – understand what a volunteer should and shouldn't do in the event of an emergency.
- Become informed about emergency response agencies - who will be in charge, what each agency does (see Phase 2 - During the Event).
- Make contact with the local first response agency (likely the local Fire department) to inform them of the Community Action Plan and Team.



2. Identify risks and hazards in our community.

In order to quickly identify areas at risk during weather emergencies, we need to develop a **Risk Map** for our community.

A Risk Map can be simple and easy to prepare:

- Use a map of your community that shows all the streets by name as well as major environmental features such as lakes, rivers, and wetlands. (This can be a purchased map or hand drawn, or a combination - it just needs to be complete.)
- Identify particular properties and areas that are at risk and note the reason why.



- Update the map regularly if new roads are built.
- Ideally, the map would be available to volunteers via e-mail or on a community website. Otherwise make colour copies and distribute. All volunteers should have a copy.
- Provide a copy of the map to the local fire department.

A property may be at risk if:

- The bottom floor of the house is less than 3 metres above high tide.
- It is prone to flooding.
- The shoreline is eroding.
- There are large, dead or dying trees near the house or nearby power lines.
- The resident(s) are ill, elderly, have limited mobility, are single parents, etc.

3. Identify Community Resources.

The Team should identify and document the following resources:

☒ VOLUNTEERS

Identify a list of community individuals willing and able to assist the Climate SMART Community Action Team to respond in emergency situations. A list of names, addresses and contact numbers should be developed and maintained and accessible to several lead volunteers.

☒ SAFE PLACES

List and show on a **Resources Map** any green spaces, parking lots and community centres/arenas that could function as temporary emergency shelters /evacuation areas.

Emergency measures organizations will identify these for particular emergencies. Contact these organizations in an emergency to identify safe places nearest to your community and get the word out to your neighbours.

☒ FLOODING EQUIPMENT

Develop a list of sump pumps available in your neighbourhood, for residents to borrow in the event of an emergency.

☒ MEANS OF TRANSPORTATION

Develop a list of residents and business operators willing to transport equipment and/or people (to hospital, safe places) when those in need are not able to provide transportation themselves in an emergency.

☒ BASIC FIRST AID EQUIPMENT

Assemble basic first aid kits available to volunteers who will act in emergency situations.

☒ COMMUNITY ORGANIZATIONS

Develop and maintain a list of contacts (names and phone numbers) of agencies that may provide assistance to your community during emergencies. This may include the local Fire Department, Ground Search and Rescue, Red Cross, Salvation Army, Food Banks, and community associations such as ratepayers associations, Rotary or Lions Clubs, cultural and religious associations. Contact the local fire department to prioritize the list of contacts for your neighbourhood.

4. Identify the actions to be taken by the Climate SMART Community Action Team.

This may include:

- Practicing emergency response measures/plans before any emergency event.
- Meeting to identify areas/people at risk (using the Risk Map prepared in advance) once a weather warning is issued.
- Contacting at risk individuals to confirm their risk and to offer assistance.
For example, should the Team check on an elderly neighbour? Set times to check in. provide contact numbers to call if they need assistance.
- Contacting sump pump owners who have volunteered to share their equipment, to be on stand by when flooding is expected.
- Arranging transport of people and/or equipment, if necessary.



Actions may be specified for particular events such as hurricanes, power outages (particularly in winter time), flooding, storm surge, etc.

5. Inform the community of the Climate SMART Community Action Plan

This should also include education on individual preparedness. See the following list for recommendations on the contents of an emergency kit.

Individual Emergency Pack and Equipment

You should encourage everyone in your community to have emergency supplies available for times of power outages, severe weather emergencies or evacuation.

- Water (at least 2 litres per person per day for 3 days)
- Camping Stove, cooking fuel
- First aid kit
- Prescription medications required by family members
- Flashlight and batteries
- Candles with a sturdy holder
- Matches or lighter
- Battery operated or wind-up radio and batteries
- Cell phone for communication
- Non-perishable (canned & dry) food supply for at least 72 hours
- Can opener (manual)
- Cash
- Contact list of emergency services
- Extra warm dry clothing
- Extra keys.



The Nova Scotia Emergency Management Office website contains self-help brochures for individual preparedness. Refer to the "Be Prepared, Not Scared" brochure for more suggestions on preparing for emergencies.
<http://www.gov.ns.ca/emo/AbsPage.aspx?id=1003&siteid=1&lang=1>

The Public Safety and Emergency Preparedness Canada website provides information on what you can do during the first 72 hours of an emergency - <http://www.psepc-sppcc.gc.ca/prg/em/gds/genprep-en.asp>

Tip: If using a back-up generator, have it installed by a professional and operate it according to the manufacturer's directions, in order to avoid other hazards such as fire and carbon monoxide inhalation.

Phase 2 DURING THE EMERGENCY - RESPOND

Emergency response is the responsibility of organizations and authorities, such as the local fire department, HRM Emergency Management Operations (EMO), Halifax Regional Police, the RCMP, 911, the Red Cross, the Salvation Army, and Nova Scotia Community Services. A list of these agencies and contacts is provided at the end of this guide. These agencies have the responsibility, training and resources to:

- Issue orders for evacuation and inform the community.
- Identify safe places for evacuation.
- Provide emergency response and first aid.
- Deal with downed power lines.
- Clear streets of downed trees and debris.
- Identify which water supplies are contaminated and which are safe.



Photo Courtesy Nova Scotia Emergency Measures Organization

But, the community can be prepared to assist when and where EMO resources are stretched thin and until help arrives!!

The Climate SMART Community Action Team should initiate the Plan:

- The Team should briefly confer to assign and confirm responsibilities and availability of Team members.
- Establish contact with local emergency response agencies.
- In consultation with emergency measures authorities, identify meeting points and temporary community shelters to be available during the emergency. Systematically communicate with your neighbours:
 - Provide information on emergency procedures underway during an emergency.
 - Identify anyone requiring assistance.
 - Encourage residents to keep young children at home during the emergency.
 - Encourage residents to stay off the roads during the emergency to keep emergency routes clear for emergency and clean up vehicles.
- Team members to maintain regular communication amongst themselves.



- Provide assistance to residents in need:
 - Transport to safe places or medical facilities.
 - Arrange for temporary shelter and/or food supply within the community.
 - Locate and if necessary transport emergency supplies or equipment available in the community.
- Provide a preliminary damage assessment to local authorities.



Flooding in 2003
Photo Courtesy Andrew Spicer



Damage from Hurricane Juan Storm Surge
Photo Courtesy Chris Fogarty



Damage from Hurricane Juan
Photo Courtesy Peter Hayes

Phase 3 AFTER THE EMERGENCY – REHABILITATE & RESTORE

We can't avoid natural disasters, but we can minimize their impact and damage!

REHABILITATION

During this Phase, you can help to re-establish critical services and meet the needs of the affected community.

Rehabilitation actions may include the following:

- Organize Neighborhood Action Teams to assist with basic rehabilitation tasks such as helping to clear debris from houses and properties. *Please note that large trees and trees against or near powerlines pose a very real and significant danger and require removal by qualified individuals. Please*

contact HRM Transportation and Public Works or Nova Scotia Power in these situations. Be patient – staff will be very busy following extreme events.

- Conduct an assessment of local community damage and basic community needs, and report to the appropriate local authority.

RECONSTRUCTION
Reconstruction is the process of restoring structures and environment affected by the event to their original state.

Reconstruction actions may include:

- Cleaning up your own property and adjacent areas.
- Volunteering your support to municipal and community organizations in their efforts to repair/reconstruct local community buildings, facilities, and green spaces.
- Helping to set-up community-based neighbour-to-neighbour support groups to help victims overcome post-traumatic stress syndrome.
- Respect emergency public service announcements (tune in to Radio 97.9 FM), and pay particular attention to emergency curfews and traffic restrictions.



STEP FIVE
Publicize, test & evaluate the Action Plan

To test and evaluate the climate SMART Community Action Plan:

- Inform your community about the Plan.
- Provide information on the Plan (perhaps through a community meeting).
- Hold a realistic emergency simulation. This will tell you:
 - The Plan's effectiveness.
 - What works or needs changing to be effective.
 - Who knows and remembers what.



PLEASE REMEMBER:

Prevention and preparedness planning equip us for extreme weather and emergencies. They are the best community adaptation measures to reduce the risks associated with global climate change.



CLIMATE CHANGE RESOURCES AND EMERGENCY LINKS

Fill in the phone numbers for your community.

- **911** (Fire, Ambulance, Police)
- Local Fire Department _____
- HRM Emergency Measures Office: <http://www.halifax.ca/emo/index.html>
 - For emergency, dial 911
 - 24 hour non-emergency (490-5020)
 - general inquiries, Mon to Fri., 8:30-4:30 (490-5400)
- Nova Scotia EMO: <http://www.gov.ns.ca/EMO/AbsPage.aspx?siteid=1&lang=1&id=1>
 - General enquiries (424-5620)
 - 911 inquiries and information (424-6208)
 - toll free (1-800-388-3911)
- Nova Scotia Power Inc (NSPI): http://www.nspower.ca/customer_service/outage_information/
 - For power outages, 24-hour (428-6004)
- HRM Transportation and Public Works
 - For trees down on roads, snow removal, sewage overflows, road flooding
 - HRM Call Centre (490-4000)
- Nova Scotia Community Services: http://www.gov.ns.ca/coms/emergency_ss.html
 - Community Services Emergency Social Services Program (424-8333)
 - HRM Call Center (490-4000)
- Canadian Red Cross: <http://www.redcross.ca/article.asp?id=000283&tid=025>
 - Halifax Regional Office (423-3680)
- Salvation Army:
 - Halifax (422-1598)
 - Dartmouth (466-6847)
- Public Security Emergency Preparedness Centre (PSEPC): <http://www.psepc.gc.ca/>
 - 426-2082
- Environment Canada Climate Centre:
<http://atlantic-web1.ns.ec.gc.ca/climatecentre/default.asp?lang=En&n=0D8BAF5C-0>
(provides weather forecasts and warnings)
 - For weather reports (426-9090)

REFERENCES AND LINKS

Reference Documents/Links

- <http://www.halifax.ca/climate/index.html>
- WWF Climate Change in The Pacific Mitigation & Adaptation Community Action Guide: http://www.sprep.org.ws/att/publication/000431_CBDAMPIC.pdf

Other HyperLinks

- Red Cross/Red Crescent Climate Centre: Preparedness for Climate Change, Implications for the International Federation of the Red Cross & Red Crescent Societies. A Study to assess the future impact of climatic changes upon the frequency and severity of disasters, and the implications for humanitarian response and preparedness. www.climatecentre.org; climatecentre@redcross.nl
- Intergovernmental Panel on Climate Change (IPCC): www.ipcc.ch. The IPCC website includes a vast array of reports on current scientific consensus on climate change
- United Nations Framework Convention on Climate Change (UNFCCC): www.unfccc.org. The UNFCCC is the international mechanism for negotiations on climate change
- RETScreen International Clean Energy Decision Support Centre: RetScreen seeks to build the capacity of community planners, decision-makers and industry to implement renewable energy and energy efficiency projects by; developing decision-making tools. Tools include: software, training materials, e-textbooks and case studies relating to wind energy, small hydro, biomass and solar air/water heat. www.retscreen.net
- World Meteorological Association: www.wmo.ch. The WMO coordinates global scientific activity on issues like: weather prediction, climate change, depletion of the ozone layer, and air pollution. There are links to weather and climate forecasts, and a listing of National Weather Services
- United Nations International Strategy for Disaster Reduction (UNISDR): www.unisdr.org. The UN body that promotes disaster risk reduction
- Provention Consortium: www.proventionconsortium.org. The Provention Consortium, currently based at the International Federation of the Red Cross/Red Crescent in Geneva, is a global coalition of governments, international organizations, academic institutions, private sector and civil society organizations dedicated to increasing the safety of vulnerable communities, and reducing the impact of disasters in developing countries
- Netherlands Red Cross and Free Voice work jointly on climate change and disaster risk reduction in Central America and the Caribbean: The Netherlands Red Cross and Free Voice aim to strengthen the resilience of people most vulnerable to the risks of climate change in Guatemala, Nicaragua, Costa Rica, Colombia, Dominican Republic and Haiti, through partnerships, improved education, and community level actions
- www.novaweather.net. The website has reports and photos of major weather events and current weather information.