Adaptation Deep Dive

Introduction by
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December 7, 2017, Vancouver, BC
Introduction
Island Health: Who We Are

• One of 7 health authorities in BC

• 765,000 people served on Vancouver Island, the islands in the Salish Sea and Johnstone Strait
Motivation

• BC’s 2016 Climate Leadership Plan calls for 10-year emissions reduction and adaptation plans.
  • Island Health has a 5 year emissions reduction plan.
  • Do not have an adaptation plan. This is a first step.

“A climate resilient health system is one that is capable to anticipate, respond to, cope with, recover from and adapt to climate-related shocks and stress, so as to bring sustained improvements in population health, despite an unstable climate.”

- World Health Organization, 2015
Impact of Climate Change on Human Health

- Injuries, fatalities, mental health impacts
  - Severe Weather
  - Air Pollution
- Asthma, cardiovascular disease
  - Changes in Vector Ecology
  - Increasing Allergens
- Heat-related illness and death, cardiovascular failure
  - Extreme Heat
  - Environmental Degradation
- Forced migration, civil conflict, mental health impacts
  - Water and Food Supply Impacts
  - Water Quality Impacts
- Malnutrition, diarrheal disease
  - Cholera, cryptosporidiosis, campylobacter, leptospirosis, harmful algal blooms
- Malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, West Nile virus
  - Respiratory allergies, asthma
  - Cognitive changes
Physical Impacts
- Power or water outages
- Inadequate HVAC
- Building envelope damage
- Waste or stormwater back-flows
- and more

Social Impacts
- Patient surges
- Longer patient stays
- Strain on medical & basic supplies
- Increased demand on staff & mental health impacts
- and more

Disruption to health care service delivery

Adapted from: Climate Risks & Impacts to Health Care Service Delivery.
Presentation Overview

- Climate Vulnerability Assessment of Nanaimo Regional General Hospital
- Climate Adaptation Research and Mapping Project
- Q & A
Climate Vulnerability Assessment of Nanaimo Regional General Hospital

Joe Ciarniello, M.Eng, P.Eng, CEM • Vancouver Island Health Authority
Robert Lepage, M.A.Sc., P.Eng., Ph.D. Candidate • RDH Building Science Inc.
Trevor Murdock, M.Sc. • Pacific Climate Impacts Consortium
Introduction

• How important is keeping hospitals fully operational? CRITICAL

• NRGH - second largest hospital campus (Royal Jubilee Hospital in Victoria is the largest)
  • Serves ~350,000 people
  • Construction dates range from early 1960’s to 2012
  • 55,000 m² floor area, 34 GWh total annual energy consumption

• Pilot project: to learn “how to”

• Build capacity for conducting PIEVC risk assessments
Presentation Themes

- Climate change and climate projections
- PIEVC Protocol
- Climate vulnerability assessment of NRGH
- What climate scientists can & can’t provide engineers
Climate is Changing, But What Does That Mean for Engineers?
Change in number of days >25°C

10 km x 10 km
800 m x 800 m
2050s “1-in-20” wet day
The PIEVC Protocol

What is it?
Why Define Climate Risks and Vulnerabilities?

• To deal with the uncertainties of future climate
• To deal with risks to physical infrastructure & services
• Protect people, property and environment
• Better manage infrastructure lifecycle, operations, reduce costs and avoid surprises
• It’s the first step in risk reduction planning to improve climate resilience
How do **Small Changes** Lead to Catastrophic Failure?

- Design Capacity
- Safety Factor
- Impact of age on structure
- Impact of unforeseen weathering

- Design Load
- Change of use over time
  - e.g. population growth
- Severe climate event
The probability of extreme changes in climate parameters

INCREASES IN MEAN and VARIANCE

Increasing Variability
## Risk Assessment Matrix

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<tr>
<th>Probability of Occurrence</th>
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The matrix categorizes risks based on consequence and probability of occurrence, with different levels indicated by color coding and symbols.
PIEVC Protocol
5 Steps plus an Optional TBL Module
The PIEVC Protocol, Now & Future

• 45+ projects/studies to date across Canada
  • Water, storm & waste water systems, roads & bridges, buildings (1 hospital), transportation & energy infrastructure

• PIEVC Workshops: on-site and on-line versions available

• Evolution to a permanent on-going program of Engineers Canada
  • Infrastructure Resilience Professional Credential (IRP) – Launched June 2016

• PIEVC Lite Version
  • Simple, lower cost
  • No Step 4 - engineering analysis

• PIEVC First Nations (FN) Version by April 2018
The Assessment of Nanaimo Regional General Hospital

The Infrastructure
Risk Assessment
Challenges
The PIEVC Protocol

• Process to assess *infrastructure component* response to impacts of a changing climate

• 5 Step Roadmap
  1. Concept
  2. Scoping
  3. Team Building
  4. Execution
  5. Reporting
Nanaimo Regional General Hospital

- Nursing Tower 1963
- Rehabilitation 1969
- Phase 1 Addition 1992
- Ambulatory Care 1995
- Renal and Perinatal 2008
- New Emergency Department 2012
Campus Discipline Infrastructure Components Systems

Nanaimo Regional General Hospital

Mechanical

Cooling Plant

Cooling Towers

Chilled Water Pumps

Chiller

Thermal Plant

Structural

Zone 1, Pump 1

Zone i, Pump j

Infrastructure Breakdown

27
Infrastructure Breakdown

- Mechanical
- Enclosure
- Civil
- Electrical
- Structural
- Water
Risk Assessment
## Risk Assessment

- **Risk:**

  - *Probability or Likelihood of an Event Occurring* 
    \[ \times \text{Consequence or Severity of Occurrence} \]

- **Identify patterns and assess vulnerability**

- **Vulnerability:** Load surpassing adaptive capacity

### PIEVC SEVERITY SCORES

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<thead>
<tr>
<th>Score</th>
<th>Method D</th>
<th>Method E</th>
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<td>1</td>
<td>Measurable</td>
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<td>Major</td>
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<td>Serious</td>
<td>Loss of Capacity Some Loss of Function</td>
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<td>Extreme Loss of Asset</td>
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<td>Probability Method A</td>
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<td>Not Applicable</td>
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### PIEVC SCORES

- **Score 0**: Negligible, Not Applicable
- **Score 1**: Highly Unlikely, Improbable
- **Score 2**: Remotely Possible
- **Score 3**: Possible, Occasional
- **Score 4**: Somewhat Likely, Normal
- **Score 5**: Likely, Frequent
- **Score 6**: Probably, Often
- **Score 7**: Highly Probable, Approaching Certainty

- **Severity**: Loss of Asset
- **Probability**: Loss of Capacity, Some Loss of Function
- **Severity**: Major Loss of Function
- **Probability**: Major Loss of Serviceability
- **Severity**: Moderate Loss of Serviceability
- **Probability**: Low Slight Loss of Serviceability
- **Severity**: Very Low Some Measurable Change
- **Probability**: Improbable
- **Severity**: Not Applicable
- **Probability**: Negligible

### Risk Assessment

- **Severity of Occurrence**
- **Probability of Occurrence**
Probability - Climate Parameters

- Relied on climate scientists: Pacific Climate Impacts Consortium (PCIC)
- Interpreted climate model data
- Focus on engineering design parameters
- 3 Classes of Parameters:
  1. Heat
  2. Moisture
  3. Wind
## Probability Scores

<table>
<thead>
<tr>
<th>Climate Parameter</th>
<th>Definitions</th>
<th>Indicator</th>
<th>Code</th>
<th>RCP 8.5 – 2050 Forecasted Relative Values</th>
<th>Robustness</th>
<th>Probability Score</th>
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<tbody>
<tr>
<td>Heat Waves</td>
<td>A stretch of unseasonably warm weather.</td>
<td>Cooling Dry Bulb (0.4%) [°C]</td>
<td>26.8</td>
<td>28.8 30.0 31.2</td>
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</table>
Severity Workshop

- Identify severity of impact on hospital operations given infrastructure component failure
- Gathered all experts in one room
- Consensus based
Definitions

- 1) Climate Parameter
- 2) Asset Component

Vote

- ±1: Accept
- >2: Reconcile

Reconcile

- 1) Consultant Amends Score (±1)
- 2A) Consultant Justification
- 2B) Highest Voter Justification

Re-Vote

- ±1: Accept
- >2: Average and Mark
## Infrastructure Components

### Critical Air Systems

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#### Heat waves

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Rationale For Severity Score
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<td>Civil</td>
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<td>Trees/irrigation/grass/vegetation</td>
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<td>Landscaping</td>
<td>Retaining walls</td>
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<td>Landscaping</td>
<td>Trees/irrigation/grass/vegetation</td>
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<td>Site Access Systems</td>
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<td>Civil</td>
<td>Site Access Systems</td>
<td>Roads/Parking Areas</td>
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<td>Fire Supression System (i.e. fire hydrants)</td>
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<td>Drainage infrastructure - grading and drains</td>
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Challenges
Vulnerability Trends

- Heat Waves, Humidity, and Water Shortages
- Main challenges: Sensible and Latent Cooling
- Susceptible Systems:
  - Mechanical – Cooling Plant
  - Mechanical – Critical Air
  - Water Shortages – Jurisdiction
Prioritization

VFA Data

• Cross-reference at risk systems with VFA Data

• Low-cost opportunity to upgrade with like-for-like. Assets within 10 year horizon

• Use forecasted climatic design parameters as input for new system & study
Challenges
Challenges

• Jurisdictional Authority

• Hierarchical Systems – System Redundancies, Different Exposures

• Non-Infrastructure (Operational) Actions

• Climate Change – Design Uncertainty, Seasonality, Cascading Effects, Non-Climatic Effects, Clinical Impacts
How to use climate data

Sources
Best Practices
Where do we go from here?
Agreed or disagree? Where are these quotes from?

- “Climate is not static”
- “Past and ongoing… greenhouse gas emissions are expected to alter most climatic regimes in the future”
- “… buildings will need to be designed, maintained, and operated to adequately withstand ever changing climate loads.”
- “The analysis generally assumes that the past climate will be representative of the future climate”
**Downscaled climate projections**

- 10 km (BCCAQ) with 800m bias correction (PRISM)
- 12 GCMs, RCP 8.5, 1950-2100
- Daily
- Nighttime low temperature, daytime high temperature, precipitation
Additional climate parameters

- Indices of extremes derived from daily temperature and precipitation
- Daily snowpack model
- Daily humidity & wind: Global Climate Models (~100 km)
<table>
<thead>
<tr>
<th>Climate Parameter</th>
<th>Indicator</th>
<th>Code / Present Values</th>
<th>RCP 8.5 - 2050 Forecasted Relative Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contaminated Water</td>
<td>Biological Oxygen Demand/Particulate Suspension</td>
<td>&lt;= 5NTU, Coliform &lt;10/100mL</td>
<td>-</td>
</tr>
<tr>
<td>Heat Waves</td>
<td>Cooling Dry Bulb (0.4%) [°C]</td>
<td>26.8</td>
<td>26.8, 30.0, 31.2</td>
</tr>
<tr>
<td>Strong Winds</td>
<td>1/50 Wind Pressure [Pa]</td>
<td>500</td>
<td>116, 505, 890</td>
</tr>
<tr>
<td>Storm Intensity and Frequency</td>
<td>1/5 Wind Driven Rain Pressure [Pa]</td>
<td>200</td>
<td>40.0, 205, 378</td>
</tr>
<tr>
<td>Warmer Winters</td>
<td>Heating Degree-Day Base 18.0 [°C/Day]</td>
<td>3000</td>
<td>1884, 2105, 2405</td>
</tr>
<tr>
<td>Air Pollution (Forest Fires)</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cold Snap</td>
<td>Heating Dry Bulb (5%°C) [°C]</td>
<td>-8</td>
<td>-3.5, -2.3, -0.5</td>
</tr>
<tr>
<td>Winter Storm &amp; Ice Storm</td>
<td>Snow Load [kPa]</td>
<td>0.3</td>
<td>0.40, 1.15, 2.07</td>
</tr>
<tr>
<td>Humidity</td>
<td>Mean Coincident Wet Bulb [°C]</td>
<td>17</td>
<td>18.2, 19.6, 20.7</td>
</tr>
<tr>
<td>Daily Temperature Range</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Drier and Warmer Summers</td>
<td>Heating Degree-Day Base 18.3 [°C/Day]</td>
<td>07</td>
<td>160, 308, 442</td>
</tr>
<tr>
<td>Water Shortages</td>
<td>Monthly maximum daily maximum temperature [°C]</td>
<td>30.0</td>
<td>33, 34.2, 35</td>
</tr>
<tr>
<td>Sea Level Rise</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Warmer Domestic Water Supply</td>
<td>Average summer time temperature [°C]</td>
<td>30.6</td>
<td>32.7, 34.1, 32.5</td>
</tr>
<tr>
<td>Flooding</td>
<td>1 in 50 year l-day rainfall [mm]</td>
<td>91</td>
<td>90.8, 116, 134.2</td>
</tr>
</tbody>
</table>
Complementary approach: energy modelling with future weather files

M. Ek, T. Murdock, S. Sobie, B. Cavka, B. Coughlin, R. Wells
Best practices

• Make use of climate information – at whatever level of detail available

• Use a range of future projections

• Cross-disciplinary engagement

• Iteration, iteration, iteration
ONLINE ADAPTATION TOOLS, WHAT ARE THEY GOOD FOR?

Resources to accompany BC Regional Adaptation Collaborative webinar
30 November 2016

Plan2Adapt http://pacificclimate.org/analysis-tools/plan2adapt

PICS short course http://pics.uvic.ca/education/climate-insights-101#quicktabs-climate_insights_101=1

ClimateBC
•  HectaresBC http://www.hectaresbc.org
•  ClimateWNA http://genetics.forestry.ubc.ca/cfgc/ClimateWNA/ClimateWNA.html
•  ClimateBC Online http://www.genetics.forestry.ubc.ca/cfgc/ClimateBC40/Default.aspx
•  BC Climate Explorer http://www.bc-climate-explorer.org/

PCIC Data Portals https://pacificclimate.org/data

Data Basin
https://nplcc.databasin.org/galleries/Sa3a424b36ba4b63b10b8170ea0c915e#expand=105363%2C106698%2C106712%2C110010%2C105359%2C105364

Wrap-Up

Infrastructure Adaptation: Review of What It Means
Lessons Learned
Next Steps for Island Health
Infrastructure Adaptation: Review of What it Means

• Gain *climate understanding* → *engage climate scientists*

• Understanding *risks and vulnerabilities*

• *Prioritize the risks* (Urgent to Least Urgent)

• *Minimize the risks* (engage Risk Reduction Programs)

• *Evaluate costs and benefits* to reduce risks

• *Communicate* to decision-makers

• Combining these provides key elements of an *Infrastructure Climate Risk Assessment* and *Risk Mitigation Plan*

• …and its not just for existing infrastructure
Lessons Learned

• Secure strong mandate from management
  • Ensures adequate time from subject matter experts – not easy to do in a hospital

• This needs to be an on-going iterative effort

• w.r.t. Standard of Practice and what it means for engineers?
  • New information may indicate standards/codes should be reconsidered
9 Principles of Climate Change Adaptation for Engineers (source: Engineers Canada)

• Professional Judgment
  • Integrate Adaptation into Practice
  • Review Adequacy of Current Standards
  • Exercise Professional Judgement

• Integrating Climate Information
  • Interpret Climate Information
  • Work with Specialists and Stakeholders
  • Use Effective Language

• Practice Guidance
  • Plan for Service Life
  • Use Risk Assessment for Uncertainty
  • Monitor Legal Liabilities

Note that Engineers Canada does not regulate the engineering profession in BC, EGBC does.
Next Steps for Island Health at NRGH

• Key retrofits/upgrades to pursue include, but not limited to:

  • Review and update maintenance procedures
  • Increased cooling capacity, redundancy, and load shedding strategies
  • Ability to recirculate 100% of ventilation air with enhanced filtration (reinstall return-air systems)
  • Back-up potable water supply
  • On-Site $O_2$ generation
Acknowledgements

• Natural Resources Canada – Climate Change Impacts & Adaptation Division for partial project funding: $40,000

• Clinical and Facilities staff at NRGH for their time, knowledge, and active participation in the workshops

• David Lapp for overall guidance, support and encouragement

• The consulting team:
Climate Adaptation Research and Mapping Project

Ting Pan, M.Sc., Sustainability Coordinator • Vancouver Island Health Authority
Trevor Murdock, M.Sc. • Pacific Climate Impacts Consortium
Climate Adaptation Research and Mapping

• Internship Grant Funded by the Pacific Institute of Climate Solutions
• Intern – Riley Richardson – Uvic Student Climate Adaptation Researcher
• Outcomes:
  • Climate projection maps with Island Health facilities on them
  • Climate variables for selected sites
  • Climate Adaptation Assessment Toolkit customized for Island Health
Climate Adaptation Research and Mapping

Pioneering work by the following organizations:

- For mapping
  - Capital Regional District
  - Cowichan Valley Regional District
  - Pacific Climate Impacts Consortium

- For assessment tool development
  - Lower Mainland Health Organizations
  - BC Housing
  - Canadian Coalition of Green Health Care
  - The U.S. Department of Health and Human Services
Co-produced climate reports

- Intense, iterative feedback between climate scientists and local governments

- PCIC:
  - ensure accurate interpretation
  - help convene conversations

- Local gov’t:
  - results tailored to local needs incl. planning processes
  - include what climate impacts mean to region & possible responses

http://www.crd.bc.ca/about/data/climate-change
What does climate change mean in CRD?

- Warmer winter temperatures and fewer days below freezing
- 80% fewer frost days

- More extreme hot days in summers and longer dry spells in summer months
- 3x days > 25°C
- 20% drier summers

- More precipitation in the fall, winter and spring
- ~15% wetter fall season

- Increased frequency and intensity of precipitation and storm events
- ~30% stronger 1-in-20 year one day rainfall
Hotter summers

Summer Days
(temperature over 25°C)

Number of days per year

- Past
- 2050s
- 2080s
Fewer frost days

2050s: ~70% decrease / ~80% Greater Victoria
CRD Climate Projections Report → Impacts
http://www.crd.bc.ca/about/data/climate-change

- Human Health
- Rainwater Management And Sewerage
- Water Supply And Demand
- Tourism And Recreation
- Transportation Network
- Ecosystems And Species
- Buildings And Energy Systems
As our climate warms and storm events become more intense and frequent, the business case for investing in durable, resilient buildings improves. Buildings provide site-specific opportunities to address challenges, such as heat and drought, through technologies, including rainwater capture and reuse, stormwater detention and management, resilient landscaping, green roofs and walls, and passive shading. In some years, buildings may need to withstand heavier snow loads and precipitation events, higher and more frequent winds, higher temperatures and longer duration of heat waves, and in coastal areas, rising sea levels. Building retrofits (e.g., insulation, heat pumps) to address both heating and cooling demand, and additional climate adaptation measures, including storm-resistant design and materials, should be considered. Future climate projections and energy efficiency will also be important to consider for new construction, as this could result in long-term cost savings and future-proofing.

Concentrating development in already developed areas can create opportunities for natural ecosystems to buffer changes to our climate. Protecting the existing and future flood plains from development can reduce risks of personal injury and damage to property from extreme storm events. Also, avoiding conversion of agricultural land to residential and commercial uses will better enable our region to become more self-reliant as traditional agricultural areas become less arable.

In response to warmer year-round temperatures, seasonal and longer-term energy demands will change across the region. Significant shifts are also anticipated across BC, with an increase in cooling demand and decreasing heating demand over time. These shifts in energy demands can be offset with comprehensive energy retrofits to enhance the energy efficiency of existing buildings using air sealing, insulation, and space and water heating upgrades, and initiatives designed to reduce consumption from baseloads (lighting and appliances). Constructing energy efficient (or net-zero ready) homes and buildings would also substantially reduce energy demand. There may also be opportunities for solar electricity production and other types of renewable energy.
Climate Adaptation Research and Mapping

- Latest projections – more variables, higher resolution, covering more than half of Island Health owned facilities
- Selected 15 climate variables the most relevant to our facilities
- Results:
  - Maps
  - Climate variable values for sites

<table>
<thead>
<tr>
<th>Climate Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Cooling Degree Days</td>
</tr>
<tr>
<td>2  Heating Degree Days</td>
</tr>
<tr>
<td>3  Annual Average Min Temperature</td>
</tr>
<tr>
<td>4  Annual Max Temperature</td>
</tr>
<tr>
<td>5  Summer Days T&gt;25</td>
</tr>
<tr>
<td>6  1-in-20 Hottest Day</td>
</tr>
<tr>
<td>7  Maximum Length of Dry Spell</td>
</tr>
<tr>
<td>8  1-in-20 Wettest Day Precipitation</td>
</tr>
<tr>
<td>9  Annual Precipitation</td>
</tr>
<tr>
<td>10 Summer Precipitation</td>
</tr>
<tr>
<td>11 Winter Precipitation</td>
</tr>
<tr>
<td>12 Single Day Max Precipitation</td>
</tr>
<tr>
<td>13 Five-Day Max Precipitation</td>
</tr>
<tr>
<td>14 99th Percentile Wettest Days</td>
</tr>
<tr>
<td>15 95th Percentile Wettest Days</td>
</tr>
</tbody>
</table>
**Figure 1:** Historical summer days for 1971-2000 in the South Island region.

**Figure 2:** Projected summer days for the 2050’s (2041-2070) in the South Island region.
**Figure 3:** Historical annual cooling degree days for the South Island region averaged over 1971-2000.

**Figure 4:** Projected future annual cooling degree days into the 2050’s (2041-2070) for the South Island.
Figure 5: Past single day maximum precipitation over 1971-2000 for the South Island.

Figure 6: Projected single day maximum precipitation for the 2050’s (2041-2070) in the South Island region.
<table>
<thead>
<tr>
<th>Hospitals</th>
<th>Past Cooling Degree Days (CDD)</th>
<th>Cooling Degree Days (CDD) 2041-2070</th>
<th>Percent Change in CDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royal Jubilee Hospital</td>
<td>20</td>
<td>176</td>
<td>765%</td>
</tr>
<tr>
<td>Saanich Peninsula Hospital</td>
<td>33</td>
<td>206</td>
<td>520%</td>
</tr>
<tr>
<td>Victoria General Hospital</td>
<td>24</td>
<td>180</td>
<td>660%</td>
</tr>
<tr>
<td>Cowichan District Hospital</td>
<td>66</td>
<td>267</td>
<td>307%</td>
</tr>
<tr>
<td>Nanaimo Regional General Hospital</td>
<td>56</td>
<td>240</td>
<td>329%</td>
</tr>
<tr>
<td>Lady Minto Hospital</td>
<td>51</td>
<td>243</td>
<td>379%</td>
</tr>
<tr>
<td>New Cowichan District Hospital</td>
<td>63</td>
<td>262</td>
<td>319%</td>
</tr>
</tbody>
</table>
Climate Change Adaptation Assessment Toolkit

- Involve key stakeholders at a particular site
- Take 2-6 hours to respond to questions related to their roles and responsibilities
- Cover 5 elements:
  1. Climate Risks and Community Vulnerabilities
  2. Land Use, Building Design and Regulatory Context
  3. Infrastructure Protection
  4. Essential Clinical Care Service Delivery Planning
  5. Environmental Protection and Ecosystem Adaptations
- Excel and online versions

### Resilience scores

<table>
<thead>
<tr>
<th>Element 1: Climate Risks and Community Vulnerabilities Assessment</th>
<th>Number of questions</th>
<th>Score (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>39</td>
<td>78%</td>
</tr>
<tr>
<td>Step 1: Climate Risks</td>
<td>11</td>
<td>23%</td>
</tr>
<tr>
<td>Step 2: Community Preparedness and Vulnerabilities</td>
<td>5</td>
<td>100%</td>
</tr>
<tr>
<td>Step 3: Climate Risk and Vulnerability Analysis</td>
<td>5</td>
<td>100%</td>
</tr>
<tr>
<td>Step 4: System-wide Climate Risk and Vulnerability Analysis</td>
<td>10</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Element 2: Land Use, Building, Design, and Regulatory Context</th>
<th>Number of questions</th>
<th>Score (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>55</td>
<td>73%</td>
</tr>
<tr>
<td>Step 1: Land Use, Design, and Landscape</td>
<td>10</td>
<td>100%</td>
</tr>
<tr>
<td>Step 2: Transportation and Site Access</td>
<td>5</td>
<td>64%</td>
</tr>
<tr>
<td>Step 3: Critical Building Inventory</td>
<td>12</td>
<td>63%</td>
</tr>
<tr>
<td>Step 4: Building Construction and Vertical Transportation</td>
<td>6</td>
<td>58%</td>
</tr>
<tr>
<td>Step 5: Passive Survivability Inventory</td>
<td>16</td>
<td>66%</td>
</tr>
<tr>
<td>Step 6: Other</td>
<td>3</td>
<td>100%</td>
</tr>
</tbody>
</table>
Extreme Weather Impact Surveys

Intent:

• To understand the actual impact of extreme weather events that might increase in frequency and intensity due to climate change
• To illustrate the need to prepare for them
• To build a knowledge base in order to formulate appropriate response strategies
Heat Wave Impact Surveys

• Surveys sent to sites and functions across Island Health
• 218 responses in total
• Responses from a wide range of areas:
  • admitting
  • ambulatory care
  • community and home care services
  • volunteer resources
  • support services
  • facility management
  • long term care
  • medical imaging and more
Next Steps for Island Health

- Test our climate adaptation assessment tool at our own sites
- Assess where and when to use the PIEVC protocol in the future
- Ensure new construction & major renovations use climate projections to inform design (e.g. NRGH Intensive Care Unit)
- Develop staff capacity to identify and implement adaptation measures
- Develop a 10-year adaptation plan integrated with updated mitigation plan
THANK YOU