Colwood's Coastline

Glorious Asset: Continuing Challenge

Colwood

What we will be covering

- Background information needed for reports to come – you are not being asked to make any decisions tonight
- Recent history and current situation on Colwood coastline (excluding DND and Royal Bay)
- Latest information about our responsibility to prepare for climate change effects
- A review of what we have in process so far
- Ideas of what we could do in addition
- Next steps

Erosion and Accretion

- Coastal bluffs eroding for centuries
- Currents carried erosion products to Esquimalt and Albert Head Lagoon peninsulas
- Gravel mining started 1909
- Waste sand increased material in the currents
- Postwar sand no longer wasted to the ocean – Coburg began to shrink

Coast line from Royal Bay dock to Lagoon 1968

Note sand and silt in the water in front of Royal Bay and drifting north.

Coburg circa 1935

Note distance from Dugout pub to the highwater mark and the long extension north towards Esquimalt Harbour - causeway to the lighthouse being built in 1950-1951.

Ranger's Building (formerly Dugout Pub)

Note high water mark now part way through building and exposed pipe

Quotes from 2008 Seabulk Systems report

- “an apparent problem is that the beach was developed with a road, pub, parking areas and other facilities when the beach was in an inflated state. These developments are now apparently in jeopardy…” (page 4)

Quotes from 2008 Seabulk Systems report

- "an apparent problem is that the beach was developed with a road, pub, parking areas and other facilities when the beach was in an inflated state. These developments are now apparently in jeopardy…" (page 4)

- "…the recent overtopping indicates the road elevation is low." (page 5)

Quotes from 2008 Seabulk Systems report

- "an apparent problem is that the beach was developed with a road, pub, parking areas and other facilities when the beach was in an inflated state. These developments are now apparently in jeopardy…" (page 4)
- "…the recent overtopping indicates the road elevation is low." (page 5)
- "The current trend for Victoria is a sea level rise of 6 cm per century." (page 5)

Quotes from Seabulk report contd.

- "We would conclude that the event of November 12th that impacted the Coburg Peninsula shoreline was significant but that much larger events will occur in the future." (page 6)

Quotes from Seabulk report contd.

- "We would conclude that the event of November 12th that impacted the Coburg Peninsula shoreline was significant but that much larger events will occur in the future." (page 6)

- "In the absence of an increase in sediment discharge to the foreshore upcoast of the peninsula, the beach will not rebuild to levels it had in the past." (page 13)

Apparent situation post 2008

- The bridge approaches are at risk of erosion
- The north abutment has subsequently been rebuilt and is holding well
- The south abutment is no longer under direct attack and so holding although it is weak
- The road is at risk of overtopping and possible damage
- Council has not so far decided to spend money to add protection to the road

Apparent situation post 2008 cont.

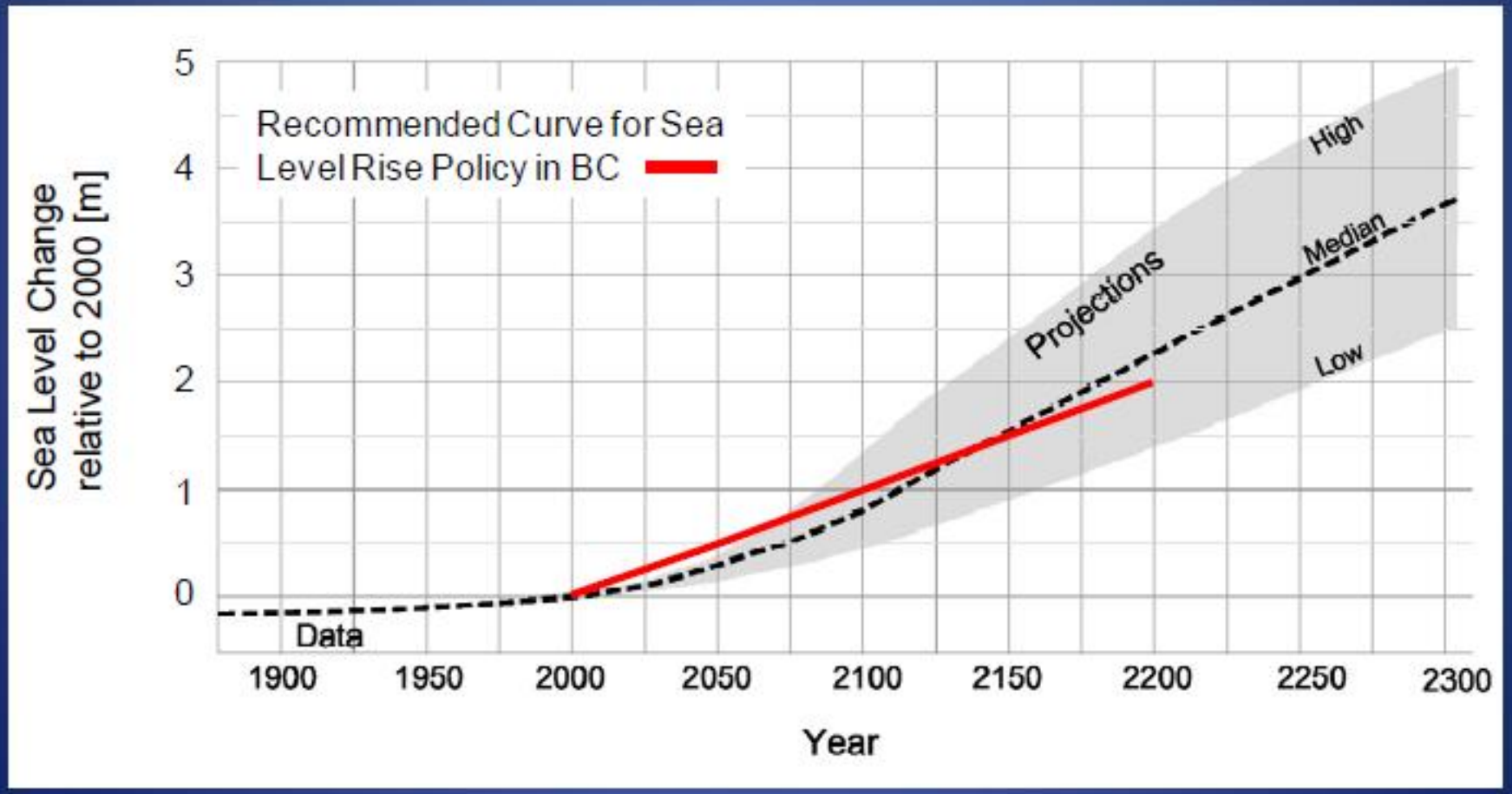
- The sewage pump station is at some risk of failure
- An RFP for the design of protective works has been issued
- Ocean Boulevard south of Lagoon road is under active and destructive attack but is still fully functional when not closed by debris
- No decision has been taken on protective measures for this section of road
- There are private assets on the coastline


OCEAN BLVD.

Information received since Seabulk

- Following graph from Ministry of Forests, Lands and Natural Resources Operations
- MFLNRO responsible for flood prevention activities of the Province
- Grants for flood prevention works must take into account the following information
- Response to requests for assistance with flood damage will take into account the following information

Recommended Sea Level Rise Curve for Planning & Design



Sea level rise plus other effects

- Sea level rise is net of crust movements and increases with time as shown in the graph

Sea level rise plus other effects

- Sea level rise is net of crust movements and increases with time as shown in the graph
- Highest predicted tides must be considered

Sea level rise plus other effects

- Sea level rise is net of crust movements and increases with time as shown in the graph
- Highest predicted tides must be considered
- Storm surge increases with decreasing atmospheric pressure of the storm which will get worse as more energy is added to the atmosphere. This must be added to sea level

Sea level rise plus other effects

- Sea level rise is net of crust movements and increases with time as shown in the graph
- Highest predicted tides must be considered
- Storm surge increases with decreasing atmospheric pressure of the storm which will get worse as more energy is added to the atmosphere. This must be added to sea level
- Wave action increases with energy added to the atmosphere and must be added to storm surge

Effects of sea level rise on the Coastline

- Current reach of erosive power of waves is about 3 metres geodetic (above sea level) or more
- We are required to allow for a reach in 2100 of approximately 4.3 metres plus factor of safety.
- Almost all of the peninsula is under 3.5 metres
- Rates of erosion will increase steadily
- We must assume the road will be regularly overtopped in the winter long before 2100.
- Detailed study could predict more accurately

Colwood

Why should we believe this?

Sources of information used in this presentation:

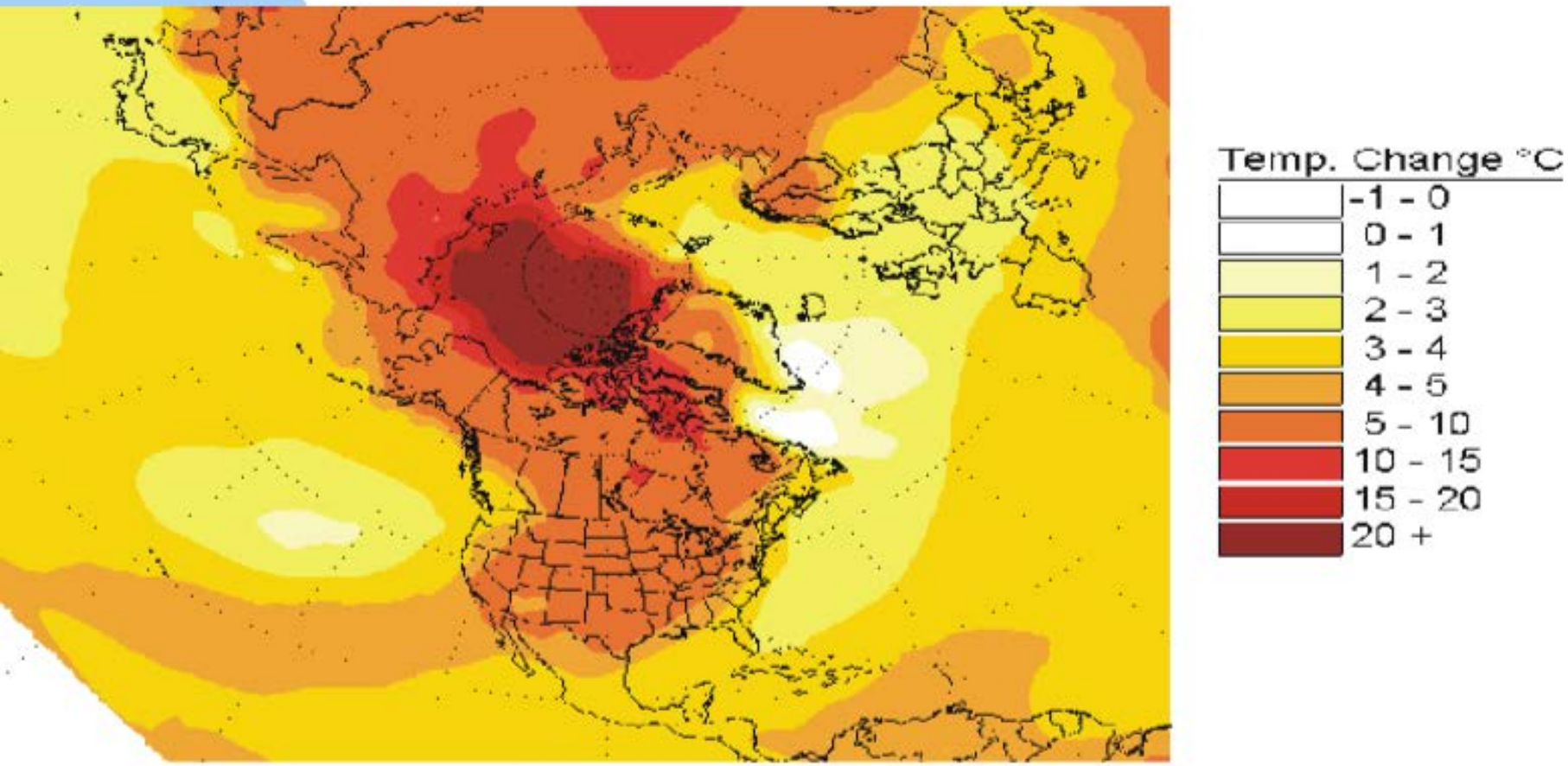
- BC Ministry of Forests, Lands and Natural Resource Operations
- BC Ministry of the Environment
- Insurance Bureau of Canada
- Institute for Catastrophic Loss Reduction
- British Columbia Climate Action Secretariat
- BC Regional Adaptation Collaborative Research
- CRD Coastal Inundation Mapping
- Various Engineering Consultants

Its not that bad for Colwood

- Victoria is one of the least affected areas in North America
- Everyone with a coastline will have to deal with sea level rise
- The other effects are very variable as we shall see shortly

Projected winter temperature change

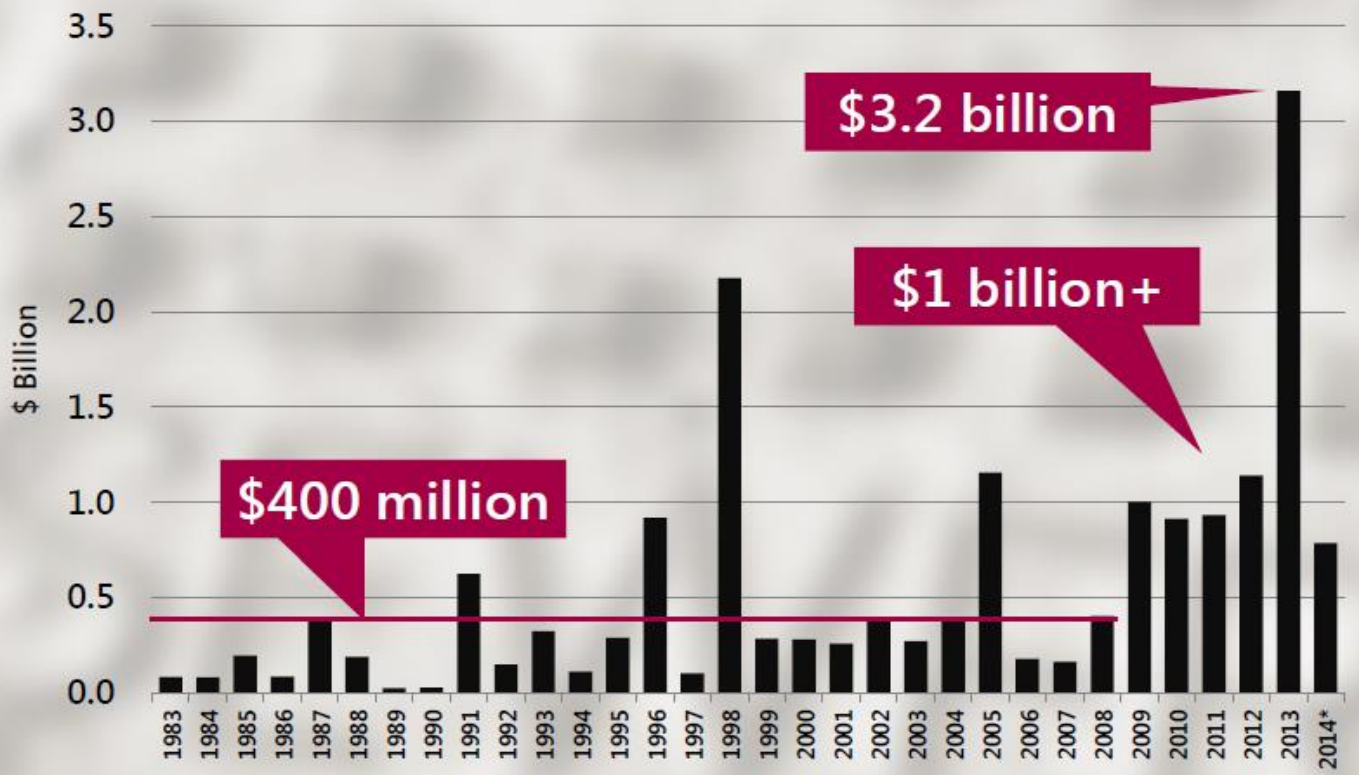
Between 1975-1995 and 2080-2100, Canadian climate change model



Source: Meteorological Service of Canada, Environment Canada.

Colwood

Catastrophic Losses in Canada Since 1983



Source: IBC Facts Book, PCS, Swiss Re, Munich Re & Deloitte | Values in 2013 $ CAN

Colwood

Disaster Financial Assistance Arrangement

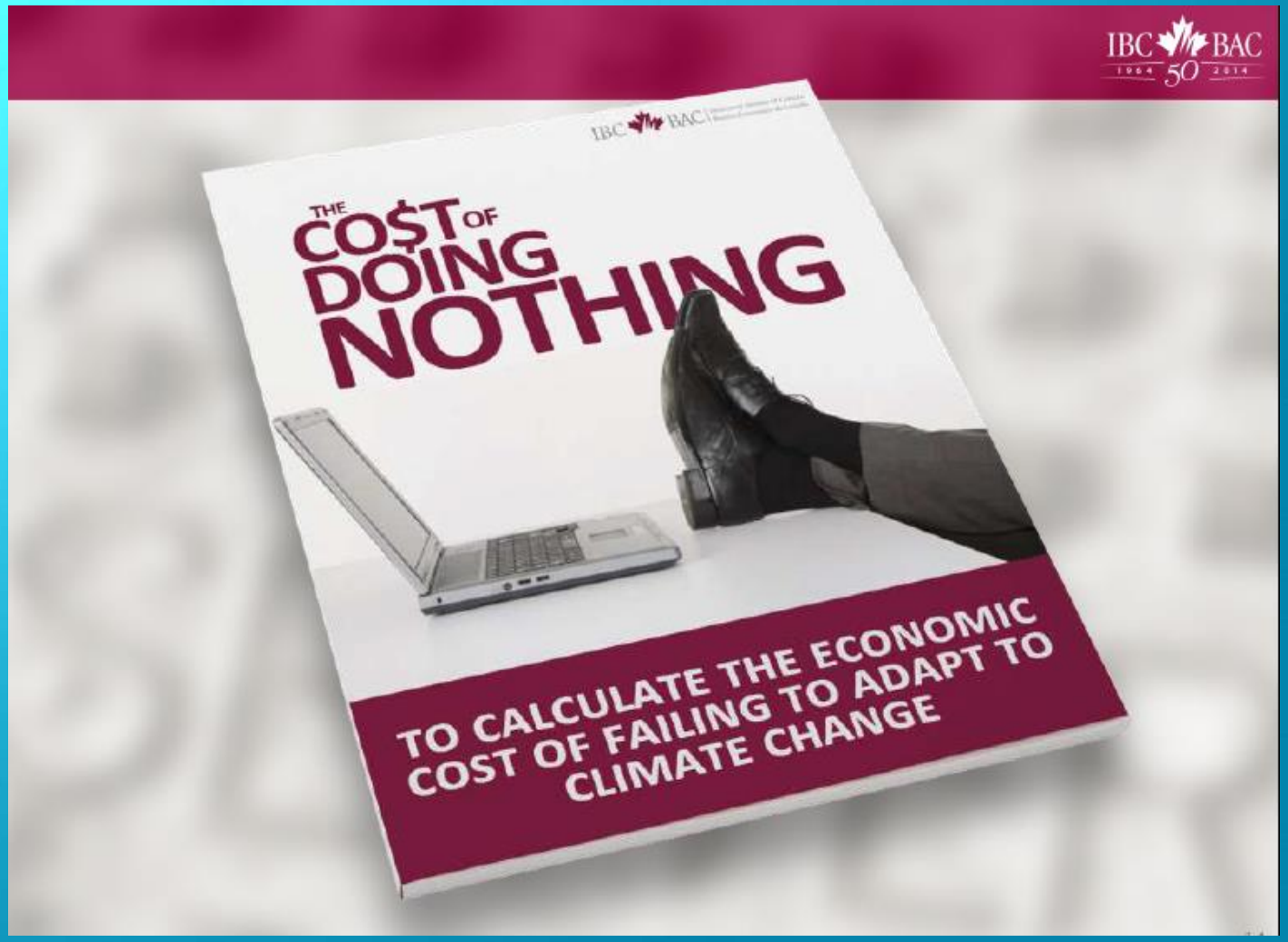
IBC BAC 1964 50 2014

1970s: **$36 million** a year

2000s: **$166 million** a year

2010s: **$1 billion** a year

Colwood


IBC BAC
1964 50 2014
IBC BAC
THE COST OF DOING NOTHING
TO CALCULATE THE ECONOMIC COST OF FAILING TO ADAPT TO CLIMATE CHANGE

Colwood

IBC BAC 50

Three streams of data

MRAT

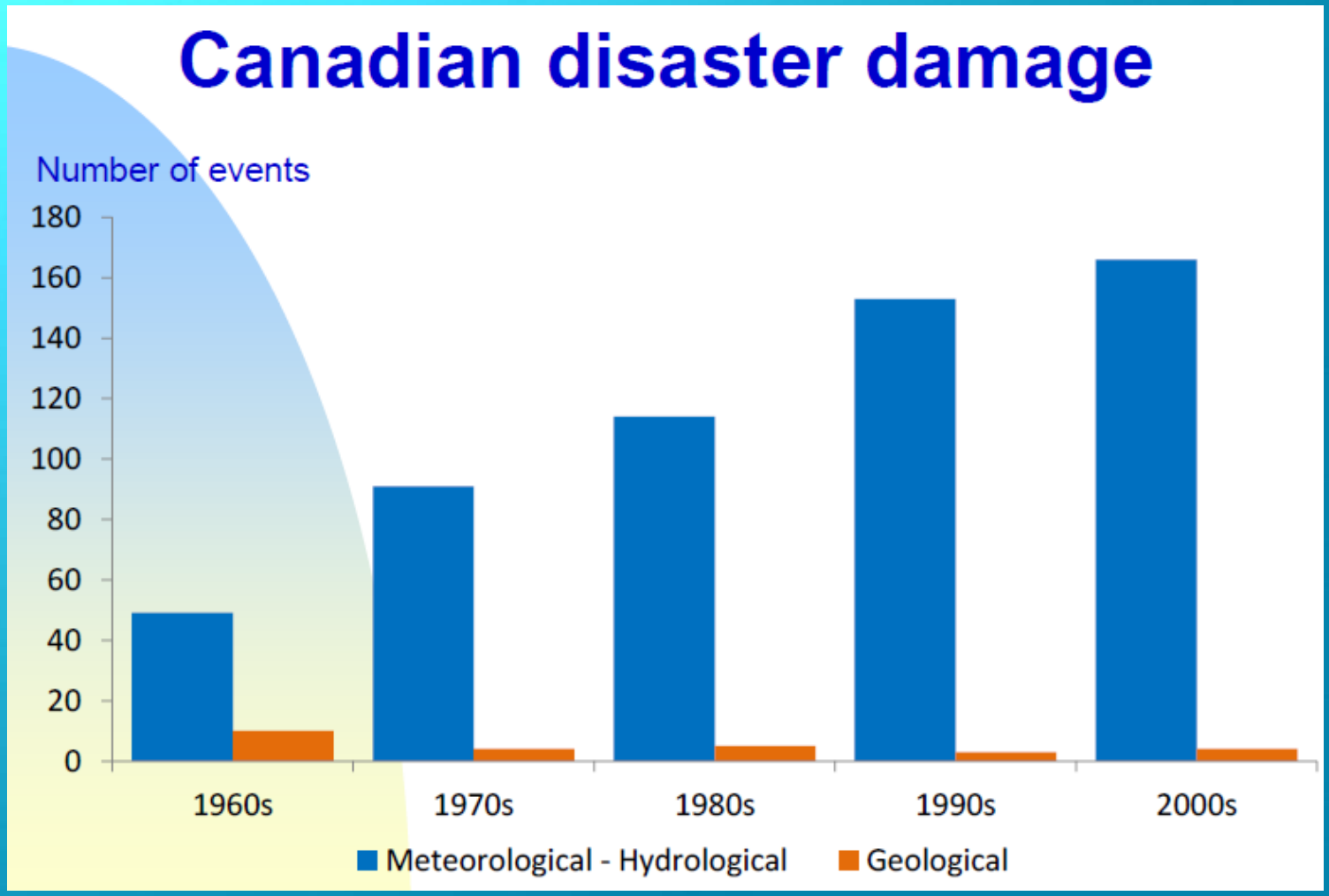
FUTURE INFRASTRUCTURE PLANNING

Institute for Catastrophic Loss Reduction

- Mission – reduce loss of life and property caused by severe weather and earthquakes
- Created in 1997 by the insurance community to confront rising disaster losses
- Multi-disciplinary research and education provides an essential foundation for ‘science to action’
- 30 scientists / 100+ students / 12+ universities / 350+ research papers / $50+ million in research

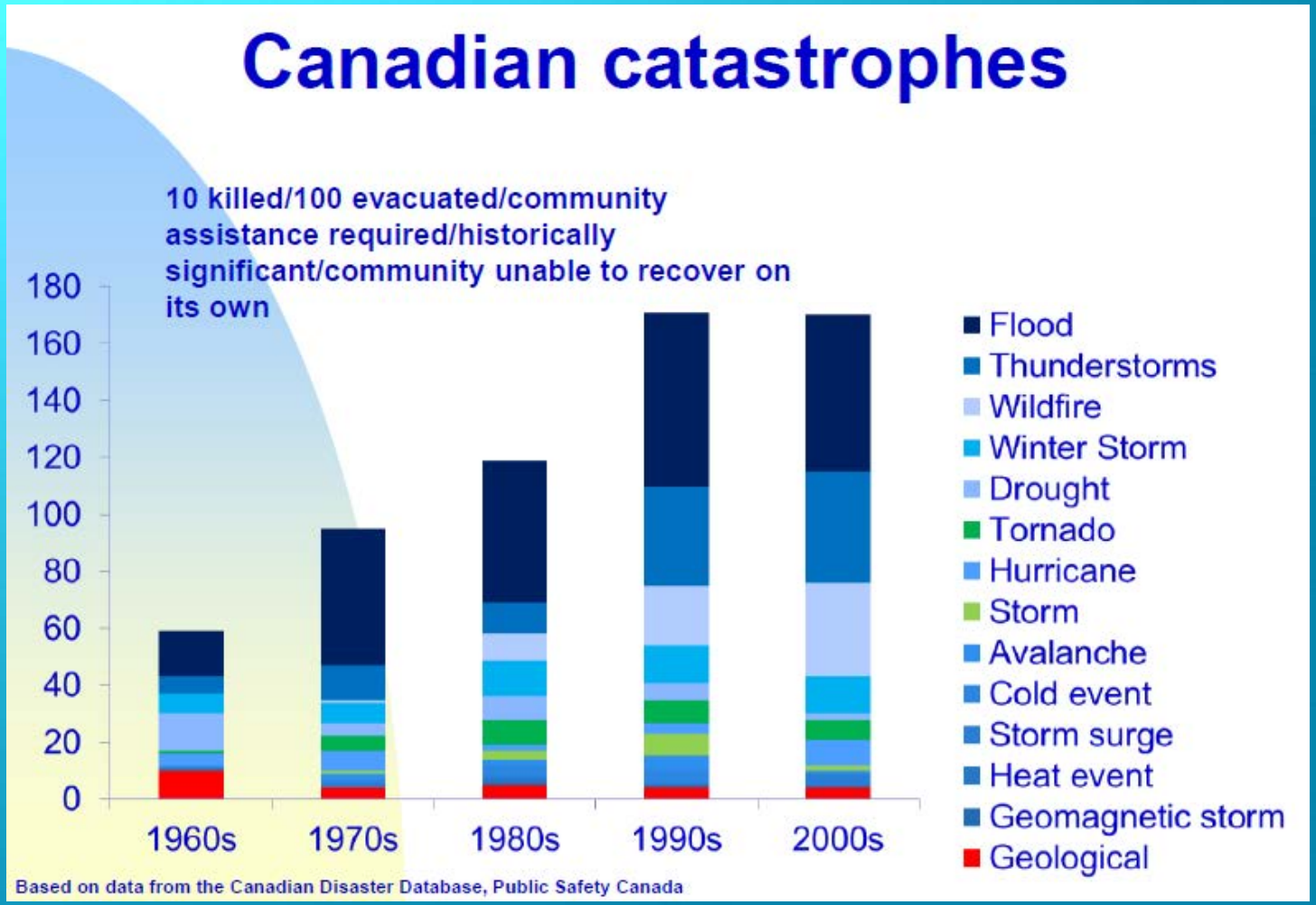
Colwood

Institute for
Catastrophic Loss Reduction



Colwood

Institute for Catastrophic Loss Reduction




Aidrie, Alberta hailstorm
MAZDA
MAZDA
$450 million
insured damage
Insured losses only August 7 and 8, 2014

Colwood

Institute for
Catastrophic Loss Reduction

Why are losses rising?

- More people and property at risk
- Aging infrastructure
- The climate is changing

Colwood

BCCAS
(part of Ministry of Environment)

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

Climate models can inform design decisions

- The past climate is an imperfect guide to the future;
- Climate models can increase our understanding of what to expect;
- Uncertainty is a fact of life;
- Design professionals will need to weigh the risks associated with a changing climate against the costs associated with mitigating those risks.


Colwood
"BELIEF IN CLIMATE CHANGE IS OPTIONAL, BUT PARTICIPATION IS MANDATORY."
- UNKNOWN
@CLIMATEREALITY
FACEBOOK.COM/CLIMATEREALITY
The Climate Reality Project

Planning Institute of BC

Professional Leadership in a Changing Climate: Joint Statement

Planning Institute of British Columbia
Association of BC Forest Professionals
Association of Professional Biology
College of Applied Biology

"We recommend that all levels of government should review existing laws and policies in light of climate change to ensure that:
Proponents, clients, license holders and professionals consider climate change in decision making…"

Association of Professional Engineers and Geologists of BC

APEGBC registrants are expected to keep themselves informed about the changing climate, and consider potential impacts on their professional activities.

Association of Professional Engineers and Geologists of BC

- The climate in BC is continuing to change, challenging many traditional assumptions of long-term climate stability.

Association of Professional Engineers and Geologists of BC

- The climate in BC is continuing to change, challenging many traditional assumptions of long-term climate stability.
- There are expected to be a range of impacts at the regional level, including changing precipitation patterns (such as intensity, duration and frequency), hotter summers (potentially leading to increased risk of drought and forest fire events) and warmer, wetter winters (potentially increasing flood risks).

Association of Professional Engineers and Geologists of BC

- The climate in BC is continuing to change, challenging many traditional assumptions of long-term climate stability.
- There are expected to be a range of impacts at the regional level, including changing precipitation patterns (such as intensity, duration and frequency), hotter summers (potentially leading to increased risk of drought and forest fire events) and warmer, wetter winters (potentially increasing flood risks).
- Future characteristics of temperature, precipitation, the frequency of extreme events and sea level may be affected as the climate continues to change, and is likely to be markedly different from conditions in the recent past.

Colwood

Institute for Catastrophic Loss Reduction

New normal

"The Institute for Catastrophic Loss Reduction (ICLR) reports that large insured losses from extreme weather appear to be 'the new normal' for the Canadian insurance industry, expecting that large-loss years will no longer be rarities."

Canadian Underwriter (November 6, 2012)

Colwood

Institute for
Catastrophic Loss Reduction

Public awareness

- Community actions are the most important and effective in promoting disaster safety -- think locally and act locally
- Informed families and businesses are best able to manage nature's hazards
  - Don't be taken by surprise
  - Don't wait for it, plan for it
- Canadians must establish a culture of preparedness

Colwood

Institute for
Catastrophic Loss Reduction

We must act…

"The rising cost of natural disasters and the financial burden on Ottawa is the country's biggest public safety risk"…

Public Safety Canada, 2013/14, Report on Plans and Priorities

Sea level rise
the easiest to deal with

- It is the most predictable
- Its change is gradual and steady (although not so the storms)
- The forces are incredibly powerful but always directed where we would expect – the coastline
- BUT – its predictability may lead senior gvts to expect us to deal with this ourselves
- SO – being pro-active and a leader in responsible action may attract grants

What should we do?

- Take advantage of the slow steady nature of it
- There is time to have a full discussion with the community
- Plan ahead
- Prepare to gradually increase protection
- OR to gradually retreat
- Build nothing that will be lost before its time
- Put money aside to deal with the problems

We have been informed

There is now no excuse for allowing a catastrophe to happen

If we are not ready we cannot expect to be forgiven by the other levels of government and a community that is dealing with its own climate induced difficulties

What are we doing already to prepare for change?

- Consultant to prepare protection/replacement plans for Ocean Boulevard pump station
- Consultant to provide estimates for similar work on other assets on the coast
- Money for first round of field work budgeted
- Urban ecology plan
  - Rainwater management
  - Urban forests

What are we doing to limit change?

- Urban forest strategy – save$
- Transportation Master Plan – active transportation options
- Requirements for energy efficiency etc. at rezoning - save$
- Public Works creating new active routes (e.g., Allendale)
- Helping home owners reduce energy use (Solar - Colwood) - save$
- Supporting use of electric vehicles - save$

What are we doing to limit change?

- Working closely with BC Transit to improve service
- Certified Green Vancouver Island Business
- Reducing corporate energy use and GHG production - save$

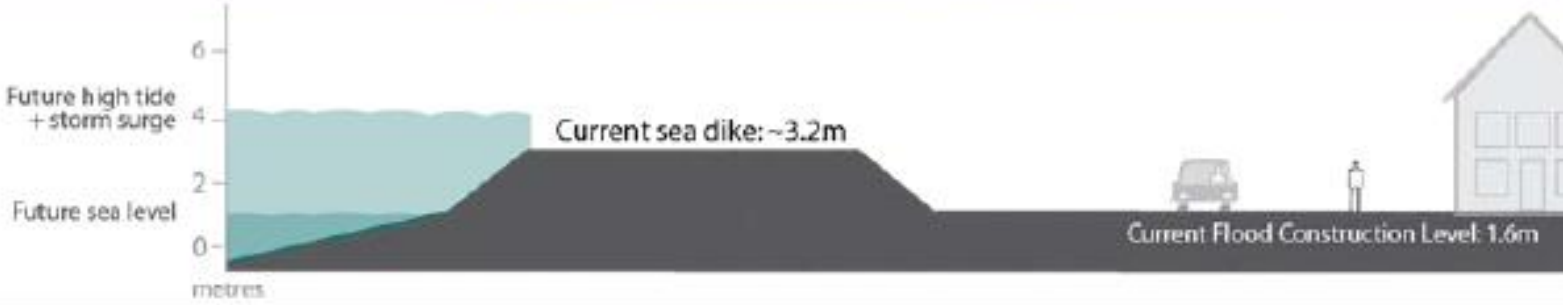
What else can we do to prepare for change?

- Sewage treatment that recovers water - save$
- Combine disaster resiliency and local renewable energy - save$
- Begin talking to the coastal community about the future for their properties
- Begin talking to the wider community about the future
- Begin putting aside money for future preventative measures or dealing with disasters – save$

Climate change impacts

LADNER dike view

Current dike height, water level of 4.2m
2m high tide, 1m storm surge
1.2m sea level rise



What else can we do to prepare for change?

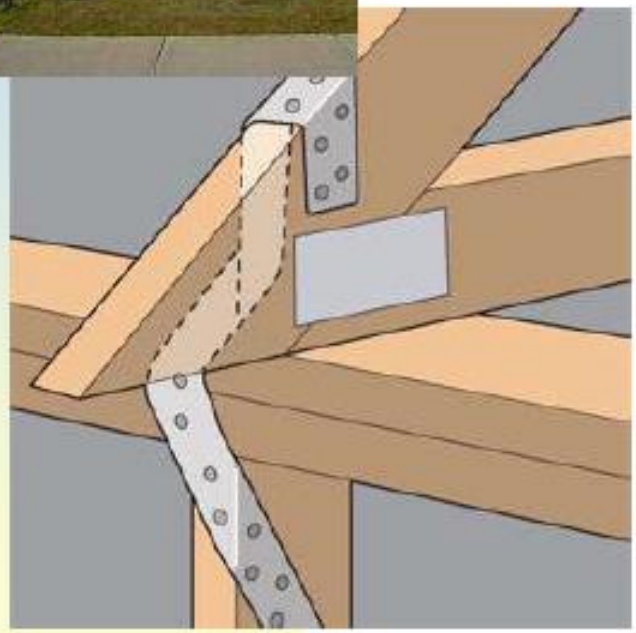
- Advocate for and support improved building regulations to make housing
  - Energy positive
  - Water smart
  - Disaster resilient

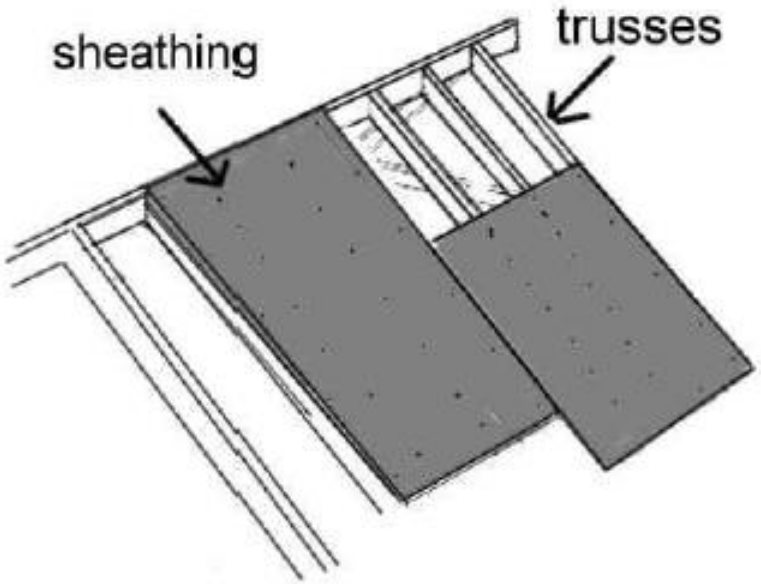
Colwood

Annual energy cost - $150

"What we could not grasp prior to living in it was the amazing comfort, indoor air quality and quiet interior environment of a Passive House"

Building code work

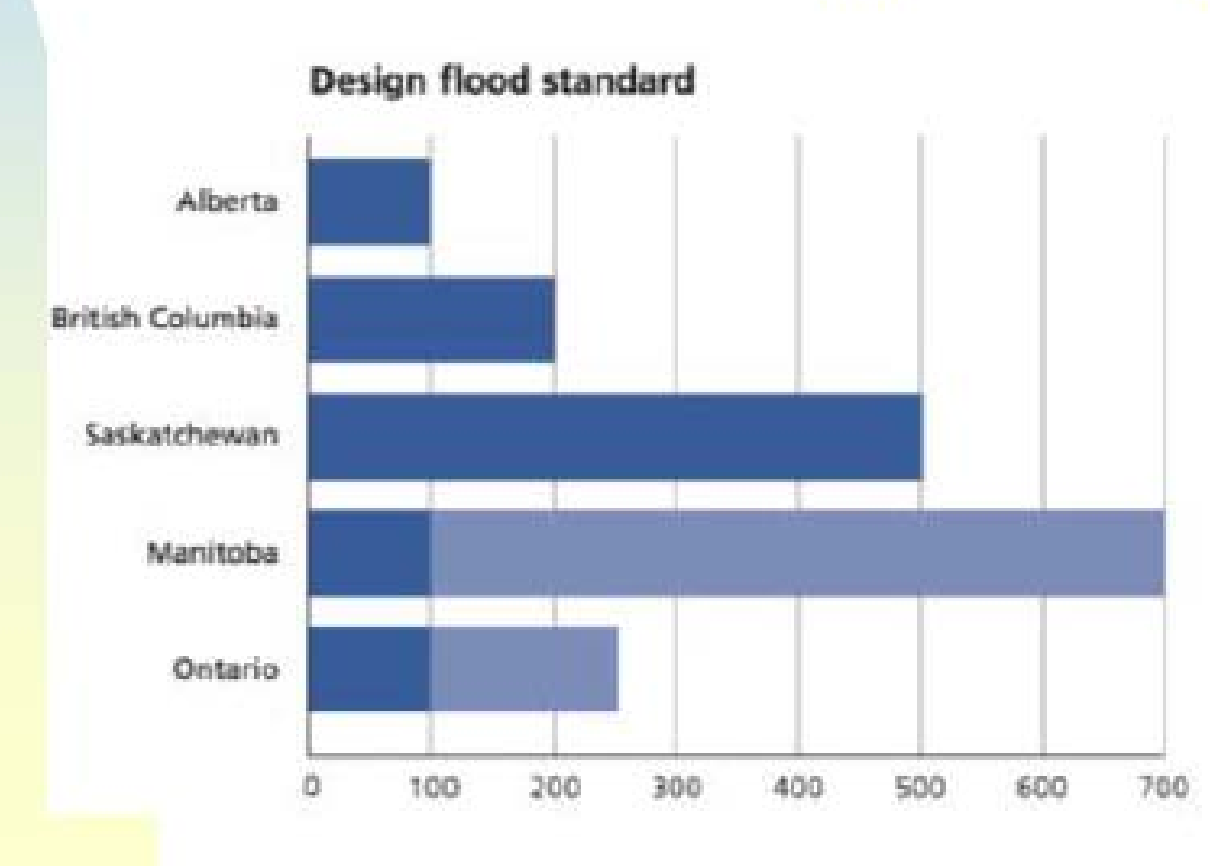




Institute for Catastrophic Loss Reduction

Non structural measures are effective means to improve the safety of how we live, study and work

Land use planning has been proven to be a powerful tool to reduce damage and injuries



What else can we do to limit change?

- Land use policies/bylaws to require/encourage onsite renewable energy and low energy developments - save$
- Use OCP and other regulations to require and encourage complete and walkable communities
- Sewage treatment that recovers energy - save$
- Continue to help homeowners save energy - save$
- Gradually convert streetlights to LED - save$
- Solar powered LED for new developments save$
- Gradually convert fleet to electric as available save$

What else can we do to limit change?

- Incentivize low energy or onsite renewable energy developments - save$
- Use onsite renewables and batteries as backup power - save$
- Work with UBCM to improve government policies, statutes and regulations - save$

Next steps

- Reports with more detail and recommendations on
  - Protection of individual assets on the coastline
  - Public process to involve the community
  - Transportation Master Plan outcomes and work plan for implementation
  - Changes to land use policies and bylaws to more fully implement the OCP policies
  - Urban Ecology Plan process