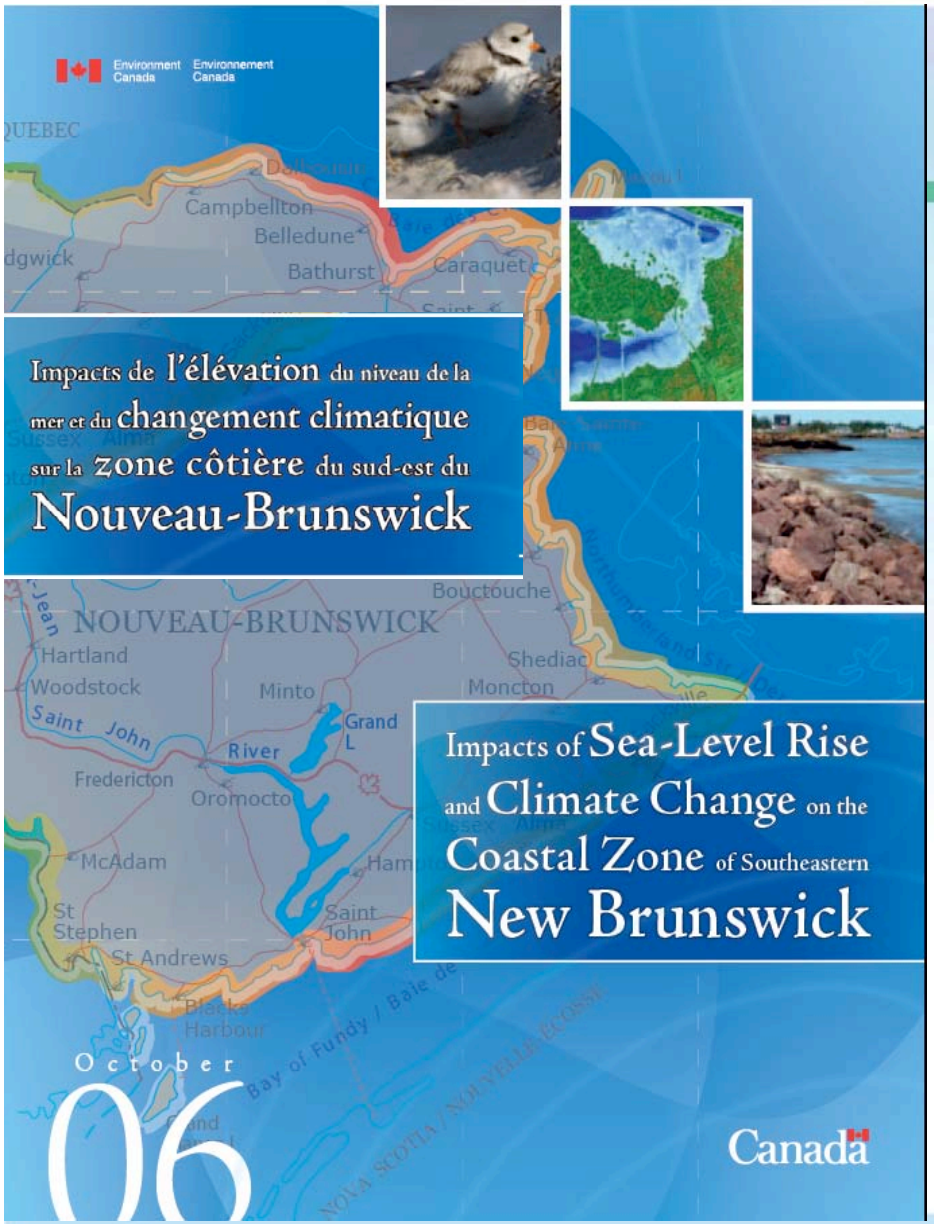


Project Lead: ***Environment Canada***

Research Partners:

Université de Moncton
University of New Brunswick
Mount Allison University
Dalhousie University
Université Laurentian University
Centre of Geographic Sciences
Université de Sherbrooke
NB Department of Environment
NB Department of Natural Resources
Environment Canada
Natural Resources Canada
Parks Canada Agency
Fisheries and Oceans Canada

Canada

New Brunswick Sea-level Rise Project

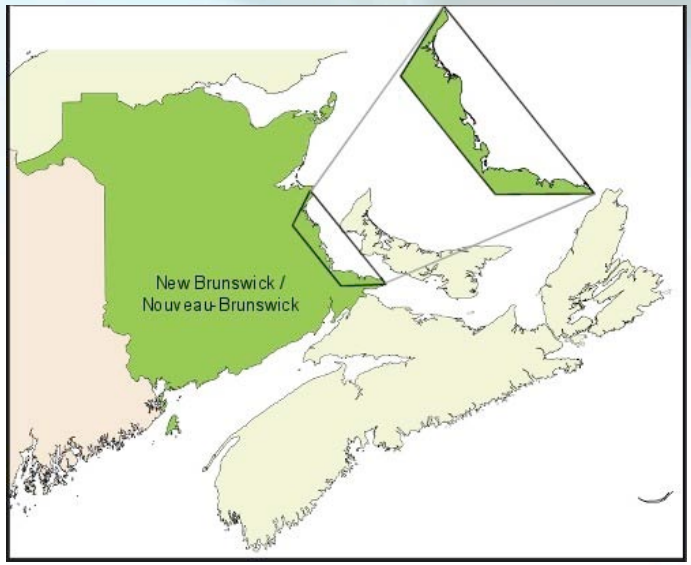
Objective:

To quantify the impacts of sea-level rise in support of ….

- ***Sustainable management***
- ***Community resilience***
- ***Adaptation strategies***

Multi-disciplinary Integrated Approach:

- ***Sea-level Rise and Regional Subsidence***
- ***Storm Surge, Wind, Wave and Ice Climatology***
- ***Storm Surge and Meteorological Modeling***
- ***Lidar and Digital Elevation Model***
- ***Coastal Erosion***
- ***Ecosystems Impacts***
- ***Socio-Economic Impacts***
- ***Adaptation Strategies***



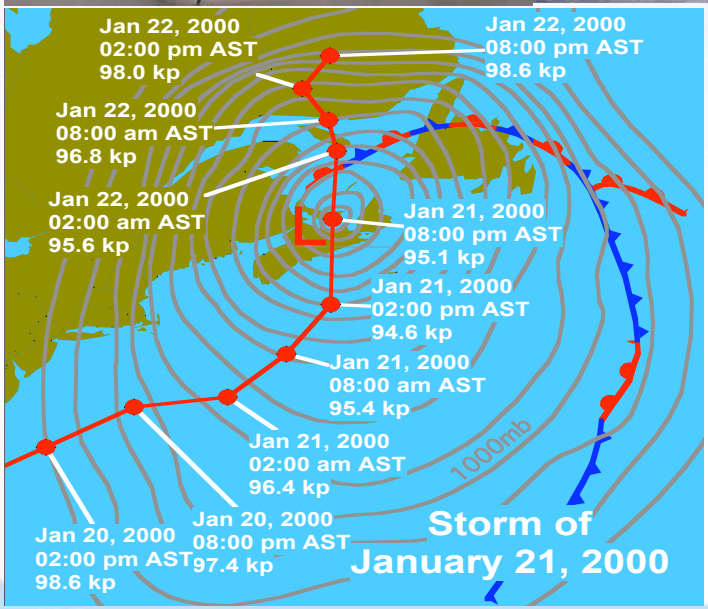
Canada

Climate-Change Issues in Coastal Zone

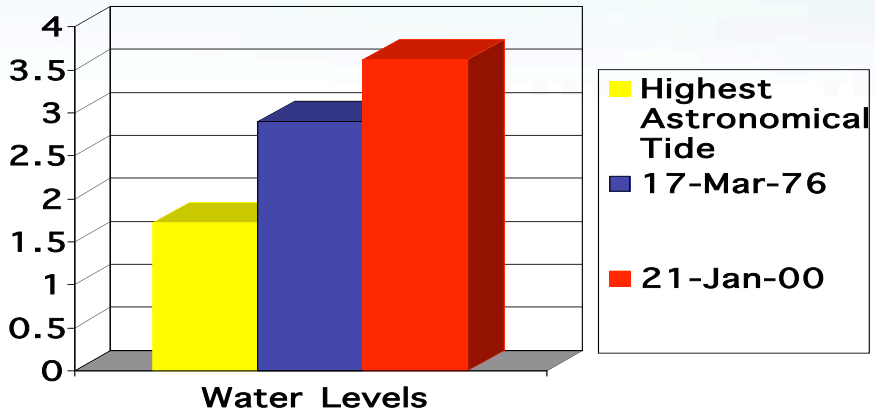
- *Storms & storm-surge flooding*
- *Sea-level rise*
- *Shoreline erosion*
- *Sea ice & open water*
- *Ecosystem impacts*
- *Community impacts*
- *Socio-economic response*

Canada

Baseline Storm Surge Event – 21 Jan 2000



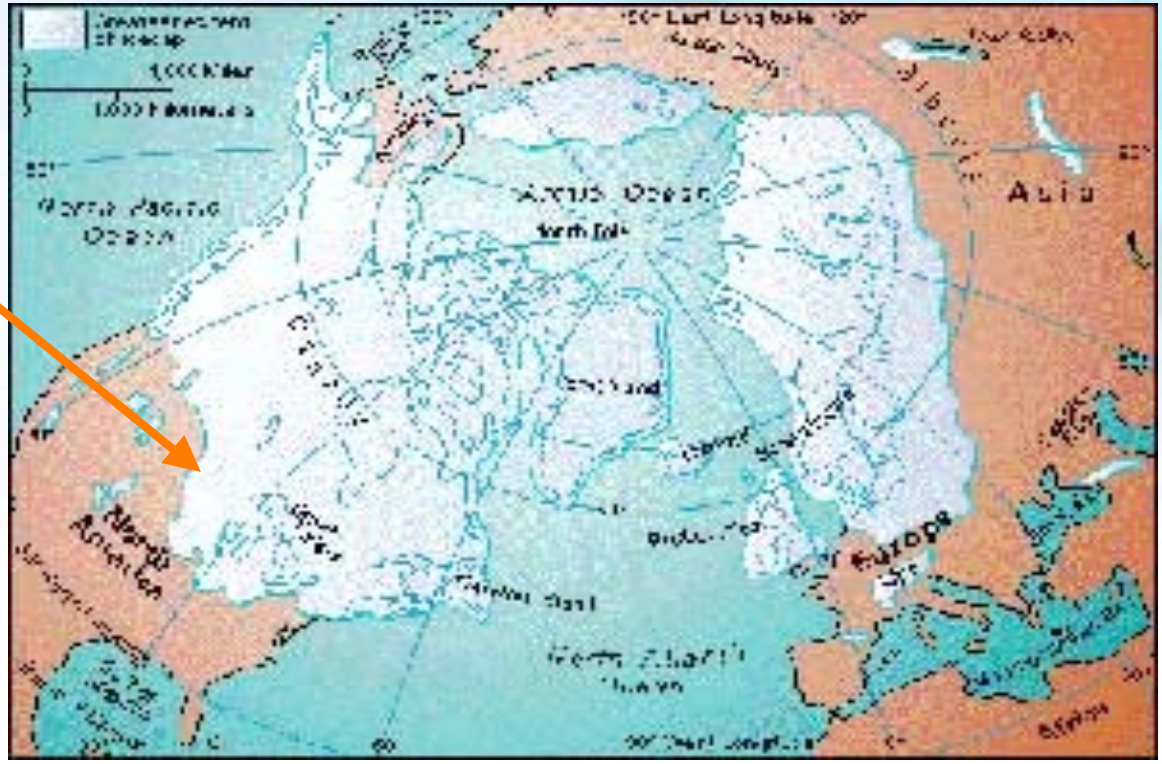
Shediac Bay Surge



Canada

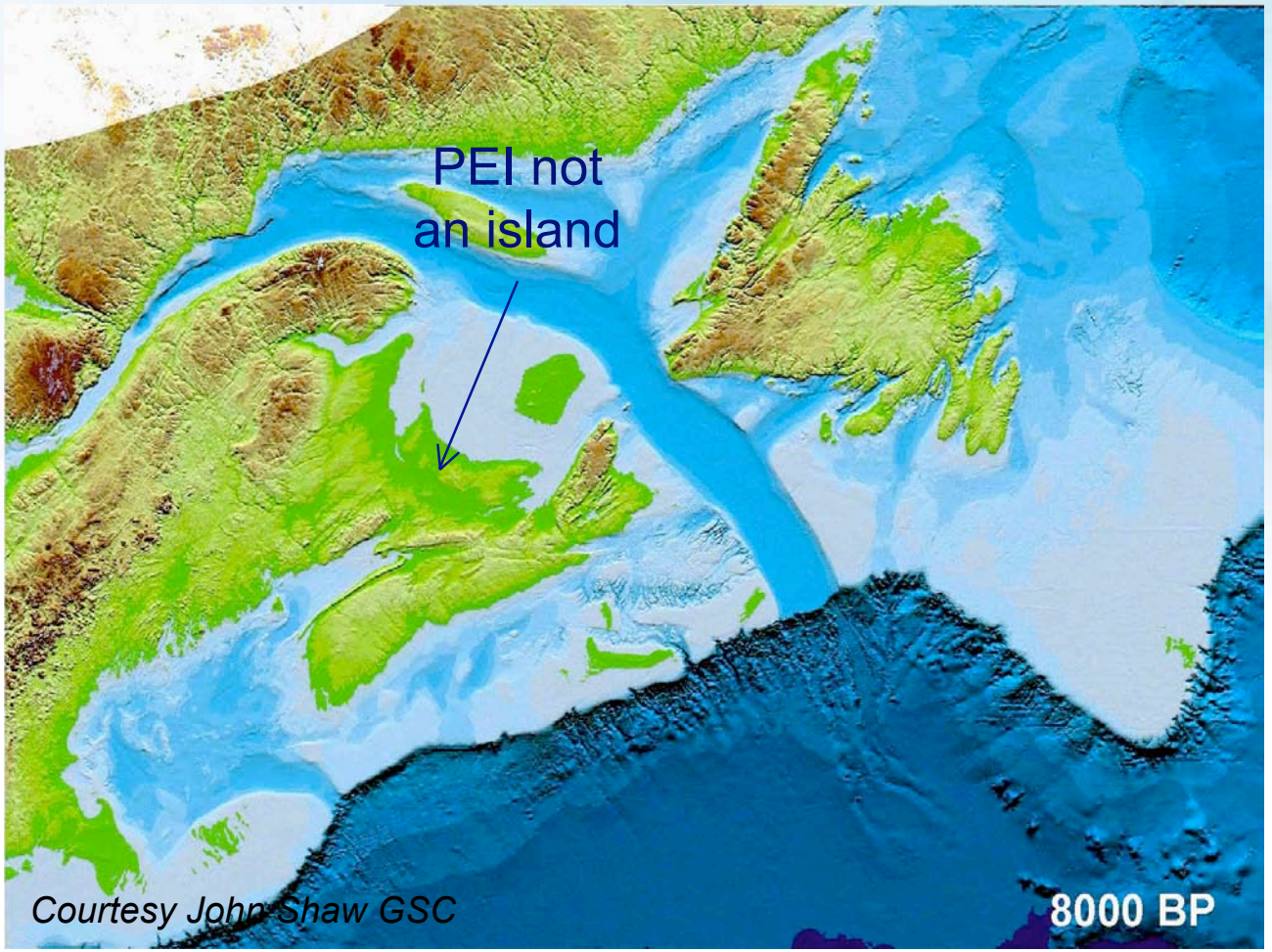
Sea level has risen 120 m since last glaciation

Maximum extent of glaciation 18 000 years ago….



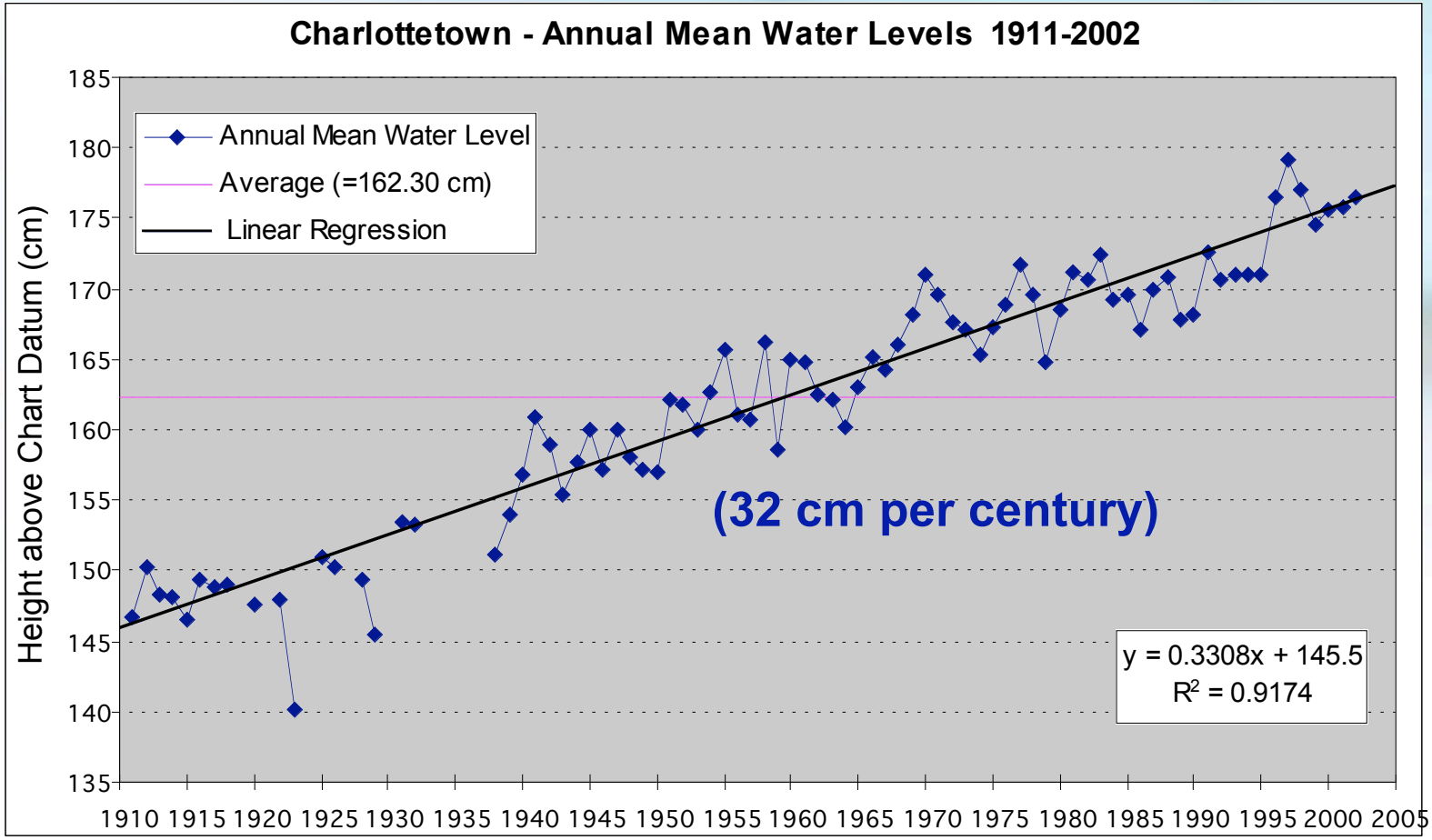
Canada

8000 Years Ago



Canada

The Past Century



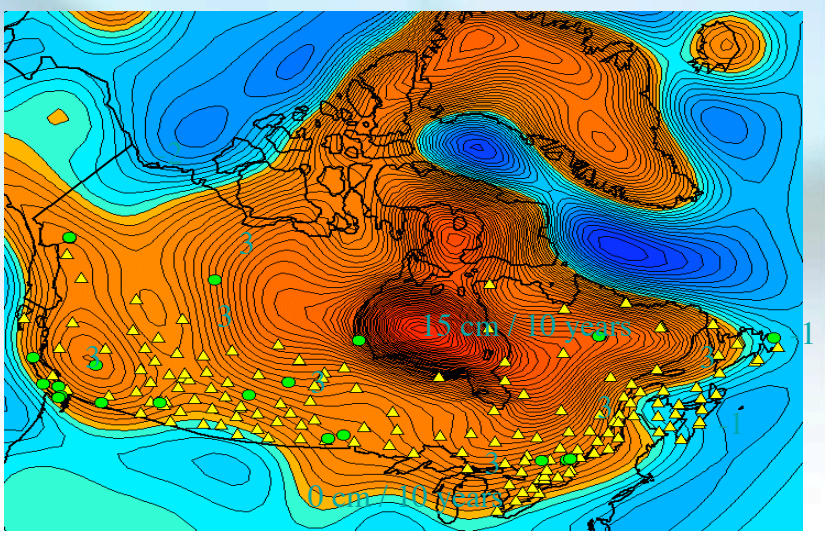
Georges Parkes, Environment Canada; Don Forbes, Natural Resources Canada

Canada

Sea Level Rise for Next Century (NB Study)

Site	*Vertical Motion (cm)*	*Total Rise (cm)*
Cape Jourimain	*15 ± 5*	*59 ± 35*
Shemogue	*13 ± 5*	*57 ± 35*
Cap-Pelé	*12 ± 5*	*56 ± 35*
Shediac	*10 ± 5*	*54 ± 35*
Bouctouche	*9 ± 5*	*53 ± 35*
Kouchibouguac	*7 ± 5*	*51 ± 35*
Escuminac	*6 ± 5*	*50 ± 35*

Vertical Motion of the Earth's Crust

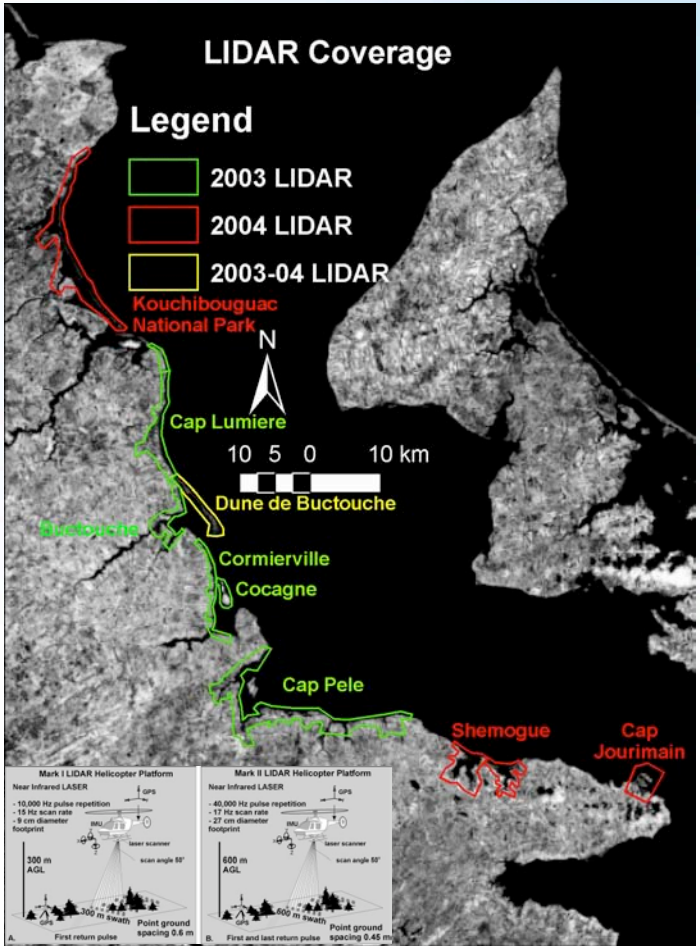


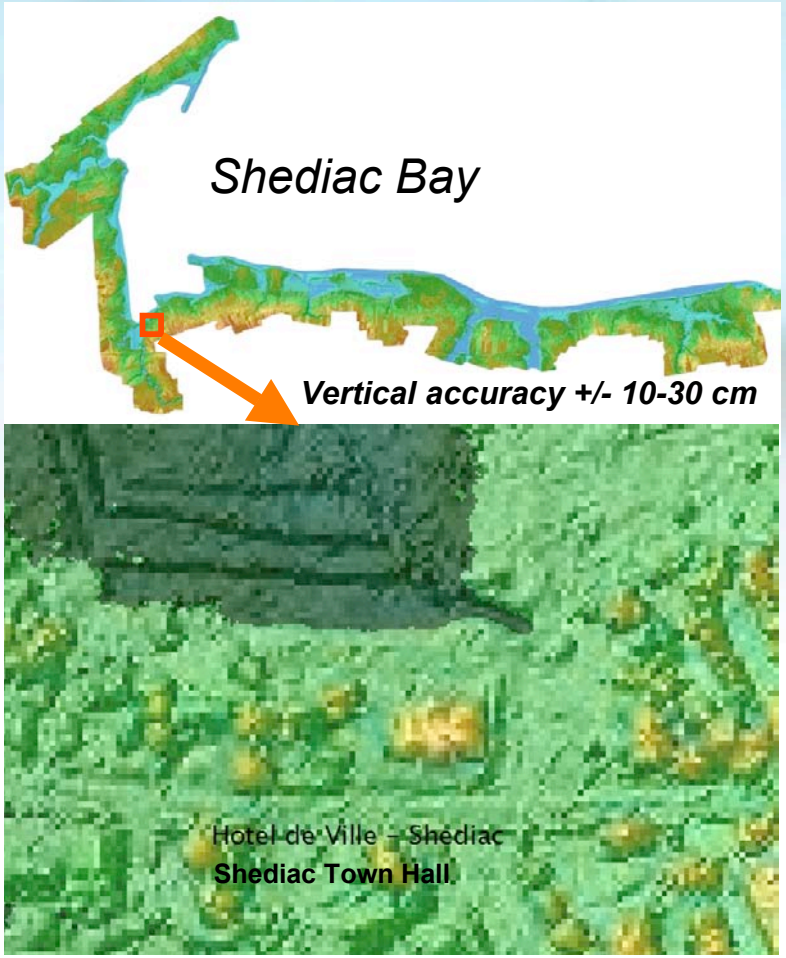
Canadian Spatial Reference System *(courtesy Geomatics Canada)* & vertical velocity from ICE-4G *(courtesy W.R. Peltier University of Toronto)*

Don Forbes, Natural Resources Canada

Canada

LiDAR Mapping

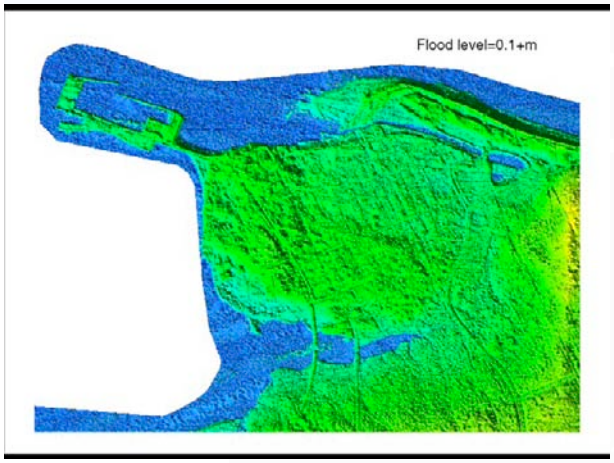




Tim Webster, Centre of Geographic Sciences

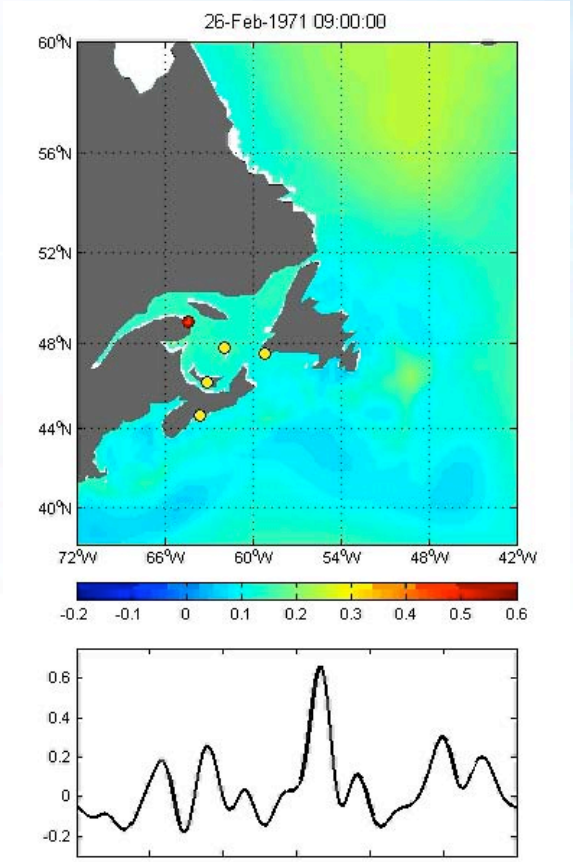
Canada

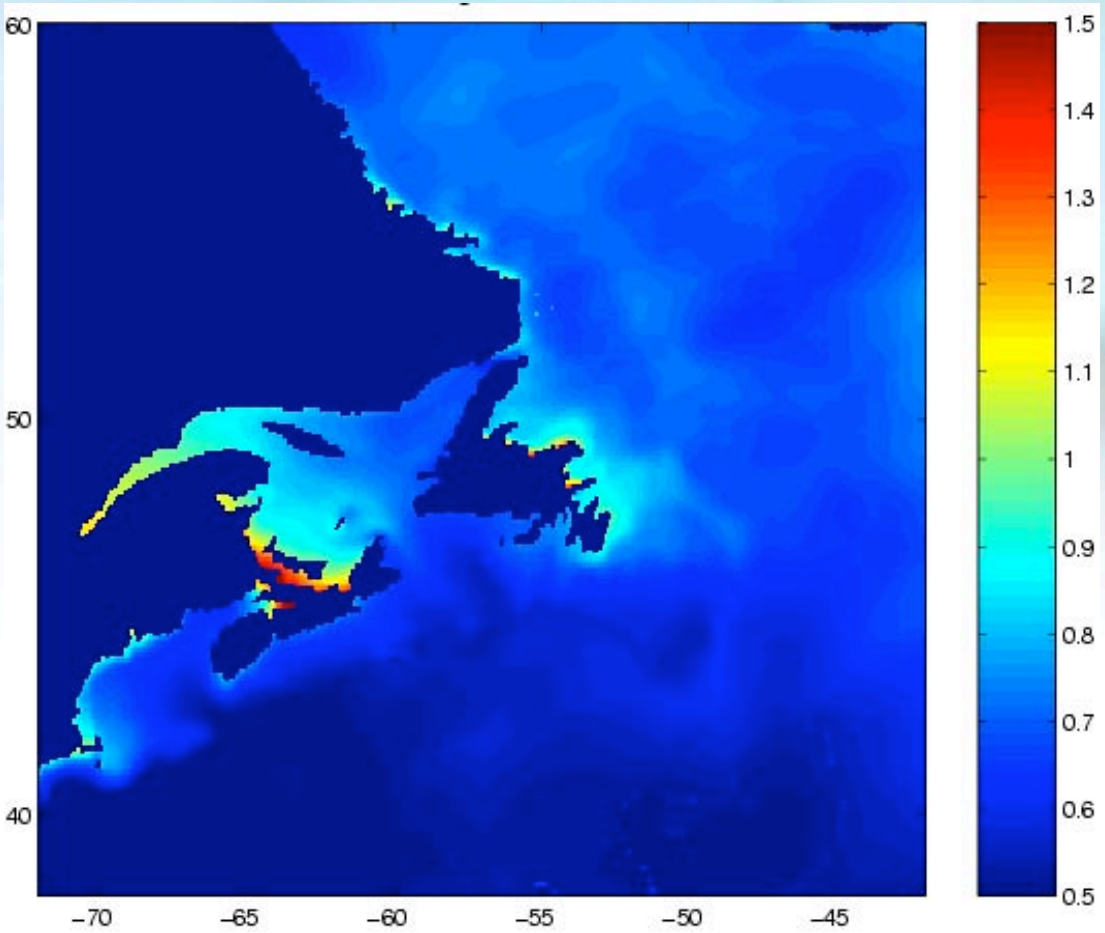
Scenario – Jan 21, 2000



Canada

40 –Year Return Level for Storm Surge Events

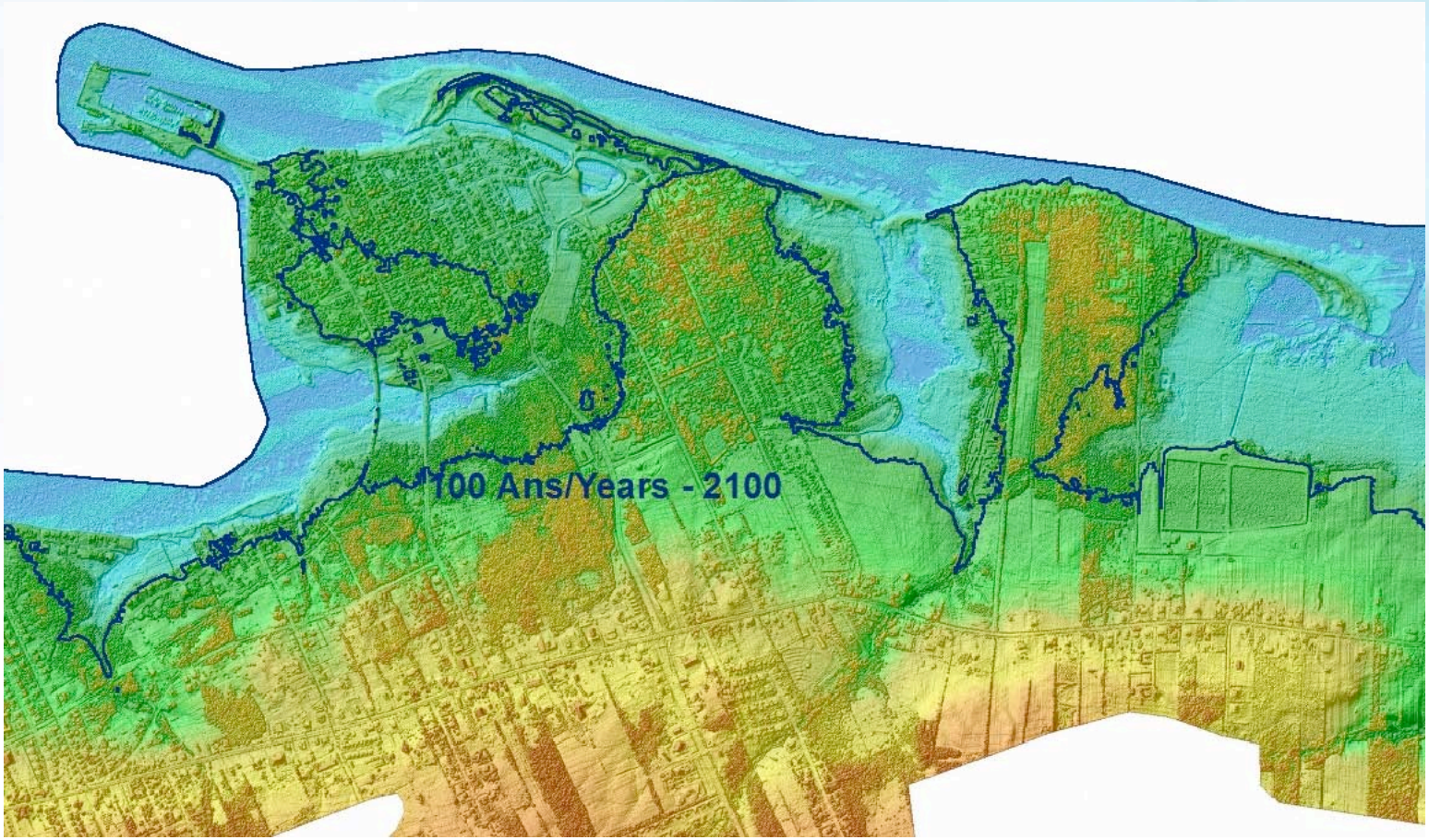




Hal Ritchie, Environment Canada; Natasha Bernier, Keith Thompson, Jeff MacDonald, Jie Ou, Dalhousie University

Canada

Storm Surge Return Periods – Pointe-du-Chêne



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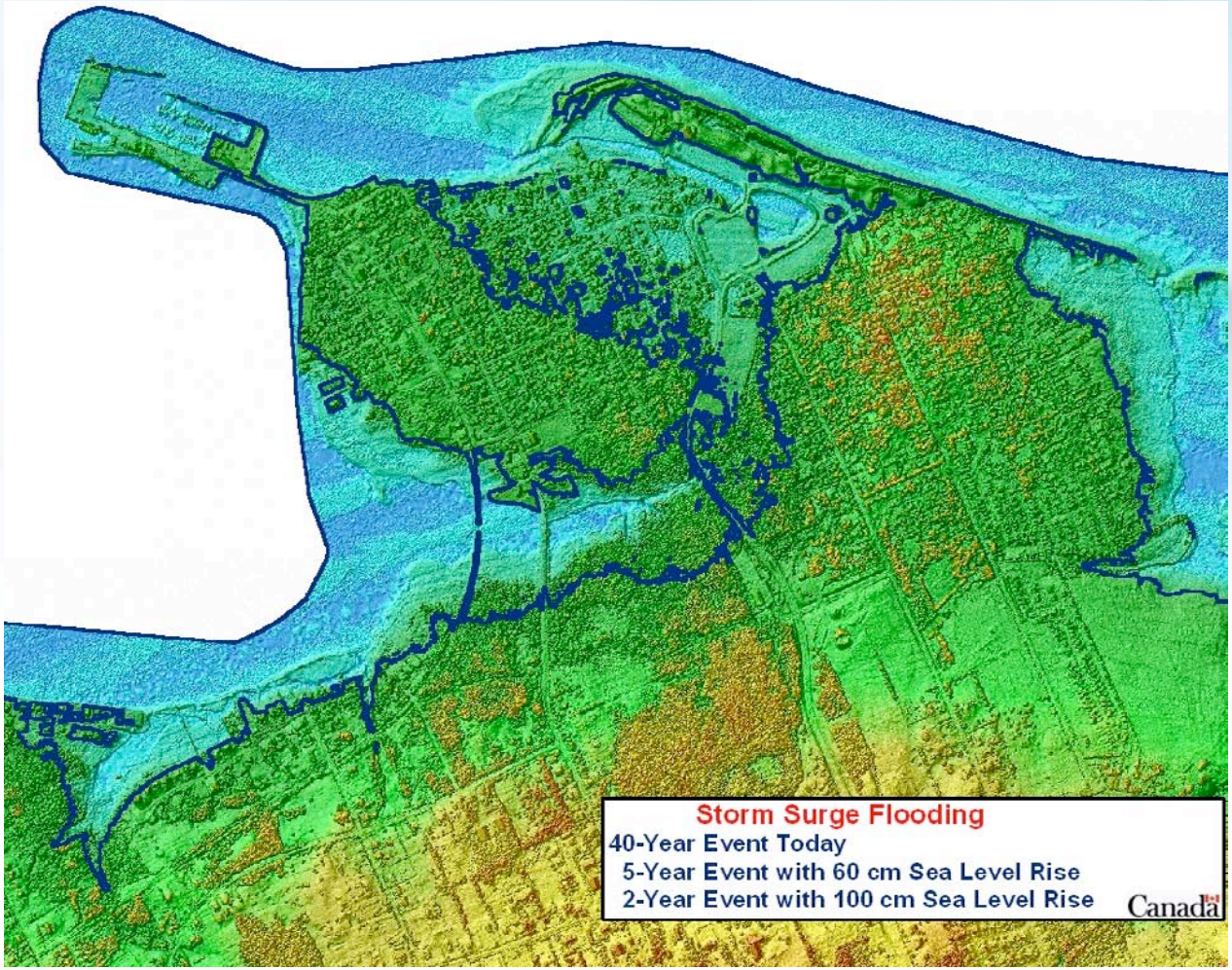
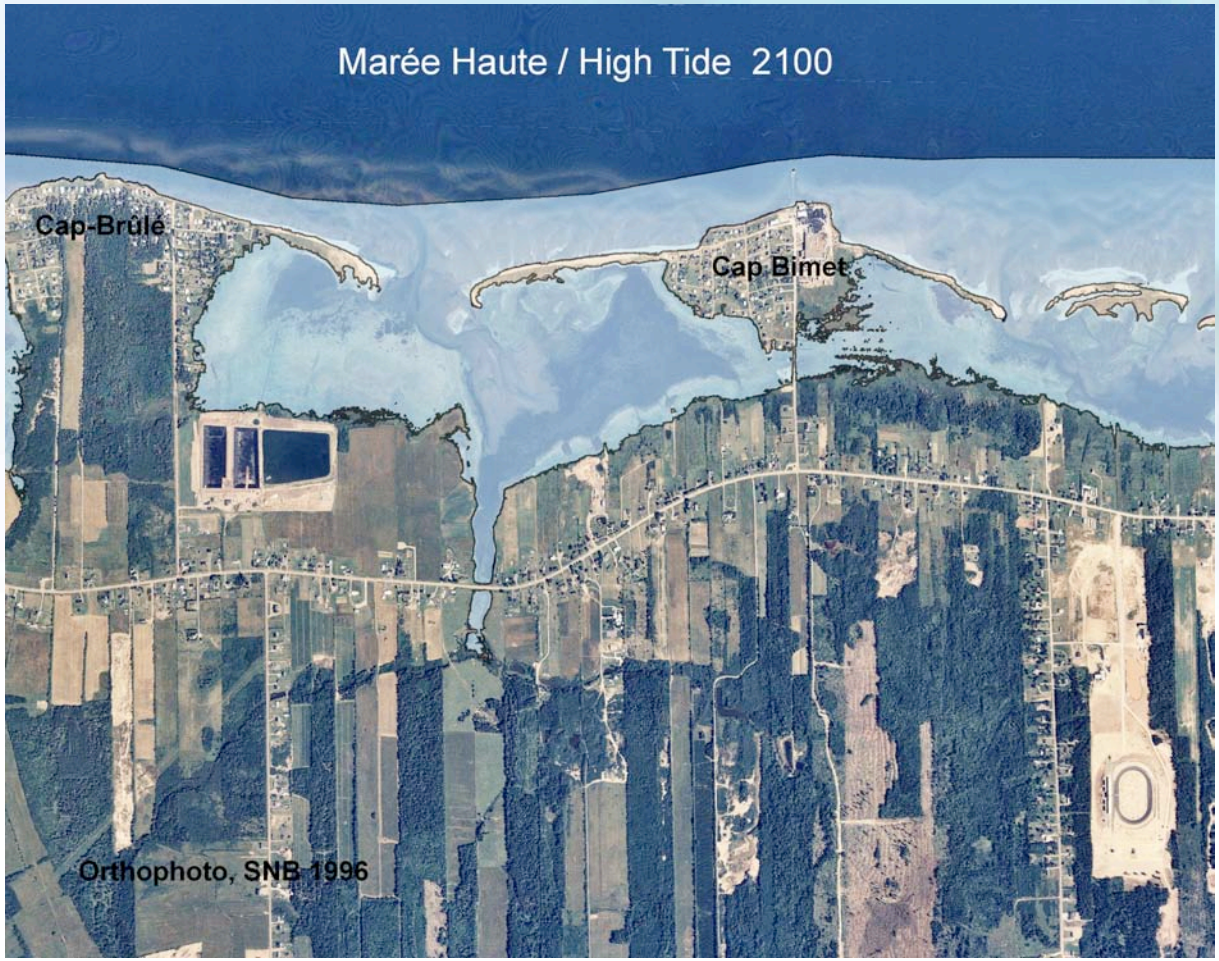
Diminishing Return Periods…



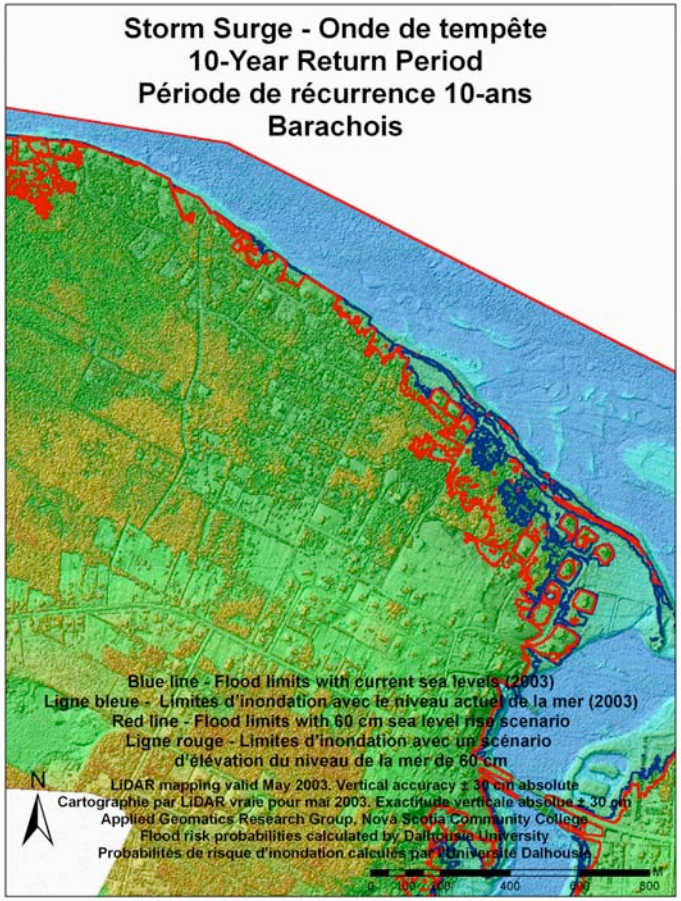
Canada

Sea-Level Rise Impact on Tides

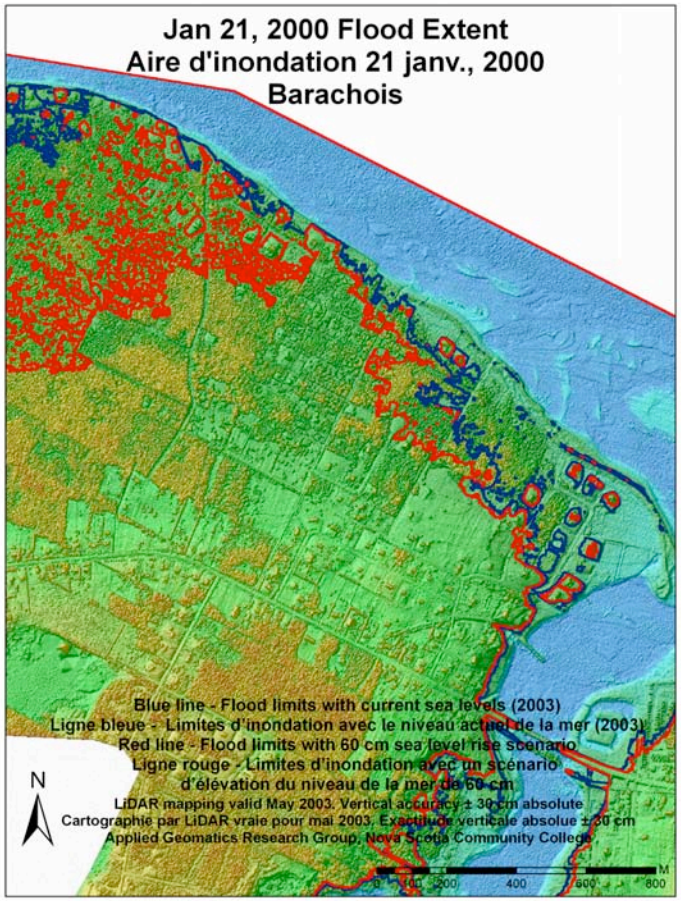


Canada

Annex / Annexe A



Annex / Annexe B



Canada

Key message – Future Flooding Risks

The research has shown that ……

- ***the current 100-year storm-surge return level (the record flooding event of January 21, 2000) is expected to occur, on average, every 10 years with a 60-cm sea-level rise scenario***

- ***and every 5 years with a 1-metre sea-level rise scenario***

Canada

Coastal Erosion Component

One of the most important consequences of climate change will be the acceleration of coastline and shoreline recession rates

Dominique Bérubé, Stéphane O'Carroll, NB Department of Natural Resources

Canada

Erosion – La Dune de Bouctouche

July 1999

Photo by G. Manson

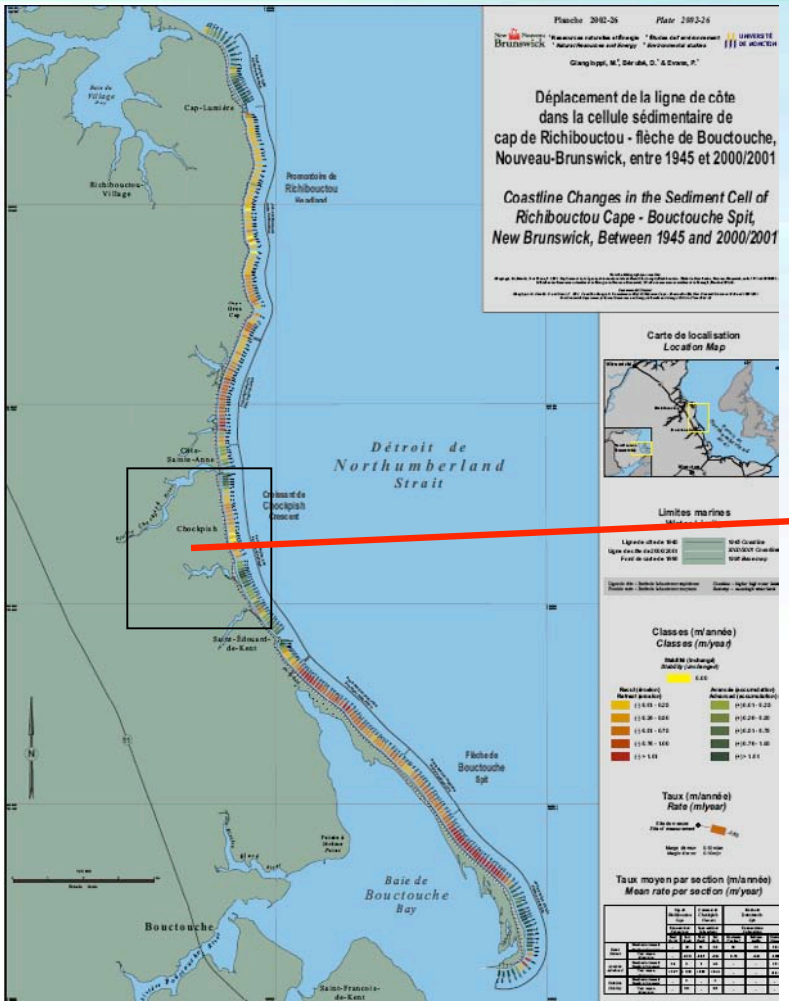
April 2004

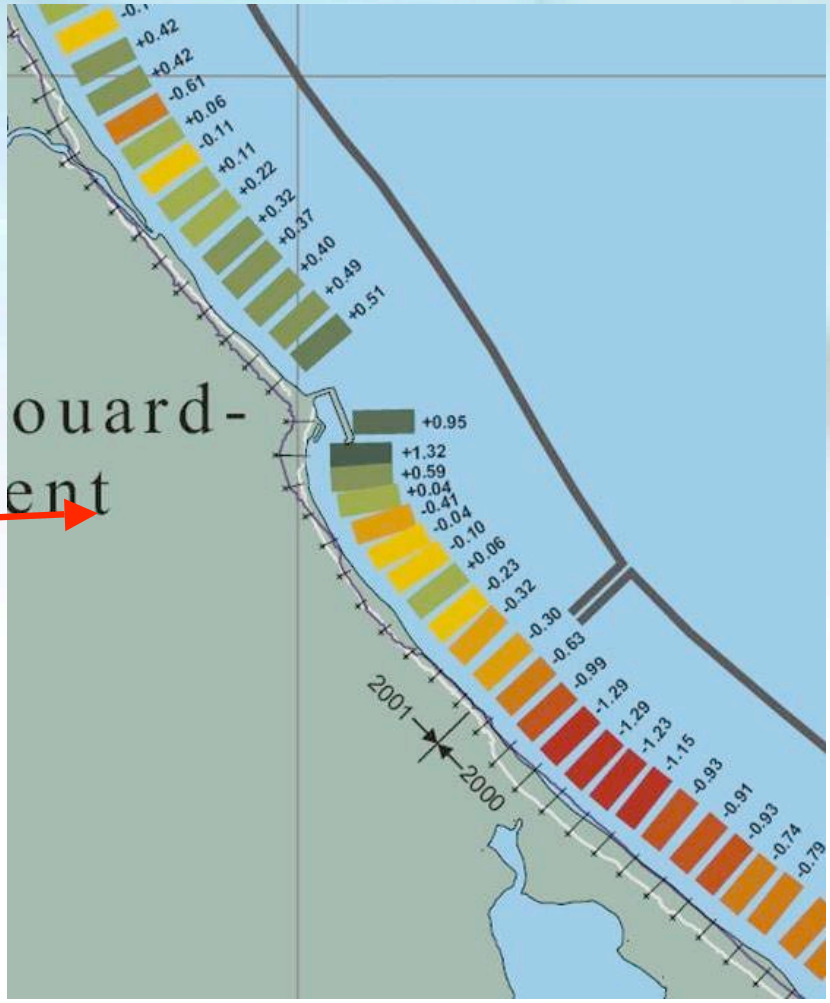
Dec 28 2004

Photo by R. Daigle

Photo by G. Manson

Coastal Erosion/Change





Canada

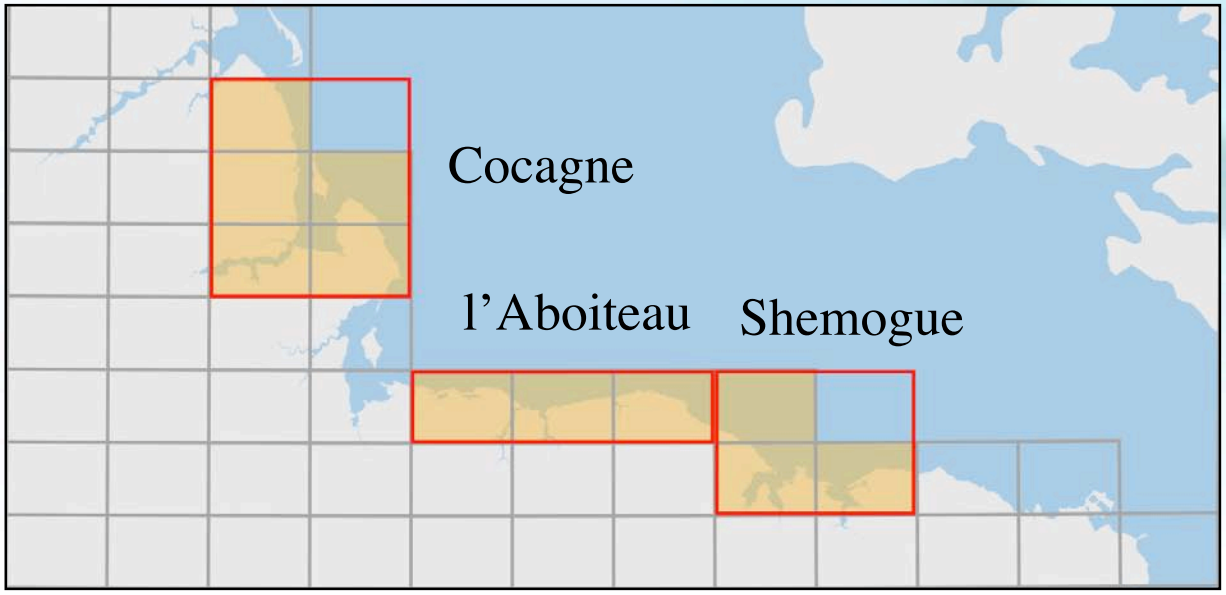
Coastline/Shoreline changes in New Brunswick

(1944/1945 – 2001/2002)

Landform	Trend	Chaleurs Bay		North-East Coast		Northumberland Strait		Bay of Fundy	
		Sample	Rate (m/y)	Sample	Rate (m/y)	Sample	Rate (m/y)	Sample	Rate (m/y)
Cliff	Recession (-)	103	0.29	45	1.73	752	0.31	23	0.35
	Stable (s)	19	0.00	2	0.00	21	0.00	-	-
	Progradation (+)	39	0.09	-	-	112	0.12	-	-
Sub total		161	n.a.	47	n.a.	885	n.a.	23	n.a.
Dune	Recession (-)	116	0.39	82	1.25	686	0.90	13	0.21
	Stable (s)	5	0.00	3	0.00	16	0.00	1	0.00
	Progradation (+)	82	0.23	63	0.75	251	0.70	6	0.11
Sub total		203	n.a.	148	n.a.	953	n.a.	20	n.a.
Beach	Recession (-)	179	0.36	220	1.00	199	0.78	8	0.87
	Stable (s)	10	0.00	2	0.00	4	0.00	-	-
	Progradation (+)	74	0.37	29	0.54	72	0.70	-	-
Sub total		263	n.a.	251	n.a.	275	n.a.	8	n.a.

Canada

Erosion Rates Changing?



Average coastal erosion rates for the three sectors

1944-1971: 0.99 m/y (margin of error: ±0.27 m/y)
1971-2001: 0.83 m/y (margin of error : ±0.23 m/y)

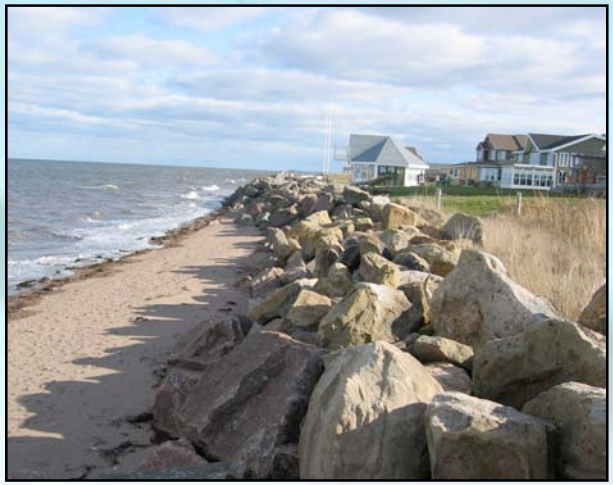
Canada

Coastal Erosion Component…In Conclusion:

- *Three quarters of the coastline in southeastern New Brunswick has moved inland since 1944;*

- *Coastline/shoreline recession rates can highly variable from one area to another, and from one decade to another, which make them hard to predict;*

- *Erosion control structures are a major threat to coastal habitat integrity.*



Canada

Ecosystem Impacts - Piping Plover

- *Endangered shorebird endemic to NA*
- *Atlantic Canada population 500 adults*
- *Recovery goals: 510 adults, 1.65 chicks/yr*

Al Hanson, et al. Environment Canada

Canada

Key Message – Ecosystem Impacts

Must manage short-term and long-term human impacts on wildlife populations and ecosystems

Canada

Socio-economic Impacts

Purpose:

- *To enhance communities' understanding of the economic implications of climate change in the coastal zone*

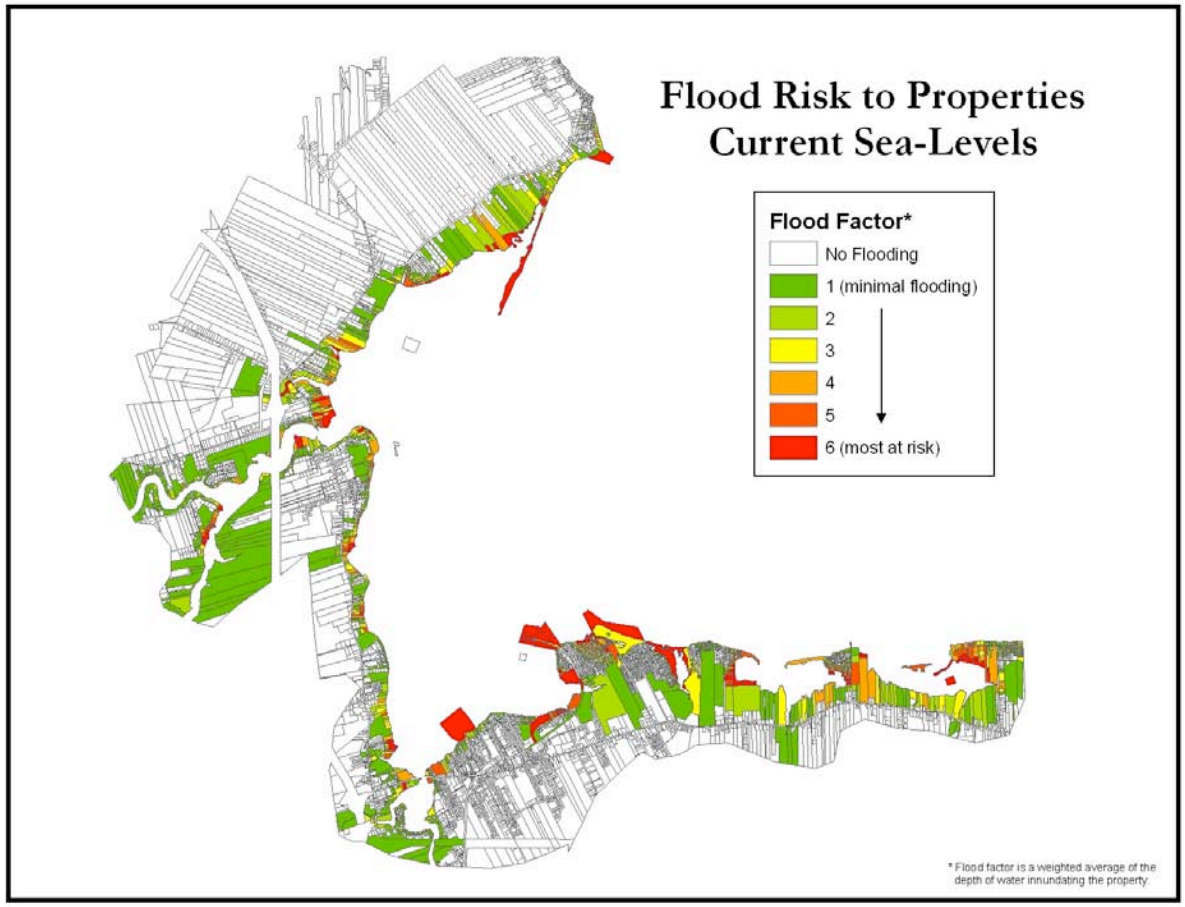
Research Objectives:

- *Evaluate potential impacts*
- *Test various economic assessment tools*
- *Evaluate community resilience & adaptation capacity*

Lisa DeBaie, Kelly Murphy Environment Canada

Canada

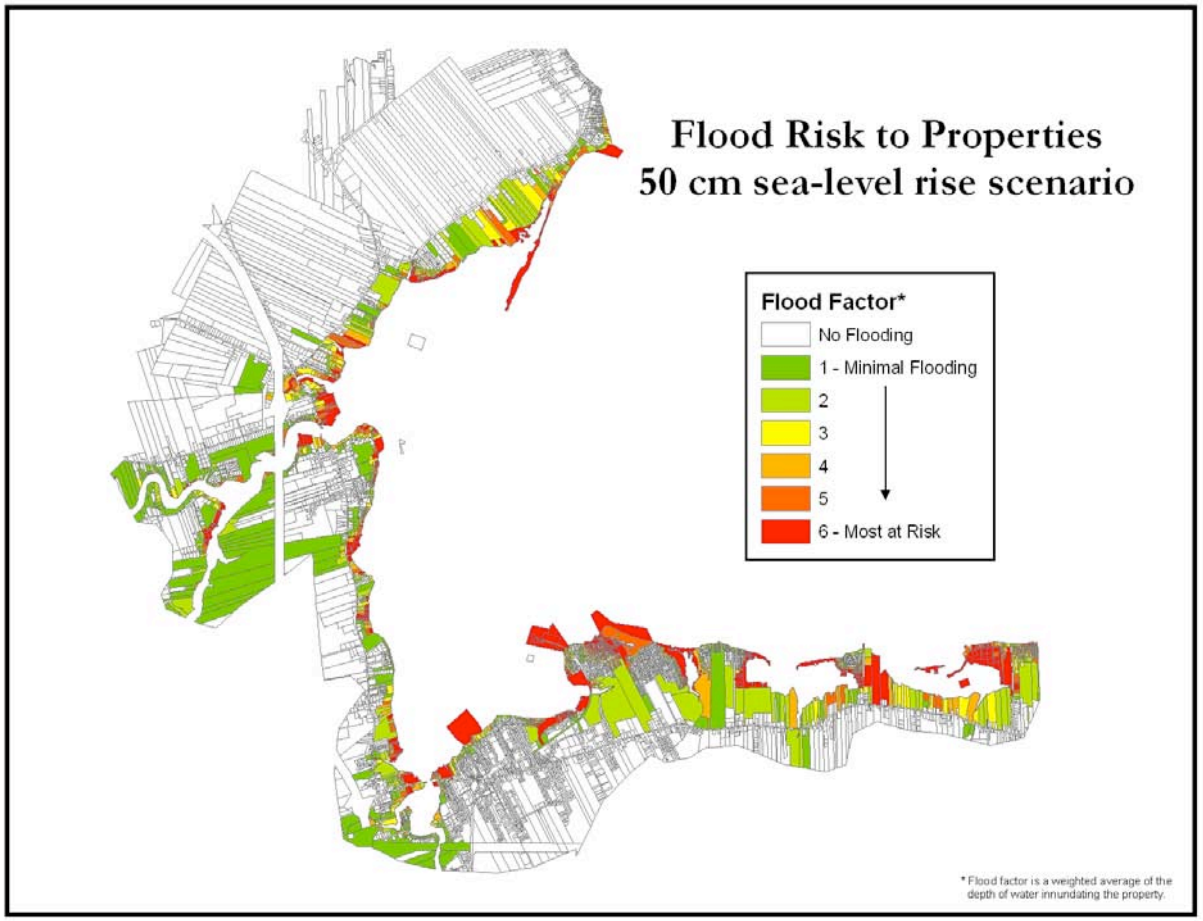
Socio-Economic Impacts – Shediac Bay



Flood Class	Depth
1	0 - 0.5M
2	0.5M - 1.0M
3	1.0M - 1.5M
4	1.5M - 2.0M
5	2.0M - 2.5M
6	> 2.5M

Canada

Socio-Economic Impacts – Shediac Bay



Flood Class	Depth
1	0 - 0.5M
2	0.5M - 1.0M
3	1.0M - 1.5M
4	1.5M - 2.0M
5	2.0M - 2.5M
6	> 2.5M

Canada

Existing properties at risk of flooding, 21 Jan 2000 event (current sea level)

Flood Class	Residential		Commercial & Industrial		Institutional		Recreational		Farms & Woodland	
	No.	Assessed Value	No.	Assessed Value	No.	Assessed Value	No.	Assessed Value	No.	Assessed Value
1	535	$48,812,700	23	$4,165,900	9	$2,169,800	600	$32,105,700	21	$457,100
2	98	$8,501,700	8	$4,163,200	3	$39,700	234	$12,212,900	2	$57,400
3	20	$1,509,600	0	$0	1	$60,000	65	$3,309,200	1	$1,200
4	4	$14,400	1	$800	0	$0	7	$196,800	2	$2,700
5	1	$10,000	0	$0	1	$128,300	2	$3,300	0	$0
6	0	$0	1	$3,500	0	$0	0	$0	0	$0
Total	658	$58,848,400	33	$8,333,400	14	$2,397,800	908	$47,827,900	26	$518,400

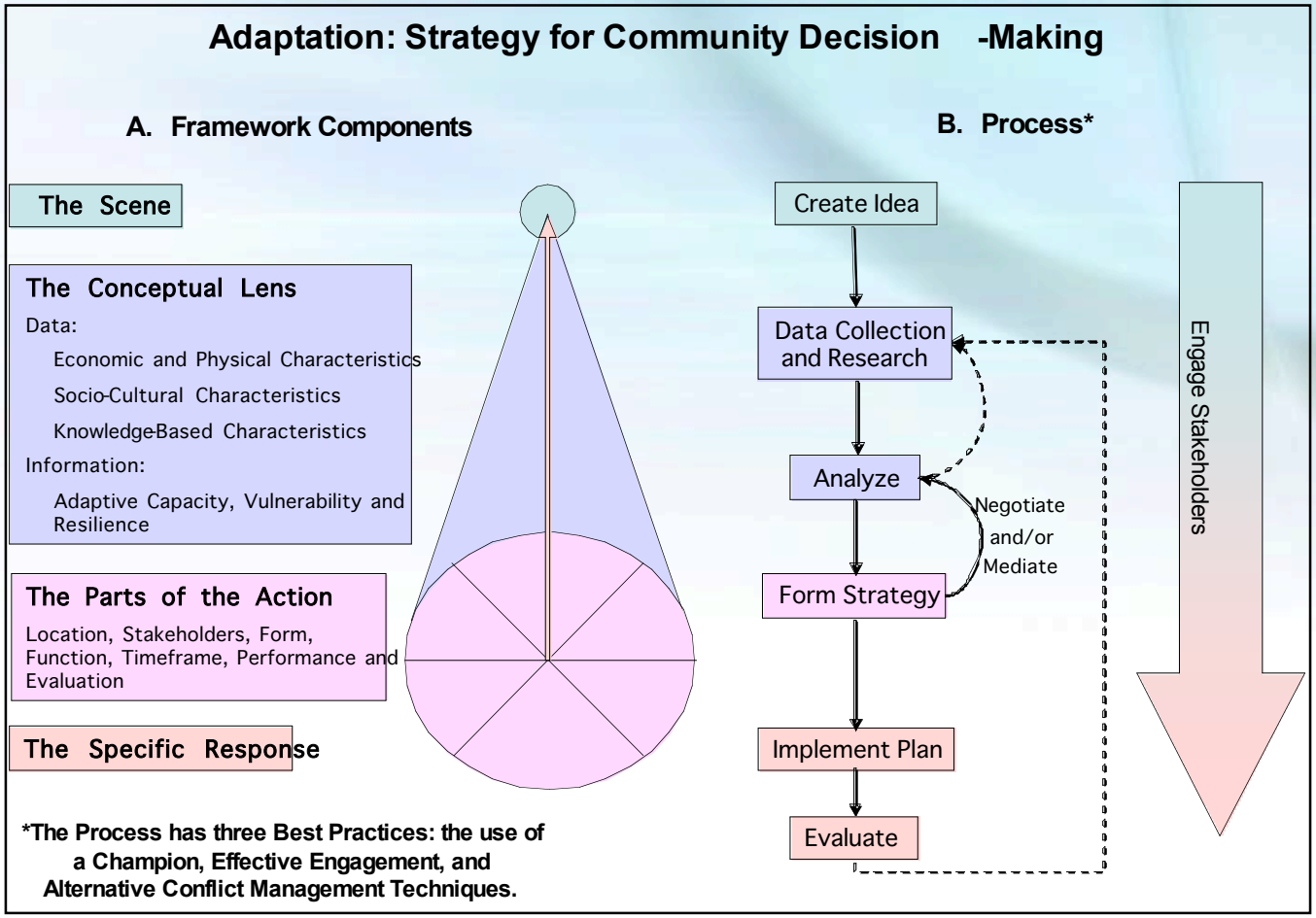
Canada

Existing properties at risk of flooding, 21 Jan 2000 event (50-cm SLR Scenario)

Flood Class	Residential		Commercial & Industrial		Institutional		Recreational		Farms & Woodland	
	No.	Assessed Value	No.	Assessed Value	No.	Assessed Value	No.	Assessed Value	No.	Assessed Value
1	530	$45,145,200	20	$4,736,200	10	$1,646,700	467	$25,235,000	23	$416,000
2	206	$17,951,700	13	$1,857,900	2	$740,500	336	$15,706,600	4	$123,000
3	69	$6,072,600	8	$4,163,200	4	$99,700	213	$10,820,800	0	$0
4	16	$1,072,000	0	$800	0	$0	62	$3,192,800	1	$1,200
5	4	$14,400	1	$3,500	0	$0	7	$196,800	2	$2,700
6	1	$10,000	1	$0	1	$128,300	2	$3,300	0	$0
Total	826	$70,265,900	43	$10,761,600	17	$2,615,200	1,087	$55,155,300	30	$542,900

Canada

Adaptation Framework



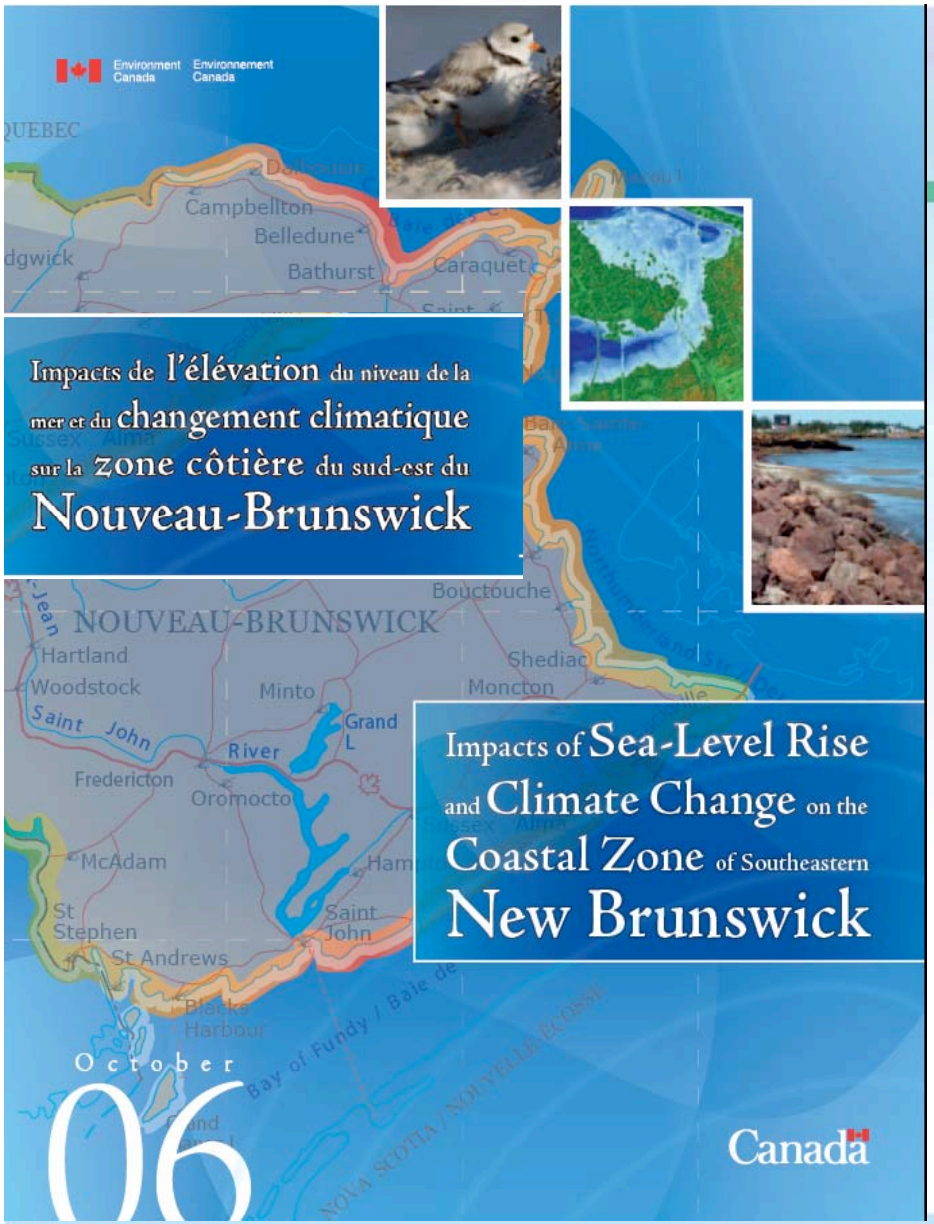
Sue Nichols, Hazel Onsrud, UNB

Canada

What worked well in NB project….

- ***The smoking gun!***
- ***The sustained media interest***
- ***The integrity of the science***
- ***The integrity of the mapping***
- ***The multi-disciplinary approach***
- ***THE COMMUNITY ENGAGEMENT***

Canada



Thank you
Merci

Project Report:
http://www.adaptation.nrcan.gc.ca/projdb/final_coastal_e.php

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Canada