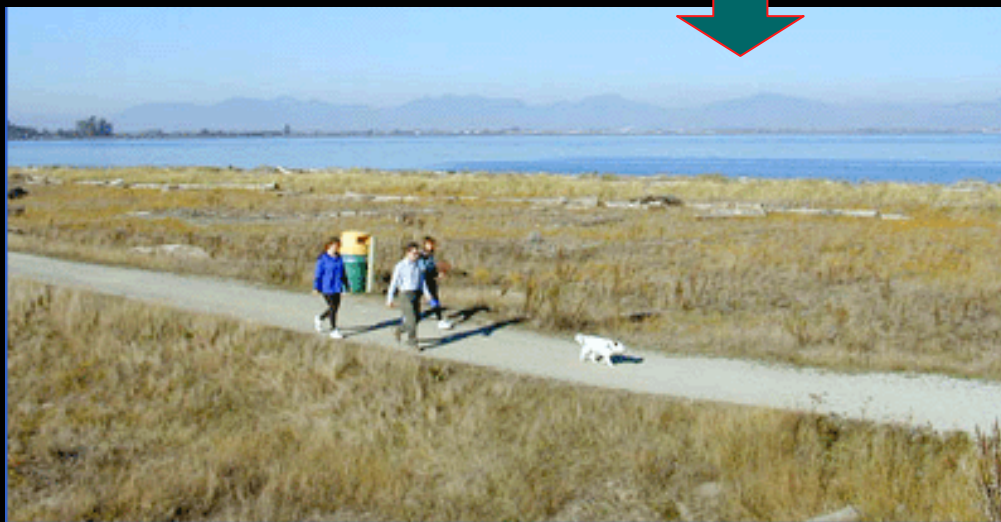
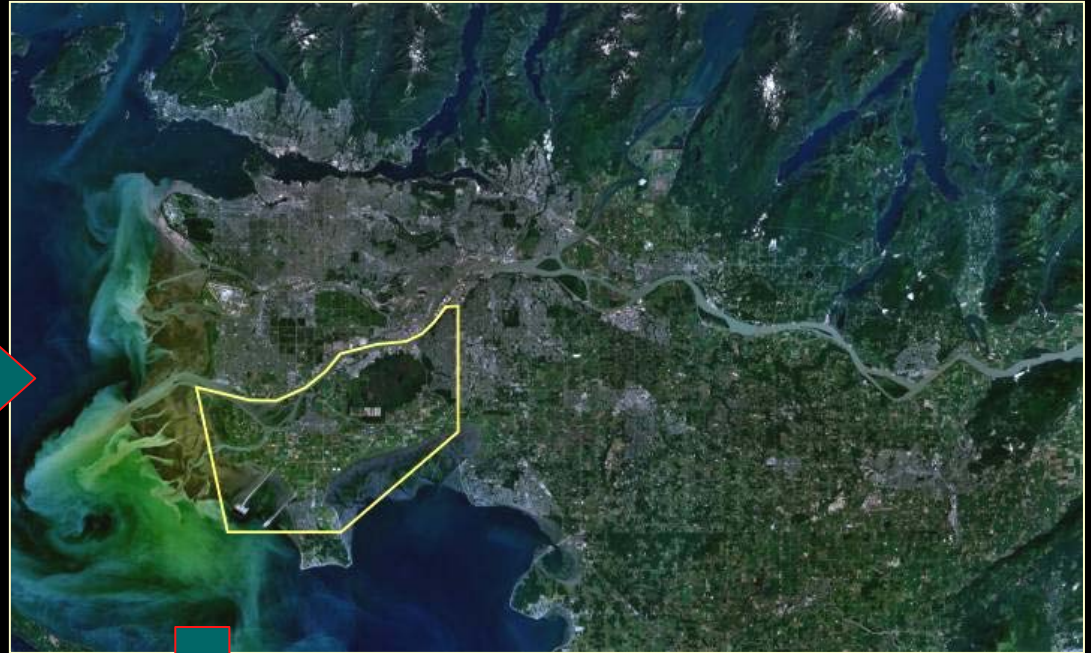
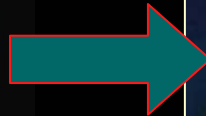
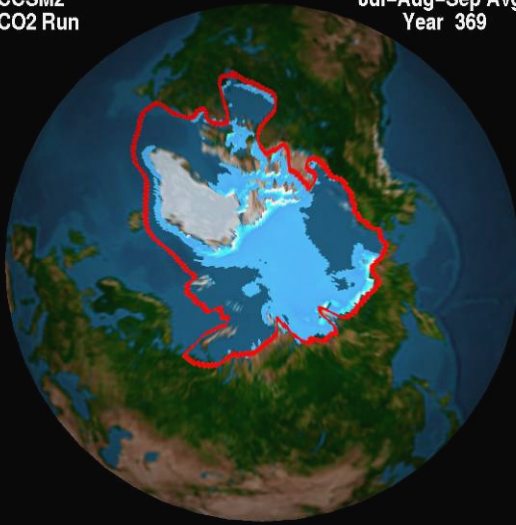


Local Climate Change Visioning Project

CCSM2
CO2 Run

Jul-Aug-Sep Avg
Year 369



Collaborative for Advanced
Landscape Planning



C A L P

David Flanders, BSc | MLA

May, 2008

Moving From Global to Local



Global



Regional



Local

GEOIDE Study Objectives

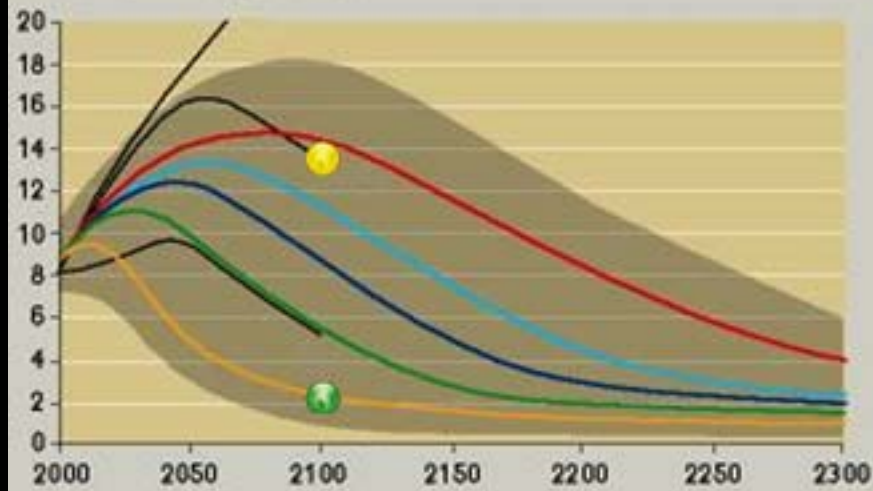


Developing & testing a process:

- To show how climate change might affect local communities in alternative futures for Delta and the Lower Mainland
- To build awareness of community choices and response options

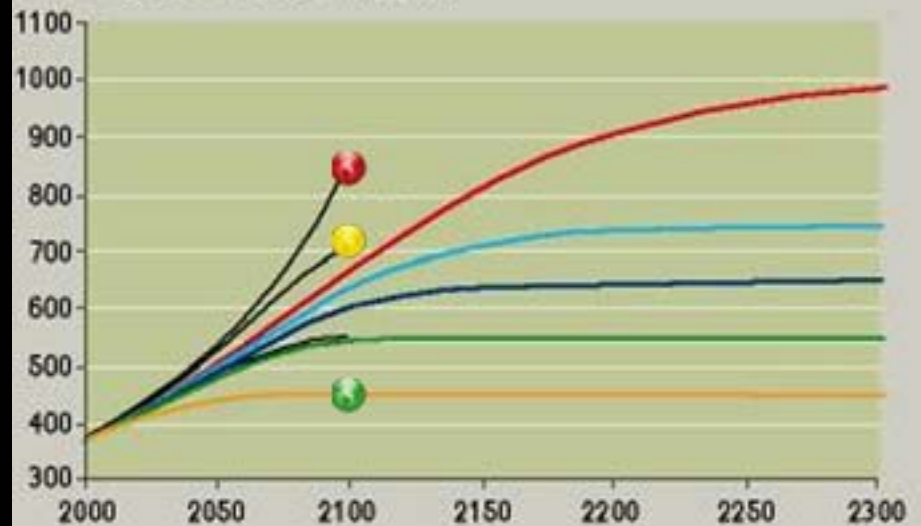
Alternative Emissions Worlds

(a) CO₂ emissions (Gt C)

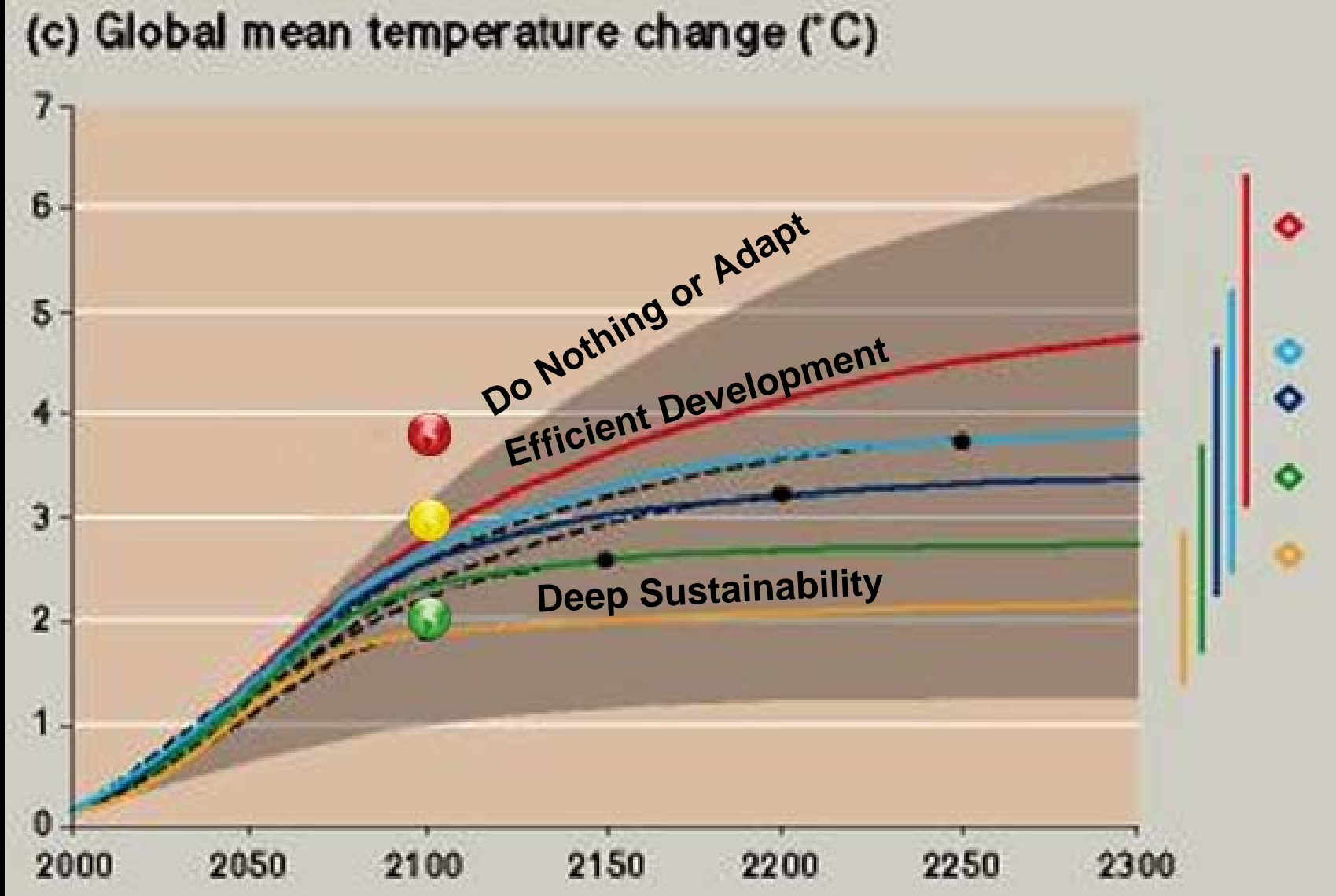


- 1 Do Nothing or Adapt
- 2 Efficient Development
- 3 Deep Sustainability (CO₂ Stabilization by 2100)
- 4
- 5

(b) CO₂ concentration (ppm)



Temperature Change



REGIONAL STORYLINES

POPULATION

GHGs

ENERGY USE

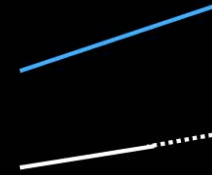
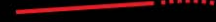
ECONOMY

LAND-USE AREA

% AGRICULTURE —
% RESIDENTIAL —



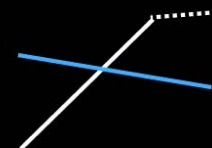
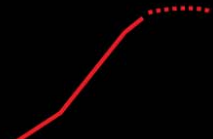
Deep Sustainability



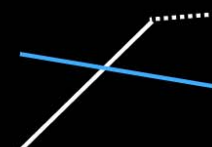
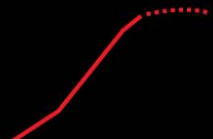
Efficient Development



Adapt to Risk & Vulnerability







Do Nothing



Regional Assumptions

E = Emissions (1990)
 CO₂ = Concentration
 Temp = Avg. Temp. Change
 SLR = Sea Level Rise

	2020	2050	2100
	E = -9.6 % CO ₂ = 410 ppmv Temp = 0.33 C SLR = 0.13 m	E = -61 % CO ₂ = 445 ppmv Temp = 0.43 C SLR = 0.27 m	E = -85 - 100 % CO ₂ = 450 ppmv Temp = 0.72 C SLR = 0.40 m
	E = +25 % CO ₂ = 410 ppmv Temp = 0.5 C SLR = 0.13 m	E = +63 % CO ₂ = 470 ppmv Temp = 1.5 C SLR = 0.27 m	E = +70 % CO ₂ = 620 ppmv Temp = 2.63 C SLR = 0.49 m
	E = +57 % CO ₂ = 410 ppmv Temp = 0.45 C SLR = 0.13 m	E = +144 % CO ₂ = 550 ppmv Temp = 1.6 C SLR = 0.27 m	E = +175 % CO ₂ = 850 ppmv Temp = 3.75 C SLR = 0.58 m
	E = +57 % CO ₂ = 410 ppmv Temp = 0.45 C SLR = 0.13 m	E = +144 % CO ₂ = 550 ppmv Temp = 1.6 C SLR = 0.27 m	E = +175 % CO ₂ = 850 ppmv Temp = 3.75 C SLR = 0.58 m

Current Projects and Policies (Approximate Locations)

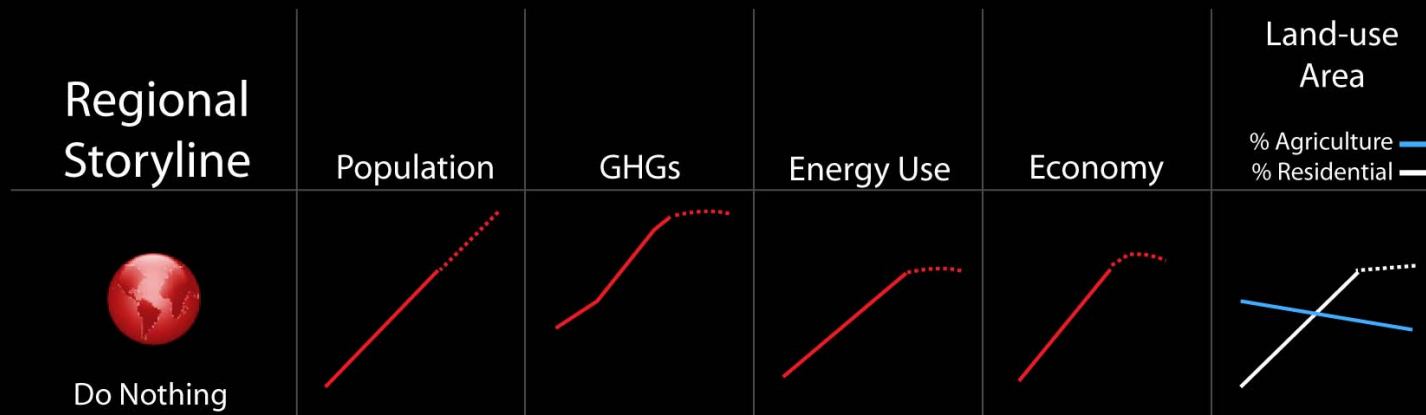
- The CIRS Project
- Livable Region Strategic Plan
- Southeast False Creek Initiative
- SmartGrowth BC
- FCM Partners for Climate Protection
- The Green Plan
- Delta Official Community Plan
- Climate Change & GVRD
- Adaptation Strategies for Long-Term Utility Planning
- DeltaPort Third Berth Project
- The Gateway Program

World 1: Do Nothing



Delta Assumptions: 2100

- High population growth
- High economic growth until late century
- 3x carbon emissions
- +3.75°C
- Sea-level rise of 0.58 meters
- Mean snowline (April 1st): 1074m (Current: 759 m)



South Delta Context: Main Sources of GHG Emissions

- 85% of residents commute outside Delta
- South Fraser perimeter road
- Delta Port 3rd berth project



Transportation to Work

Car, truck, van as driver	16,795	81.2%
Car, truck, van as passenger	970	4.2%
Public transit	1,545	7.5%
Walk to work	880	4.3%
Bicycle	230	1.1%
Other method	150	0.7%

Source: Corporation of Delta Greenhouse Gas Inventory



February 2006 (storm surge conditions)

Courtesy of Corp. of Delta

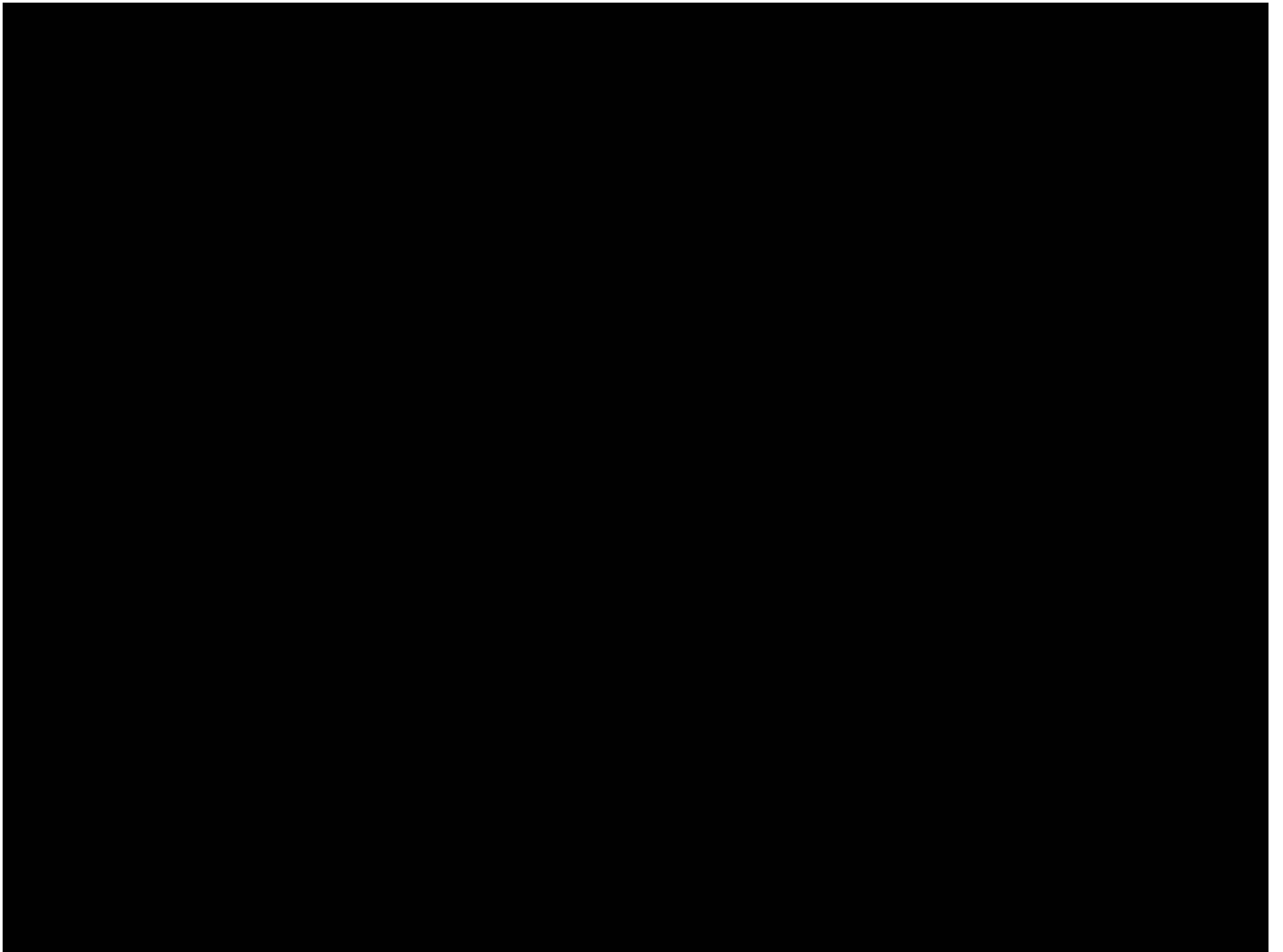


Westham Island

Brunswick Point

West Delta Agriculture

Current NHT + storm surge/flooding





Roberts Bank: 2100

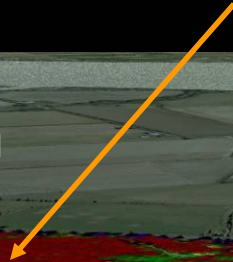
Existing dike + normal high tide + sustained storm surge + breach

Delta Marshlands

2100

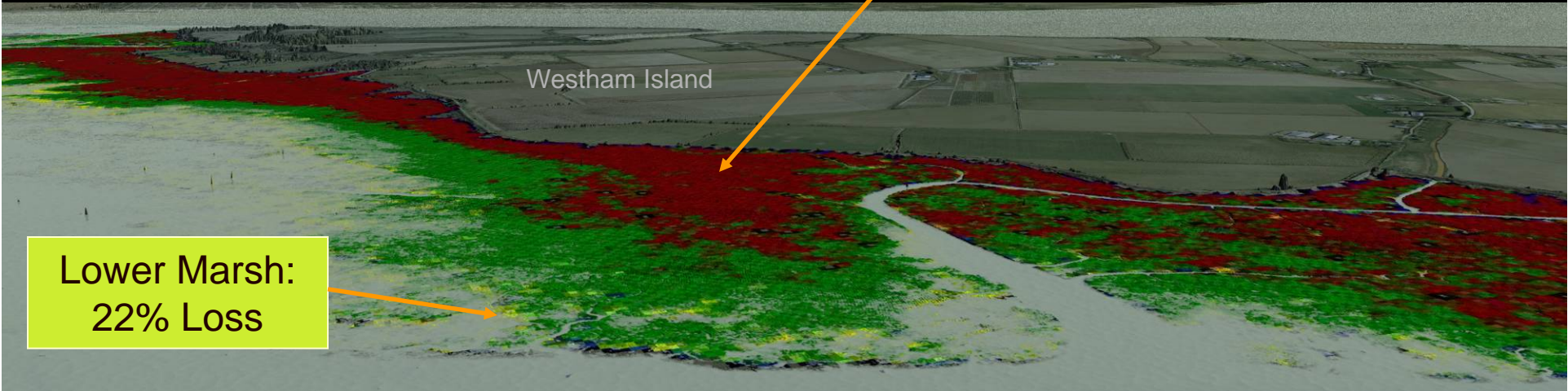


Upper Marsh:
41% Loss



Westham Island

Lower Marsh:
22% Loss



Black Brant Geese



Snow Geese

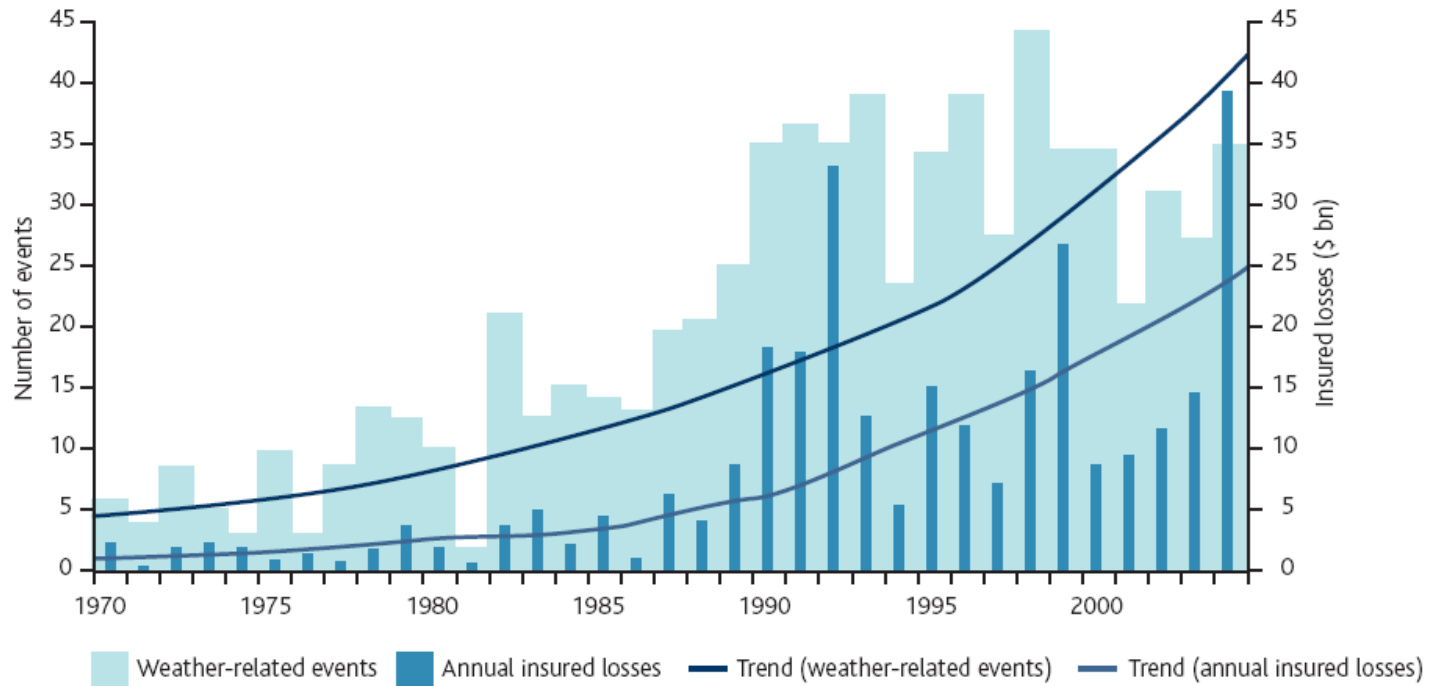


Western Sandpiper



Global Frequency of Weather Events

(b) Number of weather-related catastrophes and insured losses (2004 prices)



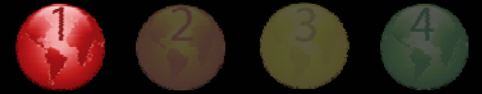
Source: Sigma Database, Swiss Re.

Unplanned Development

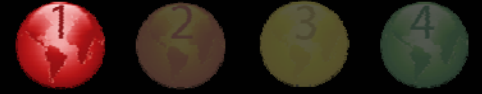


*“Some [1995] estimates suggest that 150 - 200 million people may become permanently displaced by the middle of the century due to rising sea levels, more frequent floods, and more intense droughts”
(Stern Report 2006).*





South Delta: 2000



South Delta: 2100



Existing Conditions



- 1
- 2
- 3
- 4

Existing condition /
Storm surge breach



2020
Storm surge breach



- 1
- 2
- 3
- 4

2050
Storm surge breach



2100
Storm surge breach



2100: Mean Sea Level





2100: Storm Surge
No Waves





2100: Storm surge with breach / overtopping



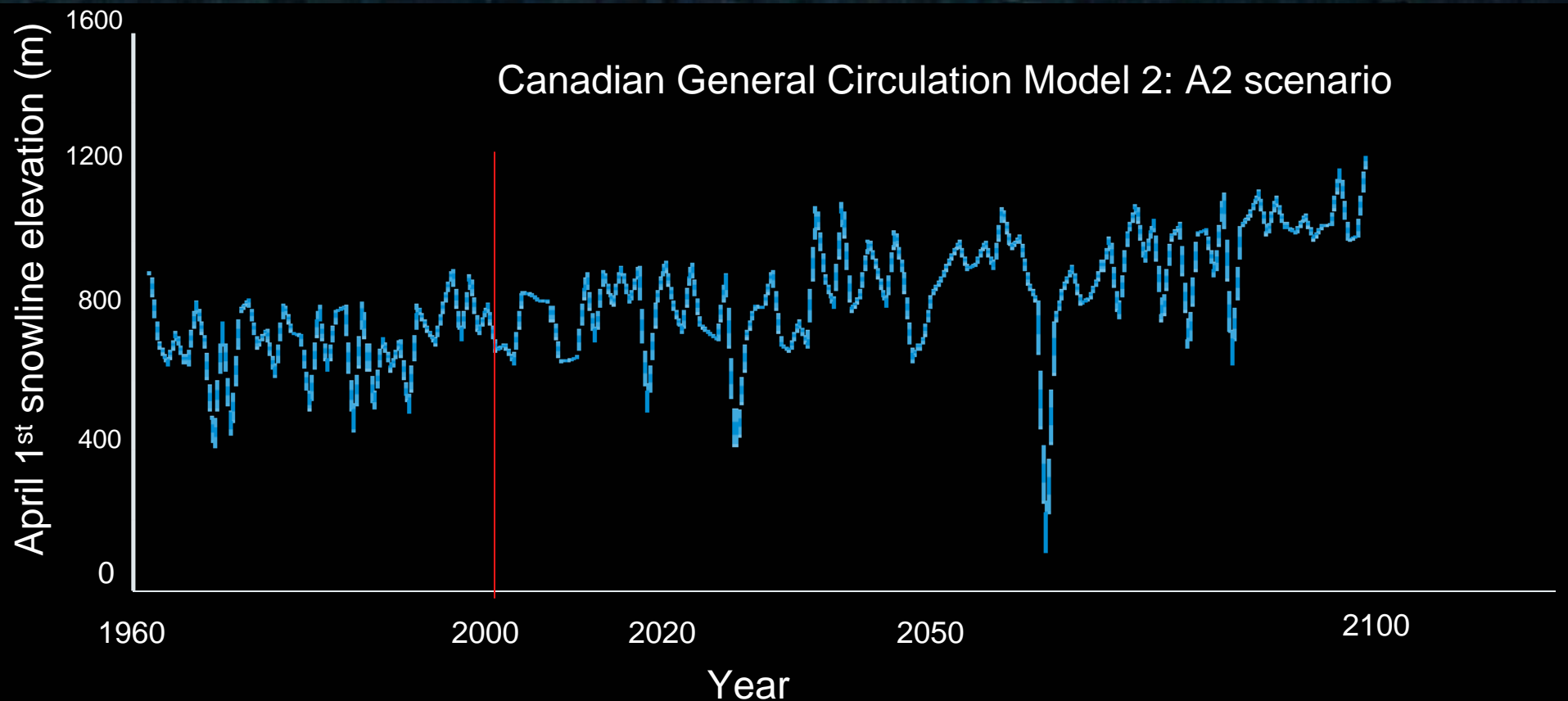


2100: Coastal housing
uninsured





Average April 1st Snowline





Northshore storyline

Existing
Housing

Grouse
Mountain

Mosquito
Creek



2020



Increased
debris flows
/ erosion

Forest
blowdown



2050



Expansion of homes
at higher elevations

Burnt
areas



Kelowna, 2004

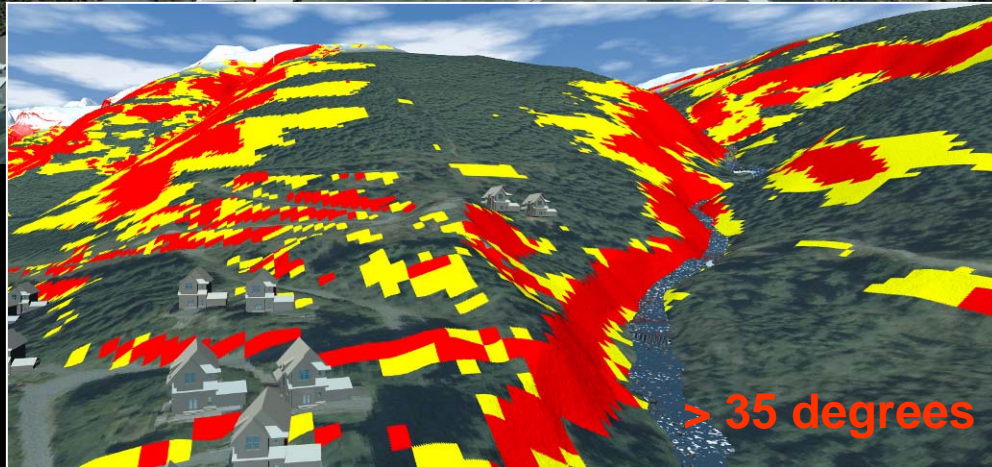


High risk fuels

2100

Reduced forest health from pests / drought

Loss of creek habitat, increased slope instability



Capilano Reservoir Water Storage

Peak summer drawdown: Lower lake level (439 ft.), more frequent

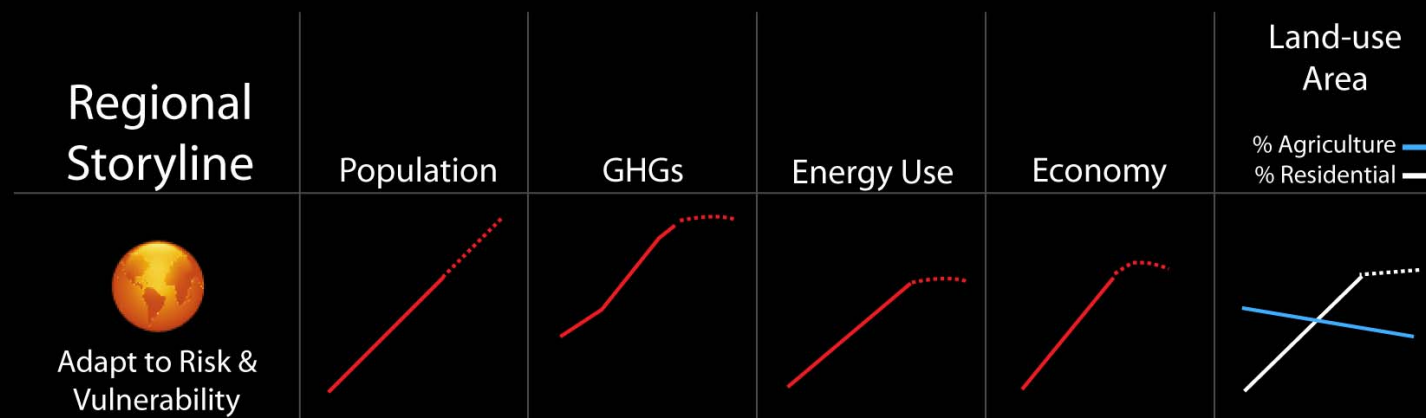


World 2: Adapt to Risk



Delta Assumptions in 2100:

- High population growth
- High economic growth until late century
- 3x carbon emissions Pro-active adaptation strategies
- +3.75°C increase
- 0.58 m sea level rise
- Mean snowline (April 1st): 1074m (Current: 759 m)





Roberts Bank: 2100

Existing Dike with normal high tide + storm surge

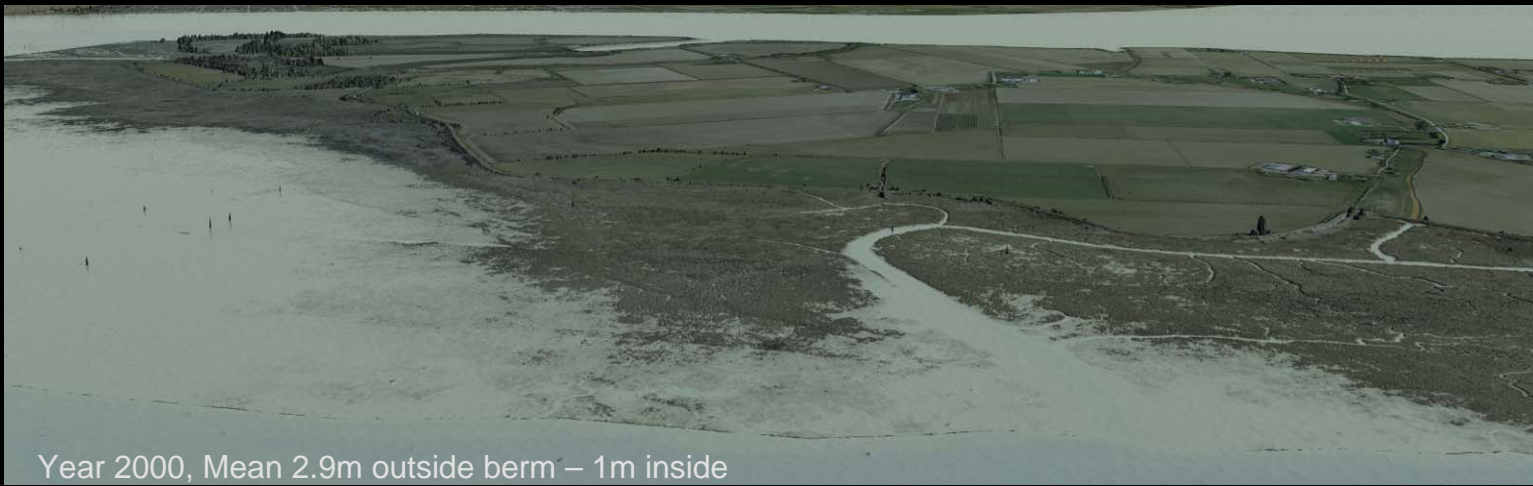


Roberts Bank: 2100

Raised dyke with normal high tide + storm surge



Year 2000, Mean Sea Level (0m) with outer berm



Year 2000, Mean 2.9m outside berm – 1m inside



Year 2000, 2.9m, no outer berm,



South Delta: 2000



South Delta: 2050



South Delta: 2100



Existing Conditions



2100: Wall Adaptation



2100: Dike Adaptation

Dike Design Options





2100: Raised Sea Wall
(4.23m)





2100: Raised Houses

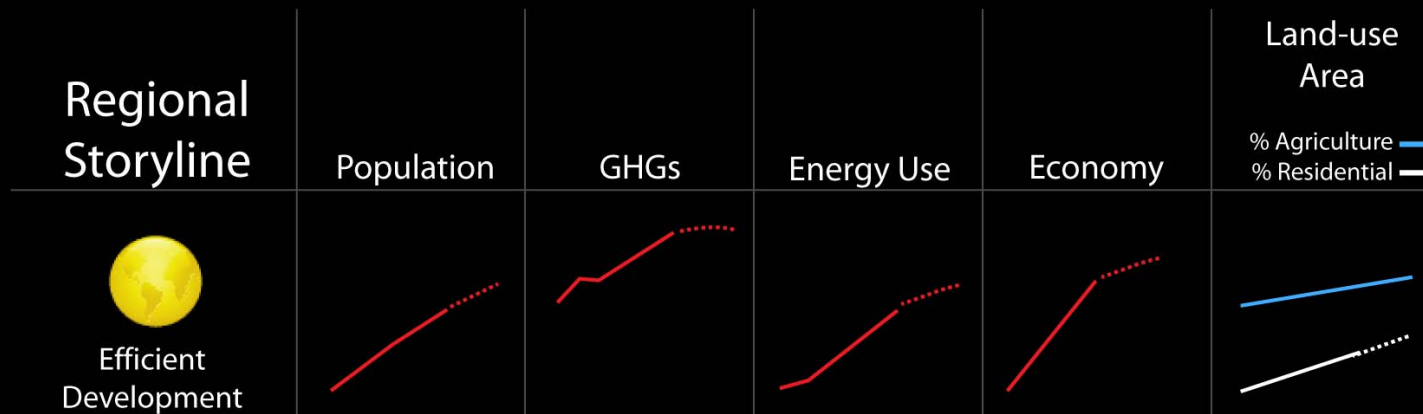


World 3: Efficient Development



Delta Assumptions: 2100

- Moderately high population growth
- High economic growth / more efficient development
- 2x carbon emissions
- +2.63°C
- 0.49 m sea-level rise
- Mean snowline (April 1st): 1005 m (Current: 759 m)
- Similar adaptations to World 2
- More sustainable development



East Ladner Edge:

Sustainability by Design Charrette

UBC Design Centre for Sustainability, 2006

Before



After





South Delta: 2000



South Delta: 2100



- 1
- 2
- 3
- 4

Existing Conditions



2050: Raised Dike /
alternative energy
sources



2100: Raised
houses





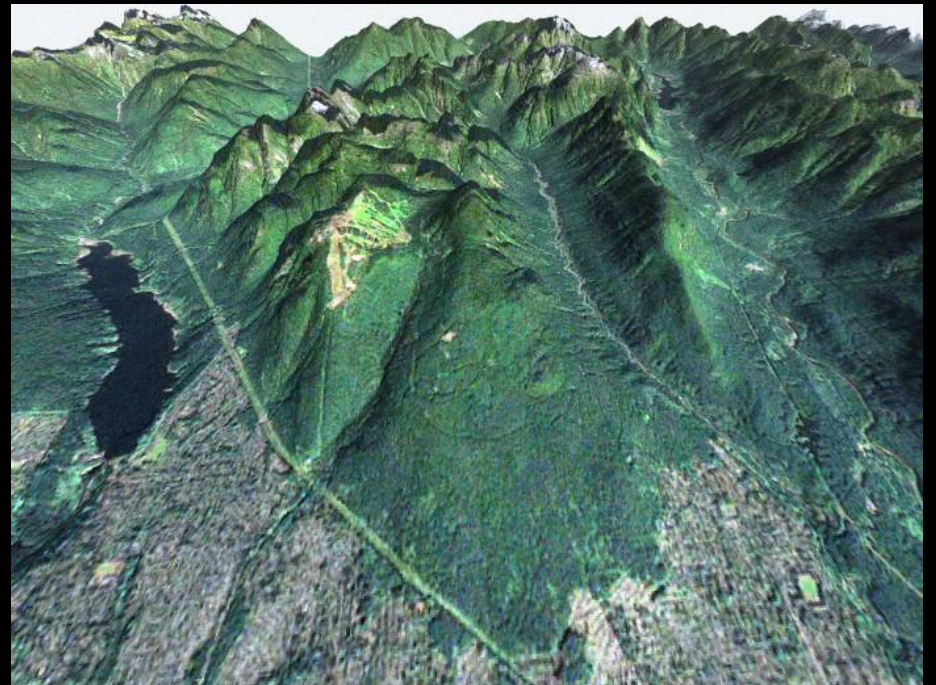
2100: Raised
houses /
alternative energy
sources



Reservoirs / Water Storage



- Reduced snowmelt for summer water supply
- Proactively adapt to increase water storage
- Increased winter precipitation events
- Utilize winter reservoir spill for energy



MetroVancouver hydro-electric energy recovery options

- Existing turbine in pipe from Filtration Plant to Capilano Reservoir (1.7MW)
- Potential turbine in pipe from Seymour Dam to Filtration Plant (2MW)



Capilano Hydroelectric Turbine



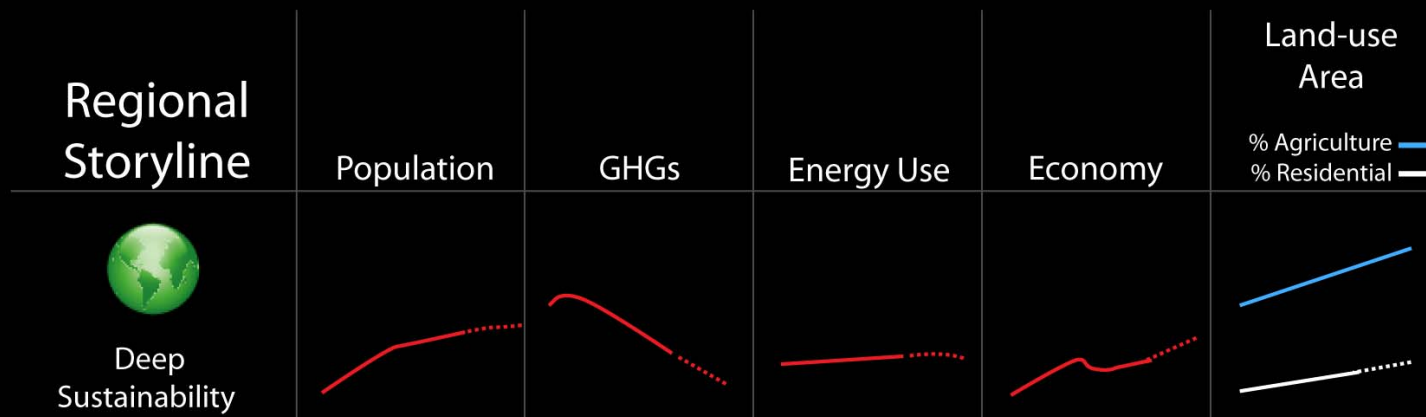
Generate energy from
winter spill: 16MW
(12,000–16,000 homes)

World 4: Deep Sustainability (Low Carbon World)



Assumptions:

- Lower population and economic growth
- Low and zero-carbon development
- Major retrofitting occurs early in the century
- ~ 90% reduction in carbon emissions (from 1990)
- + 0.72°C
- Sea-level rise of 0.4 meters
- Mean snowline (April 1st): 777m (Current: 759 m)
- Global climate change stabilizes at 450 ppmv





W-05

2050 S4



**Preliminary visualisations
of hypothetical windpower
development**

Low-Carbon Building Types



BEDZED: Carbon Neutral Community in UK

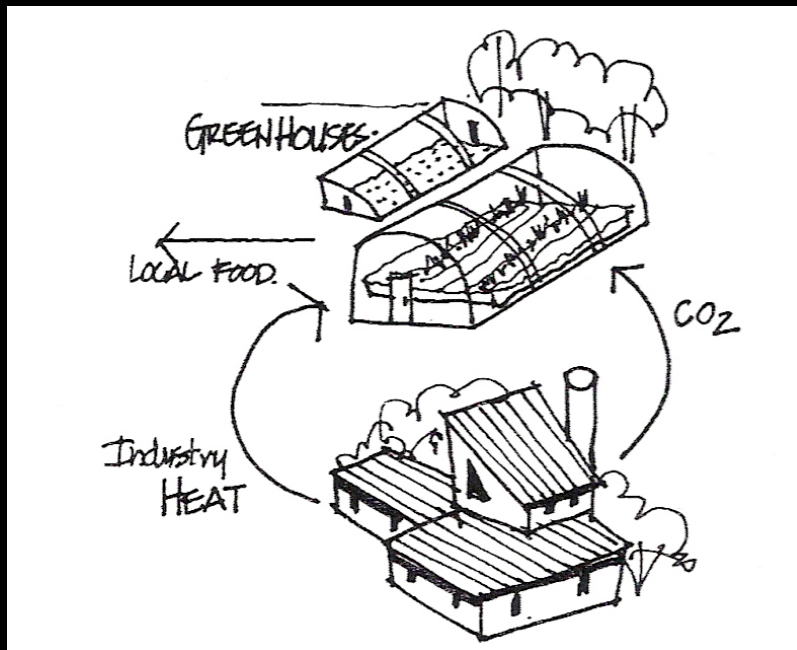
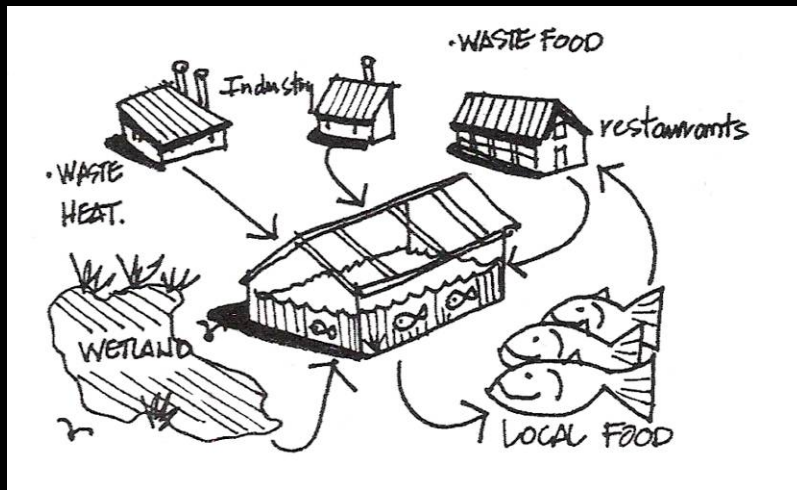


Centre for Interactive Research, Vancouver, B.C.



Dockside Green: LEED platinum: Victoria, B.C

Eco-Industrial Networks and energy farm clusters





**2050 Amphibious Housing/
Combined Energy Stratas:**
Shared, low carbon
residential energy clusters



2050 Amphibious and Stilt Housing:
Reduce vulnerability to flooding

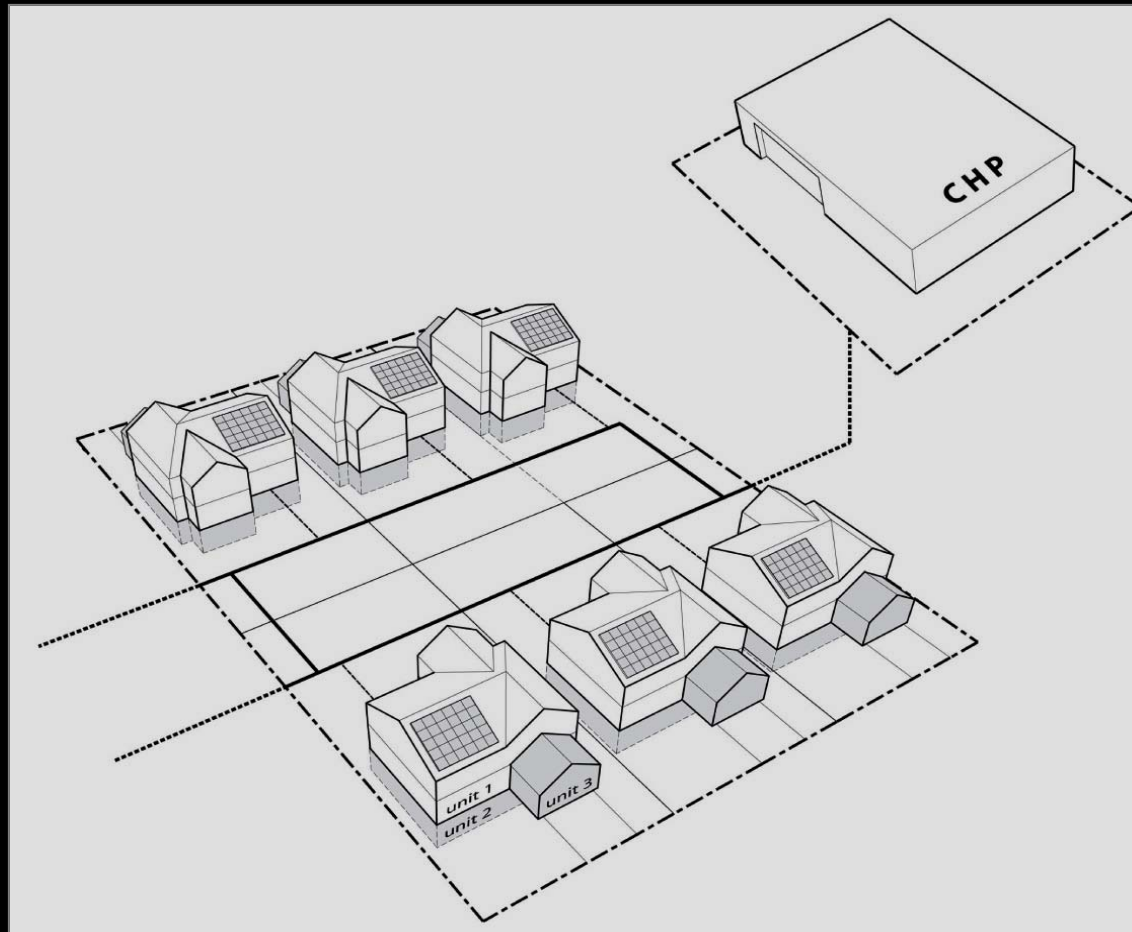


South Delta: 2000

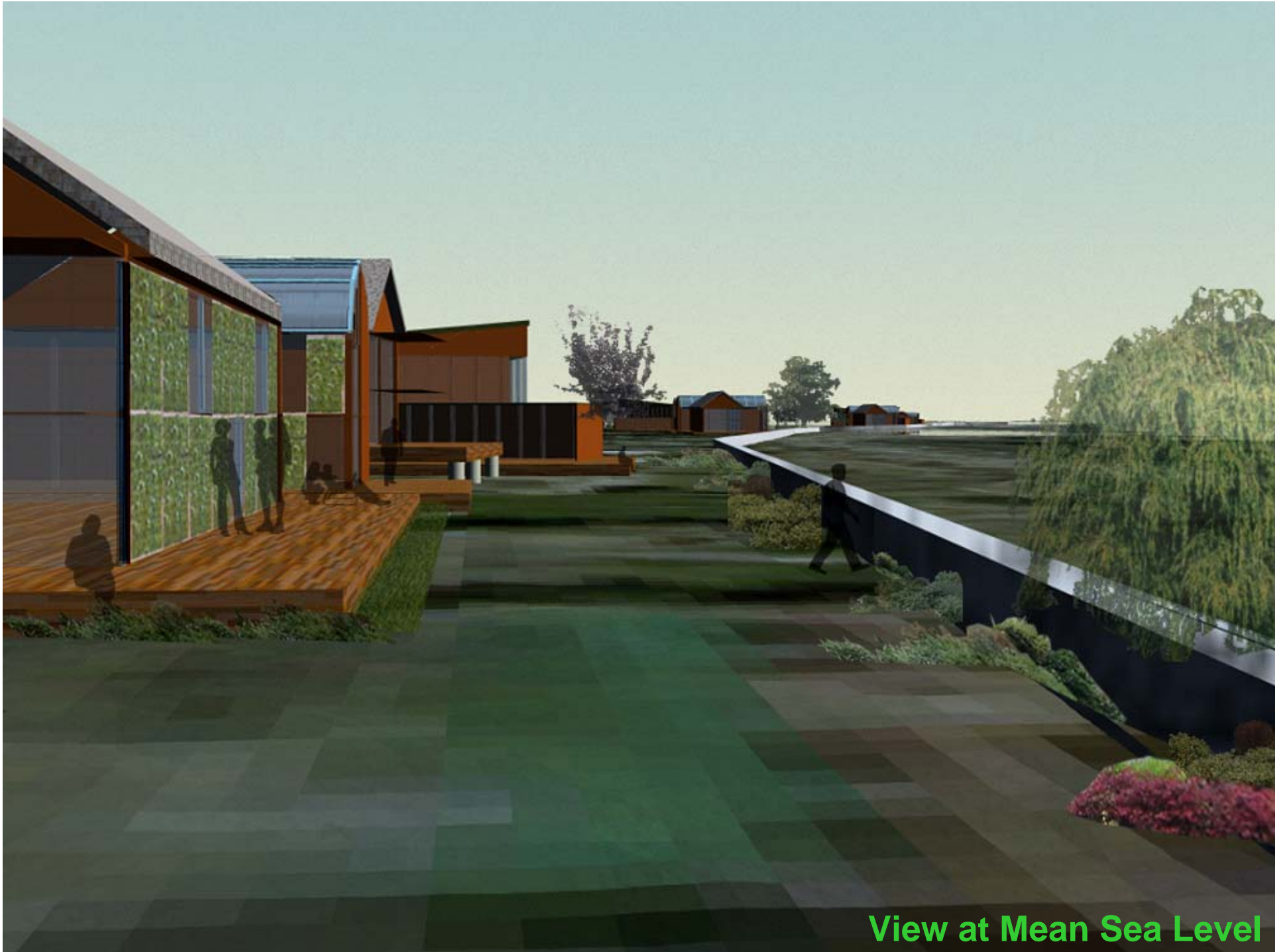


South Delta: 2100

2020: Neighbourhood Heat and Power Energy Systems







View at Mean Sea Level

Potential Grouse Mountain

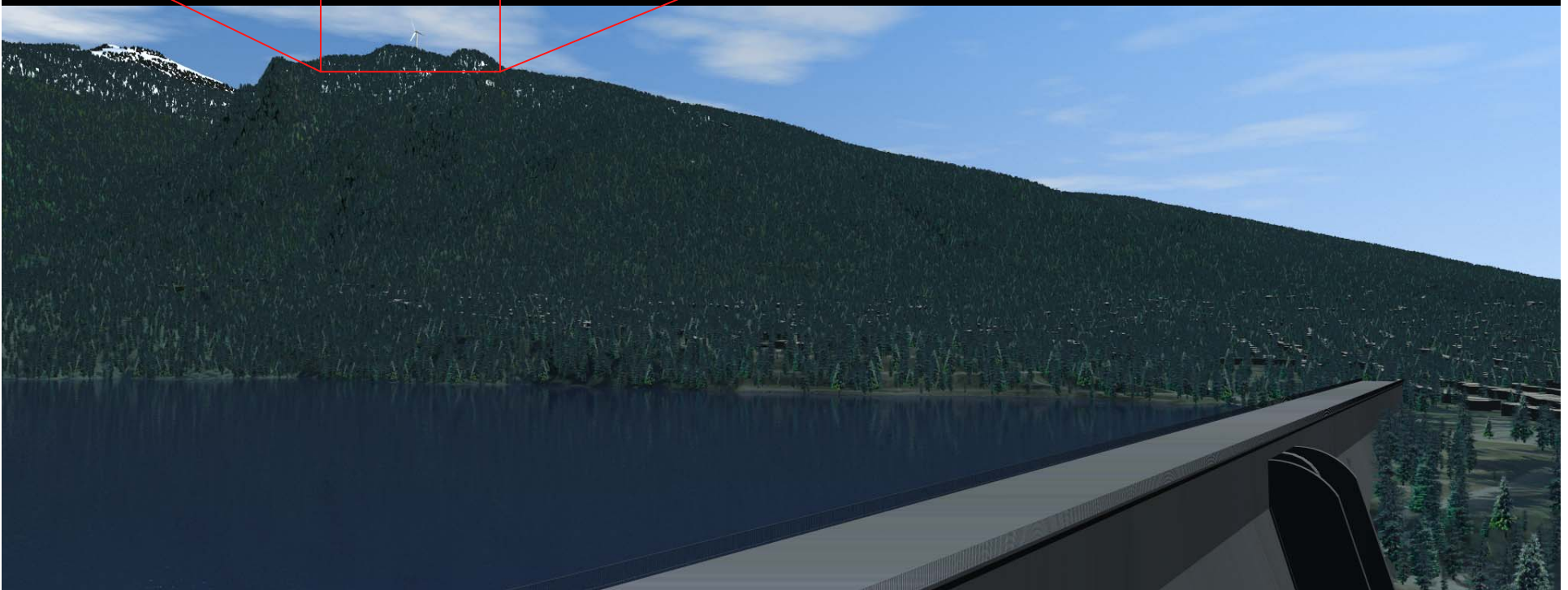


- Learning Laboratory

- Demonstration projects?
- Wind energy generation?

- Carbon-neutral development

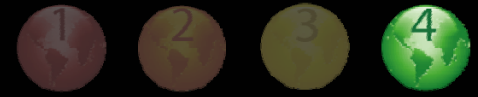
- Expansion plans?





- Zero-carbon resort development
 - Wind energy generation
- Education Centre on green energy
 - Demonstration projects

Forest Conditions 2000



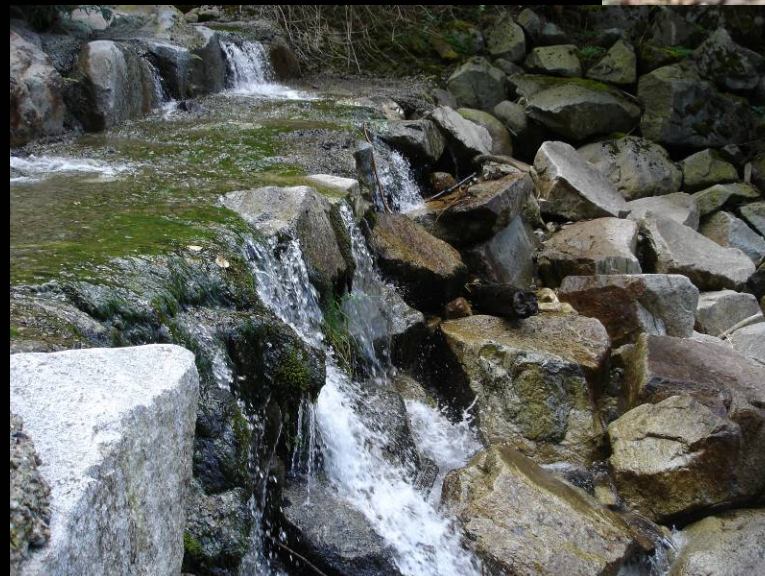
Forest Conditions 2100



Stream Rehabilitation



- Reinforced banks
- Washout controls
- Fish ladders
- Protection of riparian zone



Run-of-River Energy Options



Micro Hydroelectric Generation





Local food market

Live / work development

Stormwater drainage swale

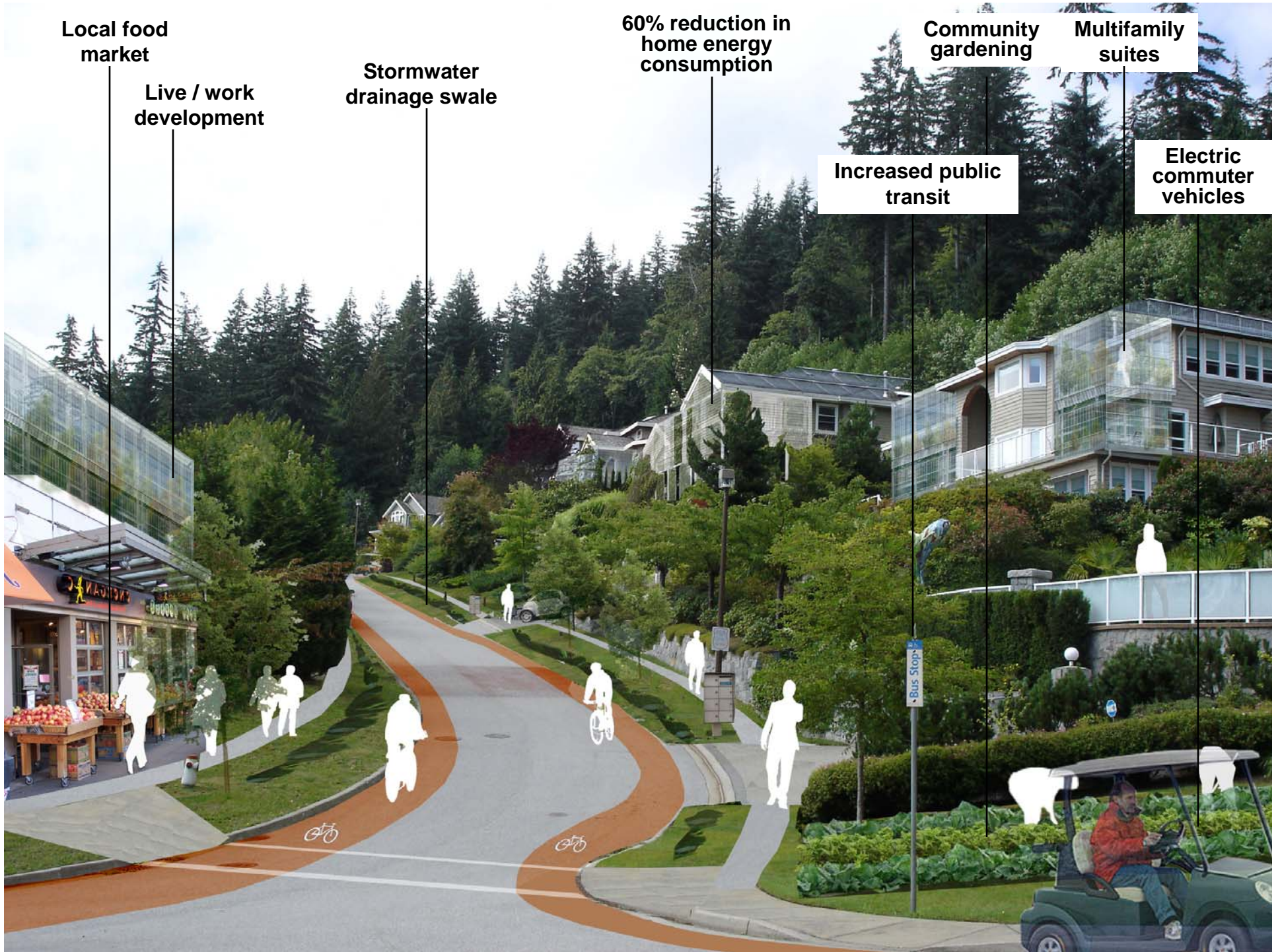
60% reduction in home energy consumption

Community gardening

Multifamily suites

Increased public transit

Electric commuter vehicles



Preliminary results of Delta community visioning sessions

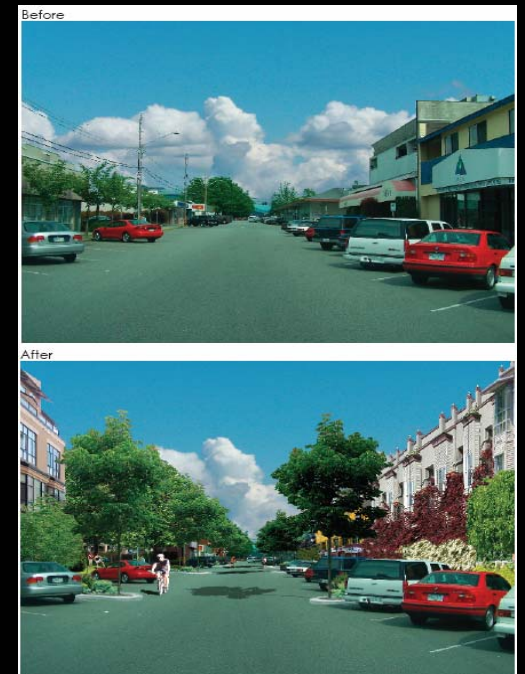
- High credibility of visualisations (79% “quite or very plausible/credible”)
- Future scenarios/framework well understood and adopted
- Increase in awareness about local effects of climate change (23% ‘knowledgeable’ before, 67% after)
- *“I learned how climate change could affect my community in a very graphic way. Numbers may not stay with me but visuals will”*



Motivation/action indicators:

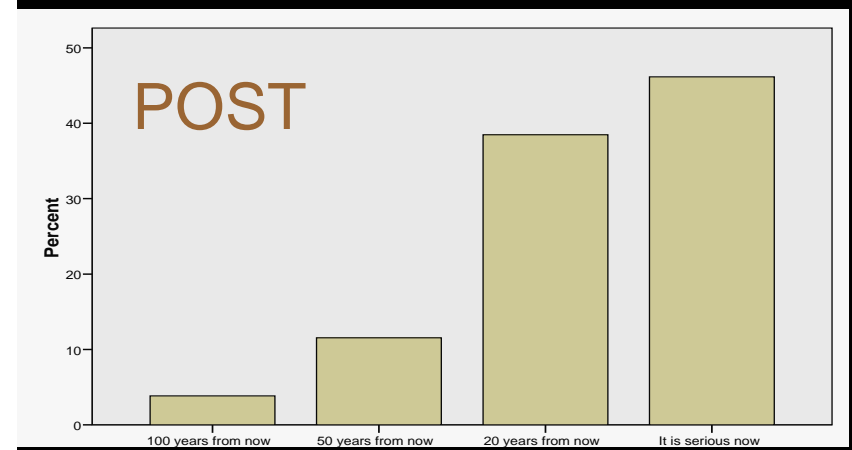
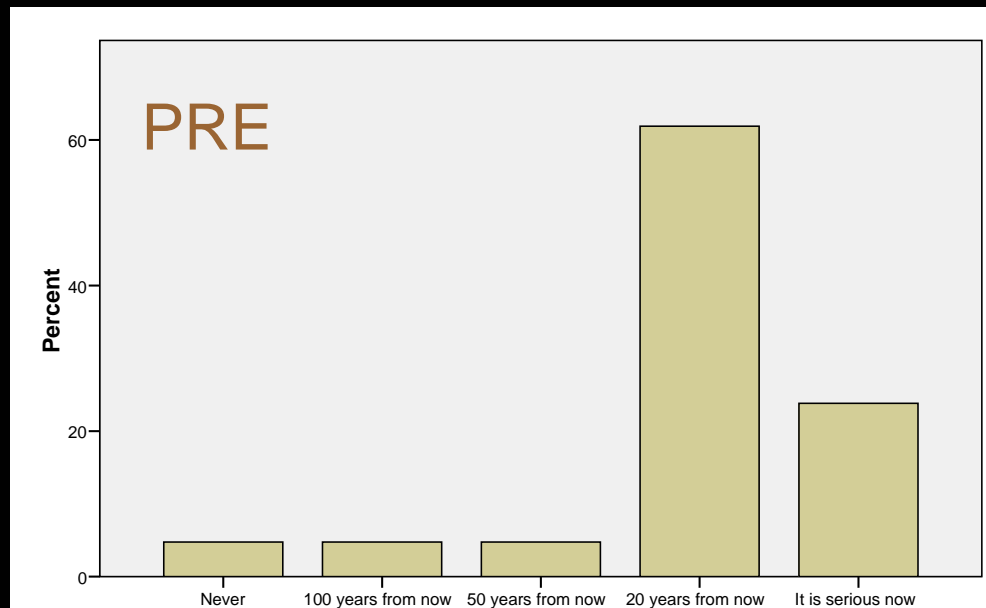
- 70% of respondents strongly agreed that community policies that reduce GHGs must be in place within the next 10 years

“Shows how much you have to do if you want things to stay the same”



Feedback from practitioner visioning sessions

- Reasonable credibility of visualisations:
 - 85% rated them as quite or very plausible
- When impacts of climate change will occur in the community:



Never

100
years

50
years

20
years

Serious
now

100
years

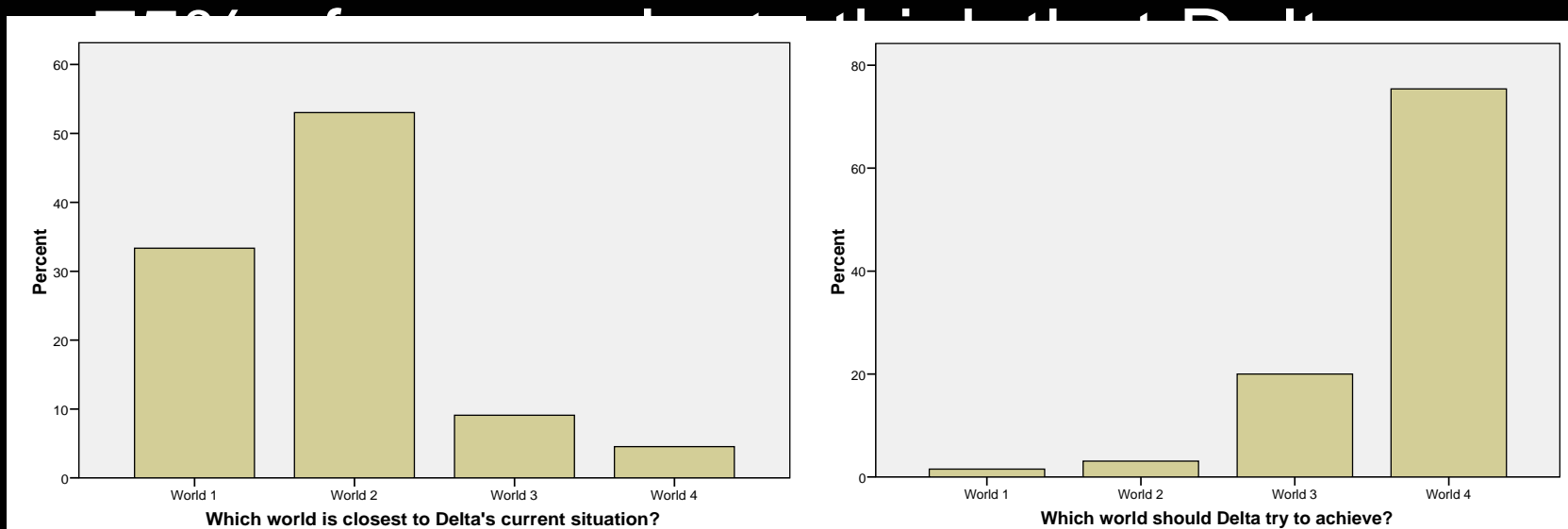
50
years

20
years

Serious
now

Responses to Worlds 1-4:

- 86% of respondents think that Delta is in either World 1 or 2 (33% World 1, 53% World 2)



CONCLUSIONS

- A holistic, pragmatic, engaging public process on climate change can be carried out at the local level
- Attitudes can be changed
- Visualisations can reveal implementation barriers and solutions
- More research needed (better modelling and wider testing)

....but we can't wait for the research results



CONCLUSIONS

- A holistic, pragmatic, engaging public process on climate change can be carried out at the local level
- Attitudes can be changed
- Visualisations can reveal implementation barriers and solutions
- More research needed (better modelling and wider testing)

Phase IV....





Acknowledgements:

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C A L P

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