

Climate Change Adaptation – planning for climate resilience



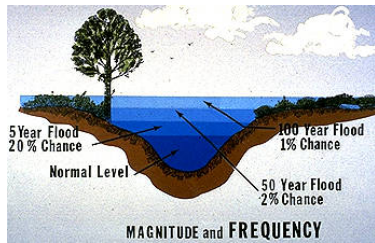


Photo by Brian Chow


Tina Neale, MoE &
Cathy LeBlanc, MCSCD
AVICC Annual Conference
April 13, 2013



Many decisions consider climate, but assume that the future climate will be the same as the past climate (*stationarity*)




Design standards Land-use



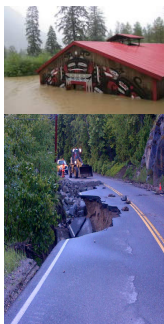

The Climate is Changing

1. The evidence base is robust
2. Additional change is inevitable
3. Failing to consider future climate results in sub-optimal decisions
4. We have the knowledge and tools, and are developing the processes, to begin to prepare for a changing climate





There are implications for BC

- Extreme weather events more costly and frequent
 - Damage to property and infrastructure
 - Business disruptions
 - Increased illness and mortality
- Long term changes jeopardize natural resources and communities
 - longer droughts, invasive species, longer forest fire season, ocean acidification

British Columbia Climate Action Charter commitments

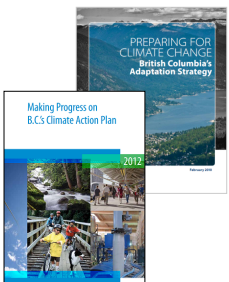

- Being carbon neutral in respect of their operations for 2012 – Reporting underway
- Measuring and reporting on their community's GHG emission profile (Community Energy Emissions Inventory-CEEI)
- Creating complete, compact, more energy efficient rural and urban communities

BC's Climate Change Adaptation Strategy

Vision: BC is prepared for and resilient to the impacts of climate change

1. **Develop knowledge** to support action across the economy
2. **Integrate** adaptation in BC Government's business
3. **Collaborate** with key stakeholders in climate sensitive sectors.

Planning for Adaptation is about...

Temperature zones in British Columbia:

- 7.0 to 8.0
- 8.0 to 9.0
- 9.0 to 10.0
- 10.0 to 11.0
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Resilience, Multiple Benefits & Mainstreaming

Mitigation Reduces Emissions

- Renewable energy
- Energy conservation and efficiency measures that reduce fossil fuel use
- Combined heat & power systems
- More active transportation (cycling and walking)
- Expanded transit use
- Fuel efficient & electric vehicles
- Reduced air travel
- Capture & use landfill gas

Adaptation Reduces Harm

- More permeable surfaces
- Basement sewer backflow valves
- Upgrades to sewers, culverts & overland flow routes for extreme rainfall
- Enhanced emergency & business continuity planning for extreme weather events
- Enhanced heat response system
- West Nile & Lyme Disease Programs
- Identification & control programs for invasive species
- Downspout disconnection

Green roofs, Shade programs, Better insulated buildings, Expand tree canopy, Deep lake water cooling, Local food

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Some Early and Emerging Adapters

- Prince George
- Metro Vancouver
- Richmond
- Delta
- North Vancouver
- Okanagan Basin
- Kimberly
- Elkford
- Cowichan Valley Regional District
- Rossland
- Castlegar
- Kaslo & RD Central Kootenay
- Area D
- Saanich
- Whistler
- Vanderhoof
- Etc.

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BC's Regional Adaptation Collaborative (RAC): Securing BC's Water Future

www.retooling.ca

Support Improved Decision-Making

- Water allocation and use
- Forest and Watershed Management
- Flood protection and floodplain management
- Community Adaptation

ReTooling for Climate Change

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Implementation Guide for Local Governments

http://www.retooling.ca/tools_resources.html

- BC Examples
- Planning strategies, tools & processes - land use, regulation, emergency mgmt, infrastructure, finance & asset mgmt
- Checklist to start discussion
- Land use scenarios
- Consideration for LG with limited resources

PREPARING FOR CLIMATE CHANGE
An Implementation Guide for Local Governments in British Columbia

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Implementation Focus:

plans & strategies, regulation, asset management, legal liability, insurance

PART 2: IMPLEMENTING CLIMATE CHANGE ADAPTATION STRATEGIES...26

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Regional Growth Strategies 28

Official Community Plans 30

Development Permit Areas 35

Development Approval Information Areas 39

Zoning (or land use) bylaws and density bonuses 40

Development cost charges 43

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Subdivision and servicing bylaws 45

Specific regulatory powers 48

Tree protection 48

Run-off control, landscaping, and soil removal and deposit 50

Animal control bylaws 53

Some notes on permitting and enforcement 54

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Long term financial planning and reporting 59

Asset management 62

Infrastructure 64

Civic building policy and building regulation 67

Watershed management planning 69

Liquid waste management plans 70

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Community and economic development services 74

Legal liability 76



Insurance 78

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Checklists to guide and prompt...

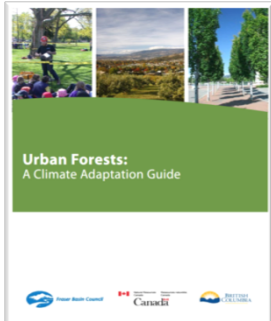
*Transportation systems and connectivity
(Roads, trails, railways, airports, marine transportation, communications, utilities, etc.)*

- ☐ Has the community engaged in a climate change assessment process that has identified vulnerabilities, quantified risk, and decided on priority areas for action with respect to transportation systems and connectivity?
- ☐ Is the local road network vulnerable to climate-related emergencies (e.g. increased risk of flooding or wildfire) or longer-term gradual impacts (e.g. sea level rise)?
- ☐ Are there specific assets such as bridges and culverts that are particularly vulnerable to climate change impacts?
- ☐ Are there pipes or conduits located under or alongside bridges that need to be relocated?
- ☐ Is consultation and coordination required with other authorities and operators (e.g. Ministry of Transportation and Infrastructure, railway companies, port authorities)?
- ☐ Will more freeze-thaw cycles or increased summer temperatures result in higher maintenance demands for roads and sidewalks?
- ☐ In the event of a climate-related emergency (e.g. flooding) will there be impacts on the transportation network?



 

Urban Forests: A Climate Adaptation Guide

http://www.retooling.ca/_Library/docs/Urban_Forests_Guide.pdf



Urban Forests:
A Climate Adaptation Guide

Local Climate Change Visioning & Landscape Visualizations:

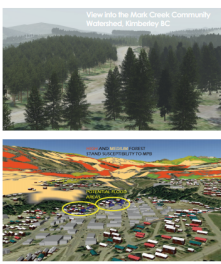
Guidance Manual

Online Training Modules



<http://calp.forestry.ubc.ca/local-climate-change-visioning-online-training-modules/>

LOCAL CLIMATE CHANGE VISIONING AND LANDSCAPE VISUALIZATIONS
GUIDANCE MANUAL

View into the South Coast Community Watershed, British Columbia



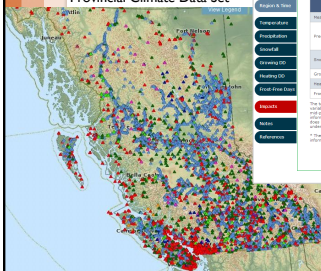
Collaborative for Advanced Landscape Planning
University of British Columbia
VERSION 1.1, July 2010

Pacific Climate Impact Consortium (PCIC):

Climate science with a regional focus <http://www.pacificclimate.org/>

Provincial Climate Data Set



PACIFIC CLIMATE IMPACTS CONSORTIUM

Summary of Climate Change for Capital in the 2050s

Climate Variable	Scenario	Baseline (1980-1999)	Range (2050-2059)
Mean Temperature (°C)	Annual	+1.8 to +2.2	+1.8 to +2.2
Maximum Temperature (°C)	Annual	+1.8 to +2.2	+1.8 to +2.2
Minimum Temperature (°C)	Annual	+1.8 to +2.2	+1.8 to +2.2
Maximum Daily Temperature (°C)	Annual	+1.8 to +2.2	+1.8 to +2.2
Minimum Daily Temperature (°C)	Annual	+1.8 to +2.2	+1.8 to +2.2
Maximum Daily Temperature (°C)	Annual	+1.8 to +2.2	+1.8 to +2.2
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Minimum Daily Temperature (°C)	Annual	+1.8 to +2.2	+1.8 to +2.2



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Plan2Adapt

Adaptation actions will be unique for each community

Each community will have to do it's own work
Starting with the Science and considering...

- + local geographic assessment
- + vulnerability
- + risk
- + costs
- + local knowledge & choices
- + mainstreaming & integration

Preparing for Sea Level Rise on the BC Coast



(c) 2012 Doreen Farmer Photography.com

Tina Neale
Climate Action Secretariat
AVICC Annual Conference
April 2013

From science to policy and implementation...

- Regional projections of sea level rise (2008)
- On-line storm surge forecasting
- Public outreach: King Tides Photo Initiative
- Guidelines for coastal flood hazard planning and construction of sea dikes (2011)
- Coastal floodplain mapping guidelines (2011)
- SLR Costing study for Metro Vancouver (2012)
- SLR Adaptation Primer for local governments (2013)



BC's Flood Management Legislative Framework

- *Environmental Management Act* allows the **provincial government** to publish guidelines for flood area land use management.
 - Flood Hazard Area Land Use Management Guidelines (2004)
 - Climate Change Adaptation Guidelines for Sea Dikes and Coastal Flood Hazard Land Use (2011)
- *Land Title Act* and *Local Government Act* give **local governments** authority to manage flood hazards by
 - Considering Provincial guidelines
 - Designating flood hazard areas and developing bylaws
 - Establishing setbacks and flood construction levels
 - Requiring engineering reports
 - Establishing requirements for subdivision in flood-prone areas



"Sea level rise is an *inevitable* consequence of global warming."

The Copenhagen Diagnosis, 2009

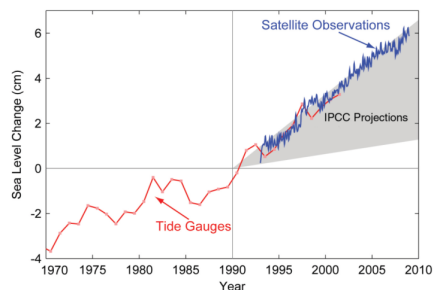


Source: ACIA, 2004

Credit: Nicolo E. DiGirolamo, SSAINASA GSFC, and Jesse Allen, NASA Earth Observatory



Global sea level has risen 20cm since 1870

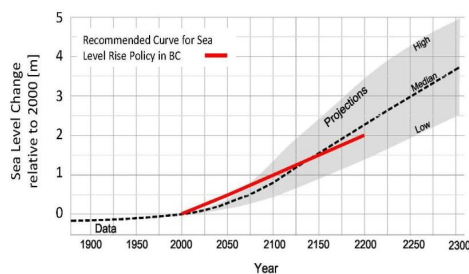


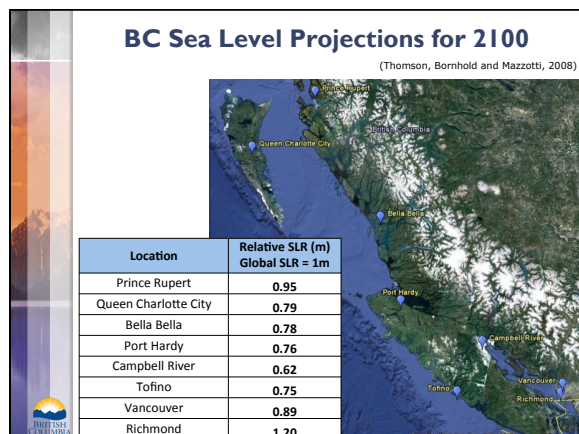
Global sea level is projected to rise another 47 to 190 cm by 2100



Photo credit: Steve Young

How much sea level rise should we plan for?

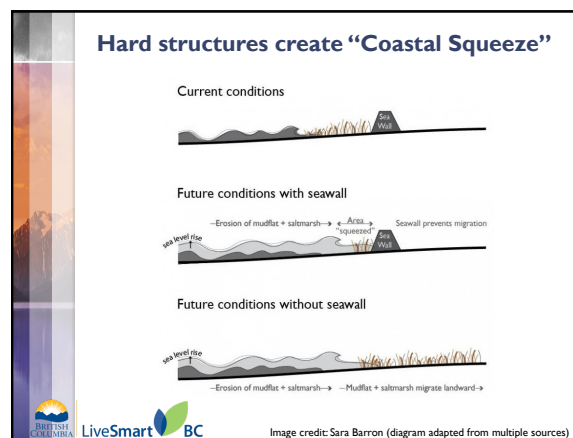
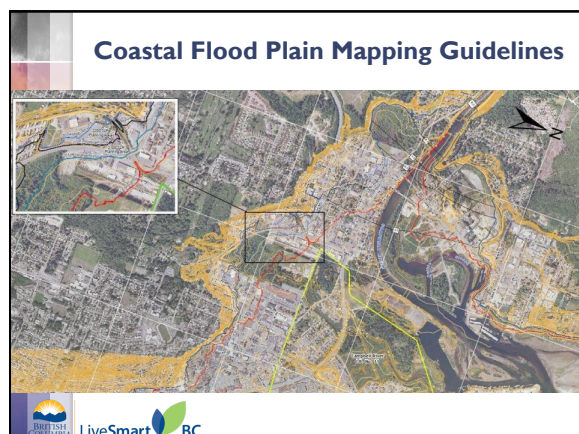
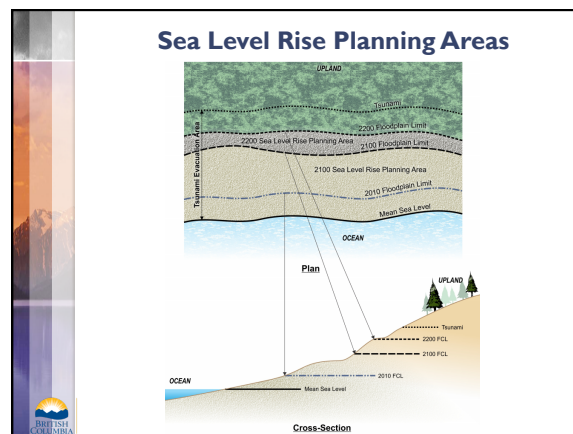
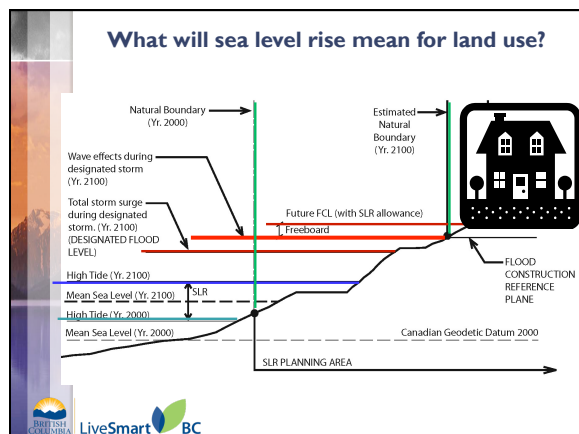




1m of SLR = more than 1m increase in elevation for development

- Sea level rise
- Local land uplift or subsidence
- High tide
- Storm surge
- Wind and wave effects
- Freeboard

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Emerging “Blue Carbon” initiative could reduce GHGs and help communities adapt

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Sea Level Rise Adaptation Primer

SEA LEVEL RISE ADAPTATION PRIMER
A TOOLKIT TO BUILD ADAPTIVE CAPACITY ON CANADA'S SOUTH COASTS
JANUARY 2013

PREPARED BY: Adaptation Group Planning + Architecture Inc.
Ekan Engineering Consultants Ltd.
J.R. Jacobs Consulting
Sustainability Solutions Group

PREPARED FOR: British Columbia Ministry of Environment

Adaptation planning framework
Information gathering and public engagement
21 adaptation tools
• Planning
• Regulatory
• Land use change
• Structural
• Non-structural
Application, advantages and disadvantages
Economic, environmental, social and considerations
Companion materials in development

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Local governments are being proactive

CITY OF VANCOUVER
January 17, 2013
Dear Customer,

RE: Flood-proofing Policy Review and Interim Measures

As part of its Climate Change Adaptation Planning, the City of Vancouver is planning to revise its Flood Proofing Policies to address projected sea level rise following the release by the Province of British Columbia of Climate Change Adaptation Guidelines for the Ocean and Coastal Flood Hazard (2012) report.

Following preliminary studies, recommendations to revise policies are being developed. The City is currently reviewing the Flood Proofing Policies to ensure they are consistent with the Province's guidelines. The City will encourage applicants with projects in identified flood hazard areas to meet an interim FCL equal to the current applicable FCL plus 1 metre (interim FCL).

“...the City will encourage applicants with projects in identified flood hazard areas to meet an interim FCL equal to the current applicable FCL plus 1 metre...”

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District of West Vancouver Shoreline Protection Program

SPP 2012 2015
District of West Vancouver
Shoreline Protection Plan 2012 - 2015

- Objectives & Policies
- Foreshore Lease
- Development Permits
- Management Plans
- Soft Armouring
- Stakeholder Engagement

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Combination of Tools = Adaptation

Enhanced shoreline protection will help to **reduce infrastructure repair and maintenance costs**.

Marine and near shore plants and encrusting animals help reduce wave energy and stabilize the substrates in which they grow **improving the shore's resistance to erosion**.

2006 2010

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King Tides Photo Initiative

<http://www.livesmartbc.ca/connect/kingtidephotos/>

Photo credit: Tina Neale

Visualizations are powerful conversation starters
<http://www.delta-adaptation-bc.ca/>




"Hold the line" scenario shows wider and higher dike. Dashed lines show location of existing street.

Build up" scenario shows individual property adaptations for higher and more frequent floods.

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What's next for BC?

- How will provincial policies be affected by sea level rise?
- How will coastal storms change?
- How effective is soft armouring?
- How will coastal aquifers be affected?
- What tools and information are needed to support adaptation?



Cadboro Bay, December 21, 2010
 Photo by Jim Crover

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Thank You

Ministry of Environment
 Climate Action Secretariat
http://www.env.gov.bc.ca/cas/adaptation/sea_level.html
Tina.Neale@gov.bc.ca

Ministry of Community, Sport & Cultural Development
 Intergovernmental Relations & Planning
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