



C-PAC³ Community of Practice on Adaptation to Climate Change

Workshop 1: Ottawa, Ontario, Canada

October 29-31, 2012

MEETING SUMMARY

ATTENDEES

Colleen Mercer Clarke (University of Ottawa)
John Clarke (University of Ottawa)
Daniel Lane (University of Ottawa)
Philippe Crabbe (University of Ottawa)
Donald Forbes (Memorial University)
Michael Epp (Gibsons, British Columbia)
Colleen Healey (Government of
Nunavut)(sitting in for Meagan Leach,
Iqaluit)
Hope Parnham (Charlottetown, Prince
Edward Island)
Jeff Stanley (Isle Madame, Nova Scotia)

Sandra Sookram (University of West Indies)
Rawle Edinboro (Georgetown, Guyana)
Kevin Muhammad (Grande Riviere, Trinidad &
Tobago)
Herman Belmar (Bequia, St. Vincent and the
Grenadines)
Crystal Sissons (SSHRC)
David O'Brien (IDRC)
Kathy Cunningham (Administrator)
Heidi Braun, (Doctoral Student UOttawa)
Jessica Jaja, (Graduate Student UOttawa)
Mingliang Lu (Graduate Student UOttawa)

ABSENT WITH REGRETS

Meagan Leach, Iqaluit, Nunavut, Canada
Guadalupe Rosado, San Pedro, Belize

Meeting Summary: Day One

The working session opened with a welcome from Dan Lane, who noted the coincidence of our meeting at the same time that Tropical Storm Sandy was continuing its historic track of devastation throughout the Caribbean region and the eastern coast of the United States. Colleen Mercer Clarke continued the opening session with a roundtable of introductions by all attendees, followed by a brief summary of the structure and roles of communities of practice, how we see the community of practice applied to our C-Change project and beyond, and the structure and logistics for the working session. Colleen welcomed community partners to provide a summary of their issues, challenges, and the processes by which they are dealing with climate change adaptation.



Jeff Stanley (Director of Tourism and Economic Development, Richmond County, Cape Breton, Nova Scotia)

Jeff provided an overview of Isle Madame highlighting the rural nature of communities on the Island and the role of the County government in working collaboratively with other local organizations including the Université Sainte Anne.

The heritage of settlement on the Island has resulted in properties which tend to be long and narrow, fronting on the ocean shoreline. However, as most people built their homes to abut the roadways and not the shoreline, residents can be less aware of climate change impacts such as sea level rise and storm surges. As well, while sea level rise is a gradual process, the currently observed changes in weather, especially in storm severity and frequency, are more memorable to the population.

Municipal impacts include flooding of roads and bridges, including the causeway and bridge that together provide the only road access to the island. Flooding in these areas is of particular concern as it isolates residents and impairs emergency access. The municipality together with local organizations have invested significant funds and labour in the construction of tourism infrastructure such as boardwalks and trails, some of which have been damaged or destroyed by storms and storm surges. Repairs and replacement of all these facilities are costly, and with the projected increased frequency of storm events may not be possible into the future.

Isle Madame also suffers from coastal area erosion and sedimentation, and changes in precipitation patterns that damage infrastructure and result in increased maintenance costs. As the climate shifts, there is an increase in the occurrence of freezing rain and black ice (slippery conditions on roads), requiring increased applications of road salt, which can lead to contamination of drinking water wells. Drinking water wells and septic systems are also impacted by changes in precipitation events that can result in groundwater contamination where houses are close together and wells and septic beds are also in close proximity.

The community is working through an adaptation committee to identify hazards, impacts and vulnerable areas, and to continue collaboration with the C-Change project. A number of climate change related initiatives are underway to examine municipal policy, facilities and infrastructure, and the associated social, economic and environmental considerations and to identify priorities for actions. In the province of Nova Scotia, communities are required to have completed a climate change adaptation plan by December of 2013.

All of these issues pose considerable challenges for this rural area where the population of approximately 3800 is largely aging, and has decreased over the last 10 years by 15%.

Hope Parnham (Planning/Development Officer, City of Charlottetown, Prince Edward Island)

Hope provided an overview of Prince Edward Island, the smallest province in Canada. Charlottetown, the provincial capital, is situated on Charlottetown Harbour which it shares with Cornwall and Stratford. Three rivers empty into the Harbour, requiring a number of significant



bridges to link the areas. Some of these bridges have been repaired in recent years, but as they are part of a regional road system, the repairs were done by the Province and the City doesn't have access to the data used in the design of the replacements.

The older parts of the City are most vulnerable to sea level rise and storm surge, including flooding of waterfront areas, flooding resulting from backing up of the storm water outflows, and damage to the local shoreline boardwalk. The City has access to data resources and to mapping, but there are licensing issues that must be addressed before the data can be used, and the associated information can be integrated into policy

The City has not yet amended its development approval processes to address sea level rise or storm surges. Currently, Charlottetown has contracted consultants to develop a new master plan for its waterfront area. These consultants have been instructed to contact C-Change researcher Don Forbes to ensure that they are aware of the implications of climate change. Within the downtown area there are many heritage properties, and a continuing pressure to allow more development right at the water's edge.

Michael Epp (Town Planner, Gibsons, British Columbia)

The Town of Gibsons covers four square kilometres in area and is home to 4200 people. Located on the Sunshine Coast of British Columbia, the Town has been built on a 25-30% grade sloped to the water (like an amphitheatre), and has only a small area that is potentially at threat from sea level rise and storm surges. However, the Davis Bay road, which is the only road/ferry connection to Vancouver, is likely to be underwater sometime within the next 100 years.

Gibsons is largely a retirement destination, with no on-site medical facilities. Working with the C-Change team, the Town has been examining the nature of their preparedness for climate change impacts. Recently they completed a harbour area plan that included projected scenarios of sea level rise and storm surge on the waterfront infrastructure and potential development areas. Recent sea level rise modelling conducted by the C-Change project has projected that in downtown areas of the Town there could be significant flooding within the next 100 years.

Gibsons has had little development along its waterfront for nearly 20 years, and residents have become concerned about the aesthetic appearance of the town, and about the effect on economic development. In recent times, a proposal to construct a large waterfront hotel and associated services has caused polarization in the community over opinions as to the scale and appropriateness of the development.

Gibsons relies on an aquifer for its drinking water, and has insufficient data on the capacity of the aquifer, especially during times of drought such as the 90 day period without rain this summer. Given the draw down pressures on the aquifer and the rising sea levels, there are also concerns over the vulnerabilities of the aquifer to salt water intrusion. As a remote community on the coast, Gibsons has also seen changes in the biogeography (bear habitat moving south) of the local area that some attribute to climate change.



Colleen Healey (Climate Change Co-ordinator, Government of Nunavut, Iqaluit)

The City of Iqaluit is the fastest growing city in Canada, with a population of 7300. Communities in the north are challenged by their remoteness, short summers and long winters, reliance on sea lift (ocean transportation of goods), high costs of living, limited personnel and expertise and the high rate of staff turnover. Iqaluit is constructed on an area of continuous permafrost, which with warming associated with climate change is continuing to thaw. It is anticipated that temperatures in the Canadian Arctic will increase by 3-6 degrees Celsius by 2080, causing a decrease in the duration of snow cover, loss of permafrost, increased droughts and floods, coastal erosion, melting glaciers and a region that will be ice free in the summer within 30-40 years.

The impacts of the changing climate will be felt on infrastructure, development and transportation, where the opening of the Northwest Passage will increase oceanic traffic and development (with associated risks of more marine disasters and/or oil spills). Increased development in the North includes the oil and gas industry as well as major mining projects. These developments will increase the temporary work force in some areas, adding to social issues and pushing the cost of living even higher.

Because the land in the north is rising as the glaciers recede (isostatic rebound), sea level rise is not as large an issue as in other areas of Canada. However, with the loss of sea ice and the changes in the storm climates, coastal areas are more susceptible to damage from storm and tidal surge and as a result of associated coastal erosion on the thawing permafrost. By example, older municipal dumpsites located near the shoreline, such as the dump at the former trading post at Apex on the outskirts of Iqaluit, are now falling into the sea.

The Nunavut government has developed a new website as part of the Nunavut Climate Change Centre that contains information and linkages on climate change projects currently being conducted in the area. However, there are ongoing challenges with the Arctic research projects as, while many of them require consultation with the territory, the government of Nunavut is not getting much information back that can be directly applied to understanding and solving local challenges. The government itself is conducting work on terrain monitoring and hazard mapping programs, community adaptation plans, research collaborations, climate change traditional knowledge studies, pan-territorial programs, and permafrost monitoring (Homeowners Guide to Permafrost in Nunavut)

Kevin Muhammad (Community Conservation Coordinator, Grande Riviere, Trinidad & Tobago)

Grande Riviere is a remote village located on the north eastern coast of Trinidad. The village is comprised of only 320 people, who live near the shore of a tropical rainforest, and are 43 miles to the nearest grocery store. The remainder of the eastern coast of Trinidad is more fully developed as a result of the oil and gas industry, but development of this type has contributed to local contamination.



The Grande Riviere area has the highest rainfall in Trinidad, making the flora and fauna of the local area more typical of South America than the Caribbean, and increasing its susceptibility to climate change. And although there continues to be lots of rainfall, the total is decreasing over time.

In Grande Riviere, the primary issues associated with climate change focus around impacts to the beach nesting areas of the giant leatherback sea turtles. The beach at Grande Riviere is one of the most important nesting areas in the Caribbean, and has given rise to an eco-tourism industry that is exceptionally important to villagers. If the turtle nesting sites are harmed or disappear as a result of storm surges and/or sea level rise, the turtles will go and so will the tourists.

In small communities such as Grande Riviere, for 200 years local people have been adapting to changing conditions and to changing climates. The village has no specific planning infrastructure, there is one person in the country that has a responsibility for town and country planning. Trinidad and Tobago have a national climate change policy (2010) but it has not really been implemented as yet. Along the coast, when there is storm damage, there are problems with cleanup. When buildings fall into the sea, there is a question of who is responsible to remove the debris.

In this past year, rainfall events resulted in flood conditions in the Grande Riviere, which greatly eroded and altered the beach structure, and put some of the village hotels at risk, isolating them from the beach. The event had both national and international media coverage, and considerable pressures placed on the government to take action to improve conditions for the hotel. As a result the military came to the village and restructured the beach, causing additional damage to existing nest sites.

Rawle Edinboro (Planner, Georgetown, Guyana)

Guyana is a coastal South American country located close to Trinidad, and bordered by Venezuela, Brazil and Suriname. The capital city, Georgetown, which is home to 90% of Guyana's population, is an historic city located at the mouth of the Demerara River and spread over 40 sq km of the flat coastal plain of the Atlantic Ocean. The city is actually situated some seven feet below mean sea level and protected from the sea by a system of sea walls and dikes. Rainfall patterns in the area are changing temporally and spatially, with the country just coming out of a three month period of drought. Nevertheless, there is a need to control water flooding into the city from both the ocean, and during periods of high precipitation, from the marshy areas, and water reservoirs. The existing drainage system is gravity-based and fails during heavy rainfalls. Guyana is a very hot country, and average temperatures have increased 0.3 degrees since 1960.

Guyana has a very centralized system (Office of the President), and not much filters down to the municipal level. There is a stronger commitment to a more participatory approach to governance, with increased emphasis on public education and awareness. Some of the recent initiatives include new drainage improvement projects (need to plan more for the future, not just be responsive), and mangrove restoration projects as opposed to constructed breakwaters, intended as a natural intervention to manage erosion. But more science is needed to address the combined effects of the naturally occurring erosion/deposition cycles. At the community level, there are initiatives in yard



raising, in building raised ground floors of residential buildings, and in securing vulnerable areas. There are as well many additional projects being undertaken by the Civil Defense Commission.

Herman Belmar (Deputy Director of Grenadines Affairs; Bequia, St. Vincent & the Grenadines)

Bequia is a small volcanic island, where much of the waterfront areas are fully owned and developed. Developable land is limited to narrow areas along the coast, as the grades of the volcano slopes make development very difficult. Much effort has been expended to reach the community through education of the children, and there are programs that demonstrate changes in beach conditions, and the need to monitor those changes. As sea level rises and the ocean encroaches through erosion and beach loss, there is continuing unauthorized development which is having major impacts on the coast. Hard armouring often results in more damage to beach areas and to adjacent properties, and removes or damages natural defenses. In some of the waterfront areas, storm surges of only a foot are enough to flood and/or to damage local businesses such as restaurants, retail outlets and taxi stands. In 2010, there were 10 months without any rain, and as most of the water that falls in the area drains immediately to the sea, drinking water supply is a serious issue. In recent years, a reverse osmosis system has been installed to meet water demands by creating potable water from sea water.

Sandra Sookram (Standing in for Guadalupe Rosado – San Pedro, Belize)

San Pedro is located on Ambergris Caye, which is part of the Belize barrier reef. The town has a population of 4000, whose income is largely derived from tourism, fisheries and the coral reefs, all of which are climate sensitive. Recent development along the Caye, including tourism infrastructure, has resulted in the destruction of habitat, infilling of wetlands, and loss of mangrove areas. In some areas of the backshore, coastal armouring is being used as a protective measure. Belize has developed a Climate Change Adaptation Policy, as well as a Belize National Hazard Mitigation Policy which need to be implemented and enforced.

Don Forbes (Natural Resources Canada, and Memorial University of Newfoundland)

Don provided an update on the coastal impacts and risks associated with climate change, with special emphasis on accelerated sea level rise; increased storm intensity and storm surges; thaw and destabilization of permafrost; more frequent freeze/thaw cycles; reduced sea ice thickness, duration, and extent; rising sea temperatures; and ocean acidification. Don noted that scientists working on climate change now consider that we are tracking the worst case scenario projected for temperature rise and sea level rise. In 2012 there was a record low extent of sea ice in the Arctic, the previous low was in 2007. The first impacts of climate change that are memorable are the result of extreme weather impacts, such as storm surges and flooding.

Colleen Mercer Clarke and John Clarke (University of Ottawa)

Colleen and John presented a summary of the policy options available to communities, focussing on the categories designated as Protect, Accommodate, Retreat, and Do Nothing. The benefits and costs of these options were examined, together with the changing timelines for action as climate



change impacts become more evident. Existing instruments for the management of coastal land development were presented (coastal setbacks, rolling easements, vegetation buffers, zoning, insurance and investment, emergency response) and discussed for appropriateness of application in the space and time planning horizons of project partner communities. The issue of public assumption of private risk was discussed

The ensuing general discussion pondered the effectiveness of these policies and instruments and their application to circumstances within the C-Change partner communities. Challenges related to financial costs, logistics, political awareness, and political priorities were examined, and the group moved forward to identify priority issue areas for coastal planning to be addressed during the next day's charrette.

Meeting Summary: Day Two

Dan Lane (University of Ottawa)

Dan led the morning session with a discussion on Risk Management, and a case study on river flooding in Perth-Andover, New Brunswick in March of 2012. In his presentation Dan dealt with how science, governments and communities identify and quantify threats, vulnerabilities and risks. Using combinations of the four pillars of community management (economic, social, environment, culture), communities have to decide where their values fall, and which aspect is the most important. Using this case study, Dan worked through a Pair-wise Comparison Exercise and an Impact Utility Exercise which asks how do increasing losses affect happiness and utility. The group discussion addressed these and other issues such as how governments accept responsibilities for costs associated with private risks.

During the afternoon, a Planning Charette was conducted, in which the group discussed specific priorities for action on climate change in their communities, focussing on the priority issues identified the previous day:

- Municipal infrastructure,
- Waterfronts,
- Residential and Commercial, and
- Natural and Cultural Assets.

Municipal infrastructure

The municipal infrastructure category includes utilities, transportation, and water/wastewater services. Topics discussed included:

- impacts to sewage collection and treatment systems from flooding;
- cross contamination of septic systems and wells from flooding;

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- flooding and washouts of roads and other transportation services (often addressed by regional governments);
- bridges, bridge safety and the adequacy of crossings to address new flood levels;
- deforestation which leads to erosion and mud slides onto access roadways;
- maintenance of existing dykes, groins, breakwaters, is costly and many are old and unable to withstand projected future impacts from climate change events:
- damage to existing breakwaters and other hard armouring measures;
- loss of port facilities require removal of catches to other areas for sale and transport;
- loss of natural protection (wetlands, trees, mangroves, etc.) can compromise coastal and municipal infrastructure;
- flooding caused by heavy precipitation events, combined with storm surges, can back up systems, and also cause contamination of drinking water reservoirs;
- loss of permafrost undermines traditional community building practices and threatens stability of existing infrastructure;
- loss of permafrost is causing surface water (lakes, rivers) to disappear, and threatening potable water supplies;
- where only access is by sea or by air, major storms affect travel and communication;
- rising sea levels are causing salt water intrusions into ground and surface fresh water supplies;
- many airports are on low lying areas near the coast and vulnerable to sea level rise and storm surge;
- as sea levels rise, communities are being caught in coastal squeeze – all developable land along the coast is fully utilized and there is nowhere else to retreat to; and
- emergency response routes are vulnerable to interference from flooding and storm surges, separating residents from medical, police and fire services, and interfering with evacuation routes.

Waterfronts

Waterfronts in the partner communities include urban development areas, tourism infrastructure, port facilities, and traditional and cultural uses of the shore. The discussion raised the following points:

- reforestation of mangrove and other wetland areas to provide natural barriers to storm surges can be in conflict with tourism development and other uses;



- regulations for waterfront development are often not enforced;
- new development holds the promise of jobs and improved economic conditions, putting pressure on governments and decision-makers to allow development to proceed, even in areas at risk from climate change impacts;
- existing congestion on waterfronts prevents construction of badly needed upgrades for transportation and shipping (i.e. increased practice of shipping in containers);
- some insurers will not cover storm damage in waterfront areas under risk;
- continued construction of tourism infrastructure on or near beaches and other coastal amenities means buildings are at threat from storm damage and local erosion;
- local planning authorities have few instruments that specifically govern new waterfront development, especially instruments that address sea level rise and other climate impacts; and
- public education and awareness is integral to success (people may simply not be aware of existing laws).

Residential and Commercial

Continuing demands for residential and commercial property development are placing much new construction at risk from changing conditions. Some of the topics covered included:

- the lack of setback regulations in waterfront areas to at least restrict new development from hazard areas;
- where setbacks exist there are many exceptions made to the rules;
- in many areas all shoreline land has been taken up with development, and there is no more land available for new construction:
- existing development is at risk, and owners have resorted to often unpermitted hard armouring, intended to protect their property, but often resulting in more negative impacts to the shore;
- squatters on the beaches, pursuing traditional livelihoods, have nowhere to go as the water levels rise;
- where large developments (condominiums) are proposed, the pressure for development is greater than the perceived threat to the structures and/or to personal safety; and
- even where private insurance is not available, there can be expectations that governments will assist if properties are damaged.



Natural and Cultural Assets

Natural and cultural assets include areas of ecological significance as well as historic and cultural sites and buildings. During the discussion the following were noted:

- heritage sites can often be in the older, near water areas, and are more vulnerable to sea level rise and storm surge, as well as to flooding and drainage from precipitation events;
- heritage buildings are a challenge to protect as there is no easy way to flood proof these forms of construction;
- there is a low level of consciousness regarding protecting heritage buildings, as people do not understand the threat; and
- some heritage sites are likely to be lost to rising sea levels, especially when the costs of protection are prohibitive.

Meeting Summary: Day Three

Dan opened the session with some excerpts from the media on climate change impacts and adaptation, in which reporters had estimated that climate change would cost Canada \$5 billion by 2020. He noted that after this week's event with Tropical Storm Sandy, these estimates might not be high enough. There is a need to break down the costs of climate change adaptation and extreme events by each community, so that local towns and villages have a better idea of what they may be facing. In going over the C-Change project deliverables to date Dan and others noted that during our discussions this week:

- there has been considerable use of the city maps that were presented, making it much easier to understand issues through use of these visual aids;
- community profiles and other information have been developed but we need to do more;
- the charrette went well, with lots of discussion on both unique and shared issues and concerns;
- the project researchers are continuing to conduct community surveys in areas such as Grande Riviere, Gibsons, and Isle Madame;
- some adaptation scenarios and strategies have been proposed (e.g., Little Anse (Isle Madame) (Mostofi), Gibsons (Vadeboncoeur and Epp), but there is a still a gap between these academic strategies and their potential usefulness within the community;
- most of the communities share a wide array of common issues, including aspects of process such as the complexity of the problems; working in silos; multiple participants and responsibilities; the need for local involvement in decision-making; the need to ensure

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successful and supportive co-existence of development and heritage; and the need for pragmatic and useful tools that promote best practices in development management;

- threats and vulnerabilities must address not only the direct impacts (e.g., drought, extreme events (rainfall, storm surge), access to land, food security; emergency response), but must also begin to understand the linkages to broader issues of community planning and management such as water supply, wastewater treatment, loss of cultural assets;
- we need to support the development of a culture for decision-making that is anticipatory, not merely reactive;
- some of the capacity issues faced by our communities include limited bandwidth for internet resources; accessibility to equipment and other resources to aid in adaptive measures (e.g., Grande Riviere required the military to bring heavy machinery for the beach work); and the lack of informed individuals at the local level to advise on adaptive measures in the aftermath of storm events; and
- education, especially of youth, is still a priority throughout our partner communities, where integration of climate change into the public school system appears to offer considerable promise in preparing youth for their future challenges.

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