AGENDA

SPECIAL ENVIRONMENT COMMITTEE

Wednesday, October 7, 2020, 3:00 P.M. - 5:00 P.M.

Board Room, Service and Resource Centre,

411 Dunsmuir Street, Nanaimo, BC

Pages

1. CALL THE MEETING TO ORDER:

[Note: This meeting will be live streamed and video recorded for the public.]

2. INTRODUCTION OF LATE ITEMS:

3. ADOPTION OF AGENDA:

4. ADOPTION OF MINUTES:

4.a Minutes 1 - 6

Minutes of the Environment Committee Meeting held in the Boardroom, Service and Resource Centre, Nanaimo, B.C. on Wednesday, 2020-JUL-15 at 3:00 p.m.

5. PRESENTATIONS:

6. DELEGATIONS:

7. REPORTS:

7.a REIMAGINE Nanaimo: Climate Action and Environmental Technical Backgrounders 7 - 62

To be introduced by Lisa Bhopalsingh, Manager, Community Planning.

Purpose: This report is to provide committee members with the Draft REIMAGINE NANAIMO technical backgrounders on climate and hazard adaptation, GHG Mitigation, and Green Infrastructure / Nature.

Recommendation: That the Committee provide comment and input on the draft technical background documents on climate and hazard adaptation, GHG Mitigation, and Green Infrastructure/Nature.

7.b Environmental Responsibility Framework 63 - 70

To be introduced by Rob Lawrance, Environmental Planner.

Purpose: To provide background on a presentation to the Environment Committee on Environmental Responsibility Frameworks to be presented by Councillors Brown and Geselbracht.

Presentation:

1. Councillor Brown and Councillor Geselbracht.

7.c Climate and Environmental Gap Analysis 71 - 122

To be introduced by Rob Lawrance, Environmental Planner.

Purpose: To provide the Environment Committee with an update on the Climate Action Plan and review current policy and best practice to identify potential environmental policy and program gaps.

Presentation via Zoom:

1. David Reid, Lanarc.

Recommendation: That the Environment Committee receive the attached presentation, provide comment, and input as requested.

8. OTHER BUSINESS:

9. ADJOURNMENT:

MINUTES
ENVIRONMENT COMMITTEE MEETING
BOARD ROOM, SERVICE AND RESOURCE CENTRE
411 DUNSMUIR STREET, NANAIMO, BC
WEDNESDAY, 2020-JUL-15, AT 3:00 P.M.

Present: Councillor T. Brown, Chair
Councillor B. Geselbracht
E. Boulanger, At Large Member (joined electronically 3:50 p.m.)
D. Chen, At Large Member (joined electronically)
L. Frey, At Large Member (joined electronically)
J. Lesemann, At Large Member (joined electronically)
L. McCunn, At Large Member (joined electronically)
W. Wells, At Large Member (joined electronically)

Absent: H. DesRoches, At Large Member

Staff: J. Rudolph, Chief Administrative Officer
D. Lindsay, General Manager, Development Services
B. Sims, General Manager, Engineering and Public Works
J. Holm, Director, Development Approvals
R. Lawrance, Environmental Planner
C. Sholberg, Community Heritage Planner
S. Snelgrove, Deputy Corporate Officer
J. Vanderhoef, Recording Secretary

1. CALL THE ENVIRONMENT COMMITTEE MEETING TO ORDER:

The Environment Committee Meeting was called to order at 3:00 p.m.

2. ADOPTION OF AGENDA:

It was moved and seconded that the Agenda be adopted. The motion carried unanimously.

3. ADOPTION OF MINUTES:

It was moved and seconded that the Minutes of the Special Environment Committee Meeting held in the Boardroom, Service and Resource Centre, 411 Dunsmuir Street, Nanaimo, BC, on Wednesday, 2020-JUN-03 at 3:00 p.m. be adopted as circulated. The motion carried unanimously.

4. REPORTS:

(a) Climate Change Resilience Strategy

Introduced by Rob Lawrance, Environmental Planner.

Presentation:

1. Rob Lawrance, Environmental Planner, provided a PowerPoint presentation. Highlights included:

- Raising awareness within the community about environmental issues and improving communication
- There will be a mitigation aspect and an adaptation and resilience aspect to responding to climate change
- Most of the funding for Sea Level Rise Study and Resiliency Strategy came from the Federation of Canadian Municipalities – Climate Innovation Program
- Objectives of the Sea Level Rise Study and Resiliency Strategy is to identify local climate change impacts and specify action to protect residents and assets
- Provided an overview of the Sea Level Rise Study:
  - Provided diagrams outlining the process for the Sea Level Rise Study and how flood construction levels are determined in order to estimate where to expect flooding over the coast line
  - Conclusion was that overall the City is in a good position but there are areas that could use follow-up in Departure Bay, Downtown and Saysutshun
  - Recommendations from the Sea Level Rise Study: create a coastal hazard development permit area, review zoning and building bylaws to update flood hazard requirements, review coastal erosion monitoring program and create a green shores strategy to identify locations and ways to install features to respond to flooding and erosion
- Provided an overview of the Resiliency Strategy:
  - Identified four project phases relating to engaging, identifying conditions, assessing and implementing
  - There has been strong engagement from City Staff as well as many external stakeholders
- Expected Climate Impacts:
  - Reduced water availability
  - Expect more short duration/high intensity rain events creating flash flooding
  - A hotter/drier climate
  - Changes to tree species
  - Increases in stress and anxiety on vulnerable populations, first responders and supporting community members
- Reviewed the Strategy Development Process: prepare impact statements, prioritize areas identified as vulnerable, take action on quick wins and brainstorm/evaluate actions, plan guiding principles and goals, determine/implement a plan
- Provided a sample of evaluation criteria and implementation planning

- Recommended actions:
  - Water Supply: prepare for a more limited water supply, and improve resiliency of water infrastructure
  - Flooding and Drainage: minimize overland flooding resulting from heavy rainfall. Prepare for the impacts of sea level rise, including associated erosion and coastal flood risk
  - Environment, Parks and Recreation: quantify and manage Nanaimo's urban forest

Committee discussion took place. Highlights included:

- Rainfall collection not being included in planning
- Regional District of Nanaimo (RDN) providing rebates for rainwater cisterns
- City of Nanaimo citizens are eligible for RDN cistern rebates
- Improving communication regarding storm water capture
- REIMAGINE NANAIMO includes a review of the Water Supply Strategic Plan
- Effects of changing groundwater tables on City infrastructure
- Focus of the Resilience Strategy was on fish bearing streams and maintaining watercourses during extreme water events

Rob Lawrance, Environmental Planner, continued his presentation as follows:

- Recommended actions (continued):
  - Environment, Parks and Recreation: assess and restore Nanaimo's ecological diversity, focusing on the City's urban watercourse and marine foreshore
  - Well Being and Preparedness: work with community partners to minimize health impacts of extreme weather on residents, developing an extreme heat response strategy. Improve knowledge, capacity and response plans to deal with increasing risk of landslides and wildfires. Raising public awareness of expected impacts and how to prepare for them
  - Land Use and Buildings: improve resilience planning for new and existing City facilities and residential development. Ensure development regulations and guidelines incorporate expected climate-related hazards
  - Corporate Governance: improve the City's ability to respond and recover from climate related events. Working with neighbouring jurisdictions to support climate resilience and limit transfer of risk across jurisdictional boundaries

Committee discussion took place. Highlights included:

- Information being shared between the City and the RDN
- RDN's Drinking Water and Watershed Protection Program is taking a broader approach and has a focus on watersheds
- City staff meet regularly with other regional planners to share information and plans
- The Resiliency Strategy was brought forward as a foundational piece when Council was presented with the REIMAGINE NANAIMO project

(b) CleanBC Home Renovation Rebate Program Update

Rob Lawrance, Environmental Planner, spoke regarding the following:

- City participation in Provincial rebate program
- Program began in April 2020
- Due to COVID-19 the current uptake is fairly low
- Programs have the potential to increase energy efficiencies
- Incentive for commercial installers to help promote the program as they receive funding for completing installations
- Improving communications to increase effectiveness

Committee discussion took place. Highlights included:

- Timeframe for the rebate program currently runs until 2022
- Province is currently promoting the program through their media resource; however, the City might be able to promote more locally
- Contacting local installers to advise them of these programs
- Providing more clarity about the program and the application process to improve access
- The Province has a website called "EfficiencyBC" which identifies rebates available in each community
- Targeting existing homes to improve energy efficiencies
- Staff are planning to provide a draft communication plan in the Fall of 2020

(c) Verbal Update Regarding REIMAGINE NANAIMO Process

Chris Sholberg, Community Heritage Planner, provided a verbal update regarding the REIMAGINE NANAIMO process. Highlights included:

- Report going to Council on 2020-JUL-20 to launch the REIMAGINE NANAIMO process
- Starting with the engagement process
- Information will be provided to the public through the "Get Involved Nanaimo" platform with background information on high-level topics such as: how we adapt, how we live and care, how we work, how we move, and how we connect and play
- Starting by involving people who may not have planning backgrounds and then focusing on more specific topics for engagement
- A series of questionnaires will be available on "Get Involved Nanaimo" focusing on the high level overall vision for Nanaimo and then topic specific questionnaires

E. Boulanger joined the meeting electronically at 3:50 p.m.

- Website planned to launch on Tuesday, July 21st
- Engagement planned with City committees and local stakeholders
- Currently working on details of how to hold engagement sessions
- A series of City videos will be launching to coincide with questionnaires and topics

- Ultimate objective of engagement is updating community plans:
  - Official Community Plan
  - Parks, Recreation and Culture Plan
  - Active and Sustainable Transportation plan
  - Economic Development Strategy
  - Water Supply Strategic Plan Update
  - Climate Action Plan
- Goal is to identify issues that are out of date, or have changed, and gain public input into where priorities should be, with Council making a final decision

Committee discussion took place. Highlights included:

- REIMAGINE NANAIMO report going forward to Council on the 2020-JUL-20 Agenda
- How the committee can prepare for this project – register for "Get Involved Nanaimo" to contribute and be advised of engagement initiatives, and review surveys when they are posted

6. OTHER BUSINESS:

(a) Councillor Geselbracht re: Update from Working Group

Councillor Geselbracht provided an update regarding the working group meeting held a week earlier. Highlights included:

- How to communicate to the community about the climate adaptation strategy and receive people's feedback
- Staff will be working on developing a survey to better understand how the community interprets these issues
- Potentially using video to increase communication to the public
- Creating an environmental webpage to provide information in one location

Committee discussion took place. Highlights included:

- The City potentially purchasing more land around the watershed
- Considering making permeable cement mandatory to help with drainage – a large portion of Nanaimo sits on bedrock so options need to be based on what is appropriate
- Specifying that native plant species are the most endangered due to climate changes
- What is considered a cooling space and ensuring these are equitable and accessible – more than just buildings, this includes shade features as well
- Consider installing living walls Downtown to avoid the heat island effect
- Communications with Snuneymuxw First Nation (SFN) regarding the Resilience Strategy and Staff have shared this information with SFN staff

7. ADJOURNMENT:

It was moved and seconded at 4:09 p.m. that the meeting adjourn. The motion carried unanimously.

_____
CHAIR

CERTIFIED CORRECT:

_____
CORPORATE OFFICER

CITY OF NANAIMO
THE HARBOUR CITY

Staff Report for Decision

File Number: ENV 03

DATE OF MEETING October 7, 2020

AUTHORED BY ROB LAWRANCE, ENVIRONMENTAL PLANNER

SUBJECT **REIMAGINE NANAIMO: CLIMATE ACTION AND ENVIRONMENTAL TECHNICAL BACKGROUNDS**

OVERVIEW

Purpose of Report:

This report is to provide committee members with the Draft REIMAGINE NANAIMO technical backgrounders on climate and hazard adaptation, GHG Mitigation, and Green Infrastructure / Nature.

Recommendation

That the Committee provide comment and input on the draft technical background documents on climate and hazard adaptation, GHG Mitigation, and Green Infrastructure/Nature.

BACKGROUND

On 2019-APR-29, Council declared a Climate Emergency. Declaring the climate emergency challenges the City to lower Greenhouse Gas emissions (GHG) to between 50% and 58% below 2010 levels by 2030, and between 94% and 107% below 2010 levels by 2050. Part of the motion included completing a review and update to the City's current climate mitigation plan (the "Sustainability Action Plan").

At the 2020-JUN-03 Environment Committee meeting, the Committee received a presentation from Lanarc Consulting on how climate action was going to be integrated into the REIMAGINE NANAIMO process.

At the time, the Environment Committee expressed a desire to provide comment and feedback on public engagement and survey design for the Climate Action Plan update, as well as, other relevant components in the REIMAGINE NANAIMO process.

The REIMAGINE NANAIMO process involves a comprehensive planning policy review and update of key strategic planning policy documents for the City. Central to this is an update of Nanaimo's 2008 Official Community Plan (OCP), the 2005 Parks Recreation and Culture Plan and the creation of the City's first Active Transportation Plan.

The process also includes a public engagement process for these plans as part of a broader process that involves coordinated engagement and review of other key strategic plans, including the Economic Development Strategy, Water Supply Strategic Plan, and the Sustainability Action Plan (Climate Action Plan).

By combining the review and update of these policy documents, the City can maximize community participation and engage the community on these interrelated policy documents. This approach ensures consistency between the plans and efficient resource use, and prevents public confusion and potential engagement fatigue from multiple overlapping planning processes. The process also provides an opportunity to consider combining several plans into one document.

The Climate Action Plan will be coordinated through a sub-consultant, specializing in climate modeling (C2MP), who will develop an emissions profile and climate action scenarios, which will help evaluate what mix of options are best for Nanaimo to help meet its targets.

The climate action update will include a review and update of the City's Greenhouse Gas (GHG) emissions profile. The profile will be used to develop a set of projections that will be based on anticipated fossil fuel use between 2010, 2030 and 2050; showing how the City can best meet its GHG reduction targets.

DISCUSSION

The following draft technical backgrounders have been attached to this report for the committee's review and comment:

- Climate and Hazard Adaptation
- Greenhouse Gas (GHG) Mitigation
- Green Infrastructure / Nature.

These 'Technical Backgrounders' build on the more general 'Public Backgrounders' that are on the ReImagine Nanaimo website. The Technical Backgrounders are aimed at a professional staff and technical stakeholder audience. Their main purpose is to summarize Nanaimo's recent progress and compare that to what other leading jurisdictions have done, with a focus on the Pacific Northwest and jurisdictions with similar goals and objectives.

The backgrounders have lists of 'potential next steps' that fall into the Phase 1 'Gathering Ideas' stage of the REIMAGINE Nanaimo public engagement strategy. Not all of these topics or potential next steps may become priorities for Nanaimo.

SUMMARY POINTS

- The Climate Action Plan will be coordinated through a sub-consultant, specializing in climate modeling (C2MP), who will develop an emissions profile and climate action scenarios, which will help evaluate what mix of options are best for Nanaimo to help meet its targets.
- The Technical Backgrounders are aimed at professional staff and a technical stakeholder audience.
- The main purpose of the Technical Backgrounders is to summarize Nanaimo's recent progress and compare that to what other leading jurisdictions have done, with a focus on the Pacific Northwest and jurisdictions with similar goals and objectives.

ATTACHMENTS

ATTACHMENT A: DRAFT Climate and Hazard Adaptation Technical Backgrounder
ATTACHMENT B: DRAFT GHG Mitigation Technical Backgrounder
ATTACHMENT C: DRAFT Green Infrastructure / Natural Restoration Technical Backgrounder

Submitted by:

Rob Lawrance
Environmental Planner

Concurrence by:

Jeremy Holm
Director, Development Approvals

Dale Lindsay
General Manager, Development Services

CLIMATE & HAZARD ADAPTATION

Nanaimo is experiencing more extreme weather, which increases Nanaimo's risk for forest or brush fires, flooding, and drought. We must continue to assess risks and prepare to adapt.

Adaptation means responding to changes in our community and preparing for a successful and resilient future. In 2008, Nanaimo put targets in place to reduce greenhouse gas (GHG) emissions. However, like almost all BC municipalities, desired GHG reductions have been difficult to achieve. In 2019, Nanaimo City Council declared a climate emergency to bring a new focus to energy and emissions management.

Federal and Provincial policies, actions and incentives are increasing the focus on climate change planning, mitigation and adaptation. Nanaimo and its citizens have the opportunity to capture a share of this senior government and related private investment and encourage clean growth to provide both a resilient local environment and resilient economy.

This technical backgrounder summarizes policy status and potential gaps regarding climate change adaptation and management of natural hazards in Nanaimo.

Nanaimo is underway with climate change planning. The Climate Change Resilience Strategy presents over 60 action items to build Nanaimo's resilience.

Nanaimo's Parks, Recreation & Culture Plan, Transportation Master Plan, & Trail Implementation Plan lay a foundation for a connected system of street transportation, parks, greenways, and trails. For more information see the Mobility and Park, Recreation and Culture Technical Backgrounders.

Policies for changing the way we construct our buildings are important now. To reduce GHG emissions, the need for change/retrofits is urgent. For climate adaptation triggered by sea level rise or new flood risks, we can carry out adaptations gradually, as buildings or infrastructure are developed or redeveloped, or at the end of their service life.

For more information on climate mitigation, energy and buildings, see the GHG Mitigation Technical Backgrounder.

Technical expertise in this backgrounder was provided by Lanarc 2015 Consultants Ltd.

While Greenhouse Gas (GHG) mitigation and Natural Environment/Green Infrastructure is being addressed in separate documents, the topics below summarize recent progress and introduce potential next steps to manage climate change adaptation in Nanaimo:

Adapt to Changing Flood Hazard / Increased Rainfall
Adapt to Changing Drought Patterns
Adapt to Changing Heat Patterns

ADAPT TO CHANGING FLOOD HAZARD / INCREASED RAINFALL

Increased global warming is having the effect of increasing sea levels due to thermal expansion of ocean waters as well as melting of ice caps and glaciers. Sea Level Rise (SLR) will continue for centuries, with current BC provincial guidance to plan for 1.0 m SLR by about Year 2100, and 2.0 m SLR by about Year 2200. Current research recognizes a range of SLR rates, with some recent projections anticipating higher future sea levels than current BC provincial guidance.

Rainfall patterns are also predicted to change due to increased global warming. Precipitation in winter months will increase, and precipitation in summer months will decrease.

Subject areas considered under this topic include:

Mapping of Coastal and Inland Floodplain Extents/Depth
Modelling of Coastal Wave Effects
Building Flood Construction Levels for new construction
Site Flood Construction Levels for new construction
Hard Flood Line of Defense and Protection (e.g. dikes)
Soft Flood Line of Defense and Protection (e.g. green shores)
Management and evacuation of floodable uses (adapt)
Management and evacuation of future retreat areas
Identification and protection of critical infrastructure
Public education on flood management on private prop
Review and upsizing of stormwater piped system
Review stormwater source controls and stream management in face of climate change

Recent Progress in **Nanaimo**

Nanaimo's OCP includes the following policies for flood hazards and sea level rise:

- Objective: to provide flood protection and minimize impacts on the aquatic environment. Achieve a balance between protecting property from flood hazards and protecting the aquatic environment in terms of both water quantity and quality.
- Manage development to protect life and property from natural and human-made hazards such as steep slopes, floodplains, and abandoned mining structures.

Development Permit Areas (DPAs) support extra care in planning and design for sensitive areas. Our current DPAs include:

- Natural Hazard Lands DPAs to protect areas of bank instability and require professional engineering to guide potential modifications.

Nanaimo's Flood Prevention Bylaw 1996 No. 5105 focuses on designated watercourses, but not coastal flood management.

The Subdivision Control Bylaw 1989 No. 3260 triggers the Manual of Engineering Standards and Specifications which specifies stormwater and landscape design and installation standards.

The Zoning Bylaw 4500 includes watercourse setback, leave area and flood control requirements. Flood control requirements follow floodplain mapping for the Nanaimo River and Millstone River and are set at 1.5 m above natural boundary of a sea or other watercourses. Where not certain, flood construction level determination may require applicants to provide a site plan certified by a Geotechnical Engineer.

For sea level rise (SLR), a first phase of planning and risk management has been completed in the Sea Level Rise Study (2019). Work to date has focussed on vulnerability and draft update to Flood Construction Levels (FCLs) which set minimum heights for habitable floors of new buildings. Recommended upcoming phases would consider refined FCLs, inundation models and flood depths in key areas such as Departure Bay, Downtown and Protection Island, and would address potential management solutions and priorities, and update to regulations (e.g. new Coastal Hazard Development Permit Area and update to Zoning Bylaw).

Coastal and stream erosion are also issues to monitor.

Estuary and riparian enhancement work have been completed with partners on Departure Bay Creek.

Potential Next Steps

The scope of the upcoming coastal flood management studies was not known at the time of writing this report. Considering other precedents (below), idealized steps to consider include:

- Reviewing and finalizing potential Flood Construction Levels for both the marine waterfront and major rivers, from current regional and provincial guidance, with a view of more recent IPCC research findings.
- Designing a 'line of defense' across the Nanaimo waterfront and estuaries. While it is important that the line of defense is continuous so as not to be breached through back channels or openings, this line may not always be at the existing shoreline. For example, it may move inland in select areas:
  - Port and railway areas which need to be close to tidewater, with a general permanent flood barrier perforated by limited temporary flood barriers to be installed at key gateways (e.g. rail crossings) before flood events;
  - Floodable outdoor land uses like some areas of park open space, festival space, low-use parking areas, seasonal uses;
  - Floodable habitat areas like marshes, estuaries, riparian and other wildlands, and related low use trails.
- Creating a set of best practice guidelines, including typical sections, isometric drawings and photographs, showing various methods of creating the line of defense and associated habitat or floodable land uses.

- Reviewing drainage and other underground or low-lying surface utilities to determine at what point of SLR or increased creek flooding it would be necessary to 'raise' the utility. In a related matter, determining when and where pump stations may be needed to move stormwater over the coastal line of defense at times of high water.
- Reviewing flood management standards for land uses upland of the line of defense. Considering application of provincial policy that would require all habitable floors to be above the flood construction level (crest level) of the line of defense in order to mitigate the high consequence of failure of the line of defense.
- Reviewing pragmatic strategies and conceptual phasing of how roads, parking areas, and adjacent site works and landscape could be raised to levels that are resilient to coastal flooding and adjacent backwater or groundwater effects. Raising of roads and sites will need to be coordinated with redevelopment of buildings to higher elevations, with considerations of reasonable access for goods and people with disabilities between buildings and sites.
- Reviewing and updating piped utility capacity and potential overages related to increased precipitation related to climate change.
- Early identification of land needs for coastal and estuary defense and habitat compensation, and determination of strategies for land / water lot acquisition.
- Community, business, development, and real estate industry engagement in the above strategies, with extensive education on the risks, potential solutions, and potential phasing as redevelopment occurs. Visualizations including dynamic visualizations of flooding and wave effects are very helpful in creating public understanding of how a design storm event could interact with the existing or future shorelines.
- Working with other utility providers (electrical, gas, communications) to ensure they are planning proactively to be resilient against coastal or creek flood risks.
- High-level costing and budgeting and phasing of solutions – with the intent to adjust financial mechanisms such as Development Cost Charges, Community Amenity Contributions, Reserve Funds or Partnership Grants / Applications to organize long-term funding for long-term and gradual adaptation.
- Cooperation with the Port and federal agencies (DFO, Environment Canada) on systematic review and approval procedures for adaptation projects.

Precedents

The following precedents are selected from a review of current published documents in the Pacific Northwest.

KEY POLICY PRECEDENTS

- Campbell River – Rising Seas SLR Assessment Study (2019)
  - **Purpose:** To summarize local SLR risks and evaluate the strengths and challenges of common SLR adaptation tools, providing support for updated regulations and strategies.
  - **Method:** Includes a public engagement process to provide public with background information and rationale for the planning process, and to collect feedback on public preferences and priorities.

Technical studies were completed at specific locations and planning guidelines were developed based on technical recommendations and community preferences.

- District of North Saanich - SLR and Marine Policy Planning Studies
  - **Purpose:** To better understand the impacts of SLR on land use planning, flood hazard policies, capital investment planning, and emergency preparedness strategies.
  - **Method:** Includes coastal flood inundation mapping and modelling, explores policy options for balancing risk reduction and development costs for property owners.
- Surrey - Coastal Flood Adaptation Strategy (2019)
  - **Purpose:** A long-term strategy to reduce climate change driven coastal flood risks.
  - **Method:** Includes proposed programs and policy actions as well as context-specific actions for planning areas, considering retreat as well as protection strategies.
- BC FLNRO Guidelines – Dikes, Seismic Guidelines, Coastal Flood Guidelines
  - **Purpose:** To reduce impacts of flooding on communities and infrastructure.
  - **Method:** Includes policies, regulations, guidelines, and funding estimates.
- North Vancouver - Flood Assessment Study (2010)
  - **Purpose:** To assess riparian flood hazards for specific streams in North Vancouver.
  - **Method:** Includes the development of a spatial database, hydraulic and hydrologic data collection, and production of flood depth maps. Sets out requirements for more detailed studies (that are now underway).

OTHER BACKGROUND LINKS

- Vancouver - Coastal Flood Risk Assessment Phases 1,2,3 (2014-2018)

ADAPT TO CHANGING DROUGHT PATTERNS

Nanaimo is in a 'rain shadow' with common summer drought. Climate change is likely to increase the length of summer drought patterns.

Subject areas considered in this topic include:

Garden water conservation strategies, landscape and irrigation drought best practices
Water use restrictions
Water step pricing
Drought watering strategies for public trees/plants
Review adequacy of bulk water supply

Water for aquatic habitat is addressed in the Green Infrastructure/Nature Technical Backgrounder.

Recent Progress in **Nanaimo**

Nanaimo's OCP includes the following policies for drought management:

- Objective: To ensure a sustainable water supply. Ensure that the community can continue to grow and prosper while maintaining environmental quality. This includes developing a conservation mindset towards water use.
- The City will continue a water conservation program that includes:

- Development of policies to reduce water use per capita;
- Public education on the benefits and methods of conserving water;
- Advanced measures for detecting leaks in the water supply system;
- Water conservation measures in municipal facilities;
- Landscaping in public places and landscaping requirements for new development (for example, low-flow or drip irrigation systems, plant species and landscape designs that reduce the need for watering); and'
- Methods of recognizing individual and corporate efforts to conserve water.

Nanaimo participates in the Water Smart program with the Regional District of Nanaimo and neighbouring local governments. Public education under that program, combined with low flow appliance incentives, seems to have been effective in substantially reducing Nanaimo's per capita water consumption.

Climate change creates earlier springs and longer summers with associated seasonal drought. This trend has led to increased use of automatic irrigation in Nanaimo and other jurisdictions, which if not following industry best practices, can increase summer peaks in water use.

Nanaimo is undertaking a review of its Water Supply Strategic Plan. A key consideration is the potential timing of the need for additional water source. There is a direct relationship between peak water use – typically for fire flows and summer landscape watering – and the need for new supply and water storage facilities. Growth in

number of water supply users, partnerships with adjacent local and first nation governments, and the form of housing (e.g. apartment vs. low density single family) also influences water supply needs.

Nanaimo's Climate Resilience Strategy includes recommendations to improve tree resilience and planting standards in streets and parks, and restore riparian habitats using a climate lens.

Potential Next Steps

Considering other precedents (below), idealized steps to consider include:

- Updating public information materials (print, web, video) that summarize climate change resilience strategies, including water conservation issues and best practices. These include practices for landscape hydrozones (plans for areas of high, moderate, low and no summer watering), proper soil depth and quality, planting to match hydrozones, and irrigation best practices.
- Update design and performance specifications for landscape and irrigation best practices in Nanaimo engineering standards, adding consideration of climate change and resilience, recognizing that they apply to all public projects and could be referenced for private projects.
- Require the use of 'Smart' weather-based irrigation controllers on all new irrigation installations.
- Work with the development and landscape/irrigation industry to promote best practice applications (IIABC, BCNTA, BCSLA, APEGBC, AIBC, UDI, Home Builders Association).
- Create simple guidelines and worksheets for calculation of Water Budgets and establish water use targets or limits for various land use types.
- Update Development Permit language to require Water Budget and water use targets and best practices to be incorporated into development approvals and implementation.
- Consider Irrigation Permits as a supplement to stormwater management requirements for all developments, including single family and duplex.
- Review stepped water rates to encourage water conservation, and to provide an incentive for proper maintenance and programming of irrigation systems.

KEY POLICY PRECEDENTS

- City of Kelowna Landscape and Irrigation Water Demand Management, and similar Regional District of Nanaimo public information
- Guide to Water Efficiency (2010)
  - **Purpose:** To empower property owners to reduce potable water use for irrigation in the summer months.
  - **Method:** Includes background information and guidance on soil, mulch, plant selection, and irrigation design.
- District of Lantzville Stepped Water Pricing
- Metro Vancouver Restrictions to use of treated drinking water
  - **Purpose:** To reduce peak demands on the drinking water supply.

- **Method:** Municipalities are responsible for implementing practices to meet Metro Vancouver's water use restrictions. City of Vancouver sets restrictions based on address, time of day, and type of water use.

- Seattle Third Tier Water Rates
  - **Purpose:** To reduce peak demands for potable water from May through September.
  - **Method:** Water utility charge rates are tiered based on volume of usage and location of use. Rates vary depending on the time of year.

OTHER BACKGROUND LINKS

- Metro Vancouver Drinking Water Management Plan (2011)
  - **Purpose:** To ensure that regional water needs are met safely, reliably, and affordably.
  - **Method:** The plan states that municipalities are responsible for developing: bylaws to encourage water efficiency, residential water metering programs and municipal rebate programs for water efficient fixtures/appliances, bylaws and design standards to encourage on-site rainwater capture for non-potable uses, enhanced lawn irrigation regulations.
- Portland - Water Conservation Rate Structure Review
  - **Purpose:** To explore advantages and disadvantages of various retail water rate structure alternatives, and their effectiveness at incentivizing customer water conservation.
  - **Method:** Includes a review of uniform and block rate structures, an evaluation of historical water demand under different rate structures, an assessment of the effectiveness of the current rate structure at meeting local objectives.

ADAPT TO CHANGING HEAT PATTERNS

As a parallel to Nanaimo, the City of North Vancouver has completed a *Climate Change and Impacts for the City of North Vancouver* report. An excerpt: 'Projected increases in average summer temperature would result in a summer climate warmer than present-day Seattle by the 2050s and warmer than San Diego by the 2080s … high temperature events that are currently expected only once every 10 or 25 years would instead occur every 3.6 or 7.8 years, respectively ' Murdock et al., 2012). Nanaimo could face similar changes in temperature to North Vancouver.

Wildfire is a risk. Over the past decade, communities across BC have been threatened by wildfire. Nanaimo is fortunate to not have been heavily impacted in the past, but is vulnerable to urban interface wildfires.

Subject areas considered in this topic include:

Wildfire management for urban forest
Building design for solar shading
Building design with green roof insulation
Private / public site design to mitigate heat island effect
Drinking Water supply to homeless
Cooling / warming locations for public

Recent Progress in Nanaimo

Nanaimo's OCP includes the following policies for changing heat patterns:

- Support development of innovative green spaces to reduce the urban heat island effect.

Nanaimo's Community Wildfire Protection Plan identifies how to prepare for and manage fire risks.

Current focus in Nanaimo has been on protection of urban forest and habitat, and this remains appropriate. However, in the longer term (end of life of buildings constructed now), consideration of more shading and protection from excess heat will be very important.

Nanaimo Climate Change Resilience Strategy recommendations include:

- Develop fuel management in large parks and a community education program regarding wildfire risk.
- Develop an extreme heat response strategy.

Potential Next Steps

- Review development permit and other Nanaimo design guidelines and approval checklists to add consideration of heat island effect and provision for heat mitigation in building and urban design, as well as urban wildfire interface management.
- Continue implementation of street tree installations and replacements, with consideration of shade potential of chosen species and resilience to climate change.

- Consider update and implementation priorities of the Community Wildfire Protection Plan in concert with senior government and UBCM incentives for wildfire risk management.

KEY POLICY PRECEDENTS

- District of North Vancouver Community Wildfire Protection Plan (2007)
  - **Purpose:** To quantify and identify areas of wildfire risk, recommend management actions to reduce risk, and improve communication of issues to the public.
  - **Method:** Includes a risk assessment to spatially quantify fire risk, an identification of fuel types, and an outline of measures to mitigate risk.
- District of North Vancouver - Development Permit Area for wildfire risk areas
  - restrictions are put on the land title and are retained when land ownership changes.
  - Wildfire fuel management funded by grants and city budget.
- City of Nanaimo Wildfire Management Plan
  - **Purpose:** To improve public safety and reduce risk of property damage from wildfires.
  - **Method:** Includes a threat assessment and recommendations to reduce risk.
- Georgetown Climate Centre - Adapting to Urban Heat: A toolkit for local Governments (2012)
  - **Purpose:** To mitigate the public health impacts of increased urban heat events intensified by climate change by helping local governments adapt.
  - **Method:** Includes policy tools for encouraging cool roofs, green roofs, cool pavements, and urban tree canopy cover.
- Toronto - Green Roof Bylaw
  - **Purpose:** To encourage green roofs on public and privately owned buildings.
  - **Method:** Establishes a graduated green roof requirement for new development or additions greater than 2,000 m² gross floor area. Applies to industrial, commercial, institutional, and multifamily residential developments.
- Philadelphia - Cool Roof Law
  - **Purpose:** To decrease the urban heat island effect by encouraging reflective-coloured roofs.
  - **Method:** Requires buildings of certain types to have roofs with specified solar reflectivity values.

STEEP SLOPE & SUBSIDENCE HAZARD LANDS

Development patterns on hillsides have continuing challenges including fragmented green areas and extensive earthworks to meet safety standards.

Waterfront steep slopes and ravines can be locally unstable and increased rainfall intensity further impacts stability, leading to washouts or landslide.

Subject areas considered under this topic include:

Management of steep and potentially unstable slopes
Coastal erosion risks including sea level rise, and undermining of steep slopes
Climate changes in rainfall and groundwater patterns and effect on steep slopes
Coal workings and other risks of land subsidence
Contaminated sites (generally under Provincial regulation)

Recent Progress in **Nanaimo**

Nanaimo's OCP includes the following policies for steep slopes and subsidence:

- Manage development to protect life and property from natural and human-made hazards such as steep slopes, floodplains, and abandoned mining structures.
- Limit and, if necessary, prohibit development in natural hazard areas and areas of abandoned mining works that could result in loss of property or personal injury.
- Design with nature to protect hillside character using cluster development to preserve open space.
- Control erosion during development.
- Sustain urban forests, treed areas, and wildlife trees.
- Create a network of riparian and upland corridors to link natural habitat and support wildlife movement.
- Assist the Province in regulating use and rehabilitation of contaminated sites.

The 'North Slope Stability Study (1993)' has provided guidance to address steep slopes and related development setbacks. Nanaimo's Climate Change Resilience Strategy recommends an update to that study to incorporate known climate predictions.

Nanaimo's OCP includes two Development Permit areas that are related to hazard lands:

- Natural Hazard Lands DPAs to protect areas of bank instability or subsidence and require professional engineering to guide potential modifications.
- Steep Slope DPAs to achieve environmentally-sound, safe, and livable hillside neighbourhoods, including protection of vegetated slopes.

Potential Next Steps

- Review the North Slope Stability Study and other steep slope areas of Nanaimo to update analysis and recommendations to include climate changes in rainfall patterns, potential wildfire, coastal and watercourse erosion, groundwater seepage and related slope stability.
- Update the Hazard Land and Steep Slope Development Permit Areas and related guidelines for private development.
- Identify public infrastructure at risk from coastal or watercourse erosion, flood or landslide, and create a strategy to manage these risks associated with maintenance or replacement at end of service life.

GREENHOUSE GAS (GHG) MITIGATION

This technical backgrounder focusses on the role of the City of Nanaimo in mitigating climate change through encouraging the reduction of Greenhouse Gases (GHG).

The City of Nanaimo has declared a climate emergency: in April 2019, it set itself an ambitious target of reducing community emissions by 50 to 58% of 2010 levels by 2030, and by 94% to 107% of 2010 levels by 2050.

Community Emissions are the emissions generated by Nanaimo residents and businesses. Even though the City of Nanaimo does not directly control the GHGs emissions in its community, the City has adopted targets that, working with residents and senior levels of government, it hopes to achieve in order to help Nanaimo do its part to reduce its emissions and help Canada and British Columbia meet their climate commitments.

Technical expertise in this backgrounder was provided by Duncan Cavens, C2MP Consulting Ltd. with oversight by Lanarc 2015 Consultants Ltd.

RECENT ACHIEVEMENTS AND CONTEXT: PLANS AND POLICIES

Nanaimo has adopted policies over the years that seek to directly or indirectly reduce community emissions. Some of these include:

- The 2008 Official Community Plan had a strong sustainability focus and outlined a number of policies directly related to energy and emissions. This included encouraging greater energy efficiency in buildings and neighbourhoods, implementing a sustainability checklist, and encouraging multi-use buildings. Other policies were broadly supportive of increasing energy efficiency and emissions reductions: increasing density along nodes and corridors; prioritizing active transportation; reducing vehicle trips; and supporting waste reduction.
- In 2010 Council amended its OCP to adopt specific targets for GHG reductions: to reduce emissions by 33% below 2007 levels by 2020, and 80% of 2007 levels by 2050.
- The Community Sustainability Action Plan (2012) and its accompanying Community Energy and Emissions Study (2011) suggested specific policies, indicators and an action plan for achieving the OCP's revised goals.
- The Transportation Master Plan describes a vision for a multi-modal transportation system that should result in less-energy intensive mobility;

- In 2018, Council endorsed the "BC Energy Step Code Implementation Strategy", which identified how City would adopt the BC Step Code to require new buildings to achieve higher energy efficiency than the BC building code;
- In 2020, the Parking Bylaw was amended to require electric vehicle charging infrastructure in new developments;
- The Climate Change Resiliency Strategy (ongoing as of summer 2020) is identifying climate change impacts and identifying actions to protect residents and municipal assets.

TARGETS & RESULTS

GHG Inventory

As GHGs are invisible and produced from a wide variety of sources, there exist numerous approaches and protocols for calculating municipal-scale emissions. This backgrounder uses the Partners for Climate Protection (PCP) approach to measuring and tracking community-scale emissions, which accounts for greenhouse gases emitted within the boundaries of the City, in particular from buildings, transportation and solid waste.

Using base data released by the Province, an analysis was conducted that It shows that despite Nanaimo's policies and strategies listed above, GHG emissions have increased by 18% between 2010 and 2017 (the latest year where data is available). This compares to a population growth during this period of 14%: emissions are growing faster than population growth.

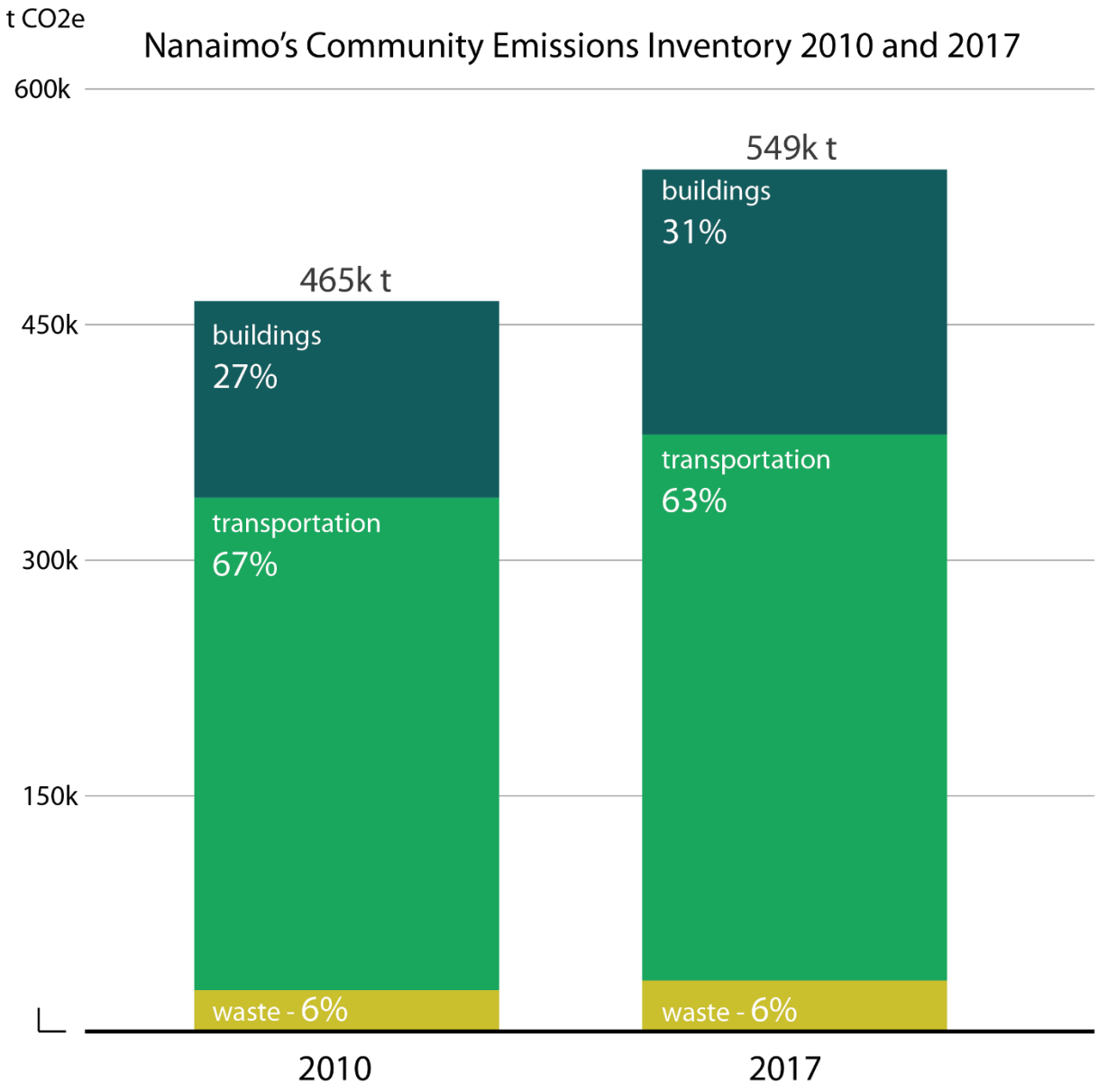


Figure 1 Community Emissions Inventory

Growth is particularly dramatic in the building sector, which saw large growth in natural gas use (55% increase), and much smaller increases in electricity (5%). While some of the growth is likely from economic growth and expansion of energy-intensive workplaces, a large proportion is likely due to residents and businesses continuing a long-term shift from electricity to natural gas due to arrival of natural gas on the Island in the 1990s. As natural gas produces 16x more emissions than BC Hydro electricity for an equivalent unit of energy, this shift has profound implications for Nanaimo's ability to reach its climate targets.

Additional emissions from plane and ferry travel, and emissions from the production and transport of food and goods consumed by Nanaimo residents and businesses, while likely substantial, are not easy to track and come from areas over which local governments have little to no influence or jurisdiction. It is important to note that Nanaimo's residents and businesses are responsible, either directly or indirectly, for these additional emissions. One local government that has tried to quantify them is the District of Saanich, which estimates that if emissions from other transportation and industrial activities are included, its emissions would increase by 20%. By including the emissions from goods consumed by residents, its emissions would increase further.

SCENARIO: BUSINESS AS USUAL IN NANAIMO

GHG emissions overlap federal, provincial and local government jurisdictions. Nanaimo will only able to reach its reduction goals with strong partnership with federal, provincial and regional governments and aggressive implementation of GHG reduction plans and actions at all levels of government.

Using C2MP's CAN model, current policies were analyzed to understand what their effect could be on Nanaimo's emissions in the future. Using population and employment projections prepared by Vann Struth Consulting Group in 2020, future building, transportation and solid waste emissions were estimated for 2030 and 2050. Only concrete policies and regulations were analyzed: all levels of government have adopted aspirational targets that are more aggressive but that will not be realized without concrete policies. The following policies were included in the scenario:

- Federal standards for new vehicles (to 2025);
- Net-zero building code by 2032 for new construction;
- Provincial low-carbon fuel regulations (to 2025);
- BC's Zero-Emissions Vehicle Act;
- BC Transit's Low Carbon Fleet Program;
- Nanaimo's Step Code implementation;

Policies that are based on voluntary participation (such as the CleanBC incentive programs currently running) were not modelled, as the uptake rates are difficult to estimate and have historically been very low.

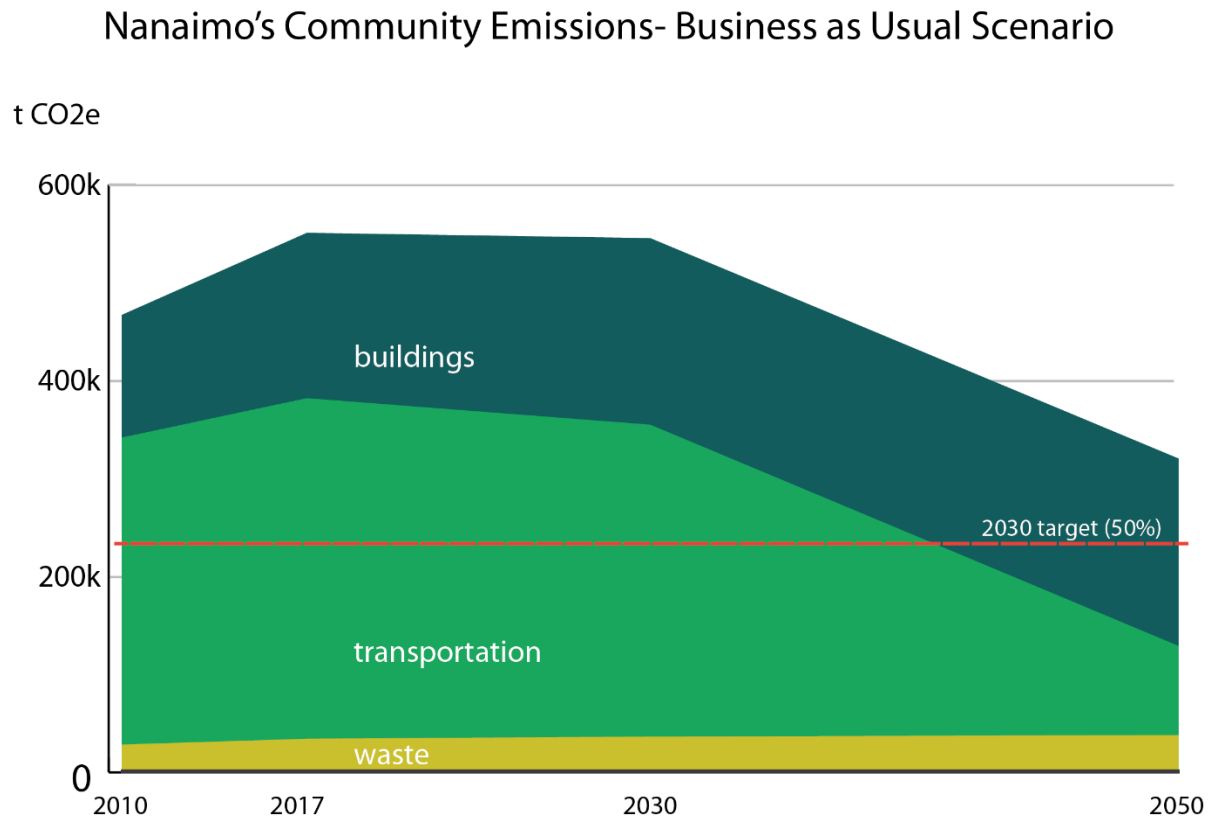


Figure 2 Modelled Business as Usual Scenario

The model shows that while current policies could result in a 32% reduction in GHGs from 2010 to 2050, reductions from 2017 to 2030 would only amount to 1%. However population growth is predicted to be 31% from 2010 to 2030 and 53% from 2010 to 2050, which means that emissions per capita are expected to decline substantially.

The decline can largely be attributed to the provincial policies on zero-emission vehicles and the low-carbon fuel standard. While the bulk of the decline is not expected to be seen until after 2030 (owing to the natural replacement rate of vehicles), the decline is dramatic.

In considering building emissions, analysis differentiates between future (new) and existing building stock. Emissions from new buildings are modelled to be a small proportion of the overall emissions (11%) Existing buildings are the one area where existing policies have little predicted effect: ongoing fuel switching from electricity to natural gas (which increases emissions) is expected to counteract any efficiency gains from households and businesses increasing efficiency when upgrading their heating and hot water systems.

KEY CHALLENGES & OPPORTUNITIES

KEY CHALLENGES

- Reducing community emissions has proven difficult: despite a decade of policies targeting emissions reductions, emissions have risen by 18%;
- Nanaimo's 2030 targets substantially exceed the Provincial targets (50-57% vs 40% by 2030 - the City's target also starts from a 2010 baseline, which was lower than the province's 2007 baseline due to the lingering effects of the 2008 financial crisis). As a result, Nanaimo can not merely rely on federal and provincial policies and programs to meet their local targets: the City needs to substantially supplement senior government actions despite having fewer powers and financial resources;
- Emissions targets are absolute, not per capita. Economic and population growth provides investment and capital to fund low-carbon projects, but also means that, on average, individual households and businesses in Nanaimo need to reduce their emissions by more than 50-57%;
- At present, natural gas is considerably less expensive on a per GJ basis than low-carbon alternatives. This is particularly apparent when comparing high-efficiency natural gas heating with standard electric furnaces or baseboards;
- Again at present, many low-carbon options (such as heat-pumps, electric bikes or electric vehicles) have higher upfront costs than the default fossil fuel alternative. While operating expenses are either comparable (heat pumps) or substantially lower (electric vehicles), higher initial costs are a barrier for some Nanaimo residents and businesses to choose low-carbon options;
- Like all local governments in BC, Nanaimo has limited and/or shared jurisdiction over key drivers of carbon emissions, such as building codes and vehicle efficiency. The City has limited ability to compel residents and businesses to adopt low-carbon fuels, and are limited to educating and providing incentives in many areas;
- Many building systems, municipal infrastructure and some vehicles have longer expected lifetimes than 2030 or even 2050. Vehicles and heating systems purchased today may still be contributing carbon well after 2030. Today's decisions around street design and pedestrian infrastructure will likely be in place after 2050;
- Local data on emission sources, are poor, in particular from transportation. Without regular updates of data on the sources of emissions and/or key indicators, it is difficult to ascertain if policies are having the desired effect and if they need to be modified or accelerated;

KEY OPPORTUNITIES

- Due to its abundance of Hydro power. BC has a very low carbon electricity grid and relatively low electricity rates compared to other jurisdictions. As a result switching from fossil fuels to electricity has an immediate and substantial reduction in carbon emissions without needing to find other (more expensive) renewable sources of energy;
- The provincial and federal governments are accelerating policies and programs to support residents and businesses lower their carbon emissions, including those in Nanaimo. Some examples include:
  - The Province has mandated that 10% of new personal vehicles sold in BC need to be electric vehicles (EV) by 2025 (25% by 2030, 100% by 2040) and there are substantial subsidies to new EV purchasers;
  - The Province has promised updates to the BC building code requiring net-zero buildings by 2032;
  - BC Transit has committed to a low carbon fleet by 2040;
  - The Province is funding rebate programs for switching from fossil fuel building systems to low-carbon alternatives;
- Federal and provincial infrastructure programs are increasingly targeting investments that lower carbon emissions as a priority goal;

POTENTIAL NEXT STEPS

HOW CAN NANAIMO REDUCE ITS EMISSIONS?

The vast majority of Nanaimo's GHG emissions result from burning fossil fuel to provide energy for transportation and to heat buildings and hot water. Broadly speaking, there are only two ways to reduce the emissions: reduce the demand for these fuels, or switch to less carbon intensive fuels.

Reducing demand is by far the least expensive option in theory, but in practice it has proven to be difficult to actually achieve at the scale necessary to meet Nanaimo's targets. Reducing demand by upgrading furnaces from 85 to 98% efficiency does not equate to a 50% reduction in decade: indeed there are rebound effects where increasing efficiency lead to increased demand as residents increase the inside temperature to improve comfort at a slightly reduced cost, negating the efficiency gains. Similarly, switching some work trips from private vehicles to walking or cycling can induce longer recreational or shopping trips due to transportation affordability overall.

While consumers often focus on highly visible renewable energy sources such as solar or wind, these approaches are expensive, especially at a household scale. In BC, due to the abundance of relatively low cost hydroelectricity, switching from fossil fuels to electricity is generally the most cost effective way to achieve deep emissions reductions quickly. Coupling this switch with an improvement in efficiency can result in very significant emission reductions with a competitive operating cost.

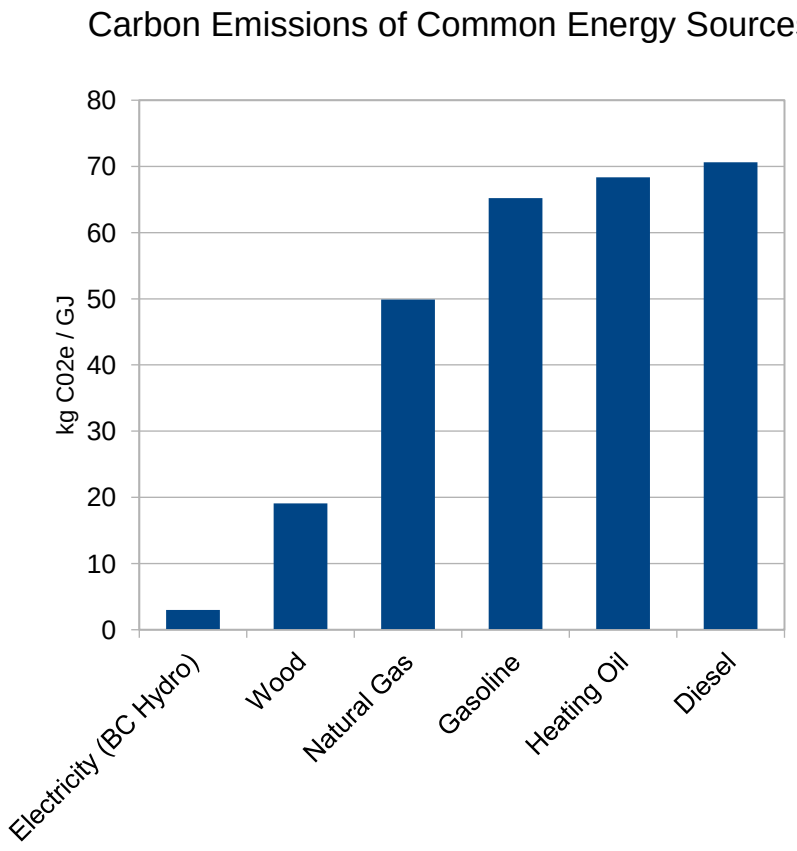


Figure 3 Carbon intensity of common fuels

DATA GAPS / TRACKING EMISSIONS

Despite setting emissions reduction goals starting in 2010, data collection has not been consistent to allow the City to report if progress has been made. A key issue has been a lack of provincial on-going data collection- the province originally committed to releasing its Community Energy and Emissions inventory every two years. For various reasons, this program was halted after the release of the 2012 inventory, causing significant gaps in data.

The Province has subsequently released utility data yearly broken down by local government. However, the data is aggregated into categories that make sense for utilities, but not necessarily to understand what kinds of buildings are driving emissions growth over time. **Asking the province for better disaggregate building data** would allow Nanaimo to target its building programs to those building types and sectors where potential reductions would be greater.

Transportation data is generally the responsibility of the City. However, due to the expense of collecting it, travel surveys are done infrequently (the latest survey was done in 2012) and focuses on mode share and travel distance. These metrics are more useful for managing congestion than for tracking transportation emissions. Total annual vehicle kilometers travelled (VKT) is the key driver of transportation emissions: it is currently not tracked necessitating reliance on estimates and province-wide factors to understand vehicle emissions over time. **Tracking VKT on a consistent time frame** (at least every 5 years) would allow the City to understand if transportation investments are having the desired effect on transportation emissions.

BUILDINGS

Existing Buildings

While municipal policies have typically focused on regulating new developments, reducing emissions from the existing building stock in Nanaimo is critical to reaching Nanaimo's climate targets. The overwhelming majority of existing buildings will still exist in 2030, and most in 2050. Buildings contributed 169,000 tonnes of c02e in 2017: to meet targets, this needs to be reduced to 84,000 tonnes, and by 2050 this needs to be reduced to close to zero.

The City of Nanaimo has limited jurisdiction over retrofits and cannot currently mandate particular heating systems or standards for increased building GHG efficiency. While higher levels of government have committed to introducing a retrofit code, this is likely years away from implementation. Currently, the City is limited to providing education and financial incentives.

FUEL SWITCHING

From 2010 to 2017, natural gas usage has been increasing above the rate of population growth. This suggests that, due to the low cost per GJ of natural gas at present, residents and businesses are switching from low-efficiency electrical systems such as baseboards or electric furnaces to natural gas furnaces. While this likely results in short-term cost savings to residents and businesses, it runs counter to Nanaimo's climate change goals. Provincial incentives to switch to low carbon heating and hot water systems have recently been increased to $3000 for high efficiency installs. In addition, there is a $500 incentive for related upgrade to electrical service if required. Nanaimo currently tops up the provincial heat pump rebate by $350 and the electrical service upgrade by $500. It is worth noting that these incentives, while considerably higher than the recent past, are still less than the incremental cost of a heat pump system vs a natural gas furnace (estimated at $5000 or more). **Other local governments in BC have substantially increased their incentives in order to quickly drive fuel switching** (e.g. the City of North Vancouver and Victoria now offer $2000 top-ups for converting to a heat pump, while Vancouver offers up to a $6000 top up limited to 80% of install cost.)

OIL TO HEAT PUMP PROGRAM

According to provincial estimates, approximately 360,000GJ of heating oil was consumed in Nanaimo in 2017, resulting in roughly 20% of estimated building emissions overall. This translates into upwards of 3500 homes heated by heating oil. As heating oil furnaces are likely to be older and less efficient than natural gas furnaces,

and have other environmental risks from potential oil spills, it makes sense to **target heating oil conversion to low-carbon energy such as electric heat pumps**.

RENEWABLE NATURAL GAS

Fortis BC has been providing a renewable natural gas (RNG) option to its customers since 2010. Naturally occurring methane from decomposing organic waste from farms, landfills and other suppliers are captured and cleaned and injected into the main natural gas supply, reducing its overall GHG emissions. As renewable natural gas comes from organic matter within the earth's annual carbon cycle, it is considered carbon neutral. Currently, demand far exceeds available supply, even at prices higher than conventional natural gas. Fortis BC has set an ambitious target of providing 15% renewable natural gas by 2030. If sufficient sources of RNG can be found and developed, it could be a significant part of achieving Nanaimo's climate goals. However, a 15% reduction in emissions from natural gas would only represent 3% of Nanaimo's total emissions in 2017. It should not be viewed as a quick fix for easily reducing building emissions, but rather reserved for those buildings that are particularly difficult to retrofit to zero emission fuel sources (recreation facilities, heritage buildings and industrial processes that require combustion.)

LOW INTEREST LOANS

In order to further reduce the burden on upgrading their buildings, some local governments across Canada have chosen to offer **low/zero-interest loans to upgrade systems that reduce their emissions**. The idea is that local governments can access financing at lower rates than many individuals and can assist homeowners to make projects more financially viable.

Nelson, BC has an EcoSave program that targets energy efficiency upgrades and assists homeowners and businesses to navigate retrofit rebates. It also allows upgrade costs to be financed at low-interest rates and repaid via on-bill payments to the city-owned electric utility. Recently, e-bikes were added to the suite of acceptable projects.

More information: https://www.nelson.ca/742/EcoSave-Energy-Retrofit-Program

Halifax, NS runs the Solar City program, which allows for financing of energy efficiency and renewable energy projects. The municipality places a voluntary Local Improvement Charge (LIC) on the property after a pre-approved efficiency project is completed.. The LIC is an additional annual charge and is separate from the property owner's annual property tax bill. The charge is tied to the property, not the owner, so charges continue in the event the property is sold.

More information: https://www.halifax.ca/home-property/solar-projects/about-solar-city-halifax

New Construction

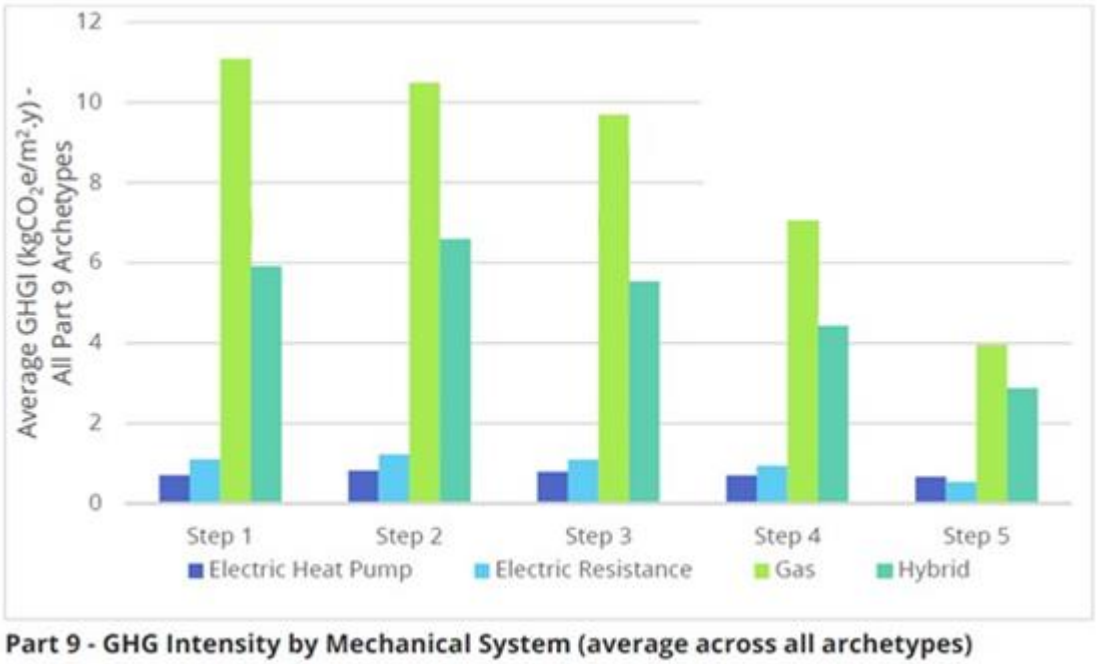
While new buildings are considerably more efficient than the average older building, unless they are fueled by zero-carbon energy sources, each new building built in Nanaimo will continue to increase emissions rather than

decrease them. Given the difficulty inherent in reducing emissions from existing buildings, careful consideration should be given to minimizing the number of new buildings that are not low to zero carbon.

STEP CODE VS GHG INTENSITY

In 2018, Nanaimo adopted BC's voluntary Step Code. The step code provides standardized tiers ("steps") of building performance that a local government can require builders to achieve. Starting in 2020, new construction in Nanaimo is required to demonstrate that it meets existing energy efficiency requirements, and in 2021/2022, new buildings will be required to be 10% more efficient than current code, increasing to 20% by 2022 for smaller buildings like houses and simple commercial buildings.

While requiring higher efficiency building seems at first glance to be a good measure to reducing occupants energy costs and carbon emissions, in practice it is not necessarily the most effective approach to reducing GHG emissions from new construction. A 2019 study by the Integral group demonstrated that the carbon intensity of the fuel used to provide heating and hot water to a building has far more impact than the absolute efficiency (see figure 4.) A lower efficiency building heated with electricity can have far lower carbon emissions than a highly efficient building that uses natural gas as its primary source of energy.



Part 9 - GHG Intensity by Mechanical System (average across all archetypes)

Figure 4 Source: Integral Group, Implications of the BC Energy Step Code on GHG Emissions June 2019

Achieving higher steps in the step code can also be complex and expensive for builders: using electricity as a primary source is often considerably less expensive than achieving high levels of efficiency. As a result, municipalities have started to introduce alternative approaches to the step code: the City of Burnaby allows buildings that meet a GHG intensity target to meet a lower step. While this lowers the overall efficiency of the building, it meets the City's GHG objectives while also lowering costs to developers.

More Information: https://www.burnaby.ca/Assets/city+services/building/Brochures+$!26+Bulletins/Building+Technical+Information/Energy+Step+Code+(Part+3+Buildings).pdf

DENSITY BONUSING FOR ENERGY EFFICIENCY/LOW EMISSIONS

While Nanaimo has chosen to implement the Step Code on a city-wide basis, it is possible to require higher levels of efficiencies for re-zonings, in effect using density-bonusing to offset the costs of increasing energy efficiency.

An example from the City of North Vancouver: https://www.cnv.org/-/media/city-of-north-vancouver/documents/density-bonusing-program/step-code-rezoning-policy-for-part-3-buildings.ashx?la=en

TRANSPORTATION

Transportation is the largest contributor to GHG emissions in Nanaimo, accounting for 63% of emissions in 2017. Of this, 80% of emissions were from personal vehicles such as cars, small trucks and SUVs, while 20% were from larger commercial vehicles such as tractor trailers and large trucks.

Demand Reduction

Reducing the amount of travel, particularly from single occupancy vehicle traffic, is a simple, yet long term, way to reduce emissions. Continuing Nanaimo's development towards dense nodes connected by transit and pedestrian oriented corridors should contribute over time to reduced travel demand, as residents live closer to their everyday needs and choose to drive less. Ongoing investments in bike networks and pedestrian infrastructure will also accelerate this trend.

Nanaimo's Transportation Plan sets out a goal of doubling sustainable mode share from 12% to 24% by 2041. This includes goals for walking (12% of all trips), cycling (4%) and transit (8%). These shifts should reduce community carbon emissions: walking and cycling trips are zero carbon, and transit will become low to zero carbon as BC Transit implements its Low Carbon Fleet Program over the next two decades.

Investments in active transportation, in addition to reducing congestion and improving community health, among other benefits, will likely have a modest impact on transportation emissions. A 12% increase in mode share does not translate into a 12% reduction in carbon emissions from transportation: trips that shift to active transportation tend to be shorter trips (e.g. the average pedestrian trip in 2012 was 800 meters vs 6.5km for vehicle trips). Distance travelled and fuel type is what ultimately drives transportation emissions, not mode share.

Research has shown that vehicle ownership rates have a high correlation with total vehicle kilometers travelled: households with fewer vehicles drive less. Restricting parking (or reducing parking requirements for new

buildings) could be very effective in reducing the amount of travel in vehicles and reducing transportation emissions.

Electric Bikes

The recent explosion in electric bikes (e-bikes) has the potential to up-end the comments above. With the increased availability and reduced price of electric-assisted bicycles, the type and length of trips made by the average rider appears to be increasing and a wider cross-section of society is adopting them. Initial research has indicated that e-bike trips are more likely to replace vehicle trips than other modes, but research is still unclear on the extent of this shift in practice.

Municipal policies targeting bicycling such as improved bike routes and secure bicycle parking are likely to benefit e-bike users as well. Some municipalities are currently exploring other ways in increase the uptake of e-bikes, such as including them in low-interest financing programs (Nelson, BC) or providing subsidies to specific users (District of Saanich.)

Electric Vehicles

BC's 2018 CleanBC plan recognized that electric vehicles (EVs) are a key part of achieving BC's transportation emissions goals. While other technologies such as hydrogen vehicles might gain prominence over time, current worldwide trends suggest that electric vehicle availability is set to increase substantially. As battery prices fall and range increases, manufacturers have announced ambitious electric vehicle programs that will broaden the types of vehicles available to consumers. BC has mandated that by 2025, 10% of all personal vehicles sold in the province will be zero-emissions, increasing to 25% by 2030 and 100% by 2040. The vast majority of these vehicles are expected to be electric.

Due to the low carbon content of electricity in BC, and the increased efficiency of EVs compared to internal combustion engines (up to 80% of the energy used by combustion engines is wasted as heat), EVs can reduce carbon emissions per kilometer by more than 98%.

As of December 2019, according to ICBC data, only 0.4% of vehicles registered in Nanaimo were EVs. This is even though 9% of light duty-vehicles sold in BC in 2019 were electric vehicles, up from 4% in 2018. Due to the lifespan of a typical vehicle (estimated to be 15 years on average), the number of electric vehicles on the road will increase gradually. The Current Policy Trends scenario assumes that 12% of light-duty vehicles will be EVs by 2030, rising to close to 100% by 2050. Providing adequate charging infrastructure to accommodate the roughly 80,000 EVs required by 2050 is critical.

Research, such as from the Sustainable Transportation Action Research Team at SFU, has identified home charging infrastructure as a key barrier to widespread adoption of EVs.

While installing charging stations in single family, duplex and townhouses is relatively simple and inexpensive, retrofitting significant numbers of charging stations in apartments and condo buildings is expensive and

technically challenging. This is particularly the case if one anticipates that 100% of vehicles in a given building will be electric by 2050.

In the 2018 updates to its Parking Bylaw, Nanaimo requires that 10% of parking spaces in new multi-family buildings have chargers installed, and a further 20% are required to have electrical infrastructure to allow them to be upgraded to provide charging. Further requirements are in place for single-family dwellings and off-street parking for commercial developments. **Further investigation is advised to determine if this level of charging infrastructure is sufficient to meet the future situation where 100% of vehicles will need charging.**

While the parking bylaw provides charging infrastructure for residents of buildings built after 2018, as of 2016 there were roughly 8,500 multi-family units in Nanaimo. Retrofitting them to provide adequate charging to accommodate 100% of vehicles is likely to be difficult. While most public charging stations in Nanaimo are currently located at destinations such as shopping malls, car dealerships and public institutions, meeting the needs of these households is likely to require more charging infrastructure near these homes. In order to ensure that every resident could switch to a zero-emissions vehicle, **a plan should be developed to strategically target specific neighbourhoods for public charging infrastructure**.

The following document provides information on residential EV charging for BC local governments:

https://pluginbc.ca/wp/wp-content/uploads/2018/10/Residential-EV-Charging-A-Guide-for-Local-Governments.pdf

SOLID WASTE

Solid waste represented 6% of community emissions in 2017. Solid waste emissions result from the decomposition of organic wastes in a landfill which results in methane and other gases that have a potent greenhouse effect. Two main approaches to reducing these emissions are diverting organic matter to composting facilities and landfill gas capture.

Diverting Organic Waste

Nanaimo has seen a dramatic increase in the amount of household waste diverted from the landfill since introducing the green bin collection of household organics in 2012: from 32% in 2012 to 66% in 2019. The RDN goal of 90% diversion by 2029 per the Regional Solid Waste Management Plan should reduce the amount of emissions from organics in the landfill.

A Waste Composition study being conducted in 2020 should give further insight into the primary source of organic waste and help the City tailor waste reduction programs to reduce organic waste in the landfill. Increased wood waste from construction is thought to be one of the drivers of the increase in organic waste and emissions.

In the long term, in order to reduce emissions from solid waste to zero as per Nanaimo's 2050 emissions targets, exploring alternatives such as additional landfill gas capture or achieving true zero waste with respect to organics would need to be pursued.

IMPLICATIONS FOR THE OFFICIAL COMMUNITY PLAN UPDATE

Since the current OCP ("planNanaimo") was adopted in 2008, the issue and challenges of mitigating and adapting to climate change have become more prominent. However, the OCP's adoption of Sustainability as a guiding principle for the plan – and related actions on integrated land use and transportation planning remain relevant. Even as the 2008 OCP reaffirmed the vision from the 1996 OCP while providing a clearer indication of sustainability as an integral element of Nanaimo's vision for itself, the 2020 OCP update has the opportunity to embed the urgency of council's climate emergency declaration into Nanaimo's guiding document.

In order to achieve a 50% reduction in Carbon emissions by 2030, and achieving a 100% reduction by 2050, all decisions need to be evaluated in terms of implications for carbon emissions. While an OCP is not the place for specific technologies or implementation action details, the overall vision needs to reflect the urgency of reducing carbon emissions across the community. Providing a framework that prioritizes emission reductions over other demands, at least in the short term, could provide direction to staff to direct resources to achieve Nanaimo's ambitious emission reduction goals.

OTHER PRECEDENTS AND RESOURCES:

Local governments around the world are very active in mitigating greenhouse gases. The following links provide 'food for thought' about precedent actions elsewhere. Enabling legislation and legal frameworks vary and therefore not all of these actions can be immediately implemented in British Columbia without the cooperation of Senior Governments.

Ban on Natural Gas for new construction

https://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/Berkeley%20Energy%20Reach%20Code%20for%20Electrification%20and%20Natural%20Gas%20Prohibition%209-27-19.pdf (last visited Sept 3 2020)

- Purpose: To reduce the GHG emissions from new construction to close to zero.
- Method: the City of Berkeley, California, has adopted an ordinance which bans natural gas for new construction as of January 1st, 2020. It provides a number of exemptions for developers and owners, such as a public-interest exemption and/or when it is not feasible to construct a new building without natural gas. Other cities in the United States are considering similar bans, such as Seattle, WA, and Bellingham, WA, which have similar electrical grid mixes as British Columbia.

Reduce average vehicle distance driven per resident

https://vancouver.ca/files/cov/greenest-city-action-plan-implementation-update-2019-2020.pdf (last visited Sept 3 2020)

- Purpose: Reduce average vehicle distance driven per resident by 20% from 2007 to 2020
- Method: The City of Vancouver set a goal of reducing distance driven by resident by 2020 in addition to mode share goals. Due to an ambitious program of building bicycle and pedestrian infrastructure, large federal and provincial investments in rapid and conventional transit, coupled with increasing density in key mixed-used locations, they exceeded their target and achieve a 37% reduction of average vehicle distance travelled per resident in 13 years.

Allowing Consumers to Request Public EV Charging Infrastructure

https://www.interregeurope.eu/policylearning/good-practices/item/1699/amsterdam-s-demand-driven-charging-infrastructure/ (last visited Sept 3 2020)

- Purpose: Increase EV Charging infrastructure in existing neighbourhoods in order to maximize usage
- Method: The City of Amsterdam has become one of the world leaders in public charging infrastructure by allowing individual car drivers to request needed charging infrastructure, instead of relying exclusively on top down planning. A framework for evaluating requests means that new installations serve both individual and overall network needs. Amsterdam now has over 3800 public chargers serving a variety of neighbourhoods that would have been difficult to retrofit either due to lack of parking or electrical infrastructure limitations.

GREEN INFRASTRUCTURE / NATURE

INTRODUCTION

This Environmental Gap Analysis brief is intended to provide background technical research in support of ongoing City staff and technical stakeholder engagement. The factors and precedents discussed in this report will be integrated with other factors such as community mobility, social planning, waste and GHG mitigation. A key purpose of the engagement will be to listen carefully to values that are important to the community.

In consideration of both community values and technical review, City Staff and Council will need to consider priorities in implementation. Only some of the 'Potential Next Steps' listed in these document wills be immediate priorities. Other steps may be deferred to a follow-on phase, or not deemed important to City of Nanaimo's context.

Precedents provided here are a snapshot in time, focused primarily on the Pacific Northwest. New programs and senior government challenge grants appear regularly. We recommend that the precedent and priorities section of this document should be updated on a regular basis – approximately once every five years.

SCOPE OF ENVIRONMENTAL GAP REVIEW

Natural scenery and biodiversity are hallmarks of Nanaimo. The harbour and estuaries, islands, lakes, forests, hills, and watercourses that make our community attractive also play key roles in making our City less vulnerable to the impacts of climate change. These areas can be affected by development and human activity. The current Official Community Plan (OCP) guides us to plan our community to protect and enhance our environment.

This technical backgrounder addresses both the natural environment and urban 'green infrastructure' that support or mimic ecosystem processes in the City of Nanaimo. Specific topics include:

- Water Quality and Quantity in Watersheds
- Habitat Conservation and Restoration
- Urban Forest and Vegetation Cover
- Urban Agriculture
- Environmental Rating Systems
- Environmental Performance Monitoring and Education

Technical expertise in this backgrounder was provided by Lanarc 2015 Consultants Ltd.

WATER QUALITY AND QUANTITY IN WATERSHEDS

Nanaimo has a long history of caring for its watersheds in cooperation with the Regional District of Nanaimo which holds most of the watershed headwaters.

As the City grows, and as land use density intensifies to meet other objectives, urban roof areas and pavement reduces rainfall infiltration into soil and groundwater, causing rapid runoff into streams, leading to erosion and water quality impacts in watercourses.

Stormwater best practices are required in new development in Nanaimo but improving watershed health in older neighbourhoods will require retrofit. In practice, new subdivisions and higher density developments are implementing stormwater best practices. Single family or duplex residential development are also densifying with secondary dwellings, but often do not manage their increased impervious area and related runoff as yet.

The topics below summarize recent progress and introduce potential next steps to manage water quality and water quantity in watersheds in Nanaimo:

Rainwater management and watercourse flows
Control Sediments and Erosion, Pollutants
Limit Instream Erosion and Deposition

Rainwater Management and Watercourse Flows

Subject areas considered under this topic include:

Stormwater Source Controls
Stormwater and drainage planning and design
Disincentivize Stormwater Discharges
Limit instream erosion and sedimentation

RECENT PROGRESS IN NANAIMO

Most of Nanaimo streams are open to the surface, with small streams in underground piping in some headwaters and in the Downtown, port and north slope waterfront areas. New development is required to mimic the runoff of pre-development flows to keep our water resources healthy. In older neighbourhoods retrofits are needed to reduce runoff.

Major watercourses such as Millstone and Nanaimo River have been relatively stable in Nanaimo. Historic erosion and deposition had been occurring in Northfield Creek.

A draft-level GIS analysis of recent Nanaimo airphoto provided a breakdown of pervious and impervious area across the City:

49% Pervious Area
Tree Cover, Natural Areas, Lawns, & Landscape
Streams flow naturally when there is extensive cover of natural forest and meadows. Increasing pervious surfaces helps keep our City green.

~51% Impervious Area Buildings and Pavement
Where natural flows are disrupted by impervious surfaces, stormwater best practices can be used to reduce peak flows and improve water quality to protect streams.

Nanaimo's OCP includes the following policies for its watersheds:

- Protect environmentally sensitive areas, preserve aquatic habitat, and provide opportunities for nature appreciation and for fish and wildlife to thrive.
- Sustain urban forests, treed areas, and wildlife trees.
- Create a network of riparian and upland corridors to link natural habitat and support wildlife movement.

Nanaimo's current Development Permit Areas (DPAs) include:

- Watercourse DPAs to protect watercourses and their streamside riparian areas.
- Environmentally Sensitive DPAs and Development Approval Information Areas that require environmental assessments to define non-disturbance areas to protect sensitive ecosystems.

Nanaimo has a well-developed set of guidelines and approval process for implementation of streamside riparian vegetation protection.

Stormwater source controls promote rainwater capture and infiltration. This approach is increasingly common, promoted by *Metro Vancouver Stormwater Source Control Guidelines*. Nanaimo has many excellent examples of stormwater source control implementation at the subdivision and project scale in higher density residential and commercial /industrial developments.

The Nanaimo' Manual of Engineering Standards and Specifications include requirements for major and minor stormwater systems as well as rainwater management measures. Specific targets are given for volume reduction, detention and water quality treatment. Applicants are required to account for climate change. Where developments are upstream of a watercourse, runoff volume controls must recognize both peak flows and duration of post development peak flows with a goal to match pre-development conditions as much as possible.

In Nanaimo, stormwater source controls are not common or required by regulation at the single/duplex/triplex lot scale. Like in other jurisdictions with this exemption, a large portion of watershed areas in low density development is left out of rainwater management requirements. As increased impervious area is created through addition of larger residences or carriage/lane homes in single-family neighbourhoods, this exemption could lead to increasing impacts on watercourses, aquatic habitats and downstream infrastructure over time.

POTENTIAL NEXT STEPS

While up to common practice in this area, Nanaimo could consider additional steps:

- Reviewing potential implementation of rainwater management in single/duplex/triplex or carriage home developments, with application requirements graduated to the degree of proposed imperviousness. The intent is to mitigate increasing annual flows that cause instream erosion and deposition and habitat impacts.
- Collecting data on impervious area in existing developments, categorized by roof and surface pavement.

- A regulatory limit on cumulative impervious area as a percent of parcel area, in particular in single/duplex/triplex or carriage home residential developments.
- Recognition of pervious paving as one means to limit effective impervious area.
- Design guidelines and standard drawings, potentially in the MOESS, for pervious paving, absorbent landscape, rain gardens, infiltration chambers, roof rainwater leader disconnection, in parallel with other recommended practices.
- Creation of a stormwater utility, which would set a fee on impervious area and require annual payment.
- Use of funding from a stormwater utility to establish a program to accelerate stormwater management and water quality improvements on public lands (streets, parks, greenways city lands).
- Add stormwater source controls to road renovation projects, to reduce rate of runoff from city streets or parking areas.
- Review instream erosion and deposition sites, and design / implementation of habitat-sensitive management practices.
- Ticketing enforcement provisions to address breaches of total impervious area, lack of sediment control, water quality offences, etc.

KEY POLICY PRECEDENTS

The following precedents are selected from a review of current published documents in the Pacific Northwest.

- City of North Vancouver Stormwater Management Website, Tools and Bylaws
  - **Purpose:** To require and support implementation of stormwater source controls at all scales of development, including single family homes
  - **Method:** Provides well illustrated guidance, standard details and calculation sheets on sizing and implementation of stormwater source controls
- Seattle Stormwater Manual Vol. 3-Project Stormwater Control (2017)
  - **Purpose:** To reduce flow rates and volumes of stormwater runoff, levels of pollutants contained in runoff, and to convey runoff.
  - **Method:** Describes and provides technical requirements for selecting, analyzing, designing, constructing, and maintaining stormwater best management practices.
- Vancouver Rain City Strategy (2019)
  - **Purpose:** To advance rainwater management practices and services.
  - **Method:** Includes a strategic plan, sets targets, and outlines an action plan. Recommends 46 programs and initiatives to be developed and implemented over the coming 30 years.
- Seattle - RainWise Rebate Program
  - **Purpose:** To reduce sewer backups and pollution and erosion in waterways by incentivizing the adoption of stormwater BMPs.
  - **Method:** Provides rebates for hiring contractors to install raingardens or cisterns on single-family properties.
- Victoria - Stormwater Utility Charges
  - **Purpose:** To provide a monetary incentive for property owners to reduce stormwater runoff from their properties.
  - **Method:** Includes removing stormwater fees from property taxes and instead charging an annual utility bill based on impervious area of property, length and type of road frontage, and property type, and rewards credits and rebates for installing SWM BMPs
- Portland - % for green program
  - **Purpose:** To support the adoption of green infrastructure that manages stormwater, enhances livability, or provides other environmental benefits.
  - **Method:** Provides funding for stormwater BMPs that treat water from public ROW or go beyond stormwater management requirements for a property.

Control Sediments and Erosion, Pollutants

Subject areas considered in this topic include:

Construction on private lands / frontage
Construction on public lands / streets
Operations (e.g. spill control into storm sewers)
Catch basin cleaning

RECENT PROGRESS IN NANAIMO

Nanaimo's OCP includes the following policies for sediment and erosion control:

- Control erosion during development.
- Restore eroded areas.

Nanaimo's Sewer Regulation and Charge Bylaw 1982 No. 2496 prohibits discharge of identified pollutants to the public sanitary sewer system and regulates connections and cross-connections.

The City provides a web-based Erosion and Sediment Control brochure that describes common practices. Site signage is required at all construction sites to remind of rainfall and erosion risks.

POTENTIAL NEXT STEPS

- Update and promote public and small builder awareness materials and training programs to illustrate common best practices to reduce erosion.
- Add Erosion and Sediment Control best practices and standard details to Nanaimo Engineering standards, to serve as a reference for public and private projects – especially for small projects.
- Add a ticketing offense with more expedient small fines compared to court procedures that bring attention to the issue. Such fines can be reissued each day of ongoing offense.
- Renew and increase implementation of regular catch basin cleaning practices.
- Implement end of pipe water quality management practices.

KEY POLICY PRECEDENTS

The following precedents are selected from a review of current published documents in the Pacific Northwest.

- City of North Vancouver Sediment Control Plan Requirements
  - **Purpose:** To provide specific guidance on required erosion and sediment control.
  - **Method:** Sediment control plans signed and sealed by a professional engineer are required, including plans, specifications and design calculations, a monitoring program, and an operation and maintenance program. Engineer waived for single/two family.
- King County - Stormwater Pollution Prevention Manual (2016)
  - **Purpose:** To reduce pollution in waterways caused by storms.
  - **Method:** Provides information on implementing stormwater BMPs on Commercial, Multi-family, Residential properties.
- Seattle - Stormwater Manual Vol. 2: Construction Stormwater Control (2017)
  - **Purpose:** To prevent pollution of surface water, groundwater, downstream infrastructure and resources.
  - **Method:** Provides requirements for erosion and sediment control plans, info on how to select controls, and standards and specifications. The requirements apply to all construction projects.
- Maple Ridge – Watercourse Protection Bylaw No. 6410 & Watercourse Protection DP Requirements
  - **Purpose:** To prevent pollution of surface water, groundwater, downstream infrastructure and resources.
  - **Method:** Requires contractors to retain a Qualified Environmental Professional to provide an Erosion and Sediment Control Plan on lots near watercourses, with steep slopes, or during rainy season. Monitoring is required in certain conditions.

OTHER BACKGROUND LINKS

- City of Nanaimo - Erosion and Sediment Control Brochure
  - **Purpose:** To provide information on erosion and how to address it during construction.
  - **Method:** Includes background information on erosion and an overview of principles and methods for source erosion control, runoff control, and sediment control.
- City of Campbell River - Subdivision and Development Servicing Bylaw No. 3419 (2010) Section II Design Standards, Part 5 Erosion & Sediment Control
  - **Purpose:** To control erosion on all developments that may be susceptible to erosion.
  - **Method:** Sets performance standards and prescriptive standards.

HABITAT CONSERVATION AND RESTORATION

Most natural habitat in Nanaimo is associated with stream ravines and riparian areas. These provide a series of green corridor (habitat greenways) that connect to corridors and mountainside natural areas in the Regional District of Nanaimo. Other areas of Nanaimo are urban, but still have potential to support adapted flora and fauna and to provide ecosystem services.

Restoration of urban streams is underway. Departure Creek restoration is a collaboration between the City, Snuneymuxw First Nation, Departure Bay Neighborhood Association, and Departure Bay Streamkeepers to

enhance fish and wildlife habitat and create more opportunity for residents to enjoy nature in their neighborhood.

The topics below summarize recent progress and introduce potential next steps to manage and restore habitat in Nanaimo:

Support Stream / Fish / Amphibian Habitat
Control Sediments and Erosion, Pollutants
Support Bird / Bat / Pollinator Populations

Support Stream / Fish / Amphibian Habitat

Subject areas considered under this topic include:

Instream Habitat Complexing
Riparian Area / Shade Integrity
Provision of Fish Passage / remove barriers
Stream Daylighting and complexing
Estuary Habitat Improvements
Foreshore Habitat Improvements

RECENT PROGRESS IN NANAIMO

Nanaimo's OCP Development Permit Areas (DPAs) include:

- Watercourse DPAs to protect watercourses and their streamside riparian areas.
- Environmentally Sensitive DPAs and Development Approval Information Areas that require environmental assessments to define non-disturbance areas to protect sensitive ecosystems.

Nanaimo Watercourses Development Permit Areas require a development permit for removal of soil, vegetation, trees, paving, and construction in areas within a Streamside Protection and Enhancement Area. The Zoning Bylaw 4500 includes specific setback requirements.

New development is required to follow sustainability checklists that encourage a high standard in climate-conscious and eco-friendly design.

POTENTIAL NEXT STEPS

- Continue estuary and riparian area restoration projects in cooperation with Regional District of Nanaimo, Snuneymuxw First Nation and community groups.
- Improvements to fish passage, estuaries and marine foreshore, considering green shores where applicable.
- Update educational materials on the importance to fish and aquatic habitat of riparian area conservation/restoration, stormwater source controls and infiltration to groundwater, and erosion and sediment and other pollution controls.
- Add a ticketing offence to address minor non-conformance with riparian protection requirements.

KEY POLICY PRECEDENTS

The following precedents are selected from a review of current published documents in the Pacific Northwest.

- Canada DFO - Shoreline Structures Environmental Design (2002)
  - **Purpose:** To mitigate negative impacts from shoreline development on fish and wildlife habitats.
  - **Method:** Includes planning and management guidance and detailed environmental design concepts.
- Seattle - Cedar River Watershed Aquatic and Riparian Restoration Strategic Plans (2008)
  - **Purpose: To restore aquatic and riparian ecosystem services and evaluate success**
  - **Method: Includes a framework for implementing aquatic and riparian restoration, strategies for screening and** prioritizing sites for restoration, and for documenting projects.

OTHER BACKGROUND LINKS

- Portland - Salmon Safe Certification Report (2016)
  - **Purpose:** To acknowledge ecologically sustainable land management practices.
  - **Method:** Includes an evaluation of Portland's watershed management polices and programs.
- Seattle - Landscape Synthesis Framework for Cedar River Watershed (2009)
  - **Purpose:** To provide guidance for planning and implementing restoration, protection, and conservation projects over a 50-year timeframe.
  - **Method:** Uses a landscape template to guide ecosystem conservation and restoration.

Support Bird / Bat and Pollinator Populations

Subject areas considered under this topic include:

Nesting tree conservation
No clearing during nesting season
Bird feeder / water best practice guidelines
Bird domestic predator best practice guidelines/controls
Bird / glass collision / night light best practice guidelines
Artificial Bird Nest Boxes
Artificial Bat Roost Boxes
Pollinator gardens and flowering green roofs
Insecticides (e.g. controls over use or applications)
Biodiversity Strategies

RECENT PROGRESS IN NANAIMO

Nanaimo's OCP does not specifically mention bird, bat or pollinator populations, but the policies below are aimed at more general habitat protection:

- Protect environmentally sensitive areas, preserve aquatic habitat, and provide opportunities for nature appreciation and for fish and wildlife to thrive.
- Sustain urban forests, treed areas, and wildlife trees.
- Create a network of riparian and upland corridors to link natural habitat and support wildlife movement.

Nanaimo maintains the Pesticide Use Bylaw 2010 No. 7102 which prohibits the use and/or application of pesticides for maintaining ornamental vegetation.

Other local governments in Canada and Metro Vancouver have policies to support bird populations and pollinators, but this is a policy gap in Nanaimo. However, bird and bat habitat has been considered and implemented in Nanaimo restoration projects.

POTENTIAL NEXT STEPS

- Promote the Naturescape Series of documents (part of the Stewardship Series, and available from the Habitat Conservation Trust Fund), by adding references on the Nanaimo website. This can encourage Naturescape practices on private lands. Also consider adding these guidelines to development permit requirements and continue to incorporate them into public projects.
- Review and consider implementing a bird policy that is patterned after City of Toronto initiatives to reduce collisions of birds with large unmarked glass surfaces. Recent CSA guidelines also apply.
- Increase local knowledge and incentives for inclusion of bird and bat houses in residential yards and parks.

- Implement wildlife tree and downed large woody debris and related ecosystem biodiversity in Nanaimo parks and public works.
- Ensure tree clearing is restricted in the nesting season, in concurrence with BC Environment best practices.
- Consider partnering with the ButterflyWays project to increase pollinator gardens.
- Continue to encourage rewilded meadows (and potentially green roofs) that are designed to support pollinators.
- Develop a biodiversity strategy for Nanaimo that consolidates policies for habitat conservation, habitat restoration and Naturescape for a wide variety of species.

KEY POLICY PRECEDENTS

The following precedents are selected from a review of current published documents in the Pacific Northwest.

- Vancouver - Bird Strategy (2015)
  - **Purpose:** To address the biological, social and economic challenges to creating healthy conditions for native bird species.
  - **Method:** Discusses habitat loss, invasive species, pet predation, building collisions, human disturbance.
- Vancouver - Bird Friendly landscape Operational Guidelines (2015)
  - **Purpose:** To guide public land operations and maintenance staff, stewardship groups and landscape industry personnel in maintaining landscapes with bird-friendly methods.
  - **Method:** Defines work windows based on bird-breeding times, defines vegetation structure for bird habitat, mowing methods, use of tree and plant debris for habitat, and other habitat structures.
- Vancouver - Bird Friendly Design Guidelines for DP (2015)
  - **Purpose:** "To protect, enhance and create bird habitat in the city, as well as reduce threats to birds in the urban environment."
  - **Method:** Outlines voluntary landscape and building design guidelines.

- Toronto - Best practices for effective lighting (2017)
  - **Purpose:** To minimize the negative impacts of urban light sources on human and nocturnal animal life.
  - **Method:** Outlines design considerations for reducing light pollution.
- Toronto-Bird Friendly Best Management Practices "Glass" (2016)
  - **Purpose:** To encourage architectural design that reduces bird collisions with built structures.
  - **Method:** Outlines architectural design best practices.
- Calgary - Responsible Pet Ownership Bylaw
  - **Purpose:** "To ensure that cats and dogs live in safety and harmony with their owners and neighbours.
  - **Method:** A bylaw barring pets from being at large. Calgary was given the inaugural Safe Cats Safe Birds Award from Nature Canada.
- Richmond – Bat Friendly Community Certification
  - Richmond Bat Public Info Web Page
  - **Purpose:** To recognize municipalities that protect and create habitat, provide information about bats to residences, and promote bat education.
  - Richmond was the first lower mainland community to achieve this certification. Their initiatives include: Terra Nova Park, Richmond Nature Park, ecological management policies, pesticide and riparian response policies.
- Community Bat Projects of BC – BC Bat Friendly Communities Guide (2018)
  - **Purpose:** To help communities manage and enhance bat habitat.
  - **Method:** Includes basic information about bats and tools for protecting habitat, creating habitat, and mitigating hazards to bats.
- Naturescape British Columbia Guides
  - **Purpose:** To restore, preserve, and enhance wildlife habitat in urban and rural landscapes.
  - **Method:** Includes information on how to plan projects, describes various types of habitat elements and how to maintain them.
- Port Moody Naturescape Policy
  - **Purpose:** To support residents in implementing Naturescape principles on private property, and to mandate NatureScape principles on City projects.
  - **Method:** Includes landscape design principles and education and outreach resources.
- Pollinator Partnership Canada - Selecting Plants for Pollinators Lower Mainland (2017)
  - **Purpose:** To improve the health of pollinator populations by educating the public on plant species selection.
  - **Method:** Lists plant species native to Lower Mainland Eco-region that attract pollinators.
- Toronto - Pollinator Protection Strategy (2018)
  - **Purpose:** To protect and sustain healthy pollinator populations.
  - **Method:** Outlines actions the City and public can take.
- Suzuki Foundation - Butterfly Ways
  - **Purpose:** To protect and sustain healthy butterfly populations.
  - **Method:** Outlines actions the public can take.
- City of Coquitlam – Landscaping Near Sensitive Bear Habitat
  - **Purpose:** To discourage bears from visiting residential landscapes.
  - **Method:** Outlines landscape design and maintenance practices.
- Edmonton - Wildlife Passage Engineering Guidelines (2010)
  - **Purpose:** To maintain habitat connectivity and reduce human contact in transportation projects.
  - **Method:** Provides transportation designers with design recommendations.

- Toronto Guidelines for Biodiverse Green Roofs (2013)
  - **Purpose:** To create habitat and promote biodiversity on green roofs.
  - **Method:** Outlines design guidelines.

OTHER BACKGROUND LINKS

- Vancouver Biodiversity Strategy (2016)
  - **Purpose:** To support biodiversity in parks and other public and private lands.
  - **Method:** Outlines goals, targets, objectives, and actions.

URBAN FOREST AND VEGETATION COVER

Nanaimo's urban forest protection regulations encourage street trees and retention of natural forest areas in our parks and neighbourhoods. Forest areas support rainwater management and healthy streams.

New streets commonly have boulevards with a growing inventory or urban street trees.

The topics below summarize recent progress and introduce potential next steps to manage the urban forest in Nanaimo:

Control Invasive Species
Manage Natural Woodland Areas
Manage Private Trees
Manage Street Trees

Control Invasive Species

Subject areas considered under this topic include:

Vegetation Invasives Management in City Parks / Streets
Vegetation Invasives Management on Private Lands
Wildlife Invasives Management e.g. Canada Geese

RECENT PROGRESS IN NANAIMO

Nanaimo's OCP and development permits do not address invasive species specifically, other than a prohibition on planting invasive species. Nanaimo maintains the Pesticide Use Bylaw 2010 No. 7102 which prohibits the use and/or application of pesticides for maintaining ornamental landscapes.

Nanaimo's *Controlling Invasive Plants: Information and Process Package* provides background, identification and management techniques for key invasive plants in Nanaimo. Volunteers in Parks is a program that includes removal of invasive plants.

POTENTIAL NEXT STEPS

- Create an invasive plant inventory and update it every 5 years.
- Continue to organize a community-supported workplan that encourages volunteers to reverse invasive species incursions into Nanaimo lands.
- Publicize recent accomplishments and current challenges and priorities.
- Re-invigorate Nanaimo and partnership actions to continue to manage removal of priority invasive species and replanting of eradicated sites with desirable native species where appropriate.
- Consider implementation of a noxious weed control bylaw and related ticketing enforcement for select species on private lands.

KEY POLICY PRECEDENTS

The following precedents are selected from a review of current published documents in the Pacific Northwest.

- City of North Vancouver Invasive Plant Management Strategy (updated 2013)
  - **Purpose:** To organize volunteer efforts to remove invasives from parks.
  - **Method:** Focusses efforts on about 20% of City park areas that were invaded
- Portland - Invasive Plants Management Strategy (2008) and Invasive Plant Policy Review (2011)
  - **Purpose:** To reduce invasive plant populations.
  - **Method:** Identifies how invasive plant management practices can be integrated into City programs, estimates costs, identifies potential funding sources.
- Portland - Integrated Pest Management Program (2019)
  - **Purpose:** "To manage pests that are harmful to the health, function or aesthetic value of park landscapes in an efficient, effective, and environmentally responsible manner, while paying careful attention to public and employee safety."
  - **Method:** Procedures for applying and handling pesticides in various environments and for various pest types.
- Vancouver - Integrated Pest Management Policy
  - **Purpose:** To reduce pesticide use in the management of public lands.
  - **Method:** Primarily use cultural and biological controls.
- Metro Vancouver – Livestock Invasive Plant Control Pilot ($150K, 3-year program)
  - **Purpose:** To test alternatives to pesticides for invasive plant control.
  - **Method:** Includes investigating the feasibility, costs, benefits of targeted grazing, and field testing with contractors.

Manage Natural Woodland Areas, Street and Private Property Trees

Subject areas considered under this topic include:

Forest Management for Species / Age Diversity
Forest Management for Cover / Erosion Control
Conservation of Forest Endangered / of Concern Species
Expansion of Woodland Areas
Street Tree and Urban Forest Canopy Resilience through Species / Age Diversity
Replacement and Expansion of Street Tree Cover
Tree Protection Requirements
Protection During Construction
Tree Replacement Requirements

RECENT PROGRESS IN NANAIMO

Nanaimo's OCP includes the following policies for its natural woodlands and urban trees:

- Protect environmentally sensitive areas, preserve aquatic habitat, and provide opportunities for nature appreciation and for fish and wildlife to thrive.
- Design with nature to protect hillside character using cluster development to preserve open space.
- Sustain urban forests, treed areas, and wildlife trees.
- Create a network of riparian and upland corridors to link natural habitat and support wildlife movement.

Nanaimo's Management and Protection of Trees Bylaw 2013 No. 7126 sets out requirements for tree permits, Tree Management Plans, tree protection and replacement. Heritage Trees are identified.

Nanaimo provides a Tree Voucher which subsidizes the cost of planting trees on private land.

The *Urban Forest Management Strategy* (2010) provides an overview of Nanaimo's urban forest, its benefits and management. Appendices address tree health, planting species and guidelines.

A climate-related trend that has been noted but not quantified is stress and dieback associated with some tree species – particularly western red cedar. It is suspected that this dieback is related to on-going heat and water stress associated with longer summer dry periods than historic norms. This theory warrants further research and identification of management actions if necessary.

POTENTIAL NEXT STEPS

- Undertake a supplementary study to the 2010 *Urban Forest Management Strategy* to assess the cause and future trend of climate change on both the park forested areas and on free-standing native trees in Nanaimo. Recommend management actions if appropriate (e.g. whether to allow stress and dieback to occur as a contributor to wildlife trees, or whether and where to intervene with soil or water supports, etc.).
- Review the implementation status and upcoming programs to implement existing and new recommendations in the *Urban Forest Management Strategy*, considering select stand thinning and

underplanting with climax species, additional control of trail erosion and human encroachment into wooded areas, ongoing invasive species management and riparian restoration, and ecologically sensitive management of danger trees within reach of trails, parking and overhead power lines.

KEY POLICY PRECEDENTS

The following precedents are selected from a review of current published documents in the Pacific Northwest.

- Vancouver-Urban Forest Strategy (2018)
  - **Purpose:** To protect and enhance Vancouver's urban forest.
  - **Method:** Sets goals, targets, and actions, and recommends policy updates.
- Metro Vancouver -Urban Forest Climate Adaptation Framework (2017)
  - **Purpose:** To increasing the resilience of the urban forest to climate change.
  - **Method:** Includes an identification of risks, assessment of regional vulnerability, and a framework and guidelines for building resilience.
- King County - Forest Carbon Credit Program
  - **Purpose:** To protect existing tree canopy and provide more public parks.
  - **Method:** Creates carbon credits by permanently protecting threatened forests and tree canopy.
- City of North Vancouver – Street Tree Master Plan (2004)
  - **Purpose:** To create a long-term planning framework for the planting, maintenance and funding of the Nanaimo's street trees.
  - **Method:** Defines goals and principles, outlines design and management guidelines, an implementation and maintenance strategy, tree protection guidelines, and tree planting and maintenance standards and specifications.
- Metro Vancouver - Design Guidebook Maximizing Climate Adaptation Benefits Trees (2017)
  - **Purpose:** To support landscape design projects, design guidelines updates, and the design of new developments.
  - **Method**: Describes the climate adaptation benefits of trees and outlines checklists for success for tree planting in various contexts.
- Portland - Free Street Tree program
  - **Purpose:** To increase urban tree canopy cover.
  - **Method:** "Provides free street trees and four years of establishment care (including watering) for commercial, industrial, and multi-family residential properties."
- Seattle Green Factor Program (Code Chapter 23.86.019 Green Factor measurement)
  - **Purpose:** To improve the quality and quantity of landscaping in new development.
  - **Method:** Defines a score-based code requirement.
- City of New Westminster – Tree Protection Program
  - **Purpose:** To decrease urban forest canopy decline.
  - **Method:** Establishes a bylaw and permitting requirements.

URBAN AGRICULTURE

Urban agriculture is 'growing food within an urban area, where agricultural land did not previously exist. It includes community gardens, farmers markets, hobby beekeeping, keeping urban chickens, shared garden plots,

edible landscapes, and growing food in your backyard' (City of North Vancouver Living City Summary Report).

Support Local Edible Gardens and Local Food Use

Subject areas considered in this topic include:

Public Community Edible Garden systems / supports
Support for food gardens on private lands / roof / yards
Support for community markets to exchange local food
Support for walk-to groceries with local food
Support for local food restaurants
Support for local food delivery
Bee-keeping policies
Poultry policies
Provisions for other livestock

RECENT PROGRESS IN NANAIMO

Nanaimo's OCP includes a section on Food Security:

- Develop sustainable local food systems.
- Encourage partnerships for food security.
- Ensure access to food.

The OCP policies list a variety of actions to support local urban agriculture and food security.

Nanaimo Zoning Bylaw 4500 allow urban food gardens and roadside stands in all zones, subject to conditions.

POTENTIAL NEXT STEPS

- In coordination with steps to increase absorbent landscape and water conservation, encourage land managers and homeowners to include food production in their landscape areas. Exempt edible food garden areas from calculations for stormwater or water use budgets.
- Consider community interest in additional community gardens. Candidate locations may be found in the expanding open space system, in either parks or large roadside spaces that are otherwise underutilized, subject to meeting safety considerations.
- Nanaimo may consider whether parts of the parks system can be partners with Metro Vancouver or local Regional Districts in exploring use of livestock (e.g. goats, sheep) for invasive vegetation control.

KEY POLICY PRECEDENTS

The following precedents are selected from a review of current published documents in the Pacific Northwest.

- Vancouver - Urban Agriculture Policy for Parks (2015)

- **Purpose:** To assist residents and community groups in finding suitable land and connecting project partners.
- **Method:** Sets criteria for public consultation, requirements for how urban agriculture projects can operate.

- Vancouver - Urban Agriculture Design Guidelines for Private Realm
  - **Purpose:** To provide guidance to designers of urban agriculture installations, and to guide City staff in assessing proposals for new installations
  - **Method:** Outlines design considerations and lists appropriate edible plant species.
- Vancouver – Food Strategy (2013)
  - **Purpose:** To improve equity and sustainability in Vancouver's food system.
  - **Method:** Includes public consultation, identification of gaps and vulnerabilities, defines goals, principles, and actions for food production, processing, access, and waste.

- Seattle – Food Action Plan (2012)
  - **Purpose:** "To get more healthy food to more Seattle residents, expand opportunities to grow food in the City, strengthen our regional food economy, and reduce food-related waste."
  - **Method:** Defines 40 actions to be implemented.
- Portland – Urban Food Zoning Code Update (2012)
  - **Purpose:** To "support community food production and distribution with the primary goal of increasing access to healthful affordable food for all Portland residents."
  - **Method:** Proposes zoning code amendments.
- Vancouver - Urban Honey Beekeeping Bulletin (2015)
  - **Purpose:** To ensure public safety and bee health.
  - **Method:** Outlines requirements and responsibilities for urban beekeepers.
- Vancouver - Backyard Hens Guidelines (2010)
  - **Purpose:** To ensure public safety and hen health.
  - **Method:** Includes recommendations for the humane and sanitary keeping of backyard hens and includes bylaw amendments.
- Seattle - Urban Agriculture Permits
  - **Purpose:** To "create a more sustainable and secure local food system by increasing opportunities to grow and sell food in all zones."
  - **Method:** Changes to the land use code.
  -

OTHER BACKGROUND LINKS

- Vancouver - Community Garden Portal (web page)
  - **Purpose:** To direct residents to nearby community gardens.
  - **Method:** Includes a map of community gardens and instructions on how to apply for a plot.

ENVIRONMENTAL PERFORMANCE MONITORING / EDUCATION

Subject areas considered under this topic include:

Environmental Rating Systems
Public Information, Events and Training

Environmental Rating Systems

Subject areas considered under this topic include the following monitoring and performance rating systems:

LEED (Leadership in Energy and Environmental Design)
A widely used building rating system that recognizes building projects for meeting environmental performance criteria. Performance metrics have been established for many criteria: project location, transportation access, sustainable site development practices, water efficiency, energy and emission efficiency, materials and resource use, indoor environment quality, and innovative practices.

SITES (Sustainable Sites Initiative)
A landscape rating system that recognizes development projects all scales (larger than 185.8 m^2) for meeting environmental and social performance criteria. Performance metrics have been established for many criteria including: site selection, pre-design site assessment practices, water management, management of soils and vegetation, material use, human health and well-being, construction practices, site operations and maintenance, education and performance monitoring, and innovative practices.

Green Shores
A rating system that recognizes coastal development projects for minimizing their environmental impacts and restoring previously degraded ecosystem functions. In addition to the rating system, Green Shores also delivers educational sessions and publishes design guides to empower developers, designers, and homeowners to implement sustainable coastal development practices. Performance metrics have been established for many criteria, including: Site selection, site design, impacts on the public, habitats, stormwater, sedimentation, contamination, and climate change.

ENVISION
A rating system that recognizes civil infrastructure projects for sustainable planning, design, construction, and operation. Performance metrics have been established for many criteria, including quality of life, leadership, resource allocation, natural world, climate change, and risks.

MetroVan Stormwater Monitoring Program
Although not a full rating system comparable to the programs listed above, Metro Vancouver municipalities are following requirements for regular monitoring of flows and water quality in surface watercourses and pipe outfalls. Guidance is given for adaptive management to meet targets.

RECENT PROGRESS IN NANAIMO

Nanaimo often meets LEED standards in its new public buildings.

Nanaimo's Climate Change Resilience Strategy (2020) recommends a set of indicators for adaptation action implementation.

Water quality testing in Nanaimo has been focussed on drinking water quality – where on-going testing and regular reports are provided. Monitoring of habitat values e.g. stream water quality is less consistent.

POTENTIAL NEXT STEPS

- Establish budgets and targets using the indicators in the Climate Change Resilience Strategy (2020), and monitor for success.
- Review the potential integration of LEED, SITES and/or ENVISION rating systems to provide better inclusion of site and engineering considerations in development and municipal projects.
- Implement stormwater monitoring programs and testing (consider Metro Vancouver guidelines). BIBI (Benthic Index of Biological Integrity) is a common measure to monitor watercourse and watershed ecosystems health.
- Expand testing of water quality in stormwater piped systems and choose priorities for water quality treatment installations to reduce sediment and pollutant loads from piped outfalls to watercourses or the harbour.
- Consider if there are locations in Nanaimo where the Green Shores rating system could be applicable.

KEY PRECEDENTS

The following precedents are selected from a review of current published documents in the Pacific Northwest.

- City of Vancouver requires that all new municipal facilities be built to Leadership in Energy and Design (LEED) Gold
  - **Purpose:** To improve the sustainability of City facilities.
  - **Method:** Internal City policy.
- Seattle Green Factor – score-based code requirement (Code Chapter 23.86.019)
  - **Purpose:** To increase the quality and quantity of landscaping in new developments.
  - **Method:** A score-based code requirement.
- Seattle - Code Chapter 23.58D Green Building Standard
  - **Purpose:** To reduce resource consumption and promote clean renewable energy.
  - **Method:** A land use regulation establishing that green buildings standards are required for developers to gain additional height, floor area or density, or an expedited permitting process.
- Seattle - Sustainable Buildings and Sites Policy (2011)
  - **Purpose:** "To maximize the environmental quality, economic vitality, and social health" of Seattle.
  - **Method:** Policy requiring development on City-owned properties to achieve LEED Gold or greater.
- Portland - Watershed Monitoring Program (2011)
  - **Purpose:** To measure the effectiveness of watershed protection actions, demonstrate compliance with federal regulations, and compare data with others.

- **Method:** Based on a national monitoring program EMAP (Environmental Monitoring and Assessment) using probabilistic survey design.

- Portland - Stormwater Management Facility Monitoring Reports
  - **Purpose:** To monitor performance to quantify benefits, lower maintenance costs, ensure public safety, and improve design and function.
  - **Method:** Includes infiltration testing, flow metering, flow testing, water quality sampling, and sediment and soil sampling.
- Portland Tree Canopy Monitoring Report (2017)
  - **Purpose:** "To understand how canopy may be changing, and understanding canopy trends will allow managers to make important decisions regarding management strategies."
  - **Method:** Uses aerial photos to measure canopy cover over time.

Public Information, Events and Training

Subject areas considered in this topic include:

City Web and Print Information
Information Partnerships with Senior/Adjacent Agencies
Cooperation with School Districts
Cooperation with First Nations
Cooperation with Stewardship Non-Government Organizations
Cooperation with Professional Associations
Cooperation with Health Authority
Cooperation Business and Industry

RECENT PROGRESS IN NANAIMO

Nanaimo is in active partnerships with Snuneymuxw First Nation, Provincial Agencies such as BC Housing, the School District and local stewardship groups

POTENTIAL NEXT STEPS

- Consider further partnerships with adjacent RDN communities and the School District and VIU to co-fund and co-support public outreach and education programs.

KEY POLICY PRECEDENTS

The following precedents are selected from a review of current published documents in the Pacific Northwest.

- Vancouver - Environmental Education Stewardship Action Plan (2014)
  - **Purpose:** To improve and enhance public experiences of nature and increase understanding and awareness of nature.
  - **Method:** Includes a park stewardship program, educational programming, and funding for public-led projects.
- WildBC - Get Outdoors Educators Guide
  - **Purpose:** To empower educators to use parks and schoolgrounds as outdoor classrooms.
  - **Method:** An educator's guide, including activities for K to 12.
- Portland - Stewardship Community Partner Program
  - **Purpose:** To encourage the public to adopt green spaces.
  - **Method:** A partnership with City transportation department, the community partner maintains the adopted space.
- Seattle - Right Place Right Project Community Partnerships (2015)
  - Purpose: To help the public select appropriate stormwater BMPs for their location
  - Method: Includes site selection criteria, partnership opportunities, and grant assistance.

CITY OF NANAIMO
THE HARBOUR CITY

Information Report

File Number: ENV003

DATE OF MEETING October 7, 2020

AUTHORED BY ROB LAWRANCE, ENVIRONMENTAL PLANNER

SUBJECT ENVIRONMENTAL RESPONSIBILITY FRAMEWORK

OVERVIEW

Purpose of Report:

To provide background on a presentation to the Environment Committee on Environmental Responsibility Frameworks to be presented by Councillors Brown and Geselbracht.

BACKGROUND

The 2020 Workplan for the Environment Committee, which was adopted by Council in January 2020, includes developing an environmental framework for Nanaimo.

The framework is described as providing the public with an overview of the City's environmental priorities and goals, which are implemented through various policies, programs and regulations that the City of Nanaimo is responsible for.

In March 2020, the Environment Committee met to review a draft environmental framework. The draft Environmental Framework was built around a set of core principles that staff felt could be monitored over time.

The core principles of the City's draft Environmental Framework centers on:

- Climate Action: Meeting our Green House Gas (GHG) emissions reduction targets as a community and showing climate leadership corporately.
- Protection and Restoration of Natural Spaces: Protecting and enhancing the ecological diversity found within the City through the purchase and restoration of our parks. Through the development process on private land, and by working with the community to provide opportunities to learn about these spaces.
- Zero Waste and Energy Management: In coordination with the Regional District of Nanaimo, providing services to work towards a zero waste future for the City, and demonstrate corporate leadership through energy and waste management practice.
- Community Health and Food Security: Community health covers the role the City plays in protecting the public from potential environmental harm and provide healthier options for getting out and enjoying the environment.

During the review of the draft framework, it was anticipated that core principles can be reviewed and adjusted going forward. In addition, environmental policy, program gaps and target setting are expected to be addressed as part of the REIMAGINE Nanaimo process. The committee accepted the report and recommended the environmental framework be on the City of Nanaimo webpage with links to existing environmental policy and program webpages.

DISCUSSION

The presentation is prepared by Councillors Geselbracht and Brown, which provide additional information and insight for consideration on environment frameworks. The presentation also introduces the 'Environmental Responsibility Framework' for consideration.

Recommendations are presented for the Committee to consider endorsing:

a) That Council, as part of its Strategic Plan review process, consider revising the Key Focus Area, under the strategic theme of Environmental Responsibility, to include: "Taking responsibility to build a city and community that operates within planetary boundaries necessary to maintain core life sustaining ecological functions"

b) That the Environment Committee Workplan be amended to include the development of a 'holistic, complete and objective-based' Environmental Responsibility Framework, to be included for consideration within the REIMAGINE Nanaimo process.

SUMMARY POINTS

- The 2020 Workplan for the Environment Committee, which was adopted by Council in January 2020, includes developing an environmental framework for Nanaimo
- The presentation is prepared by Councillor Geselbracht and Brown, which provide additional information and insight for consideration on environment frameworks. The presentation introduces the 'Environmental Responsibility Framework' for consideration.
- Recommendations are presented for the Committee to revise the City's Council Strategic Plan to include consideration of a revised environmental framework within the REIMAGINE Nanaimo process.

Submitted by:

Rob Lawrance
Environmental Planner

Concurrence by:

Jeremy Holm
Director, Development Approvals

Dale Lindsay
General Manager, Development Services

Environmental
Responsibility Framework

Councils Strategic Priority: Environmental Responsibility

"We will protect and enhance Nanaimo's natural environment by looking after the community's biological diversity and adapt the way we live, work, recreate and move."

KEY FOCUS AREAS

1. **Take a leadership role and focus on our environmental impact and climate change contributions in our decision making and regional participation**
2. Ensure our community and transportation planning are multi-modal designed to encourage active and public transportation

Coherence: The quality of forming a unified whole

"Just as an equalizing tuning system permitted twenty-four different musical scales to integrate and to influence one another for the first time—so cities need a framework to unify their many disparate programs, departments, and aspirations…When a community has a vision, and a plan for how to carry it out, and is able to coherently integrate its disparate elements, then it begins to be well tempered. Coherence is essential for cities to thrive."

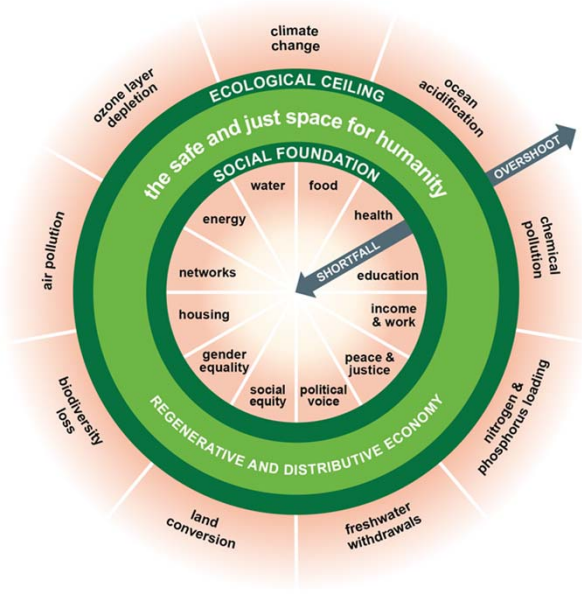
- Jonathan F.P. Rose (The Well Tempered City)

Effectively coordinating: Action to achieve shared goals

Frameworks:

- Communicate a clear vision, purpose and direction;
- They are aspirational, organized around objectives; and
- They include key performance indicators to assess progress.

Doughnut Economics: A Big Picture Framework for the 21st Century



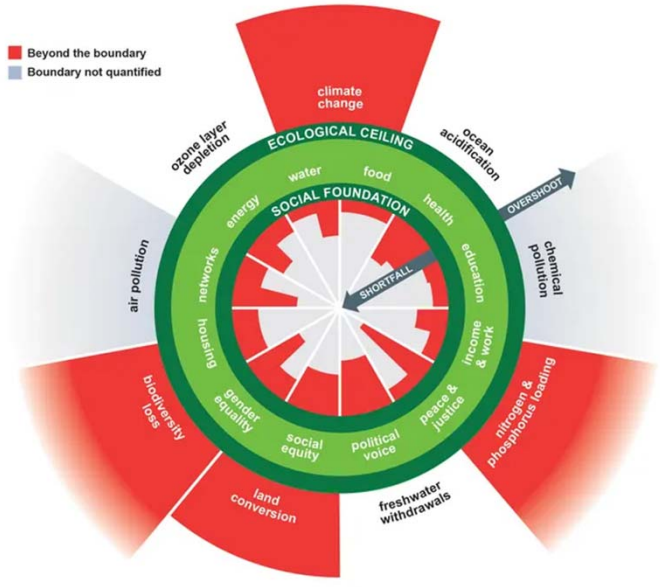


Table 2. The ecological ceiling and its indicators of overshoot

Earth-System Pressure	Control Variable	Planetary Boundary	Current Value and Trend
Climate change	Atmospheric carbon dioxide concentration, parts per million (ppm)	At most 350ppm	400ppm and rising (worsening)
Ocean Acidification	Average saturation of aragonite (calcium carbonate) at the ocean surface, as a percentage of pre-industrial levels	At least 80% of pre-industrial saturation levels	Around 84% and falling (intensifying)
Chemical Pollution	No global control variable yet defined	—	—
Nitrogen and Phosphorus Loading	Phosphorus applied to land as fertiliser, millions of tons per year	At most 6.2 million tons per year	Around 14 million tons per year and rising (worsening)
	Reactive nitrogen applied to land as fertiliser, millions of tons per year	At most 62 million tons per year	Around 150 million tons per year and rising (worsening)
Freshwater Withdrawals	Blue water consumption, cubic kilometres per year	At most 4,000 km^3 per year	Around 2,600 km^3 per year and rising (intensifying)
Land Conversion	Area of forested land as a proportion of forest-covered land prior to human alteration	At least 75%	62% and falling (worsening)
Biodiversity Loss	Rate of species extinction per million species per year	At most 10	Around 100–1,000 and rising (worsening)
Air Pollution	No global control variable yet defined	—	—
Ozone Layer Depletion	Concentration of ozone in the stratosphere, in Dobson Units	At least 275 DU	283 DU and rising (improving)

Source: Steffen et al. (2015).

Amsterdam: Downscaling the Doughnut

"the launch of a new and holistic approach to downscaling the Doughnut, and we are confident that it has huge potential at multiple scales – from neighbourhood to nation – as a tool for transformative action."

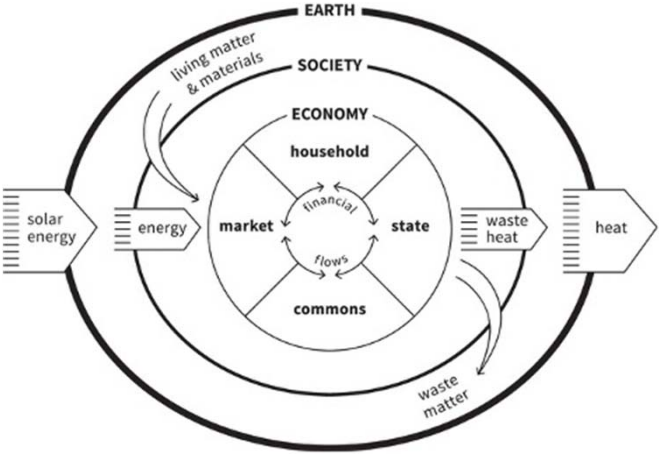
- Kate Raworth

(Source: The Amsterdam City Doughnut - A Tool for Transformative Action)

Nanaimo: Doing our Part

How do we take responsibility as a city for living within the Planetary boundaries?

How Do we build a city environmental framework and OCP that supports larger goals and objectives?



Our Framework

Questions to Review our Framework:

- Does it define our strategic focus and give our city a clear vision of what we are working to achieve?
- Is it organized around objectives and is it aspirational?
- What should be the embedded target indicators that will provide feedback on whether our actions are effective and achieving outcomes?
- Can it serve as the foundation for internal and external messaging, organizing all priorities and initiatives into strategic drivers that ladder up to higher level goals and purpose?
- Can it provide an externally facing, visual outline of activities that make up our organization's overarching strategy and intentions, and show how our actions match our intentions?

Our Proposal: Refocus Our Work Plan

- To review key categories of the city's Environmental Responsibility Framework and ensure they are objectives based and capable of capturing local responsibility for key planetary boundaries, such as outlined in the doughnut.
- To review and create environmental targets and key performance indicators that the City can monitor and report on as to evaluate initiative effectiveness.
- To liaise with Community and re-imagine Nanaimo process on setting key targets and embed the environmental framework into the OCP.
- To identify gaps in key programs and initiatives within the Environmental Responsibility Framework.

Recommendations to Council

1. That Council, as part of it's Strategic Plan review process, consider replacing key Focus Area 1 under the Environmental Responsibility Key Focus Area with: "We will take responsibility to build a city and community that operates within the planetary boundaries necessary to maintain core life sustaining ecological functions."

1. That the Environment Committee Work Plan be amended to focus on the development of a holistic, complete and objective-based Environmental Responsibility Framework and that the principles and objectives of the Environmental Responsibility Framework be included in the Re-Imagine Nanaimo process.

CITY OF NANAIMO
THE HARBOUR CITY

Staff Report for Decision

File Number: ENV 03

DATE OF MEETING October 7, 2020

AUTHORED BY ROB LAWRANCE, ENVIRONMENTAL PLANNER

SUBJECT CLIMATE AND ENVIRONMENTAL GAP ANALYSIS

OVERVIEW

Purpose of Report

To provide the Environment Committee with an update on the Climate Action Plan and review current policy and best practice to identify potential environmental policy and program gaps.

Recommendation

That the Environment Committee receive the attached presentation, provide comment, and input as requested.

BACKGROUND

During the 2020-JUN-03 Environment Committee meeting, the committee received a presentation from Lanarc Consulting on how Climate Action was going to be integrated into the REIMAGINE Nanaimo process.

At the time, the Environment Committee expressed a desire to provide comment and feedback on public engagement and survey design for the Climate Action Plan update, as well as, other relevant components in the REIMAGINE Nanaimo process.

The REIMAGINE Nanaimo process involves a comprehensive planning policy review and update of key strategic planning policy documents for the City. Central to this is an update of the City of Nanaimo 2008 Official Community Plan (OCP), the 2005 Parks Recreation and Culture Plan and the creation of the City's first Active Transportation Plan.

The process also includes a public engagement process for these plans as part of a broader process that involves coordinated engagement and review of other key strategic plans, including the Economic Development Strategy, Water Supply Strategic Plan, and the Sustainability Action Plan (Climate Action Plan).

By combining the review and update of these policy documents, the City can maximize community participation and engage the community on these interrelated policy documents.

DISCUSSION

The presentation will provide a high-level review of current and potential environmental frameworks and what needs to be considered when integrating them into the current REIMAGINE Nanaimo process.

The presentation reviews the City of Nanaimo Green House Gas emissions (GHG) profile, and the following key environmental policy focus areas:

- Climate Mitigation: GHG Targets and trends;
- Climate Adaptation: Flood, rainfall, drought, heat, slope stability;
- Watersheds: Water quality and quantity;
- Habitat conservation and restoration;
- Urban forest and vegetation cover, urban agriculture.

The presentation will be used to identify policy and program gaps that may exist. This input will contribute to the Phase 2 “Options Review” phase under REIMAGINE Nanaimo.

As each focus area is reviewed during the presentation, committee members will be asked to respond to the following questions:

- What leading successes do you know of;
- What issue / gap are yet to be addressed in Nanaimo;
- What integrated strategies could be considered?

SUMMARY POINTS

- The REIMAGINE Nanaimo process involves a comprehensive planning policy review and update of key strategic planning policy documents for the City.
- The presentation will be used to identify policy and program gaps that may exist. This input will contribute to the Phase 2 “Options Review” phase under REIMAGINE Nanaimo.

Submitted by:

Rob Lawrance
Environmental Planner

Concurrence by:

Jeremy Holm
Director, Development Approvals

Dale Lindsay
General Manager, Development Services

Climate/Environmental Gap Analysis

Environment Committee
Wednesday, October 7, 2020

Today's Agenda

1. Presentation
   - A Look Ahead: Potential Integrating Frameworks
   - Areas of Concern for Climate/Environmental Policy
   - Overview of 'State of the Art' precedents
   - Potential Next Steps in Nanaimo
2. Your Experience: Insights into Each Area of Concern
3. Next Steps & Questions

Nanaimo Climate + Environment

A Look Ahead:

Potential Integrating Frameworks

From Doughnut Economics, Kate Raworth, 2012, see kateraworth.com

Doughnut Economics

Meeting the needs of all within the limits of the planet

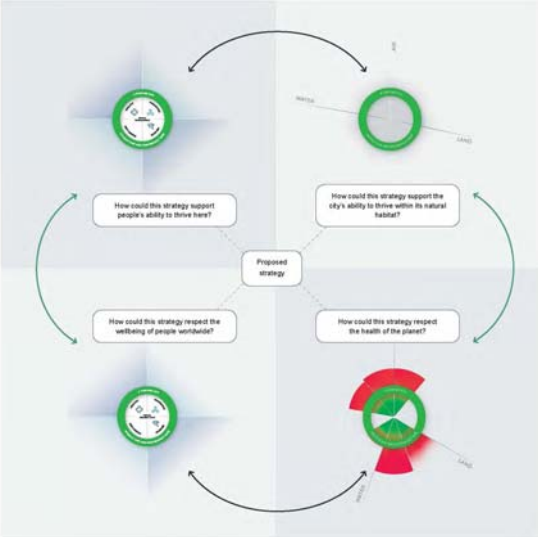
"How do my actions contribute to humanity living within the just and safe space between planetary and social boundaries?"

Downscaling from global to local application:

Creating City Portraits Methodology

"The City Portrait methodology combines local aspirations – to be thriving people in a thriving place – with global responsibility – both social and ecological – that requires every place to consider its many complex interconnections with the world in which it is embedded. "

From Creating City Portraits Methodology, Kate Raworth, 2020, see kateraworth.com



Positioning Nanaimo for goals, objectives and trends in global, federal, provincial, corporate and public opportunities

TABLE 2: CLIMATE CHANGE GOALS AND OBJECTIVES FOR CANADA	
GOALS	**OBJECTIVES**
Thriving Canadians	Healthy Canadians
	Resilient Canadians
	Sustainable Ecosystems
	Intergenerational Fairness
Economic Prosperity	Low-Carbon Competitiveness
	Climate Resilience
	Cost-Effectiveness
Global Action	Global Emission Reductions
	Policy Spillovers
	Technology Spillovers

From Charting Our Course, Canadian Institute for Climate Choice, 2020

Pandemic recovery

Fuel switching

Climate adaptation

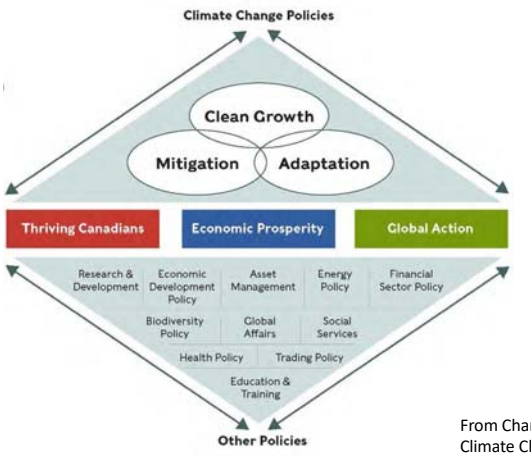
Green infrastructure

Building retrofits

Affordable housing

Remote working

Ex-urban migration



Clean Growth integrating

Mitigation

Adaptation

Social goals (thrive)

Economic goals (prosperity)

Global context (action)

and other policies

From Charting Our Course, Canadian Institute for Climate Choice, 2020

Attractions to Living at Mobility Hubs and Mixed-Use Nodes

- ❑Compact and complete mixed-use nodes with transit hubs
- ❑ Walk to work, recreation, culture
- ❑ Vehicle charging, cycle parking/charging
- ❑ Fully connected walk/cycle networks 5 km around nodes
- ❑ Longer commuter and e-bike, transit connections to link nodes/corridors
- ❑Urban node attractions and walk/cycle amenities e.g. weather protection and streetscape, permanent patios, public art and performance programs

Integrating Strategy

Attractive Mobility Hubs & Nodes

reimagine NANAIMO

Diverse housing/density with water/biodiversity stewardship:

- Support gentle densification and housing diversity (secondary suites, carriage homes, small multiple family) to include all ages and abilities
- Incorporate rainwater management and water conservation as densification occurs
- Encourage habitat restoration and biodiversity (naturescape) at home
- Increase tree planting and urban forest / parks management
- Support local food (community and private gardens)
- Cycle and walking connections to neighbourhood commercial/cultural/transit

Integrating Strategy

Green and Complete Neighbourhoods

Positive image of the city supporting tourism/growth/investment:

- Housing and social supports
- 'Spring Forward' entry employment program (contract training)
- Increased levels of maintenance of streetscapes / medians
- Management of urban interface / parks wildfire risks
- Invasive vegetation management
- Community garden supports
- Integrate with social support / skills training / volunteers in parks / stewardship

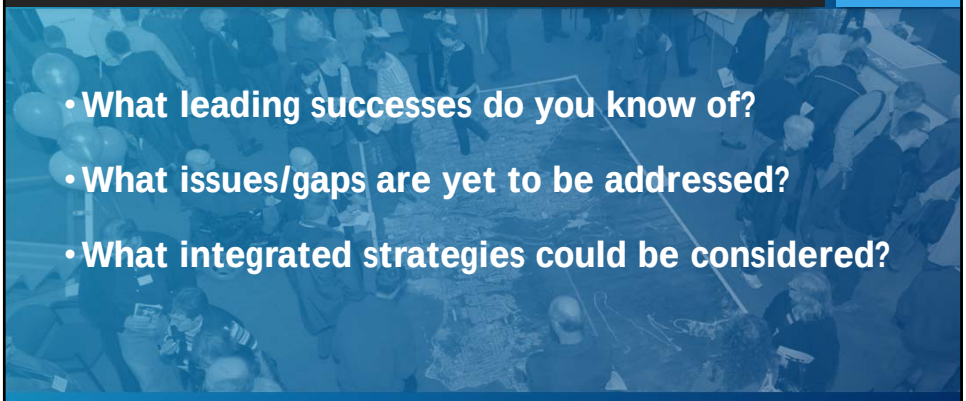
Integrating Strategy

Nanaimo Pride of People & Place

Areas of Climate/Environmental Concern

- Climate Mitigation: GHG targets & trends
- Climate adaptation: flood / rainfall / drought / heat / slope stability
- Watersheds: water quality & quantity
- Habitat conservation & restoration
- Urban forest & vegetation cover, urban agriculture
- Potential Integrating Options

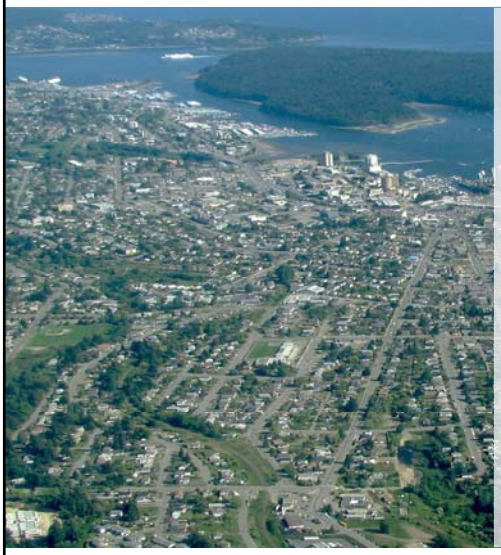
Environmental Gaps: Provide Your Insights



- **What leading successes do you know of?**
- **What issues/gaps are yet to be addressed?**
- **What integrated strategies could be considered?**

Climate Mitigation

GHG: Targets & Trends



Nanaimo has committed to:

Reduce greenhouse gas emissions **50%*** from 2010 levels by 2030

Reduce greenhouse gas emissions **94%*** from 2010 levels by 2050

* 50 to 57% by 2030, 94 to 107% by 2050
Climate Emergency Declaration, April 2019

What causes Nanaimo's emissions?

Burning of fossil fuels by residents is primary driver:

gasoline/diesel for vehicles

natural gas/oil for heating/hot water

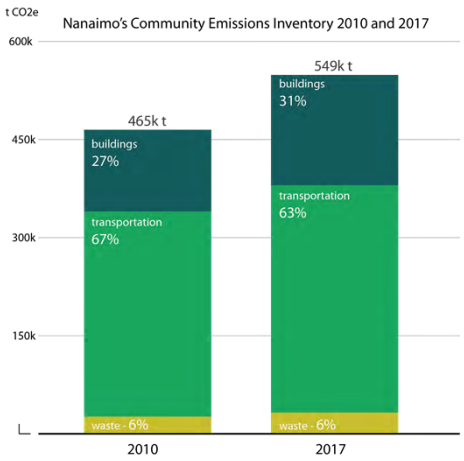
Nanaimo's climate policies

- ❑ 2008 OCP had policies to reduce energy use
- ❑ 2010 GHG targets of **33%** reduction **by 2020** from 2007
- ❑ Community Sustainable Action Plan (2012) suggested policies and indicators
- ❑ Transportation master plan describes a multi-modal vision of transportation
- ❑ Energy Step Code policy (2018) for increased energy efficiency for new buildings
- ❑ Rezoning policy incentivizes exceeding Energy Step with density bonus points. Rezoning policy under review re additional Energy Step Code requirements
- ❑ 2020 parking bylaw introduced EV charging requirements for new construction
- ❑ City promotes the Clean BC top-up incentives for home or work/apartment EV charging stations, and EV purchase incentives

But emissions are still rising.

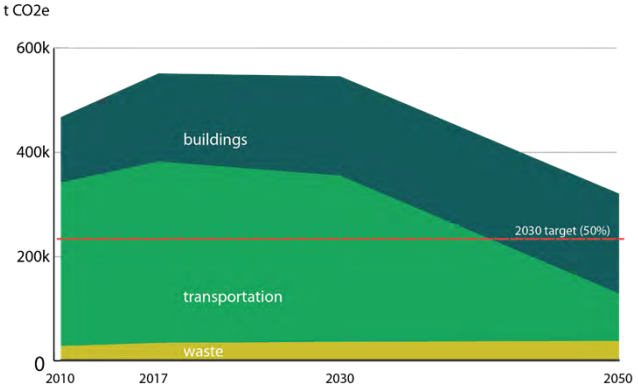
In 2010, council set a target of33% reduction in emissions by 2020.

Emissions in 2017 increased **18%** since 2010.



Current policy and planning is not enough.

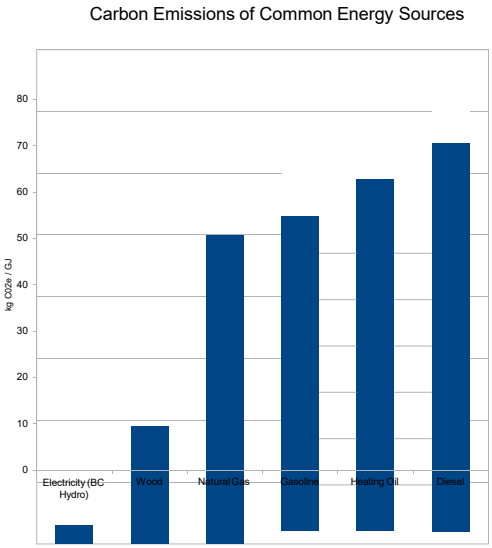
BAU modeling projects a 32% reduction from 2010 GHG emissions by 2050.



How do we reduce GHG emissions?

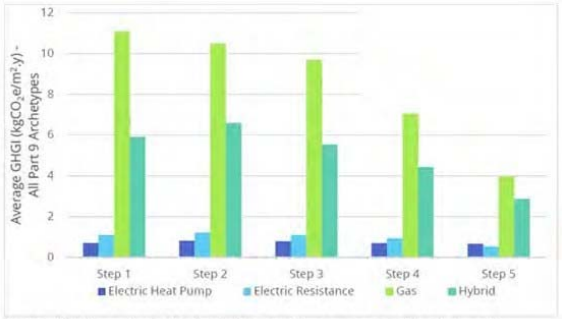
Increase efficiency / reduce demand

Switch to zero-carbon energy sources



Fuel switching is key

While increased efficiency reduces fuel demand, it is unlikely to produce dramatic drops in GHG emissions quickly enough to reach targets.



Part 9 - GHG Intensity by Mechanical System (average across all archetypes)

Source: Integral Group, Implications of the BC Energy Step Code on GHG Emissions June 2019

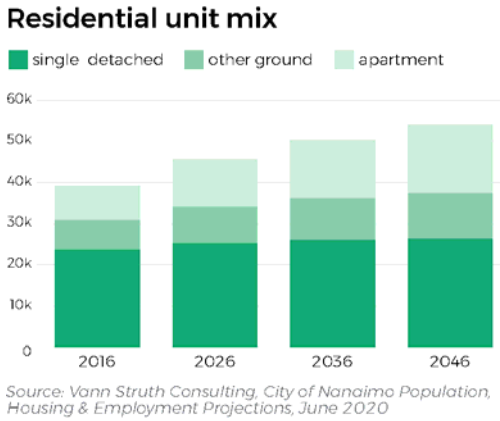
Fuel switching is key

While increased efficiency reduces fuel demand, it is unlikely to produce dramatic drops in GHG emissions quickly enough to reach targets.

Renewables don't always reduce GHG emissions.

Nanaimo has access to low-emission hydroelectricity

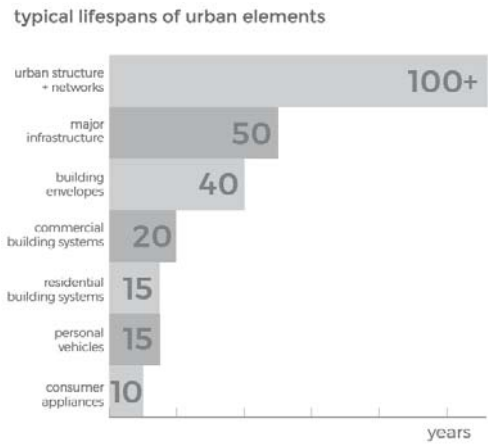
Replacing grid electricity with renewables in BC doesn't significantly reduce GHG emissions



Source: Vann Struth Consulting, City of Nanaimo Population, Housing & Employment Projections, June 2020

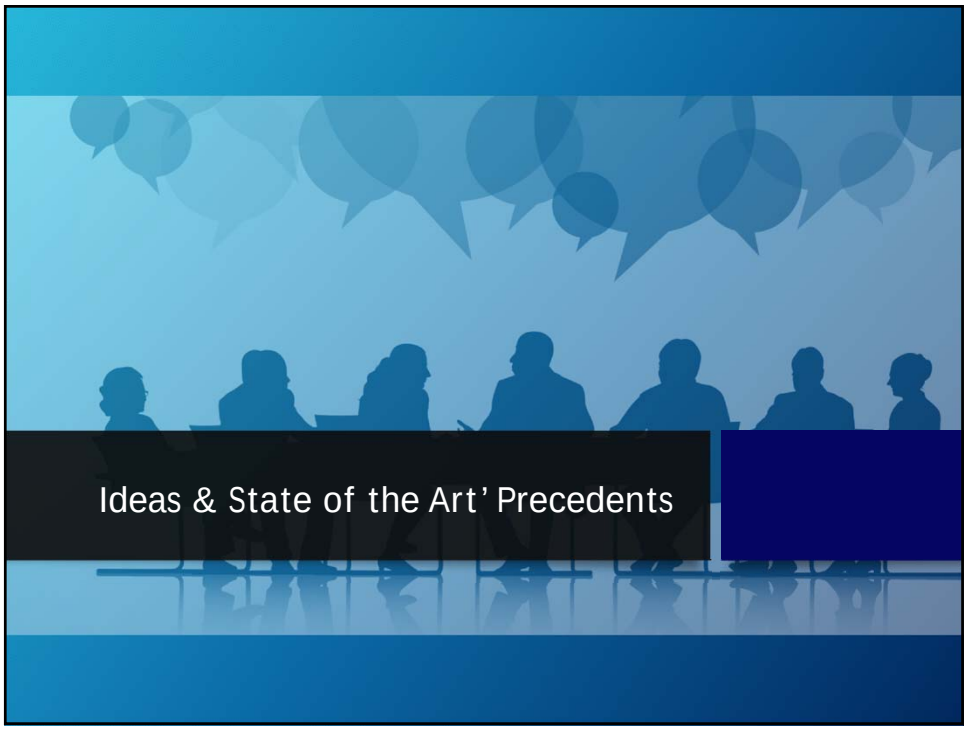
~60% of buildings in 2050 have already been built.

75% of 2050 buildings will be built before 2032 Net-zero building code is implemented.



Some strategies will have longer impacts.

Infrastructure with long lifespans amplifies impacts and missed opportunities.



Possible GHG Options

Education

Increase Incentives

Target Oil Heating

Provide financing for upgrades

Possible GHG Options

Increase Energy Step Code Requirements

Add GHG intensity alternative pathway

Density bonusing for zero carbon buildings

Possible GHG Options

Improve public charging infrastructure

Target charging investments for buildings that are expensive to upgrade

Increase EV charging requirements in new construction

Possible GHG Options

Waste reduction programs

Continue to improve organic waste diversion

Explore integrated waste management for reducing GHG emissions from waste

Possible GHG Options

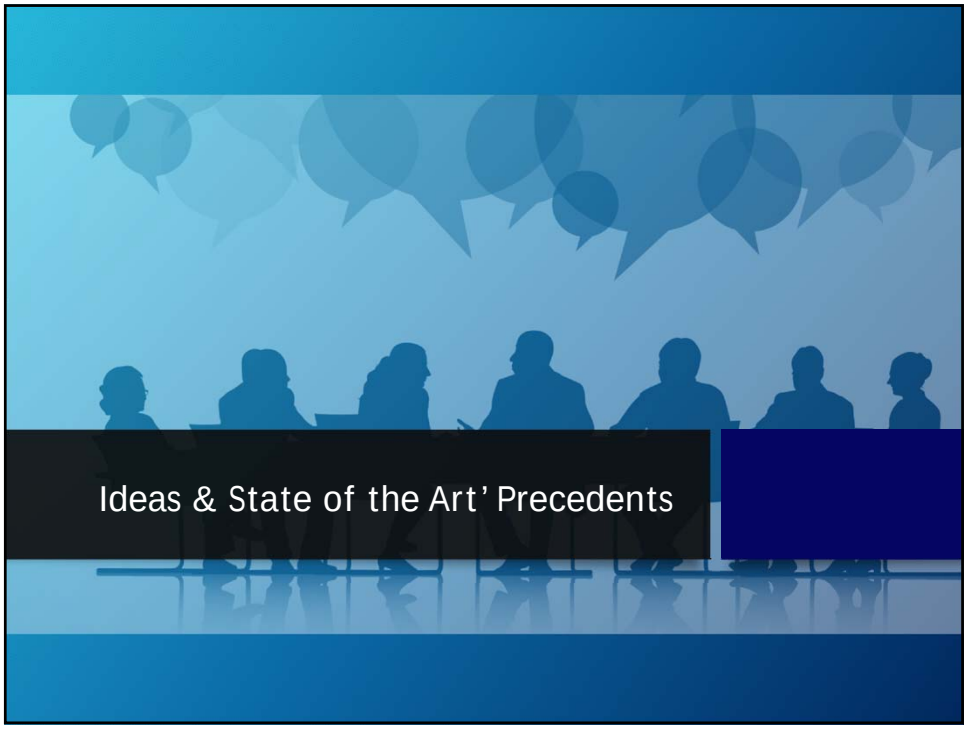
Increasing investment in active transportation infrastructure

focus development in nodes and corridors to reduce need for driving

Investigate e-bike infrastructure needs

Climate Adaptation

Coastal Flood Hazard



Climate Adaptation – Coastal Flood Hazard

- Campbell River Rising Seas (2019)
- Surrey Coastal Flood Adaptation Strategy (2019)
- Vancouver Coastal Flood Risk Assessment (2014)
- North Saanich – DRAFT Coastal Flooding Mitigation Bylaw 1439 (2018)

Note: Climate adaptation to increased rainfall will be discussed in the Watersheds topic later on

FLOOD MANAGEMENT PROCESS

Case Study

2020.03.09

City of Campbell River

nhc LANARC

FLOOD CONSTRUCTION LEVELS: DOWNTOWN

Map shows Flood Construction Level (FCL) determination – but only the first step!

What needs to follow is a public process to identify local values (what is most important), assemble adaptation options and select/visualize the best combination of options, partnerships, priorities and finance.

Might be done by study area e.g. Departure Bay, Newcastle Channel, Downtown/Port, Nanaimo Estuary

City of Campbell River

Multiple Benefits of Adaptation?

- Integrate waterfront walks, parks, public improvements with private adaptation
- Visualizations can be powerful tools to communicate potential impacts, scenario options, and spatial relationships

Without mitigation

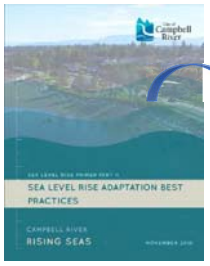
With mitigation

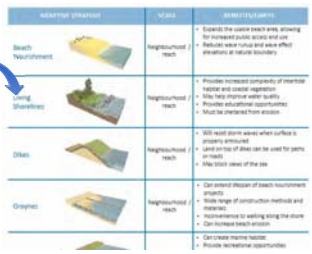
City of Campbell River

LANARC nhc northwest hydraulic consultants

Primer I: Introducing Risk And Solutions

Primer II: Adaptation Best Practices





City of Campbell River

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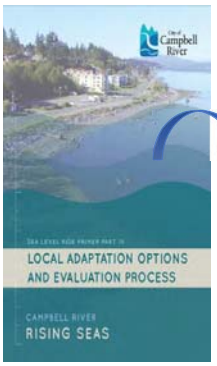
EVALUATING OPTIONS

Round Two Public Engagement

Primer III: Local Adaptation Options and Evaluation Process



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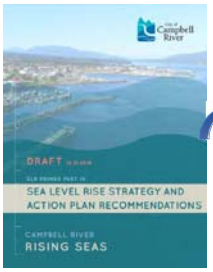
RECOMMENDED STRATEGIES

Round Three Public Engagement

Primer IV: Strategy & Action Plan



City of Campbell River

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Figure 11125 Existing Downtown Conditions - Coastal Flood Management Area

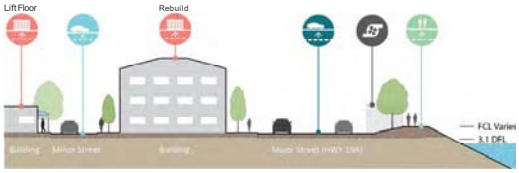


Figure 11126 Option C- Coastal Flood Management Area

Raise major streets/ utilities above DFL in one lift

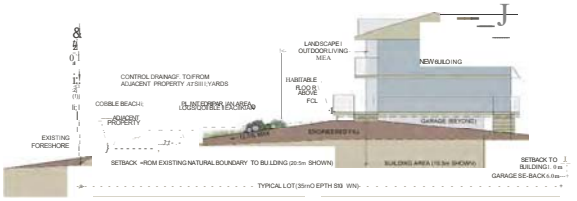
Raise habitable parts of existing buildings to FCL or rebuild buildings. Non-habitable, flood-adapted designs are allowable below FCL, but above DFL

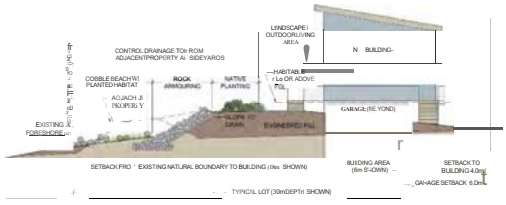
Raise waterfront trail to established FCLs as sea levels rise.

Raise minor streets/ utilities above DFL in one lift

Install underground stormwater tanks and pump stations at Ostler Park and Nunns Creek (as needed)

Additional adaptation measures
-Extend breakwaters at BCFerries and small craft harbour
-Install temporary flood barriers at BCFerries





City of Campbell River

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Climate Adaptation:Coastal Flood Hazard

Potential Next Steps in Nanaimo

- Finalize Flood Construction Levels for buildings – based on SLR at end of building life
- Provide info to support well-informed private and public investment
- Consider 'multiple benefits' possible in concert with adaptation
- Design a 'Line of Defense'
- Consider 'retreat' in some locations
- Manage 'bathtub' areas of inland flood risk
- Phase adaptations as infrastructure comes to end of service life where possible
- Plan ahead for required land acquisition, capital budgets
- Take advantage of senior government funding

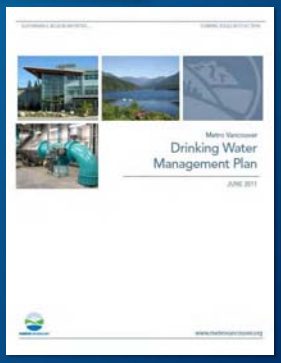
Climate Adaptation

Drought Management

Climate Adaptation – Drought Management

BULK WATER SUPPLY:

- Nanaimo Water Supply Review (underway as parallel process)



Climate Adaptation – Drought Management

WATER STEP PRICING:

- Portland - Water Conservation Rate Structure Review
- Seattle - Third Tier Water Rates
- Lantzville – Tiered Pricing

Third-Tier Water Rates

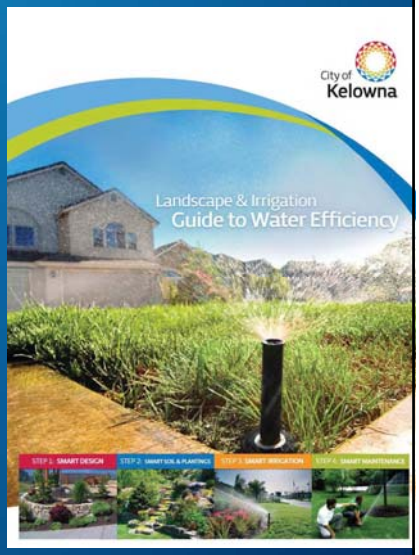
Peak residential water rates are in effect from May 16 through September 15 each year. Peak rates incorporate a three-tiered rate structure with progressively higher rates as water consumption increases. Third-tier water rates are included in this rate structure.

Effective January 1, 2020:

Water Usage	Inside Seattle	Outside Seattle	Shoreline & Lake Forest Park*
Off-Peak Usage (Sept. 16 – May 15)	$5.40	$6.16	$6.39
Peak Usage (May 16 – Sept. 15)			
First-Tier: Up to 10 CCF in 60 days	$5.55	$6.33	$6.73
Second-Tier: Next 26 CCF in 60 days	$6.86	$7.82	$8.32
Third-Tier: Over 36 CCF in 60 days	$11.80	$13.45	$14.31

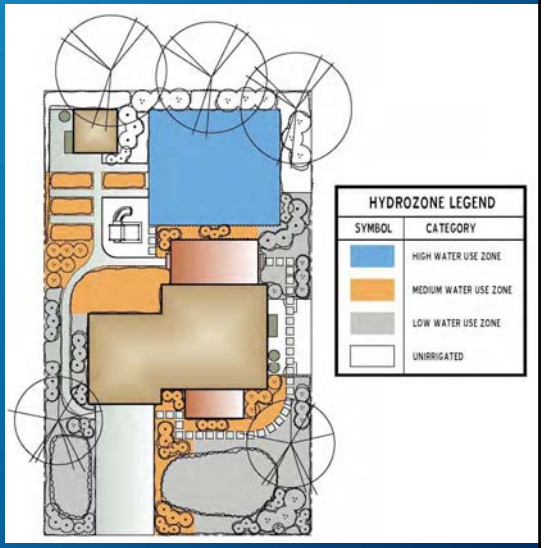
Education

- Landscape & Irrigation Guide to Water Efficiency – also in RDN
- Four Steps to Water Conservation:
  - Smart Design
  - Smart Soil & Plantings
  - Smart Irrigation
  - Smart Maintenance



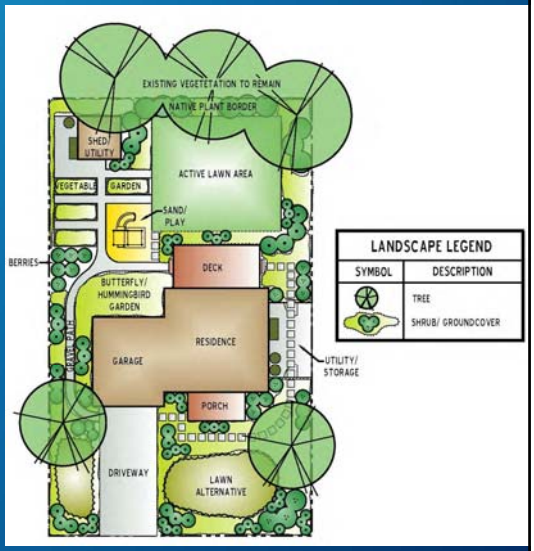
Guidelines

- Smart Design
- Hydrozones
  - High Water Use
    - Lawns - for active use only
    - Ornamentals-reserve for high-impact planting
  - Medium Water Use
    - Less water to look great all year round
    - Use drip or low volume irrigation
  - Low Water Use/ Unirrigated
    - Little or no water once established-native plants
    - Use permeable surfacing for unplanted areas



Guidelines

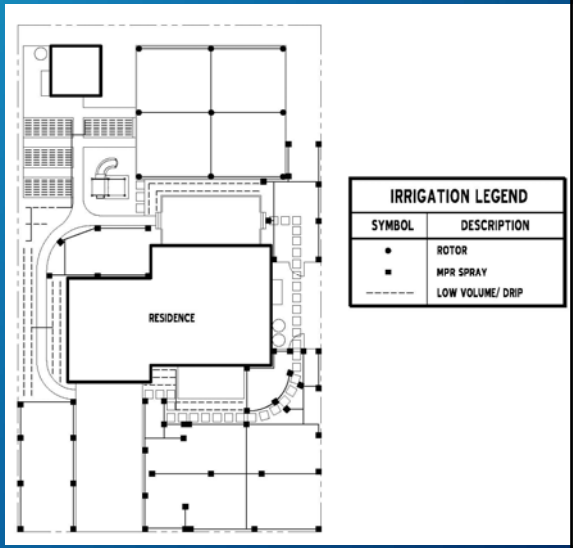
- Meeting a Water Conservation Target
- (15% - 30%)
  - Design 15% - 30% of site to not require watering
  - Limit turf to 25-50% of landscape
  - Lawn alternatives: ground cover, meadowgrass/ flowers, cobble, mulch, stone/ gravel, interlocking brick, permeable unit paving, decking, etc..
  - Use large areas of low water use plants
  - Ensure growing medium depth and quality and provide mulch
  - Use high efficiency irrigation and weather or sensor-based controllers



Guidelines

Smart Irrigation and Controls

- Group by Hydrozones
  - Never irrigate turf and shrubs on same zone
  - Provides healthier plant material
  - May require more zones initially, but will save water in the long run
- Head-to-head Coverage
  - To avoid dry spots and overwatering sprinklers spray should touch the next
- Match precipitation rates
  - Rotors, spray and/or drip never share a zone
  - Up to 30% savings with even application
- Site Contours
  - Avoid extreme elevation changes that causes low head drainage, or use check valves
- Avoid Over-Spray
  - to adjacent structures, paving or properties
- Smart Controller
  - Adjusts automatically to changing weather



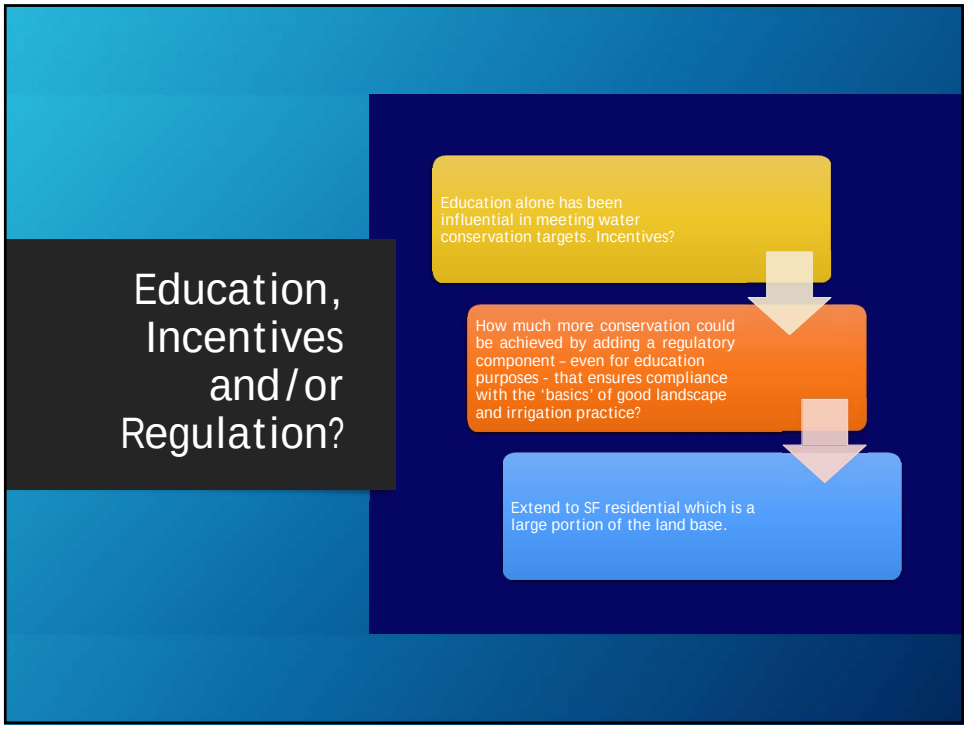
Rainwater Capture System

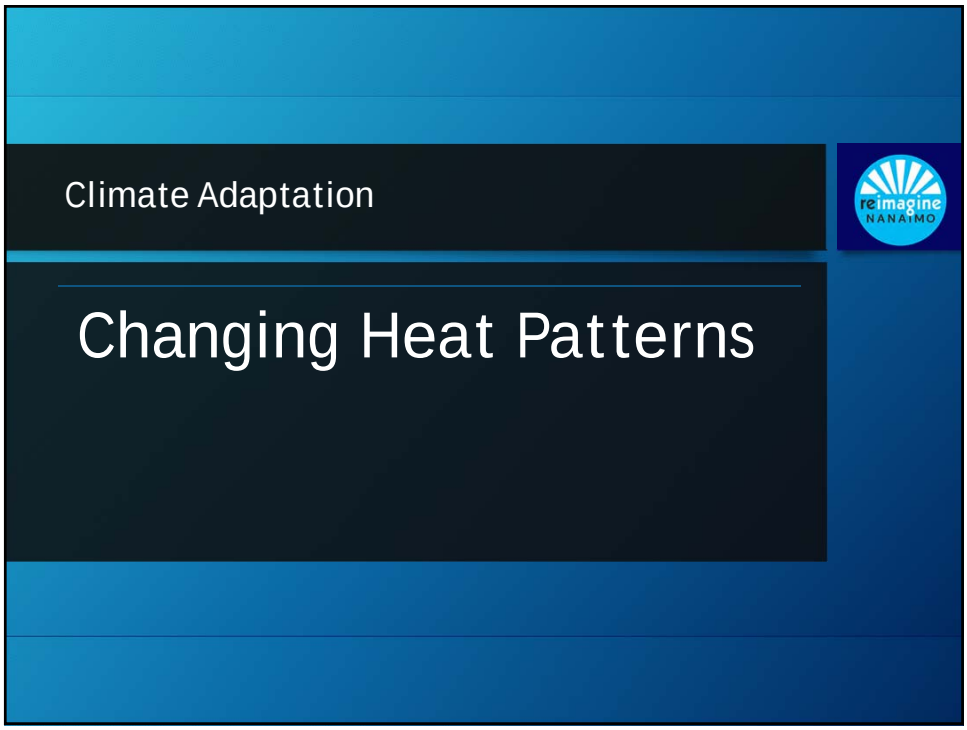
A future priority?

Climate Adaptation:Drought Management

Potential Next Steps in Nanaimo

- ❑ Continue work with RDN Water Smart
- ❑ Update water conservation information/education materials and social marketing
- ❑ Review water pricing – stepped and/or seasonal peak rates?
- ❑ Provide simple information on landscape 'hydrozones' and 'water budgeting'
- ❑ Move towards permitting for irrigation systems to enforce best practices
- ❑ Mandate use of 'Smart' weather-based controllers
- ❑ Review timing of increase in bulk water supply


Education, Incentives and/or Regulation?
Education alone has been influential in meeting water conservation targets. Incentives?
How much more conservation could be achieved by adding a regulatory component – even for education purposes - that ensures compliance with the 'basics' of good landscape and irrigation practice?
Extend to SF residential which is a large portion of the land base.

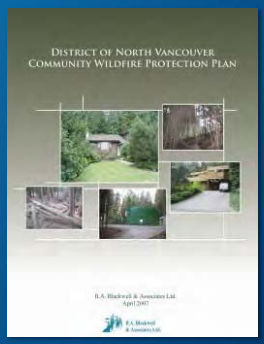

Climate Adaptation
reimagine NANAIMO
Changing Heat Patterns

Climate Adaptation – Urban Heat Island

- Georgetown Climate Centre - Adapting to Urban Heat: A toolkit for local Governments (2012)
- Toronto - Green Roof Bylaw
- Philadelphia - Cool Roof Law

Climate Adaptation – Wildfire Management

- City of Nanaimo has prepared a Wildfire Protection plan
- UBCM is very active on this topic, with ongoing funding
- Updates and joint implementation with RDN?



Climate Adaptation: Changing Heat Patterns

Potential Next Steps in Nanaimo

- ❑ Review development checklists for urban heat island mitigation
- ❑ Update and implement urban interface wildfire best practices in development and parks
- ❑ Continue urban forest and street tree implementation with an eye on climate change resilience and urban heat management

Watersheds: Water Quality and Quantity

Rainwater Management

Watersheds – Rainwater Management

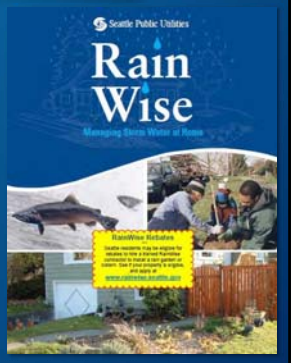
INFILTRATE TO SOILS:

- Seattle - Plan to Protect Waterways (2015)
- Seattle - Stormwater Manual Vol. 3-Project Stormwater Control (2017)
- Vancouver-Rain City Strategy (2019)

Watersheds – Rainwater Management

INCENTIVE PROGRAMS:

- Seattle - RainWise Rebate Program
- Victoria - Stormwater Utility Charges
- Portland - % for green program



Managing Trends to Increased Impervious

Support gentle densification and housing diversity: secondary suites, coach houses?

Manage impervious area and rainwater management implications?

70% impervious area	35% impervious area	59% impervious area

PARKING TO BIOSWALE

RAIN GARDEN

COURTYARD WITH RAINGARDEN

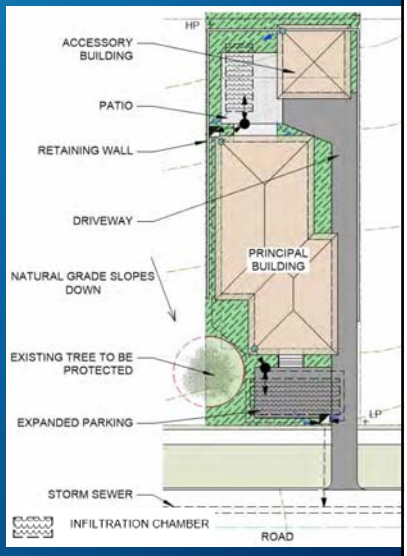
Deep Soil / Compost Mixes

Recreate the 'sponge' of the forest floor

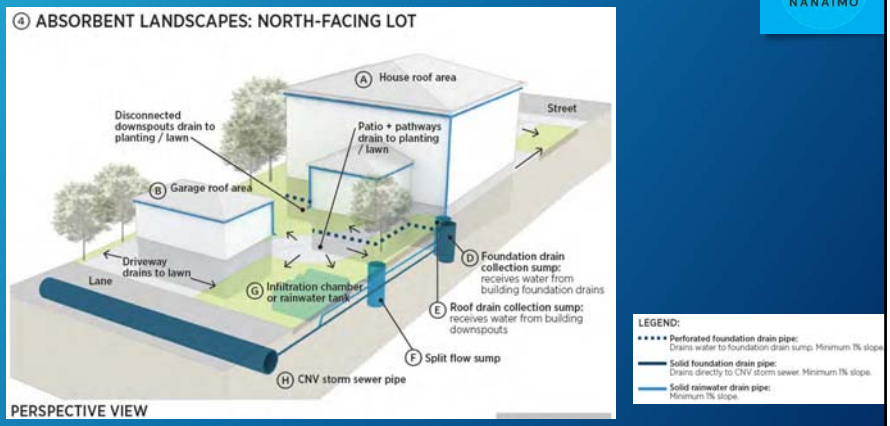
Single Family with Suite + Coach House– Absorbent Soils & Infiltration Chamber (Impervious Area = 77%)

- Direct all impervious areas to absorbent landscape at a maximum 2:1 ratio
- Direct all roof impervious areas to infiltration trench
- Proprietary system with an assumed porosity of 0.98

Areas directed to absorbent landscape	Accessory building, driveway, patio
Areas directed to BMP	Principal building
Total BMP Area (not including absorbent soil)	48.6
% of landscaped area required as absorbent landscape to meet target	100%
Depth of absorbent landscape (mm)	450.0
% of baseline achieved	97%



North Vancouver Precedent



Climate Adaptation: Rainwater Management

Potential Next Steps in Nanaimo

- ❑ Expand implementation to single/duplex/triplex residential
- ❑ Integrate with carriage/lane home housing projects
- ❑ Create standard details and specifications for best practices in engineering standards (e.g. for rain gardens, pervious paving, infiltration chambers)
- ❑ Consider a stormwater utility to incentivize changes
- ❑ Move towards regulations/enforcement for developments above an impervious area threshold

Watersheds: Water Quality and Quantity

Sediment, Erosion, Pollutant Control

Watersheds – Sediment, Erosion, Pollution Control

- Nanaimo encourages erosion and sediment control – others are more aggressive in implementation
- King County - Stormwater Pollution Prevention Manual (2016)
- Seattle - Stormwater Manual Vol. 2: Construction Stormwater Control (2017)

SOURCE CONTROL – PROVIDE FULL COVER

SEDIMENT TRAP

ROCK ACCESS PAD

STABLE SILT FENCE

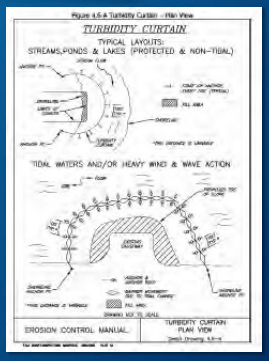
CATCH BASIN INSERT

Watersheds: Water Quality and Quantity

Instream Erosion & Deposition

Watersheds – Instream Erosion & Deposition

- Nanaimo watershed stormwater planning program is restarting (e.g. Cottle Creek)
- Nanaimo stream enhancement projects support streamkeepers (e.g. Departure Bay Creek)
- Portland – Erosion and Sediment Control Manual (2008)
  - Instream Sediment Trapping Devices
- Seattle - Instream Flow Monitoring and Research

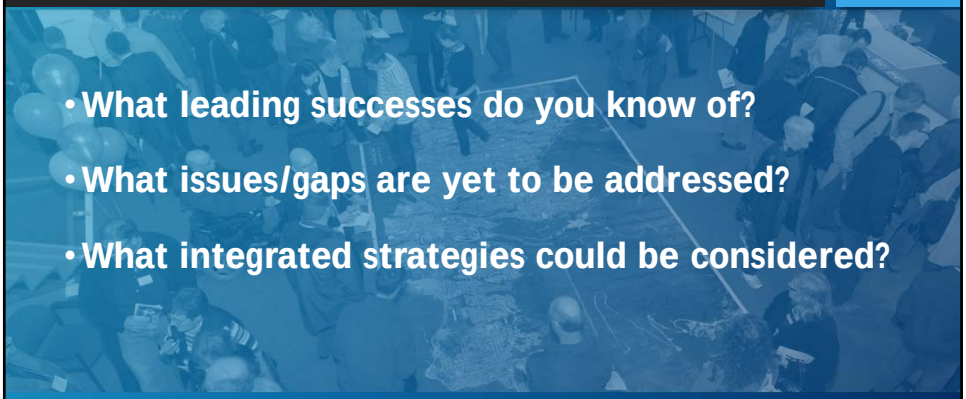


Climate Adaptation: Watersheds

Potential Next Steps in Nanaimo

- Complete watershed hydrology / rainwater management planning
- Update best practice information and training – industry and small builder
- Create standard details and specifications for best practices in engineering standards (e.g. for erosion and sediment control techniques during construction, pollution control practices and devices, instream and riparian restoration)
- Consider a ticketing offense for small infractions
- Review and upgrade catch basin cleaning operations

Environmental Gaps: Provide Your Insights



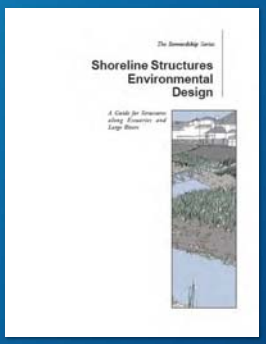
- **What leading successes do you know of?**
- **What issues/gaps are yet to be addressed?**
- **What integrated strategies could be considered?**

Habitat Conservation & Restoration

Biodiversity Management

Habitat Conservation – Fish / Amphibian Habitat

- Nanaimo / BC Riparian Area protection guidelines are well established
- DFO - Shoreline Structures Environmental Design (2002)
- Portland - Salmon Safe Certification Report (2016)
- Seattle – Cedar River Watershed Aquatic and Riparian Restoration Strategic Plans (2008)



Streamwide/Wetland Restoration

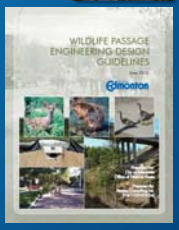
Overview of streamside revegetation

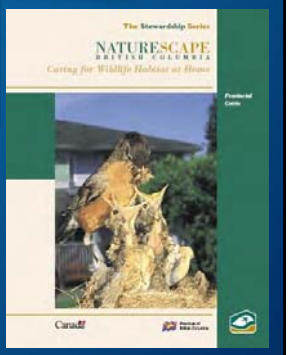
Live stake through soil wrap

Unmanicured riparian

Habitat Conservation – Biodiversity Planning

- Vancouver - Biodiversity Strategy (2016)
- Seattle - Landscape Synthesis Framework for Cedar River Watershed (2009)
- Edmonton - Wildlife Passage Engineering Guidelines (2010)
- Toronto - Guidelines for Biodiverse Green Roofs (2013)



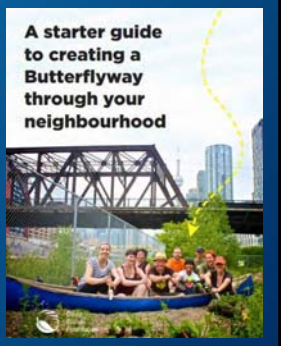


BUTTERFLY GARDEN PLANTING

COMMUNITY AWARENESS SIGNAGE

Habitat Conservation – Pollinator Populations

- Pollinator Partnership Canada - Selecting Plants for Pollinators Lower Mainland (2017)
- Toronto - Pollinator Protection Strategy (2018)
- Suzuki Foundation - Butterfly Ways



WILDLIFE TREE

WILDLIFE TREES FOR WOODPECKERS / CAVITY NESTERS

BIRD FEEDING, WATERING AND NESTING STATIONS

Habitat Conservation – Bird / Bat Populations

- Vancouver - Bird Strategy (2015)
- Vancouver-Bird Friendly landscape Operational Guidelines (2015)
- Vancouver-Bird Friendly Design Guidelines for DP (2015)
- Toronto-Best practices for effective lighting (2017)
- Toronto-Bird Friendly Best Management Practices "Glass" (2016)
- Calgary - Responsible Pet Ownership Bylaw

Biodiversity Management: Habitat Restoration

Potential Next Steps in Nanaimo

- ❑ Maintain streamside protection policies
- ❑ Continue co-operative stream / riparian restoration projects
- ❑ Integrate with Sea Level Rise coastal and estuary adaptation
- ❑ Consider 'Green Shores' principles
- ❑ Promote 'Naturescape' approaches (target both public and private sites)
- ❑ Review and create bird, bat, butterfly and pollinator habitat policy / design guidelines

Urban Forest & Vegetation Cover

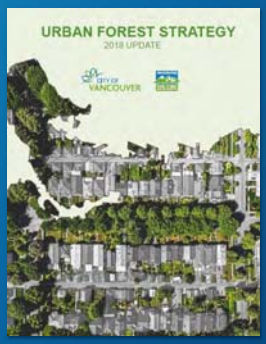
Urban Forest Management

Urban Forest & Vegetation – Invasive Species

- Portland - Invasive Plants Management Strategy (2008) and Invasive Plant Policy Review (2011)
- Portland - Integrated Pest Management Program (2019)
- Vancouver - Integrated Pest Management Policy
- Metro Vancouver – Livestock Invasive Plant Control Pilot ($150K, 3-year program)

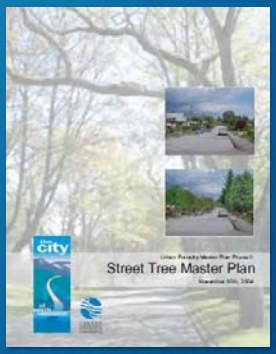
Urban Forest & Vegetation – Natural Woodlands

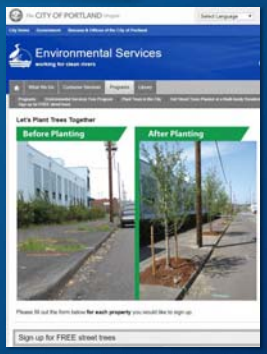
- Vancouver-Urban Forest Strategy (2018)
- Metro Vancouver - Urban Forest Climate Adaptation Framework (2017)
- King County - Forest Carbon Credit Program



Urban Forest & Vegetation – Public Street Trees

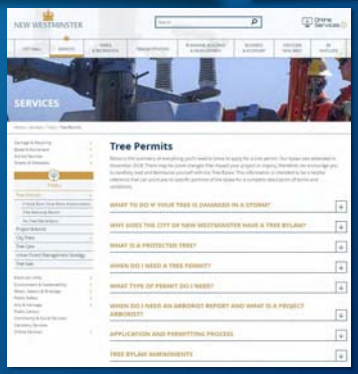
- Nanaimo requires new street trees during subdivision
- City of North Vancouver – Street Tree Master Plan (2004)
- Metro Vancouver - Design Guidebook Maximizing Climate Adaptation Benefits Trees (2017)
- Portland - Free Street Tree program





Urban Forest & Vegetation – Private Trees

- Nanaimo Tree Protection program protects approximately 20% of existing woodlands and requires tree replacement
- Seattle Green Factor Program (Code Chapter 23.86.019 Green Factor measurement)
- City of New Westminster – Tree Protection Program



Urban Forest / Vegetation Cover Management

Potential Next Steps in Nanaimo

- ❑ Finalize invasive plant inventory
- ❑ Scale-up community volunteer / low barrier employment program for invasives removal – both in park and also in streetscapes
- ❑ Consider noxious weed control bylaw and enforcement
- ❑ Review climate change effects on natural woodlands (e.g. red cedar)
- ❑ Implement the Urban Forest Management Strategy, adding further depth on management of trail braiding/encroachment, wildfire risk management and ecologically sensitive management of danger trees and riparian areas

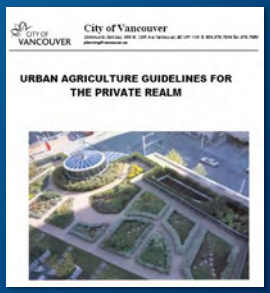
Urban Agriculture

Local Edible Gardens

Urban Agriculture – Local Edible Gardens

- Vancouver - Urban Agriculture Policy for Parks (2015)
- Vancouver - Urban Agriculture Design Guidelines for Private Realm
- Vancouver - Community Garden Portal (web page)

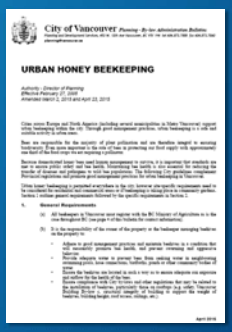

PARK BOARD URBAN AGRICULTURE POLICY


City of Vancouver

URBAN AGRICULTURE GUIDELINES FOR THE PRIVATE REALM

Urban Agriculture – Food Livestock

- Vancouver - Urban Honey Beekeeping Bulletin (2015)
- Vancouver - Backyard Hens Guidelines (2010)
- Seattle - Urban Agriculture Permits
- Metro Vancouver – Livestock Invasive Plant Control Pilot ($150K, 3-year program)


City of Vancouver

URBAN HONEY BEEKEEPING


Seattle Permits

Urban Agriculture

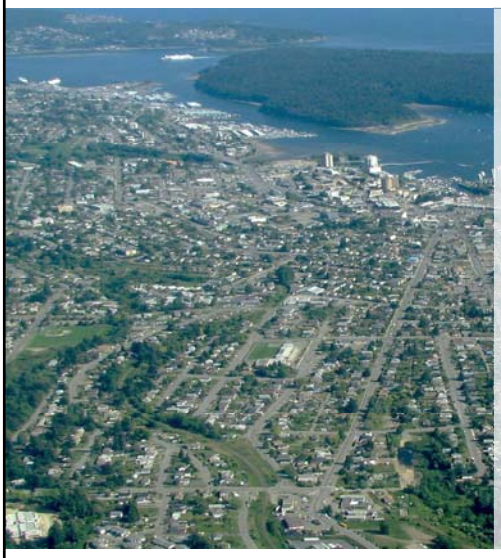
Urban Agriculture

Potential Next Steps in Nanaimo

- ❑ Consider interest in additional community gardens as densification occurs
- ❑ Encourage food gardens in private lands
- ❑ Exempt food gardens from restrictions on landscape water use or stormwater calcuations

Environmental Gaps: Provide Your Insights

- What leading successes do you know of?
- What issues/gaps are yet to be addressed?
- What integrated strategies could be considered?



Next Steps: Options

Principles
Indicators
Public values
Comparisons

THANK YOU!

reimagine NANAIMO

Monitoring and Rating Systems

LEED vs SITES or both?

Project Rating Systems – LEED / Green Bldg

- City of Vancouver requires that all new municipal facilities be built to Leadership in Energy and Design (LEED) Gold – focus on energy but not site design
- Seattle Green Factor – score-based code requirement (Code Chapter 23.86.019)
- Seattle - Code Chapter 23.58D Green Building Standard
- Seattle - Sustainable Buildings and Sites Policy (2011)

Project Rating Systems – SITES

- SITES Rating System for Sustainable Land Development
  - Greenfield conservation
  - Stormwater management
  - Soil conservation
  - Habitat conservation
  - Building materials
  - Construction practices
  - Human health and well-being
  - Education and Performance Monitoring