

The Community Engagement Process: A Governance Approach in Adaptation to Coastal Erosion and Flooding in Atlantic Canada *

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Climate change is an important topic attracting much public and media attention both at the local and global level. The latest report of the Intergovernmental panel on climate change (IPCC) confirms with 90 % certainty the anthropogenic origin of the increase in global temperatures, an increase that is predicted to reach 1.8 to 4 degrees Celsius before 2100 (IPCC 2007). As a consequence, expected sea-level rise for the next century is of the order of 18 to 59 cm, although the IPCC warns that the increase in sea-level could be even more severe since the conclusions reached do not consider data on the melting of the Greenland and Antarctic glaciers.

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Impacts from climate change and sea-level rise are particularly important for coastal communities where flooding and erosion are predicted to increase. In Canada, certain parts of the Atlantic coast are particularly vulnerable to storm surges and rising sea-levels. According to the storm surge prediction model developed by Dalhousie University (Dalcoast 2005), the Northumberland Strait part of the Gulf of St Lawrence is the most susceptible area to storm surges in Atlantic Canada. Here, sea-level rise due to the expansion of warming waters is accentuated by coastal subsidence. This movement of the land mass is more accentuated in the south-eastern portion of the province with a subsidence rate of approximately 10 cm per century (Environment Canada 2006) and is even more important with approximately 30 cm in the eastern axis near the Îles de la Madeleine in Quebec or the southern axis in the Truro-Halifax region of Nova Scotia.

Many coastal communities of New Brunswick (NB) suffer from flooding and coastal erosion related to storm surges that have hit the area since the establishment of these communities over the last few centuries. Climate change and sea-level rise have the potential to increase the frequency and severity of these events and the related impacts. For example, in January 2000, a storm surge event resulted in over 1.5 million dollars worth of damages. In the same year, following a storm surge in October, claims to EMO for damages in the same area totalled 1.3 million dollars (Environment Canada 2006). Other storm events since then (2001 and 2004) have also caused serious problems for infrastructure such as roads, bridges and residences. But storm surges can also have other impacts. In some particularly vulnerable coastal areas, flooding during surge events has isolated residences or whole sections of communities, resulting in problems for emergency vehicle access and potential threats to residents' health and safety. Indirect impacts to health of citizens can also be linked to damages to local infrastructure, the displacement of local populations or changes to the natural habitat (Health Canada 2004).

Coastal rural communities in Atlantic Canada must be prepared to deal with increasing environmental, economic and social stress associated with climate change impacts. This paper provides information about research undertaken in two communities in New Brunswick where attempts have been made to build adaptive capacity in terms of governance (Salamon and Elliot 2002; Goodwin 1998; Theys 2003) for managing climate and weather risks have been ongoing (Rey-Valette and Roussel 2006; Delusca et al 2005; Bulkeley 2005; Henocque 2006). After this introduction, the discussion is organized into four sections. The following section describes the specific research project that forms the basis for the paper and begins with some background on why the governance approach in climate change adaptation is original and necessary for Atlantic Canada. Results, analysis and discussion of the implications from the project follow and include a discussion on how the residents' themselves viewed the research process. A brief summary is offered as a conclusion.

Governance Preoccupations and adapting to Climate Change Related Sea-level Rise: Research in Atlantic Canada

What Atlantic Canada has experienced shows that adaptation does not rely solely on technical or engineering questions. The coordination and cooperation between stakeholders in the design of a common strategy for adaptation (Beuret and Pennanguer 2002), inevitably linked to governance, seems necessary in order to incorporate the complexity of the climate change phenomena, sea-level rise and impacts on the coastal area. We can also mention the importance of social resilience (Lebel et al. 2006, Munasinghe 2007), which refers to the capacity of the local communities in terms of decision making to identify means of coordinating the participation of all stakeholders (civil society, public and private sectors). Also, the literature on governance underlines the importance of social capital in capacity building; social capital forms the basis for democratic decision making (Reimer et al. 2008). In this regard, the example of community engagement of coastal communities needing to develop their own adaptation strategy, as presented in this paper, can provide some learning to others involved in similar processes.

Climate change adaptation is usually defined in terms that reflect the IPCC explanation as an “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC 2001). Adaptation strategies for managing risks to coastal communities fall into three categories: retreat, accommodation and protection (IPCC 2001). Retreat consists of the displacement of residences or other infrastructure away from the coast in order to avoid potential impacts. Accommodation consists of actions that compensate to some degree for the occurring changes, e.g. building houses on higher foundations or infilling the property prior to construction or building on pylons to avoid flooding. Protection describes an approach using structures such as sea walls in order to protect certain features from flooding, erosion or other impacts. Protection can use also use “natural” techniques such as beach nourishment and vegetation planting in water front areas or more artificial technology incorporating structures built with armour stone or cement walls.

As an issue, adaptation, or anticipation of future climatic impacts, has many components. In most areas of the world, there has been little direction or resources made available to communities to help reduce their vulnerability to climate change impacts such as sea-level rise and storm surge events. Also, the role of governments is paramount and the need for their involvement is implied: «There is little evidence to date that efficient and effective adaptations to climate change risks will be undertaken autonomously » (IPCC 2001: section 1.3.4). Previous studies conducted in south-eastern New Brunswick confirm that although some adaptation is occurring, there is a definite lack of government resources and direction in order to promote a cost effective and sustainable response (Environment Canada 2006).

Research focused on understanding and improving adaptive capacity for

climate change impacts in Atlantic Canada communities was carried out in 2003 and 2005.¹ Among the goals and objectives, researchers wanted to increase the level of information and awareness about impacts from climate change and sea-level rise and possible adaptation strategies. It was especially important to:

- examine all adaptation possibilities according to the best available information;
- ensure that costs and benefits and social and environmental impacts of various options are considered in the decision making process;
- ensure that decisions are taken considering up to date information on climate change and sea-level rise predictions;

Two coastal communities, Pointe-du-Chêne (located in south-eastern New Brunswick) and Le Goulet (located in the north-eastern part of the province) were selected for the study (see Figure 1). Community leaders from these two sites had been involved in earlier climate change information meetings and expressed interest in having more work completed in their locations. They felt that they needed support to address impacts related to flooding, erosion, salt water intrusion in certain wells and health and safety issues following flooding of septic systems or waste water pump stations during or following storm surges. The communities provided the opportunity for researchers to examine local ownership and leadership in matters of adaptation in two very different governance structures. Pointe-du-Chêne is a rural non-incorporated area where a Local Service District (LSD) committee provides recommendations directly to the Minister of Local Government. Le Goulet on the other hand is an incorporated village where a mayor and councillors are elected to represent the citizens and manage the budget generated by municipal taxes.

Pointe-du-Chêne is a small and mostly Anglophone community located on a low lying peninsula north-east of the town of Shediac, an important tourist destination in New Brunswick with over 900 000 visitors per year, half of them visitors to the wharf of Pointe-du-Chêne. The community is also located immediately adjacent to Parlee Beach Park, another very important tourist attraction of the area. The Pointe is densely populated with approximately 1000 residents in the winter season and more than 3000 in the summer. The community is located approximately 30 km. east of the Greater Moncton area with a population of 126,000.

The village of Le Goulet, incorporated in 1986, is a small Acadian (francophone) community with a population of 969 residents (survey of 2002) on approximately 1400 acres of land. Fishing has been the traditional dominant economical activity and most residences are located near the shore, separated from the Gulf of St-Laurence water by salt marshes, sand dunes and sandy beaches.

1. Environment Canada, Natural Resources Canada and Environmental Trust Fund.

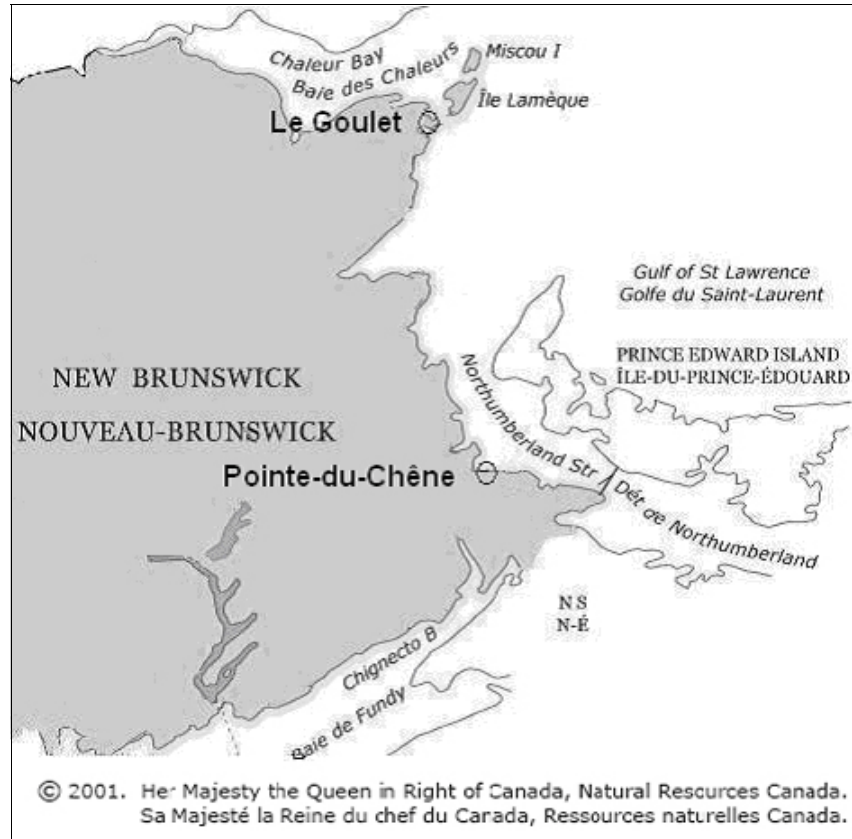


FIGURE 1 Le Goulet and Pointe-du-Chêne's location

Research Methods

Using a community engagement process approach,² prior to working directly with Le Goulet and Pointe-du-Chêne, researchers completed an initial step involving documenting how residents in the area perceive climate change, local impacts and adaptation in the coastal zone.³ The use of this local traditional knowledge is important because it reflects a dimension of knowledge complementary to that of western analytic sciences (Roots 1998) and values individual experiences so that a more complete understanding of an empirical problem is possible. In this initial

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2. In this paper, the term *community engagement process* is identified with the participatory research paradigm.
 3. This component of the research was held in southeastern NB from 2003 to 2006 in the course of different projects, most importantly the *New Brunswick sea-level rise* project led by Environment Canada (2006).

phase, researchers conducted 39 semi-directed interviews followed by six group discussions and 15 public information sessions to present and discuss the research findings. These meetings were held throughout southeastern NB, thereby giving researchers an opportunity to validate the results by seeing how they were received in other parts of coastal New Brunswick.

The next step in the research involved working directly with Pointe-du-Chêne and Le Goulet. Researchers began by holding a series of six public presentations where researchers and specialists from different fields related to climate change and adaptation participated. A meteorologist, a coastal geomorphologist, a structural engineer, a wildlife biologist, an environmental economist and a researcher in environmental studies made presentations on different aspects of climate change, coastal erosion and storm surges. Following these presentations, two researchers coordinated five group discussions in both communities which resulted in the creation of an adaptation plan. The group discussions were composed of between 10 to 15 participants (local government leaders and other concerned citizens) who expressed an interest in developing such a plan. Notes from all of the meetings were used for content analysis.

As a follow up, researchers interviewed six participants from both Le Goulet and Pointe-du-Chêne to gain their insights on the research activity and interactions (Chouinard et al. 2007b). Finally, a thematic analysis was carried out of all the information gathered through the numerous interviews, group discussions and presentations conducted throughout the study (Paillé 1996).

Results and Analysis

In general, participants both in the south-eastern and north-eastern parts of the province had the perception that extreme events have always been part of life in coastal areas, but most found that they are happening more often or with greater impacts in the last five years or so (e.g. ice storms and storm surges with heavy winds). Many talked of other impacts such as erosion and flooding, the melting of glaciers (at a global level), the absence of ice on the coast in the last few winters and the resulting risks of erosion (to beaches and dunes mostly). Others noticed milder winters, abrupt temperature changes and changes in patterns of precipitation. As a whole, participants are preoccupied with potential impacts to the tourism and the fisheries sectors of the economy. Most would like to see governments playing a greater role in helping citizens to deal with these challenges.

Pointe-du-Chêne

Because of its location, this community is very vulnerable to flooding. The bridge on Pointe-du-Chêne Road which constitutes the main access to the community is frequently flooded during storm surges and even during some astronomically high

tides. The secondary access road, via Parlee Beach Park, is also under water during such events, as are many streets in the community. Residents then find themselves blocked off on the peninsula during such events, a situation that has many residents worried in case of the need for emergency services. These services come from outside the community and could be prevented from gaining access to many parts of the Pointe. An example from the January 2000 storm surge involved one resident suffering from an illness; this resident had to have two neighbours carry him a significant distance out of the flood zone before the ambulance could be reached.

Residents also noted the stress from having to boil water when directed to by provincial authorities if flooding had contaminated well water. There is substantial concern that the water quality of Shediac Bay is affected during floods since the pump stations for the waste water of the Town of Shediac are inundated during surges and some untreated water spills into the Bay.

Erosion is also an important preoccupation in some parts of the Pointe-du-Chêne territory. The community including the Anglican Church (owners of approximately 70% of the properties), has invested considerable amounts of money to protect the most exposed areas. Protection in the form of armor stone sea walls was built which has turned out to be efficient for the area. The wharf has also needed considerable repairs. In 2004, approximately two million dollars was invested to repair and modify some of the wharf structures. The breakwater and wharf walls for example were raised by approximately one metre which allows for some resistance to extreme events.

Le Goulet

Participants described many accounts of flooding that had disturbed community activities. This region, including the adjacent Town of Shippagan, is flat and low lying. In 1995, many residences and roads in Le Goulet were flooded during a storm surge event. The major flood events of January and October, 2000, were especially difficult for the community; twelve residences required evacuation (Village Le Goulet 2000). The evacuation was difficult but because the flooding occurred during the day residents could see the rising waters and act quickly to prevent things from getting worse. Approximately 2000 feet of boardwalk were damaged or destroyed; the access road to the wharf was flooded; and the wharf itself was damaged by wave action during these two storms. Also, the dune, which acts as a natural buffer protecting the marshes and the community behind it, has suffered major erosion. This has many people worried that future storm waters will penetrate even more. The dune crest, which could, in some areas, reach a height of two metres above the upper beach (O'Carroll and Bérubé 1997), is now less than a half metre in height.

Since 1997, the community had been using snow fencing in order to try to trap sand and promote sand accretion and dune growth. All the adjustments made, which represented a value of approximately \$250 000, were lost following the January 2000 storm. In December 2003, another storm surge brought sea waters

to the level of the main road.

Following all of these events, nearly 60 residences have had some salt water intrusion in their wells, while others have had problems with mold because of water infiltration. With climate change and the projected sea-level rise, community members fear that more houses will be affected in the near future. At least 50 houses are considered to be within a high flood risk area. Also, the erosion seems to have accelerated since the major changes to the dune and beaches have occurred in front of the central part of the village. Some residents have lost several metres of their property due to erosion.

Participants recognize that these events are not new, since similar cases of flooding have been witnessed or described in the past. But residents feel the frequency of such events is accelerating and the fact that there is less natural protection has residents fearing the worst. Also, the ice, which in most winters offers a certain protection from wave action and hence erosion, seems to be forming later than in previous years in the Gulf of St. Lawrence.

In general, residents feel that there is a need for more concerted efforts to reduce the risks of flooding following extreme events.

Previous Adaptation Efforts

Based on data from interviews and group discussions, it is evident that many residents are already adapting to the changing conditions, mostly through protection efforts with the use of armor stone sea walls. Some have used an accommodation approach by raising their properties with infill, or building higher foundations. Other than the restoration of the wharves which were undertaken with considerable funding from the federal government, and for some work undertaken by the Anglican Church in Pointe-du-Chêne, most of the work has been undertaken by individual property owners. Research results indicate many options were chosen based on what others in the area had done or as the result of a trial and error process over the years. Although snow fences and dune restoration are being employed, in many cases these efforts are eventually abandoned because of lack of long term funding or because continued storm surges erode their effectiveness.

Obstacles to Adaptation

Even with some efforts undertaken, participants feel that more needs to be done towards adaptation and that there is an urgency to act in order to reduce vulnerability to extreme events. According to residents, a lack of government resources and direction appear to be the two most important obstacles to adaptation. In the case of Pointe-du-Chêne, the Local Service District committee has made numerous efforts to convince provincial and federal governments to support the adaptation efforts but they have had little success so far (Chouinard and Martin 2007). Since the LSD committee acts as a consultation body only, with

no control or access to resources, it is difficult to plan and carry out adaptation responses. This type of governance – or lack of local governance where coordination with government representatives or civil servants is difficult – is an important factor in the adaptive capacity of communities (Chouinard et al. 2006). Although it is at the local government level where ownership and stewardship of development for a more sustainable future are most likely to emerge (Beatley et al. 2002), the governance structures are not always in place to facilitate action. The example of Pointe-du-Chêne is a good example in point.

Many respondents openly criticized the absence of a fully functional coastal policy with regulations preventing real estate development in flood zones in New Brunswick. Although the province adopted a Coastal Zone Policy in 2002, it has either been ignored or found inadequate because of the absence of regulations to protect all affected areas. This is particularly the case in south-eastern New Brunswick where real estate development near the coast has boomed in the last decade. Others feel that the policy restriction on building within 30 metres of the high water mark is insufficient. According to them, building should be completely excluded within high risks areas. The storm surge witnessed in 2000 for example reached 2 metres above the high water mark which for many is an indication that the policy does not consider sea-level rise and is not sufficient to plan appropriately for the future.

Implications of the Research Findings and Activity

The research described in this paper incorporated substantial involvement from community residents who had expressed concerns over the potential damage to coastal areas from the storm surges and sea level rise associated with climate change. Participants modified their perceptions of appropriate adaptive responses after being engaged in the research process. For instance, in 2002, the municipality of Le Goulet hired an engineering consultant firm to evaluate the costs associated with building a 3.8 km sea-wall for protection from flooding in the central area of the village. The estimate was for approximately \$3.3 million (Roy Consultants 2002). Following discussions during the research meetings, participants in the focus groups questioned the value of that wall and indicated a preference for adopting a “retreat” option, namely to move back the 30 or more houses most vulnerable to flooding. The fact that these residences already do not have access to potable water because of salt water intrusion greatly influenced the discussions and the preference to move the homes. Participants were also made aware that the engineering study showed that the flooding of the area behind the dunes could still occur even with a wall although it would likely be slowed down considerably (Roy Consultants 2002). Concerns regarding the potential impacts of a sea wall on the beach and its wildlife and on the general esthetic appeal of the area were also voiced during the latter stages of the research process.

Engaging residents directly in the research process increased their knowledge and awareness about governance capacities in terms of how to work within the planning system for the municipality and build their adaptive capacity for

managing climate change risks (without necessarily using those terms). Participants in Le Goulet, for example, have chosen to initiate discussions with their local Planning Commission to look at the possibility of a stricter zoning plan so that no new buildings are erected in the high risk areas.

A number of gaps in knowledge and research needs were also identified by community residents who joined in this study. For example, they felt that detailed elevation maps of the area (where different flood scenarios could be projected) would allow for a better delineation of the high risk areas. Also, residents desired a better understanding of the potential impacts from a proposed break water near the wharf and recommended future studies of possible changes to currents and erosion as a result of the structure.

In Pointe-du-Chêne, options for adaptation retained through the process were similar to those already envisioned by the LSD committee (Chouinard and Martin 2007a). A higher bridge and approaches on the main road remain the first priority. Ongoing discussions on this issue with civil servants and Ministers seem promising. As a second option, participants have decided to retain the idea of a dike and flood gates to control flooding. Many confess being aware of the high costs and potential social and environmental impacts of such a measure, and recommended a study to assess these important elements for decision making. Some participants felt the idea would be very difficult to sell to residents in general since the community is seen as very attached to the esthetics of the area.

On the other hand, some new elements have emerged from the discussions in Pointe-du-Chêne. A more restrictive zoning plan, the need for a communication plan to work at information and awareness building at the community level and the need to work more closely with certain civil servants are some examples of new measures.

Evaluating the Research Process

Participants of both communities said being engaged in the research process with social scientists was beneficial but for different reasons. In Le Goulet, respondents talked of the importance of the process in finding more cost-effective and sustainable solutions. In Pointe-du-Chêne, the process added some elements to existing envisioned solutions, but mostly served to give more credibility to previous efforts undertaken by the LSD committee. Also, throughout the process, researchers organized existing ideas on adaptation and produced a working document that would be useful for future efforts to address governments. The process has also served to strengthen bridges between the community and civil servants by reinforcing the link of trust. Finally, some feel the task of prioritizing key adaptation options which was achieved through the process was very important.

A majority of participants in both communities said that the process enabled them to understand the phenomenon of climate change and sea-level rise better as well as increasing their appreciation for proactive adaptation. Both groups have also asked for continued assistance from the researchers involved. From the residents' perspective, the next necessary step is to work on broader community

awareness; they think some assistance is needed for this. Participants in Le Goulet especially felt that in order for the community at large to become involved, there needs to be more awareness developed through group discussions with residents.

In Pointe-du-Chêne, there are also fears that citizens may not see the purpose of the adaptation plan. Many feel that the community is divided between long time residents who may be less privileged economically and not as convinced of the need to act proactively on the one hand, and newly arrived citizens, often with more economic means, who have a tendency to act individually. In this community, the presence of a significant number of seasonal residents also complicates education and awareness efforts.

Having (provincial and federal) government representatives present at most of the meetings strengthened bridges with the community leaders. It also helped those representatives get a much clearer picture of the community's needs and aspirations than they would have had otherwise. Similarly, the participation of specialists from different disciplines linked to climate change and adaptation was viewed as very important by participants although there were some language barriers.

In both communities, participants commented that the research process has created optimism and confidence that things can be accomplished for the future. They unanimously agreed on the need to pursue a costing exercise for the selected adaptation options as proposed by Environment Canada in the spring of 2007.

Conclusion

This action research was aimed at creating and implementing a participatory process for two coastal communities working towards decision-making in matters of governance in terms of adaptation to coastal erosion, flooding and other impacts of climate change and sea-level rise. Two communities from coastal New Brunswick participated in this process. Initial data from Pointe-du-Chêne were gathered starting in 2003 and in Le Goulet since 2005. The research approach used allowed for a better understanding of the climate change and sea-level rise phenomena and enabled participants to make decisions regarding adaptation efforts needed. Both communities' residents admit that more work is necessary to reach others in the area and to communicate the reasons behind the selected options. They feel further assistance from researchers is necessary to achieve such a goal.

Results demonstrate that some citizens in both communities have already been adapting, acting mostly on an individual basis, as opposed to having government agencies support and direct adaptation measures. Yet, this work shows how difficult it can be for small communities (less than 1000 people, often far from decision making centres) to find resources and support at government levels and then to act according to their own perceptions and wishes. We have extended our research process to validate these results in other sectors of Gulf of St-Lawrence (Plante et al 2007).

The use of both local traditional knowledge and scientific knowledge has

enabled researchers to understand local concerns better and to enhance the residents' views and understanding of climate change impacts and adaptation. Researchers also benefited from the research experience, gaining a better understanding of how communities appropriate scientific language and information according to their reality. During the engagement with residents, researchers found the process may be handicapped when participants wait for answers from the 'experts' since they feel those answers cannot come from the community itself. In fact, often participants said 'tell us (speaking to the researchers) what is the right approach' all along the process. Very often participants looked to the 'specialists' for answers whereas researchers wanted to proceed with a bridging of local knowledge and scientific information to enhance a locally owned decision process. Finally, our governance perspective shows that the academics in social science can play a major role in linking the complexity of climate change effects (sea level rise and flooding on littoral) and socio-political issues.

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