net-zero
atlantic

BEHAVIOURAL INTERVENTIONS FOR A NET-ZERO TRANSITION IN ATLANTIC CANADA

POLICY INSIGHTS

A white paper on the implications and recommendations from the Pro-Climate Behaviours in Atlantic Canada research project.

APRIL 2025

DAVIS PIER

Authors

Lead Authors

Jocelyn Brown, MSc
Research Analyst at Davis Pier, currently completing her PhD in Industrial/Organizational Psychology at Saint Mary's University, with an MSc in this field at Western University and a BSc (Honours) from Dalhousie University in Psychology.

Raquel Rosas, PhD
Behavioural Science Associate at Davis Pier, with a Doctorate in Health Psychology from the ISPA University and the William James Center for Research, as well as a Master of Science in Health Psychology and a Bachelor of Science in Psychology, both from the ISPA University.

Lead Reviewer Eliza-Jane Stringer, MSc
Principal Researcher at Davis Pier, holding a Master of Behavioural Science from the London School of Economics and a Bachelor of Business (Economics) from the Queensland University of Technology.

Co-Authors

Academic Supervisors *(Listed Alphabetically by First Name)*

- **David Foord, LLB, PhD** - Academic Supervisor. Faculty of Management of the University of New Brunswick.

- **Lena Liang, PhD** - Academic Supervisor. McDougall Faculty of Business of the University of Prince Edward Island.

- **Martin V. Day, PhD** - Academic Supervisor. The Societal Cognition Lab of Memorial University of Newfoundland.

- **Mary Beth Doucette, PhD** - Academic Supervisor. Shannon School of Business of Cape Breton University.

- **Stanley T. Asah, PhD** - Academic Supervisor. School of Resource and Environmental Studies (SRES) of Dalhousie University

- **Xiao Chen, PhD** - Academic Supervisor. McDougall Faculty of Business of the University of Prince Edward Island.

Co-Authors

Student Researchers *(Listed Alphabetically by First Name)*

- **Alex Dandridge** - Student Researcher. University of New Brunswick.
- **Anam Khan** - Student Researcher. Dalhousie University.
- **Brady Doucette** - Student Researcher. Cape Breton University.
- **Chloe Young** - Student Researcher. Cape Breton University.
- **Daud Saifullah** - Student Researcher. University of Prince Edward Island.
- **Fatemeh Ghazavi Khorasgani** - Student Researcher. Memorial University of Newfoundland.
- **Haley Bonnell** - Student Researcher. Memorial University of Newfoundland.
- **Jaimie Reynolds** - Student Researcher. Memorial University of Newfoundland.
- **Jeevitha Palani** - Student Researcher. University of New Brunswick.
- **Jude Imuede** - Student Researcher. University of Prince Edward Island.
- **Kristina Denny** - Student Researcher. Cape Breton University.
- **Paria M. Nashta** - Student Researcher. Dalhousie University.
- **Shaun Taylor** - Student Researcher. University of Prince Edward Island.
- **Shawna Brenton** - Student Researcher. Memorial University of Newfoundland.
- **Spencer Lynch** - Student Researcher. University of Prince Edward Island.
- **Summer Geng** - Student Researcher. University of Prince Edward Island.
- **Zhen Li** - Student Researcher. University of Prince Edward Island.

Research Manager
Non-author Supporting Contributor

Nicolle Jaramillo, MDE.
Research Manager at Net Zero Atlantic, holding a Master of Development Economics from Dalhousie University and a Bachelor of Science in Economics from the Universidad San Francisco de Quito.

Acknowledgements

This project was undertaken with the financial support of the Government of Canada.

Ce projet a été réalisé avec l'appui financier du gouvernement du Canada.

Canada

Contents

Executive Summary

Global climate change threatens ecosystems, communities and quality-of-life worldwide. In Atlantic Canada, like the rest of the world, action to reduce greenhouse gas (GHG) emissions must be significantly scaled up to achieve the net-zero emissions targets required to mitigate the climate emergency.

Reaching these targets requires a combination of technological, policy, regulatory and behavioural changes by individuals, private organisations and governments. As such, understanding the human behaviours and decision-making processes that drive individual and collective action for climate mitigation and adaptation is important to mitigate behavioural barriers to emissions reduction in Atlantic Canada. In line with this objective, the Environmental Damages Fund's Climate Action and Awareness Fund, administered by the Department of Environment and Climate Change Canada, selected the Net-Zero Advisory Body to deliver a collaborative research project entitled 'Determining critical behavioural interventions for enabling an effective transition to net-zero emissions in Atlantic Canada'. The project brought together five Atlantic Canadian Universities (Cape Breton University, Dalhousie University, Memorial University of Newfoundland, the University of New Brunswick, and the University of Prince Edward Island) and a Canadian consulting and social impact agency that solves complex government and social challenges, working across government, healthcare, and community-based service providers to drive meaningful outcomes for people (Davis Pier). This white paper is one of the final deliverables from this project, which summarises the policy insights obtained across the project and can be read alongside an accompanying White Paper which provides more in-depth research outputs. Throughout this work, Equity, Diversity, and Inclusion (EDI) principles were integrated to ensure the approaches were applicable to diverse groups in the four provinces. The findings will help inform scalable and behaviourally informed policy strategies for pro-climate action.

The findings indicate that behavioural science strategies, considering factors like awareness, emotion, capability (including knowledge and skills), and motivation, are beneficial in driving climate-related behaviour change. In transportation, for example, it was noted that there is a need for investments in active and public transit to decrease reliance on personal, gas or diesel vehicles. In rural communities, tailored strategies like carpooling, ride-share, and subsidized eco-friendly vehicles might be most impactful due to the existing barriers to accessing sustainable transport.

net-zero
atlantic

Pro-climate changes in energy efficiency and residential infrastructure changes, like heat pumps, insulation upgrades and solar panels, can decrease emissions and energy costs substantially. Indeed, the modelling exploratory research led by Net Zero Atlantic found that heat pumps have the potential to have the largest reduction in GHG emissions, followed by insulation upgrades. While residential solar panels had the smallest reduction. These results will be available in the white paper focused on the modelling efforts taken as part of this project. Reviewed literature indicates that adoption is hindered by financial barriers, incorrect perceptions, and knowledge gaps, with equitable-based transitions in need to be considered (EfficiencyOne, 2023). Many are unable to adopt these technologies due to high up-front costs and a lack of autonomy for non-homeowners. Furthermore, adopters can also overestimate the impact, ending up with a higher energy consumption due to perceived savings. Both realities demonstrate the need for further behavioural interventions to tackle these challenges. These include incentive and informational programs in support of the installation of heat pumps and insulation upgrades.

Policies expanding access for low-income households, landlords and building owners, who have rental rates geared towards people/families with more moderate-incomes, and First Nations communities who often do not own their home would be beneficial. In addition, personalized energy-saving feedback and community-based initiatives could decrease emissions from residential properties.

This research highlights the need for behaviourally informed, equity-focused policy approaches to help Atlantic Canadians lower their carbon emissions. Future research focusing on long-term behaviour change and scaling equitable interventions could provide policymakers with insights to develop more practical, inclusive, and effective policies that empower citizens to meet Canada's 2050 net-zero goals.

net-zero
atlantic

Summary of Research Projects and Findings

Climate change is a global crisis catching the attention of governments, organizations, and individuals. While necessary attention is given to policy and societal interventions, individual-level behaviours are less understood. The promotion of individual and collective pro-climate action can be improved through behavioural science insights.

This document is the third deliverable of the Net-Zero Atlantic initiative, funded through the Environmental Damage's Climate Action and Awareness Fund by the Department of Environment and Climate Change Canada. It summarizes research findings from five Atlantic Canadian universities, exploring behavioural interventions supporting Atlantic Canada's transition to net-zero emissions with a strong focus on Equity, Diversity, and Inclusion principles.

These research projects varied across sectors but primarily focused on high-emissions sectors in the region, including transportation, buildings, and energy efficiency. Transportation is the leading GHG emitting sector in two of the four provinces in the Atlantic region (Newfoundland and Labrador-NL, 43%; Prince Edward Island-PEI, 42%; Canada Energy Regulator, 2024), primarily due to high personal vehicle ownership (91-94%) and use (Statistics Canada, 2024). This is likely tied to the specific geographic and socio-economic barriers to adopting sustainable transport in rural communities (40-54% of the region; Statistics Canada, 2022a). Energy use

is another key contributor in Atlantic Canada, particularly due to the use of non-sustainable sources in New Brunswick (28%) and Nova Scotia (39%; Canada Energy Regulator, 2024). Finally, we know that building-related emissions also result from heating sources and are significant drivers of emissions in PEI (19%) and Nova Scotia (14%; Canada Energy Regulator, 2024). This portfolio expands our understanding of emission behaviours in key areas, particularly for marginalized and underrepresented communities.

net-zero
atlantic

Overview of Research Teams and Projects

Reaching net zero greenhouse gas emissions requires significant changes in human behaviour, yet current techno-economic analyses often overlook these factors and might potentially lead to socially impractical solutions. To address these critical omissions in techno-economic analyses and to ensure that behavioural-based climate change mitigation solutions are considered alongside technological ones, research is required to understand how and at what cost low or zero emissions behaviours can be achieved and advance methodologies for integrating understanding of human behaviour within energy system modelling. The project addressed these research needs through the following research teams and topics.

University of Prince Edward Island (UPEI)

Lead Researchers and Topic: Team led by Dr. Xiao Chen and Dr. Lena Liang focused on understanding barriers and enablers for the adoption of eco-friendly driving in Prince Edward Island. Promoting eco-friendly driving behaviour in Prince Edward Island. Using a mixed-method approach, including a systematic literature review and interviews with key parties (e.g., individual drivers, educators, and policymakers), this work targeted insights from rural residents, Indigenous communities, and newly landed immigrants to understand the impacts of factors such as geographic isolation and socio-economic challenges.

University of New Brunswick (UNB)

Lead Researcher and Topic: Team led by Dr. David Foord aimed to build an understanding of the "envisioned future" for people in Fredericton, and strategies to promote sustainable transportation as a key factor in these visions. Assessing intrinsic and extrinsic motivators and exploring challenges and opportunities for behaviour change, they aimed to compare the expectations of citizens and government in relation to sustainable transitions while considering how barriers may uniquely impact vulnerable populations.

Cape Breton University (CBU)

Lead Researcher and Topic: Team led by Dr. Mary Beth Doucette was dedicated to identifying socio-political and geographic barriers affecting First Nations communities' ability to transition into sustainable transportation and energy-efficient upgrades. Employing the Two-Eyed Critical Sensemaking approach to assess policy gaps and Indigenous perspectives, this work focused on First Nations living on-reserve in rural communities, who often lack access to public transit and housing autonomy for energy upgrades.

Dalhousie University (DAL)

Lead Researcher and Topic: Team led by Dr. Stanley Asah focused on the adoption barriers for solar energy and heat pumps in Atlantic

Canadian households, using a mixed-methods approach with interviews and literature reviews. This work aimed to consider the needs disparities affecting diverse groups such as immigrants, African Nova Scotians, and non-homeowners who are often excluded from home energy policies.

Memorial University of Newfoundland (MUN)

Lead Researcher and Topic: Team led by Dr. Martin Day focused on how a psychologically informed personalized carbon footprint feedback intervention (vs. control) could drive individual actions, completing an experimental longitudinal study over two months, measuring self-reported and actual carbon-intensive behaviour shifts. This work also addressed geographic inclusion, ensuring insights were gathered from urban and rural communities.

Net Zero Atlantic

Lead Researcher and Topic: Research Associate Dr. Ahmad Mezher focused on evaluating how individual changes could influence the region's energy system transition. Utilizing the open-source Atlantic Canada Energy System (ACES) model, what-if scenarios have were developed to assess the potential impact of targeted pro-climate behaviours outcomes on energy consumption, emissions, and system costs through 2050.

Additionally, a core part of this project was applying an equity lens to ensure that behavioural science research explores how achieving net zero can be inclusive and effective for all communities. As part of these efforts, the research team reflects geographic and faculty diversity, bringing expertise from climate science, behavioural science, and social research. To better guide this approach, the project team agreed on an overarching research framework, and Net Zero Atlantic developed an equity lens guideline and held a workshop to ensure consistent application across research teams.

Bridging the Gaps

Addressing diverse desired pro-climate behaviours, the findings of these research projects critically build upon the need to purposely tackle behavioural challenges. They noted a variety of motivators and barriers. There were knowledge-action and attitude-behaviour gaps that persisted in all areas. For example, factors like the rebound effect mean that emissions for households that have adopted efficient technologies such as heat pumps and solar panels increase due to lower energy costs. This aligns with personal values and social norms, which are known to shape pro-climate behaviours. These require reinforcement, however, through things like policies, infrastructure and incentives, as well as a clear understanding of the barriers that equity-deserving groups face. Policies and infrastructure strategies that address financial constraints and make pro-climate choices more convenient remain the strongest determinants of sustainable choices over environmental concerns alone.

Tackling Access-related Challenges

Infrastructure and accessibility appeared in many research studies as a key consideration in changing individual-level action. For example, researchers learned that rural and First Nations communities had limited or no access to public transit or sufficient active transport infrastructure, increasing their dependency on cars. This aligns with existing research in this area (Lois et al., 2020; Kokoni & Leach, 2021). In addition, infrastructure and accessibility impact home upgrades through upfront costs and housing limitations. Research from DAL and CBU will address a literature gap by talking to household dwellers, people who live in a home, rather than just household owners, who are more commonly consulted. This population is becoming increasingly important to consult as homeownership rates are declining in the region, with 24.3 to 33.2% of the population not owning their home (Statistics Canada, 2022b).

In addition, it is crucial to note that homeownership is strongly related to factors such as age, race, disability, and socioeconomic status (Al-Tawil, 2019; Canada Mortgage and Housing Corporation, 2021; Randle & Thurston, 2022; Statistics Canada, 2022c). The decision to upgrade to more sustainable options is further dictated by things like high up-front costs, which can be exacerbated due to energy poverty.

These contextual factors align with the need for tailored feedback and, when feasible, policies to drive change. Research from MUN noted that personalized feedback, like information from a psychologically informed carbon footprint feedback intervention, can increase knowledge of carbon-related behaviours. They additionally explain, however, that this feedback must be paired with resources to drive the action. Government policy and strong political support are the most significant drivers in pro-climate behaviour change, particularly through incentives, penalties, and infrastructure investments.

Policy Recommendations

The research projects showcase the complexities of human behaviour and its precursors. Researchers highlight the importance of expanding studies to improve our understanding of promoting sustained behaviour change following interventions. It also showcases the importance of providing scalable, community-driven solutions that consider the needs and perspectives of underserved and marginalized groups. This section summarizes the policy implications identified across projects, including barriers and enablers to action, challenges in equity-deserving communities, and corresponding recommendations to support inclusive and effective climate action in Atlantic Canada.

Enhancing Infrastructure for Sustainable Transportation

Across studies, it was found that policies must recognize how decisions are limited by existing infrastructure and resources. This availability impacts not just realistic options but also the attitudes held about pro-climate behaviours. As mentioned, citizens in rural communities need to rely on personal vehicles due to limited access to public transit, bike lanes, and sidewalks. In addition, however, the attitudes of citizens are shaped by their experiences with these services. Researchers from UNB, for example, learned that people who were current users of public transit had more negative attitudes due to things like infrequent schedules and limited routes. Investments in public and active transportation infrastructure, as well as alternative strategies like community-driven carpooling and ride-sharing programs, could help Atlantic Canadians to make pro-climate choices.

Incentivizing in Favor of Pro-Climate Habits

Policies addressing financial barriers are essential, as affordability is a major constraint in adopting carbon-reducing behaviours. Findings from UNB were similar, with 32% of participants stating affordability concerns were the most prominent barrier. While current financial incentives exist, many require upfront investments (Environment and Climate Change Canada, 2022) that create obstacles for diverse groups. It is possible that mindful approaches, such as incentivizing the purchase of used electric vehicles or tiered subsidies based on income, could minimize the barriers to pro-climate transportation behaviours (Finlayson & Graham, 2023). Expanding rebate programs, introducing low-interest financing options, incentivizing landlords and business owners to upgrade, and providing financial rewards are just a few ways that cost-reduction strategies can be implemented to make environmentally friendly options the most viable ones.

Empowering Change through a Combined Behaviour Insights Approach

Finally, interventions benefit from a shared awareness of effective climate-friendly behaviour. Many people are unfamiliar with the impact of their behaviours and often overestimate or underestimate the emissions tied to their actions. Highly targeted education,

including approaches like formal training during licensing, can help combat misinformation and clarify the true impact of behaviours. In addition, relevant information can be provided through personalized feedback tools to help people understand their own behaviour. Equity considerations include age-related gaps due to engrained habits or new information, as well as the impact on trust in recognizing the relevance of information. Providing clear and reliable information can promote informed decision-making for Atlantic Canadians.

Embedding Equity, Diversity, and Inclusion Principles into Net-Zero Policy

The comprehensive findings from the research projects published in the previous White Paper in the scope of this initiative highlight significant challenges in the emergence of Equity, Diversity, and Inclusion (EDI) principles across the design and implementation of the different studies. These challenges reveal that geographic isolation, mistrust, and cultural and language barriers significantly hinder efforts to represent and engage equity-deserving groups adequately. These difficulties underscore the need for policies that not only address environmental concerns but also the social dimensions of sustainability.

To advance meaningful change, policy must emphasize the creation of flexible and inclusive strategies that can adapt to the diverse needs

of communities across Atlantic Canada. This includes acknowledging and overcoming the complexities involved in embedding EDI principles within research frameworks. Researchers must strive to foster deeper, trust-based relationships with underrepresented groups and employ culturally competent methodologies. For this, adequate resources and adaptability are necessary for research-related infrastructures. This approach will enhance the relevance and impact of research findings, mitigating the effects of climate actions that have been overburdening for equity-seeking communities and striving for future environmental efforts that benefit community segments equitably. Investment in building and expanding capacity among research-leading entities and project-related partners is crucial to nurturing a robust ecosystem for EDI-focused applied research. These efforts will not only uplift these entities but also catalyze broader societal benefits by fostering inclusive and sustainable environmental stewardship.

While the path to fully integrating EDI principles into environmental research and policymaking is still demanding improvement, this strategic focus will empower underrepresented groups, enrich academic and policy landscapes, and ensure that environmental initiatives are as diverse and dynamic as the populations they aim to serve. These efforts are not merely additive but foundational to achieving truly sustainable and inclusive environmental outcomes in Atlantic Canada.

Evidence-based Policy for a Net-Zero Future

These projects showcase the ways that human behaviour and thought processes can influence pro-climate information. Integrating behavioural science in this way helps us to build more efficient solutions. The findings highlight human factors that can either help or hinder behaviour change, such as habits, resources, social norms, beliefs and convenience. Using approaches like behavioural science can help design interventions that work in the long term. Interventions that balance incentives with values-based motivations based on concepts like the Self-Determination Theory (Deci & Ryan, 2000), Design Science (Chapman, 2019) approach, and Capability, Opportunity, and Motivation (COM-B; Michie, van Stralen & West, 2011) model can shape policies that make sustainable choices easier. There are ample opportunities for future research in this area. Researchers from all five universities will continue their projects to build their understanding of behaviours impacting emissions in Atlantic Canada. Research should continue to address ways to measure long-term behaviour change, assess the impact of community-driven initiatives, utilize digital and automated tools, and develop scalable solutions for demographically different groups.

The findings from these projects help to build a foundation for evidence-based strategies that support behavioural shifts in high-emissions areas in key sectors. This research addresses a critical gap in understanding by studying pro-climate behaviours in Atlantic Canada, an understudied region with untapped potential. These outcomes emphasize the importance of community engagement and reinforce the need for integrated policies that ensure behavioural interventions are rooted in practicality and supported by systemic and structural changes. By applying these findings, policymakers can develop practical and equitable policies that empower both people and communities. These efforts will play a critical role in Canada's journey towards net-zero emissions by 2050.

References

Chapman, G. B. (2019). A decision-science approach to health-behavior change. *Current Directions in Psychological Science*, 28(5), 469-474.

Deci, E. L., & Ryan, R. M. (2000). The" what" and" why" of goal pursuits: Human needs and the self-determination of behavior. Psychological inquiry, 11(4), 227-268.

Environment and Climate Change Canada. (2022). 2030 emissions reduction plan: Canada's next steps for clean air and a strong economy (Catalogue No. En4-460/2022E-PDF). https://publications.gc.ca/collections/collection_2022/eccc/En4-460-2022-eng.pdf

Finlayson, J., & Graham, K. (2023). A review of electric vehicle consumer subsidies in Canada. Fraser Institute. https://www.fraserinstitute.org/sites/default/files/review-of-electric-vehicle-consumer-subsidies-in-canada.pdf

Kokoni, S., & Leach, M. (2021). Policy mechanisms to support heat pump deployment: A UK case study based on techno-economic modelling. *Renewable and Sustainable Energy Transition, 1*, 100009.

Lois, D., Moriano, J. A., & Rondinella, G. (2015). Cycle commuting intention: A model based on theory of planned behaviour and social identity. Transportation research part F: traffic psychology and behaviour, 32, 101-113.

Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. Implementation Science, 6(42), 1–12. https://doi.org/10.1186/1748-5908-6-42

Al-Tawil, J. (2019, December 5). Homeownership, income, and residential property values. Statistics Canada. https://www150.statcan.gc.ca/n1/pub/46-28-0001/2019001/article/00002-eng.htm

Canada Mortgage and Housing Corporation (2021, November). Homeownership rate varies significantly by race. Research Insight. https://assets.cmhc-schl.gc.ca/sites/cmhc/professional/housing-markets-data-and-research/housing-research/research-reports/housing-finance/research-insights/2021/homeownership-rate-varies-significantly-race-en.pdf

Randle, J., & Thurston, Z. (2022, June 10). Housing experiences in Canada: Persons with disabilities. Statistics Canada. https://www150.statcan.gc.ca/n1/pub/46-28-0001/2021001/article/00011-eng.htm

EfficiencyOne. (2023, December 8). Energy poverty and an equitable transition to a net-zero carbon future in Nova Scotia. https://www.efficiencyone.ca/energy-poverty-and-an-equitable-transition-to-a-net-zero-carbon-future-in-nova-scotia/

Statistics Canada. (2024, August 13). The Daily — Households and the Environment Survey: Electric and hybrid vehicles, 2021. Government of Canada. https://www150.statcan.gc.ca/n1/daily-quotidien/240813/dq240813a-eng.htm

Canada Energy Regulator. (2024, September 6). Provincial and territorial energy profiles. Government of Canada. https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/index.html

Statistics Canada. (2022a, February 9). Population growth in Canada's rural areas, 2016 to 2021 (Catalogue No. 98-200-X2021002). https://www12.statcan.gc.ca/census-recensement/2021/as-sa/98-200-x/2021002/98-200-x2021002-eng.cfm\

Statistics Canada. (2022b, September 21). To buy or to rent: The housing market continues to be reshaped by several factors as Canadians search for an affordable place to call home. The Daily. https://www150.statcan.gc.ca/n1/daily-quotidien/220921/dq220921b-eng.htm

Statistics Canada. (2022c, December 16). Homeownership rate by age of primary household maintainer, Toronto (Census division), 2011 to 2021. Focus on Geography Series, 2021 Census. https://www12.statcan.gc.ca/census-recensement/2021/as-sa/fogs-spg/alternative.cfm?topic=7&lang=E&dguid=2021A00033520&objectId=7