Islands Trust Climate Indicators

Scoping Exercise to Identify Climate Change Indicators for the Islands Trust Area

Final Report

August 5, 2020

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Introduction

The Islands Trust is located within the treaty lands and territories of the BOḰEĆEN, Cowichan Tribes, Halalt, Homalco, K'ómoks, Klahoose, Ts'uubaa-asatx, Lək̓ ʷəŋən (SXIMEŁEŁ, Songhees, T'Sou-ke), Lyackson, MÁLEXEŁ, Penelakut, Qualicum, Scia'new, səl̓ilwətaʔɬ, SEMYOME, shíshálh, Snaw-naw-as, Snuneymuxw, Sḵwx̱wú7mesh, SȾÁUTW̱, Stz'uminus, Tla'amin, Tsawwassen, We Wai Kai, Wei Wai Kum, W̱JOŁEŁP, W̱SIḴEM, and xʷməθkʷəy̓əm.

In March 2019, Islands Trust declared a climate emergency, stating:

> *We are committed to intensifying our efforts to better match the urgency of the climate change emergency identified by the world's leading scientists. We will seek to work with local communities, First Nations, partner agencies, and other levels of government to pursue an absolute reduction in greenhouse gas emissions in this very special region.*[1]

In support of this goal, the Trust is conducting a scoping exercise to identify appropriate indicators to measure climate change related parameters for the Islands Trust Area. This report offers a preliminary list of indicators that are well suited to enhance local understanding and support regional planning processes across the Trust Area. These preliminary indicators aim to measure:

1. How the climate is changing over time: measured climate parameters; ecosystem impacts, and community impacts.
2. The effectiveness of climate change mitigation efforts by Islands Trust.
3. The effectiveness of climate change adaptation efforts by Islands Trust.

Included in the Islands Trust climate emergency declaration was the importance of incorporating First Nations input within climate action planning, stating:

> *Trust Council directs staff to work with First Nations and First Nations government agencies to seek support for the climate change emergency and to engage to coordinate climate action strategies with First Nations within the Islands Trust Area.*

The need to further engage with First Nations on the development of these indicators came up numerous times during staff and trustee interviews, and is included as a recommendation moving forward.

Type of Indicators

This report includes three types of indicators: climate parameters, process indicators, and outcome indicators.

Climate Parameters:

Climate change parameters are measured (historical) factors that define a current state of weather which, when averaged over extended timespans (approximately 30 years), offer insight into how the climate is changing. They are used to show the path and future trajectory of climate over time. Collecting annual data illustrates the projected variability season-over-season, and year-over-year, and provides a strong source of data to track changes over time. Climate parameter indicators are listed in Section 1: page 5.

[1] http://www.islandstrust.bc.ca/media/347410/2019-09-it-climatechageemergencydeclaredfinal.pdf

Outcome indicators:

Outcome indicators measure the result of programs and policies. They are the result of both the "quantity" ("how many") and quality ("how well") of the activities implemented.[2] For climate change mitigation, this may include creating an inventory of GHG emissions of the community. For climate change adaptation, this involves measuring how prepared a community is for the changing climate. Outcome indicators are listed in Section 2 and 3: pages 8-10.

Process Indicators:

Process indicators measure whether planned activities took place.[3] They are designed to provide feedback on whether a program is being applied as planned, what obstacles may exist, and what changes are needed. Process indicators can reveal whether or not a program is working towards the ultimate goal of climate change mitigation and adaptation. An example of a process indicator for climate change is: number of staff resources assigned to climate change file. Process indicators are listed in Section 4: page 11 and 12.

Project Process

The project team conducted research to identify climate change indicators that are used in other similar jurisdictions to measure impact and effectiveness. From this work, a long list of possible indicators was developed and sent to staff and trustees for comment on applicability to the local context. For each indicator, respondents were asked for comments on:

- Interest / usefulness of this indicator
- The current status of data collection
- The feasibility of data collection
- Level of effort required to collect data

Based on this feedback, a shortlist that reflected local priorities was developed for each category. Relevant indicators suggested by staff were also included. The shortlist was then reviewed in a series of meetings with staff and trustees to further refine priority indicators for each category, and discuss in more detail the feasibility and level of effort of data collection required for each indicator. The results of these two iterations of review are provided in this report.

Source: https://www.facebook.com/IslandsTrust/

[2] http://www.emro.who.int/child-health/research-and-evaluation/indicators/Type-of-indicators.html
[3] Ibid.

Section 1: Climate Change Impacts

Climate Parameters

For the indicators below, baseline data have been collated by the Islands Trust Conservancy's "Climate Projections for Islands Trust Area" report[4]. Star (*) denotes indicators which were not included within the report.

Indicator	General notes from staff / trustee interviews:
Summer temperature indicators: • Annual hottest day • 1.2 Days over 25°C • Days over 30°C • Growing Degree-Days • Growing Season Length	• Spatial graphs are helpful for communication tools to residents (before / after) • Actual data in different time stamps to show historical would be useful as a communication tool ○ Example, decadal historic data to show how things are changing
Winter temperature indicators: • Warmest Winter Day • Coldest Day • Frost Days • Ice Days	
Precipitation indicators: • Seasonal Precipitation • 1-in-20 wettest day precipitation • Maximum 1-Day Total Precipitation • Maximum 5-Day Total Precipitation • 95th and 99th percentile wettest days • Dry spells	
Average monthly temperature*	
Change in annual precipitation*	

[4] http://www.islandstrust.bc.ca/media/349473/itc_climateprojectionsreport_final.pdf

Total monthly precipitation*	
Speed of extreme wind gusts (max recorded speed)*	
Number of extreme weather events (e.g. wind, precipitation)*	
Average annual change in ocean surface temperature (Salish Sea)	
Shifts is in seasonal shifts precipitation, temperature and wind*	

Ecosystem Impacts

These indicators measure the impact that the changing climate is having on the natural environment.

Indicator	Notes from staff / trustee interviews:
Population of nearshore species such as eelgrass beds	• Collected for an IT Conservancy project (2014/2015) • Funding for eelgrass mapping project approved in Mar 2020 • Concern that mapping is being done piece meal – don't have data for the whole Trust Area; different methodologies are being used
Acidification of marine water	• Advocacy role – advocate to federal government for data • Other agencies collecting this information, not a need for IT to collect • Impacts eelgrass, marine food webs and aquatic species at risk
Bird counts	• Collected during Christmas bird count • Can be used as indicator species for ecosystem health
Number of days when fire risk is indicated	• Collected by fire halls
Forest health	• Measure impacts of drought on forest • Collaborate with Ecological Research Network (ERN) led by Dr. Tara Martin / Raincoast Conservation
Foreshore ecosystem indicators • Shoreline type changes over time • Erosion and deposition studies • Forage fish spawning beaches	• Use of LIDAR and GIS mapping to map foreshore habitat • Foreshore habitat very important to First Nations
Terrestrial ecosystem indicators • Stream temperature • Water quality and quantity • Invasive species distribution • Disturbance ITC Mapping • Groundwater recharge levels • Forest cover (volumetric density of biomass)	• Groundwater recharge study underway by IT • Lake and stream monitoring underway by community groups • Disturbance ITC mapping from a 2014 project focused on logging and disturbance, not climate • Use of hyperspectral data (specifically for understory measurements)

Community Impacts

These indicators measure the impact that the changing climate is having on the people who live, work and play in the Island Trust region.

Indicator	Notes from staff / trustee interviews:
Weather-related disruption of electricity supply. Ideas to measure: • Number of service calls to BC Hydro • Number of service outage events	• Can be collected from BC Hydro
Frequency of weather-related ferry cancellations	• Can be collected from BC Ferries
Shifts in property value near shoreline	• Negative shift in property values indicates shoreline hazard problem
Number of households affected by drought	• IT groundwater recharge project will provide domestic groundwater indicators.
Frequency and timing of water service conservation levels	• Collected by Regional Districts / local utilities
Number of businesses and households located in areas of flood/coastal erosion risk	
Impact to cultural sites or shoreline archaeological areas due to climate change	• letters from First Nations naming concerns over impact to cultural sites • Shoreline archeological impact could be measured using storm surge events
Percentage of forest area susceptible to die off due to climate change (Number of dead indicator species)	
Salinization of wells and/or salinization of septic fields	• Part of IT groundwater recharge study

Section 2: Mitigation Outcome Indicators

Greenhouse Gas Emissions

These indicators measure the quantity of greenhouse gases (GHGs) that are emitted by human activity in the Islands Trust area.

Indicators	Notes from staff / trustee interviews:
Terrestrial GHG emissions (total / per capita)	• Subtract industrial GHG emission from pre-contact GHG emissions to eliminate the signature of fossil fuels and set GHG targets • Idea for a PhD project • See Appendix A: Building a Baseline for more details
Consumption-based GHG emissions (total / per capita)	• See Appendix A: Building a Baseline for more details
Percentage of local (<500km) vs imported (>500km) foods and beverages consumed	• Measure via surveys

These indicators measure the quantity of greenhouse gasses (GHGs) that are absorbed back into the ecosystem by plants in the Island Trust area.

Indicators	Notes from staff / trustee interviews:
Square kilometres of protected forest area	• Terrestrial Ecosystem Mapping (TEM) can determine how much carbon is being sequestered over time • See “Carbon sequestration and monitoring” section below for more details on how to measure
Blue carbon (size of eelgrass beds)	• Limited data available (Islands Trust Conservancy report, 2014)

Community Action Indicators

These indicators measure the actions taken by the Islands Trust to reduce GHG emission originating from the region.

Indicators	Notes from staff / trustee interviews:
Population served by public/community/shared transit including car stop programs	
Kilometers of multi-use trails for active transportation (walking, cycling etc.)	

Section 3: Adaptation Outcome Indicators

Adaptation Outcome Indicators

These indicators measure the level of preparedness that has been achieved through efforts to adapt to the changing climate.

Indicators	Notes from staff / trustee interviews:
Percent recharge of groundwater used	• Southern Gulf Islands Groundwater Sustainability Strategy – project measuring groundwater recharge by Islands Trust • If above 40% it is not sustainable
Kilometers of foreshore that is treated through soft shore protection	
Increased percentage of climate resistant trees planted	
Acreage in food production on each island	
Number of days each island could last on local food	• Ben Kadel has done calculations (http://www.highgrove.farm/author/user30/)
Percentage of households at reduced fire risk due to construction of new or enhanced defenses (e.g. firesmart practices)	
Volume of stormwater runoff (L)	• Being collected in groundwater study by IT
Bylaw complaints regarding stormwater runoff	• This shows how the infrastructure is or is not working for residents

Section 4: Climate Action Process Indicators

These indicators are designed to measure the level of effort and effectiveness of climate change adaptation and mitigation by Islands Trust.

Indicators	Notes from staff / trustee interviews:
Number of policies and coordination mechanisms explicitly addressing climate adaptation, mitigation or sustainability	
Percentage of coastline under marine protection	
Policies in place to restrict disturbance in climate impact areas	
OCPs and LUB that incorporate climate adaptation and mitigation	
Risk and vulnerability assessments conducted on new developments (applications/projects that change in zoning, density, etc.)	
LTC bylaw implementation of directive policies related to climate change at a Trust level	
Climate lens developed for Trust Council decision making, as well as staff and local planning committees	
Climate change vulnerability maps of coastal zone developed; or, number of residents engaged in sea level rise strategy	• The Ministry of Environment's Climate Related Monitoring Program (CRMP) • CRDs Flooding & Storm surge map
Staff resources assigned to climate change	
Number of educational opportunities IT creates on climate adaptation and mitigation	• Can be measured with UN Webcrawler portal https://unep.ecoresearch.net/weblyzard/en/
Number of community engagement/educational sessions IT runs on climate change or sustainability	• Easy to track internally
Number of hits on the webpage related to climate change	

Section 5: Recommendations

Based on this initial scoping exercise and interviews with Islands Trust staff and trustees, the project team compiled the following recommendations for Trust Programs Committee to consider as it contemplates the next phase of this Climate Indicators Project:

- Engage further with First Nations to include into this work Traditional Ecological Knowledge and indicators of importance to First Nations in the Trust Area.

- Work with Trust Council to refine the purpose and scope of the Climate Change Indicators Project to focus on tangible, easily measurable indicators related directly to the mandate and project profile of Islands Trust and Islands Trust Conservancy.

- Where desired climate change related data is not directly under the jurisdictional purview of Islands Trust, advocate to other levels of government (i.e. regional districts, provincial and federal governments) and collaborate with partner agencies to access reliable and relevant data sets specific to the Islands Trust Area.

Appendix A: Details on Measuring Climate Mitigation

Building a baseline

The ultimate indicator of climate mitigation effectiveness is a community's greenhouse gas (GHG) emissions. Across the Islands Trust Area, activities undertaken by residents, businesses and organizations that result in GHG emissions include: heating and cooling buildings, heating hot water, transporting people and goods, and disposing of organic waste in landfills (such as food scraps, paper, wood).

In addition to these core sources of GHG emissions, other sources that occur in the community boundaries but are not directly addressed by community-scale climate action plans include: agriculture (including emissions from animals, fertilizer and pesticide application, and agricultural burning), non-road engines (including farm vehicles, other heavy-duty equipment used at commercial and industrial sites, and small equipment such as lawnmowers), rail and aircraft. These sources are important to understand and reduce, but they are primarily managed by provincial and federal governments and are generally outside the influence and authority of local governments.

Some of the aforementioned sources of GHG emissions are measured and reported through the Provincial government's Community Energy & Emissions Inventory (CEEI), however not all are a good source for the Islands Trust Area, which is specified where relevant in the utility, waste, and transportation sections below.

The following outline the current sources of GHG emissions within the Island's Trust community that are inside the influence of local government, along with outlining existing data availability and gaps with options for how they might be measured.

Territorial vs. consumption approach:

- A "territorial"[5] emission inventory focuses on quantifying emissions from activities taking place within the borders of the municipality, including: energy used in buildings in the community (electricity, natural gas, heating oil, etc.), energy used in transportation based on vehicles registered in the community, and tonnage of solid waste generated in the community.
- A "consumption-based" emission inventory takes an alternative approach by focusing on the consumption of goods and services by residents in a community, allocating GHG emissions to the consumer rather than the producer of goods and services. For reference, the District of Saanich prepared both types of inventories and provided the following side-by-side comparison, where the consumption-based emissions are approximately double the amount of territorial emissions.
    - Consumption based inventory requires tracking more types of data to capture the lifecycle emissions of goods and services.
    - The District of Saanich used the ecocity Footprint Tool to measure their emissions.

[5] Note from Islands Trust Staff: Although "territorial" is a commonly used term in GHG emissions measurement, it is problematic since it is a term used by First Nations to define their location in place. As this could be seen as an appropriation of terminology, staff suggest amending this term in any future reporting on climate indicators for the Islands Trust Area.

Utility emissions:

- Can track home and business energy usage through the CEEI - Utility data is published and reliable.
    - Can rely on CEEI for electricity, wood, oil, and propane as relevant.
- Some heating and cooling of buildings by electric generators will not be tracked by the CEEI and may need a similar method to the transportation data determined below: use of a local survey or fuel sale data.

Waste emissions:

- CEEI can provide accurately.

Transportation emissions:

Transportation is a large cause of GHG emissions: this includes not only commuting by motor vehicle, but also by boat.

- Can conduct a local, in house survey to determine transportation distances and vehicle types.
    - Can use electric vehicle ownership from the ICBC data to see how many per capita have electrified.
    - Challenge: Islanders will register vehicles to island and drive them on the mainland for lower insurance costs. ICBC registered vehicles may not be an accurate measure for vehicle ownership and use in the Islands Trust Area.
    - CRD does one trip diary each year and it extends to Salt Spring Island. Can use as a proxy for the other islands, or use similar approach for other islands.
    - Access BC Ferries emissions data for transport to and from the islands, along with survey of how often islanders are traveling by ferry.
    - Include in survey boat ownership and distance.
- If fuel providing companies within the Islands Trust Area will allow, can use fuel sale data to determine motor vehicle fuel consumption on islands.

Carbon Sequestration Indicators

Carbon sequestration is the process of removing carbon dioxide from the atmosphere, including through natural processes such as plant growth. As Islands Trust and Islands Trust Conservancy work to protect natural areas throughout the Islands Trust Area, measuring how much carbon is sequestered through protected forests (green carbon) and eelgrass/ocean plant growth (blue carbon) could be used as indicators of climate change mitigation efforts. This can be achieved through a mapping exercise (as Metro Vancouver has done) that quantifies carbon sequestration of the Islands Trust Area. The CRD is hiring an intern this year with a Pacific Institute of Climate Change grant to initiate a regional carbon sequestration study. There is a possibility for Islands Trust to do something similar or collaborate with the CRD on this initiative.