Nisga’a Nation Climate Leadership Plan

December 2025

Prepared by Community Energy Association and

NLG’s Capital, Housing and Facilities Directorate

Community Energy Association

Nisga’a Lisims Government

Contents

List of Abbreviations

AC- Air conditioning

BAL North - Building A Legacy North

BAU - Business as usual

BCAFN- British Columbia Assembly of First Nations

CEA - Community Energy Association

CEEI- Climate Energy Emissions Inventory

CHFO - Capital, Housing & Facility Operations

ESC - Energy Step Code

EV - Electric vehicle

GHG - Greenhouse gas

GJ - Gigajoules

HAAS - House-as-a-system

HHER - Healthy home energy retrofit

HRV - Heat recovery ventilator

HVAC - Heating ventilation air conditioning

ICE - Indigenous Clean Energy

I.C.E. - Internal combustion engine

IDP - Integrated Design Plan

NDIT- Northern Development Initiatives Trust

NLG - Nisga'a Lisims Government

NRCan - Natural Resources Canada

RFQ - Request for quotation

PIEER - Partners in Indigenous Energy Efficiency and Resilience

SFD - Single family dwelling

SOW- Scope of work

tCO_2e - Tonnes of carbon dioxide equivalent

ZCSC - Zero Carbon Step Code

Executive Summary

Climate change is already influencing key environmental, cultural, and economic systems across Nisga'a Lands. Warming temperatures, shifting precipitation patterns, and an increase in extreme events, such as heavy rainfall, flooding, and wildfire, are expected to accelerate in the decades ahead. On behalf of Nisga'a Nation, Nisga'a Lisims Government (NLG) is taking decisive action on climate mitigation, adaptation and resilience through several interconnected initiatives, detailed in this report. Taking a progressive, holistic approach, we strive to get out in front of the climate crisis and to minimize the high risks and negative impacts it presents to our People and fellow Canadians, as well as the lands, waters, flora and fauna that we have stewarded, and relied upon, since time immemorial.

Walking alongside our many partners and collaborators, our dedicated NLG staff within the Capital, Housing and Facilities Operations team worked to progress our various climate initiatives and address the challenges described in this report through four, interconnected priorities:

- Coordinated communications and engagement of the various climate initiatives listed below. This key work informed diverse Nisga'a and regional stakeholder groups about the climate actions taking place, explained their importance and inter-connections, invited input, and outlined the anticipated outcomes and co-benefits for individuals, communities, and the Territory.

- Wrote this comprehensive Climate Leadership Plan in consultation with Nisga'a elected officials and citizens as well as other key stakeholders. The plan incorporates data and findings from community energy and emissions inventory, a climate risk assessment, the low-carbon transportation plan, healthy home energy retrofit work planning, and land and water research.

- Developed and started early implementation of a Healthy Homes Energy (HHE) Retrofits workplan in a phased approach for a large-scale retrofits program. Individual homeowners, or Nation-owned properties, have opportunity to pursue various degrees of building energy retrofits using an envelope-first and house-as-a-system approach.

- Improved climate and energy literacy region-wide through customized capacity building, and training activities offered both within Nisga'a Nation and the northwest region. This capacity building included intentional two-way mentorship between NLG staff and CEA and offered many high-performance building science and construction training opportunities regionwide. The various capacity building initiatives woven into the climate actions listed above will, over time, enable Nisga'a Nation and locally based collaborators, contractors, and technical supports to carry out this work more independently and confidently.

The Nation's 2023 baseline energy and emission inventory and land cover analysis showed the following annual totals:

- Energy consumption of 205,508 GJ
- Green house gas (GHG) emissions of 9,253 tCO_2e
- Energy expenditures of $8,517,846

Transportation fuels dominated the emissions and expenditures, followed by buildings, and waste. Business as Usual (BAU) projections to 2050 showed a large decline in emissions and expenditures, driven mainly by assumed Federal/Provincial vehicle electrification policies, underscoring that the fleet electrification efforts seen throughout the Nation are positive actions that can further improve outcomes and co-benefits.

Community engagement to date showed strong support for home upgrades and improved transit options, especially bus service within/between villages and to Terrace, alongside interest in shared mobility and enabling conditions for electric mobility.

Future planning processes should take any opportunity to share knowledge and reduce efforts across directorates in NLG by intentionally incorporating the research findings and knowledge already held by other departments, such as the Lands Directorate, for example. Finding more ways to interweave Nisg̲a'a traditional ecological knowledge and cultural values, and our interconnection with our homelands would also be an invaluable contribution to this ongoing, important work.

Continuing to leverage multiple funding sources and diverse collaborators in a coordinated, strategic fashion will enable Nisg̲a'a Nation to achieve implementation success with the priorities of this climate leadership plan for the betterment of Nisg̲a'a Nation, Northwest BC, and Canada.

Project Origins

On behalf of Nisg̲a'a Nation, Nisg̲a'a Lisims Government (NLG) is taking decisive action on climate mitigation, adaptation and resilience through several collaborative initiatives, detailed in this report. The Nisg̲a'a Nation is represented by NLG and has the authority to pass laws on a variety of matters. Nisg̲a'a lawmaking coincides with Canadian federal and provincial authority. Designed to assure democracy, transparency, and accountability, the Nisg̲a'a Government is comprised of NLG, the four Nisg̲a'a Village Governments, and three Nisg̲a'a Local Societies. Supported by the Nisg̲a'a Executive Committee, the Capital, Housing, & Facilities Operations Directorate facilitates climate initiatives and engagement plans.

Taking a progressive, holistic approach, we strive to get out in front of the climate crisis and to minimize the high risks and negative impacts facing our People and fellow Canadians, as well as the lands, waters, flora and fauna that we have stewarded, and relied upon, since time immemorial. To achieve this vast and complex climate portfolio, NLG's Housing, Capital and Facilities Operations Directorate established a Climate Action Coordinator position in 2024 and is collaborating with many governments, organizations and funders, including:

- Governments: City of Terrace, Regional District of Kitimat Stikine, the Province of BC, the Canadian Federal Government through the Indigenous Climate Leadership initiative
- Funders: Canadian Mortgage and Housing Corporation (CMHC), BC Association of First Nations, BC Hydro, BC Housing, Real Estate Foundation of BC
- Consultants: Makola Developments, Community Energy Association
- Training and mentorship providers: Indigenous Clean Energy (ICE), Kitselas 5 Tier (K5T), RDH Building Science, Ecolighten, Holistic Building Performance Inc., Envelope First Consulting and Contracting, BC Institute of Technology, Natural Resources Canada and others.

Climate action is indistinguishable from social, economic and environmental responsibilities, and as such many of the priorities and projects described in this plan started long before the conceptualization of this climate leadership plan in 2023. Indeed, as the rightful stewards of our Land, Culture and People, priorities such as quality housing and infrastructure, right relationship to healthy and abundant ecosystems, and better and more efficient transportation naturally intertwine with our inherent Rights and Responsibilities as Nisg̲a'a in our Territory. Our climate leadership aspirations and associated initiatives described here are simply an extension and re-imagining of our Ayuukhl Nisg̲a'a, the ancient laws and customs that shape our governance, relationships, and responsibility to the land.

Traditional knowledge, values and culture

The Nisg̱a'a Nation is guided by Ayuukhl Nisg̱a'a, the ancient laws and customs that shape our governance, relationships, and responsibility to the land. These teachings have been passed down through generations, ensuring the resilience and prosperity of our people. The Nisg̱a'a Constitution recognizes the role of Simgigat (Chieftains), Sigidim Haanak' (Matriarchs), and respected Elders in advising the Nisg̱a'a Government on matters related to traditional values, governance, and cultural preservation.

Nisg̱a'a Lisims Government (NLG) is deeply committed to protecting and revitalizing the Nisg̱a'a Language and cultural practices. Our knowledge systems, including sustainable land and resource management, have sustained our people for millennia. In addressing climate change, we recognize the importance of integrating Nisg̱a'a traditional ecological knowledge (TEK) with contemporary climate science to build resilience and ensure a sustainable future for our Nation.

Key Climate Strategy and Actions

In 2020 the government of British Columbia announced its Clean BC Roadmap that introduced new measures for British Columbia communities to use to help meet emissions reductions targets. Six "Big Moves" were identified by the BC Climate Leaders (an initiative formed from the BC Municipal Climate Leadership Council (BCMCLC) and the Community Energy Association (CEA)) to achieve 50% emissions reduction by 2030 and net zero by 2050[1]. These actions are intended to guide local governments in structuring their climate actions to meet these climate goals and are grouped into three primary categories: **transportation, buildings and waste**.

Like municipal governments, First Nations leaders and governments across BC influence local policy in our territories. Unlike local governments, First Nations are rights holders with stewardship responsibilities and decision-making authority that is rooted in Indigenous traditions and land governance. The Big Moves framework provides a useful tool that can be incorporated into the Nisg̱a'a Climate Leadership Plan while also prioritizing Nisg̱a'a perspectives, cultural priorities and vision.

[1] BC Climate Leaders Playbook - The Big Moves

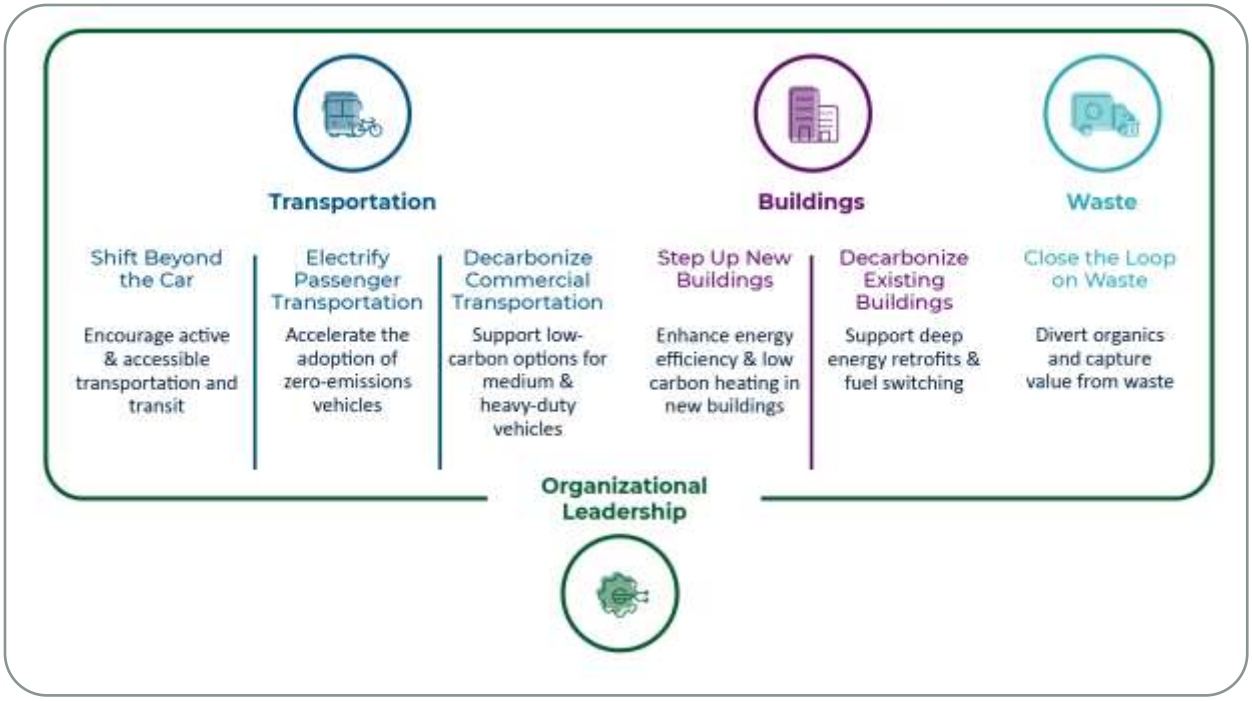


Figure 1: BC Climate Leaders six Big Moves to net zero communities by 2050.

This Climate Leadership Plan aims to address the Nation's priorities within the framework of the Big Moves while reviewing each in the context of the Nisga'a Nation's priorities and community challenges.

This report provides a current snapshot of the Nation's energy profile using a Greenhouse Gas (GHG) Emissions Inventory, highlighting challenges and opportunities for future improvement. This evidence-based tool provides a baseline that will help to inform and guide community targets and climate leadership implementation going forward. It will also serve to help the Nation track improvements over time and can be beneficial to access future funding opportunities for implementation projects.

Based on the findings and recommendations that this community review has revealed to date, the Climate Leadership Plan will guide the Nation through climate planning with strategic direction while providing practical and meaningful community co-benefits. Climate change planning, mitigation and resiliency goes hand-in-hand with general quality of life improvements: better housing, more cost-effective transportation options and more services within the Nation. The NLG's commitment to Climate Leadership can result in improved quality of life and resilience to environmental and economic shock while– priorities of the Nation that compliment the BCMCLC Big Moves.

Project Description: Interconnected Climate Initiatives

The Nation's remote setting and complex community challenges demand a comprehensive climate leadership plan. This plan addresses critical areas such as energy, transportation, housing, capacity building and understanding climate risks, described below (Figure 2). Achieving meaningful climate leadership for the Nisga'a Nation requires integrated strategies that combine climate adaptation with targeted community investments (See Appendix A, Recommendations to Canada submitted through the Indigenous Climate Leadership initiative).

Walking alongside our many partners and collaborators, our dedicated NLG staff within the Capital, Housing and Facilities Operations team worked to progress our various climate initiatives and address the challenges described above through four, interconnected priorities:

- Coordinated communications and engagement of the various climate initiatives listed in Figure 2. This key work informed diverse Nisga'a and regional stakeholder groups about the climate actions taking place, explained their importance and inter-connections, invited input, and outlined the anticipated outcomes and co-benefits for individuals, communities, and the Territory. Appendix B is an informational overview sheet of the key components of the climate leadership work updated through time and used as a handout for various activities

- Co-developed and wrote this comprehensive Climate Leadership Plan in consultation with Nisga'a elected officials and citizens as well as other key stakeholders. This plan integrates the initiatives listed in Figure 2 to allow prioritization of implementation activities and identify desired outcomes. The plan incorporates data and findings from community energy and emissions inventory, a climate risk assessment, the low-carbon transportation plan, HHE retrofit work planning, and land and water research.

- Developed and started early implementation of a HHER workplan and phased approach for a large-scale retrofits program. Individual homeowners, or Nation-owned properties, have opportunity to pursue various degrees of building energy retrofits—from replacing individual pieces of equipment to comprehensive overhauls of the whole building, known as deep energy retrofits.

  The HHE retrofits workplan incorporates capacity building, building condition and energy use assessments, professional upgrades to envelopes, mechanical systems and ventilation, quality assurance and compliance, contract management, construction management, and communications.

- Improved climate and energy literacy region-wide through customized capacity building, and training activities offered both within Nisg̲a'a Nation and the northwest region. This capacity building included intentional two-way mentorship between NLG staff and CEA and offered many high-performance building science and construction training opportunities regionwide. The various capacity building initiatives woven into the climate actions listed above will, over time, facilitate Nisg̲a'a Nation and our locally based collaborators, contractors, and technical supports to carry out this work more independently and confidently.

Success will hinge on coordinated planning, sustained funding, and community-driven approaches that reflect the Nation's priorities (Figure 2).

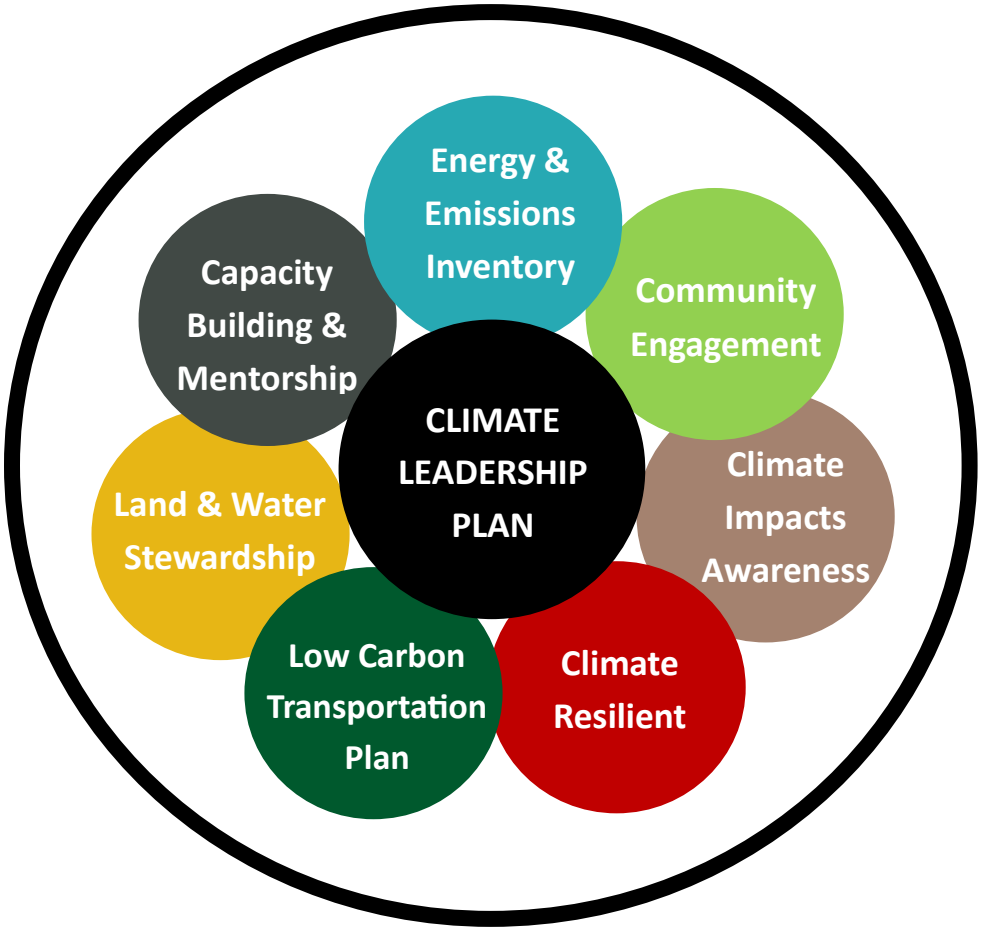


Figure 2: Interconnected elements of the Nisg̲a'a Climate Leadership Plan

Nation Geographic and Climatic Description

Nisg̲a’a Nation is a rural, remote First Nation on the northwest coast of British Columbia situated in climate zone 6 approximately 95 km northwest of Terrace along BC highway 113 (Figure 3). Nisga’a Lands extend southeast-northwest following the K̲’alii Aksim Lisims (Nass River) from the coast inland roughly 80 km and encompasses roughly 217, 000 square km in the Nass Valley. Nisg̲a’a Lands host four Nisg̲a’a Villages: Gitlaxt’aamiks, Gitwinksihlkw, Laxgalts’ap, and Gingolx.

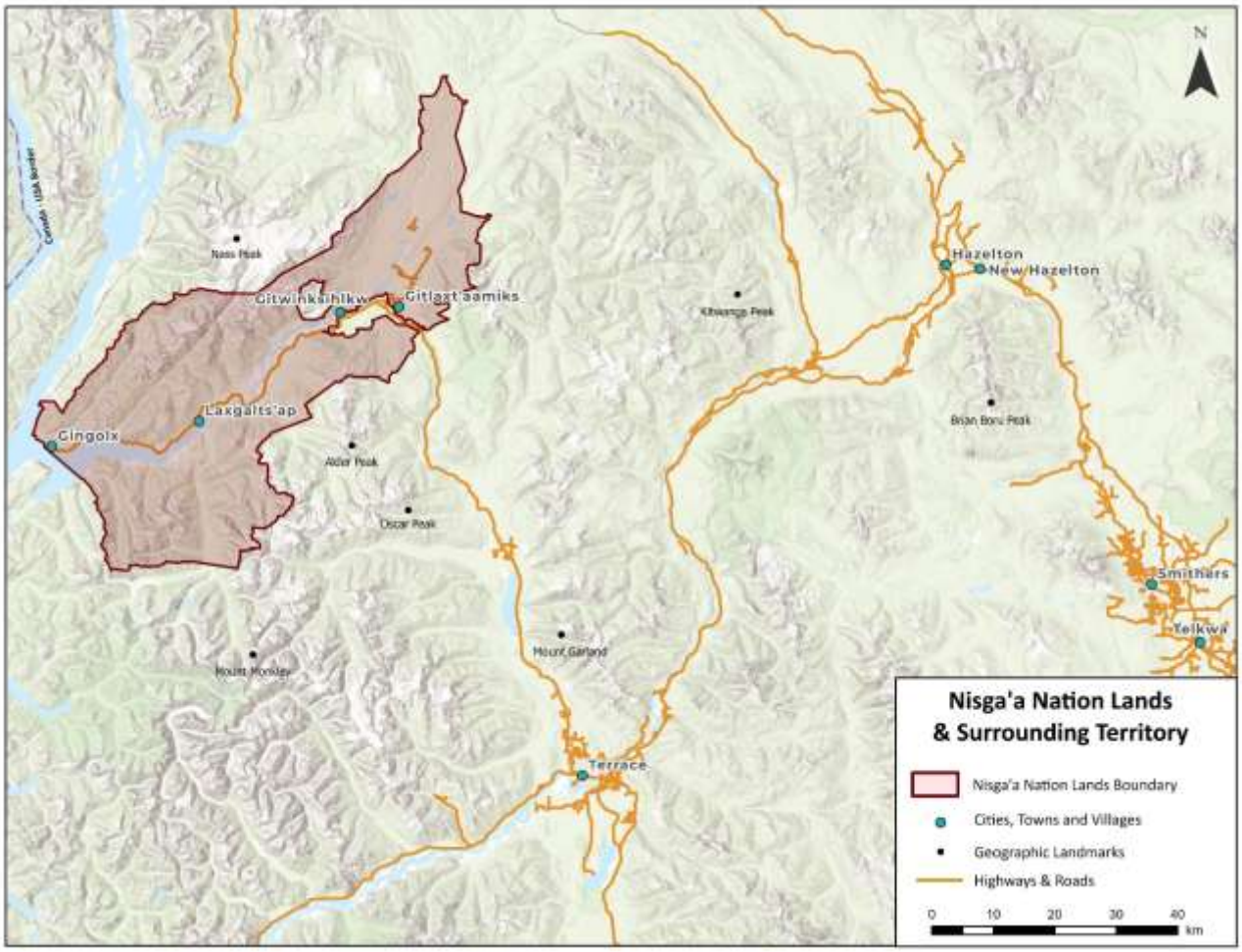


Figure 3: Geographic context of the Nisg̲a’a Nation Lands

This remote and rural geography presents both opportunities and challenges for community resilience, infrastructure development, and climate leadership.

Nation Challenges and Considerations

As a rural and remote First Nation, Nisg̲a'a faces several challenges to effectively, rapidly address climate-related issues. Geographical isolation and wide population dispersion present several logistical challenges when organizing community engagement sessions, accessing education and training, and cost-effectively engaging qualified contractors and consultants. Regionally, there are economy-wide capacity limitations for qualified staff, contractors and technical experts in education, health, construction, administration, trades, industry, etc. There are supply-chain issues with technologies that are required at scale, for example, heat-pumps. Finally ongoing impacts of colonial violence and genocide, including but not limited to, sub-standard Indian Act housing and the resulting impoverished conditions endured by many our citizens is an additional challenge we face. Asking Nisg̲a'a to learn about, and value climate action, is a big request when many people are necessarily focused on their day-to-day realities and ensuing struggles.

The following topics describe important climate and energy context of Nisg̲a'a Nation:

Energy and Resources

Access to reliable and affordable energy is essential to supporting community well-being and economic development. In Nisg̲a'a Nation, electricity is primarily supplied by BC Hydro; however, power outages occur during winter months due to severe weather conditions. During these periods, many households and community buildings rely on fossil fuel–powered generators for backup electricity and wood-burning fireplaces or pellet stoves for heat. Developing a more consistent and resilient energy supply through Nation-owned clean energy generation and battery storage presents a significant opportunity to advance local climate leadership, enhance energy security, and foster economic development. In addition, ongoing community and government greenhouse gas (GHG) and land use inventories will establish a comprehensive energy-use baseline to guide future improvements and sustainability initiatives.

Transportation and Accessibility

The Nisg̲a'a Nation's distance from major service centres limits access to health, education, grocery stores and economic opportunities for community members. Seasonal weather events, variable road conditions, and limited public transportation infrastructure restricts mobility and increases the costs of goods and services. This is felt more acutely in low-income and Elder populations.

Housing and Infrastructure

Better buildings and houses function as both climate mitigation and adaptation. Building to high-performance standards in new construction and retrofitting existing housing to improve

health and comfort, as well as improving energy efficiency, is a major goal for the NLG. Like other service challenges in Nisga'a Nation, higher costs for materials and labour as well as supply chain, transportation infrastructure and weather-related construction delays present significant logistical and financial challenges in this remote region.

Climate and Environmental Resilience

The Nass Valley is exposed to multiple natural hazards, including flooding due to both sea level rise and extreme precipitation, as well as landslides and coastal and riverbank erosion. Climate change is expected to amplify these risks while also affecting salmon and shellfish populations, forest health, and other key aspects of the traditional ecosystem. Building adaptive capacity and integrating traditional ecological knowledge into planning processes are central to community-led climate action for the Nisga'a Nation (Appendix A).

Climate Leadership Community Dialogues and Engagement

Figure 5: February 2024. Public engagement at Hoobiyee, Gingolx. Left to right, NLG housing and climate staff James Percival, Jordan Morven, Kaitlyn Robinson.

Community Engagement Overview

The Climate Leadership team connected with diverse community members and many audiences various times throughout 2023 and 2024. Engagement activities and collection of both qualitative and quantitative baseline data illuminated the concerns and priorities of Nisga'a citizens. Community engagement activities are summarized in Table 1.

Table 1: Summary of engagement events held in the community in 2023 and 2024.

Date	Audience/Participants	Activity Type	Format
Oct-Nov '23	Citizens, staff and elected officials	GHG Inventory data collection	Household surveys (Appendix C) and meetings with village administration and staff
Feb '24	Citizens, staff and elected officials	Hoobiyee public engagement	Climate, housing and transportation surveys. Information booth.
Feb '24	Village Administration and Housing Committee	Transportation & Housing Visioning	2-days in-person meetings
May '24	Citizens, staff and elected officials	Special Assembly public engagement	Climate, housing and transportation surveys. Information booth.
Aug '24	Citizens, staff and elected officials	Housing & Climate Action Week	Meetings with elected officials and public in each village
Jun-Dec '24	Key stakeholders: staff, funders, Nisga'a Valley Health, Northern Development Initiatives Trust	Key Actor Interviews	Key actor interviews regarding transportation challenges and solutions
Aug & Oct '24	Citizens, staff and elected officials	Climate Leadership Lunch & Learns	Online- climate leadership, transportation, housing topics
Multiple Dates, ongoing from Jun '24	Housing staff, elected officials, local contractors, subtrades, suppliers and transporters.	Healthy Home Energy Retrofits (HHER) Training and Data Collection	Webinars, classroom training, home tours, hands-on envelopes construction, after-hours networking events, etc.

Outside of these events, the NLG Executive met once a month to receive updates from NLG Senior Administration about the Nation's activities, providing Nisga'a elected leadership opportunity for feedback and engagement.

Spotlight on Climate Engagement Week 2024

During the week of August 12 – 15, 2024 citizens were asked for their input to inform the Climate Leadership Plan and the Low Carbon Transportation Plan. Community dinners were held in Laxgalts'ap, Gingolx, Gitwinksihlkw, and a public open house was held at NLG offices in Gitlaxt'aamiks.

Community members were asked about their hopes, concerns, and thoughts on climate action, home energy retrofits, and transportation. Overall, input showed high interest in and support for home energy retrofits and alternative transportation options.

Figure 6: Climate and Housing Week community engagement in Laxgalts'ap, Aug 2024. Right: Kaitlyn Robinson, left: community member.

Hopes & Concerns

Residents were invited to share their high-level hopes and concerns related to climate action, housing or transportation.

Hopes - comments showed high interest in:

- Housing retrofits for safety, comfort, and improved heating/cooling
- Waste recycling
- Alternative energy sources

Concerns - comments included concerns about:

- Poor condition of some homes (beyond what retrofit program can address)
- Difficulty of dealing with plastic waste

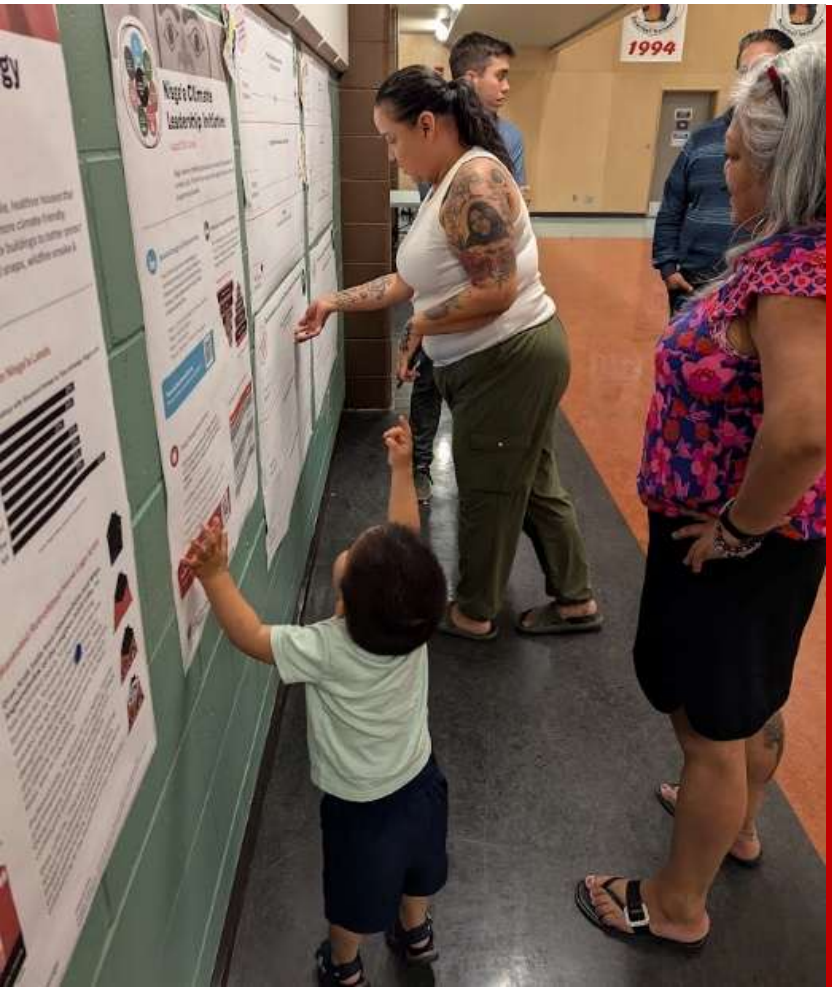


Figure 7: Laxgalts'ap community members filling in hopes and concerns sticker charts during Climate and Housing Week, Aug 2024.

Healthy Home Energy Retrofits

The following themes show community member input on home energy retrofits to increase comfort, durability, and affordability.

Energy Efficiency Improvements - Input from community members indicated interest in and support for home energy retrofits to improve energy efficiency and update energy systems:

- 3-ply windows in every home
- Make sure enough insulation on roof-attic – keep wind/cold out in winter months
- Get suitable blinds for windows to keep heat in house in winter
- Bring older homes up to date on heating
- Total house renovation (new roof, new foundation)
- Need house renovations
- Heat pumps
- Alternative heating that is cost-effective
- Back up heating unit for the new apartment (it's cold in there, as a concerned Elder we need to do it)
- More deep energy retrofits for everyone

Concerns & Issues - Some community members cited specific concerns and issues needing to be addressed:

- Old homes that need new foundation
- Mould in houses
- Fireplaces in some homes
- Hydro costs: so high in winter, in older buildings
- How would citizens pay for energy appliances?
- Get my own house on my parents' lot
- How do I get my house condemned? ($47k new build grant)

Considerations for Elders & Families - Community members expressed the importance of a home energy retrofit program that is accessible and addresses the needs of Elders and families:

- All dependent Elders [could be] provided 1 level tiny home
- Heating and cooling availability for families and Elders
- [Focus on] Elders' homes and apartments

Low-Carbon Transportation

The following themes show community member input on the question: "***What are the top 3 things which could be done to make transportation safer, cleaner, and more affordable?***"

Bus Service: community members indicated strong support for bus service, both locally for shuttle buses between villages, and regionally for service to Terrace or other larger centres. Comments highlighted interest in offsetting the costs of personal vehicle travel, as well as providing easier access to jobs and appointments.

- *It would be nice if there was a Terrace City Bus coming to each village. As it is, it's very hard to go to doctor and specialist appointments in Terrace. I am saying this for the Elders of the Nass Valley A regular scheduled bus service between villages and to Terrace – could reduce personal vehicle use; saving fuel and wear and tear costs.*
- *Bus service to and from home and town*
- *Want bus to Gitwinksihlkw*
- *Run it as an on-demand service (no set stops)*
- *More available time/days for transportation or food supplies*
- *Each community invest in a shuttle bus – free for Elders*
- *The Village Governments should utilize their buses for workers that travel for work*
- *People would like to keep kms "down" on personal vehicles*
- *More use of our village government bus transport for cultural events and duties and home needs (getting food/wood)*
- *Shuttle bus good idea for workers*
- *Students to school*

Shared Transportation: Community members expressed interest in having access to reliable ride-sharing options like carpools or pick service.

- *Cab service in villages*
- *Have taxi service - local travel at certain times scheduled*
- *Car or van services*
- *Carpool to work – rotation basis*
- *Carpooling and ride sharing (people need to stop hitchhiking)*
- *Carpools that charge informally*

Electric Mobility: Comments showed a modest interest in electric vehicles or e-mobility, including electric cars or golf carts.

- *I totally agree with electric cars, makes the air cleaner*
- *Challenge for distance - EVs*
- *Promote electric and alternative fuel vehicles*
- *E-golf carts in village for people with mobility problems*

Figure 8: Participants in Gingolx discuss climate leadership options and priorities at Climate and Housing Week, Aug 2024.

Training and Support: Participants noted the existing barriers to transit service and shared ideas for improvements.

- *Train more young people for transport licenses*
- *Driver's training*
- *Patient bus drivers – positive attitude, responsibility, honest, knowledge of/speaking the language*
- *Issues with phones for online booking*

Other Comments:

- *Need vehicles to be available and more affordable*
- *More available and affordable transportation for everyone and Elders who cannot afford or do not have any kind of transportation*
- *Like to have Elders scenic ride*
- *Adding speed bumps in villages (cars at top speed is unsafe for children)*

Shuttle Bus Challenges

Community members were asked to provide input on challenges with taking the shuttle bus. All the barriers listed were indicated as highly to somewhat challenging, but bus frequency (how often it runs) was cited as the most challenging issue followed by accessibility and then cost.

Transportation Options

Community members were asked to indicate their level of interest in low-carbon transportation options. The most interest was for bus service between villages and to larger centres. There was also good support in increasing access to e-bikes or e-scooters with a slightly more interest in funding for individuals to purchase their own e-bike/scooter over having access to a shared fleet. For both car sharing and the use of electric vehicles, the interest was mixed.

The following list shows the options ranked according to the level of interest.

1. Improved shuttle bus service (within and between villages)
2. Improved bus service to larger centres
3. Funding to purchase an e-bike or e-scooter
4. Shared community fleet of e-bikes and/or e-scooters
5. Use of electric/hybrid vehicles
6. Car share (community fleet of shared vehicles)

Capacity Building and Two-Way Mentorship

Capacity building, both in Nisga'a Nation and the northwest region will continue to be an important part of the future success of the various climate initiatives outlined in this plan. This aspect of the work has been intentionally integrated into both the planning and implementation stages in various ways, including formalized two-way mentorships with NLG staff and external organizations that include:

- Partnering with the City of Terrace on a Building Official mentorship and capacity-sharing arrangement.
- Kaitlyn Robinson joining the Indigenous Clean Energy (ICE) "Bring It Home" accelerator as a mentee who also shared her learnings from Nisga'a Nation's activities with other participants throughout Canada.
- Working closely with CEA to co-plan and co-deliver the various climate initiatives, including a pilot of "Healthy Homes Energy Retrofits Coaching" for homeowners who wish to do a HHE Retrofit. This ongoing two-way mentorship among Nisga'a housing and CEA staff encourages cultural safety and understanding as well as technical knowledge transfer that will enable Nisga'a Nation to customize and independently support homeowners to achieve successful future retrofits as well as other climate leadership initiatives.

Capacity Building for HHE Retrofits: A Regional Approach

At time of writing more than 100 contractors, experts, government officials, community representatives, and students have now participated in training and capacity-building related to home energy retrofits in northwestern BC. Co-developed by Nisga'a Nation and CEA, the program is providing training on retrofit techniques, building science, and the integrated design process, while also facilitating information-sharing that is leading to more certainty on the true local costs of energy retrofits.

The initiative grew from the Northwest Energy Retrofit Forum in June 2024 through the Building A Legacy initiative primarily funded by BC Hydro. This was followed by a workshop aimed at identifying detailed local labour and material costs that would help communities and contractors accurately budget for energy retrofit projects.

In April 2025, more than 40 people took part in a four-day, hands-on training session, hosted by Kulspai Learning Village and instructed by BCIT, that provided instruction on constructing high-performing building envelopes for retrofits. Participants ranged from pre-apprentices to experienced contractors and included more than 25 learners from at least three First Nations: Nisga'a, Kitselas and Gitxsan.

The program is gaining accolades locally and from across Canada, often from people who have been involved with homebuilding for decades. “I’ve never seen anything like this,” said one participant. Another has called the information on local labour and material costs “the most comprehensive and up to date costing database in the country.”

Figure 9: CEA’s Gaëtane Carignan (left) and NLG’’s Kaitlyn Robinson (right) co-delivered a plenary session about Nisga’a Nation’s Climate Leadership and Energy Retrofits initiative at the North Central Local Government Association AGM and conference in Prince Rupert on May 14, 2025. Source: Terrace Standard

Go to these links for more information:

- **A CBC radio interview about the initiative**
- **Northwest Energy Retrofit Forum showcase (June 2024)**
- **Summary of the Retrofit Costing Workshop (December 2024)**
- **The 4-Day Hands-On Course (April 2025)**
- **Terrace Standard article on our NCLGA plenary session (May 2025)**

One direct outcome of the retrofits training program described above was the development of an in-person Integrated Design Process meeting in support of the energy retrofits of two duplexes owned by the Village of Gingolx. This work began in the spring of 2025 and is further explained in the Nisga'a Healthy Homes Energy Retrofits Workplan.

Figure 10: May 2025 Integrated Design Process (IDP) meeting in Nisga'a Nation for the energy retrofit of two duplexes in Gingolx – part of the ongoing climate leadership and housing work in Nisga'a Nation. Shown: Art Angus, Housing Manager, Village of Gingolx; Shawn Wiebe, Holistic Building Performance Inc.; Cody Brentzen, Envelopes First Contracting and Consulting; Kaitlyn Robinson, Climate Coordinator, NLG.

GHG Baseline Inventory: Energy Challenges and Opportunities

Nisga'a Nation is committed to measuring and GHG emissions to fulfill our Ayuukhl Nisga'a, identify opportunities, and measure our progress over time. A critical first step in this effort is the development of a comprehensive baseline GHG inventory to quantify total emissions generated within the region. Key sectors contributing to emissions include transportation, buildings, and waste from both government and community members. This inventory analyses emissions from each sector to help identify major sources of GHGs and prioritise reduction strategies. Additionally, the inventory helps distinguish between total regional emissions and for each village government. This distinction will help shape targeted policies and actions where Nation and village governments can have the greatest impact.

Nisga'a Nation plans to update the GHG inventory periodically to monitor emission trends and assess progress towards reduction targets. To ensure the consistency and ease of future reporting, the project has also produced a practical tool and methodology that enables staff to replicate and update the inventory efficiently. This initiative underscores the Nation's commitment to evidence-based action.

The main objectives of the GHG inventory are to:

- Complete a comprehensive GHG inventory using best available information originating from within the region, including a breakdown of emissions by sector (i.e. vehicles, buildings, waste), by source (e.g. gasoline, diesel, electricity, etc.), and by geographic area (i.e. by each village).
- Develop a spreadsheet that can be updated by the Nation as new information becomes available.
- Forecast GHG emissions to 2050, using Business-As-Usual (BAU) for both total and village government emissions.

Community and Government Inventories

An energy and emissions inventory illustrates where and how much energy a community uses and how the emissions are produced. The information helps communities make informed decision about where energy can be saved to reduce emissions and cost, planning for a more sustainable future. It can guide local policies, support climate action plans, and help secure funding for clean energy projects. It also allows communities to track progress over time and measure the impact of their efforts.

A spreadsheet-based inventory tool has also been developed specifically for the Nisga'a Nation for an easier method to compile energy-related information, prepare visually effective charts, and update through time.

The baseline inventory results presented here are for the year 2023. The inventory provides data on energy use, emissions, and cost from community members, Village governments, and NLG. Village governments include those from four villages – Gitlaxt'aamiks, Gingolx, Laxgalts'ap, and Gitwinksihlkw. See Appendix D for a full description of the methodology and assumptions.

Table 2 provides a snapshot of the total energy consumption, GHG emissions, and energy expenditures in 2023.

Table 2: Nisga'a Nation's total energy consumption, GHG emissions, and energy expenditures in 2023.

Total energy consumption	205,508 GJ
Total GHG emissions	9,253 tonnes of CO_2e
Total energy expenditures	$8,517,846

Table 3 outlines energy consumption, GHG emissions, and energy expenditures by village, separated by community and government.

Table 3: Nisga'a Nation's community and government energy consumption, GHG emissions, and energy expenditures in 2023 by village.

	Total energy use (GJ)	Total emissions (tonnes of CO_2e)	Total energy costs
Community inventory			
Village of Gitlaxt'aamiks	71,996	3,414	$2,983,987
Village of Gingolx	38,607	1,830	$1,600,109
Village of Laxgalts'ap	47,476	2,251	$1,967,701
Village of Gitwinksihlkw	15,130	717	$627,070
Government inventory			
Village of Gitlaxt'aamiks	2,549	177	$134,651
Village of Gingolx	7,310	249	$462,261
Village of Laxgalts'ap	3,869	12	$130,697
Village of Gitwinksihlkw	6,509	269	$295,663
Nisga'a Lisims Gov. (NLG)	11,613	332	$462,261

For community energy use, GHG emissions, and energy expenditures, villages with a larger number of households tend to show higher values due to the methodology used. To more accurately represent the energy profile of each village, future data collection should aim for larger and more representative sample sizes when gathering information on energy use and costs from Nisga'a Nation community members.

Regarding the government inventory, it is essential to collect and report energy use and costs across all fuel types and sectors. For instance, the Village of Gitlaxt'aamiks did not report electricity bills, and the Village of Laxgalts'ap did not submit their fleet list. These omissions have led to a skewed government emission to energy use conversion ratio - much higher for the Village of Gitlaxt'aamiks and lower for the Village of Laxgalts'ap. This relationship is illustrated in Figure 10, which shows that common mobility fuels like gasoline and diesel have a higher emission to energy conversion ratio. The figure also highlights that electrification is among the most effective strategies for reducing emissions.

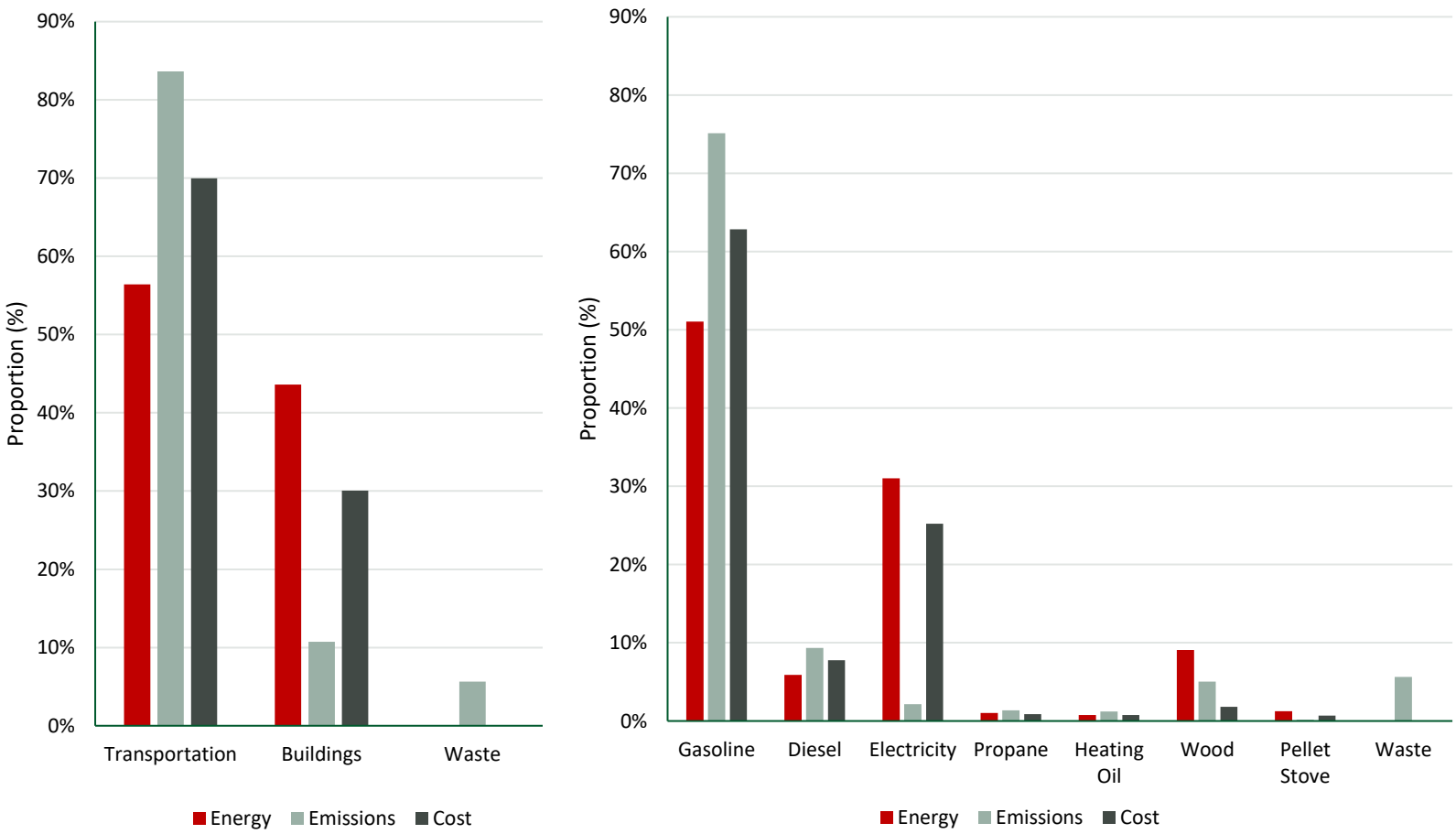


Figure 11: Proportion of energy use, emissions, and cost by sector (left) and source (right) for the Nisga'a Nation.

The values include energy from the community, Village governments, and NLG (Figure 11). Community member emissions contribute to most of the total emissions (89%), followed by Village governments (8%) and NLG emissions (3%). See Appendix D: Community and Village Government Emissions by Village for the breakdown of community members and Village government emissions for each village.

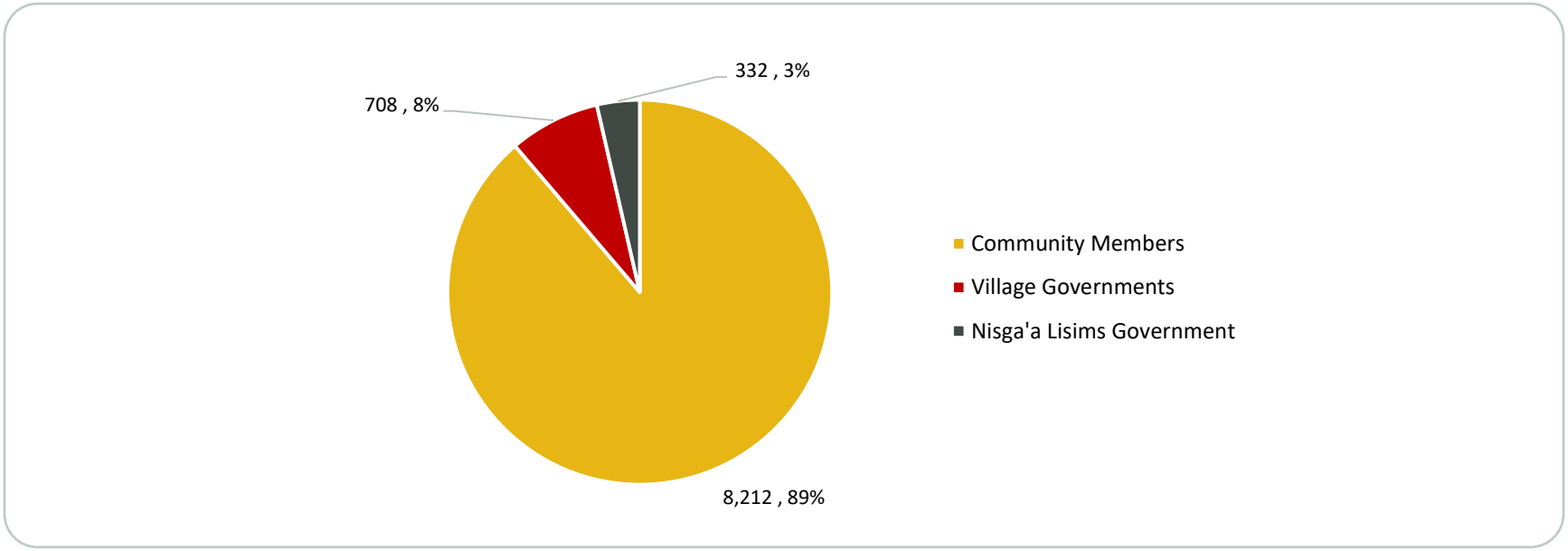


Figure 12: 2023 Nisga'a Nation Emissions (tCO_2e) by group.

The measurements of gigajoules (GJ) and tonnes of carbon dioxide equivalent (tCO_2e) are used throughout this report. GJ is used to measure energy, such as the energy that buildings and transportation rely on. These forms of energy produce emissions, typically displayed as tCO_2e. The "e" in tCO_2e stands for equivalent, which is used because different GHGs have different global warming potentials and converting all GHGs to the equivalent global warming in CO_2 allows for one standard unit to be used.

2023 Government Energy & Emissions Inventory

Government Energy & Emissions for the year 2023 was calculated by referring to various electricity and propane bills, as well as the fleet assessment from village governments and the NLG. There are four village governments, including those from Gitlaxt'aamiks, Gingolx, Laxgalts'ap, and Gitwinksihlkw.

Table 4 provides a snapshot of the total government energy consumption, GHG emissions, and energy expenditures in 2023.

Table 4: Total government energy consumption, GHG emissions, and energy expenditures in 2023.

Total energy consumption	31,850 GJ
Total GHG emissions	1,401 tonnes of CO_2e
Total energy expenditures	$1,338,980

Figure 12 presents a Sankey diagram illustrating the total energy inputs and outputs for Nisga'a Nation in 2023. That year, approximately 32,000 GJ of energy were generated from four different sources to support government transportation and building operations. This energy use resulted in around 1,400 tonnes of CO_2e emissions and incurred costs of over $1.3 million to the community.

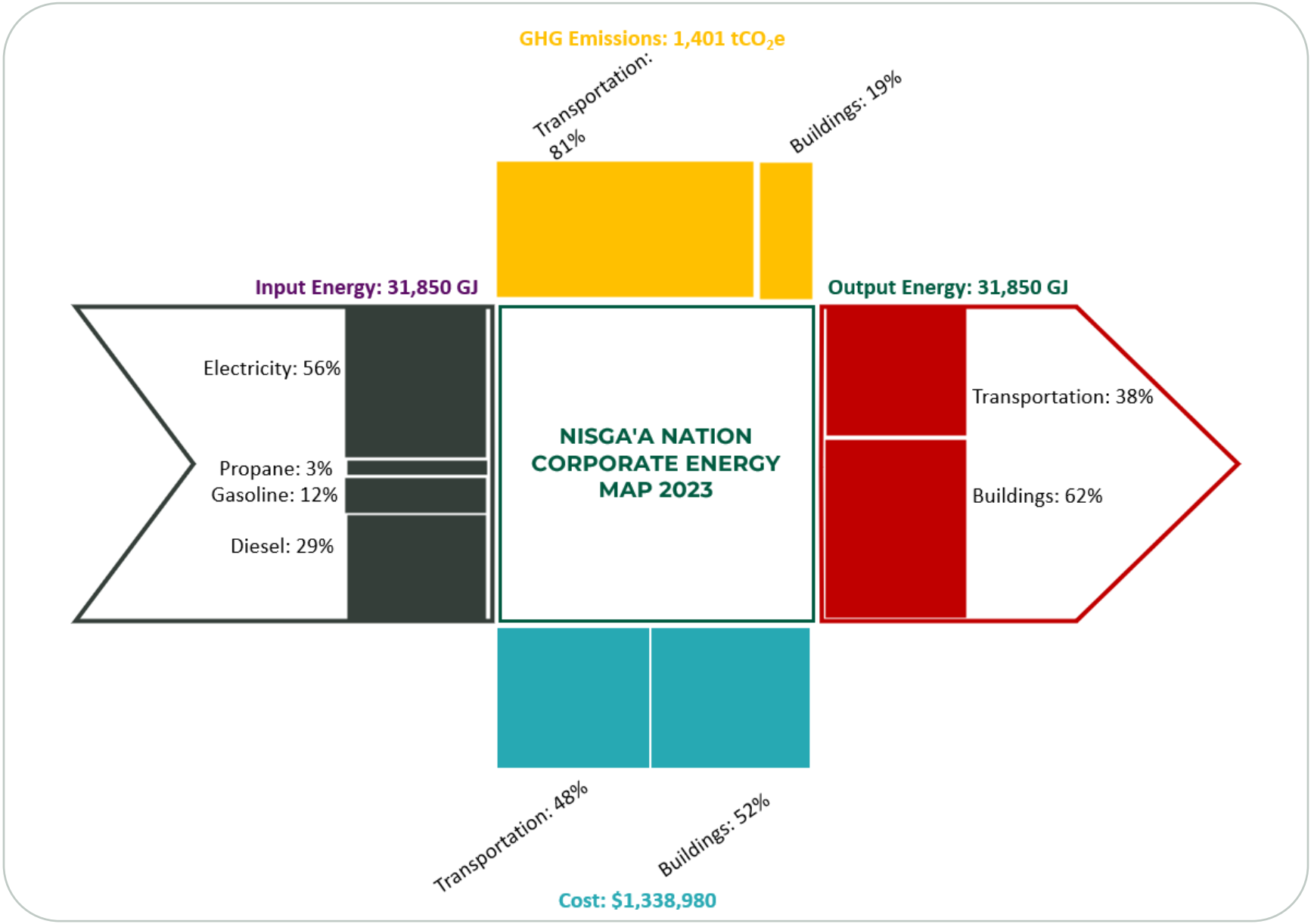


Figure 13: Nisga'a Nation Sankey Diagram for its government inventory.

Village of Gitlaxt'aamiks

Government Energy Use

2023 energy use data was analysed by sector and source, as shown in Figures 13 and 14 below. The total energy use in the Village of Gitlaxt'aamiks was just over 2,549 GJ.

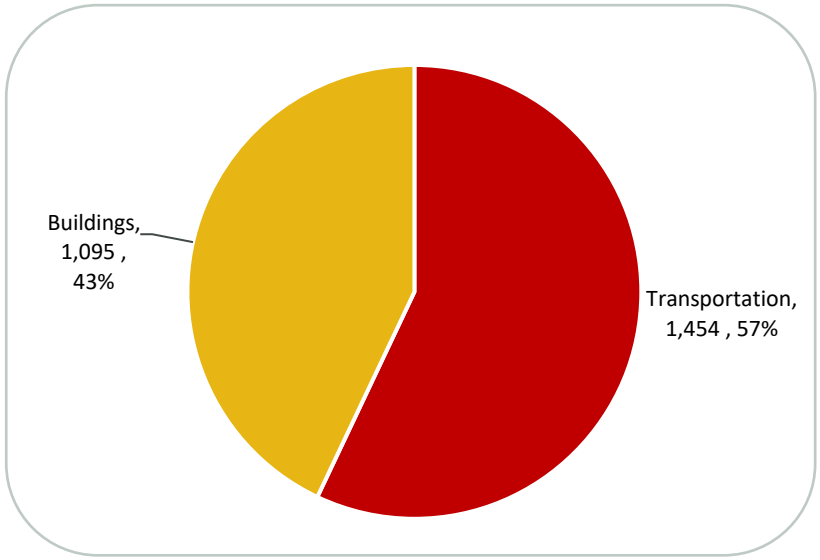


Figure 15: 2023 Village of Gitlaxt'aamiks government energy use (GJ) by sector.

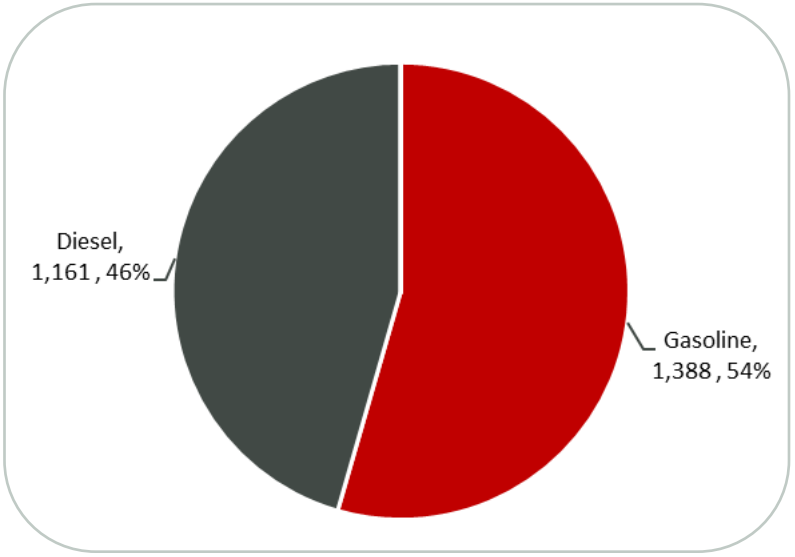


Figure 14: 2023 Village of Gitlaxt'aamiks government energy use (GJ) by source.

There was no electricity data available from this community, which is why the data shows that only gasoline and diesel are the sources used in both buildings and transportation. More than half of the energy use comes from transportation (57%). While there is more gasoline used in buildings (54%), diesel is the common fuel type for transportation use (46%).

Government Emissions

GHG emissions, in tonnes of carbon dioxide equivalent (tCO_2e), split by sector are shown in Figure 15 and by source in Figure 16. Total GHG emissions in the Gitlaxt'aamiks Government for the year 2023 was 177 tCO_2e.

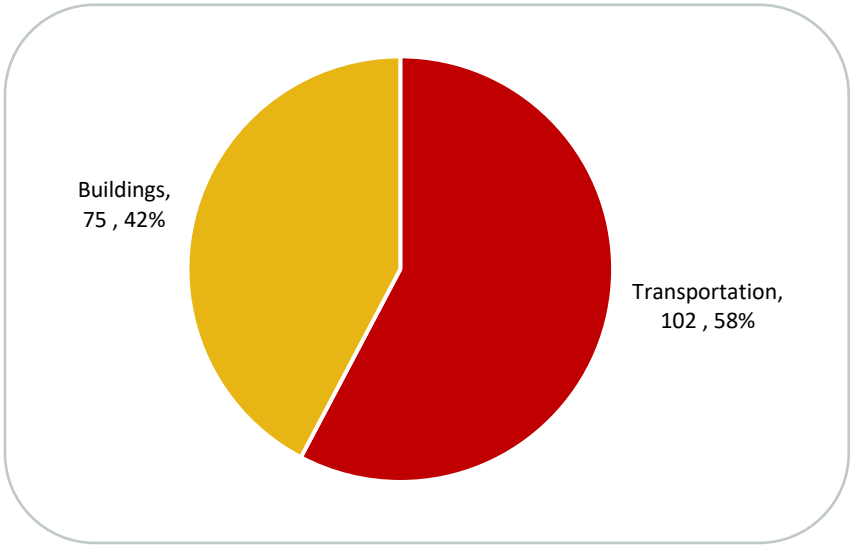


Figure 17: 2023 Village of Gitlaxt'aamiks government emissions (tCO2e) by sector.

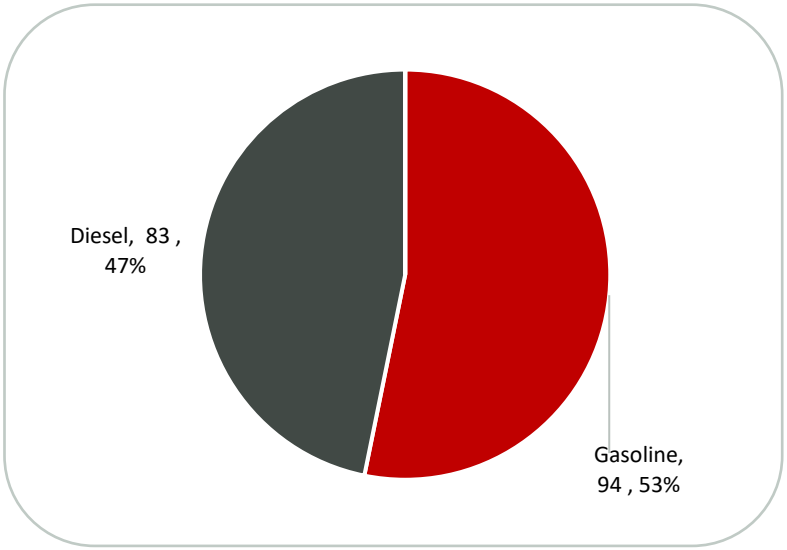


Figure 16: 2023 Village of Gitlaxt'aamiks government emissions (tCO_2e) by source.

The distribution of emissions by sector and by source remains similar to the energy use. This is because there is only gasoline and diesel data available – the two fuel types with very similar energy use to emissions conversion factors. This suggests that switching from diesel to gasoline and vice versa will have minimal impact on government emissions.

Government Costs

Government energy costs ($) are shown by sector in Figure 17 and by source in Figure 18. In 2023, the total energy costs were nearly $135 thousand.

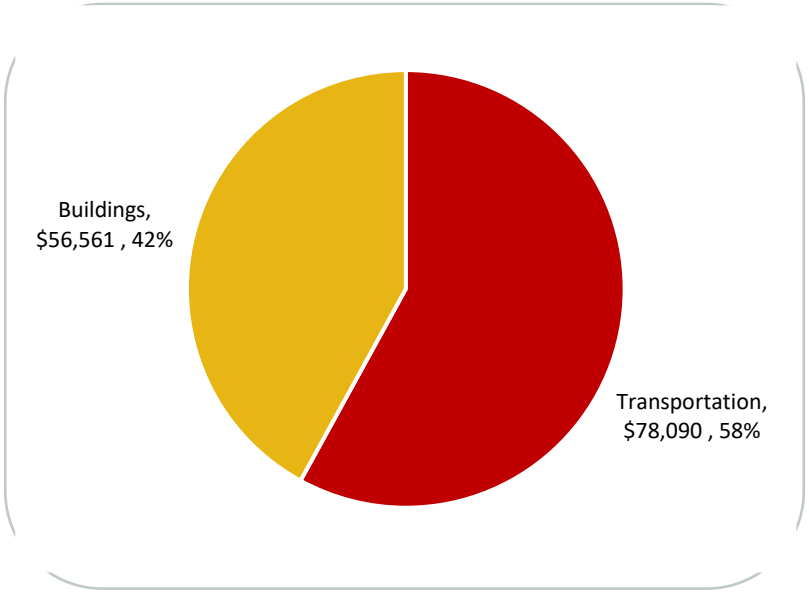


Figure 18: 2023 Village of Gitlaxt'aamiks government costs by sector.

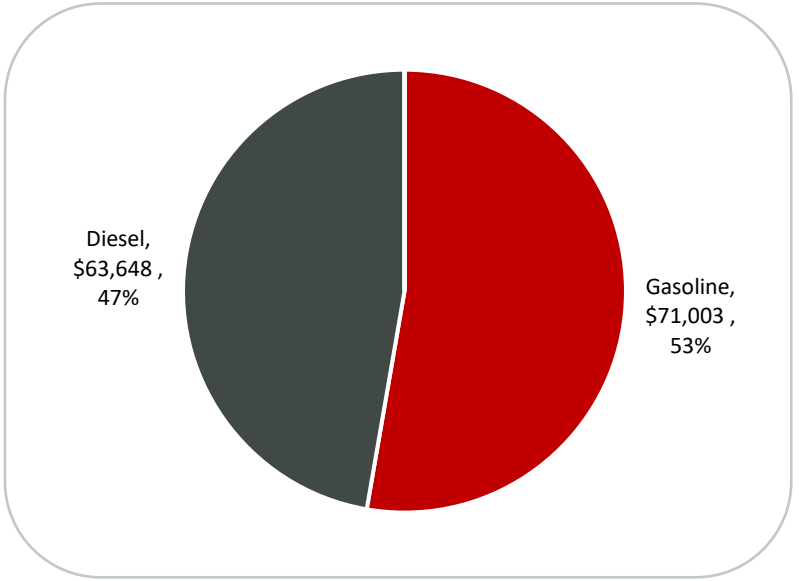


Figure 19: 2023 Village of Gitlaxt'aamiks government costs by source.

The distribution of cost by sector and by source remains similar to the energy use. This is because there is only gasoline and diesel data available – the two fuel types with very similar cost per litre of fuel. This suggests that switching from diesel to gasoline and vice versa will have minimal impact on government energy costs.

Village of Gingolx

Government Energy Use

2023 energy use data was analysed by fuel type and by sector, as shown in Figure 19 and Figure 20 below. The total energy use in the Village of Gingolx was just over 7,310 GJ.

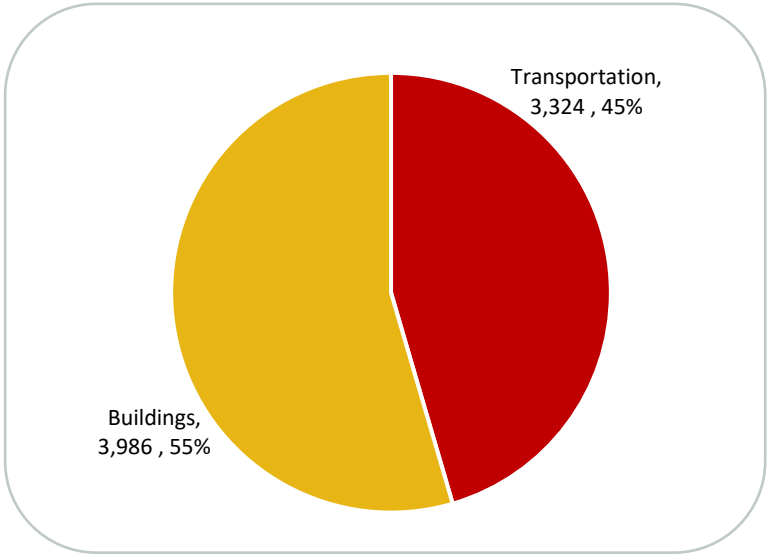


Figure 20: 2023 Village of Gingolx government energy use (GJ) by sector.

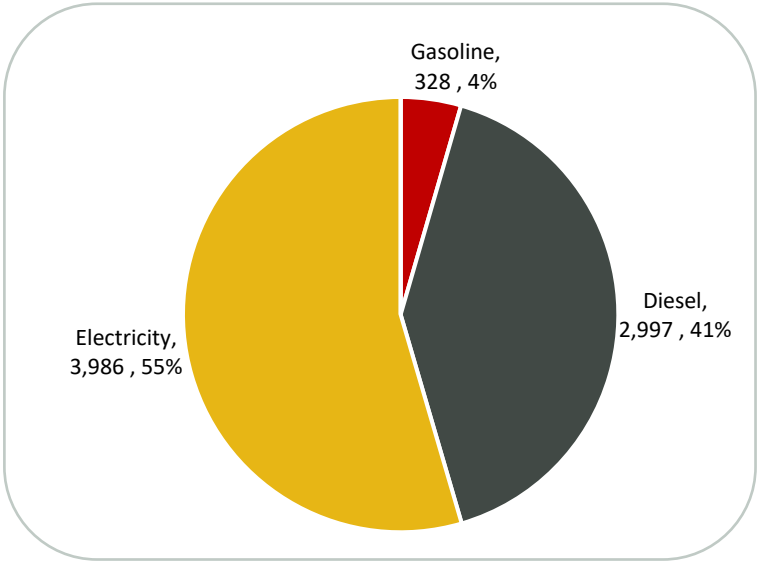


Figure 21: 2023 Village of Gingolx government energy use (GJ) by source.

More than half of government energy use comes from electricity used in building (55%), which is the only utility serving buildings. The remaining 45% accounts for transportation energy use which is primarily fuelled by diesel (90% of total transportation energy use), followed by gasoline (10% of total transportation energy use).

Government Emissions

GHG emissions, in tonnes of carbon dioxide equivalent (tCO2e), split by sector are shown in Figure 21 and by source in Figure 22. Total GHG emissions in the Gingolx government for the year 2023 was 249 tCO_2e.

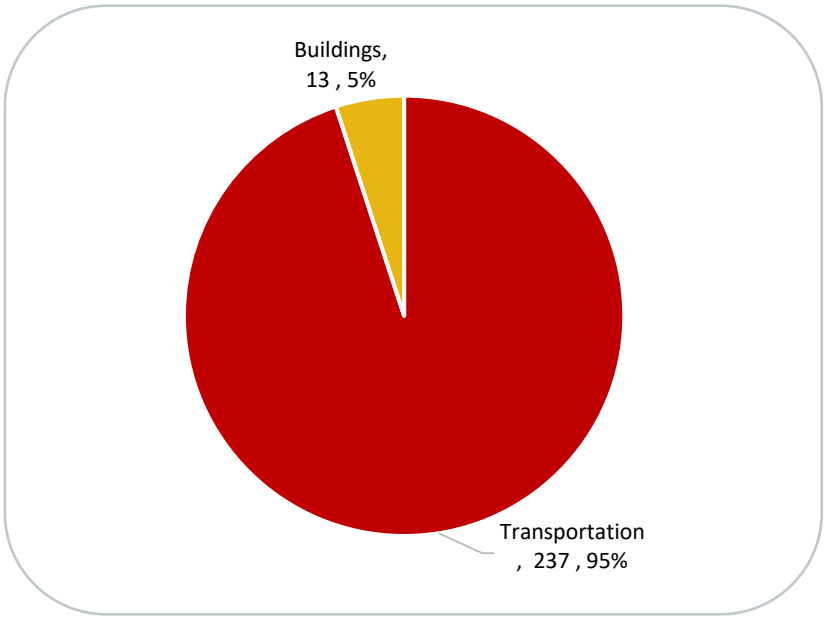


Figure 23: 2023 Village of Gingolx government emissions (tCO2e) by sector.

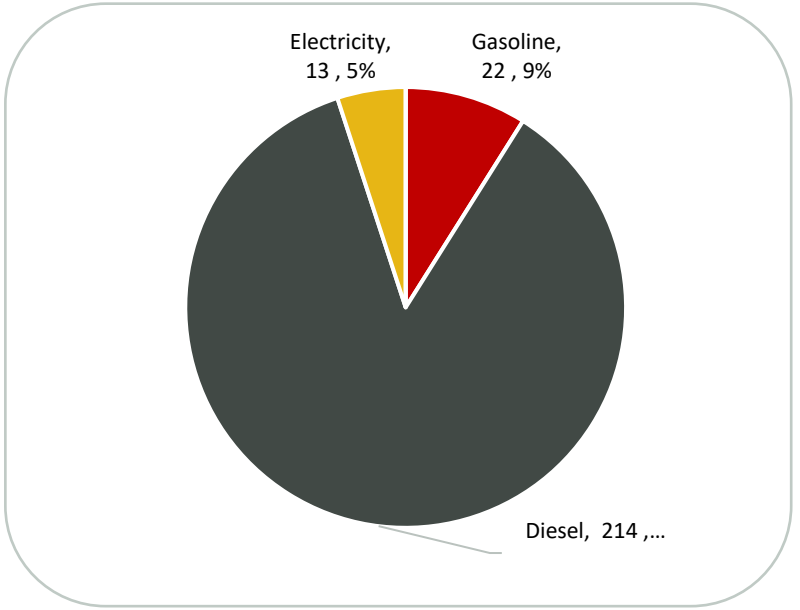


Figure 22: 2023 Village of Gingolx government emissions (tCO_2e) by source.

Although gasoline and diesel make up only 45% of the total government energy use, they are responsible for the majority, 95%, of emissions. On the other hand, electricity accounts for 55% of energy use but contributes just 5% of total emissions. This is because the emissions intensity is significantly lower for electricity compared to fossil fuels like gasoline and diesel.

Government Costs

Government energy costs ($) are shown by sector in Figure 23 and by source in Figure 24. In 2023, the total energy costs were nearly $316 thousand.

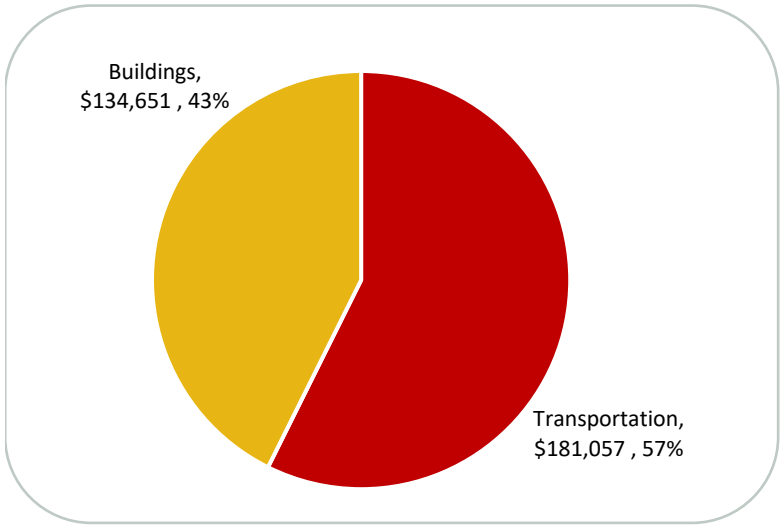


Figure 25: 2023 Village of Gingolx government costs by sector.

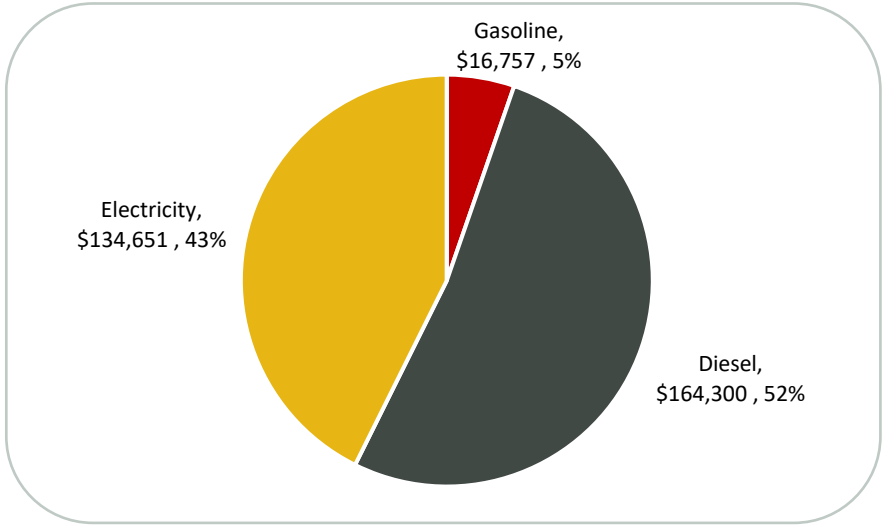


Figure 24: 2023 Village of Gingolx government costs by source.

Although gasoline and diesel account for only 45% of total energy use, they contribute to 57% of the community's energy costs. In contrast, electricity, which makes up 55% of energy use, represents just 43% of total costs. These figures suggest that electrifying both building and transportation fuel sources would not only reduce emissions but also cost effective.

Village of Laxgalts'ap

Government Energy Use, Emissions and Cost

For this report, building electricity data was the only available data for the Village of Laxgalts'ap. With this in mind, Figures 25 and 26 show that the total energy use in the village government was 3,869 GJ. This translated to 12 tCO_2e and nearly $131 thousand.

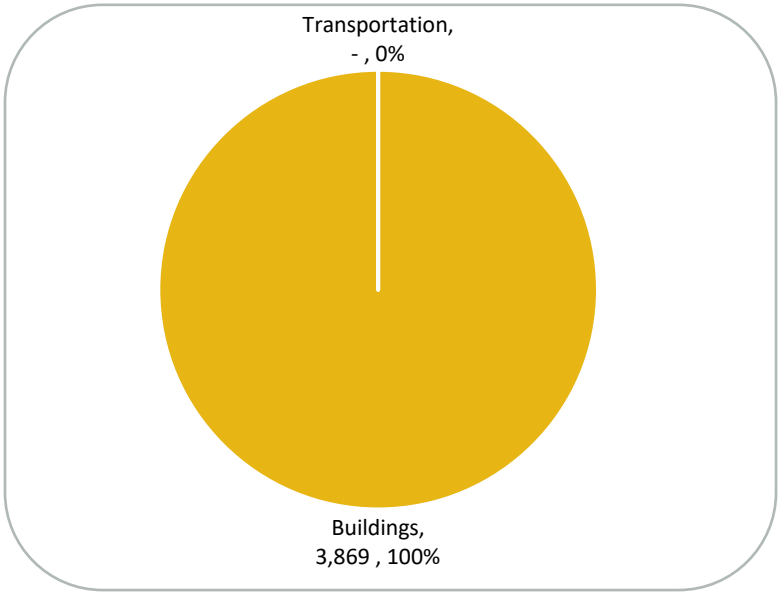


Figure 27: 2023 Village of Laxgalts'ap government costs by sector.

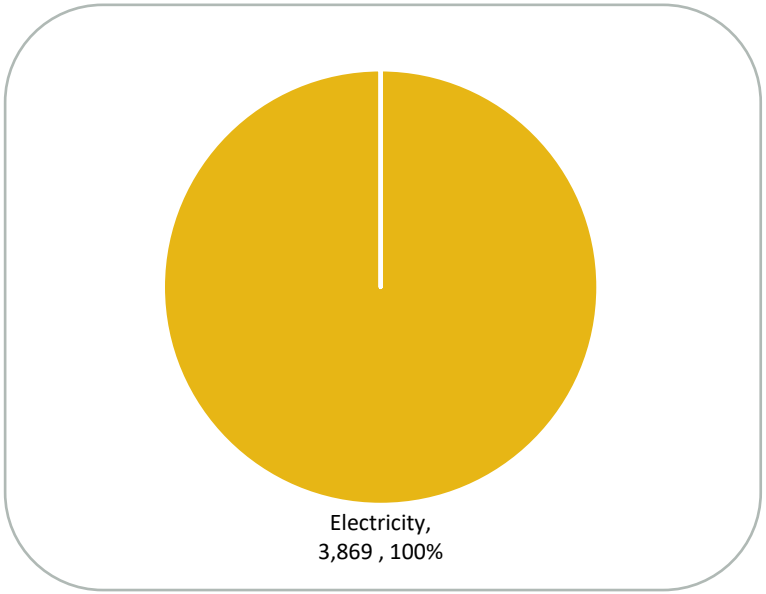


Figure 26: 2023 Village of Laxgalts'ap government costs by source.

With additional data that also captures transportation and other sources of building energy, a more thorough analysis can be conducted.

Village of Gitwinksihlkw

Government Energy Use

2023 energy use data was analysed by sector and by source, as shown in Figure 27 and Figure 28 below. The total energy use in the Village of Gitwinksihlkw was just over 6,509 GJ.

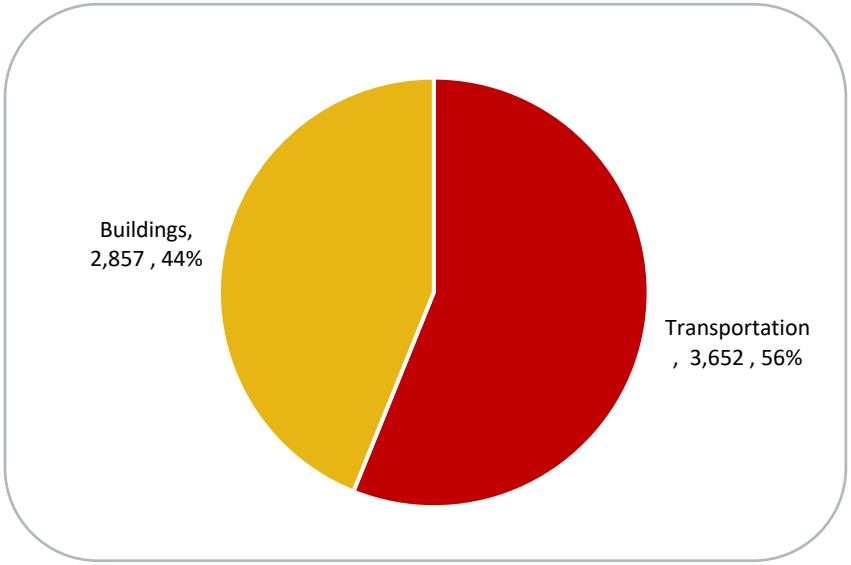


Figure 29: 2023 Village of Gitwinksihlkw government energy use (GJ) by sector.

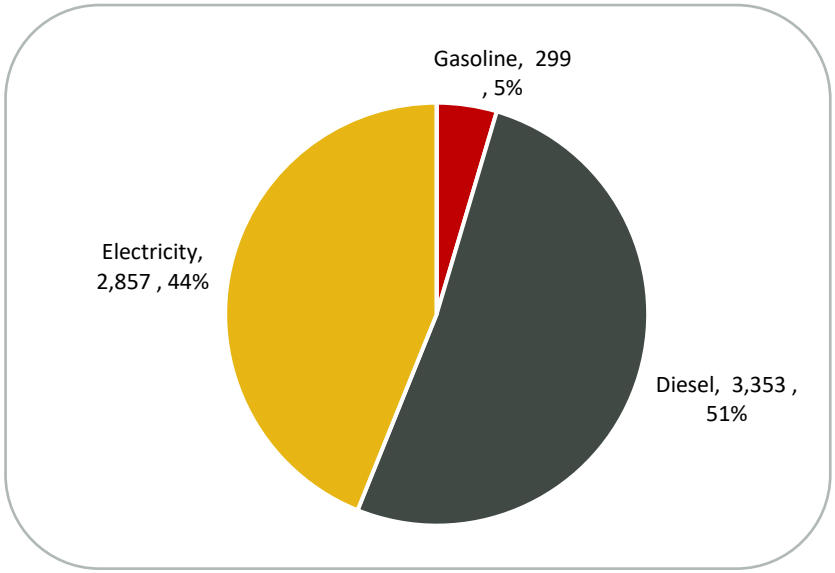


Figure 28: 2023 Village of Gitwinksihlkw government energy use (GJ) by source.

More than half of energy use comes from transportation (56%) which includes gasoline and diesel. The remaining 44% of the total energy use originates from building electricity use.

Government Emissions

GHG emissions, in tonnes of carbon dioxide equivalent (tCO_2e), *split by sector are shown in Figure 29 and by source in Figure 30. Total GHG emissions in Gitwinksihlkw Village government for the year 2023 was 269* tCO_2e.

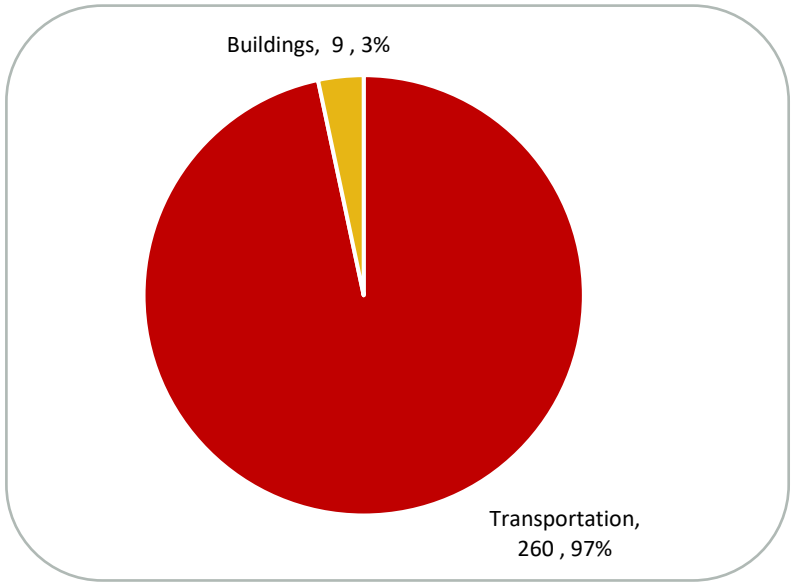


Figure 31: 2023 Village of Gitwinksihlkw government emissions (tCO2e) by sector.

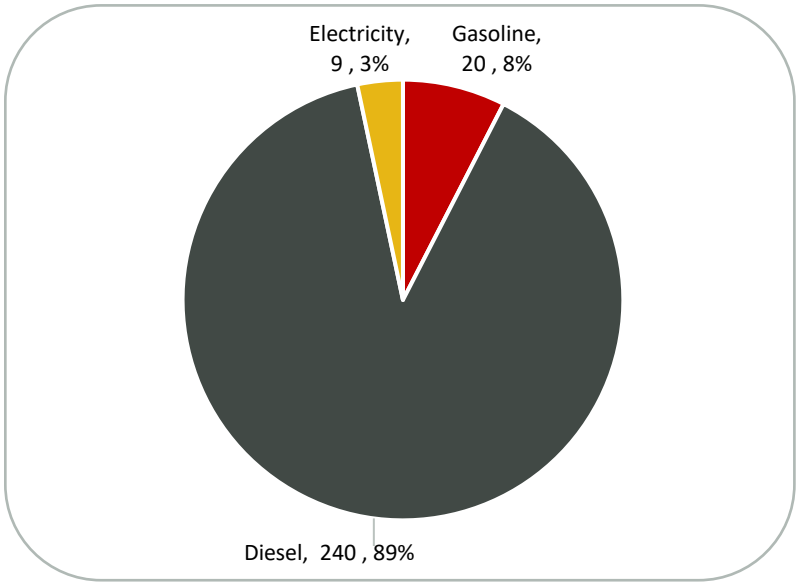


Figure 30: 2023 Village of Gitwinksihlkw government emissions (tCO_2e) by source.

Despite gasoline and diesel accounting for 56% of energy use, they contribute to 97% of emissions. On the other hand, while electricity contributed to 44% of energy use, they are only 3% of the total emissions in the community. This is because electricity is much more efficient as an energy source, in terms of emissions, than gasoline and diesel.

Government Costs

Government energy costs ($) are shown by sector in Figure 31 and by source in Figure 32. In 2023, the total energy costs were over $295 thousand.

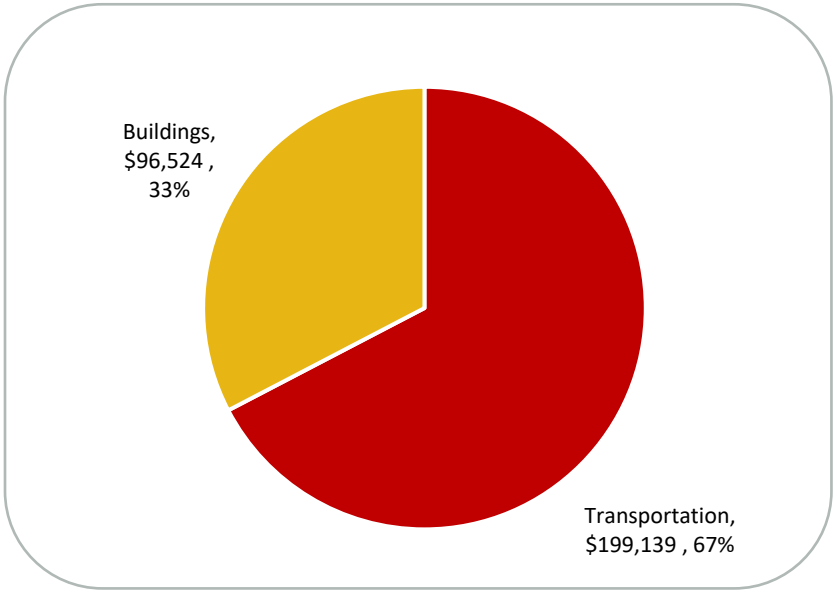


Figure 33: 2023 Village of Gitwinksihlkw government energy costs by sector.

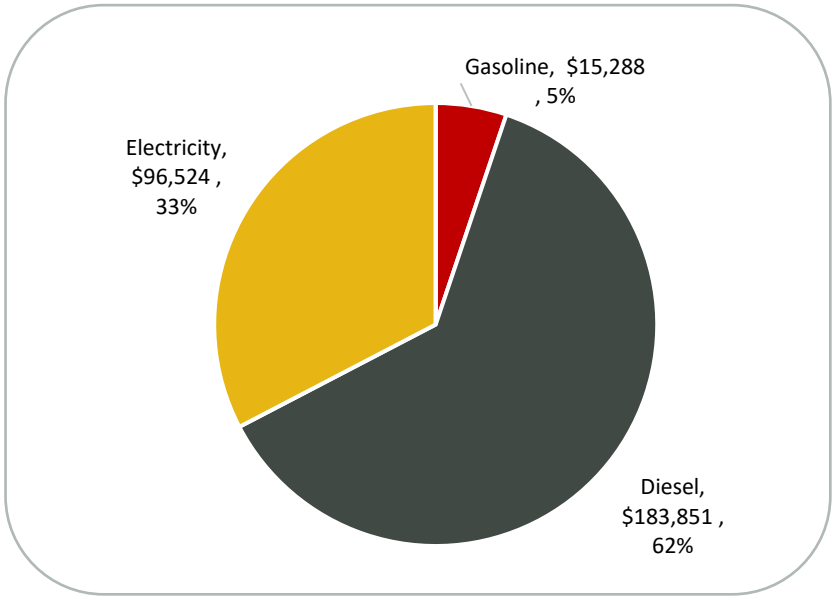


Figure 32: 2023 Village of Gitwinksihlkw government energy costs by source.

Despite gasoline and diesel only accounting for 56% of energy use, they contribute to 67% of costs. On the other hand, while electricity contributed to 44% of energy use, they make up 33% of the total cost of the total costs in the community. These values suggest that electrifying building and transportation fuel sources are less emission intensive and more cost-effective.

2023 Community Energy & Emissions Inventory

A survey was crafted to understand energy used in residential buildings and personal vehicles, as well as the amount of waste community members dispose. There were survey responses from all four villages - Gitlaxt'aamiks, Gingolx, Laxgalts'ap, and Gitwinksihlkw. The total community energy use, emissions, and cost were estimated by first calculating the average fuel consumption per household, then applying the number of households in each village. See Appendix D for a detailed methodology. As a result, while different villages have their own community energy use, emissions, and cost, the proportion of those by sector (i.e. transportation, buildings, and waste) and source (i.e. gasoline, diesel, electricity, etc.) are the same.

Table 5 provides a snapshot of the total government energy consumption, GHG emissions, and energy expenditures in 2023.

Table 5: Total community energy consumption, GHG emissions, and energy expenditures in 2023

Total energy consumption	173,208 GJ
Total GHG emissions	8,212 tonnes of CO_2e
Total energy expenditures	$7,178,866

Figure 33 presents a Sankey diagram illustrating the energy inputs and outputs for Nisga'a Nation in 2023. That year, approximately 108,000 GJ of energy were generated from seven different sources to support community transportation and building operations. This energy use resulted in approximately 8,200 tonnes of CO_2e emissions and incurred costs of over $7,100 to the community.

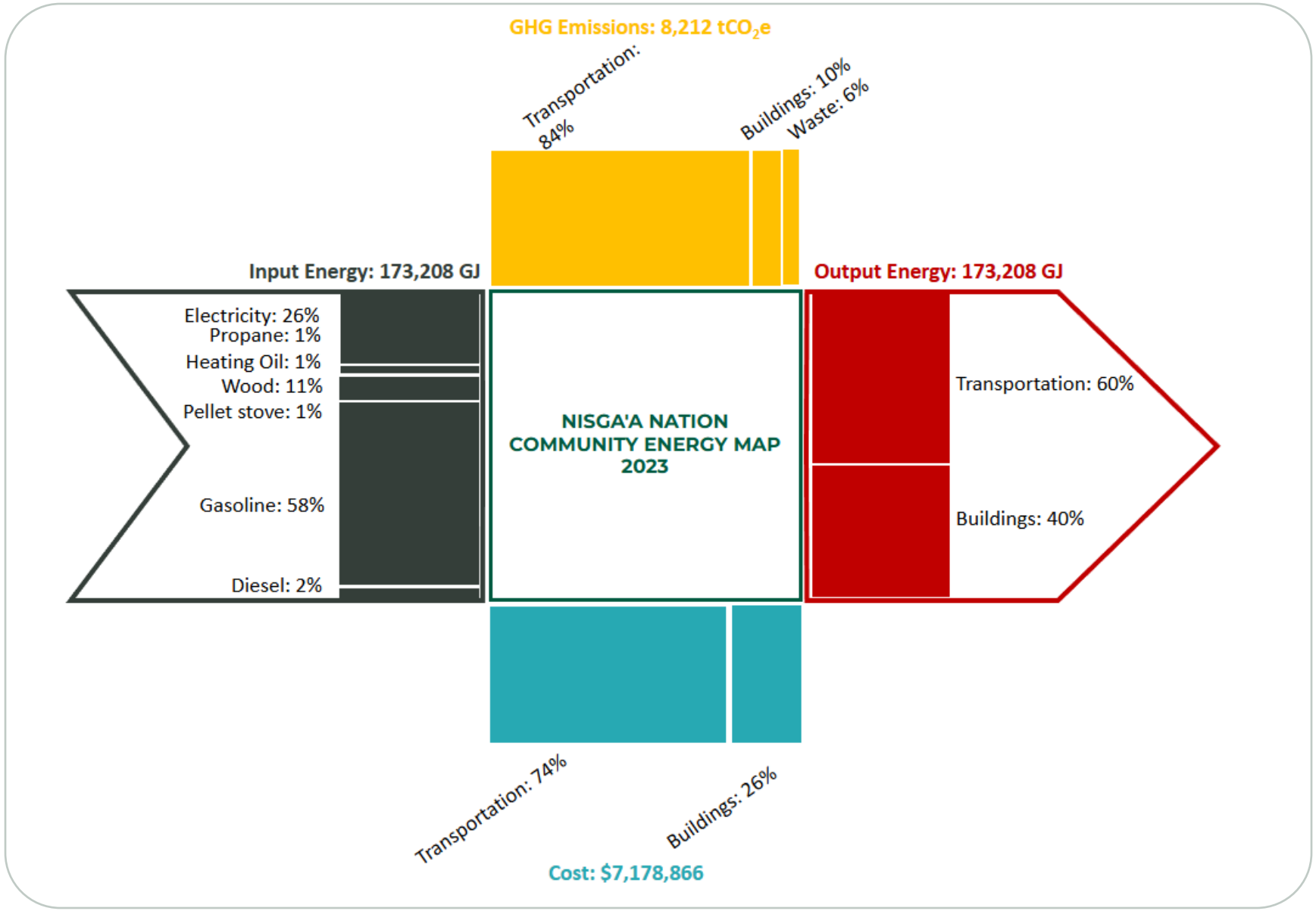


Figure 34: Nisga'a Nation Sankey Diagram for its community inventory.

Community Energy Use

2023 energy use data was analysed by sector and by source, as shown in Figure 34 and Figure 35 below. The total energy use was nearly 72,000 GJ in the Village of Gitlaxt'aamiks, over 38,600 GJ in Gingolx, nearly 47,500 GJ in Laxgalts'ap, and over 15,100 GJ in Gitwinksihlkw. As a result, the Nisga'a Nation's total energy use was over 170 thousand GJ (Figure 33). More than half of the energy use comes from transportation (60%) (Figure 34), in which the majority are gasoline-fuelled vehicles.

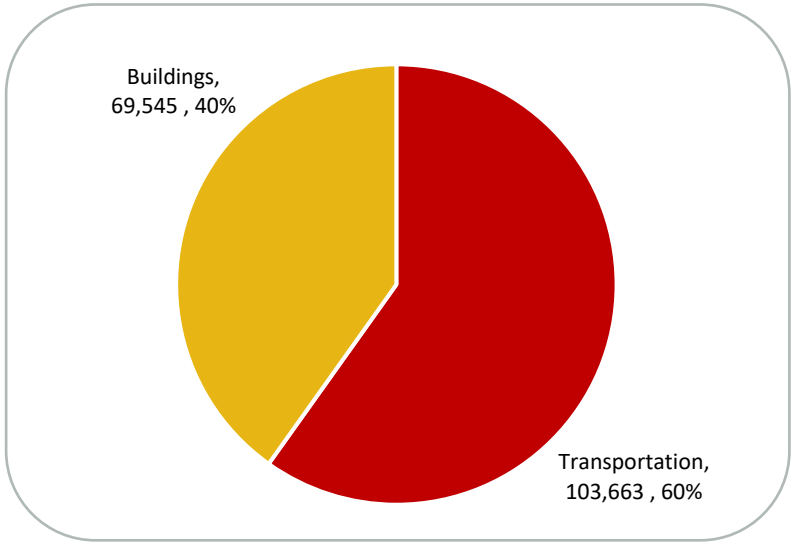


Figure 36: 2023 total community energy use (GJ) by sector.

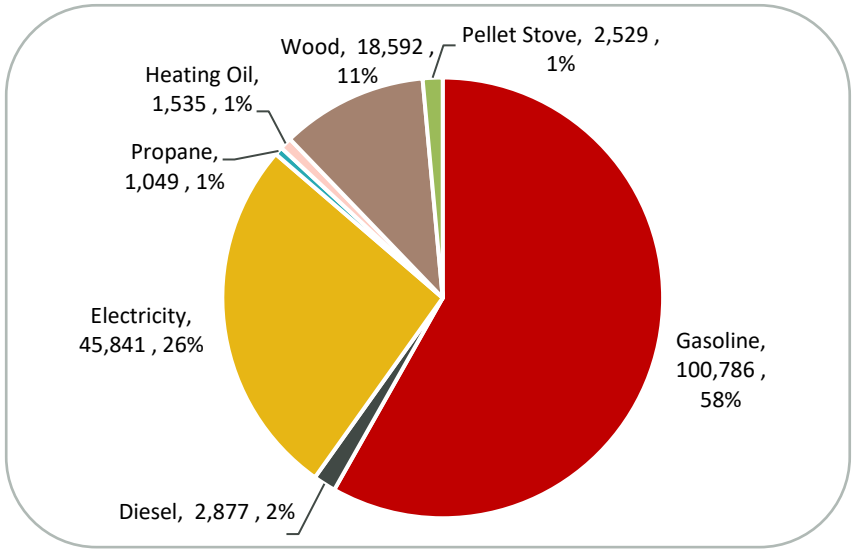


Figure 36: 2023 total community energy use (GJ) by source.

The remaining 40% is energy use for building operations, in which electricity (26%) and wood (11%) are primary sources of energy.

Community Emissions

GHG emissions, in tonnes of carbon dioxide equivalent (tCO2e), split by sector are shown in Figure 36 and by source in Figure 37. The total GHG emissions was over 3,400 tCO_2e in the Village of Gitlaxt'aamiks, nearly 1,850 tCO_2e in Gingolx, over 2,250 tCO_2e in Laxgalts'ap, and nearly 720 tCO_2e in Gitwinksihlkw. As a result, the Nisga'a Nation's total community GHG emissions was nearly 8,200 tCO_2e.

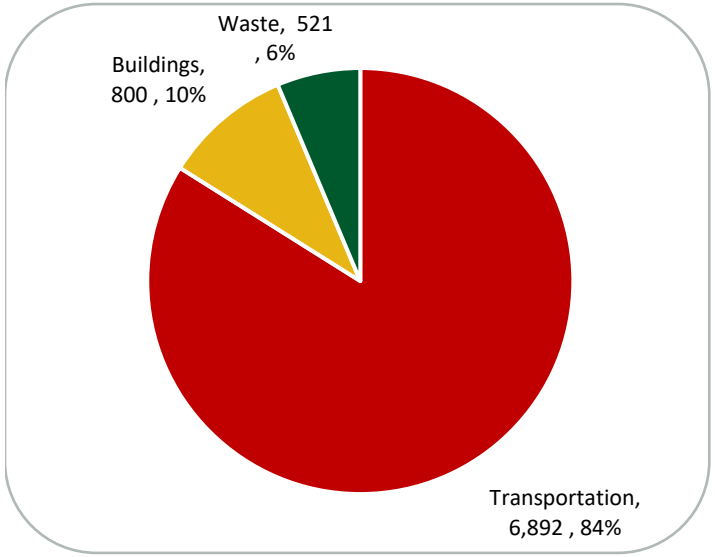


Figure 37: 2023 total community emissions (tCO_2e) by sector.

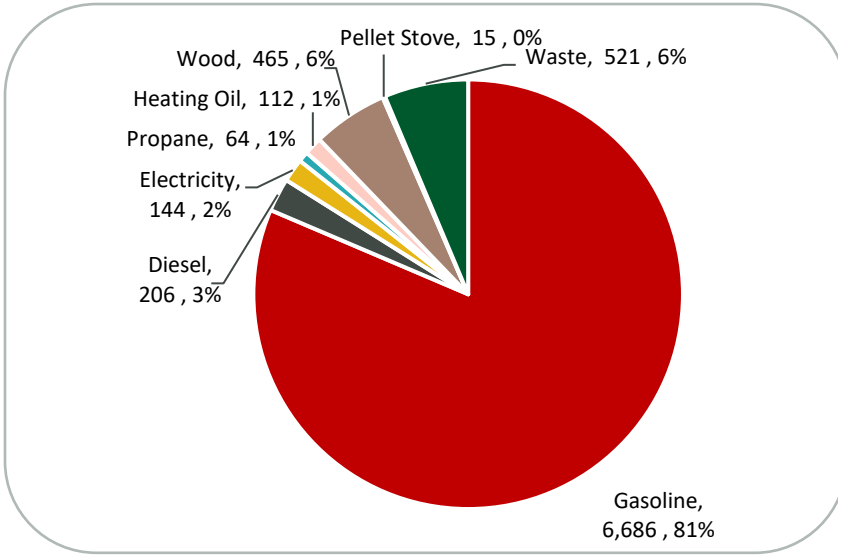


Figure 38: 2023 total community emissions (tCO2e) by source.

Despite gasoline and diesel accounting for 60% of energy use, they contribute to 84% of emissions. On the other hand, while electricity contributed to 26% of total energy use, it is only 2% of the total emissions in the community. This is because electricity is much more efficient as an energy source, in terms of emissions, than mobility fuels like gasoline and diesel. As a result, the majority of emissions comes from transportation (84%), and less from buildings (10%) and waste (6%).

Community Costs

Government energy costs ($) are shown by sector in Figure 38 and by source in Figure 39. In 2023, Nisga'a Nations' total community energy costs were just over $7.1 million: nearly $3 million in the Village of Gitlaxt'aamiks, approximately $1.6 million in Gingolx, just over $1.9 million in Laxgalts'ap, and nearly $730 thousand in Gitwinksihlkw.

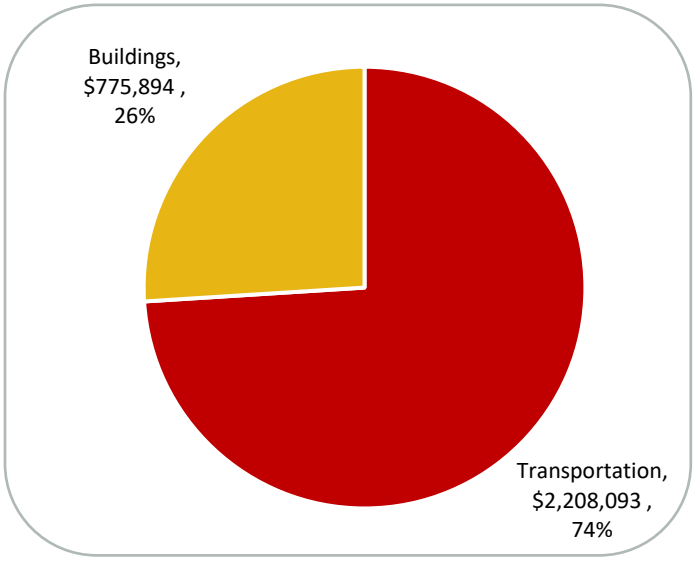


Figure 39: 2023 total community emissions (tCO_2e) by sector.

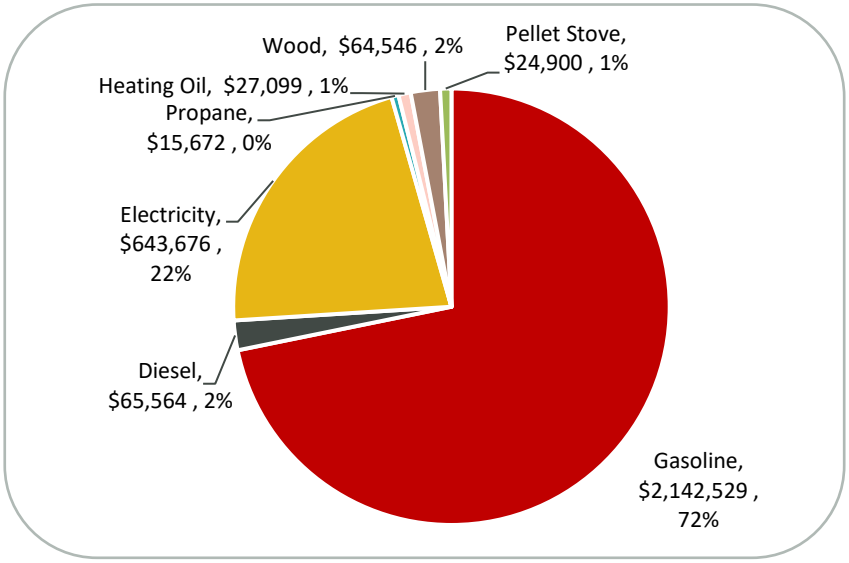


Figure 40: 2023 total community emissions (tCO2e) by source.

Despite gasoline and diesel accounting for 60% of energy use, they contribute to 74% of the total community energy costs. On the other hand, while electricity contributed to 81% of energy use, it is 74% of the total emissions in the community. These values suggest that if the Nation electrified a portion of its transportation this would be more cost-effective and less emissions intensive.

Business-As-Usual Projections

Inventory data from 2023 is shown in this section, with Business-As-Usual (BAU) projections through 2050.

What does 'Business As Usual' mean?

Business As Usual, or BAU, is a way of describing what is estimated to happen to community emissions if no further action to decrease emissions is taken, beyond what they are already doing and plan to do. A number of factors are used to develop BAU emissions scenarios, population growth being one of the most important considerations. As the number of people increase in a community, more buildings are needed and more vehicles are driven on roads.

Other considerations that were taken into account to develop the BAU emissions scenario include:

- **Changing climate patterns—warmer winters and hotter summers will continue to change the way that energy is consumed in buildings i.e. more cooling in the summer and less heating in the winter.**
  - **Likely future impacts of policies already adopted by other orders of government, such as:**
    - **Renewable and low carbon fuel standards**
    - **Vehicle tailpipe emissions standards**
    - **Federal Zero-Emission Vehicle (ZEV) sales mandates requiring 26% of new light-duty vehicle sales to be ZEVs by 2026, 90% by 2030, and 100% by 2035**
  - **Provincial ZEV sales mandates requiring 30% of new medium- and heavy-duty vehicle sales to be ZEVs by 2030 and 100% by 2040**
    - **Increasing renewable energy supply in the electricity grid**

Figures 40 and 41 show Nisga'a Nation's Business-As-Usual projections by sector and source, using a population growth rate of -0.92% (Appendix D).[2] It includes community and government emissions from the four villages and the Nisga'a Lisims Government.

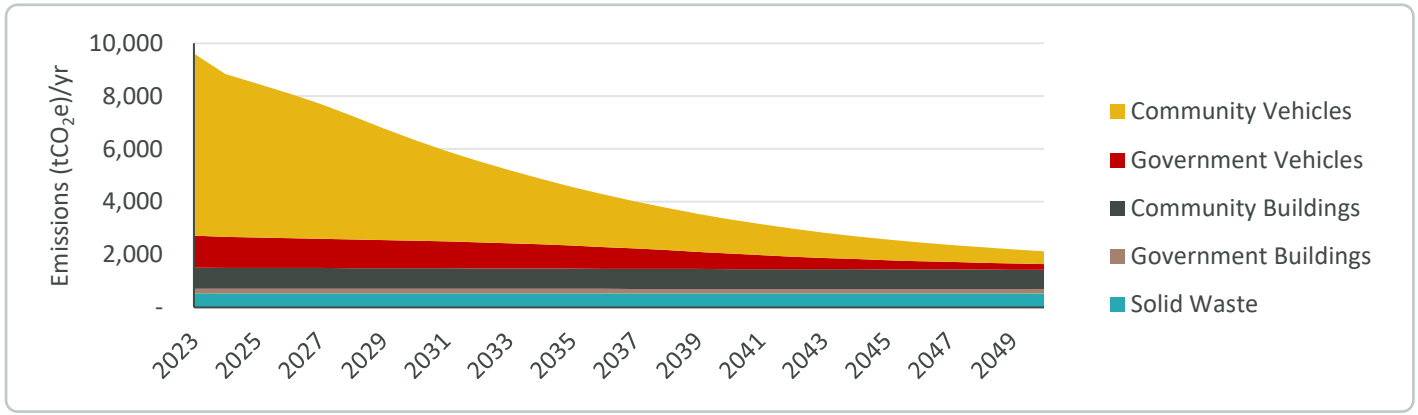


Figure 41: Inventory and BAU projections by sector.

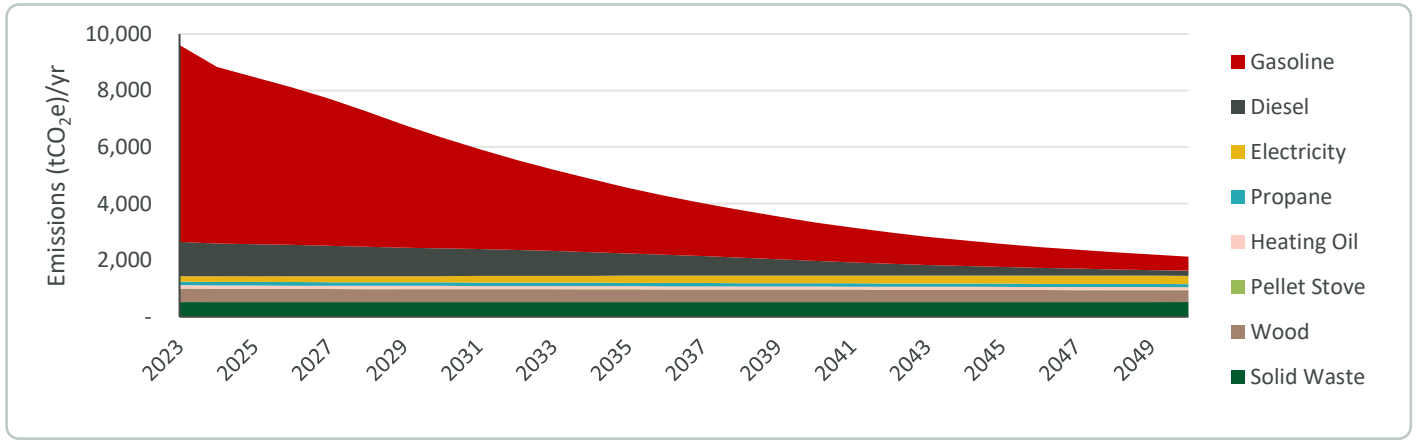


Figure 42: Inventory and BAU projections by source.

The BAU projections show that the emissions are projected to drop from 9,612 tCO_2e in 2023 to 2,130 tCO_2e in 2050, a reduction of 78%. Note that the reductions in the BAU projections incorporate federal and provincial actions, particularly the Federal zero-emissions vehicle mandate. This accounts for the rapid drop in community vehicles from 2023 to 2050.

[2] Population growth rate estimated from the Nisga'a Housing Needs Report. Nisga'a Lisims Government. (2022, April). *Housing needs report*. https://www.nisgaanation.ca/wp-content/uploads/2025/01/Nisgaa-Lisims-Government-Housing-Needs-Report-April-2022.pdf

Village of Gitlaxt'aamiks

Figures 42 and 43 show Business-As-Usual projections by sector and source for Gitlaxt'aamiks, using a population growth rate of 0.32% (Appendix D).

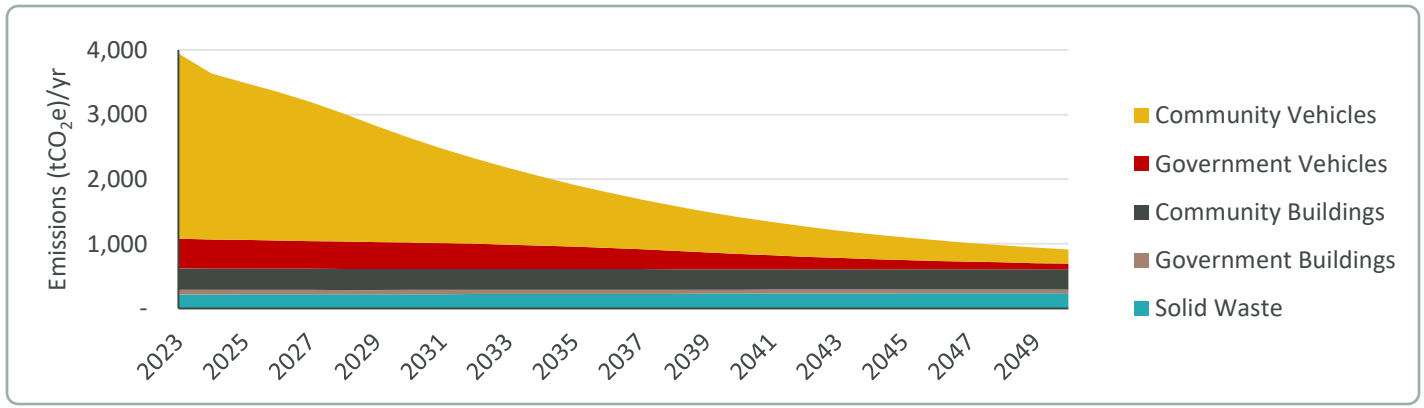


Figure 43: Inventory and BAU projections by sector.

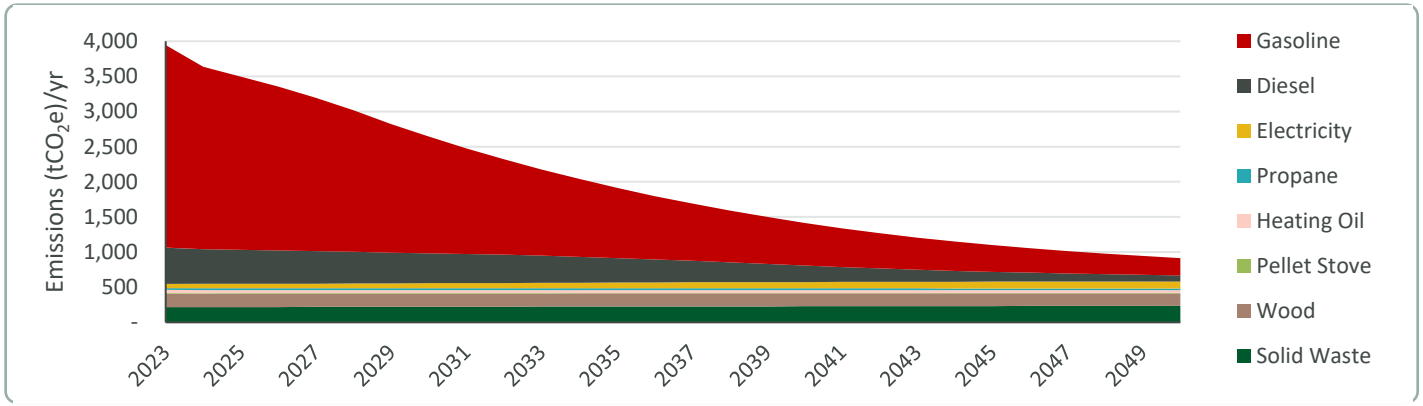


Figure 44: Inventory and BAU projections by source.

The BAU projections show that the emissions are projected to drop from 3,951 tCO2e in 2023 to 915 tCO2e in 2050, a reduction of 77%. Note that the reductions in the BAU projections incorporate federal and provincial actions, particularly the Federal zero-emissions vehicle mandate. This accounts for the rapid drop in community vehicles from 2023 to 2050.

Village of Gingolx

Figures 44 and 45 show Business-As-Usual projections by sector and source for the village of Gingolx, using a population growth rate of -0.38% (Appendix D).

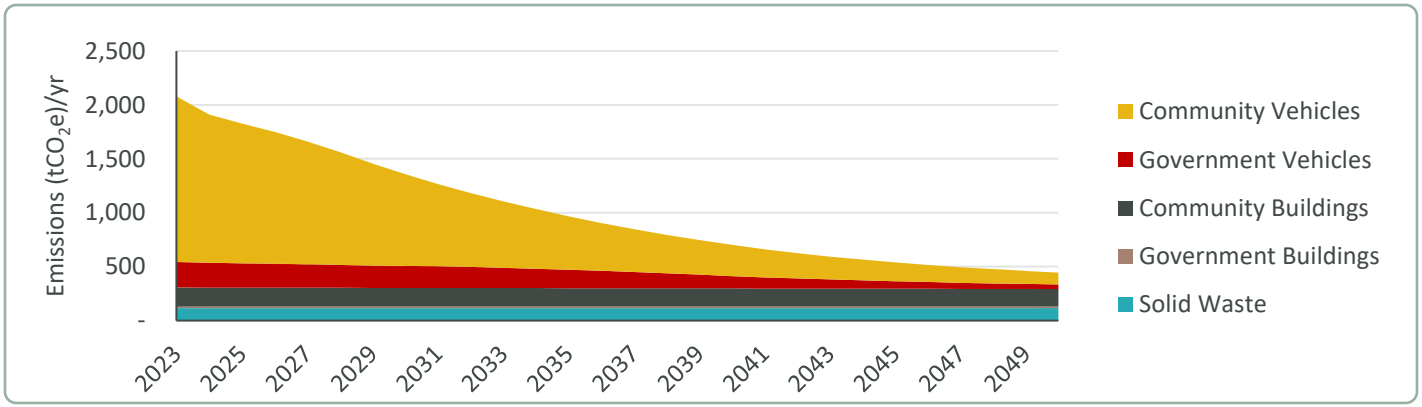


Figure 45: Inventory and BAU projections by sector.

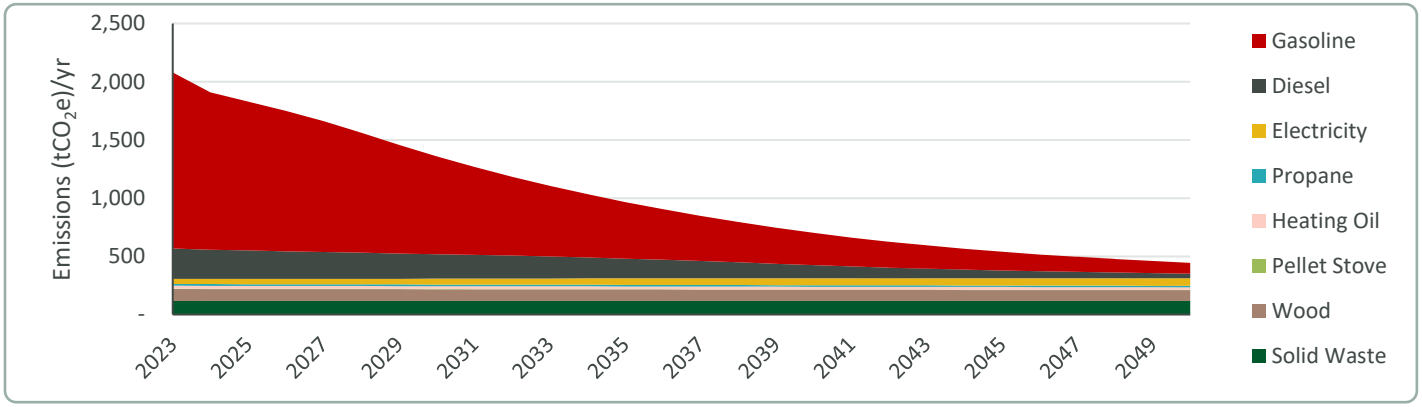


Figure 46: Inventory and BAU projections by source.

The BAU projections show that the emissions are projected to drop from 2,080 tCO_2e in 2023 to 444 tCO_2e in 2050, a reduction of 79%. Note that the reductions in the BAU projections incorporate federal and provincial actions, particularly the Federal zero-emissions vehicle mandate. This accounts for the rapid drop in community vehicles from 2023 to 2050.

Village of Laxgalts'ap

Figures 46 and 47 show Laxgalts'ap's Business-As-Usual projection by sector and source, using a population growth rate of -6.8% (Appendix D).

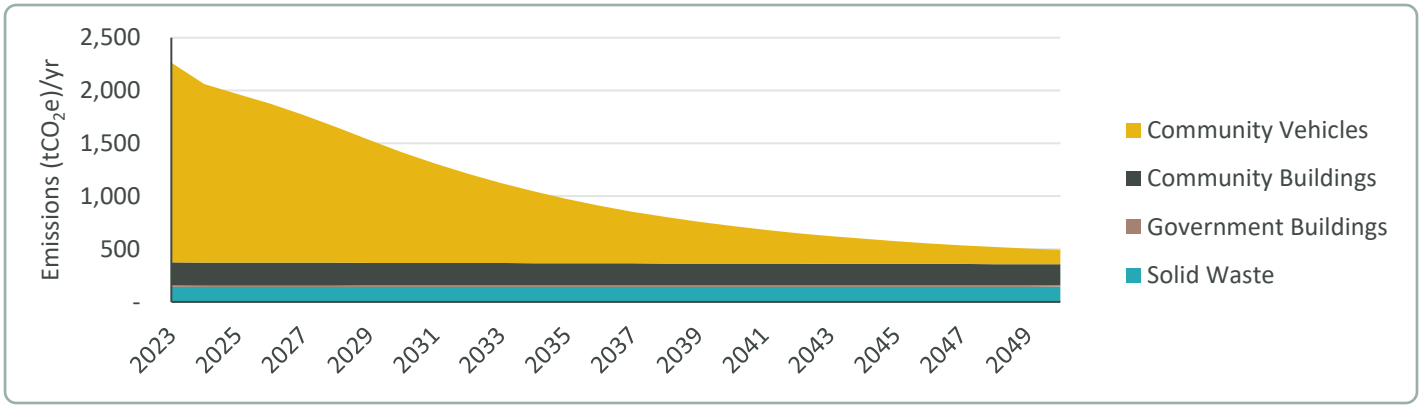


Figure 47: Inventory and BAU projections by sector.

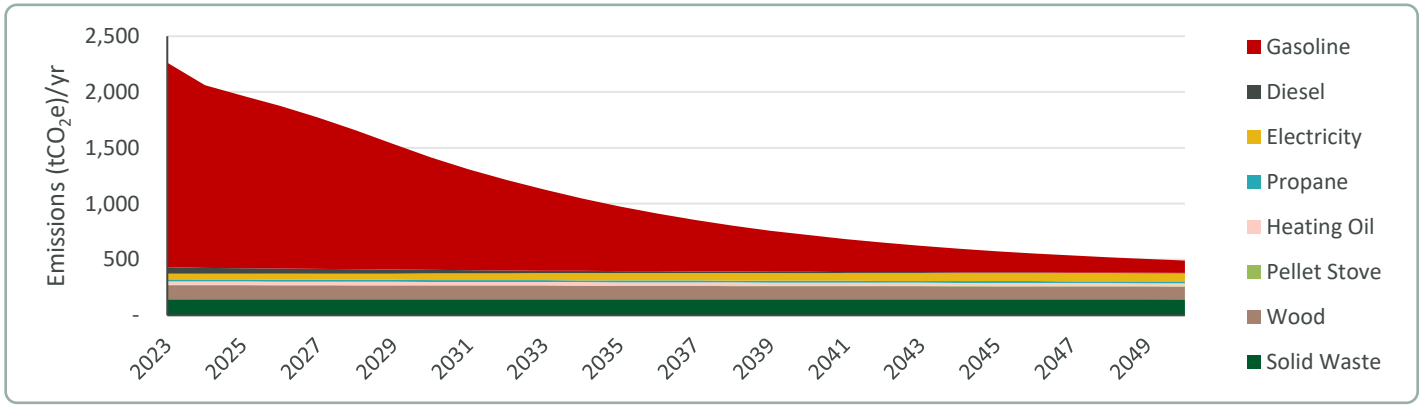


Figure 48: Inventory and BAU projections by source.

The BAU projections show that the emissions are projected to drop from 2,263 tCO_2e in 2023 to 491 tCO_2e in 2050, a reduction of 78%. Note that the reductions in the BAU projections incorporate federal and provincial actions, particularly the Federal zero-emissions vehicle mandate. This accounts for the rapid drop in community vehicles from 2023 to 2050.

Village of Gitwinksihlkw

Figures 48 and 49 show Business-As-Usual projections by sector and source for Gitwinksihlkw, using a population growth rate of -0.38% (Appendix D).

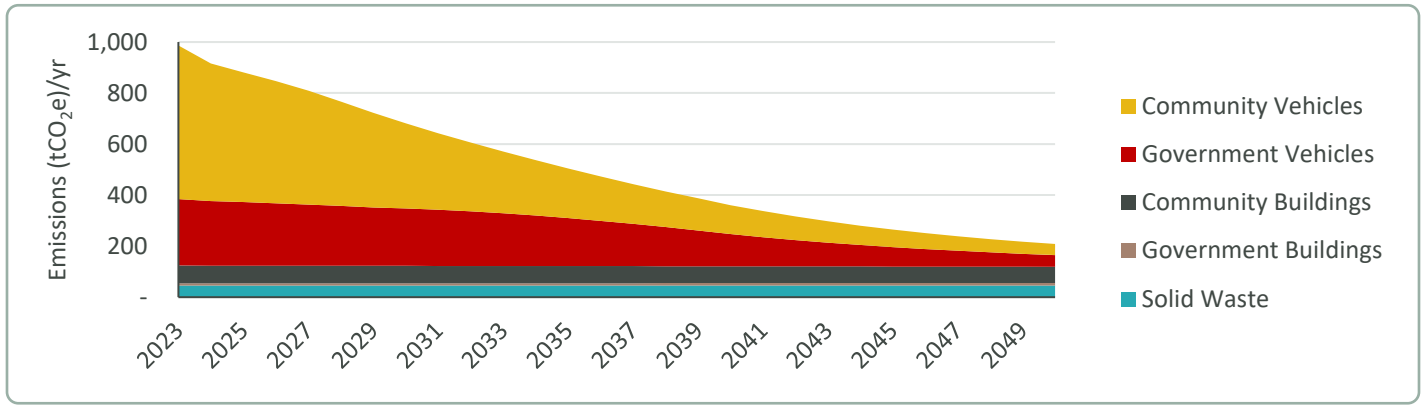


Figure 49: Inventory and BAU projections by sector.

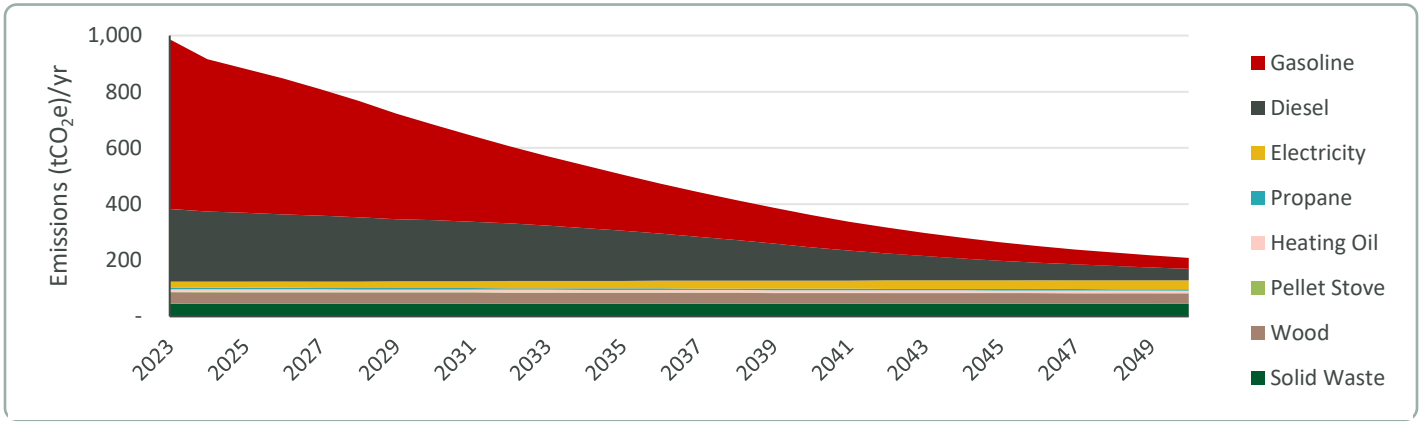


Figure 50: Inventory and BAU projections by source.

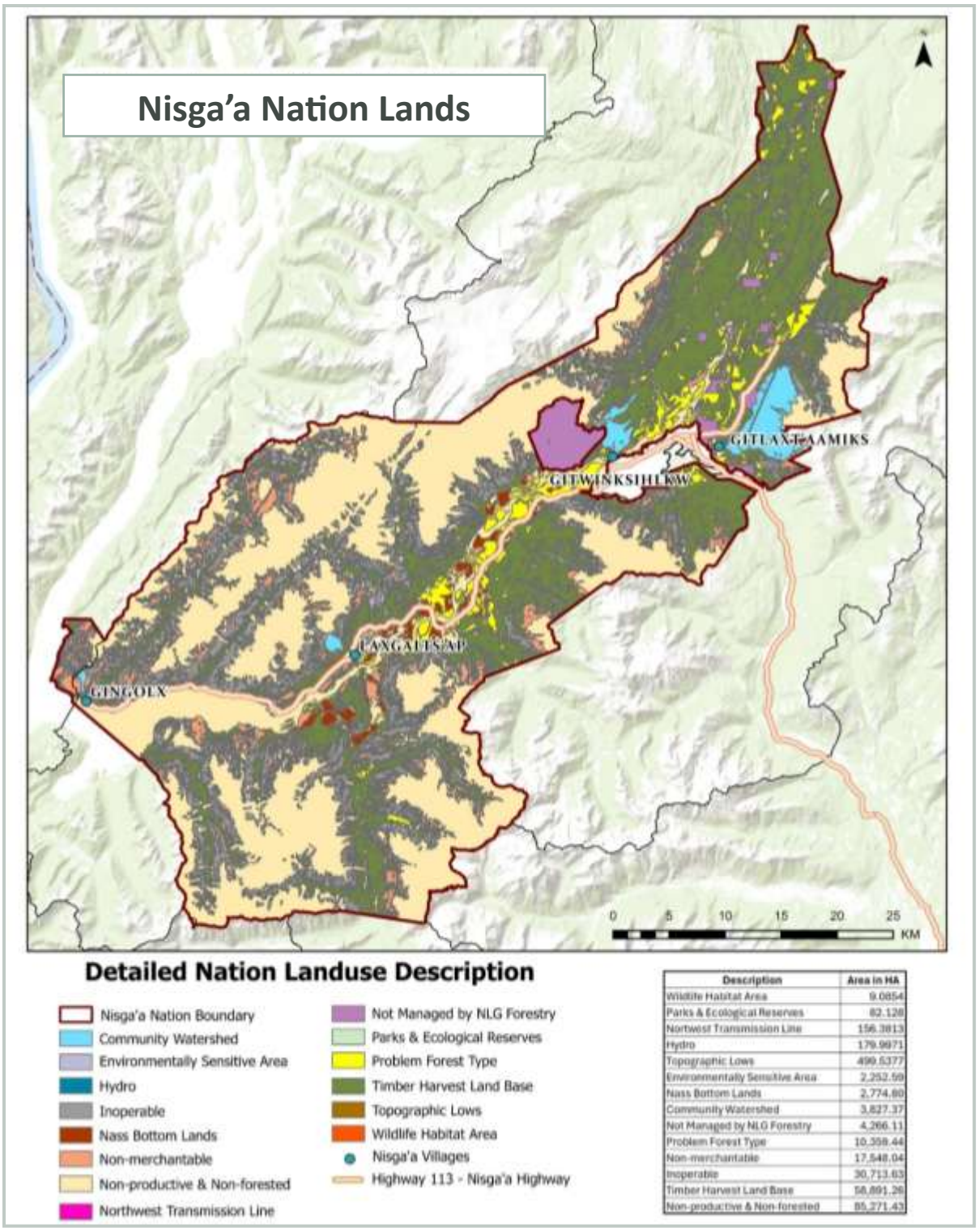
The BAU projections show that the emissions are projected to drop from 987 tCO_2e in 2023 to 208 tCO_2e in 2050, a reduction of 79%. Note that the reductions in the BAU projections incorporate federal and provincial actions, particularly the Federal and Provincial zero-emissions vehicle mandate. This accounts for the rapid drop in community and government

Land Cover Analysis – Nisga’a Lands

The change in land cover over time plays a key role in GHG emissions. Both human activities such as building development, agriculture and timber harvesting, and natural processes such as wildfires can have an impact on a region’s total GHG inventory. Furthermore, land use management decisions can contribute to a net zero emissions strategy by monitoring and balancing the net exchange of GHG emissions and GHG removals, or carbon sequestration, from a region based on land use activity. Broadly speaking, land cover of a region can be broken down into one of seven categories: trees/forest, water, built environment, cropland, rangeland, flooded vegetation and bare rock. The majority of the Nisga’a Nation’s built environment has been analysed in detail in the community and government inventories in this report. Of the remaining land cover types, trees/forested area is significant across the Nisga’a Lands making up 75% of all land types, and the Nation’s active forest management and harvesting of the Nass Valley is widespread.

There are many factors used to estimate managed forest emissions and carbon sequestration rates of forests including the type and age of trees, forest management practices, soil types and natural events such as wildfire or insect infestation. The calculation of detailed land use-related GHG emissions is outside the scope of this inventory. However, this report does provide a breakdown of land cover types and their total areas that can serve as a starting point for further analysis of land use-related GHG emissions in the Nisga’a Lands. With additional data from managed forest practices, this inventory could be further refined in the future.

Land use zoning data was sourced from the NLG Land Use department (Figure 50) and further verified with satellite data and aerial photo imagery from both 2018 (Figure 51) and 2024 (Figure 52) (see Appendix D for detailed methodology). From these, land was grouped into seven main categories and total land area (hectares) in each category for both years is summarized in Table 6 and Figures 53 and 54.



Description	Area in HA
Wildlife Habitat Area	9.0854
Parks & Ecological Reserves	82.128
Northwest Transmission Line	156.3813
Hydro	179.9971
Topographic Lows	499.5377
Environmentally Sensitive Area	2,252.59
Nass Bottom Lands	2,774.80
Community Watershed	3,827.37
Not Managed by NLG Forestry	4,266.11
Problem Forest Type	10,359.44
Non-merchantable	17,548.04
Inoperable	30,713.63
Timber Harvest Land Base	58,891.26
Non-productive & Non-forested	85,271.43

Figure 51: Detailed land use across the Nisga'a Lands considering forest production, ecology and habitat areas.

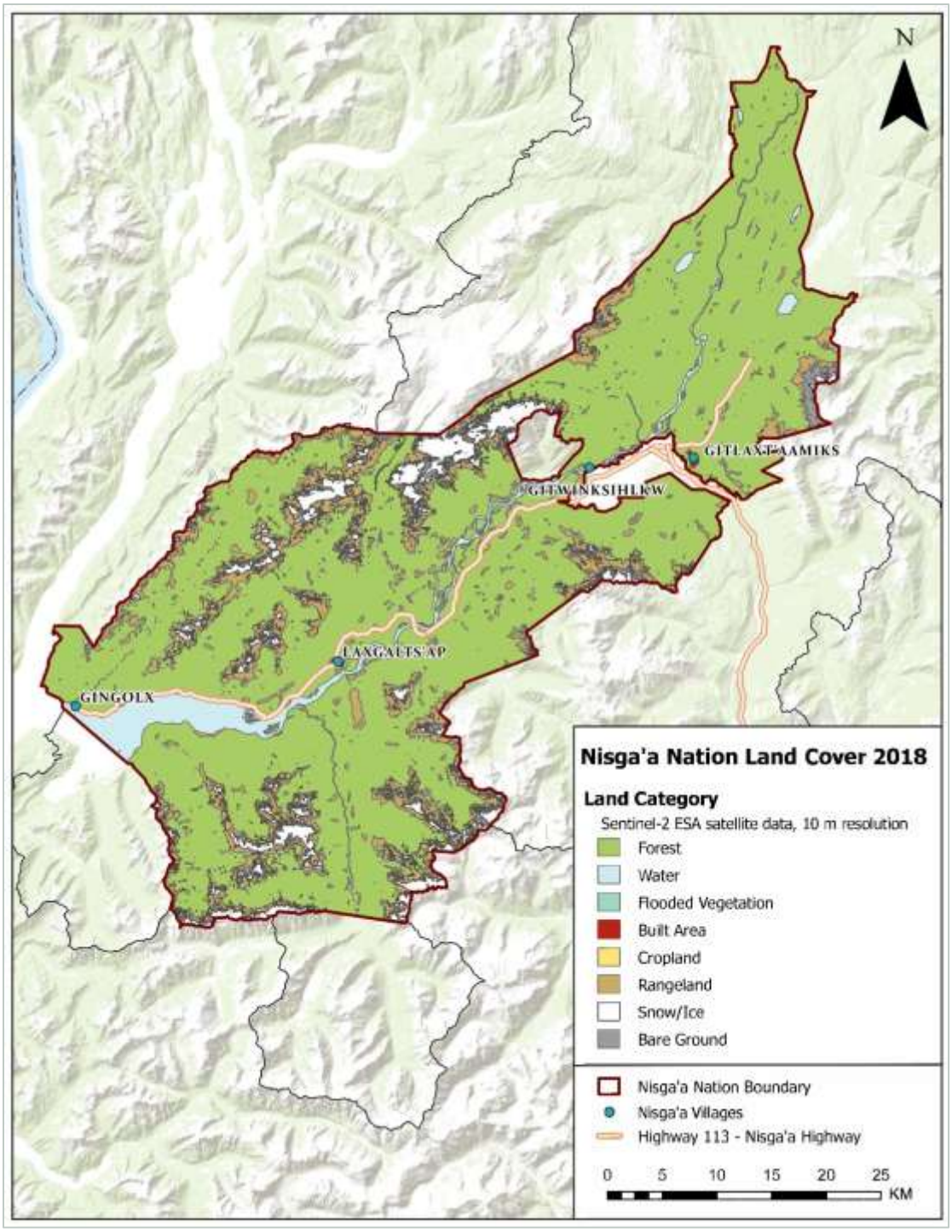


Figure 52: Detailed land cover in 2018 across the Nisga'a Lands derived from European Space Agency Sentinel-2 Satellite data.

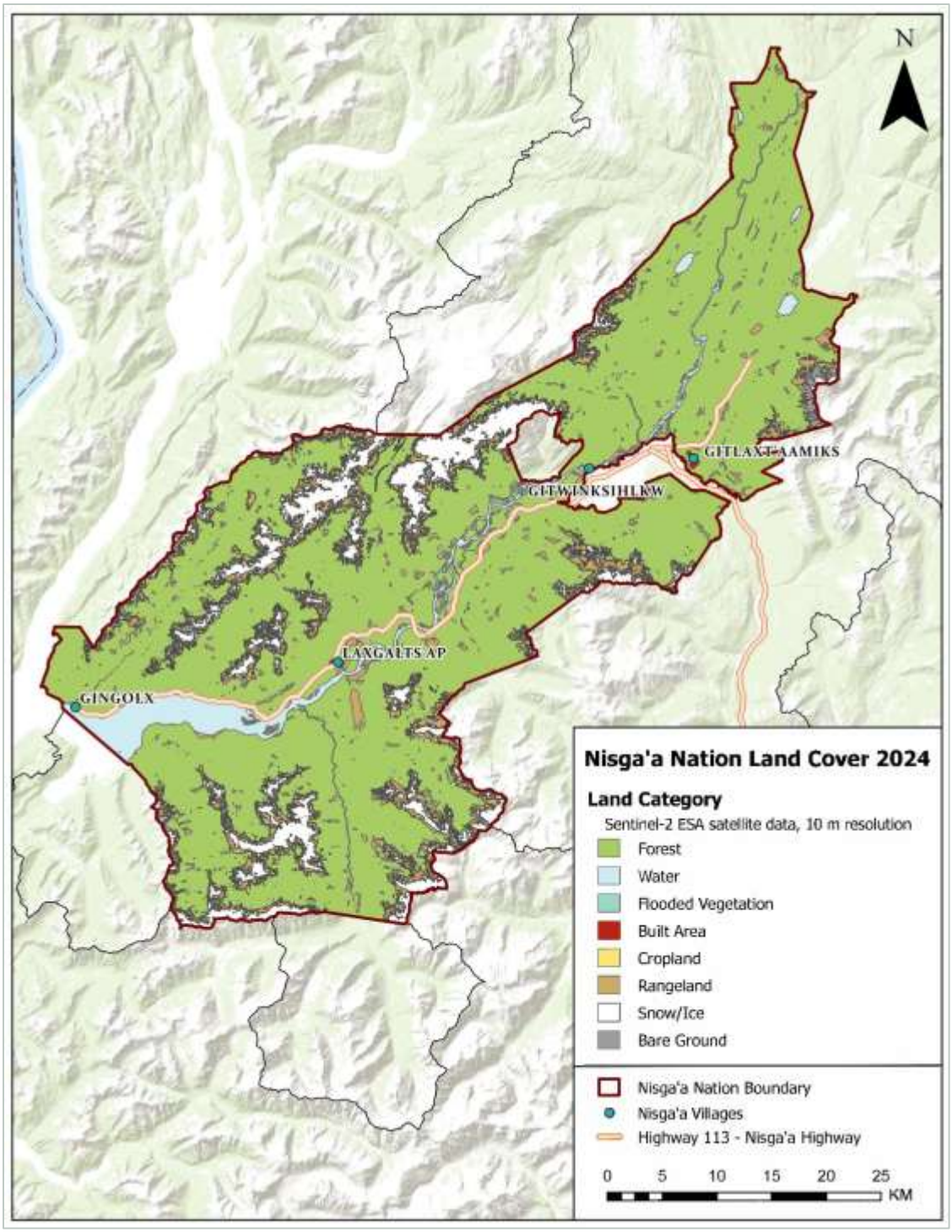


Figure 53: Detailed land cover in 2024 across the Nisga'a Lands derived from European Space Agency Sentinel-2 Satellite data.

Table 6: Land Cover categories across the Nisga'a Lands and their change in area from 2018 to 2024.

	2018		2024		
Land Cover Category	**Area (HA)**	**% of Total Land Area**	**Area (HA)**	**% of Total Land Area**	**% Change from 2018-2024**
Water	9,601.26	4.48%	9,563.40	4.463%	-0.39%
Forest	161,809.92	75.51%	160,668.69	74.973%	-0.71%
Flooded Vegetation	1.2	0.00%	75.93	0.035%	6227.50%
Cropland	11.85	0.01%	8.53	0.004%	-28.02%
Built Area	150.97	0.07%	195.67	0.091%	29.61%
Bare Ground	4,937.16	2.30%	1,788.58	0.835%	-63.77%
Snow/Ice	11,725.34	5.47%	23,161.17	10.808%	97.53%
Rangeland	26,064.31	12.16%	18,840.01	8.791%	-27.72%

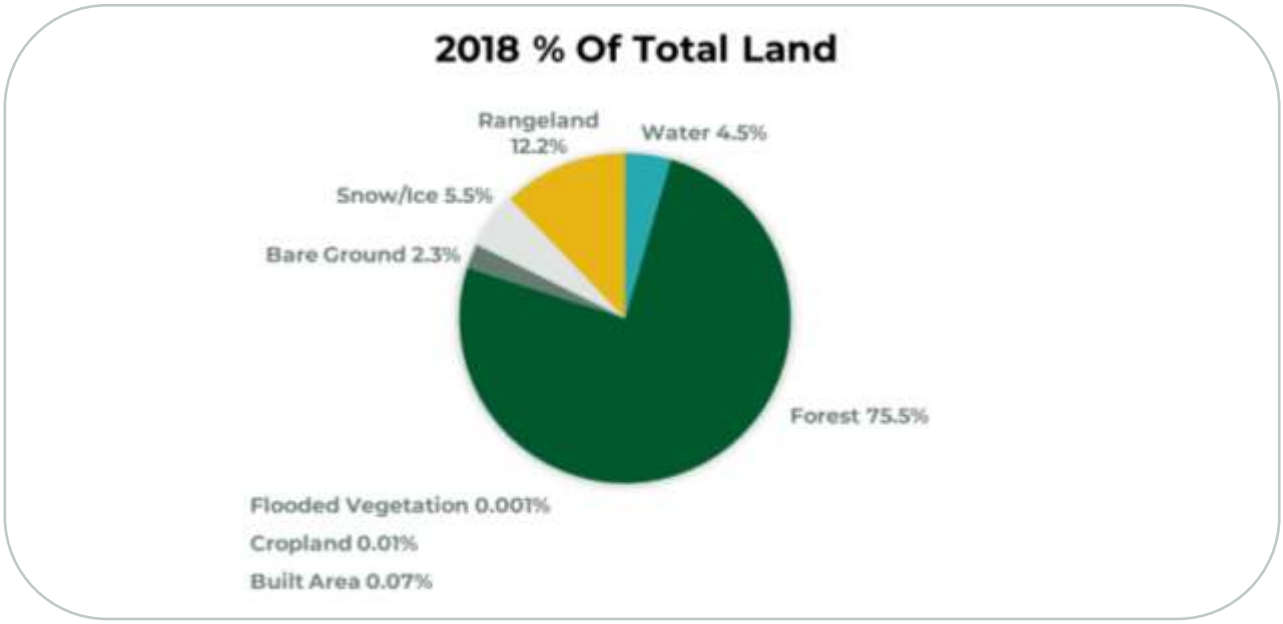


Figure 54: Distribution of land cover in Nisga'a Lands in 2018. Note that Built Area, Cropland and Flooded Vegetation are too small to show at this scale.

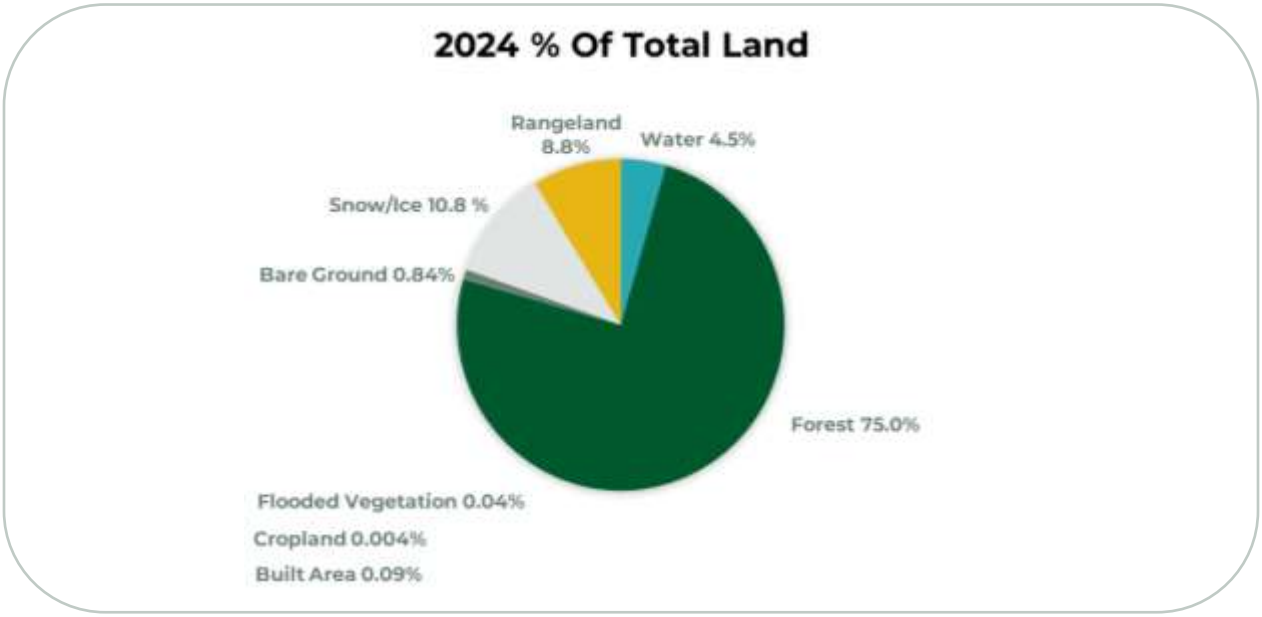


Figure 55: Distribution of land cover in Nisga'a Lands in 2024.

The change in land use from 2018 to 2024 is subtle. The most notable increase was in the amount of built area, up 29.61% as population and urban areas expand. Both flooded vegetation and snow/ice showed increases between 2018 and 2024 as well. Although average temperatures are generally increasing in this region and one might not expect an increase in snowpack, the amount of precipitation is also increasing.[3] This combination of weather could result in an increase in flooded or wetland areas in the Nass Valley bottom while the higher altitude peaks experience greater snowfall at the same time. Decreasing snowpack is not necessarily represented by a yearly compilation of satellite images as these are capturing snow extent over time, but not total snow volume, as is measured by snowpack. This is something that the Nation should keep in mind when developing land in the future as increasing precipitation can result in expansion of wetland areas and contribute to increased seasonal flooding.

[3] City of Terrace. (2020, August). *City of Terrace climate projections report*. https://www.terrace.ca/sites/default/files/Terrace%20Climate%20Projections_FINALa.pdf ; Prairie Climate Centre. *Climate Atlas of Canada – Map: Annual precipitation, 2030 (high emissions)*. Climate Atlas of Canada. Retrieved from https://climateatlas.ca/map/canada/annual_precip_2030_85#z=9&lat=55.03&lng=-127.26&grid=1088

Actions for Low Carbon Resilience

Climate Resilient Buildings

As shown by the 2023 baseline GHG inventory, buildings greatly influence carbon footprint through operational GHG emissions. They also impact our ability to cope with challenging weather and a changing climate. Airtight, well-insulated, energy efficient buildings that use non-fossil fuel heat sources, such as electric heat pumps, reduce emissions and can cut energy costs. Heat pumps also provide cooled and filtered air during heat waves and smoke events.

For new construction, adopting higher steps of the Energy Step Code (ESC) and Zero Carbon Step Code (ZCSC) ensures strong energy and carbon performance from the start. The new homes recently constructed in Laxgalts'ap are an example of this, many of them meeting Step 4 of the Energy Step Code, one efficiency step higher than what is currently provincially mandated. Nisga'a Nation could consider adopting a Nation-wide Building Standard, and much like the West Coast Building Standard[4] developed by Nuxalk hereditary chief and building expert, Richard Hall, take into account values such as energy efficiency, affordability, low-embodied carbon of construction materials used, and cultural adaptations such as a having cultural kitchens designed to handle high levels of moisture and ventilate appropriately to control humidity.

Expanding local renewable energy generation, and pairing solar with battery storage, can further cut emissions while improving resilience during power outages.

Existing Construction: Healthy Home Energy Retrofits

Climate resilient retrofits are upgrades to a home that improve the home's ability to keep its occupants safe and comfortable in a changing climate.

As detailed in the 2025 Healthy Homes Energy Retrofit workplan, one of Nisga'a Nation's priority climate leadership, equity and justice initiatives is to energy retrofit hundreds of degraded homes to make them more durable, healthy, energy efficient and climate resilient. Energy retrofitting is a great opportunity for low carbon resilience, as it often shares key objectives and co-benefits, such as improving energy efficiency and

[4] Hall, R. J. (2022, August 28). *West Coast building standard: A guide for building energy-efficient homes in coastal British Columbia*. https://indd.adobe.com/view/publication/9d3e3273-089e-4de6-b3a9-48631358b19c/1/publication-web-resources/pdf/Final_Construction_booklet_-_revised_2022-08-28.pdf

reducing carbon emissions, and can address multiple climate risks occurring simultaneously, for example wildfire smoke and extreme heat.

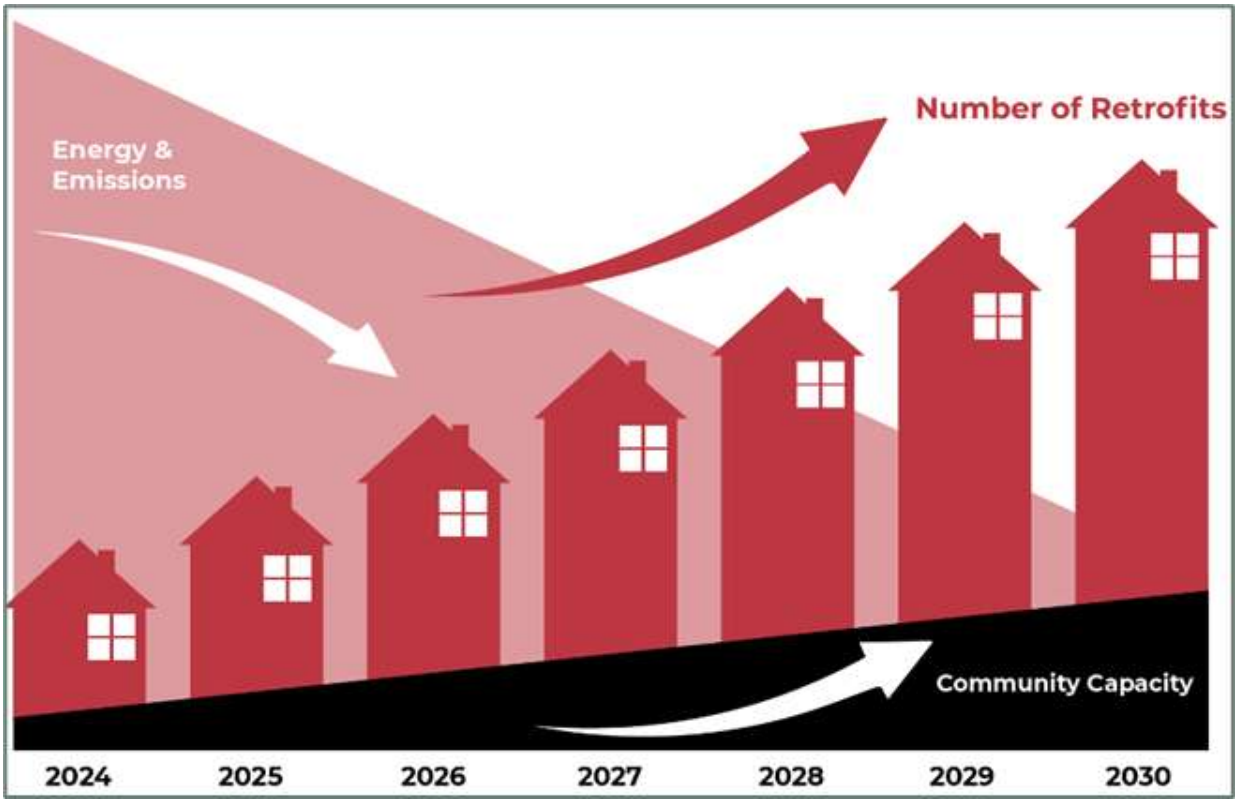


Figure 56: Graphic conceptualization showing that as the number of quality HHE Retrofits grows, community capacity increases and the energy and emissions from home heating and cooling decreases, along with their associated energy costs.

Progress toward a large-scale HHE Retrofit has been made through engaging community members, establishing partnerships, learning the building science and associated costs, and developing capacity in both Nisg̲a'a Nation and in the wider region.

NLG's Capital, Housing and Facilities Operations (CHFO) team has secured significant capital funding and energy retrofits incentives to enable the majority of Nisg̲a'a Nation residences to take advantage of home renovation grants. Depending on a homeowner's home upgrade priorities this funding could serve as a substantial foundation for structural and home energy improvements, i.e. Healthy Home Energy (HHE) retrofits. Depending on individuals' budgets, HHE retrofits could range from simply improving airtightness and insulation to comprehensive overhauls of the whole home, often referred to as a deep energy retrofit.

CEA recommends activating these funds through a systematic approach to HHE Retrofits that apply sound building science and thoughtful process to maximize the positive outcomes of the upgrades and to avoid causing unintended consequences or maladaptation. Maladaptation are actions that may lead to increased risk of adverse climate-related outcomes and increased

vulnerability to climate change. For example, while adding inefficient air conditioning (AC) to adapt to more extreme heat events as a result of climate change can help occupants to stay cool, AC units do not provide heating options or reduce emissions and may lead to increased energy demand. HHE retrofit actions should be based on the findings of a home energy audit and seek to improve air tightness, ventilation and air quality, health, durability and energy efficiency based on the specific needs of each home. For these multiple and complementary benefits to be realized it will be important to employ an Integrated Design Process (IDP) that takes a house-as-a-system (HAAS) and envelope first approach, using qualified workers and employing accountability measures such as written contracts, agreed upon retrofit specifications, individualized priority upgrades and post-retrofit energy assessments.

The Nisg̲a'a HHE retrofits workplan is conceptualized in three phases:

Phase 1 Building A Foundation - Planning and Partnerships

Phase 2 Implementation Through Mentorship

Phase 3 Rinse & Repeat - Applying the Process and Knowledge

This three-phase plan emphasizes two-way mentorship, region-wide workforce development, and training and hiring Nisg̲a'a members where possible. This could create immediate job opportunities in various sectors, including construction, mechanical systems technicians, communications and energy advising. Both Nisg̲a'a Nation and regionally based construction industry stakeholders will enjoy enhanced knowledge and capacity regarding HHE retrofits, energy literacy and tangible climate actions that improve people's overall quality of life and resilience to climate impacts through quality home upgrades.

HHE Retrofits Priorities

The following HHE Retrofit priorities were established during Phase 1: Building A Foundation:

- **Climate mitigation and resilience**: significantly improve energy efficiency (30% or greater) and lower GHG emissions through combining envelope improvements and fuel switching from fossil fuels to electric where applicable. Prioritize low embodied carbon materials.
- **Use a house-as-a-system approach and envelope first approach** to address many aspects of home upgrades simultaneously including health and safety concerns, wildfire resilience, lower maintenance costs and improved repairability.
- **Cultural considerations:** HHE retrofits should take into consideration the rural, remote lifestyle in Nisg̲a'a Nation and housing features that support this. Cultural activities such as feasts and family gatherings, food preservation activities such as canning, and multi-generational living are all normal parts of life that may not be taken into consideration with standard housing design. Moisture-resistant materials and finishes, increased

ventilation for moisture-management, sufficient storage space and exterior envelope repairs that enable future interior renovations for multi-generational living are all examples of cultural considerations.

- **Qualified workers and oversight**: resulting in durable, healthy homes that can be passed to the next generation with pride. Home warrantees and contractor accountability should be built into the process.
- **Coordinated approach and bundling** multiple home retrofits concurrently to gain material and scheduling cost efficiencies.
- **Capacity building**, both within the Nation and regionally, will improve the knowledge and understanding of quality energy retrofits and create self-sufficiency as well as economic spin-off opportunities.

Figure 57: December 2024. Lucas Coletta explains the cost optimization methodology and associated building science best practice for energy retrofits at the Nisga'a Energy Retrofits Costing Charette.

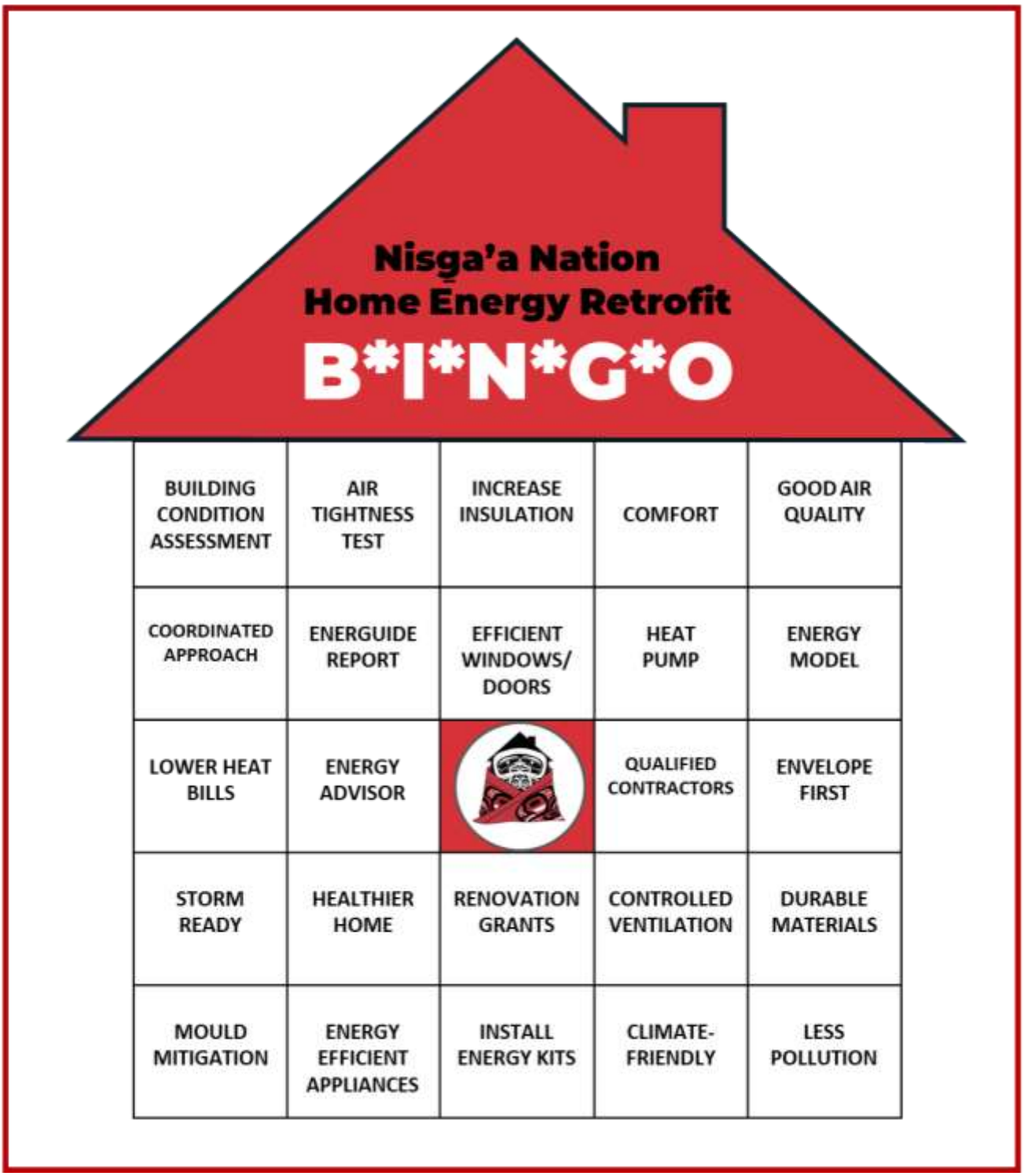


Figure 58: Graphic illustrating some of the interacting conditions, needed actions and co-benefits of a HHE Retrofit as they relate to a HAAS and envelopes-first approach.

Healthy Home Energy Retrofit Steps

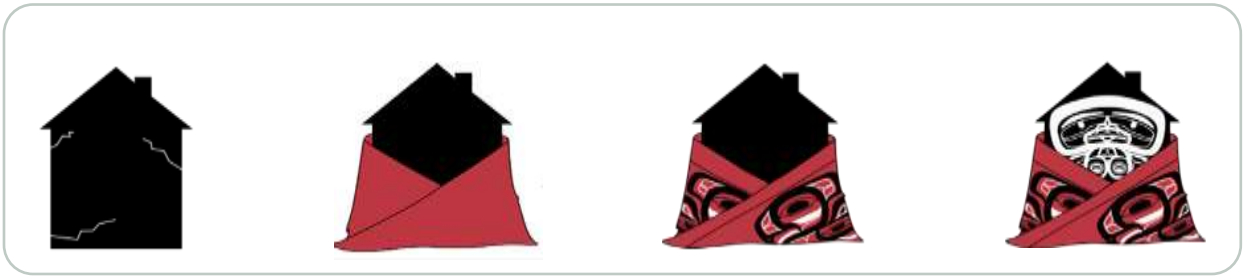


Figure 59: The blanketed retrofitted home graphic conceptualized by Nisg̱a'a artist Drae Azak, represents the house-as-a-system (HAAS) and envelope first approach pathway from a degraded home needing repair, to one that supports the protection, comfort and health of its occupants after a HHE Retrofit. The blanket represents addressing the envelope first, then adding further upgrades, and finally the home becomes like a thriving being itself. Drae hails from Gitwinksihlkw and Wilps Axgwindaskw of the Laxgibuu tribe. Professionally, he serves as the Capital, Housing, and Infrastructure Manager for Laxgalts'ap Village Government. Drae reflects, "The work is incredibly rewarding, as our team witnesses firsthand the positive impact of housing and infrastructure expansions on our people's lives, and we know we are contributing to the betterment of our community."

HHE Retrofits can be complex and knowing how to get started can support confidence while navigating the HHE retrofit journey. The following steps outline the recommended pathway to achieving a quality HHE Retrofit of any scale or budget:

1. **Community Communication and Engagement:** Invite community members/homeowners to attend open house/information night(s) with presentations to learn about the program, basic energy literacy, house-as-a-system and envelope-first approaches. Thermal imagery can be used to clearly demonstrate heat loss and opportunities for improvements. Create a program website with key messages and contacts.
2. **Invite Candidates:** Each participating Nisg̱a'a Village identifies candidate homes and homeowners for this pilot phase of the program based on Village priorities and HHE retrofit eligibility criteria. Talk to the homeowners and provide information to ensure they have a clear understanding of why, how, who, when and what to expect during the HHE retrofit. Provide information and point of contact to have their questions addressed, such as a designated "Retrofit Coach" in a future Nisg̱a'a HHE Retrofit Coaching program.
3. **Pre-Retrofit Energy Assessment:** Engage a registered energy advisor to conduct an energy audit. The advisor will assess building conditions, energy efficiency and air leakage, producing a Renovation Upgrade Report. Occupants fill in an Occupant Questionnaire provide past year's heating and electric bills, and how much wood was burned (cords). The report generated will outline current energy performance and recommend priority upgrades for improved comfort and efficiency. To minimize occupant disruptions, consider completing quick fixes and installing a free energy kit at the same time with Community Energy Champions (apprentices) who are enrolled in an

associated basic carpentry course. This home visit is another good opportunity to speak with homeowners and answer any questions they may have.

4. **Integrated Design Process (IDP) Session:** Host an inclusive, collaborative design session involving homeowners, housing staff, the energy advisor, mechanical technician, Retrofit Coach, and construction manager/mentor. Using the EnerGuide Renovation report , discuss budget and priorities. Distinguish between urgent maintenance tasks and deeper retrofitting needs. Address how building science can mitigate long-term issues like mould.
5. **Develop a Standardized Request for Quotation (RFQ):** Issue a comprehensive RFQ that uses the pre-retrofit energy audit, building condition assessments (electrical, HVAC & plumbing systems) and renovation upgrade report to scope and prioritize the need repairs and retrofit actions. Categorize repairs to allow for bulk purchase of needed supplies. Integrate accountability measures such as post-retrofit energy assessments and an agreed upon standard for the repair, such as 30% or greater energy efficiency improvement and air tightness of less than 3.0 air changes per hour (ACH) at 50 Pascal. Consider integrating the Nisga'a Retrofits Costing Tool by requiring contractor applicants use it to standardize cost estimates, as well as define building materials and their approach (e.g. exterior insulation, rainscreen, Hardie plank).
6. **Engage Qualified Contractors:** Insist upon qualified contractors who are committed to a holistic, house-as-a-system approach. Contractors should demonstrate a willingness to both learn and mentor, for example, attendance at education and training sessions. Cultural sensitivity is a must. Standardize contract templates and clauses to streamline expectations and financial processes for both homeowners and contractors.
7. **Envelope Improvements:** Prioritize needed upgrades to the building envelope such as: address air leaks, fix roofs, enhance insulation, replace siding and install energy-efficient windows and doors. Remember that when airtightness is improved, ventilation must also be sufficiently upgraded.
8. **Mechanical Systems Upgrade:** Upgrade heating, cooling, and ventilation systems by installing energy-efficient equipment like heat recovery ventilators (HRVs) and cold climate heat pumps. Replace fossil fuel systems with electric solutions for improved safety, efficiency and lower GHG emissions. Proper heat load and air exchange calculations, vs rule of thumb system sizing, is a must.
9. **Install Energy-Saving Measures:** Once priority improvements have been made to the structure, energy efficiency and home health and safety, consider implementing additional energy-saving technologies such as programmable thermostats and energy-efficient appliances to further enhance energy performance.
10. **Performance Verification:** Always conduct a final building condition/energy assessment and air tightness test to evaluate the improvements to air tightness, building envelope and home health measures. A contractually agreed upon post-retrofit energy assessment is a key accountability tool that allows both the homeowner and contractor peace of mind that the work has been completed to an agreed upon standard.

11. **Homeowner Education:** Educate homeowners about the upgraded systems, maintenance requirements, and the importance of regular upkeep versus professional interventions.
12. **Feedback and Data Collection including Post-Retrofit Energy Audit:** Collect and provide feedback on the energy retrofit process and the outcomes of the upgrades (energy efficiency, GHG reduction, energy bills, health improvements, costs), ensuring continuous improvement for future projects.

The Health Costs of Degraded Housing

As with most First Nations in Canada whose housing was built under discriminatory colonial policy and legislation such as the Indian Act, most existing homes in Nisga'a Villages were built to poor construction standards and are in varying degrees of disrepair. A Nisga'a Nation Housing Needs Assessment in 2022[5] determined that only one-third of homes had no serious structural concerns; the balance had a combination of problems with roof and gutter systems, foundations, walls, etc. It was also determined that 25% of homes were experiencing mould. Many homes use more energy than necessary for heating and cooling, have poor indoor air quality, and require significant upgrades.

In addition to the risk of energy insecurity caused by degraded and substandard housing, the health risks facing many people living in these conditions often challenge physical, mental, and social well-being.

Indigenous Clean Energy and the Canadian Climate Institute have been collaborating on a research project titled "Beyond Sustainability: The Power of Indigenous Health Energy Homes".[6] This seminal work aims to provide an evidence-based argument for including health data when measuring the "true cost" of retrofitting the depleted Indigenous housing stock across Canada. Below is a non-exhaustive list of health conditions commonly experienced by occupants of degraded homes, who are facing energy insecurity and systemic marginalization:

Respiratory issues are among the most common health conditions.

Temperature-related illnesses result from extreme heat or cold due to inadequate insulation and poor heating systems or energy poverty. Hypothermia and heat exhaustion occur, leading to further health concerns, in extreme cases these conditions can result in the death. Cardiovascular health can be worsened by temperature related conditions.

[5] Nisga'a Lisims Government. (2022, April). *Housing needs report*. https://www.nisgaanation.ca/wp-content/uploads/2025/01/Nisgaa-Lisims-Government-Housing-Needs-Report-April-2022.pdf
[6] Indigenous Clean Energy & Canadian Climate Institute. (2024, June). *Beyond sustainability: The power of Indigenous healthy energy homes*. https://climateinstitute.ca/wp-content/uploads/2024/06/Beyond-sustainability-power-Indigenous-Healthy-Energy-Homes.pdf

Toxic exposure can be caused by mould, lead, mercury, radon, benzene or other environmental toxins that are commonly found in older building materials and surrounding environment. These can cause long-term health problems, including neurological and respiratory conditions.

Injury Risk is prevalent in homes with broken stairs, collapsed ceilings, damaged floors, or inadequate lighting. Additionally electrical fires and shocks occur when electrical wiring is faulty or outdated.

Overcrowded and degraded homes have contributed to a decline in mental health for many people as stress, despair and helplessness can persist. Sleep can be disrupted when a home is overcrowded and uncomfortable, leading to many chronic and acute health problems. There is a higher rate of infectious disease transmission in overcrowded houses. Stress, lack of security and social isolation are commonly felt by people living in degraded housing.

One great benefit of HHE Retrofits is addressing health issues associated with degraded housing by improving the structure, remediating mould, fixing drafts and improving ventilation and insulation, among other improvements. This can be achieved by following a HAAS approach with sound building science and good process, further detailed in the Nisg̲a'a Healthy Home Energy Retrofit Workplan (2025).

The Risk of Doing Nothing

Upgrading existing housing in Nisg̲a'a Nation through HHE retrofits would go a long way to addressing housing shortages and associated challenges experienced in the Homelands. Nisg̲a'a homeowners have an unprecedented opportunity to significantly improve their homes with the grant and incentives currently available to them. Better still, the proposed upgrades are very doable! Homes like many of those in Nisg̲a'a Nation with simple rectangular shapes are excellent candidates for retrofits.

Although the cost of construction in northern remote regions is higher than other parts of the province, the base funding available could still significantly upgrade homes, increase their usable lifespans, improve their comfort, make them healthier to live in as well as make them more energy efficient, thereby lowering costs of heating and cooling.

With each passing construction season where available funding is not activated to achieve priority HHE retrofits, Nisg̲a'a Nation risks that their most important family assets, their homes, degrade to the point of becoming irreparable and in need of eventual demolition.

The costs of repairs and of construction will continue to increase even as the homes themselves become more degraded and more expensive to fix. A critical, urgent action is to invest the time and effort now to assess these homes and to make individualized HHE retrofit plans for each. Completing quality HHE retrofits in the majority of Nisg̲a'a homes would help to ensure Nisg̲a'a citizens have quality housing and be able to remain in their communities and/or return to them in the future. There is likely insufficient budget to complete all of the recommended HHE retrofit actions at one time, and that is okay. By completing the most urgent upgrades now, homeowners can buy themselves time to then plan and prepare for the next phase of HHE retrofits over a 5-, 10-, or 15-year timescale. This phased HHE retrofit strategy would ensure there would still be an energy efficient, safe and healthy home well into the future on which to complete more maintenance and upgrades by future generations.

Retrofit Coaching Pathway

To date, the limited capacity for NLG and Village Housing Staff capacity has resulted in limited uptake of the capital funds and incentives for home repair. With each passing construction season that the available funding is not activated to achieve priority HHE retrofits, Nisg̲a'a Nation risks that their most important family assets, their homes, degrade to the point of becoming irreparable and in need of eventual demolition.

One promising pathway forward for both Nisg̲a'a housing staff and homeowners is HHE Retrofit Coaching, led by CEA in collaboration with the Nisg̲a'a Housing Committee. This pilot would be based on customization of CEA's trademarked *Retrofit Assist* program, a retrofits coordination and navigation service for homeowners, delivered in partnership with local governments.

The proposed Nisg̲a'a HHE Retrofit Coaching Pilot would be a community-based program that would work with housing staff, homeowners, local contractors, and industry experts to fulsomely support HHE Retrofits by Nisg̲a'a homeowners. The program would be administered by the CEA to both train dedicated housing staff to become qualified Retrofits Coaches, and to support residents wanting to undertake HHE retrofits to improve energy efficiency, health and durability of their homes.

Participants in the program work with a team of experts that provide guidance along the retrofit journey with input from certified energy advisors, industry experts and contractors specializing in building envelope (air sealing, insulation, windows and doors) and mechanical system (heating, cooling, hot water and ventilation) upgrades. In Nisg̲a'a Nation, this team would also include the Nation-hired Construction Manager/Mentor who would represent the interests of the homeowners and act as a key intermediary with contractors for quality control. The Retrofit Assist team also guides homeowners to maximize the financial supports available through incentive programs.

With free, prior and informed consent of homeowners, the data that is respectfully collected through Nisga'a HHE Retrofit Coaching would most likely include energy efficiency improvements, costs, IAQ changes, and more. This data could then be used to inform Phase 3: "Rinse and Repeat", to identify costing and scheduling efficiencies, improve processes, and communicate successes to the communities.

From the foundational retrofit work planning already undertaken, the goals of a Nisga'a HHE Retrofit Coaching program would be:

- Increase the uptake of HHE retrofits that can improve indoor air quality, structural integrity and reduce energy use and GHG emissions, guided by a HAAS and envelope-first approach,
- Compliment and leverage existing supports in the BC home energy retrofit space, including utility incentives (i.e. PIEER), government programs, financing opportunities, and industry activities,
- Mentor NLG and Village housing staff to be able to confidently and independently coach homeowners through HHE Retrofits informed by energy assessments, building science, and regional costing data.
- Collect data to inform future process and project management improvements and track changes in home energy efficiency, comfortability, and construction cost efficiencies.

Figure 60: April 2025. Left: Facilitators and instructors of the 4-day hands-on retrofits envelopes training hosted by K5T. Right: Cody Brentzen instructing at the event.

Transportation

Nisg̱a’a Nation historically cultivated intricate land and water transportation networks that facilitated the movement of people and exchange of goods, services, and ideas across vast distances. Indeed, Highway 113 (Figure 60) that traverses Nisg̱a’a Nation commemorates the first trip over land and water via canoe by Nisg̱a’a leaders to Ottawa. These determined leaders traveled to assert Nisg̱a’a rights to Land and Culture, and the Nation then endured a 113 year long fight to achieve a modern Treaty with Canada and BC. Traditional trade routes spanned extensive regions, showcasing the specialized knowledge, adaptability and resourcefulness of First Nations in navigating, and connecting diverse and challenging landscapes. Understanding and acknowledging this deep-rooted history and cultural connection to First Nations transportation networks and mobility offers valuable insights and inspiration for the development of the *NLG Low Carbon Transportation Plan* (LCTP) developed in 2024-2025.

Figure 61: The eastern entrance to Nisg̱a’a Nation heading north on Highway 113, adjacent the lava beds.

The plan was developed as part of the BC Assembly of First Nations (BCAFN) First Nations Low Carbon Transportation Project and was informed by the *Safe, Equitable, Affordable, and Low Carbon Transportation Planning Guide*. The First Nations Low Carbon Transportation Project was a provincial initiative by BCAFN aimed at addressing the many challenges, gaps, and opportunities faced by First Nations on transportation, while incorporating low carbon and sustainable transportation thinking.

In May 2025, delegates to the first-ever BC Assembly of First Nations low-carbon transportation forum in Lheidli T'enneh Territory (Prince George) heard how the transportation system is stacked against First Nations and significantly contributes to climate change, but solutions were always top of mind.

This was especially true in a panel discussion (Figure 61) that featured a transportation assessment report prepared by the BC AFN and CEA that outlined a wide variety of issues and opportunities and included recommendations around 11 themes. The results of a survey of hundreds of respondents, highlighted the prevalence of out-of-community travel, the high cost of transportation relative to the BC average, and the strong interest in public transit and shared transportation options.

Figure 62: May 2025. Delegates to the first-ever BC Assembly of First Nations low-carbon transportation forum in Lheidli T'enneh Territory, including Kaitlyn Robinson, NLG and Jeremy Johnston, CEA.

The primary goal of low-carbon transportation planning is to understand the carbon intensity of an existing transportation system and reduce it by exchanging unsustainable ways of getting around (i.e. those with a higher carbon intensity) for those that are more sustainable (i.e. those with a lower carbon intensity). The relationship between transportation methods and carbon intensity is shown in Figure 63 below.

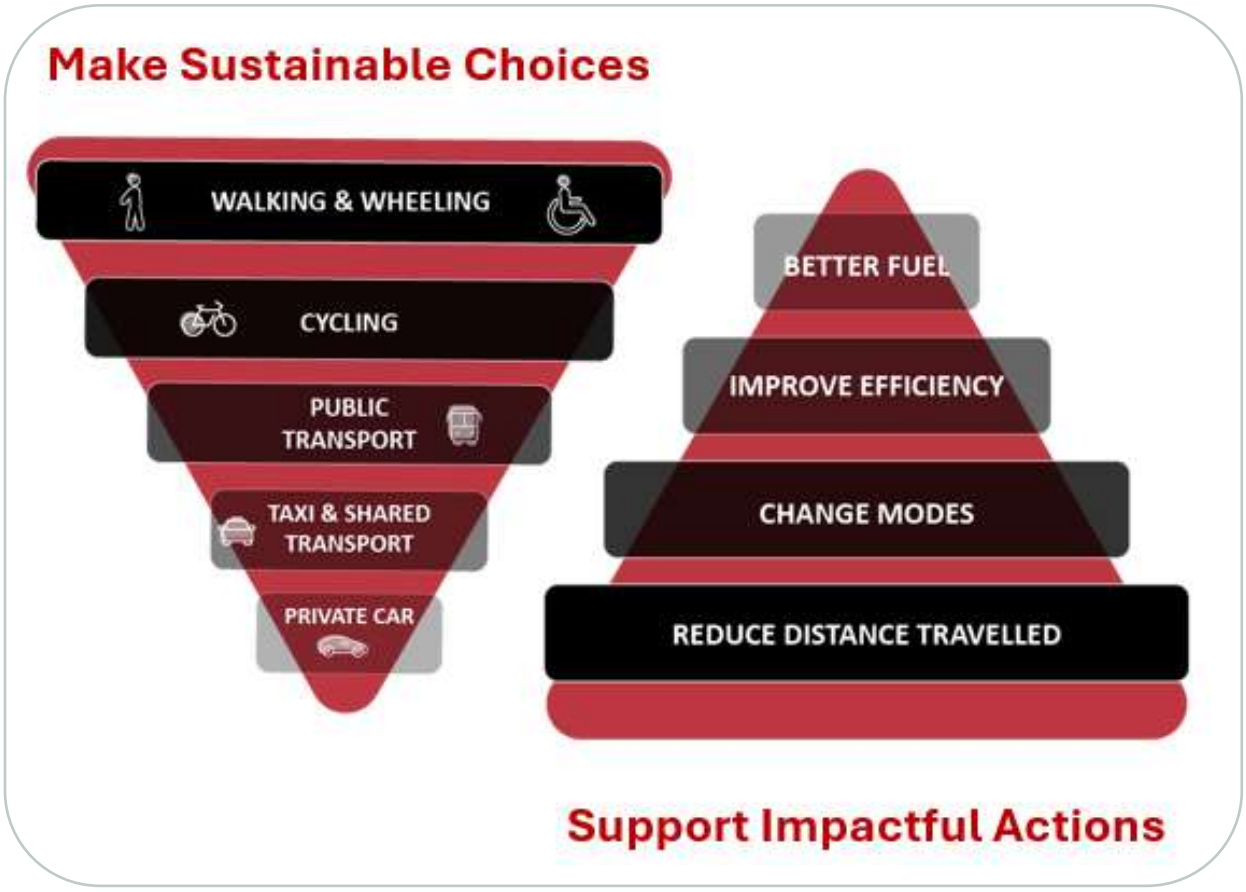


Figure 63: Relationship between transportation methods and carbon intensity.

As discussed in the inventory section, transportation in Nisga'a Territory accounts for 84% of total emissions (Figure 36), representing some $2.2 million in costs to community members. Of this, 81% is from gasoline, and 3% is from diesel (Figure 37). Insights from the LCTP show that inter-community and regional trips are the basis for these emissions (Figure 63). Given the absence and/or scarcity of services between communities, in Terrace, and beyond, the need to regularly travel long distances creates a reliance on personal vehicles in the absence of other options such as public transportation or shared vehicles.

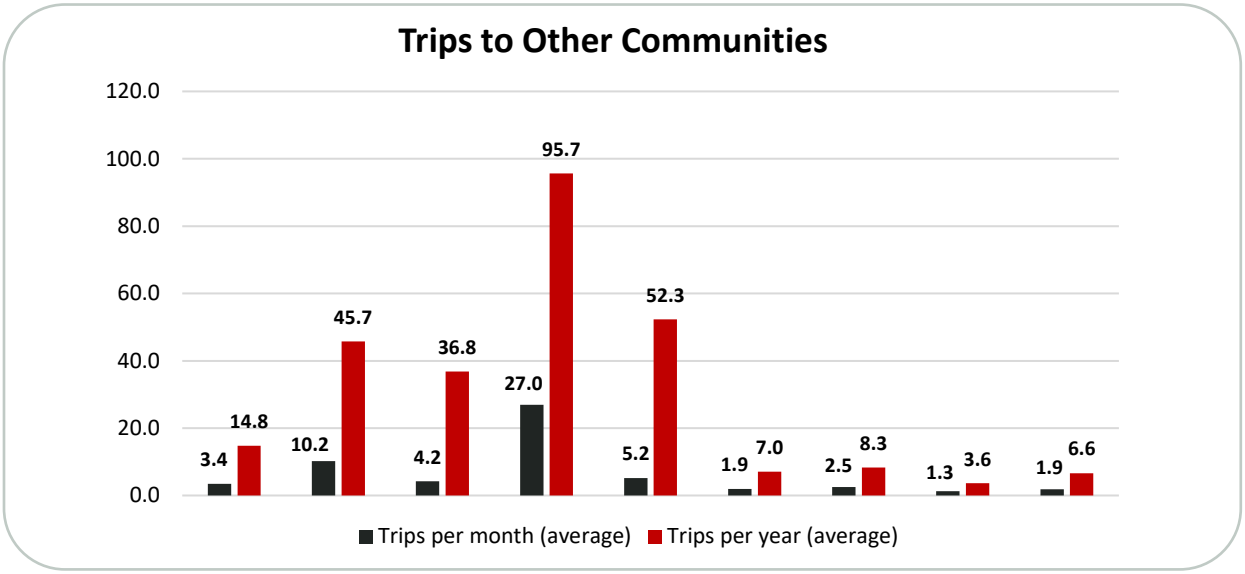


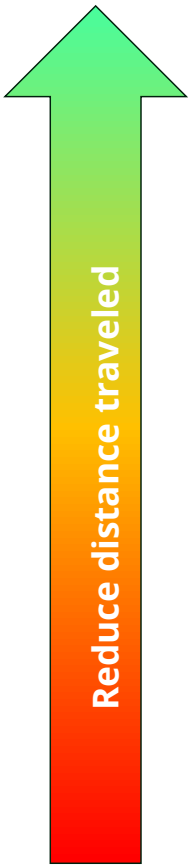
Figure 64: Prevalence of trips to destinations outside the respondent's community. From NLG GHG Inventory survey (2024).

Using these insights, CEA has classified transportation habits within Nisga'a Nation into three trip types: within villages, between villages, and outside the Nation. These trips have been analyzed by their relative carbon intensity to understand which transportation behaviours are contributing most significantly to Nisga'a Nation's carbon footprint (Table 7).

The most carbon-intense trips in Nisga'a Nation are those associated with either single- or multi-occupancy trips between villages and beyond. The targeted solution for each type of trip is listed in order of priority according to the sustainable transportation pyramid (Figure 62).

Table 7: Carbon intensity matrix of trips in Nisga'a, each trip is assigned a carbon intensity based on emissions and trip frequency with higher scores indicating greater emissions.

	Type of Trip	Carbon Intensity	Estimated Prevalence	Carbon Footprint	Targeted Solutions
Within Villages	All-Terrain vehicle trips within village	Medium (2.5)	Prevalent (3)	7.5	1. Convert trips to transit 2. Convert trips to active transportation 3. Convert fuel type to lesser-emitting
	Single-occupancy trips within village by I.C.E.	Medium (2.5)	Somewhat Prevalent (2)	5	1. Convert trips to active transportation modes 2. Convert fuel type to lesser-emitting
	Multi-occupancy trips within village by I.C.E.	Low-Medium (2)	Less prevalent (1)	2	1. Convert trips to active transportation modes 2. Convert fuel type to lesser-emitting
	Single-occupancy trips within village by EV*	Low (1.5)	Less prevalent (1)	1.5	1. Convert trips to transit 2. Increase EV adoption within the community
	Multi-occupancy trips within village by EV*	Low (1.5)	Less prevalent (1)	1.5	1. Convert trips to transit 2. Increase EV adoption within the community
	Active transportation trips within village	Extremely Low (0.5)	Prevalent (3)	1.5	1. Increase % of trips made by active transportation modes
Between Villages	Single-occupancy trips to other villages by I.C.E.	Very High (3.5)	Very Prevalent (4)	14	1. Convert trips to multi-occupancy/transit 2. Convert fuel type to lesser-emitting
	Multi-occupancy trips to other villages by I.C.E.	High (3)	Prevalent (3)	9	1. Convert trips to transit 2. Convert fuel type to lesser-emitting
	Single-occupancy trips between village by EV*	Low (1.5)	Less prevalent (1)	1.5	1. Convert trips to transit 2. Increase EV adoption within the community
	Multi-occupancy trips to other villages by EV*	Low (1.5)	Less prevalent (1)	1.5	1. Convert trips to transit 2. Increase EV adoption within the community
	Transit/shuttle trips to other villages	Low-Medium (2)	Less prevalent (1)	2	1. Increase % of trips made by transit 2. Convert fuel type to lesser-emitting 3. Convert fuel type to lesser-emitting
Outside Nisga'a Nation	Single-occupancy trips to Terrace/beyond by I.C.E.	Extremely High (4)	Very Prevalent (4)	16	1. Reduce # of trips of this type 2. Convert trips to multi-occupancy of transit 3. Convert fuel type to lesser-emitting
	Multi-occupancy trips to Terrace/beyond by I.C.E.	Very High (3.5)	Prevalent (3)	10.5	1. Reduce # of trips of this type 2. Convert trips to multi-occupancy of transit 3. Convert fuel type to lesser-emitting
	Single-occupancy trips to Terrace/beyond village by EV*	Low (1.5)	Less prevalent (1)	1.5	1. Convert trips to transit 2. Increase EV adoption within the community
	Multi-occupancy trips to Terrace/beyond by EV*	Low (1.5)	Less prevalent (1)	1.5	1. Convert trips to transit 2. Increase EV adoption within the community
	Transit/shuttle trips to Terrace/beyond	Medium (2.5)	Somewhat Prevalent (2)	5	1. Increase % of trips made by transit 2. Convert fuel type to lesser-emitting 3. Convert fuel type to lesser-emitting



**Despite not emitting carbon from their operation, these modes are still assigned a carbon intensity rating which assumes emissions associated with electricity used to charge and/or embodied carbon.*

Transportation Targets & Recommendations

Figure 65: Village of Gingolx's "Share the Road" sign, highlighting multiple modes of transportation.

CleanBC[7] is the BC Government's plan to lower climate-changing emissions by 40% by 2030. The policy document outlines a variety of initiatives, actions, and goals to accomplish this overall target. Specific to transportation, BC has a goal to reduce emissions from transportation by 27-32% by 2030.

The Government of Canada has published Canada's 2030 Emissions Reduction Plan that sets a target of reducing 40–45% of greenhouse gas emissions below 2005 levels by 2030. The general actions being taken by Canada include:

- Expanding clean and accessible transportation
- Encouraging the adoption and medium- and heavy- duty Zero Emissions Vehicles.
- Accelerating the switch to passenger Electric Vehicles.

Figure 66: October 2023. NLG's electric hybrid fleet vehicle charging at Gingolx's newly installed level 2 charger.

[7] Government of British Columbia, *CleanBC Roadmap to 2030* (2021), https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc_roadmap_2030.pdf

When decarbonizing transportation in Nisg̲a'a Nation, NLG should generally follow the sustainable transportation hierarchy:

1. **Reduce distance travelled**: as much as possible, seeking opportunities to reduce the distance people need to travel for their needs will help to decarbonize transportation. This involves identifying opportunities to replace trips to Terrace/beyond with trips within Nisg̲a'a Nation, or within the villages.
2. **Change modes**: mode shift involves changing trips made by carbon intensive modes (e.g., single-occupancy I.C.E. trips) to trips made by less-carbon intensive modes (e.g., active transportation trips). This action can generally be prescribed as following the "Make Sustainable Choices" pyramid referenced in Figure 61. Modes at the top of the pyramid should be exchanged for modes at the base.
3. **Improve efficiency**: when the previous two options are not available, efforts should be made to improve the efficiency of the trip. This includes the number of people moved per vehicle (e.g., carpooling), as well as the efficiency of the vehicle being used (e.g., vehicle size, engine efficiency).
4. **Better fuel**: when other actions have already been taken, or are not possible, then consider whether there is a less-emitting fuel source to be used. This action includes switching I.C.E. trips to electric vehicle trips *(*i.e., switching gasoline for electricity as a fuel source). It can also extend to include choosing less carbon-intensive petroleum-based fuels such as biodiesel, or even sourcing electricity from better sources (e.g., through hydroelectricity, wind, or solar, rather than a diesel generator).

Given the geographic remoteness faced by Nisg̲a'a citizens, implementing recommendation 1 is unfeasible in so far that basic goods and services remain located in Terrace or beyond. NLG continues to plan for, and make investments in, infrastructure and housing to enable more Nisg̲a'a citizens to come home to the Territory. With planning, this re-homing could lead to more goods and services offered within Nisg̲a'a Nation that would help to reduce the need for longer distance travel to serve daily needs. However, to meet the targets outlined in this plan, and to contribute to the targets committed to by the Government of Canada and British Columbia, nearer-term actions will need to play a role.

Recommendations therefore focus on actions 2 through 4 of the sustainable transportation hierarchy. Given that most emissions in Nisg̲a'a Nation are associated with longer distance trips, increasing the prevalence of shared modes (busses, carpooling) and fuel switching (increasing the adoption of EVs) will have a more immediate impact in reaching emissions and transportation targets set out in this plan. Consider implementing actionable targets for the Nation that align with the sustainable transportation hierarchy such as doubling the amount of annual trips by public transportation, +10% increase in EV ownership in the community and 100% NLG fleet light-duty vehicles replaced by EVs by 2030.

Transportation solutions also must consider the unique equity, affordability, and safety considerations which are inherent and intrinsic to how people get around. Recognizing this, NLG invested in the development of a Low Carbon Transportation Plan which considers transportation improvements using this holistic approach and recommends detailed implementation pathways.

Figure 67: Sign commenting on the dangers of hitchhiking. Despite the recognized dangers, some community members still see this as a viable method of transportation along Hwy 113 because of few options outside of costly personal vehicles.

To reduce the carbon footprint of transportation in Nisga'a, and achieve the targets outlined in this Plan, CEA recommends:

Review the Nisga'a Lisims Low Carbon Transportation Plan with all Villages to Ensure Buy-In

Effective results are only achieved when there is buy-in from key actors who share the onus for implementing actions. Given the governance structure of NLG and the Village Governments, each Village must act if transportation targets are to be achieved. CEA recommends reviewing the Climate Leadership and Low Carbon Transportation Plans with Village Governments on an annual basis. Each review should document actions taken in the previous year, the status of any ongoing projects, and set actions to be taken in the following year. NLG should track and collect data on Key Progress Indicators to monitor each Plan's progression year-over-year.

Create Action Plans to Implement Recommendations in the Low Carbon Transportation Plan

The Low Carbon Transportation Plan provides a comprehensive set of recommendations intended to help decarbonize transportation while improving equity, affordability, and safety outcomes. CEA recommends creating coordinated action plans which detail the expected year-by-year actions and investments to be made towards implementing recommendations by NLG and each Village Government. Action plans should consider the roles and responsibilities of each party, expected capital and/or operation expenses, targeted funding opportunities and capital injections.

Invest in Public Transportation Options

Investing in public transportation such as bus services, ride sharing services, carpooling, and others should increase the frequency, cost effectiveness, and safety of these options. Public transportation represents an opportunity to significantly reduce transportation emissions as the number of single-occupancy trips can be reduced. Nisg̲a'a citizens demonstrated a strong desire for enhanced bus and transit options. CEA recommends investing in new public transportation vehicles, driver training, accessibility upgrades, and/or other infrastructure or services as identified in the LCTP. Investments should be targeted to increase the frequency of public transportation trips and/or increase the trip capacity.

Enable EV Adoption Among Citizens

EV adoption remains relatively low in Nisg̲a'a. Citizens can be empowered to adopt electric vehicles through targeted supports. Ongoing engagement and education efforts can help to understand and shift attitudes around EVs, clarifying myths or providing resources. For some, the purchase cost of an EV remains inaccessible despite the lifecycle savings compared to ICE vehicles. Securing funding to offer rebate or inventive programs will help overcome this barrier.

Work Collaboratively to Support Transportation Decarbonization

Decarbonizing transportation does not need to happen in isolation. First Nations, Local Governments, private companies, and organizations across BC and within or near Nisg̲a'a Territory are all working to reduce transportation emissions. CEA recommends NLG seek opportunities to work collaboratively with local industry partners, governments, and other organizations to identify and co-develop solutions which support cleaner transportation.

Climate Adaptation & Resilience

Climate Change in Nisga'a Nation

Climate change is already reshaping environmental conditions in and around Nisga'a Territory, including the Nass River valley and surrounding mountain and coastal systems. Long-term shifts in temperature, precipitation, snowpack, sea level rise, and seasonal patterns are underway, and are expected to intensify in the coming decades. These changes will impact water, wildlife, infrastructure, health, and traditional practices.

While the meaning of climate resilience in the Nisga'a context must ultimately be shaped by Nisga'a leadership, knowledge holders, and community members, climate resilience often refers to the ability of people, communities, ecosystems, and systems to anticipate, prepare for, respond to, and recover from climate-related impacts. It can include both reducing risks of acute climate-related events (i.e. heat waves) and adapting to more gradual changes over time (i.e. sea level rise). In many Indigenous contexts, resilience is understood not only in terms of physical infrastructure or emergency response, but also through relationships to land, community, culture, governance, and knowledge systems.

The analysis draws primarily from localized projections for four Nisga'a villages (Gitwinksihlkw, Laxgalts'ap, Gitlaxt'aamiks, and Gingolx) using data from the Climate Atlas of Canada[8], along with complementary insights from the *Climate Projections for the City of Terrace* (2022) report.[9] While this is not a comprehensive or participatory risk assessment, it offers a foundation for future, community-led processes to define resilience and identify adaptation priorities.

Additional Climate Resilience Initiatives: Past and Present

In addition to the GHG inventory, transportation planning and HHE retrofits work described above, NLG and Village Governments have undertaken several projects that contribute directly or indirectly to climate resilience. These initiatives span disaster mitigation, environmental protection, food sovereignty, infrastructure renewal, and sustainable development. These projects include:

[8] Prairie Climate Centre, *Climate Atlas of Canada* (website; current version released July 10, 2019, https://climateatlas.ca/

[9] City of Terrace. (December 2022). *Climate projections for the City of Terrace* [PDF]. https://www.terrace.ca/sites/default/files/Terrace%20Climate%20Projections_FINALa.pdf

Gingolx Harbour Climate Resilience Upgrades

In 2024 nearly $20 million in federal investment was allocated to extend and elevate breakwater infrastructure, protect the shoreline from storms, reduce silt buildup from the Nass River, and protect fish habitat and marine access for commercial and private vessels.

Greenville Creek Sediment Mitigation (Laxgalts'ap)

Completion of emergency repairs to an existing dike damaged by 2020 flooding. The $247K federally funded project, completed in 2024, restored 100 m of critical flood protection infrastructure, with environmental monitoring and habitat protection measures.

Tait Avenue Active Transportation and Storm Drainage (Gitlaxt'aamiks)

Construction of new sidewalk, storm drainage, and gutter infrastructure as part of the Gitlaxt'aamiks Village Government Sidewalk Plan. Completed in 2024 with $1.12M in federal support. This improves community connectivity while enhancing resilience to heavy rainfall and localized flooding.

Food Security and Sovereignty

Annual Salmon Run Population Counts

The traditional, seasonal harvesting of various food sources from both land and water (Figure 67) will be impacted by shifting weather patterns brought by climate change.[10] Salmon stewardship through annual salmon run population counts is an important initiative that tracks salmon population changes. Led by NLG's Lands Directorate, the annual counts determine harvest entitlements for Nisga'a Treaty Fisheries, support food security for citizens and inform evidence-based management practices on the K'alii Aksim Lisims (Nass River) to help sustain salmon populations into the future.[11]

[10] Nisga'a Nation. Seasonal harvest wheel. Nisga'a Language and Culture. Retrieved from https://nisgaalanguage.ca/our-culture/cultural-practices-traditions/seasonal-harvest-wheel/
[11] Coast Funds. (2021, March 1). *Nisga'a Nation enhances salmon stewardship*. https://coastfunds.ca/stories/nisgaa-salmon-stewardship/

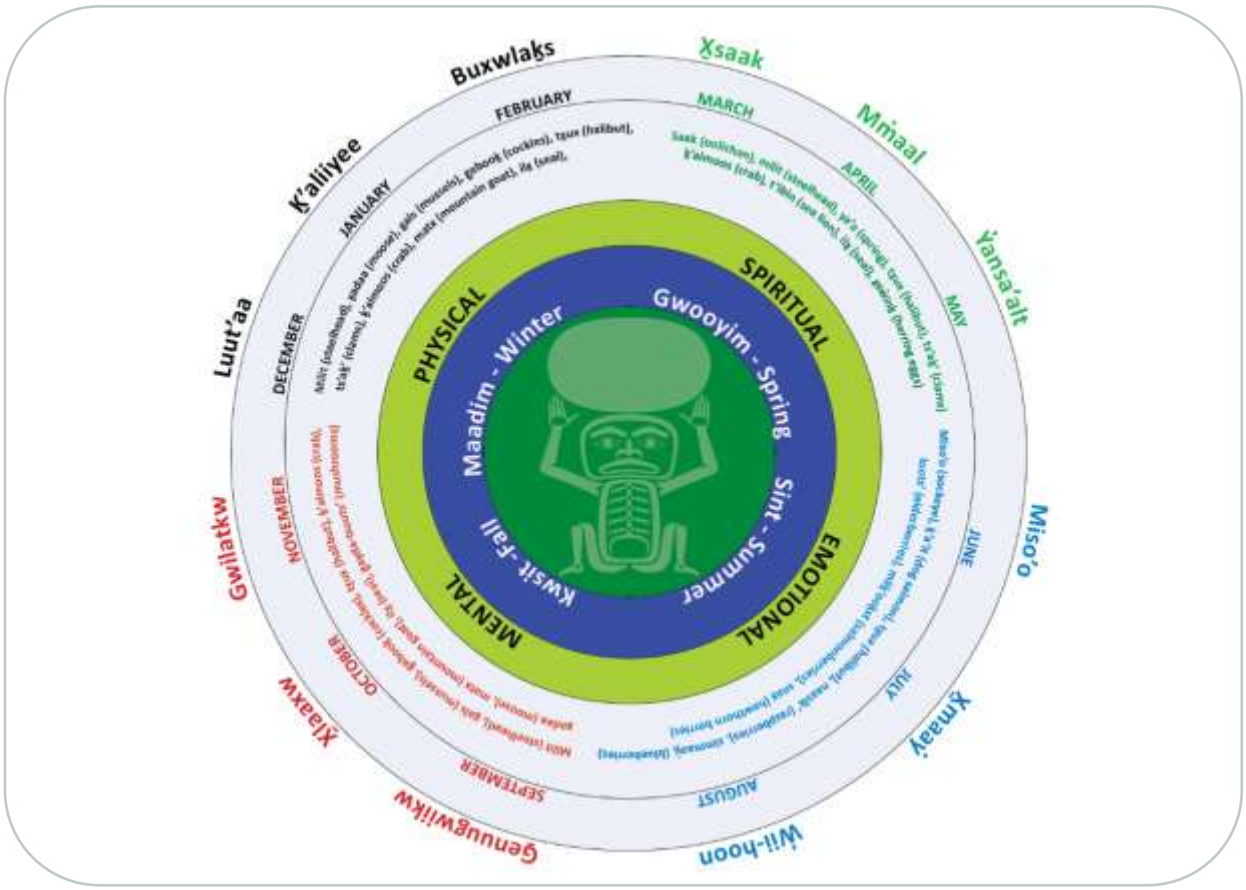


Figure 68: Hli Hloksihl K'uuhl Wil Siwineekshl Nisga'a - Nisga'a Traditional Harvesting Seasons.

Nisga'a Women's Health Foods, Shelter and Education in the Mountainous Permafrost

Led by the Wilp Wilxo'oskwhl Nisga'a Institute, this 2011 project combined ecological fieldwork and intergenerational knowledge sharing to explore how climate change is transforming alpine ecosystems traditionally used for food harvesting. As glaciers in the Nass Valley recede, they give rise to alpine meadows and subalpine shrublands, ecosystems rich in berries, edible plants, and cultural materials long relied on by Nisga'a people. Field studies at Lax Bilak, a well-known berry-picking area, documented women's traditional ecological knowledge and emphasized the importance of cultural continuity in adapting to changing landscapes. The project resulted in a community video and booklet and engaged youth in ethnobotany field trips and day camps that helped restore and transmit place-based knowledge.[12]

[12] ClimateTelling, "Nisga'a," *ClimateTelling* (web page), http://www.climatetelling.info/nisgaa.html

Nisg̱a’a Nation Climate Adaptation Project Flood Mapping

Funded through the First Nations Adapt Program, part of the National Disaster Mitigation Program, this project developed flood mapping for the villages of Gitwinksihlkw, Laxg̱alts’ap, and Ging̱olx on the Nass River and Nass Bay, and along the Nisg̱a’a Highway 113 in low lying areas in between the villages (Figure 68). Comprehensive river and coastal flood mapping was developed along with coastal flood mapping for the only road connecting Ging̱olx and Laxg̱alts’ap. The study helped to develop an understanding of the system through targeted data collection to accurately model the flood plains of the relevant watersheds, including interaction with water levels from Nass Bay.

Forest Management and Climate Resilience

The Nisg̱a’a Nation has engaged in research examining the impacts of climate change on traditional forest practices. The study highlighted the importance of integrating Indigenous knowledge with adaptive forest management strategies to enhance ecosystem resilience in the Nass Valley.[13]

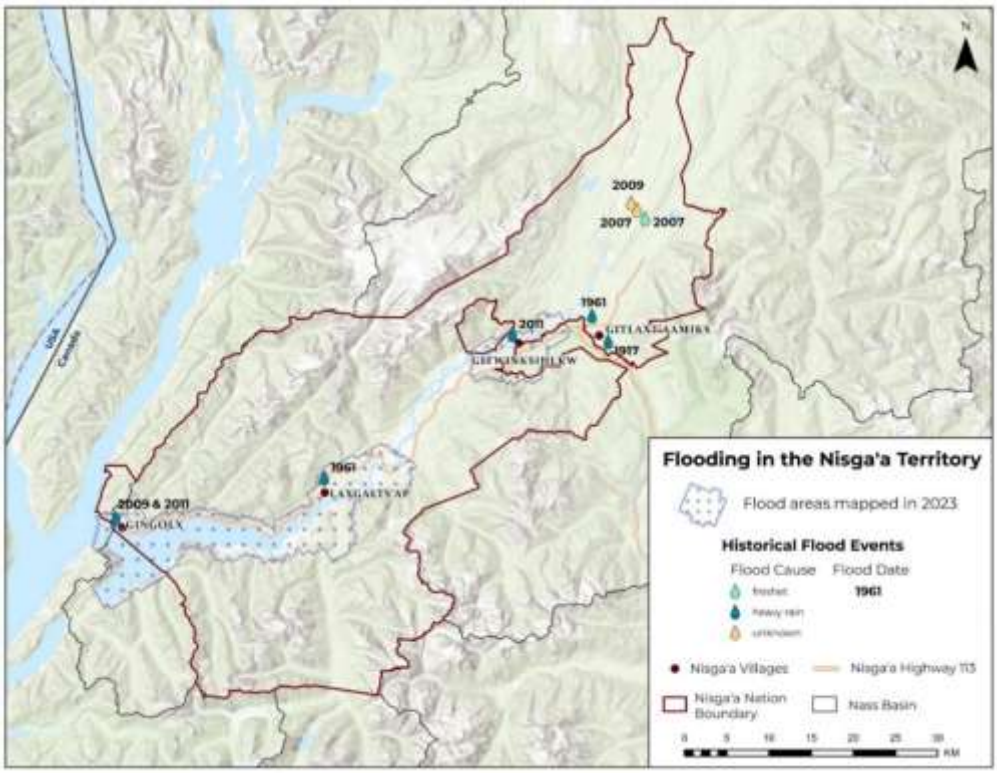


Figure 69: Areas of comprehensive flood mapping of low-lying areas along Hwy 113 and in Nisg̱a’a villages that have historical flood events and are susceptible to both river and coastal flooding.

[13]J. R. Arias-Bustamante & J. L. Innes, “Adapting Forest Management to Climate Change: Experiences of the Nisg̱a’a People,” *International Forestry Review*, 23(1), 1–15 (March 30, 2021).

Future Climate Projections

Temperature, Precipitation, and Seasonal Shifts

Climate projections for Nisga'a Territory illustrate a clear warming trend and changes in precipitation patterns and seasonal shifts that are expected to intensify over time. Summers are projected to become hotter, winters wetter, and seasons will shift significantly, with earlier springs, later autumn frosts, and much longer frost-free periods.

Available climate projections summaries were downloaded from Climatedata.ca for the Villages of Gitwinksihlkw, Laxgalt'sap, Gingolx, and Gitlaxt'aamiks.[14] These summaries show that under a high-emissions scenario (RCP8.5) for the 2051-2080 time period:

- Average annual temperatures are projected to rise 3.7 °C (Gingolx) to 3.9 °C (Gitlaxt'aamiks), with upper-range projections (90th percentile) of warming of up to +5.5 °C.
- Very hot days (> 30 °C) are projected to increase from near zero historically to ~8–16 days per year in inland villages, and ~4 days in Gingolx. Upper-range projections (90th percentile) project up to 20-33 days per year for inland sites.
- Total annual precipitation is projected to rise by ~12–13 % across all communities, with high-end increases of ~30–36 % (90th percentile). Gains are strongest in fall and winter, while summer precipitation changes remain modest.
- Frost-free season projected to lengthen by ~73–74 days, with upper-range projections showing ~115–125 days (90th percentile) of additional frost-free conditions. Springs will start earlier, with the last frost in some communities shifting from late April to early March or even February (90th percentile). Falls will end later, with first frosts moving from late October to late November or December (90th percentile).

Sea Level Rise

Projections for sea level rise for the Gingolx area, taken from Climatedata.ca, show that by **2100**, median (50th percentile) sea levels are projected to rise by approximately:

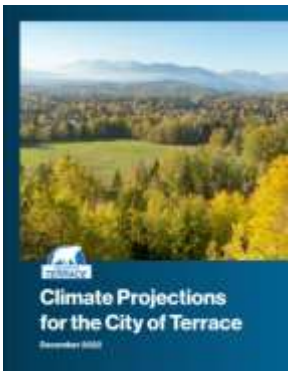
- **43 cm** under a low-emissions scenario (SSP1-2.6)
- **51 cm** under a medium-emissions scenario (SSP2-4.5)
- **59 cm** under a high-emissions scenario (SSP3-7.0)

[14] Prairie Climate Centre. *Climate Atlas of Canada – Map: Days < –15°C, 2030 (high emissions)*. Climate Atlas of Canada. Retrieved from https://climateatlas.ca/map/canada/minus15_2030_85#z=7&lat=55.71&lng=-127.06&grid=1088

- **67 cm** under a very high-emissions scenario (SSP5-8.5)

Upper-range projections (83rd percentile) suggest that sea level rise could reach up to **94 cm** by 2100 under SSP5-8.5. These estimates reflect vertical land motion. The Gingolx area, which lies at the coastal edge of Nisg̲a'a Territory, is directly exposed to marine influences. Sea level rise increases the risk of coastal erosion, storm surge impacts, and tidal flooding.

Climate Impacts Awareness



Climate change is already influencing key environmental, cultural, and economic systems across Nisg̲a'a Lands. Warming temperatures, shifting precipitation patterns, and an increase in extreme events—such as heavy rainfall, flooding, and wildfire—are expected to accelerate in the decades ahead. This section offers a broad overview of potential climate-related impacts across major sectors, including ecosystems, water resources, infrastructure, land use, and community well-being (Table 8).

These summaries are grounded in available climate projection data for Nisg̲a'a villages (primarily from ClimateData.ca), regional studies such as the *Terrace Climate Projections Report* (2022), and published literature on observed and anticipated climate impacts in northern BC and Indigenous communities. Where possible, the analysis reflects what is known about local infrastructure, land use, and economy within Nisg̲a'a Lands. However, the assessment is not comprehensive, and some sector summaries rely on generalized knowledge or remain intentionally high-level due to limited place-specific data.

Table 8: Overview of potential climate-related impacts across major sectors, including ecosystems, water resources, infrastructure, land use and community well-being.

Sector	Context	Expected Impacts
Ecosystems	Nisga'a Territory spans coastal, river valley, and mountain ecosystems, including transitional areas between coastal temperate rainforest and interior boreal forests. The Nass River and its tributaries support diverse ecosystems that are ecologically and culturally significant. The region's vegetation and wildlife patterns are shaped by seasonal snowpack, glacial melt, and historically cool, wet conditions.	• Rising air temperatures will warm rivers, lakes, and streams, increasing stress on aquatic species. Salmon and other cold-water fish are particularly vulnerable. • Reduced warm-season streamflow and increased turbidity from erosion may further disrupt fish habitat and spawning conditions, especially following extreme weather events. • Longer, hotter summers are projected to increase the risk and intensity of wildfires, potentially extending the fire season into autumn. • Plants sensitive to heat and drought stress may experience declines under more frequent extreme heat events. • Warmer year-round temperatures may increase populations of forest pests and facilitate the spread of invasive species. • As ecosystems respond to shifting temperature and moisture regimes, the distribution and composition of plant and animal species may change, placing additional pressure on some local populations.
Water Resources	Nisga'a communities rely on a range of local water systems, including surface water sources such as creeks. For example, Gitlaxt'aamiks draws water from Gitzyon Creek and treats it through a slow sand filtration system, while Gitwinksihlkw has historically depended on upland creeks but has experienced summer water shortages due to low seasonal flow, occasionally requiring water trucking. Infrastructure upgrades have been made to improve water treatment and supply reliability. Climate projections for the region indicate reduced snowpack, earlier spring melt, and warmer temperatures year-round, all of which can alter seasonal water availability. These shifts may affect both surface water reliability and the recharge of shallow aquifers, particularly during drier summer months.	• Hotter and drier summers and increasing water demand from growth may occasionally lead to low seasonal flows and water-supply challenges. • May have need to access backup water supplies (which may need additional treatment). • Watershed may switch from snow dominated watershed to a rain and snow dominated leading to earlier spring freshet and larger autumn flows. • Possibility of increasing flood frequency, affecting groundwater and other water supply quality. • Earlier and more rapid snowmelt, combined with more precipitation falling as rain in winter, may reduce the reliability of traditional water sources over the summer. • Drought conditions in late summer and early fall may challenge surface water sources and strain shallow aquifers, especially during multi-year dry periods.

Sector	Context	Expected Impacts
Stormwater Management	In some areas, climate-related infrastructure upgrades have already been made to improve drainage and reduce flood risk. For example, the Village of Gitlaxt'aamiks completed a sidewalk and storm drainage project in 2024 to improve community connectivity and resilience to heavy rainfall. While each community has distinct topography and drainage needs, regional climate projections indicate that more intense precipitation, which has implications for stormwater management.	• Increasing intensity of extreme precipitation events may overwhelm existing drainage infrastructure. • Localized flooding could occur more frequently in areas with undersized culverts or stormwater systems. • Higher runoff volumes may lead to erosion at drainage outfalls, ditches, or streambanks, particularly where vegetation is disturbed or slopes are steep. • Drainage systems may require more frequent maintenance to manage debris and sediment carried by heavier rainfall. • Infrastructure upgrades may be needed to accommodate higher peak flows, especially in flood-prone or low-lying areas. • In coastal areas like Gingolx, stormwater impacts may be amplified when heavy rainfall coincides with high tides or sea level rise.
Tourism, Recreation, and Culture	Nisg̲a'a Nation offers a rich array of cultural, recreational, and ecotourism experiences, including the Nisg̲a'a Museum, Hli G̲oothl Wilp-Adok̲shl Nisg̲a'a, Anhluut'ukwsim Lax̲mihl (Lava Beds Memorial Park), fishing lodges, natural hot springs, and the scenic Nisg̲a'a Highway 113 auto tour route. These destinations draw both residents and visitors. Outdoor recreation is central to community life and to the Nation's tourism economy, with activities ranging from cultural tourism to camping, hiking, fishing, and seasonal gatherings.	• More warm days will extend the summer recreation season. • Hotter summers and milder shoulder seasons could increase visitor numbers, placing pressure on natural systems and facilities. • Extreme heat and smoke events may increase demand for cooling and shelter in tourism and community facilities. • Earlier or extended campfire bans, and temporary recreation site closures may be required during wildfire season. • Increased frequency of extreme rainfall may cause trail washouts or access issues, particularly at unpaved or sloped sites. • Warming waters and altered river flows may affect salmon and other culturally significant fishing opportunities. • Wildfires, flooding, or landslides may periodically disrupt transportation corridors and tourism access, with consequences for local businesses. • Warmer summers with modest precipitation change may increase wildfire-related disruptions to tourism and resource-based economies.
Transportation	Transportation routes in the Nass Valley, including Highway 113 and connecting roads to the four Nisg̲a'a villages, are vital for community access, emergency response,	• Warming temperatures during the autumn, winter, and spring will likely delay and shorten the window for winter snowfall, making winter travel safer earlier in autumn and later in spring.

Sector	Context	Expected Impacts
	commerce, and cultural connectivity. These routes traverse mountainous terrain, floodplains, and forested landscapes that are exposed to seasonal hazards such as snow, ice, landslides, and flooding. Gitwinksihlkw, for example, has recently upgraded evacuation routes connecting to Hwy 113, emphasizing the role of transportation infrastructure in climate emergency preparedness. Community concerns have also been raised about flash flooding, unstable slopes, and culvert capacity, highlighting the vulnerability of road networks under future climate extremes.	• Active transportation will potentially be more desirable for more months of the year; however, increased precipitation might offset this trend. • With precipitation falling in more extreme events, an increase in runoff could overwhelm existing drainage infrastructure. This may be coupled with an increased risk of landslides and slope instability, could threaten roads and bridges leading to temporary closures of transportation corridors. • Increased risk of washouts and closures on Hwy 113 and secondary roads due to extreme rainfall, earlier freshet, and debris flows, particularly in areas with steep slopes or limited culvert capacity (Gitlaxt'aamiks, Gitwinksihlkw). • Sea level rise and coastal storm surge may affect marine and intermodal transport access in Gingolx, especially where dock and harbour infrastructure interfaces with road access points. Evacuation and emergency routes may become more critical during climate-related hazards.
Land Use	Nisga'a communities are located throughout the Nass River valley and coastal inlets, with village sites situated near rivers, estuaries, and alluvial lowlands. While detailed geotechnical and hydrological studies would be needed to assess area-specific vulnerabilities, climate-informed land use planning may help identify areas at greater risk and guide the placement or retrofitting of infrastructure in the future.	• Climatic changes may change where it is appropriate to build or maintain development, especially in areas exposed to increased flood risk, erosion, landslides, or other climate hazards. • Culturally important land uses (e.g., berry picking grounds, seasonal harvesting areas, ceremonial sites) may be affected by ecological change and access limitations caused by climate-related hazards.
Building and Energy Systems	Buildings across Nisga'a communities are expected to face greater stress from rising temperatures, heavier precipitation, and more frequent extreme weather events. These changes may require shifts in how homes and community facilities are designed, maintained, and powered.	• Rising summer temperatures and more frequent "very hot days" (above 30 °C) may increase the risk of indoor overheating, especially in homes without cooling systems or adequate ventilation. • Warmer winters may reduce heating demand in some months, but overall energy use could increase due to cooling needs and air filtration during smoke or poor air quality events. • Heavier fall and winter rainfall could increase the risk of moisture intrusion, mould, or water damage in older buildings or those not designed for such conditions.

Sector	Context	Expected Impacts
		• Changing precipitation and storm intensity may increase the risk of localized flooding, putting pressure on foundations, crawlspaces, or mechanical systems located in basements or lower levels. • New or upgraded buildings will need to consider future climate conditions, including temperature extremes, precipitation changes, and air quality, to ensure they remain safe, comfortable, and resilient over their full life cycle.
Economy	Climate change may affect the Nisga'a economy through its impacts on natural resources, transportation routes, housing, cultural infrastructure, and regional tourism. Many economic activities in the Nass Valley are closely tied to land and environmental conditions, through forestry, fisheries, and tourism, making them vulnerable to environmental change.	• Warmer temperatures may change the distribution and composition of ecosystems and are likely to affect the reproductive cycles of forest pests like the mountain pine beetle and spruce beetle, which could impact timber supply and result in job losses in the forestry sector. • Hotter summers may increase the likelihood of severe wildfires, which may impair forestry operations, compromise air quality, and reduce tourism. • Flooding in the wet seasons may cause damage to natural and economic infrastructure, further limiting industrial activities and reducing tourism.
Food and Agriculture	Changing climate conditions are expected to affect both cultivated and traditional food systems in Nisga'a communities, impacting agriculture, home gardening, harvesting, fishing. This has implications for well-being and food sovereignty. Climate change may present both risks and opportunities for these systems.	• As the climate warms, growing seasons become longer, which can have a positive impact on food and agriculture. • However, longer, warmer summers can cause water stress for producers and the general public during shortages. • Changes in seasonal precipitation and temperature patterns and snowmelt timing may affect access and abundance of harvested plant and animals. • Warmer temperatures may also lead to diminished soil quality, heat stress in plants, and a rise in agricultural pests. • Increasing variability in climate will also challenge food producers, making it harder to plan and execute successful harvests.
Human Health	Changing climate conditions in Nisga'a Territory may pose growing risks to community health and wellness, particularly for vulnerable populations such as Elders, young children, and people with pre-existing health conditions who may be most affected	Rising temperatures and periodic extreme heat events could increase the risk of heat stress, particularly for Elders, children, and those with pre-existing health conditions. Wildfire smoke events may become more common during the summer months, which could affect

Sector	Context	Expected Impacts
	by hazards such as smoke or heat. Seeing the land and water challenged and disturbed by climate change, as well as experiencing hazardous events such as floods or wildfires, can have an impact on mental health.	respiratory health, especially for vulnerable populations. Changes in seasonal weather patterns and extreme events may disrupt outdoor activities, traditional practices, and community gatherings, contributing to stress, anxiety, and cultural disconnection. Increased precipitation and flooding could heighten risks of waterborne illnesses or mold exposure in homes and buildings. Longer allergy seasons and increased presence of disease-carrying insects (e.g., ticks, mosquitoes) may also emerge as potential concerns in a warming climate, although further monitoring would be needed.
Emergency Services	Climate change is expected to increase the frequency and severity of emergencies in Nisga'a Territory, creating new demands on first responders and local emergency management systems. Increased collaboration between local governments, Nisga'a Village Governments, and provincial/federal emergency response agencies may be needed to support integrated and culturally appropriate emergency preparedness strategies. Investments in early warning systems, backup power, community-based response training, and accessible communications will be important for enhancing emergency resilience.	• More intense and frequent extreme weather events—including flooding, landslides, and wildfire—may lead to more frequent activation of emergency response systems, as well as temporary evacuations or disruption of transportation routes. • Warmer and drier summers raise the potential for interface wildfires, requiring enhanced preparedness and community protection measures, such as FireSmart programming and evacuation planning. • Extreme heat events may require activation of cooling centres or other protective measures for at-risk populations, including Elders, infants, and people with chronic illness. • Climate-driven emergencies may further strain existing emergency infrastructure in remote and rural communities, where access and capacity can already be limited.

Key Observations and Priority Actions

Climate change and the actions needed to address it touch nearly every aspect of our lives. Progressing Nisga'a Nation's inter-related climate leadership initiatives through both mitigation and adaptation activities has real potential to improve climate resilience alongside several measures of quality of life for Nisga'a, and all our relations, both inside and outside of the Territory. The work deeply aligns with Ayuukhl Nisga'a, the ancient laws and customs that shape Nisga'a governance, relationships, and responsibility to the land.

This Climate Leadership Plan brings together some of the key strategies that could be implemented to improve resilience and quality of life through:

- energy efficiency, security and sovereignty;
- housing quality, health, safety and resilience to extreme weather and climate impacts;
- transportation options that would influence employment options, access to services, food security, and safety;
- self-reliance through capacity building, skills development and related career advancement;
- understanding of climate risks to inform community development and planning,
- etc.

Coordination and information sharing across NLG directorates, village governments and other Nisga'a organizations presented significant challenges in this engagement and planning process. There are past and ongoing climate related projects within the Nation that we were unable to fully acknowledge, coordinate with or learn from while doing this work. As this initiative is updated and expanded upon it would be encouraging and worthwhile to find ways to have greater collaboration with many others who are also working on climate, lands and water stewardship, language and culture, health, housing, waste, transportation, capacity building and energy related initiatives. In this way, the important work of others could be acknowledged and amplified and the learnings, benefits and resilience to climate change shared more broadly amongst every Nisga'a citizen.

Tables 9 to 15 list the key observations, significance and suggested priority actions for the inter-related climate initiatives detailed in this report and shown in Figure 2. It will be up to Nisga'a governments and citizens to determine what actions best align with their other priorities and to direct attention toward those that offer the greatest potential co-benefits and resilience in a changing climate.

Energy & Emissions Inventory

Table 9: 2023 baseline energy and emissions inventory related key observations, significance and associated priority actions.

Topic	Key Observations	What this means	Priority Actions
Overall GHG Profile	• 9,253 tCO_2e total emissions • Community emissions = 89% • Village Governments & NLG emissions = 11%	Most emissions are outside direct government control; meaningful reductions require community-wide action supported by policy, infrastructure, and incentives.	• Focus climate action on community transportation and housing • Use government leadership to enable community change
Energy Use & Costs	• 205,508 GJ total energy use • $8.52M in annual energy costs	High ongoing energy costs represent both a financial and climate burden for the Nation.	• Target measures that reduce both emissions and operating costs • Prioritize actions with strong payback
Transportation Energy & Emissions	• 56% of energy use • 84% of emissions • 70% of costs • Dominated by gasoline and diesel	Transportation is the single largest driver of emissions across community and government inventories.	• Electrify government fleets • Explore public transportation options • Support community EV adoption • Invest in charging infrastructure
Buildings Energy & Emissions	• 44% of energy use • 11% of emissions • 30% of costs • Electricity already a major energy source • Much lower emissions intensity than transportation	Buildings are partially decarbonized already, but heating fuels and back up systems (e.g. wood stoves, propane heaters, diesel generators) still contribute to emissions and costs.	• Electrify heating systems • Improve energy efficiency in homes and public buildings
Fuel Use	• Electricity has one of the largest of energy uses at 31% but only contributes 2% of total emissions • Fossil fuels contribute to 86% of the total emissions and 73% of total costs to the Nation	Electrification is the most effective and cost-efficient emissions reduction strategy.	Shift vehicles and buildings away from gasoline, diesel, and propane

Topic	Key Observations	What this means	Priority Actions
Government Operations	• Emissions = 1,041 tCO_2e • Fossil fuels and the transportation sector dominate emissions sources even though electricity and buildings contribute more to total energy use	Government emissions are smaller than community emissions overall but highly visible and controllable, making them ideal for lead-by-example opportunities.	• Electrify fleets and buildings first • Use government projects as pilots and demonstrations
Community	• Emissions = 8,212 tCO_2e • Fossil fuels and the transportation sector dominate emissions and energy use	Community emissions make up most of the Nation's profile.	Prioritize effective government supported emissions reductions strategies that are easy for community members to adopt such as: • Electrify vehicles • Increased public transportation • Home heating electrification and energy efficiency programs such as HHE Retrofits
Data Quality & Tracking	• Missing electricity and fleet data in some villages • Small survey sample sizes affect accuracy	Data gaps limit precision and comparability across villages and over time.	• Standardize data collection • Update the inventory regularly using the developed tool

Community Engagement

Table 10: Community engagement related key observations, significance and associated priority actions.

Topic	Key Observations	What this means	Priority Actions
Community Engagement & Governance	• Extensive engagement with citizens, Elders, staff, elected officials, contractors, and partners across 2023–2024 through surveys, meetings, interviews, training, and public events.	Findings reflect broad participation and strong legitimacy; community voices are directly informing planning.	• Maintain regular engagement; ensure clear feedback pathways between leadership and citizens.
Climate Action Priorities	• High interest in practical climate action focused on housing retrofits and transportation • Additional interest in recycling and alternative energy.	Climate action is understood as a way to improve quality of life through affordability, comfort, and community well-being.	• Prioritize actions that deliver immediate household and community benefits.
Housing, Energy Retrofits & Elders' Needs	• Strong support for energy efficiency upgrades, alongside concerns about poor housing conditions and high winter energy costs. • Emphasis on safe, comfortable, and accessible housing for Elders and families	Retrofit programs must be equitable and flexible, addressing both energy efficiency and underlying housing condition issues, with a focus on vulnerable households.	• Implement tiered retrofit and renovation pathways; • Prioritize Elders' and family homes; • align energy retrofits with major repair or replacement funding; • reduce upfront costs through grants and supports.
Transportation (Access, Affordability & Low-Carbon Options)	• Strong support for improved shuttle and bus service within and between villages and to larger centres • Key barriers include frequency, accessibility, and cost. • Interest in shared transportation, ride-sharing, e-	Transportation is a major equity issue affecting access to services, healthcare, jobs, education, and cultural activities.	• Improve shuttle bus frequency and regional service • Subsidize or provide free transit for Elders • Pilot ride-sharing services; support e-bike/e-scooter funding

Topic	Key Observations	What this means	Priority Actions
	bikes/e-scooters, and limited interest in EVs		
Waste & Resource Management	• Community support for recycling • Ongoing concerns about managing plastic waste.	Waste reduction is a shared priority but requires system-level solutions.	• Explore improved recycling infrastructure and plastic reduction initiatives.

Climate Impacts Awareness

Table 11: Climate impacts awareness related key observations, significance and associated priority actions.

Topic	Key Observations	What This Means	Priority Actions
Overall Climate Change	• Warming temperatures, shifting seasons, heavier rainfall, and sea level rise are already occurring and will intensify	Climate change affects all systems—land, water, culture, health, and infrastructure.	• Advance a Nisga'a-led, culturally grounded climate resilience framework
Precipitation, Flooding & Sea Level Rise	• Wetter fall/winter • Heavier rainfall events • Coastal flooding risk in Gingolx • Overland flood risk in all areas	Higher flood risk across Nisga'a Nation lands, erosion and infrastructure damage are likely.	• Upgrade drainage, flood protection and coastal defences • Climate-proof infrastructure
Temperature & Seasons	• Temperatures rise ~4°C by 2050 • More extreme heat • Much longer frost-free periods • Shifting seasons	Increased heat stress, ecosystem change, and pressure on infrastructure, homes and services.	• Integrate heat adaptation into buildings, health planning, and emergency response
Water Resources	• Reduced snowpack • Earlier and more rapid snowmelt • Increased drought in summer	Reduced reliability of traditional water sources as summer water shortages are possible.	• Protect watersheds • Plan for backup water supplies • Enhance water system resilience and storm water management
Ecosystems & Food Systems	• Growing season has become longer • Hard to plan on harvest/hunting/fishing with changing seasons and unpredictable weather	Risks to food security, culture, and resource-based livelihoods.	• Strengthen Indigenous stewardship • Monitor fisheries

	• Salmon, forests, and traditional harvesting areas are stressed by warming, low stream flows, pests, and wildfire		• Develop/increase food sovereignty initiatives
Transportation & Access	• Roads, evacuation routes, and coastal access vulnerable to flooding, erosion and landslides • Warmer, shortened winters could make winter travel safer	Though winter travel might become easier, disruptions to safety, emergency response, and economic activity are possible	• Climate-adapt roads, culverts, and evacuation routes • Plan for coastal impacts and find alternate routes if possible
Buildings & Energy	• Homes and facilities face overheating, moisture damage, flooding, and smoke exposure	Higher health risks, energy demands and damaged property/ insurance claims are likely.	• Expand retrofits and design new buildings for future climate conditions and energy efficiency
Human Health & Emergency Services	• Increased heat, smoke, flooding, and climate-related emergencies	Greater strain on vulnerable populations and emergency systems.	• Enhance emergency preparedness • Invest in cooling and clean-air community spaces • Enhance community response capacity
Economic & Cultural Activities	• Tourism and resource sectors face both opportunities and disruptions	Economic uncertainty is tied to climate impacts.	• Integrate climate risk into economic and land-use planning
Current Resilience Efforts	• Significant investments already made in flood mapping, harbour protection, stormwater, and cultural knowledge projects	Strong foundation for future adaptation work.	• Build on existing projects to create a coordinated, long-term adaptation plan

Climate Resilient Buildings

Table 12: Climate resilient buildings related key observations, significance and associated priority actions.

Topic	Key Observations	What this means	Priority Actions
Buildings & GHG Emissions	• Buildings are a major source of operational GHG emissions and strongly affect climate resilience • Airtight, well-insulated and ventilated, all-electric homes perform best	Improving building performance is one of the most effective ways to reduce emissions, lower energy costs, and increase climate resilience at the same time.	• Prioritize high-performance building envelopes and fuel switching to electric heat pumps for both new and existing buildings
Climate Resilience & Health	• Heat pumps provide heating, cooling, and filtered air during heat waves and wildfire smoke events • Degraded housing contributes to significant physical and mental health impacts	Housing quality is directly linked to community health, safety, and resilience to climate impacts.	• Integrate health, comfort, and indoor air quality outcomes into all housing upgrades and standards
New Construction Standards	• The West Coast Building Standard, ESC and Zero Carbon Step Code ZCSC provide strong performance frameworks • New homes in Laxgalts'ap exceed provincial requirements (ESC Step 4).	Building better from the start avoids future retrofit costs and ensures long-term benefits.	• Adopt a Nation-wide Building Standard similar to the West Coast Building Standard and aligned with higher ESC/ZCSC steps and Nisga'a cultural values
Cultural & Community Needs	• Standard housing design often fails to reflect cultural kitchens, moisture loads, food preparation, and multi-generational living	Climate-resilient housing must reflect lived realities and cultural practices to be effective and durable.	• Embed cultural design requirements (ventilation, moisture control, storage, adaptability) into new builds and housing standards (e.g. the West Coast Building Standard)
Renewable Energy & Energy Security	• Local renewable energy paired with battery storage improves resilience during outages and reduces emissions	Energy independence strengthens community resilience and long-term affordability.	• Expand solar and battery installations alongside building efficiency improvements whenever possible • Search out funding possibilities for this initiative

Topic	Key Observations	What this means	Priority Actions
Healthy Home Energy Retrofits (Existing Homes)	• Most homes have structural issues • Mould is a serious health and safety issue • Many homes are energy-inefficient • Significant funding and incentives are available but underutilized • HHE retrofits can improve durability, energy efficiency (≥30%), health, and climate resilience simultaneously • Poorly planned upgrades risk maladaptation	Upgrading existing homes is urgent, feasible, and essential for health, housing security, and climate leadership. Capacity—not funding—is the main barrier. Quality outcomes depend on building science, coordination, and accountability.	• Systematically scale HHE retrofits using a house-as-a-system, envelope-first approach • Activate existing funding • Require energy audits, integrated design processes, qualified contractors, performance targets, and post-retrofit testing • Implement phased retrofit plans over 5–15 years • Launch the Nisga'a HHE Retrofit Coaching Pilot to build local capacity, support homeowners, and collect data for continuous improvement
Risk of Inaction	• Delays increase repair costs, worsen health outcomes, and risk permanent loss of housing stock • Construction costs continue to rise	Inaction is more costly than proactive investment and threatens long-term community viability.	• Treat HHE retrofits as an urgent preventative investment in housing, health, and community resilience

Low Carbon Transportation

Table 13: Low carbon transportation related key observations, significance and associated priority actions.

Topic	Key Observations	What this means	Priority Actions
Transportation Emissions	• Transportation accounts for ~84% of total GHG emissions in Nisga'a Lands, costing ~$2.2M annually	Transportation is the single largest opportunity for emissions reductions and cost savings for the Nisga'a Nation.	• Prioritize transportation actions within climate planning • Apply the sustainable transportation hierarchy to all transportation decisions and investments
Travel Patterns	• Most emissions come from inter-village and regional trips to Terrace and beyond using personal vehicles • Housing and services outside the Nation drive ongoing travel demand	Personal vehicle vehicles are the preferred method of travel. Long-distance travel is unavoidable in the near term due to the location of community services and geography. Transportation planning must align with broader community development goals.	• Focus on shared transportation, efficiency improvements, and fuel switching rather than trip elimination • Invest in housing, infrastructure, and local services to reduce future travel needs
Public & Shared Transportation	• Limited existing services • Strong community interest in public transit, carpooling, and ride-sharing	Opportunity for the community to shift from single-occupancy vehicles to shared transportation modes offers immediate emissions reductions and provides a desired public service.	• Invest in buses and community shuttles • Develop ride-sharing programs • Provide greater driver training opportunities • Support and expand infrastructure (roads, walkways, shelters, signage)
Equity & Affordability	• Transportation costs are higher than the BC average affecting low-income, disabled and Elder populations the most • Transportation options are limited, leading to unsafe practices such as hitchhiking	Transportation inequities directly affect safety, affordability, and access to services.	• Integrate equity and affordability considerations into all transportation solutions • Expand affordable, reliable, and safe public and shared transportation options • Ensure services meet the needs of Elders, youth, people with disabilities, and low-income households

Topic	Key Observations	What this means	Priority Actions
Electric Vehicle Adoption	• EV ownership remains low due to cost, infrastructure gaps, and limited awareness • NLG has begun electrifying fleet vehicles	Without targeted supports, EV adoption will remain slow despite long-term savings. Fleet electrification is a visible and controllable pathway to emissions reduction.	• Expand public charging infrastructure • Provide education on EVs • Pursue rebates or incentive programs for the community • Transition 100% of NLG light-duty fleet vehicles to EVs by 2030
Governance & Coordination	• Successful implementation requires coordination between NLG and Village Governments	Without shared accountability, targets are unlikely to be met.	• Set clear, measurable transportation and emissions-reduction targets • Review the Nisg̱a'a Lisims Low Carbon Transportation Plan with all villages to ensure buy-In • Conduct annual plan reviews and track KPIs to monitor progress • Align with CleanBC and Canada's 2030 Emissions Reduction Plan

Land & Water Stewardship

Table 14: Land and water stewardship related key observations, significance and associated priority actions.

Topic	Key Observations	What this means	Priority Actions
Land Cover Overview	• ~75% of Nisga'a lands are forested • Built area <0.1% of land base	Forests are the Nation's largest carbon asset offering carbon sequestration potential and therefore an important GHG reduction pathway.	• Protect forest cover where possible • Integrate carbon conscious practise into forest management • Use nature-based solutions to offset emissions
Land Cover Change (2018–2024)	• Built area increased ~30% though this remains a small percent of total land • Forest cover decreased slightly (~0.7%) • Flooded vegetation and snow/ice extent increased slightly, likely due to increased precipitation in the fall/winter	Development impacts are small on Nation lands but high in GHG emissions. Climate change is altering hydrology, increasing flood risk and land-use uncertainty.	• Minimize unnecessary land conversion • Encourage compact, efficient development • Integrate flood and wetland risk into land-use planning • Avoid development in high-risk areas
Land Use & Carbon Accounting	• Baseline land cover dataset has been established • Detailed land-use emissions not yet quantified	The Nation lacks a full picture of carbon sequestration vs emissions from land use.	• Consider developing land-use carbon accounting for more accurate GHG inventory
Land Use, Food Security & Stewardship	• Climate change is altering land- and water-based ecosystems that support traditional harvesting • Glacier/snowpack retreat is creating new alpine and subalpine harvesting areas	Food security and sovereignty are directly shaped by land and water use decisions. Protecting river systems, alpine harvesting areas, and access routes is essential to sustaining traditional harvesting, ecological health, and Indigenous governance as landscapes change.	**Short-term (<3 years)** • Continue salmon run counts • Identify and map key harvesting areas • Support Indigenous knowledge sharing and youth engagement **Medium Term (3-7 years)** • Integrate harvesting areas and seasonal use into land use plans • Strengthen watershed and habitat protections

Topic	Key Observations	What this means	Priority Actions
			• Recognize emerging alpine harvesting zones **Long Term (7+ years)** • Maintain Indigenous governance of fisheries and harvesting areas • Adapt land use planning frameworks over time to reflect ongoing climate-driven ecosystem changes and food system needs

Capacity Building & Mentorship

Table 15: Capacity building and mentorship related key observations, significance and associated priority actions.

Topic	Key Observations	What this means	Priority Actions
Two-way mentorship pathway	• Formalizing a two-way mentorship arrangement between NLG and CEA resulted in effective coordination, customized communications and approaches and multi-directional transfer of knowledge.	This approach benefitted Nisga'a Nation with internal capacity and skills development while effectively guiding external consultants on community context, key contacts and cultural protocols.	• Find ways to incorporate this approach to relationship building and knowledge transfer in ongoing climate work and related initiatives
Participation in the Indigenous Clean Energy "Bring it Home" Accelerator Program	• Designed to support the development of Indigenous energy efficiency housing projects. Nisga'a • Nation received virtual and in-person training and access to a national network of experts and mentors to support the creation of a HHE Retrofits plan.	NLG's climate coordinator received direct support and mentorship from this leading Indigenous-led organization to support and inform the HHE Retrofits workplan approach, priorities, and implementation strategies. The program provided valuable relationships and resources to support the work.	• Continue identifying and leveraging partnerships, training opportunities, and supports through the ICE network and related organizations.
Local Capacity & Workforce Development	• Healthy Home Energy Retrofit training engaged local housing staff, contractors, and suppliers through hands-on and classroom learning.	Building local capacity supports long-term program delivery and community economic benefits.	• Continue and expand training programs to strengthen local retrofit and construction capacity.

Appendices

Appendix A: Recommendations to Canada

First Nations Climate Leadership Agenda: Nisg̲a’a Nation Recommendations to Canada

Submitted by Kaitlyn Robinson, Climate Coordinator, NLG

October 2024

BACKGROUND

The Nisg̲a’a Nation is represented by NLG and has the authority to pass laws on a variety of matters. Nisg̲a’a lawmaking coincides with federal and provincial authority. Designed to assure democracy, transparency, and accountability, the Nisg̲a’a Government is comprised of NLG, the four Nisg̲a’a Village Governments, and three Nisg̲a’a Local Societies.

Supported by the Nisg̲a’a Executive Committee, the Capital, Housing, & Facilities Operations Directorate facilitates climate initiatives and engagement plans. In July 2024, an official Climate Action Coordinator position was established to focus on these important initiatives. Due to lack of capacity and short timelines for these specific initiatives, engagement topics from February-July 2024 prioritized resilient, healthy, energy efficient housing and low-carbon transportation considerations. Going forward, engagement activities will further consider climate topics such as food sovereignty, resiliency measures for our communities located in floodplains, and turning to knowledge keepers to better understand the impacts of climate change on our traditional ways of life.

RECOMMENDATIONS

NLG works collaboratively with the Nation’s four Village Governments to engage our leadership, Nisg̲a’a citizens, and government administration. Through the workplan of the Climate Action Coordinator, initial engagement findings have gone into the following high-level recommendations to Canada:

- Upholding Self-Governing Treaty Obligations
    - Support capacity building efforts through direct funding of positions
    - Allocate funds for implementation of initiatives that align with Federal, Provincial and Nisg̲a’a climate plans.
- Support Climate Resilient Infrastructure and Housing Projects
- Support the Bridging of Western & Traditional Knowledge
- Improve Collaboration Amongst Governments, First Nations, and Non-Governmental Organizations (NGOs)

Recommendation – Upholding Self-Governing Treaty Obligations

Canada must recognize and honour the Nisg̲a'a Nation's treaty rights by providing predictable and ongoing funding directly through self-government transfers. This would provide the Nisg̲a'a Nation opportunity to implement a newly established Climate Department to carry out initiatives that align with provincial, federal, & Nisg̲a'a climate plans. This funding would be directed toward the hiring and retention of climate professionals, including:

- 1.0 Climate Change Manager
- 1.0 Energy Specialist
- 1.0 Climate Policy Analyst
- 1.0 Climate Engagement Officer
- 1.0 Climate Outreach Specialist

Rationale

The Nisg̲a'a Nation has inherent rights to self-governance, including over land and resource management. However, there are challenges in building capacity to address complex climate issues. Funding dedicated to positions focused on climate policy, energy management, and community engagement will support the Nisg̲a'a Nation in exercising our treaty rights and fulfilling our climate goals. Equipping the Nisg̲a'a Nation with the necessary financial resources and technical support is essential for implementing and scaling up climate initiatives. Secure funding for climate projects, providing technical training, and facilitating access to tools and technologies will bridge gaps and empower Nisg̲a'a communities to lead in climate action. See Appendix 2 for relevant Nisg̲a'a Final Agreement Chapters.

Recommendation – Support Climate Resilient Infrastructure and Housing Projects

The Nisg̲a'a Risk Assessment project through the Lands & Resources directorate at NLG has identified flood risks in three of four Nisg̲a'a communities. Next steps in this project will be to establish recommendations on how to mitigate these risks, including costs to do so. Canada must establish funding to protect the buildings and homes on Nisg̲a'a lands and invest in development for innovative techniques to enhance overall resiliency efforts.

Rationale

Initial findings through the Nisg̲a'a Floodplain Risk Assessment show that flooding will pose a great risk to three of our four communities. Prioritizing climate resilient homes and infrastructure is crucial to ensuring that our communities will be able to sustain through future environmental events such as flooding, windstorms, and forest fires.

Recommendation – Support the Bridging of Western & Traditional Knowledge

Establish formal frameworks to recognize and integrate Indigenous knowledge systems alongside Western scientific approaches through institutionalized co-management and policy development that respects Nisga'a/indigenous rights. Ensuring that Nisg̲a'a voices are heard, respected, and given authority within formal governance structures is key to creating equitable and sustainable policies that address contemporary challenges.

Rationale

The Nisg̲a'a possess invaluable traditional ecological knowledge and sustainable land management practices since time immemorial. Integrating this knowledge with contemporary climate science offers a holistic approach to climate stewardship. By recognizing and supporting Nisg̲a'a methods, such as controlled burning and traditional (ang̲o'oskw) land management, recommendations aim to leverage proven strategies that enhance ecosystem resilience and biodiversity. These practices often maintain ecological balance, which can strengthen resilience against climate change impacts. Traditional knowledge often includes methods for conserving and enhancing local biodiversity, which is crucial in mitigating the effects of climate change.

Recommendation – Improve Collaboration Amongst All Levels of Governments, First Nations, & Non-Governmental Organizations (NGOs) Who Work on Behalf of Nations

Promote and fund collaborative research and community projects that involve all stakeholders. Ensure projects in Nisg̲a'a Territory address the needs and priorities of Nisg̲a'a communities and are designed with their active participation. Facilitate opportunities with all levels of government to enhance collaboration and transfer of knowledge (such as engagement findings, data sharing, etc.).

Rationale

Federal, provincial, and municipal governments should meet regularly to share updates on their interactions with Indigenous nations to avoid multiple levels of government asking the same questions or launching overlapping initiatives. Further, all levels of government should establish regular channels of communication with nations to keep them updated on research and engagement efforts, reducing the need for repetitive consultations.

Expected Short-Term Outcomes:

- Increased Capacity and Empowerment: Nisg̲a'a communities will have greater access to resources, training, and support, enabling improved climate leadership.
- Enhanced Collaboration: Stronger partnerships between Indigenous communities, government agencies, and NGOs, leading to more inclusive and culturally relevant climate solutions.
- Immediate Climate Action: Implementation of localized, traditional ecological knowledge-driven projects that address urgent climate challenges, such as habitat restoration, sustainable land management, and renewable energy adoption.
- Policy Influence: Greater representation of Indigenous perspectives in national and regional climate policies, leading to more holistic and sustainable decision-making.
- Increased Awareness: Broader public recognition and appreciation of Indigenous knowledge systems and their vital role in climate resilience.

Expected Long-Term Outcomes:

- Sustainable Environmental Stewardship: Long-term preservation and restoration of ecosystems, guided by traditional knowledge and practices that have sustained these lands for generations.
- Resilient Communities: Nisg̲a'a communities become more resilient to climate impacts through infrastructure improvements and associated community health improvements, sustainable economic development, and enhanced food and water security.
- Systemic Change in Climate Governance: A shift in climate governance frameworks to prioritize traditional leadership, ensuring that climate actions are equitable, inclusive, and effective.
- Intergenerational Knowledge Transfer: Strengthened transmission of Nisg̲a'a ecological knowledge to future generations, ensuring that our traditions stay alive.

Risks of Inaction

Short-Term Risks:

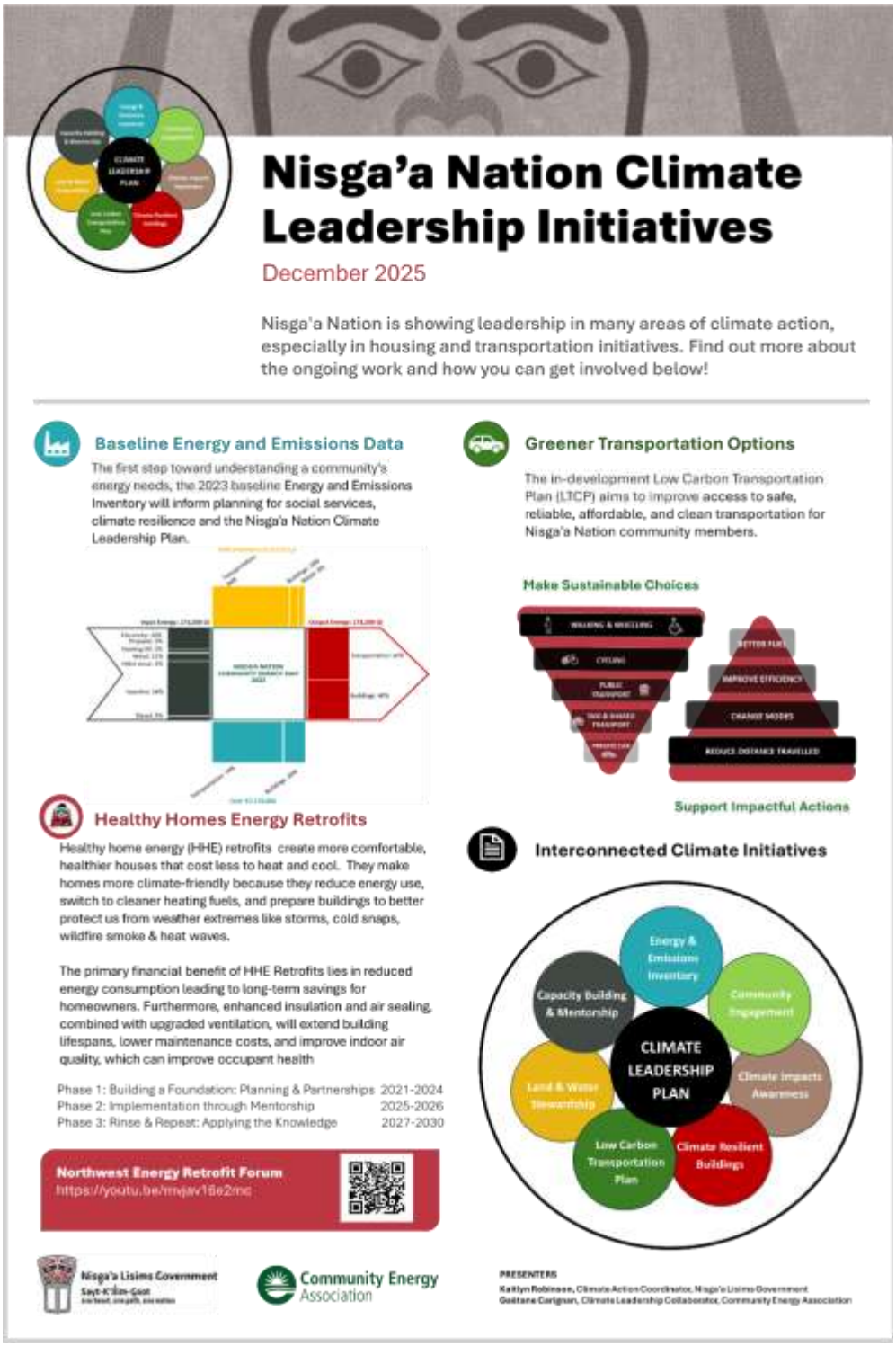
- Increased Frequency and Severity of Natural Disasters: Without proactive climate action, our lands could experience more frequent and severe natural disasters, such as floods, wildfires, and storms. These events can lead to loss of life, loss of natural resources, property damage, and significant costs for emergency response and recovery efforts.
- Immediate Threats to Nisg̲a'a Communities: the Nisg̲a'a villages are located in vulnerable areas with limited emergency evacuation options. Inaction could pose greater threats to our citizens' health and well-being. Loss of traditional lands and resources, displacement, and increased health problems related to climate impacts.

- Decrease in Trusting the Government: Failing to address climate issues, particularly those affecting Nisga'a communities, could eliminate trust in the government. Increased social unrest, legal challenges, and difficulty in implementing future policies.
- Deterioration of Biodiversity: Without action, critical habitats and species could be lost due to climate change and environmental degradation. Loss of biodiversity has immediate ecological and cultural consequences.

Long-Term Risks:

- Irreversible Climate Change Impacts: Inaction may lead to surpassing critical climate thresholds, such as extensive heat/drought, and ice caps melting causing a rise in sea level. This could result in permanent loss of ecosystems, widespread species extinctions, and drastic changes to global weather patterns, making it difficult to mitigate or adapt to climate change.
- Worsening Inequality and Social Disparities: worsening poverty, reduced access to resources, increased displacement, and social instability, with lasting effects on community cohesion and national unity.
- Economic Decline and Loss of Competitiveness: Long-term economic costs of inaction include decreased productivity, increased infrastructure damage, and reduced investment as Canada becomes less attractive to businesses focused on sustainability.
- Loss of Global Leadership and Reputation: Inaction could undermine Canada's international reputation as a leader in climate action and human rights, including its commitment to Indigenous reconciliation.
- Intergenerational Impacts: Future generations will inherit a world with reduced natural resources, more severe climate events, and greater challenges in achieving sustainable development.
- Cultural Losses: The continued degradation of the environment could lead to the erosion of cultural practices and knowledge systems that are rooted in the land. Loss of cultural identity, and traditional knowledge, which has long-term implications for the preservation of heritage and community resilience.

Appendix B: Nisga’a Climate Leadership Overview



Nisga’a Nation Climate Leadership Initiatives

December 2025

Nisga'a Nation is showing leadership in many areas of climate action, especially in housing and transportation initiatives. Find out more about the ongoing work and how you can get involved below!

Baseline Energy and Emissions Data

The first step toward understanding a community's energy needs, the 2023 baseline Energy and Emissions Inventory will inform planning for social services, climate resilience and the Nisga'a Nation Climate Leadership Plan.

Greener Transportation Options

The in-development Low Carbon Transportation Plan (LTCP) aims to improve access to safe, reliable, affordable, and clean transportation for Nisga'a Nation community members.

Make Sustainable Choices

Support Impactful Actions

Healthy Homes Energy Retrofits

Healthy home energy (HHE) retrofits create more comfortable, healthier houses that cost less to heat and cool. They make homes more climate-friendly because they reduce energy use, switch to cleaner heating fuels, and prepare buildings to better protect us from weather extremes like storms, cold snaps, wildfire smoke & heat waves.

The primary financial benefit of HHE Retrofits lies in reduced energy consumption leading to long-term savings for homeowners. Furthermore, enhanced insulation and air sealing, combined with upgraded ventilation, will extend building lifespans, lower maintenance costs, and improve indoor air quality, which can improve occupant health

Phase 1: Building a Foundation: Planning & Partnerships 2021-2024
Phase 2: Implementation through Mentorship 2025-2026
Phase 3: Rinse & Repeat: Applying the Knowledge 2027-2030

Northwest Energy Retrofit Forum
https://youtu.be/rmjav16e2mc

Interconnected Climate Initiatives

Energy & Emissions Inventory
Capacity Building & Mentorship
Community Engagement
CLIMATE LEADERSHIP PLAN
Land & Water Stewardship
Climate Impacts Awareness
Low Carbon Transportation Plan
Climate Resilient Buildings

Nisga’a Lisims Government
Sayt-K’ilm-Goot

Community Energy Association

PRESENTERS
Kaitlyn Robinson, Climate Action Coordinator, Nisga’a Lisims Government
Gaëtane Corignan, Climate Leadership Collaborator, Community Energy Association

Appendix C: Residential Inventory Survey Questions

This online survey was open for approximately three months in late 2023 to early 2024. In that time, 135 individual responses were recorded, however only 47 individuals completed the entire survey. Respondents were evenly distributed with individuals participating from all villages.

Part A - Tell us about your home

1A. How old is your home? Enter approximate year built:

2A. What type of house is it?

- ◯ Detached house (single family)
- ◯ Attached house / duplex / row house
- ◯ Apartment / condo
- ◯ Mobile
- ◯ Seasonal house (cottage / cabin)
- ◯ Other (Please specify)

3A. If you know it, what is the square footage of your home? Enter size in sq. feet.

4A. What fuel do you use in your home (select from list)? See instructions below to help determine the following:

Oil furnace/boiler

Wood stove

Propane furnace/boiler

Pellet stove

Diesel

Electric baseboard

Electric furnace/boiler

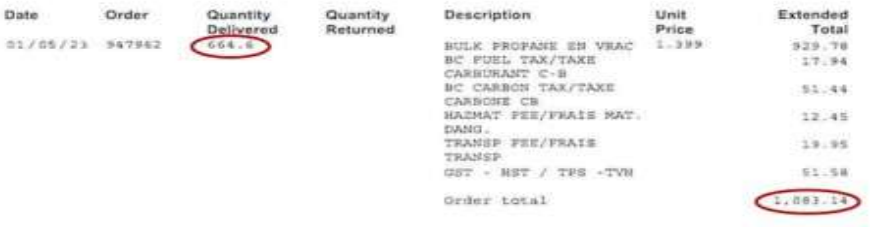
Other

Describe other heating source

Ways to Determine Energy Use

To assist with the section below, here are a couple of different methods that can be used to determine the annual volume and cost of fuels. If possible, please follow the examples below to find the actual amount. If that is not possible, please provide an estimate.

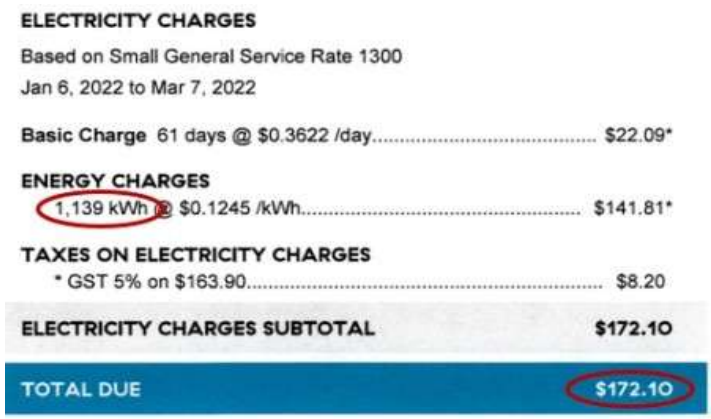
Example 1 - Superior Propane



Date	Order	Quantity Delivered	Quantity Returned	Description	Unit Price	Extended Total
01/05/23	947962	664.8		BULK PROPANE EN VRAC	1.399	929.78
				BC FUEL TAX/TAXE		17.94
				CARBURANT C-B		
				BC CARBON TAX/TAXE		51.44
				CARBONE CB		
				HAZMAT FEE/FRAIS MAT. DANG.		12.45
				TRANSP FEE/FRAIS TRANSP		19.95
				GST - HST / TPS -TVH		51.58
				Order total		1,083.14

Example 2 - Electricity

Energy use (kWh) and cost can be found on monthly bills (see example #1 below). Other options are to login to your BC Hydro account (example #2) or to provide your BC Hydro account number and permission for NLG to access your data.



ELECTRICITY CHARGES

Based on Small General Service Rate 1300

Jan 6, 2022 to Mar 7, 2022

Basic Charge 61 days @ $0.3622 /day..... $22.09*

ENERGY CHARGES

1,139 kWh @ $0.1245 /kWh..... $141.81*

TAXES ON ELECTRICITY CHARGES

* GST 5% on $163.90..... $8.20

ELECTRICITY CHARGES SUBTOTAL **$172.10**

TOTAL DUE **$172.10**

Example 3 - Firewood

5A. In 2022, how much energy did your heating systems consume and cost? *Note: If your home uses electric heating, please combine your total electric consumption in question 6 below.*

	Oil furnace/boiler (Litres)	Wood Stove (Cords)	Propane furnace/boiler (Litres)	Pellet stove (kgs)	Diesel (Litres)	Other
Amount of Energy Used						
Cost (CAD $)						

6A. In 2022, how much electric energy did your household consume and how much did it cost?

Electricity (kWh)

Amount of Energy Used

Cost (CAD $)

7A. Approximately how often do you experience power outages?

- ◯ More than once per week
- ◯ Once per week
- ◯ Once per month
- ◯ 2-3 times per month
- ◯ 4-6 times per year
- ◯ 2-3 times per year
- ◯ Once per year

8A. How long do power outages usually last?

- ◯ Less than 1 hour
- ◯ 1-2 hours
- ◯ 2-4 hours
- ◯ 4-6 hours
- ◯ 6-12 hours
- ◯ less than 24 hours
- ◯ more than 24 hours

9A. How do you power your home during power outages?

10A. Approximately how much fuel (diesel or other?) do you use because of power outages, annually?

11A. If you burn firewood, how long do you season/dry the wood before burning it?

◯ Less than 3 months ◯ 3-6 months ◯ More than 6 months

Part B - Tell us about the vehicles you own

1B. What kind of operational vehicle(s) do you own, and how many? How much do you spend on fuel per month on average?

	Truck (light or heavy duty)	Small Car	SUV or Large Car	ATV or Side-by-Side	Motorcycle	Snowmobile	Outboard Motorboat
Number of vehicle type							
Type of Fuel Gas or Diesel							
Approximate Monthly Cost of Fuel							

2B. Please tell us about any electric vehicles you may own. How far do you travel with them, and how much electricity do you use to charge them?

Type of Vehicle	Number of vehicle type	Approximate Monthly Distance (km)	Approximate Monthly Charging (kWh)
E-bike or tricycle			
E-scooter			
EV Small Car			
EV SUV or Large Car			
EV Truck (light or heavy duty)			
EV ATV or Side-by-Side			
EV Motorcycle			
EV Snowmobile			
EV Motorboat			

3C. How often do you travel to other villages and communities in a month, or if it's less frequent, in a year?

Location	Number of trips in a month	Number of trips in a year
Gingolx		
Laxgalts'ap		
Gitwinksihlkw		
Gitlaxt'aamiks		
Terrace		
Prince Rupert		
Kitimat		
Smithers		
Prince George		

4B. If you travel by road to other communities than those listed above, where do you travel to, and how many times per year? e.g. Vancouver 2 times per year.

5B. If you travel by boat, how many marine trips do you make a year? Where do you travel to? e.g. Prince Rupert

Survey summary & responses:

Appendix D: Methods & Assumptions

Government Energy and Emissions

The following data was shared by the Nisga'a Nation to analyse government energy use, emissions, and cost from transportation and buildings operations for NGL and each of the four village governments:

- 2023 BC Hydro bills from NLG, Gitlaxt'aamiks, Gingolx, and Gitwinksihlkw in kilowatt hours (kWh), and Laxgalts'ap in kWh and cost
- 2023 Superior Propane bills from NLG in litres (L) and cost
- 2023 fuel sales from NLG and Gitlaxt'aamiks
- 2024 electric vehicles charging station data
- 2024 fleet list from NLG, Gitlaxt'aamiks, Gingolx, and Gitwinksihlkw

Conversion factors from fuel units (i.e. kWh and L) to gigajoules (GJ) were obtained from Canada Energy Regulator[15], and GJ to tonnes of carbon dioxide emissions equivalent (tCO_2e) conversion factor for electricity was calculated using the 2022 electricity emission intensity factor[16] and the 2022 National Inventory Report[17] for propane, gasoline, and diesel. The average electricity cost per kWh was calculated using Laxgalts'ap's 2023 BC Hydro bill, and average gasoline and diesel cost per L were calculated using Gitalaxt'aamiks' fuel data. Propane costs were directly extracted from NLG's propane bill.

Buildings electricity, propane, gasoline, and diesel use were directly extracted from various bills and fuels sales data.

Transportation gasoline and diesel use were estimated by using the fleet list and the Community Energy and Emissions Inventory (CEEI)[18] from the Province of BC. Using the CEEI, the average fuel consumption and emissions for each vehicle type in the Kitimat-Stikine Unincorporated Area in the year 2022 (the most recent inventory year) was calculated. Additionally, the fleet list was aggregated into the vehicle types listed in the CEEI. With the two datasets, we estimated

[15] "Canada Energy Regulator", Government of Canada, May 2, 2016, https://apps.cer-rec.gc.ca/Conversion/conversion-tables.aspx?GoCTemplateCulture=en-CA
[16] "Electricity emission intensity factors for grid-connected entities", Government of BC, April 8, 2025, https://www2.gov.bc.ca/gov/content/environment/climate-change/data/electricity
[17] "National Inventory Report 1990-2022 Part 2", Environment and Climate Change Canada, 2024, https://publications.gc.ca/site/eng/9.506002/publication.html
[18] Current Community Energy and Emissions Inventory data", Government of BC, January 14, 2025, https://www2.gov.bc.ca/gov/content/environment/climate-change/data/ceei/current-data

the annual fuel consumption and emissions by fuel type for the year 2023. Electric vehicle energy consumption was estimated using the 2024 electric vehicle charging data.

Community Energy and Emissions

CEA sent out a survey to Nisga'a community members to inquire about energy use and cost at their homes and for personal vehicles, as well as the tonnage of waste community members dispose. There was a total of 46 respondents from all four villages (Figure 69). See Appendix D for the full list of survey questions.

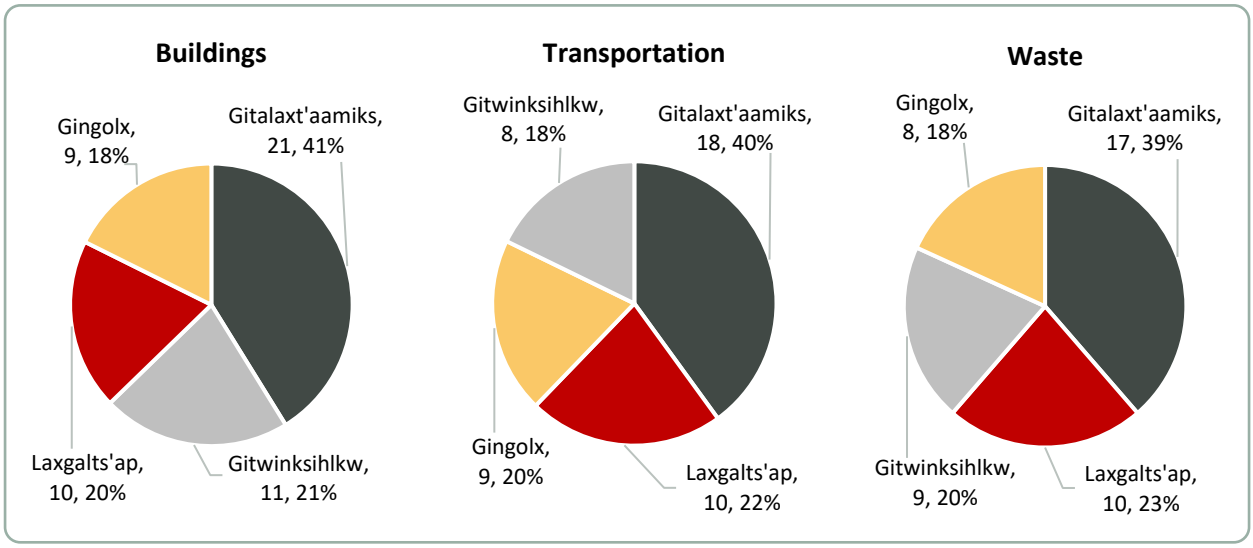


Figure 70: Distribution of respondents from the Nisga'a Nation community inventory survey.

First, average household fuel use was calculated based on survey responses, covering electricity, propane, heating oil, wood, and pellet stoves use in homes, as well as gasoline and diesel for personal vehicles. Responses were received from all four communities, and data from respondents living outside the villages were excluded. Total fuel consumption and cost for each village was then estimated by multiplying the calculated average household fuel use by the number of households in each village.

Conversion factors for gasoline, diesel, and electricity followed the same methodology as the government energy and emissions inventory. Conversion factors of other fuel types referred to those used in the CEEI for Kitimat-Stikine Unincorporated Area.

Population & Housing

The population and housing data for each village was obtained from NLG Housing Needs Report[19], which provides 2016 and 2021 population data, and dwelling count in 2020 by village (Table 16).

Table 16. Summary of population and dwelling data from the Nisga'a Nation.

	Population (2016)	Population (2021)	Total Dwellings (2020)
Nisga'a Lands	1,880	1,794	-
Village of Gitlaxt'aamiks	737	749	276
Village of Gingolx	374	367	148
Village of Laxgalts'ap	376	248	182
Village of Gitwinksihlkw	211	207	58

To inform the annual population growth rate for each village BAU projections were estimated using the 2016 and 2021 population data:

- Nisga'a Lands: -0.92%
- Village of Gitlaxt'aamiks: 0.32%
- Village of Gingolx: -0.38%
- Village of Laxgalts'ap: -6.8%
- Village of Gitwinksihlkw: -0.38%

Because the most recent available data are the 2021 population and the 2020 dwelling data, the 2023 population and dwelling totals for each community are assumed to remain consistent with those values.

[19] Nisga'a Lisims Government. (2022, April). Housing needs report. https://www.nisgaanation.ca/wp-content/uploads/2025/01/Nisgaa-Lisims-Government-Housing-Needs-Report-April-2022.pdf

Land Use

Land use imagery for Nisga'a Lands was generated using a layer series from ESRI derived from the European Space Agency Sentinel-2 satellite imagery at a 10m resolution using the most recent complete data set for the year 2024 as well as historical data from 2018. These land use data layers are generated with a deep learning AI land classification model that uses surface reflectance data in the visible blue, green, red, near infrared, and two shortwave infrared bands. To create the final data layers, the model is run on multiple dates of imagery throughout a year, and the outputs are consolidated into a final representative map for each year.

Descriptions of Land Use Categories[20]:

Forest - Any significant clustering of tall (~15 feet or higher) dense vegetation.

Cropland - Human planted/plotted cereals, grasses, and crops not at tree height; e.g.: corn, wheat, soy.

Rangeland - Open areas covered in grasses, wild cereals or scrub, with little to no taller vegetation and no obvious human plotting e.g. pastures, natural meadows and fields, parks.

Built Area - Human made structures; major road and rail networks; large homogenous impervious surfaces e.g. houses, dense villages / towns / cities, paved roads, parking lots.

Water - Areas where water was predominantly present throughout the year e.g. rivers, ponds, lakes.

Flooded vegetation - Areas of any type of vegetation with obvious intermixing of water throughout most of the year; seasonally flooded area.

Bare ground - Areas of rock or soil with very sparse to no vegetation for the entire year e.g. exposed bedrock or soil.

Snow/Ice - Large homogenous areas of permanent snow or ice, typically only in mountain areas or highest latitudes; examples: glaciers, permanent snowpack, snow fields.

Cloud Cover - No land cover information due to persistent cloud cover.

[20] *Source: Sentinel-2 10m Land Use/Land Cover Time Series -* https://ic.imagery1.arcgis.com/arcgis/rest/services/Sentinel2_10m_LandCover/ImageServer