ST. JOHN'S

Committee of the Whole
Agenda

March 9, 2022
9:30 a.m.
4th Floor City Hall

Pages

1. Call to Order

2. Approval of the Agenda

   2.1. Approval of Agenda - March 9, 2022

3. Adoption of the Minutes

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4. Presentations/Delegations

5. Finance & Administration - Councillor Ron Ellsworth

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7. Community Services - Deputy Mayor Sheilagh O'Leary

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9. Housing - Councillor Ophelia Ravencroft

10. Economic Development, Tourism & Immigration - Mayor Danny Breen

11. Arts & Culture - Deputy Mayor Sheilagh O'Leary

12. Governance & Strategic Priorities - Mayor Danny Breen

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ST. JOHN'S

Minutes of Committee of the Whole - City Council

Council Chambers, 4th Floor, City Hall

February 23, 2022, 9:30 a.m.

Present:	Mayor Danny Breen Deputy Mayor Sheilagh O'Leary Councillor Maggie Burton Councillor Ron Ellsworth Councillor Sandy Hickman Councillor Debbie Hanlon Councillor Jill Bruce Councillor Ophelia Ravencroft Councillor Jamie Korab Councillor Ian Froude Councillor Carl Ridgeley
Staff:	Derek Coffey, Deputy City Manager of Finance & Administration Tanya Haywood, Deputy City Manager of Community Services Jason Sinyard, Deputy City Manager of Planning, Engineering & Regulatory Services Lynnann Winsor, Deputy City Manager of Public Works Cheryl Mullett, City Solicitor Susan Bonnell, Manager - Communications & Office Services Ken O'Brien, Chief Municipal Planner Karen Chafe, City Clerk Christine Carter, Legislative Assistant
Others	Kelly Maguire, Communications and Public Relations Officer Keith Barrett, Director of Corporate Information Services Andrew Niblock, Director of Environmental Services Norm Mensour, President, Scotia Recycling Darren Welner, Director of Sales, Scotia Recycling Tammy Gulliver, Controller / Operations Manager, Scotia Recycling Judy Tobin, Manager, Housing

1. Call to Order

Mayor Breen called the meeting to order at 9:33 am.

2. Approval of the Agenda

Recommendation
Moved By Councillor Ravencroft
Seconded By Deputy Mayor O'Leary

That the agenda be adopted as presented.

MOTION CARRIED

3. Adoption of the Minutes

3.1 Adoption of Minutes - February 9, 2022

Recommendation
Moved By Councillor Hanlon
Seconded By Councillor Bruce

That the minutes of February 9, 2022, be adopted as presented.

For (11): Mayor Breen, Deputy Mayor O'Leary, Councillor Burton, Councillor Ellsworth, Councillor Hickman, Councillor Hanlon, Councillor Bruce, Councillor Ravencroft, Councillor Korab, Councillor Froude, and Councillor Ridgeley

MOTION CARRIED (11 to 0)

4. Presentations/Delegations

4.1 Scotia Recycling Presentation

Representatives from Scotia Recycling presented to Council on their recycling operations at the Robin Hood Bay Waste Management Facility.

Highlights of the presentation included:

- Background on Scotia Recycling
- Review of the City's Current program
- Closed-loop Recycling and the Circular Economy
- Current Real-life Closed Loop - Successes
- Current Real-life Closed Loop - Challenges
- Items Impacting Recyclability
- Trends that will Impact Recycling

Members of Council also raised other issues such as options for the recycling of glass or the development of a market/reuse for glass, proper cleaning of recyclable plastics, clam shell recycling, capacity of the Robin Hood Bay facility with increased recycling uptake by residents, and the environmental footprint of recycling and the value of recycling.

The representatives from Scotia Recycling and City Staff were thanked for all the great work being done to increase recycling in the City.

5. Finance & Administration - Councillor Ron Ellsworth

5.1 New Information Technology Policy

Deputy Mayor O'Leary asked for clarification on Section 3.5 - IT printing and how Council members are to print off items required. The Deputy City Manager of Finance and Administration advised that members of Council and Staff should print any required documents at City Hall.

Recommendation
Moved By Councillor Ellsworth
Seconded By Councillor Hanlon

That Council approve the Information Technology Policy and rescind the related policies listed in Annex A.

For (11): Mayor Breen, Deputy Mayor O'Leary, Councillor Burton, Councillor Ellsworth, Councillor Hickman, Councillor Hanlon, Councillor Bruce, Councillor Ravencroft, Councillor Korab, Councillor Froude, and Councillor Ridgeley

MOTION CARRIED (11 to 0)

6. Public Works - Councillor Sandy Hickman

7. Community Services - Deputy Mayor Sheilagh O'Leary

8. Special Events - Councillor Debbie Hanlon

9. Housing - Councillor Ophelia Ravencroft

9.1 Housing Division Update

Councillor Ravencroft reviewed with members of Council the Housing Division update and noted that this annual report highlights some of the activities happening in the Housing Division.

A separate report to highlight the activities of the Affordable Housing Strategy will follow at a later date.

Ms. Judy Tobin, Manager of Housing, was welcomed to the meeting and was commended by members of Council on the work of the City's Housing division and on the partnerships that have been formed with the province towards meeting housing needs in the City.

Ms. Tobin advised that work is ongoing to renovate existing larger units into smaller 1–2-bedroom units to accommodate the changing demographics in the community. She also noted that during these renovations, there is also a focus on making the units more energy efficient.

Several questions from Council were posed, including an explanation on the agreements that had been in place with NLHC, and the creation of one housing wait list amongst NLHC, the Province and other housing partners. Ms. Tobin advised that the current Cities Act prohibits the City from sharing and collecting information, therefore, we are unable to share a common list with housing partners at this time.

It was noted by Council that the number of applicants currently on the wait list reflects the need by so many in the City for affordable housing and that number continues to grow. The cost of converting the larger units (3-4 bedrooms) into smaller units was also discussed, and shows how expensive these renovations are, and why they are not all completed immediately.

A question was asked concerning the turnover time required to have units ready for new residents. Ms. Tobin advised that the Staff are very efficient in getting repairs completed and readying units for new tenants in a very timely manner. A property could be vacant for a period of time if it is a larger unit and not in demand, or if there is major damage that needs to be repaired.

9.2 Affordable Housing Working Group Membership

Recommendation
Moved By Councillor Ravencroft
Seconded By Councillor Burton

That Council recommend appointment of, and extension of membership to the following members to the Affordable Housing Working Group:

1. Sonya Clark-Casey, First Light (Until May of 2022)

2. Colin Hipditch, Government of NL (Until December of 2023)
3. Doug Pawson, End Homelessness St. John's (Until December of 2023)
4. Grayson Kelly, Newfoundland and Labrador Housing Corporation

For (11): Mayor Breen, Deputy Mayor O'Leary, Councillor Burton, Councillor Ellsworth, Councillor Hickman, Councillor Hanlon, Councillor Bruce, Councillor Ravencroft, Councillor Korab, Councillor Froude, and Councillor Ridgeley

MOTION CARRIED (11 to 0)

10. Economic Development, Tourism & Immigration - Mayor Danny Breen

11. Arts & Culture - Councillor Debbie Hanlon

12. Governance & Strategic Priorities - Mayor Danny Breen

13. Planning - Councillor Ian Froude

13.1 Heritage Plan Terms of Reference

Councillor Burton advised that the Development of a Heritage Plan is an action item in the 2019-2029 City of St. John's Strategic Plan, and will set out a vision, goals and action item for the protection, management, and promotion of St. John's heritage. This will include built heritage (buildings and structures) as well as natural and cultural heritage. The Heritage Plan will be completed internally by City planning staff.

To ensure transparency in the process, the Terms of Reference are presented to Council and the public before staff starts the project. The Terms of Reference indicate the intent of the Heritage Plan; the content will evolve as background research and public consultation is completed.

Planning staff have begun initial conversations with other departments on appropriate and effective public consultation opportunities. The City will use an independent facilitator to conduct larger public consultation meetings which will occur either late spring or early fall 2022. As well, a communications plan will be prepared to assist in promoting the public consultation.

It is anticipated that the St. John's Heritage Plan will be completed for Council's consideration next Spring.

Recommendation
Moved By Councillor Burton
Seconded By Councillor Froude

That Council approve the St. John's Heritage Plan Terms of Reference as proposed.

For (11): Mayor Breen, Deputy Mayor O'Leary, Councillor Burton, Councillor Ellsworth, Councillor Hickman, Councillor Hanlon, Councillor Bruce, Councillor Ravencroft, Councillor Korab, Councillor Froude, and Councillor Ridgeley

MOTION CARRIED (11 to 0)

14. Development - Councillor Jamie Korab

15. Transportation and Regulatory Services - Councillor Maggie Burton

16. Sustainability - Councillor Maggie Burton & Councillor Ian Froude

17. Other Business

17.1 Referral from Town of Portugal Cove – St. Phillip's for Lot Paving and Site Upgrades – 901-909 Thorburn Road – INT2100092

Several members of Council voiced their support for this motion and the site upgrades planned for the property.

Recommendation
Moved By Councillor Froude
Seconded By Councillor Korab

That Council approve the proposed site upgrades to the existing commercial Use at 901-909 Thorburn Road (Sharpe's Store), which would allow paving of the existing gravel area of the parking lot, new concrete walkway along the store front, removal of grass at the rear which would then be covered with stone, installation of two (2) retaining walls and extension of the fencing along the boundary, upon the recommendation of the City Manager pursuant to with Section 104 (4)(d) City of St. John's Act.

For (11): Mayor Breen, Deputy Mayor O'Leary, Councillor Burton, Councillor Ellsworth, Councillor Hickman, Councillor Hanlon, Councillor Bruce, Councillor Ravencroft, Councillor Korab, Councillor Froude, and Councillor Ridgeley

MOTION CARRIED (11 to 0)

18. Adjournment

There being no further business the meeting adjourned at 10:57 am.

_____

Mayor

INFORMATION NOTE

Title: Clear Bags for Garbage and Recycling Tonnages

Date Prepared: February 16, 2022

Report To: Committee of the Whole

Councillor and Role: Councillor Sandy Hickman, Council Lead for Public Works

Issue: Clear Bags for Garbage and Recycling Tonnages

Discussion – Background and Current Status:

New Bylaw
In January 2021, Council approved a new Sanitation Regulations Bylaw to reflect modern practices of waste collection including curbside recycling and other ways to divert waste from the landfill. Outlined in the Bylaw is the definition of a garbage bag as a transparent, colourless watertight bag; a privacy bag as an opaque bag with a limit of one per collection; and recycling material that is to go in a transparent, blue bag.

Clear Bag Campaign Launch
Beginning in January 2022, the new Sanitations Regulations required that clear bags be used for garbage and curbside recycling would be mandatory. This was publicly communicated throughout 2021. A promotional campaign launched in November 2021 included a paid advertising campaign and distribution of clear bag samples through the City Guide magazine delivered to residential mailboxes. Distribution of clear bag samples continues at City Community Centre's, Access St. John's and public events.

Clear Bag Availability
In December 2021 there was some lack of availability of clear garbage bags at local retailers, particularly kitchen-bin size bags. The initial unavailability of clear bags was anticipated and has occurred in other jurisdictions across Canada when clear bags for garbage was introduced. Taking a 'soft' and educational approach to give residents time to find, purchase and use clear bags for garbage has been publicly communicated throughout the clear bag campaign. With a "soft" approach, initially the City would continue to collect waste that was not in clear bags.

Increase in Recycling
The use of clear bags with mandatory recycling has resulted in a positive impact towards Council's waste diversion and sustainability efforts. Residents have placed approximately 30-40% more recycling material, measured by weight in metric tonnes, at the curb in the first two months of 2022 than in the same two months for the previous 5 years:

Period	Metric Tonnes of Recycling Collected	% increase in 2022
Jan-Feb 2022	*579.39*	*--*
Jan-Feb 2021	*343.83 ** *	*68.5% ** *
Jan-Feb 2020	*410.03*	*41.3%*
Jan-Feb 2019	*443.80*	*30.6%*
Jan-Feb 2018	*443.79*	*30.6%*
Jan-Feb 2017	*413.05*	*40.3%*

*** Recycling collection was cancelled for two weeks in Feb 2021 due to COVID-19*

An increase in recycling tonnages was expected however staff are encouraged by the results from the first 2 months of the program. In addition to the increased tonnage, curbside collectors are reporting a marked increase in the number of households participating in the recycling program overall. These results indicate that residents are making positive efforts to divert wastes away from the landfill and that there is a significant proportion of "new" recyclers.

Increase in Recycling Inquiries

Since the clear bag campaign launch there has been an increase in inquiries through Access St. John's, ACRs, emails and City social media about curbside recycling, particularly from those seeking more details on how recycling is processed and what new products it is made into. Waste & Recycling has provided this information on the CurbitStJohns.ca website, the Spring 2022 edition of the City Guide, and arranged a presentation by Scotia Recycling to the previous Committee of the Whole on the topic.

Conclusions / Next Steps:

Clear bag suppliers and retailers expect to have a steady supply of clear bag products on shelves in March 2022. Until there is a consistent supply of clear bags at most local retailers, Waste & Recycling will continue to collect garbage that is not in clear bags.

The next phase of the "soft" approach will begin in April 2022 when waste staff will spot check for the use of clear bags for garbage. During this phase, stickers will be left to remind or acknowledge residents for using clear bags for garbage. Waste & Recycling staff will continue to collect garbage that is not in clear bags, but our focus will shift more towards education and ensuring all residents transition to the clear bags.

It is important that we provide feedback to the public on the benefits of the clear bag program. We also need to reinforce our messaging and provide information for "new" and experienced recyclers to ensure that all are aware of what items are acceptable material in the curbside program. Additionally, messaging concerning what is not acceptable for curbside programs such as hazardous wastes is important for the safety of our collectors and landfill staff. Waste & Recycling is working with the Communications Division to develop relevant messaging around these topics using several communication mediums.

It is noteworthy that the City of St. John's is also a member of a focus group pulled together by the Multi-Materials Stewardship Board (MMSB) to develop a provincial marketing campaign about blue bag recycling. This will be the first time such an initiative with a focus on municipal curbside programs will take place.

Key Considerations/Implications:

1. Budget/Financial Implications: N/A

2. Partners or Other Stakeholders: Communications Division, MMSB

3. Alignment with Strategic Directions/Adopted Plans: A Sustainable City

4. Legal or Policy Implications: N/A

5. Privacy Implications: N/A

6. Engagement and Communications Considerations

    - Continue to give public feedback on the benefits of clear bags for garbage
    - Continue to promote and support curbside recycling education and information
    - Continue to educate on what is not acceptable in a curbside program for the safety of our staff and the public.

7. Human Resource Implications: N/A

8. Procurement Implications: N/A

9. Information Technology Implications: N/A

10. Other Implications: N/A

Prepared by/Date: **Shelley Pardy, Waste Diversion Supervisor**
Reviewed by/Date: **Andrew Niblock, Director, Environmental Services**
Approved by/Date: **Lynnann Winsor, Deputy City Manager, Public Works**

Attachments: N/A

INFORMATION NOTE

Title:	**549 Southside Road interpret zone line**
Date Prepared:	March 1, 2022
Report To:	Committee of the Whole
Councillor and Role:	Councillor Ian Froude, Planning
Ward:	Ward 5

Issue: To interpret zone lines affecting the residential property at 549 Southside Road.

Discussion – Background and Current Status:

The residential property in question is located partially in the Residential 2 (R2) Zone and partially in the Residential 1 (R1) Zone. The property owner is interested in future development in the R2Zone, similar to neighbouring properties going west along the Southside Road. To the east, the R1 Zone runs along the road but the nearest house is approximately 50 metres away. The zone boundary line cuts the subject property in half.

Under the Envision St. John's Development Regulations, section 10.3 "Interpretation of Zone Boundaries", "Where the boundary of a Zone … (b) is shown on the Zoning Map as substantially following Lot Lines of an approved Subdivision or other acceptable base map, the Lot Lines shall be deemed to be the boundary."

Therefore, in this case, I can interpret the boundary between the R1 and R2 Zones to run along the eastern side of the subject property. Therefore, the property will be entirely zoned R2, and properties to the east will remain in the R1 Zone. No change is needed to the Envision St. John's Municipal Plan map, as all of this area is in the Residential District.

Key Considerations/Implications:

1. Budget/Financial Implications: None.
2. Partners or Other Stakeholders: Property owner; nearby property owners and residents.
3. Alignment with Strategic Directions/Adopted Plans: Not applicable.
4. Legal or Policy Implications: This is in accordance with rules of interpretation in the Envision St. John's Development Regulations, section 10.3 "Interpretation of Zone Boundaries".

5. Privacy Implications: Not applicable.

6. Engagement and Communications Considerations: None.

7. Human Resource Implications: Not applicable.

8. Procurement Implications: Not applicable.

9. Information Technology Implications: Not applicable.

10. Other Implications: None.

Conclusion/Next Steps:

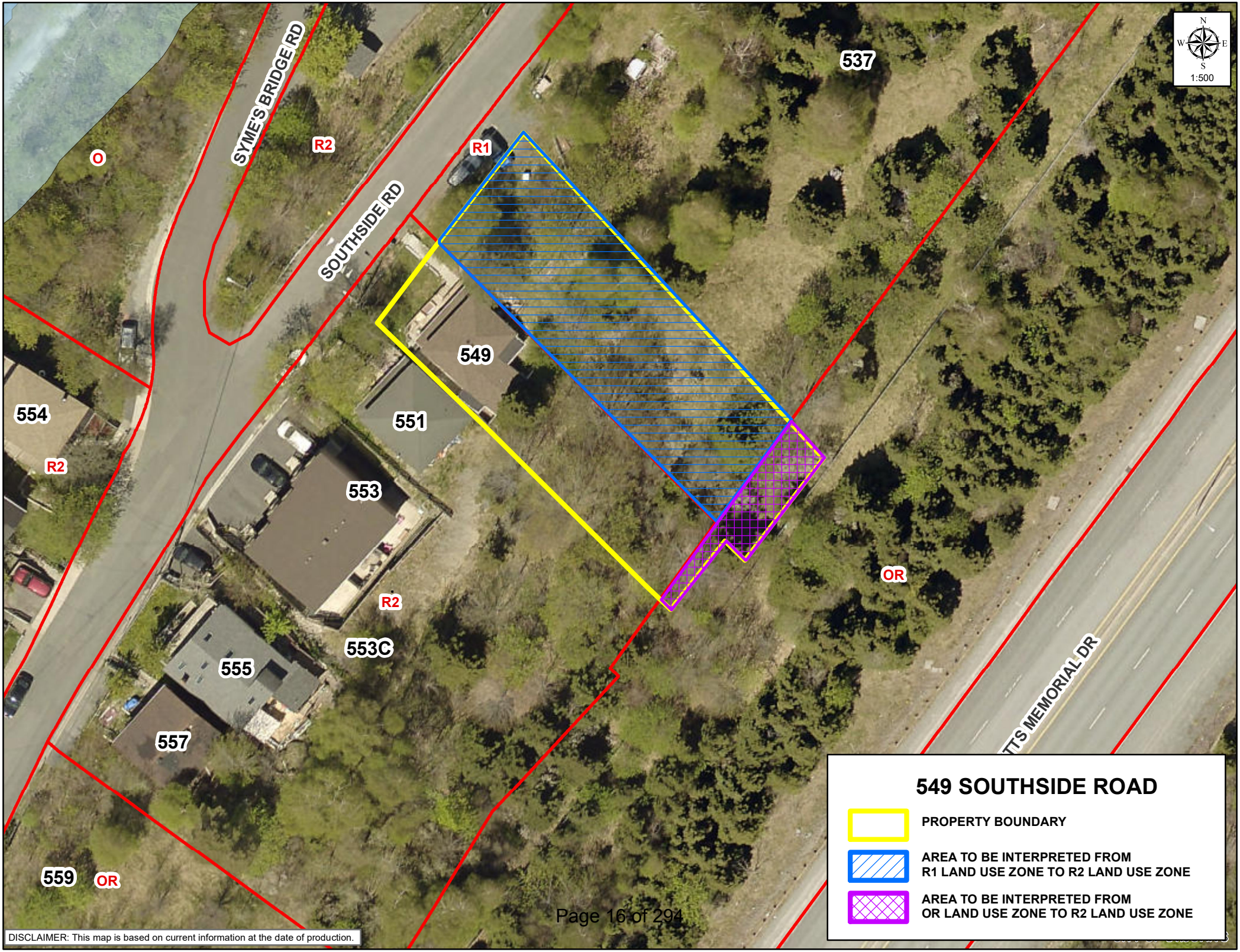
At 549 Southside Road, the zone boundary between the Residential 1 (R1) Zone and the Residential 2 (R2) Zone is interpreted to encompass all of the subject property in R2. No changes are needed to the Future Land Use Map of the Envision St. John's Municipal Plan. This accords with the rules of zone interpretation in Section 10.3 of the Envision St. John's Development Regulations.

Report Approval Details

Document Title:	549 Southside Rd interpret zone line.docx
Attachments:	- 549 SOUTHSIDE ROAD REZONING.pdf
Final Approval Date:	Mar 1, 2022

This report and all of its attachments were approved and signed as outlined below:

Jason Sinyard - Mar 1, 2022 - 5:07 PM



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INFORMATION NOTE

Title:	**20 Boland St. interpret zone lines**
Date Prepared:	March 1, 2022
Report To:	Committee of the Whole
Councillor and Role:	Councillor Ian Froude, Planning
Ward:	Ward 5

Issue:
To interpret zone lines affecting the residential property at 20 Boland Street.

Discussion – Background and Current Status:
The residential property in question is located partially the 3 zones: Residential 1 (R1) Zone, Cemetery (CEM), and Institutional (INST). It was built as a clergy house for St. Kevin's Church, on land owned by the Roman Catholic Episcopal Corporation of St. John's. The zoning reflects the surrounding land uses: the residential neighbourhood along Boland Street plus the nearby cemetery and St. Kevin's Church and parking lot. The zone boundary lines do not reflect land ownership property lines.

The house is being put up for sale as part of current court actions. A representative of the Episcopal Corporation asked to clarify the zoning, as they do not want any status of a non-conforming use to affect a potential sale. The house on the property is at the end of a line of houses on that side of Boland Street and is a typical house for the neighbourhood. As part of recent communications, the representative provided an updated survey of the house property.

Under the Envision St. John's Development Regulations, section 10.3 "Interpretation of Zone Boundaries", "Where the boundary of a Zone … (b) is shown on the Zoning Map as substantially following Lot Lines of an approved Subdivision or other acceptable base map, the Lot Lines shall be deemed to be the boundary."

Therefore, in this case, I can interpret the boundary between the R1 Zone and the other 2 zones, CEM and INST, so that the R1 Zone contains all of 20 Boland Street. Corresponding changes will be made to the Envision St. John's Municipal Plan map for the boundaries between the Residential District and the Open Space and Institutional Districts.

Key Considerations/Implications:

1. Budget/Financial Implications: None

2. Partners or Other Stakeholders: Property owner; property owners and residents nearby.

3. Alignment with Strategic Directions/Adopted Plans: Not applicable.

4. Legal or Policy Implications: This is in accordance with rules of interpretation in the Envision St. John's Development Regulations, section 10.3 "Interpretation of Zone Boundaries".

5. Privacy Implications: None.

6. Engagement and Communications Considerations: Not applicable.

7. Human Resource Implications: Not applicable.

8. Procurement Implications: Not applicable.

9. Information Technology Implications: Not applicable.

10. Other Implications: None.

Conclusion/Next Steps:

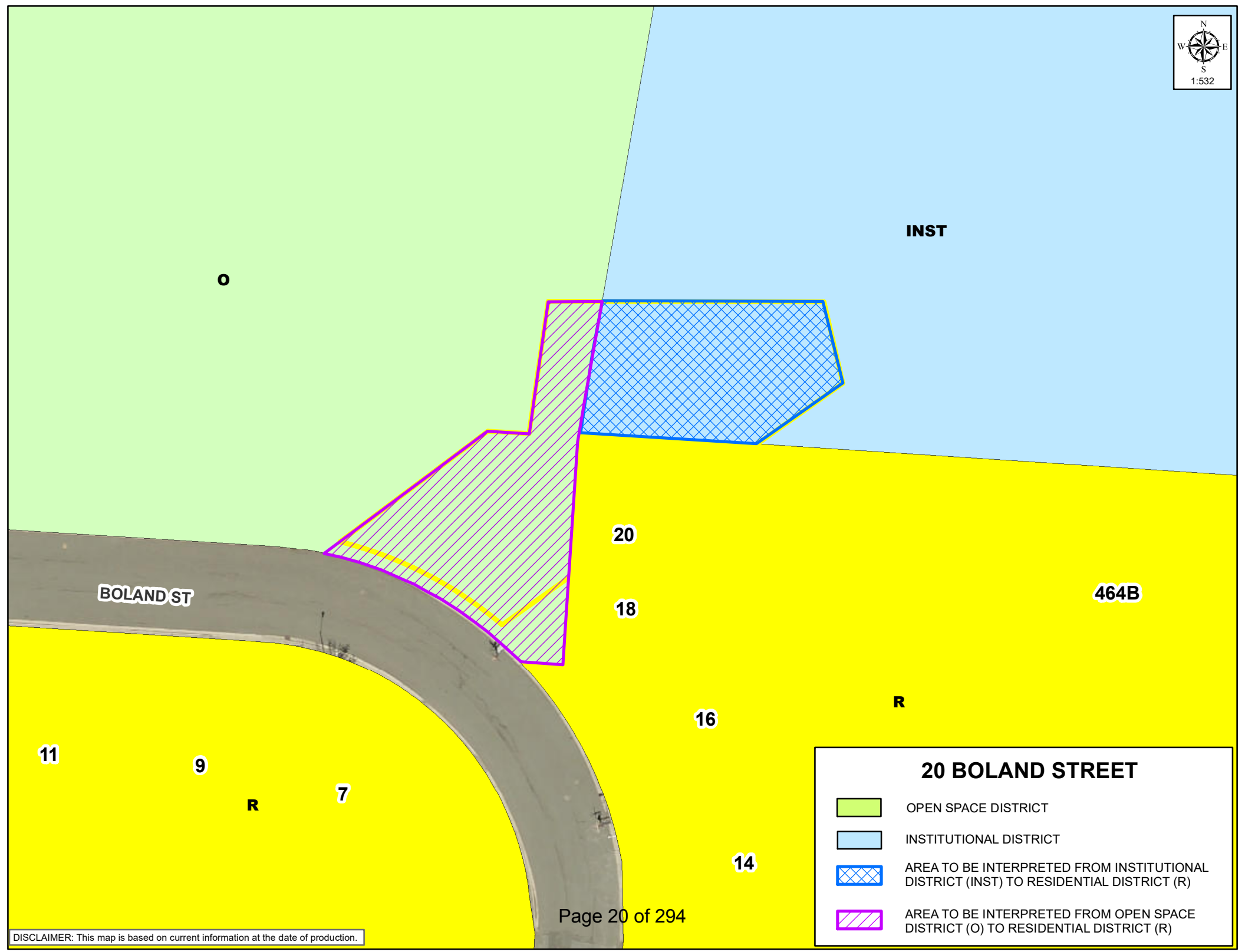
At 20 Boland Street, the zone boundary between the Residential 1 (R1) Zone and the Cemetery (CEM) and Institutional (INST) Zones is interpreted to encompass all of the subject property in R1. Corresponding changes will be made to the Future Land Use Map of the Envision St. John's Municipal Plan. This accords with the rules of zone interpretation in Section 10.3 of the Envision St. John's Development Regulations.

Report Approval Details

Document Title:	20 Boland St interpret zone line.docx
Attachments:	- 20 BOLAND STREET DISTRICT CHANGES.pdf - 20 BOLAND STREET REZONING.pdf
Final Approval Date:	Mar 1, 2022

This report and all of its attachments were approved and signed as outlined below:

Jason Sinyard - Mar 1, 2022 - 5:07 PM



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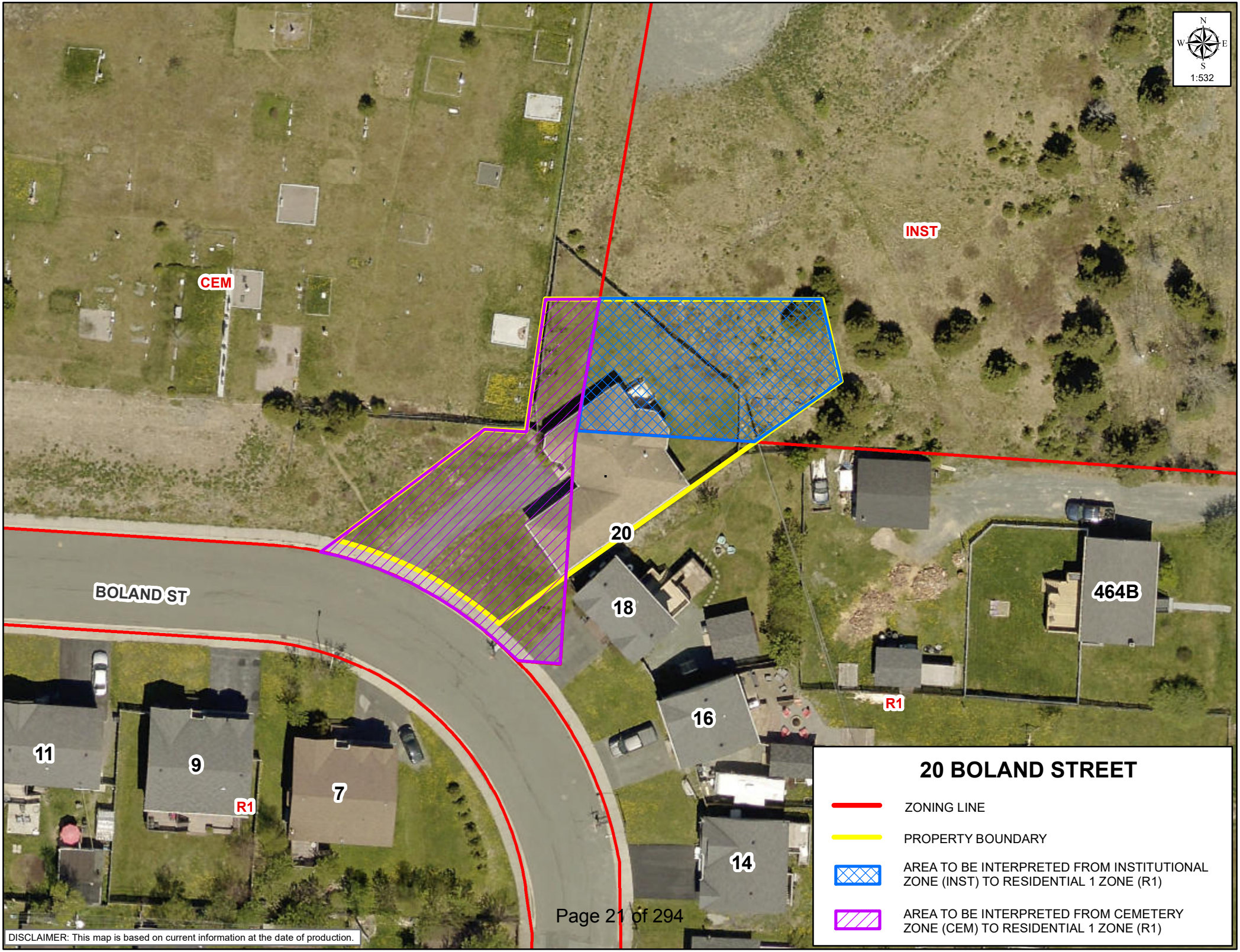

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DECISION/DIRECTION NOTE

Title:	**"What We Heard" – Traffic Calming Policy Update – Public Engagement**
Date Prepared:	February 28, 2022
Report To:	Committee of the Whole
Councillor and Role:	Councillor Maggie Burton, Transportation & Regulatory Services
Ward:	N/A

Decision/Direction Required:

A review of the City's Traffic Calming Policy is ongoing. Following the Council's recommendations (Decision Note of March 16, 2021), public engagement was held to gather public feedback on the 12 policy update areas that were identified from the policy review. Further study will be required on some policy update areas where there is no clear direction or where the public views are contrary to staff recommendations.

Discussion – Background and Current Status:

The Traffic Calming Policy and the associated Traffic Calming Warrant were developed by a consultant for the City and were completed in 2011. They were designed to manage the requests to slow vehicle traffic, reduce non-local traffic, and/or correct or improve perceived safety concerns in the street network.

Traffic Calming Policy is founded on a neighbourhood driven concept meaning residents can notify the City of traffic issues or perceived traffic issues on their neighbourhood streets and request traffic calming. The policy creates a framework to screen and prioritize these requests for traffic calming. In recent years, Council has allocated capital funding on an annual basis for the Traffic Calming Program.

In June of 2020, Staff prepared an overview of the City's Traffic Calming Policy. Following this, Council requested that the policy be reviewed to address points of common difficulty and improve the policy overall. Transportation Engineering and the Office of the City Clerk have since initiated a full policy review.

In December 2020, Staff prepared a preliminary review of the of the policy and identified some key areas for updating the policy. This review was discussed with Council to gather feedback on how the policy could be updated to better reflect current Council priorities.

On March 16, 2021, following the preliminary review, 12 policy update areas were identified, and Council directed taking these for public engagement to collect public concerns and feedback. Changes were divided into two major categories: substantive updates and housekeeping items.

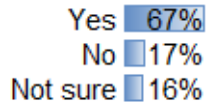
The substantive updates are more related to improving project selection and scoring criteria, whereas housekeeping items are more related to improving traffic calming process based on previous practices. The following is the list of policy update areas grouped under these two categories:

1. **Project Selection and Scoring Criteria**
   - Traffic Volume Threshold
   - Non-Local Traffic Volume
   - Interrelated Factors
   - Target Speed
   - Street Context
   - New Development/Rehab Work

2. **Traffic Calming Process**
   - Annual Priority List
   - Formalize Temporary Implementations
   - Public Survey Distribution
   - Public Response Rate
   - Re-evaluation Timeline
   - Cul-de-sacs and Crescents/P-loops

Public Engagement was held in February 2022 to collect public feedback on those two categories of policy areas via an online survey. For each update area, a brief background explaining the context and what the current policy says was provided followed by a choice question. Also, public were given an opportunity to provide their feedback and comments via the comment section. **Table 1** summarizes public responses related to updating Project Selection and Scoring Criteria under six specific sub-headings. The full report for What We Heard is included in the attachment.

Table 1: Public Responses: Project Selection and Scoring Criteria

Policy Update Area	**Staff Recommendation** (December 2020)	**Public Engagement** (Survey Question and Response)
a) Traffic Volume Threshold	Increase volume thresholds somewhat and/or modified given that the existing thresholds are very low.	**Q.** Should the traffic volume thresholds be investigated, and appropriately changed, in the updated policy? **R.** 
b) Non-Local Traffic Volume	Eliminate non-local traffic volume criterion in favor of an improved system for volume and speed	**Q.** Should the non-local traffic volume factor be eliminated in the evaluation process? **R.**

Policy Update Area	Staff Recommendation (December 2020)	Public Engagement (Survey Question and Response)
		Yes 56% No 33% Not sure 11%
c) Street Context	Increase the weight of street context criteria relative to technical criteria (e.g., presence of sensitive uses or vulnerable)	**Q.** Should more weights be given for street context in the updated policy? **R.** Yes 89% No 9% Not sure 2%
d) New Development/ Rehab Work	Include in the revised policy provisions for the application of traffic calming tools to projects completed in new development or road rehabilitation /reconstruction	**Q.** Should this provision to consider new development and/or rehab work be included in the updated policy? **R.** Yes 81% No 10% Not sure 9%
e) Target Speed	Develop a system to score City streets based on a target speed.[1]	**Q.** Should target speed be considered for scoring in the updated policy? **R.** Yes 52% No 34% Not sure 14%
f) Interrelated Factors	Develop a system to score factors that are related to each other such as high speed and sensitive uses scoring higher than either.[1]	**Q.** Should interrelated factors be considered in the updated policy? **R.** Yes 58% No 23% Not sure 19%

In summary, public response shows a clear preference (more than two-third support) to the policy updates recommended by Staff in regard of updating criteria for modifying traffic volume threshold, giving more weights to street context and incorporating provision of traffic calming for New Development/ Rehab Works. For the remaining three recommendations related to eliminating non-Local Traffic volume criteria, developing scoring based on target speed and interrelated factors, public preference is still as strongly aligned. Note that the previous review stated developing scores for target speed and interrelated factors require a significant effort and were recommended for an external consultant to assist on this. Relevance of making change on

[1] Noted in the Decision Note March 2021, this requires a significant effort to evaluate streets and determine their appropriate target speeds, which would likely require an input from external consultant.

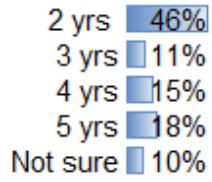
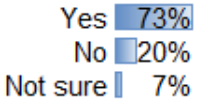
these three policy areas could be verified in-house by conducting a jurisdiction review of other municipal traffic calming policies.

Similarly, **Table 2** summarizes public responses related to updating of specific Traffic Calming Process.

Table 2: Public Responses: Traffic Calming Process

Policy Update Area	**Staff Recommendation** (December 2020)	**Public Engagement** (Survey Question and Response)
a) Annual Priority List	Priority list be trimmed to a maximum of 10 projects at any one time.	**Q.** Do you agree that the policy should be changed to set a list annually of no more than 10 projects from the priority list? **R.** Yes 64% No 18% Not sure 18%
b) Current practice: (Formalize Temporary Implementations)	Formally update several practices that have been revised in minor ways since the creation[2].	**Q.** Should the temporary implementation approach be adopted in the updated policy? **R.** Yes 82% No 14% Not sure 4%
c) Public Survey Distribution	Review the process of public votes	**Q.** Should the updated policy formalize the process of City of St. John's staff distributing/conducting the public survey? **R.** Yes 86% No 8% Not sure 6%
d) Public Response Rate	Formalize the current practice of using a 60% of responses for the threshold	**Q.** Should the public response rate be changed from “60% of the affected residents” to “60% of the survey responses”? **R.** Yes 70% No 22% Not sure 8%

[2] Other current practices (e.g., public response rate, public survey distribution) falling under this category are considered under separate sub-headings.

Policy Update Area	Staff Recommendation (December 2020)	Public Engagement (Survey Question and Response)
e) Re-evaluation Timeline	Extend the re-evaluation timeframe to 5 years.	**Q.** What timeline for re-evaluation should be used? **R.** 
f) Cul-de-sacs and Crescents/P-loops	Screen out Cul-de-sacs and Crescents/P-loops	**Q.** Should cul-des-sacs and crescents/P-loops be screened out in the updated policy? **R.** 

Public response shows a clear preference (more than two-third support) to the policy update areas recommended by Staff in regard of setting annual priority list to 10 projects, formalizing current practice on use of temporary traffic calming measures, public survey distribution by City staff, change in public response rate, and screening out of Cul-de-sacs and Crescents. However, for the re-evaluation timeframe, the public has a different preference. Majority of the public supports for current policy – 2-year period for re-evaluation. Previous review stated that it is not likely to have a different evaluation outcome within 2-year time period, unless there is a major change in the traffic pattern in that street. To prevent wastage of staff resources from having a short re-evaluation timeline, Staff recommended changing it from 2-year to 5-year to allow more time to focus on new requests.

In addition to public engagement, Staff had stakeholder meetings with agencies that would have direct effect on their service due to the City's traffic calmed streets. This included virtual meetings with Emergency Medical Service (EMS) - Eastern Health, Royal Newfoundland Constabulary (RNC) and Metro Bus. One of the main objectives was to share the ongoing review/update plan of City's current Traffic Calming Policy and get feedback based on their experience on City's traffic calmed streets. Discussions were documented in meeting minutes and shared with the stakeholders and will be incorporated into the draft Traffic Calming Policy that will be brought forward for discussion ith Council.

Key Considerations/Implications:

1. Budget/Financial Implications:
   N/A

2. Partners or Other Stakeholders:
   N/A

3. Alignment with Strategic Directions/Adopted Plans:
   N/A

4. Legal or Policy Implications:
   This note is part of a policy review that currently underway with the Office of the City Clerk

5. Privacy Implications:
   N/A

6. Engagement and Communications Considerations:
   Public Engagement was undertaken by Staff in Organizational Performance and Strategy.

7. Human Resource Implications:
   N/A

8. Procurement Implications:
   N/A

9. Information Technology Implications:
   N/A

10. Other Implications:
    N/A

Recommendations:

That Council

- Share the “What We Heard” document on the Traffic Calming Policy Update on Engage page.
- Give consideration to the “What We Heard” in the preparation of draft Traffic Calming Policy Update.

Prepared by: Lalita Thakali, Transportation System Engineer
Approved by: Scott Winsor, Director of Engineering

Attachment:

1. “What We Heard” – Traffic Calming Policy Update- Public Engagement (February 2022)

Report Approval Details

Document Title:	WWH - Traffic Calming Policy Update- Public Engagement.docx
Attachments:	- What We Heard Traffic Calming Policy Update 2022-02-11.pdf
Final Approval Date:	Mar 2, 2022

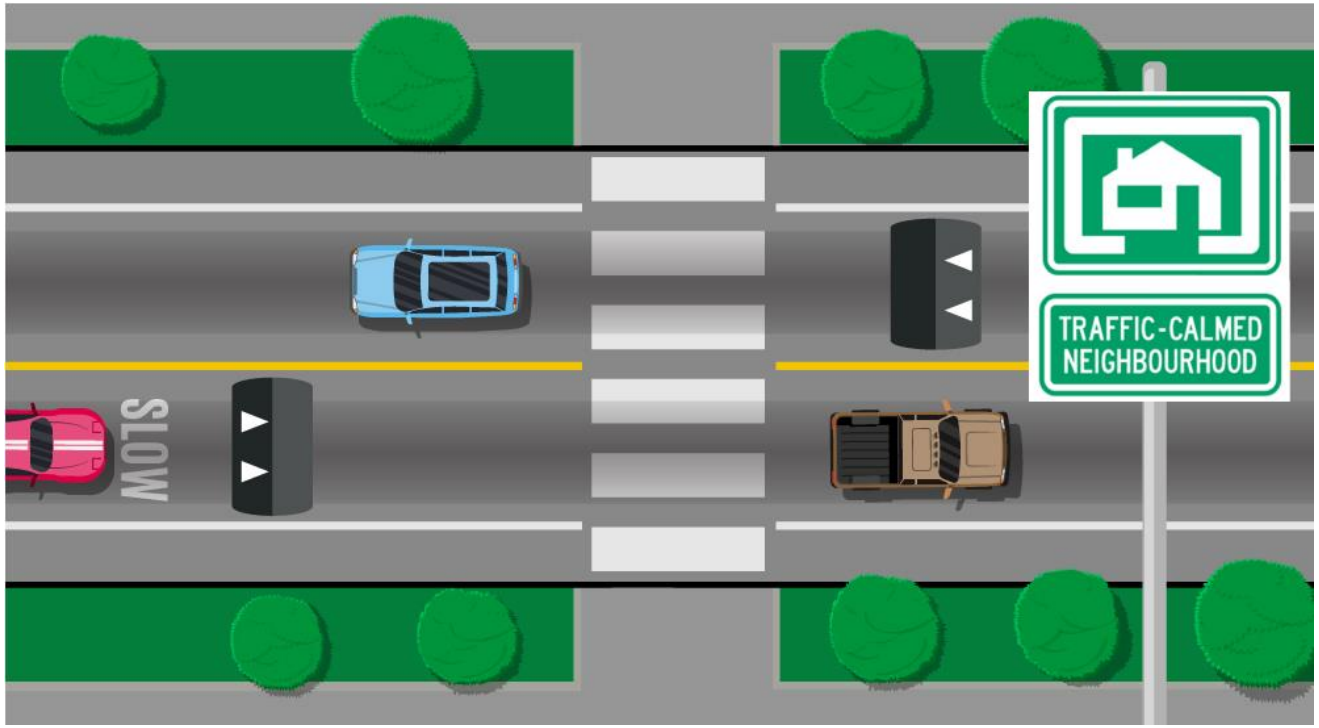
This report and all of its attachments were approved and signed as outlined below:

Scott Winsor - Feb 28, 2022 - 1:16 PM

Jason Sinyard - Mar 2, 2022 - 10:41 AM

Traffic Calming Policy Update

Public Engagement



What We Heard
February 2022

ST. JOHN'S

Disclaimer

- This document provides a summary of what was heard during this engagement process. It is not meant to reflect the specific details of each submission word-for-word.
- The City produces a What We Heard document for every city-led public engagement project. This collected commentary is shared with the community to ensure we heard you correctly.
- The City protects the privacy of those who provide feedback as per Access to Information and Privacy Legislation.
- The full scope of commentary is used by city staff and Council to help inform recommendations and decisions.

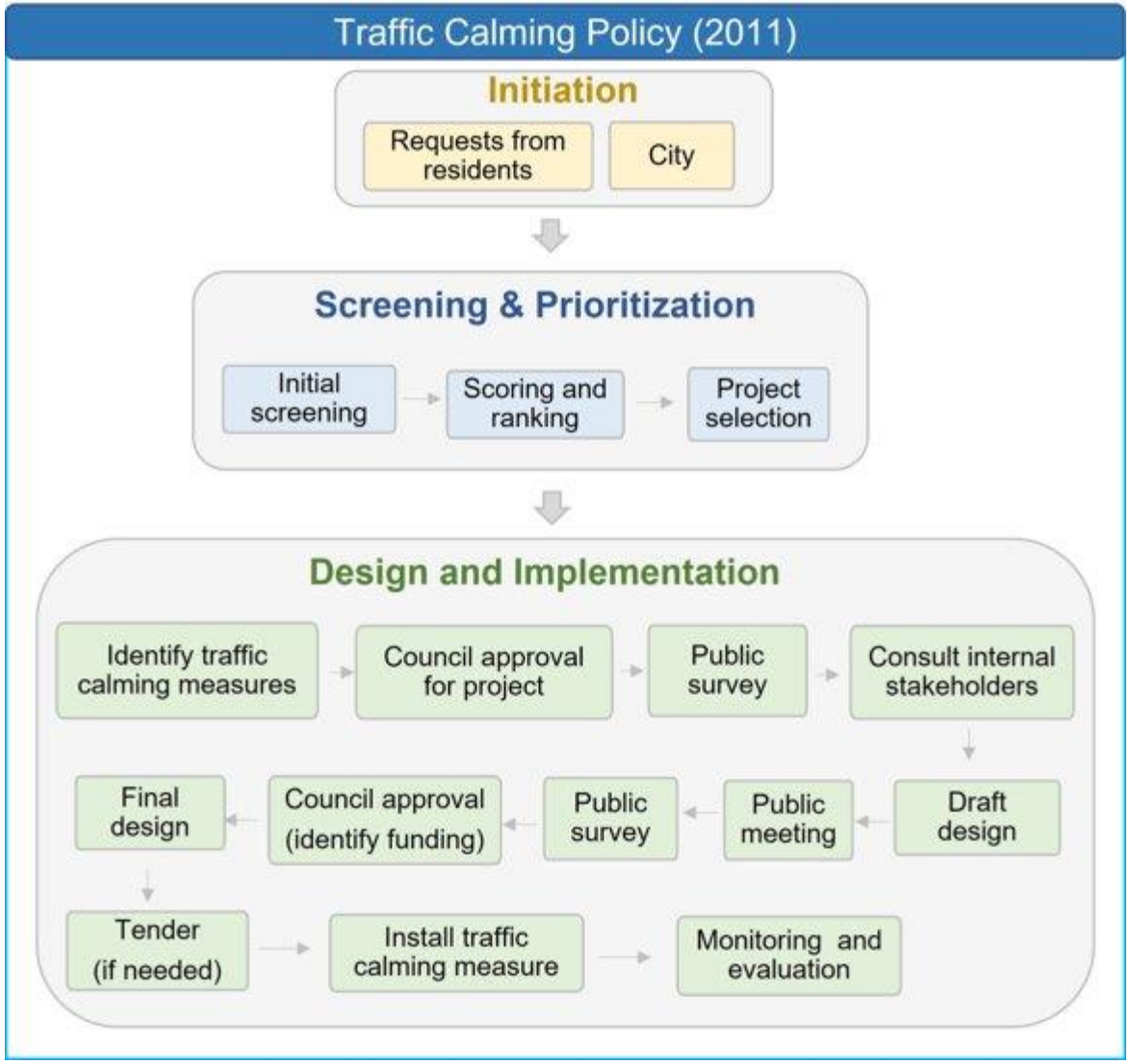
Context

- The current Traffic Calming Policy, first introduced in 2011, was developed to handle the numerous requests coming from residents mainly regarding the issues related to speeding, high non-local traffic, and inappropriate driving behaviours on their neighbourhood streets.
- For any given street to be eligible for traffic calming, it must pass all eligibility criteria set in the policy. Eligible streets are then scored and ranked to determine their priority for implementation of traffic calming measures.
- Since the Policy was introduced, there have been some changes in the project approval process and residents' involvement, which need to be formalized. Improvements in technical scoring is also being included following the policy review.
- Following a preliminary review of the policy, Council approved the policy revision, as noted in the Decision Note of March 16, 2021.
- 12 policy update areas were identified.

Background

The City follows a process for Traffic Calming Requests:

- Requests are initiated from residents.
- Requests then go through screening and prioritization.
- Finally, approved requests go through Design and Implementation.



Public Engagement Plan

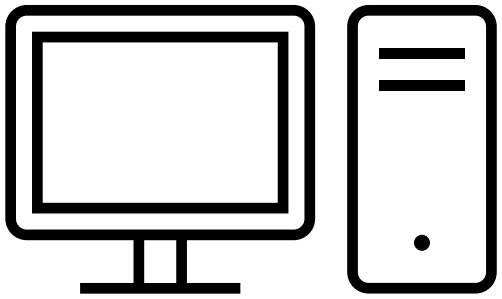
Purpose:

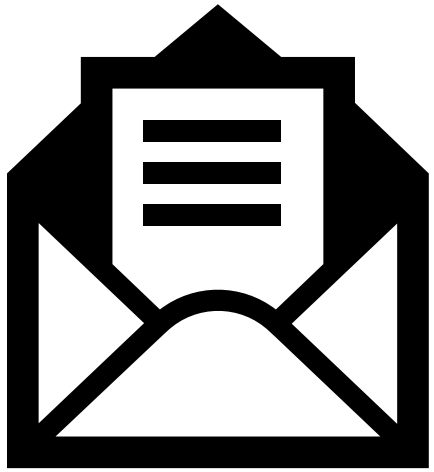
- To work with the public and key stakeholders to ensure their concerns and preferences are directly reflected in the policy review recommendation presented to Council.
- To get feedback on the 12 points of policy review.

Approach:

- To provide multiple ways for the public to give feedback
- To provide feedback on how public input influenced the decision.

Engagement and Communications





- Public Service Announcement issued on January 24, 2022
- Project page on EngageStJohns.ca published on January 24, 2022
- Newsletter to 3,200 registered users and followers of EngageStJohns.ca
- Posts to regular City communications channels including social media, listservs, website

Who Engaged

On EngageStJohns.ca

- Total Visits: 1.1 k
- Max Visitors Per Day: 188
- New Registrations: 158
- **Engaged Visitors** (People who posted questions/ comments or answered surveys): **314**
- **Informed Visitors**: 596
- **Aware Visitors** (Unique visitors): **938**

Online Questions and Comments:

- 32 submissions posted on EngageStJohns.ca

Survey Responses:

- Traffic Calming Process: 292
- Project Selection and Scoring Criteria: 151

Email:

- 13 submissions

What We Heard Highlights

- Traffic calming remains an important topic to St. John's residents, with numerous questions, comments, and emails in this engagement.
- Response rates for the surveys on the 12 points of policy updates were high, with more responses to the questions on the Traffic Calming Process.

Survey 1
Traffic Calming Process

Traffic Calming Process

Policy Point 1. Annual Priority List

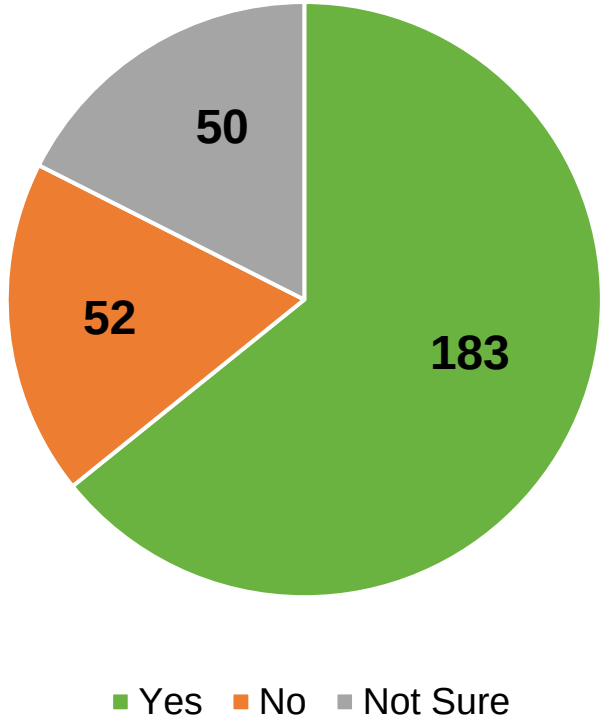
Currently, the list for traffic calming projects is very long, with over 40 streets eligible for traffic calming. Given the resources the City has for the traffic calming program, up to 5 streets per year (in the current budget) may have traffic calming projects completed. Projects are selected from the list using a ranking system based on assessments completed when traffic calming requests are received. The proposed change is to trim the priority list to a maximum of 10 projects for each year. Setting a yearly priority list allows the technical team to prepare a systematic plan for implementation for the given fiscal year, rather than changing the order of potential projects throughout the year. This would allow for more work efficiency. Projects would be removed from the list when they are completed.

Traffic Calming Process

Question 1. Annual Priority List

Do you agree that the policy should be changed to set a list annually of no more than 10 projects from the priority list?

- Yes: 64%
- No: 18%
- Not Sure: 18%



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Traffic Calming Process

Policy Point 2. Formalize Temporary Implementations

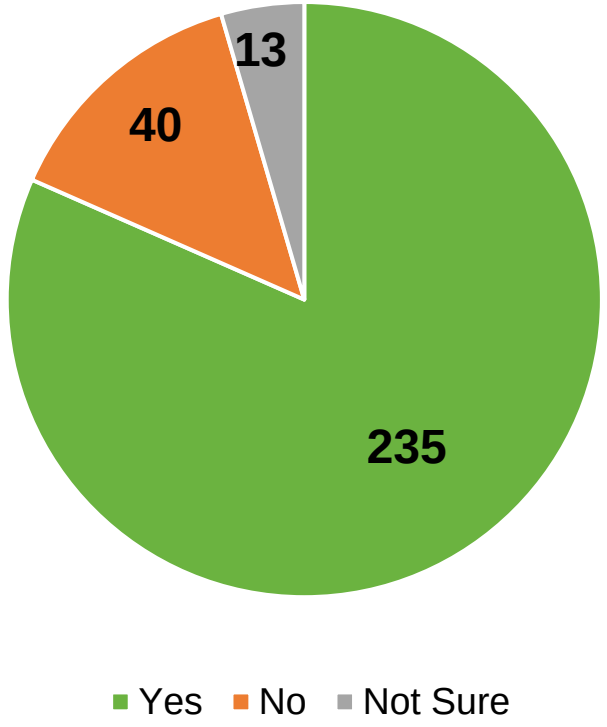
The City has been installing temporary traffic calming measures prior to any permanent installation. While this was not part of the formal policy, it proved to be effective in testing and evaluating traffic calming for both residents/road users and the technical team. The proposed change is to make temporary implementations a formalized part of the traffic calming process. This change would require an additional public survey before the implementation of the temporary measures (see the FAQs to learn about the process).

Traffic Calming Process

Question 2. Formalize Temporary Implementations

Should the temporary implementation approach be adopted in the updated policy?

- Yes: 82%
- No: 14%
- Not Sure: 4%



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Traffic Calming Process

Policy Point 3. Public Survey Distribution

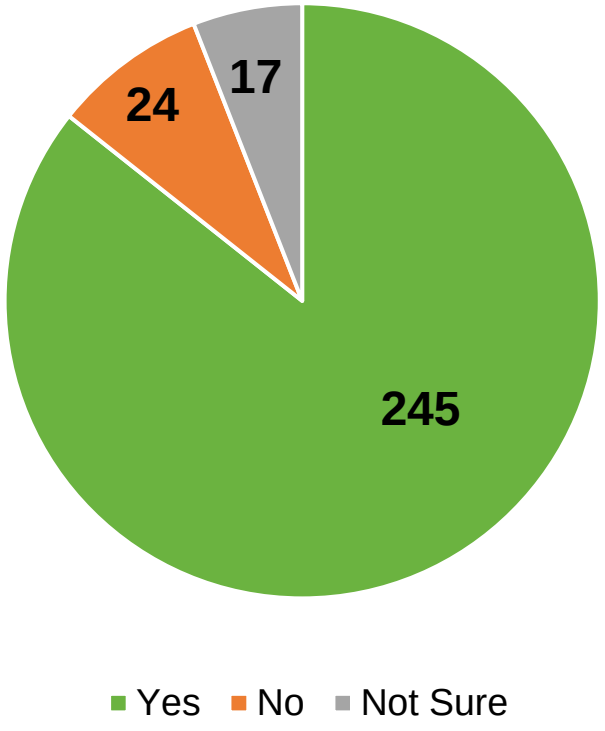
Public participation is a key part of implementing traffic calming measures in neighbourhoods. After a traffic calming project passes pre-screening, a paper-based survey is distributed (e.g., dropped off or mailed out) to the affected residents. Current policy requires the resident initiating the traffic calming request to distribute the survey to the affected residents. However, to make the process more effective, City staff has been asked to distribute the survey in some past projects.

Traffic Calming Process

Question 3. Public Survey Distribution

Should the updated policy formalize the process of City of St. John's staff distributing/conducting the public survey?

- Yes: 86%
- No: 8%
- Not Sure: 6%



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Traffic Calming Process

Policy Point 4. Public Response Rate

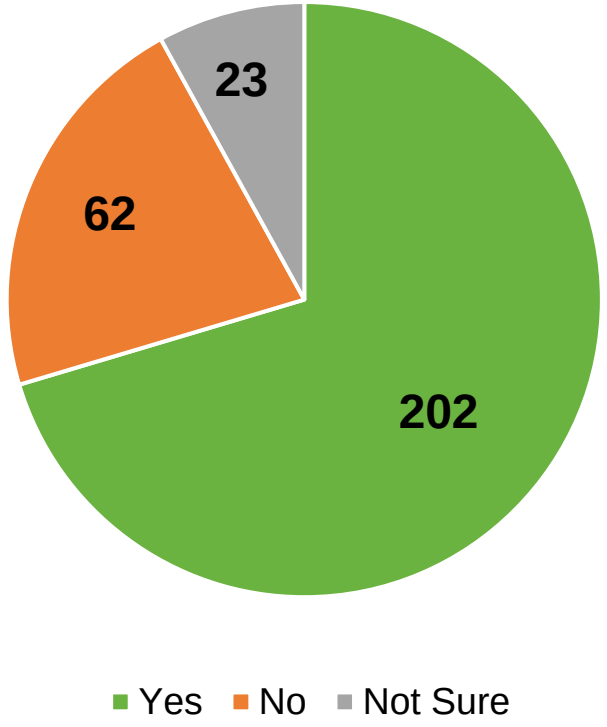
In the public survey asking for resident input on eligible traffic calming projects, the public response rate is measured. A positive response rate of 60% from affected residents is required for a project to proceed, which means that 60% of the people notified would need to vote “yes” for the project to move to the next stage of implementation. The response rates from these surveys have historically been low. The proposed change is to consider no response from a resident as a “neutral” vote, and to change the requirement from "60% of the affected residents" to "60% of the survey responses". This change would likely result in more projects being approved for implementation and would have budget considerations.

Traffic Calming Process

Question 4. Public Response Rate

Should the public response rate be changed from “60% of the affected residents” to “60% of the survey responses”?

- Yes: 70%
- No: 22%
- Not Sure: 8%



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Traffic Calming Process

Policy Point 5. Re-evaluation Timeline

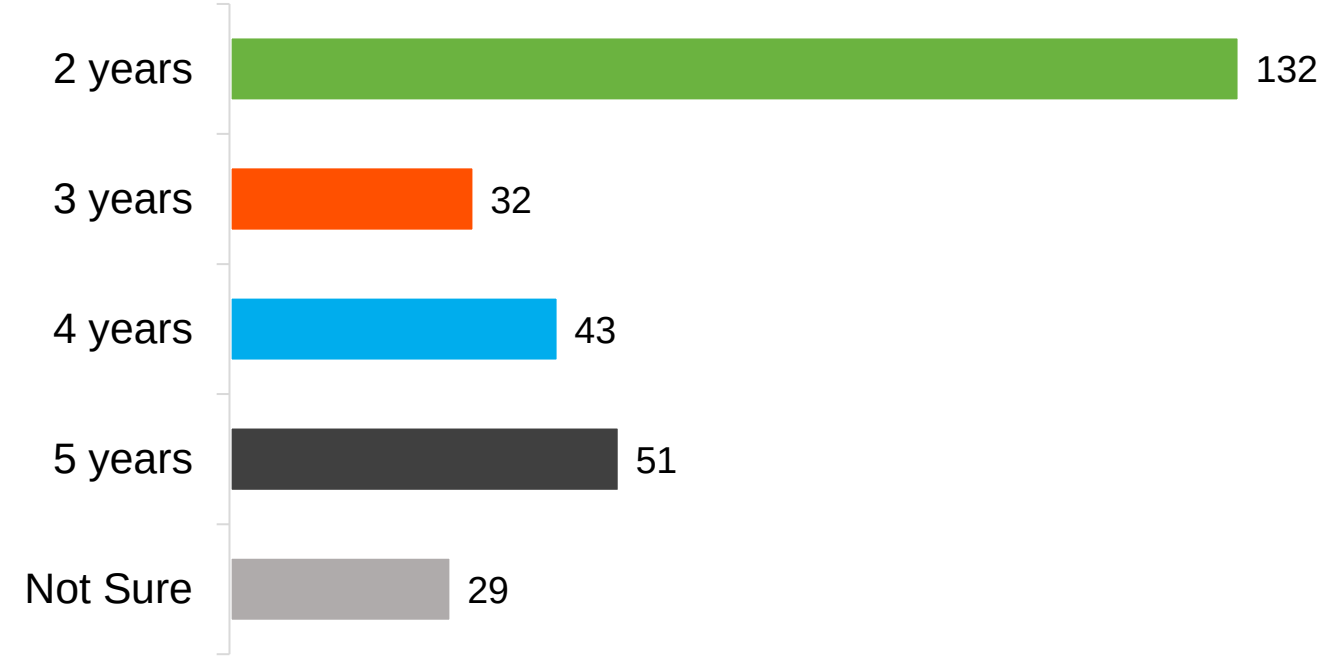
Current policy states that if a street segment is not assessed as eligible for traffic calming, another request can be submitted for re-evaluation after 2 years. Re-evaluation can be costly with an inefficient use of limited resources. Unless there is a major change in the traffic pattern in that street, it is not likely to have a different evaluation outcome within a short time span. If there is a significant change, staff could re-evaluate on a shorter timeline. The proposed change is to extend this time frame.

Traffic Calming Process

Question 5. Re-evaluation Timeline

What timeline for re-evaluation should be used?

- 2 years (current policy): 46%
- 3 years: 11%
- 4 years: 15%
- 5 years: 18%
- Not sure: 10%



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Traffic Calming Process

Policy Point 6. Cul-de-sacs and Crescents/P-loops

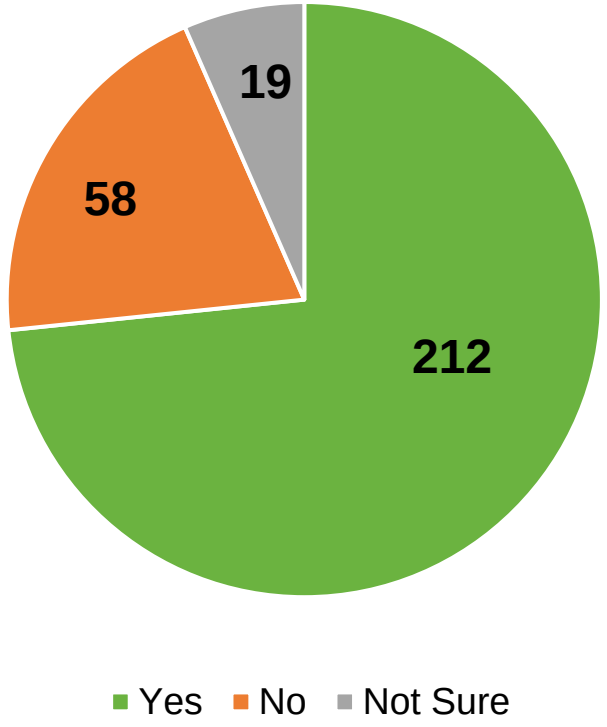
A P-loop is like a crescent and is a street in the shape of the letter "P". Due to the nature of these streets (e.g., local, no through traffic, low speed, etc.), they typically do not score high enough to be eligible for traffic calming, based on past requests and analysis. The City is spending significant time and money on data collection and analysis for streets with low likelihood of being eligible. The evaluation process could be streamlined by excluding these from consideration. The proposed change is to screen out traffic calming requests for cul-de-sacs and crescents/P-loops. For longer crescents, further analysis would be required to come up with specific details.

Traffic Calming Process

Question 6. Cul-de-sacs and Crescents/P-loops

Should cul-des-sacs and crescents/P-loops be screened out in the updated policy?

- Yes: 73%
- No: 20%
- Not Sure: 7%



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Survey 2
Project Selection and Scoring Criteria

Project Selection and Scoring Criteria

Policy Point 1. Traffic Volume Threshold

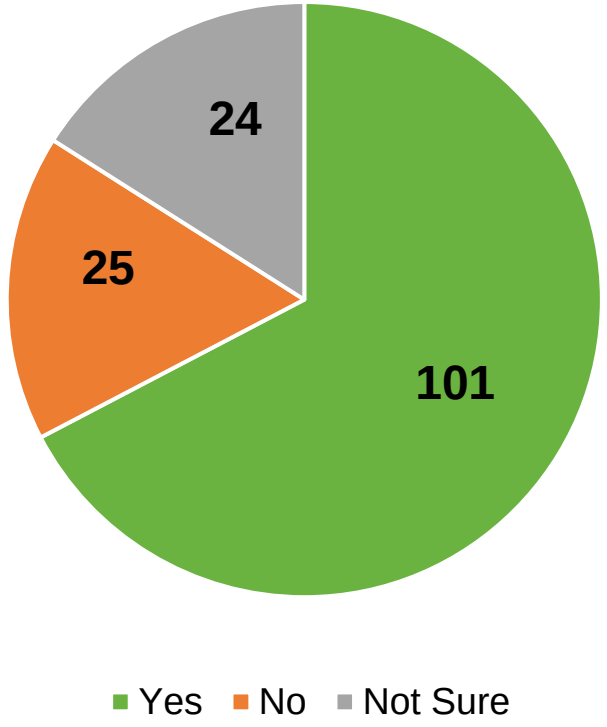
When evaluating and prioritizing traffic calming requests, traffic volume is one of the important considerations used for scoring. Points are allocated for meeting a volume threshold. There is a maximum 25 points allocated for this factor which is reached when exceeding an upper volume threshold. Local roads get points if the traffic volume is above the lower threshold (900 vehicles per day or "vpd") and reach the maximum of 25 points if it reaches 2,250 vpd. Collector roads get points if the traffic volume is above the lower threshold (3,000 vpd) and reach the maximum of 25 points at 5,500 vpd. Current policy has the upper threshold relatively low (i.e., all local roads that have traffic volume above 2,250 vpd - or collector roads above 5,500 vpd - would score the same). This low threshold means that the volume metric has limited power to differentiate between roads for evaluation and priority. Setting the threshold higher may allow a focus on streets with more serious volume issues. The proposed change is to increase or modify volume thresholds, following further study and consideration.

Project Selection and Scoring Criteria

Question 1. Traffic Volume Threshold

Should the traffic volume thresholds be investigated, and appropriately changed, in the updated policy?

- Yes: 67%
- No: 17%
- Not Sure: 16%



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Project Selection and Scoring Criteria

Policy Point 2. Non-Local Traffic Volume

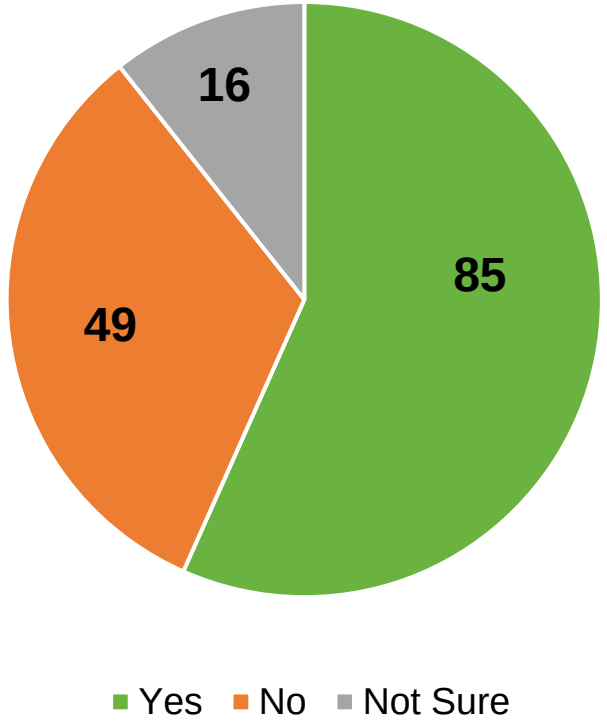
"Non-local traffic" is defined as short-cutting traffic passing through a neighbourhood. Current policy uses "non-local traffic volume" as one of the considerations for evaluating traffic calming requests. It is difficult, time-consuming, and costly to measure it accurately. As total traffic volume is already included in the scoring, having non-local traffic volume factor, busy streets often get points for the same criterion twice. This could be the reason that most of the other jurisdictions do not consider this factor in their scoring. The proposed change is to treat all traffic volume the same.

Project Selection and Scoring Criteria

Question 2. Non-Local Traffic Volume

Should the non-local traffic volume factor be eliminated in the evaluation process?

- Yes: 56%
- No: 33%
- Not Sure: 11%



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Project Selection and Scoring Criteria

Policy Point 3. Interrelated Factors

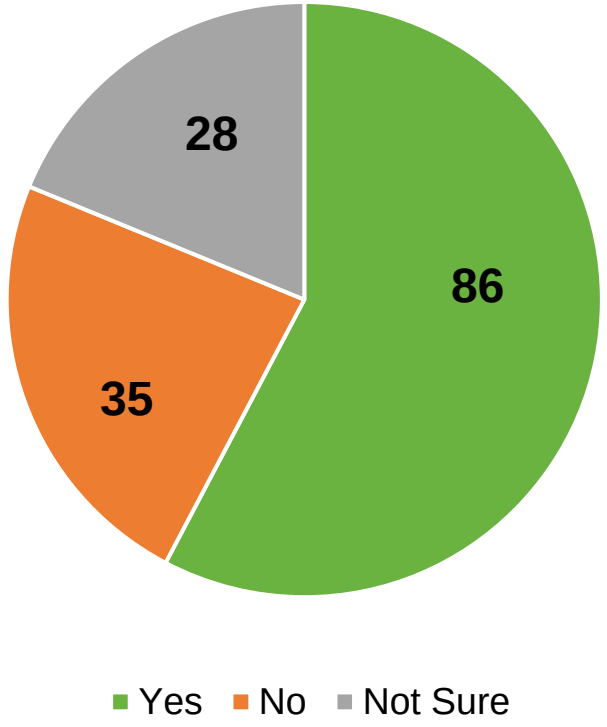
The idea of "interrelated factors" for scoring is that multiple things would be considered in combination rather than individually when scoring streets. For example, higher speed in a school zone would be scored for the combination of speed and school zone factors. Currently, in this example, high speed and school zone would be separate considerations. There are other combinations which would be investigated. However, creating a new combination system, where several factors could be considered together to give a justification for traffic calming, would need in-depth study. It has been recommended for external input from a consultant. The current policy has a scoring system where each factor is scored individually. Similar individual scoring procedures are followed by other jurisdictions in Canada.

Project Selection and Scoring Criteria

Question 3. Interrelated Factors

Should interrelated factors be considered in the updated policy?

- Yes: 58%
- No: 23%
- Not Sure: 19%



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Project Selection and Scoring Criteria

Policy Point 4. Target Speed

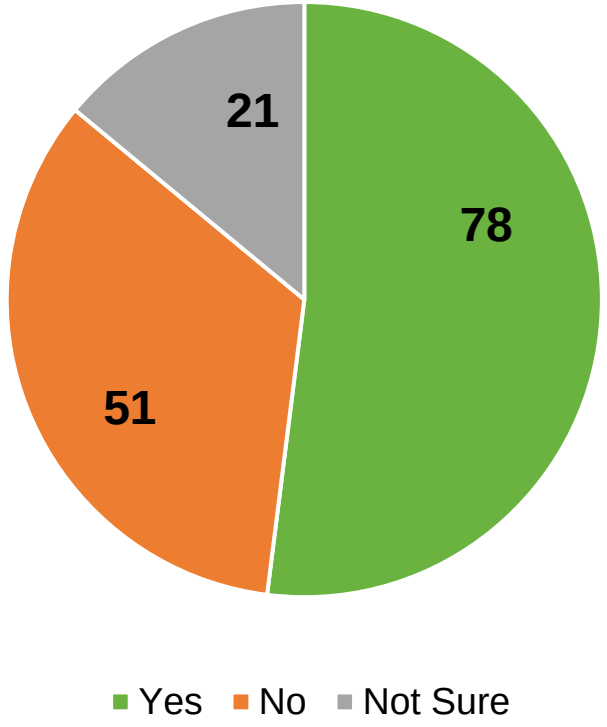
Target speed is based on roadway geometry and surrounding land-use characteristics and differs from the posted speed limit. The posted speed limit is typically set to 85% of travel speed and is expected to be lower than the target speed. The current policy uses the posted speed when scoring streets. Scoring based on target speed instead may mean that higher driving speeds would be accepted within the scoring system, and streets with higher speeds (that still meet target speeds) may score lower and may not quality for traffic calming. Developing a score based on target speed would require in-depth study to determine a target speed for each street and validate its concept in scoring. It has been recommended for external input from a consultant.

Project Selection and Scoring Criteria

Question 4. Target Speed

Should target speed be considered for scoring in the updated policy?

- Yes: 52%
- No: 34%
- Not Sure: 14%



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Project Selection and Scoring Criteria

Policy Point 5. Street Context

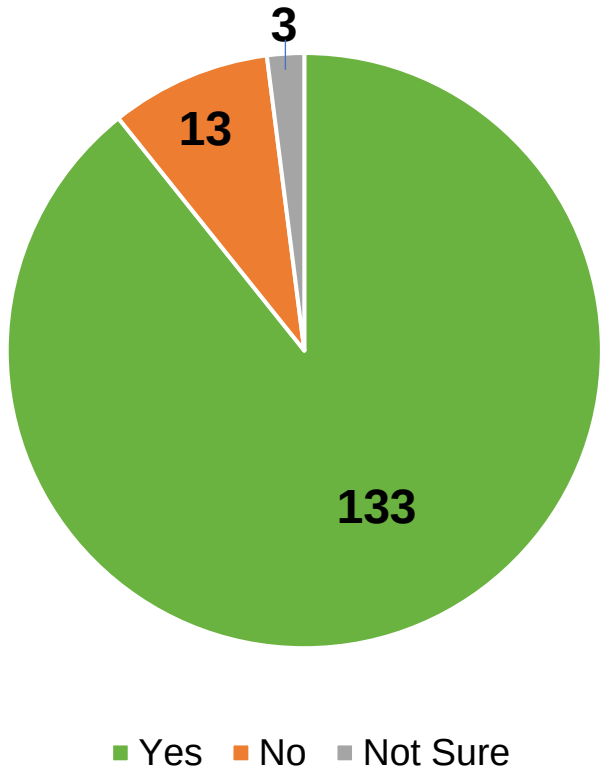
Street context is a way to give certain considerations more weight, or importance, in the scoring system. This would mean giving more emphasis to streets that have high pedestrian usage (e.g., schools, community centres, daycares, etc.) to reflect its surrounding land-use characteristics. The proposed policy change is to give more weight (i.e., place more importance) to street context in addition to what is currently in the policy.

Project Selection and Scoring Criteria

Question 5. Street Context

Should more weights be given for street context in the updated policy?

- Yes: 89%
- No: 9%
- Not Sure: 2%



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Project Selection and Scoring Criteria

Policy Point 6. New Development/Rehab Work

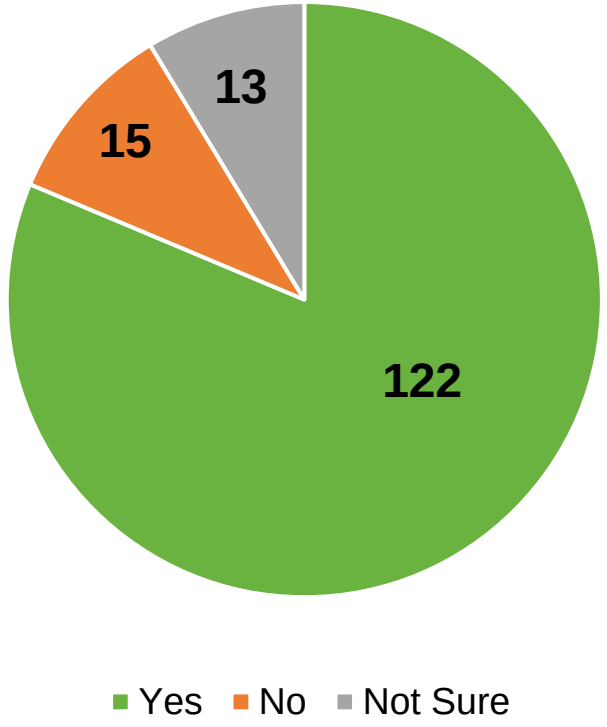
If a street is eligible for new traffic calming measures and the street has Rehab work planned for the near future, giving priority to traffic calming on the street, in alignment with the Rehab work, would save on overall implementation cost and limit the road users' inconvenience. Likewise, if a street is part of a new development project, giving priority to traffic calming on the street, in alignment with the new development work, would save on overall implementation cost and limit the road users' inconvenience. The proposed change to the policy is to consider New Development and Rehab work projects when prioritizing eligible traffic calming projects. This is not formally considered in the current policy.

Project Selection and Scoring Criteria

Question 6. New Development/Rehab Work

Should this provision to consider new development and/or rehab work be included in the updated policy?

- Yes: 81%
- No: 10%
- Not Sure: 9%



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Questions and Comments

Question Themes

29 Questions (online and via email)

- Requests for traffic calming: 13
- Technical support: 8
- Clarify survey intent: 2
- Traffic calming effectiveness: 2
- Traffic cameras: 2
- Road categorization: 2
- Traffic Calming Process questions: 2

*some questions/comments had multiple themes

Comment Themes

37 Comments online and via email

Most popular themes (3 or more comments):

- Speeding: 10
- Survey is too complicated: 4
- More RNC enforcement: 4
- School zones: 3
- Traffic calming process is ineffective: 3
- More than local people consulted: 3
- Narrower roads: 3
- Calming affects other streets: 3
- Dislikes curb extensions: 3
- More speed bumps: 3

*some questions/comments had multiple themes

Summary and Next Steps

What We Heard - Summary

- The proposed policy updates are acceptable, based on survey responses.
- Traffic Calming remains an important topic to St. John's residents.
- Residents would like more directly involved in determining which measures are used and/or knowledge about the criteria for deciding.
- Safety is a very big priority for all street users.

Next Steps

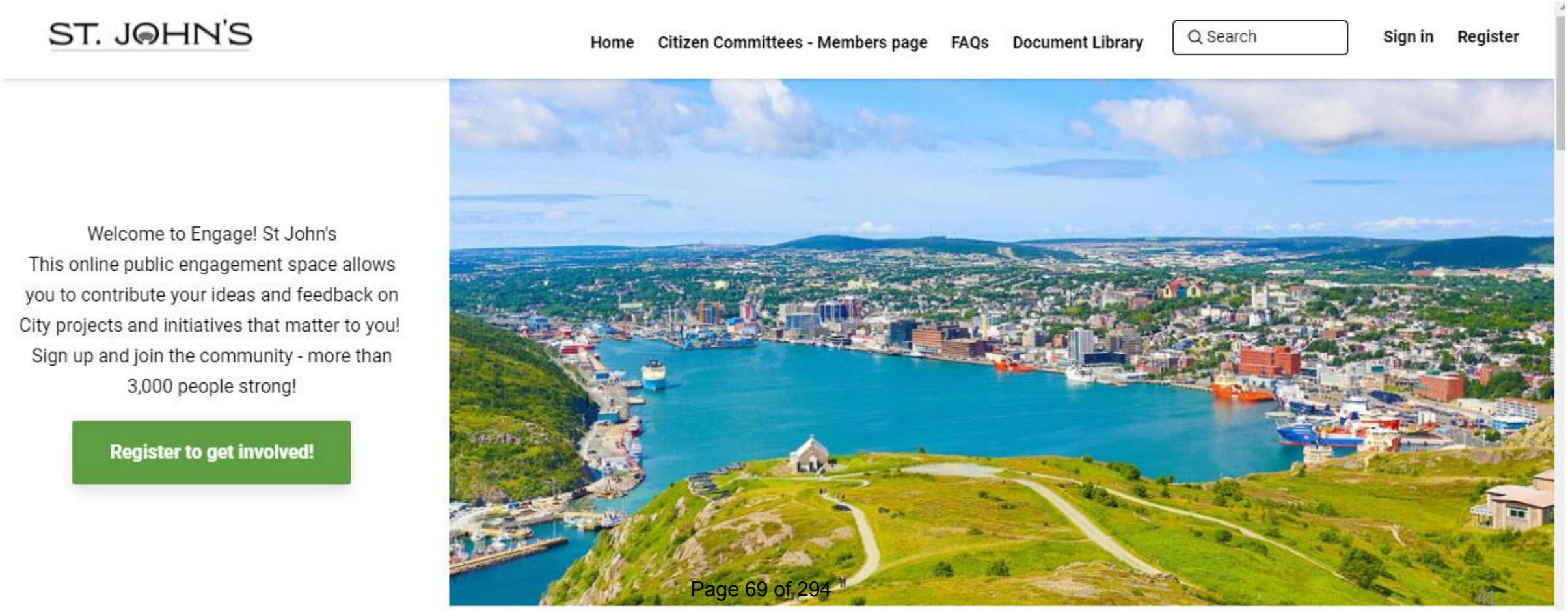
Release What We Heard

Council to review information note

Any policy changes will be communicated

To Stay Informed

Follow the project page or sign up to receive notifications at EngageStJohns.ca



DECISION/DIRECTION NOTE

Title:	Resilient St. John's Community Climate Plan
Date Prepared:	February 22, 2022
Report To:	Committee of the Whole
Councillor and Role:	Councillor Maggie Burton & Councillor Ian Froude, Sustainability
Ward:	N/A

Decision/Direction Required:

For Council to consider the adoption of the Resilient St. John's Community Climate Plan.

Discussion – Background and Current Status:

The City of St. John's (CSJ) strives to be sustainable today and for future generations. This is the vision expressed in the City's Strategic Plan.

St. John's City Council declared a climate emergency in November 2019, joining major cities countries around the globe, including over 500 municipalities across Canada calling for urgent action to avert the climate change crisis by reducing greenhouse gas emissions and adapting to changes, in order to avert the climate change crisis.

In May 2021 council committed to the following corporate GHG reduction targets: 40% reduction by 2030 with a stretch target of 50% by 2030 from 2018 emissions, and Net-zero before 2050. Municipalities play the most direct government role in their residents' everyday lives and associated energy and greenhouse gas (GHG) emissions associated with: community buildings; the shape of their streets and public spaces; the route and frequency of transit; and community development and redevelopment standards. Municipalities advocate on behalf of their communities, to higher levels of government, institutions, and utilities, and support and shape local economic development.

The Resilient St. John's Community Climate Plan (Resilient St. John's Plan) is the remaining component of the City's response to the climate emergency. The Plan outlines St. John's energy transition, and the climate risks we must adapt to, as well as goals and actions developed through best practice reviews and local engagement. The next five to ten years are critical to setting St. John's on the path to support national and global efforts, to address climate change and to manage irreversible changes in climate.

This plan is in line with Newfoundland and Labrador's commitments to reduce greenhouse gas emissions by 30 per cent below the 2005 GHG emissions level by 2030, and to achieve Net-Zero by the year 2050. It also follows energy transition and risk management best practices, and satisfies requirements from programs that the City is part of including FCM Partners for Climate Protection, Global Covenant of Mayors for Climate and Energy, and Cities Race to Net Zero.

A Note on COVID19 and Recovery

The COVID-19 pandemic significantly changed the way we live, work and play in our City. The pandemic has had several negative economic and environmental consequences. Many governments, including the Canadian government, are strategizing how economic recovery packages can be used to "build back better" and support an equitable transition to a resilient low-carbon society. It is also in the interest of Municipalities to look at green recovery and supporting initiatives which may help adapt to climate change, reduce greenhouse gas emissions, and increase overall well-being.

Development of the Plan

Municipal governments have various levels of control and influence across the community. For instance, direct control exists on municipal infrastructure, city buildings and fleet; influence exists on transportation mode share, food security and land use; little influence exists on vehicle standards and air travel. The Resilient St. John's Plan includes all levels of control and influence, and its implementation relies on strong collaboration with the community.

The development of this plan followed an evidence-based, stakeholder-driven, holistic process. The planned development was a multi-stage process including: context review, early public consultation, stakeholder engagement workshops, technical modelling for business-as-usual and low-carbon scenarios, scenario-based risk management practices consistent with the ISO 31000:2018 Risk Management for Climate Adaptation & Resilience standard, and a second stakeholder and public engagement effort to inform the path forward.

To support the City's efforts Sustainable Solutions Group (SSG) an environmental consulting cooperative specializing in climate change modelling and planning, was hired to perform technical energy, financial and emissions modelling. SSG collaborated with the City in the writing of the energy transition portion of the plan.

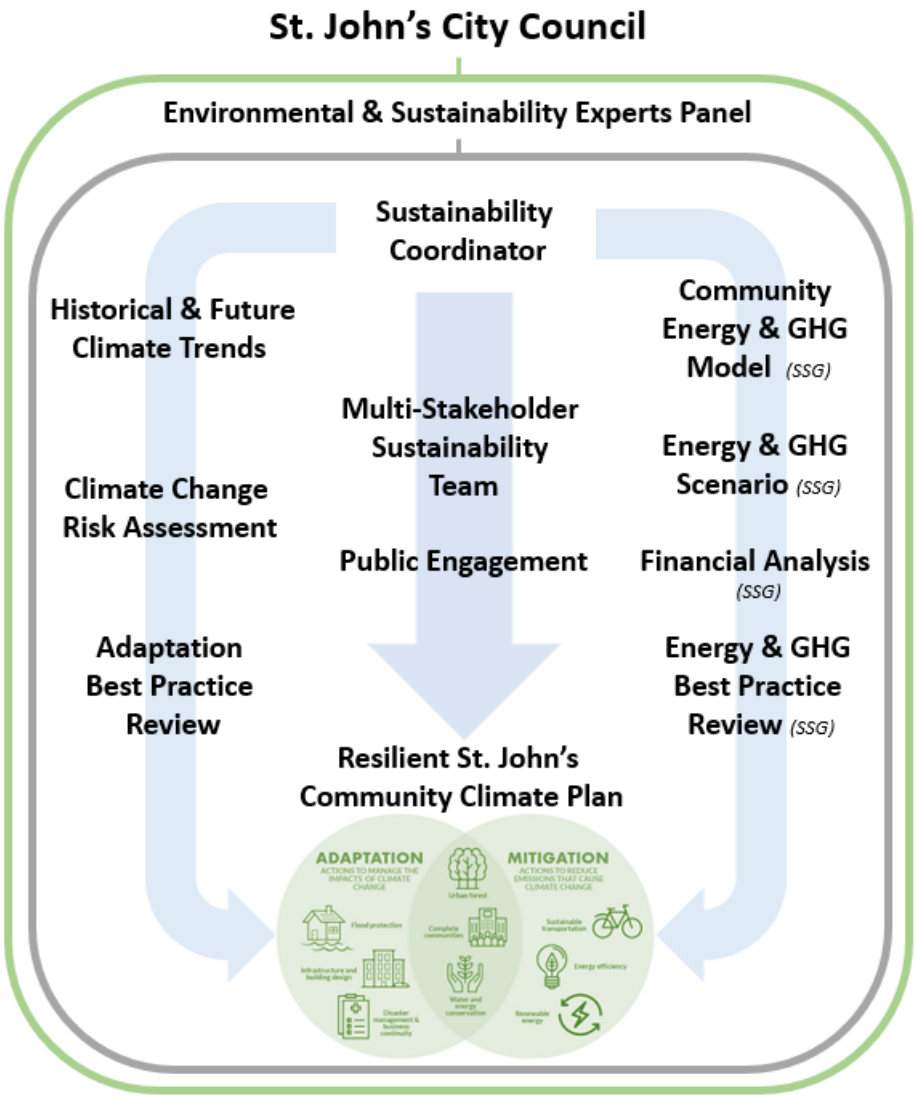


Figure 1. Resilient St. John's Community Climate Plan development.

Engagement

The City of St. John's convened a variety of groups including residents, staff, community organizations, businesses, association, and academics to engage in various levels of technical and non-technical discussions. Due to the impacts of COVID-19, most of the engagement was held virtually throughout 2020 and 2021.

A DIY toolkit was developed to support community leaders in hosting conversations about climate change and to provide early feedback. Two train-the-trainer style public sessions were held for anyone interested in using this tool in October 2020. The sessions trained 7 members of our community. Two feedback forms have been provided to the City by the public from community groups' virtual events using the toolkit.

The St. John's Engagement platform, City Guide, City Website News, e-newsletter reaching over 2,831 users, and over 200,000 social media impressions, and Council members

interviews with media, were used to raise awareness, and elicit feedback on various stages of the planning process.

Prior to finalizing the plan, the City sought additional input from the public, and various Citizen Committees of Council including: Accessibility and Inclusion Advisory Committee, Arts and Culture Advisory Committee, Bike St. John's, Built Heritage Experts Panel, Healthy City Strategy Steering Committee, Seniors Advisory Committee, as well as working groups.

What We Heard About the Preliminary Draft

- Economic analysis to make sure the proposed path and economic policy is good.
- The plan should lead to de-incentivization of sprawl, more mixed-use, and intensification.
- Energy efficiency is very important to help manage increasing energy costs, address affordability issues, food security and overall wellbeing.
- The plan should value the existing built environments and encourage adaptive reuse of existing buildings and encourage maintenance over demolition and rebuild.
- Focus on public transit improvements, active transportation, electrification of vehicles and collaboration to improve access to electric vehicle charging.
- Develop a solution for Electric Vehicle charging for those who don't have off-street parking.
- Desire to produce more food locally in an environmentally responsible way, including community gardens and composting.

To incorporate the comments, the Resilient St. John's Plan has included various changes, including an increased level of detail in the actions to indicate clearly what they would incorporate as they become projects and move forward. Specifically, the final draft includes information on the importance of the existing built environment, the priority of improvements to public and active transportation, and the role of ongoing engagement in the implementation of the plan.

The Resilient St. John's Plan was then brought forward for review to the Environmental & Sustainability Experts Panel prior to being presented to Council for adoption consideration.

<u>Energy Transition Pathway</u>

The CityInSight spatial energy and emissions model was populated with information on population, buildings, energy use, land use, and transportation in the City, to develop a baseline and future GHG emissions, energy use, and a financial model. Two scenarios were studied, first a business-as-usual and then a Net-Zero pathway. To determine an evidence-based and community-informed energy transition pathway, the CityInSight model was populated with a series of actions informed by best practices, available technologies, and community insight.

In summary, the results showed that a business-as-usual (BAU) future is likely to see a decrease in St. John's community-wide emissions by 2050. The decrease would be from an estimated 789 kilotonnes of carbon dioxide equivalents (ktCO2e) in 2016 to 573 ktCO2e in

2050. This is due to existing policies, regulations, and market trends, most notably the near-decarbonization of the provincial electricity grid as well as federal regulations on transportation fuel efficiency. However, the climate emergency requires much more.

Modelling results show that to achieve net-zero by 2050, St. John's needs to follow a pathway of emission reductions of approximately 25% by 2025, and 50% by 2030 from the 2016 baseline. This will require a comprehensive series of changes across all sectors. Results show that we can reduce the GHG emissions 93% by 2050 as compared to business-as-usual emissions using currently available technologies and best practices. The majority of remaining emissions are mostly from organic waste decomposing in the landfill, and continued minimal use of heavy duty-type vehicles. In the future, this remaining carbon gap will need to be addressed through the purchase of offsets, once the other actions are implemented. Future revisions of this Energy Transition will have the benefit of considering further policy and technological innovations like hydrogen.

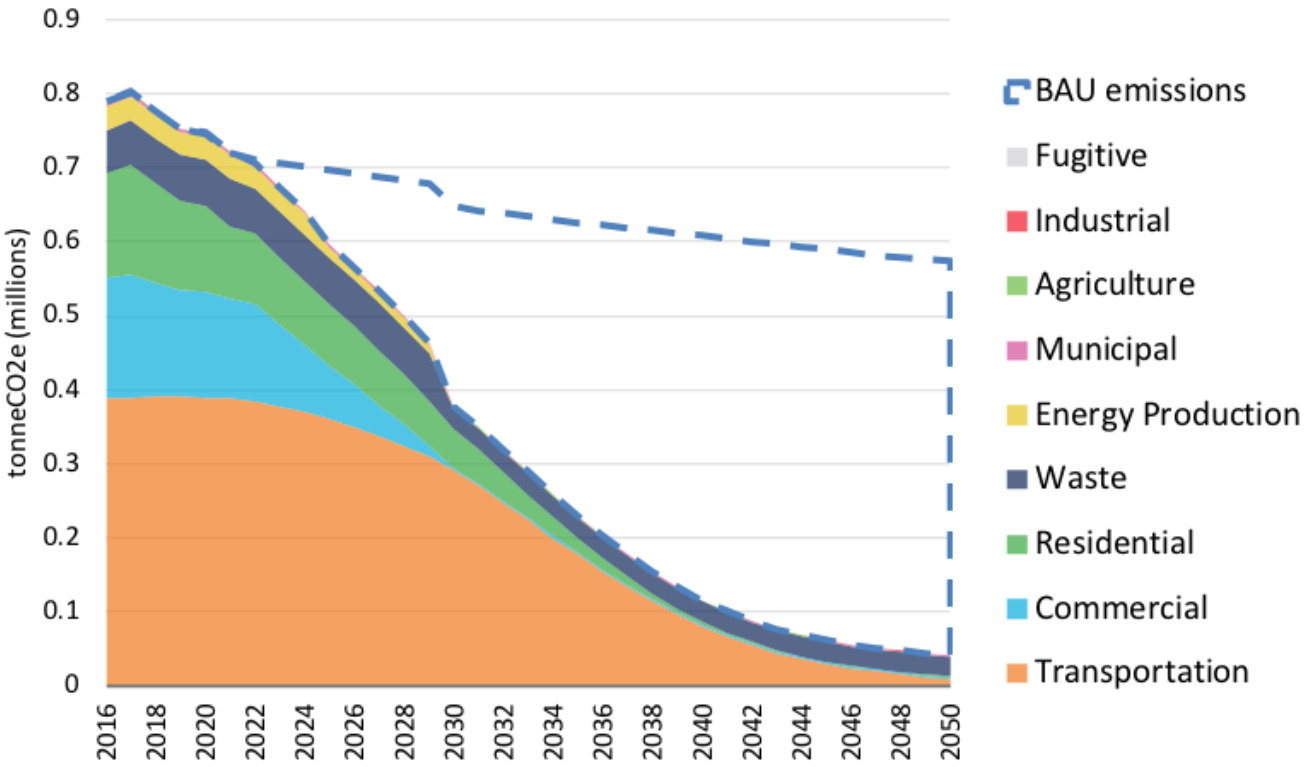


Figure 2. St. John's greenhouse gas emissions by sector in a net-zero scenario, 2016-2050.

The urgency with which the City reduces its emissions matter. Delaying the transition results in overall more greenhouse gas emission and a delay in financial and other co-benefits. Also, ongoing decision-making today may lock in emissions for decades to come. For example, a fossil fuel-dependent asset purchased today will delay the next opportunity to transition this asset for the useful life of that asset. While those decisions may still need to be taken in specific cases, it is important to consider low-carbon alternatives now and plan a feasible transition.

Adapting to the Risks

The City of St. John's undertook a climate change risk assessment to inform how changes in climate may continue to impact our community. The vulnerability of our community to these risks is planned to be reduced through the implementation of identified adaptive management practices. The adaptation planning process was led by the City and engaged local stakeholders through the Multi-Stakeholder Sustainability team, and public engagement. The strategic-level risk assessment leveraged localized climate projects to identify damaging impacts to our community through engagement. The assessment identified 55 impacts to our community from changes in climate. Impacts were identified across the infrastructure, socioeconomic, and ecological systems of our community. Prioritization was based on the likelihood of the impact taking place, as well as the consequences it would have across the community's: health, infrastructure, local economy & growth, natural resources, psychological, culture, social cohesion, and consequences to the public administration.

Among the highest risks were:

- Sea level rise, including storm surge & coastal erosion
- More telecommunication & power disruptions
- More urban flooding
- Temperature impacts on the marine food chain
- More frequent precipitation damage (e.g., mould, leaks)

Actions to reduce our vulnerability are included in the Resilient St. John's Plan and were developed to address all high risks directly with considerations given to all medium risks for St. John's. The actions were based on best practices in adaptation management from other municipalities and refined through public and stakeholder feedback.

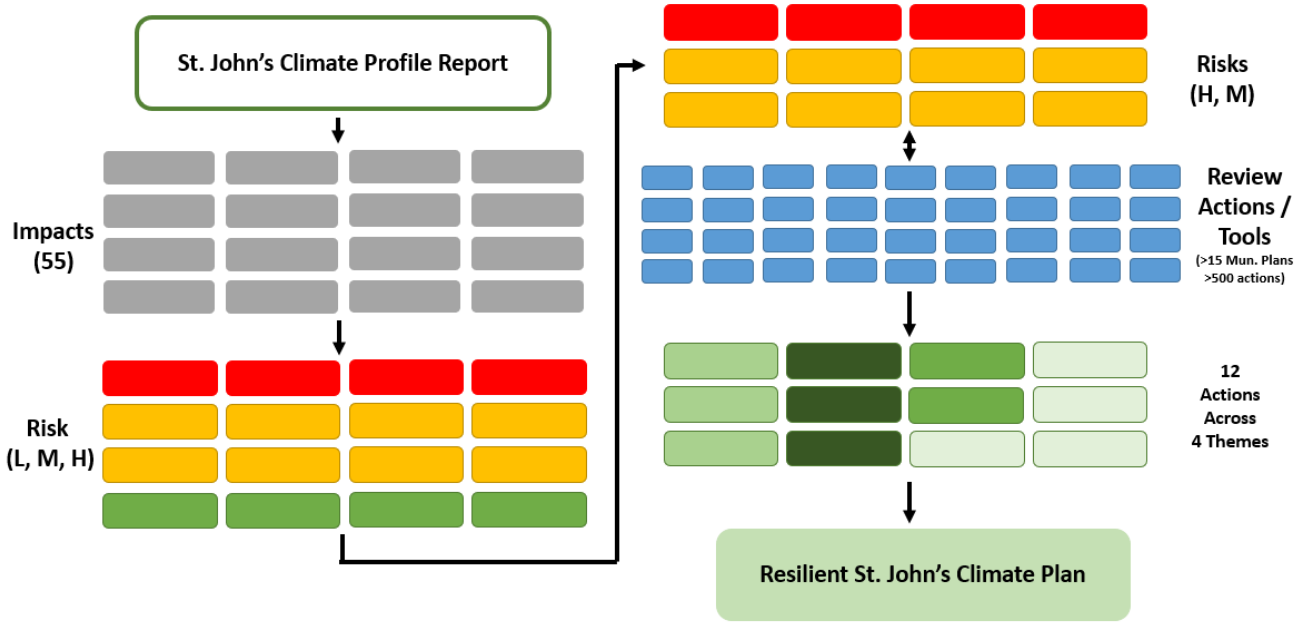


Figure 3. Visualization of the path from climate trends to adaptation actions for the Plan

An Equitable Transition by Addressing Energy Poverty

Over a third of all households in Newfoundland live in energy poverty, where they spend more than 6% of their after-tax income on energy — that's the second-highest such rate in the country. St. John’s numbers are not that different from the rest of the province, with 34% of households experiencing this level of energy poverty. Energy poverty is projected to worsen in a BAU scenario due to projected energy price rises (see Figure 2). To ensure the transition is equitable, the pathway focuses on energy efficiency, resulting in a major reduction in the community’s energy poverty rates.

Households facing energy poverty or energy insecurity face difficult choices such as "heat or eat". In particular, energy insecurity disempowers low-income residents such as single parents, the elderly, persons with disabilities, and others with low or fixed incomes. Energy insecurity leads to stresses such as food insecurity, utility-related debt, shutoffs, inefficient heating systems, antiquated appliances, and extreme home temperatures with significant health impacts. This is only exacerbated when including the higher expense of vehicle ownership vs active or public transportation. In an energy poverty context, children may experience nutritional deficiencies, higher risks of burns from non-conventional heating sources, indoor air quality issues, higher risks for cognitive and developmental behaviour deficiencies, and increased incidences of carbon monoxide poisoning. Subsequent impacts include parents being unable to work in order to look after children, missed school days, and lost productivity.

Between 2022 and 2050, the net-zero scenario saves the average St. John's household about $80,667 in gross fuel and electricity expenditures (i.e., not including the cost to undertake the efficiency improvements). Depending on the business, policy and financing strategies used in the implementation of the actions, these savings will be partly offset by the incremental capital expenditures required.

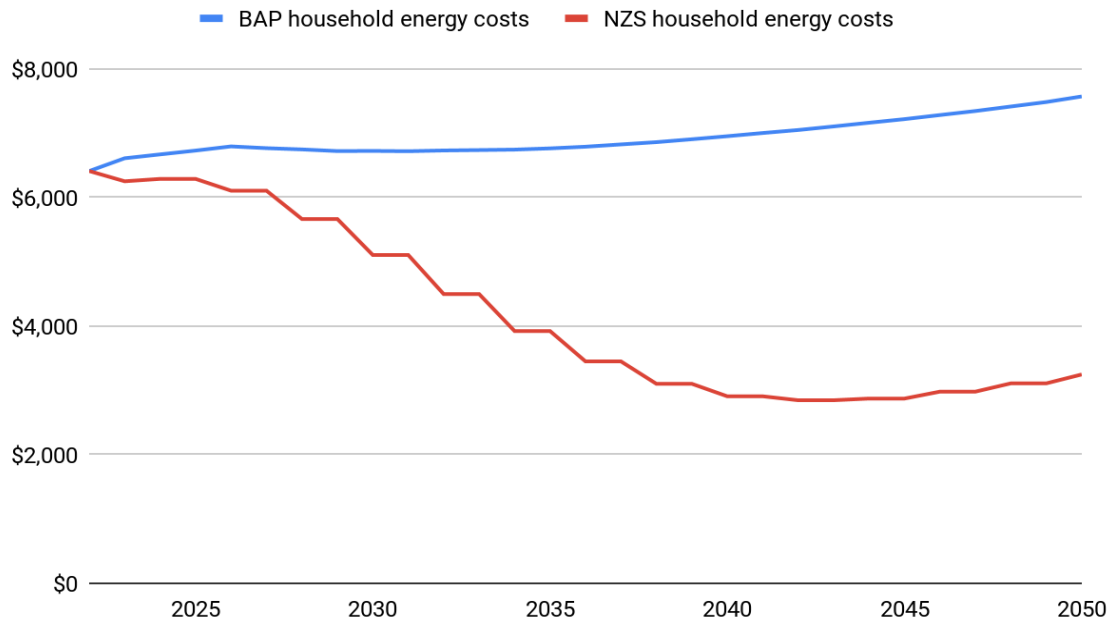


Figure 4. Average annual household energy costs in the net-zero (NZS) and business-as-usual (BAP) scenarios, 2022-2050.

Economic Development

St. John's has many unique resources that are leveraged in the Energy Transition, namely its creative and resilient residents and business community, plentiful nearly emissions-free central grid supply, technology, entrepreneurial spirit, as well as potential partnerships with institutions and organizations. St. John's also counts with significant wind energy potential to support the energy transition. Perhaps most valuable in this transition, are the engaged and committed residents, who are ready to support, oversee and participate in the Transition.

The Resilient St. John's Plan leverages these strengths to respond to climate risks and some of the community's GHG reduction challenges. One of the largest challenges is the need to address our older, energy-inefficient building stock that relies on inefficient electric baseboard heaters or GHG-intensive fuel oil, while retaining its built and landscape heritage.

Wherever defensible data was available, each action included in the Energy Transition within the CSJ Plan was assessed to determine its financial value in comparison to a business-as-usual scenario. This value is derived from a combination of the action's costs (i.e., capital and operational) and benefits (i.e., avoided costs of carbon, energy, and maintenance, as well as revenue), with a discount value of 3% to account for the time value of money.

Addressing all emissions will be necessary to achieve net-zero by 2050. The financial analysis undertaken shows the Transition as a whole is cost-effective and overall good economic policy for St. John's.

The mass deep energy retrofit and vehicle electrification programs the pathway proposes represent a major economic growth opportunity that will reduce household energy costs, create many local good green jobs, and provide a solid return on investment. Land use considerations in the pathway aim to make it more possible to reduce personal vehicle trips by fostering public and active transportation.

Financial data indicates the Transition will need about $205 million per year to be invested by the community as a whole, with an average of $167 in savings per GHG tonne reduced over the total transition (28-years). The savings add up quickly over the 28 years to an overall return of nearly $1.8 billion dollars; this is a 33% return on the $5.5 billion dollar investment needed to realize the transition. The majority of the financial benefit is due to the $7 billion avoided energy and carbon costs, as well as maintenance savings associated with the energy efficiency improvements and fuel switching included in the Resilient St. John's Plan.

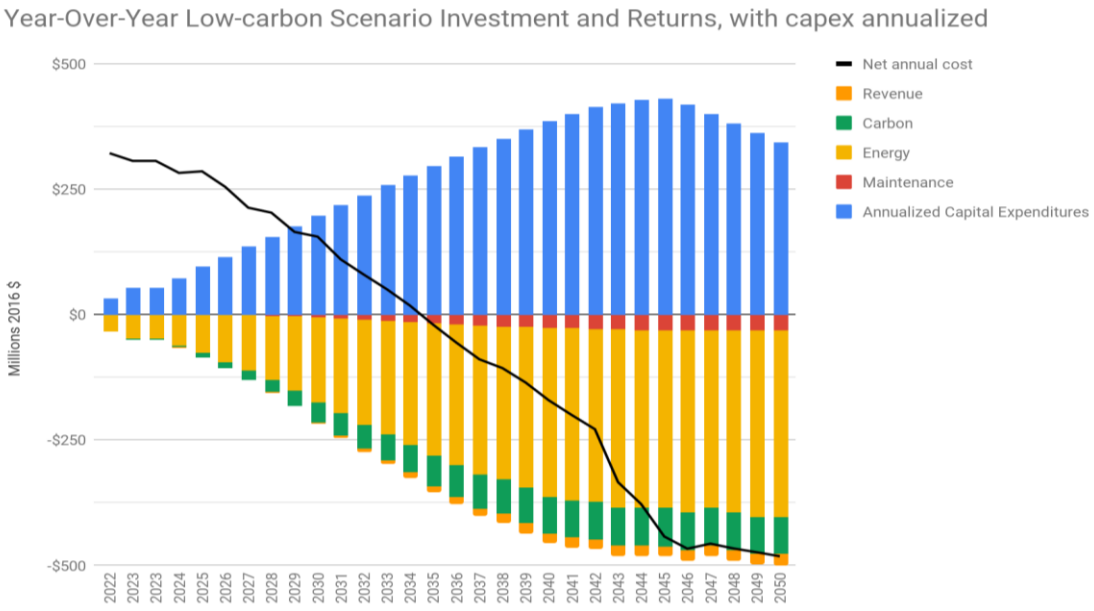


Figure 5. Annualized capital expenditures vs. savings and revenue from the net-zero scenario, 2022-2050.

The savings benefits are considered to be fairly conservative, as many critical benefits of the transition and risks of not transitioning are NOT included in the financial analysis. These are more difficult to quantify, ie. improving public health, and improving energy security, decreasing social inequity. Furthermore, the risks of not acting, being stuck with stranded assets or missing out on economic opportunities presented by the local, national, and global low-carbon transition are impossible to quantify.

More specifically, the Transition will produce 38,600 person-years of employment (1,400 full-time jobs). It also will produce savings for households of about 50% on their energy costs, which could then be used to afford things like quality food, education, recreation, etc.

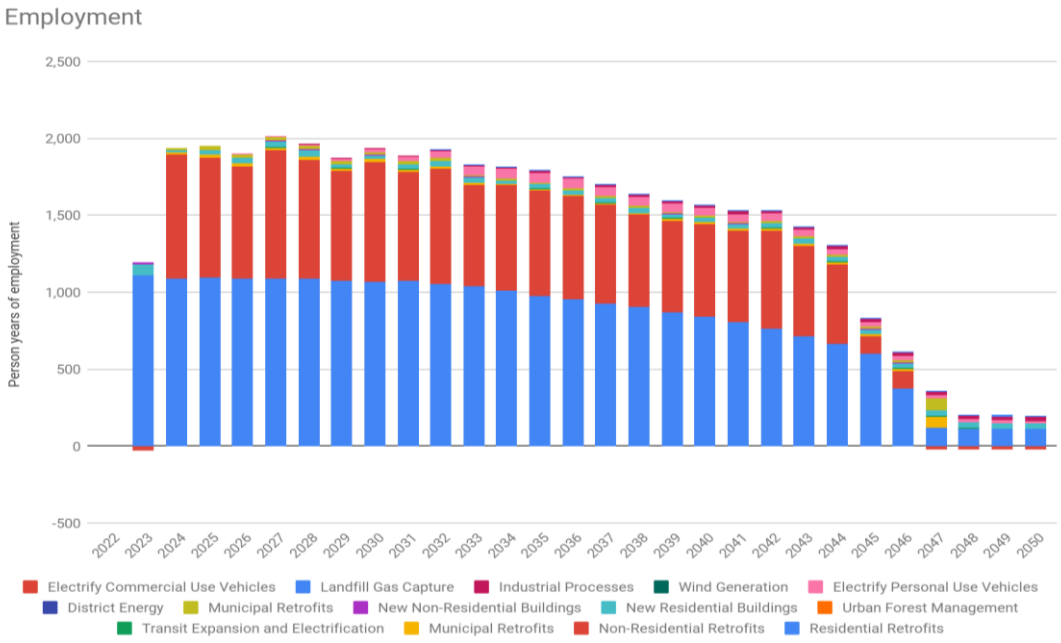


Figure 6. Additional person-years of employment associated with Energy Transition actions.

The Transition won't only provide the benefits mentioned above, it will result in a more resilient economy. The sensitivity analysis shows that, when you increase or decrease the overall energy costs by 20% in St. John's, the net cost of the scenario in 2050 is affected by 13-14% in either direction. It can be concluded that there is an important co-benefit of energy efficiency, electrification, and local renewable energy generation measures in terms of resilience against future energy price increases controlled mainly by external pressures.

To be clear, the Energy Transition will be funded by many different sources, including the City, other levels of government, the private sector, and individual residents. Where necessary, these investments will be enabled through innovative financing mechanisms and incentives. An equitable program design will ensure that all residents and businesses have access to the savings.

What We Need to Do

Details of what we need to do are captured in the planning documents. However, collectively as a community, the path forward can be summarized by the following categories:

1. Provide municipal leadership
2. Improve building practices in new development and retrofitting existing buildings
3. Expand active and public transportation opportunities, and electrify the remaining vehicles.
4. Pursue a low-waste future
5. Protect and enhance our natural environment
6. Renewable energy
7. Emergency Preparedness

1. Provide municipal leadership

There are a few essential overarching measures that must be taken to ensure the City is facilitating community improvement. This comprises coordination support, progress reporting, academic and innovation partnerships, working towards incorporating a carbon budget system to support council in aligning City spending and policies, and a complete five-year review on energy use and GHG emissions.

Densification and complete community policies help protect green spaces and increase access to transit and active transportation options. Partnerships with academic institutions help identify the training and research needed, while collaboration is needed to foster a supportive environment for small start-ups seeking to work in the growing green economy. By preserving and growing the forest canopy, open space, and natural areas, we can reduce hazards while also balancing part of the remaining GHG emissions in 2050, through natural carbon sequestration

2. Improve building practices in new development and retrofitting existing buildings.

To strengthen building envelopes and increase uptake of technology like air-source heat pumps, the Plan calls for a massive deep building rehabilitation program. This mass building

deep retrofit program's focus will be to reduce GHGs while reducing residential energy expenses. Investment in retrofits is the Transition's largest job creator (over 1,350 person-years of employment for each year from 2022 to 2050).

New buildings built to today will most likely still be standing in 2050. Development decisions need to be aligned with a net-zero future as soon as possible, as retrofitting buildings at a later date is a much more costly proposition. Adaptive re-use of existing buildings and materials also supports the reduction of waste and embedded carbon in construction materials into the future.

3. Expand active and public transportation opportunities, and electrify the remaining vehicles.
The Plan's transportation transition is critical, as transportation now accounts for half of St. John's GHG emissions. Prioritize efforts to increase the number of journeys taken by foot, bike, and e-bus in the future. Meanwhile, electric vehicles will be used to replace the remaining vehicles (EVs). Through electrifying its transit and fleet and facilitating additional public and active transportation by expanding and enhancing transit networks as well as infrastructure options for walking, cycling, and riding scooters, the City can play a crucial role as a first mover.

To encourage the adoption of electric vehicles, the city and private sector need to work together to expand EV charging infrastructure and related policies, while increasing local support for and the availability of EVs.

4. Pursue a low-waste future
The inclusion of circular economy principles in our economy will support the City's diversion and material reuse efforts, while also encouraging new businesses to design waste out of their products and services. To reach net-zero, a timely implementation of an organic waste diversion program, as well as timely expansion projects of the landfill gas capture system to address legacy organic waste emissions deposited, are required.

5. Protect and enhance our natural environment
It is important that actions continue to be taken, and applied as intended, to protect natural assets (like trees, watershed, wetland and floodplain protection policies). Natural assets provide significant value to our community and buffer St. John's from climate impacts. Climate Change also poses a threat to local and global food systems and agriculture. Improvements and collaboration with local food and agriculture sectors can improve local food availability; while reducing greenhouse gas emissions from transportation.

6. Emergency Preparedness
It is a shared responsibility to be prepared for an emergency and to build a resilient community. Climate change and its consequences can be mitigated by reducing greenhouse gas emissions, but current greenhouse gas levels require us to prepare for hazardous climate shifts. Forecasts for increasingly intense and frequent extreme weather events, as well as

lessons learned from previous disasters, must be factored into catastrophe, business continuity, and emergency management plans, with contingencies and flexibility taken into account when dealing with these events.

7. Renewable Energy

In addition to the upcoming hydro-based central grid electricity, St. John is supportive of leveraging other renewable energy generation to meet future electricity demands. However, ambitious energy efficiency is more cost-effective, can be implemented in the short term, and generally provides additional co-benefits to residents. The City will be exploring the potential beneficial use of methane gas that will be increasingly captured at its landfill, similar to the beneficial use of methane collected at the Riverhead Wastewater Treatment Plant. Additionally, the City will explore models to support adding wind generation to the municipal grid. This will enable the City to diversify its electricity supply and support the Province's vision of Maximizing our Renewable Future Plan. This diversification generates local revenues and increases the resilience of the city in the event of disruptions to electricity distribution or generation.

<u>Resourcing & Financing the Implementation</u>

It is imperative to begin work on all recommended actions and strategies to meet the challenges that Climate Change presents. The Resilient St. John's Plan outlines in more detail the proposed timing of the initiatives listed above, and the strategic pathway beyond 5-years from now. The strategies in the Plan enable the City to provide broad leadership on Climate Change. However, close cooperation and partnership with multiple stakeholders are critical for the plan to be realized.

Some strategies indicate the need for the City to develop specific municipal initiatives or programs. The specific costs (operating and capital) will be developed as part of their development and brought to Council for consideration through the budgeting process. The consultant's report recommends that new positions are urgently needed to carry out the community climate plan. Currently, one employee is exclusively focused on climate-related work, with City staff supporting as to the extent possible. Resourcing, including additional consulting support, should be aligned to implement the community plan at the scale and in the time that is required. It is understood that at least one additional climate specialist is needed along with contractors to provide broad technical and research support.

A scan of the administration will be conducted to identify employees with relevant skills and capacity to support the plan's implementation by explicitly incorporating this work as part of their role in the City. Effort and ownership by each department will be required for the timely and successful implementation of climate action. Additional staff may be required in some areas, and financial resources will be requested from Council through the budgeting process. Funding opportunities that include staff support will continue to be explored.

The Environmental and Sustainability Experts Panel (ESEP) will be tasked by Council with the development of the Terms of Reference for a stakeholder community climate action task force. Membership of the task force will be established by the ESEP, starting with invitations to the City's Multi-Stakeholder Sustainability Team. However, additional stakeholders may be added based on interest from community organizations to participate in both scoping and implementing the transition. The Community Climate Taskforce (CCT) will meet periodically to (i) share initiatives relevant to the Resilient St. John's Plan, and (ii) collaboratively develop and identify a lead for projects in-line with the Plan and funding programs from all levels of government. The ESEP will provide recommendations to Council to support developed projects through either letters of support, and/or matching funds, if necessary and appropriate.

In the meantime, staff will actively monitor and collaborate with stakeholders to ensure our community is well-positioned to apply for new funding opportunities to realize the Resilient St. John's Plan. Significant federal and provincial funding is already tied to outcomes related to the Plan, and there are no indications this will change. Since 2020, the City's Climate work has obtained over $255,000 in funding for planning, naturalization, EV chargers from other levels of government. Also, it has supported partner organizations in obtaining over $700,000 towards improving residential energy retrofit programming, electric vehicle education, and the study of wetlands. Additionally, over $200,000 in additional project funds are currently pending funder decisions. Additional funding with climate change considerations has been associated with capital works projets like Kelly's Brook trail, Kenmount Rd, and others.

Updates on the action will be brought forward to Council through the Strategic plan updates. In addition, the City will update and publicly disclose through the CDP platform which is required as part of the City's commitment to the Partners for Climate Protection program, and the Covenant of Mayors for Climate and Energy. The Carbon Disclosure Project Platform (CDP) is the only global climate disclosure platform that includes Cities and Corporations (more than 6,000 companies on behalf of more than 800 institutional investors).

For transparency and improved coordination with the community, additional digital tools to help coordinate, plan, track, measure and publish the Resilient St. John's Plan on one easy-to-use platform will be explored and brought to Council for consideration.

<u>Environment and Sustinability Experts Panel Recommendation:</u>

The Resilient St. John's Climate Plan was brought to the ESEP panel for final review and comment. The panel expressed support for the content of the report, its development process, and unanimously recommends Council to adopt the plan, the targets presented, and collaborative framework.

Key Considerations/Implications:

1. Budget/Financial Implications: Financial resources will be requested from Council through the budgeting process.
2. Partners or Other Stakeholders: Extensive public and stakeholder engagement for the development of the Resilient St. John's Plan is detailed in the plan documents and previous what we heard documents publicly available.
3. Alignment with Strategic Directions/Adopted Plans: A Sustainable City, A City that Moves, A Connected City, Climate Emergency, St. John's Corporate Climate Plan.
4. Legal or Policy Implications: N/A
5. Privacy Implications: N/A
6. Engagement and Communications Considerations: If adopted, materials will be developed to share the contents of the plan with the public, including the targets, roles and actions they can undertake to support the implementation.
7. Human Resource Implications: A scan of existing staff will be conducted, at least one additional climate specialist needed in the medium term.
8. Procurement Implications: Partnership structures will be discussed and reviewed through procurement City processes as needed.
9. Information Technology Implications: N/A
10. Other Implications: There are significant environmental, economic and social benefits associated with the implementation of Resilient St. John's Plan. These positive implications are outlined within the body of this report and associated attachments.

Recommendation:

That Council adopts the Resilient St. John's Community Climate Plan, as Schedule A and B.

That Council adopts community greenhouse gas absolute emission reduction targets, from the estimated 2016 baseline of: 25% by 2025, 50% by 2030 with a stretch target of 60%, and Net Zero by 2050 at the latest.

That Council accepts in principle the need to resource the role of the City in the coordination and financing of the plan and direct the City Manager to return to Council with a resource plan.

That Council directs staff to integrate the outlined actions in the Plan into the multi-year capital plan and future annual budgets for consideration.

That Council directs the Environmetal and Sustainability Experts Panel to develop a Terms of Reference to a Task Force that will support the implementation of the Resilient St. John's Climate Plan.

That Council directs all City staff to prioritize actions in the Corporate Climate Plan previously adopted in May 2021 as part of the City's municipal leadership to the Resilient St. John's Community Climate Plan.

Prepared by: Edmundo Fausto, Sustainability Coordinator

Approved by:

Report Approval Details

Document Title:	Resilient St. John's Community Climate Plan.docx
Attachments:	- Resilient St Johns Climate Plan- Adaptation.pdf - Resilient St Johns Climate Plan-EnergyTransition.pdf - Resilient St. John's Community Climate Plan- Slides.pdf
Final Approval Date:	Feb 22, 2022

This report and all of its attachments were approved and signed as outlined below:

Brian Head - Feb 22, 2022 - 3:32 PM

Lynnann Winsor - Feb 22, 2022 - 3:41 PM

Resilient St. John's

Community Climate Plan:

Adapting to Climate Change

Table of Contents

Terms

Adaptation – The process and actions to manage the actual and projected climate impacts and risk to reduce the effects on built systems, the natural environment and people

Built Infrastructure – The infrastructure of a country, society, or organization consists of the basic facilities such as transport, communications, power supplies, and buildings, which enable it to function.

Climate – Weather conditions prevailing in an area in general or over a long period.

Climate Risk – Risk resulting from climate change affecting natural and human systems

Greenhouse Gases – is any gas in the atmosphere that absorbs infrared radiation, thereby trapping heat in the atmosphere

Mitigation – The processes and actions that stabilize or reduce the greenhouse gas concentration in the atmosphere

Natural Infrastructure – An area or system that is either naturally occurring or naturalized and then intentionally managed to provide multiple benefits for the environment and human well-being.

Resilience – The capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow despite chronic stresses (e.g. water shortages) and acute shocks they experience (e.g. floods)

Smart Growth – planned economic and community development that attempts to curb urban sprawl and worsening environmental conditions.

Vulnerability – the state of being exposed to the possibility of being impacted

Weather – The state of the atmosphere at a place and time regarding heat, dryness, sunshine, wind, rain, etc.

Land Acknowledgements

We respectfully acknowledge the Province of Newfoundland & Labrador, of which the City of St. John's is the capital city, as the ancestral homelands of the Beothuk. Today, these lands are home to a diverse population of Indigenous and other peoples. We also acknowledge, with respect, the diverse histories and cultures of the Mi'kmaq, the Innu, the Inuit, and the Southern Inuit of this Province.

This project was carried out with assistance from the Green Municipal Fund, a Fund financed by the Government of Canada and administered by the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.

Contributors to the Plan

Many residents and organizations contributed to the development of the plan throughout the various engagement stages, including public engagement and consultation, membership of the Multi-Stakeholder Sustainability Team, St. John's Environmental and Sustainability Experts Panel, and St. John's Corporate Energy Team. We also want to thank all the residents and organizations who reached out to staff and council, completed the online surveys, hosted do-it-yourself climate change workshops, and attended any virtual sessions or council meetings.

St. John's Environmental and Sustainability Experts Panel

Kieran Hanley
Joel Finnis
Krista Langthorne
Pablo Navarro
Joseph Daraio
Michel Wawrzkow
Dennis Knight

Multi-Stakeholder Sustainability Team

-Government of Newfoundland and Labrador
-Food First NL
-NAACAP
-Healthy City St. john's
-Bike St. John's
-Newfoundland Federation of Agriculture
-Econext (NEIA)
-Memorial University
-CCNL
-Professional Engineers and Geoscientists Newfoundland & Labrador
-Quidi Vidi / Rennies River Development Foundation
-Ducks Unlimited Canada
-CMHC
-Department of Fisheries and Oceans
-AIM network
-Metrobus
-St. John's Airport (YYT)
-Newfoundland Power
-Home Builders Association
-BOMA NL
-NOIA
-Destination St. John's
-St. John's Board of Trade
-Canadian Home Builders' Association
-Grand Concourse Authority
-MUN Botanical Gardens
-Drive Electric NL
-North Atlantic
-Martin Batterson
-East Coast Trail
-FFAW
-Newfoundland and Labrador Public Health Association
-SWANA
-MMSB

We also thank First Voice and First Light for supporting an ongoing conversation of the role of this plan, the environment and climate action in the healing process of the indigenous peoples in our community.

Data Acknowledgements

Government of Newfoundland and Labrador
Harris Centre, particularly the Regional Analytics Laboratory (RAnLab)
Government of Canada, Canada's Changing Climate Report
Climate Atlas of Canada
Newfoundland Power

A Note on COVID19

The COVID-19 pandemic significantly changed the way we live, work and play in our City. The pandemic has had several negative economic and environmental consequences. Many governments, including the Canadian government, are strategizing how economic recovery packages can be used to "build back better" and support an equitable transition to a resilient low-carbon society. It is also in the interest of Municipalities to look at green recovery and supporting initiatives which may help adapt to climate change, reduce greenhouse gas emissions, and increase overall well-being.

Introduction

Responding to the climate emergency

Climate change is an urgent worldwide crisis. The climate science from the Intergovernmental Panel on Climate Change's (IPCC) report "The Special Report on Global Warming of 1.5°C" is clear: allowing global temperature rise to exceed 1.5°C will disrupt global social, economic and ecological systems, with severe consequences for the most vulnerable populations[1]. Global temperatures are likely to reach 1.5°C between 2030 and 2052 if greenhouse gas emissions (GHG) continue to increase at current global rates, and the window to curve this is closing very quickly.

Analysis by the Federal government of Canada, the Government of Newfoundland and Labrador, and the City of St. John's indicates that our community will experience significant changes in climate. We have already observed temperature increases of 0.8°C since 1942, warming of sea surface temperatures, an increase of intensity and duration of some storms, and sea level rise of about 1.9 mm/year since the 1940's.

It is projected that without action temperatures will have increased by 2.7°C by the 2050s, leading to other significant changes in precipitation, winter conditions, and sea level rise. This would make existing risks greater for vulnerable residents, it would disrupt infrastructure systems, and lead to economic impacts. While the global goal is to achieve net-zero GHG emissions by mid-century to avoid many of the worst climate impacts, it is well understood that a certain amount of climate change is now inevitable.

The City of St. John's strives to be sustainable today and for future generations. This is the vision expressed in the City of St. John's Strategic Plan. St. John's City Council declared a climate emergency in November 2019, joining countries and major cities around the globe, including over 500 municipalities across Canada calling for urgent action to avert the climate change crisis by reducing greenhouse gas emissions and adapting to the expected changes.

This report is a component of the City's response to the climate emergency, it outlines the Adaptation portion of the Resilient St. John's Community Climate Plan. This is in line with requirements from programs that the City is part of including FCM Partners for Climate Protection, Global Covenant of Mayors for Climate and Energy, and Cities Raze to Net Zero.

This plan outlines St. John's risks we must adapt to, as well as adaptation goals and actions developed through best practice reviews and local engagement. The next five to ten years are critical to setting St. John's on the path to support national and global efforts to address climate change and to manage the irreversible changes in climate.

What is Climate Change?

- **Climate** is the "average weather" in a location, over some time ranging from months up to thousands of years.
- **Climate change** refers to a change in the state of the climate that persists for decades or longer.

In the current time.

- The global climate has changed over long periods of time naturally. Recent and rapid climate change is attributed to human activity, like burning fossil fuels and land use changes.
- The temperature is changing 50 times faster than it did during the time when modern civilization and agriculture developed over 10,000 years ago.
- The temperature on Earth has increased by more than 1^{o} Celsius since 1880. In the past, a -1^{o} to -2^{o} change took the Earth into the Little Ice Age.
- Approx. 20,000 years ago it was a -5^{o} change that caused the Ice Age, burying most of North American under the towering mass of ice that created the fjords in Western Brook Pond, NLs.
- Impacts from current Climate Change are being felt in Canada and around the globe, and the impacts are expected to worsen as more GHGs are added to the atmosphere.

[1] https://www.ipcc.ch/sr15/

A Community Climate Plan

Municipal governments have various levels of control and influence across the community. For instance, direct control exists on municipal infrastructure, city buildings and fleet; influence exists on transportation mode share, food security and land use; little influence exists on vehicle standards and air travel. The Resilient St. John's Community Climate Plan includes all levels of control and influence, and its implementation relies on strong collaboration with the community.

To ensure the City is maximizing co-benefits of climate action and to prevent maladaptation, the City of St. John's opted to follow the Low Carbon Resilience (LCR) planning framework. This means the plan integrates climate change action that reduce greenhouse gas emissions (mitigation) and those that address risks from change in climate (adaptation). By strategically aligning these two types of climate action (adaptation & mitigation) we can enhance the effectiveness of both strategies, avoid risks, and generate economic, ecological, and social benefits.

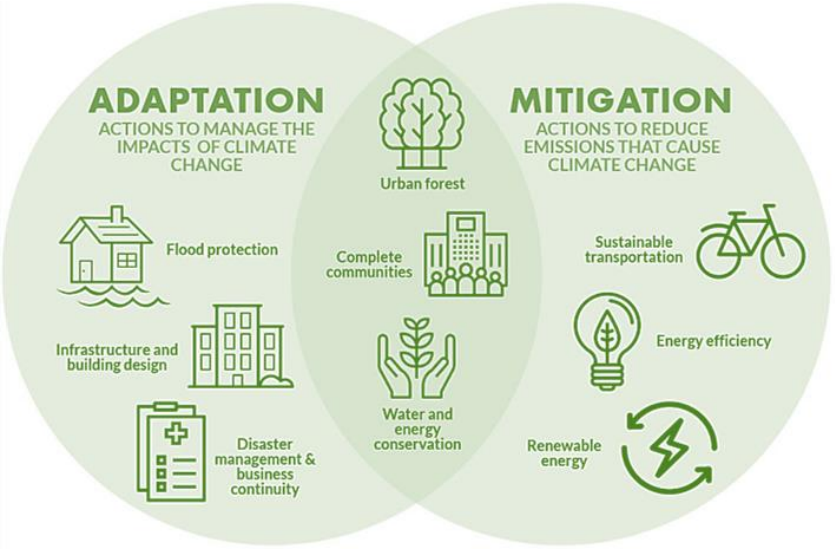


Figure 1 Adaptation vs Mitigation (Source: City of Waterloo Corporate Climate Change Adaptation Plan)

Developing a Plan for Action

The development of this plan followed an evidence based, stakeholder driven, holistic process. This process was guided by the following principles:

Guiding Principles

Commitment: Demonstrate proactive leadership to sustain progress

Inclusiveness: Actively engage and foster shared responsibility for action

Relevance: Develop locally relevant goals and solutions

Integration: Integrate mitigation and adaptation considerations throughout decision making

Evidence Based: Consider current climate science, knowledge, and best management practices, while committing to ongoing learning

Risk-Based: Use a risk-based approach to manage uncertainty in decision making

Process

The plan development was a multi-stages process, which included an early public consultation, stakeholder engagement workshops, technical modeling for business-as-usual and low-carbon scenarios, and scenario-based risk management practices consistent with the ISO 31000:2018 Risk Management for Climate Adaptation & Resilience standard.

Engagement

Figure 2 Engagement groups and roles

The City of St. John's convened a variety of groups including residents, staff, community organizations, businesses, association, and academics to engage in various levels of technical and non-technical discussions. Due to the impacts of COVID-19 most of the engagement was held virtually throughout 2020 and 2021. The St. John's City Guide, City Website News, e-newsletter reaching over 2,831 users, and over 200,000 social media impressions, and Council members interviews with media, were used to raise awareness, and elicit feedback on various stages of the planning process.

A toolkit was developed to support community leaders in hosting conversations about climate change and to provide early feedback. Two train-the-trainer style public sessions were held for anyone interested in using this tool in October 2020. The sessions trained 7 members in our community. Two feedback forms have been provided to the City by the public from community group virtual events using the toolkit.

Prior to finalizing the plan, the City sought additional input from the public, and various Citizen Committees of Council including: Accessibility and Inclusion Advisory Committee, Arts and Culture Advisory Committee, Bike St. John's, Built Heritage Experts Panel, North East Avalon Healthy Communities Alliance, Seniors Advisory Committee, as well as working groups.

What We Heard from Residents

"Well-connected and close-knit group of stakeholders who are acting as champions and are leading the climate action effort."

"St. John's would be a leader that serves as a shining example for other municipalities throughout Newfoundland and Labrador and the rest of Canada. When extreme events associated with climate change occur, we would not face the same disastrous outcome that other communities may face and have been facing."

"St. John's would have complete streets, neighbourhoods; food growing locally in parks and open spaces. There would be more people using public and active transportation systems (less cars on the road). There would be a vast urban forest, instead of fragmented forests across the city. There would be urban greenways, natural environment buffers along roadways, streets, and in neighbourhoods to help with flooding and heat. There would be more electrified vehicles on the road, including buses and city fleet. We would have an easy-to-understand role for everyone from residents to top levels of government.

Adapting to Changes in Climate

It is clear that St. John's has experienced changes in climate, and that more climate change is now inevitable. It is imperative that we plan to adapt to these changes, while St. John's plans to do its part in reducing greenhouse gas emissions. Governments, residents, and other stakeholders need to work together to create resilient adapted communities that reduce greenhouse gas emissions and support a high standard of living.

What are Climate Trends and Climate Change?

Climate change is a term used to describe various changes in long-term weather patterns (for example the difference in the general weather conditions experienced in the mid-20th century and the early 21st century). Discussion of climate change often begins with a look at temperature, which has (as a global average) been rising noticeably over recent decades. Consequently, 'climate change' temperature changes are often referred to as 'global warming'. Since the 1880s, the average global average surface temperature has risen by a little more than 1°C. This is a significant change: for reference, the last Ice Age was about 5.5°C colder than pre-industrial temperatures.

The Climate of St. John's is Changing

St. John's Climate Profile report compiled climate information from local, provincial, and federal sources. Climate Change projections indicate that our climate is expected to become more wetter, warmer, and more extreme. Some of these changes have already occurred.

Observed Changes	
Sea Level & Temperature	• Relative sea-level has risen by +1.9mm/year since the 1940's. • Warming in the sea surface temperature of 0.13 °C per decade (at the ocean surface), and a warming of 0.02 °C per decade was observed below the surface (0-175m).
Temperature	• Average temperatures have increased by approximately +0.8 °C since 1942.
Extreme Temperatures	• Hottest summer temperature has increased by approximately 1.0 °C. • Coldest temperatures in the winter have increased by 0.5 °C.
Freeze-Thaw	• Likely to have had a slight decreasing (number of days per year that experience freeze-thaw since 1950).
Precipitation & Storms	• The total amount of precipitation (rain + snow) per year since 1942 is likely to have decreased very slightly. However, the intensity and duration of storms is likely to have increased since 1949 (particularly with durations over 30 minutes).
Snow	• It is possible that the total annual snowfall in St. John's may have decreased slightly since 1942. • Satellite imagery suggests that Eastern Canada has seen a decrease in snow cover (-5% to -10%) duration in the months between October-January since 1981.

Future projections for St. John's indicate these changes are expected to continue, and the impacts from associated weather events will become a new normal. The next few pages summarize the changes in climate that St. John's is expected to see by the 2050s and towards the end of the century. There is reasonable confidence on these projections. However, for clarity we have included a scale that helps to show how confident we are on the magnitude and timing of the changes versus others for which we are less confident of their magnitude or timing.

City of ST. JOHN'S
Climate Profile

COLOR OF SIDE BAR SHOWS LEVEL OF CONFIDENCE: HIGH, MEDIUM, LOW

ANNUAL AVERAGE TEMPERATURE

Average, Minimum, and Maximum daily temperatures are projected to increase

9.7 °C **2080s**

7.7 °C **2050s**

5.1 °C **Baseline**

SEASONAL MEAN TEMPERATURE

2.1 °C **2080s**

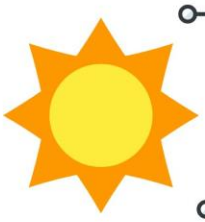
0.2 °C **2050s**

-3.2 °C **Baseline**

5.3 °C **2080s**

3.4 °C **2050s**

1.8 °C **Baseline**



18.3 °C **2080s**

16.5 °C **2050s**

14.1 °C **Baseline**

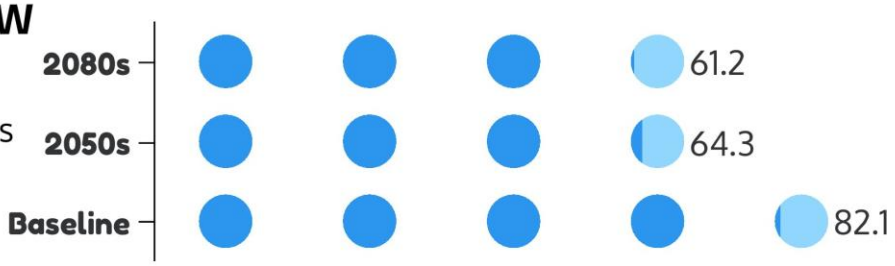
13.0 °C **2080s**

10.9 °C **2050s**

7.6 °C **Baseline**

FREEZE-THAW CYCLES

Freeze-thaw days are projected to decrease



ST. JOHN'S

City of ST. JOHN'S
Climate Profile

YEARLY MEAN PRECIPITATION

Yearly precipitation is expected to increase.

1523 mm **2080s**

1408 mm **2050s**

1400 mm **Baseline**

SEASONAL MEAN PRECIPITATION

462 mm **2080s**

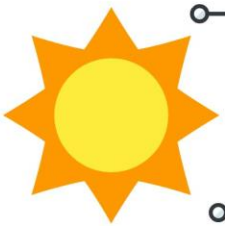
440 mm **2050s**

408 mm **Baseline**

365 mm **2080s**

352 mm **2050s**

327 mm **Baseline**



277 mm **2080s**

274 mm **2050s**

267 mm **Baseline**

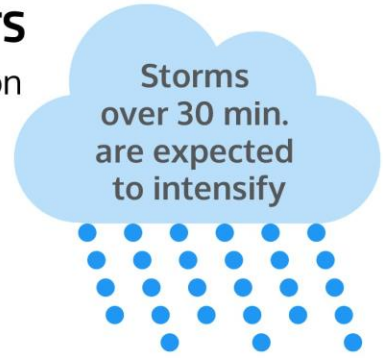
418 mm **2080s**

410 mm **2050s**

398 mm **Baseline**

STORM EVENTS

Heavy precipitation events are expected to become more extreme.



DAYS WITH OVER 10 mm

62.2 **2080s**

62.5 **2050s**

59.9 **Baseline**

ST. JOHN'S

City of ST. JOHN'S
Climate Profile

SNOW

Snowfall is expected to decrease, while freezing rain and winter rain increases.

Surface Snow Thickness is Predicted to Decrease

60% by 2050s

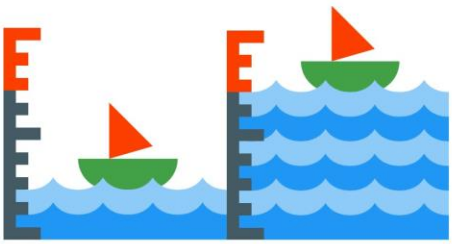
90% by 2080s

FREEZING RAIN

Freezing rain events are expected to increase during winter, with little to no change in November or April.

SEA LEVEL

Sea Level is expected to rise by 75 to 100 cm *by 2100*



WIND & GUSTS

There is significant uncertainty on wind projections

Wind speed are likely to increase

To read the full report or to learn more about the City's climate change adaptation and mitigation strategies, please visit the Sustainability page at stjohns.ca

ST. JOHN'S

Addressing the Risks

The City of St. John's undertook a strategic risk assessment to inform how changes in climate may impact our community. This process was led by the City and engaged local stakeholders. The assessment identified over 50 impacts across the infrastructure, socioeconomic, and ecological systems of our community. Prioritization was set based on the likelihood of the impact taking place, as well as the consequences it would have across the community's: health, infrastructure, local economy & growth, natural resources, psychological, culture, social cohesion, and consequences to the public administration.

Infrastructure Systems Sea level rise is anticipated to increase erosion and likelihood of storm surges flooding coastal infrastructure. Precipitation changes are expected to increase stress and maintenance requirements on stormwater infrastructure and buildings (e.g., mould, leaks), while water crossings may experience increased vulnerability and potential for failure. Similarly, sport fields may see an increase in required maintenance due to flooding. Warmer summers will increase energy use for cooling, and demand for cooled venues for youth and vulnerable populations, as well as opportunities for gardening. Meanwhile, the increase in winter freeze-thaw cycles may increase maintenance requirements on roads. Increased extreme weather may lead to more frequent outages in communications and power.

Socioeconomic Systems Climate change will have direct impacts on St. John's socioeconomic system. Impacts to our transportation systems (roads, public and active transportation) can impact the local economy by causing delays and disruptions to business operations. Similarly, impacts to the marine ecosystems, agriculture, and energy use can change the food security future of our community. Increased infrastructure maintenance and repair can lead to changes in servicing costs.

Health impacts form climate change have been identified. This includes changes to winter leading to less opportunities for winter activities, increased incidence of vector-borne diseases, injury from extreme weather events, exacerbations to weather dependent health conditions (e.g., respiratory and cardiovascular conditions), and psychological effects of extreme weather impacts

Ecological Systems Warmer temperatures are expected to impact the freshwater and sea temperatures leading to changes in both ecosystems, as well as terrestrial ecosystems, including invasive species. These changes may also impact migratory birds and fish, which can have an impact on recreation and fishing activities. Temperature and precipitation changes are expected to create an extension to the forest fire season. The impact of wind is uncertain, but if winds do increase (along with intensity of storms) it is expected that more tree blowdowns may take place (contributing to fire risk), and that wind would also impact the number of viable fishing days.

Adaptation Actions

The impacts of climate change are already being felt in St. John's, these are driven by greenhouse gas emissions (GHGs) emitted in the past. These impacts will continue and many of them will become more severe. Adapting to these changes, while reducing GHGs, is imperative to prevent impacts from affecting residents of St. John's. The impacts of climate change do not affect everyone equally. Vulnerable populations feel the impacts from climate change more strongly. Climate adaptation should be implemented to prioritize these populations. Different sectors and assets have different planning horizon (Figure 3), this is why adaptation to climate change needs to start immediately but is understood to be an ongoing process that builds resilience over time

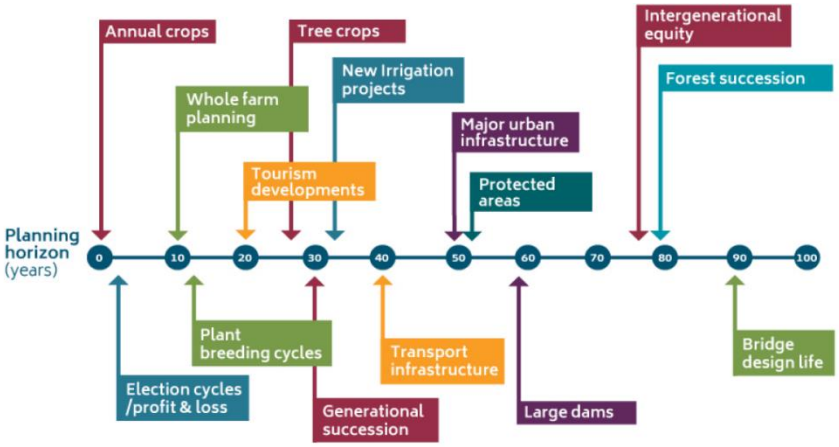


Figure 3 Typical planning horizons (years) for different sectors (Source: Jones and McInnes 2004).

Actions to adapt to climate change were developed based to address impacts rated to be of medium and high risk to our community. Actions are based on best practices from municipalities, informed by local stakeholders, and public engagement.

Actions are presented within themes, each theme includes actions, as well as supporting actions. Each supporting action includes an anticipated timing: Short-term (<2 Years), medium-term (2-5 years), long-term (5+ years), and ongoing.

Themes are (not in order of importance):

- **Smart Growth**
- **Resilient Natural and Built Infrastructure**
- **Thriving Natural Environment and Agriculture**
- **Disaster Resilience and Emergency Preparedness**

Figure 4 Vision for the City of St. John's (Source: Envision St. John's Municipal Plan)

Smart Growth

St. John's recognizes that growth presents many opportunities and challenges. St. John's City Council identified Sustainability ("a city that is sustainable today and for future generations; economically, environmentally and financially") and Climate Change as strategic priorities. Significant strides were achieved through the update of St. John's Municipal Plan (Figure 4 is the vision of our City), which states "the key is to manage growth in a sustainable manner while maintaining the character of St. John's Community".

Growth can result in pressure on the City to provide new and improved infrastructure and an expanded range of services, while presenting challenges to address existing infrastructure deficits. To achieve a low-carbon resilient future, the City needs to manage the ongoing growth and re-development today in a manner that realizes the opportunities of a low-carbon society and addresses the long-term impacts of climate change. Recent and near-term planning efforts are key in addressing infrastructure deficits and ensure ongoing infrastructure investments are already adapted to the changes expected within their useful life. Smart Growth tools for climate adaptation and resilience can help prepare communities for impacts from climate change through land use and development policies.

Smart Growth Actions

I)	**Improve the resilience of new buildings, roads, and stormwater infrastructure to extreme weather.**	
	1) Collaborate to support the timely building code review and adoption, including the harmonization of codes (e.g., building and energy codes) in line with federal's target to harmonize codes by 2025.	Ongoing
	2) Continue to use best available climate model information to 'future-size' stormwater system (e.g., rain pipes, catch basins, outlets) and complete sewer separation while future-size storm sewers to current standards as part of renewal (where possible) to reduce risk of overflows.	Ongoing
	3) Explore the development of an integrated stormwater management plan (ISMPs) to inform future development and re-development in each watershed. ISMPs help balance the development needs with the City's sustainability values and the watershed's ecological functions. This may include: • Conducting a study to propose watershed-based water quantity and quality development targets that takes into account cumulative development (based on land-use planning), and aims to prevent water quality and ecosystem degradation. • Consider including mapping and prioritization of high-risk slopes susceptible to slides and evaluating tools/options (e.g., planting, percolation, anchors, retaining walls, deep-water infiltration, etc.) • Consider including opportunities for stormwater detention or storage during park redesign and in new parks (e.g., Blue-Green Infrastructure like resolving barriers that constrain streets draining to parks).	Medium
	4) Continue collaborations with academia to research acute and chronic climate hazards and identify potential solutions. • For example, continuing the evaluation of materials to identify what works best for our climate, and incorporating climate projections for changing temperatures and freeze-thaw cycles.	Ongoing
II)	**Increase the resilience of the City by informing Municipal Plans with the latest Climate data and projections of future extreme weather events.**	

1) Continue to integrate climate adaptation and resilience into the municipal plan, master plans, capital improvements, and hazard mitigation plans.	Ongoing
2) Work with provincial departments to ensure St. John's Municipal Act review includes considerations to enable climate action.	Short
3) Establish policy to revise climate change information (Environment Canada and Province of NL) every 5 years and review Adaptation Strategy.	Short
III) Protect and enhance coastal infrastructure from the impacts of sea-level rise and storm surge.	
1) Collaborate with all levels of government to initiate the development of a detailed Sea Level Rise Coastal Flood Risk Assessment (including outfalls) to estimate timelines and the economic, social, and environmental implications of best-practice adaptation solutions that address sea level rise (i.e., infrastructure, land use policy, and development fees).	Medium

Resilient Natural and Built Infrastructure

St. John's relies on a complex network of natural and built infrastructure to support its community including over 1,400 kilometres of streets, over 500 kilometres of sanitary sewer, while our drinking water and fire safety depends on three drinking water treatment plants, over 460 km of water pipes, 3,070 hydrants and over 8,955 valves and other drinking water related systems. In addition, The City of St. John's counts with 61 hectares of gateway park lands and 212 hectares of community park lands which provide recreation, environmental, climate regulating, and overall social and psychological wellbeing benefits to our community.

It is essential for our community's resilience that our built and natural infrastructure is adapted to climate change, so that it can withstand and recover from extreme events, as well as repeated impacts. Although much of existing infrastructure was established during the climate of the past, there are actions that can be taken to reduce the impacts that climate change may bring to our community.

Resilient Natural and Built Infrastructure Actions	
IV) Increase household-level climate risks protection (e.g., flood and fire).	
1) Engage citizens on ways they can adapt their households or otherwise prepare for climate change impacts (e.g., promote sustainable drainage techniques, plant appropriate tree species, emergency preparedness)	Short
2) Use tax notices and website to provide information on minimizing severe risk like flooding and fire (e.g., ICLR handbook on reducing basement flooding).	Short
V) Improve the resilience of existing buildings, roads, and stormwater infrastructure to extreme weather and temperatures.	
1) Explore the feasibility of a collaborative education and incentive program to encourage more resilient choices for the renewal of development.	Medium
2) Consider future climate impacts when designing and retrofitting City buildings.	Ongoing
3) Undertake a Low Impact Development demonstration project (e.g., rain garden, rock pit) to test and communicate residential and commercial development of the opportunities to improve flood resilience of existing development and provide guidance on implementation approaches.	Medium
VI) Protect and enhance resilience of parks and open spaces, including habitats from the impacts of climate change.	
1) Continue to implement the City's Urban Forest Management Plan recommendations, while integrating a climate lens by: • Planting of native species or hardy non-native species. • Reviewing species resilience to future climate change and reflecting findings in City-Land planting efforts, and the Landscaping Development Policy. • Relaying primarily on diversification as the best long-range approach to pest control (Collaborate with stakeholders to identify and manage priority invasive species).	Ongoing
2) Explore the collaborative development of an addendum for the City's Open Space Master Plan that details impacts from climate change research, corporate knowledge, opportunities, and best practices related to sustainable and functional horticulture in St. John's including soil management, prevention and management techniques for invasive species and pests.	Medium

Thriving Natural Environment and Agriculture

The City of St. John's has development control of four watersheds which supply its drinking water (including the Broad Cove River and Windsor Lake, Bay Bulls Big Pond and Petty Harbour Long Pond). The City also counts with more than 10,000 wetland components (bogs, fens, swamps, marshes and areas of open water within wetlands), ponds, and many kilometres of streams with their respective floodplains and buffer areas. Development pressures place various levels of stress on St. John's natural environment. It is important that strategies continue to be explored and applied to protect natural assets (like existing watershed, wetland, and floodplain protection policies) under the understanding that these assets provide significant value to our community, known as "ecosystem services", which include:

- regulating our environment (temperature, wind, water, pollinators, and pests),
- providing goods (food, fuel, natural resources),
- supporting community services (water cycle, soil, nutrients, habitat), and
- cultural benefits (recreation, aesthetics, and overall well-being).

Climate Change also poses a threat to local and global food systems and agriculture, which also impacts a steady increase in food prices. However, opportunities exist to create resilience to impacts on the global food chain, while reducing greenhouse gas emissions, and improving local food availability.

Thriving Natural Environment and Agriculture Actions	
VII) Protect surface and ground water quality and quantity.	
1) Explore incentives for residents to purchase and utilize water conserving appliances/toilets and/or rainwater harvesting technologies on private properties.	Short
2) Incorporate Climate Change in water assessments and management plans.	Ongoing
3) Enhance and uphold watershed and wetland protection to limit human influence or impact on drinking water sources and habitat.	Ongoing
4) Engage residents in water efficiency education campaigns including its role in climate resilience in residential and commercial settings (e.g., share lessons from Metrobus' rainwater reuse system), including Continue Water Conservation Order enforcement.	Short
5) Explore improvements to salt handling, storage, and application and explore alternatives to optimize ice management by the City, businesses, and residents. • Hold a promotional campaign to begin at the start of every winter maintenance season and continue throughout the season that will help educate the public about salt application best management practices and the City's winter maintenance program. May include promotional materials in the local newspaper, informational pamphlets, ads through City run social media outlets, etc.	Ongoing
VIII) Enhance the resilience of ecological assets from climate change.	
1) Collaborate on forensic studies to determine climate thresholds by partnering with stakeholders, associations, and local academic institutions to continue learning about impacts to human and ecological health.	Ongoing
2) Identify eco-assets and incorporate these in the Municipal Asset Management Plan.	Medium
3) Explore the development of a Privately-Owned Tree Management Strategy to encourage more tree planting and better tree maintenance	Long

IX) Improve local food security by supporting food and agriculture sector.	
1) Continue to support local food production, including community gardens, backyard farming, regenerative farming, greenhouses, farmers markets, and vertical farming.	Ongoing
2) Collaborate to identify and showcase local agricultural best management practices and impacts to support timely adaptation.	Medium
3) Continue to support protection of agricultural lands, natural features and water resources through planning and zoning policies.	Ongoing
X) Monitor and plan for the spread of invasive species and infectious disease.	
1) Develop a monitoring program for residents to report invasive species.	Medium
2) Encourage health agencies and collaborate with research institutions to anticipate, monitor, and reduce the impact of climate change on the spread of infectious disease.	Long
3) Continue the naturalization program through pilot projects, public education, and awareness to support to support a resilient aquatic and terrestrial ecosystem (e.g., pollinators, trees, etc).	Ongoing

Disaster Resilience and Emergency Preparedness

The City of St. John's is responsible for ensuring that mitigation measures, response and recovery plans are in place for all hazards including natural, technological, and human caused disasters. However, being a prepared and a resilient community is a shared responsibility. Climate change and its impacts can be lessened by reducing greenhouse gas emissions, but already existing greenhouse gas levels mean that we need to prepare for dangerous changes in climate. It is essential that projections for more intense and frequent extreme weather events, and lessons from past events are integrated into disaster, business continuity, and emergency management planning, while contingencies and flexibility is considered when dealing with these events. Actions can be taken to improve our community's preparedness to climate-related disasters.

Disaster Resilience & Emergency Preparedness Actions	
XI) Improve resilience and preparedness of key services and businesses to extreme weather events.	
1) Prioritizing several of the highest ranked risks (e.g., storm surge, power & telecom outages, urban flooding, ice storms) to the City, assess the risks and interconnections to critical infrastructure "lifelines for resilience". Consider the PIEVC framework and New Zealand lifeline study examples[2].	Short
2) Ensure climate change considerations are incorporated into the City's Hazard Identification and Risk Assessment framework, as well as business continuity planning's review process and training.	Medium
3) Work with stakeholders and associations to support building awareness so businesses can analyze their vulnerability to climate change and take action.	Long
4) Explore the implementation of a system to record and map climate related incidents specially during extreme events (e.g., flooding, wildfire, extreme snowfall).	Medium
XII) Improve resilience and emergency preparedness of residents to extreme weather events.	
1) Engage with stakeholders and experts to timely share locally relevant education materials like Fire Smart to reduce home's risks to wildfire. • Share materials on City website and seasonally through communication tools. • Integrate materials with the Residential Fire Prevention Awareness Program	Short-Medium
2) Engage Residents in emergency preparedness and response: • Explore establishing a buddy systems/help you neighbour programs to implement during extreme weather events • Incorporate climate change into existing emergency preparedness programs/outreach efforts targeted towards residents	Short-Medium
3) Explore options to establish registry of community groups that work with vulnerable populations to support coordination of resource distribution and best practices.	Short
4) Work with key partners to integrate climate change messaging into communication materials related to public health and safety including connecting to resources and programs to mitigate risks (e.g., rapid assessments for businesses, incentive programs, emergency preparedness guidance).	Ongoing

[2] https://pievc.ca/; https://www.civildefence.govt.nz/cdem-sector/lifeline-utilities/lifelines-reports-and-resources/

Implementation and Governance

The adaptation of St. John's will require leadership, collaboration, resources, and the creativity that characterizes our community. The City of St. John's will play a lead and coordinating role in the implementation of the plan, supporting community efforts to identify and secure financial support. The City will work to support sharing of ideas and project lessons learned and to advocate to all levels of government for enabling policy to realize the vision of a climate change resilient St. John's.

The City will explore the integration of climate change adaptation considerations in its decision making process to support St. John's City Council's decision making and leadership, along with a carbon budget that informs action and progress towards greenhouse gas mitigation efforts.

The implementation of this plan will take a collaborative, integrated approach. This plan recognizes that adaption is a shared responsibility and an ongoing process which requires integration, evaluation and continual improvement.

Implementation and Governance Actions	
1) Increase staff resources for plan implementation	Short
2) Establish a formalized, multi-stakeholder climate change working group supporting the Environmental and Sustainability Experts Panel to guide implementation of the Resilient St. John's Climate Plan.	Short
3) Engage regionally with other municipalities, indigenous peoples, and vulnerable populations representatives on the implementation of the Resilient St. John's Climate Plan.	Ongoing
4) Collaboratively seek funding, investment, and partnership opportunities to enhance the speed and quality of adaptation initiatives.	Ongoing
5) Advocate to all levels of government for enabling climate policy and legislation, as well as financial support for municipal action.	Ongoing
6) Integrate climate change into capital and business planning and asset management.	Long
7) Monitor and track implementation of the Community Climate Change Adaptation Plan and report on progress annually through CDP tool.	Ongoing
8) Update Resilient St. John's Climate Plan's Adaptation actions every 10 years, with a mid-point review every 5 years.	Medium

Appendix A: Climate Change Community Strategic Risk Assessment

Setting the Context

- **Goal:** To conduct a Strategic Level Community Climate Change Risk Assessment for St. John's
- **Scale:** Municipal Boundary of St. John's
- **Timeframe in Mind:** 2050's, with 2080's in mind
- **Emission Scenario**: RCP8.5
- **Objectives of Adaptation Action. To Minimize**…

Natural Resources	Loss of Natural Resources
Economic Vitality	Loss of Economic Productivity
	Loss of Infrastructure services
Health	Loss of Life
	Morbidity, Injury, Disease, or Hospitalization
Social Functioning	Psychological Impacts
	Loss of Social Cohesion
Cultural Resources	Loss of Cultural Resources
Governance	Cost to Municipal Government

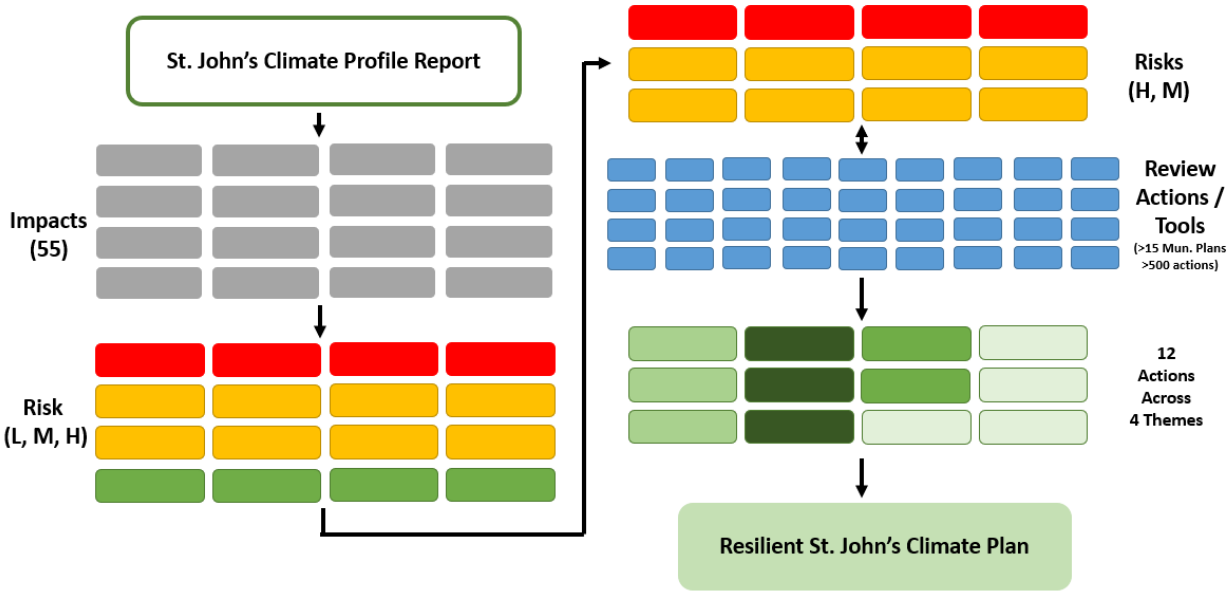


Figure 5 Visualization of the path from climate trends to actions

St. Johns' Climate Trends: Adaptation planning began by the review of historical and future climate for the City of St. John's. This included literature review and compilation of the main sources of climate information for the City (e.g., Environment Canada, Provincial Government of Newfoundland and Labrador, and other met-ocean reports locally available). The purpose was to characterize current and future climatic hazards. The St. John's Climate Profile Report and subsequent stakeholder engagements served as the foundation for the plan.

Impact Identification: Impacts to the City of St. John's were identified through a series of stakeholder workshops and public engagements. Each impact was formulated in a IF-SO format.

IF – if a particular projected change in climate take place.

SO – then the following impact is expected to take place in our community.

The impacts identified through The City of St. John's RVA were then ranked based on their likelihood of occurrence and severity of the consequences that would result from the impact.

Likelihood identification

Likelihoods for each of the impacts becoming a reality was estimated in collaboration with the City's Environmental and Sustainability Experts Panel. The likelihoods were assigned using a scale from 1-5.

Rating		Description	Numerical Description
5	**Almost Certain**	The Impact will occur	90-100% probability
4	**Likely**	The impact will probably occur	55-90% probability
3	**Possible**	The impact could occur	30-55% probability
2	**Unlikely**	The risk may occur	5-30% probability
1	**Rare**	The risk will occur only in exceptional circumstances	Less than 5% probability

Consequence Ranking:

Consequences across eight categories were assessed. Standard definitions for each severity of the consequence were developed and agreed upon through review with the City's Environmental & Sustainability Experts Panel, as well as the stakeholders Sustainability Team.

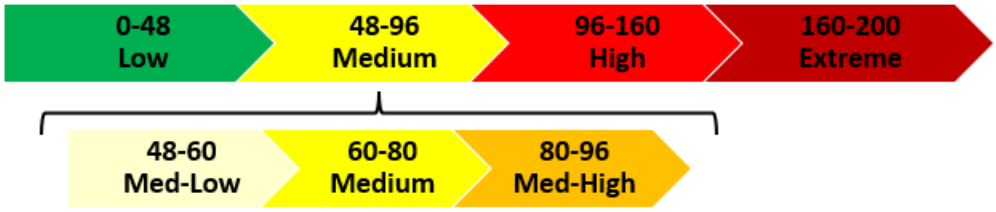
Rating	Health	Psychological	Social Cohesion	Cultural Resources	Natural Resources	Local Economy & Growth	Infrastructure Damage	Public Administration
5 Catastrophic	1,000 people affected, and/or **loss of life of 10+ people**	**Widespread** and severe disturbance resulting in **long-term** psychological impacts (e.g., post-traumatic stress disorder)	**Months-long** disruption to daily life. Widespread, permanent loss of livelihoods or way of life. Severe, widespread erosion in public confidence in government in the medium term. Erosion of community institutions and community cohesion	Resource can **never recover**; destruction is permanent and irreversible (e.g., destruction of an irreplaceable artifact or knowledge)	Resource can **never recover**; destruction is permanent and irreversible (e.g., extinction of a species, permanent loss of water resource)	Potential direct and indirect economic losses of **over $20 million**; **Months**-long disruption **or long-term** loss of an economic sector and associated job losses	**Months-long** disruption in infrastructure services Major impediment to day-to-day life	Public Administration would **struggle to remain effective** in the short term and take a **couple of years** to re-build.
4 Major	100-1000 people affected and/or **loss of life of 1-10 people**	**Localized** severe disturbance resulting in **long-term** psychological impacts (e.g., loss of home, identity, or sense of place)	**Weeks-long** disruption to daily life. Localized, permanent loss of livelihoods or way of life Moderate, medium-term erosion of public trust in government or community cohesion	Recovery of the resource will take **decades**	Recovery of the resource will take several **decades**	Potential direct and indirect economic losses of **up to $20 million**; **Weeks**-long disruption to a major economic sector and associated job losses	**Weeks-long** disruption in infrastructure services Major impediment to day-to-day life	Public Administration would be under **severe pressure** on several fronts for **several months** (cost directly to municipality of up to $10M)
3 Moderate	10-100 people affected and/or high **potential for loss of life**	**Widespread moderate** disturbance resulting in temporary psychological impacts (e.g., feeling of fear and anxiety)	**Days-long** disruption to daily life. Short term loss of livelihoods or way of life. Minor interruption of public trust in government or community cohesion	Recovery of the resource will take **years**	Recovery of the resource will take several **years**	Potential direct and indirect economic losses of **up to $10 million**; **Days**-long disruption to a major economic sector and employment	**Days-long** disruption in infrastructure services Major impediment to day-to-day life	Public Administration would be **under pressure** on several fronts for **several weeks** (cost directly to municipality of $5 - $10M)
2 Minor	Less than 10 people affected and/or **low potential for even a single loss of life**	**Localized moderate** disturbance resulting in temporary psychological impacts (e.g., feeling of fear and anxiety)	**Hours-long** disruption to daily life. Low potential for erosion of public trust in government or community cohesion	Recovery of the resource will take **months**	Recovery of the resource will take **months**	Potential direct and indirect economic losses of **up to $5 million**; **Hours**-long disruption to a major economic sector and employment	**Hours-long** disruption in infrastructure services	**Minor instances** of Public Administration being **under more than usual stress** (cost directly to municipality of up to $5M)
1 Insignificant	**No possibility of loss of life**, injury, disease or hospitalization	**Minimal** expected reactions of fear, anxiety, or disruption to daily life	**Minimal** disruption to daily life (e.g., inability to access employment and/or education, forced displacement). Trust in government or community cohesion remains unchanged	Little impact or resource can recover within **days**	Little impact or resource (e.g., air, soil, vegetation, water, ecosystem function) can recover within **days**	Potential direct and indirect economic losses **less than $1 million**	Temporary **nuisance**	**No real stress** on Public Administration

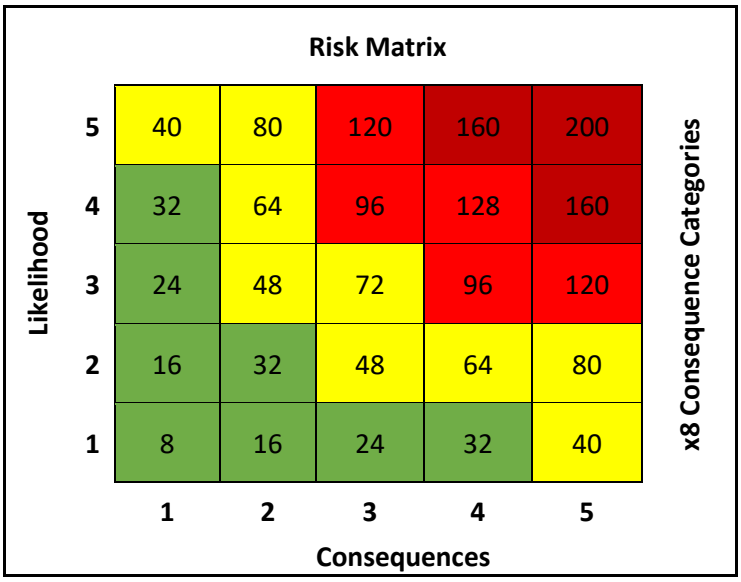
Risk Ranking: Overall risk was estimated across all eight categories of consequences to enable prioritization of the identified impacts. Severity across consequence categories, particularly the highest consequence category was also considered as part of the development of proposed actions.

Risk is defined in the following way: *Risk = Sum Consequences x Likelihood*

Most impacts were found to be Medium risks, therefore, an additional level of differentiation for the purpose of action planning was temporarily implemented (Med-Low, Medium, Med-High). The Best practice review aimed to find actions that directly address High and Medium High risks, while keeping

Medium and Med-Low risks in context. This sub-categorization does not have an impact on the overall risk categories, but instead was used as a lens to support action planning.





Action Identification: Actions were developed to address all high risk and considerations given to all medium risks for St. John's. They were based on best practices from other municipalities and refined through public and stakeholder feedback.

Action Design Charrette: Stakeholders were engaged to discuss risks, best practices, and implementation considerations to develop the draft action plan.

Public Consultation: The draft action plan was shared with the public for consultation and to elucidate any additional implementation considerations.

Appendix B: Climate Change Community Strategic Risk Assessment Results

Table 1 Complete Impact List, Likelihood and Consequences Ranking

#	Impact	Cultural Resources	Health	Infrastructure Damage	Local Economy & Growth	Natural Resources	Psychological	Public Administration	Social Cohesion	Sum Consequence	Max Consequence	Likelihood	Risk Score (Sum of Consequences)	Risk Ranking
1	Sea level rise, storm surge & coastal erosion	2.4	2.7	3.9	3.3	3.1	2.7	2.4	2.4	22.9	3.9	5	114.7	High
2	More telecommunication & power disruptions	2.4	2.4	1.7	3.6	4.1	2.4	2.1	2.0	20.9	4.1	5	104.5	High
3	More urban flooding	1.7	2.1	3.9	2.5	2.1	2.1	2.9	2.1	19.5	3.9	5	97.7	High
4	Temperature impacts to marine food chain	1.4	2.9	1.6	2.0	3.0	2.6	2.7	1.9	18.0	3.0	5	90.2	Medium
5	More frequent precipitation damage (e.g., mold, leaks)	2.4	1.6	3.4	2.4	3.3	1.6	2.0	1.4	18.0	3.4	5	90.0	Medium
6	More water crossings failure & flooding	1.3	2.7	1.7	3.0	1.4	2.7	2.0	2.3	17.1	3.0	5	85.7	Medium
7	Impacts to migratory birds	1.5	2.0	3.4	2.0	1.7	1.9	2.6	1.8	16.9	3.4	5	84.4	Medium
8	More ice and wet snow on roads and sidewalks	3.0	2.1	1.5	3.9	3.9	2.5	2.0	2.1	21.0	3.9	4	83.9	Medium
9	Increased pest management demand	2.0	2.0	2.6	1.7	1.4	2.0	2.3	2.7	16.7	2.7	5	83.7	Medium
10	Longer gardening season and demand for spaces	3.8	1.8	2.3	2.8	4.0	2.3	2.0	2.0	20.8	4.0	4	83.0	Medium
11	Plant ecological composition impacts	1.3	2.3	3.0	2.2	1.0	2.1	2.4	2.2	16.5	3.0	5	82.4	Medium
12	More demand for cooled venues for youth	1.9	1.7	3.4	2.8	1.1	1.7	2.1	1.6	16.3	3.4	5	81.4	Medium
13	Less opportunity for winter outdoor activities	3.3	2.0	3.0	2.0	3.5	2.5	2.0	2.0	20.3	3.5	4	81.0	Medium
14	More power outages	2.0	3.0	3.0	3.0	1.5	2.5	3.0	2.0	20.0	3.0	4	80.0	Medium
15	More sport fields damages	1.4	2.5	3.4	2.3	3.0	2.4	2.3	1.9	19.1	3.4	4	76.5	Medium
16	I&I increase	1.3	2.4	1.3	1.8	1.3	2.5	1.9	2.4	14.9	2.5	5	74.6	Medium

17	Longer forest fire season	2.5	2.4	2.6	2.1	3.3	1.7	1.9	2.0	18.5	3.3	4	73.9	Medium
18	More flight disruptions	2.1	2.0	3.3	2.3	2.6	2.0	2.4	1.7	18.4	3.3	4	73.8	Medium
19	More hurricane/tropical storms	1.7	3.6	1.3	2.3	2.1	2.9	1.9	2.3	18.0	3.6	4	72.1	Medium
20	Increased incidence of weather-health conditions	4.3	2.3	2.0	3.8	4.3	2.8	1.5	3.3	24.0	4.3	3	72.0	Medium
21	More wet snow affecting planted landscapes	3.0	2.8	3.8	3.5	4.3	3.0	2.0	1.8	24.0	4.3	3	72.0	Medium
22	Marine ecosystem and fisheries impacts	1.3	2.1	1.9	2.0	2.6	1.6	1.7	1.1	14.3	2.6	5	71.5	Medium
23	More precipitation related vehicular accidents	1.3	2.4	2.9	3.0	1.6	2.4	2.5	1.7	17.8	3.0	4	71.2	Medium
24	More uprooting of large trees from wind gusts	3.8	2.3	2.0	3.3	4.0	3.0	2.0	3.0	23.3	4.0	3	69.8	Medium
25	More vulnerable riverine species	1.6	2.0	3.0	2.0	2.8	1.9	2.3	1.8	17.2	3.0	4	68.9	Medium
26	Changes to spring-thaw pattern	1.4	2.7	1.4	1.8	1.6	3.0	2.0	3.1	17.1	3.1	4	68.3	Medium
27	Increased river undermining & landslides	1.3	2.0	3.3	2.3	1.9	1.7	2.1	1.4	16.0	3.3	4	64.2	Medium
28	More winter Freeze-thaw impacts	2.3	1.9	1.4	3.0	2.6	2.0	1.3	1.6	16.0	3.0	4	64.1	Medium
29	Increased violence due to heat	2.1	2.6	3.4	2.7	3.8	2.4	2.4	2.0	21.4	3.8	3	64.1	Medium
30	More vector borne diseases incidence	2.3	2.5	1.0	2.0	1.1	2.9	1.1	2.8	15.7	2.9	4	62.6	Medium
31	Increased need for active tree canopy management	1.3	2.1	1.9	1.9	1.3	2.7	2.3	2.1	15.6	2.7	4	62.2	Medium
32	More rain-on-snow flooding	1.4	2.4	2.9	2.4	1.6	1.7	1.7	1.3	15.4	2.9	4	61.8	Medium
33	Thinning pond ice	1.0	1.6	1.7	1.4	2.0	1.2	2.0	1.2	12.1	2.0	5	60.5	Medium
34	Need for public transportation shelters	1.4	1.9	1.4	3.3	1.0	2.1	1.6	2.3	15.0	3.3	4	59.9	Medium
35	More wind related infr. damage	2.2	2.3	3.2	3.2	3.6	2.0	1.7	1.8	19.9	3.6	3	59.6	Medium
36	Marine transportation disruptions	1.1	2.3	2.9	1.7	1.4	1.6	2.3	1.1	14.5	2.9	4	57.9	Medium
37	Pond water quality decrease	1.3	1.7	2.6	1.7	1.4	1.9	2.1	1.3	14.0	2.6	4	56.1	Medium
38	Less viable fishing days (wind)	2.3	2.3	3.0	2.0	3.3	2.0	1.8	1.5	18.0	3.3	3	54.0	Medium
39	More water demand (drinking & irrigation)	1.1	1.6	2.6	1.8	1.3	1.7	2.0	1.3	13.5	2.6	4	53.8	Medium
40	Aggravated respiratory health issues	2.0	2.3	1.8	2.8	3.5	2.0	1.8	1.5	17.5	3.5	3	52.5	Medium
41	Reduced salmon survival rates	1.9	2.3	1.0	1.1	1.4	2.0	1.3	2.0	13.0	2.3	4	52.0	Medium
42	Increased demand for homelessness services	1.4	3.0	1.0	1.9	1.1	3.0	1.7	2.9	16.0	3.0	3	48.0	Medium
43	More wind blowing solid waste	1.3	2.4	2.0	1.6	1.0	3.0	1.7	2.9	15.8	3.0	3	47.5	Low
44	More ice build-up (roof & power lines)	1.0	1.3	2.6	1.6	1.3	1.3	1.8	1.0	11.8	2.6	4	47.2	Low
45	More forest blow-downs	1.5	2.0	2.5	1.8	2.0	2.0	2.3	1.5	15.5	2.5	3	46.5	Low
46	Leaky buildings increasing energy demand on windy days	1.3	2.1	1.7	3.1	2.7	1.9	1.3	1.3	15.4	3.1	3	46.2	Low

47	More hail damage	1.3	3.0	1.0	1.5	1.0	3.0	1.7	2.9	15.4	3.0	3	46.1	Low
48	Higher risk of avalanches	1.8	2.2	2.3	1.7	1.7	1.7	1.5	1.5	14.3	2.3	3	43.0	Low
49	More river erosion and sedimentation	1.0	1.5	1.0	1.5	1.6	1.3	1.4	1.3	10.7	1.6	4	42.8	Low
50	Increased heat stress incidence	1.1	3.4	1.1	1.3	1.1	3.0	1.4	1.6	14.1	3.4	3	42.3	Low
51	Increased soil erosion	1.3	2.0	1.5	1.6	1.0	2.2	2.6	1.7	13.9	2.6	3	41.7	Low
52	Impacts to fish migration & fishing season	1.3	1.7	1.9	2.0	2.2	1.2	2.0	1.2	13.4	2.2	3	40.2	Low
53	Reduced crop yields (flooding)	1.3	2.3	1.6	1.4	1.0	1.9	1.7	1.9	13.0	2.3	3	39.0	Low
54	Increased risk during construction activities	1.2	1.9	2.8	2.6	1.6	2.1	2.1	2.1	16.3	2.8	2	32.7	Low
55	More incidence of injury due to snow (back & heart)	1.1	2.4	1.1	1.1	1.0	1.4	1.1	1.3	10.7	2.4	3	32.0	Low

ST. JOHN'S

Resilient St. John's Community Climate Plan: Energy Transition

SSG

February 2022

CONTENTS

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Preliminary Matter

Land Acknowledgements

We respectfully acknowledge the Province of Newfoundland & Labrador, of which the City of St. John's is the capital city, as the ancestral homelands of the Beothuk. Today, these lands are home to a diverse population of Indigenous and other peoples. We also acknowledge, with respect, the diverse histories and cultures of the Mi'kmaq, the Innu, the Inuit, and the Southern Inuit of this Province.

Acknowledgments

Many residents and organizations contributed to the development of this plan throughout the various engagement stages, including public engagement and consultation, membership of the Multi-Stakeholder Sustainability Team, St. John's Environmental and Sustainability Experts Panel, and St. John's Corporate Energy Team. We also thank all the residents and organizations who reached out to staff and council, completed online surveys, hosted do-it-yourself climate change workshops, and attended any virtual sessions or council meetings.

St. John's Environmental and Sustainability Experts Panel

- Kieran Hanley
- Joel Finnis
- Krista Langthorne
- Pablo Navarro
- Joseph Daraio
- Michel Wawrzkow
- Dennis Knight

Multi-Stakeholder Sustainability Team

- Government of Newfoundland and Labrador
- Food First NL
- NAACAP
- Healthy City St. john's
- Bike St. John's
- Newfoundland Federation of Agriculture
- Econext (NEIA)
- Memorial University
- CCNL
- Professional Engineers and Geoscientists Newfoundland & Labrador
- Ducks Unlimited Canada
- Quidi Vidi / Rennies River Development Foundation
- CMHC
- Department of Fisheries and Oceans
- AIM network
- Metrobus
- St. John's Airport (YYT)
- Newfoundland Power
- Home Builders Association
- BOMA NL
- NOIA
- MMSB
- Destination St. John's
- St. John's Board of Trade
- Canadian Home Builders' Association
- Grand Concourse Authority
- MUN Botanical Gardens
- Drive Electric NL
- North Atlantic
- Martin Batterson
- East Coast Trail
- FFAW
- Newfoundland and Labrador Public Health Association
- SWANA

Additionally, we thank First Voice and First Light for supporting an ongoing conversation about the role of this plan and environment and climate action more broadly in the healing process of the Indigenous peoples in the community.

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- Government of Newfoundland and Labrador
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- Government of Canada, Canada's Changing Climate Report
- Climate Atlas of Canada
- Newfoundland Power

A Note on COVID19

The COVID-19 pandemic significantly changed the way we live, work, and play in our City. The pandemic has had several negative economic and environmental consequences. Many governments, including the Canadian government, are strategizing how economic recovery packages can be used to "build back better" and support an equitable transition to a resilient low-carbon society. It is also in the interest of Municipalities to consider green recovery and support initiatives that help adapt to climate change, reduce greenhouse gas emissions, and increase overall well-being.

Acronyms

BAU	business-as-usual
CO2e	carbon dioxide equivalents
EV	electric vehicles
GHG	greenhouse gas emissions
Kt	kilotonne
t	tonne

Disclaimer

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How to Read this Report

This report summarizes St. John's Community-wide Energy Transition.

St. John's Climate Action Context sets the scene, including information on the 2050 GHG emissions target, the community's energy, and greenhouse gas (GHG) emissions in a business-as-usual scenario, the net-zero GHG emissions transition pathway, and the Transition's overall projected economic impacts.

Sector-by-Sector Transition Pathways lays out the net-zero pathway actions by sector—for transportation, buildings, clean energy, waste, and land use—their key near-term (i.e., first 5 years) implementation strategies and benefits. Targets for each of the actions within the Transition pathway that would lead to a net-zero future can be found in Appendix A. The approach for each of the implementation strategies in this document will be refined through public consultation as they move toward implementation.

Moving Forward outlines the City's unique role in administering and reporting on the Transition, and as a leader in taking on climate action with its own assets. It also includes a discussion on the types of collaboration and innovation that will be needed to bring the Transition to life, as well as the oversight needed to keep it on track and ensure accountability. Finally, this section highlights the need for equitable program design to ensure investments are deployed in a manner that benefits the entire community.

The Appendices contain the technical analysis that underpin the Energy Transition. These are referenced throughout this report.

For clarity, the action plans for adaptation and mitigation are being released separately but were developed together, through a holistic approach.

St. John’s Climate Action Context

What is St. John’s Energy Transition?

St. John’s declared a climate emergency in 2019 and committed to a target of net-zero greenhouse gas (GHG) emissions by 2050. This target aligns with dozens of communities across the country, as well as the Provincial and Federal governments (see the Textbox: St. John’s Climate Target in Context). Net zero means reducing as much GHGs as possible, then offsetting the little that remains. All levels of governments are setting targets for net-zero emissions because each has a critical role to play in achieving the GHG reductions needed to address the climate crisis.

Newfoundland and Labrador (NL) released Climate Change Action Plan 2019-2024, which was built on commitments to reduce NL’s GHG emissions by 10% below 1990 levels by 2020,reduce provincial GHG emissions by 30% below 2005 GHG emissions level by 2030, and a commitment to net-zero emissions by the year 2050. Municipalities play the most direct role in their residents' everyday lives and associated energy and GHG emissions—including community buildings; the shape of their streets and public spaces; the route and frequency of transit; and community development and redevelopment standards. Municipalities advocate on behalf of their communities to higher levels of government, to institutions and businesses, and to utilities in order to support and shape local economic development. This Energy Transition (or ‘Transition’) is the evidence-based and community-tailored pathway for how the City of St. John's can use its influence to achieve community-wide net-zero GHGs by 2050.

St. John's Climate Target in Context

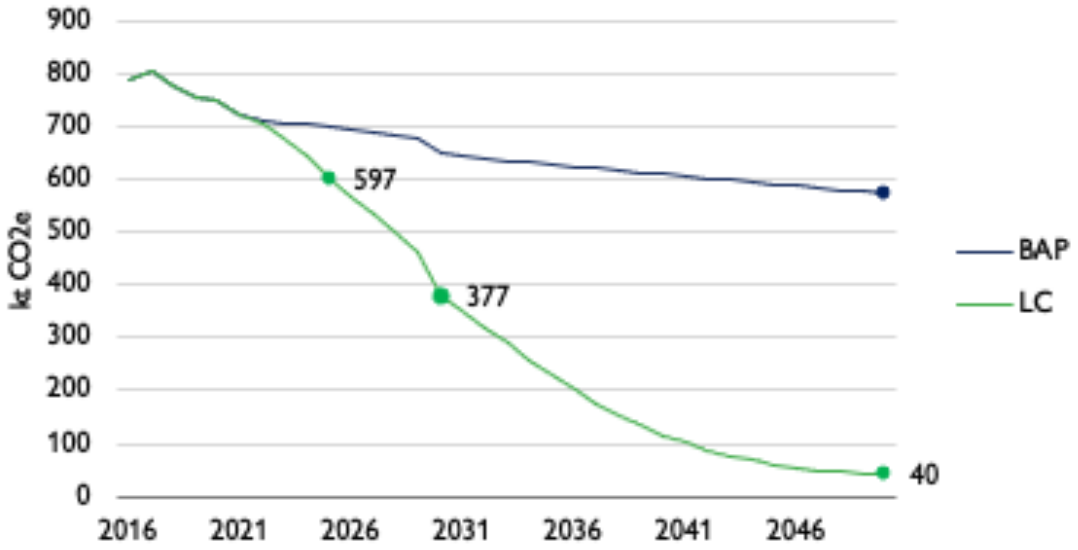
In November 2019, St. John's City Council declared a climate emergency and set a community-wide target of net-zero GHG emissions by 2050. The Province followed suit in May 2020 and committed to reaching net-zero by 2050, followed by the Federal government in July 2021. Hence, St. John's can be considered one of the municipalities that paved the way for climate action in the region, joining the ranks of hundreds of other cities around the globe. St. John's is part of national partnerships like the Partners for Climate Protection, the Global Covenant of Mayors for Climate and Energy, and most recently, the Cities Race to Zero. As of December 2021, 733 cities around the world have joined the global Cities Race to Zero campaign.[1]

Municipalities have the benefit of being nimble and the ability to act more quickly to respond to their community's needs than higher levels of government. They also have unique resources to enable climate action, from operating transit and waste systems to determining land use and setting development standards.

Moving forward, the City can continue to be a climate leader by moving beyond its 2050 point-in-time target to setting an interim target, and annual caps for emissions in every year leading up to 2050. This last action is referred to as a carbon budget and is a best practice for establishing science-based climate action. Every tonne of emissions counts, not just those released in 2050.

Community-wide modeling results show that to achieve net-zero by 2050 (at the latest) St. John's should follow a pathway of emission reductions of approximately 25% by 2025, and 50% by 2030 from the 2016 baseline. This means capping emission to 600 kt COe2 by 2025, 380 kt CO2e by 2030, and zero by 2050 at the latest.

[1] See: https://unfccc.int/climate-action/race-to-zero-campaign.



The Transition is first and foremost an energy transition away from fossil fuels toward an energy-efficient and renewable energy-powered future. These energy-related GHG emissions represent the bulk of the community's GHG emissions (92% of the total 573 ktCO2e in a 2050 business-as-usual (BAU) scenario, see Figure 1). The Transition also addresses the remaining 8%, which are the community's non-energy GHG emissions (i.e. from organic waste), as well as potential natural carbon sequestration solutions.

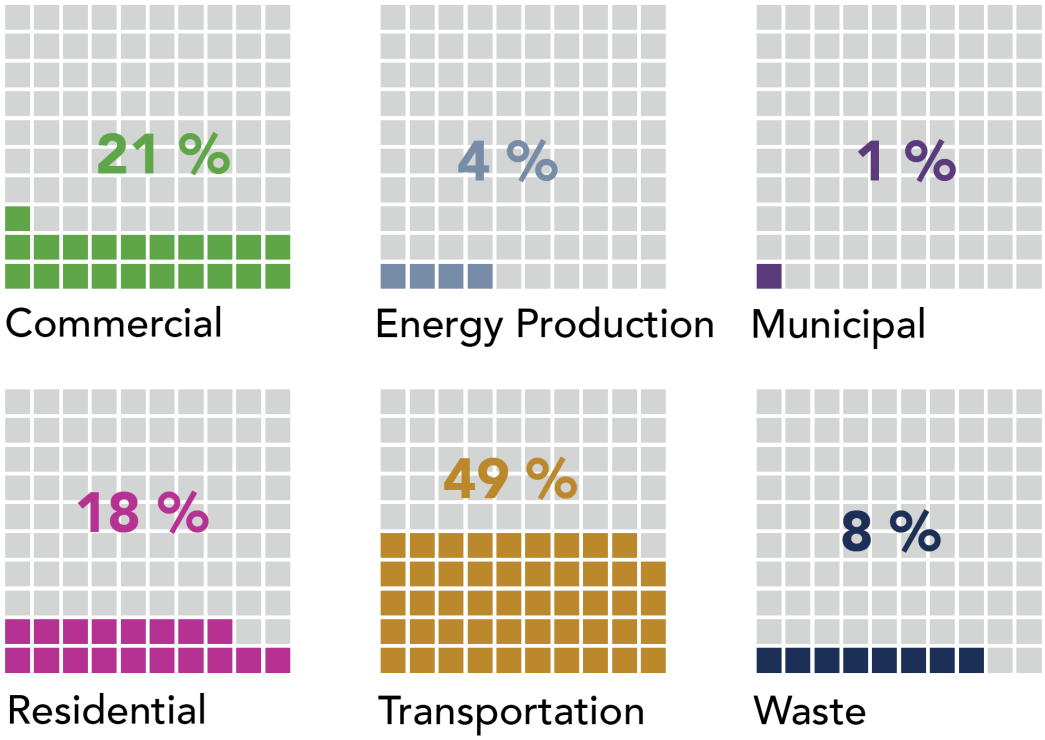


Figure 1. St. John's community greenhouse gas emissions by source in 2020.

Building on Strengths to Overcome Challenges

St. John's has many unique resources that are leveraged in this Energy Transition, namely its creative and resilient residents and business community with a technology and entrepreneurial spirit. It also has a nearly emissions-free central grid supply, many institutions and organizations to partner with, and wind energy potential. However, the most valuable of all are St. John's engaged and committed residents, who are ready to support, oversee, and participate in this Transition.

The Energy Transition leverages these strengths to respond to some of the community's GHG reduction challenges. The largest being the need to address its old, energy-inefficient building stock that relies on inefficient electric baseboard heaters or GHG-intensive fuel oil for heating, while retaining its built and landscape heritage.

Over a third of all households in Newfoundland live in energy poverty, where they spend more than 6% of their after-tax income on energy—that's the second-highest rate in the country.[2] St. John's numbers are similar to the rest of the province, with 34% of households experiencing this level of energy poverty. Additionally, energy poverty is projected to get worse in a BAU scenario due to the projected rise in energy costs (see Figure 2). The Energy Transition's focus on energy efficiency results in a major reduction in the community's energy poverty rates (see Figure 3).

[2] Canadian Urban Sustainability Practitioners, Energy Poverty in Canada: a CUSP Backgrounder (October 2019) online: https://energypoverty.ca/backgrounder.pdf.

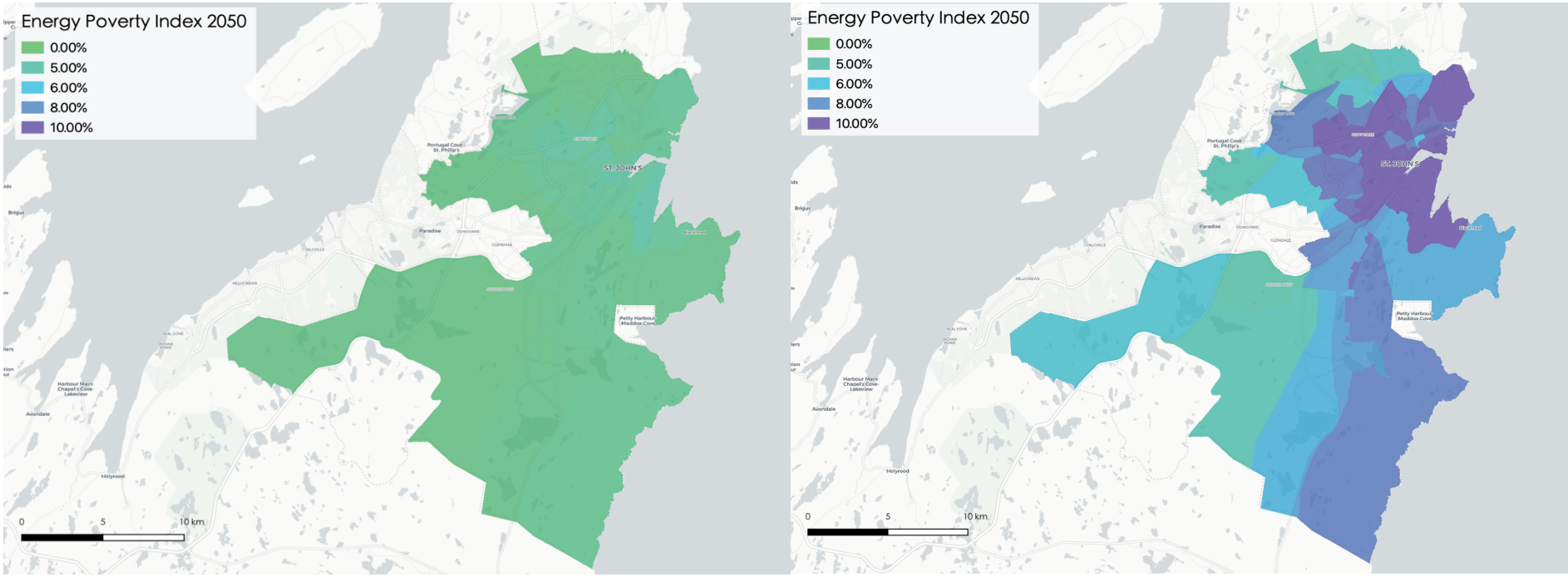


Figure 2. St. John's energy poverty rates by household and by zone in 2020 (left) and in a 2050 BAU scenario (right). An overall rise in energy poverty is forecasted in 2050 due to rising energy costs

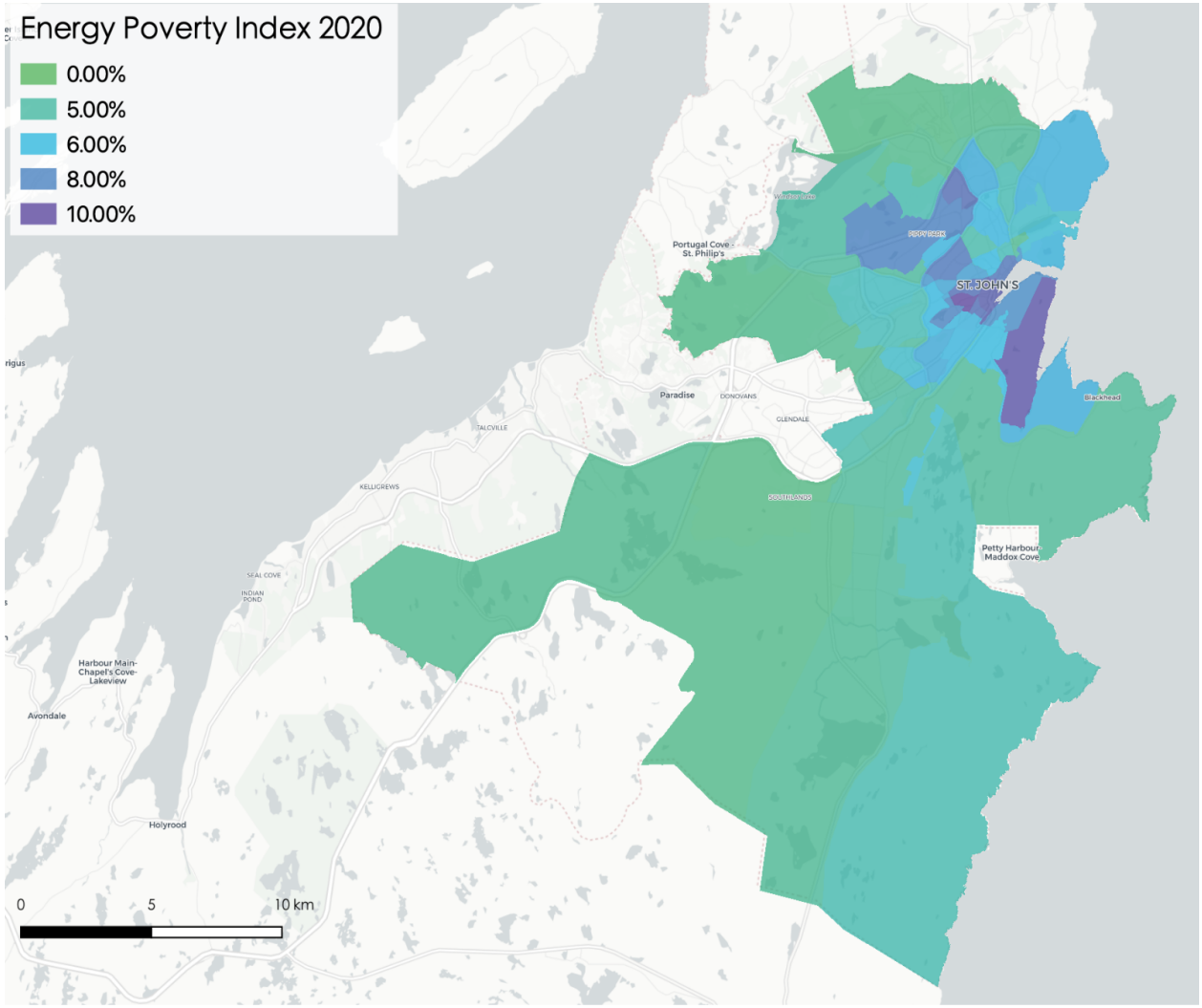


Figure 3. St. John's Energy Transition energy poverty rates by household and by zone in 2050.

This pathway responds to the building stock challenges by prioritizing energy efficiency, then capitalizes on the region's emissions-free electricity resources to heat and power its buildings. It also recognizes the role of intensification to enable transit and active transportation's part in enabling the community to drive less, and when necessary, only via emissions-free vehicles. Embedded carbon in items such as building materials is also acknowledged, and while more difficult to quantify, the pathway includes measures to increase waste diversion and adaptive reuse to repurpose old buildings.

The Toll of Energy Poverty

Households facing energy poverty, or energy insecurity, face difficult choices such as "heat or eat."[3] In particular, energy insecurity disempowers low-income residents such as single parents, the elderly, persons with disabilities, and others with low or fixed incomes.[4] Energy insecurity leads to stress such as food insecurity, utility-related debt, shutoffs, inefficient heating systems, antiquated appliances, and extreme home temperatures with significant health impacts.[5] This is only exacerbated when combined with the higher expense of vehicle ownership than that of active or public transportation. In an energy poverty context, children may experience nutritional deficiencies, higher risks of burns from non-conventional heating sources, poor indoor air quality, high risks for cognitive and developmental behaviour deficiencies, and increased incidences of carbon monoxide poisoning.[6] Subsequent impacts include parents being unable to work in order to look after children, missed school days, and lost productivity.

The mass deep energy retrofit and vehicle electrification programs proposed by the pathway represent a major economic growth opportunity that will reduce household energy costs, create local green jobs, and provide a substantial return on investment. Additionally, land use considerations in the pathway aim to reduce personal vehicle trips by fostering public and active transportation.

[3] Cook, J. T., Frank, D. A., Casey, P. H., Rose-Jacobs, R., Black, M. M., Chilton, M., ... Cutts, D. B. (2008). A brief indicator of household energy security: Associations with food security, child health, and child development in US infants and toddlers. PEDIATRICS, 122(4), e867–e875. https://doi.org/10.1542/peds.2008-0286

[4] Hernández, D. (2013). Energy insecurity: A framework for understanding energy, the built environment, and health among vulnerable populations in the context of climate change. American Journal of Public Health, 103(4), e32–e34. https://doi.org/10.2105/AJPH.2012.301179

[5] Hernández, D., & Bird, S. (2010). Energy burden and the need for integrated low-income housing and energy policy. Poverty & Public Policy, 2(4), 5–25. https://doi.org/10.2202/1944-2858.1095

[6] Ibid.

Available financial data indicates the Transition will cost about $205 million per year, with a 33% return on investment. It will produce 38,600 person-years of employment (1,400 full time jobs), and save households about 50% on their energy costs, which could then be used to afford quality food, education, recreation. (see the Textbox: Valuing the Transition).

The City is committed to ensuring an equitable Transition, meaning that it is implemented in a manner that allows all residents to have access to its many benefits. This particularly includes access for low-income residents and small businesses to energy efficiency improvements, active transportation infrastructure, emissions-free transit, and good-quality green jobs. The Transition stands to benefit many residents experiencing energy poverty and underemployment or the risk of underemployment due to the energy transition. Making these potential benefits a reality will require much more than the City Corporation taking action; the entire community will need to work together.

Valuing the Transition

When defensible data was available, each action included in the Energy Transition was assessed to determine its financial value in comparison to a BAU scenario. This value is derived from a combination of the action's costs (i.e. capital and operational) and benefits (i.e. avoided cost of carbon, energy, and maintenance, as well as revenue), with a discount value of 3% to account for the time value of money. Each action's value was then divided by the cumulative reduction of GHG it represents. This value is also known as the action's marginal abatement cost.

The marginal abatement cost is a useful tool for climate action decision-makers but should not be considered in a vacuum. Expensive actions may be necessary to enable for some of the affordable and even cost saving actions. Furthermore, addressing all emissions will be necessary to achieve net-zero by 2050. The financial analysis shows the Transition, as a whole, is cost-effective and overall a good economic policy for St. John's, with an average $167 in savings per GHG tonne reduced. This quickly adds up, over 28 years, to an overall return of nearly $1.8 billion dollars, or a 33% return on a $5.5 billion dollar investment. The majority of the financial benefit is due to the $7 billion avoided energy and carbon costs, as well as maintenance savings associated with the energy efficiency improvements and fuel switching included in this plan.

The Energy Transition will be funded by many different sources, including the City, other levels of government, the private sector, and individual residents. Where necessary, these investments will be enabled through innovative financing solutions and incentives. Equitable program design will ensure all residents and businesses have access to the savings.

Finally, many critical benefits of the transition and risks of not transitioning are NOT included in the financial analysis. This is because it includes aspects that are difficult to quantify, such as, improving public health, enhancing energy security, decreasing social inequity, etc. Furthermore, not taking any action involves risks including stranded assets or missing out on economic opportunities presented by the local, national, and global low-carbon transition which are impossible to quantify.

See Appendix B for more financial and economic impact analysis information.

Getting from BAU to Net-Zero

A BAU future will see a decrease in St. John's community-wide emissions by 2050 (see Figure 1); decreasing from about 789 ktCO2e in 2016 to 573 ktCO2e in 2050. This is due to existing policies, regulations, and market trends, most notably the near-decarbonization of the provincial electricity grid as well as federal regulations on transportation fuel efficiency. However, the climate emergency demands much more.

In order to eliminate as many GHG emissions as possible by 2050, a comprehensive series of changes across all sectors will be necessary. To determine an evidence-based and community-informed pathway, the CityInSight spatial energy and emissions model (described in Appendix C) was populated with a series of actions informed by best practices, available technologies, and community insight (actions are detailed in Appendix A). GHG emissions can be reduced by 93% in 2050 when compared to business-as-usual emissions in 2050 (see Figure 4). The majority of the remaining emissions are from organic waste decomposing in the landfill. For now, this remaining carbon gap would need to be addressed in the future via the purchase of offsets. Future revisions of this Energy Transition will have the benefit of considering further policy and technological innovations.

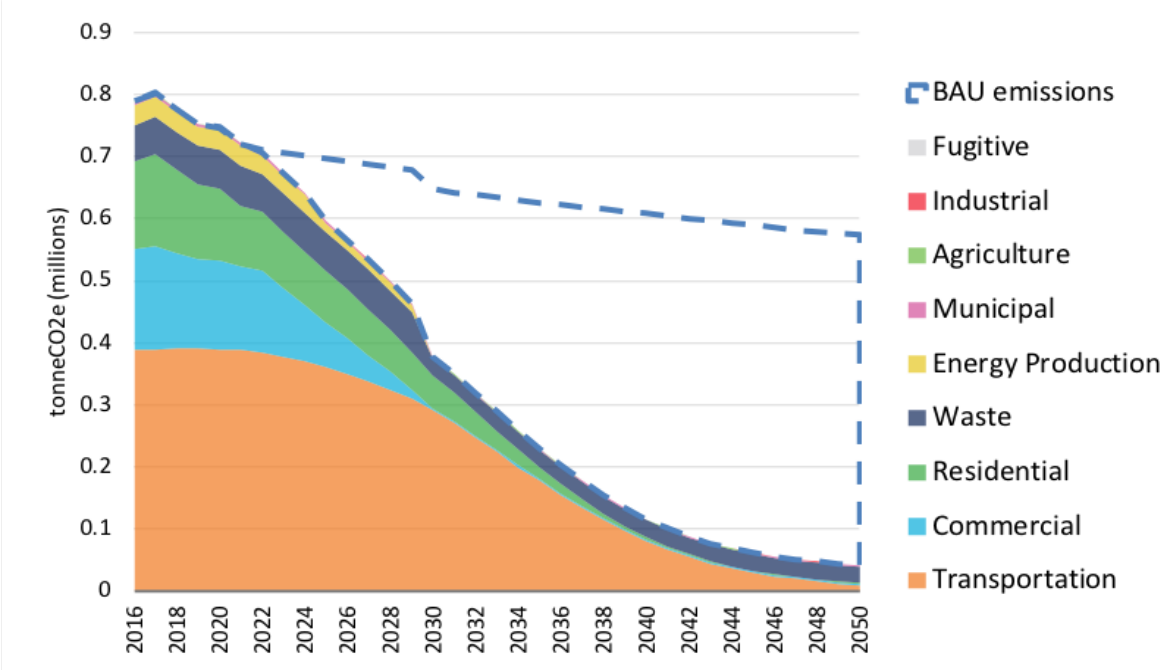


Figure 4. St. John's forecasted greenhouse gas emissions, by sector, in a net-zero scenario, 2016-2050.

Efficiency First, Local Renewable Energy Second

Prioritizing energy efficiency in the St. John's Energy Transition helps reduce the overall cost to society—electricity consumers and the environment. The International Energy Agency promotes energy efficiency as the first fuel in the energy transition, with multiple benefits beyond reduced energy demand, including energy security, home comfort, and the preservation of the existing built environment.[7]

Energy efficiency saves costs in many ways. Despite NL having abundant hydro energy available to St. John's, maximizing energy efficiency will eliminate costly additional electricity capacity to support the electrification of homes, businesses, industry, and transportation. Prioritizing efficiency in buildings also entails minimizing the equipment needed to replace existing heating and cooling systems, saving capital costs. Finally, improved energy efficiency has the important benefit of reducing household energy bills, which currently contribute to St. John's having one of the highest energy poverty rates in the country.[8]

In addition to energy efficiency, by increasing the local renewable energy supply, St. John's has the potential to display leadership, create local jobs, generate revenue, and increase the community's energy security.

[7] International Energy Agency. Multiple Benefits of Energy Efficiency (March 2019). Online: www.iea.org/reports/multiple-benefits-of-energy-efficiency.

[8] 'Energy poverty' is considered to exist when a household spends more than 6% of their after-tax income on home energy costs (including transportation fuels). (per Canadian Urban Sustainability Practitioners, Energy Poverty in Canada: a CUSP Backgrounder (October 2019) at 2, online: https://energypoverty.ca/backgrounder.pdf.)

Sector-by-Sector Transition Pathways

The Energy Transition requires dozens of strategic actions across all sectors between now and the year 2050. These actions, detailed in Appendix A, are based on best practices, current available technologies, and community insight. The wedge diagram in Figure 5 provides a visual representation of how much each action or bundle of actions contributes to the Transition from the BAU scenario. Table 1 lists the cumulative emissions reductions achieved by each action or bundle of actions from the BAU by 2050.

Each action is critical to achieving net-zero emissions, even if it only represents a fraction of overall GHG reductions. In some cases, an action facilitates another action (e.g. increased densification allows for more affordable transit and active transportation infrastructure, which in turn enables the reduced need to use personal vehicles for shorter trips). Actions also provide unique sets of co-benefits beyond GHG reductions, such as improved resiliency to climate extremes (e.g. tree planting and naturalization) or improved air quality and noise pollution (e.g. active transportation, as well as electrification of transit, cars, and trucks).

The proceeding sections provide detail on sectoral transition pathways, their decarbonization actions, near-term implementation strategies, GHG reductions, and co-benefits. This is the 30-year energy transition pathway for the community of St. John's. Each section also introduces the 5-year implementation strategies that will catalyze action now to enable for the longer-term pathway. Additional details on each of the implementation strategies (timing, reporting metrics, GHG impact, co-benefits, estimated cost, potential partners and funders) are provided in Appendix D.

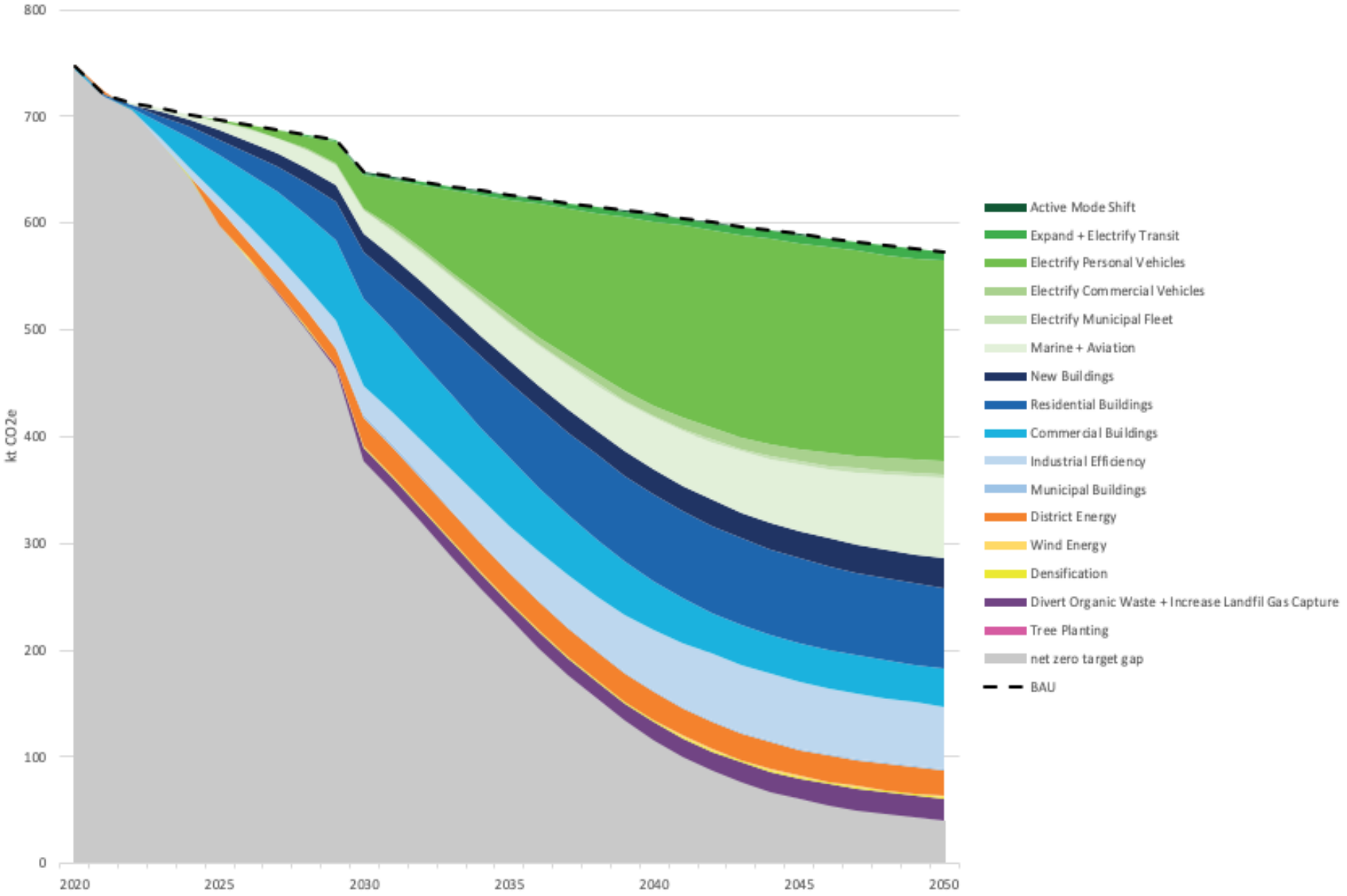


Figure 5. St. John's Energy Transition Pathway, by action, and the associated GHG reductions from 2016-2050.

Table 1. Energy Transition Pathway actions and associated cumulative GHG reductions by 2050.

Energy Transition Pathway Actions	Cumulative GHG Reductions by 2050	% of Total
Expand and electrify transit	121kt CO2e	1.1%
Increase active transportation	14 kt CO2e	0.1%
Electrify personal use vehicles	3,096 kt CO2e	29.7%
Electrify commercial vehicles	178 kt CO2e	1.7%
Municipal fleet electrification	52 kt CO2e	0.5%
Marine efficiency + aviation net-zero	1,100 kt CO2e	10.6%
More efficient, electrically-heated new buildings	548 t kCO2e	5.3%
Mass, deep residential retrofits	1,677 kt CO2e	16.1%
Mass, deep commercial retrofits	1,407 kt CO2e	13.5%
Deep industrial retrofits	1,166 kt CO2e	11.2%
Deep municipal retrofits	44 kt CO2e	0.4%
More efficient, electrically-heated new buildings	548 t kCO2e	5.3%
Decarbonize Memorial University's district energy system	601 kt CO2e	5.8%
Produce local wind energy	11 kt CO2e	0.1%
Increase densification	3.4 kt CO2e	0.5%
Divert organic waste and increase landfill gas capture systems	350 kt CO2e	3.4%
Tree planting	0.25 kt CO2e	0.002%

Overarching Enabling Actions

Before outlining the Transition Pathway for each sector, there are a few overarching actions critical for ensuring the City is enabling community-wide progress toward the Energy Transition's longer-term goals that need to be addressed.

Annual public reporting on action is critical to track progress and enable for a **comprehensive five-year review** on energy use,GHG emissions, and other required updates to the plan . This review is an opportunity to make adjustments that reflect lessons learned, community input, new technologies, and best practices that have arisen over the years.

In addition, it is critical the **City's major spending and policy documents are aligned** with the Energy Transition. This would ensure that the City is taking action by ensuring public dollars and power are working in support of the Energy Transition.

Densification and complete community policies not only help protect green spaces, but they also enable for increased access to transit and active transportation options which reduces the need for other personal vehicle trips. In addition, by maintaining and expanding its tree canopy and green spaces, the City can offset some of its remaining GHG emissions via **natural carbon sequestration**. Maintaining green spaces and expanding the tree canopy will help enhance local air quality and improve the community's resilience to extreme weather.

Walkable communities support community cohesion and healthy living, while ensuring many of the existing natural areas remain undisturbed. **Natural areas** within and around the city, in the era of climate change, are a buffer. They help protect neighbourhoods and communities, as a whole, from changes in climate, and invasive species, while also providing green spaces for important pollinators such as bees and butterflies.

Finally, the Energy Transition will require **skills training and new businesses**. The City will partner with academic institutions to identify the training and research needed to implement the Energy Transition. In addition, the City will help provide a supportive environment for small start-ups seeking to work in the growing green economy.

Table 2. Key overarching Energy Transition actions and implementation strategies.

Pathway Action	Implementation Strategy
1.1 Integrate climate considerations into city-wide development policies	**Policy:** Ensure that climate considerations are fully integrated into St. John's Municipal Plan, subsequent neighbourhood-level plans, and included in updates of other strategies.
1.2 Continue to provide annual GHG and energy use reporting (for City and broader community)	**Program:** Public, annual reporting on progress of action, and at least a 5-year community-wide GHG and energy use reporting.
1.3 Develop and implement a climate lens for all City budget decisions	**Policy:** Develop a climate policy lens to guide City budget decisions **Program:** Annual reporting on corporate GHGs and energy use
1.4 Undertake regular reviews and updates of RSJ	**Initiative:** Establish a 5-year update to RSJ
1.5 Natural area protection and enhancement	**Program:** Continue and expand urban tree planting and naturalization programs **Program:** Continue to naturalize greenspaces, and protect wetlands and waterway buffers
1.6 Business and industry working groups	**Initiative:** Establish a working group with local industries to develop strategies to meet climate goals
1.7 Partnership with academic institutions and entrepreneurship incubators for pilot project and training	**Initiative:** Work with academic institutions and entrepreneurship incubators to identify opportunities for innovation, training, and development

Affordable, Efficient Buildings for All

BAU Energy + Emissions Profile

Residential and commercial buildings are St. John's second-largest source of emissions today and into 2050 in a BAU scenario. They represent 35% of the community's emissions, or 204 kt CO2e, in 2050. Despite the sector's relatively high share of low-emissions electricity use (about

60% today), a small share of buildings still rely on high-carbon fuel oil (about 18%) and propane (about 9%).

Taking Action Now

The following table outlines the key near-term (2022-2025) implementation strategies that will initiate the transformation of buildings (i.e. homes and businesses) in St. John's. These actions build on existing work at the City and in the community and are informed by community input and global best practices.

These implementation strategies address St. John's building sector BAU energy use and emissions sources, and help achieve the sector's long-term Energy Transition goals and associated co-benefits.

Table 4. Buildings decarbonization actions and implementation strategies.

Pathway Action	Implementation Strategy
2.1 All new buildings are net-zero by 2030	**Policy:** Establish new Sustainable Development Guideline
2.2 Mass deep retrofits to existing homes and buildings, followed by switching to electric heat pumps and water heaters, achieving net-zero or net-zero ready	**Program:** Develop a deep retrofit program for all buildings **Initiative:** Pilot a neighbourhood retrofit **Initiative:** Pilot a low-income housing retrofit
2.3 Heat pumps and electric water heaters in all buildings	**Initiative:** Pilot a rental property retrofit **Leading by example/Infrastructure:** Retrofit municipal buildings to net zero or net zero ready
2.4 Convene a roundtable to address energy poverty	**Initiative:** Convene a roundtable to address energy poverty

About the Transition Pathway

The transition pathway for St. John's buildings starts with a **mass deep retrofit program**, first to improve building envelopes, then to make the switch to air-source heat pumps. These heat pumps are more than twice as efficient as electric baseboard heaters and are even more efficient than fuel oil boilers. This means that heat pumps supply the same amount of heat as electric baseboards and fuel oil burners, but use considerably less energy. Currently, electric baseboard heating represents about 70% of St. John's home heating systems.

To ensure effective and equitable **retrofit program design**, consultations will be needed with residents, businesses, other levels of government, industry, service providers, and public interest groups. Program design will then be tested and refined via pilot programs. Broader deployment of the retrofit program will require the development of appropriate incentive/financing solutions and public-private collaboration and innovation.

New buildings built today will likely still be standing in 2050. Long-term infrastructure decisions need to be aligned with a net-zero future, as retrofitting buildings at a later date is a more costly proposition. Early considerations of adaptive re-use may also support waste reduction and embedded carbon in construction materials into the future. The City can help ensure this by establishing a comprehensive and clear green development guideline.

Local training institutions will need to ensure that technicians are being trained and retrained to fill all the **new jobs** that will be created to deliver retrofits and build to net-zero.

Co-Benefits

The mass deep retrofit program is critical to the Transition's projected decrease in household energy costs (including vehicle fuel) by over 50%. The City is committed to deploying residential retrofits in a manner that supports low-income households. This will help reduce energy poverty, encourage building improvements, respect heritage, and enable households to afford other household necessities. Furthermore, envelope retrofits have the added benefit of improving resident comfort and health.

Investment in retrofits are also the biggest potential job creator of the Transition, estimated to create over 1,350 person-years of employment for each year from 2022 to 2050.

Transportation Transformation

BAU Energy + Emissions Profile

Transportation is St. John's single largest source of GHG emissions out to 2050 in a business-as-usual (BAU) scenario, representing 52% of the community's emissions. Despite significant increases in vehicle fuel efficiency and incremental electric vehicle adoption, gasoline- and diesel-fuelled cars and trucks on the roads in 2050 are projected to emit 215 kt CO2e. Marine and aviation emissions associated with the community are expected to be 81 kt CO2e in 2050.

Taking Action Now

The following table outlines the key near-term (2022-2025) implementation strategies that will initiate the transformation of the transportation sector in St. John's. These actions build on existing work at the City and in the community and are informed by community input and global best practices.

These implementation strategies address St. John's transportation sector BAU energy use and emissions sources, and help achieve the sector's long-term Energy Transition goals and associated co-benefits.

Table 3. Transportation decarbonization actions and implementation strategies.

Pathway Action	Implementation Strategy
3.1 Electrify personal, municipal, and commercial vehicles	**Infrastructure**: Partner on the deployment of electric vehicle charging stations **Initiative**: Work with local car dealerships to improve access to EVs **Initiative**: Develop an EV education program **Initiative**: Convene a commercial fleet decarbonization working group **Leading by Exampl**e: Purchase electric vehicles for the municipal fleet
3.2 Expand and electrify transit	**Program**: Conduct a feasibility study and pilot project for electric buses in St. John's on select routes **Initiative**: Implement the ridership growth strategies identified in the Transit Review Study, 2019 **Initiative**: Update transit study, when appropriate, to identify transit needs and further increase ridership and route coverage across the city
3.3 Improve and expand walking and cycling infrastructure	**Initiative**: Engage with the public and ramp up implementation of the Bike St. John's Master Plan **Initiative**: Initiate a review of walking infrastructure needs in the city

About the Transition Pathway

The transition pathway for St. John's transportation sector prioritizes efficiency by **increasing the number of trips taken by foot, bike, and e-bus,** and then, replacing remaining vehicles with electric vehicles (EVs). Since the number of car trips are reduced, and because EVs are significantly more efficient than combustion engine vehicles, cars and light trucks are projected to use nearly 70% less energy by 2050 in the Energy Transition.

Fossil fuel-free alternatives for heavy trucks in Newfoundland are not fully tested and for the time being are only partially addressed via electrification in this Transition. Some combustion engine heavy trucks are assumed to still be on the roads in 2050 in the Energy Transition. Future iterations of the Transition may consider an expanded heavy-truck electrification, sustainable green hydrogen, or compressed renewable natural gas, as these technologies become available in NL.

The municipality plays a critical role as a first mover in **electrifying its fleet and transit.** It also plays a central role in facilitating increased public and active transportation, by expanding and improving transit networks as well as infrastructure for walking, cycling, and riding scooters.

In order to encourage the adoption of electric vehicles, the municipality and private sector will need to work collaboratively to **expand EV charging infrastructure**, and increase local support for and the availability of EVs.

As for the **marine and aviation transition,** both industries have committed to significant efficiency targets, and the latter has committed to net zero by 2050.

The efforts in this sector can be furthered significantly through co-benefits of land-use actions captured in the **non-energy emissions** sector. Reduction of vehicular trips, and replacing them with transit, walking, or cycling, reduces the overall energy demand. Land use decisions that maximize the availability of non-vehicular trips will improve the quality of life, and build stronger communities.

Co-Benefits

Transitioning the transportation sector will help significantly improve local air quality and noise pollution. Walking and cycling on a safe network of on-street and environmentally- sensitive paths and trails will also help residents stay active and connected with their community. This

will enable easier access to amenities such as shops, doctor's offices, schools, workplaces, parks and restaurants. Moreover, if implemented equitably, these public services can be designed to serve those most in need, ensuring that all residents can use affordable, safe and healthy transportation solutions.

Clean Energy for Resilience

BAU Energy + Emissions Profile

A BAU scenario projects that St. John's energy use profile will stay relatively constant out to 2050, subject to some reductions in gasoline and diesel (-29% by 2050), and a minor increase in electricity use (8% by 2050, see Figure 6). These changes are primarily due to overall improvements in efficiency standards, in particular improved federal vehicle fuel efficiency standards and the expected uptake of electric vehicles, as well as population growth (14% by 2050).

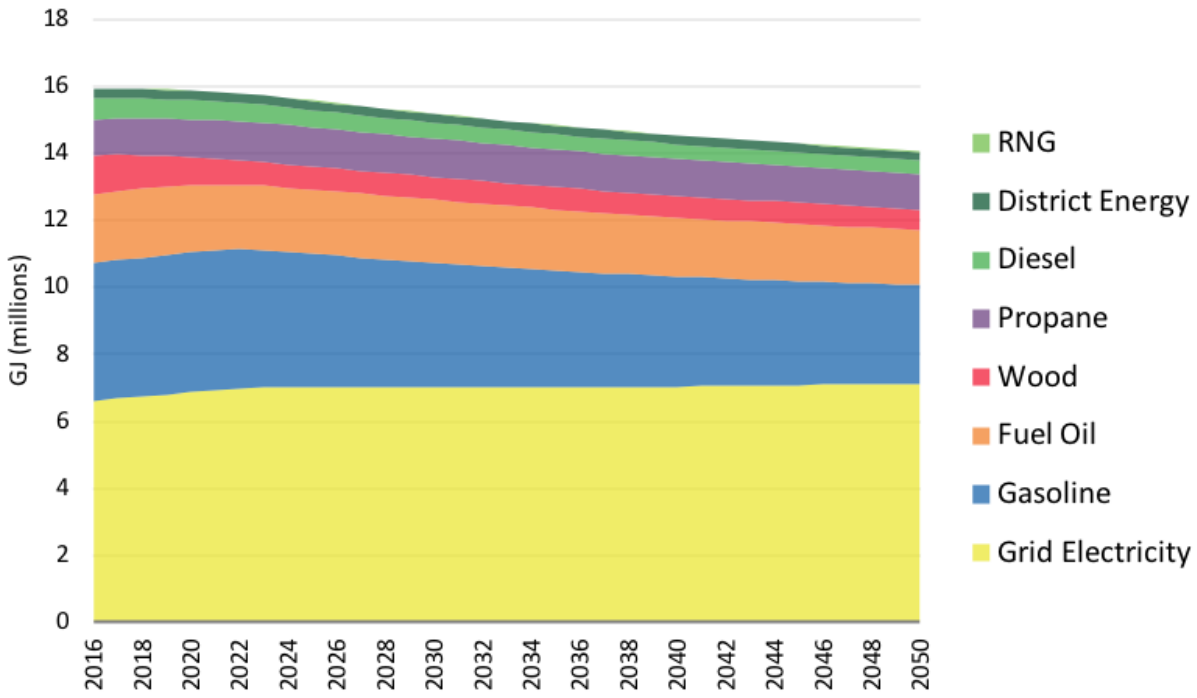


Figure 6. St. John's community energy use, by fuel, in a BAU scenario, 2016-2050.

St. John's energy profile is unique and opportune in its large share of nearly emissions-free electricity, almost exclusively from hydroelectric generation as of 2022. Though electricity is estimated to provide about 50% of the community's energy use by 2050 in a BAU scenario, it is

estimated to produce only a small fraction of the community's greenhouse gas emissions (see Figures 6 and 7).

Apart from the carbon-neutral biogas (shown as RNG in Figure 6) that is currently re-used at the Riverhead wastewater treatment plant, the remaining half of the community's energy supply remains fossil-fuelled in a BAU scenario (see Figure 5). Cars and trucks are the primary consumers of fossil fuels, followed closely by fuel oil, a major source of building heating. The shared Memorial University of Newfoundland (MUN)/Eastern Health district energy system is also expected to remain powered by fuel oil boilers in a BAU scenario.

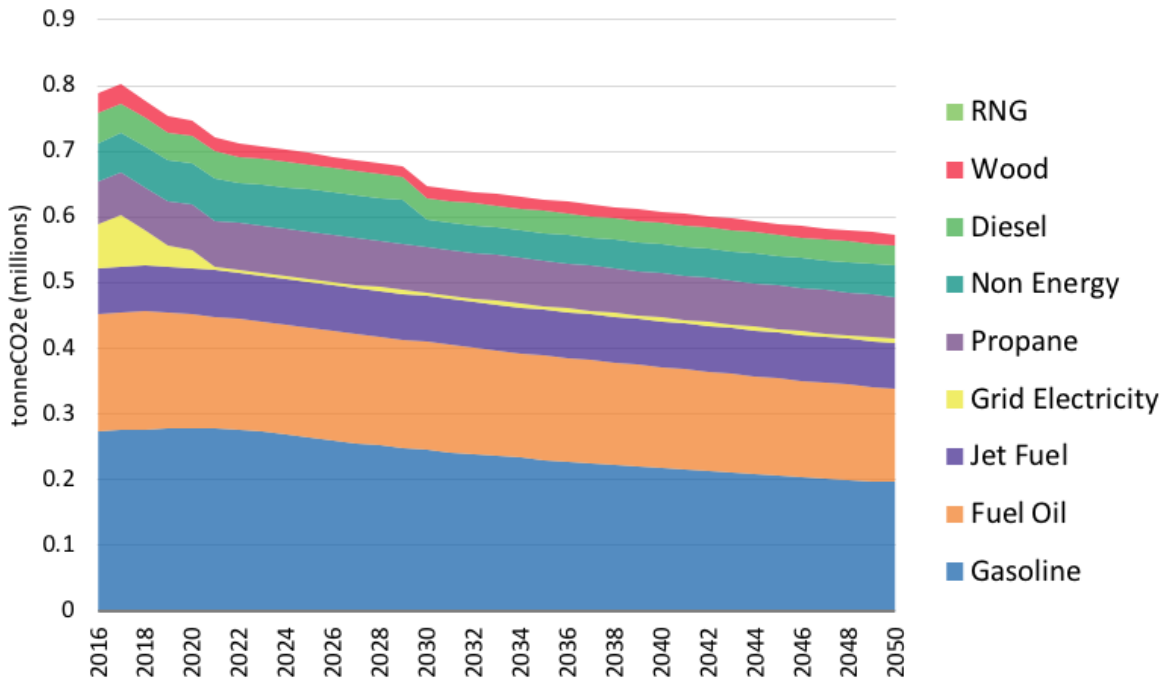


Figure 7. St. John's community GHG emissions, by fuel, in a BAU scenario, 2016-2050.

Taking Action Now

The following table outlines the key near-term (2022-2025) implementation strategies that will initiate the transformation of the energy system in St. John's. These actions build on existing work at the City and in the community and are informed by community input and global best practices.

These implementation strategies address St. John's energy system BAU energy use and emissions sources, and help achieve the sector's long-term Energy Transition goals and associated co-benefits.

Table 5. Energy system decarbonization actions and implementation strategies.

Action	Implementation Strategy
4.1 Partnership with MUN to decarbonize the District Energy system	**Initiative:** Collaborate with MUN/EH to decarbonize the DE system
4.2 Install wind farms to supplement the provincial electricity grid	**Policy:** Support the implementation of the renewable energy policies in the Envision St. John's Municipal Plan **Initiative**: Renewable Energy Co-operative (REC) public education campaign & search for local leads
4.3 Expand landfill gas capture	**Infrastructure**: Expand the landfill gas capture system and explore collaborative frameworks for its feasible reuse
4.4 Ensure the electricity system is planning to manage new demand and new supply mix	**Initiative:** Commission an hourly analysis of electricity demand and capacity to ensure a stable, reliable electricity grid for a net-zero future

About the Transition Pathway

In addition to nearly-emissions-free central grid electricity, in its Energy Transition to a net-zero future, St. John's capitalizes on several other local, abundant emissions-free resources, namely:

- ambient energy from the air (a major energy input for electric air source heat pumps that will heat and cool St. John's homes and businesses);
- avoided energy use from efficient building envelopes;
- avoided energy use from efficient electric versus combustion engine motors (gasoline or diesel);
- avoided energy use from reduced personal use vehicle trips; and
- wind energy.

The combination of these resources results in a massive energy demand reduction for the community by 2050: a 53% reduction from BAU and a 58% reduction from 2016 energy demand levels. The City is supportive of renewable energy generation to meet future demands; however, ambitious energy efficiency is more cost effective, can be implemented in the short-term, and generally provides added co-benefits to residents.

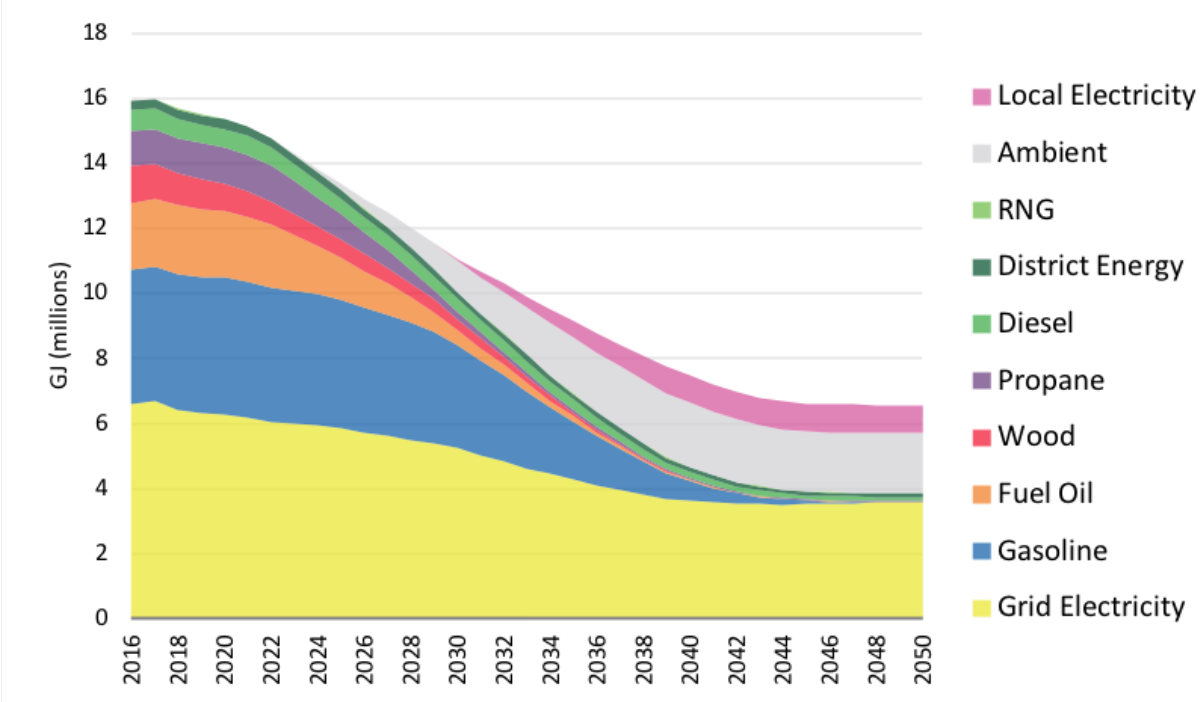


Figure 8. Community energy use, by fuel, in a net-zero scenario, 2016-2050.

The City will also be exploring the potential **beneficial use of methane gas** that will be increasingly captured at its landfill, similar to the beneficial use of methane collected at the Riverhead wastewater treatment plant. Landfill gas could be used to heat neighbouring buildings, generate local electricity, fuel a district energy system, or fuel vehicles.

To deploy the significant energy efficiency improvements included in the Transition and add local clean energy to the grid, the City will need to **coordinate with the Province, Newfoundland Power, and Newfoundland and Labrador System Operator** to ensure the electrical system is prepared for the changing demand and supply mix.

A**dding zero-emissions electricity from wind generation** may not immediately make financial sense in a location with clean grid electricity. However, by adding wind generation to the grid in St. John's, the city will diversify its electricity supply and support the Province's vision

in the Maximizing our Renewable Future Plan. This diversification will also increase the resilience of the city in the event of disruptions to electricity distribution or generation.

Co-Benefits

The benefits of reducing overall energy demand and diversifying some of the community's electricity supply include: decreased household energy costs, increased energy system resilience (from electricity price increases and any potential disruption to the onshore electricity supply), and local economic development (for more on co-benefits, see the section 'Efficiency First, Local Renewable Energy Second' above).

Non-Energy Emissions: Low-Waste Future

BAU Energy + Emissions Profile

The current 7% of St. John's GHG emissions resulting from non-energy sources are due to the decomposition of organic waste at the Robin Hood Bay Landfill. This methane produced here is partially captured by the landfill's gas capture system, as they can only be installed in inactive areas of the landfill. The 59 kt CO2e presently emitted are projected to decrease slightly to 47 kt CO2e by 2050 in a BAU scenario. This is primarily due to planned expansion of the landfill gas capture systems from a 60% to 70% capture rate in 2030.

Although methane from the landfill reflects a small share of the community's emissions, it is critical in the short term. Over the next 100 years, methane's climate change impact is considered to be 34 times more potent than carbon dioxide (i.e. 1 tonne of CH4 = 34 tonnes of CO2e)[9]. In comparison to the next 20 years, methane's climate change impact is much more consequential, during which it is 86 times as potent as carbon dioxide (i.e. 1 tonne of CH4 = 86 tonnes of CO2e). For this reason, it is vital the City continues and expands on its waste diversion and methane capture practices. The benefit of landfill gas collection expansion to the climate is significant, even if the City simply continues to flare the methane being captured at its landfill as carbon dioxide (versus capturing the gas for beneficial reuse).

Other non-energy emissions sources and pathway actions, while seemingly small, have significant co-benefits that enable the actions in other sectors, the residents' overall health and

[9] Standardized GHG accounting and reporting standards require that methane's global warming potential be measured on a 100-year time horizon.

well-being, and climate adaptation (i.e., intensification, naturalization, conservation, tree planting).

Taking Action Now

The following table outlines the key near-term (2022-2025) implementation strategies that will transform non-energy sources (i.e. waste management in St. John's). These actions build on existing work at the City and in the community and are informed by community input and global best practices.

These implementation strategies address St. John's BAU non-energy emissions sources and help achieve the long-term Energy Transition goals and associated co-benefits.

Table 6. Waste decarbonization actions and implementation strategies.

Pathway Action	Implementation Strategy
5.1 Public education to reduce overall waste production, and improve waste diversion	**Program:** Develop and deliver educational programming about waste reduction, and waste sorting
5.2 Support the development of a circular economy	**Initiative:** Convene a working group to identify opportunities for building a local industry for repair and reuse including community composting and building materials reuse such as: • undertaking a review of existing guidance (e.g., Guide to Community Gardens in the City of St. John's) to incorporate neighbourhood level community composting on city-owned land. • identifying barriers and opportunities for building materials reuse. • exploring the development of a food waste and resource flow map to identify food waste-to-value opportunities for innovation.

About the Transition Pathway

The Energy Transition requires the timely introduction of an **organic waste diversion program** along with an **expansion of the landfill gas capture system** to address legacy organic waste emissions. The **inclusion of circular economy principles** in the economy will support the City's diversion and material reuse efforts, while also encouraging new businesses to design out waste from their products and services.

Organic waste takes up to 50 years to completely decompose and stop producing methane.[10] Beneficial use of the energy provided from decomposing organic waste can take the form of compost or biogas. Since St. John's operates a regional service, financial support and collaboration from the Provincial and Federal government are essential to realize the decarbonization of this sector. The latter can be an important source of carbon neutral energy for St. John's, and is discussed in the prior section on Clean Energy for Resilience; it will need to be seriously considered via a feasibility study.

Co-Benefits

Incorporating circular economy principles would support work toward the eventual elimination of waste while encouraging innovation in the local economy. For example, diverting organic waste from the landfill has the added benefit of providing a useful resource for the community, either as rich compost or as biogas.

The Path Forward

The Role of the City

Declaring a climate emergency, setting GHG emissions targets, and developing this Transition Strategy are necessary first steps. Once passed, the City will need to move to action as soon as possible. Though directly responsible for a fraction of the community's emissions, the Municipality plays a critical leadership role in the Energy Transition.

1. Being a first mover

The City will show leadership by ensuring that all its Council-approved spending decisions are aligned with a resilient, net-zero future, starting as soon as possible. The City will achieve this by adopting a climate lens that ensures the City remains within its annual cap on emissions, with surpluses and deficits applied to the following year.

[10] "Landfill Gas Primer - An Overview for Environmental Health Professionals" online at Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services: www.atsdr.cdc.gov/hac/landfill/html/ch2.html.

2. Providing public education, progress reporting, and periodic reviews

The City will continue to be the central source of public education about the Energy Transition, providing annual public reporting on the City's corporate GHG emissions and progress metrics for key community-wide programs. This data will help the community provide essential oversight and inform the Strategy's 5-year reviews.

3. Enabling and coordinating community action

The City will also help coordinate community action by establishing enabling policies and regulations, convening potential partners, and supporting proposals to various levels of government, as well as by lobbying higher levels of government for new funding and supporting policies. In addition, the City will support community action by coordinating private sector working groups to share resources and best practices.

4. Leading certain key programs, with an equity and local economic development lens

There are certain community decarbonization programs that the City will lead, partnering with the private sector where appropriate. For example, the City's sustainable development guideline will be led by the City, and the City will play a role in mass retrofit residential and commercial retrofit programs.

In leading community decarbonization programs, the City is committed to do so with an equity and local economic development lens. This will promote community accessibility to programs and services, notwithstanding income or other circumstances. It will ensure the City's Energy Transition addresses energy poverty in St. John's and maximizes local business participation.

The Role of the Community

1. Learn, participate, and shape

The community's role in the Energy Transition is to become informed about, participate in, and shape programs. The community will review their options and prepare to take advantage of Energy Transition programs as they become available. The community can help shape St.

John's Energy Transition by participating in Energy Transition committees or working groups; attending public information meetings and asking questions or making suggestions; or reaching out to their Councilors–among many other options.

To keep abreast of opportunities to do so, residents can register for updates from the City at: https://stjohns.ca/

https://twitter.com/SustainStJohns

https://www.facebook.com/SustainableStJohns

2. Organizations as partners and leaders

The Energy Transition is a large undertaking for any single organization to lead. There are significant opportunities for businesses, institutions, associations, and community groups to step up as Energy Transition program delivery partners or leaders. They can do so by bidding for public projects or by accessing public funding. Organizations can also learn about their own emissions and set organizational net-zero targets. Finally, organizations can lobby higher levels of government for support in their emissions reductions efforts. The City may be able to assist these efforts by:

- providing letters of support (sometimes required to access funding),
- sharing know-how to build capacity,
- convening working groups, and
- generally keeping communication channels open and transparent.

Growth of the Green Economy

The Energy Transition will not only save money on household and business energy costs, it will also create many local economic development opportunities for St. John's. In particular, the massive building retrofit and heating system switch will require a small army of service providers and businesses to undertake the required energy audits, finance and administer the projects, undertake the envelope improvements, and provide and service the equipment. Economic modelling suggests the investments in mass deep retrofits across the community's building stock will result in more than 1,350 full time job equivalents by 2050. In total, the Transition is projected to produce a net increase of 1,400 jobs across all of its programs.

The Energy Transition is a community investment plan that will result in many new jobs and also a transition of skills in existing jobs. For example, the electrification of vehicles will require a transition from skills that are currently focused on servicing combustion engine vehicles to batteries. The transition to air source heat pumps as a primary source of heating for buildings will require technicians accustomed to installing electric baseboards or fuel oil boilers to retool. And so on.

To fill these new jobs and business opportunities, the City will work with local colleges, technical training institutions, and universities to ensure their course offerings and research programs reflect the evolving economy. The City is committed to ensuring training and retraining programs are made accessible to those whose jobs will be affected by the transition or that are experiencing under-employment.

See **Appendix C** for more details on the Transition's economic impacts.

APPENDICES

A. Business-as-Usual and Net-Zero Scenario Modelling Assumptions and Results

B. Economic and Financial Analysis

C. Modelling Scope, Method, and Process

D. Implementation Strategy

Appendix A: BAU and Net-Zero Scenario Modelling Assumptions and Results

November 2021

About this document

This report was developed by SSG as a technical resource to support and inform the development of the City of St. John's Energy Transition. This report details the key energy use and greenhouse gas (GHG) assumptions used to model St. John's 2016 to 2050 business-as-usual (BAU) and net-zero energy and emissions scenario (NZS), as well as the model results.

A separate document, the Data, Methods and Assumption Manual, details the model used to produce the results outlined in this document.

Disclaimer

Reasonable skill, care, and diligence have been exercised to assess information acquired during the preparation of this analysis, but no guarantees or warranties are made regarding the accuracy or completeness of this information. This document, the information it contains and upon which it relies are subject to changes that are beyond the control of the authors. The information provided by others is believed to be accurate but has not been verified.

This analysis includes high-level estimates of energy and use and emissions that should not be relied upon for design or other purposes without verification. The authors do not accept responsibility for the use of this analysis for any purpose other than that stated above and do not accept responsibility to any third party for the use, in whole or in part, of the contents of this document.

This analysis applies to the geographic area of the City of St. John's and cannot be applied to other jurisdictions without analysis. Any use by the City of St. John's, project partners, sub-consultants or any third party, or any reliance on or decisions based on this document are the responsibility of the user or third party.

Contents

Summary of BAU and NZS Actions

Table 1. Summary of business-as-usual (BAU) and net-zero scenario (NZS) assumptions modelled for the City of St. John's Energy Transition.

Category		BAU Assumption	Net-Zero Action	Source
POPULATION				
a.	Population	Increases by 14% by 2050 from 2016 total	Same as BAU	City
BUILDINGS				
New buildings growth				
1	Building growth projections	Focus 5% of new development in intensification zones, per 5-year period, the remainder should continue according to current population placement	Focus 10% of new development in intensification zones, the remainder should continue according to current population placement.	City
New buildings energy performance				
2	Residential	In line with the 2012 NBC, held constant to 2050	All new buildings are substantially more efficient and electric by 2030 (NZER equivalent). Efficiency improvements are modelled as follows: NBC (small buildings & houses):	BAU: St. John's Building By-Law, s.46. NZS: Current model National Building Code and National Energy Building Code 2020 (delayed until at least December 2021) proposes buildings be net-zero ready by 2030.
3	Multi-residential			
4	Commercial & Institutional	none		

5	Industrial		• 2022: 2015 NBC s.9.36 • 2024: 10% better • 2026: 20% better • 2030: 40% better NEBC 2020 (commercial & industrial): • 2022: NEBC 2020 • 2024: 25% better • 2026: 50% better • 2030: 60% better	Net Zero Energy Ready (NZER) is a highly energy efficient building that minimizes energy use such that on-site or community renewables or energy from a clean grid can be used to reach NZE.
6	Municipal	none		
Existing buildings energy performance				
7	Residential	Existing building stock efficiency increases at 1%/year 2016-2050.	Achieve 50% thermal savings and 50% electrical savings in 100% of all existing dwellings by 2045. (modelled before any fuel switching)	BAU: Pembina, Pathway Study on Existing Residential Buildings in Ottawa, 2019 (at 22). NZS: The Newfoundland and Labrador Conservation Potential Study (2020-2034) estimates about 30% electricity savings are possible in the residential sector by 2034. Studies undertaken by the US National Renewable Energy Laboratory and the Rocky Mountain Institute indicate that retrofits achieving far more than 50% in energy savings are possible, and that the deeper and more systemic the retrofits, the more affordable they become.
8	Multi-residential			
9	Commercial & Institutional			
10	Municipal			

11	Industrial	none		Increasing government funding is making technical potential more economical. Existing building retrofits are considered a key priority from the public engagement (March 2021, What We Heard PPT presentation).
End use				
12	Space heating	Fuel shares for end use unchanged; held from 2016-2050.	100% of buildings' space heating needs are met by electric heat pump systems by 2050. (No new oil fuel heating systems can be installed from 2030 onwards)	NZS: To ensure net-zero by 2050, no fossil-fuelled heating systems can be purchased that might still be in use by 2050. In addition, air source heat pumps offer the most efficient use of energy for cooling and heating.
13	Water heating			
14	Space cooling			
ENERGY GENERATION				
Low- or zero-carbon energy generation (community scale)				
15	Rooftop Solar PV	To hold constant out to 2050 at 0 MW	n/a	Public survey showed interest; however, wind has greater potential for grid supply in the area. Small projects for cost-avoidance may occur where feasible through net-metering.
16	Ground mount solar		n/a	
17	Biogas	Riverhead Anaerobic Digester and re-use of biogas, expected to increase to 11,697.6 GJ in 2030, then hold constant.	n/a	St. John's Energy and Greenhouse Gas Inventory (2018) at Table 32.

18	Wind	To hold constant out to 2050 at 0 MW	30 wind turbines	NZS: Public survey showed interest in local renewable energy projects. A large wind project is currently under development in central Nova-Scotia (2,800 hectares, 34 wind turbines, 3 MW each--Vaughn, NS). This project is a best practice and an example for the City to follow. The consultant recommends that the City and its partners undertake a further study to identify maximum wind potential and strategic siting.
19	District Energy Generation	Memorial University / Health Science Centre diesel DE system to remain unchanged	Replace existing fuel oil boilers with electric boilers (from 2030 onwards)	BAU: Currently Memorial University university and the Health Science Center relies on 4 high temperature hot water oil boilers, 2 are back up. NZS: Electric are not as efficient as many of the best practices that are available for district energy systems (e.g., ambient geothermal with ground source heat pump back up; or, RNG-powered boilers or CHP), without a detailed study to determine sufficiency of back-up energy supply, electric boilers have been modelled. The consultant recommends that a detailed study be undertaken before committing to electric boilers.
TRANSPORTATION				
Transit				

20	Expanded transit	2018 ridership to stay constant out to 2050, despite the significant decline in 2020-2021 due to Covid.	30% increase ridership by 2030 50% increase ridership by 2040 2% per year (from baseline) per year after that.	Identified as a priority from public engagement. St. John's Transportation Commission (Metrobus).
21	Electrify transit system	No current plans	Electrify transit system by 2045, starting in 2025 all new buses are electric	St. John's Transportation Commission (Metrobus).
Active Transportation				
22	Mode share	Hold constant in all zones, except for intensification zones, where the active transportation share increases moderately out to 2050. Overall sustainable mode share increases from an average of 13% to 15%.	Increase modeshare by 50% for short trips (<2km walking <10 km for biking), linearly, starting in 2022 by 2050	BAU: City (Very low sustainable mode share target from the Direction Note to the Committee of the Whole on Sustainable Mode Share Targets, November 4, 2020.) Consistent with Mode Share Target Council Decision (November 2020)
Private/personal use				
23	Electrify municipal fleet	No change to municipal fleets.	100% EV by 2045	Corporate Climate Plan (adopted May 2021)
24	Electrify personal vehicles	10% new sales by 2034, continue increase at 1% a year until 2050, reaching 26% of new sales by 2050	100% new sales EV by 2035	BAU: Dunsky, Newfoundland Conservation Potential Study (2020-2034), Appendix 2, Table F- 39: Adoption Under Baseline Scenario. (Reaching 10% of new

25	Electrify commercial vehicles	11% new sales by 2034, continue increase at 1% a year until 2050, reaching 28% of new sales by 2050	100% new sales EV by 2035; other than heavy trucks, which reach 25% new sales being electric by 2035, then stays constant	personal vehicle sales and 11% of commercial vehicles sales by 2034.) Identified as a priority from public engagement Aligned with the new federal target of 100% of vehicle sales to be EV by 2035 (assuming a 13-year vehicle life cycle).
MARINE & AVIATION				
26	Marine	Based on share of local employment	Reduce GHG use intensity by 50%	BAU: Statistics Canada, Provincial Marine Fuel Use for Newfoundland, Table: 25-10-0029-01 (2017 data, as 2016 was suppressed) NZS: International Marine Organization commitment, halving emissions by 2050 as compared to a 2008 baseline.
27	Aviation	Based on population	100% net zero by 2050	BAU: Statistics Canada, Provincial Aviation Fuel Use for Newfoundland, Table: 25-10-0029-01 (formerly CANSIM 128-0016) (2017 data, as 2016 was suppressed) NZS: Air Canada committed to be 100% Net-Zero by 2050; International Civil Aviation Organization has also begun to track net-zero aligned commitments by airlines and airports.
WASTE				
28	Waste diversion	To hold constant	Divert 95% of organic waste from landfill by 2040 to composting facility	City

29	Landfill gas capture	Robin Hood Bay: landfill gas capture system currently captures an estimated 60% of methane emissions, to increase by 5% by 2022, and another 5% by 2030.	to increase to 80% by 2040	NZS: the consultant recommends that the City and its partners undertake a feasibility study on the potential to divert organic waste to a central anaerobic digester and refinery, so that it may be used as a local source of fuel, potentially for a district energy system.
30	Industrial efficiencies (including wastewater treatment)	No change.	Increase by 50% by 2050 (linearly, starting in 2023)	NZS: Newfoundland Achievable Conservation Potential Study; Ontario Achievable Potential Study.
TREE PLANTING				
31	Tree Planting	none included	8.24 t CO2 reduced annually to 2050, from 11.3 hectares of urban reforestation (2021-2023)	NZS: City tree planting project – "Carbon Sequestration Naturalization" (Approved by City Council Nov. 2020). Additional naturalization and fuel switching of turf maintenance equipment supports the effort to reach NZ.

Community Energy and Emissions

Table 2. Community energy use and emissions, per capita, in 2016 and in 2050 in a business-as-usual and in a net-zero scenario.

	2016	2050 BAU	2050 NZS	% +/- 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Per capita energy (GJ/cap)	127,728	99,020	46,203	-64%	-53%
Per capita emissions (tCO2eJ/cap)	6.3	4.0	0.3	-95%	-93%

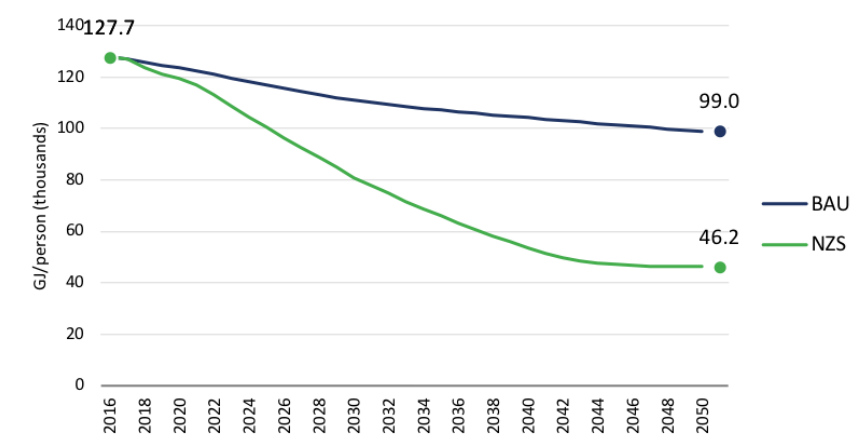


Figure 1. Energy use per capita in a business-as-usual and in a net-zero scenario, 2016-2050.

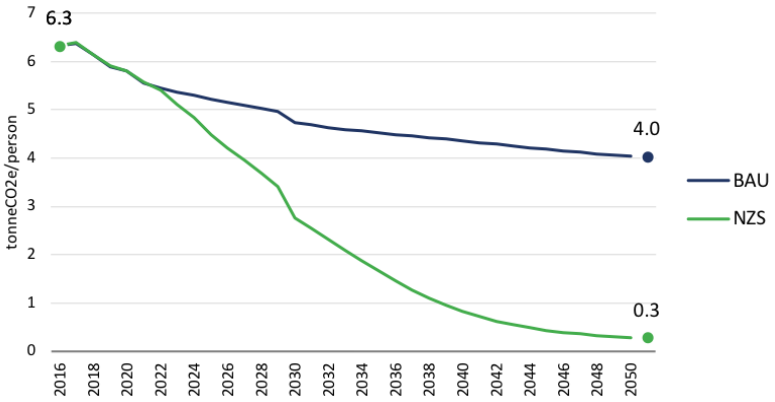


Figure 2. Greenhouse gas emissions per capita in a business-as-usual and in a net-zero scenario, 2016-2050.

Table 3. Community energy use, by fuel, in 2016 and in 2050 in a business-as-usual and in a net-zero scenario.

Energy by fuel (GJ)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/- 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Ambient	0	0	0	0	1,843,677	28%	100%	100%
Diesel	628,279	4%	424,451	3%	103,010	2%	-84%	-76%
District Energy	288,025	2%	237,347	2%	119,943	2%	-58%	-49%
Fuel Oil	2,047,977	13%	1,640,875	12%	15,260	0.2%	-99%	-99.9%
Gasoline	4,120,829	26%	2,947,728	21%	4,037	0.1%	-100%	100%
Grid Electricity	6,617,928	42%	7,120,629	51%	3,585,153	55%	-46%	-50%
Local Electricity	0%	0%	0%	0%	856,398	13%	100%	100%
Propane	1,052,276	7%	1,056,078	8%	26,441	0.4%	-97%	-19%
RNG	11,478	0%	11,572	0%	7,715	0.1%	-33%	-33%
Wood	1,167,207	7%	623,884	4%	0	0%	-100%	-100%
Total	**15,934,000**	**100%**	**14,062,563**	**100%**	**6,561,634**	**100%**	**-59%**	**-53%**

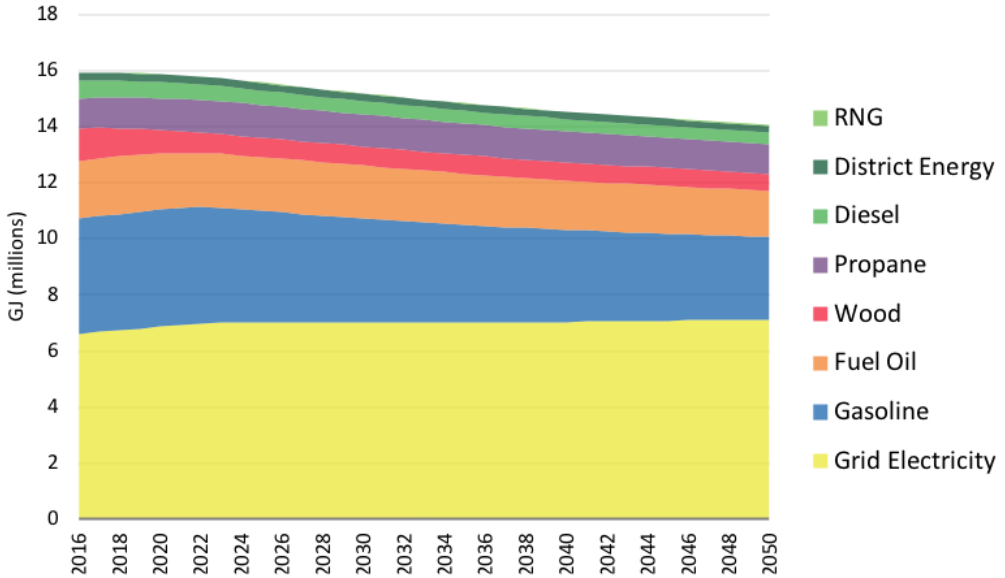


Figure 3. Community energy use by fuel in a business-as-usual scenario, 2016-2050.

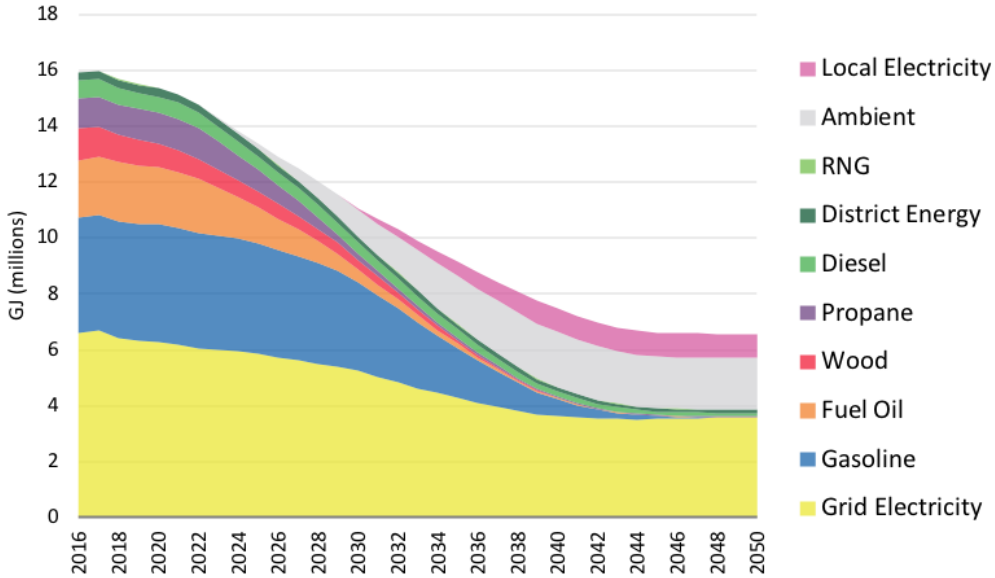


Figure 4. Community energy use by fuel in a net-zero scenario, 2016-2050.

Table 4. Community energy use, by sector, in 2016 and in 2050 in a business-as-usual and in a net-zero scenario.

Energy by fuel (GJ)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/- 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Agriculture	7,538	0%	10,043	0%	6,695	0%	-11%	-33%
Commercial	5,071,507	32%	4,693,371	33%	1,470,246	22%	-71%	-69%
Industrial	35,882	0%	36,489	0%	22,442	0%	-37%	-38%
Municipal	265,029	2%	324,624	2%	176,479	3%	-33%	-46%
Residential	5,811,293	36%	5,348,128	38%	3,337,774	51%	-43%	-38%
Transportation	4,742,750	30%	3,649,909	26%	1,547,997	24%	-67%	-58%
Total	15,934,000	100%	14,062,563	100%	6,561,634	100%	-59%	-53%

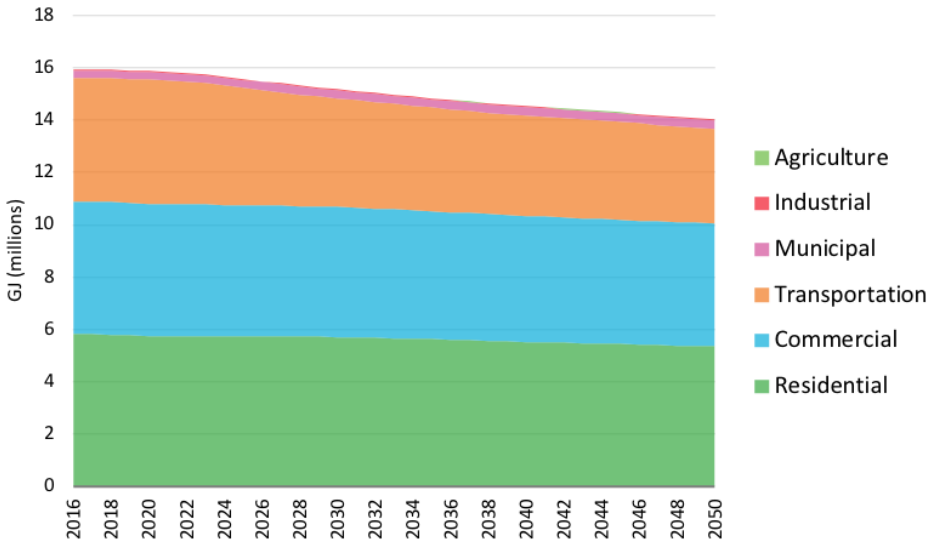


Figure 5. Community energy use by sector in a business-as-usual scenario, 2016-2050.

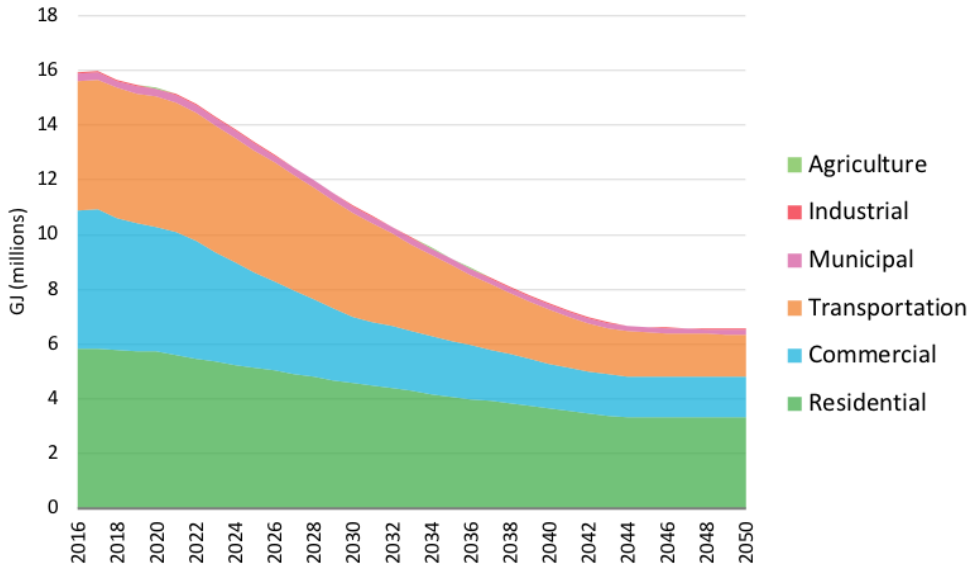


Figure 6. Community energy use by sector in a net-zero scenario, 2016-2050.

Table 5. Community greenhouse gas emissions, by sector, in 2016 and in 2050 in a business-as-usual and in a net-zero scenario.

Emissions by sector (tCO2e)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/- 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Agriculture	537	0%	715	0%	477	1%	-11%	-33%
Commercial	161,651	20%	107,175	19%	2,409	6%	-99%	-98%
Energy Production	31,533	4%	25,966	5%	95	0%	-100%	-100%
Fugitive	14	0%	14	0%	9	0%	-33%	-38%
Industrial	351	0%	133	0%	72	0%	-79%	-46%
Municipal	5,806	1%	3,827	1%	1,180	3%	-80%	-69%
Residential	141,273	18%	92,133	16%	952	2%	-99%	-99%
Transportation	389,384	49%	296,754	52%	8,627	21%	-98%	-97%
Waste	58,867	7%	46,590	8%	26,391	66%	-55%	-43%
Total	**789,417**	**100%**	**573,307**	**100%**	**40,213**	**100%**	**-95%**	**-93%**

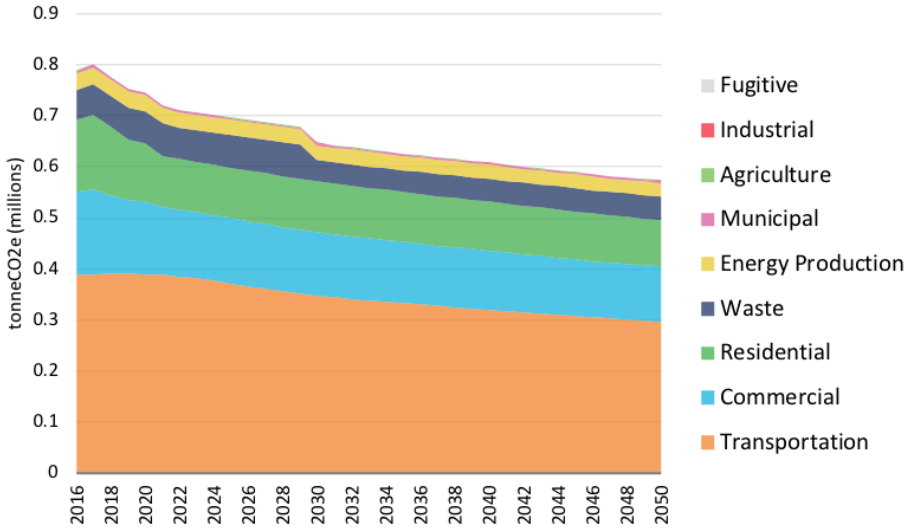


Figure 6. Community greenhouse gas emissions by sector in a business-as-usual scenario, 2016-2050.

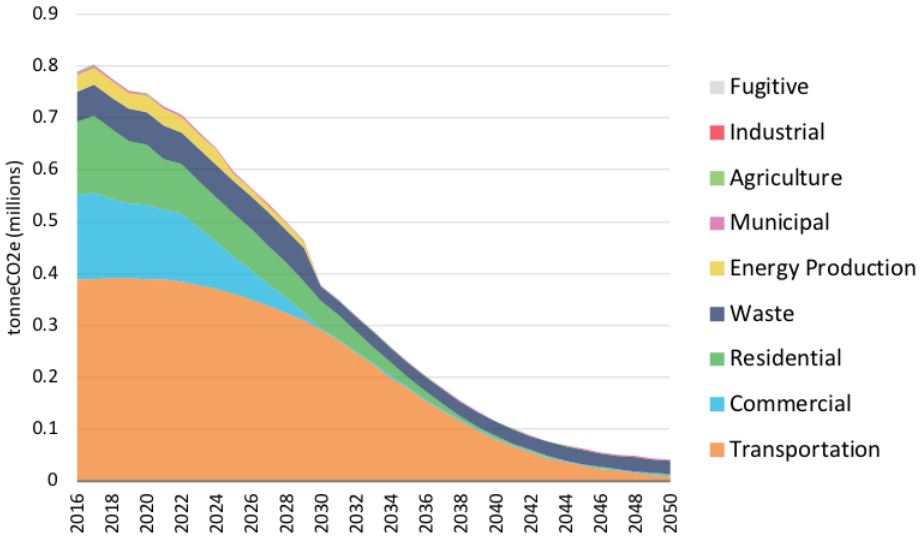


Figure 7. Community greenhouse gas emissions by sector in a net-zero scenario, 2016-2050.

Table 6. Community greenhouse gas emissions by fuel in 2016 and in 2050 in a business-as-usual and in a net-zero scenario.

Emissions by source (tCO2e)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/- 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Diesel	46,148	6%	31,491	5%	7,913	20%	-83%	-75%
Fuel Oil	177,213	22%	142,672	25%	1,087	3%	-99%	-99%
Gasoline	274,028	35%	196,017	34%	269	1%	-100%	-100%
Grid Electricity	68,044	9%	5,620	1%	2,924	7%	-96%	-48%
Jet Fuel	69,734	9%	69,734	12%	0	0%	-100%	-100%
Non-energy	58,881	7%	46,604	8%	26,401	66%	-55%	-43%
Propane	64,360	8%	64,593	11%	1,617	4%	-97%	-97%
Wood	3	0%	3	0%	2	0%	-33%	-33%
Total	**789,417**	**100%**	**573,307**	**100%**	**40,213**	**100%**	**-95%**	**-93%**

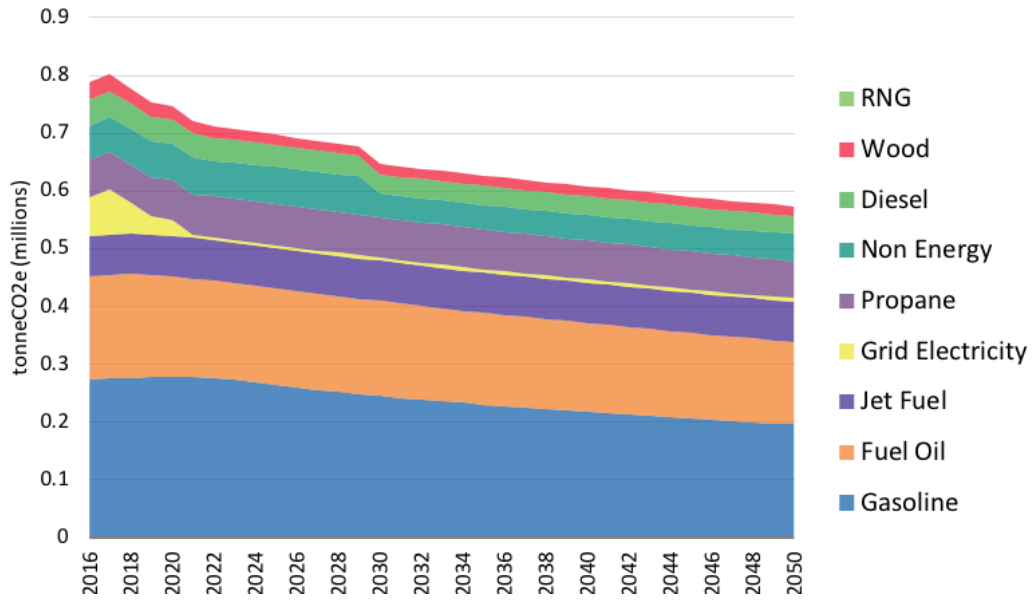


Figure 8. Community greenhouse gas emissions by fuel in a business-as-usual scenario, 2016-2050.

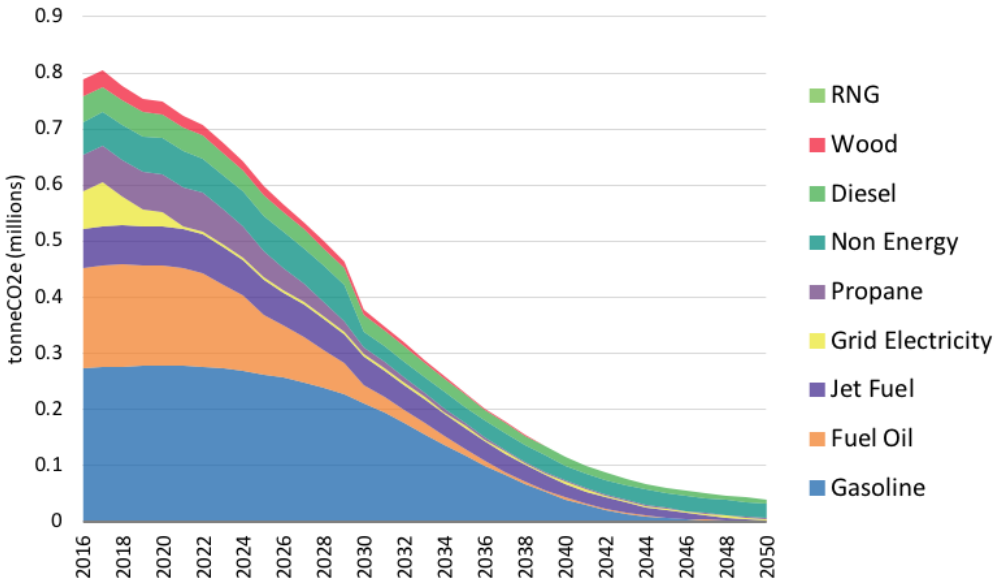


Figure 9. Community greenhouse gas emissions by fuel in a net-zero scenario, 2016-2050.

Buildings Energy and Emissions

Table 7. Buildings energy use in 2016 and in 2050 in a business-as-usual and in a net-zero scenario, by fuel.

Energy by end use (GJ)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/- 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Industrial Processes	138,736	1%	173,046	2%	117,101	2%	-16%	-32%
Lighting	714,956	6%	769,070	7%	404,589	8%	-43%	-47%
Major Appliances	363,034	3%	419,242	4%	287,172	6%	-21%	-32%
Plug Load	1,690,499	15%	1,759,888	17%	959,741	19%	-43%	-45%
Space Cooling	233,115	2%	452,153	4%	64,271	1%	-72%	-86%
Space Heating	7,020,732	63%	5,773,626	55%	2,860,857	57%	-59%	-50%
Water Heating	1,030,177	9%	1,065,628	10%	319,907	6%	-69%	-70%
Total	**11,191,249**	**100%**	**10,412,655**	**100%**	**5,013,637**	**100%**	**-55%**	**-52%**

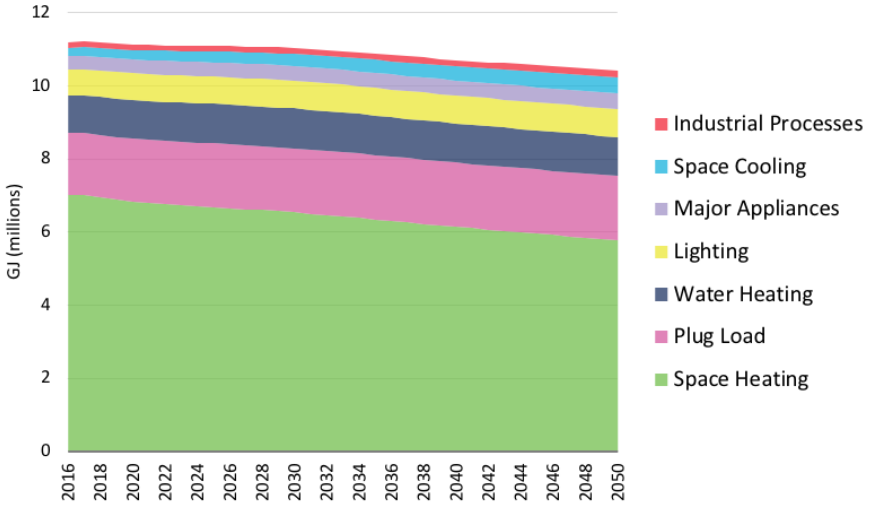


Figure 10. Building energy use by end use in a business-as-usual scenario, 2016-2050.

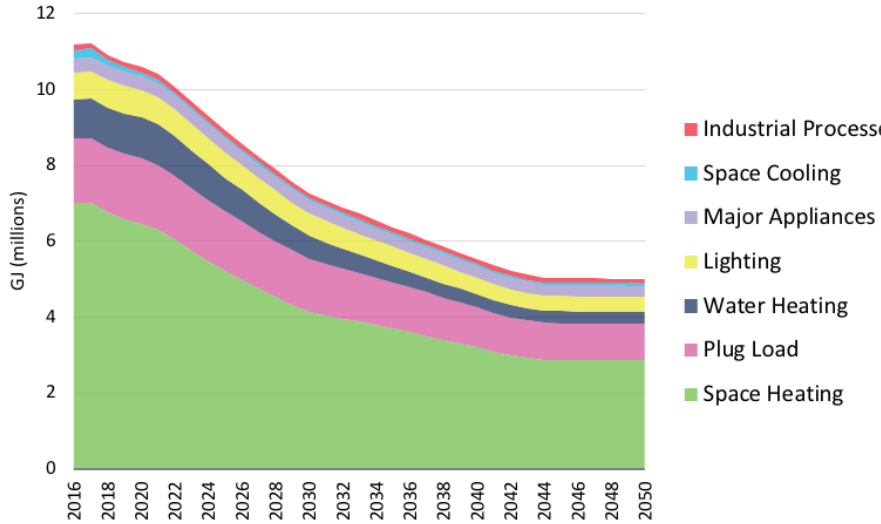


Figure 11. Building energy use by end use in a net-zero scenario, 2016-2050.

Table 8. Buildings energy use in 2016 and in 2050 in a business-as-usual and in a net-zero scenario, by fuel.

Energy by fuel (GJ)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/- 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Ambient	0	0%	0	0%	1,843,677	37%	100%	100%
Diesel	7,538	0%	10,043	0%	6,695	0%	-11%	-33%
District Energy	288,025	3%	237,347	2%	119,943	2%	-58%	-49%
Fuel Oil	2,047,977	18%	1,640,875	16%	15,260	0%	-99%	-99%
Grid Electricity	6,616,748	59%	6,832,858	66%	2,416,636	48%	-63%	-65%
Local Electricity	0	0%	1,056,078	10%	577,270	12%	100%	-45%
Propane	1,052,276	9%	11,572	0%	26,441	1%	-97%	128%
RNG	11,478	0%	623,884	6%	7,715	0%	-33%	-99%
Wood	1,167,207	10%	10,412,655	100%	0	0%	-100%	-100%
Total	**11,191,249**	**100%**	**10,043**	**0%**	**5,013,637**	**100%**	**-55%**	**-52%**

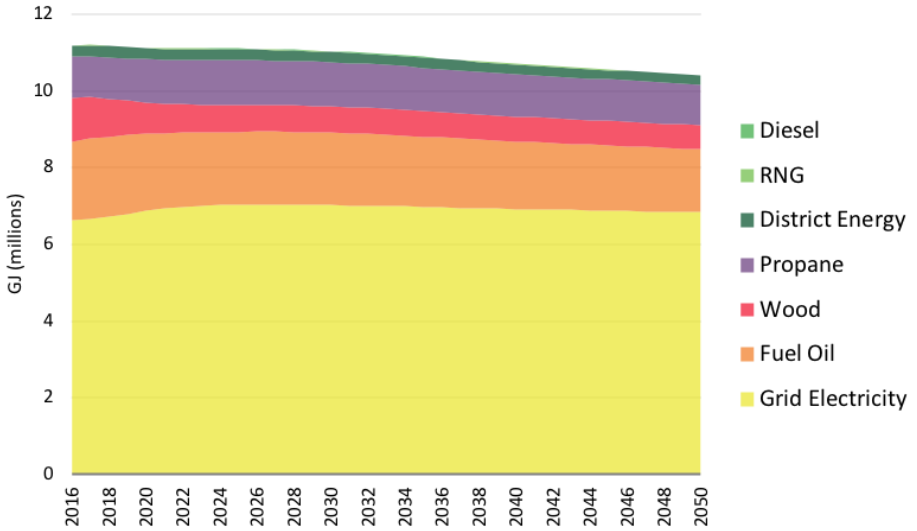


Figure 12. Building energy use by end use in a business-as-usual scenario, 2016-2050.

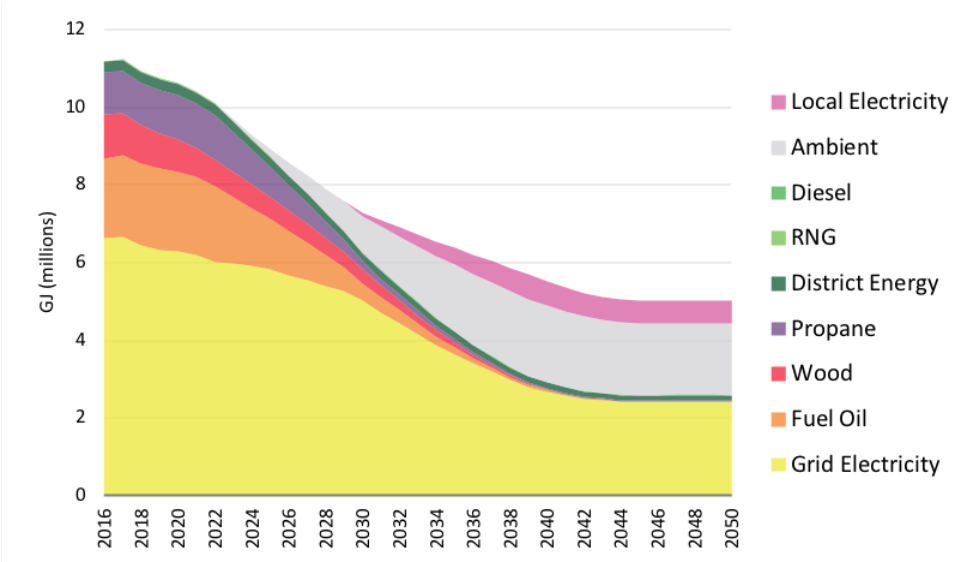


Figure 13. Building energy use by end use in a net-zero scenario, 2016-2050.

Table 9. Buildings greenhouse gas emissions in 2016 and in 2050 in a business-as-usual and in a net-zero scenario, by end use.

Emissions by end use (tCO2e)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/- 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Industrial Processes	2,879	1%	2,468	1%	1,633	32%	-43%	-34%
Lighting	7,351	2%	607	0%	258	5%	-96%	-58%
Major Appliances	3,733	1%	331	0%	183	4%	-95%	-45%
Plug Load	19,876	6%	4,417	2%	2,160	42%	-89%	-51%
Space Cooling	2,397	1%	357	0%	41	1%	-98%	-89%
Space Heating	236,716	76%	161,846	79%	582	11%	-100%	-100%
Water Heating	36,668	12%	33,959	17%	234	5%	-99%	-99%
Total	**309,618**	**100%**	**203,984**	**100%**	**5,090**	**100%**	**-98%**	**-98%**

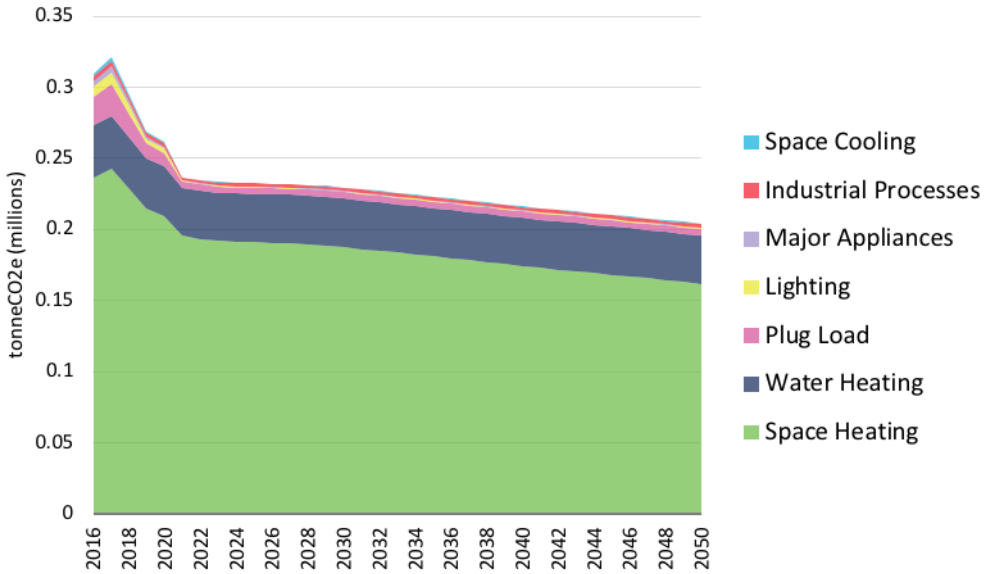


Figure 14. Building greenhouse gas emissions by end use in a net-zero scenario, 2016-2050.

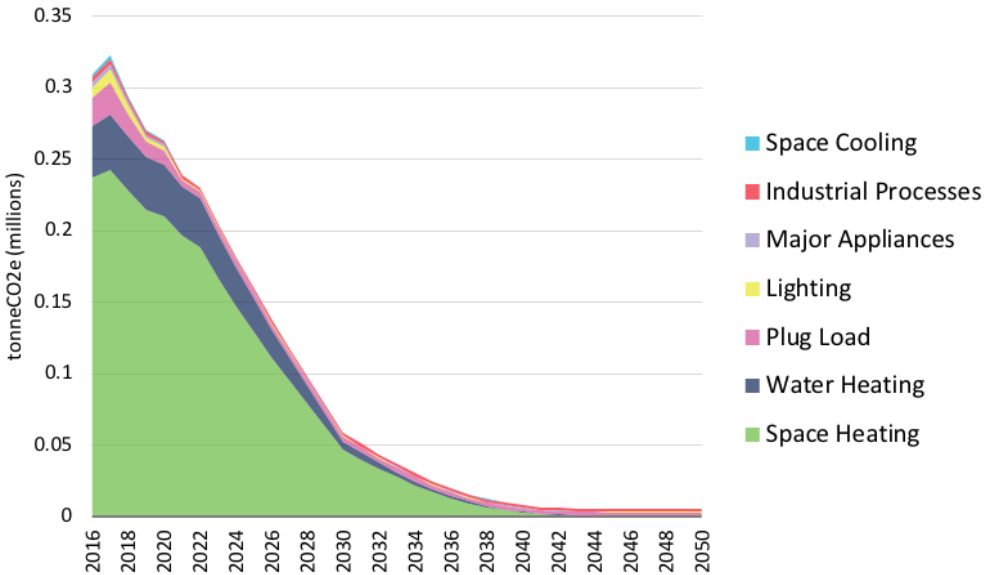


Figure 15. Building greenhouse gas emissions by end use in a net-zero scenario, 2016-2050.

Table 10. Buildings greenhouse gas emissions in 2016 and in 2050 in a business-as-usual and in a net-zero scenario, by fuel.

Emissions by fuel (tCO2e)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/- 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Diesel	537	0%	715	0%	477	9%	-11%	-33%
Fuel Oil	145,679	47%	116,706	57%	1,087	21%	-99%	-99%
Grid Electricity	68,031	22%	5,393	3%	1,907	37%	-97%	-65%
Propane	64,360	21%	64,593	32%	1,617	32%	-97%	-97%
RNG	3	0%	3	0%	2	0%	-33%	-33%
Wood	31,008	10%	16,574	8%	0	0%	-100%	-100%
Total	**309,618**	**100%**	**203,984**	**100%**	**5,090**	**100%**	**-98%**	**-98%**

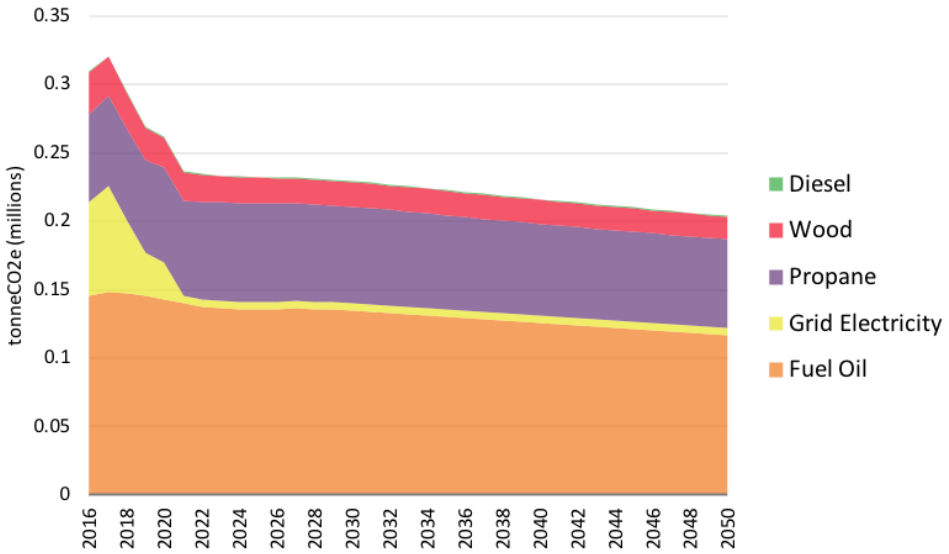


Figure 16. Building greenhouse gas emissions by fuel in a business-as-usual, 2016-2050.

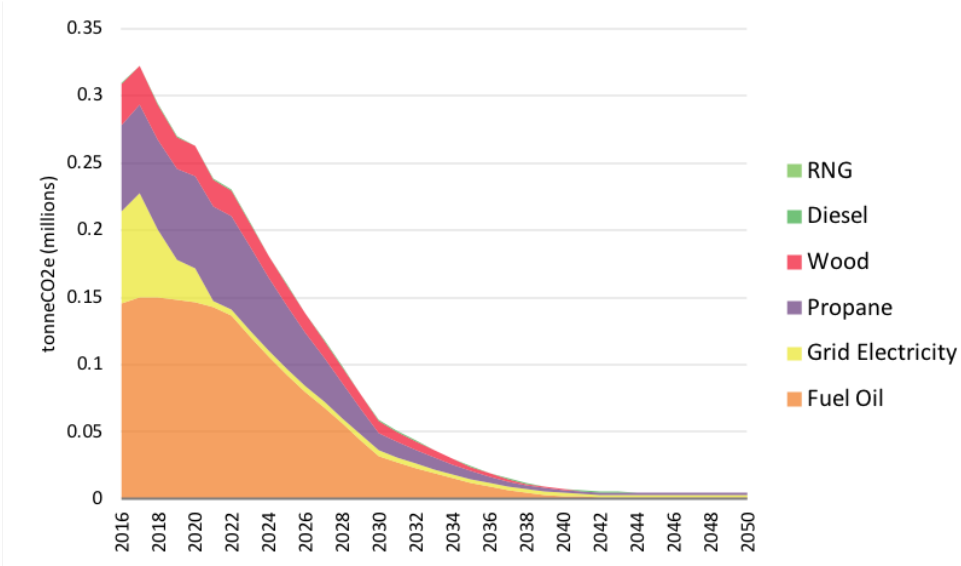


Figure 17. Building greenhouse gas emissions by fuel in a net-zero scenario, 2016-2050.

Transportation Energy and Emissions

Table 11. Transportation energy use in 2016 and in 2050 in a business-as-usual and in a net-zero scenario, by fuel.

Energy by fuel (GJ)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/- 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Diesel	472,741	10%	266,408	8%	22,315	2%	-95%	-92%
Gas	4,120,829	90%	2,947,728	84%	4,037	0%	-100%	-100%
Grid electricity	1,180	0%	287,772	8%	1,134,385	79%	960,53%	294%
Local electricity	4,594,750	100%	3,501,909	100%	270,975	19%	100%	100%
Total	472,741	10%	266,408	8%	1,431,711	100%	-69%	-59%

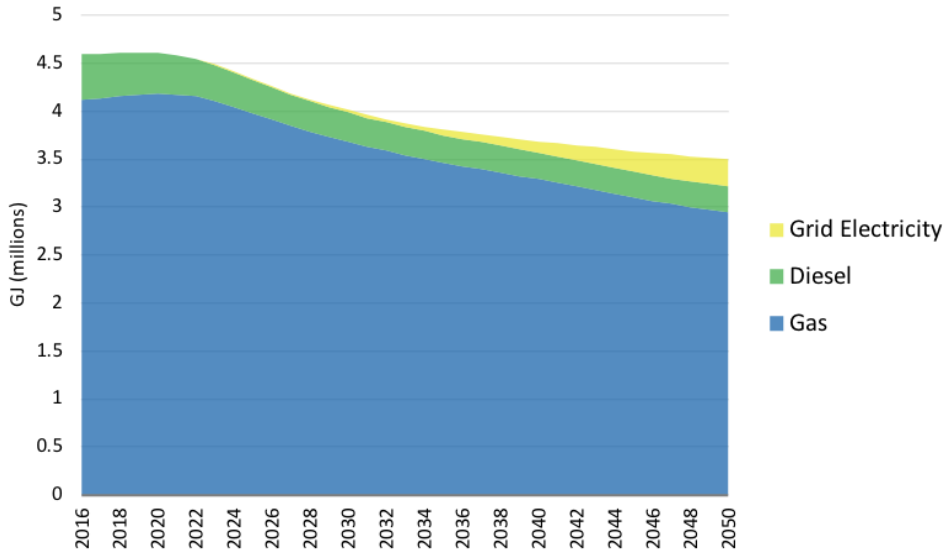


Figure 18. Transportation energy use by fuel in a business-as-usual scenario, 2016-2050.

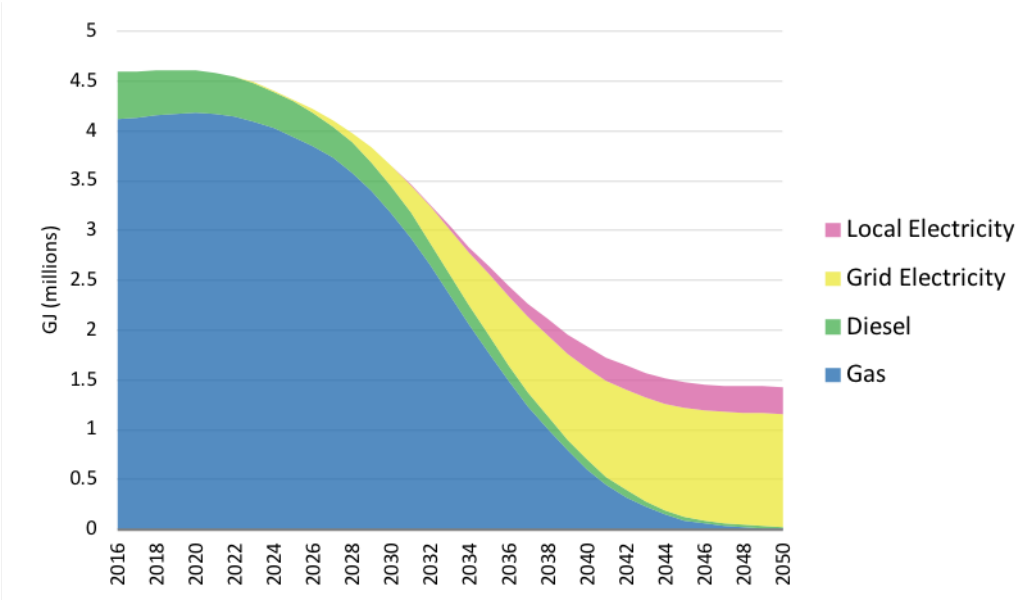


Figure 19. Transportation energy use by fuel in a net-zero scenario, 2016-2050.

Table 11. Transportation energy use in 2016 and in 2050 in a business-as-usual and in a net-zero scenario, by vehicle type.

Energy by vehicle (GJ)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/ 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Car	3,298,242	72%	1,161,231	33%	467,351	33%	-86%	-60%
Heavy truck	146,173	3%	103,196	3%	42,384	3%	-71%	-59%
Light truck	1,067,866	23%	2,155,013	62%	894,655	62%	-16%	-58%
Urban bus	82,469	2%	82,469	2%	27,322	2%	-67%	-67%
Total	4,594,750	100%	3,501,909	100%	1,431,711	100%	-69%	-59%

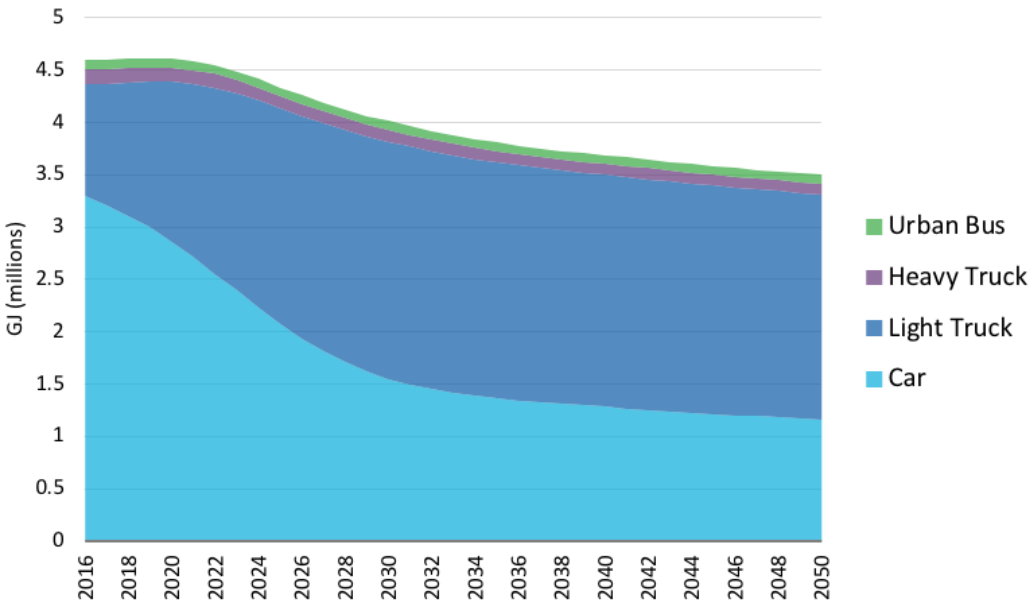


Figure 20. Transportation energy use by vehicle type in a business-as-usual scenario, 2016-2050.

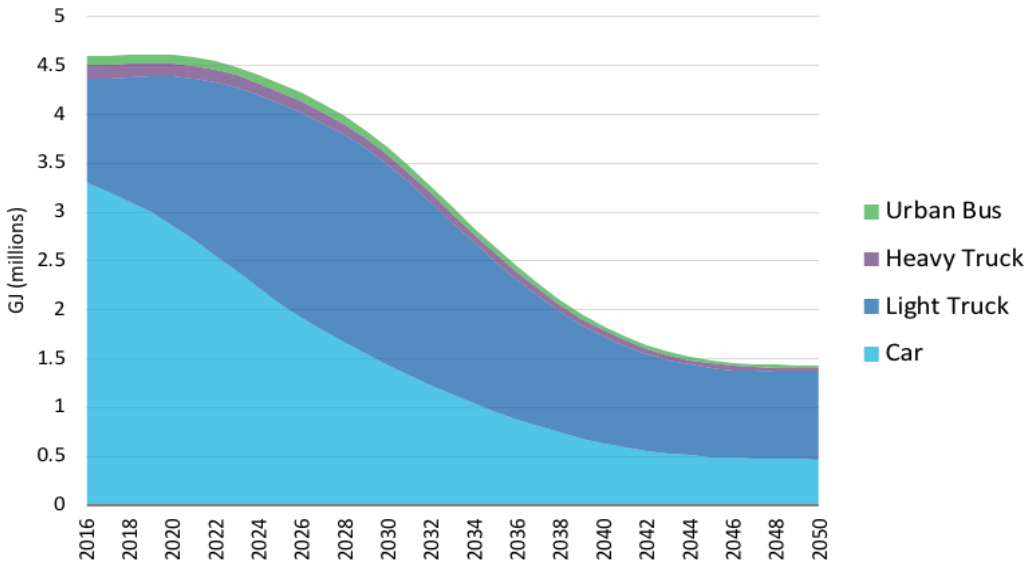


Figure 21. Transportation energy use by vehicle type in a net-zero scenario, 2016-2050.

Table 12. Transportation greenhouse gas emissions in 2016 and in 2050 in a business-as-usual and in a net-zero scenario, by fuel.

Emissions by source (tCO2e)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/ 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Diesel	45,611	12%	30,776	10%	7,436	86%	-84%	-76%
Gasoline	274,028	70%	196,017	66%	269	3%	-100%	-100%
Grid electricity	12	0%	227	0%	922	11%	7,503%	306%
Jet fuel	69,734	18%	69,734	23%	0	0%	-100%	-100%
Total	389,384	100%	296,754	100%	8,627	100%	-98%	-97%

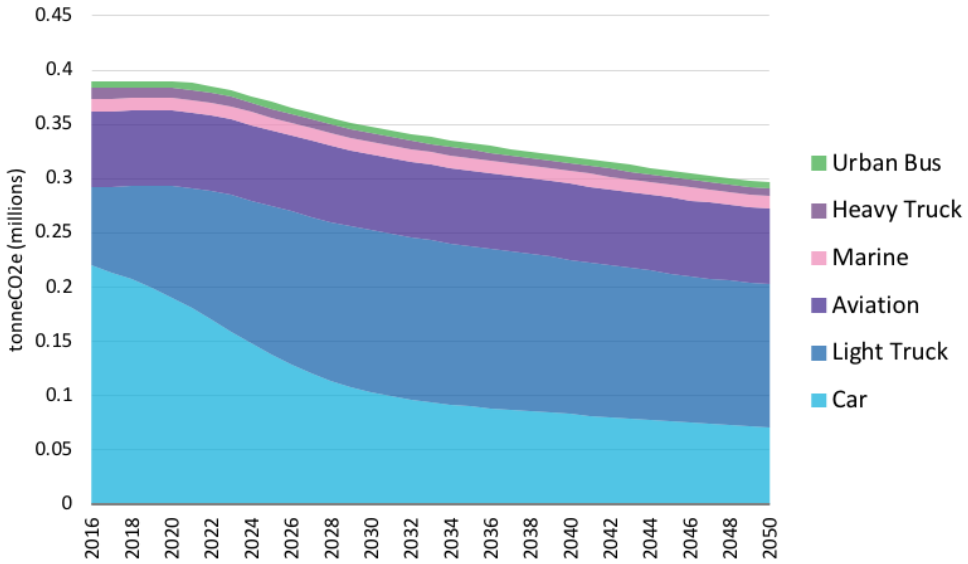


Figure 22. Transportation greenhouse gas emissions, by vehicle type, in a business-as-usual scenario, 2016 to 2050.

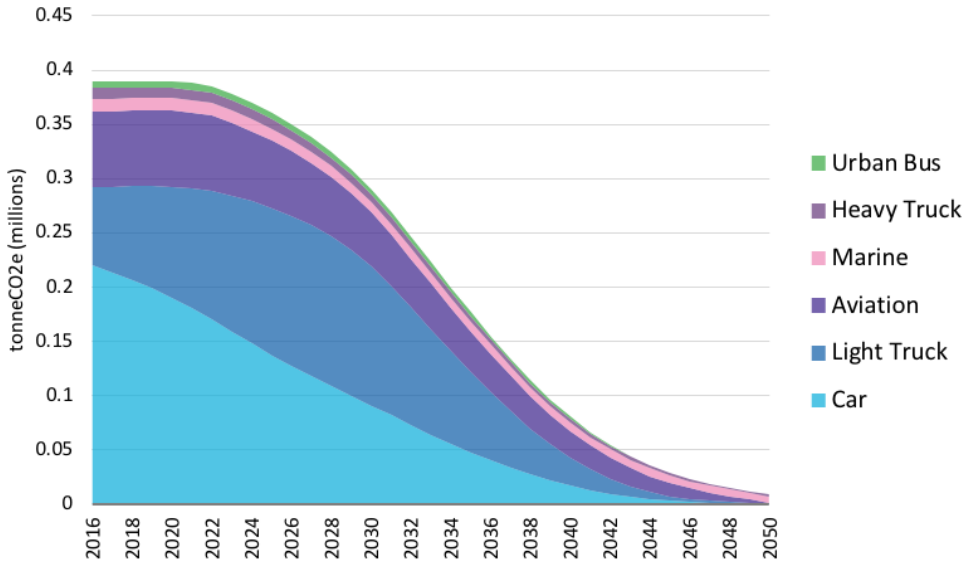


Figure 23. Transportation greenhouse gas emissions, by vehicle type, in a net-zero scenario, 2016 to 2050.

Table 13. Transportation greenhouse gas emissions in 2016 and in 2050 in a business-as-usual and in a net-zero scenario, by vehicle type.

Emissions by vehicle (tCO2e)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/ 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Aviation	69,734	18%	69,734	23%	0	0%	-100%	100%
Car	219,829	56%	71,019	24%	370	4%	-100%	-99%
Heavy truck	10,440	3%	7,134	2%	1,603	19%	-85%	-78%
Light truck	71,782	18%	131,275	44%	770	9%	-99%	-99%
Marine	11,681	3%	11,681	4%	5,868	68%	-50%	-50%
Urban bus	5,919	2%	5,911	2%	17	0%	-100%	-100%
Total	389,384	100%	296,754	100%	8,627	100%	-98%	-97%

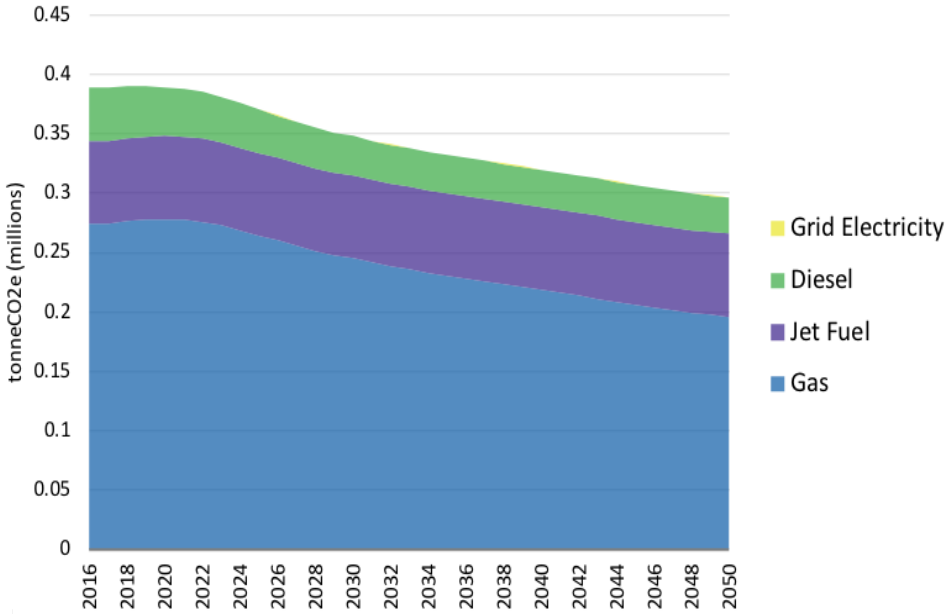


Figure 24. Transportation greenhouse gas emissions, by fuel, in a business-as-usual scenario, 2016 to 2050.

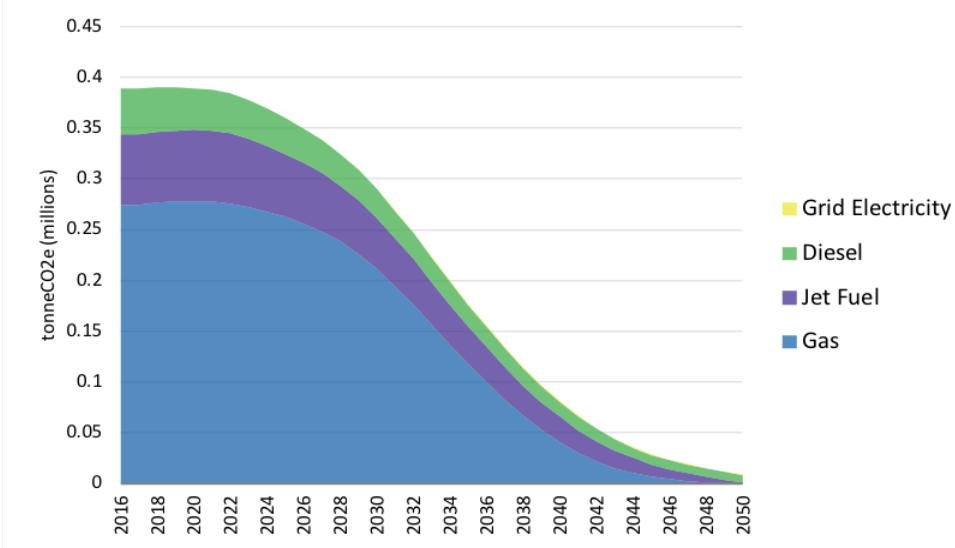


Figure 25. Transportation greenhouse gas emissions, by fuel, in a net-zero scenario, 2016 to 2050.

Waste Emissions

Table 14. Waste greenhouse gas emissions, by waste type in 2016 and in 2050 in a business-as-usual and in a net-zero scenario.

Emissions by source (tCO2e)	2016	share 2016	2050 (BAU)	share 2050	2050 NZS	share 2050	% +/ 2016-2050 NZS	% +/- 2050 BAU-2050 NZS
Biological (compost)	0	0%	0	0%	2,185	8%	100%	100%
Landfill	33,354	57%	40,440	87%	18,056	68%	-46%	-55%
Wastewater	25,514	43%	6,150	13%	6,150	23%	-76%	0%
Total	**58,867**	**100%**	**46,590**	**100%**	**26,391**	**100%**	**-55%**	**-43%**

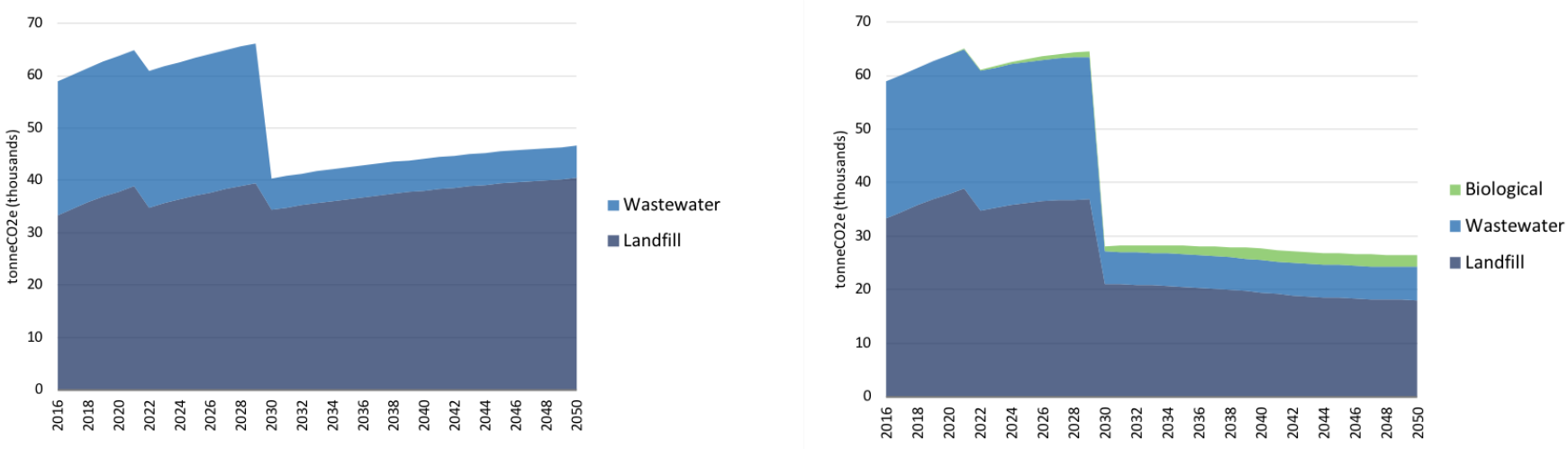


Figure 26. Waste emissions, by waste type, in a business-as-usual and net-zero scenario, 2016 to 2050.

Appendix B: St. John's Energy Transition Economic and Financial Analysis

October 2021

Purpose of this Document

This document provides a summary of the projected costs, revenues, and savings represented by the City of St. John's Energy Transition, on the whole and on an action-by-action basis. It also provides an overview of some of the Energy Transition's broader economic impacts, such as on jobs and household energy costs.

Contents

DISCLAIMER

Reasonable skill, care, and diligence have been exercised to assess the information acquired during the preparation of this analysis, but no guarantees or warranties are made regarding the accuracy or completeness of this information. This document, the information it contains, the information and basis on which it relies, and the associated factors are subject to changes that are beyond the control of the author. The information provided by others is believed to be accurate but has not been verified.
This analysis includes strategic-level estimates of capital investments and related revenues, energy savings, and avoided costs of carbon represented by the proposed Energy Transition. The intent of this analysis is to help inform project stakeholders about the potential costs and savings represented by the Energy Transition in relation to the modelled reference scenario. It should not be relied upon for other purposes without verification. The authors do not accept responsibility for the use of this analysis for any purpose other than that stated above and do not accept responsibility to any third party for the use, in whole or in part, of the contents of this document.

This analysis applies to the City of St. John's and cannot be applied to other jurisdictions without further analysis. Any use by the City of St. John's, its sub-consultants or any third party, or any reliance on or decisions based on this document, is the responsibility of the user or third party.

Acronyms

BAP	business-as-planned
GHG	greenhouse gas
NPV	net present value
NZS	net zero scenario
MAC	marginal abatement cost
MACC	marginal abatement cost curve
PV	present value

Units

CO2e	carbon dioxide equivalents
kWh	kilowatt hour

Overview

The following table highlights the key findings from the financial analysis of the net-zero scenario modelled for the City of St. John's Energy Transition. Further details about what is captured in each financial estimate are provided in the body of the report, as indicated in the right-hand column.

Table 1. Summary of high-level financial analysis of St. John's' Energy Transition.

Financial estimate	Key results	Where to find further details
The net benefit of the Energy Transition investments, 2022-2089	*≈ $1.788 billion, NPV.*	NPV, Figure 4
Total incremental capital investment, 2022-2050	*≈ $5.46 billion NPV.*	NPV and MAC Values
Total savings (avoided energy maintenance and carbon costs), 2022-2089[11]	*≈ $7.00 billion, NPV.*	Cash Flow Analysis
Total revenue, 2022-2089	*≈ 246 million, NPV.*	Cash Flow Analysis
Average cost to reduce each tonne of GHG	*≈ $167 in savings, NPV.*	Table 3
Top 5 most cost-effective GHG-reduction actions ($/ tonne CO2e)	1. *Large scale wind ≈ $5,466 in savings* 2. *New residential buildings ≈ $940 in savings* 3. *Transit expansion & electrification ≈ $836 in savings* 4. *Municipal fleet electrification: ≈ $588 in savings* 5. *New commercial & industrial buildings: ≈$572 in savings*	Table 3
Household savings on energy, average in 2050	*≈ $4,324*	Pt. 2, Cost Savings for Households

[11] While the capital investments in the Energy Transition all occur by 2050, the savings and revenue from many of those investments continue well beyond 2050 and are tracked in this analysis to the year 2089.

What Is and Is Not Included

The following five categories of costs and savings are included in this financial analysis:

1. capital costs,
2. maintenance costs,
3. revenues,
4. energy costs/savings, and
5. carbon cost savings.

Neither are the operating costs associated with actions (e.g., administration, education, or marketing costs) or the avoided costs of additional central electricity capacity included in the financial analysis.

Where defensible cost and savings are not identified for particular actions, they are excluded from the financial analysis. As a result, the following Energy Transition actions are not included in this financial analysis:

- active transportation mode share increase,
- organics waste diversion,
- marine fuel efficiency, and
- aviation fuel net-zero by 2050.

Part 1. Key Financial Analysis Concepts

The direct financial impacts of St. John's' Energy Transition provide important context for local decision-makers. However, it is important to note that the direct financial impacts are a secondary motivation for undertaking actions that reduce greenhouse gas (GHG) emissions. First and foremost, GHG reductions are a critical response to the global climate emergency. In addition, most measures included in the Energy Transition provide social goods to the community, such as net job creation and positive health outcomes. These benefits are only marginally captured in this financial analysis via the cost of carbon.

Key concepts that are used to analyze the financial impacts of the Energy Transition are summarized below.

Costs Are Relative to the BAP

This financial analysis tracks projected costs and savings associated with net-zero measures that are above and beyond the assumed "reference" costs under a business-as-planned (BAP) scenario, which is a projection of current plans and policies.

Discount Rate

The discount rate is the baseline growth value an investor places on their investment dollar. A project is considered financially beneficial by an investor if it generates a real rate of return equal to or greater than their discount rate.

An investor's discount rate varies with the type of project, the duration of investment, risk, and the scarcity of capital.

The social discount rate is the discount rate applied for comparing the value to society of investments made for the common good. As such, it is inherently uncertain and difficult to determine. Some argue that in the evaluation of climate change mitigation investments a very low or even zero discount rate should be applied. In this project, we evaluate investments in a net-zero future with a 3% discount rate.[12]

Net Present Value

The net present value (NPV) of an investment is the difference between the present value (PV) of the future stream of savings and revenue generated by the investment and the capital investment.

NPV= (PV savings + PV revenue) - PV capital investment

Five aggregate categories are used to track the financial performance of the net-zero actions in this analysis: capital expenditures, energy savings (or additional costs), carbon cost savings (assuming the carbon price reaches $170/tonne CO2e in 2050 and is held constant thereafter),

[12] 3% is the social discount rate recommended by the Treasury Board of Canada (Treasury Board of Canada Secretariat, Canadian Cost-Benefit Analysis Guide Regulatory Proposals, 2007, at 38). A social discount rate is recommended for instances where:

- A regulatory proposal primarily affects private consumption of goods and services
- A regulatory proposal's impacts occur over the long term (50 years or more)

(Treasury Board of Canada, 'Policy on Cost-Benefit Analysis', policy effective as of September 2018, online: www.canada.ca/en/government/system/laws/developing-improving-federal-regulations/requirements-developing-managing-reviewing-regulations/guidelines-tools/policy-cost-benefit-analysis.html).

operation and maintenance savings, and revenue generation (associated with renewable energy production facilities and some transit actions).

What is NOT included are administrative costs associated with implementing programs, as well as any energy system infrastructure upgrades that may be required. Similarly, the broader social costs that are avoided from mitigating climate change are not included in the financial analysis.

Abatement Cost

The abatement cost of an action is the estimated cost for that action to reduce one tonne of greenhouse gas emissions (GHG) and is calculated by dividing the action's net present value (NPV) by the total GHG emissions it reduces (tCO2e) over its lifetime. For example, if a project has a NPV of $1,000 and generates 10 tCO2e of savings, its abatement cost is $100 per tCO2e reduced.

Amortization

The costs of major capital investments are typically spread over a period of time (e.g., a mortgage on a house commonly has a 25-year mortgage period). Amortization refers to the process of paying off capital expenditures (debt) through regular principal and interest payments over time. In this analysis, we have applied a 25-year amortization rate to all investments. This period has been selected as it is the average amortization period for home mortgages in Canada, and the majority of the investments included in the plan are similar infrastructure investments.

Energy and Carbon Cost Projections

Energy cost projections are key underlying assumptions in this financial analysis. Our projections were derived from:

- the US Energy Information Administration (propane); and
- the Canadian Energy Regulator (formerly National Energy Board) for all other fuels.

In Newfoundland, electricity costs are projected to increase more rapidly than fuel oil, gasoline, or propane. However, current Federal regulation sets an escalating cost of carbon, reaching $170 per tonne by 2050, which is included in our financial analysis and helps mitigate this growing differential. The projected cost impact of the Federal Clean Fuel Standard on diesel and gasoline were excluded from this analysis, which results in conservative avoided cost estimates.

In addition to the cost of carbon, energy efficiency helps further mitigate the growing cost differential. Electricity is a more efficient source of energy than combusting fossil fuels, which loses energy in waste heat. In addition, the net-zero scenario modelled for St. John's also prioritizes energy efficiency via actions such as building envelope retrofits and increased transit service, which helps reduce energy costs and exposure to energy price fluctuations.

Because energy cost projections are so important to the financial analysis, they were also included in a sensitivity analysis included at the end of this report.

Part 2. City of St. John's Energy Transition Financial Analysis Results

Abatement Costs

As outlined in Table 2 (below), the Energy Transition investments included in this financial analysis yield a positive financial return that translates to a weighted average benefit of $167 per tonne of CO2e reduced.[13] All measures that have a positive abatement cost (i.e., greater costs than benefits) are highlighted in red, all measures with a negative abatement cost (i.e., greater benefits than costs) are highlighted in green.

The most expensive actions are industrial process retrofits, at $497 per tonne of CO2e avoided. This retrofit action is followed closely by tree planting at $490 per tonne of CO2e avoided. The third most expensive action is the residential retrofits at $335 per tonne of CO2e avoided. The commercial retrofits are more cost-effective primarily because their baseline energy sources are more carbon-intensive than residential energy uses. As a result, the commercial retrofits represent greater carbon reductions, which both increases the denominator of their marginal abatement cost (i.e., their costs are spread over more tonnes of carbon) and the avoided cost of carbon.

[13] This average is weighted in terms of actions that reduce more tonnes of GHGs influence the average more than actions that reduce less tonnes of GHGs, The net present value of the measures includes credit for the avoided costs of carbon ($170/tonne CO2e by 2050); if that credit were excluded, the net savings per tonne of GHG mitigated would be correspondingly lower.

Again, it is important to note that the marginal abatement cost for these actions do not capture the savings from avoided increased energy generation infrastructure (i.e., large scale electricity generation facilities) or the ecosystem services they provide (e.g. in the case of tree planting, stormwater management, biodiversity support) which can be significant.

It is also worth noting that the residential and non-residential retrofit actions represent a bundle of three actions (i.e., envelope improvements, heat pumps, and electric water heaters) that are broken out in italics in the table. Depending on how these retrofit programs are designed will affect their costs and long-term impact on the electricity grid and customer energy bills. In our modelling approach we have prioritized energy efficiency to reduce the pressure on central grid capacity and the sizing of new heating and cooling equipment.

Large scale wind generation has the lowest cost per tonne of GHG reduction, at an estimated savings of over $5,465 per tonne of CO2e avoided. The basis for the assumed profitability of this action is a guaranteed cost per kwh produced, in line with historic wind power purchase agreements on the island (i.e., 0.069 kwh, an average of the Fermeuse and St.Lawrence power purchase agreements). Any potential costs required to connect wind turbines to the grid, prepare the site, and obtain environmental approvals are not included in the marginal abatement cost.

Reviewing the following table action-by-action requires understanding the action's sequencing in the model (i.e., what the action is offsetting), which is not provided here as it would require a complex and lengthy model description. For this reason, what is most important when looking at the following table is the abatement cost for the entire plan, as well as identifying which actions are considered to have a positive versus negative abatement cost. Measures with a *positive* net present value (i.e., where the investment has a positive return of at least 3%) will therefore have a *negative* abatement cost (i.e., they would be worth doing even without consideration of the carbon benefits), whereas measures with a *negative* net present value will have a *positive* abatement cost (i.e., these are measures with returns less than 3%). For example, electrifying personal vehicles has a high net-present value because of the high savings associated with increased efficiency of electric cars combined with the avoided cost of carbon and the fact that the investment costs are projected to decrease.

Table 2. Net present value and marginal abatement costs by action.

Decarbonization Action	Average Annual Emissions Reduction (t CO2e)	Cumulative Emissions Reduction (kt CO2e)	Net Present Value	Marginal Abatement Cost ($ / t CO2 e)
New Residential Buildings	6,679	194	-$182,092,639	-$940
New Non-Residential Buildings[14]	10,241	297	-$169,798,954	-$572
Residential Retrofits	57,823	1,677	$561,812,118	$335
Envelope		*617*	*$1,228,781,879*	*$1,990*
Heat pumps		*899*	*-$537,410,511*	*-$598*
Water heaters		*161*	*-$41,745,488*	*-$260*
Non-Residential Retrofits[15]	88,237	2,559	-$332,080,975	-$130
Envelope		*1,158*	*$509,408,450*	*$440*
Heat pumps		*1,025*	*-$699,697,531*	*-$682*
Water heaters		*376*	*-$29,265,288*	*-$78*
Municipal Retrofits	1,502	44	$7,102,278	$163
Industrial Processes[16]	437	13	$6,295,261	$497
District Energy[17]	22,937	665	-$105,598,859	-$159
Transit Expansion and Electrification	4,178	121	-$101,357,712	-$836
Electrify Municipal Fleet	1,779	52	-$29,928,509	-$580
Electrify Personal Use Vehicles	106,756	3,096	-$1,063,989,651	-$344
Electrify Commercial Use Vehicles	6,127	178	-$53,138,951	-$299
Landfill Gas Capture	7,060	205	$8,270,033	$40

[14] 'Non-Residential' includes commercial and industrial buildings.
[15] *Ibid.*
[16] 'Industrial Processes' includes energy uses other than envelope improvements, e.g., lighting systems, space heating, water heating, motive energy, and process heat.
[17] 'District Energy' here refers to the oil-fuelled heating system at Memorial University.

Wind Generation	396	11	-$62,734,084	-$5,465
Urban Forest Management	9	0.25	$120,999	$490
				AVERAGE -$167

Marginal Abatement Cost Curve

Figure 1 shows the marginal abatement cost curve (MACC) for measures included in the City of St. John's' Energy Transition.

While a MACC illustrates the financial profile of the suite of actions, it is an imperfect indicator. The presentation of the MACC implies that the actions are a menu from which individual actions can be selected. In fact, many of the actions are dependent on each other. For example, the energy use costs increase without retrofits. In addition, in order to achieve the Town's target all the actions need to be undertaken, as soon as possible. Delaying action for any reason, including waiting for technological improvements, will reduce the savings that can be achieved for households and businesses, and the new employment opportunities created.

The MACC provides useful insights that guide implementation planning. It helps answer critical questions, such as:

- Can high-cost and high-savings actions be bundled to achieve greater GHG emissions reductions?
- How can the Town help reduce the costs of the high-cost actions by supporting innovation or by providing subsidies?
- Which actions both save money and reduce the most GHG emissions? These can be considered "big" moves.
- Which actions are likely to be of interest to the private sector, assuming barriers can be removed or supporting policies introduced?

Such insights are illustrated in Figure 2.

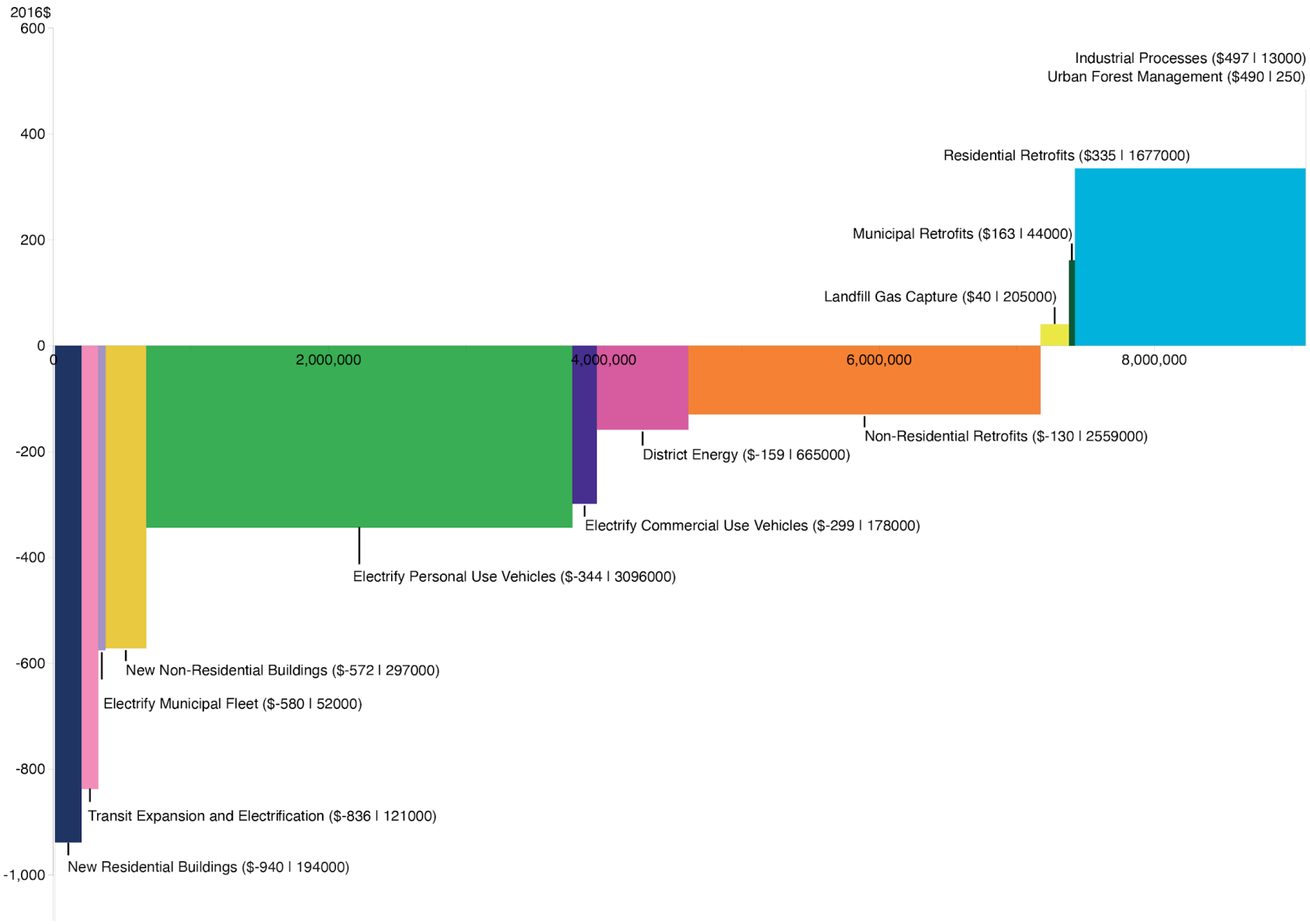


Figure 1. The Marginal Abatement Cost Curve (MACC) for the actions included in the Energy Transition.

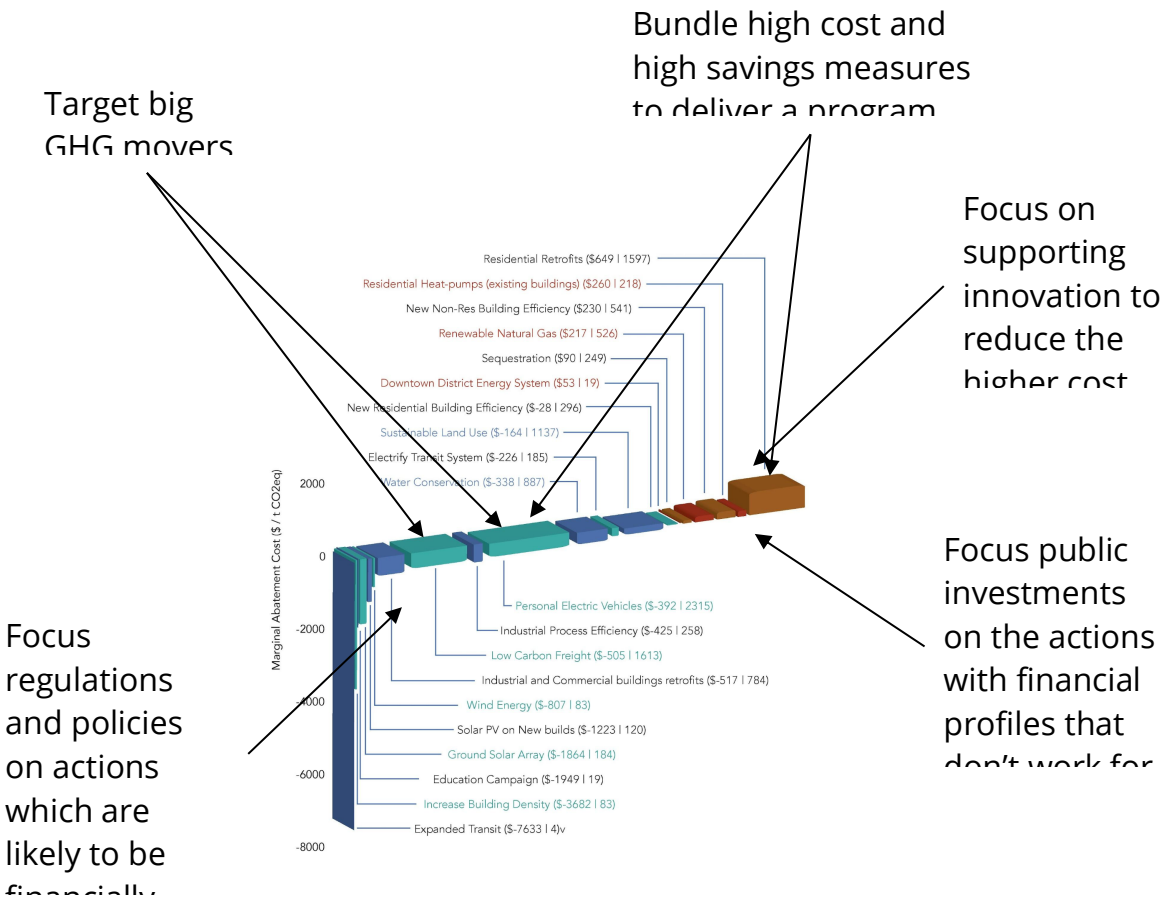


Figure 2. Examples of the strategic uses of a marginal abatement cost curve analysis.

Present and Net Present Values

As noted in the previous section, most of the actions in the net-zero scenario have positive net present values, as does the program of investments as a whole. Figure 3 shows the present value of the major components of the Energy Transition: investments, operations and maintenance savings, fuel and electricity savings, avoided costs of carbon, and revenue from transit and local energy generation. After discounting at 3%, the investments in the program have a present value of $5.5 billion and the savings, avoided cost of carbon, and revenue have a present value of $7.25 billion. The NPV of the whole scenario is $1.788 billion.

Even though capital investment for the plan ends in 2050, the NPV includes the energy, maintenance, carbon costs savings and projected revenue over the full life of the measures, which, in some cases, extends as far as 2089.

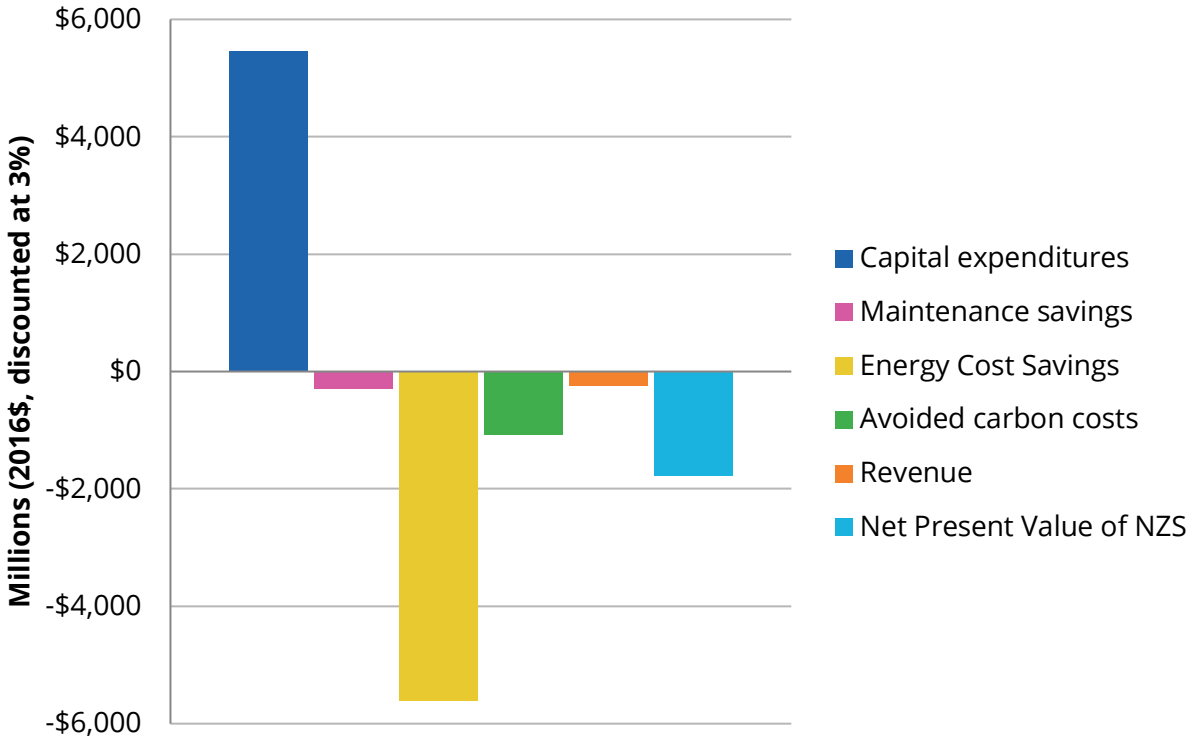


Figure 3. Present values of net-zero scenario costs, and savings, and net present value of the net-zero scenario. Costs are positive in this convention, and revenue and savings are negative.

Cash Flow Analysis

The annual costs, savings, and revenue associated with fully implementing the actions in the Energy Transition are shown in detail in Figure 4 and Table 4, with capital expenditures shown in full in the years in which they are incurred. (Please review the section 'What Is and Is Not Included', above.)

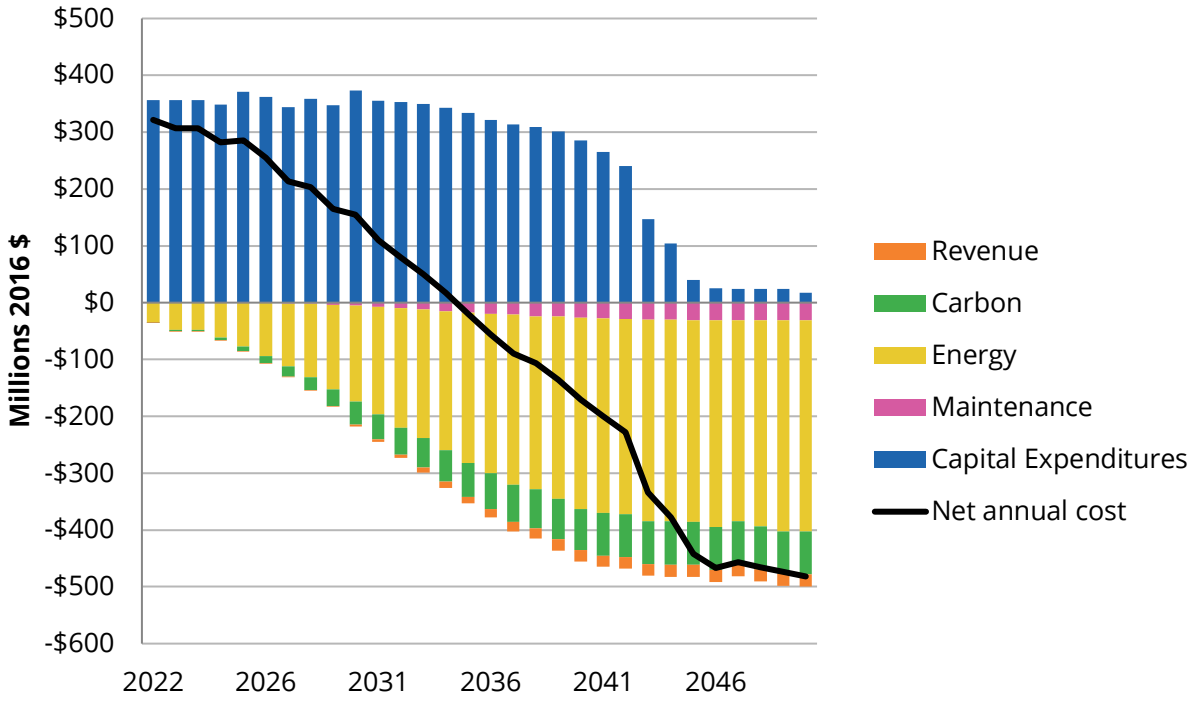


Figure 4. Capital expenditures vs. savings and revenues from the net-zero scenario, 2022-2050.

Table 4. Annual (2030, 2035, 2040, 2045, and 2050) and overall net-zero scenario capital expenditures and savings.

	$ Millions *(negative costs = savings)*					
	2030	2035	2040	2045	2050	Net Present Value
Capital Expenditures	$373	$333	$285	$40	$18	**$5,458**
Maintenance	-$5	-$17	-$27	-$31	-$31	**-$306**
Energy	-$169	-$264	-$337	-$355	-$372	**-$5,617**
Cost of Carbon	-$41	-$60	-$72	-$76	-$75	**-$1,076**
Revenue	-$3	-$12	-$20	-$21	-$22	**-$246**
Net Cost	$155	-$20	-$171	-$442	-$482	**-$1,788**

As is characteristic of net-zero transitions, the capital expenditures in the early years of the transition are significantly greater than the savings and revenues generated, but, by 2035, the annual benefits exceed the annual investments and the cumulative benefits are greater than the cumulative costs.

Figure 5 presents the same costs and benefits, but with the capital expenditures amortized over 25 years at 3%. With this approach, which presumably better reflects actual approaches for financing the transition, the annualized capital payments are about equal to the savings and revenue generation from 2024. On an annual basis, the program never has a significant annual deficit; there is a net annual benefit that grows steadily throughout the 2020s. By 2050, the annual net benefit is over $100 million. After 2050 (not shown in Figure 5), the benefits and revenues continue, resulting in continuing growth in the net annual benefit in the post-2050 period.

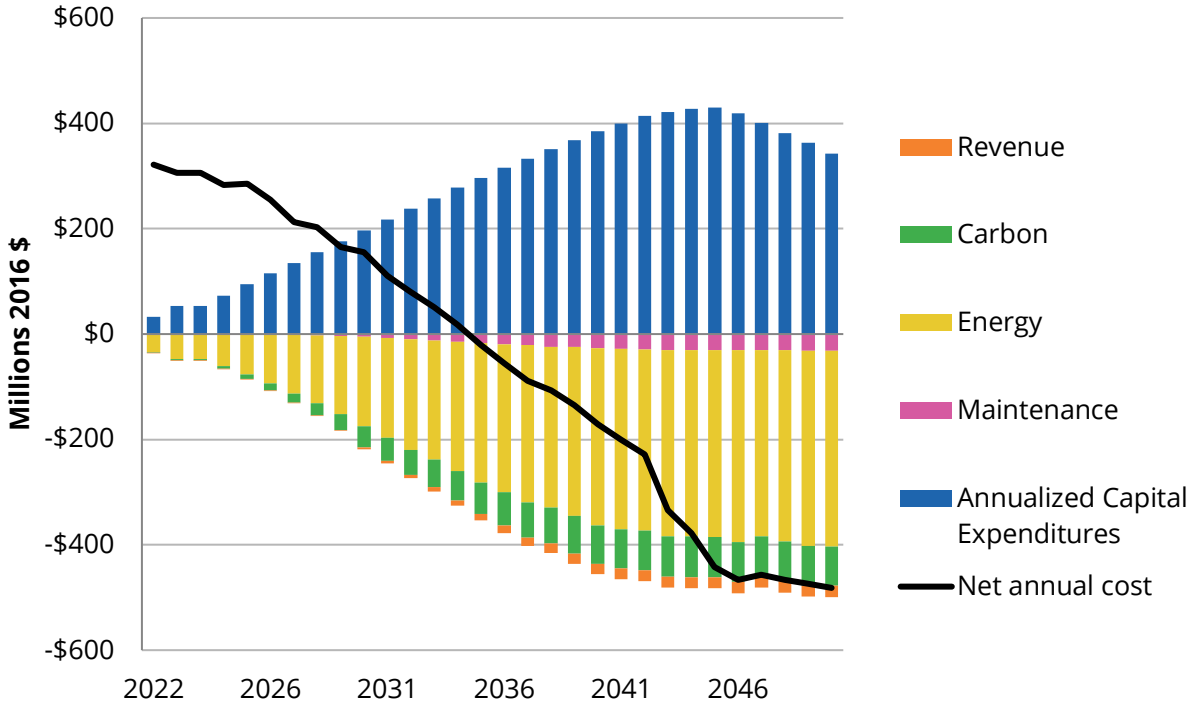


Figure 5. Annualized capital expenditures vs. savings and revenue from the net-zero scenario, 2022-2050.

Cost Savings for Households

According to CUSP (Canadian Urban Sustainability Practitioners) energy poverty is considered to exist when a household spends more than 6% of its after-tax income on energy.[18] Newfoundland and Labrador has some of the highest rates of energy poverty in Canada.[19] In 2016, the average St. John's household spent about 9% of their after tax income on energy—electricity, oil, gasoline, and diesel.[20] Keeping energy costs low, especially for low-income households, is critical for any climate action plan that aims to achieve improved equity, local economic growth, and public buy-in.

Household expenditures on energy are projected to slightly increase in the BAP and decline quite significantly in the net-zero scenario (see Figure 6). In the BAP, household energy expenditures increases are somewhat mitigated because vehicles become more efficient due to national fuel efficiency standards and because of decreased heating requirements as the climate becomes milder due to climate change. They are projected to increase primarily because of the federal price on carbon.

The net-zero scenario involves shifting away from oil and gasoline to electricity, a more costly energy source. The increased cost of electricity, however, is offset by the increased efficiency of homes and electric vehicles, as well as the avoided carbon price.

In the net-zero scenario, an average St. John's household spends $3,250, on fuel and electricity (household energy and transportation expenditures) in 2050—over 50% less than they would have in a BAP scenario ($7,345).

Between 2022 and 2050, the net-zero scenario saves the average St. John's household about $80,667 in gross fuel and electricity expenditures (i.e., not including the cost to undertake the efficiency improvements). Depending on the business, policy and financing strategies used in the implementation of the actions, these savings will be partly offset by the incremental capital expenditures required.

[18] CUSP, Energy Poverty in Canada: a CUSP Backgrounder (October 2019) online: https://energypoverty.ca/backgrounder.pdf.

[19] Ibid, at Figure 2.

[20] Statistics Canada, 2015 Census, average after-tax income by St. John's household was $77,960 (adjusted for inflation to 2016$ this would translate to $78,817). In 2016 average household energy expenditures were $7,153.

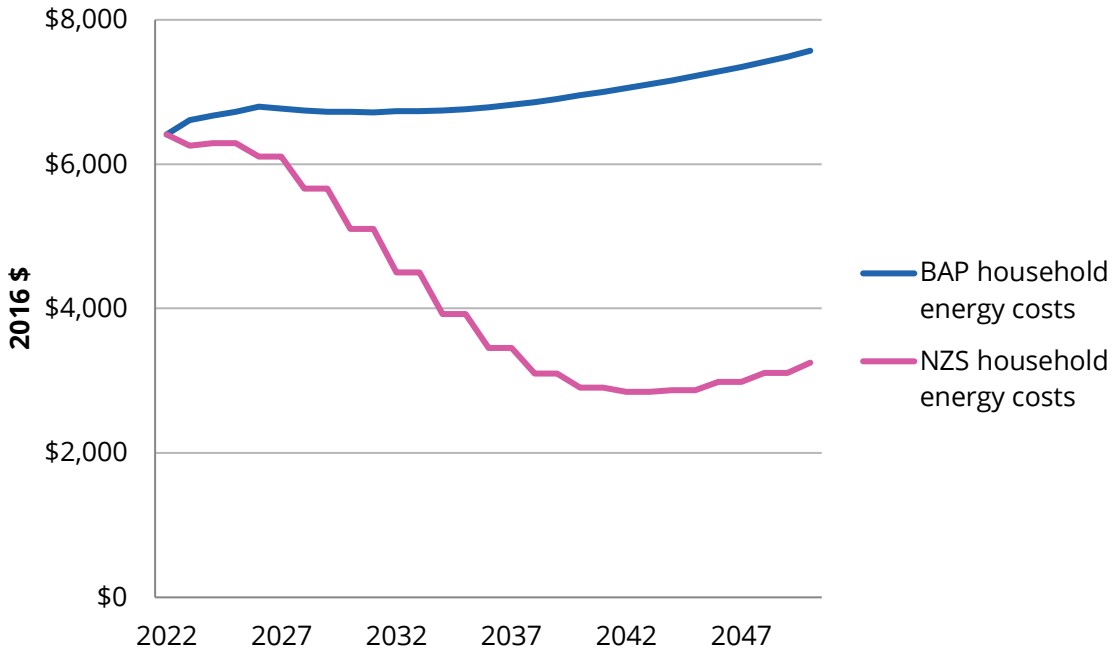


Figure 6. Average annual household energy costs in the net-zero and BAP scenarios, 2022-2050.

New Job Opportunities

Transitioning to a low- or zero-carbon economy is expected to have four categories of impacts on labour markets: additional jobs will be created in emerging sectors, some employment will be shifted (e.g., from fossil fuels to renewables), certain jobs will be reduced or eliminated (e.g., combustion engine vehicle mechanics), and many existing jobs will be transformed and redefined.

According to the direct job multipliers from Census Canada, the Energy Transition will result in a net job increase of an average annual 1,400 full time jobs in St. John's (or 38,600-person years of employment over 28 years). These are primarily due to the investment in retrofits (see the red and blue bar bars in Figure 7), followed by personal use vehicle electrification (in pink) and more energy efficient new residential buildings (in turquoise).

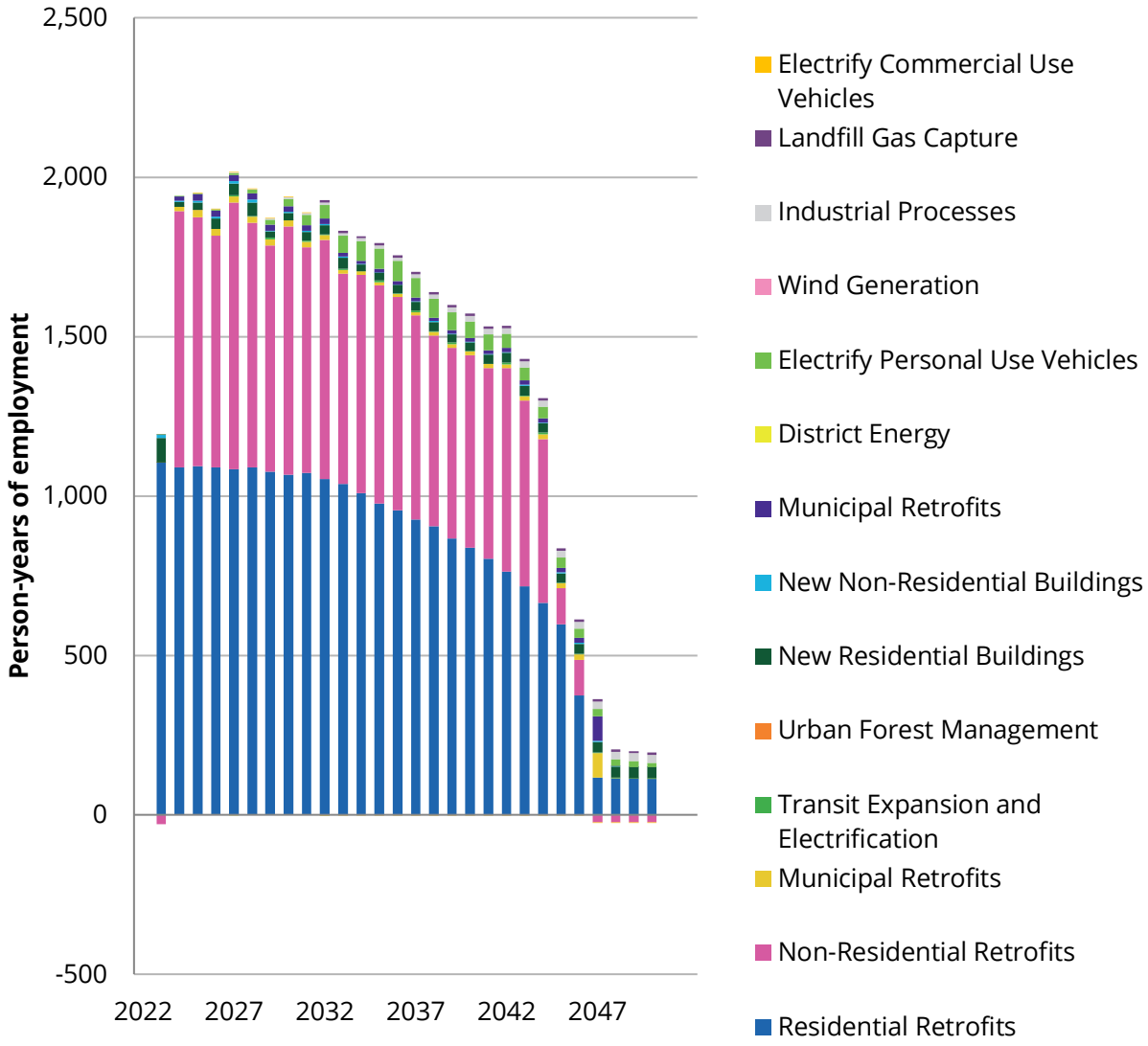


Figure 7. Additional person-years of employment associated with Energy Transition actions.

Sensitivity Analysis

The financial analysis involves several assumptions on building, infrastructure, equipment, and energy costs. A sensitivity analysis was conducted to assess how uncertainties in future costs could affect the overall results. The following chart shows how changing key parameters (i.e., energy costs) in the model will affect the net-zero costs pathway for the City of St. John's.

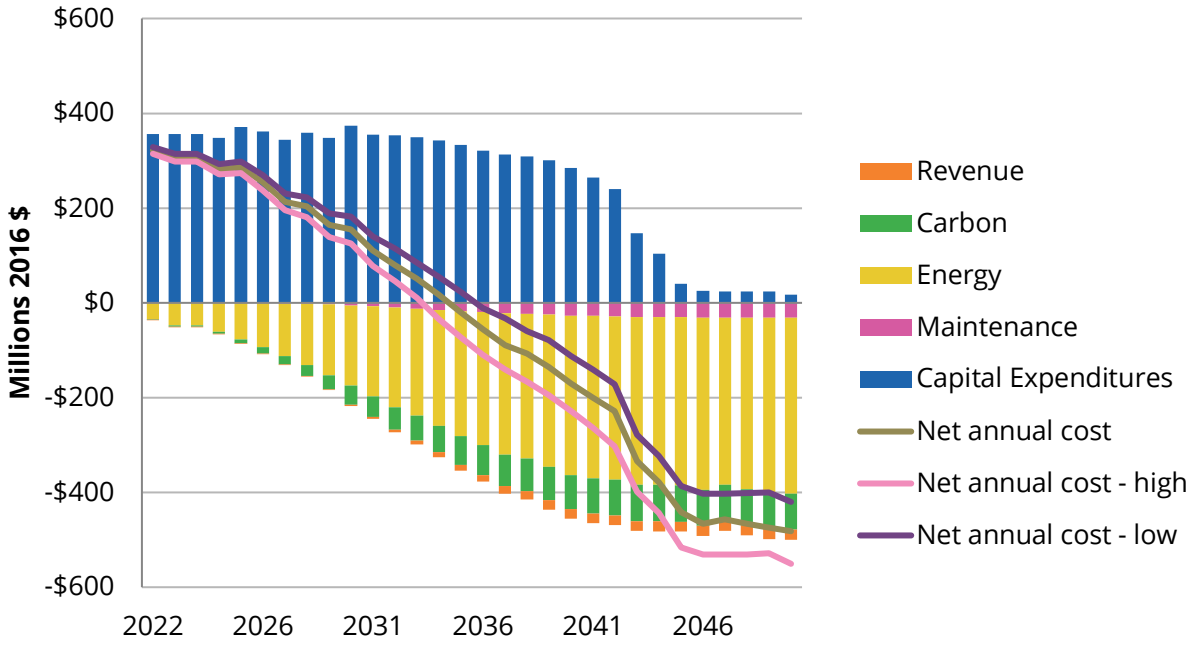


Figure 8. Sensitivity analysis of the energy costs for the Energy Transition investment and returns.

The sensitivity analysis, which is displayed in Figure 8, shows that, when you increase or decrease the overall energy costs by 20%, the net cost of the scenario in 2050 is affected by 13-14% in either direction. A major conclusion that can be drawn by this sensitivity analysis is the important co-benefit of energy efficiency and local energy generation measures in terms of hedging against future energy price increases.

Key Financial Assumptions

Land Use	Capital Investment Assumption
Land use intensification	- Capital costs associated with land-use intensification encompass standard investment in the community, such as new housing developments. - Generally speaking, with more infill development, new infrastructure spending decreases.
Decrease share of single-detached housing	
New Buildings	

New residential buildings with heat pumps	- The cost for new construction of buildings on a $/m^2 is estimated to be:
	  - Single-detached: $1,372 / m^2
	  - Double: $1,372 / m^2
	  - Apt 1-6 storey: $2,072 / m^2
	  - Apt 7-12 storey: $2,207 / m^2
	  - Apt > 12 storey: $2,260 / m^2
	  - Commercial: $2,395/ m^2
	  - Industry: $3,202 / m^2
	- A residential heat pump has a capital cost of approximately $8,500 (non-residential is ~$10,000) and annual operating cost of approximately $160 annually (~$400 annually for non-residential).

New industrial building efficiency	
New commercial building efficiency with heat pumps	
Existing Buildings	

Retrofits of homes and heat pumps	- The average cost of a 50% energy efficiency retrofit is assumed to be:
	  - Residential (per unit): $45,000
	  - Non-Res ($/m2) : $275
	- Industrial upgrades average the following in 2022 and 2050 per GJ/year
	  - Lighting system: $134→ $59
	  - Space heating: $25 → $34
	  - Water Heating: $32 → $49
	  - Motive: $66 → $176
	  - Process heat: $27 → $43

Retrofits of commercial and industrial buildings	
Industrial improvements (process motors/efficiency)	

Renewable Energy	
Wind	- Onshore wind turbines are assumed to cost about $2,336 per kw/year in 2022, their maintenance costs are assumed to be $55 per kw/year.
Transport	
Establish local electric bus service	- Today electric buses cost approximately $630,000, and are expected to cost less than a diesel bus by 2031. A fast charger costs about $140,000, and is assumed to be needed on a 1:20 ratio with electric buses. Electric bus maintenance costs are approximately 30% lower than for diesel buses. - The cost of a personal electric vehicle is approximately $34,000 in 2021 and is expected to decrease to $32,000 by 2030, dropping below the cost of an average combustion engine vehicle by 2025. As of today, maintenance costs for an EV are assumed to be half of those for combustion engine vehicles. - Heavy duty combustion engine vehicles are not expected to reach cost parity with their electric counterparts by 2050.
Electrify municipal fleets	
Electrify personal vehicles	
Net-zero commercial transport activity	
Waste and Wastewater	
Wastewater process efficiency	- Improving wastewater process efficiency will cost an estimated $497 per tonne of GHG reduced.
Landfill gas capture increase	- The landfill gas capture increase is expected to cost $700,000/year from 2022-2050.
Natural Environment and Sequestration	
Tree planting	- Tree planting will cost an average of $23,350/year from 2022-2050.

Appendix C: Modelling Scope, Method, and Process

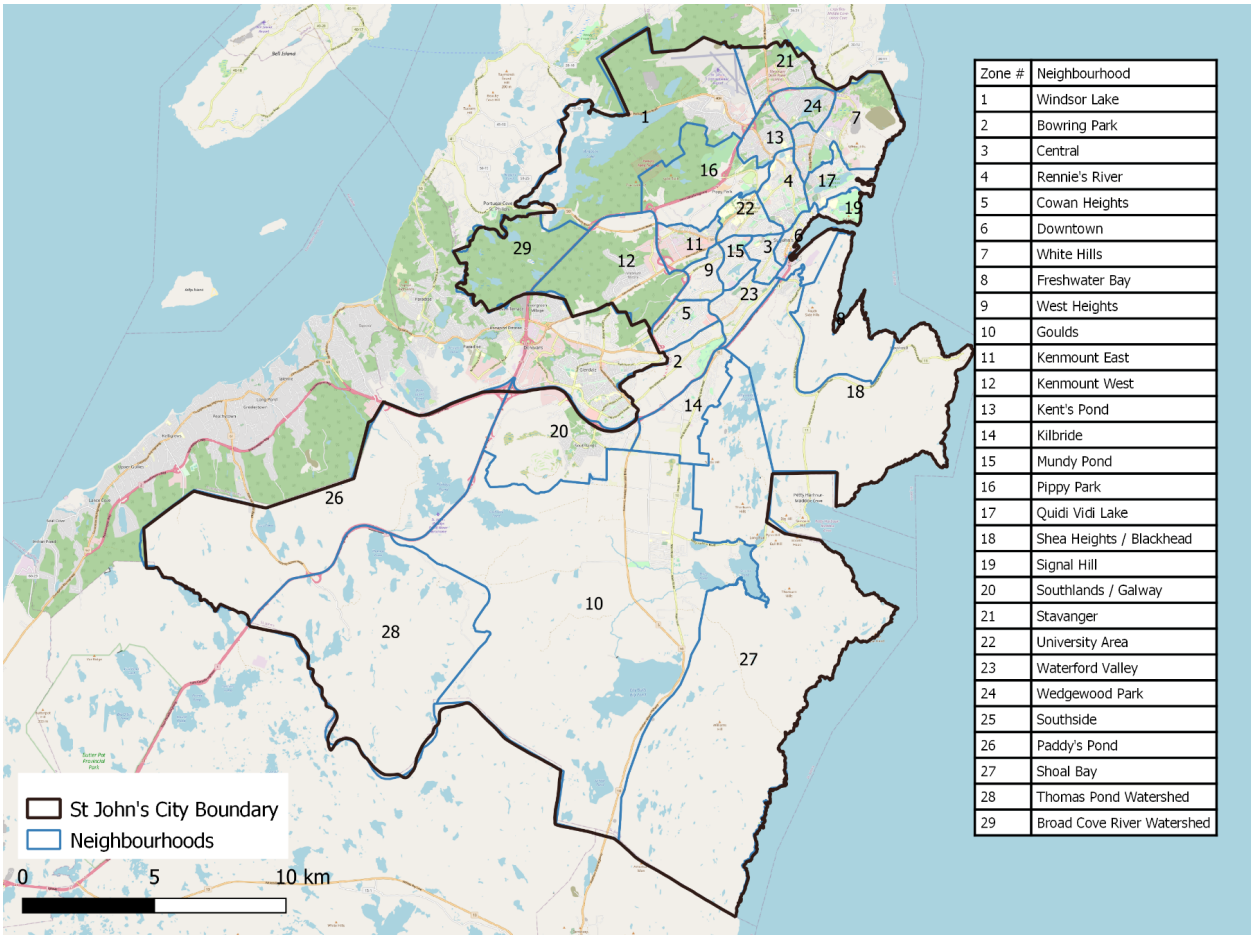
May 2021

Contents

I. Modelling Scope

Geographic Boundary

The geographic boundary of the modelling assessment is the municipal boundary of the City of St. John's (Figure 1). The model will use the 29 neighbourhoods outlined in Figure 1 to assign energy use and greenhouse gas emissions spatially.



Zone #	Neighbourhood
1	Windsor Lake
2	Bowring Park
3	Central
4	Rennie's River
5	Cowan Heights
6	Downtown
7	White Hills
8	Freshwater Bay
9	West Heights
10	Goulds
11	Kenmount East
12	Kenmount West
13	Kent's Pond
14	Kilbride
15	Mundy Pond
16	Pippy Park
17	Quidi Vidi Lake
18	Shea Heights / Blackhead
19	Signal Hill
20	Southlands / Galway
21	Stavanger
22	University Area
23	Waterford Valley
24	Wedgewood Park
25	Southside
26	Paddy's Pond
27	Shoal Bay
28	Thomas Pond Watershed
29	Broad Cove River Watershed

Figure 1. Assessment boundary for the City of St. John's and the 29 neighbourhoods that will be used in the modelling process.

Time Scope

- The assessment will cover the years from 2016 to 2050.
- The year 2016 will be used as the base year within the model. The rationale for using this as the base year is that:
    - The model requires the calibration of a base year system state (initial conditions) using as much observed data as possible in order to develop an internally consistent snapshot of the city.
    - A key data source for the model is census data. At the time of modelling, the most recent census year for which data is available is 2016.
- 1-year increments are modelled from the 2016 base year. 2016 is the first simulation period/year, as it is the most recent Statistics Canada Census year.
- Some 2016 data was not available, and was supplanted by more recent data, most notably the City of St. John's community and corporate energy use and greenhouse gas emissions inventory for 2018, namely:
    - wastewater and water pumping electricity (2018 corporate inventory)
    - wastewater BOD (2018 data from the City's Environmental Services Division, Public Works)
    - fuel oil use by sector (2018 community inventory)
    - Kent vehicle fuel use data (used for calibration, 2018 data in liters)
    - LFG capture rate at Robinhood Bay Landfill (2018 community inventory)
    - methane flared at RiverHead (2018 community inventory)
    - student enrollment (2014, 2016, 2018 for private institutions, College of the North Atlantic, Memorial University, respectively)
    - vehicle stock (2018 data from provincial Motor Registration Division)
    - transit data (2018 corporate inventory)
    - school bus data (2021 from the City)
    - municipal fleet (2018 corporate inventory)
    - City Corporation electricity use (2018 corporate inventory)
    - population share by zone (2020 data from Environics)
- Projections will extend to 2050.

Emissions Scope

The relevant emissions sources for St. John's and their emissions scope are detailed in Table 1. Of note is treatment of local electricity supplied to the grid: all emissions reductions from new local energy generation are accounted for locally, rather than distributed through the central electricity grid. However, central electrified generation facilities located within municipal boundaries, are only accounted for through the electricity grid emissions factor. This distinction is made because the current central electricity generation is already accounted for through the grid emissions factor. Reporting on such a facility is not required under GPC Protocol BASIC or BASIC+. New local energy generation projects are not included in electricity emissions factor projections.

Table 1. Sources included in St. John's model.

	Scope 1	Scope 2	Scope 3	Notes
Stationary Energy				
Residential buildings	Y	Y		
Commercial and institutional buildings and facilities	Y	Y		
Manufacturing industries and construction	Y	Y		
Energy industries	Y	Y		
Energy generation supplied to the grid				Additional renewable electricity is included beyond what is currently included in emissions factors projections
Agriculture, forestry, and fishing activities	Y	Y		
Non-specified sources				NA
Fugitive emissions from mining, processing, storage, and transportation of coal				NA
Fugitive emissions from oil and natural gas systems				N/A
Transportation				
On-road	Y	Y		
Railways				N/A
Waterborne navigation	Y	Y		
Aviation	Y	Y		
Off-road	Y	Y		
Waste				
Disposal of solid waste generated in the city			Y	
Disposal of solid waste generated outside the city				NA
Biological treatment of waste generated in the city			Y	
Biological treatment of waste generated outside the city				NA

Incineration and open burning of waste generated in the City				NA
Incineration and open burning of waste generated outside the city				NA
Wastewater generated in the city	Y		Y	
Wastewater generated outside the city				NA
Industrial processes and product use (IPPU)				
Industrial processes	Y			
Product use				NA
Agriculture, forestry and other land use (AFOLU)				
Livestock	Y			
Land	Y			
Aggregate sources and non-CO2 emissions sources on land	Y			
Other Scope 3			Y	

Emissions Factors

Table 2. Emissions accounting framework and global warming potential.

Category	Base Year Data/Assumption	Source
Emissions accounting		
Accounting Framework	Global Protocol for Community-Scale GHG Emission Inventories (GPC)	Global Protocol for Community-Scale GHG Emission Inventories (GPC)
Emissions scope	Scope 1, 2 and partial scope 3	See GPC emissions scope table for scope 3 items included.
Sectors	Stationary energy (buildings) Transportation Waste	See GPC emissions scope table for sectors and sub-sectors included.
Boundary	Municipal boundary of St. John's	City
Reporting	GPC BASIC & partial BASIC+	Global Protocol for Community-Scale GHG Emission Inventories (GPC)
Transportation methodology	GPC induced activity method	Global Protocol for Community-Scale GHG Emission Inventories (GPC)
Base year	2016	N/A
Projection year	2050	N/A
Global Warming Potential		
Greenhouse gases	Carbon dioxide (CO2), methane (CH4) and nitrous oxide (N20) are included. GWP: CO2 = 1 CH4 = 34 N2O = 298 Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6) and nitrogen trifluoride (NF3) are not included.	Myhre, G. et al., 2013: Anthropogenic and Natural Radiative Forcing. Table 8.7. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Table 3. Emissions factors for fuels in St. John's model.

Category	Base Year Data/Assumption	Source
Emissions Factors		
Natural gas	49 kg CO2e/GJ	Environment and Climate Change Canada. National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada. Part 2. Tables A6-1 and A6-2.
Electricity	**2016:** CO2: 36 g/kWh CH4: 0.0006 g/kWh N2O: 0.001 g/kWh 2018: CO2: 26g/kWh CH4: 0.0004 g/kWh N2O: 0.00 g/kWh **2050:** CO2: 0.0 g/kWh CH4: 0.0 g/kWh N2O: 0.0 g/kWh	2016 NIR: Elec Emissions factor - Table A13-2 NIR Part 3 2018 NIR: Elec Emissions factor - Table A13-2 NIR Part 3 Canada Energy Regulator, "Canada's Energy Future" (2016). for 2050 projection Note: though some remote communities may continue to rely on diesel generators, the City of St. John's is expected to have a fully decarbonized central electricity supply by 2050.
Gasoline	g / L CO2: 2316 CH4: 0.32 N2O: 0.66	2016 NIR Part 2 Table A6–12 Emission Factors for Energy Mobile Combustion Sources
Diesel	g / L CO2: 2690.00 CH4: 0.07 N2O: 0.21	2016: NIR Part 2 Table A6–12 Emission Factors for Energy Mobile Combustion Sources

Fuel oil	Residential g/L CO2: 2560 CH4: 0.026 N2O: 0.006 Commercial g/L CO2: 2753 CH4: 0.026 N2O: 0.031 Industrial g/L CO2: 2753 CH4: 0.006 N2O: 0.031	Environment and Climate Change Canada. National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada. Part 2. Table A6–4 Emission Factors for Refined Petroleum Products
Wood	Residential kg/GJ CO2: 299.8 CH4: 0.72 N2O: 0.007 Commercial kg/GJ CO2: 299.8 CH4: 0.72 N2O: 0.007 Industrial kg/GJ CO2: 466.8 CH4: 0.0052 N2O: 0.0036	Environment and Climate Change Canada. National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada. Part 2. Table A6–56 Emission Factors for Biomass

Propane	g/L Transport CO2: 1515.00 CH4: 0.64 N2O: 0.03 Residential CO2: 1515.000 CH4 : 0.027 N2O: 0.108 All other sectors CO2: 1515.000 CH4: 0.024 N2O: 0.108	NIR Part 2 Table A6–3 Emission Factors for Natural Gas Liquids Table A6–12 Emission Factors for Energy Mobile Combustion Sources
Waste/WW	wastewater emissions factors CH4: 0.48 kg CH4/kg BOD N2O: 3.2 g / (person * year) from advanced treatment 0.005 g /g N from wastewater discharge landfill emissions are calculated from first order decay of degradable organic carbon deposited in landfill derived emission factor in 2016 = 0.015 kg CH4 / tonne solid waste (assuming 70% recovery of landfill methane), .05 kg CH4 / tonne solid waste not accounting for recovery K values are sourced from IPCC table 3.3, temperate wet column	CH4 wastewater: IPCC Guidelines Vol 5 Ch 6, Tables 6.2 and 6.3, we use the MCF value for anaerobic digester N2O from advanced treatment: IPCC Guidelines Vol 5 Ch 6 Box 6.1 N2O from wastewater discharge: IPCC Guidelines Vol 5 Ch 6 Section 6.3.1.2 Landfill emissions: IPCC Guidelines Vol 5 Ch 3, Equation 3.1

II. Modelling Method

1. About CityInSight

CityInSight is an integrated, spatially-disaggregated energy, emissions, and finance model developed by Sustainability Solutions Group and whatIf? Technologies. The model enables bottom-up accounting for energy supply and demand, including renewable resources, conventional fuels, energy consuming technology stocks (e.g., vehicles, heating systems, dwellings, buildings), and all intermediate energy flows (e.g. electricity and heat).

CityInSight incorporates and adapts concepts from the system dynamics approach to complex systems analysis. Energy and GHG emissions are derived from a series of connected stock and flow models. The model accounts for physical flows (i.e., energy use, *new* vehicles, vehicle kilometres travelled) as determined by stocks (i.e., buildings, vehicles, heating equipment, etc). For any given year within its time horizon, CityInSight traces the flows and transformations of energy from sources through energy currencies (e.g., gasoline, electricity) to end uses (e.g., personal vehicle use, space heating) to energy costs and to GHG emissions. The flows evolve on the basis of current and future geographic and technology decisions/assumptions (e.g., EV uptake rates). An energy balance is achieved by accounting for efficiencies, conservation rates, and trade and losses at each stage in the journey from source to end use. Characteristics of CityInSight are described in Table 1.

The model is spatially explicit. All buildings, transportation and land use data is tracked within the model through a GIS platform, and by varying degrees of spatial resolution. Where applicable, a zone type system can be applied to break up the city into smaller configurations. This enables consideration of the impact of land-use patterns and urban form on energy use and emissions production from a baseline year to future dates using GIS-based platforms. CityInSight's GIS outputs can be integrated with city mapping systems.

Table 1. Characteristics of CityInSight.

Characteristic	Rationale
Integrated	CityInSight is designed to model and account for all sectors that relate to energy and emissions at a city scale while capturing the relationships between sectors. The demand for energy services is modelled independently of the fuels and technologies

	that provide the energy services. This decoupling enables exploration of fuel switching scenarios. Physically feasible scenarios are established when energy demand and supply are balanced.
Scenario-based	Once calibrated with historical data, CityInSight enables the creation of dozens of scenarios to explore different possible futures. Each scenario can consist of either one or a combination of policies, actions and strategies. Historical calibration ensures that scenario projections are rooted in observed data.
Spatial	The configuration of the built environment determines the ability of people to walk and cycle, accessibility to transit, feasibility of district energy and other aspects. CityInSight therefore includes a full spatial dimension that can include as many zones - the smallest areas of geographic analysis - as are deemed appropriate. The spatial component to the model can be integrated with City GIS systems, land-use projections and transportation modelling.
GHG reporting framework	CityInSight is designed to report emissions according to the GHGProtocol for Cities (GPC) framework and principles.
Economic impacts	CityInSight incorporates a full financial analysis of costs related to energy (expenditures on energy) and emissions (carbon pricing, social cost of carbon), as well as operating and capital costs for policies, strategies and actions. It allows for the generation of marginal abatement curves to illustrate the cost and/or savings of policies, strategies and actions.

2. Model Structure

The major components of the model (sub-models), and the first level of modelled relationships (influences), are represented in Figure 1. These sub-models are all interconnected through various energy and financial flows. Additional relationships may be modelled in CityInSight by modifying inputs and assumptions—specified directly by users, or in an automated fashion by code or scripts running "on top of" the base model structure. Feedback relationships are also possible, such as increasing the adoption rate of non-emitting vehicles in order to meet a particular GHG emissions constraint.

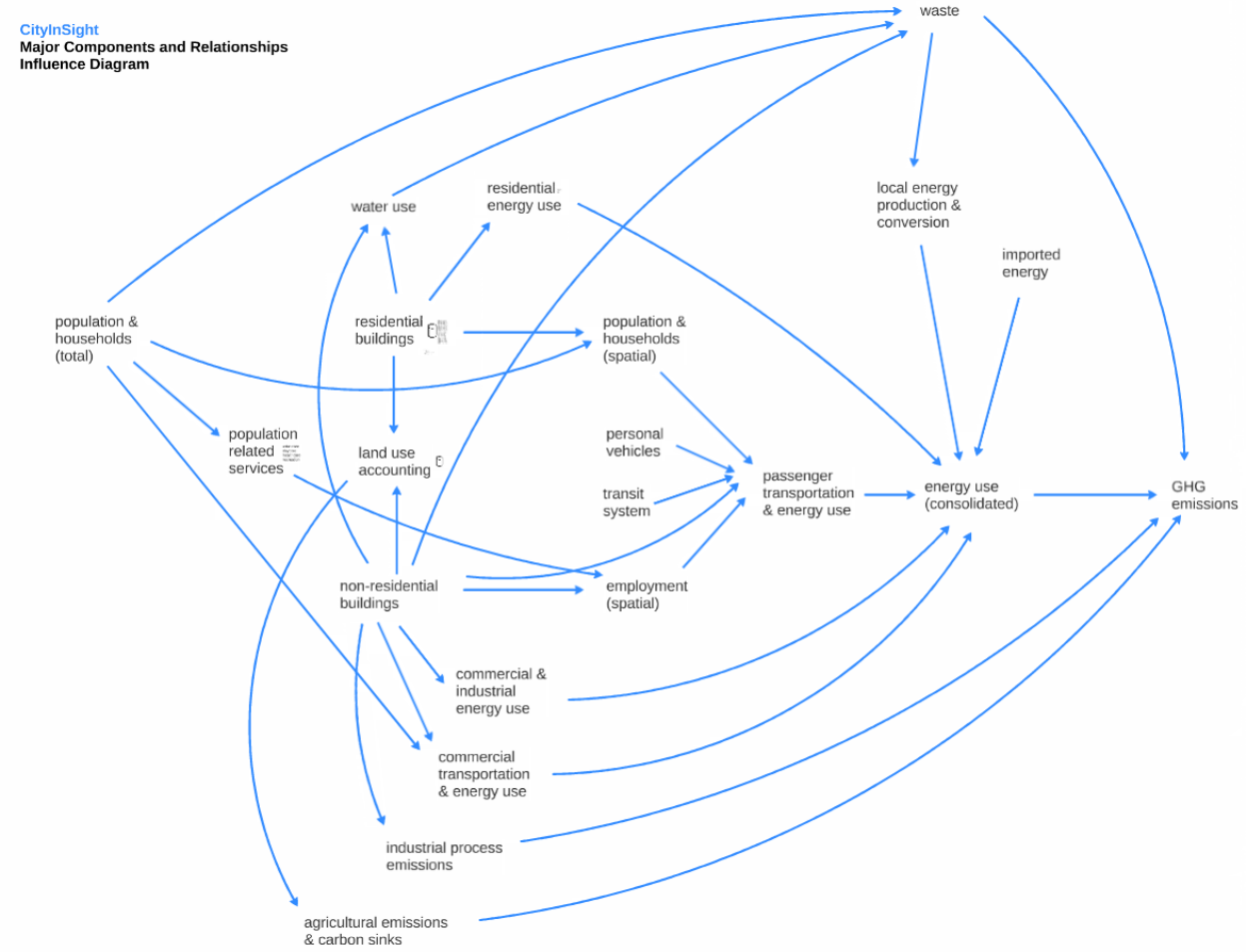


Figure 1. Representation of CityInSight's structure.

3. Stocks and Flows

Within each sub-model is a number of stocks and flows that represent energy and emissions processes in cities. For any given year various factors shape the picture of energy and emissions flows in a city, including: the population and the energy services it requires; commercial floorspace; energy production and trade; the deployed technologies which deliver energy services (service technologies); and the deployed technologies which transform energy sources to currencies (harvesting technologies). The model makes an explicit mathematical relationship between these factors—some contextual and some part of the energy consuming or producing infrastructure—making up the energy flow picture.

Some factors are modelled as stocks: counts of similar things, classified by various properties. For example, population is modelled as a stock of people classified by age and gender.

Population change over time is projected by accounting for: the natural aging process, inflows (births, immigration) and outflows (deaths, emigration). The fleet of personal use vehicles, an example of a service technology, is modelled as a stock of vehicles classified by size, engine type and model year - with a similarly-classified fuel consumption intensity. As with population, projecting change in the vehicle stock involves aging vehicles and accounting for major inflows (new vehicle sales) and major outflows (vehicle discards). This stock-turnover approach is applied to other service technologies (e.g., furnaces, water heaters) and also harvesting technologies (e.g., electricity generating capacity).

4. Sub-models

The stocks and flows that make up each sub-model are described below.

Population, Households, and Demographics

- City-wide population is modelled using the 'standard population cohort-survival method', which tracks population by age and gender on a year-by-year basis. It accounts for various components of change: births, deaths, immigration and emigration.
- Population is allocated to households, and these are placed spatially in zones, via physical dwellings (see land-use accounting sub-model).
- The age of the population is tracked over time, which is used for analyzing demographic trends, generational differences and implications for shifting energy use patterns.
- The population sub-model influences energy consumption in various sub-models:
    - School enrollment totals (transportation)
    - Workforce totals (transportation)
    - Personal vehicle use (transportation)
    - Waste generation

Building Land-Use Accounting

Land use accounting identifies buildings in space and over time, through construction, retrofits and demolitions. In the baseline, this is often directly informed by building-related geospatial data. Land use accounting consists of the follow elements:

- Quantitative spatial projections of residential dwelling units, by:
    - Type of residential structure (single detached, semi detached, row house, apartment, etc);
    - Development type (greenfield, intensification); and
    - Population is assigned to dwelling units.
- Quantitative spatial projections of non-residential buildings, by:
    - Type of non-residential structure (retail, commercial, institutional);
    - Development type (greenfield, intensification);
    - Buildings are further classified into archetypes (such as school, hospital, industrial - see Table 2).[21] This allows for the model to account for differing intensities that would occur in relation to various non residential buildings; and
    - Jobs are allocated to zones via non-residential floor area, using a floor area per worker intensity.
- Land-use accounting takes "components of change" into account, year over year:
    - New development;
    - Removals / demolitions; and
    - Year of construction.
- Land use accounting influences other aspects of the model, notably:
    - Passenger transportation: the location of residential buildings influences where home-to-work and home-to-school trips originate, which in turn also influences their trip length and the subsequent mode selected. Similarly, the location and identification of non-residential buildings influences the destination for many trips. For example, buildings identified as schools would be identified in home-to-school trips.
    - Access to energy sources by buildings: building location influences access to energy sources, for example, a rural dwelling may not have access to natural gas or a dwelling may not be in proximity to an existing district energy system. It can

[21] Where possible, this data comes directly from the municipality.

also be used to identify suitable projects: for example, the location and density of dwellings is a consideration for district energy development.

- Non-residential building energy: the identification of non-residential building archetypes influences their energy consumption based on their use type. For example, a building identified as a hospital would have a higher energy use intensity than a building identified as a school.

Table 2. Non-residential archetypes represented in the model.

- College, university - School - Retirement or nursing home - Special care home - Hospital - Municipal building - Fire station - Penal institution - Police station - Military base or camp - Transit terminal or station - Airport - Parking - Hotel motel inn - Greenhouse - Greenspace - Recreation - Community centre - Golf course - Museums, art gallery - Retail - Vehicle and heavy equipment service - Warehouse retail - Restaurant	- Commercial retail - Commercial - Commercial residential - Retail residential - Warehouse commercial - Warehouse - Religious institution - Surface infrastructure - Energy utility - Water pumping or treatment station - Industrial generic - Food processing plants - Textile manufacturing plants - Furniture manufacturing plants - Refineries all types - Chemical manufacturing plants - Printing and publishing plants - Fabricated metal product plants - Manufacturing plants miscellaneous processing plants - Asphalt manufacturing plants - Concrete manufacturing plants - Industrial farm - Barn

Residential and Non-Residential Building Energy

Building energy consumption is closely related to the land use accounting designation it receives, based on where the building is located, its archetype, and when it was constructed. Building energy consumption is calculated in the model by considering:

- Total energy use intensity of the building type (including the proportion from thermal demand) is built from energy end uses in the building. End uses include heating, lighting, auxiliary demand, etc. The energy intensity of end uses is related to the building or dwelling archetype and its age.
- Energy use by fuel is determined based on the technologies used in each building (e.g. electricity, heating system types). Heating system types are assigned to building equipment stocks (e.g., heating systems, air conditioners, water heaters).
- Building energy consumption in the model also considers:
    - Solar gains and internal gains from sharing walls;
    - Local climate (heating and cooling degree days); and
    - Energy losses in the building.
- Building equipment stocks (water heaters, air conditioners) are modelled with a stock-turnover approach that captures equipment age, retirements, and additions. In future projections, the natural replacement of stocks is often used as an opportunity to introduce new (and more efficient) technologies.

The model has residential and non-residential building energy sub-models. They influence and produce important model outputs:

- Total residential energy consumption and emissions and residential energy and emissions by building type, by end use, and by fuel;
- Total non-residential energy consumption and emissions and residential energy and emissions by building type, by end use, and by fuel; and
- Local/imported energy balance: how much energy will need to be imported after considering local capacity and production.

Figure 2 details the flows in the building energy sub-model at the building level.

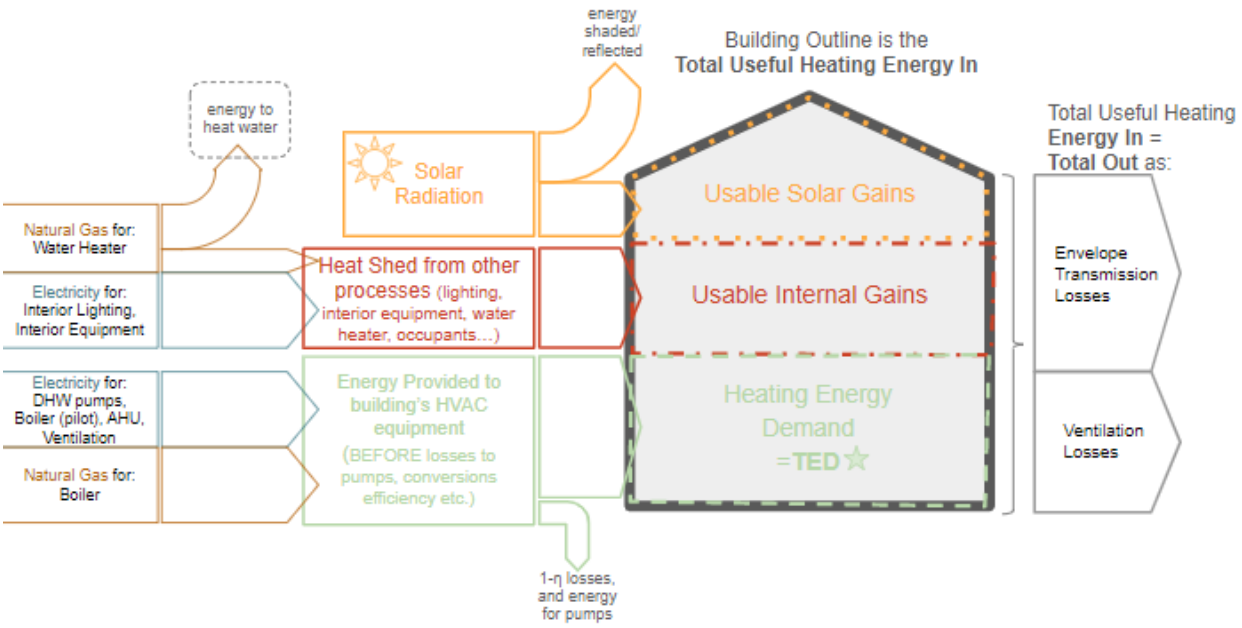


Figure 2. Building energy sub-model schematic.

Transportation

CityInSight includes a spatially explicit passenger transportation sub-model that responds to changes in land use, transit infrastructure, vehicle technology, travel behavior changes and other factors. It has the following features:

- CityInSight uses the induced method for accounting for transportation related emissions; the induced method accounts for in-boundary tips and 50% of transboundary trips that originate or terminate within the city boundary. This shares energy and GHGs between municipalities.
- The model accounts for "trips" in the following sequence:
    1. Trip generation. Trips are divided into four types (home-work, home-school, home-other, and non-home-based), each produced and attracted by different combinations of spatial influences identified in the land-use accounting sub-model: dwellings, employment, classrooms, non-residential floorspace.
    2. Trip distribution. Trips are then distributed with the number of trips specified for each zone of origin and zone of destination pair. Origin-Destination (O-D) matrix data is based on local travel surveys and transportation models.

3. Mode share. For each origin-destination pair, trips are shared over walk/bike, public transit and automobile.
    a. Walk / bike trips are identified based on a distance threshold: ~2km for walking, ~5-10km for biking.
    b. Transit trips are allocated to trips with an origin or destination within a certain distance to a transit station.
4. Vehicle distance. Vehicle kilometres travelled (VKT) are calculated based on the number of trips by mode and the distance of each trip based on a network distance matrix for the origin-destination pairs.

- VKT is also assigned to a stock of personal vehicles, based on vehicle type, fuel type, and fuel efficiency. The number of vehicles is influenced by the total number of households identified in the population sub-model. Vehicles also use a stock-turnover approach to model vehicle replacements, new sales and retirements.
- The energy use and emissions associated with personal vehicles is calculated by VKT of the stock of personal vehicles and their type, fuel and efficiency characteristics.
- Personal mobility sub-model is one of the core components of the model. It influences and produces important model outputs:
    - Total transportation energy consumption by fuel, including electricity consumption
    - Active trips and transit trips, by zone distance.

Trips accounted for in the model are displayed in Figure 3.

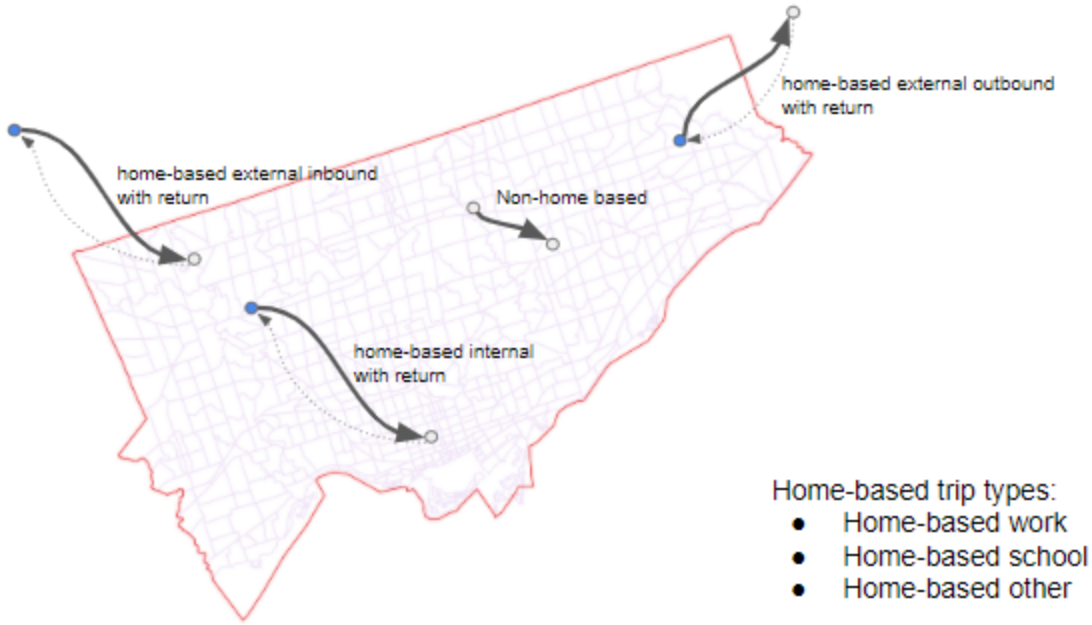


Figure 3. Trips assessed in the personal mobility sub-model.

Google Environmental Insights Explorer (EIE) data is used to inform average trip length for internal (6km) and cross boundary trips (19km outbound, 20km inbound).

Waste

Households and non-residential buildings generate solid waste and wastewater, and the model traces various pathways to disposal, compost and sludge. If present in the city, the model can also capture energy recovery from incineration and biogas. Waste generation is translated to landfill emissions based on first order decay models of carbon to methane.

Local Energy Production

The model accounts for energy generated within city boundaries. Energy produced from local sources (e.g., solar, wind, biomass) is modelled alongside energy imported from other resources (e.g., the electricity grid and the natural gas distribution system). The model accounts for conversion efficiency. Local energy generation can be spatially defined.

Financial and Employment Impacts

Energy related financial flows and employment impacts are captured through an additional layer of model logic. Costs are calculated as new stock is incorporated into the model, through energy flows (annual fuel costs), as well as other operating and maintenance costs. Costs are

based on a suite of assumptions that are input into the model. See Section 6 for financial variables tracked within the model.

Employment is calculated based on non-residential building archetypes and their floor area. Employment related to investments are calculated using standard employment multipliers, often expressed as person-years of employment per million dollars of investment.

5. Energy and GHG Emissions Accounting

CityInSight accounts for the energy flows through the model, as shown in Figure 6.

Source fuels crossing the geographic boundary of the city are shown on the left. The four "final demand" sectors—residential, commercial, industrial, and transportation—are shown toward the right. Some source fuels are consumed directly in the final demand sectors (e.g., natural gas used by furnaces for residential heating, gasoline used by personal vehicles for transportation). Other source fuels are converted to another energy carrier before consumption in the final demand sectors (e.g., solar energy converted to electricity via photovoltaic cells, natural gas combusted in heating plants and the resulting hot water distributed to end use buildings via district energy networks). Finally, efficiencies of the various conversion points (end uses, local energy production) are estimated to split flows into either "useful" energy or conversion losses at the far right side of the diagram.

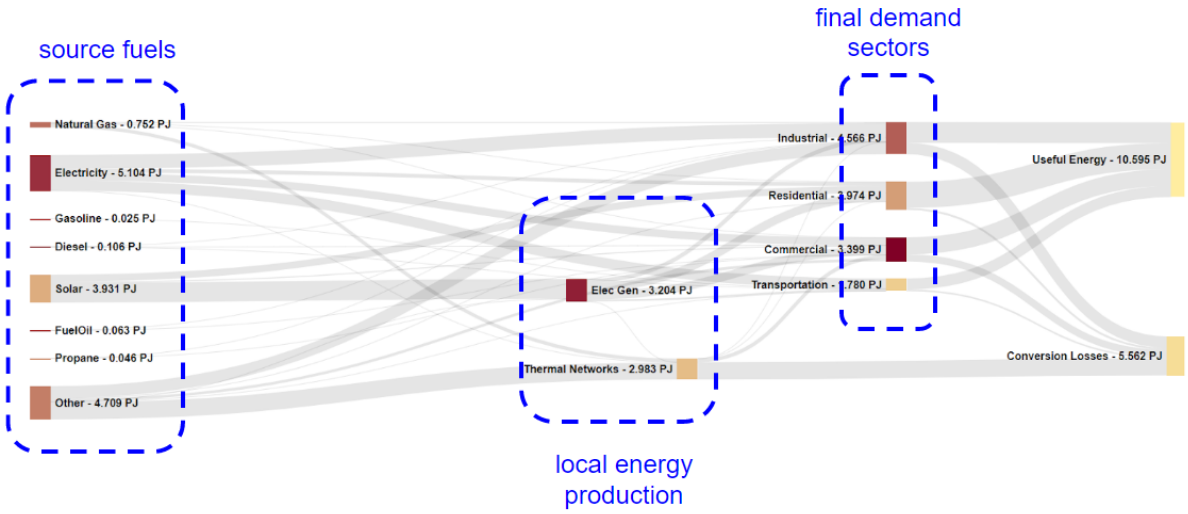


Figure 4. Energy flow Sankey diagram showing main node groups

Figure 4 above shows the potential for ambiguity when energy is reported: which of the energy flows circled are included and how do you prevent double counting? To address these ambiguities, CityInSight defines two main energy reports:

- Energy Demand, shown in Figure 5. Energy Demand includes the energy flows just before the final demand sectors (left of the dotted red line). Where the demand sectors are supplied by local energy production nodes, the cut occurs after the local energy production and before demand.
- Energy Supply, shown in Figure 6. Energy Supply includes the energy flows just after the source fuel nodes (left of the dotted red line). Where the source fuels supply local energy production nodes, the cut occurs between the source fuels and local energy production.

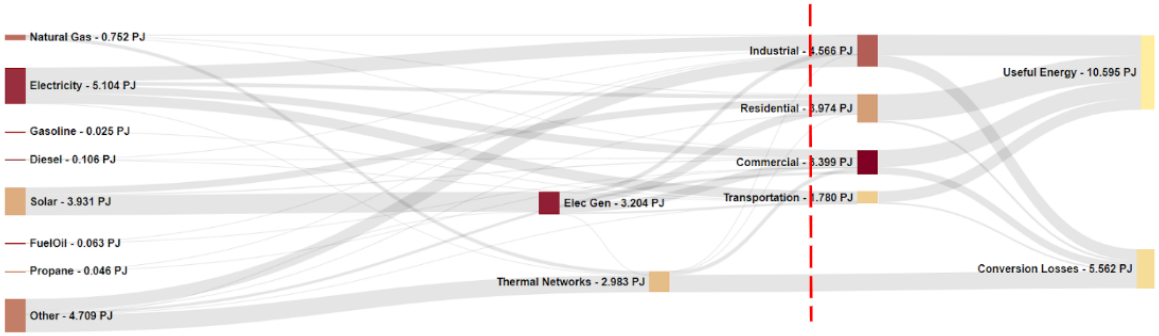


Figure 5. Energy Demand report definition

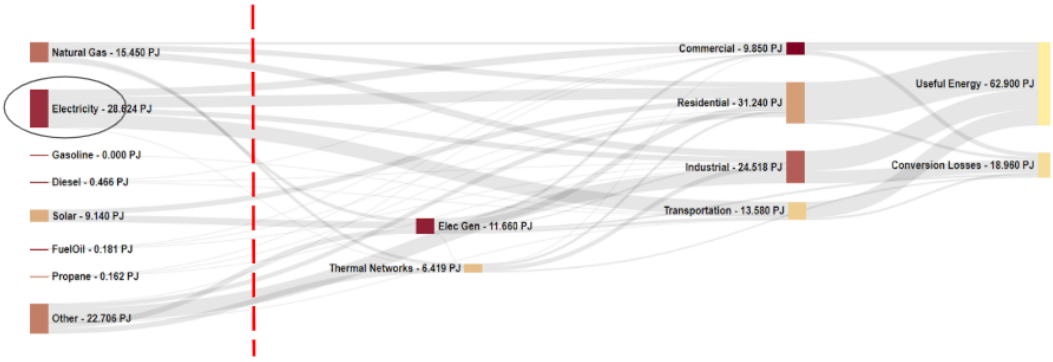


Figure 6. Energy Supply report definition.

In the integrated CityInSight energy and emissions accounting framework, GHG emissions are calculated after energy consumption is known.

6. Financial Accounting

The model also has a financial dimension expressed for most of its stocks and flows. Costs and savings modelling considers:

- Upfront capital expenditures: this is related to new stocks, such as new vehicles or new building equipment.
- Operating and maintenance costs: Annualized costs associated with stocks, such as vehicle maintenance.
- Energy costs: this is related to energy flows in model, accounting for fuel and electricity costs, and
- Carbon pricing: Calculated by on emissions generation.

Expenditure types that are evaluated in the model are summarized in Table 3. Financial assumptions will be included in further iterations of the Halton Hills model.

Table 3. Categories of expenditures.

Category	Description
Residential buildings	Cost of dwelling construction and retrofitting; operating and maintenance costs (non-fuel).
Residential equipment	Cost of appliances and lighting, heating and cooling equipment.
Residential fuel	Energy costs for dwellings and residential transportation.
Residential emissions	Costs resulting from a carbon price on GHG emissions from dwellings and transportation.
Commercial buildings	Cost of building construction and retrofitting; operating and maintenance costs (non-fuel).
Commercial equipment	Cost of lighting, heating and cooling equipment.

Commercial vehicles	Cost of vehicle purchase; operating and maintenance costs (non-fuel).
Non-residential fuel	Energy costs for commercial buildings, industry and transport.
Non-residential emissions	Costs resulting from a carbon price on GHG emissions from commercial buildings, production and transportation.
Energy production emissions	Costs resulting from a carbon price on GHG emissions for fuel used in the generation of electricity and heating.
Energy production fuel	Cost of purchasing fuel for generating local electricity, heating or cooling.
Energy production equipment	Cost of the equipment for generating local electricity, heating or cooling.
Municipal capital	Cost of the transit system additions (no other forms of municipal capital assessed).
Municipal fuel	Cost of fuel associated with the transit system.
Municipal emissions	Costs resulting from a carbon price on GHG emissions from the transit system.
Energy production revenue	Revenue derived from the sale of locally generated electricity or heat.
Personal use vehicles	Cost of vehicle purchase; operating and maintenance costs (non-fuel).
Transit fleet	Costs of transit vehicle purchase.
Active transportation infrastructure.	Costs of bike lane and sidewalk construction.

Financial Reporting Principles

The financial analysis is guided by the following reporting principles:

1. Sign convention: Costs are negative, revenue and savings are positive.
2. The financial viability of investments will be measured by their net present value.

3. All cash flows are assumed to occur on the last day of the year and for purposes of estimating their present value in Year 1 will be discounted back to time zero (the beginning of Year 1). This means that even the initial capital outlay in Year 1 will be discounted by a full year for purposes of present value calculations.

4. We will use a discount rate of 3% in evaluating the present value of future government costs and revenues.

5. Each category of stocks will have a different investment horizon

6. Any price increases included in our analysis for fuel, electricity, carbon, or capital costs will be real price increases, net of inflation.

7. Where a case can be made that a measure will continue to deliver savings after its economic life (e.g. after 25 years in the case of the longest lived measures), we will capitalize the revenue forecast for the post-horizon years and add that amount to the final year of the investment horizon cash flow.

8. In presenting results of the financial analysis, results will be rounded to the nearest thousand dollars, unless additional precision is meaningful.

9. Only actual cash flows will be included in the financial analysis.

7. Inputs and Outputs

The model relies on a suite of assumptions that define the various stocks and flows within the model for every time-step (year) in the model.

Base Year

For the baseline year, many model inputs come from calibrating the model with real energy datasets. This includes real building and transportation fuel data, city data on population, housing stock and vehicle stock etc. Other assumptions come from underlying relationships between energy stocks and flows identified through research, like the fuel efficiency of personal vehicles, the efficiency of solar PV.

Future Projections

CityInSight is designed to project how the energy flow picture and emissions profile will change in the long term by modelling potential change in:

- the context (e.g. population, development patterns),
- emissions reduction actions (that influence energy demand and the composition of stocks).

Potential changes in the system are also based on a suite of input assumptions, and are frequently referred to as "actions". Actions are an intervention point in the model that changes the relationship between a certain stock and flow at a certain time. Action assumptions can be based on existing projections and on proposed policy design, and can be as wide ranging the stocks and flows present in the model.

Stock-turnover models enable users to directly address questions about the penetration rates of new technologies over time constrained by assumptions such as new stock, market shares and stock retirements. Examples of outputs of the projections include energy mix, mode split, vehicle kilometres of travel (VKT), total energy costs, household energy costs, GHG emissions and others. Energy, emissions, capital and operating costs are outputs for each scenario. The emission and financial impacts of alternative climate mitigation scenarios are usually presented relative to a reference or "business as planned" scenario.

For example, an action may assume: "Starting in 2030, all new personal vehicles are electric." This assumption would be input into the model, where, starting in 2030, every time a vehicle is at the end of its life, rather than be replaced with an internal combustion engine vehicle, it is replaced with an electric vehicle. As a result, the increase in the electric vehicle stock means greater VKT allocated to electricity and less to gasoline, thereby resulting in lower emissions.

8. Spatial Disaggregation

As noted above, a key feature of CityInSight is the geocoded stocks and flows that underlie the energy and emissions in the community. All buildings and transportation activities are tracked within a discrete number of geographic zones, specific to the city. This enables consideration of the impact of land-use patterns and urban form on energy use and emissions production from a baseline year to future points in the study horizon. CityInSight outputs can be integrated with city mapping and GIS systems. This is the feature that allows CityInSight to support the assessment of a variety of urban climate mitigation strategies that are out of reach of more aggregate representations of the energy system. Some examples include district energy, microgrids, combined heat and power, distributed energy, personal mobility (the number, length and mode choice of trips), local supply chains, and EV infrastructure.

For stationary energy use, the foundation for the spatial representation consists of land use, zoning and property assessment databases routinely maintained by municipal governments. These databases have been geocoded in recent years and contain detailed information about the built environment that is useful for energy analysis.

For transportation energy use and emissions, urban transportation survey data characterizes personal mobility by origin, destination, trip time, and trip purpose. This in turn supports the spatial mapping of personal transportation energy use and greenhouse gas emissions by origin or destination.

III. Modelling Process

CityInSight is designed to support the process of developing a municipal strategy for greenhouse gas mitigation. Usually the model is engaged to identify a pathway for a community to meet a greenhouse gas emissions target by a certain year, or to stay within a cumulative carbon budget over a specified period.

Data Collection, Calibration and Baseline

A typical CityInSight engagement begins with an intensive data collection and calibration exercise in which the model is systematically populated with data on a wide range of stocks and flows in the community that affect greenhouse gas emissions. A picture literally emerges from this data that begins to identify where opportunities for climate change mitigation are likely to be found in the community being modeled. The calibration and inventory exercise helps establish a common understanding among community stakeholders about how the greenhouse gas emissions in their community are connected to the way they live, work and play. Relevant data are collected for variables that drive energy and emissions—such as characteristics of buildings and transportation technologies—and those datasets are reconciled with observed data from utilities and other databases. The surface area of buildings is modeled in order to most accurately estimate energy performance by end-use. Each building is tracked by vintage, structure and location, and a similar process is used for transportation stocks. Additional analysis at this stage includes local energy generation, district

energy and the provincial electricity grid. The primary outcome of this process is an energy and GHG inventory for the baseline year, with corresponding visualizations.

The Base Year and Reference Projection

Once the baseline is completed, a reference projection to the target year or the horizon year of the scenario exercise is developed. The reference projection is based on a suite of input assumptions into the model that reflect the future conditions. This is often based on: existing municipal projections, for buildings and population; historical trends in stocks that can be determined during model calibration. In particular, future population and employment and allocating the population and employment to building types and space. In the process the model is calibrated against historical data, providing a technology stock as well as an historical trend for the model variables. This process ensures that the demographics are consistent, that the stocks of buildings and their energy consumption are consistent with observed data from natural gas and electricity utilities, and that the spatial/zonal system is consistent with the municipality's GIS and transportation modelling.

The projection typically includes approved developments and official plans in combination with simulation of committed energy infrastructure to be built, existing regulations and standards (for example renewable energy and fuel efficiency) and communicated policies. The projection incorporates conventional assumptions about the future development of the electrical grid, uptake of electric vehicles, building code revisions, changes in climatic conditions and other factors. The resulting projection serves as a reference line against which the impact and costs of GHG mitigation measures can be measured. Sensitivity analysis and data visualizations are used to identify the key factors and points of leverage within the reference projection.

Low-Carbon Scenario and Action Plan

The low-carbon scenario uses a new set of input assumptions to explore the impacts of emissions reduction actions on the emissions profile. Often this begins with developing a list of candidate measures for climate mitigation in the community, supplemented by additional measures and strategies that are identified through stakeholder engagement. For many actions, CityInSight draws on an in-house database that specifies the performance and cost of technologies and measures for greenhouse gas abatement. The low carbon scenario is analyzed relative to the reference projection. The actions in the low carbon scenario are

together to ensure that there is no double counting and that interactive effects of the proposed measures are captured in the analysis.

IV. Addressing Uncertainty

There is extensive discussion of the uncertainty in models and modelling results. The assumptions underlying a model can be from other locations or large data sets and do not reflect local conditions or behaviours, and even if they did accurately reflect local conditions, it is exceptionally difficult to predict how those conditions and behaviours will respond to broader societal changes and what those broader societal changes will be (the "unknown unknowns"). The modelling approach identifies four strategies for managing uncertainty applicable to community energy and emissions modelling:

1. Sensitivity analysis: From a methodological perspective, one of the most basic ways of studying complex models is sensitivity analysis, quantifying uncertainty in a model's output. To perform this assessment, each of the model's input parameters is described as being drawn from a statistical distribution in order to capture the uncertainty in the parameter's true value (Keirstead, Jennings, & Sivakumar, 2012).
    a. Approach: Each of the variables will be increased by 10-20% to illustrate the impact that an error of that magnitude has on the overall total.
2. Calibration: One way to challenge the untested assumptions is the use of 'back-casting' to ensure the model can 'forecast' the past accurately. The model can then be calibrated to generate historical outcomes, which usually refers to "parameter adjustments" that "force" the model to better replicate observed data.
    a. Approach: Variables for which there are two independent sources of data are calibrated in the model. For example, the model calibrates building energy use (derived from buildings data) against actual electricity data from the electricity distributor.
3. Scenario analysis: Scenarios are used to demonstrate that a range of future outcomes are possible given the current conditions that no one scenario is more likely than another.
    a. Approach: The model will develop a reference scenario.

4. Transparency: The provision of detailed sources for all assumptions is critical to enabling policy-makers to understand the uncertainty intrinsic in a model.
    a. Approach: The assumptions and inputs are presented in this document.

Appendix D: Resilient St. John's Community Plan: Mitigation Implementation Framework

November 2021

Purpose of this Document

The Implementation Framework provides guidance for the near-term implementation of the GHG mitigation portion of Resilient St. John's. It is not a comprehensive list. Many of these actions have the potential for greater efficiency and effectiveness if done in collaboration with other neighbouring municipalities, levels of government, and organizations. These opportunities should always be explored first.

Acronyms

CoSJ	City of St. John's
DE	District Energy
EV	Electric Vehicle
FCM	Federation of Canadian Municipalities
GHG	Greenhouse Gas
ICI	Industrial, Commercial, and Institutional buildings
KPI	Key Performance Indicator
MUN	Memorial University of Newfoundland
PACE	Property Assessed Clean Energy
REC	Renewable Energy Cooperative
RNG	Renewable Natural Gas
RSJ	Resilient St. John's

Co-benefit and Implementation Definitions

In addition to varying levels of greenhouse gas (GHG) reductions, actions included in this Plan result in additional benefits, which are described as co-benefits. These include: equity improvements, employment increases, and return on investment. For simplicity a code has been created for each potential co-benefit—enabler, low, medium, and high—which is described in the table below.

Indicator	Enabler	Low	Medium	High
Greenhouse gas emissions	Enables GHG Emissions	<100 ktCO2e reduction by 2050	100 to 3,000 ktCO2e reduction by 2050	>3,000 ktCO2e reduction by 2050
Costs	-	($0 - $100,000)	($100,000 - $1,000,000)	($1,000,000+)
Equity	No discernible effect	Without intervention, this action may favour certain groups or create a greater disparity between higher and lower income groups	This action is more likely to be implemented in the community fairly, but existing powerful groups may still be at an advantage	This action contributes to enhanced equity
Employment	Enables employment	0-5 person years of employment per $ million invested	5-10 person years of employment per $million invested	>10 person years of employment per $million invested
Cost-effectiveness	No cost associated with supporting action	This program will need incentives, loans, or grants in order to be completed	This action has the ability to break even, especially if paired with a more attractive investment vehicle	This action will be a driver of total cost-effectiveness of the entire program

For each implementation action, a primary implementation mechanism is listed (e.g., policy, program, initiative, or infrastructure), each is defined in the table below.

Mechanism	Definition
Policy	A policy developed by the Municipality, and approved by Council
Program	An ongoing effort by the Municipality, with staff and financing to support the effort
Initiative	A study or project, undertaken by the Municipality or private sector, with a specific focus, that is implemented for a set time period
Infrastructure	Investment in physical infrastructure by the municipality or private sector

The Focus Areas

Five key focus areas for Resilient St. John's Community Climate Plan were identified by the consultant through the combination of consultation with the public, and through technical modelling. These include:

1. Municipal leadership and planning
2. Affordable, efficient buildings for all
3. Transportation transformation
4. Clean energy for resilience
5. Low-waste future

There will be some overlap between the programs in each of the focus areas, as well as between program areas themselves. Systematic implementation of the programs ensures that one program will support another. For example, building retrofits increase the impact of solar PV installations by ensuring that there is more clean electricity for electric vehicles.

1. Municipal leadership and planning

Actions, co-benefits, and reporting

Action	GHG impact	Co-benefits	Costs	Implementation Mechanism	Reporting Metrics	Timing
1.1 Integrate climate considerations into city-wide development policies	Enabler	**Equity:** Enabler **Employment:** Enabler **CE:** TBD	$	**Policy:** Ensure that climate considerations are fully Integrated into St. John's Municipal Plan, subsequent neighbourhood-level plans, and updates of other strategies. • i.e., as soon as possible, the City will establish ambitious densification targets (e.g., 10% vs. 5% expected in the BAU) for designated areas.	Review of relevant policy sections for any needed updates	Short

1.2 Continue to provide annual GHG and energy use reporting (for City and broader community)	Enabler	**Equity:** N/A **Employment:** Low **CE:** N/A	$	**Program:** Public, annual reporting on progress of action, and at least a 5-year community-wide GHG and energy use reporting.	Annual reporting by action Tracking changes over time	Ongoing
1.3 Develop and implement a climate lens for all City budget decisions	Enabler	**Equity**: N/A **Employment:** Low **CE:** N/A	$	**Policy:** Develop a climate lens policy to guide City budget decisions **Program:** Annual reporting on corporate GHGs and energy use	Annual reporting on emissions by department to council and public by means of staff reports Tracking changes over time	Short
1.4 Undertake regular reviews and updates of RSJ	Enabler	**Equity:** N/A **Employment:** Low **CE:** N/A	$	**Initiative:** Establish a 5-year update to RSJ	Completion of review and update to RSJ in 2026	Every 5 years
1.5 Natural area protection and enhancement	Low	**Equity:** N/A **Employment:** Low **CE:** N/A	$	**Program:** Continue and expand urban tree planting and naturalization programs **Program:** Continue to naturalize greenspace, and protect wetlands and waterway buffers	# trees planted Area of greenspace and natural areas protected	Ongoing

1.6 Business and industry working groups	Enabler	**Equity:** N/A **Employment:** Low **CE:** N/A	$	**Initiative:** Establish a working group with local industries to develop strategies to meet climate goals	Progress toward GHG reduction targets	Immediate
1.7 Partnership with academic institutions and entrepreneurship incubators for pilot project and training	Enabler	**Equity:** Enabler **Employment:** Medium **CE:** N/A	$	**Initiative:** Work with academic institutions and entrepreneurship incubators to identify opportunities for innovation, training, and development	# local industries developed or expanded # labourforce training programs developed	Immediate

Implementation Pathway

Implementation Mechanism	Partners	Funders	Next steps
Policy: Ensure that climate considerations are fully Integrated into St. John's Municipal Plan, subsequent neighbourhood-level plans, and updates of other strategies.	CoSJ	CoSJ staff time	Identify climate policies and targets that can be incorporated as policies into the Municipal Plan. Prepare a planning brief on climate action as an input into the Municipal Plan Process. Review the Municipal Plan from the perspective of climate action, and propose any required updates.
Program: Public, annual reporting on progress of action, and at least a 5-year community-wide GHG and energy use reporting.	CoSJ	CoSJ staff time	Ensure annual reporting of corporate GHGs and RSJ program KPIs

Policy: Develop a climate lens policy to guide City budget decisions	CoSJ	CoSJ staff time	Develop policy and framework for corporate climate lens, to be expanded to community-wide decisions.
Program: Annual reporting on corporate GHGs and energy use	CoSJ	CoSJ staff time	Ensure annual reporting of corporate GHGs and RSJ program KPIs
Program: Continue and expand urban tree planting and naturalization programs	CoSJ, local conservation groups	CoSJ staff time	Identify areas for future tree planting and naturalization opportunities to engage with the public.
Program: Continue to naturalize greenspace, and protect wetlands and waterway buffers	CoSJ, Ducks Unlimited Canada	CoSJ staff time	Complete a study to identify areas at high risk for development that play a role in flood management and erosion control, and adopt conservation measures
Initiative: Establish a 5-year update to RSJ	CoSJ	CoSJ staff time	Ensure annual reporting of progress and RSJ program KPIs Track stakeholder feedback on program implementation Track and research opportunities for new programs, technologies, policies, regulations to improve existing programs and to address the carbon gap On an ongoing basis seek to pilot new solutions, the climate emergency does not wait for the 5-year review cycle In 2026, draft a public-facing report that clearly summarizes annual progress to date from implementing RSJ, lessons learned, any new solutions

			that have been explored in the interim period, and changes toRSJ going forward to improve implementation and address the carbon gap for 2025-2030.
Initiative: Convene a working group with local industries to develop strategies to meet climate goals	CoSJ, local industry representatives	CoSJ staff time	Identify key partners within local industry to participate in working group Explore what approach would best support local industry to identify goals and timelines to meet GHG goals
Initiative: Work with academic institutions to identify opportunities for innovation, training, and development	CoSJ, MUN, CNA, other academic institutions or training providers	CoSJ staff time	Continue to collaborate with MUN and the CNA to identify potential opportunities for entrepreneurship, skill development, and capacity building

2. Affordable, efficient buildings for all

Actions, co-benefits, and reporting

Action	GHG impact	Co-benefits	Costs	Implementation Mechanism	Reporting Metrics	Timing
2.1 All new buildings are net-zero by 2030	Medium	**Equity:** Enabler **Employment:** Medium **CE:** High	$$	**Policy:** Establish new Sustainable Development Guideline	GHG intensity of new buildings (kgCO2e/m2)	Immediate
2.2 Mass deep retrofits to existing homes and buildings, followed by switching to electric heat pumps and water heaters, achieving net-zero or net-zero ready	High	**Equity:** High **Employment:** High **CE:** Low	$$$	**Program:** Develop a deep retrofit program for all buildings **Initiative:** Pilot a neighbourhood retrofit	# of buildings/homes retrofit GHG intensity of new buildings (kgCO2e/m2)	Ongoing
2.3 Heat pumps and electric water heaters in all buildings	High	**Equity:** Enabler **Employment:** High **CE:** High	$$$	**Initiative:** Pilot a low-income housing retrofit **Initiative:** Pilot a rental property retrofit **Leading by example/Infrastructure:** Retrofit municipal buildings to net zero or net zero ready	Number of non-electric systems replaced Total energy savings from space heating/water heating	Ongoing

2.4 Convene a roundtable to address energy poverty	N/A	**Equity:** High **Employment:** N/A **CE:** N/A	$	**Initiative:** Convene a roundtable to address energy poverty	#households experiencing energy poverty	Immediate

Implementation Pathway

Implementation Mechanism	Partners	Funders	Next steps
Policy: Establish new Sustainable Development Guideline	CoSJ, Canada Green Building Council, other cities undertaking similar actions.	CoSJ staff time, FCM	Communicate with cities that have undertaken similar policies, such as Toronto, Vancouver, or Whitby Review building standards that align with Net-Zero building standards
Program: Develop a deep retrofit program for all buildings	Local construction businesses, post-secondary education institutions, trade associates, MUN, NL Power	FCM, PACE programming led by the Municipality, revolving loans, provincial and federal governments.	Develop a small-scale financing and incentive program for homes, leveraging existing programs Complete a pilot project with 8-10 small businesses to complete deep retrofits, and share lessons learned
Initiative: Pilot a neighbourhood retrofit	MUN, CNA, Local construction businesses, EnergieSprong, Home Builders Association of Canada, Canada Green Building Council/ Passive House Institute Canada	FCM	Develop a project concept and create criteria for selecting a neighbourhood. Identify a funding source, such as FCM.

Initiative: Pilot a low-income housing retrofit	CoSJ, Province of NL, local construction businesses, MUN, CNA	FCM, Federal government	Identify a pilot project location, and share learnings for the project
Initiative: Pilot a rental property retrofit	CoSJ, local construction businesses, MUN, CNA	FCM, Federal government	Identify a pilot project location, and share learnings for the project
Infrastructure: Retrofit municipal buildings to net zero or net zero ready	Local construction/renovation/energy efficiency companies, Canada Green Building Council, Passive House Institute Canada, Province of NL, NL Power.	CoSJ, FCM, federal government	Explore energy performance contracting as a framework to realize early operational savings through energy retrofits to make city buildings net-zero or net-zero ready Identify a building or group of buildings for the first net-zero retrofit and share learnings from that project
Initiative: Convene a roundtable to address energy poverty	CoSJ, Province of NL, NL Power, End Homelessness St. John's, other NGOs or groups working in poverty reduction	CoSJ staff time	Identify key partners to participate in the roundtable and establish clear goals for their participation

3. Transportation transformation

Actions, co-benefits, and reporting

Action	GHG impact	Co-benefits	Costs	Implementation Mechanism	Reporting Metrics	Timing
3.1 Electrify personal, municipal, and commercial vehicles	High	**Equity:** Low **Employment:** High **CE:** High	$$$	**Infrastructure:** Partner on the deployment of electric vehicle charging stations **Initiative:** Working with local car dealerships to improve access to EVs **Initiative:** Develop an EV education program **Initiative:** Convene a commercial fleet decarbonization working group **Leading by Example:** Purchase electric vehicles for municipal fleet	Electric vehicle sales Transportation emissions # of charging stations by level	Ongoing

3.2 Expand and electrify transit	High	**Equity:** High **Employment:** High **CE:** High	$$	**Program:** Feasibility study and pilot project for electric buses in St. John's on select routes **Initiative:** Implement the ridership growth strategies identified in the Transit Review Study, 2019 **Initiative:** Later, update transit study to identify transit needs and further increase ridership and route coverage across the city.	Ridership Vehicle kilometres travelled (VKT, km/year) Transit mode share in relevant areas	Medium
3.3 Improve and expand walking and cycling infrastructure	Medium	**Equity:** High **Employment:** Low **CE: Low**	$$$	**Initiative:** Update, engage with the public, and ramp up implementation of the Bike St. John's Master Plan **Initiative:** Initiate a review of walking infrastructure needs in the city.	Total kms of bike lanes and trails Total kms of sidewalks in development areas Traffic counter data (vehicle counts, and vehicle kilometers traveled) in key areas	Medium

Implementation Pathway

Implementation Mechanism	Partners	Funders	Next steps
Infrastructure: Partner on the deployment of electric vehicle charging stations	CoSJ, Province of NL, NL Power	FCM,NL Power	Continue work underway in the CoSJ to expand the charger network Apply for funding from the Zero Emission Vehicle Infrastructure Program
Initiative: Working with local car dealerships to improve access to EVs	Local vehicle dealerships	CoSJ staff time	Convene local partners to identify existing barriers or limitations to the availability of EVs within St. John's, including used vehicles for resale on the second-hand market
Initiative: Develop an EV education program	CoSJ, NL Power	CoSJ	Develop an electric vehicle public education program, including test drives, an education website, and printed materials that answer frequent questions, support lifecycle costing of personal vehicles, and addresses concerns about battery life and range, charging infrastructure, and local winter performance
Initiative: Convene a commercial fleet decarbonization working group	CoSJ	CoSJ staff time	Identify key partners to participate in the working group Establish a Terms of Reference for the working group with clear goals and timelines

Infrastructure: Purchase electric vehicles for municipal fleet	CoSJ	CoSJ	Establish a policy whereby all vehicle purchases are electric unless a justification otherwise can be made to Council.
Program: Feasibility study and pilot project for electric buses in St. John's on select routes	CoSJ, Metrobus, NRC	CoSJ, FCM	Complete feasibility study on the electrification of the Public Transit System Purchase a small number of electric buses for a pilot project
Initiative: Initiate a review of walking infrastructure needs in the city.	CoSJ	CoSJ	Gather data and perceptions on walking infrastructure to identify needs
Initiative: Implement the ridership growth strategies identified in the Transit Review Study	CoSJ	CoSJ	Continue to invest in the ridership growth strategies identified in the Transit Review Study
Initiative: Later, update transit study to identify transit needs and further increase ridership and route coverage across the city.	CoSJ	CoSJ	Develop a community survey, and implementation plan to expand walking infrastructure across the city
Initiative: Update, engage with the public, and ramp up implementation of the Bike St. John's Master Plan; and	CoSJ	CoSJ	Update, engage, and Implement the Bike St. John's Master Plan. Complete a review of walking infrastructure and opportunities to expand the trails and sidewalks, supporting active modes of transportation

4. Clean energy for resilience

Actions, co-benefits, and reporting

Action	GHG impact	Co-benefits	Costs	Implementation Mechanism	Reporting Metrics	Timing
4.1 Partnership with MUN to decarbonize the District Energy system	High	**Equity:** Low **Employment:** Low **CE:** Low	$	**Initiative:** Collaborate with MUN/EH to decarbonize the DE system	GHGs from the DE system	Short
4.2 Install wind farms to supplement the provincial electricity grid.	Medium	**Equity:** Low **Employment:** Low **CE**:ww	$$$	**Policy:** Support the implementation of the renewable energy policies in the Envision Municipal Plan **Initiative**: Renewable energy cooperative (REC) public education campaign & search for local leads	MW of wind generation infrastructure installed	Medium
4.3 Expand landfill gas capture	Medium	**Equity:** N/A **Employment:** Low **CE:** Low	$$$	**Infrastructure**: Expand the landfill gas capture system and explore collaborative frameworks for its feasible reuse	Tonnes RNG captured	Short

4.4 Ensure electricity system is planning to manage new demand and new supply mix	N/A	**Equity:** N/A **Employment:** Low **CE:** Low	$	**Initiative:** Commission an hourly analysis of electricity demand and capacity to ensure a stable, reliable electricity grid for a net-zero future	Completion of study	Short

Implementation Pathway

Implementation Mechanism	Partners	Funders	Next steps
Initiative: Collaborate with MUN/EH to decarbonize the DE system	CoSJ, MUN	CoSJ	Establish a partnership with MUN to establish goals and timelines for decarbonization
Policy: Support the implementation of the renewable energy policies in the Envision Municipal Plan	CoSJ, Province of NL, NL Power	CoSJ	Review existing policies to identify barriers and gaps that limit the use of renewable energy, and work with the Province and other stakeholders to eliminate barriers
Initiative: Renewable energy cooperative (REC) public education campaign & search for local leads	CoSJ, NL Power, other municipalities with existing RECs (Toronto, Ottawa)	CoSJ	CoSJ to provide public education campaign CoSJ to support search for potential local groups to establish REC CoSJ to design renewable energy RFPs to enable participation by RECs

Infrastructure: Expand the landfill gas capture system and explore collaborative frameworks for its feasible reuse	CoSJ, Province of NL	CoSJ, Province of NL	CoSJ and the province to collaborate to commission a feasibility study on the improvement of landfill gas capture systems at regional landfills
Initiative: Commission an hourly analysis of electricity demand and capacity to ensure a stable, reliable electricity grid for a net-zero future	CoSJ, NL Power Province of NL	CoSJ, NL Power, Province of NL	Hire a consultant to undertake an hourly analysis of how the energy efficiency improvements and electrification included in RSJ will affect the electricity system, and how the demand can be balanced to ensure a stable, reliable grid

5. Low-waste future

Actions, co-benefits, and reporting

Action	GHG impact	Co-benefits	Costs	Implementation Mechanism	Reporting Metrics	Timing
5.1 Public education to reduce overall waste production, and improve waste diversion	Low	**Equity:** N/A **Employment:** N/A **CE:** N/A	$	**Program:** Develop and deliver educational programming about waste reduction, and waste sorting	Waste diversion rates Per capita waste generation	Short
5.2 Support the development of a circular economy	Enabler	**Equity:** N/A **Employment:** N/A **CE:** N/A	$	**Initiative:** Convene a working group to identify opportunities for building a local industry for repair and reuse including community composting and building materials reuse such as: • undertaking a review of existing guidance (e.g., Guide to Community Gardens in the City of St. John's) to incorporate neighbourhood level community composting on city-owned land. • identifying barriers and	Tonnes garbage generated annually	Short

				opportunities for building materials re-use. • explore the development of a food waste and resource flow map to identify food waste-to-value opportunities for innovation.		

Implementation Pathway

Implementation Mechanism	Partners	Funders	Next steps
Program: Develop and deliver educational programming about waste reduction, and waste sorting	CoSJ, Province of NL, MMSB	CoSJ, Province of NL, MMSB	Develop educational material on reducing waste production, and on the importance of waste sorting for all ages
Initiative: Convene a working group to identify opportunities for building a local industry for repair and reuse including community composting and building materials reuse	CoSJ, Province of NL, MMSB	CoSJ, Province of NL, MMSB	Identify key partners to participate in the working group Establish a Terms of Reference for the working group with clear goals and timelines

OUR CITY. OUR FUTURE.

Resilient **St. John's**

Community Climate Plan

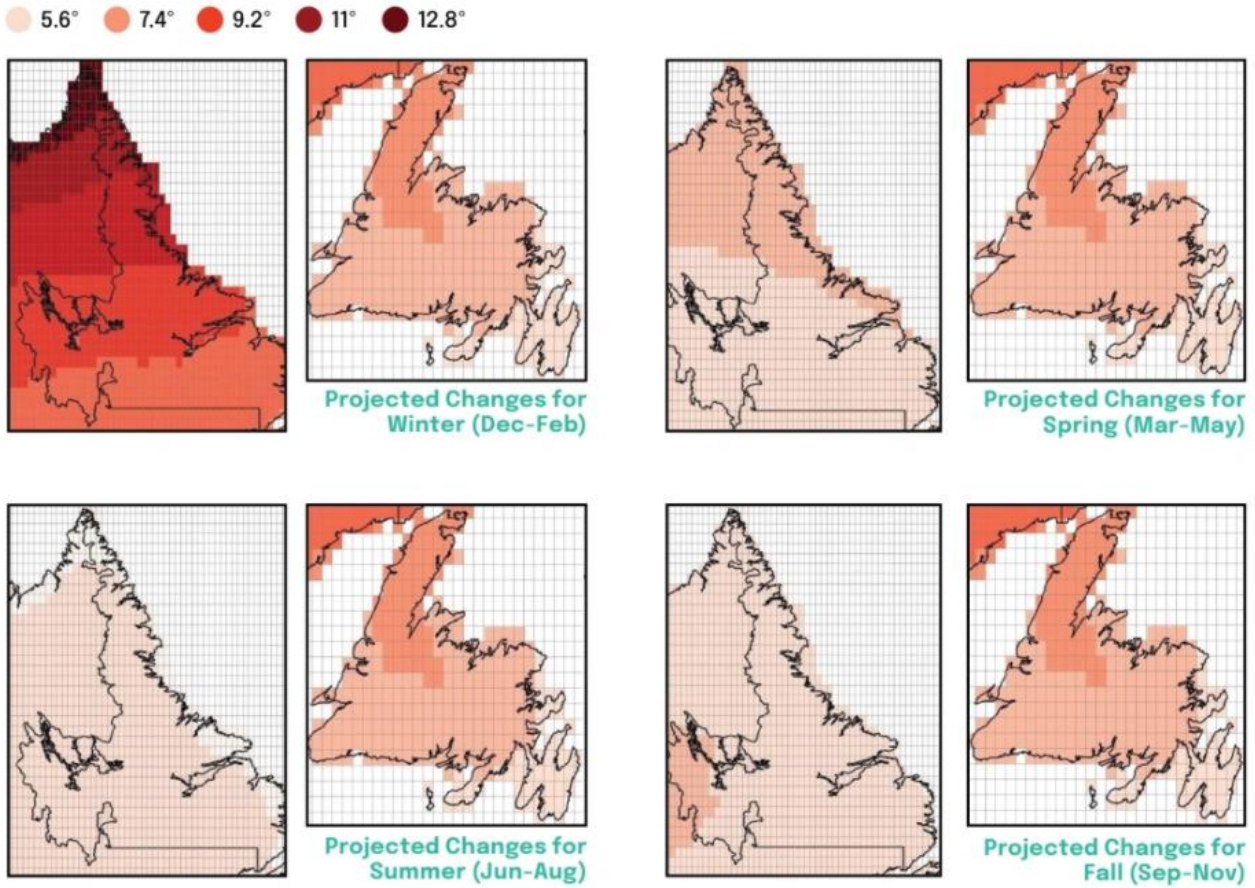
COTW Presentation to Council
March 2022

ST. JOHN'S

St. John's Climate Emergency Declared November 2019

Affirmed a climate emergency for the purpose of deepening our commitment to protecting our community, economy, natural assets, and ecosystems from changes in climate.

- Set Climate Change as a Strategic Priority
- Directed staff to develop a Plan that:
  - Assesses climate risks
  - Greenhouse gas emissions reduction targets
  - Actions and strategies
  - Reporting systems
  - The identification of funding sources and collaboration opportunities

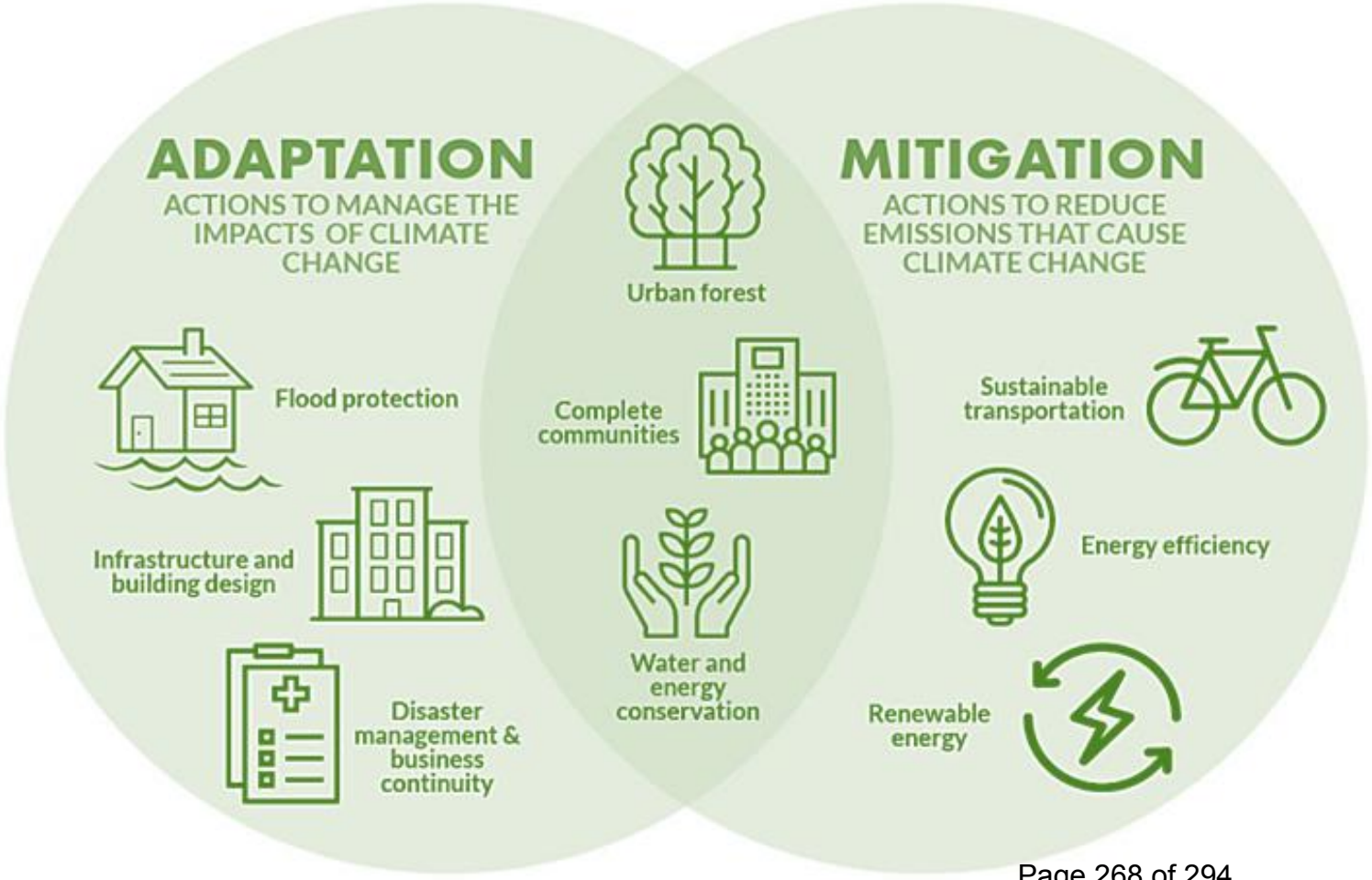


Projected Temperature Change, Late 21st Century (Average Daily)

Sources: Government of Newfoundland and Labrador, Memoria University

Pathway to
"Low Carbon Resilience"

Resilient St. John's
Community Climate Plan



Strategically aligning climate adaptation and emissions reduction can enhance the effectiveness of both strategies, avoid risks, and generate economic, ecological, and social benefits.

ACT-Adapt Simon Fraser University

An engagement and evidence based process

+30 external stakeholders

5 stakeholder workshops

Internal City Staff engagement

2 rounds of public engagement

+3 presentation to Council

3 City website news articles

2 City guide articles

+1,600 visits to engagestjohns.ca

2 quick polls w/ 77 votes

+2,000 votes on various best practice actions

+5,850 votes on what is important to prioritize

+140,280 social media impressions with 1,718 engagements

5 newsletters to +3,300 recipients through engagestjohns.ca

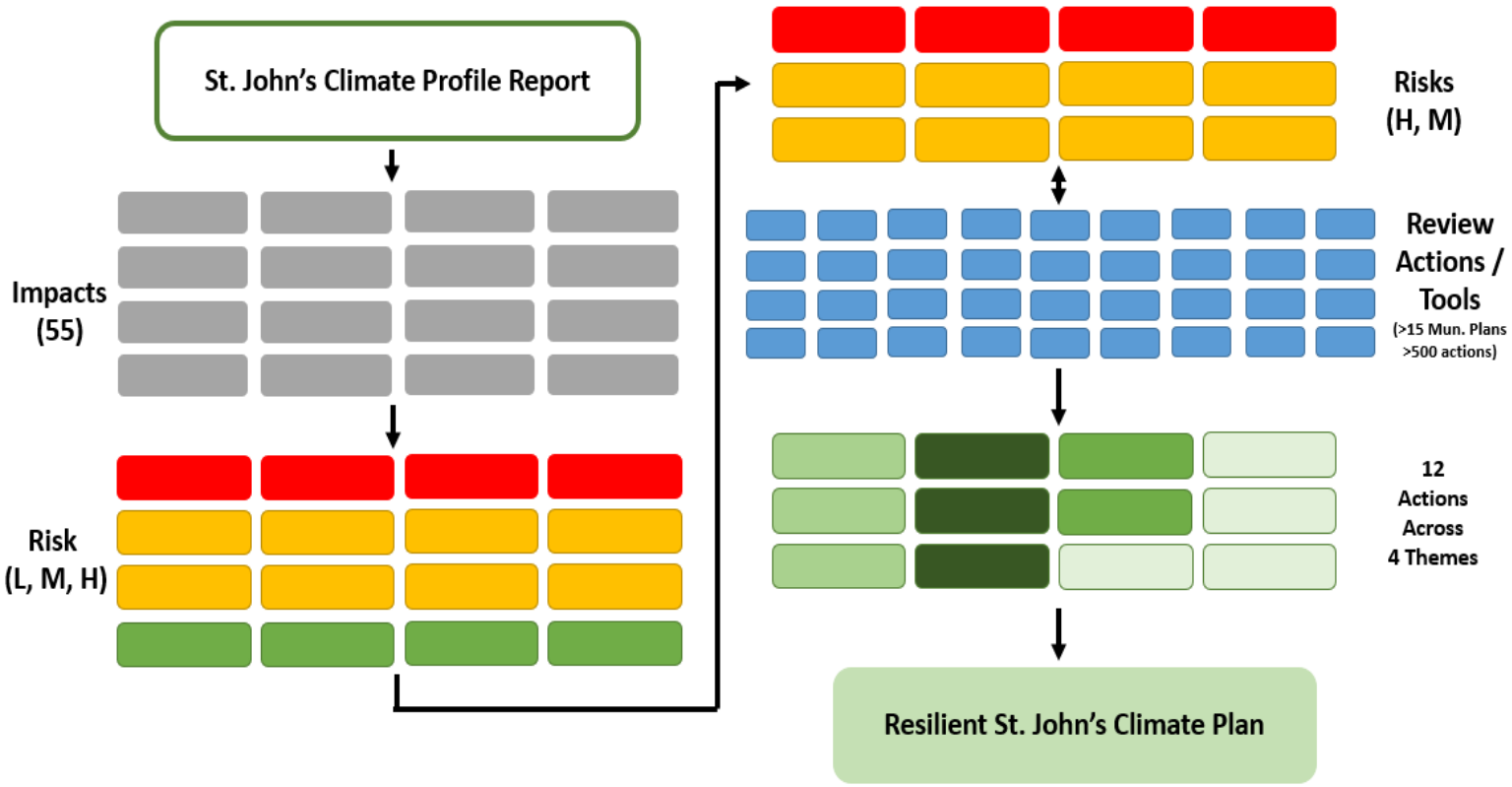
DIY climate leader toolkit and training session

+44 virtual public session attendees

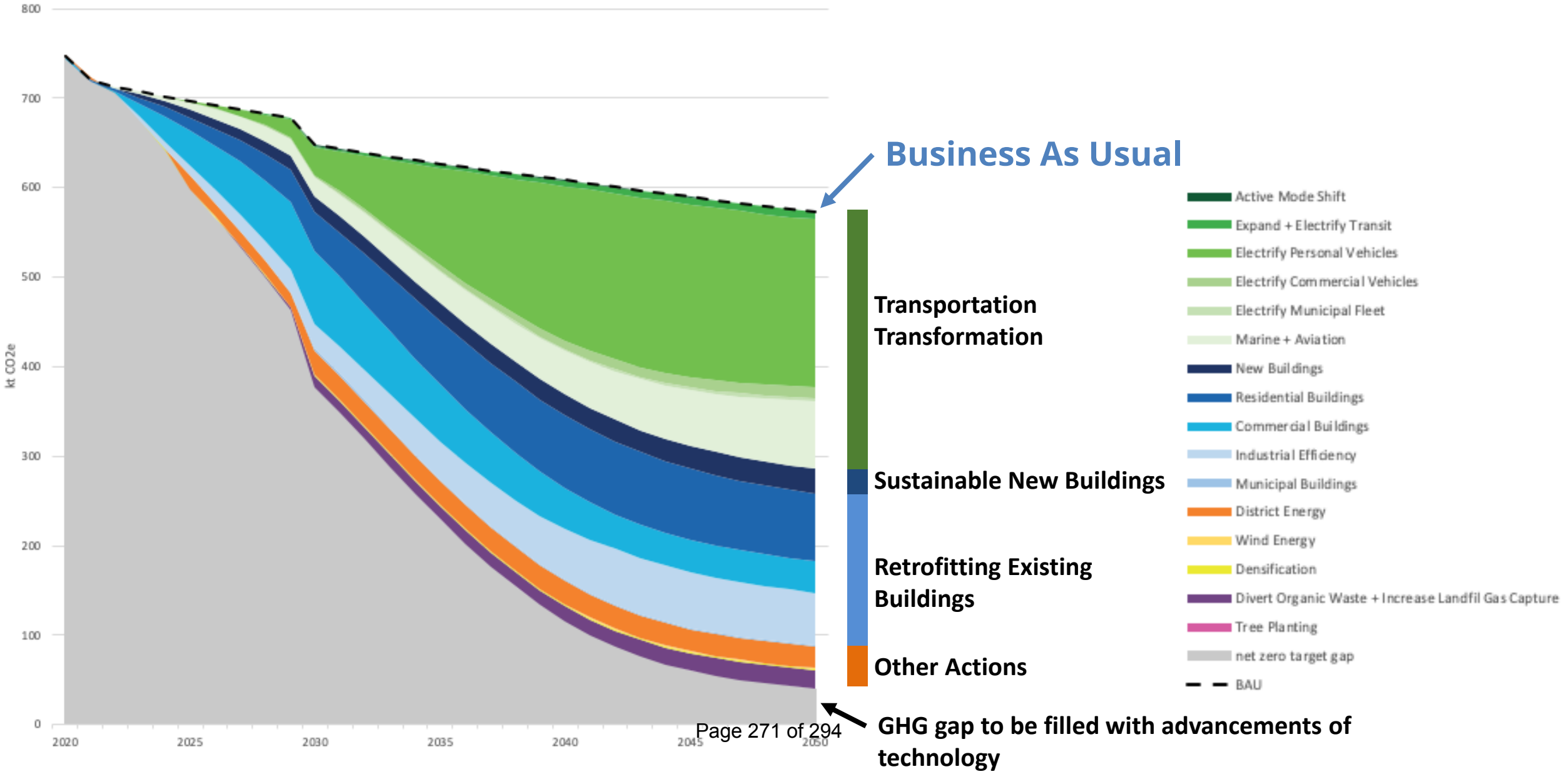
Interactive climate hazard mapping

Council radio interviews

Adapting to Climate Change Risks



St. John's Community Carbon Pathway



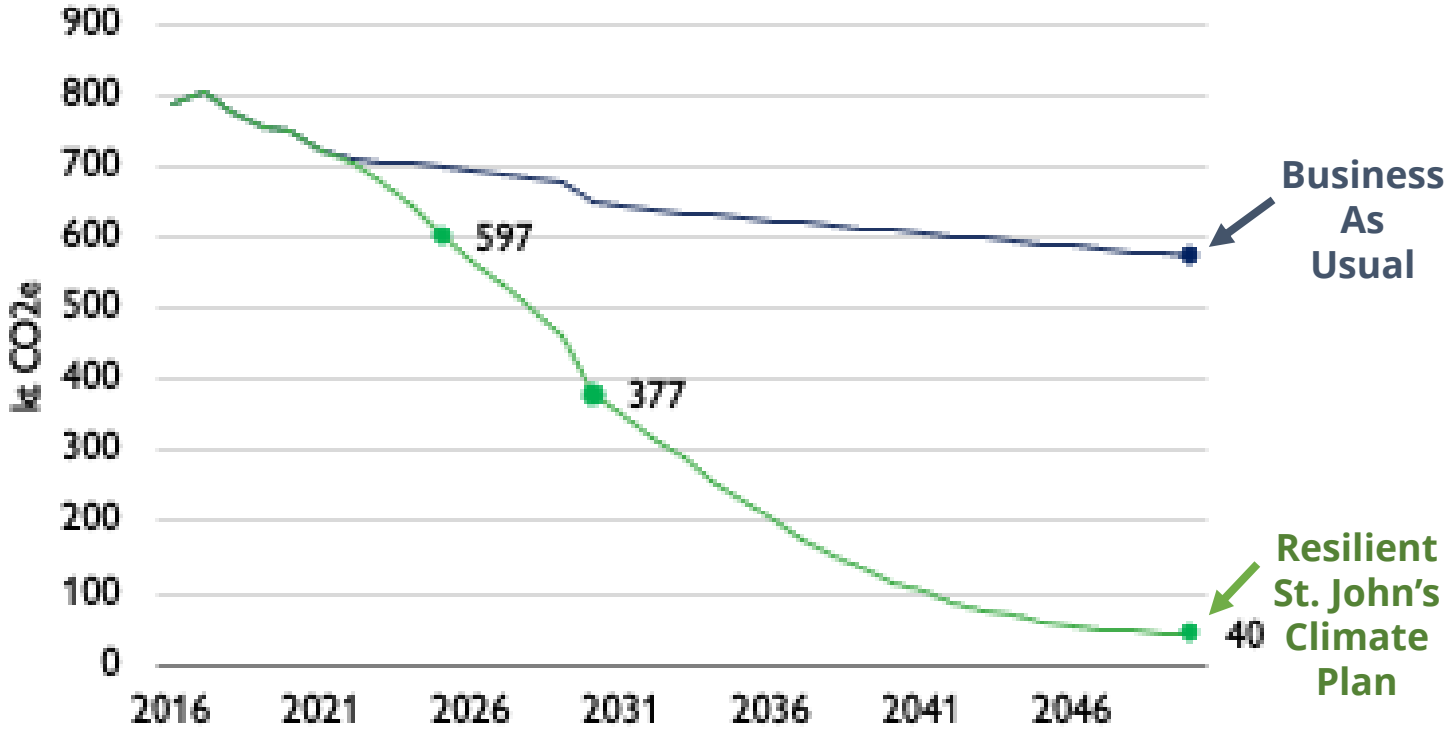
St. John's Community Carbon Targets

Community-wide modeling results show that to most feasibly achieve net-zero before 2050 St. John's should follow a pathway of emission reductions of approximately:

- 25% by 2025 from the 2016 baseline.
- 50% by 2030 from the 2016 baseline.

This means capping emission to a maximum:

- 600 kt COe2 by 2025
- 380 kt CO2e by 2030
- and zero by 2050 at the latest



↓ 15% by 2020 (from 2005)
↓ 39-48% by 2030 (from 2005)

Newfoundland Labrador

↓ 40-45% below 2005 level by 2030

Canada

Economic Opportunity

- **Economic Benefit**
  - Net benefit of $1.8 billion locally over 30 years
  - Including $7 billion in avoided energy and carbon costs
  - Reduced vulnerability to climate impacts

- **Addressing Household Resilience**
  - Households facing energy poverty face difficult choices such as "heat or eat”.
  - 50% reduction in household energy costs by 2050 vs business-as-usual (BAP)
  - Reduced costly insurance claims

- **Improving Job Market**
  - Net increase of 1,400 jobs by 2050

- **Economic recovery from COVID-19**
  - Increasing capture of federal funding for work in our community
  - Unique opportunities to do things better

Non-financial Benefits and Risks of Inaction

Non-financial benefit to our community include

- Improved public health
- Enhanced food security
- Enhanced energy security
- Decreased social inequity
- More resilient ecosystem

Risks of inaction are real and can be quite significant

- Missing out on cost-sharing funding early in the transition
- Missing out on economic opportunities presented by the local, national, and global low-carbon transition
- Possibly having stranded assets
- Long term loss of competitiveness and attractiveness for new residents

Immediate Actions

- **Governance and collaboration structures for plan implementation through ESEP and Council**
- **Energy performance contract programming for energy efficiency and low-carbon city buildings**
- **Program to improve household energy efficiency and climate risk protection**
- **Sustainable development guideline for new development and City buildings**
- **Installation of public charging network & support EV education programs**
- **Plan for electrification of public transit**
- **Framework to assess risk and protect community lifelines and critical infrastructure**
- **Resourcing for the implementation of the Resilient St. John's Climate Plan**
- **Climate change policy outlining use of data and 5-year review of plans**

Resilient St. John's
Community Climate Plan

THANK YOU

ST. JOHN'S

NEWFOUNDLAND & LABRADOR
HISTORIC TRUST
est 1966

December 3, 2021

Mayor Danny Breen
Deputy Mayor Sheilagh O'Leary
Councillors Bruce, Ravencroft, Korab, Froude, Ridgeley, Burton, Ellsworth, Hickman, Hanlon
City of St. John's
P.O. Box 908
St. John's, NL A1C 5M2

Re: Newfoundland and Labrador Historic Trust

Dear Mayor Breen, Deputy Mayor O'Leary, and Councillors Bruce, Ravencroft, Korab, Froude, Ridgeley, Burton, Ellsworth, Hickman, Hanlon:

The Newfoundland and Labrador Historic Trust (NLHT) fully supports the city of St. John's in its initiative to draft and hopefully adopt the Resilient St. John's Climate Plan; however, there is room for improvement. We all know the threats and need for immediate action that climate change brings to our city, its residents, communities, and natural and built environments.

The Newfoundland and Labrador Historic Trust is dedicated to the preservation of the province's historic buildings and landscapes and their importance to communities. We have a vision of a province of communities that recognize the cultural, environmental, and economic value of their historic buildings and landscapes. As the capital city of the province, you lead the way in setting precedent and becoming a role model for all communities. Given the closely linked connection between heritage, the built environment, and climate action the NLHT must respond to the Draft Climate Plan.

During the virtual public session held online on December 2nd, it was explained that the Net-Zero concept for new buildings is balancing the energy/greenhouse gas production of running the building with the energy/greenhouse gas savings from the building. With this in mind, according to 2.1 of the Mitigation Implementation Framework the city aims for all new buildings to become Net-Zero by 2030, however this does not go far enough. The energy involved in all stages of construction, demolition, excavation and site work, as well as the material quality, production, and transportation must be included in these calculations. What is the point of having eco-friendly "Net-Zero" new buildings if we have to divert rivers, clear forests, demolish buildings to get there? We cannot be narrow sighted and just look at how green the end product is. Greater focus on full scale analysis of climate impacts for new developments is essential.

One of the largest contributions of waste to landfill facilities (23%) is construction and demolition (C&D) waste. Of that C&D waste, 90% comes from demolition alone. Even 30% of new material delivered to a construction site will end up as waste. Existing buildings also have

massive quantities of embodied carbon. Embodied carbon is the carbon footprint associated with the construction of a building. All that energy has already been spent. Why waste it and spend even more to build new? Methods such as Life Cycle Assessment can quantify these impacts for the lifespan of a building and prove to be a useful metric in deciding upon the climate impact of a new development. 40% of Global C02 emissions are directly linked with buildings, materials, and construction. Half of new construction emissions come as a result of embodied carbon. Ignoring these metrics vastly underestimates the impact of new developments and it must be considered.

It is well within the cities ability to approve or deny development applications and their full climate impact from birth to death must be considered. It is not enough to only look at the running costs and the "Net-Zero" status of developments. It is one of the very few climate action items which the city has direct control over and its huge impact should make it a priority in the Climate Resilience Plan. Does the city acknowledge the value of embodied carbon within existing buildings and the need to maintain and reuse existing buildings instead of expending excess energy and increasing landfill contributions to demolish and re-build? Initiatives to encourage adaptive reuse, incentivize maintenance and addition over demolish and rebuild, require salvage, reuse, and recycling of materials, and prioritize sustainable, future proof design in new buildings is essential. All of these points are absent from the draft Climate Resilience Plan and it leaves a gaping hole.

It is obvious that there is an incredible environmental value in preserving built heritage and the built environment as a whole. The City of St. John's cannot ignore these facts and the Resilient St. Johns Climate Plan must take concrete steps towards valuing and prioritizing the built environment.

Sources:
Embodied Carbon: The Blindspot of the Buildings Industry (canadianarchitect.com)
Sustainable Management of Construction and Demolition Materials | US EPA)

Sincerely,

Board of Directors
Newfoundland and Labrador Historic Trust

Dear Council Members,

We applaud the comprehensive approach to forming the Resilient St. John's Community Climate Plan. We are happy to see that the City is taking steps in the right direction to become Net-Zero by 2050. The Community Climate Plan will also help individuals already working toward Low-Carbon Scenario lifestyles.

Climate change is a multi-layered issue and will require complex solutions to address it. We are most hopeful about the GHG Mitigation Action Themes *Affordable, Efficient Buildings for all, Transportation Transformation,* and *Low-Waste Future*. These plans can help reduce our consumption, especially oil and gas products while creating innovative waste (resource) management solutions that reflect income inequalities.

Members of the Social Justice Co-operative NL are part of the St. John's community. We have organized several events and projects to highlight the injustices that residents face and create solutions for their concerns.

Pedestrian and cyclist safety has been high on our agenda as they are trying to navigate our community without cars and are facing extreme danger. In our community, people are being injured, sometimes fatally, and we believe the policy changes outlined below are crucial to keeping each other safe.

People are also seeking out improved zero-waste options. Conversations with the City are underway to see how the City can play a more significant role in circularity actions. For instance, the community compost pilot project in partnership with the City, MMSB and Food First NL has been an

enormous success with strong uptake and nutritious soil creation for a community garden.

We propose that the plan includes further mechanisms to support the following activities:

- Construction of housing units to tackle the growing housing crisis

- Prioritization of safe and efficient transport of people, i.e. investment in transportation infrastructure that benefits walking, cycling, mass public transit ***before*** private car infrastructure.[1]
    - Focus on public transit like it is a public service, not a business
    - The bus system is part of the pedestrian system. Make the city pedestrian-friendly, and bus ridership will increase.
    - Keep expanding sidewalk snow clearing and salting so people can walk in the city year-round.
    - 30KM/h speed limit on residential streets as soon as possible.
    - Full implementation of the Bike Plan.

- Implement mandatory recycling and composting for residential, and Industrial, Commercial, and Institutional (ICI) units to truly achieve Zero Waste Communities.

- Expand the Environmental Coordinator team by funding an additional position tasked with writing grant applications to Provincial and Federal agencies for project implementation and maintenance that serves the Community Climate Plan.

We were elated to see the City of St. John's declare a climate emergency and join the Global Covenant of Mayors for Climate & Energy in 2019. These actions recognized the threat of climate change and the vital role

[1] http://fourthplan.org/action/streets-for-people

that cities must play to prepare. Since then, we have faced significant challenges, from “Snowmageddon” to COVID-19, highlighting the need for solid emergency preparation. We believe the City of St. John’s could be a climate action leader in Canada and well prepared for climate change’s challenges with active consultation.

The Social Justice Co-operative NL’s knowledge and experience in these areas gathered through our Action Teams’ grassroots work (i.e., Challenge Car Culture and Zero Waste) are ready to support the City to prioritize safety and care in our community.

We urge the City Council of St. John’s to strengthen and approve the Resilient St John’s Community Climate Plan in full to accomplish Net-Zero by 2050 and to implement necessary projects to achieve this goal.

Sincerely

The Social Justice Cooperative of Newfoundland and Labrador

Feedback: Resilient St. John's Mitigation and Adaptation Plans

About Food First NL

Established in 1998, Food First NL is a provincial, non-profit organization with a twenty-year history of collaboration with communities and organizations across Newfoundland and Labrador to advance food security in the province

Food First NL's Mission is to actively promote comprehensive, community-based solutions to ensure access to adequate and healthy food for all.

We Envision a province where all people at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

Our work is organized into **4 strategic goals:**

Raise Awareness | Raise awareness and understanding of food security, and its impacts, in order to increase engagement and enhance efforts to improve food security in the province.

Strengthen Partnerships | Build and strengthen our network of strong, diverse, and strategic partners, collaborators, and allies, in order to increase and enhance efforts to improve food security in the province.

Catalyze Action | Catalyze and support action across sectors at the local, regional, provincial, and national levels, in order to improve food security in the province.

Enhance Capacity | Enhance Food First NL's capacity to lead efforts to improve food security in Newfoundland and Labrador.

Our role in the process

Food First NL participated in Resilient St. John's Community Climate Plan as part of the Multi-Stakeholder Sustainability Team through 2020-21. As part of St. John's Food Assessment, Food First NL has been at the forefront of identifying food systems strengths, gaps, and opportunities for improved coordination and collaboration. Food First NL co-hosted a focus group in December 2020 as co-chair the St. John's Food Policy Council to provide early feedback on the social, environmental, and economic impact on the food system.

Our team attended the online community meeting on December 2nd, 2021 and reviewed both the Adaptation and Mitigation plans as they relate to food systems and food policy. The document contains our feedback to ensure a resilient and strengthened local food system.

Feedback: Mitigation Plan

Food systems, including local food production and municipal drinking water, are not mentioned explicitly in the GHG mitigation plan. Nonetheless, there are many connections between the proposed mitigation measures and food security in St. John's.

Key points of connection:

- **The Framework's Equity Lens:** the explicit focus on centring those who will be most impacted and least able to adapt (and are also most vulnerable to food insecurity) is a very strong element of the plan.
- **Integration of climate considerations into Healthy Communities planning,** which also includes many food systems elements
- **Energy poverty and retrofits:** all these initiatives could potentially improve people's access to disposable income which could then be redirected to affording food.
- **Expanding and electrifying transit:** physical access to food was identified as a key issue in the St. John's Food Assessment; limited transit service is a major barrier to food security for many households, especially lower-income residents.
- **Improving and expanding walking and cycling infrastructure:** as with transit, this is a critical element of improving food accessibility in St. John's.
- **Supporting the development of the circular economy:** this objective specifically references development of community composting, a major gap in our food waste management system locally

Key considerations:

- Feedback on active transportation in the St. John's Food Assessment was consistent with many City engagement processes in recent years, which is that winter sidewalk maintenance and frequent transit service need to be enhanced. The Mitigation Plan goals around identifying transit needs and reviewing walking infrastructure may be superfluous given the extensive engagement already conducted. Locating and dedicating additional resources would appear to be the primary issue in this area.

- With the plan's focus on emissions generated within the city, there is a potential for contrary outcomes in some food systems; for example, producing more food locally could result in additional emissions, if not done in a sustainable way. A resilient local food system involves working with farmers to store carbon, improve biodiversity and ecological services, reduce on-farm emissions, and identify potential partnerships for green energy use and production.
- There are additional opportunities for the City of St. John's to leverage its procurement to achieve more sustainable food system outcomes. Prioritizing local food producers within the procurement process is a way to provide concrete support to the GHG-reducing actions noted above.

Feedback: Adaptation Plan

Food systems are more explicitly referenced in the Adaptation Plan. Food First NL is glad to see them included, since the ongoing climate emergency will clearly reshape these systems both globally and locally. There are, however, areas of the plan which require some revision or clarification, and some important larger-scale context that has been omitted.

Areas for revision:

- **Projected impacts on local food production:** on page 14, this passage appears: "*The longer growing season also is expected to bring more pest management demand, but also provide an opportunity for gardening and food production.*" This is simply not consistent with the current understanding in the scientific literature, as Catto noted in *A Review of Academic Literature Related to Climate Change Impacts and Adaptation in Newfoundland and Labrador*[1], "A single extreme event (later frost, extended drought, excess rainfall during harvest period) can eliminate any benefits from improved 'average' conditions". Climate chaos presents new challenges for local producers, whose operations are also reliant on agricultural inputs, such as fertilizer and grain, produced out of province and subject to global price variability and supply chain disruption.

- **Food production objectives:** on page 19, the plan lays out the objective to *"Improve local food security by supporting the food and agriculture sector."* and identifies three pathways:
    - *Continue to support local food production, including community gardens, backyard farming, regenerative farming, greenhouses, farmers markets, and vertical farming.*
    - *Collaborate to identify and showcase local agricultural best management practices and impacts to support timely adaptation.*
    - *Continue to support protection of agricultural lands, natural features and water resources through planning and zoning policies.*

[1] https://www.gov.nl.ca/ecc/files/publications-review-literature-climatechangeimpactsadaptation-innl.pdf

As this section sets out actions to increase local food production, we would clarify that there will be different sets of needs between community-based and commercial food production systems, and emphasize that “food security” is also a matter of *access* to food, both physical and economic.

Measures to mitigate the economic costs of the climate emergency (ie, energy poverty and transportation in the plan) are important parts of the plan that can be reinforced with vibrant community markets and self-provisioning through home and community gardening. To protect remaining farmland within the St. John's Urban Region Agriculture Development Area, and support the economic viability of producers, requires significant coordination with agriculture sector organizations and all levels of government, and should have specific targets attached to this plan.

This is also an area where defined targets and objectives around land use could help articulate a path to the goals identified; this could include both the preservation of land for food production and the facilitation of urban land uses that mitigate (through density and transit) the socioeconomic barriers to food security created by the climate emergency.

- **Low Waste Future:** Noting the success of community composting led by local non-profits, enabling this activity and clarifying all insurance coverage for activities on City-owned land is an opportunity for short-term action.

Omitted Context

- **Climate-driven global food system impacts:** it is becoming increasingly clear that one outcome of the climate emergency is a steady increase in food prices. Our food systems are global in scope, and a climate-related disruption to some part of them is virtually guaranteed in any given season now. This is contributing to a sharp increase in food prices, which will put further pressure on household food security in St. John’s. The plans are (understandably) not comprehensive in listing all the various global dynamics of the climate emergency, but this particular one seems relevant to include.

Overall Feedback & Conclusions

Food First NL is excited to see such intentional work and leadership on both adaptation and mitigation strategies. Municipalities are responsible for the way communities are designed, the services provided, the policies adopted, and locating the infrastructure that ultimately impacts the local food system and how food is accessed. Addressing these complexities requires a collective approach across all levels of government while recognizing that local action is particularly effective for community change.

In reviewing these documents, furthermore, our staff did not always feel that they conveyed the necessary sense of urgency. We would certainly welcome both stronger language and accelerated timelines on the interventions proposed.

Given the urgency of the climate emergency, moving quickly forward on many of these items simultaneously is important, and this will surely involve the recruitment of a significant number of staff to do so. As the actions proposed are necessarily in-depth and broad ranging, we are left with a concern about organizational capacity. We would hope that the various funding streams from other orders of government will support this to happen quickly, alongside significant commitments of municipal resources.

The implications of these plans are potentially transformative for our local food systems at both the ecological and household levels. We very much look forward to being a partner on the planning and implementation of interventions that could make so many lives better while meeting our climate commitments.

Contact Us

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Food First NL
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DECISION/DIRECTION NOTE

Title:	Shea Heights Community Centre Board of Directors – New Board Appointment
Date Prepared:	March 2, 2022
Report To:	Committee of the Whole
Councillor and Role:	Councillor Carl Ridgeley, Ward 5
Ward:	Ward 5

Decision/Direction Required:

To approve the appointment of one (1) new At Large member to fill vacancies on the Shea Heights Community Centre Board of Directors.

Discussion – Background and Current Status:

The Shea Heights Community Centre Board of Directors is a Board that is appointed by the City of St. John's, created to facilitate the development and implementation of social, recreational and educational benefits and services for the residents of Shea Heights.

The Shea Heights Community Centre Board of Directors currently consists of a maximum of twenty (20) Board members:

1. One (1) Stakeholder Group	1 Filled
2. One (1) Community Resource Member	1 Filled
3. Twelve (12) At Large	11 Filled
4. Three (2) Resource Members	2 Filled
5. Three (4) Ex-Officio Members	4 Filled

Approval of new Board Members

As the Shea Heights Community Centre Board of Directors are appointed by the City of St. John's, any new members must be ratified through City Council.

A public expression of interest was held to seek volunteers to fill current vacancies, with an application received from **Marion Isaacs.** The application was discussed with the Board during a regularly scheduled meeting, whereby the Board supported the nomination and has put forth request to Council for appointment to the vacant At Large position.

Marion has been a resident of Shea Heights since childhood. She is highly social, friendly and well-connected to the community. Marion learned the true spirt of the community from her late mother and father Linda and Harold Druken, and works to pass those values along through her three children. Marion has previous experience in working with the Board as a past member of the Santa Claus Parade Committee.

Key Considerations/Implications:

1. Budget/Financial Implications - N/A

2. Partners or Other Stakeholders

   The Recreation Division and Community Centre staff work closely with the Board of Directors to deliver programs, services and events to residents of Shea Heights.

3. Alignment with Strategic Directions/Adopted Plans

   Directly supports the strategic direction of *"A Connected City": Increase and improve opportunities for residents to connect with each other and the City.*

4. Legal or Policy Implications

   The approved terms of reference allow for a Board which consists of up to 20 members.

5. Privacy Implications - N/A

6. Engagement and Communications Considerations - N/A

7. Human Resource Implications - N/A

8. Procurement Implications - N/A

9. Information Technology Implications – N/A

10. Other Implications

Recommendation:
It is recommended that council approve the following appointment to the Shea Heights Board of Directors:

Marion Isaacs be appointed to the Shea Heights Community Centre Board of Directors to fill the vacancy within the "at large" category of the Board structure.

Prepared by: Travis Maher, Community Services Coordinator

Approved by: Jennifer Langmead, Manager – Community Development

Report Approval Details

Document Title:	Decision Note Shea Heights Board Applications March 2022.docx
Attachments:	- Shea Heights Board Member Marion Isaacs Decision Note Attachment 2022.xlsx
Final Approval Date:	Mar 3, 2022

This report and all of its attachments were approved and signed as outlined below:

Jennifer Langmead - Mar 3, 2022 - 5:12 PM

Tanya Haywood - Mar 3, 2022 - 5:17 PM

Shea Heights Board of Directors	
Name	**Position**
Jesse Wilkins	Chair
Kearney O'Keefe	Vice-Chair
James Reardon	Treasurer
Sherri Breen	Secretary
Vacant	Past Chair
Jocelyn Delaney	At Large Member
Vacant	At Large Member
Joey Warford	At Large Member
David Warford	At Large Member
Jessica Wilkins	At Large Member
Brittany Benson	At Large Member
Madison Snelgrove	At Large Member
Kayleen Puddester	Stakeholder - NL Housing Tenants Rep
Julie O'Brien	NL Housing Rep
Ron Ellsworth	Resource Member
Theresa Minnett	Resource Member
Dr. Darcy / Lisa Bishop	Ex - Officio - Medical Centre
Carl Ridgeley	Ex - Officio - Council Rep
Travis Maher	Ex - Officio - City of St. John's
Linda Hart	Ex - Officio - School Principal

DECISION/DIRECTION NOTE

Title: Youth Engagement Working Group - Membership

Date Prepared: March 3, 2022

Report To: Committee of the Whole

Councillor and Role: Mayor Danny Breen, Governance & Strategic Priorities

Ward: N/A

Decision/Direction Required:
The selection review process has now concluded and Council's approval is required to appoint the Youth Engagement Working Group.

Discussion – Background and Current Status:
As per its Terms of Reference, the new Youth Engagement Working Group will oversee the implementation of the Youth Engagement Strategy approved by Council in October 2020 and provide ongoing advice and guidance on how to best engage youth on City matters. A call for nominations was circulated and open for three weeks. Seventy-four (74) applicants came forth for individual membership and four organizations submitted interest. Each applicant was asked the following questions:

- Why do you want to be involved with the Youth Engagement Working Group?
- How would the Youth Engagement Working Group benefit from your involvement?
- Applicants were also given the opportunity to identify as either LGBTQ plus, indigenous, a person with a disability, a visible minority to ensure the working group is representative of the youth community.

The selection process was led by Organizational Performance and Strategy with consultation from the Office of the City Clerk, Recreation, Economic Development, Culture and Partnerships, and Communications. Each of the six members of the selection review process individually ranked their selections via a rubric of qualities: diversity, passion and value, all of which were based on the responses to the above noted questions. The rankings were averaged for each applicant and selected on the basis of the highest averages achieved. The following individuals are recommended for approval:

Individual Representatives (in no particular order):
- Isabel Ojeda
- Marium Nawal Oishee
- Ony Anukem

Organizational Representatives:

- Jen Crow, Choices for Youth (alternate: Tim Smuck)
- Lindsey Hynes, Go Getters NL (alternate: Kristen Whittle)

Staff have also reached out to indigenous focused organizations to determine if a representative can be available to serve on the committee as well.

Members of the youth ad hoc committee established in 2020 which combined volunteers from the former Youth Advisory Committee and the Youth Engagement Action Team will also continue on in their roles with the new working group. They include:

- Katherine Dibbon
- Nicholas Hillier
- Maria Penney
- Michael Coombs
- Nathan Young

Key Considerations/Implications:

1. Budget/Financial Implications: N/A

2. Partners or Other Stakeholders: Youth groups and individuals

3. Alignment with Strategic Directions/Adopted Plans:

    a. A Connected City: A City where people feel connected, have a sense of belonging, and are actively engaged in community life.

4. Legal or Policy Implications: N/A

5. Privacy Implications: N/A

6. Engagement and Communications Considerations: The ad hoc committee established following the approval of the youth engagement strategy was engaged throughout the development of the new terms of reference and expression of interest process.

7. Human Resource Implications: Administrative support and facilitation from various City departments as involved with the selection review process.

8. Procurement Implications: N/A

9. Information Technology Implications: N/A

10. Other Implications: All those who expressed interest will be encouraged to sign up as members of the online Youth Panel on EngageStjohns.ca. A list of interested indiviudals will be maintained in case of vacancies as well.

Recommendation:
That Council appoint the following individuals and organizational representatives:

Individual Representatives (in no particular order):
- Isabel Ojeda
- Marium Nawal Oishee
- Ony Anukem

Organizational Representatives:

- Jen Crow, Choices for Youth (alternate: Tim Smuck)
- Lindsey Hynes, Go Getters NL (alternate: Kristen Whittle)

Prepared by:
Approved by: