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McMaster University

Climate Change Action Plan for Municipality of Port Hope
Report on Community Survey Results

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Context

This report is conducted as part of an overarching collaboration between McMaster University, the Port Hope Climate Change Working Group, and the Municipality of Port Hope through W Booth School of Engineering Practice and Technology. Beginning in September 2019, the broad project involved community engagement workshops led by Drs. Gail Krantzberg and Andrea Hemmerich.

Dr. Krantzberg is a professor of the masters in engineering and public policy program in the Walter G Booth School of Engineering Practice and Technology with immense knowledge and experience in environmental science and freshwaters. Having been the Director of the Great Lakes Regional Office of the Joint Commission in the past, she is currently Canadian Co-Chair of the IJC's Science Advisory Board Science Priority Committee.

Dr. Andrea Hemmerich is a Sessional Faculty Member in the W Booth School of Engineering Practice and Technology at McMaster University where she teaches graduate courses in Design Thinking and Human-Centred Design.

Under supervision of Dr. Krantzberg and consultations with the Port Hope working group on climate change a set of community leader interviews were conducted and consolidated by Sufiyan Bharcuha in August 2020. The survey was developed in January 2021 by Jinqiu Wang and Jinshuo Yao, with input from Sufiyan and Richard Allen who currently oversees the community engagement initiatives within the W Booth School of Engineering Practice and Technology. With invaluable inputs from Richard and the team, five unique sections were devised in this survey consisting of: 1) demographic data, 2) Awareness and Perceptions of Climate Change, 3) views on Climate Change in Port Hope from community perspective, 4) views on Climate Change in Port Hope from local government perspective, 5) use of social media as a source of information about climate change. The survey became available to the community in April 2021 and was available in English through Google Forms.

By collecting and analyzing the information from this survey, the authors of this report aim to help inform the creation of a Climate Plan by the Municipality of Port Hope and to support the Working Group in building local capacity and advancing this mandate; the goal is not to put together a Climate Plan for Port Hope but rather to enable, empower, and educate the community to create their own.

Questions or inquiries for more information can be directed to Dr. Gail Krantzberg at krantz@mcmaster.ca

Acknowledgements

We would like to express our sincere gratitude to Dr. Krantzberg for her supervision, invaluable mentorship, and continuous support throughout this project. We would like to extend our gratitude to Richard Allen and the Port Hope working group on Climate Change for their consultation and support. We are humbled and grateful for the collective knowledge and guidance that was offered to us generously in support of our goal and aspirations for this important initiative.

Executive Summary

Situated on the northern shore of Lake Ontario, about 110 kilometers east of Toronto, on the Ganaraska River, the Municipality of Port Hope supports approximately 17,000 population (Statistics Canada 2017). The region is a picturesque mix of urban and rural areas surrounded by farmland. Having been impacted by a massive flooding event in 2010, the Port Hope community has an intimate knowledge of the adverse climate change effects on infrastructure and human health. Implementing an effective Climate Change Action Plan toward resilience and adaptability for the Municipality of Port Hope requires support and action by all levels of society.

This report summarizes the analysis of the data collected through an online survey reflecting the Port Hope community's knowledge and perception of climate change, its adverse effects on the Port Hope community, individual attitudes, and expectations from the local Municipality for devising a Climate Change Action Plan for mitigation and adaptation strategies applicable to the region, as reported to council in May 2021. Highlighting the disparity in community opinions about the role of the individuals as well as the Municipality in combating the climate change impacts within Port Hope, the report is designed for the Port Hope Climate Change Working Group to serve as an input to further strategic planning at the local government level.

There were 199 participants who completed the community survey providing a 95% confidence level with a 7% margin of error. Various levels of education are well distributed in this representation, while rural habitats, low-income households (below 60K per annum), and youth groups (below 25 years of age) are underrepresented. Nonetheless, the community unanimously perceives climate change as a risk and is most concerned about increasing the number, severity, and financial implications of extreme weather events in the area. A robust public outreach plan can better inform and engage the local residents, consult with them for climate action planning, and leverage public engagement in reinforcing the program.

The locals are not accustomed to using public transportation and are not certain if investment in improving the existing system serves their community. However, they favor individual environmental behavior adjustments and are open to on-demand transportation services and cycling. They collectively expect council to prioritize supporting the local agricultural community and vulnerable population as well as supporting affordable housing strategies for the city through exploring green infrastructure for climate change adaptation and mitigation as opposed to supporting further new mass development in the area. Despite following the climate change news and Port Hope-related content on social media or through the municipality website, respondents stated they were not aware of any current Municipal strategies for combating climate change.

Qualitative Descriptions of Overall Survey Analysis

Community Perception of Climate Change

A vast majority of Port Hope survey respondents consider climate change to be anthropogenic, identifying human activities such as deforestation and the use of fossil fuels as the top causes of climate change. Consumer behavior is considered the leading factor contributing to climate change with energy demand, population control, and transportation. Port Hope residents also identify an increase in the frequency of extreme weather events and other financial implications as the negative impacts of climate change. This strong agreement about the causes of climate change and their subsequent effects on the community indicates that Port Hope residents are well informed about the issue and in agreement about individual responsibility towards climate actions. The emphasis on individual responsibility and consumer behavior is an indication that these types of elements within a potential municipal Climate Change Action Plan will be well received by the community.

Community Involvement with Municipality Climate Actions

A majority of the respondents indicated that they follow climate change-related news and content through a variety of sources. Even though a vast majority of the respondents follow at least one Port Hope-related content on social media, only a small proportion of respondents express high awareness about the activities the Municipality has undertaken toward combating climate change. This matter can result in a low level of public trust and involvement in the Municipality's existing and future plans; therefore, a potential robust public outreach is recommended for the Municipality to inform, engage, and consult with the people of Port Hope when planning future climate actions to leverage public engagement in implementing the plan. A co-benefit of this plan could be promoting more reliable and scientific news sources to prevent misconceptions and misinformation from being widespread through social media channels.

Community Evaluation of Current Climate Response Status

In terms of evaluating the current situation, the respondents mostly believe that climate change is inevitable and mitigating actions alone cannot sufficiently address the ongoing and potential damages. It is recognized that there is a genuine need for a compelling set of adaptive measures. As such, the Port Hope representative residents are generally willing to shift to eco-friendly products and services even if it costs more. It means that strategic planning can count on the popularity of actions that require a reasonably higher willingness to pay to combat the negative impacts of climate change and reduce GHG emissions.

Further, there is a slight disparity among respondents' judgment about the performance of private and public sectors in addressing climate change. Respondents believe both these sectors have had an unsatisfying performance in either adopting practical strategies or effectively communicating actions and

plans with people, leading to a notable lack of information about their activities. This level of dissatisfaction could be considered as a benchmark for the decision-makers to evaluate the success and effectiveness of the future plans.

Community Demands/Expectations of Future Climate Actions

Given the growing importance of climate change, municipal government support for the agricultural community as well as affordable housing for the existing population are of utmost priority for the survey participants. Based on their opinion, acknowledging and prioritizing matters pertaining to anthropogenic climate change and increased support for the vulnerable populations takes precedence over local economic development, job creation, quality of life improvements, First Nations reconciliations, municipal upgrades, and tax increases. At a remarkably higher rate than identified nation-wide, the Port Hope community recognizes the role of individual responsibility in combating climate change. This level of awareness within the community indicates that future environmental plans in Port Hope are likely to benefit from the support and involvement of a relatively mature populace.

In addition, it is evident that these group of Port Hope residents have ascertained opinions and consensus on several areas of focus within the local climate action. For example, there is a broad consensus among respondents Port Hope regarding the decarbonizing of municipal infrastructure. Similarly, Electric Vehicles (EVs) are determined to be the most attractive type of transportation. In addition, respondents expect the Municipality to collaborate with all levels of government to secure funding for climate change mitigation. More than eighty percent of respondents believe that the government should incentivize private companies to reduce their emissions. Further, a nearly similar proportion of respondents advocate for adaptative plans that involve tree planting and saving Ganaraska watershed wetlands as well as mitigative actions such as expanding local tree canopy. It means that institutions or individuals responsible for taking actions and making decisions regarding environmental issues should address and prioritize the same concerns as the respondents unanimously do. Otherwise, if, for whatever reason, a different set of strategies are pursued, decision-makers should have a clear and comprehensive rationale to convince the public about the validity of the decision.

General Recommendations Based on the Overall Qualitative Descriptions

Based on these findings, the following recommendations are articulated to serve as an input to the planning and development of a Climate Plan by the Municipality of Port Hope for addressing both mitigation and adaptation strategies applicable to the region.

- Prioritize climate change as a lens for all future municipal planning.
- With the majority of the respondents being open to on-demand transportation services and cycling, incorporation and further innovation in these areas are viable additions to a Climate Change strategy. Assess and investment in EV infrastructure.
- Create a transport management association to help develop a low-carbon transportation plan for local businesses, schools/colleges, and municipality staff.

- Create and maintain a complete record of existing green space. Set a yearly target for new tree plantings in public and private spaces.
- Invest in agroforestry, creating and maintaining tree planting incentives on and around agricultural land to help protect farmers from the impacts of the changing climate.
- Promote green energy incentives for agricultural communities.
- Install photovoltaic (PV) solar panels on municipal buildings, schools, and other public infrastructure with plans for an annual capacity increase.
- Incentivize local businesses to pursue higher green standards despite the marginally higher costs for local consumers.
- Plan for awareness building around digital literacy as well as local climate change actions through online media, with plans to properly transition from the traditional media forms.

Qualitative Description of Demographic Survey Analysis

Analysis Based on the Area of Residence

Overall, there are only minor differences between the urban and rural respondents to the survey, as they generally agree on most issues. There are some differences identified during the analysis, particularly related to individual actions and public transit, but insufficient to conclude that there is a significant rural-urban divide on overarching climate change issues in the Port Hope area. In terms of transit, urban respondents were generally more in favor of bringing improvements to the transit system and in favor of increasing stops, creating an on-demand minibus, installing bike lanes, and creating more routes. In contrast, rural populations have nearly no access to or information about public transportation. Urban groups also put a relatively higher priority on affordable housing in Port Hope than rural respondents.

Analysis Based on the Income Level

In the analysis of the community survey, the low-income respondents are significantly underrepresented (17% participation rate), whereas middle-income and high-income respondents are represented thrice and twice, respectively. This study suggests that low-income participants are more likely to actively follow climate change news and have better alignment with the causes and consequences of climate change compared to other income levels. Despite limited involvement with Port Hope official social media sources, the respondents with lower income are found to have higher individual awareness about the subject matter. They differentiate from the general trend by having relatively greater concerns about increasing taxes and providing support for vulnerable populations. Comparatively, the high-income respondents are considerably less aware of the implications of climate change and are less willing to spend on eco-friendly products.

Analysis Based on the Education Level

The perception of the nature of climate change does not necessarily improve with the level of education within the Port Hope community. The respondents with non-university education are more likely to revise personal lifestyles to adapt to more eco-friendly practices. Social media is not generally trusted as a valid

source of information within the Port Hope community. In particular, the highly educated members of the community prefer news or e-news channels such as the Municipality's website or direct emails. The cohort with university-level education tends to trust publications more than the social channels and are consequently often left out of the community-led conversations about the importance of individual responsibility. In terms of transportation planning, circular solutions such as on-demand minibus accommodations are more in demand among high-educated respondents. Improvements in dedicated bike lanes for respondents with non-university education are more desired.

Analysis Based on Age Group

There are notable correlations between age and differing perspectives on specific issues, but they are not uniformly distributed among all topics. The disparity of opinion mainly manifests in public transportation and First Nations rights and reconciliation. Overall, the community representation of the under 49 years of age group leans towards an altruistic/collectivist perspective, while the over 50 years old group demonstrates a slightly more individualistic view regarding how they perceived climate change and the potential actions to combat these issues. Furthermore, significant differences are also noted in the impact of the social media section, illustrating that those who are 49 or under are actively participating on social media platforms and therefore viewing more climate change-related information on such platforms than the group of 50 and over. These findings are indicative that with the exception of the aforementioned disparities, the actions taken by the Port Hope Municipality will be perceived somewhat similarly among all age cohorts.

Recommendations Based on the Demographics Discrepancies

- Core climate change knowledge should be embedded in the Port Hope Municipality website and local news channels to gain the public trust and understanding, followed by creating dedicated opportunities and spaces for climate engagement among youth and younger demographics.
- Minimize impacts on low-income households that are result of a tax on carbon by helping to finance a transition to clean energy production. Any existing incentives for natural gas usage should be eliminated since natural gas generates GHGs.
- community engagement programs should be instituted to raise awareness about municipal Climate Change Action Plans, if they exist. Adequate considerations must be given to the financial insecurities of the low-income households around affordable housing, support for vulnerable populations, and limiting increases in taxes.
- Attention should be paid to increase community awareness in Port Hope about the impacts of individual behaviors on climate change, specifically among those with university-level education. It can be beneficial to conduct workshops for this particular cohort and present opportunities that are scientifically-based to encourage participation.
- There is an interest in soft engineering solutions among the Port Hope community represented in this survey. Collaboration opportunities should be explored with local organizations and academia to advance the implementation of such solutions further which can attract and further engage the highly-educated group and create trust and optimism.
- In offering potential improvements to local public transportation, emphasize improving cycling and cycling infrastructure.

- There is a potential to increase social media engagement among the respondents to convey climate change content specific to Port Hope and increase more awareness about the municipality's involvement in programs aimed to combat climate change's destructive consequences.

Overall, the Port Hope community represented in this study is well informed about the nature and implications of climate change in the region and have definitive expectations from the municipality for mitigation and adaptation Climate Change Action Plan provided that a robust public relations strategy is devised for expanding existing engagements and establishing a diverse approach for reaching other community groups.

Appendices

The overall community survey results report

Executive Summary

This report is a part of an overarching collaborative effort between McMaster University, the Port Hope Climate Change Working Group, and the Municipality of Port Hope aimed to advise the Working Group on community values so they can inform the Municipality as it develops its locally-oriented Climate Change Action Plan. The survey was designed by a previous group of McMaster scholars in Fall 2020 and publicized within the Port Hope community through a variety of platforms, including email, social media, and the local Port Hope newspaper. The survey consisted of five categories. The first section covers general questions on participant's demographics. The second section focuses on the level of awareness of climate change in general. The next section aims to understand community views of the Port Hope situation in depth. Subsequently, the fourth section focuses on revealing perspectives on local government and climate change actions. Lastly, the final section touches on the social media usage patterns of participants.

Having received 199 responses to the survey (i.e., the sample size of 199), a ±7% margin of error with a confidence level of 95% is calculated for the survey responses, based on the population of 16,755 in the Municipality of Port Hope (Statistics Canada 2017). The majority of the respondents live in urban areas of Port Hope, are over 66 years of age, and are retired with college or bachelor's level of post-graduate education. The dominant household income was the income bracket of over 100K per annum, which is consistent with the census data.

Overall, the vast majority of respondents have a good knowledge of the nature of climate change in the region, including the impact, mitigation, and adaptation opportunities. However, a less but still considerable number of respondents do not actively seek out climate change news and are not well informed about recent actions taken by the Municipality of Port Hope. That said, 60% of the respondents believe consumer behavior can have a measurable impact on climate change, and the responsibility to mitigate it would lie with every individual making lifestyle changes. Most survey respondents expressed a desire to own hybrid and electric vehicles to shift towards greener options for transportation. 82% of the respondents agree that by incentivizing Port Hope-based businesses, the local government can contribute to a more sustainable local economy, provided that there are proper accountability and audit plans in place and fund distribution is publicized. Survey participants generally agree it is essential for the Port Hope community to address climate change at the local level so that the local communities can rally the people and financial resources needed to tackle the climate crisis.

The community has also assessed the current public and private sectors' performance in addressing climate change to be relatively poor despite the Port Hope municipality's efforts to engage local citizens and organizations around the issue of climate change. From this survey, the top three mitigation actions for the Municipality of Port Hope should be a) to protect and expand the local tree canopy, b) to ensure that municipally owned and operated assets utilize best practices in decarbonization, and to work with all orders of government to access the funding needed to address climate change. The community has also indicated the top three adaptation actions for the Municipality should be encouraging tree planting and protection, saving wetlands across the Ganaraska watershed, and amending bylaws to enable sustainable practices such as backyard agriculture and urban intensification. As such, the council's priority actions could include supporting the local agricultural community, affordable housing, and activities directly related to climate change mitigation as well as adaptation. The community identifies job creation and municipal infrastructure upgrades lowest on the priority list.

With regards to the role and popularity of social media in the community, with about 76% of the respondents using Facebook, it is the most prevalent social media platform, followed by YouTube and Twitter. Consequently, the highest engagement was received by Port Hope's Facebook page (@MunicipalityofPortHope), with 57% referring to it for information related to climate change in Port Hope. The results also suggest there is a potential to increase the frequency as well as the outreach of climate change content via short videos among the community to fit into their 30-60 minutes per day average time on various social media channels.

In summary, according to a preliminary analysis of the results obtained from this community effort, the following actions are recommended to be considered by the Port Hope Climate Change Working Group:

- The vast majority of respondents agree to substitute their existing vehicles with EV (Electric Vehicle) alternatives. This fact, along with the significant unpopularity of public transportation lifestyle among the participants, suggests that EV infrastructure advancements in the area (such as increased local charging stations) are a more effective and practical investment than the regional transit system in the short- and mid-term.
- Based on the strong advocacy for tree planting and local green space among the respondents, the Municipality of Port hope could count on inclusive public support and cooperation to implement a tree planting plan both in rural and urban areas.
- Being a quasi-rural community, respondents view the support for local agriculture as a high priority. Other high-priority issues as identified by the survey were affordable housing and support for vulnerable populations.
- The survey highlights the need for increased climate change-related outreach and engagement initiatives, in particular amongst youth groups, to increase the diversity of people consulted in climate change actions.

- Many of the respondents spend a short amount of time on social media per day and therefore prefer to receive climate-related information through short videos instead of articles or interviews. Given the habitual trends amongst the respondents and platform preferences amongst the youth, there is an opportunity for further improvements and modernization of the Port Hope social media accounts.
- This survey and its results could be used as a benchmark for future similar investigations. We suggest the survey becomes a longitudinal (trend) study and to be conducted after a year or two. By this means, the opportunity for a regular evaluation of the implemented plans and actions and their influence on public opinion and perception could be measured, and the progress could be monitored.

Section 1 - Survey Demographics

(Survey questions analyzed in this section: 1 through 7)

Based on the survey results, the majority of our respondents have valid reasons to be concerned and engaged with the Municipality of Port Hope's future plans and issues as their daily lives are intimately connected to Port Hope.

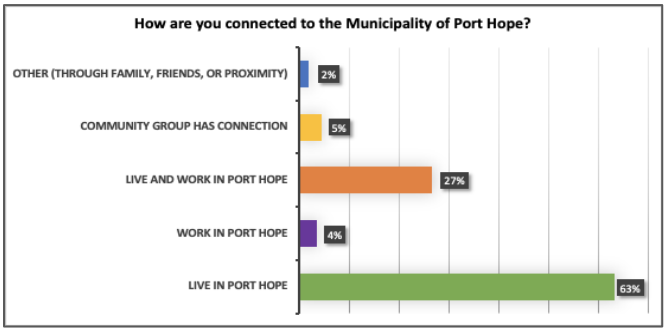

Figure 1 - Survey Respondents Connection to the Municipality of Port Hope

As shown in Figure 1, 26% of the survey respondents live and work in Port Hope, while 92% either live or work inside Port Hope's boundaries.

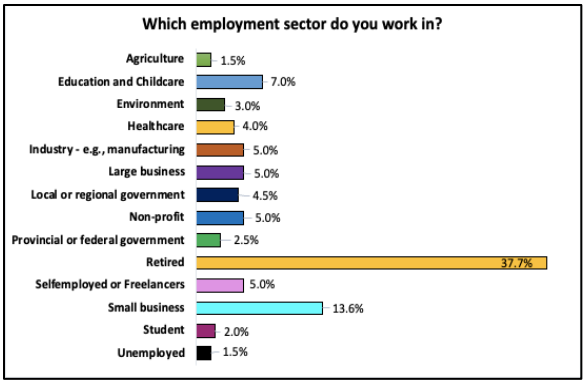

Figure 2 - Survey Demographics: Employment Sector

Shown in Figure 2 is the distribution of respondents across all employment sectors with three or more individuals; these categories make up approximately 89% of all respondents. Overall, 64% of respondents were in the labor force, which is slightly higher than the rate of 59% identified for Port Hope in the Canadian census (Statistics Canada, 2017). Retirees make up 37% of the respondents. Although it appears they are slightly overrepresented in our survey result, retirees can be an important demographic to capture in engagement initiatives. They are more likely to be involved in civic engagement or volunteering than working populations (Bogaard, Henkens, & Kalmijn, 2014).

Surprisingly, individuals identified to be employed in the agriculture sector make up only 2% of the total respondents even though much of the area surrounding Port Hope, predominantly rural areas, is mainly agricultural (Municipality of Port Hope, 2019). It is also somewhat concerning, as climate change stands to have a massive impact on local agriculture (Krantzberg, 2019). Moreover, student representation in the survey is also deficient. It could be particularly concerning, as it is often students who are the fiercest climate change activists and the group that stands to lose the most from the climate change adverse impacts, being young (O'Brien, Selboe, & Hayward, 2018). However, it is promising that the survey has captured a considerably wide array of perspectives from different employment sectors.

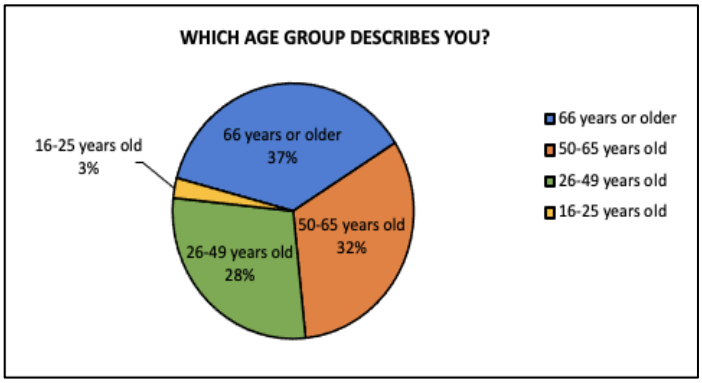

Figure 3 - Survey Demographics: Age Distribution

Figure 3 shows the age distribution of survey respondents. Overall, survey respondents' approximate age average was generally higher than the census, with 69% of all respondents being over 50 and 37% of them being 66 or above. In comparison, these numbers are 59% and 29%, respectively, in the census data of port hope respondents who are over 15 (Statistics Canada 2017). Youth, noticeably, and middle-aged populations, slightly, are underrepresented in our results as only 31% of our respondents were under the age of 49. Combined with low student participation, this may indicate that current outreach and engagement efforts have not been effective enough to engage individuals from those age groups, which could be problematic. The importance of youth participation in the fight against climate change cannot be understated and is well-emphasized in the literature (O'Brien, Selboe, & Hayward, 2018). Although Port Hope has a more senior population compared with the provincial average (Statistics Canada, 2017), survey respondents are skewed older than anticipated based on the census data.

The community engagement rate in environmental organizations is illustrated in Figure 4. Based on our results, the participation rate in the environmental organization (in any kind or any field of activity) is 21%.

Given the findings of Statistics Canada in Households and the Environment Survey, approximately 20% of Ontarian households are engaged in unpaid activities aimed at conservation or protection of the environment or wildlife (Statistics Canada, 2015). Although the term used in our survey ("member of any environmental organization") has a notable difference from the notion used in the mentioned literature, a close similarity could be observed between Ontarians and Port hope dwellers' participation rate in environment-related activities.

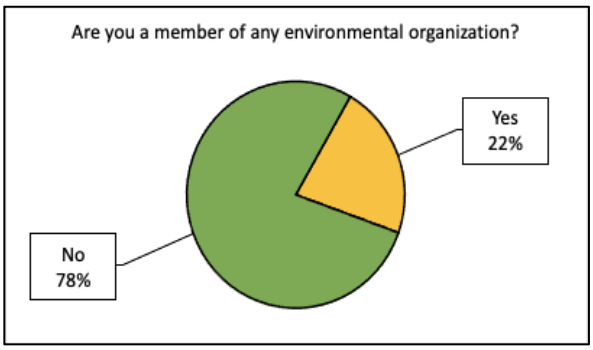

Figure 4 - Survey Demographics: Involvement with Environmental Organizations

Further, a wide range of different organizations is represented in participant responses, with Blue Dot Northumberland, Port Hope for Future, the Port Hope Working Group, and Willow Field Naturalists being the most popular organizations. These organizations cover various subjects, from wildlife and conservation groups to community groups, water protection, and climate-oriented political groups.

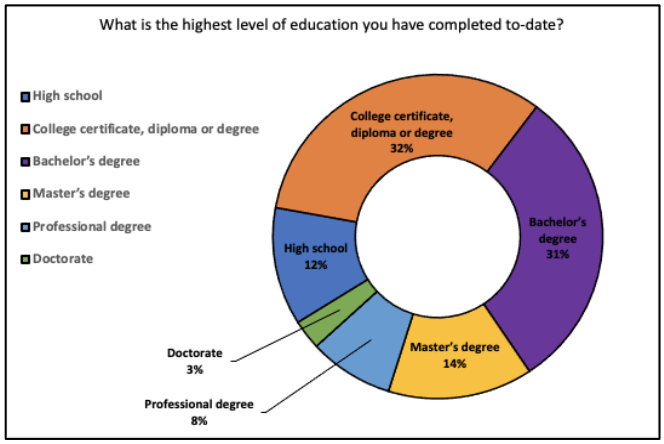

Figure 5 - Survey Demographics: Education

Figure 5 shows that our survey respondents are generally well educated, and 88% of respondents have pursued education beyond high school. Interestingly, this number is much higher than the census data for Port Hope, which is only 53% (Statistics Canada, 2017), College certificate/diploma/degree (33%), Bachelor's degree (31%), and Master's degree (14%) are the three most frequent education levels of our respondents. It should be noted that community engagement efforts are mostly reaching more educated individuals in the area, and lower education levels are not being represented proportionally, which is common incompetency amongst these kinds of studies (Suchman, 1962).

The participants' household income is presented in Figure 6. Many survey participants (22%) chose not to respond to this survey question, which may skew the survey results.

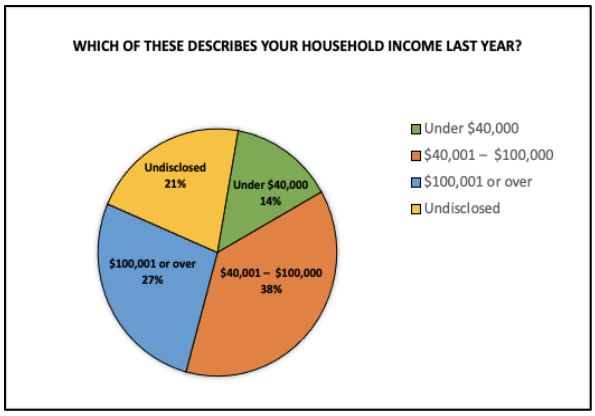

Figure 6 - Survey Demographics: Household Income

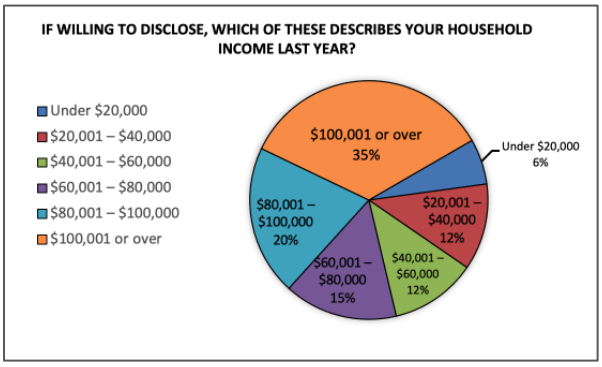

Figure 7 - Survey Demographics: Household Income (adjusted)

Relatively adjusted for in Figure 7, we observe that the survey has captured considerably few respondents in the bottom income range as only 5% of survey respondents reported their household incomes being under $20,000. A modest discrepancy can be observed in our data with that of the Port Hope census, which indicates that 8% of the population falls in the very low range of income (Statistics Canada, 2017). Our most reported household income range is the highest income level (more than $100,000 per year) with 28% compared to that of census data (32%). It is yet another indication that socioeconomically disadvantaged and marginalized communities may be missed more easily in the climate engagement efforts than those in higher-income classes.

Respondents were asked to define their living areas as either rural or urban. According to Figure 8, 32% of survey respondents live in rural areas, while 68% inhabit urban areas. Before further analysis, it should be noted that these numbers are subjected to change since the definition for urban and rural is not given to the respondents, and it may vary based on their understanding of the term. The county of Northumberland is primarily rural in terms of land area, but 80% of its approximately 86,000 residents live in urban cities with over 10,000 residents (Statistics Canada, 2017). Therefore, there is a possibility

that rural residents are over-represented in the survey. That said, it is possible that survey respondents live in Port Hope as defined by the census but generally perceive the area as rural.

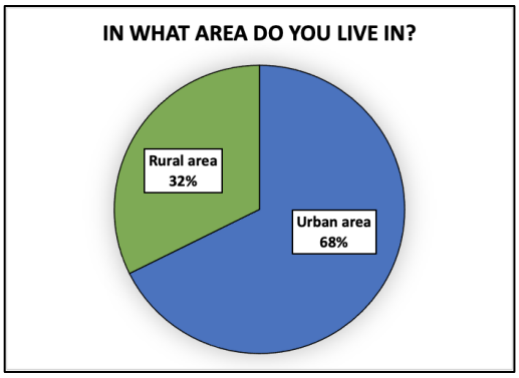

Figure 8 - Survey Demographics: Self-defined Living Area (Rural vs. Urban)

It is worth investigating further how effective it is if the definition of rural and urban is given to the respondents in advance and how the results vary if the percentages are significantly changed.

Section 2 - Climate Awareness

(Survey questions analyzed in this section: 8 through 13, 16 through 19)

As illustrated in Figure 9, 68% of survey participants actively follow climate change news.

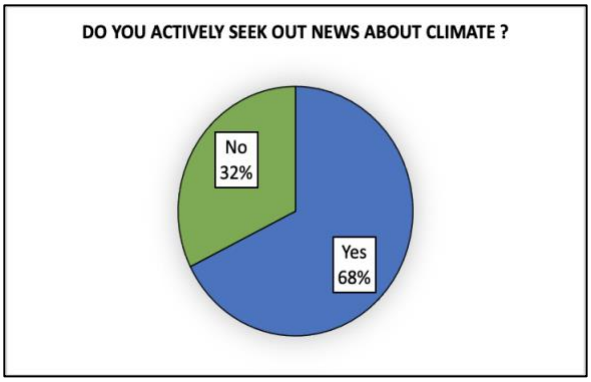

Figure 9 - Respondents Actively Seek Out News About Climate Change

It is important to note that these numbers may not be representative of the state of engagement in the latest climate news since the definition of 'active' can vary per individual. It is worth investigating the average percentages in the province of Ontario and nationwide for each age group.

As observed in Figure 10, a vast majority of respondents have indicated that the internet (92%) is the most frequent source that has been used to seek out news about climate change. Television (55%), newspapers (55%), and social media (52%) are the next highest source of information with slight differences. Results have also shown that radio (42%) is still a popular source of information. Lastly, Municipal Council,

Government (35%), friends and families (27%), and educational institutes (14%) have also been identified as sources of information relatively less popular but still considerable.

A few of the respondents have stated more detailed answers about their sources of information being podcasts, scientific journals, and environmental organizations; nevertheless, the numbers are still quite low to compare aforementioned sources.

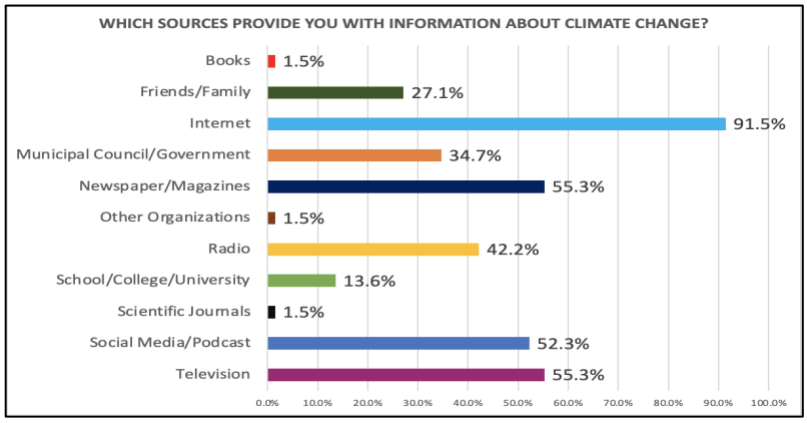

Figure 10 - Information sources about climate change

Without any further categorization in terms of environmental literacy, we observed that deforestation (79%) and usage of fossil fuels (85%) are identified as the top two causes of climate change within the community. As shown in Figure 11, intensive agriculture (45%) has been ranked third amongst others.

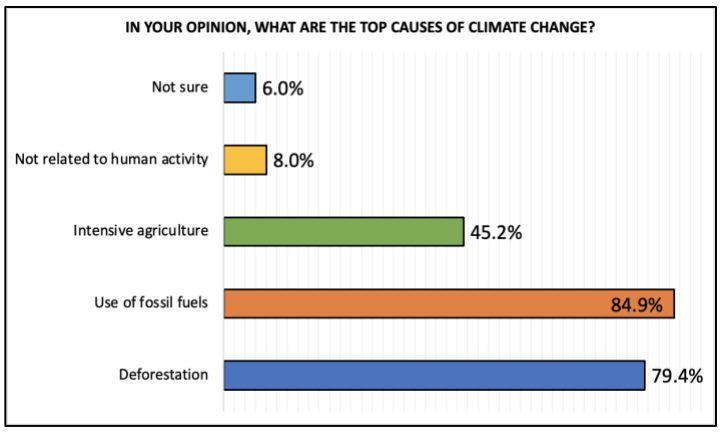

Figure 11 - Top causes of climate change

Eight percent of the respondents stated that climate change is not related to human activity, and 6% of them are not sure about the causes of climate change. This is much lower than the overall Canadian rate of almost one-third of people who are not convinced that climate change is caused by humans (Zimonjic, 2018).

Figure 12 illustrates that within the community in the study, consumer behavior (60%) has been the most frequent response as the most contributing factor to climate change. The majority of respondents also

agree that energy demand (54%), transportation (48%), population growth (41%), manufacturing and construction (32%), and urban sprawl (28%) are essential factors contributing to climate change.

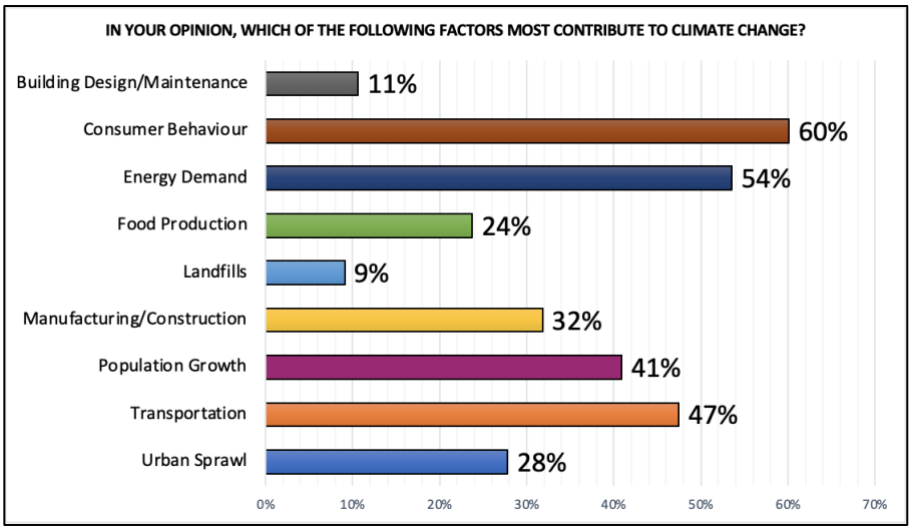

Figure 12 - Factors contributing to Climate Change

Interestingly, respondents generally put low emphasis on building design and maintenance (11%), food production (24%), and landfills (9%) as contributing factors to climate change.

Although only 48% of the respondents identified transportation as the factor contributing to climate the most, still over 90% of respondents are willing to own an electric or hybrid car. A possible scenario is that they do not believe transportation is the most significant problem, but still, they are ready to change their preference. Another scenario is that even though they agree that consumer behavior is a more prominent cause, they do not have the means/information on how to change it (or our survey did not address that). To further investigate these scenarios, let's further analyze the respondents' views on the preferred type of vehicles to own and their attitude towards public transportation.

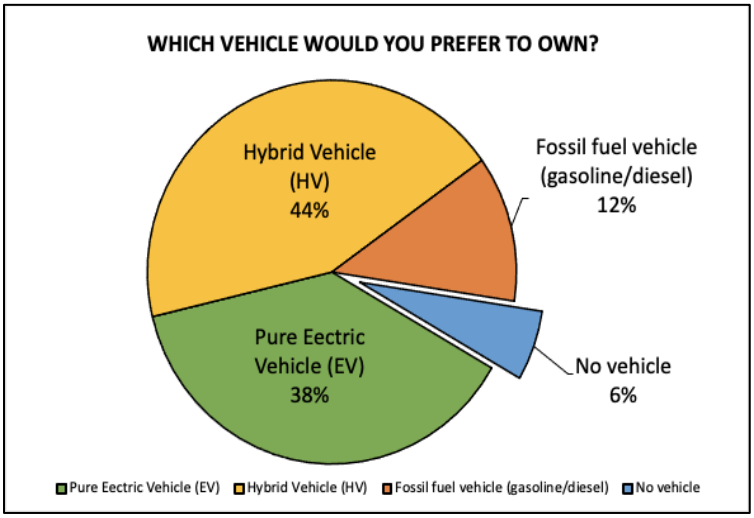

Figure 13 - Preferred vehicle to own

As illustrated in Figure 13, hybrid and electric vehicles are the preferred choice of vehicle to own by most survey respondents. A slightly higher number of survey respondents (44%) preferred hybrid vehicles, while 38% opted for pure electrical vehicles. Hybrid vehicles offer more flexibility compared to electric vehicles (EVs). However, according to Haddadian et al. (2015), EVs are expected to peak sales as infrastructure, and technological advancement are made, and prices are within grasp (Haddadian, 2015).

Canadian households demonstrate a considerable openness and willingness to pay for electric vehicles (Ferguson, 2018). Such studies also give insight into the behavioural mindset of the small percentage (12%) that still prefer fossil fuel vehicles. According to the authors, "the dominant characteristics of the Internal Combustion Engine (ICE)-oriented class are purchase price sensitivity, EV skepticism and an apparent resistance to change." A smaller proportion (6%) chose not to own a vehicle at all.

As illustrated in Figure 14, the survey indicated that 96% of respondents seldom used public transportation (local and/or regional). Such unanimous response calls for a detailed investigation on why public transportation is not a preferred choice among the respondents of Port Hope community survey.

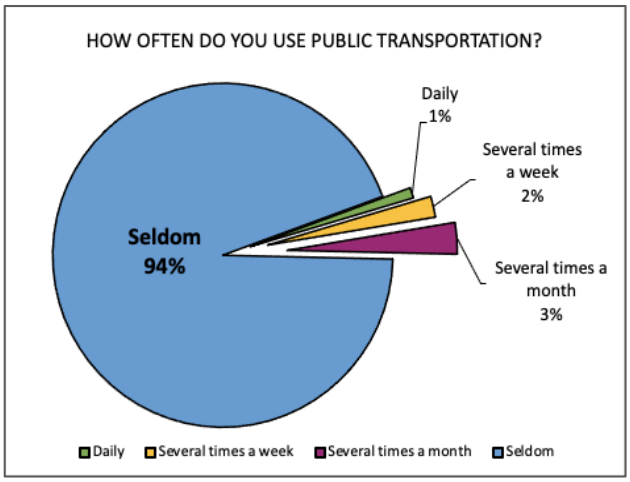

Figure 14 - Preferred mode of transportation among the respondents

A possible factor in the limited use of public transportation might be the quality, frequency, and routes of public transportation. Moreover, other factors such as income, daily commute patterns, and lifestyle choices of the respondents might also have a significant influence. This question was followed by another question, asking to rate the quality of public transportation in their respective local area of Port Hope. Since most respondents did not use public transport frequently, the opinions about the quality of public transport are inconsistent. However, the responses of comparatively frequent users of public transport in the Municipality suggest that its quality is mostly poor (Figure 15).

In response to the possible improvements in public transport, 34 % suggested that more routes and 16% suggested more stops will encourage them to use public transport. Along with this, 29% considered increasing the frequency can help promote the use of public transportation. However, increasing frequency, routes, and stops do not seem to be a viable option since, according to figure 28, respondents seldom feel the need to use public transit. The use of on-demand minibuses, scheduled by riders, is supported by 40% of the survey participants. Dedicated bike lanes and bike lock-up units at mobility hubs

are popular amongst 33% and 22%, respectively. Some interesting responses were also submitted individually; making public transport COVID safe and go trains with sufficient parking space being the notable ones.

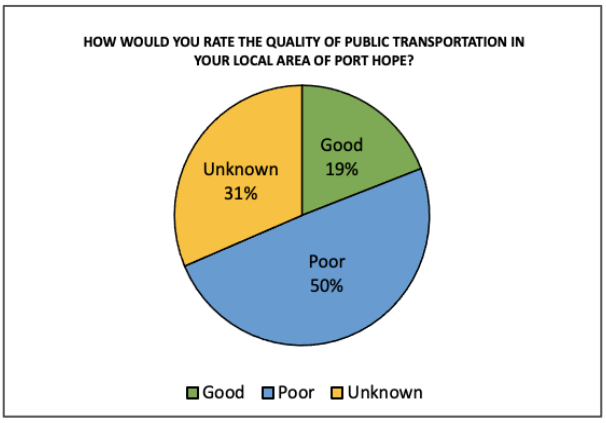

Figure 15 - Quality of Public Transit in Municipality of Port Hope as assessed by respondents

When asked if they agree with the statement **"I believe climate change is inevitable because global climate tipping points have been reached,"** 57% of the survey respondents agreed/strongly agreed. However, 25% were still unsure, and 18% disagreed/strongly disagreed with the statement (Figure 16). The response to this question reflects some level of uncertainty within the respondents towards climate change and whether or not it is inevitable by humans.

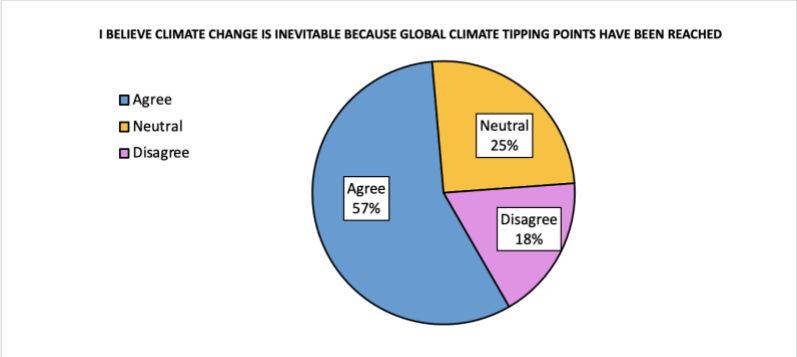

Figure 16 - Community point of view on the inevitability of climate change

In response to identifying the likely negative impacts of climate change in Port Hope in the future, the majority agreed that extreme weather events would be increasing, natural habitats and wildlife will be lost, and soil erosion continues to surge (Figure 17). This illustrates that there is a good understanding of the climate crisis's adverse effects within the community as the results are to a great extent consistent with the literature. According to a report published by Natural Resources Canada, the top three adverse effects of climate change for Canada are most likely to manifest in forestry (natural ecology diversification and massive forest fires), water resources, and agriculture (Warren, 2004). Note that increased flooding due to water level rise and lack of infrastructure has nearly 60% responses associated with extreme weather events, which may be attributed to the 1980 flood in the area and its impacts on the residents.

The respondents have also highlighted socio-economic consequences such as decreased assistance for rural settlements and increased fuel prices in rural areas (due to lack of other means of transportation). As well, there are further mentions of reduced air quality, green algae growth in Lake Ontario, increased waste from alternative sources of energy, health issues, groundwater loss, carbon sink loss, and pattern changes in fauna population. 3% of the respondents don't believe there are any foreseeable impacts for the Municipality.

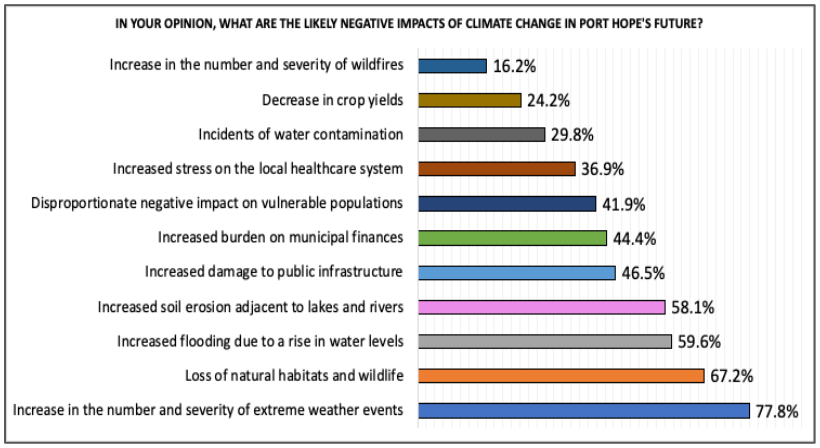

Figure 17 - Community view on likely negative impacts of climate change in Port Hope

Section 3 - Distribution of Responsibility

(Questions analyzed in this section: 14, 15, 20 through 29)

When asked about the importance of individual responsibility and lifestyle changes in tackling climate change, a substantial majority (85%) agreed with the statement, which represents a highly aware community and answers the earlier doubts about the community attitude towards consumer mentality. Only 9% disagreed/strongly disagreed with the statement and indicated that the responsibility lies only with the governmental bodies and corporations. Looking at the socio-economic concerns raised in previous questions, a possible scenario to explain the 6% who neither agree nor disagree with the statement can be the belief that until major contributors are not addressed on a global scale, no other mitigation activity can make a difference.

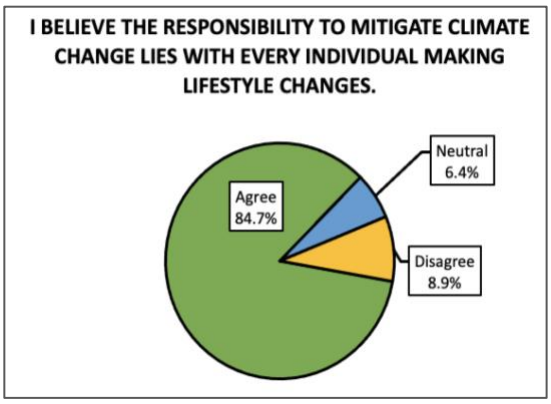

Figure 18 - Community attitude towards individual responsibility in tackling the climate crisis

An interesting pattern can be observed from the responses to the individual responsibility and general belief on the inevitability of climate change. Even though most respondents believed climate change is inevitable, a vast majority agreed that individual lifestyle changes could have positive effects. A possible explanation for this disparity could be that regardless of the opinion on the causes of climate change, there is an understanding of the harm caused by human activities to the natural environment.

In order to link individuals' attitudes towards mitigation actions to their belief in the inevitability of climate change, the respondents are asked to identify the top potential actions they can take at home that would help reduce greenhouse gas emissions (GHGs) in Port Hope. Over half of the respondents believe it is important to purchase fewer products with a significant carbon footprint followed by reducing vehicle use and creating more green spaces. It would be worth investigating whether the popular view on product purchasing reduction is related to the waste generated upon disposal or the relevant embodied carbon as it is relevant to the Municipality only.

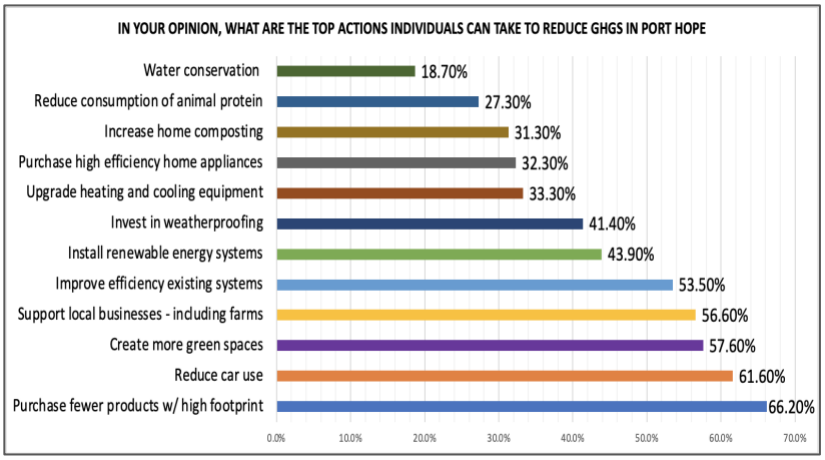

Figure 19 - Individual actions to reduce GHG in Port Hope

There are also mentions of overall consumption pattern reduction, electric vehicle usage/purchase, wildlife habitat protection, demanding sustainable packaging from agri-businesses, refraining from purchasing products made in high GHG contributors, and reducing food waste.

There are further suggestions for improvements beyond the individual scope, such as enabling work from home opportunities, focusing on corporate policy development, support and diversification of the local supply chain, promoting local spending through road closures, avoiding global shipping, revising agricultural practices, and ocean ecosystem protection.

In response to the affordability of eco-friendly products, 60% of our respondents believe they are relatively expensive, but more than half of them are willing to pay for it despite the higher cost (*Figure 20*).

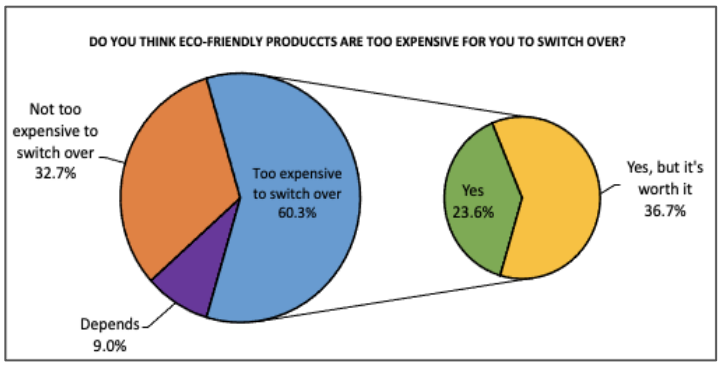

Figure 20 - Affordability of eco-friendly products (affordable)

This question can directly represent the disparity in household income representation within our study group, as discussed in Section 1 - Survey Demographics. As we can see in *Figure 21*, 32% don't find the products expensive, and roughly half of this group are willing to pay even more.

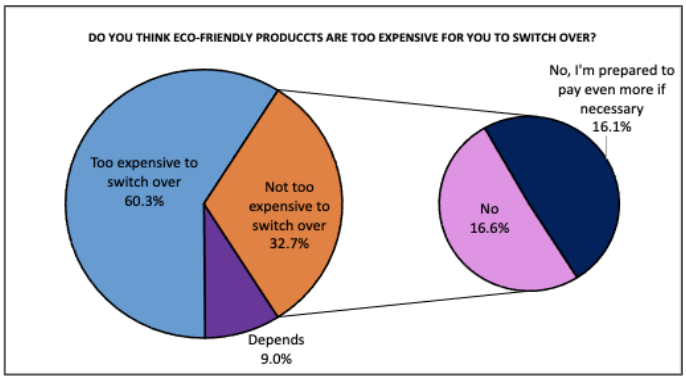

Figure 21 - Affordability of eco-friendly products (not affordable)

Only 1% of the survey population tied this topic to more consumption patterns, and 3% believed that an "eco" label alone is not a declaration of environmentally conscious choice. Overall, only 3% critically considered the product value, labeling logistics, and greenwashing prevention resulting in an overall 9% believing the value depends on the product itself. Some believe that if the demand is higher, the prices will reduce, which again falls back into the consumption patterns of a linear economy.

In identifying the top actions that Port Hope businesses can take to reduce their greenhouse gas emissions (GHGs), the responses are more scattered and do not reflect a unanimous opinion. Close to half of the respondents identified that contributing to a more sustainable local economy that supports Port Hope businesses is of high importance. However, no further elaboration is provided. **Error! Reference source not found.** illustrates other actions as deemed important by this community.

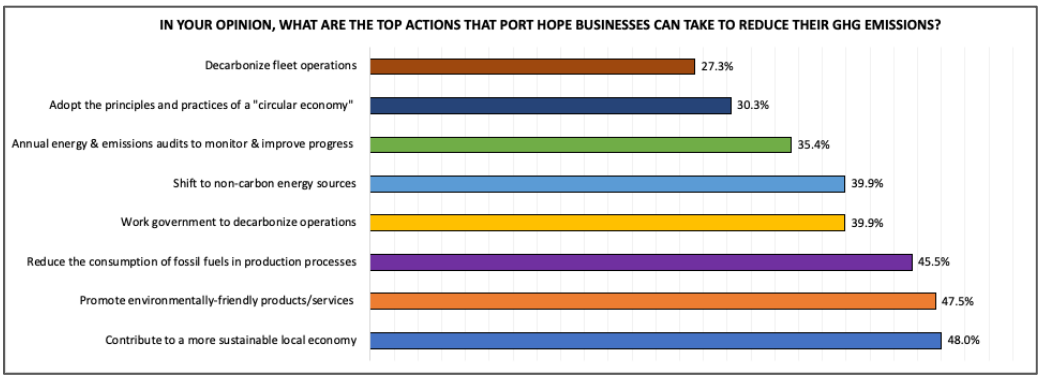

Figure 22 – Top actions for local businesses to reduce GHG emissions as deemed by the community

It is also important to note that this question assumes high levels of familiarity with circular economy principles within the community. While 30% of responders have identified the adoption of the principles of circular economy, comments are raised by some respondents questioning the meaning of the term, which can illustrate unfamiliarity with the principles on a general scale.

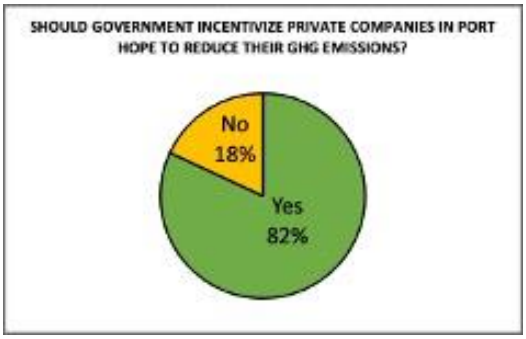

Figure 23- Incentivizing GHG reduction for private companies by the government

As illustrated in Figure 23, 82% of the respondents agree with the government incentivizing private companies in Port Hope to reduce their greenhouse gas emissions. However, the following caveats are raised:

- Accountability plans and financial restraints are in place, and no loopholes for selected few (shows lack of trust in the system)
- Publicizing the use of the funds to demonstrate the money has been a benefit to the community and/or the environment
- There should be punishments as well as rewards
- There should be science-based, measurable targets and monitoring results
- Incentives should be tied to quality jobs and education programs for illustrating long-term financial benefits of reducing GHG emissions
- Government should lead by example
- Funding should include an audit process to determine and evaluate actions

Forty-seven percent of the respondents rate the private sector's current performance in addressing climate change in Port Hope as "Not Good," while 27% believe they do not have enough information about private sector activities in the area to form an opinion. Twenty-six percent believe their performance is good, very good, adequate, mixed, or progressing, especially given the management challenges associated with the recent pandemic.

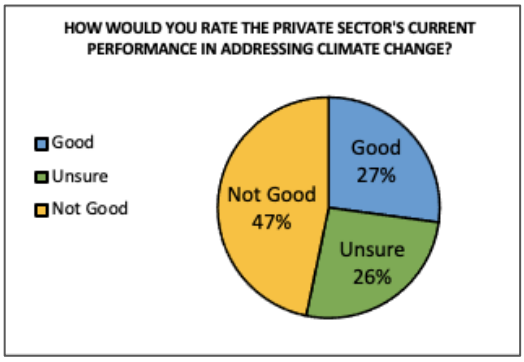

Figure 24 - Private sector's current performance rating in addressing climate change in Port Hope

Fifty percent of the respondents rate the public sector's current performance in addressing climate change in Port Hope "Not Good," 26% "Good," and 21% do not believe they have enough information to be able to determine the efficacy of public sector's performance in addressing climate change.

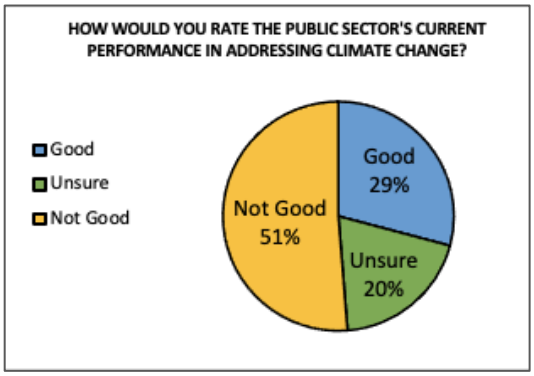

Figure 25 - Public sector's current performance rating in addressing climate change in Port Hope

While the trend is similar between respondents' rating of the public and private sectors' performance, more than half of the respondents are of the opinion that the current performance is not good or adequate towards addressing climate change.

Regarding the knowledge about the recent actions taken by the Municipality of Port Hope to address climate change and its impacts, the results are somewhat concerning. Only one action taken by the Municipality of Port Hope - Engaging local citizens and organizations around the issue of climate change - was known to over 25% of respondents. All other actions had very low awareness levels, between 23%. 33% of respondents felt that they didn't know what actions the Municipality was taking to address climate change or that they didn't think anything effective was being done. This signals a problematically low amount of awareness around local climate initiatives in Port Hope and that there is a need for more

awareness initiatives on the part of the Municipality. This will be especially important to address as climate action awareness is a key indicator for climate change initiative engagement (Mavrodieva, Rachman, Harahap, & Shaw, 2019), and so to engage the community, it will be critical that Port Hope addresses awareness.

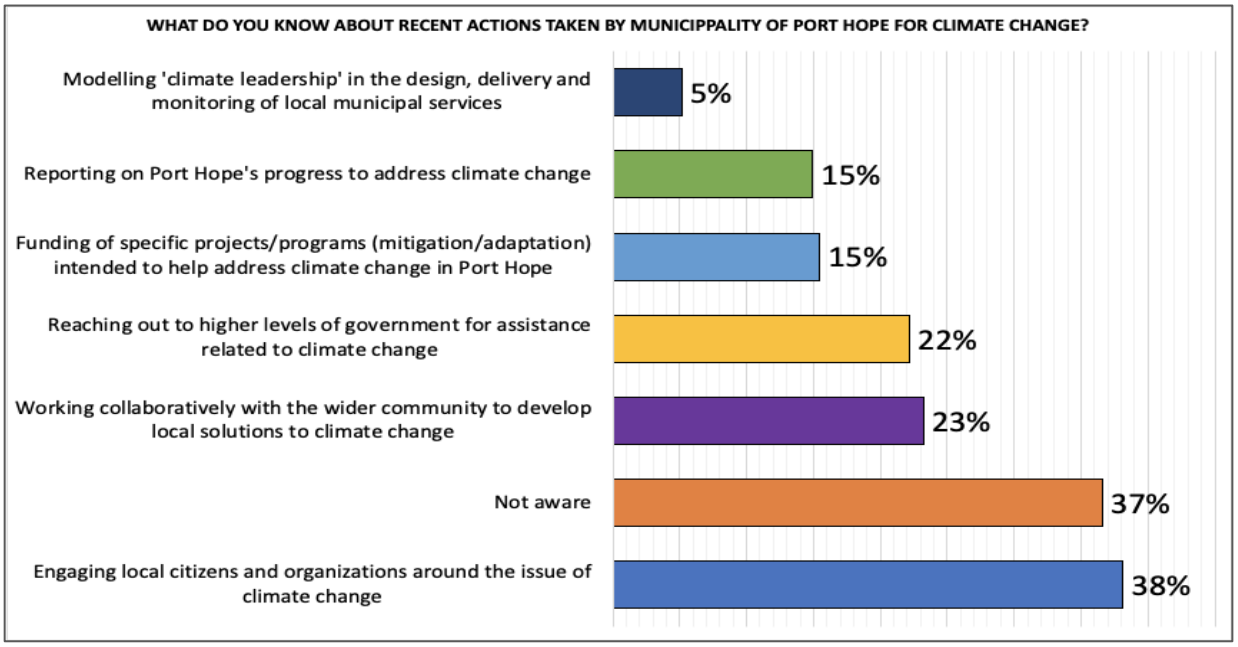

Figure 26 – Community knowledge of recent actions taken by the Municipality for the climate crisis

We asked about the respondents' opinions on the top reasons to address climate change at the local level. They generally agreed that there were four top reasons to address climate change at the local level: that communities know what's best for their village, town, or city, that local communities directly experience the impacts of a changing climate, that local communities are able to access information needed to address climate change at the grassroots level, and that local communities are able to rally people and resources needed to tackle climate change. Each of these options garnered between 60-65% of respondent support. These reasons have also been highlighted in the literature as important reasons to address climate change at the local level, especially the fact that local communities directly experience climate change impacts (Rauken, Per, & Winsvold, 2015). The only reason not selected by most of the respondents was that local communities exhibit higher concentrations of GHG emissions than rural areas, which received support from only 21% of respondents (see Figure 27).

The literature points out the importance of addressing climate change at the local level (Rauken, Per, & Winsvold, 2015) (Aguiar, Bentz, Silva, & Fonseca, 2018), and so it is promising to see local opinions line up with academic work. However, there are significant barriers that could impede municipalities like Port Hope from being able to mount sufficient responses, such as limited financial and human resources (Rauken, Per, & Winsvold, 2015); (Roberts, 2010). Also, addressing climate change at the local level requires more than just government action, such as private engagement and the use of external expertise (Dannevig, Rauken, & Hovelsrud, 2012).

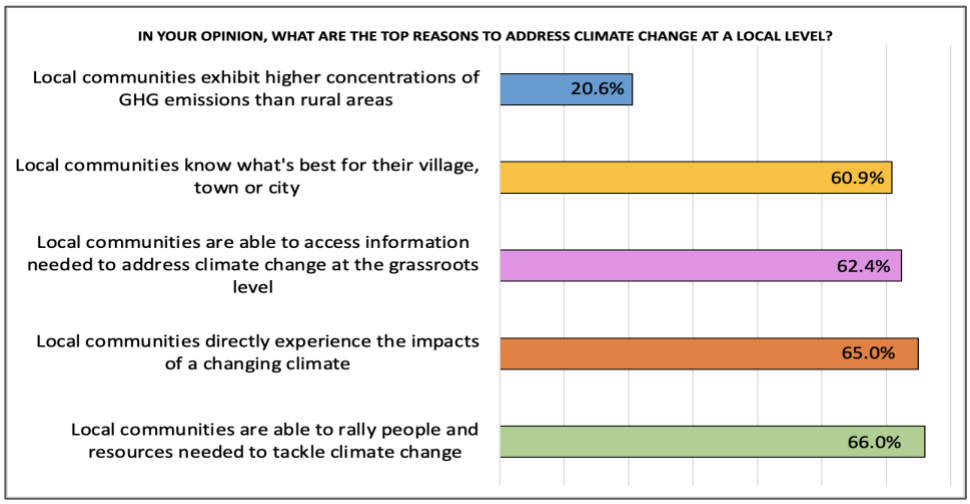

Figure 27 - Community reasons for addressing climate change at a local level

In the next section, we sought the community's opinion on the top climate change mitigation actions (existing and/or new) that the Municipality of Port Hope should focus on going forward. To avoid any ambiguity, we defined mitigation as the reduction of activities that result in greenhouse gas emissions.

Many mitigation actions received over 50% of respondent support. The two most prominent actions were to protect and expand the local tree canopy (80% support) and ensure that municipally owned and operated assets utilize best practices in decarbonization, including adopting renewable energy sources (73%). Also receiving support from the majority of respondents were working with all orders of government to access the funding needed to address climate change, designing a more walkable and bike-friendly community, limiting urban sprawl, and promoting deep energy retrofits of older buildings.

Similarly, we sought the community's opinion on top climate change adaptation actions that the Municipality of Port Hope should undertake. To avoid any ambiguity, we defined adaptation as taking actions that make us more resilient to the current and future impacts of climate change.

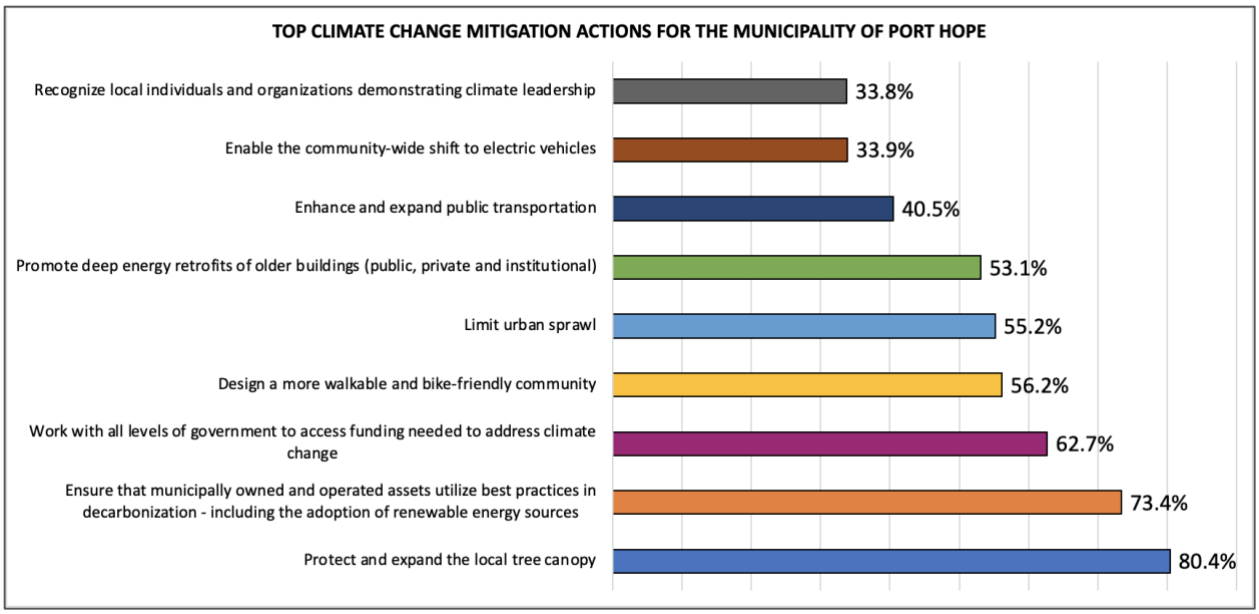

Figure 28 - Top climate change mitigation actions for the Municipality of Port Hope

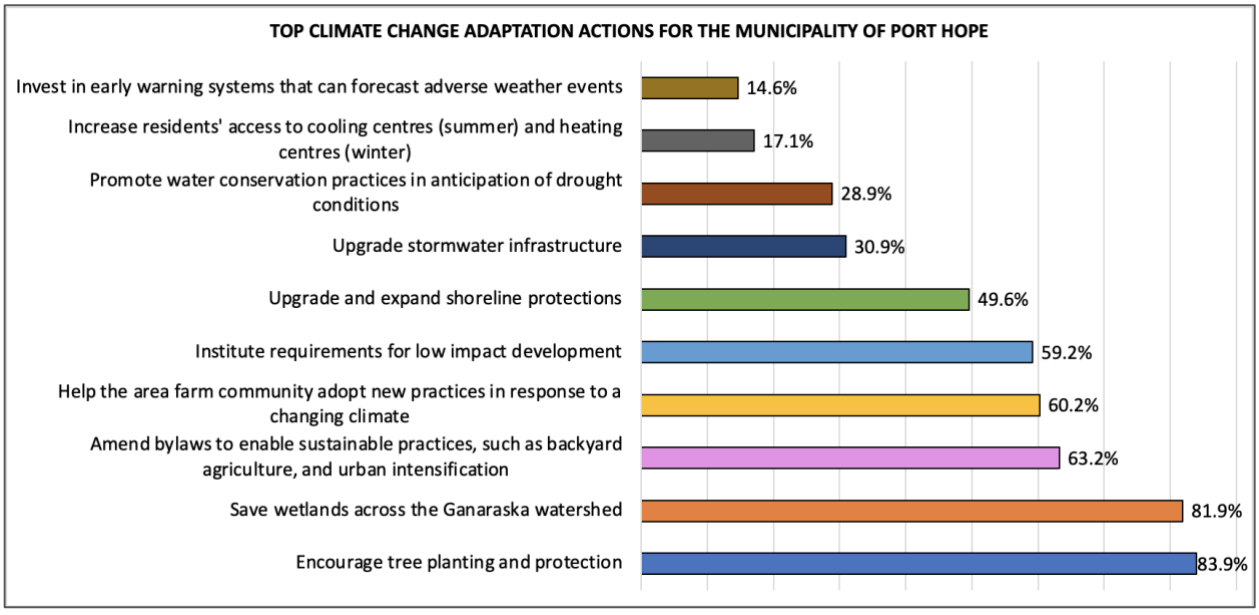

Figure 29 - Top climate change adaptation actions for the Municipality of Port Hope

Community perspectives on adaptation actions were more varied than on mitigation actions. Eighty-four percent of respondents identified encouraging tree planting and protection as a top adaptation action, while 82% indicated that saving wetlands across the Ganaraska watershed was a top adaptation strategy. It should be noted that both the top mitigation and adaptation actions identified by the community are focused on trees in the Port Hope area, indicating a strong community preference for climate change

action that promotes and protects trees in the area. Tree planting has been identified as a top climate change action in many other Canadian locales (Porter et al., 2017). They provide a myriad of adaptation and mitigation benefits, like carbon sequestration, cooling, erosion control, air quality improvement, and stormwater management (Porter, 2017). Importantly, they also provide habitat benefits to local animals and represent a low-barrier way for local citizens to get involved in climate change initiatives through engaging with tree planting (Porter et al., 2017). Other actions receiving support from the majority of respondents were, in order, amending bylaws to enable sustainable practices such as backyard agriculture and urban intensification, helping the area farm community adopt new practices in response to climate change, and instituting requirements for low impact development. Conversely, increasing residents' access to cooling and heating centers and investing in early weather systems to forecast adverse weather events received less support, 17%, and 15%, respectively.

Lastly, we asked the community to share with us their views on what the priorities of the Port Hope Municipal Council should be given the growing importance of climate change in Port Hope. In descending order, the sectors identified as high priority by the majority of survey respondents were: supports for the local agricultural community (64%), affordable housing (62%), climate change in Port Hope (60%), supports for vulnerable populations (60%), and quality of life improvements (50%). A focus on Port Hope's agricultural sector has been a recurring theme in this survey's responses. Here, respondents may be recognizing the current fragility and decline of small and medium-sized farms (Smith Cross, 2017) as a sign that help is needed from the government, or strongly feel as though it must be supported by the municipal government in the face of potentially devastating climate change effects (Union of Concerned Scientists, 2019). This also shows that respondents generally believe that climate change in Port Hope should be an utmost priority for the government going forward, which evidences a high level of climate change understanding and awareness reflected in earlier survey responses. First Nations rights and reconciliation, as well as local economic development and job creation, were also identified as a high priority. Investments in public transportation, new housing to accommodate population growth, and municipal infrastructure - upgrades/new - were all primarily identified as medium priority issues. There were no sectors that were mainly identified as low priority.

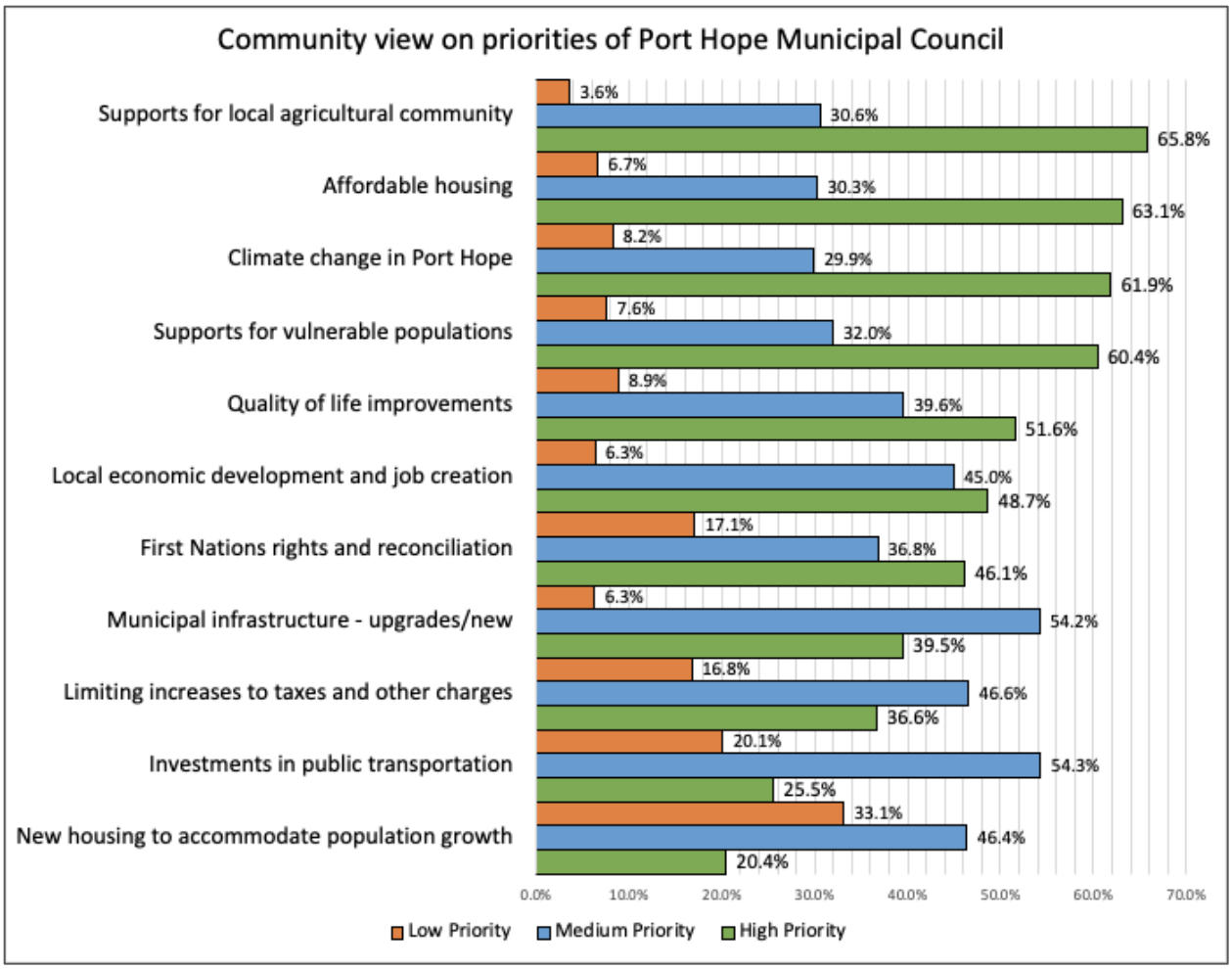

Figure 30 - Priorities for Port Hope Municipal Council

Section 4 - Role of Social Media

(Questions analyzed in this section: 30 through 35)

Most respondents spend 30 - 60 minutes on social media every day. This means that information must be presented using images or short videos that are concise and impactful to the audience.

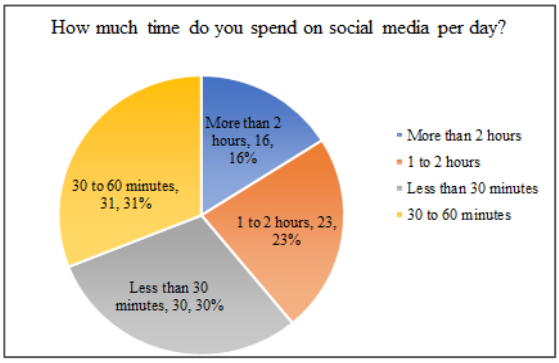

Figure 31 - Daily time spent on social media

Among the survey respondents, Facebook was the most frequent social media platform used, with almost 76% of the respondents using it. Following Facebook are YouTube at approximately 54% and Instagram at approximately 40%. Other relevant communication channels include LinkedIn, Twitter, and Pinterest. Port Hope could focus on Facebook, Instagram, and YouTube as avenues to increase the outreach of climate change information.

We were also interested in the format in which the community prefers receiving information about climate change in Port Hope. The results suggest that the most preferable form of input with 61% votes is via short videos of about 15-30s, such as those on Reels (Instagram), TikTok, and Facebook. Succeeding this proportion are images on Instagram, Facebook, and Twitter with about 45% votes and longer YouTube videos with 25%. About 16.5% also prefer getting information from Twitter, and 11% prefer discussion forums such as Reddit and Quora.

Since short videos and images seem to have the highest engagement, a digital marketing plan could be created to coordinate climate change information uniformly across these platforms. Various tools such as links and articles can also be linked to these platforms to provide more in-depth information for those interested. It is also possible to track the audience engagement and improve the plan based on the insights.

The highest digital footfall amongst Port Hope social media accounts is received by the Port Hope Municipality's Facebook page, @MunicipalityofPortHope, with about 57% of respondents referring to it for matters related to climate change. Other accounts that the respondents follow are as follows:

- Instagram: @exploreporthope (17%) and @porthopeontario (16%)
- YouTube: @themunicipalityofporthope (14%) and @porthopetoursim (9%)
- Twitter: @porthopeontario (11%) and @porthopeinfo (8%)

Since the Facebook account (@MunicipalityofPortHope) and Instagram accounts (@exploreporthope, @porthopeontario) are well used, it is worth exploring what kind of digital content appeals to the users. Their accounts could also provide relevant insights on the audience (demographics, age, activity time), which can then be used to create a digital marketing plan to boost Port Hope's population engagement.

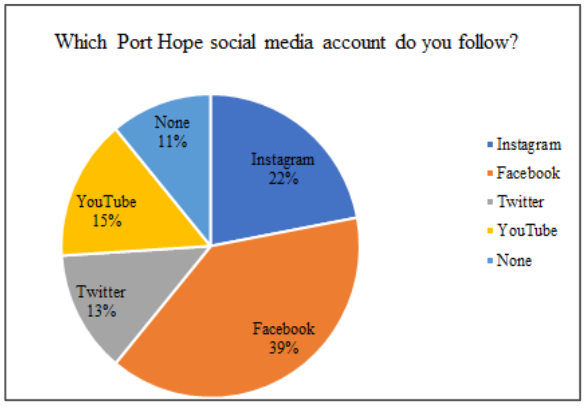

Figure 32 - Port Hope most popular social media account preference

Another aspect investigated through this survey was the frequency of viewing videos and/or images about climate change on social media. The survey answers indicate that a vast majority of 34% of people only viewed videos and images related to climate change sometimes, while 29% viewed such content often. It

is interesting to note that about 20% have rarely seen any climate change content on their respective social media channels.

About 38% of the respondents were likely to follow Port Hope on social media platforms in the future. Methods to increase the reach of the social media channels for this sample group should be discussed.

Concluding Remarks

These findings help to understand the dominant and divergent perspectives of Port Hope's citizens regarding the climate crisis. The results highlight the need to improve public engagement and provide potential guidance to the Municipal government on developing a locally oriented Climate Change Action Plan. Overall, the survey respondents are well aware of climate change impacts in the region, and they have expressed their opinions on climate change mitigation and adaptation actions. The majority of respondents, however, are not aware of any Municipal actions to address the climate change emergency.

The majority of the respondents believe consumer behavior and individual lifestyle changes can have a measurable impact on climate change. It appears the public transportation system is not used by most Port Hope residents, especially in the rural community. Should the quality and frequency of public transportation improve, many would be willing to consider it as an option. In addition, most of the respondents agreed that local government should make considerable efforts to support local businesses. They believe providing financial resources can help tackle the climate change crisis. Furthermore, respondents are of the dominant opinion that efforts to address climate change by public and private sectors are insufficient.

In terms of the priorities, the survey identified that responding residents in Port Hope expect the government to prioritize affordable housing and support for local farmers as equally crucial as actions related to climate change. Based on the survey results, protecting and expanding the local tree canopy is a priority, as is ensuring municipally owned and operated assets apply best practices in decarbonization. These actions, along with the need to work with all orders of government to access the funding required to address climate change, were the respondents' views on mitigation actions required by the Municipality of Port Hope. Priorities for adaptation to a changing climate including protecting wetlands in the Ganaraska watershed, encouraging tree planting and protection, and amending bylaws to allow for more sustainable private sector practices. According to the survey results, providing support for the local agricultural community, affordable housing, and activities directly related to climate change mitigation and adaptation were viewed as the council's priority actions.

When it comes to the social media usage patterns of the respondents, the findings show that creating short videos about climate change can increase outreach to the community. As social media has been the most popular means of communication, it is vital to consolidate the platforms run by the Municipality to improve coherence in communication and keeping the entire community equally informed.

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Education-based comparative report

By Negin Ficzkowski and Arash Golshan, June 2021

Executive Summary

Implementing an effective Climate Change Action Plan toward resilience and adaptability for the Municipality of Port Hope requires support and action at all levels of society. Having been impacted by the adverse effects of global warming, the Port Hope community has an intimate knowledge of the impacts of extreme weather events on infrastructure and human health. This study is conducted to analyze the data collected through an online survey reflecting the Port Hope community's knowledge and perception of climate change and its risks and views on the role of the municipality council and publicly accessible climate change education.

The report aims to correlate the level of education to the level of environmental literacy within the community. The results are presented to the Port Hope Climate Change Working Group as an input to the planning and development of a Climate Plan by the Municipality of Port Hope that addresses both mitigation and adaptation strategies applicable to the region.

Key Findings

- The perception about the nature of climate change does not necessarily improve with the level of education in the Port Hope community.
- The respondents with non-university education are more likely to revise personal lifestyles to adapt to more eco-friendly practices.
- The cohort with non-university education favors promoting environmentally-friendly products and services as a viable action at the corporate level for reducing GHG emissions; the higher educated counterparts prefer the focus to be on reducing the consumption of fossil fuels in production processes - energy efficiency and energy conservation. Both cohorts agree with the local government incentivizing GHG reduction for local businesses, with caveats on accountability and transparency.
- The Port Hope community unanimously perceive climate change as a risk and are most concerned about an increase in the number and severity of extreme weather events in the area; the group with non-university education anticipate an increase in flooding due to a rise in water levels and insufficient stormwater infrastructure while the group with university education have more concerns about the increased burden on municipal finances as a result of climate change.
- The community collectively agree on top mitigation actions for the Municipality of Port Hope to be protection and expansion of the local tree canopy and ensuring that municipally owned, and operated assets utilize best practices in decarbonization
- The community collectively agree on top adaptation actions for the Municipality to be encouraging tree planting and protection as well as saving wetlands across the Ganaraska watershed

- Public transportation is not a popular choice for either cohort in this study, or an investment in its upgrade is suggested by them; circular solutions such as using an on-demand minibus amongst high-educated respondents or improvements in dedicated bike lanes for respondents with non-university education are more in demand.
- The community expects the council to prioritize supporting the local agricultural community and vulnerable population as well as affordable housing strategies for the city through exploring green infrastructure for climate change adaptation and mitigation as opposed to supporting further new mass development in the area.
- Social media is not generally trusted as a valid source of information, in particular among the highly educated members of the community. Preferring news or e-news channels such as the Municipality's website or direct emails, the community, specifically those with non-university education, are open to attend more to Port Hope social media platforms and sometimes watch climate change-related short videos. Facebook is the most popular social media platform for both cohorts.

Key Recommendations

- Core climate change knowledge should be embedded in the Port Hope Municipality website and local news channels to gain the public trust and understanding.
- A survey on climate education within the Canadian public education system in 2019 has found the more exposed the community is to the conversation about anthropogenic climate change, the more their attitude changes toward their individual responsibilities. Attention should be paid to increase community awareness in Port Hope about the impacts individual behaviors can have on the bigger climate change picture, specifically among those with university-level education. As this cohort tends to trust publications more than the social channels, they have been made aware of the scale of corporate impacts on global warming but often left out of the conversations about the effects of individual responsibility. It can be beneficial to conduct workshops for this particular cohort and present opportunities that can scientifically encourage participation.
- There is an interest in soft engineering solutions among the Port Hope community represented in this survey. Collaboration opportunities should be explored with local organizations and academia to advance the implementation of such solutions further. This can attract and further engage the highly educated group and create trust and optimism.
- The locals are not accustomed to public transportation usage; therefore, further investment in upgrading or improving the existing system does not serve the community. It is best to spend the resources on developing circular solutions to replace the existing fossil fuel transportation methods. With the majority of the community being open to on-demand transportation services and cycling, further innovation in these areas seems to be a viable addition to a Climate Change strategy. Alternatively, investment in EV infrastructure also seems to be desired by both cohorts of the community.

Introduction

This report is conducted as part of an overarching collaboration between McMaster University, the Port Hope Climate Change Working Group, and the Municipality of Port Hope through W Booth School of Engineering Practice and Technology. The broad project aims to collect and analyze information from a variety of sources to help inform the creation of a Climate Plan by the Municipality of Port Hope that addresses both mitigation and adaptation strategies applicable to the region. The data used for the purpose of this collaboration was collected through a community survey explicitly designed to identify local perceptions and insights about climate change and its effects on Port Hope and surrounding areas. The survey was shared with community leaders and their network as well as the public Port Hope community through local news channels and communication media. The role of McMaster in this partnership is to support the Working Group in building local capacity and advancing this mandate; the goal is not to put together a Climate Plan for Port Hope but rather to enable, empower, and educate the community to create their own.

Situated on the northern shore of Lake Ontario, about 110 kilometers east of Toronto, on the Ganaraska River, The Municipality of Port Hope, with approximately 17 000 residents (Statistics Canada, 2017), is a picturesque mix of the urban and rural area surrounded by farmland. The town's downtown core is considered one of the best-preserved ones in the province of Ontario (Port Hope, 2021). While agriculture is a substantial economic base for the Port Hope region, with companies such as Cameco and Esco, the industry remains one of the top employment sectors in the area. Having the most significant volume of historic low-level radioactive wastes in Canada resulted from the operations of the former federal crown corporation mining company Eldorado (now privately held as Cameco Corporation), the Port Hope area initiative (PHAI), and other clean-up and remediation projects continue in the region (Fahey et al., 2013). Moreover, as of the 2018 general election, the area has a provincial Progressive Conservative political representation (Northumberland-Peterborough South) (Elections Ontario, 2019). Also, Northumberland County, within which Port Hope finds itself, has a population of approximately 85 000 (Statistics Canada, 2017).

As a result of more frequent storms in the Great Lakes region, the town of Cobourg, near Port Hope, experienced a massive flooding event in 2010 (Dillon, 2010). Posing severe threats to the infrastructure such as sewage systems and agricultural land erosion, such severe storms can cause large amounts of waste or contaminants to travel into local waterways, thereby impacting local ecosystems, local drinking water, stormwater management, manure management systems, in addition to vector-borne diseases and insect and pest controls, among other things (Krantzberg, 2019). Similarly, extreme heat days are expected to increase, and average air temperatures are projected to climb. Having experienced this extreme event, the Port Hope community has an intimate knowledge of such destructive consequences. In 1980, the Ganaraska spilled its banks, covering 66 acres of downtown Port Hope in 1.5 meters of water (Ganaraska Region Conservation Authority, 2009). Therefore, it is imperative for the local governments to adapt to new conditions and strive to mitigate further climate crises. The local municipalities have control over about half of Canada's total emissions. However, significant financial and institutional barriers limit proper planning and implementation for a mid-sized municipality like Port Hope (Hill and Perun, 2018).

As part of the third phase of this project, a report on the overall community survey results was conducted and delivered to the council in May 2021. According to a survey conducted by Lakehead University, there is a significant gap between climate change perception and climate awareness (Field et al., 2019). The current report aims to analyze the responses to the Port Hope community survey on climate change through the lens of public education to correlate the education level of the participants with their climate literacy and recommend policy directives for the Municipality in light of the key findings. The survey responses have been comparatively analyzed for two main cohorts: non-university education (high school, college, etc.) and university education. The results report is devised in four main sections; in each section, a comparative analysis of relative survey question responses is provided following related graph illustrating the distribution: section 1 presents a summary of the survey demographics from the point of view of the two educational cohorts. Section 2 presents a comparative analysis of climate change perception among the two cohorts and the role social media plays for them with regard to climate awareness. Section 3 summarizes the trend in dominant perspectives of the two groups about the distribution of responsibility in addressing the climate crisis. Finally, section 4 compares the expectations from each cohort from the local government regarding climate change action.

Methodology

In analyzing the results of the online survey in Port Hope, the following criteria were used to categorize the highest education level of the participants:

- The data was measured against the responses to question number 5 of the survey asking about the highest level of education the respondent has completed to date, with available options listed as a) high school b) college certificate, diploma or degree c) bachelor's degree d) master's degree e) professional degree f) doctorate
- There are 199 responses available for most of the questions, which, based on the 2017 Statistics Canada population of 16,755 in Port Hope, provides us with a confidence level of 95% and a 7% margin of error. This means if, instead of the mentioned sample size, every single Port Hope resident had provided their answer to our survey, with the likelihood of 95%, a deviation of ±7% from the current results would be observed.
- There is no data available to us regarding the locations of acquired education for survey participants. Therefore, all analysis is based on the Canadian education system.
- Climate change is not uniformly taught across all Canadian schools (Field et al., 2020). However, for the purpose of this analysis, we assume all survey participants, regardless of the province or territory of acquired education, have been exposed to the basics of climate change concepts.
- Considering that the college curriculum is compact and mainly field-focused in Canada, we do not expect extensive exposure to Climate Change-specific education as part of this group of credentials.
- While a professional degree is also awarded in specific fields of work, they are often exclusive to either graduate or undergraduate entry, depending on the profession. We, therefore, assume the participants who indicated "Professional Degree" as their highest level of education have already fulfilled either a bachelor's or a master's degree requirements.

- Only 2% of our participants hold a doctorate degree. As such, regardless of their scholarly level, they do not represent a standalone category.

Based on the above criteria, we have conducted a comparative analysis of the responses to the survey questions based on the following two main categories:

- **Group 1 - Non-university Education**: High school diploma and college certificate, diploma, or degree, this group consists of 45% of the participants (89 responses in this cohort).
- **Group 2 - University Education**: Bachelor's Degree, Professional Degree, Master's Degree, Doctorate; this group consists of 55% of the participants (110 responses in this cohort).

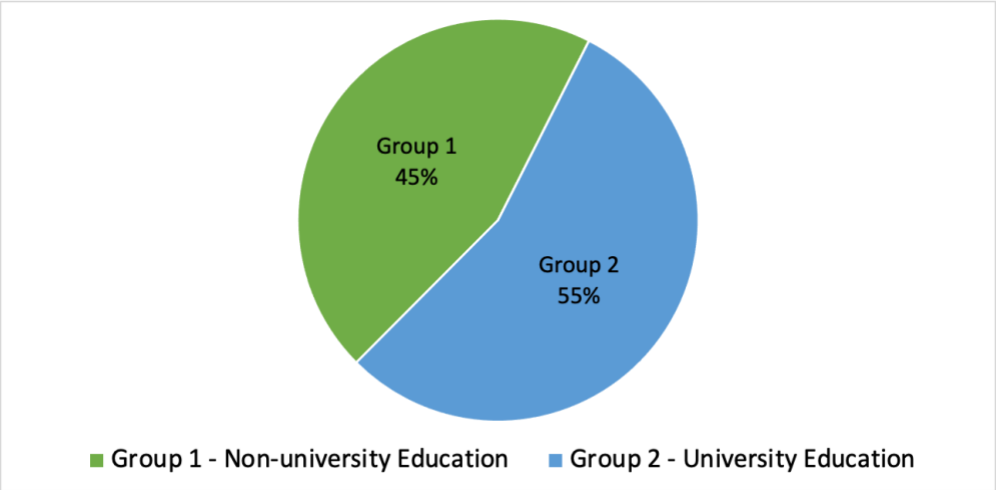

Figure 33 – Distribution of survey analysis main representation

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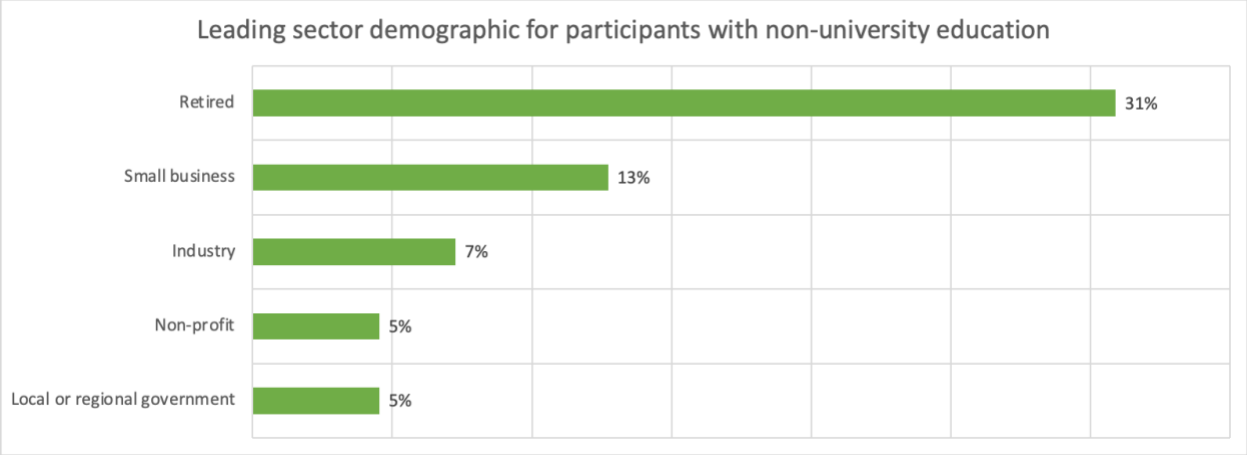
Survey Results Discussion

Section 1: Demographics

Identified as the leading sector for both groups, 31% of the participants with non-university education and 37% of those with university education have identified to be retired. No data is available to further categorize the sector of involvement prior to retirement for the group of survey participants. As indicated in Figure 34 (a), other leading sectors for participants in the non-university education group are small businesses, industry, non-profit, and local or regional governments. Figure 34 (b) indicates the leading sectors wherein the majority of participants with university education are employed; small and large businesses, education, environment, healthcare, and local or regional government are identified.



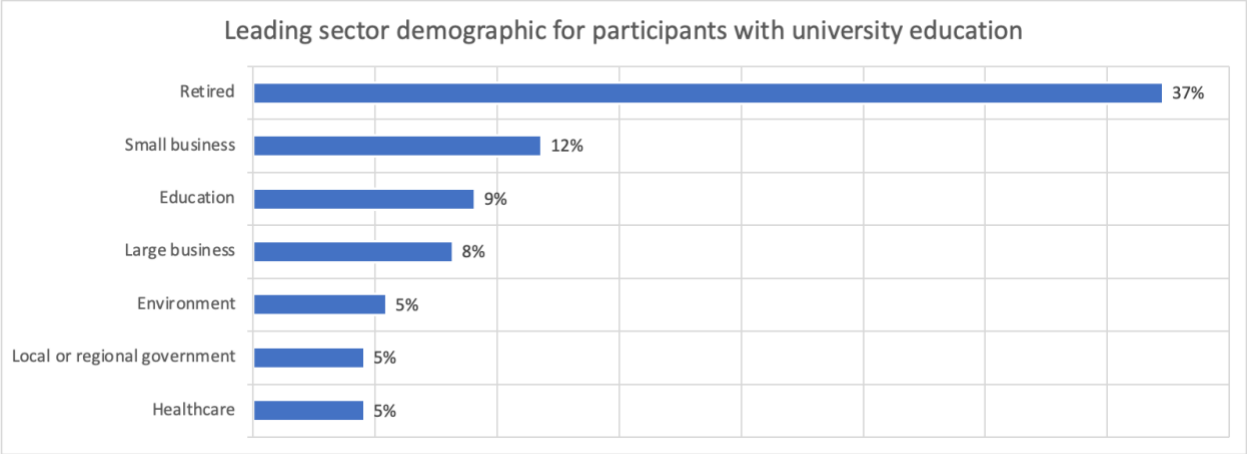


Figure 34 - Leading sector demographics for participants with (a) non-university education (b) university education

10% of the respondents do not reside in port hope, 45% of the represented residents have non-university education, 11% of whom are working in Port Hope at the time of the survey. 55% of these residents have a university education, 19% of whom are working in Port Hope at the time of the data collection. Figure 35 illustrates the distribution of the two identified cohorts amongst the respondents relative to their residency and occupation in Port Hope.

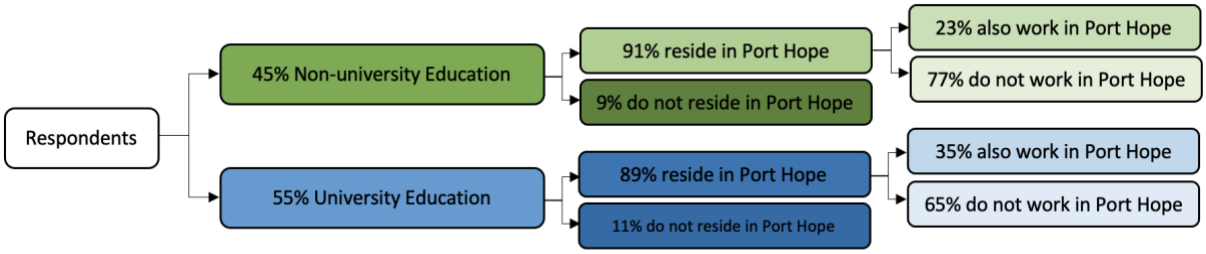


Figure 35 - Distribution of education level among Port Hope residing and non-residing participants

The majority of participants with non-university education are between 50-65 years of age, while the majority of those with university degrees are over 66 years of age. Furthermore, the non-university cohort is more age-diverse than the university cohort as they include 6% of participants between 16 to 25 years of age. The age distribution for both cohorts is illustrated in Figure 36.

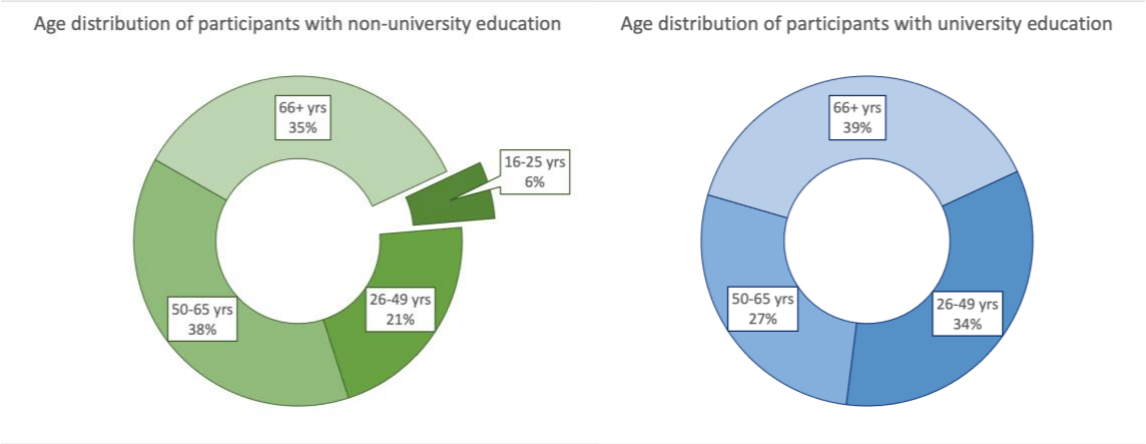


Figure 36 - Age distribution of survey-specific education cohorts

69% of the participants with non-university education and 67% of those with university education identified their living area as urban. There is no unified definition of the urban and rural areas provided to the participants. Yet, for the purpose of this report, it appears that the representation for urban and rural areas is similar in both cohorts.

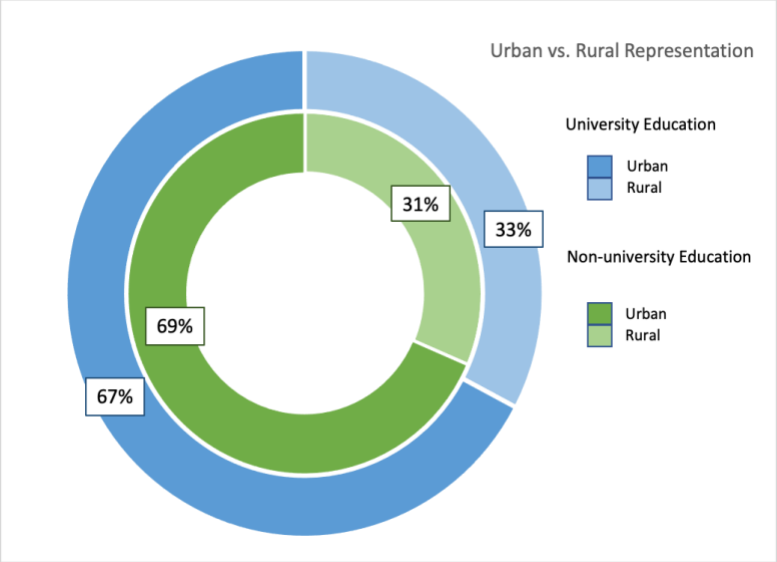


Figure 37 - Urban and Rural representation in survey-specific education-based cohorts

The financial status representation is not the same for the two cohorts in this analysis. The majority of participants with university education have over 100,000 CAD household income per year, while the majority of the respondents with non-university education are earning between 80,000 to 100,000 CAD per year household income. Figure 38 illustrates the discrepancy in financial status representation between the two cohorts.

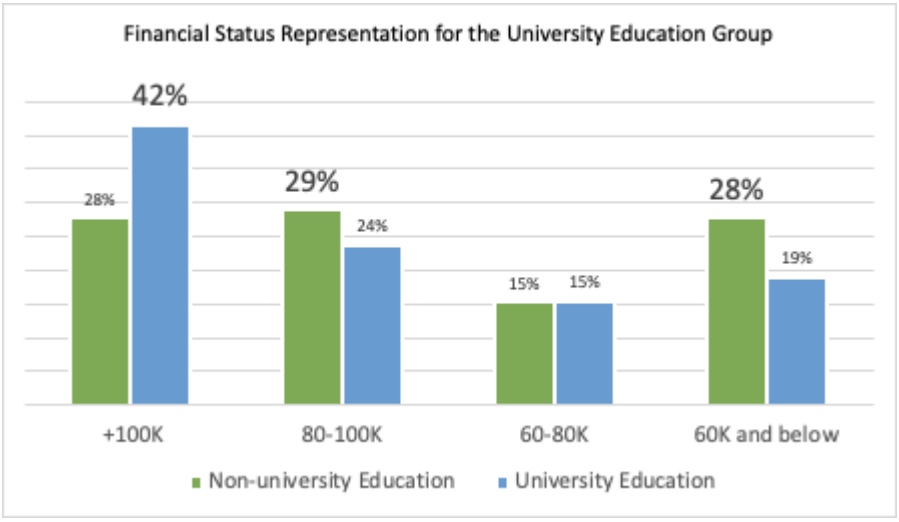


Figure 38 – Financial status representation for non-university and university education groups

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Through the analysis provided in this section, it is evident that the Port Hope community overall maintains a good knowledge of climate change globally and within the region, regardless of their level of education. While they mainly prefer to receive climate-related information through legitimate websites and news channels, they are increasingly valuing involvement in Port Hope's social media platforms.

The majority of our survey respondents (68%) tend to seek out climate change-related news actively. The difference between the responses from university degree holders and those with non-university education is negligible.

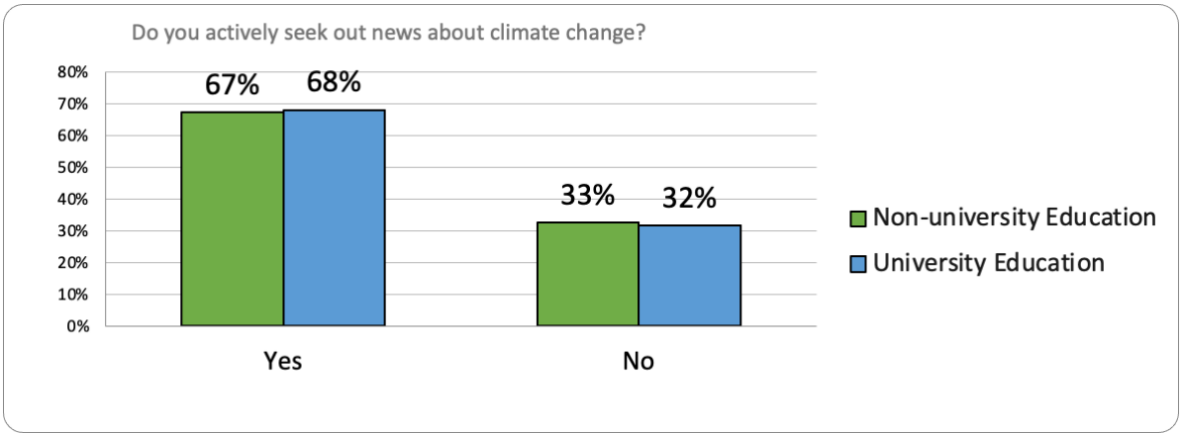

Figure 39 – Active news seeking distribution

It may be interesting to note that only 22% of the respondents with university degrees and 12% of those with non-university education are affiliated with (or a member of) an environmental organization.

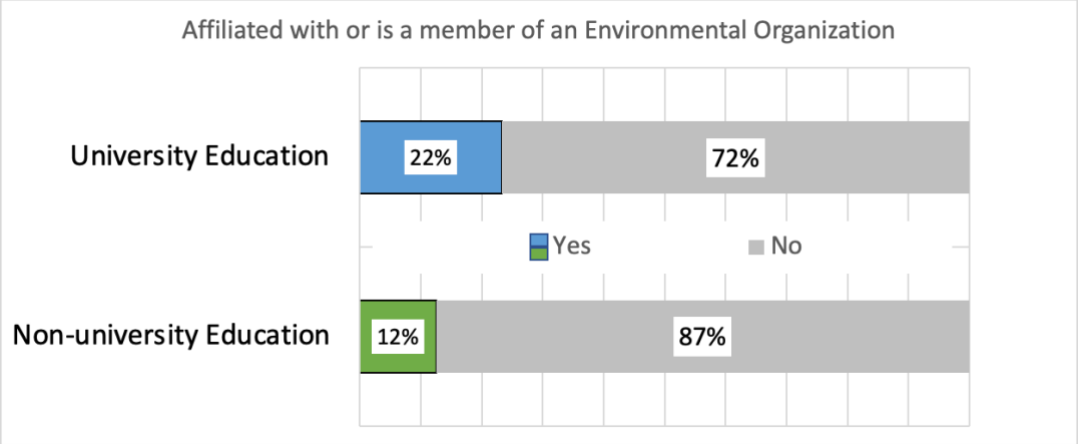

Figure 40 – Distribution of environmental organization association

As for the sources regularly relied on by the respondents for climate change-related information, the internet, television, and newspaper were the top three popular sources overall. However, there are a few noteworthy diversities in the popularity of news sources among the two educational categories. Each

"school/college/university," "Municipal council or government information," and "Newspapers" enjoy an approximate 10% higher demand from respondents who hold a university degree. This result is clearly aligned with a 2018 study that found a significant positive correlation between education level and newspaper usage as well as organizational publications (Anderson, 2018).

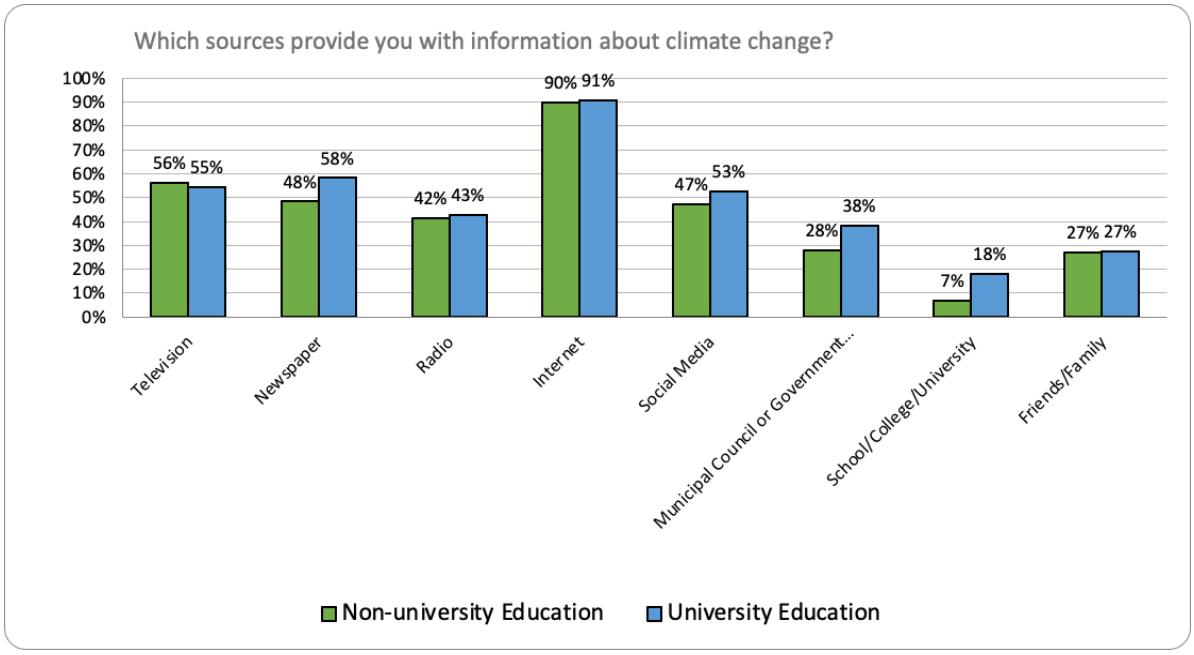

Figure 41 – Distribution of popular sources of climate change information

Following internet, television, and newspaper, the role of social media is significantly important amongst the participants such that 47% for those with non-university education and 53% for those with university education are using various social media services as one of the sources of information about climate change. The following six questions further analyze the difference between the usage between the two groups.

While the majority of respondents within both groups are spending less than 2 hours on social media, most respondents with non-university education limit it to less than an hour a day while the university degree holders do so less than 30 minutes daily. The average trend suggests about the same amount of time spent on social media amongst both groups (Figure 42). However, the most popular platform varies between the two. Those with non-university education are more active on Facebook and TikTok than those with university education. Group 2 uses all other platforms more than or equal to Group 1 (Figure 43). Specifically, YouTube and LinkedIn are used 20% more amongst university degree holders than those with non-university education.

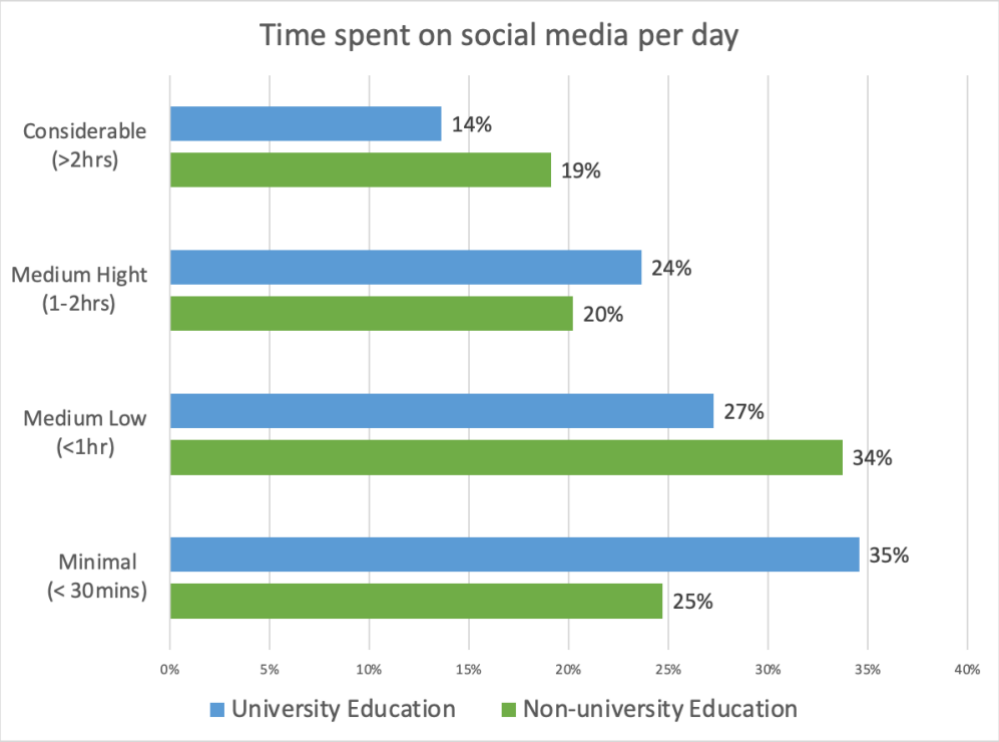

Figure 42 – Distribution of time spent on social media

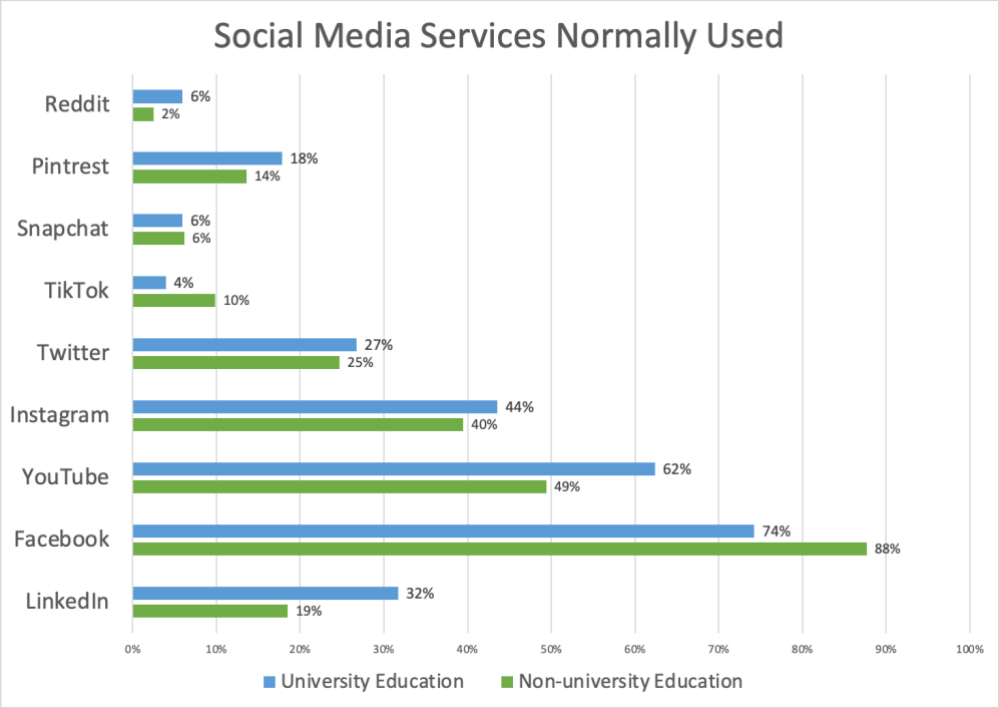

Figure 43 - Distribution of popular social media used

The social media activity trend is consistent with the survey results for the preferred method of climate information delivery for the respondents with non-university education, who prefer short videos (65%)

followed by pictures (53%). As shown in Figure 44, 2% of this group always view videos or images about climate change on social media, 32% often, and 39% sometimes do so (Figure 45). However, 30% of the respondents in this group never or rarely view such content. This represents the population that prefers news channels, newsletters (or e-newsletters), email, forums, and other text-based methods.

The university degree holders also prefer short videos more than all other methods (64%), followed by pictures (42%), while they indicate higher interest in email, press releases, and discussion forums compared to Group 1 (Figure 44). 7% of the respondents in this group always view images and videos about climate change on social media, collectively 59% often or sometimes do so, while the remainder 32% never or rarely view such content (Figure 45). Many of the respondents in this group indicated they prefer scientific journal articles, email, and government websites.

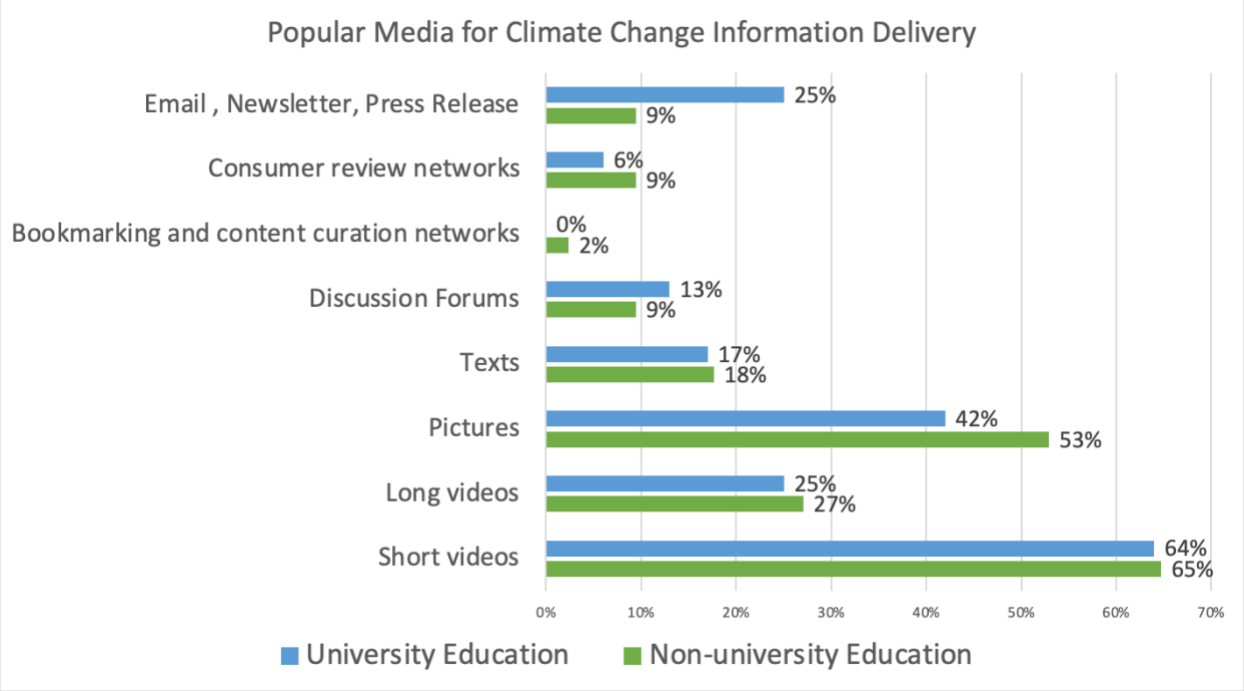

Figure 44 - Distribution of popular method of delivery for climate change information

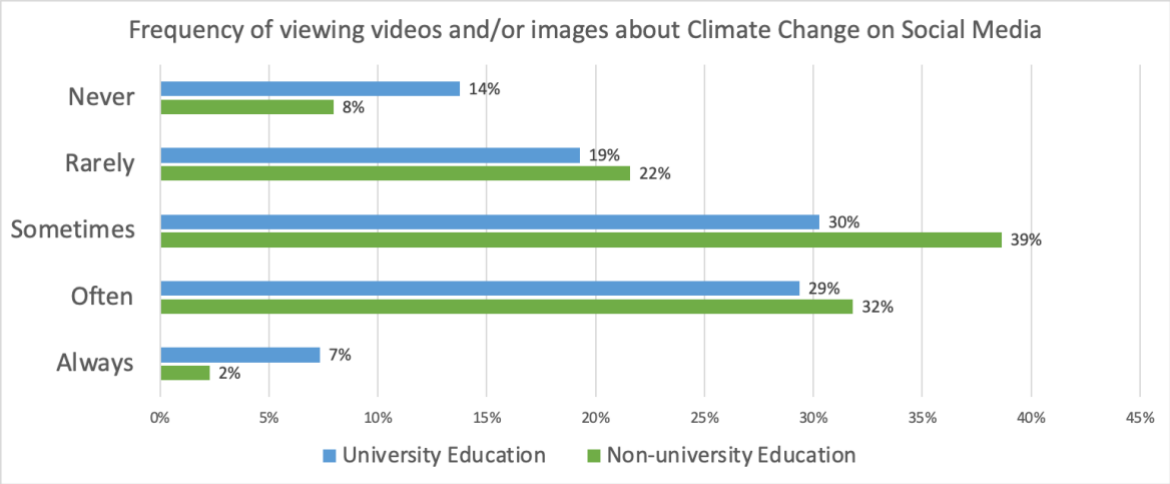

Figure 45 - Distribution of multimedia viewing frequency

When indicating their perception of climate change's leading causes, **"Humanity's use of fossil fuel"** and **"Deforestation"** were the two dominant answers amongst the respondents. University degree holders were 8% more likely to count humanity's use of fossil fuel as one of their answers, though this is likely not a significant difference between the two cohorts. A potential trend was in the case of the people who do not believe in the anthropogenic causes of climate change. In contrast with several pieces of literature' findings in the field (see Arbuthnot, 1977; Buttel & Johnson, 1977; Maloney & Ward, n.d.; Poortinga et al., 2019; Sun & Han, 2018), the university degree holder respondents were 3% less likely to believe in climate change to be human-caused. A similar trend could be observed in the Ballew et al. (2020) survey for people with a specific political background. The study concluded that highly educated respondents identifying as "conservative" (in the context of the US politics criteria) are less likely to acknowledge human-caused climate change than less-educated conservatives, which may be aligned with the mostly Progressive Conservative population in Port Hope.

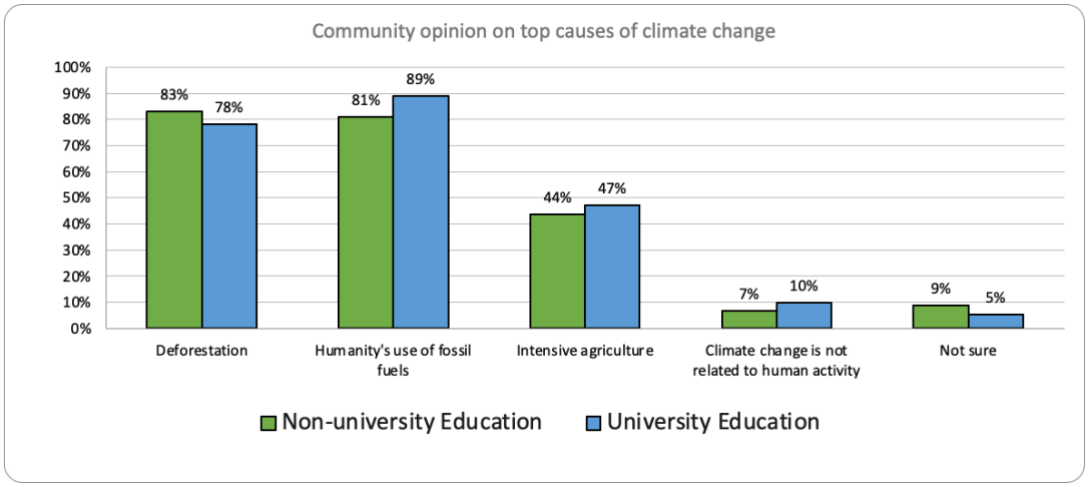

Figure 46 - Distribution of community opinion on top causes of climate change

Energy demand, Consumer behavior, and Transportation were among the top factors contributing to climate change from the respondents' perspective. Urban sprawl, Landfills, and consumer behavior were the options that were more popular among the respondents with non-university education by 15%, 12%, and 10%, respectively. In contrast, University degree holders emphasized population growth and food production as the contributing factors compared to their counterparts.

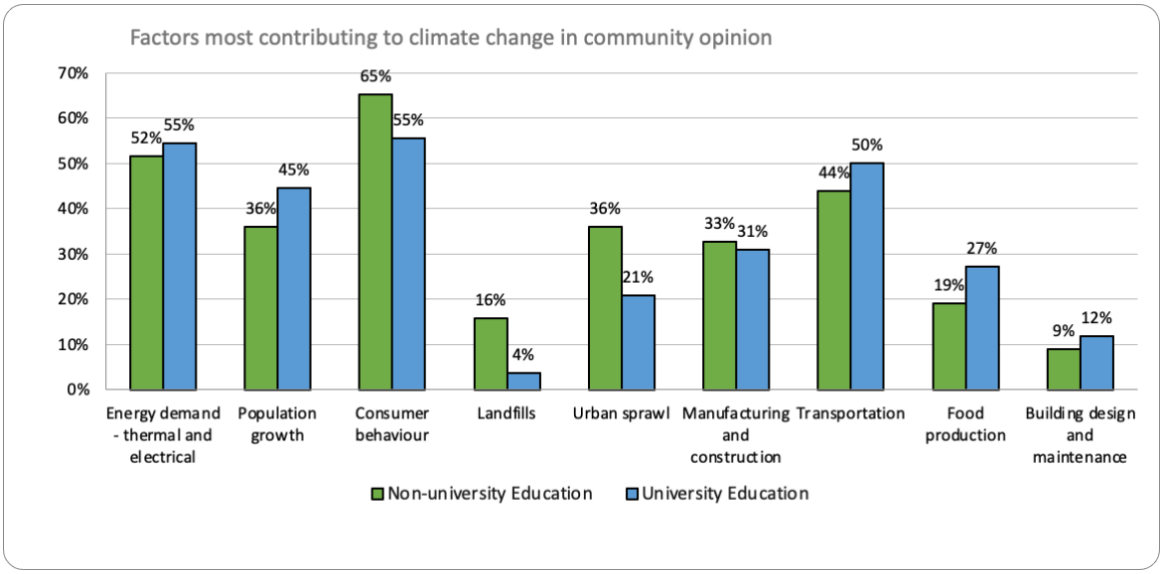

Figure 47 - Distribution of community opinion on contributing factors to climate change

Overall, most of our respondents agreed with the inevitability of climate change because of reaching a point with no return. However, there were a few inconsistencies among respondents with different educational levels. While the agreement with the idea was more prominent among university degree holders, those with non-university level education showed more tendency (by 11%) not to agree or disagree with the statement. The result could be interpreted as highly-educated respondents of Port Hope community survey are slightly less optimistic about potential mitigating actions in addressing climate change than those with non-university education.

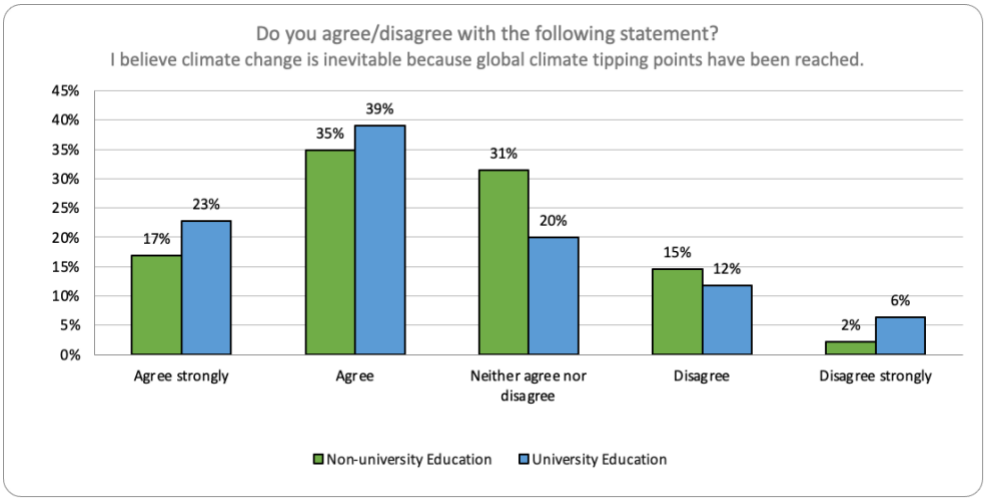

Figure 48 - Distribution of community opinion on climate change inevitability

While “Increase in the number and severity of extreme weather events” was the most probable negative impact of climate change amongst the survey respondents, in several items, different education levels led to different answers. For example, “increased burden on municipal finances” was 13% more popular among the university level education, whereas those with non-university education had 11% higher agreement with the “Increased flooding due to a rise in water levels and insufficient stormwater infrastructure” option.

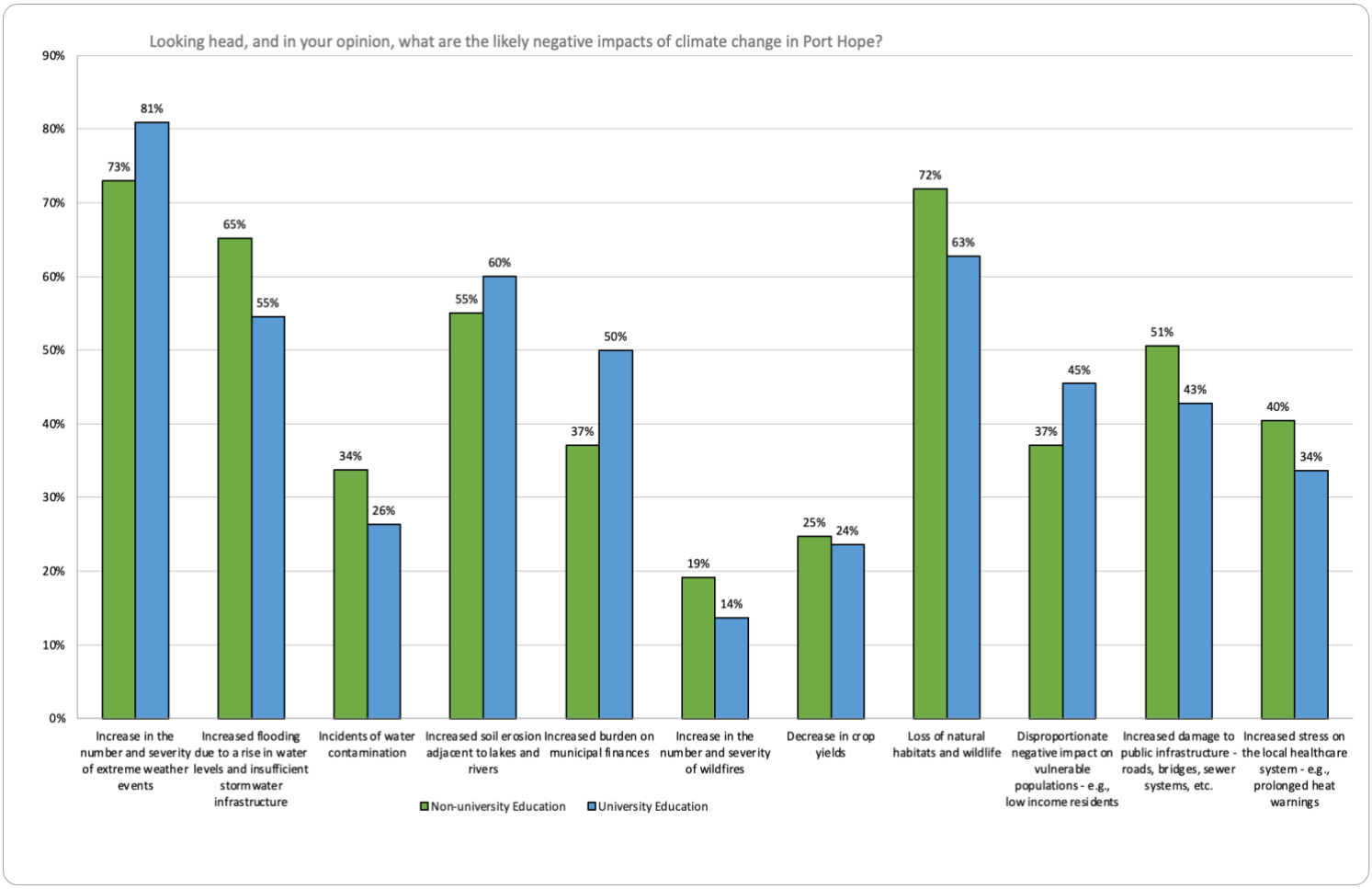

Figure 49 - Distribution of community opinion on negative impacts of climate change in Port Hope

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Both groups of survey respondents were likely to acknowledge their personal responsibility in mitigating combat climate change. However, they do not believe the public and private sectors are performing strongly in addressing climate change. They also believe it is reasonable for the government to incentivize private businesses to accelerate their GHG reduction strategies. Regardless of the level of education, the respondents are willing to adapt to more eco-friendly consumption patterns such as the use of electric vehicles or public transport provided that the infrastructure is improved to a higher standard.

85% of each group agree or strongly agree with the personal lifestyle changes being practical mitigation actions for the problem. This ratio is slightly lower (82%) for the university degree holders and marginally higher for the others (88%). Moreover, 13% of highly-educated respondents disagree/strongly disagree that their steps could contribute to the efficacy of mitigation strategies. This ratio is 10% higher than that of the other group of respondents, which could potentially lead to undesirable environmental behavior among highly-educated individuals.

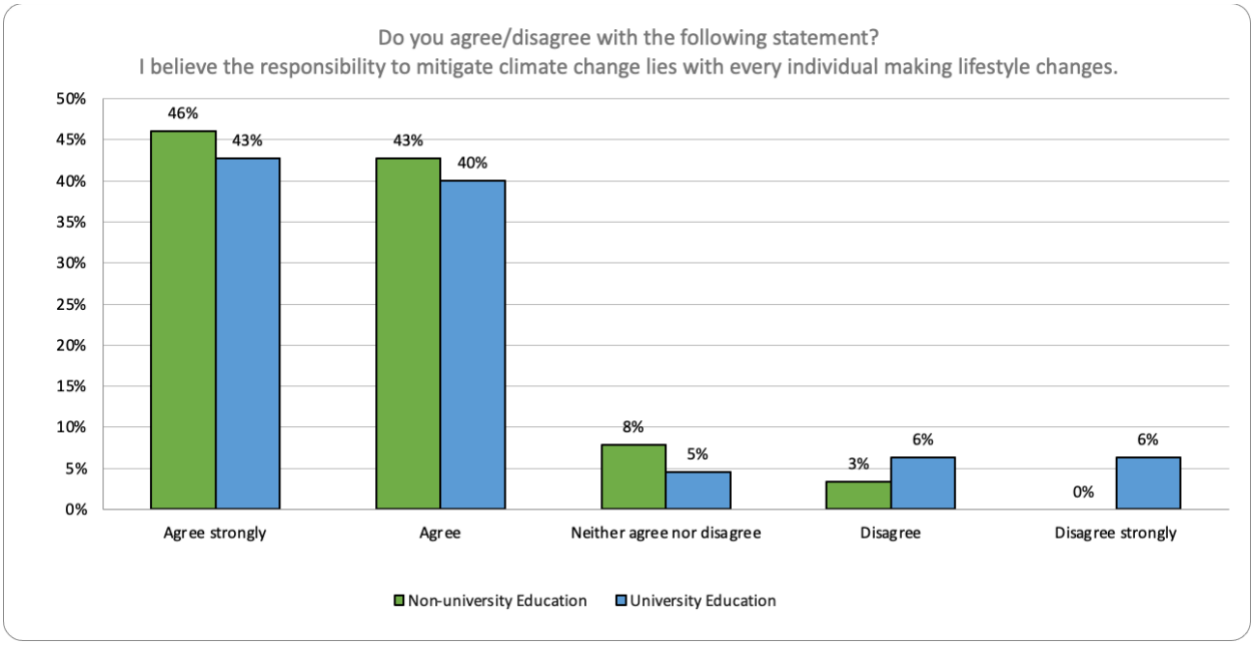

Figure 50 - Distribution of community opinion on individual responsibility to mitigate climate change

The community was asked about the top potential actions that individuals can take at home that would help reduce greenhouse gas emissions. While options such as “purchasing fewer products/services with a significant carbon footprint” and “reducing car use” were among the popular options, there were several significant differences in perspectives between people with different educational levels. For example, “purchasing high-efficiency home appliances” was 22% more favorable among the non-university education group compared to those with university education, whereas “reducing the consumption of animal protein” was 10% more popular among the university degree holders. However, this option was amongst the unpopular answers overall. Figure 51 outlines the answers in response to this question.

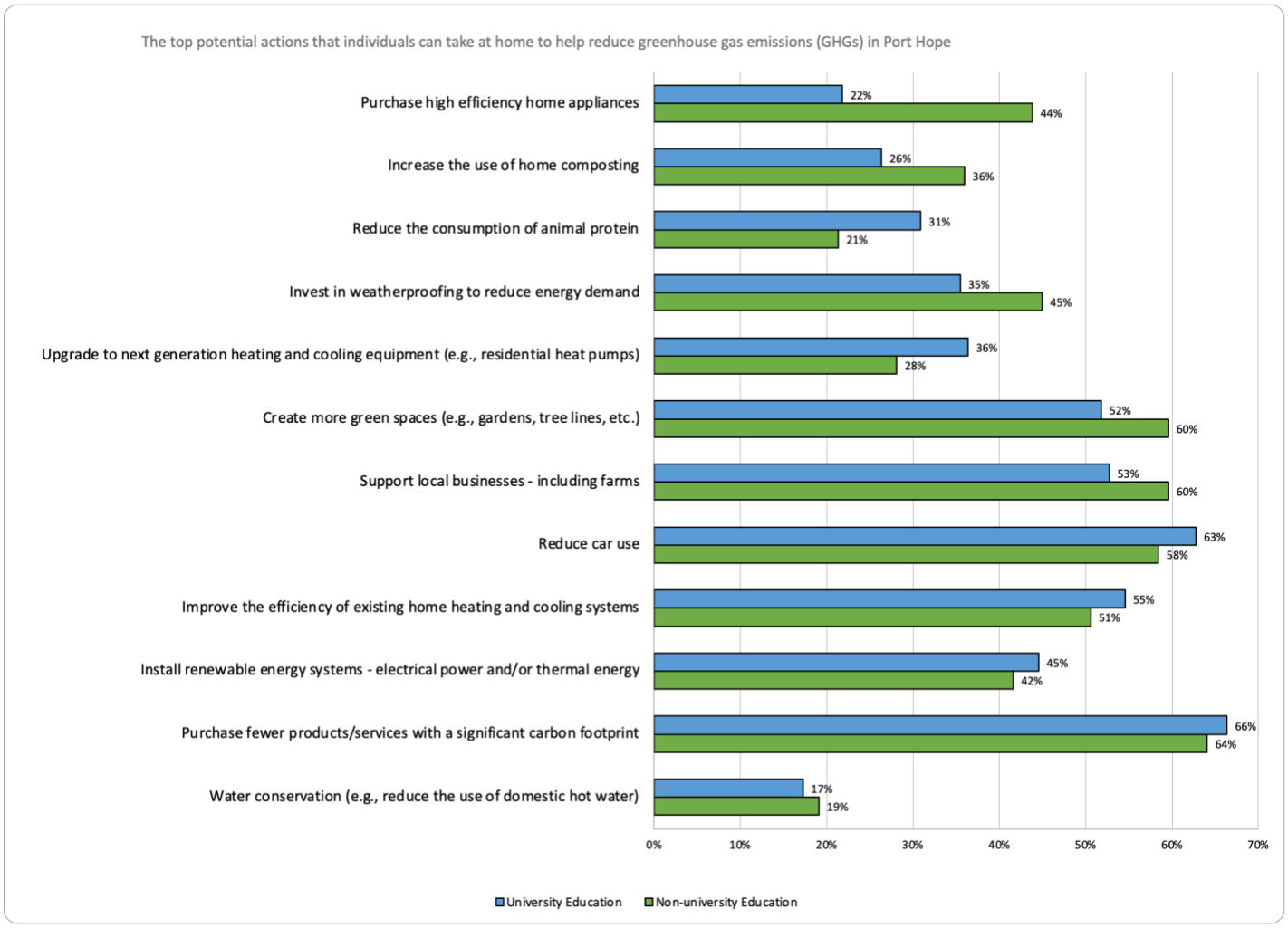

Figure 51 - Distribution of community opinion on top domestic actions to reduce GHG emissions (in descending discrepancy order)

Pure electric vehicles and hybrid vehicles were two types of cars that our respondents found attractive to own. The tendency to use pure electric vehicles was 8% higher among those with university education. On the contrary, hybrid cars were 9 % more popular among the participants with non-university education. 7% of the non-university group and 5% of the university group opt-in for the no vehicle at all option. This low percentage can be attributed to the geographical and city configuration of Port Hope. It would be interesting to investigate what percentage of those who opted in for purchasing a vehicle of any type would be interested in trying a more circular model (such as leasing or pay-per-use).

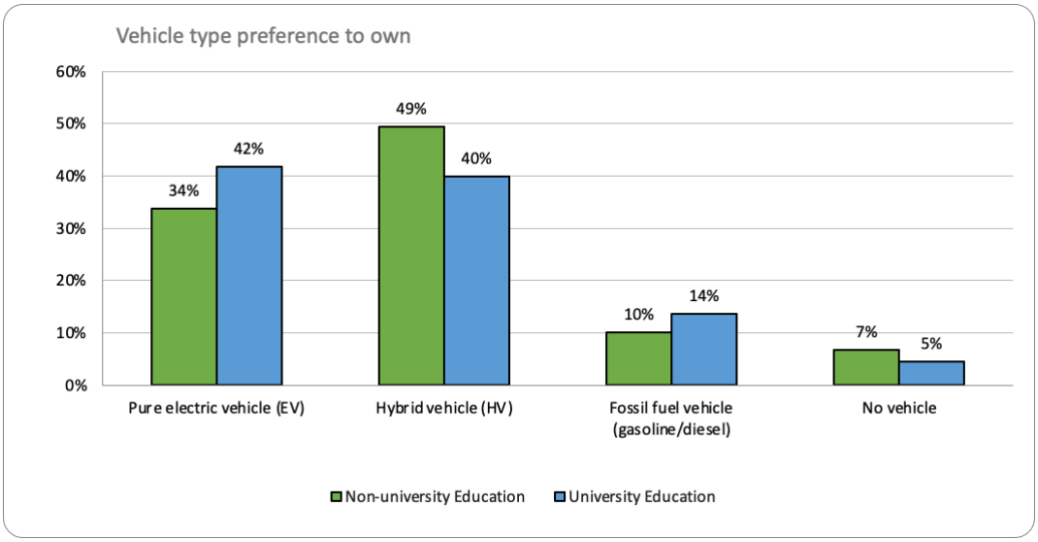

Figure 52 - Distribution of community preference of vehicle type to own

As only a marginal proportion of the respondents use public transport regularly, the majority decided not to rate the transportation system based on their lack of personal experience (Figure 53). The usage rates of two different educational cohorts were consistent. However, among respondents who evaluated their experience with the Port Hope public transportation system, the university degree holders tend to have a more negative judgment about it, with “very poor” being chosen by 16% of them, compared to 3% for their non-university counterparts (Figure 54).

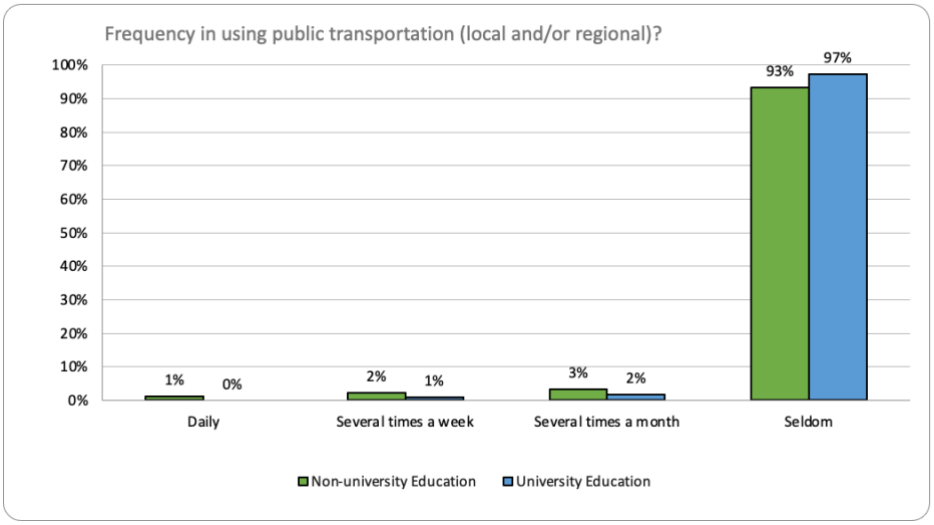

Figure 53 - Distribution of community usage frequency of public transportation

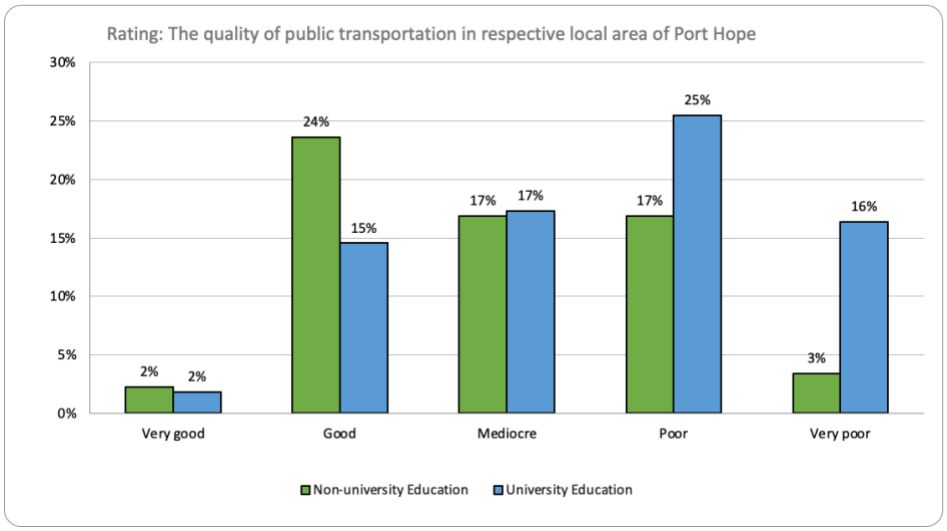

Figure 54 - Distribution of community opinion on the quality of local public transport

When asked about their suggestions for improving the public transportation system in Port Hope, "using on-demand minibus," "more routes," and "dedicated bike lanes" were the top priorities for the participants. There was a 15% difference between the popularity of the on-demand minibus option among the two educational groups, and it seems that high-educated respondents have more tendency to use this transportation option. In contrast, those with non-university education showed more interest in dedicated bike lanes by 9%.

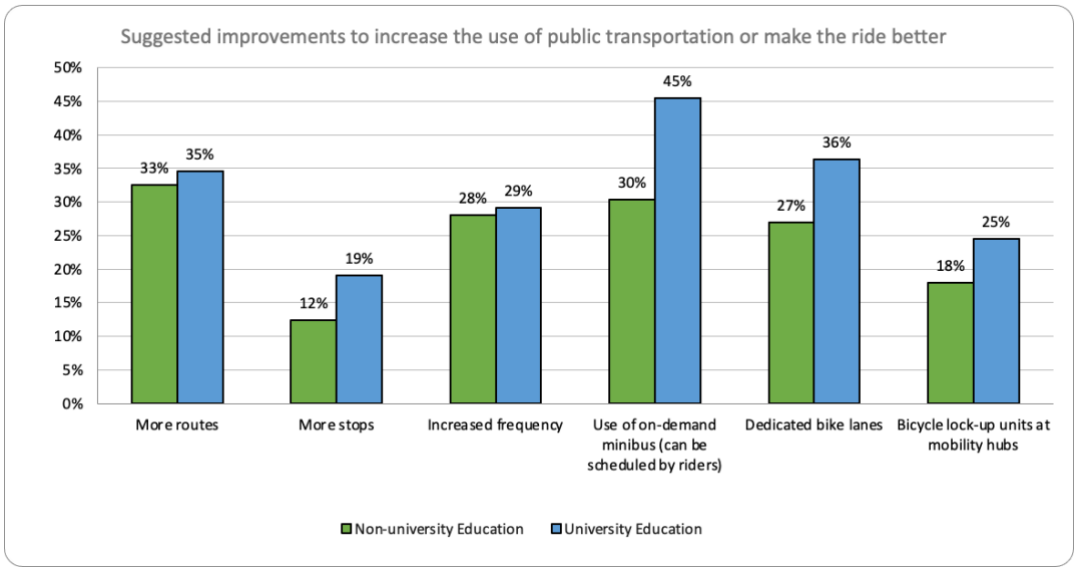

Figure 55 - Distribution of community opinion on improvements for public transportation systems

In the case of potential actions on the corporate level for reducing their GHG emissions, six out of seven options were chosen by more than 30% of the respondents. This fact, illustrated in Figure 56, indicates that from a community perspective, each of the options should be highly prioritized. Furthermore, a consensus could be observed among the two educational groups in most options. Nonetheless, "reducing

the consumption of fossil fuels in production processes - energy efficiency and energy conservation" was notably (15%) more popular among the university degree holders. In comparison, those with non-university education advocate for "promoting environmentally-friendly products and services" 18% higher than their counterparts.

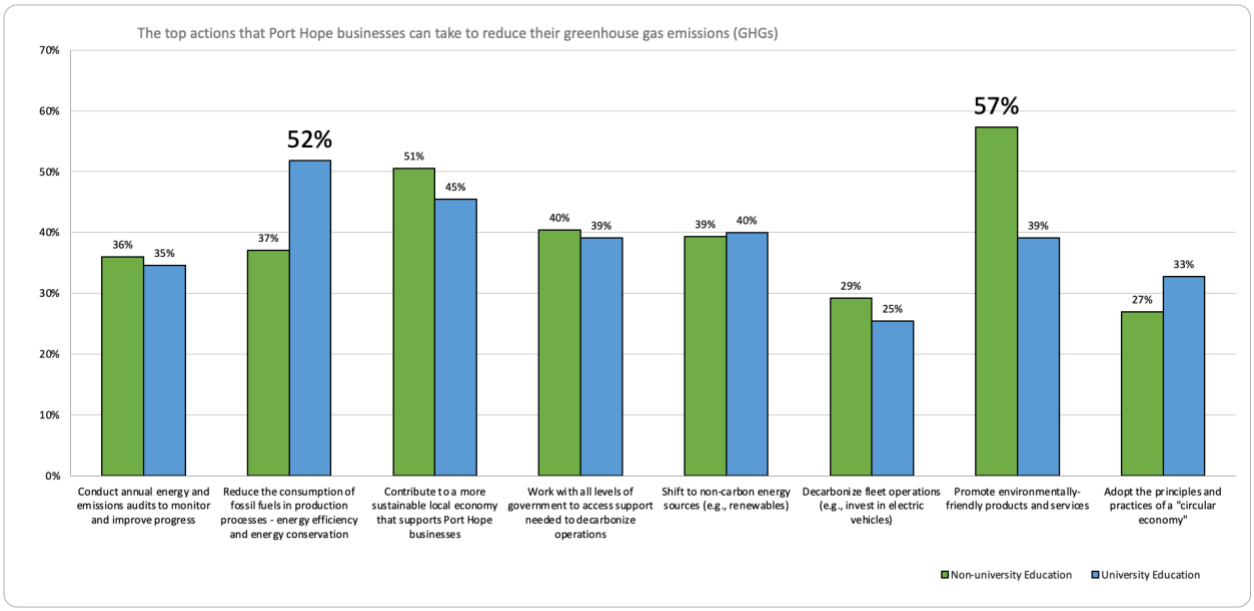

Figure 56 - Distribution of community opinion on top business actions to reduce GHG emissions

The cost of eco-friendly products was evaluated and believed by the majority to be expensive yet worth the price. 10% more of the individuals who hold a university degree expressed willingness to pay even more if necessary. There appears to be a business opportunity for those who believe "promoting environmentally-friendly products and services" should be paramount to corporate practices.

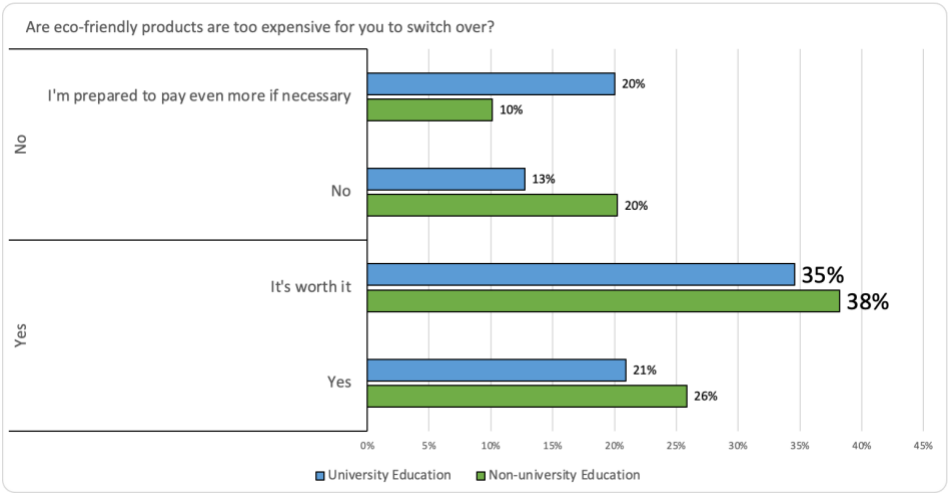

Figure 57 - Distribution of community opinion on the price of eco-friendly products

When asked their opinion on government incentivizing strategies for the private companies towards greenhouse gas emissions reduction, both educational cohorts vouched for the idea more so than opposing it. 82% of respondents with non-university education agreed, but 7% offered their opinion on what the caveat should be. To this group, financial restraints, local ownership, and proof of progress should be considered. 81% of the group with university education agreed and specified measures such as accountability and long-term plans, transparency in the use of funds, and use of measurable and science-based targets for better monitoring of the performance.

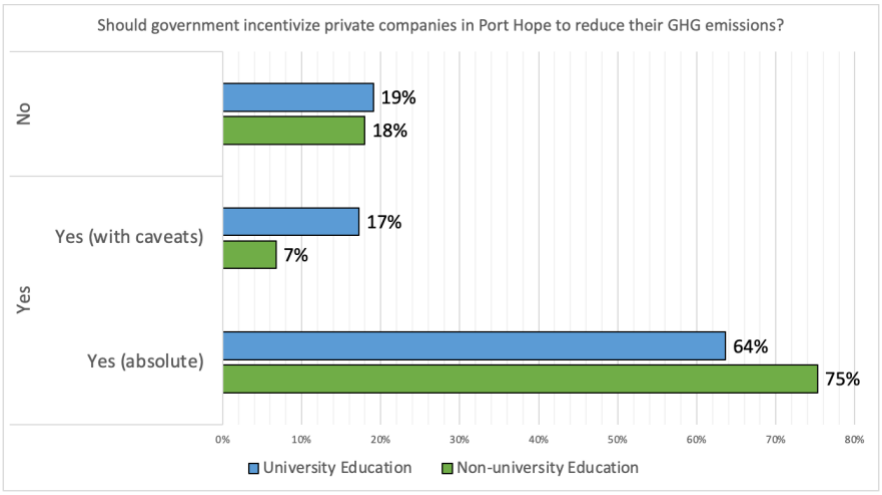

Figure 58 - Distribution of community opinion on government incentivizing emission reductions for private businesses

In 2011, a survey conducted by OECD suggested that companies are aware of gradual and extreme impacts of climate change on weather events but vary in level of awareness of the potential effects on the business itself. The survey also indicated that while there is an increasing trend in climate risk awareness within the private sector, not many had conducted risk assessments or evaluated adaptation options. However, the level of engagement of companies is dependent on the level of engagement from the public sector (Bonizella & Alan, 2013). A newer study published by Nature Climate Change in 2019 still identifies a significant gap in corporation's climate risk assessment and adaptation strategies for managing them (Goldstein et al.,2019).

As evident in Figure 59, both groups of respondents view and rate the private sector's performance "Not Good" in Port Hope for addressing climate change. Many others, however, indicated they do not have access to relative information to make a judgment. Note that 28% of respondents with non-university education (and 24% with) refrained from rating this performance due to lack of awareness about the topic.

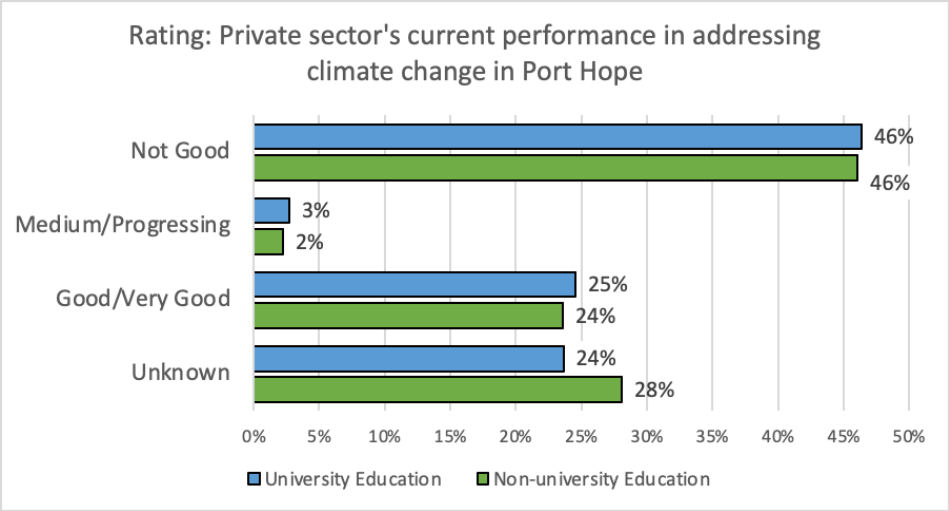

Figure 59 - Distribution of community opinion on private sector's current performance in addressing climate change

In comparison to the private sector, the public sector was rated with more confidence among both groups, illustrating a higher level of access to relative information within the community. However, the majority (53%) of the participants holding university degrees rated the performance "Not Good,"; similar to 45% of those with non-university education, which comprised the majority of the votes. It is unclear on what basis this rating was achieved, but it can be assumed a connection exists between what the residents view as priorities for the Municipality and their dismay in the current performance. Figure 60 illustrates the rating of the public sector's current performance. Section 3 provides an analysis of the participants' expectations at the local government level.

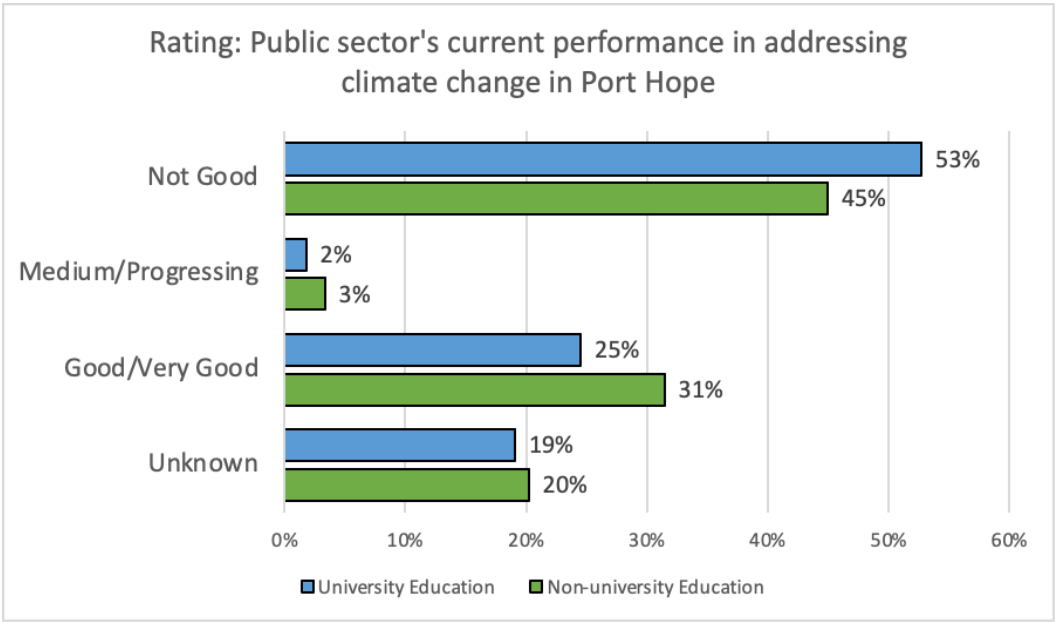

Figure 60 - Distribution of community opinion on public sector's current performance in addressing climate change

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Section 4: Local Actions for Addressing Climate Change

This section provides the overall view of the community on what is expected from the Municipality and council to achieve in Port Hope in response to climate change. From this survey, regardless of the education level of the respondents and in no particular order, the top three mitigation actions for the Municipality of Port Hope should be a) to protect and expand the local tree canopy b) to ensure that municipally owned and operated assets utilize best practices in decarbonization, and c) to work with all orders of government to access the funding needed to address climate change. Similarly, the community has also indicated the top three adaptation actions for the Municipality should be a) encouraging tree planting and protection, b) saving wetlands across the Ganaraska watershed, and c) amending bylaws to enable sustainable practices such as backyard agriculture and urban intensification. As such, it is recommended that the council's priority actions include supporting the local agricultural community, affordable housing, and activities directly related to climate change mitigation as well as adaptation. The community collectively identifies new housing to accommodate population growth and investments in public transport as the lowest on the priority list.

Local Climate Governance

Looking into literature examining the importance of local climate governance in North America, there is a tendency to move away from the conventional wisdom that climate change is a nonlocal problem. In North America, local governments are increasingly taking more leadership in developing policies and implementing GHG reduction strategies (Pulver et al., 2009). The reasons identified in a relevant publication by MIT press in 2009 are categorized as a) access and membership of local governments in national, regional, and international networks that promote and motivate climate change response (access to resources and information) b) having a more decisive influence on and expectation from citizens to develop progressive Climate Change Action Plan (ability to rally people and resources) c) attention and access to interrelationship among social, economic, and environmental issues in making decisions about the quality of life in local regions (i.e., know what is best for their village, town, or city and access information at the grassroots level).

The trend is consistent and similar between both groups in analysis throughout this report in identifying reasons for addressing climate change at the local level. Group 2, with university-level education, views the local knowledge and directly experiencing the impacts of climate change as the most important reasons, while group 1, with non-university-level education, identifies rallying necessary people and resources as the most important.

Some notable "open comment" ideas offered on this topic by the participants with non-university education were the teachability of local plans, demonstrating leadership on the local level, and promoting environmental consciousness among the local citizens. Similarly, participants with university education highlighted the importance of local actions to prevent a rise in property taxes, equally support the community, and leverage economic advantages. Evident in the responses illustrated in Figure 61, the Port Hope community is unified and consistent with one another and with the literature in identifying the reasons for addressing climate change at the local level.

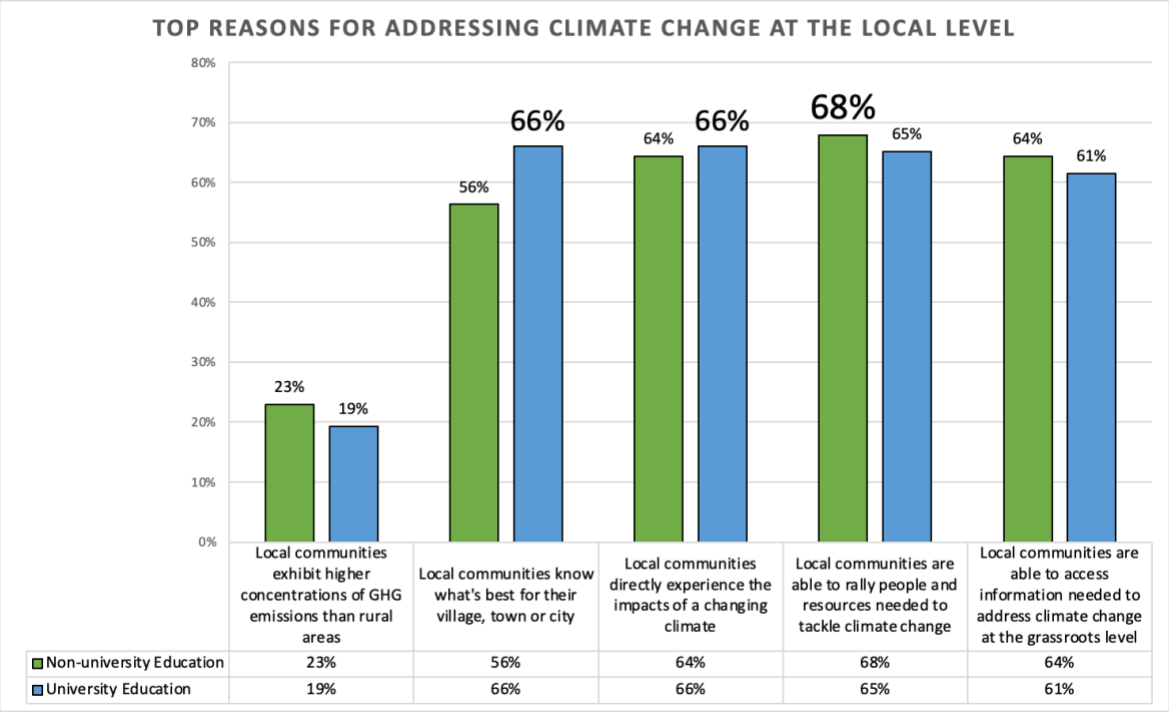


Figure 61 - Distribution of community opinion on reasons for addressing climate change at the local level

Mitigation and Adaptation Actions for Port Hope

To address climate change at a local level, the most crucial mitigation action the Municipality of Port Hope identified by 85% of the participants with university degrees is protecting **and expanding the tree canopy**. Meanwhile, 77% of the participants holding non-university degrees believe that it is more important to **ensure that municipality-owned and operated assets utilize best practices in decarbonization** (including the adoption of renewable sources). Regardless, these two actions hold the highest votes for both groups, as Figure 62 illustrates.

Similarly assessed, the most important adaptation action the Municipality of Port Hope identified by 84% of the participants with university degrees is **encouraging tree planting and protection,** which appears to be of second most importance to 90% of the participants holding non-university degrees who believe it is more important to **save wetlands across the Ganaraska watershed**. Again, despite minor discrepancies in the order of importance, both groups view these two actions as the most crucial adaptation strategies for the Municipality, as Figure 63 illustrates.

The least important adaptation action for Group 1 (non-university) is investing in early warning systems, while Group 2 (university) views increased access to cooling and heating centers of minor importance. Both groups, however, unanimously identified both aforementioned adaptation actions as of the least importance.

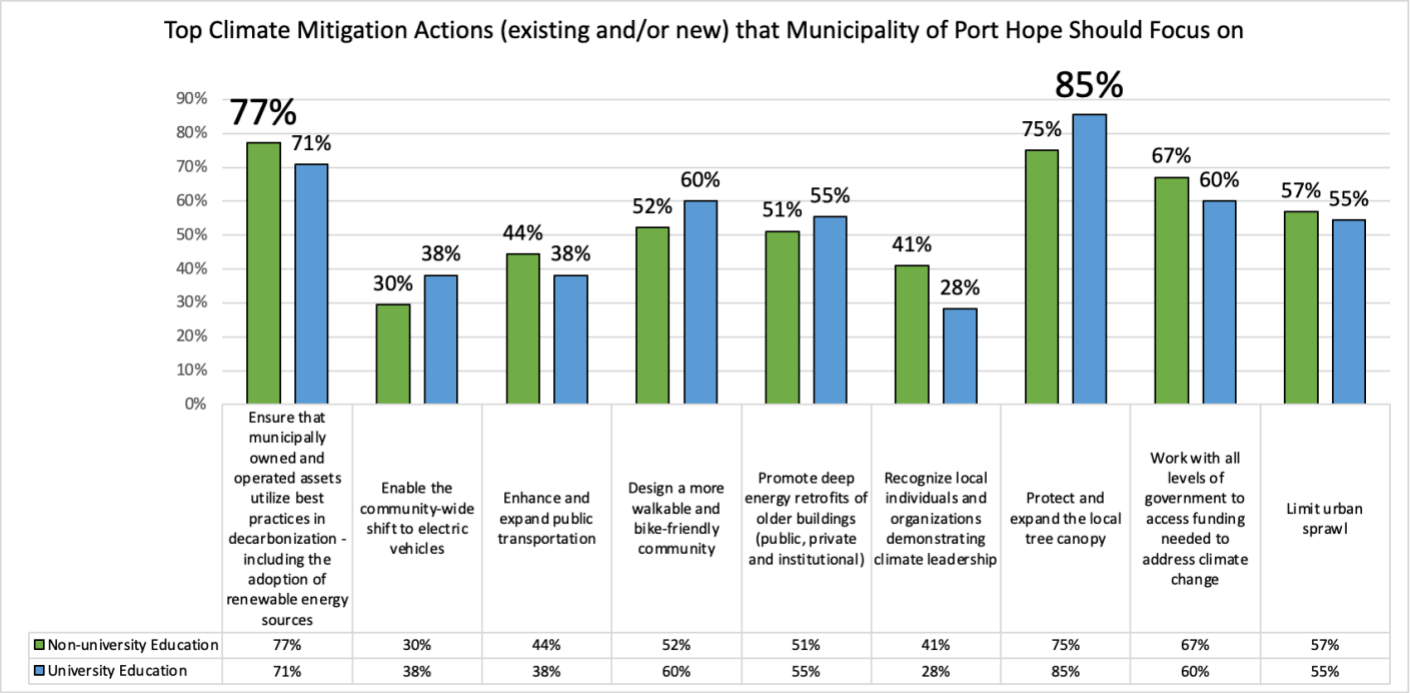


Figure 62 - Distribution of community opinion on top climate mitigation actions for Port Hope

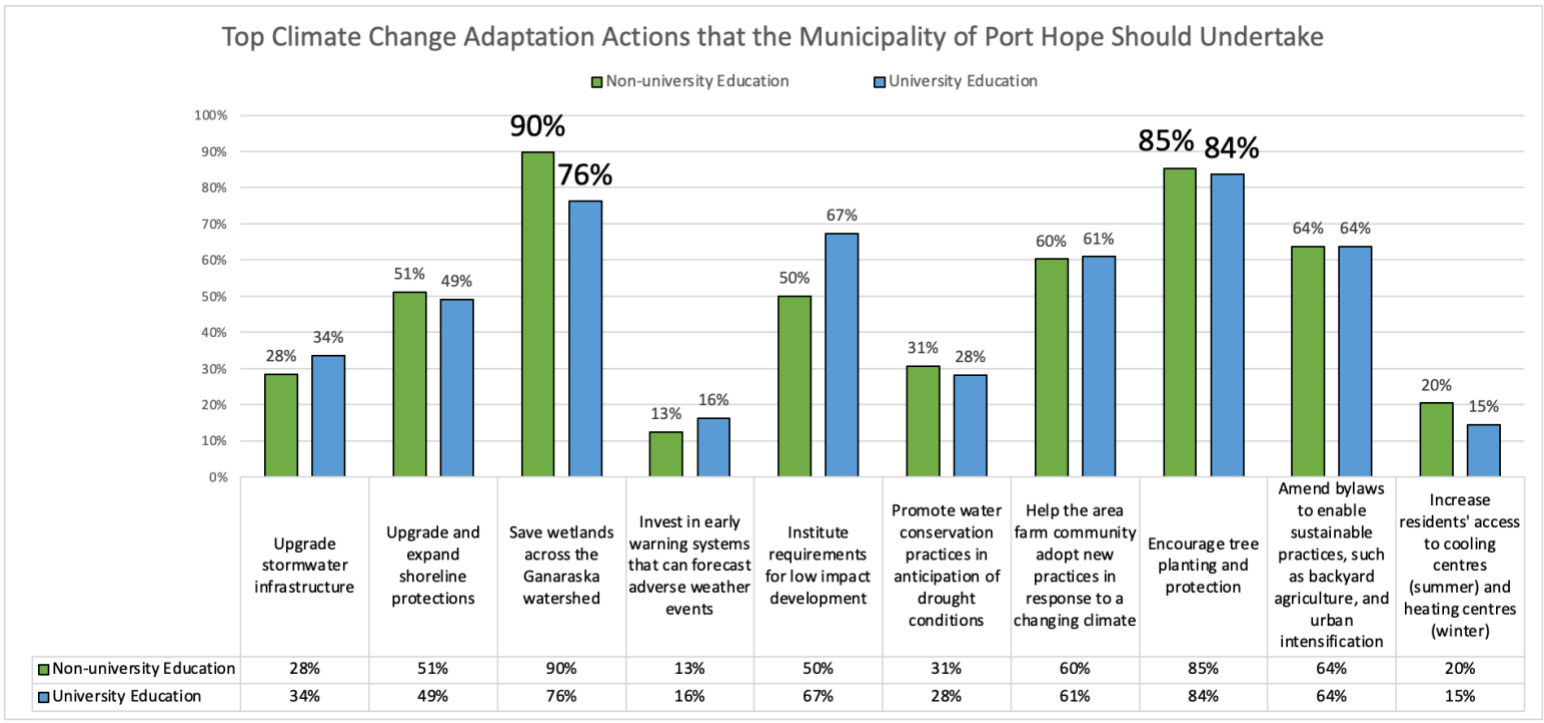


Figure 63 - Distribution of community opinion on top climate adaptation actions for Port Hope

The following are the top three mitigation and the top three adaptation actions for the Municipality as uniformly identified by both groups, regardless of the order of importance.

Mitigation Actions (Figure 62 illustrates the order of importance for each group)

- Ensure that municipally owned and operated assets utilize best practices in decarbonization - including the adoption of renewable energy sources
- Protect and expand the local tree canopy
- Work with all levels of government to access the funding needed to address climate change

Adaptation Actions (Figure 63 illustrates the order of importance for each group):

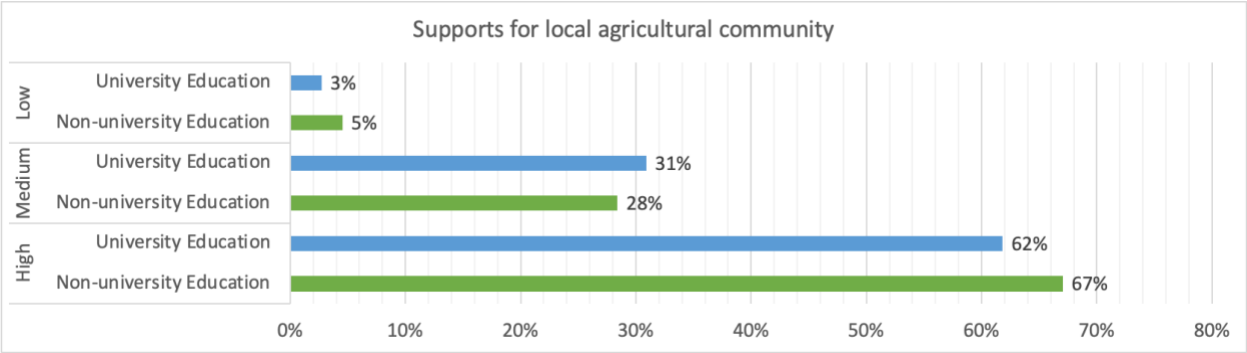
- Amend bylaws to enable sustainable practices, such as backyard agriculture, and urban intensification
- Encourage tree planting and protection
- Save wetlands across the Ganaraska watershed

Some notable suggestions offered by participants with university education for mitigation actions were to audit PHAI testing and remediation, promote regenerative agriculture, promote wildlife movement corridors in rural areas, protect Oak Ridges Moraine, and limit corporate mass development (such as Mason Homes). For adaptation actions, the cohort suggests collaborations with Grand River Conservation Authority (GRCA) to leverage skills and funding opportunities, preventing development on farmlands and promoting green infrastructure.

Council Priorities

As for identifying priorities for the Municipal Council, Figure 64 (a) to (i) illustrate the concurrence of the two groups in prioritizing the suggested areas of focus for the Municipal Council. Overall, participants recommended that the council prioritize actions to include supporting the local agricultural community and the vulnerable population, affordable housing, and improved quality of life through the lens of climate change adaptation as well as mitigation.

Figure 64 (a) to (i) - Distribution of community opinion on priorities for the Municipal Council



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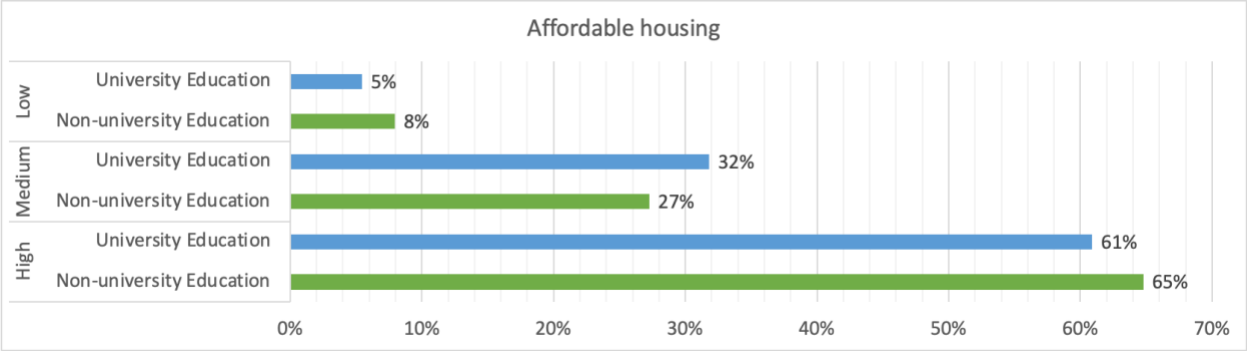

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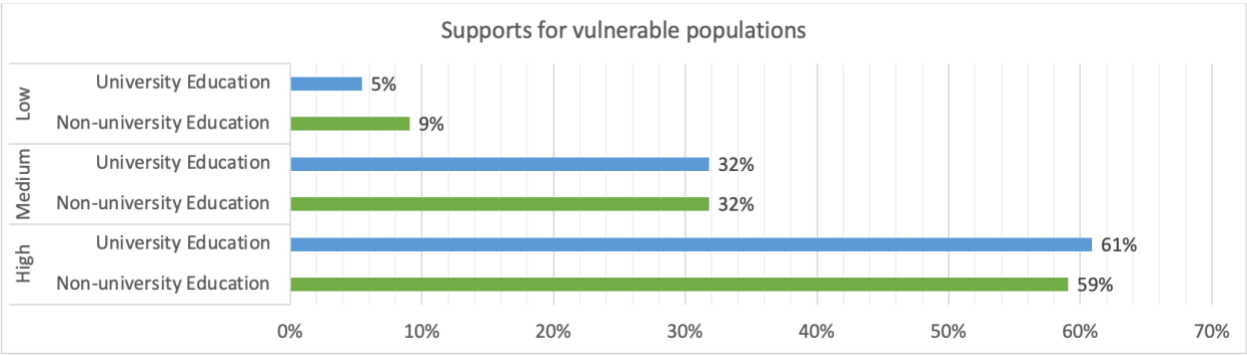

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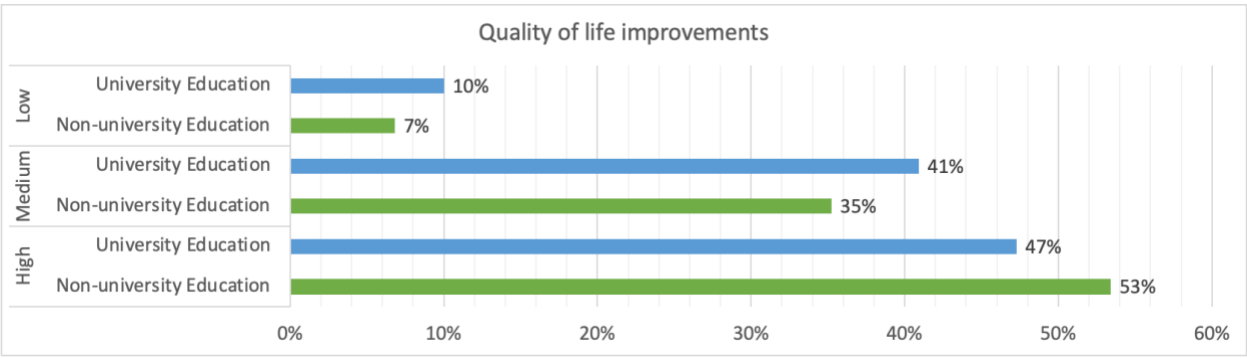

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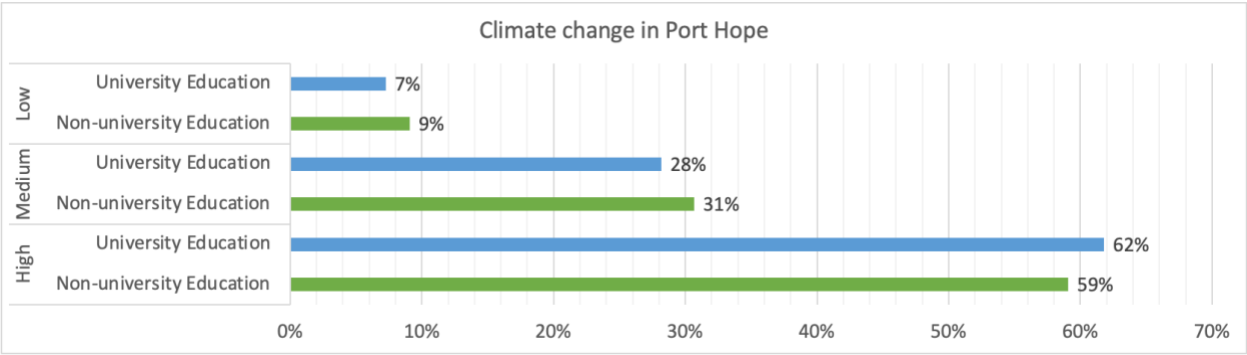
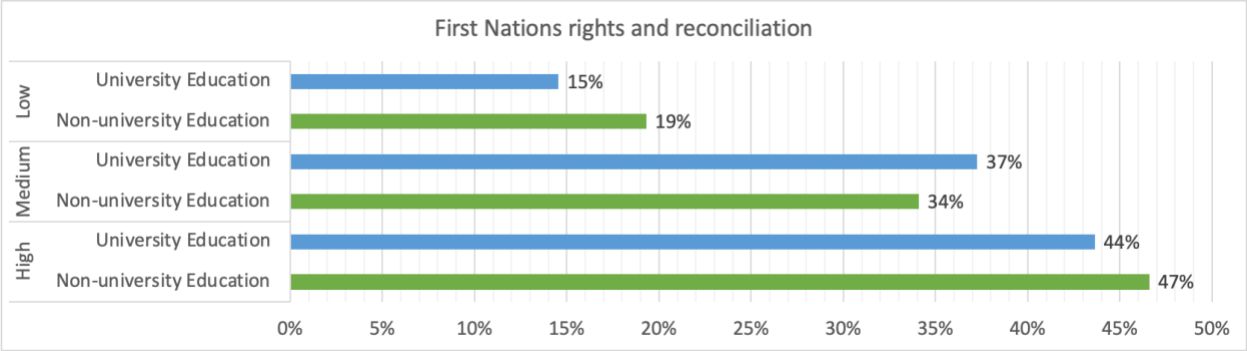


(e)

Lower on the list but still identified as a high priority by many of the respondents is First Nations rights and reconciliation.

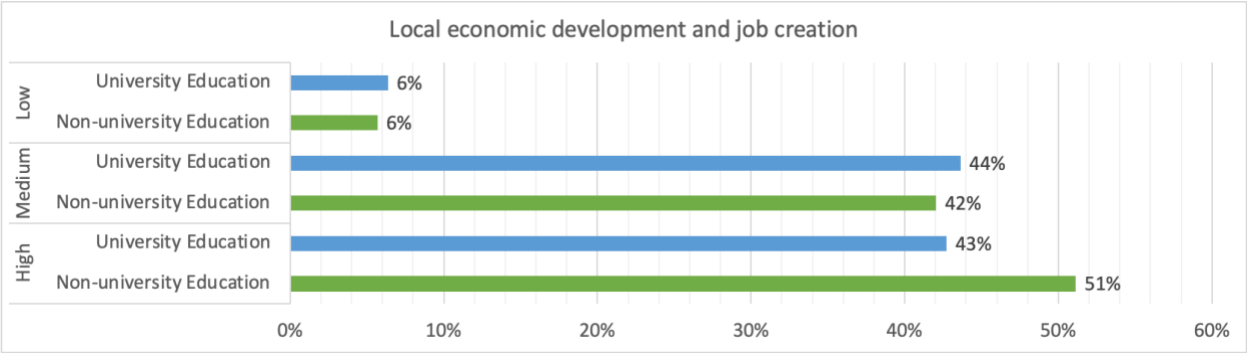


(f)

The overall trend is similar for both groups in all suggested areas of focus with the exception of the following two:

- Local economic development and job creation
- Limiting increases to taxes and other charges

The majority of participants with university-level education view these items as medium priority, while most of the ones with non-university education view them as high priorities. Consulting global trends on the first item's discrepancy, it is understood that the risk of losing jobs to automation is higher wherein the educational attainment is lower. Therefore, a higher priority is demanded for local economic development and job creation (OECD, 2018). As such, not having a university degree can impose pressure on this group of participants in terms of job security. As for the second discrepant item, given the financial status representation of the participants with non-university education (see Figure 38 for reference), it is expected for increased taxes and other additional charges to be less tolerable for this cohort compared to group 2 representation.



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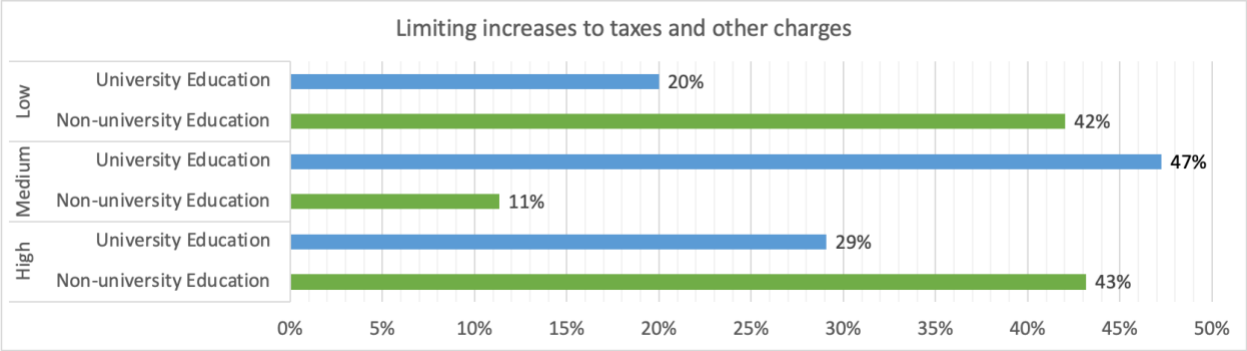

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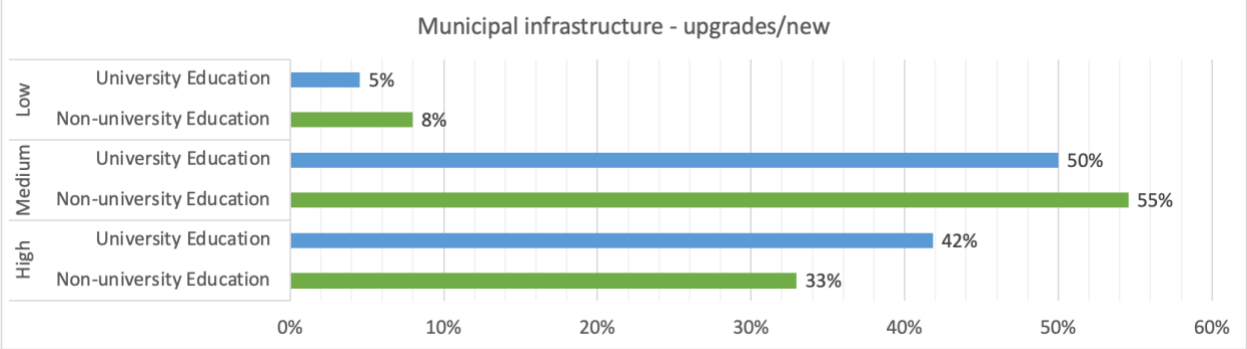
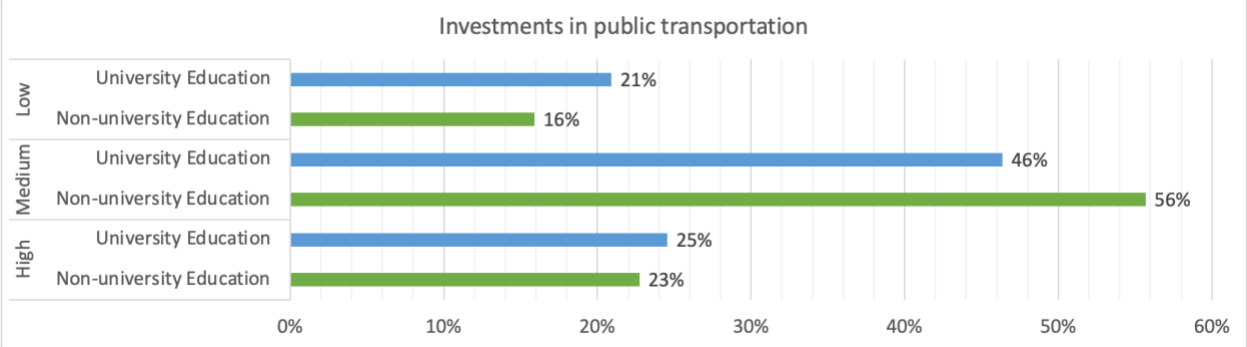


(i)

The community collectively identifies new housing to accommodate population growth and investments in public transport as the lowest on the priority list.



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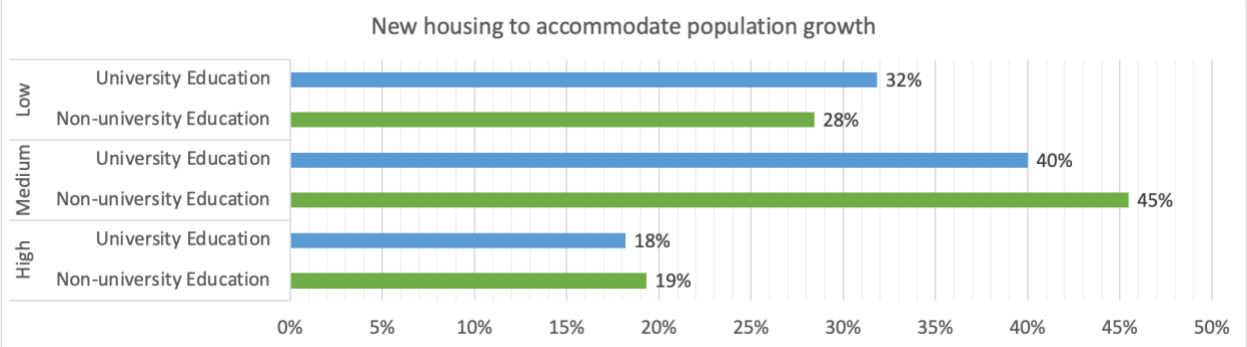

(k)

Overall, Group 1 respondents with non-university education are 16% more familiar with the recent actions taken by the Municipality of Port Hope to address climate change than Group 2. This could be attributed to their higher involvement with Port Hope's Facebook page compared to university degree holders. Figure 66 illustrates the differences in Port Hope-related social media platform usage. To further investigate the reach of actions, we segregated the responses of those who reside in Port Hope from those who either only work in the area or are connected through the community group. The trend remains the same. Figure 65 (a) and (b) illustrate the results for all respondents and only residents, respectively.

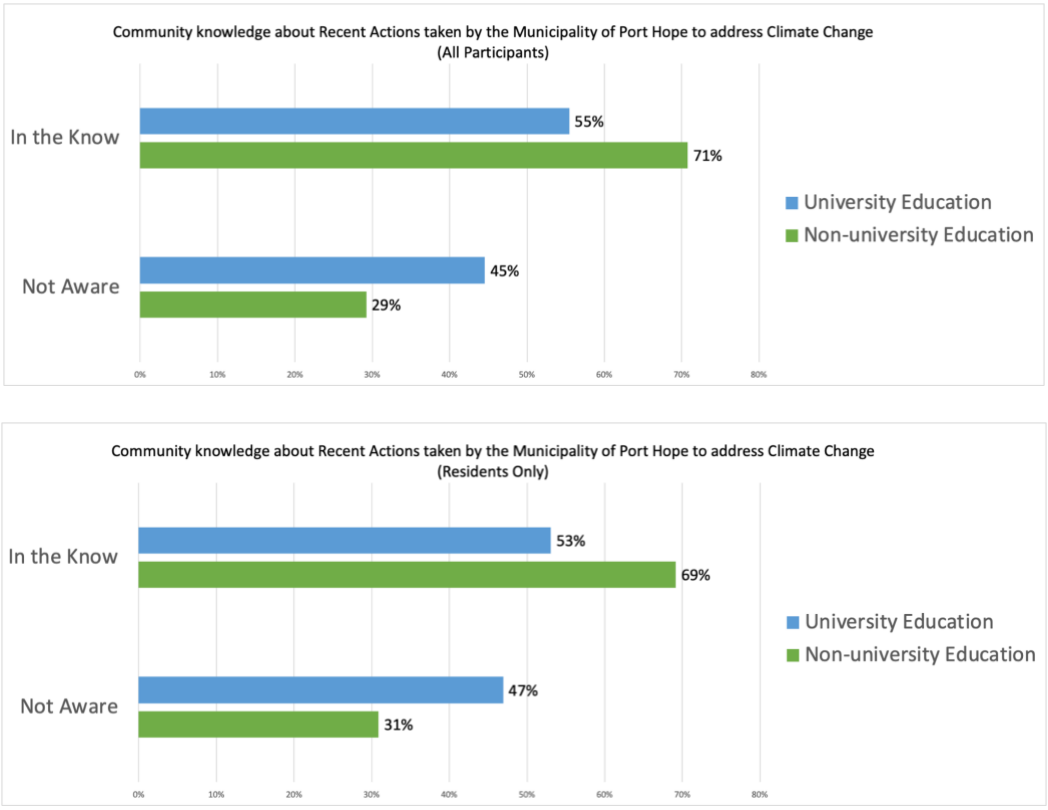

Figure 65 - Distribution of the reach of recent municipality actions to address climate change among (a) all respondents (b) residents only

Both groups follow Port Hope's Facebook page (@MunicipalityofPortHope). However, 14% more popularity is observed in group 1 with non-university education. Instagram, Twitter, and YouTube have more popularity amongst university degree holders than those with non-university education (Figure 66).

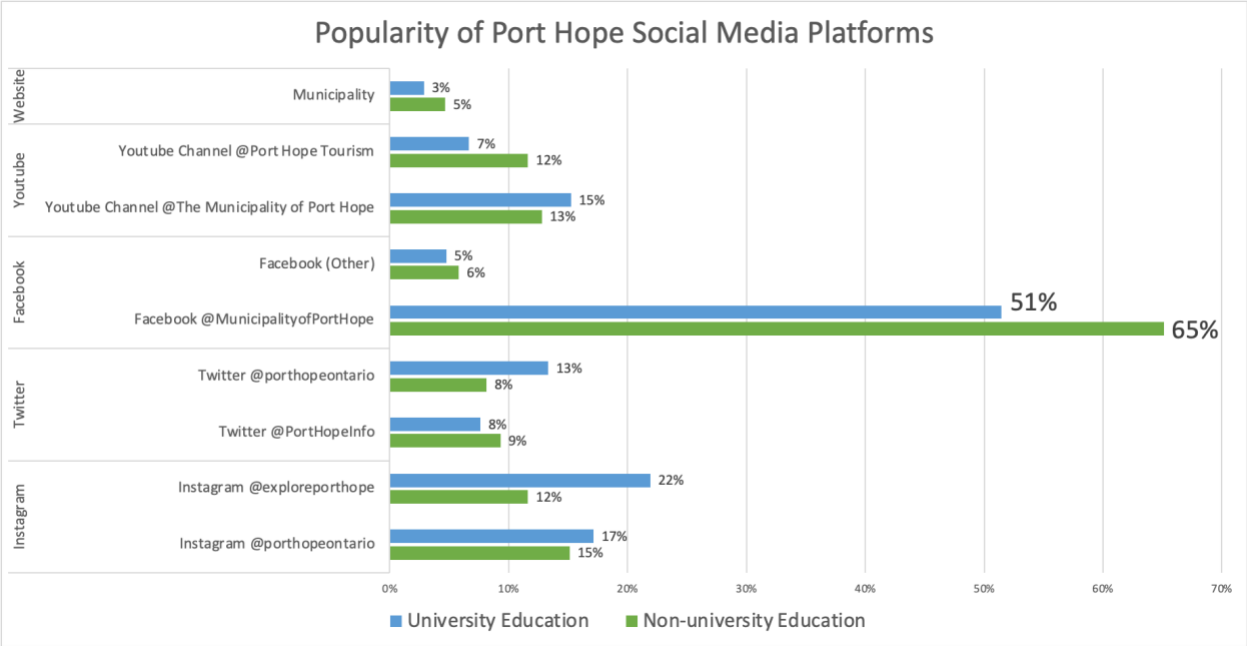

Figure 66 - Distribution of Port Hope social media popularity in the community

An interesting trend is observed for the platforms with more than one Port Hope account (i.e., Instagram, Twitter, and YouTube). With a relatively similar trend between the two cohorts, only 20% of respondents follow both accounts on Instagram (@porthopeontario and @exploreporthope), while only 6% (on average) follow both accounts on Twitter (@porthopeinfo and @porthopeontario), and similarly on YouTube (@MunicipalityofPortHope and @PortHopeTpurism). Therefore, it may be worth merging the redundant accounts to reduce the scattered follower base and improve the content. Alternatively, the purpose for each channel can be explicitly identified so that followers interested in climate or environmental information can choose the most applicable one.

Amongst those in the know, "engaging local citizens and organizations around the issue of climate change" has the highest vote in both groups. 24% of respondents with non-university education are aware of "reporting on Port Hope's progress to address climate change," while only 7% of university degree holders are aware of this action. Both groups have been least aware of "modeling climate leadership in the design, delivery, and monitoring of local municipal services, with 8% of Group 1 and 3% of Group 2 having been aware of the action. Figure 67 outlines the two groups' awareness about different actions.

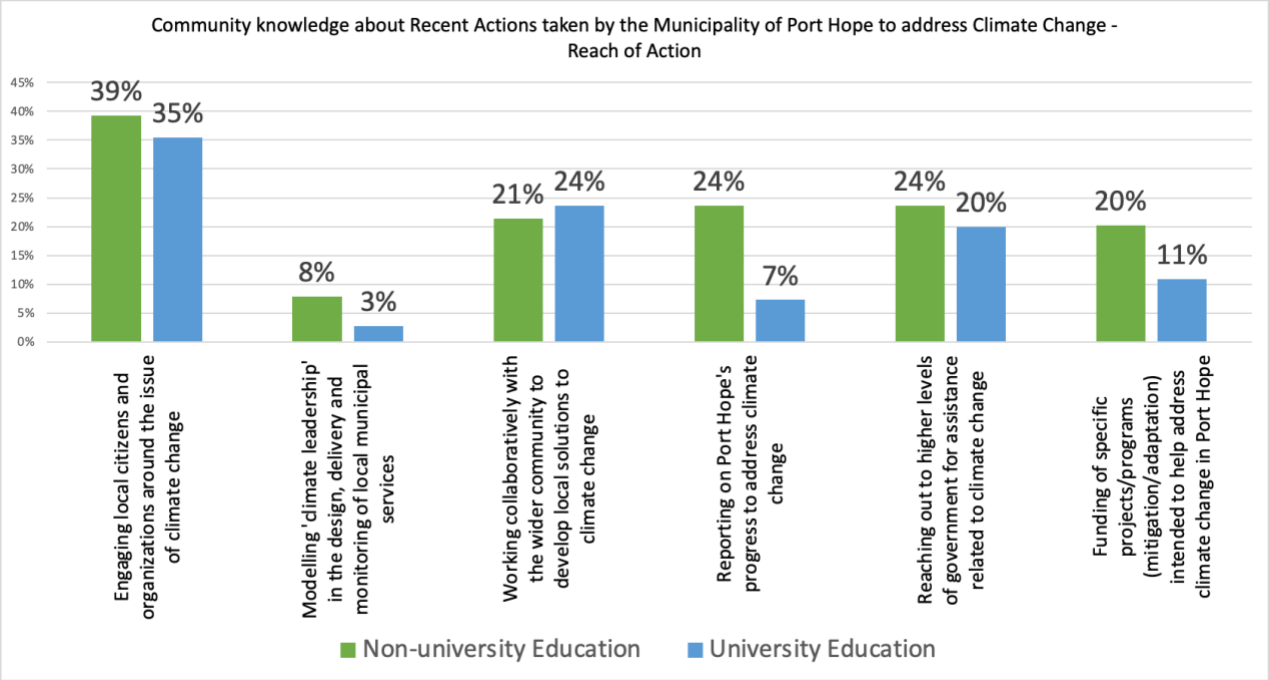

Figure 67 - Distribution of community knowledge about recent municipality actions to address climate change

62% of the respondents with non-university education that may have been unfamiliar with Port Hope social media accounts prior to the survey are likely or very likely to follow them moving forward. Only 46% of respondents with university education agree with this decision.

However, 35% of university degree holders and 30% of those with non-university education are still neutral about following Port Hope's social media accounts. Overall, 19% of respondents with university education and 9% of those with non-university education are unwilling to follow the social media trend and prefer to continue using their current methods for information delivery.

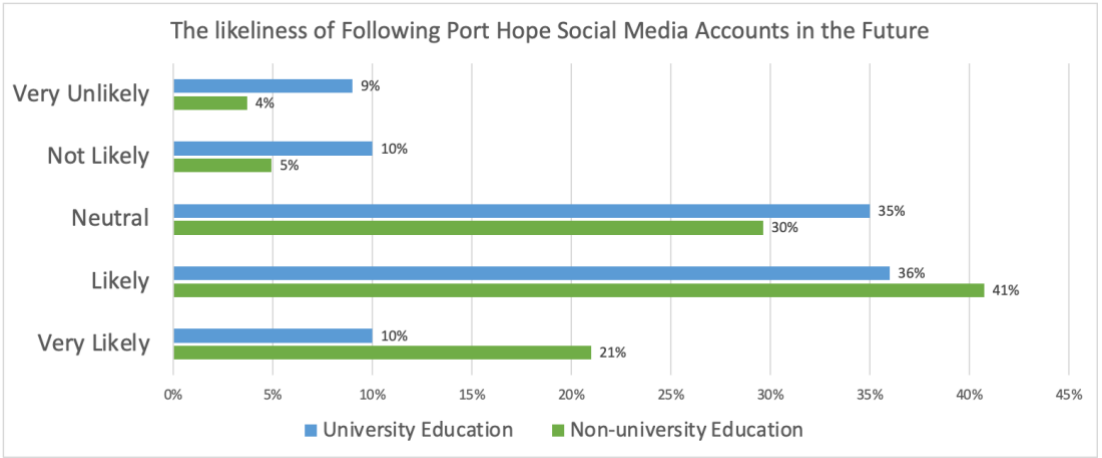

Figure 68 – Distribution of community likeliness to follow Port Hope social media accounts in future

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Concluding Remarks

The findings in this report help understand the dominant and divergent perspectives of Port Hope's citizens on the climate crisis, based on their level of education. According to the Intergovernmental Panel on Climate Change, there is a consensus among the scientific community on anthropogenic climate change (IPCC, 2014). In other words, scientific evidence suggests a 95% confidence that changes in extreme weather conditions and climate events have been caused by human's influence on the level of greenhouse gas emissions. In this regard, by assuming anthropogenic climate change as a scientifically proven fact, we can intuitively expect that as the level of education rises, greater confidence in climate change to be human-caused is observed. This intuition also has been confirmed by several empirical surveys (see Arbuthnot, 1977; Buttel & Johnson, 1977; Maloney & Ward, n.d.; Poortinga et al., 2019; Sun & Han, 2018). The mentioned trend, however, is not what the Port Hope survey result suggests.

A vast majority of our respondents, regardless of their highest level of education, acknowledged anthropogenic climate change and counted deforestation and humanity's use of fossil fuels as the top causes of climate change. University-level education does not seem to play a determinant role in the confirmation or rejection of human-caused climate change. Regarding the perception of our respondents about their individual responsibility in the context of climate change, the university degree holders, to a lesser extent, agree to revise their lifestyle in combating climate change. Moreover, in terms of their environmental attitude, university degree holders generally seem to be less optimistic about actions to mitigate climate change and showed more tendency towards owning fossil fuel vehicles as an indicator for this belief. They seem to be more closed off to more modern means of information sharing such as social media platforms and tend to value traditional methods more. The group with university-level education is also less aware of the recent actions taken by the Municipality to address climate change. With the majority of the votes, this group rated the climate-related performance of the public sector poor, more so than the private sector.

In conclusion, it could be anticipated that municipal authorities could face intense challenges if they particularly count on highly-educated citizens' more constructive environmental behavior.

Limitations of the Survey and this Report

This report is a comparative analysis of community survey findings as of May 2021. It would not reflect any changes to community activity, educational programs, policy, or perceptions after this date.

Furthermore, while effort was made to include multiple representations, some specific views may have been missed. In particular, the age demographic may not be representative of the community as the survey results did not include a comparable population of youth in Port Hope who may be undergoing an updated environmental and climate-related education curriculum. The discrepancy in the financial status representation from the two identified educational cohorts could also impact identifying priorities for the local community.

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Income-based comparative report

By Umais Abdull Baqi and Yagiz Ercin, June 2021

Introduction

In literature, there is a general understanding about the relationship between climate change and income levels that higher income generally results in a higher environmental conscience, and higher environmental conscience leads to reducing the risk perception (Choon et al., 2019). As a result, it may potentially lead to maladaptation to climate change among wealthier societies (Lo & Chow, 2015). Therefore, the report aims to reveal public perceptions and environmental literacy in Port Hope by considering climate change risks, society's view and their income levels. By comparing similarities and differences with the literature, this report may help the Municipality of Port Hope to implement successful, sustainable and efficient policies to address climate change and its consequences.

Methodology

The survey respondents were asked to identify the household income brackets they belonged to. The options provided in the survey were under $20k, $20k-$40k, $40k-$60k, $60k-$80k, $80k-$100k and $100k-over. The option of “prefer not to say'' was also provided to facilitate respondents who wish not to disclose this information. Figure 1 shows the income distribution results from the survey.

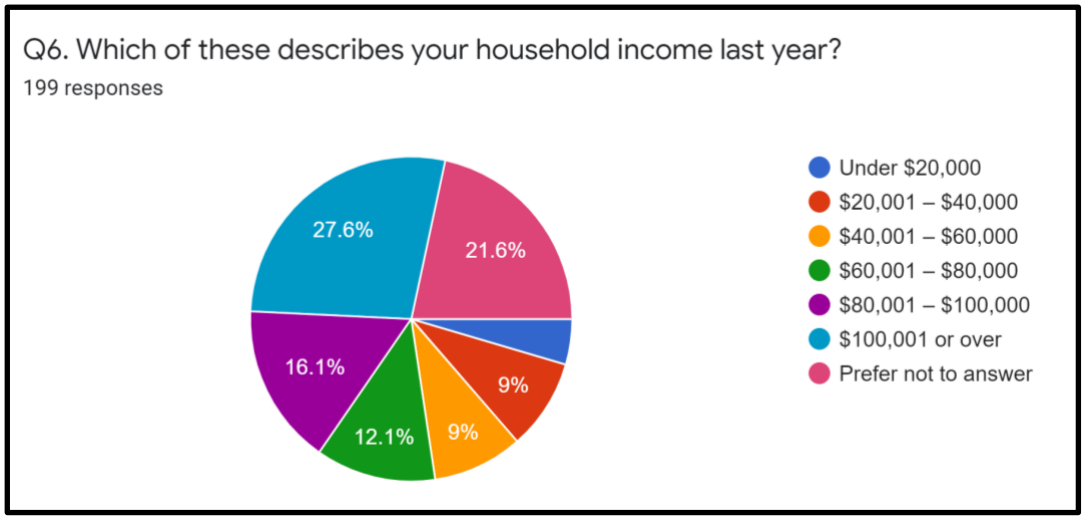

Fig 1. Household Income Distribution on Survey

For the purpose of the study 21.6% of the respondents who prefer not to disclose their income were excluded in further analysis. The remaining respondents were categorized into three brackets; low income, middle income and high income households. The income brackets were set using the low-income cut-off (LICO) values provided by Statistics Canada (Statistics Canada, 2021). The average family size was

adopted as 3, which is representative of the Canadian national and provincial average of 2.9 for Ontario (Statistics Canada, 2021). The LICO for 2019 suggested the low-income threshold for a family of 3, living in a community of under 30,000 is set as $31,673 (Statistics Canada, 2021). Considering the population of Port Hope is around 17,000 (Statistics Canada, 2017), these thresholds can be adopted to define brackets for low-income households. Based upon the information provided by the above mentioned sources the respondents were categorized into the following three categories:

- Under $40,000, 17.3% (Low-income households)
- $40,000-$100,000 47.4% (Middle income households)
- $100,000-over 35.3% (High income households)

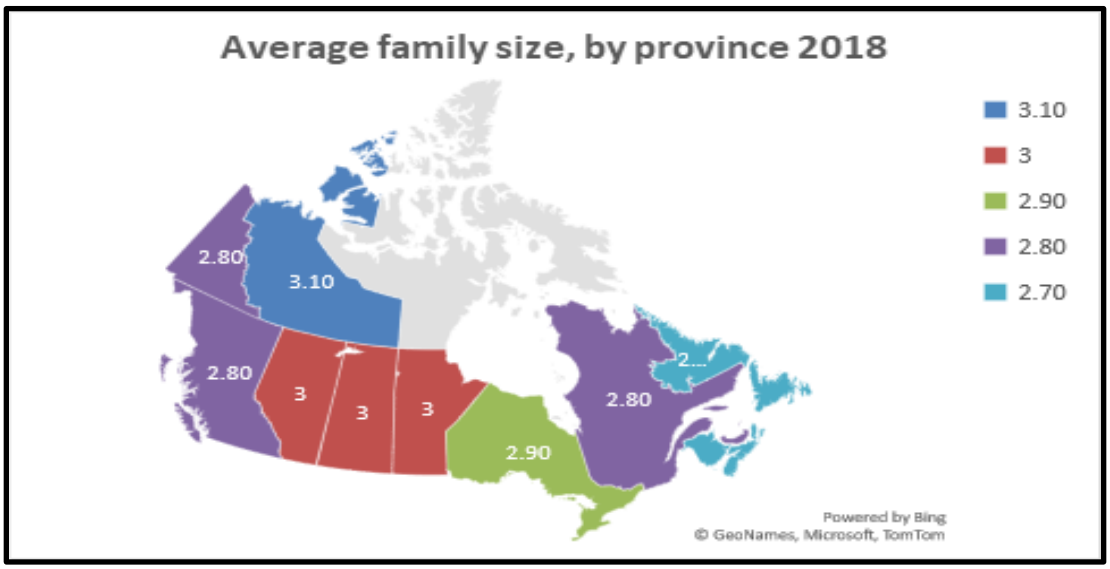

Fig 2 . Average Family Size in Canada (Statistics Canada, 2021)

Key Findings

- As the respondents' age increases, there is a decreasing trend observed on their level of income. Similarly, the percentage of middle-income respondents increases as the population gets older.
- Low level income respondents have more tendency to actively seek out climate change news compared to other groups and did not particularly use the official Port Hope social media accounts.
- From a climate change awareness standpoint, we observed no meaningful relationship between awareness and income levels.
- Hybrid and electric vehicles are equally popular among all income groups. But fossil fuel vehicles are still a choice among middle- and high-income groups.
- All income groups believed in individual responsibility towards climate change. However, low-income households were more prominent in their agreement towards individual responsibility.
- Respondents from lower- and middle-income households are more in favour of spending on eco-friendly products. However, there is a clear split in the higher income class. 48% of respondents from high income households do not prefer to spend on eco-friendly products.
- Respondents from lower income households are more likely to poorly rate the performance of the public sector. However, satisfaction improves with an increase in household income.
- Respondents from higher income households are comparatively less aware of the actions taken by the Municipality of Port Hope.
- Low-income households are more concerned with limiting increases in taxes.
- Affordable housing is a shared concern among all income groups.
- Respondents from high income households are less likely to consider investment in public transportation as a priority.
- Concerns about support for vulnerable populations increases with the decrease of income and decreases with the increase in income.
- Climate change is a higher priority for low-income households and a lower priority for high income households.
- Considering the lack of participation from low income and youth respondents in the survey, their social media preferences should be further investigated.

Demographics Analysis

The vast majority of survey respondents of low-, middle- and high-income households live in Port Hope, work in Port Hope or both work and live in Port Hope. It consists of almost 90% of the respondents from each level of income. As given in figure 3, there is a uniform distribution among the respondents with different levels of income in terms of their connection to the Municipality of Port Hope.

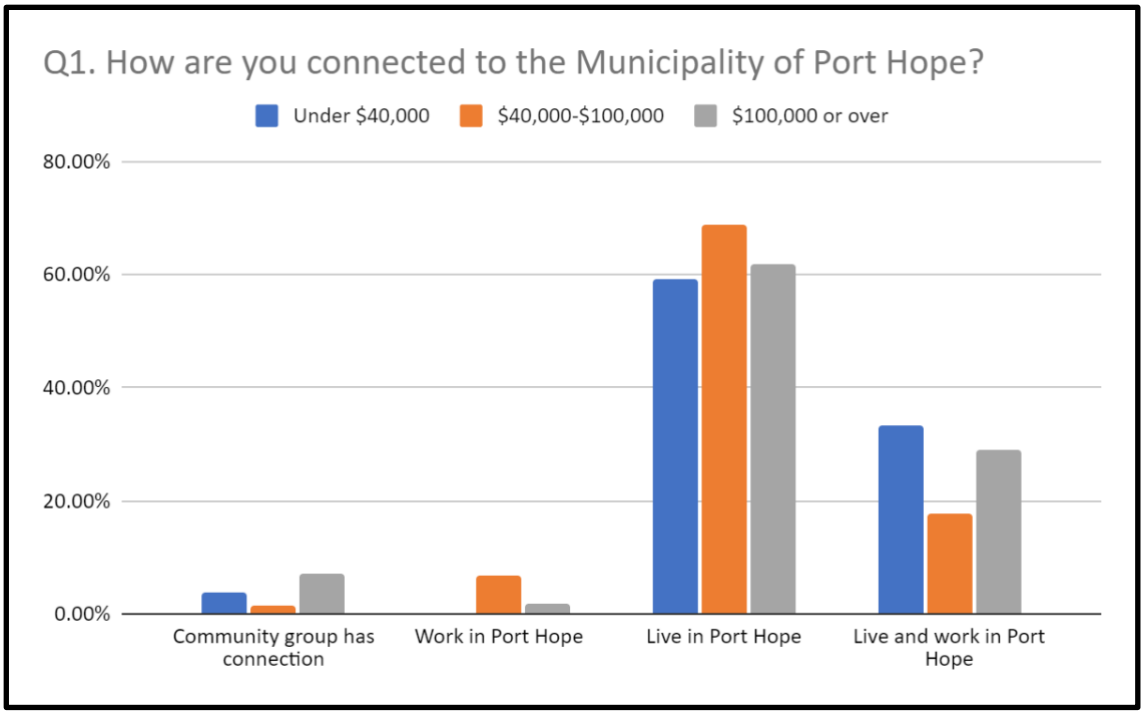

Fig 3. Survey Respondent Connection to Port Hope

As shown in figure 4, overall, the majority of respondents are retired, especially middle-income respondents, as respondents falling into these categories made up 53% of middle-income respondents. Similarly, the majority of low-income respondents are also retired (37%). For high income respondents, the employment sector distribution is slightly more varying as only 16% of them are currently retired, and 18% are working in small businesses, and 11% are currently involved in the large business sector. Moreover, since the majority of retiree respondents fall into low income or middle-income households, they are more likely to experience adverse health effects compared to high income respondents (Levy & Jonathan, 2015). Furthermore, according to a study conducted in the coastal part of the UK, senior and retired people are at more risk from the impacts of climate change (Zsamboky et al.,2011). Considering the survey respondents were generally older, with 69% of all respondents being above 50 years of age, the Port Hope population can be considered vulnerable to climate change impacts.

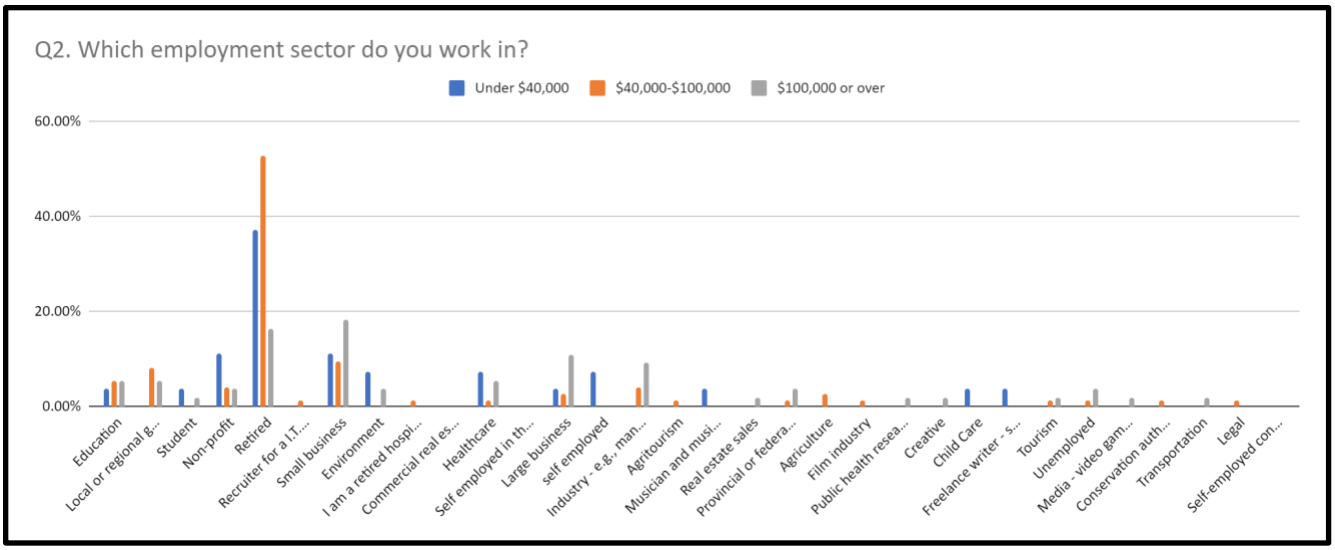

Fig 4. Survey Employment Sector and Levels of Income

The age distribution of survey respondents is given in figure 5. As it was mentioned before, youth participation was extremely limited in this survey. This pattern has appeared once again in income analysis and the data obtained from 16-25 years old respondents do not provide sufficient information. Nevertheless, it is still not very surprising because the largest population of Port Hope is in the age group of between 65 and 69 years old (Statistics Canada, 2016). According to the next age group analysis, which is respondents between 26-49 years old, we have seen the majority of them are high income respondents (47%). Only 15% of this age group are low-income respondents and this difference has been one of the significant findings of income level analysis.

A completely opposite distribution pattern has been observed for high income and middle-income respondents with respect to their age distribution. For example, 26-49 years of age bracket consist of the majority (47%) of high-income respondents. Oppositely, the majority of respondents who are 66 years old or older belong to middle income households (46%). The percentages of high-income respondents gradually decrease for higher age groups and similarly, percentages of middle-income respondents increase in the following age groups as shown in figure 5.

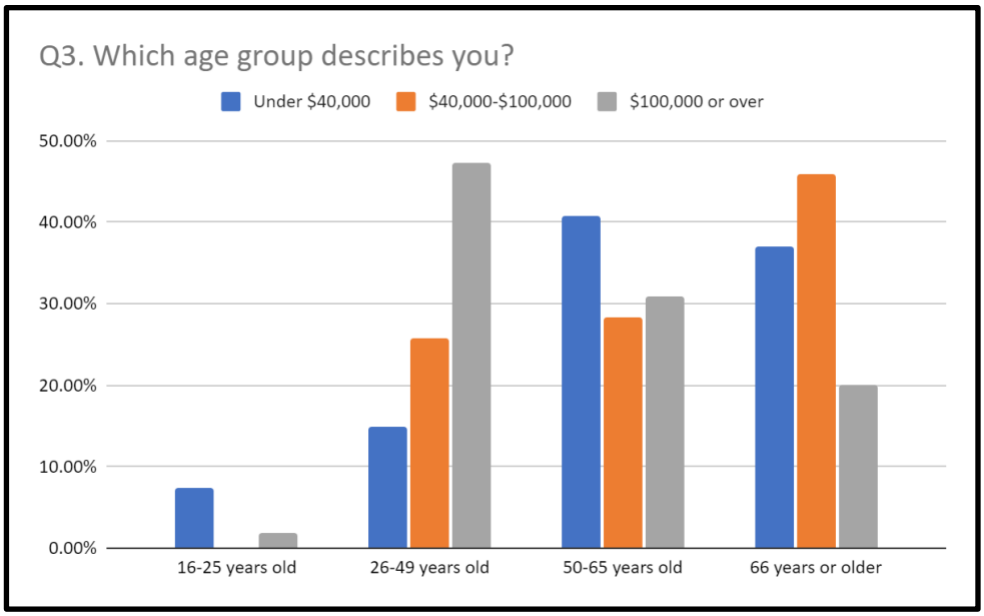

Fig 5. Respondents Age Distribution and Levels of Income

In figure 6, The majority of low-income respondents hold a college certificate, diploma or degree (48%). Differently, the majority of middle-income respondents have a bachelor's degree or higher. There is a relatively uniform distribution for high income respondents in terms of their level of education.

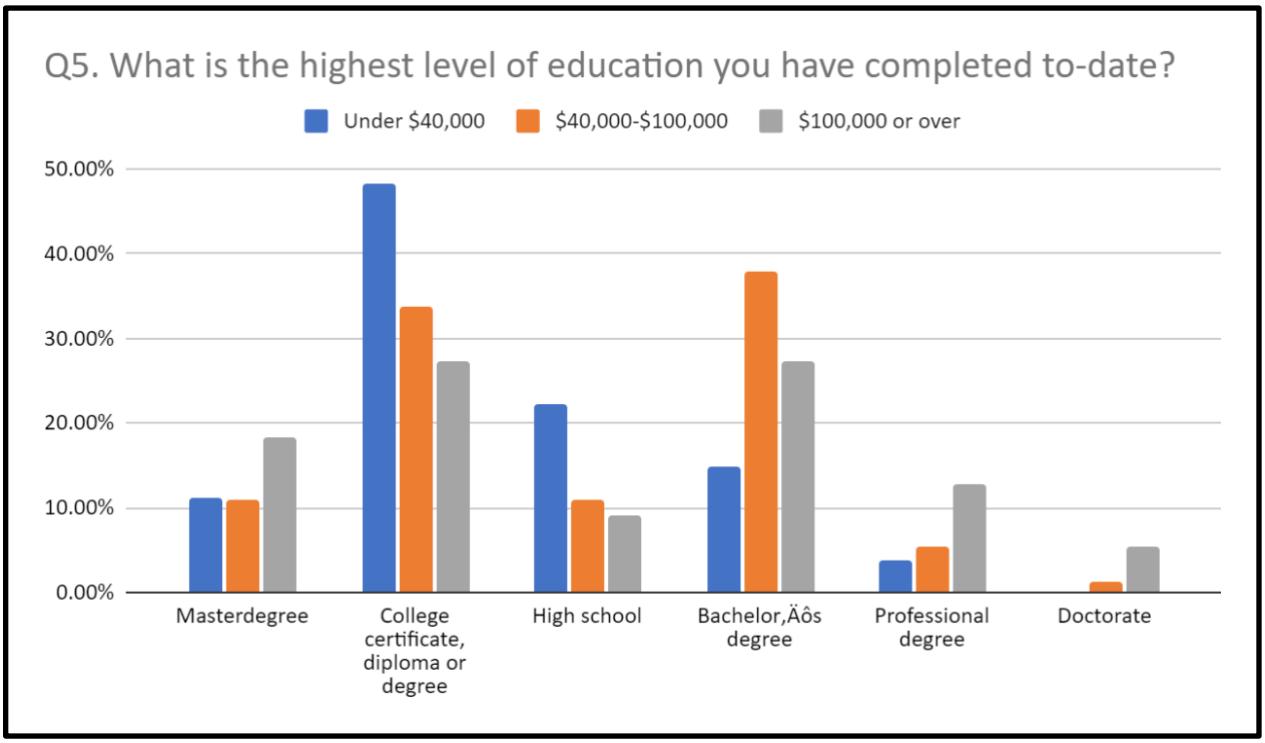

Fig 6. Educational Attainment Among Participants

The income levels of respondents are once again very similar in rural and urban areas of Port Hope (see figure 7).

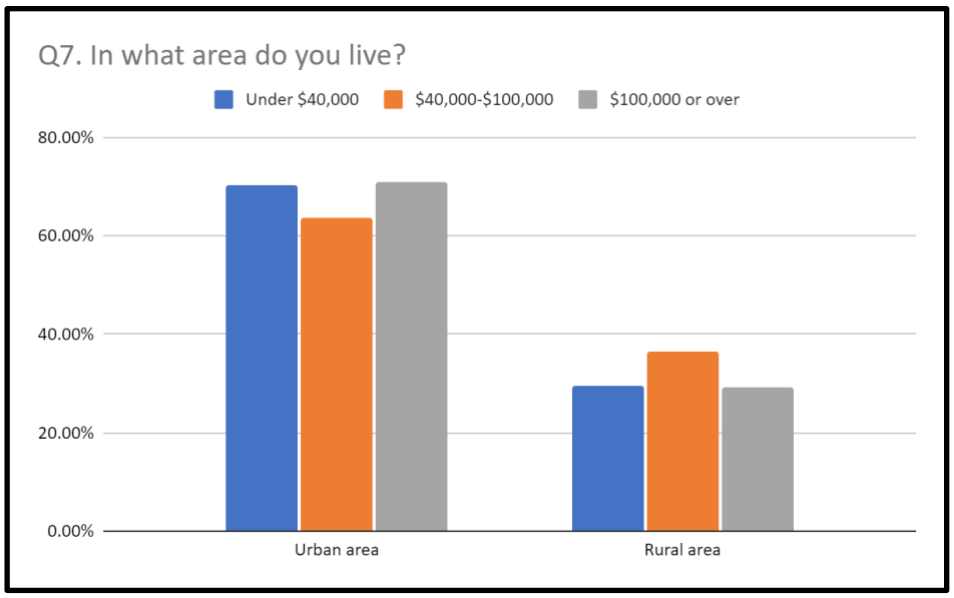

Fig 7. Where Respondents Live and Their Income Levels

Awareness and Perceptions of Climate Change

The majority of survey respondents actively seek out news about climate change (68%). Still, there is a relatively higher percentage of respondents from lower-level income groups actively following climate change news (82%) compared to higher income level groups (60%). The number of respondents who do not actively follow climate change news is the lowest for lower income groups, and almost the same for the other two income groups. The distribution is given in figure 8.

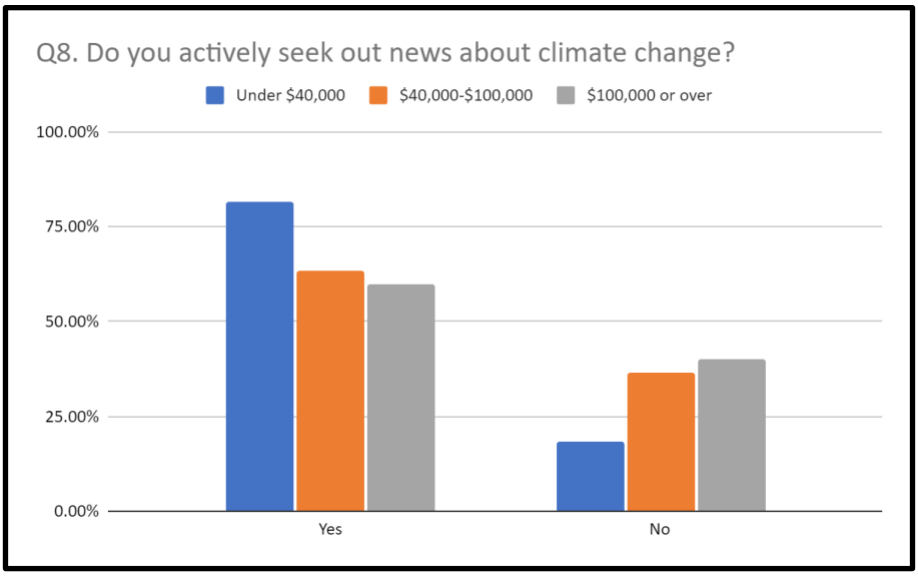

Fig 8. Respondents Who Actively Seek Out Climate Change News

The news resources used are more or less the same for each income group. The only differences observed related to the use of radio to provide climate change information. 56% of lower income respondents use radio to follow climate change news, whereas only 35% of middle income and 38% of high-income group respondents are using radio to be informed about the recent news about climate change. Climate change information sources and their distribution is given for each income level in figure 9.

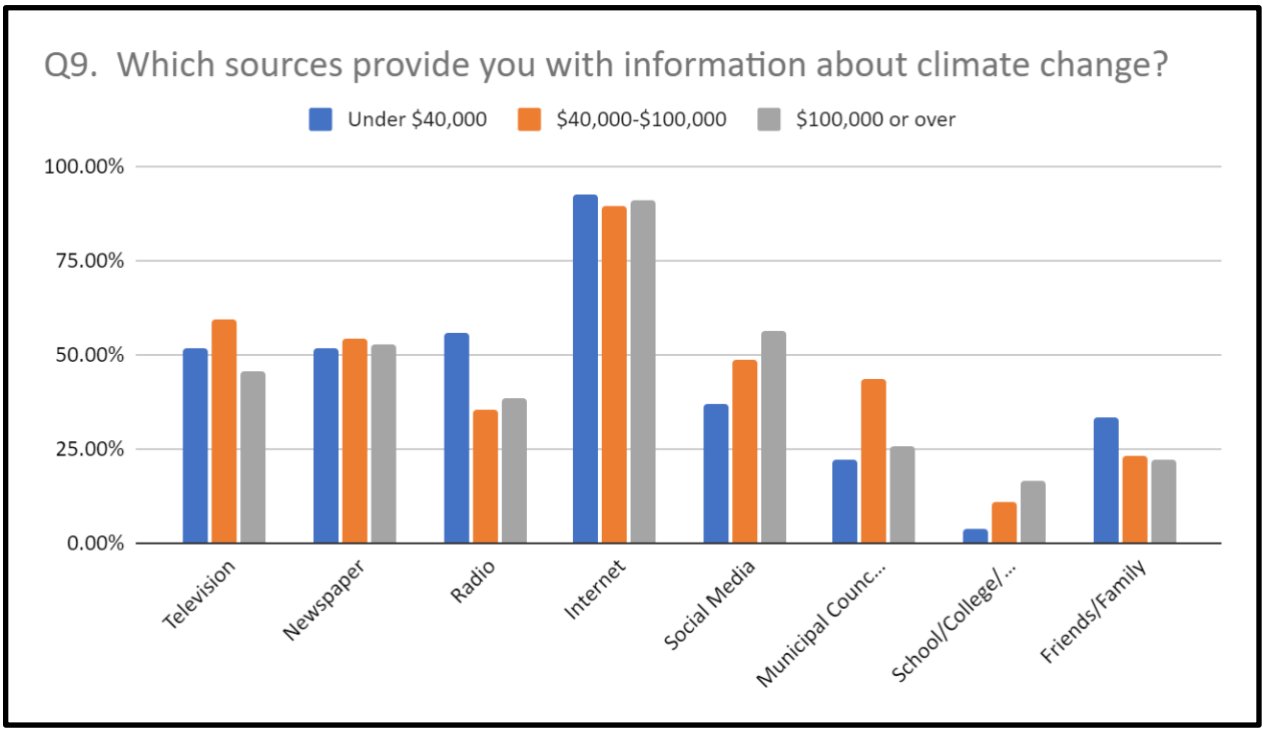

Fig 9. Main Information Sources of Survey Respondents

As figure 10 shows, deforestation is the most prominent answer as a top cause for climate change. That said, 96% of low-income respondents identified deforestation as the top cause of climate change. The percentages are lower but still dominant for middle income (74%) and high income (78%) respondents. For the other listed causes for climate change, there is an overall agreement between income groups, and no meaningful trend has been observed. We have previously revealed that the number of people who are not convinced that climate change is caused by humans is much lower in this survey compared to the overall Canadian rate. Income analysis shows further details about and we have found out that, especially low-income respondents strongly disagree that climate change is not related to human activity. Moreover, they made the highest percentages on the top three causes of climate change as seen in figure 10 amongst other income levels. Although the difference between income levels is not significant, seeing the low-income respondents has been ranked first for each top cause supports the idea in the literature that people with lower income may be more likely to have a better awareness of climate change (Lee et al., 2015). Hence, they can see climate change as a real threat compared to other individuals who have higher incomes (Lee et al., 2015).

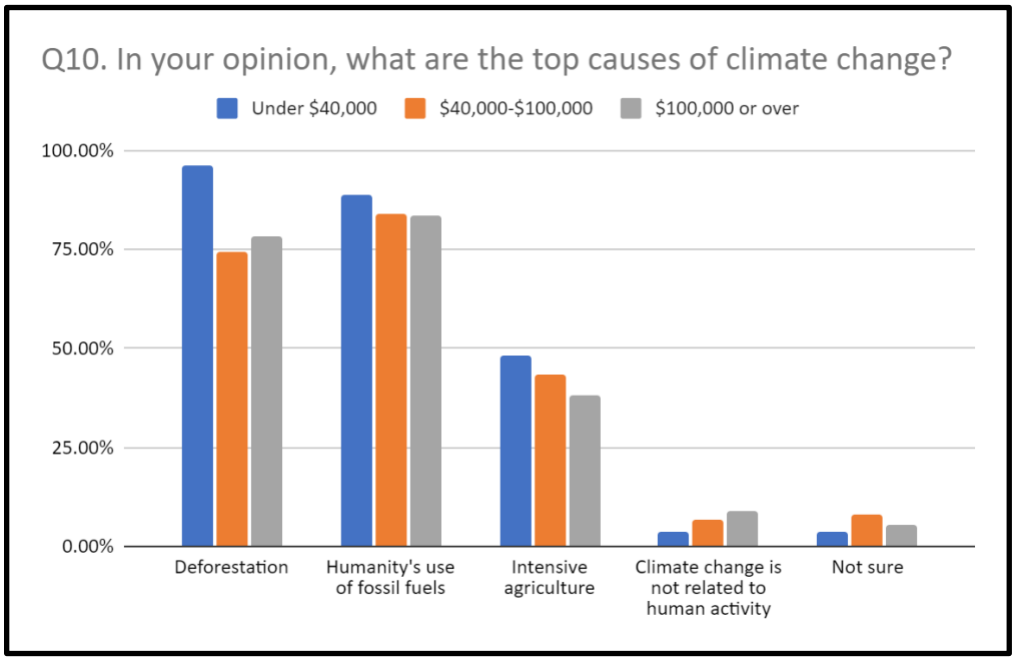

Fig 10. Top Causes of Climate Changes According to Income Levels

The majority of respondents agree that thermal and electrical energy demand, population growth, and consumer behavior are the three top factors that contribute to climate change the most (see figure 11). These views have the same distribution between income groups. The biggest difference has been observed in urban sprawl, which was identified by 44% of low-income households while only 22% of middle income and 18.2% of high-income households agree on this factor. This difference again can be linked to low-income respondents and their relatively higher vulnerability against climate change and its impact on their health compared to people who have better financial situations and thus better accessibility for medical services and treatment (Thomas et al, 2006).

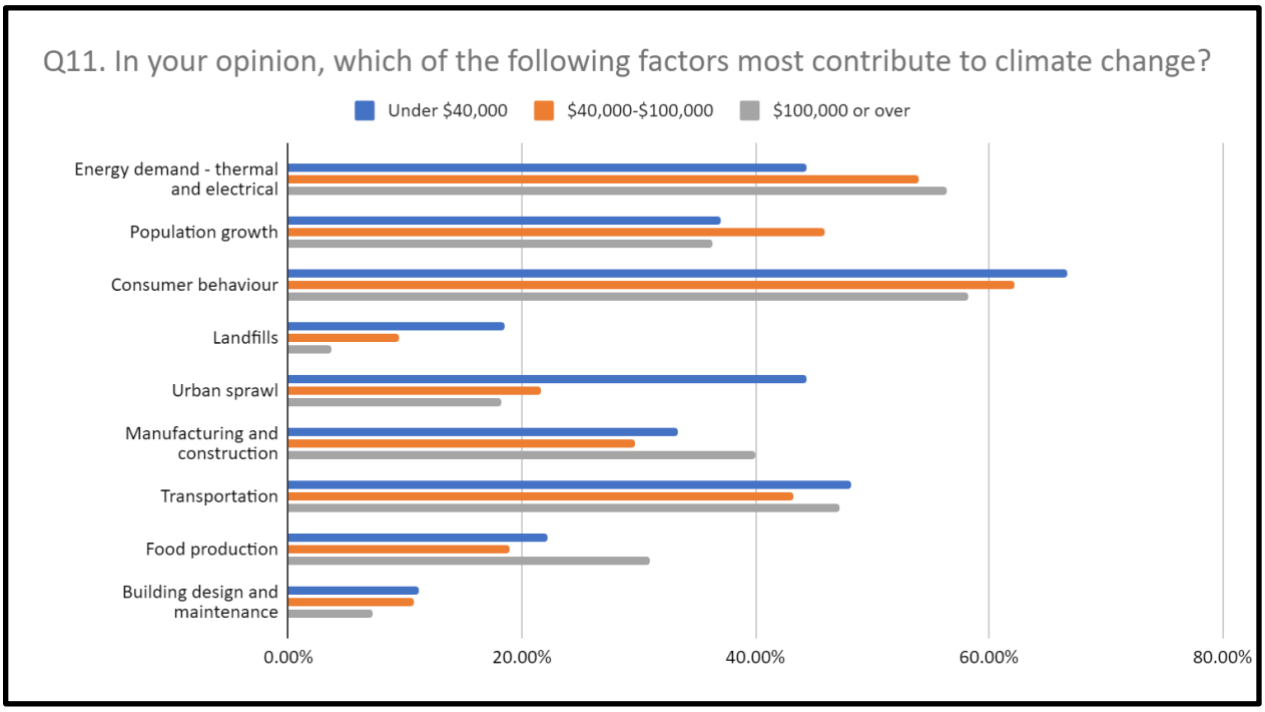

Fig 11. Top Factors Contribute to Climate Changes According to Income Levels

According to the results of question 12, slightly more than half of the survey respondents agreed that climate change is inevitable and tipping points have already been reached. The results are overall consistent between the income groups (see figure 12). Still, low-income survey respondents who strongly agree with the given statement are clearly segregating from other income groups. This result is not surprising as we have mentioned that low-income respondents have more tendency to have better awareness about climate change and this pattern has been observed here again. It can be concluded from here, low-income respondents generally think tipping points have already been reached possibly as a reflection of their higher awareness level and higher vulnerability compared to other income levels.

In addition, there is also a stronger agreement in low-income respondents (63%) to agree that the tipping point has been reached compared to the other groups (51% and 55%) when the summation of responses for “agree strongly” and “agree” is calculated.

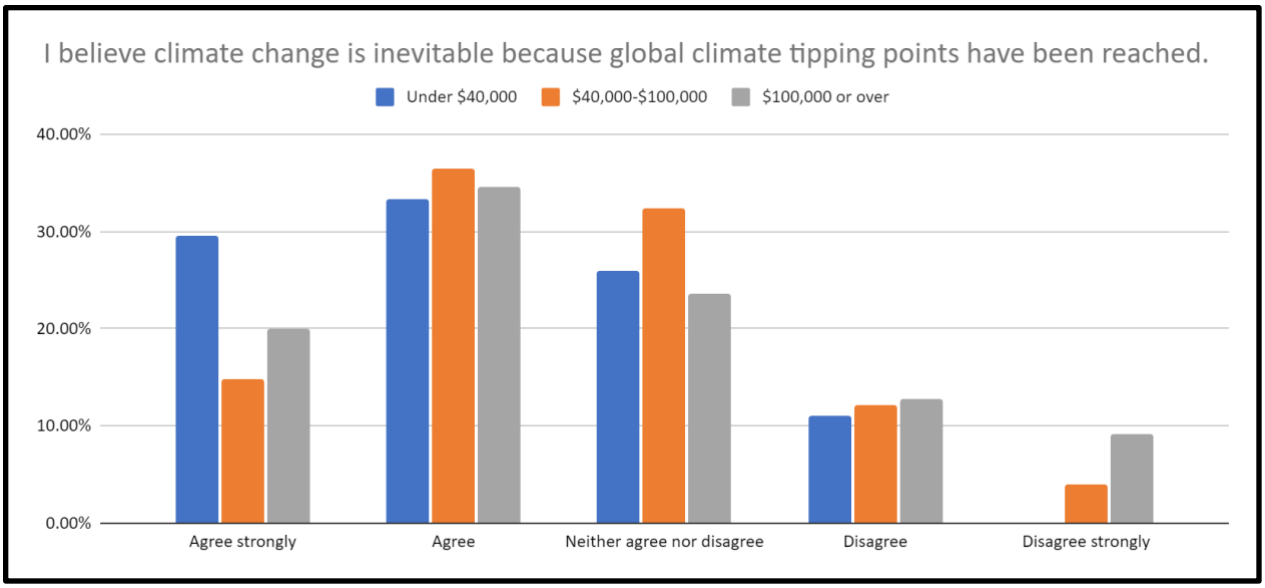

Fig 12. The Distribution of Opinion on Whether Climate Change is Inevitable

In the previous report, it was observed that approximately 78% of respondents have indicated that the increased number and severity of extreme events is a likely negative impact of climate change in Port Hope. This result should not be surprising since the town and surrounding area previously experienced such devastating events in the past. Nevertheless, fewer middle-income respondents (53%) agreeing these extreme events are the likely negative impacts of climate change in Port Hope (see figure 13).

Middle income respondents have once again different views on increased soil erosion adjacent to lakes and rivers as negative impacts of climate change. According to analysis, the majority (66%) of the middle-income group respondents believe increased soil erosion is a consequence of climate change whereas only 48% of low income and 49% of high income households have the same view. The differentiation here is not easy to explain and could be an artifact of the sample size.

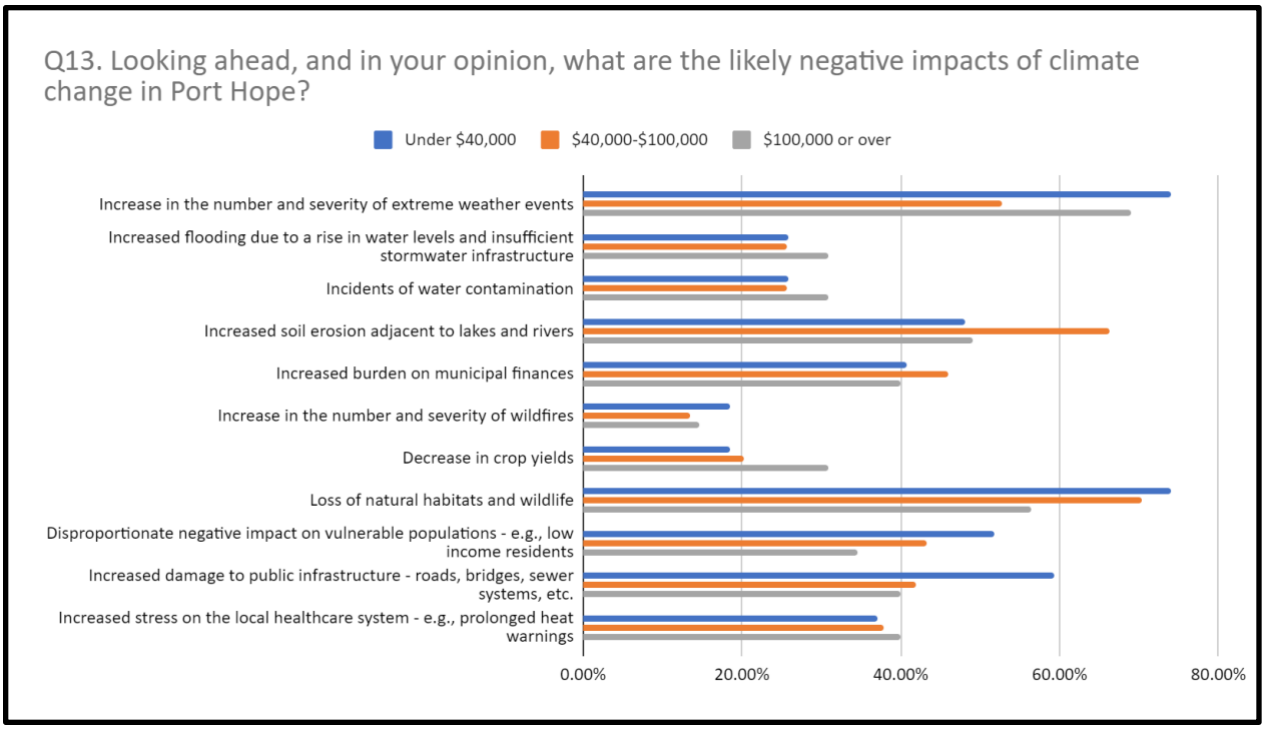

Fig 13. Opinions on Negative Impacts of Climate Change in Port Hope

Transportation

Vehicle Preference and Public Transit:

From Fig. 14, in response to the choice of vehicle,

- For Electric and hybrid vehicles, there is no significant difference between the income groups (44%, 36% & 44%).
- However, hybrid vehicles were most popular among lower and middle-income households (48 - 50%) compared to high income (36%) households.
- None of the respondents from low-income households in the survey were interested in fossil fuel vehicles. But middle and high-income households still preferred fossil fuel vehicles (14% & 15%).

A study conducted by Zubaryeva et al. (2012) in Europe suggests that due to the relatively high upfront cost for electric vehicles and hybrid vehicles, higher-income groups are more likely to adopt them. However, it is interesting to note that in the case of Port Hope, all income groups, including the lower-income households, expressed an equal propensity for electric and hybrid cars. This points towards other demographics that might be playing a role in the selection of EVs. A survey conducted in Sweden concluded that 77% of individuals purchasing EVs had a university degree (Vassileva & Campillo, 2017). Moreover, the selection of EVs can be linked to concerns about the environment, as they produce less greenhouse gas emissions (Okada et al., 2019).

The numbers regarding the use of public transport remain consistent among income groups. Almost all income groups seldom use public transport (93%, 96 & 95%). Public transportation is less popular among high-income and middle-income groups because car ownership is a prominent determinant of transit use

(Giuliano et al., 2001). As income increases, the likelihood of car ownership also increases (Clark et al., 2015). Low-income households exhibit a low mobility pattern because of limited resources (Giuliano et al., 2001).

In terms of quality of public transit, the overall ratings were poor. All income groups had similar views.

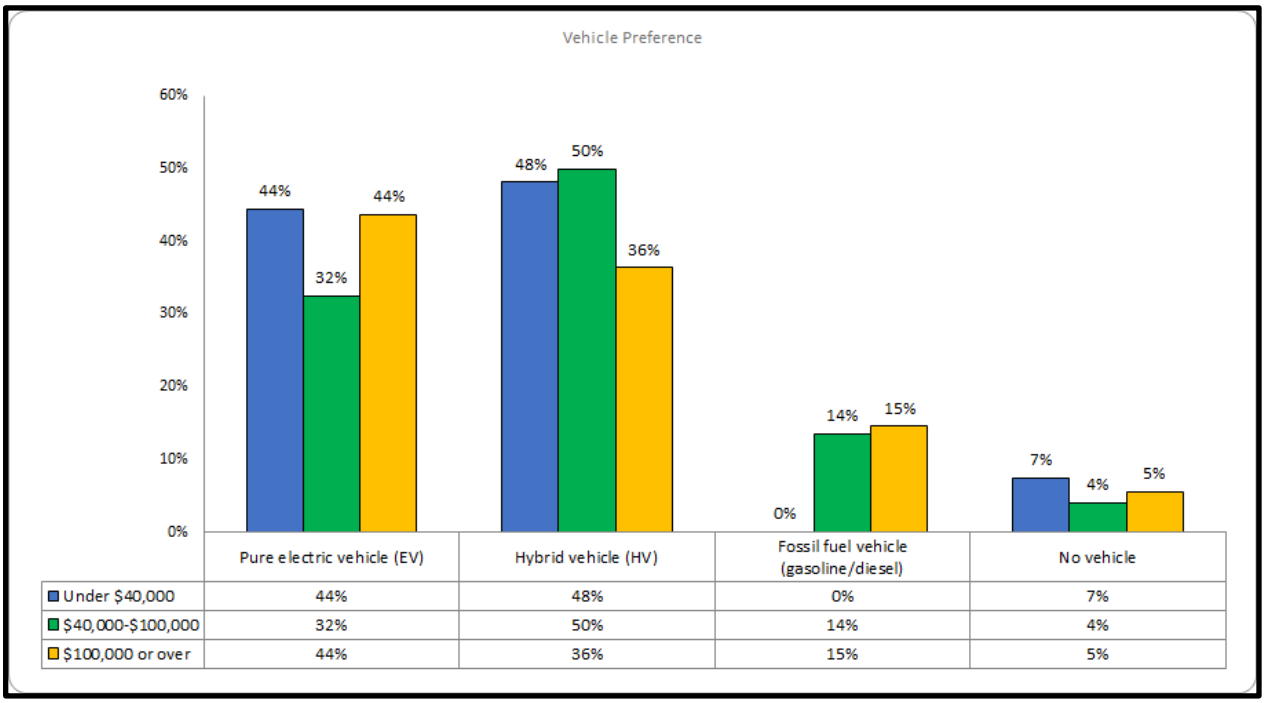

Fig 14. Vehicle Preference

Climate Change Responsibility

Response to individual and collective responsibility:

- Lower-income households (70%) are more inclined (strongly agree) towards individual responsibility, as compared to middle income (42%) and higher-income (40%) households.
- Lower-income (0%) and higher-income (18%) households differ significantly in terms of disagreement towards individual responsibility to tackle climate change (See figure 15).

Climate change is a result of the accumulation of GHG emissions caused by numerous point sources rather than emission by a single individual (Vanderheiden, 2011). Income acts as a constraint towards individual responsibility during times of financial recession. However, it is less influential during better economic conditions (Eden, 1993). Port Hope is a financially well-off community, with a median income of $72,435 at par with the national average (Port Hope Demographics, 2016), it is not surprising that even low-income households are pro-individual responsibility. However, the much higher skepticism among individuals from high-income holds can be associated with the perceived inefficiency of individual responsibility to

address climate change and identification of other stakeholders (governments, cooperates, municipalities, etc.) to take up the task (Eden, 1993).

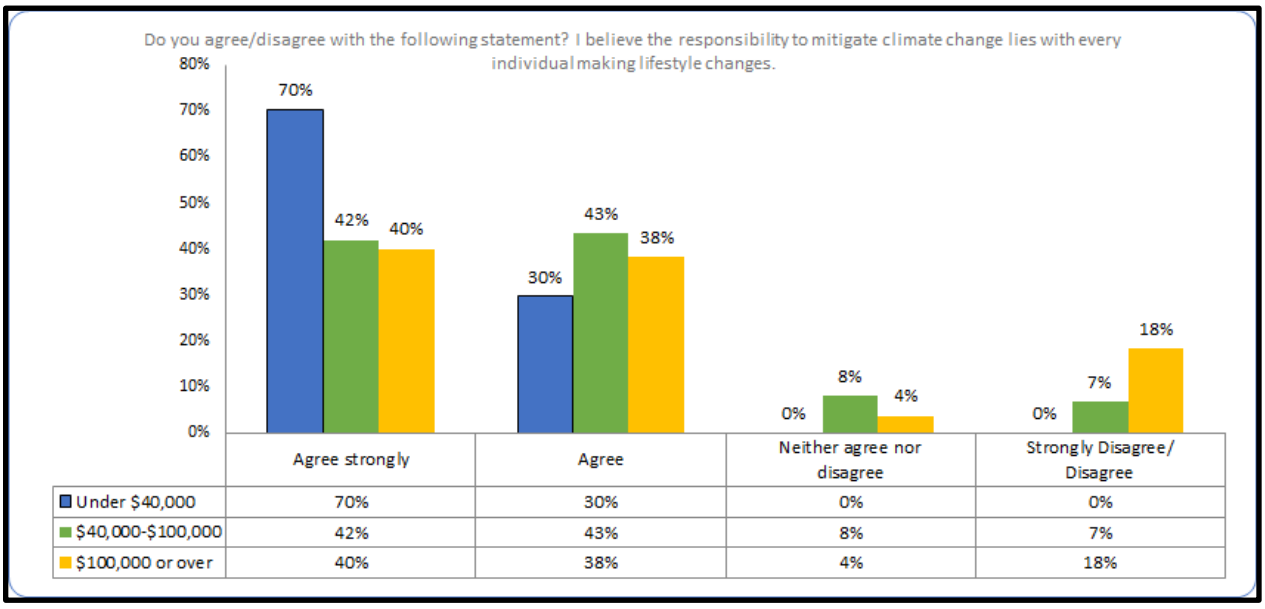

Fig 15. Individual Responsibility Towards Climate Change

Willingness to spend on eco-friendly products:

- There is a consistency in terms of choosing eco-friendly products among lower-income and middle-income households as both consider them expensive (67% & 73%) as compared to higher-income households (52%).
- Lower and middle-income households are less likely to pay for them (33% & 26%) as compared to high-income households (48%) (See figure 16).

Previous studies on the relationship between environmental purchases and income suggest a positive correlation. An increase in income results in more environmentally sensitive purchasing (Bulbul et al., 2020; Cabuk et al., 2008). However, in Port Hope, the higher-income households are in a split divide. 52% consider eco-friendly products as expensive. While 48% perceive them as inexpensive. Overall, a greater proportion of Port Hope respondents think of eco-friendly products as expensive.

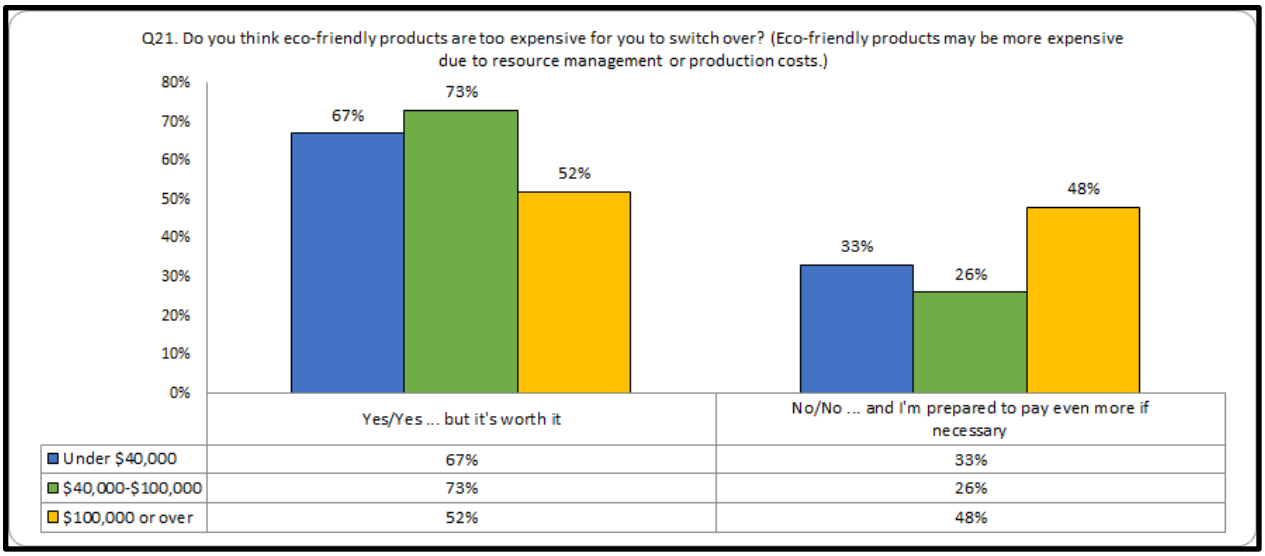

Fig 16. Willingness To Pay For Eco-Friendly Products

<u>Government incentivization of private companies to reduce GHG emissions:</u>

In terms of incentivizing private companies for reducing GHG emissions (See figure 17):

- Lower income households (96%) agreed significantly with the statement compared to middle income (69%) and higher income (73%) households.
- In terms of disagreement for incentivizing the private sector, a similar trend is observed with middle income (24%) and higher income (16%) disagreeing to much greater extent than lower income households (0%).

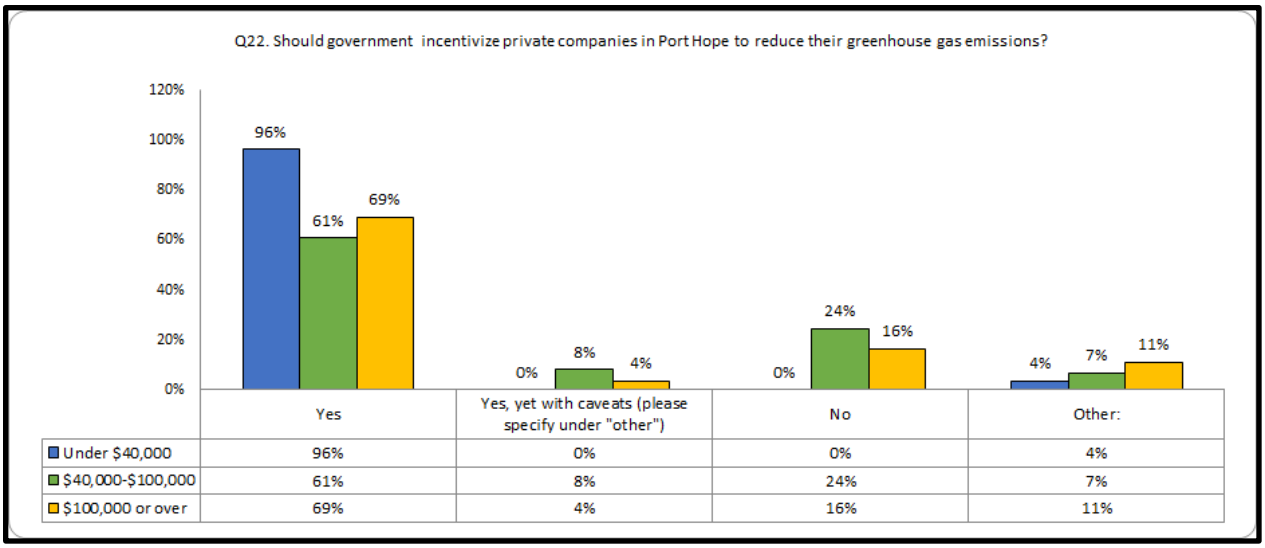

Fig 17. Incentivizing Private Sector for GHG Reduction

Awareness of Municipality's Actions for Climate Change:

- Respondents from higher income (29%, do not know) households are more unaware of the recent actions taken by the municipality compared to respondents from lower-income (15%) and middle income (13%) households, though all these results point to a lack of awareness (See figure 18).

These results are consistent with the response of another question in the survey where respondents were asked how frequently they seek out environmental news. Low-income respondents seek environmental news more often compared to high-income respondents, which explains why they are modestly more aware.

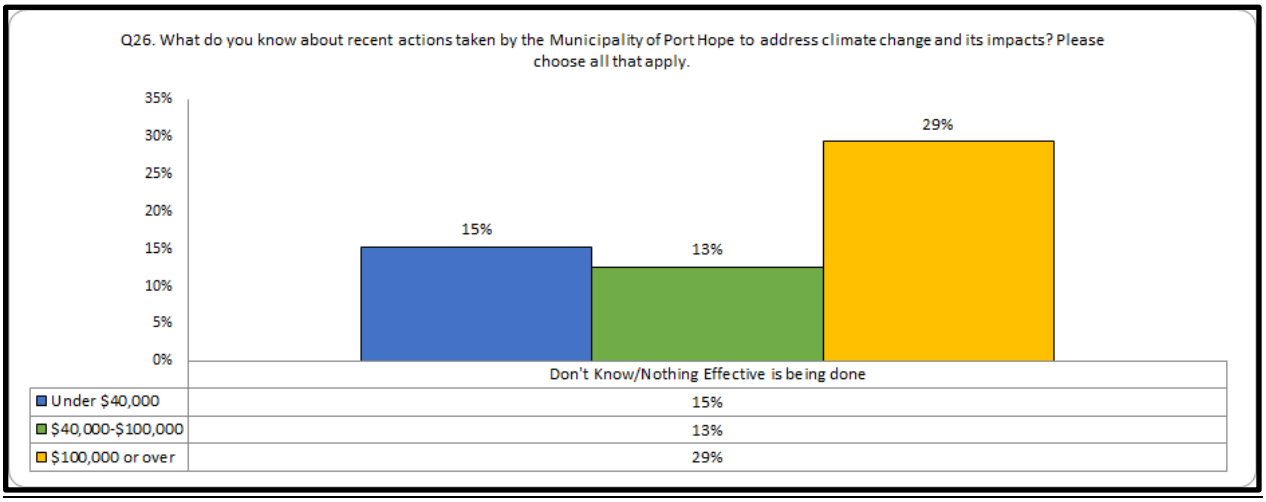

Fig 18. Public Awareness About the Actions Taken by Municipality of Port Hope

Public sector's current performance in addressing climate change in Port Hope:

In response to public sector performance in addressing climate change in Port hope (See figure 19):

- A general trend of increasing satisfaction is observed as income increases from low to high (17%,33% & 34%).
- This trend is also complemented by the decreasing satisfaction as income increases (73%, 57%, & 46%).
- Respondents from higher income households (20%) are more unaware off the performance of the public sector compared to the respondents lower (9%) and middle income households (10%).

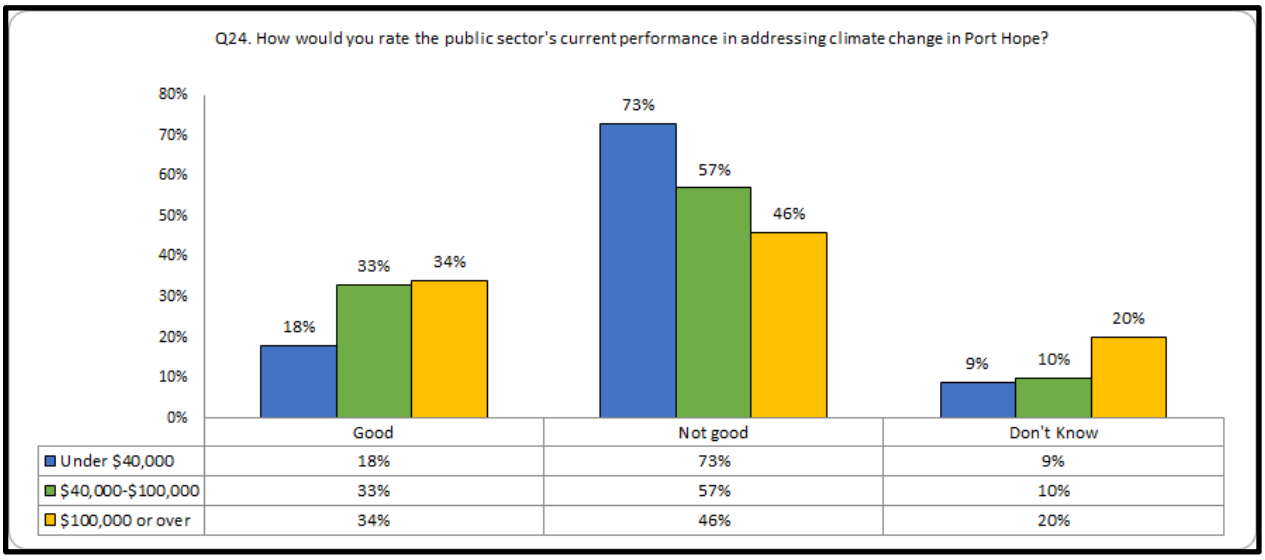

Fig 19. Public Sector's Performance

Priorities

New housing to accommodate population growth:

There is a significant change in priority setting for new housing for the three income classes (See figure 20).

- 47% of middle-income and 53% of higher income households considered new housing to be of a medium priority compared to only 25% of low-income households.
- Similarly, middle-income and higher income households considered new housing to be a higher priority compared to low-income households.

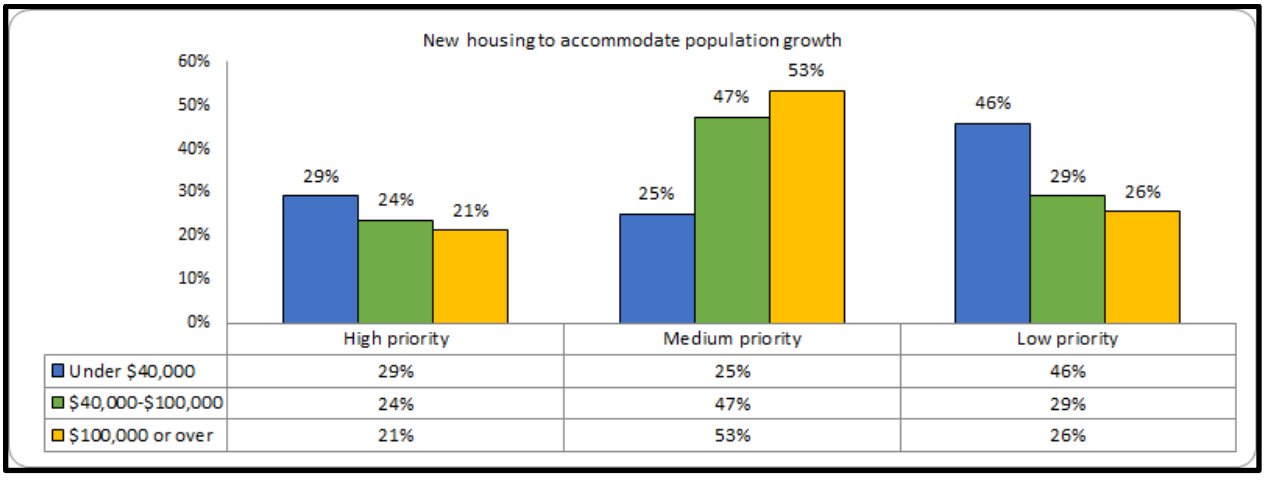

Fig 20. New Housing Accommodation

Limiting increases to taxes and other charges:

- Low-income households (44%) choose to set a high priority to limiting taxes and other charges.
- The numbers remain more or less the same for the middle (30%) and higher-income (32%) households (See figure 21).

The skepticism of low-income households towards increasing taxes is justified as studies on OECD countries suggest that carbon taxes are more likely to adversely affect low-income households compared to higher-income households (Speck, 1999; Harrison, 1995) However, these effects can be addressed by given special considerations to low-income households by providing tax-free energy allowances for gas and electricity (Vermeend & Van der Vaart, 1998).

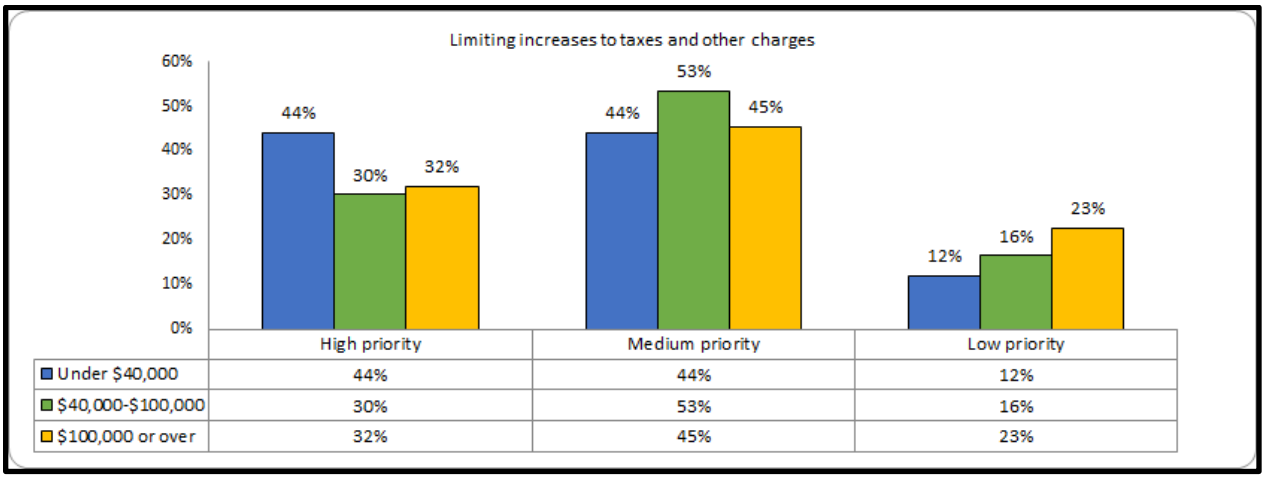

Fig 21. Limiting Increases in Taxes

Affordable housing:

In response to affordable housing, the following responses were recorded (See figure 22).

- Affordable housing is equally a higher priority for lower-income (66%) and middle-income (66%) households.
- Higher-income households are comparatively less concerned about affordable housing (54%).

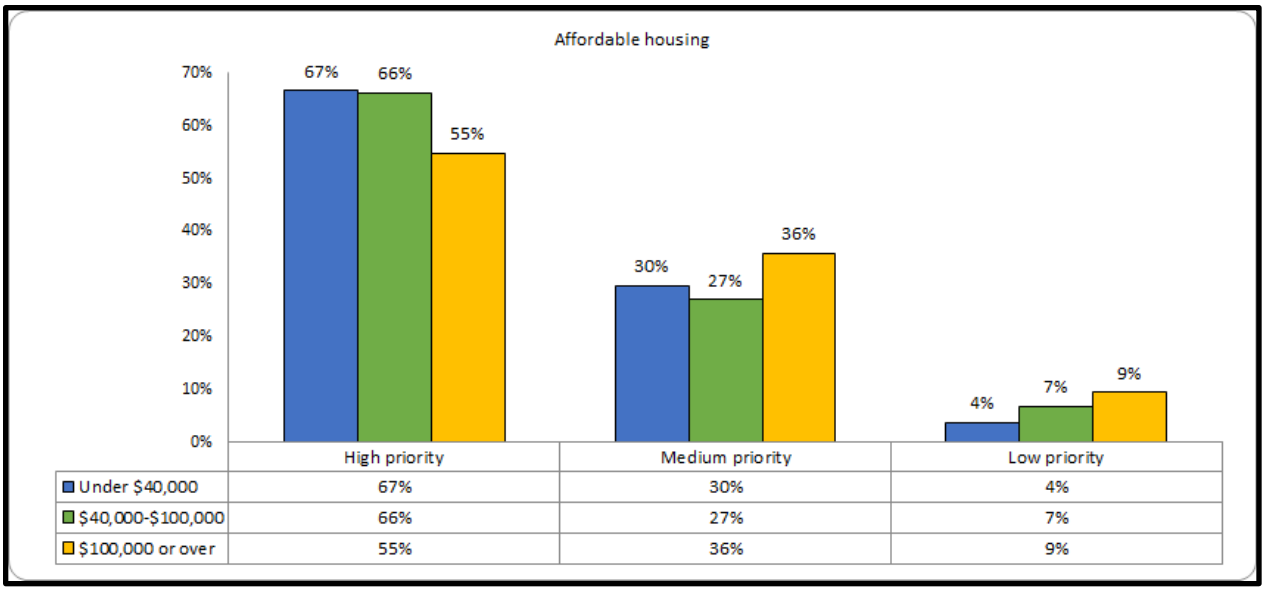

Fig 22. Affordable Housing

First Nations rights and reconciliation:

- Respondents from lower income (52%) and middle income (45%) households are consistent in setting medium priority.
- However, respondents from higher income households are more likely to set as a low priority (18%) First Nation rights and reconciliation compared to the other two income groups (See figure 23).

From the survey results, the majority of the respondents considered First Nation Right and Reconciliation as high or medium priority regardless of the income. However, a small percentage of the participants considered Frist Nation Right and Reconciliation as a low priority. This group is more dominated by middle (15%) and high (19%) income households. According to a report by Neuman (2016), this may be because these individuals do not consider First Nation issues to be unique compared to other ethnic or cultural groups. They are also critical in assessing the performance of Aboriginal leaders.

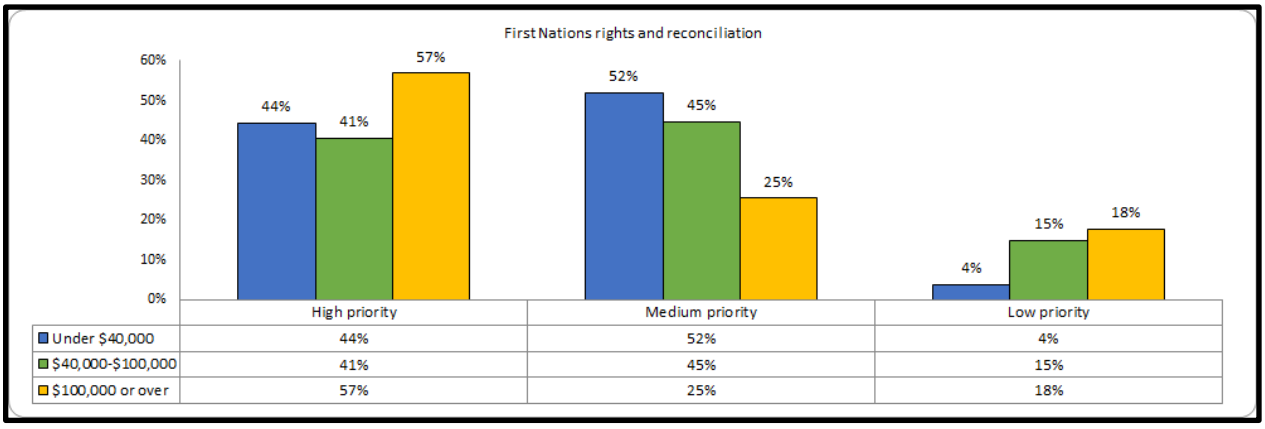

Fig 23. First Nation Rights and Reconciliation

Investments in public transportation:

- Respondents from high-income households (37%) considered an investment in public transportation as low priority compared to Low income (12%) and middle-income (16%) households (See figure 24).

As discussed above, high-income households are most likely to own a private car. Therefore, they are least likely to use public transit, thus justifying their prominence in setting low priority for public transportation.

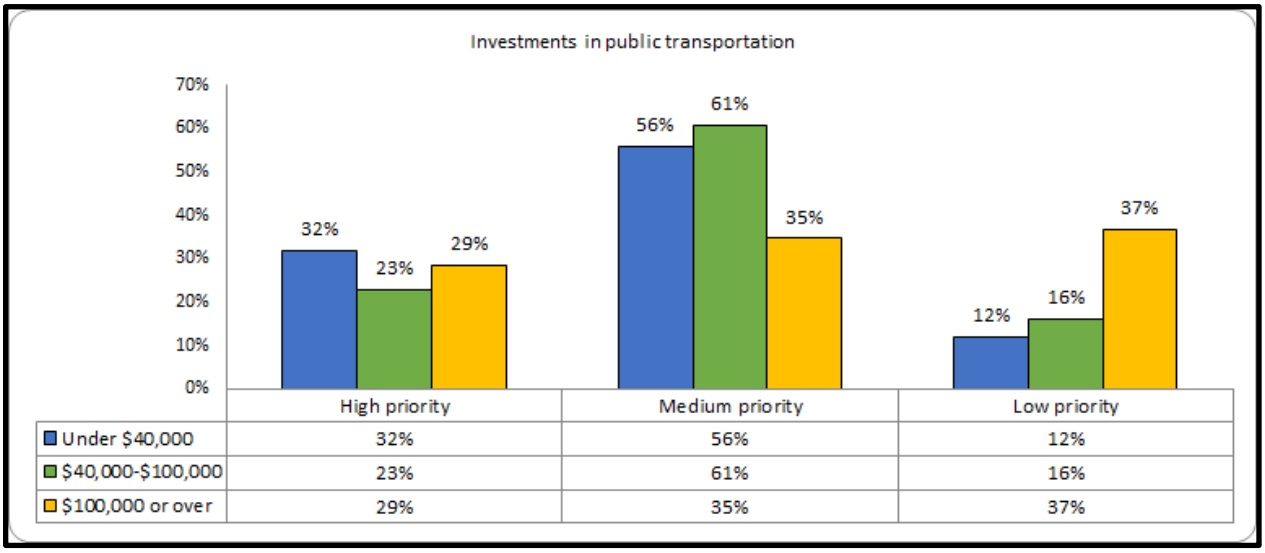

Fig 24. Investments in Public Transportation

Supports for vulnerable populations:

- Respondents from lower income households (70%) considered support for vulnerable populations a matter of high priority compared particularly to higher income (51%) households.
- Higher income households (19%) set, as a lower priority, support for vulnerable populations (See figure 25).

The literature on the relationship between vulnerability and income supports the results from the survey. Income has a direct correlation with a number of vulnerability factors, suggesting that as income decreases vulnerability increases (Deria et al., 2020).

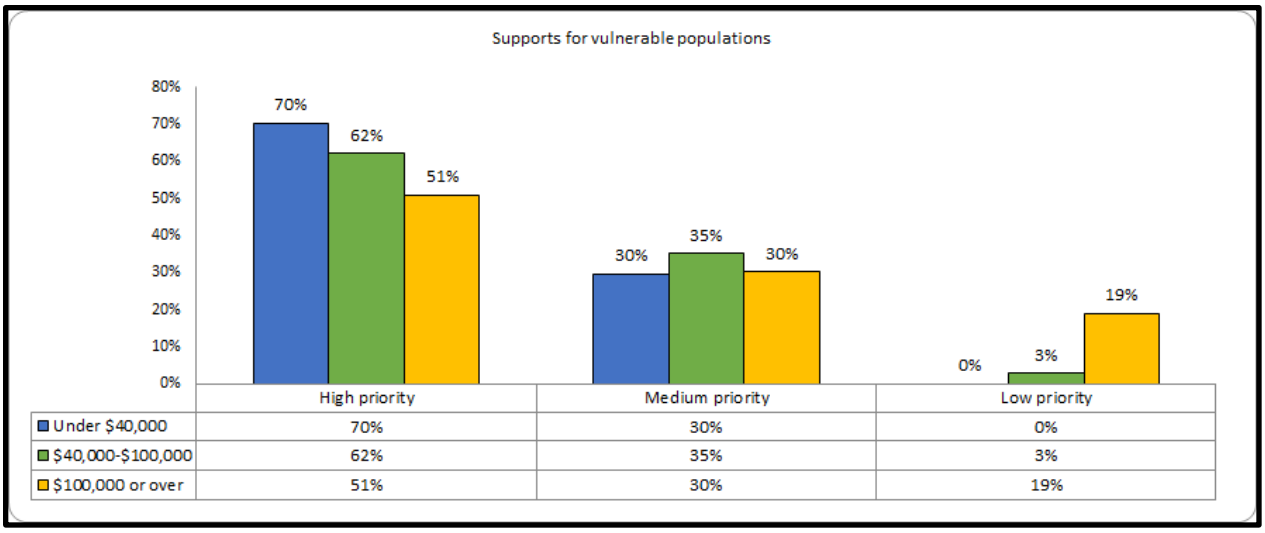

Fig 25. Support for Vulnerable Populations

Climate change in Port Hope:

- Prioritizing climate change is more strongly supported among lower income households (77%), as compared to middle income (57%) and higher income (53%) households (See figure 26).

Climate change is likely to increase the frequency of extreme weather events (Mirza, 2003). Port Hope has a history of flooding in the past (Ganaraska Region Conservation Authority, 2009). As discussed above, a decrease in income results in an increase in vulnerability. Especially in the case of floods, an increase in income significantly decreases the likelihood of getting affected by a flood (Kahn, 2005). This could explain the increased concern among the low-income households of Port Hope about climate change. Studies also highlight the increased environmental awareness among high-income households (Yang et al., 2021; Franzen & Vogl, 2013). However, this increased awareness does not necessarily translate to increased concern or precaution (Taylor et al., 2014). Higher-income households do not consider themselves vulnerable to climate change, as they have a belief that they have the means to cope with any immediate threat (Lo & Chow, 2015).

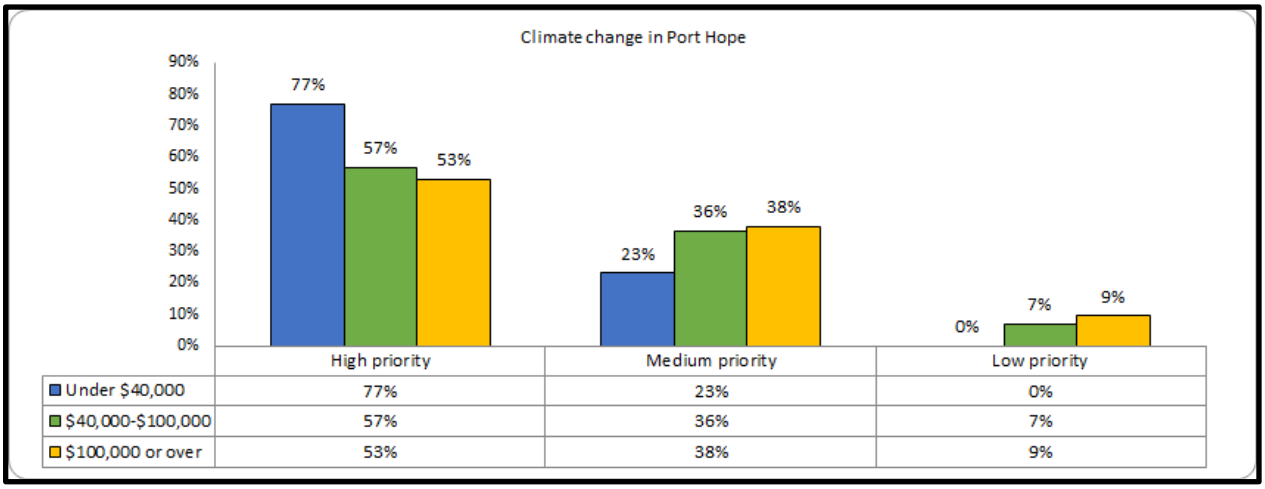

Fig 26. Prioritizing Climate Change

Social Media Usage Pattern and Income Levels

Time spent on social media differs according to the level of household income. The most significant observation is that the number of respondents from low income households who spend 1 to 2 hours on social media per day is extremely limited (11%) compared to middle income (26%) and high income (29%) respondents (see figure 27).

Differences in the amount of time spent using social media did not differ among income levels especially when the cumulative time spent on social media is considered. We have found that respondents who spend more than an hour and less than an hour on social media are almost identical for each level of income.

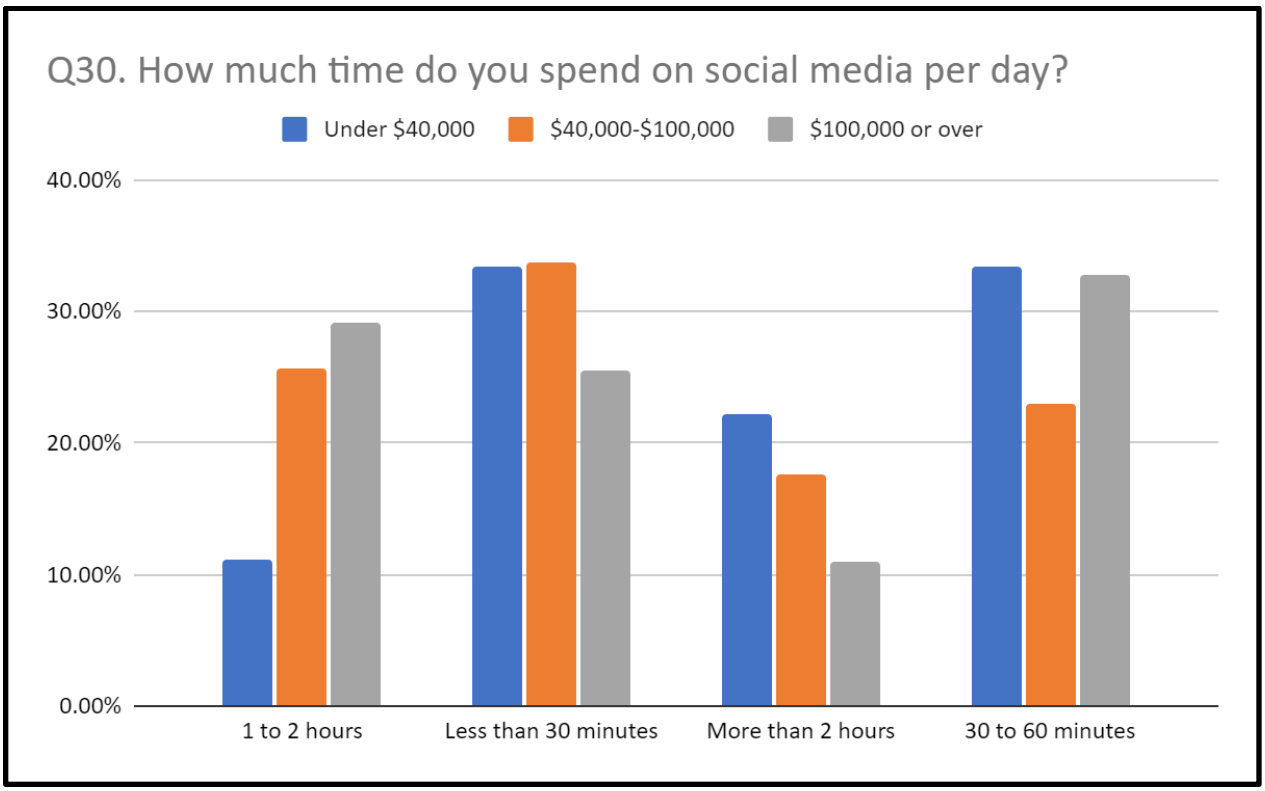

Fig 27. Time Spent on social media Among Participants Based on Income Levels

When it comes to social media services that are normally used by respondents, there is a well-distributed pattern across the respondents who have different levels of income as shown in figure 28. The most popular social media platform is once again Facebook, followed by YouTube by respondents. Low-income respondents are a bit more likely to use Twitter compared to the other respondents. High income respondents are more likely to use Pinterest compared to low- and middle-income respondents.

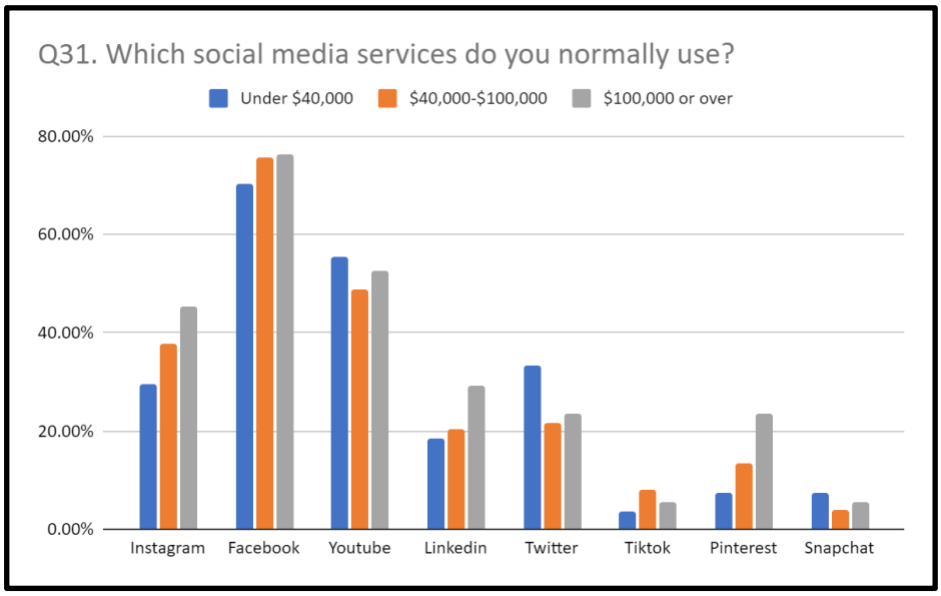

Fig 28. Social Media Platforms Used by Participants Based on Their Income Level

The most popular format for climate change information was short videos for each income level respondents, and it was mostly preferred by low-income respondents (see figure 29). The next most popular format was pictures to receive information about climate change. The distribution of the views is almost identical for each level of income. In addition, low-income respondents consist of the majority of respondents who want to receive information via text format (30%). It is almost three times higher than middle income respondents (11%) and two times higher than high income respondents (16%).

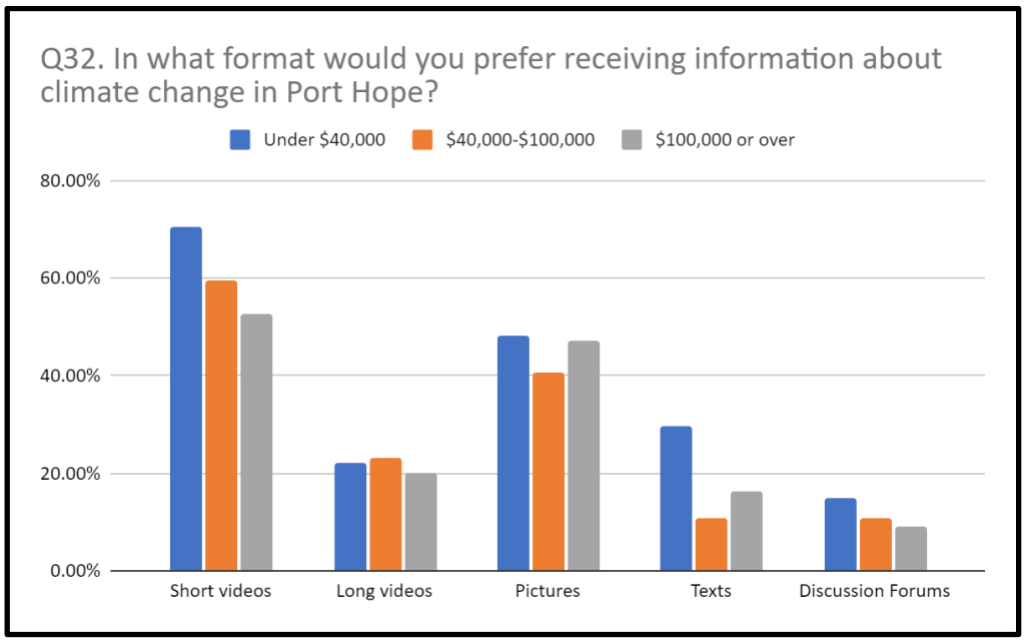

Fig 29. Preferred Format for Receiving Climate Change Information In Port Hope

As showing in figure 30, the subscription rate of Port Hope social media accounts is generally limited. The only common social media account that most of the respondents follow is @MunicipalityofPortHope Facebook page. However, the distribution of income levels is interesting. High- and middle-income respondents have similar subscription levels on this Facebook account (66%, 58%), however fewer low income respondents follow the same page (41%). Moreover, percentages of respondents who identified that they do not follow any social media accounts belong to Port Hope is highest for low-income respondents (30%) Therefore, it can be said that Port Hope's social media accounts are currently not reaching out to low income respondents.

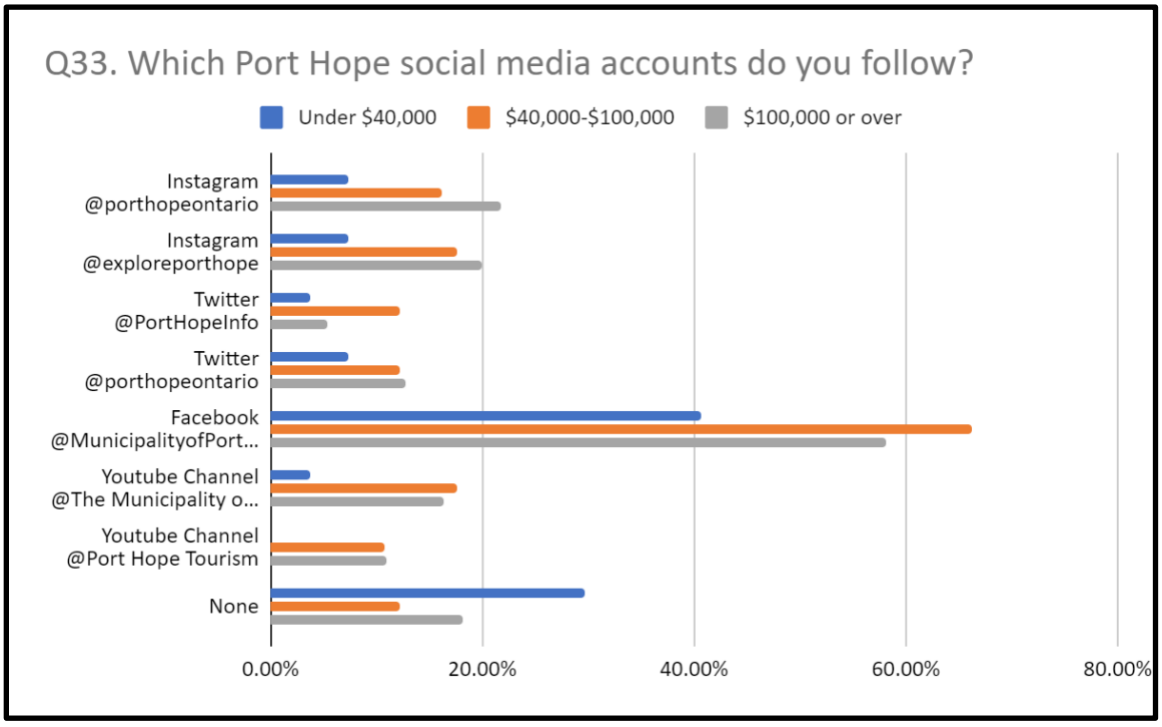

Fig 30. Followed Port Hope Social Media Accounts Based on Income Levels

Low-, middle- and high-income respondents have very similar social media trends (see figure 31). Their preferences are almost identical in terms of frequency of viewing climate change videos and/or images on social media. However, high income respondents who identified themselves as very likely to follow these pages in the future are extremely limited (4%). However, low income and middle-income respondents are more likely to follow Port Hope's social media pages in the future.

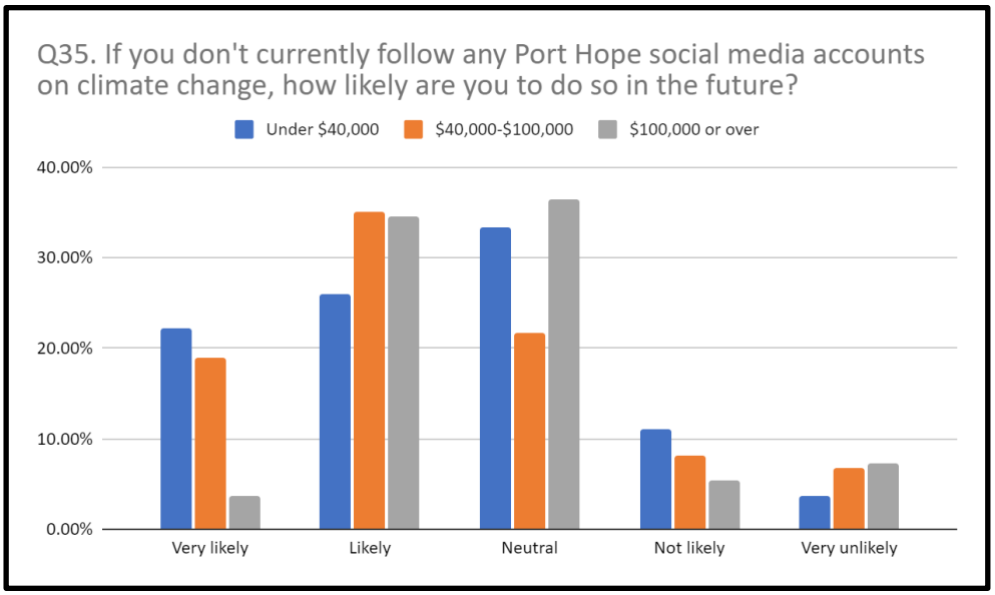

Fig 31. Likelihood to Follow Port Hope Social Media Accounts On Climate Change

Conclusion

In conclusion, this paper aims to reveal more information about the Port Hope community and their perception of climate change by examining their income levels. In the light of literature, respondents from low-income households in Port Hope exhibit a significantly pro-environment behaviour. This is evident in their level of awareness, pro-environment choices, such as EVs, eco-friendly products, emphasis on individual responsibility towards climate change and prioritizing climate change. Moreover, the increased concern among low-income households is linked with vulnerability, as there is sufficient literature to suggest that low-income households are more vulnerable to climate change.

Low-income groups are comparatively more concerned about affordable housing, and government support to vulnerable populations. Therefore, special consideration should be given to low-income households in future climate change policies to minimize the subsequent financial implications. It is important to note that the public sector's performance is considered poor among lower- and middle-income households and that all income levels are not particularly aware of any actions put forward by the municipality.

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Age-based comparative report

By Sadiyah Manidhar and Mateo Orrantia, June 2021

Introduction

Located on the northern shore of Lake Ontario, Port Hope is a small town with approximately 17,000 residents (Statistics Canada, 2017). Our collaborative study aims to understand the climate change perceptions of Port Hope residents by analyzing primary social and economic aspects, in particular, age, education level, income level, and locality of the participants. In this study, we are interested in examining the relationship between the age of the survey participants with their climate change perceptions specifically. Based on the literature, we make recommendations that may be used by the Port Hope Municipality to implement a Climate Change Action Plan.

The literature indicates that there exists a correlation between age and environmental awareness. In their study, Morrison & Beer (2017), found that the middle-aged cohort, that is, respondents in the age bracket 40 – 60, demonstrated higher environmental knowledge in comparison to the younger respondents. Similar results were also obtained by Stedman (2004), who reported that 57.8% of the participants in the 40 - 61 age cohort recognized climate change as a critical issue, thereby implying that attributes of risk assessment and scientific knowledge were greater in this demographic in contrast to the under 40 age group. Therefore, a trend of better scientific precision about environmental issues with the increased age of the participants can be expected. Despite this, the older age demographic in our survey demonstrates higher levels of environmental skepticism of climate change matters compared to youth (Wang & Kim, 2018; Zhou, 2015). Additionally, it is interesting to note that while the youth hold the governments accountable for climate change mitigation plans, they often lack confidence in these institutions (Corner et al., 2015).

Methodology

This analysis seeks to examine the potential differences and similarities between different age groups of respondents to the Port Hope community survey. To do so, the data from each question will be measured against responses to question 3 of the survey. This question asked respondents to identify their age group by choosing from the following cohorts: Under 16 years old, 16 - 25 years old, 26 - 49 years old, 50 - 65 years old, 66 years or older, and prefer not to answer. Due to the limited sample size, we have grouped these 6 categories into 2 different bins: those **49 and under**, and those 50 and above. Those who preferred not to answer (1) were excluded from the survey.

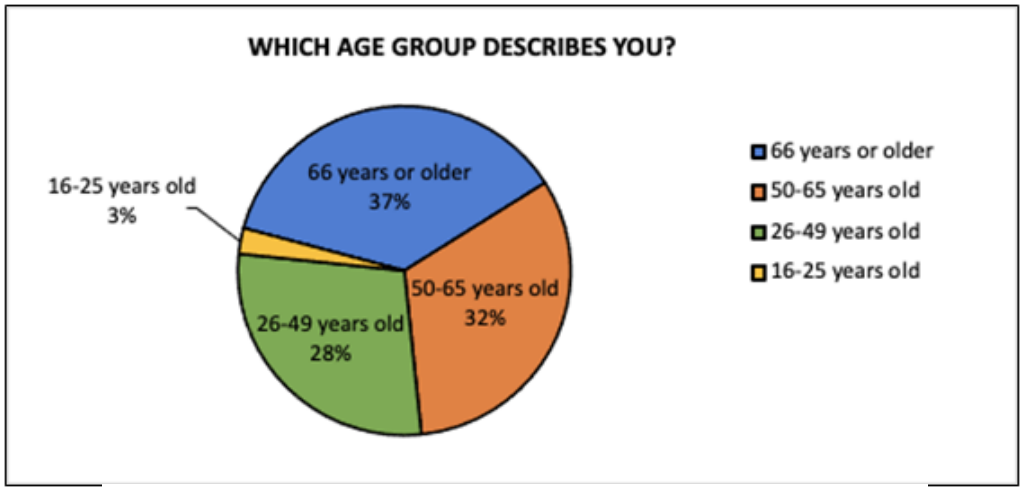

Figure1: Distribution of survey analysis main representation

Our sample of approximately 198 responses (1 prefer not to answer excluded), countered against Port Hope's population of 16,775, gives our survey results a confidence level of 95% within a margin of error of 7%. For this reason, in our analysis, we only bring attention to differences between the two groups that are greater than 10%, as anything smaller than this is unreliable due to the margins of error.

In the aim of consistency with the rest of our team, our analysis in this report is divided into 4 different sections, each one covering a different thematic group of questions: Climate Change Perceptions, Responsibility, Public Transportation, and Social Media.

Key Findings

- Overall, the 49 and under age group was more collectivist and institution/systems-oriented in their view of climate change causes, contributing factors, and actions. The 50+ age group, on the other hand, seemed to hold a more individualistic perspective
- The 49 and under age group put a much larger emphasis on public transportation in Port Hope than the 50+ age group. In offering potential improvements to local public transportation, the younger demographic largely focused on improving cycling and cycling infrastructure
- Despite large differences in where they get their information, the two age groups were overall fairly similar in their perception of climate change. Both groups overall agreed that climate change is inevitable.
- The younger group is slightly more concerned about extreme weather events, while the older group is more concerned about the loss of natural habitats and wildlife
- Both groups shared similar perspectives on potential actions that local businesses could take, as well as the top actions individuals can take against climate change. That being said, younger people were more in favor of reducing the consumption of animal protein and supporting local businesses than were the older age group.

- Both groups were in agreement that neither the public sector nor the private sector were doing a good job at addressing climate change. Relatedly, there was a significant lack of knowledge in both groups as to what actions the municipality had taken to address climate change
- Both groups agreed on top climate mitigation actions - protecting and expanding the local tree canopy, and ensuring municipal assets utilize best practices in decarbonization - but disagreed on top adaptation actions. The younger group's top choice was to put more emphasis on amending bylaws to enable sustainable practices, while the older group's top choice was to encourage tree planting and protection
- Overall, the two groups agreed on almost every priority issue, similarly identifying local economic development and job creation, quality of life improvements, affordable housing, support for local agricultural communities, support for vulnerable populations, and climate change in Port Hope as high-priority issues. Despite this, they were deeply divided on First Nations rights and reconciliation and public transportation investments, with the younger group making these are higher priority than the older group
- Neither group used public transportation much and both agreed it was poor. However, the younger group was much more enthusiastic about potentially improving it - specifically through cycling
- The preferred social media platform for both groups was Facebook, followed by Youtube. The Facebook page @MunicipalityofPortHope is popular for climate change information among both groups. There seems to be popularity for upcoming social media platforms among the 49 and under group.
- In general, the survey results indicate that there is a potential to increase social media engagement among the two groups to convey climate change content specific to Port Hope.

Results and Discussion

Section 1: Climate Change Perception

Q.8 There were no major differences between the two age groups when it came to seeking out news about climate change, as 69% of respondents 49 and under and 67% of respondents 50 and over sought out news on climate change.

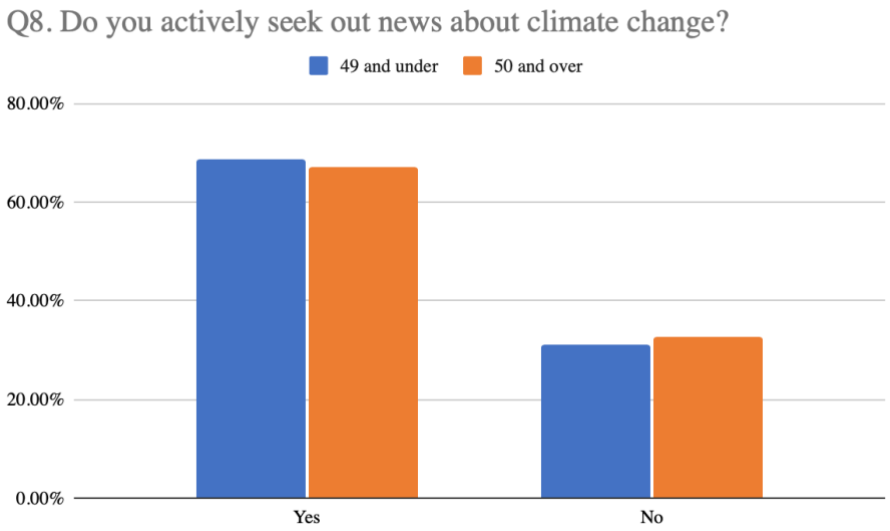

Figure 2: Survey results Q8

Q.9 - Overall, there were some significant differences in where these two age groups got their information about climate change. In fact, 30% more people in the 50 and over age group get their information about climate change from television (64% vs. 34%), and 26% more get their information from the newspaper (62% vs. 36.1%). Meanwhile, 30% more people under 50 get their information from social media (70% vs. 41%). This represents a clear dichotomy between the two age groups when it comes to receiving information from traditional and non-traditional media sources, with the 50 and over age group being far more likely to receive information from more traditional sources. That being said, the most popular source for both groups was the internet, at 97% of 49 and under and 88% of 50 and over.

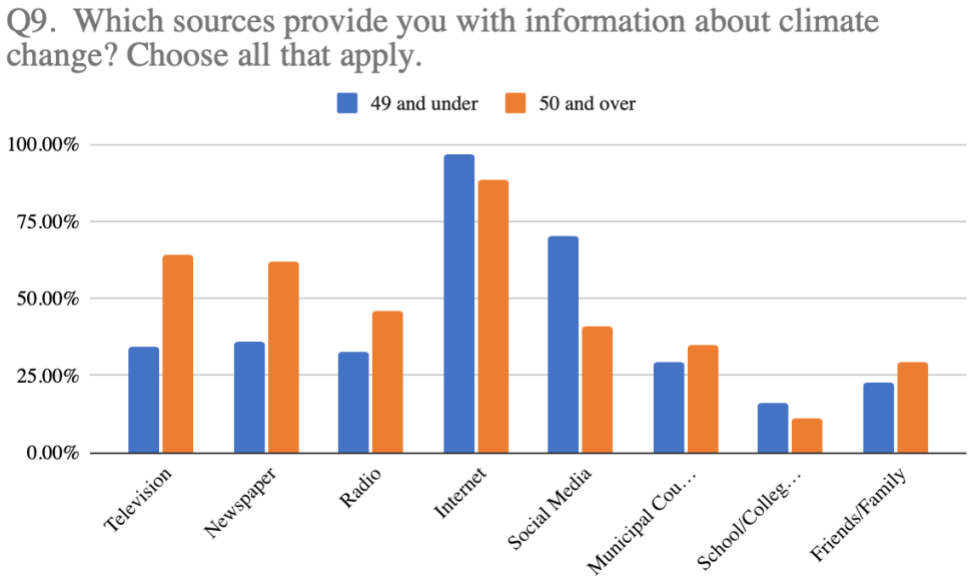

Figure 3: Survey results Q9

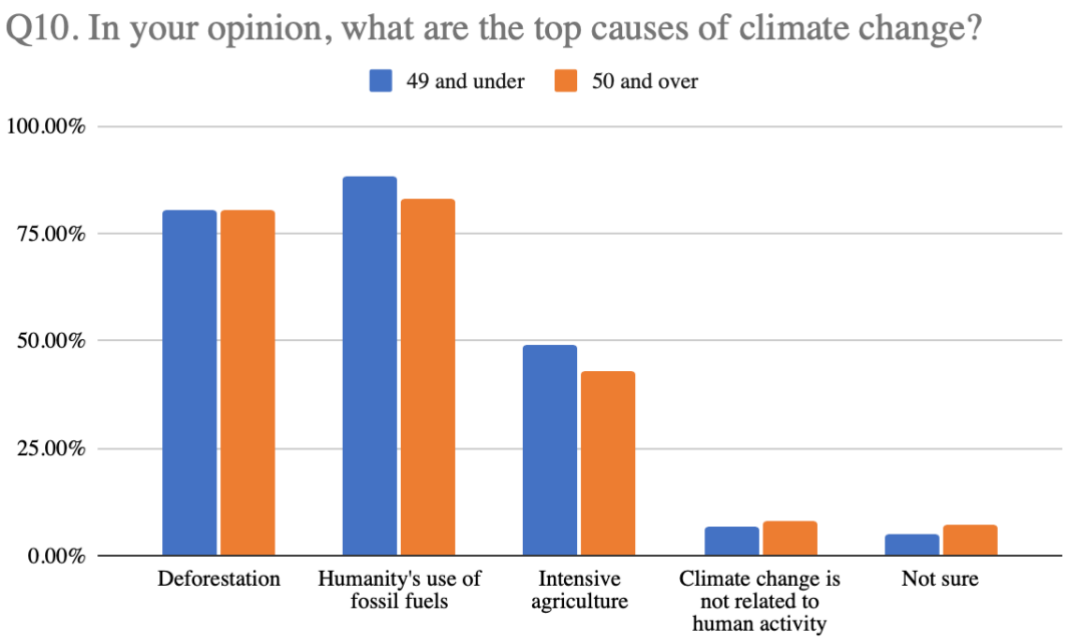

Figure 4: Survey results Q10

Q.10 - There aren't any major differences between the two age groups when it comes to identifying the top causes of climate change. The two most popular responses were deforestation and fossil fuel use, while only 7% and 8% of the 49 and under and 50 and over age groups do not think that climate change is related to human activity. This is interesting, as literature has identified that age plays a role in determining climate change beliefs, with older groups tending towards less belief in anthropogenic climate change (Poortinga et al., 2019). It is therefore interesting to not see any differences here, especially when you consider that the two groups are getting their information from very different mediums, generally (Poortinga et al., 2019).

Q.11 - Despite the fact that there were no significant differences between the groups in identifying the top causes of climate change, there were some differences in what each group perceived to be the factors that most contribute to climate change. The most popular choice for a contributing factor among the 49 and under group was Transportation (51%), while for those 50 and over it was consumer behavior (66%).

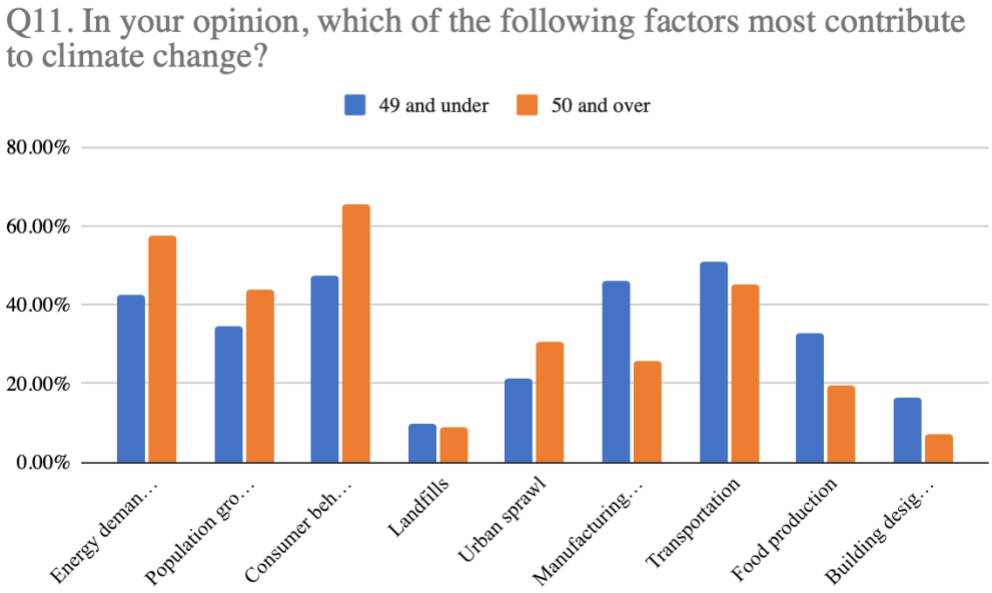

Figure 5: Survey results Q11

In fact, the biggest difference between the two groups was a 20% difference (46% vs 26%) in the proportion of 49 and under vs 50 and over respondents that identified manufacturing and construction as a major contributor to climate change. The 50 and over group was 18% (66% vs 47%) more likely to identify consumer behavior as a contributing factor to climate change. Those in the 49 and under group were slightly (13%) more sensitive to the climate consequences of food production, while those above 50 were (15%) more sensitive to the impacts of energy demands.

Q.12 - There were no major differences between the two groups in their perception of the inevitability of climate change, with the majority of both groups selecting either “Agree Strongly” or “Agree.” In this, the majority of respondents are in agreement with the broad scientific consensus - no matter what we do, there will be climate change on earth (Brooks, 2014). Those 49 and under were slightly (9%) more likely to select “Agree Strongly,” while those 50 and over were 9% more likely to “Disagree” to that statement. The takeaways from this are unclear: are those in the 50 and over age group slightly more confident in our ability to take on mitigating action, or are they in disagreement with the idea of climate change in general? Viewed in the context of their other responses, it would seem that it is the former.

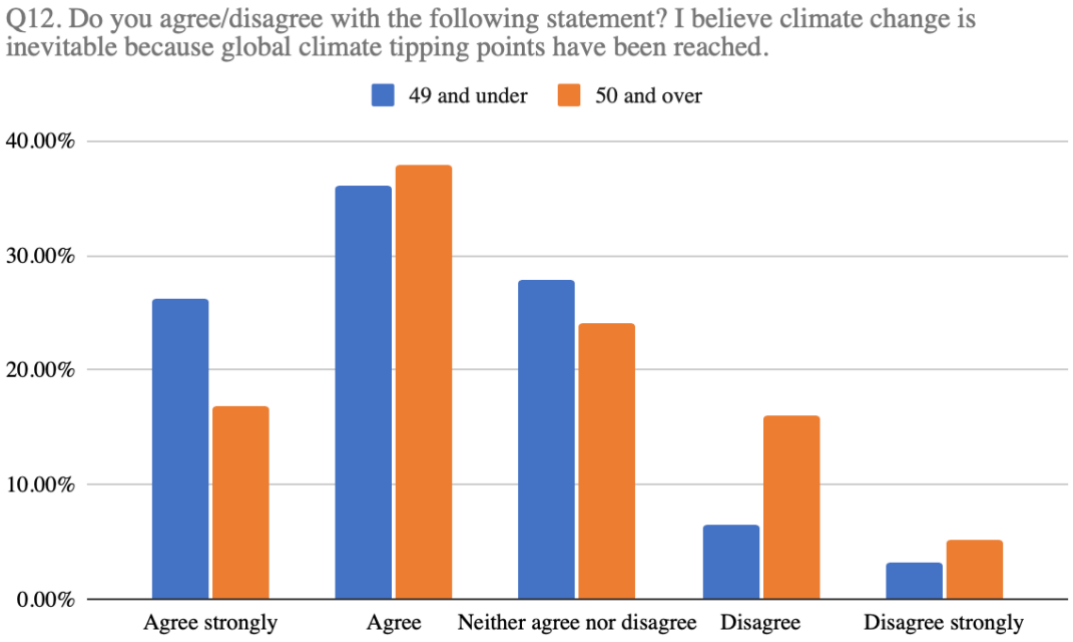

Figure 6: Survey results Q12

Q.13 - There were some differences in how the two age groups perceived the likely negative impacts of climate change. The most popular response among the 49 and under group was an increase in severe weather effects, which was selected by 72% of those respondents. In fact, this is also where the largest difference between the two groups was observed, as they were 18% more likely to select this option than their older counterparts.

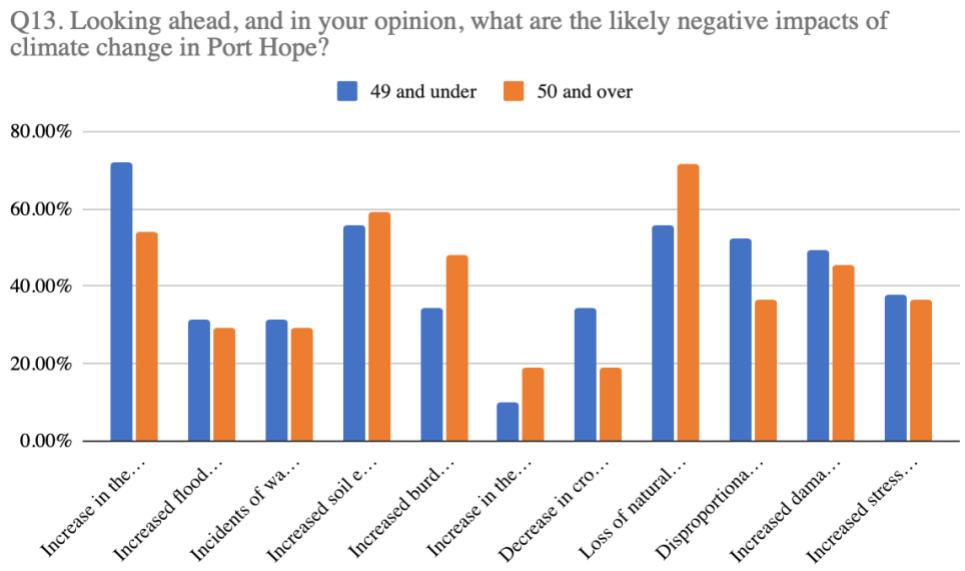

Figure 7: Survey results Q13

This is a very interesting finding, as typically it is those that have experienced extreme weather events, like flooding, are more likely to be sensitive to climate change risks, and yet here we see the younger group being more conscious about the risks (Lorencova, 2019).

This could point towards many of the 49 and under group already having experienced extreme weather events, or that the 50 and over group is much less likely to be sensitive to the risks. The younger group was also around 15% more likely to select disproportionate impacts on vulnerable populations and decrease in crop yields as negative effects. On the other hand, the most popular response (71%) among those 50 and over was the loss of natural habitats and wildlife, which they were 16% more likely to select than those 49 and under. In the literature, older groups have been found to be generally less likely than younger groups to think that climate change poses significant risks (Poortinga et al., 2019), and yet this is not what we see here: both groups clearly observe that there is a wide array of significant risks, and on average selected the same number of different risks (approx. 4.5 each) per respondent.

Section 2: Responsibility

Q.14 - Overall, the two groups were in agreement about how they perceived individual responsibility vis-a-vis climate change, with 80% of those 49 and under and 88% of those 50 and over either selecting "Agree Strongly" or "Agree" in response to this statement. Interestingly, the 50 and over were marginally more likely to select one of these responses, indicating a potential trend among the older population to be more individualistic in their attribution of climate change responsibility. This is in line with what the literature suggests - older people, at least in the west, tend to grow more conservative and individualistic as they age (Poortinga et al., 2019).

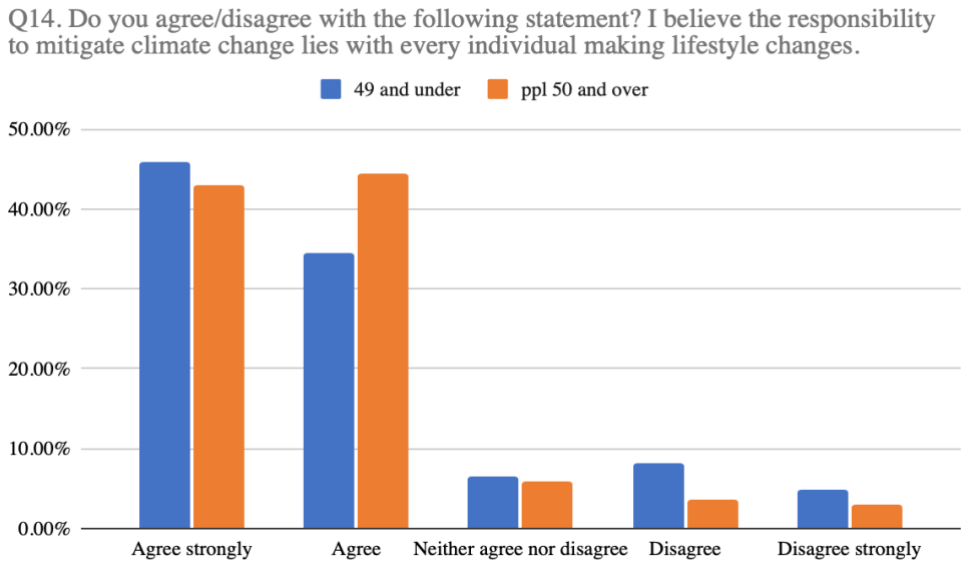

Figure 8: Survey results Q14

Q.15 - There were some differences between the two groups in response to this question. Namely, 19% more young respondents selected “support local businesses” as a top potential action, with a 69% selection rate vs a 50% selection rate from the older group. While this was the top response for the younger group, the top response for the older group was to “purchase fewer products/services with a significant carbon footprint” (69% 50 and over and 59% 49 and under). Younger people were significantly (19%) more likely to be in favour of reducing the consumption of animal protein as a top potential climate change action, as this received 39% support from this group, as opposed to only 20% from the older respondents. In fact, this was the largest gap between the two age groups. Despite these differences, the majority of both groups agreed that it was important to reduce car usage, purchase fewer products with high carbon footprints, create more green spaces, and support local businesses.

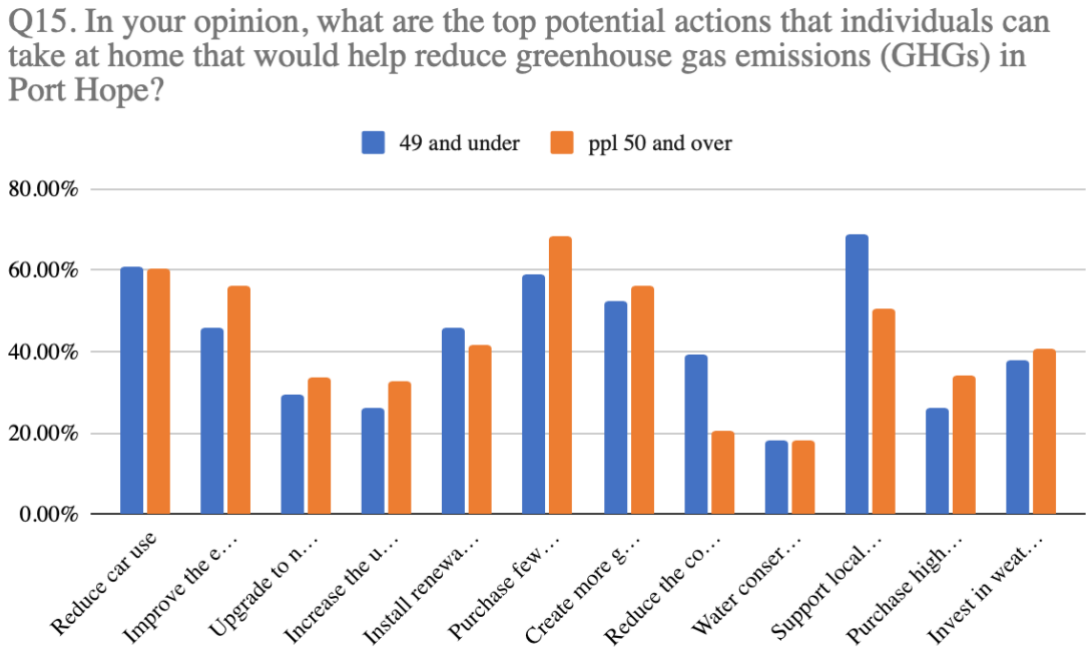

Figure 9: Survey results Q15

Q.20 - The two age groups largely agreed on the top actions that Port Hope businesses could take to reduce their carbon footprints. The most popular response (50%) among the 50 and over age group was to promote environmentally friendly products and services, while for the younger group it was to contribute to a more sustainable local economy that supports Port Hope businesses (52%). Despite differing top choices, there were only small differences in the selection of each option between each group. The only non-marginal difference was a 13% difference between the 50 and over and 49 and under group in selecting decarbonizing Port Hope fleet operations - which was one of the least popular options overall.

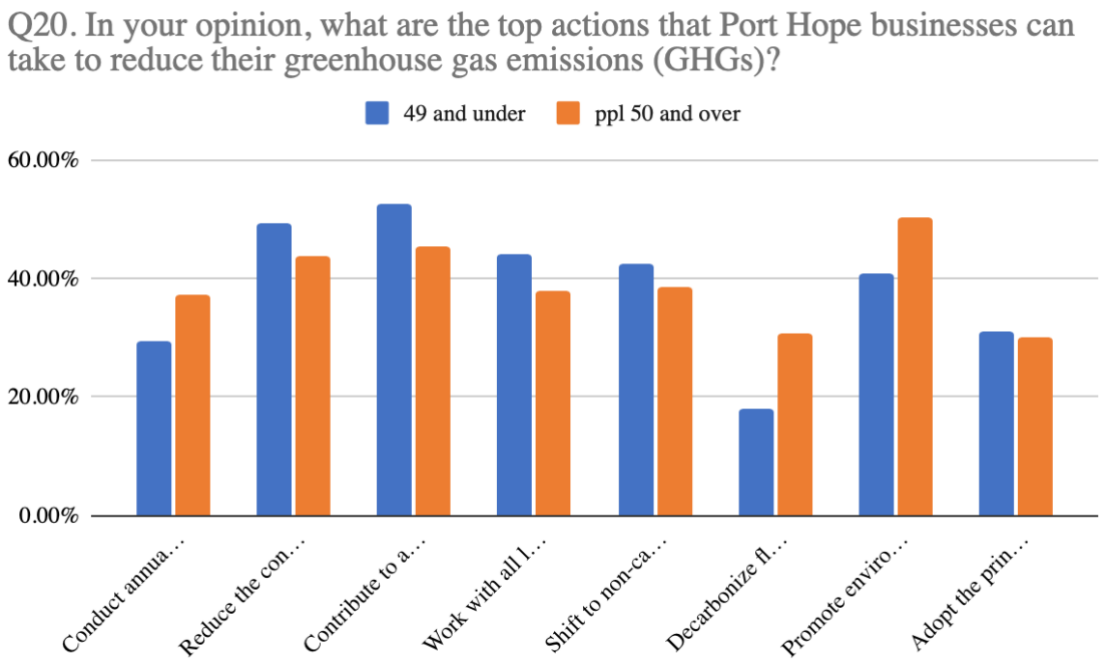

Figure 10: Survey results Q20

Q.21 - Again, there were no major differences between the two groups in their response to this question, with the most popular response for both being that such products were expensive but worth it. The 50 and over age group was slightly more likely to say that such products were not too expensive, which makes sense, given that they were overall slightly more affluent in this survey sample. What's more, this could point towards a high belief in consumer power and individual actions, which would reflect their responses to previous questions wherein they tended more towards selections that focused on consumer actions than the younger group. This was supported by an observation of the "Other" written answers for this question, in which some younger respondents wrote their own answers that showed them to be very critical of "green-washing" and of the idea that eco-products could be accessible for everyone, regardless of cost.

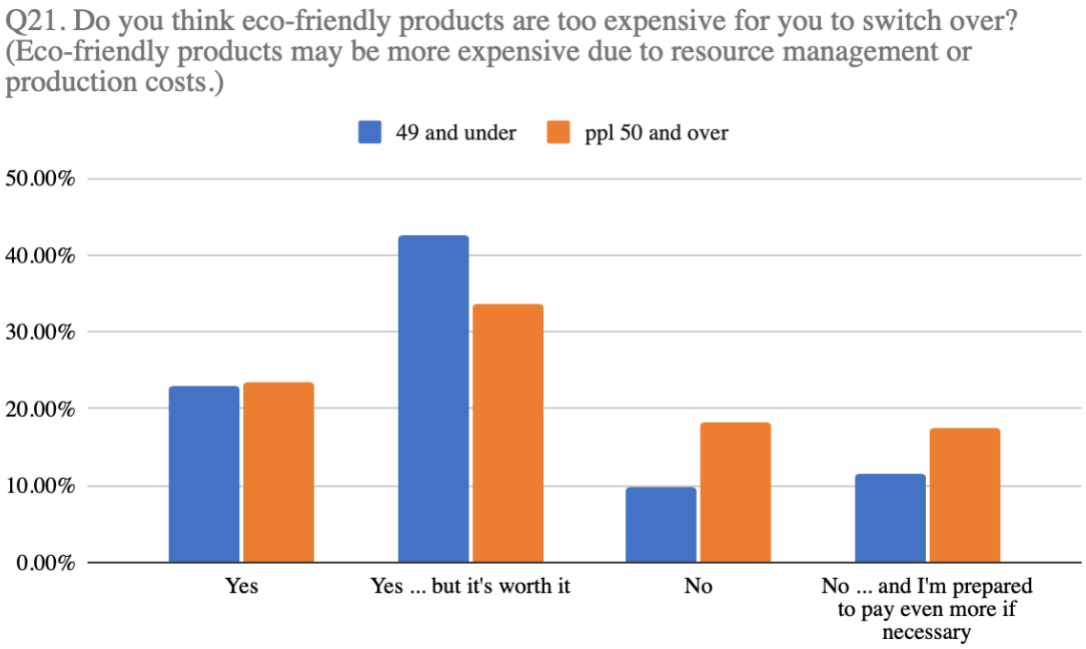

Figure 11: Survey results Q21

Q.22 - The vast majority of both groups were in agreement that the government should incentivize private companies in Port Hope to reduce emissions, and there were no differences observed between the two demographic groups. There are a variety of options for such incentives, like energy efficiency rebates, carbon tax incentives, and pollution control subsidies, to name a few. The opinion of Port Hope respondents here is supported by the literature. To that end, many authors agree that without public incentives for private companies, it will be difficult to achieve the type of action necessary to combat climate

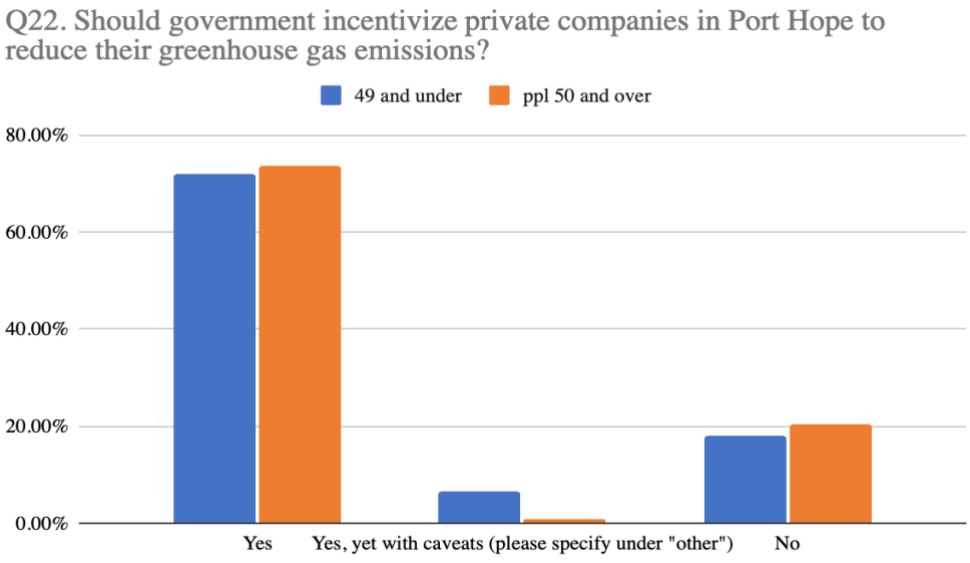

Figure 12: Survey results Q22

change (Perkins, 2012).

Q.23 - There was an agreement among both groups on the performance of the private sector in addressing current issues related to climate change.

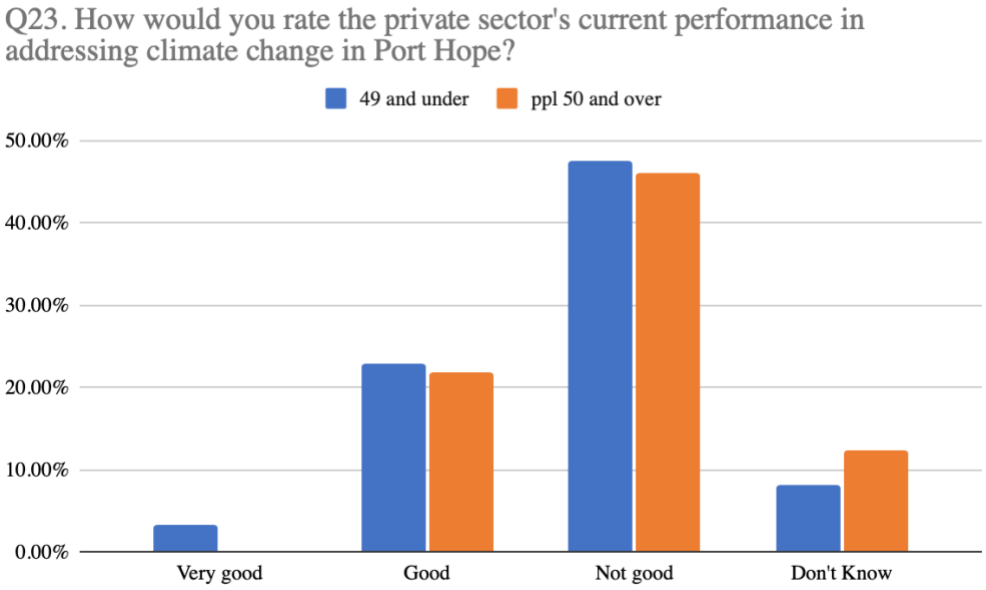

Figure 13: Survey results Q23

Among both the categories, the majority agreed that the current performance of private organizations was “not good” (48% for 49 and under, and 46% for 50 and over), while 23% of 49 and under and 22% 50 and over voted that the performance was “good”. There were a high number of “Other” responses to this question, many of which expressed that they either didn’t know what actions the private sector had taken or didn’t think that they were doing well.

Q.24- Just as they were in agreement on the performance of the private sector when it comes to climate change, the two demographics were largely in agreement in their perception of the actions of the public sector. A majority of both the age groups voted that the performance of the public sector was “not good” (48% for 49 and under and 48% for 50 and over). About 31% of those 49 and under, and 24% of the 50 and over group voted that the performance was “good”. Combined with responses to question 23, this shows that survey respondents are largely unsatisfied with the performance of both the private and public sectors in addressing climate change in Port Hope.

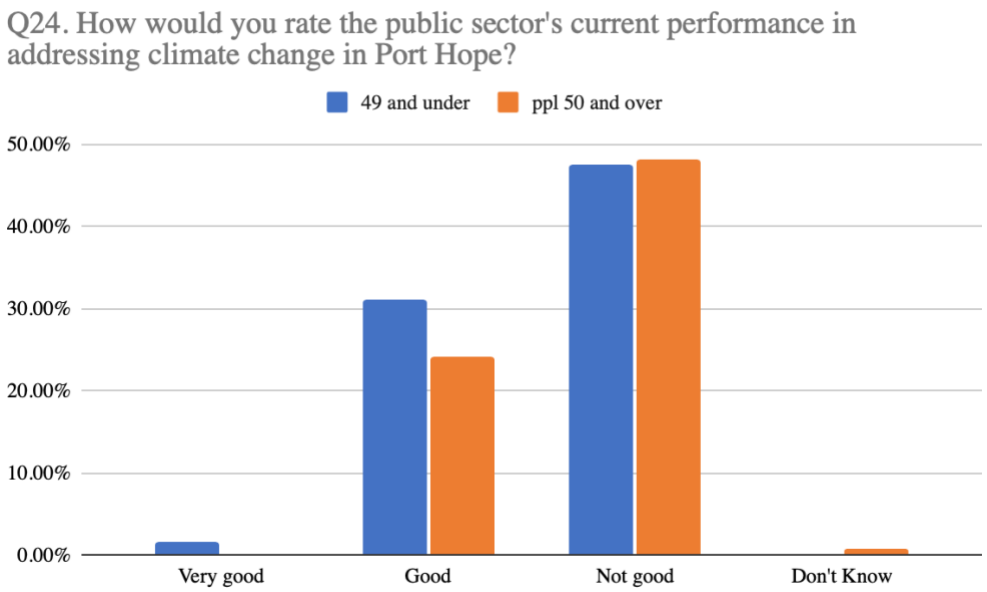

Figure 14: Survey results Q24

Q.25 - The four most popular selections in this question are shared by the 49 and under and 50 and over age groups, and all hold a similar 60%+ selection rate. These were that local communities are able to rally people and resources needed, they directly experience climate change, they can access information needed to address climate change at a grassroots level, and that they know what's best for their town or city. The only small difference is that 13% more of the 50 and over age group agreed that local communities exhibit higher concentrations of GHG emissions than rural areas - which was the least popular response for both groups.

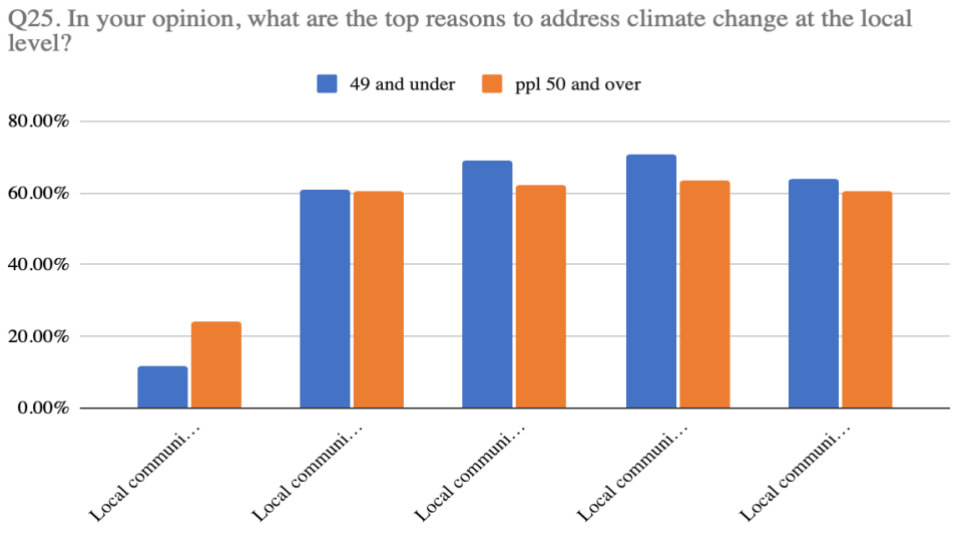

Figure 15: Survey results Q25

Q. 26 - There were no major differences between the two groups when it came to the knowledge of the recent actions taken by the municipality of Port Hope to address climate change and its impact. The most popular selection for both groups was that they knew that Port Hope was engaging local citizens and organizations around the issue of climate change. Overall, there was a significant lack of knowledge pertaining to Port Hope's actions, as the second most popular response for both age groups was that they didn't know what was being done by the municipality to combat climate change. This is decidedly problematic, as we know from the literature that local awareness is the key step towards local engagement, and without awareness of what actions are being taken locally it is exceedingly difficult to involve oneself with them (Marzano et al., 2015).

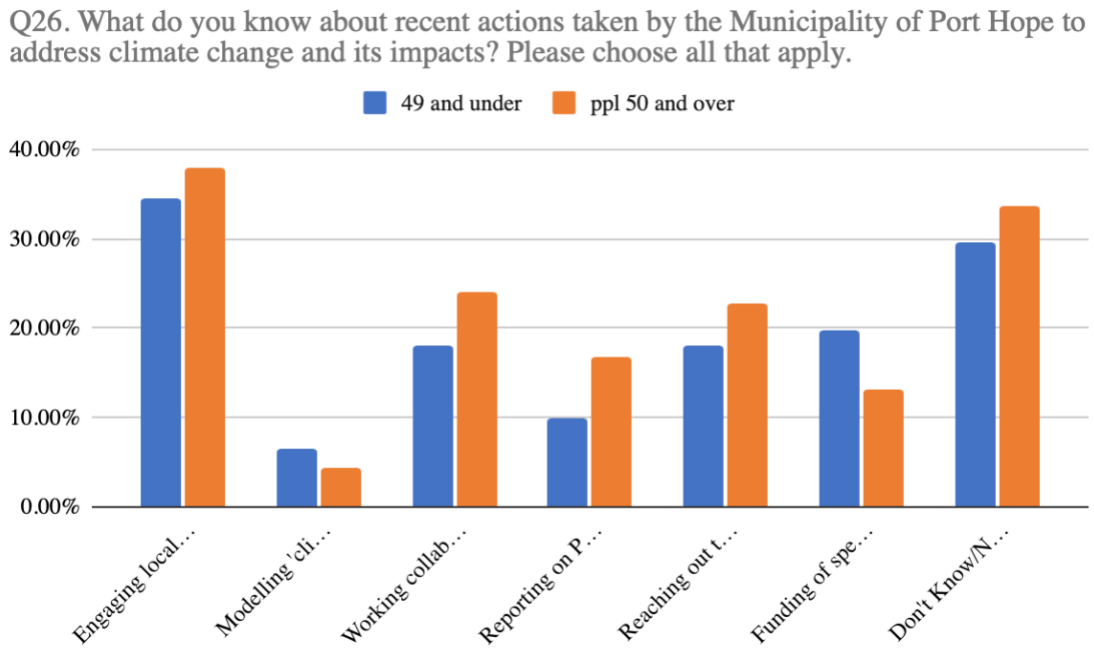

Figure 16: Survey results Q26

Q.27 - The top climate mitigation actions were shared by both groups, those being protecting and expanding the local tree canopy and ensuring municipal assets utilize best practices in decarbonization. That being said, 13% more people in the 50 and over category selected ensuring that municipal assets used best practices in decarbonization. Other disagreements were seen in the less-popular answers, as the 49 and under group were 12% more likely (49% vs. 37%) to select enhancing and expanding public transportation as a potential mitigation action for the municipality. The older group was 11% (37% vs 26%) more likely to identify enabling the community-wide shift to electric vehicles as a potential solution. We see in responses to this question a microcosm of a trend that has been emergent throughout our analysis of this survey: the younger group tended towards the more collectivist solution of improved public transportation, while the older group were more in favor of the individual, consumerist solution of enabling a shift to electric vehicles.

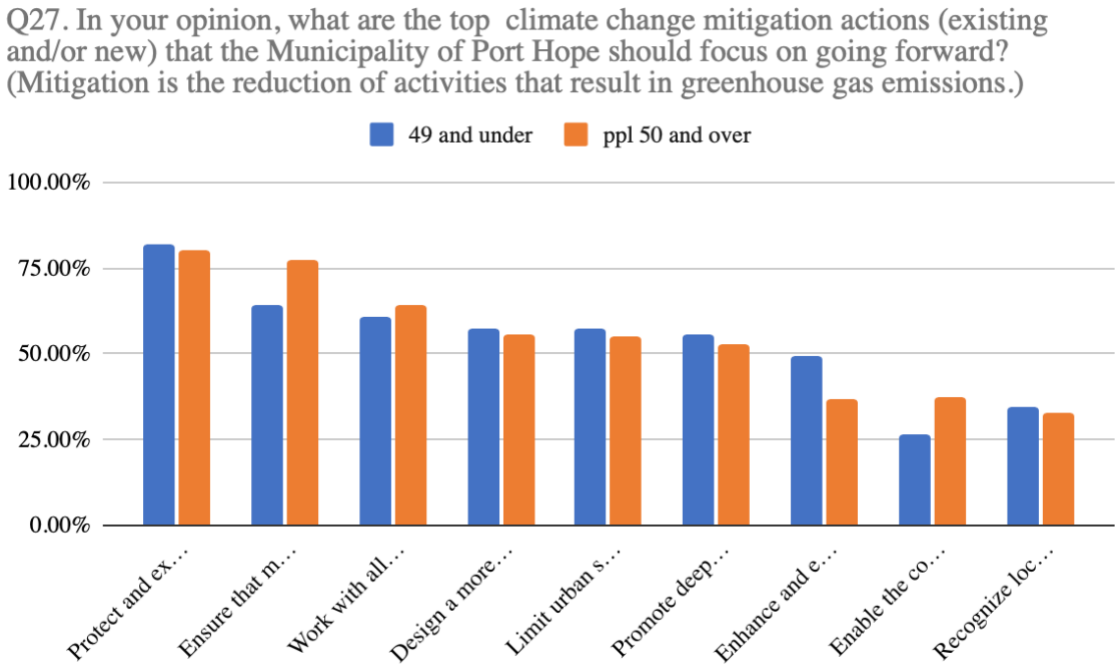

Figure 17: Survey results Q27

Q.28 - Unlike mitigation actions, there were notable discrepancies between the groups when it came to potential adaptation actions. The most popular selection (82%) among the 49 and under group was to amend bylaws to enable sustainable practices such as backyard agriculture and urban intensification, which was selected by only 55% of the 50 and over group - a 27% difference, the highest in this section of the survey. This could be reflective of a sort of old-fashioned NIMBY mentality, which has been linked to age by some studies in the past (Groothuis & Miller, 1994).

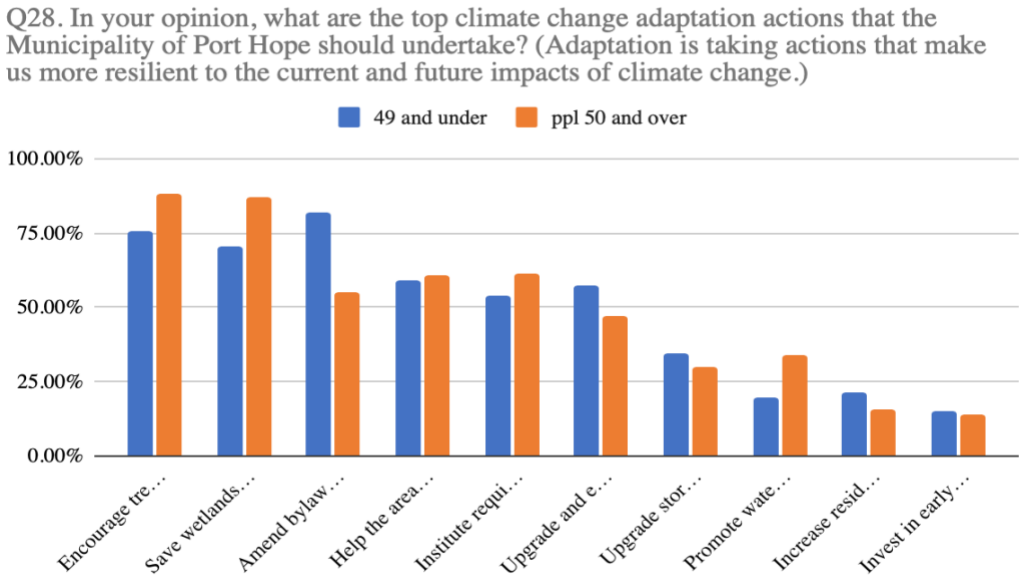

Figure 18: Survey results Q28

The most popular answer for the 50 and over group was to encourage tree planting and protection, which received support from 88% of that group and 75% of 49 and under respondents. Those in the 49 and under group were also 16% (87% vs 71%) more likely than the 49 and under group to select saving wetlands across the Ganaraska watershed as a top adaptation action. 14% (34% vs. 20%) more respondents in the 50 and over group saw promoting water conservation practices in anticipation of drought conditions as a top adaptation action.

Q.29 - Priorities

- Local economic development and job creation
    - The two groups were largely in agreement on how they feel economic development and job creation should be prioritized. 48% of both groups agreed that it should be a high priority for the municipal government.
- New Housing
    - The two groups were also largely in agreement on how they felt new housing should be prioritized, with the most popular answer for each demographic being that new housing should be a medium priority.
- Quality of life improvements
    - There were no differences in how either group viewed the prioritization of quality-of-life improvements, which both identified it mainly as a high priority issue.
- Limiting Increases to taxes and other charges
    - 12% more of those in the 49 and under age group identified this as a low priority issue than did those 50 and over, but both groups were in agreement overall, with both groups mainly identifying limiting tax increases and other charges as a medium priority issue,
- Affordable housing
    - While the majority of both groups identified this as a high priority issue, those that were 49 and under were 12% more likely to view this issue as a high priority for the municipality.
- Municipal infrastructure
    - Upgrading or building new municipal infrastructure was seen by the majority of both groups as a medium priority issue, and there were no differences in how each group perceived this sector.
- First Nations rights and reconciliation
    - This was the policy area that saw the largest differences between the two age groups in the survey. Those that were 49 and under were 23% more likely to see it as a high priority issue (61% vs. 37%), while the 50 and over group were 22% more likely to view it as a low priority issue. The groups were thus significantly divided on how they perceived the issue of First Nations rights and reconciliation. This is a potentially concerning trend, and there is not yet much research on the linkage between views on First Nations rights and reconciliation and age, so this is a worthy avenue for further exploration.
- Supports for local agricultural community -
    - The majority of both groups agreed that support for the local agricultural community should be a high priority for the municipal government. That being said, those in the 49

and under group were 11% more likely to see it as a high priority issue than those 50 and over.

- Public Transportation -
    - The two groups were somewhat divided on this issue, as those in the 49 and under were 20% more likely to see public transportation as a high priority issue, while those that were 50 and over were 19% more likely to see it as a medium priority issue. This reflects the other public transportation-related responses in this survey, which similarly show that the 49 and under group hold public transportation in higher importance than those who are 50 and over. This is logical, as public transportation is highest among younger populations and generally declines with age (Statista & Ipsos, 2015).
- Supports for vulnerable populations -
    - The majority of both groups identified supports for vulnerable populations as a high priority issue. There was one small difference, however. The 49 and under group was 10% more likely to see this as a high priority issue than were the 50 and over group. This again may point to the potentially more-individualistic outlook of the 50 and over compared to the 49 and under group.
- Climate change in Port Hope -
    - Both groups agreed that climate change in Port Hope is a high priority issue, but the 49 and under group were slightly more emphatic in this regard - they were 13% more likely to identify it as high priority than the 50 and over group.

Overall, the two groups were largely similar in the way that they identified priorities for the municipality and identified the same primary priority level for nearly every issue. That being said, there were two categories where large differences were observed: First Nations rights and reconciliation, and public transportation - with the younger group holding both of these issues in much higher priority than the older demographic.

Section 3: Public Transportation

Q.16 - The 49 and under group was 10.9% more likely to prefer to own a pure electric vehicle than the 50 and over group. In fact, it was their most popular choice, being selected by 46% of respondents in that group. This is in line with what is seen in the literature, as electric vehicle ownership has been found to be concentrated in the 30-45 age group (Sovacool et al., 2018). On the other hand, the most popular choice for the 50 and over group was hybrid vehicles, which were chosen by 46% of that age group.

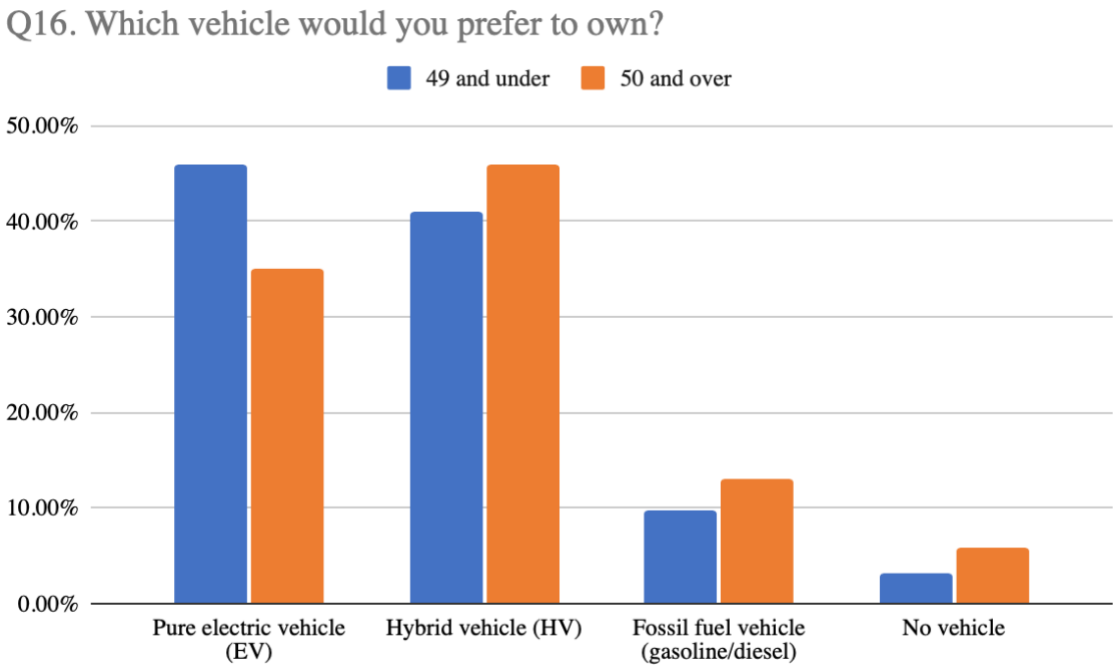

Figure 19: Survey results Q16

Q.17 -There were no major differences between the two groups in their response to this question, with 92% of those 49 and under and 97% of those 50 and over selecting that they seldom use public transportation.

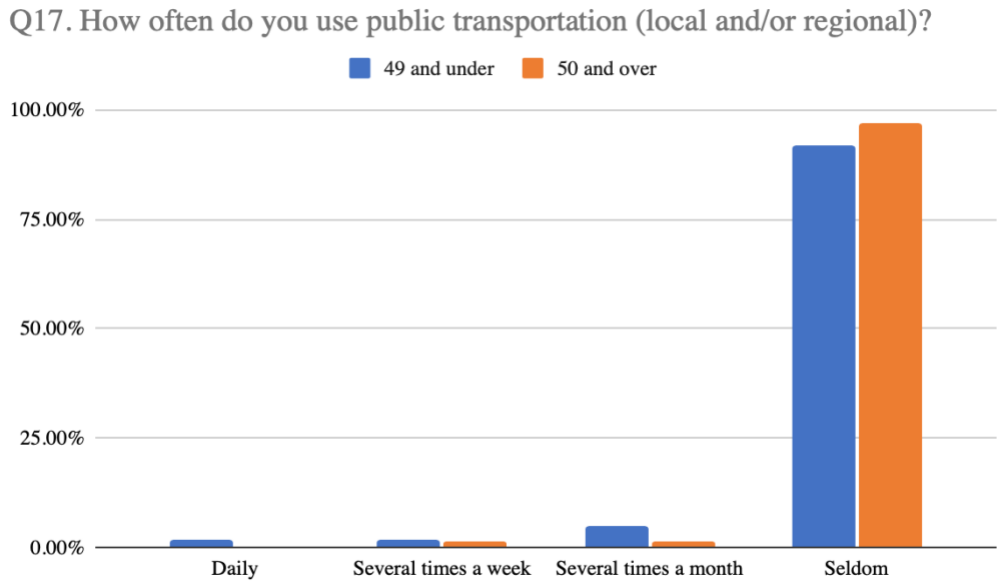

Figure 20: Survey results Q17

Q.18 - The 49 and under group was approximately 21% more likely to rate Port Hope's public transportation as "Poor," as this option was selected by approximately 36% of the group - making it their most popular choice. On the other hand, the most popular choice for the 50 and over group was "Good" - although 20% of 50 and over respondents selected it, compared to 15% of the 49 and under group.

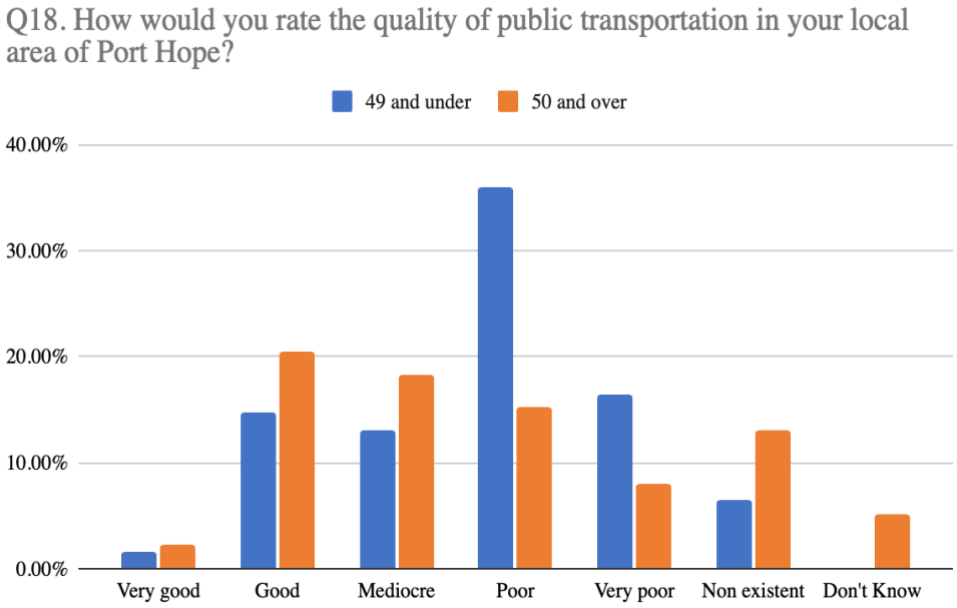

Figure 21: Survey results Q18

Q.19 - The 49 and under group was generally much more enthusiastic about improvements to Port Hope's public transportation that focused on cycling than the 50 and over group. Around 25% more respondents 49 and under selected bicycle lockups at mobility hubs as an important improvement, and 12% more selected dedicated bike lanes, making these the two most popular options among that age group.

Encouragingly, increasing accessibility to cycling has been identified by some researchers as a potential high-yield low-cost way to contribute to the reduction of GHG emissions locally (Mizdrak et al., 2020; Taylor & Hiblin, 2017). On the other hand, the most popular selection for the 50 and over group was an on-demand minibus, which was selected by 39% of that age group. The 50 and over group was somewhat less enthusiastic about potential improvements to be made, on average selecting less improvements per person than the 49 and under group. This could point towards skepticism about the potential for Port Hope's public transportation improvement, or that they would not want improvements because they would not use the public transportation system anyway.

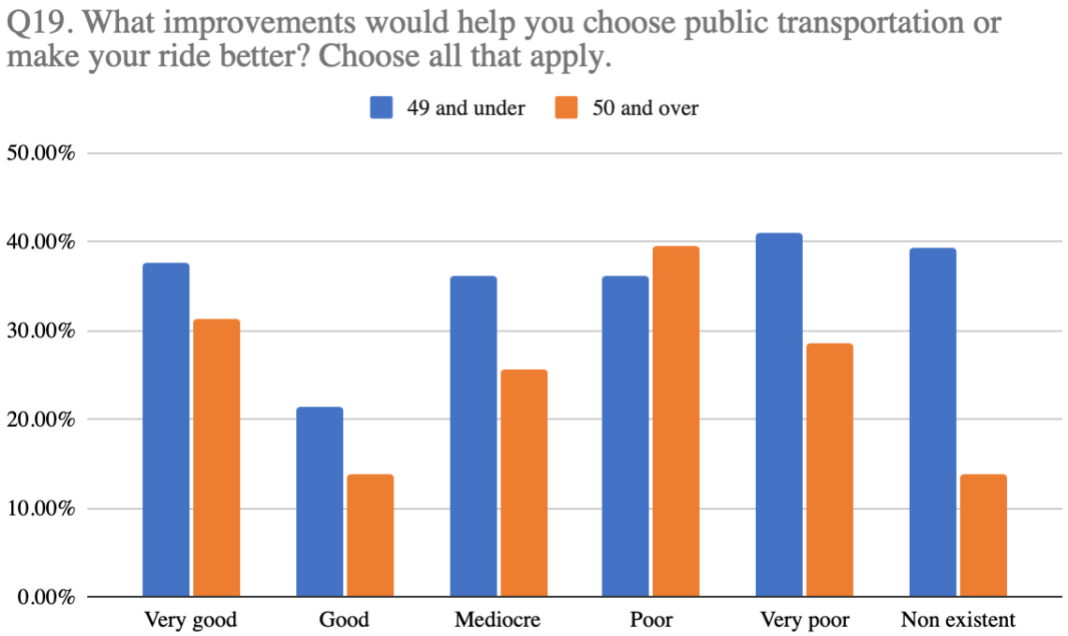

Figure 22: Survey results Q19

Section 4: Role of Social Media

Q. 30 - The 49 and under group spent more than 2 hours on social media with 33% of the respondents choosing this option. In contrast, the 50 and over group spent less than 30 mins on social media platforms, with about 39% of respondents voting for this option.

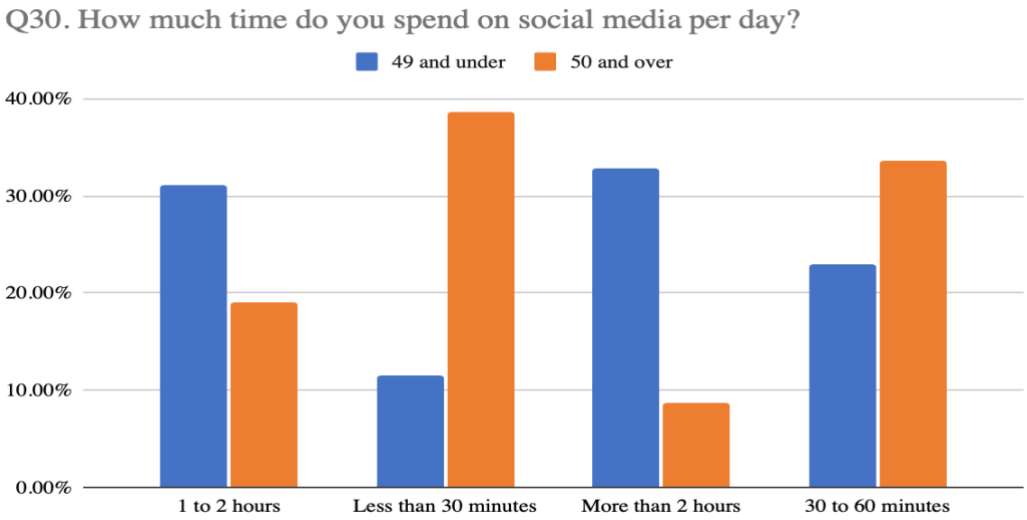

Figure 23: Survey results Q30

Q. 31 - The most popular social media platform among both the age groups was Facebook, with 82% of the 49 and under and 70% 50 and over selecting this as their preferred option.

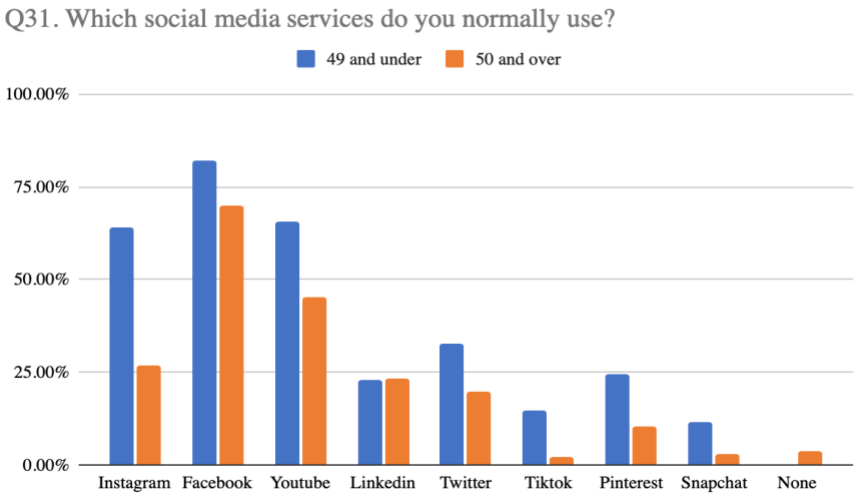

Figure 24: Survey results Q31

The 49 and under also voted for Youtube (66%) and Instagram (64%) making them popular choices after Facebook among this age group. On the other hand, 45% and 23% of the 50 and over age group used Youtube and LinkedIn respectively. It is noteworthy that the usage of upcoming platforms such as Twitter, TikTok and Pinterest by these two age groups suggests disparities. For instance, about 33% of 49 and under used Twitter compared to 20% of 50 and over, while 15% of 49 and under used TikTok compared to 3% 50 and over, indicating differences of 13% and 13% respectively.

Q. 32 - The most preferred form of receiving information for 49 and under group is via short videos (Tiktok, Instagram, Facebook) with 72%, followed by pictures (Instagram, Facebook, Twitter) at 54%, long videos (Youtube) at 31%, Discussion platforms (Reddit, Quora) at 16% and texts (Twitter) at 15%. These results have a similarity with the 50 and over age group, with the short video category receiving the highest votes (54%), followed by pictures (39%), and lastly long videos (21%). The only points of difference were the discussion forums and texts, which received votes of 8% and 16% respectively.

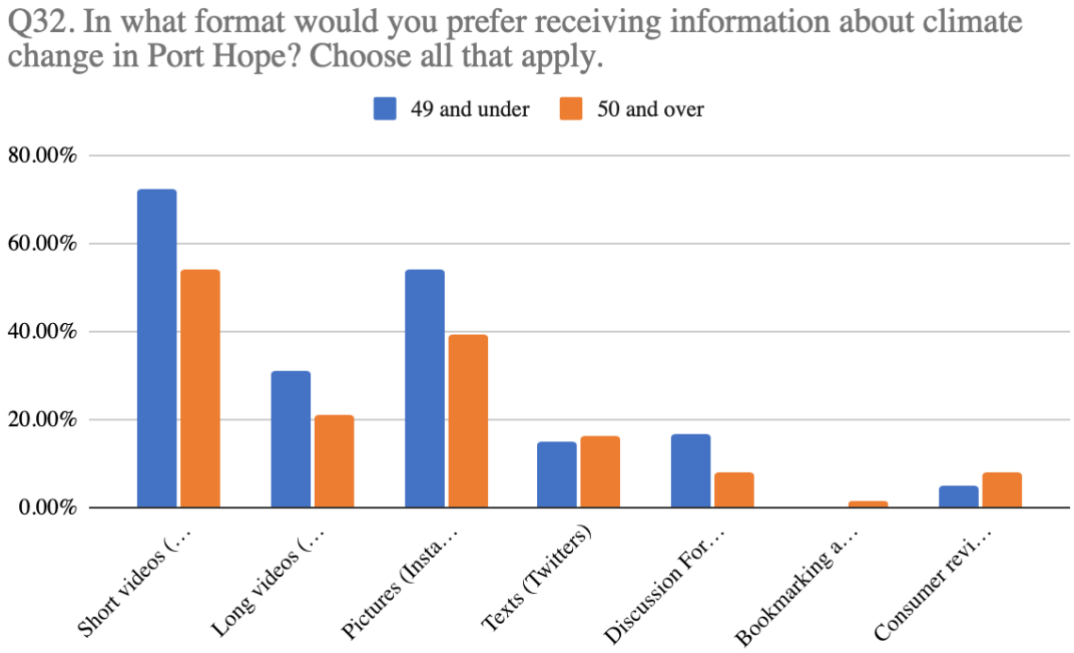

Figure 25: Survey results Q32

Q. 33 - As mentioned above, Facebook is the popular choice of social media among both age groups. This is also reflected in the answers to this question, with 74% and 47% of respondents in the 49 and under and 50 and over age group respectively voting for the Facebook page @MunicipalityofPortHope as their first choice. The 49 and under group also voted the Instagram pages @exploreporthope and @porthopeontario as their second and third choices with 38% and 36% votes respectively. Among the 50 and over group, 20% voted for none of the social media channels.

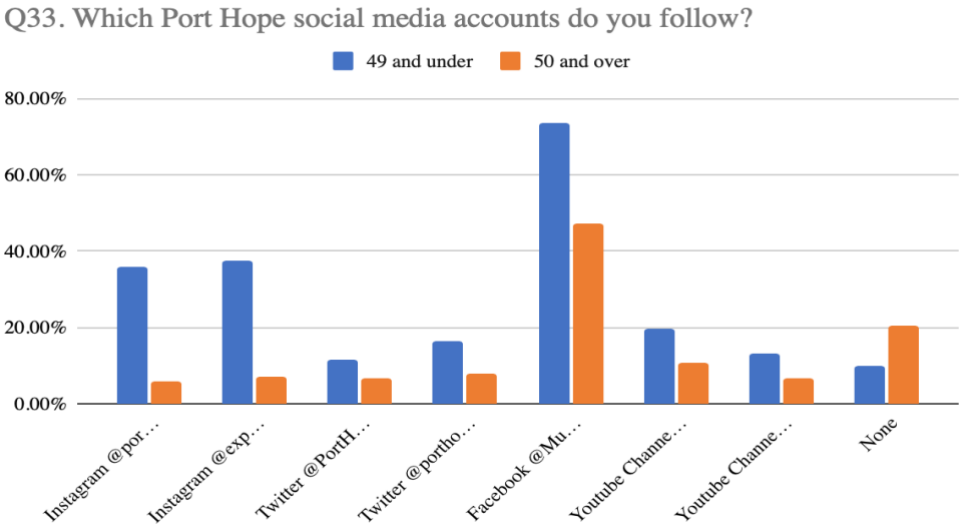

Figure 26: Survey results Q33

Q. 34 - About 46% of the 49 and under group noted that they viewed information about climate change "sometimes" and 33% viewed "often". The results of the 50 and over are interesting because the frequency of receiving information related to climate change is quite less. For instance, only 28% voted that they received such information "often", while 28% and 24% only received it "sometimes" or "rarely" respectively. Furthermore, 16% voted that they had "never" seen content relating to climate change on social media platforms.

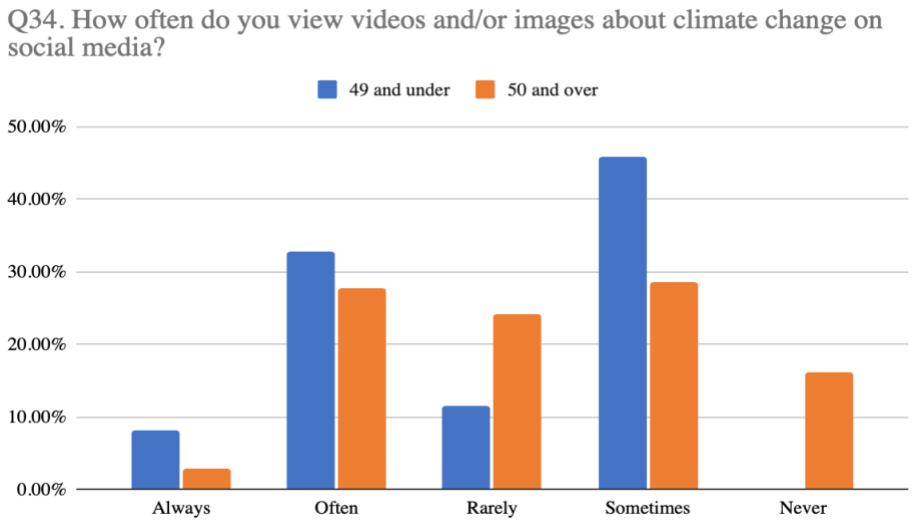

Figure 27: Survey results Q34

Q. 35 - In general, the respondents both 49 and under and 50 and over were likely to follow Port Hope's social media accounts, with this option receiving about 39% and 32% votes respectively.

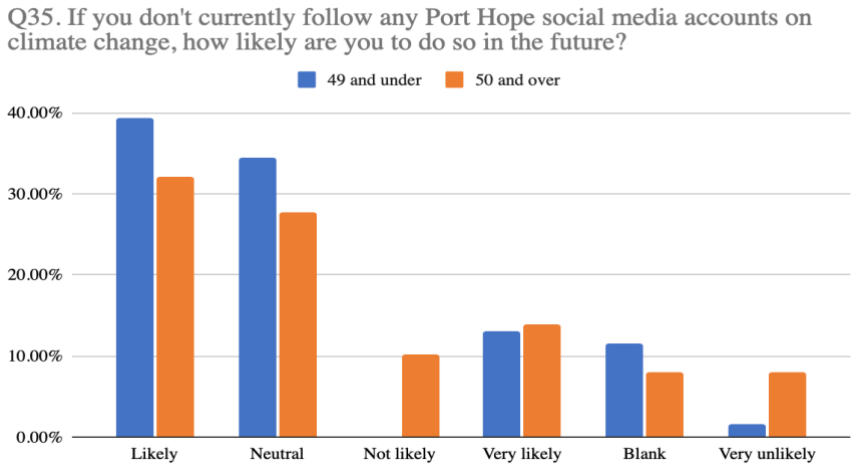

Figure 28: Survey results

About 34% of 49 and under had a neutral response to this question and a similar trend was noticeable among the 50 and over category with 28% of votes for the neutral option. 10% of the 50 and over responded that they were “not likely” to follow their local social media accounts, suggesting low interaction of this age group with social media.

Conclusion

Overall, we can see that age is linked to differing perspectives on some issues, but not others. The issues over which age played the largest role were in public transportation and First Nations rights and reconciliation. In general, the younger group tended to be slightly more altruistic/collectivist, while the older group was slightly more individualistic in the way that they perceived climate change and potential actions that could be taken in light of it. Social media was also an area where we saw significant differences between the two age groups, with the younger group being more active on social media and viewing more climate change-related information on those platforms than the older age group.

In general, the two groups were similar in their perspectives on other issues, like how they perceived the roles of the public and private sectors, as well as how they perceive the actions of those sectors thus far. This would indicate to us in large part that potential actions taken by the Port Hope government - outside of public transportation and First Nations rights and reconciliation - will likely be viewed somewhat similarly between both age groups.

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Rural-/Urban-based comparative report

By Yagiz Ercin and Mateo Orrantia, April 2021

Abstract

In this study, a comprehensive survey previously prepared by McMaster students and conducted for the Port Hope climate change situation was examined through a rural-urban perspective. This survey was conducted to better understand the local climate change situation, reveal public perspectives, and help inform the local government to address emerging issues. The survey has 36 questions that were categorized under participant demographics, awareness and perspectives on climate change, views on climate change from a community perspective and a local government perspective, as well as social media usage. Accordingly, all the data was analyzed considering the similarities and differences of rural and urban respondents. Findings have shown that both groups have similar demographics, common points of view, and identified the same things as top priorities and actions vis-a-vis climate change. That said, there were some differences, particularly in perspectives on public transit. From the data, two policy recommendations arose. The first policy recommendation was suggested based on the observation of the need for increased climate change-related outreach and engagement initiatives which have been found limited from survey results. Subsequently, our second policy recommendation was suggested based on the prominent need for local tree canopy, support for local agriculture and better-adapted farming practices.

Introduction

This paper is a small part of an overarching collaborative effort between McMaster University, the Port Hope Centre for Excellence Climate Change Working Group, and the municipality of Port Hope. Here, our part of the project is a natural follow-up to the previous work completed in the partnership. In particular, we will analyze the responses to a community survey on climate change and climate change planning (presently known as Port Hope Working Group on Climate Change) developed by a previous team of students in collaboration with the Centre for Excellence Working Group. In this paper, we will go over and analyze the results of the community survey as they pertain to rural and urban respondents. Following this analysis, we will propose some potential policy directions for the municipality in light of the data.

Background

Climate Change and Livable Cities

Cities are at the front line of climate change. In many ways, changes in ecological and climatic environments due to climate change undeniably affect the livability of cities. Heatwaves and extreme precipitation are key examples of such impacts. Specifically, extreme heat conditions not only reduce resident's comfort, but can pose fatal threats for vulnerable populations (National Health Service, 2010). Aside from increasing levels of mortality due to heatwaves, it can also affect peoples' stress level, mobility, social interactions and even financial situations (Bolitho & Miller, 2017). Similarly, climate change can also make winter conditions more unpredictable. In these ways, it directly influences urban livability by posing

threats and bringing disturbances to the way people live and their settlements. Therefore, planning for - and attempting to mitigate and adapt to - such changes including public health, social services and infrastructures are required to reduce the vulnerability of societies (Bolitho & Miller, 2017).

For these reasons, governments, municipalities, and international organizations have been collaboratively looking for efficient, quick and long-lasting solutions to climate. Accordingly, climate leadership group C40 has announced that cities themselves can be the solution to climate change. As their nature is more suitable for quick and decisive actions and as a result, there is a higher level of chance to see immediate and impactful results (C40 Cities Climate Leadership Group, n.d.). Thus, such individual achievements can be a roadmap for other communities and governments to take action towards both mitigation of, and adaptation to, climate change.

The Port Hope Project

This work is part of a broader project between the municipality of Port Hope, The Port Hope Centre of Excellence Sustainability Working Group, and McMaster University through the W Booth School of Engineering Practice and Technology. The goal of the overall project is to collect and analyze information from a variety of sources to help inform the creation of a Climate Change Action Plan by the municipality of Port Hope that addresses both mitigation and adaptation concerns. The role of McMaster in this partnership is as a support organization to the Working Group, helping build local capacity and advance the mandate of the organization. McMaster's goal is not to put together a Climate Change Action Plan for Port Hope, but rather to enable and empower the community to create their own.

Situated on the northern shore of Lake Ontario on the Ganaraska River, Port Hope is a small city of approximately 17 000 residents (Statistics Canada, 2017), surrounded by farmland. Northumberland County, within which Port Hope finds itself, has a population of approximately 85 000 (Statistics Canada, 2017).

Stretching from the headwaters of the St. Lawrence to the westernmost tip of Lake Superior, the Great Lakes contain 21% of the world's surface freshwater (EPA, 2015) - making them arguably the most important freshwater system in Canada, if not the world. Climate change stands to devastatingly impact the Great Lakes region, and some of its effects have already been felt (Kling et al., 2003). Gradually decreasing ice cover has been observed on Lake Superior since 1980, as have gradually increased surface temperatures (Krumenaker, 2014). In fact, Lake Superior itself has been shown to be warming at twice the rate of the air in the region (Krumenaker, 2014). Increasing temperatures have numerous consequences for the lakes and the communities that surround them. First, warmer temperatures result in less lake ice cover, which in turn result in greater evaporation during the winter months. This causes lake levels to gradually decrease over time, which is what we are observing: a general trend towards decreasing lake levels in the Great Lakes (Krantzberg, 2019). Lower lake levels can have devastating animal and human impacts, causing the destruction of valuable habitat like wetlands, but also causing the extension of shorelines, which can in turn impact human processes like water collection and waste disposal (Kling et al., 2003). Warmer lake temperatures stand to totally change species distributions and populations in the Great Lakes regions, making it easier for invasive species to make their way into our

ecosystems (Krumenaker, 2014). Further, they are likely to result in increased incidences of toxic algal blooms and the unpredictable movement of toxins through water systems, posing new health threats to nearby residents (Krumenaker, 2014; Krantzberg, 2019).

Severe storms are likely to become more frequent in the Great Lakes region, and earlier melting ice coupled with these storms is likely to result in significant flooding events and lake levels that are extremely high in some years (Krumenaker, 2014). This is what happened in 2010, when the town of Cobourg, near Port Hope, experienced a massive flooding event (Dillon, 2010). Severe storms pose severe threats to human infrastructure like sewage systems and agricultural lands (as they can be significantly eroded by storms) - which puts large amounts of waste or contaminants into local waterways, thereby impacting local ecosystems as well (Krantzberg, 2019). Similarly, extreme heat days are expected to increase, and average air temperatures are projected to climb as well.

Port Hope already has intimate knowledge of the destructive potential of severe storm events, the likes of which will likely become much more frequent under climate change conditions. In 1980, the Ganaraska spilled its banks, covering 66 acres of downtown Port Hope in 1.5 metres of water (Ganaraska Region Conservation Authority, 2009). This calls attention to the new demands that climate change will place on local governments to adapt to new conditions and do what they can to mitigate climate change, as local municipalities have control over about half of Canada's total emissions (Hill and Perun, 2018). It will impact local drinking water, sewer, stormwater, and manure management systems, in addition to having implications for human health, vector-borne diseases, and insect and pest controls, among other things (Krantzberg, 2019). Also of importance is the way that it will impact agriculture, an important economic base of the Port Hope region. Almost certainly, it will call for new agricultural practices like the integration of climate predictions into agriculture planning, the adoption of new varieties that may be more temperature resilient, new irrigation systems, etc. (Krantzberg, 2019). However, it must be recognized that there are significant barriers faced by mid-sized cities like Port Hope in their pursuit of these efforts: there are financial, institutional, and governmental barriers that might stand in the way of proper planning and implementation (Hill and Perun, 2018).

Why the Rural-Urban Lens:

The County of Northumberland, and the Port Hope area specifically, contain significant rural populations, as 80% of their land area is made up of rural spaces and farmland (Northumberland County and Meridian Planning, 2016). Going forward, approximately 20% of the County of Northumberland's growth is predicted to be in rural areas (Northumberland County and Meridian Planning, 2016). Importantly, the agricultural sector that these rural residents represent is a significant economic base for the region. It's therefore important that we understand how this demographic feels about the issues posed by climate change and the potential actions that could be taken by local governments.

Moreover, there are differences in the way that climate change might affect urban and rural areas. A study of urban and rural areas in eastern Europe found that urban areas are likely to feel greater effects of climate change, as the nature of their built environment is likely to lead to greater increases in

heat than their rural counterparts (Zelenakova et al., 2015). Some think that rural agricultural areas, the likes of which are found in the Port Hope area, will benefit from climate change by it bringing longer growing seasons—however, we must recognize that rural areas are much more vulnerable to the deleterious impacts of climate change due to a higher dependence on natural resources, limited economic diversification, older populations, and less institutional resources (Bukvic and Harrald, 2019; Lal et al., 2011). Furthermore, rural areas can be more fragile when it comes to flooding events, as they can have large impacts on an economic, social, and cultural scale in these less-populated areas (Bukvic and Harrald, 2019). On the other hand, due to a lack of absorptive surfaces due to changes in land use, it is possible that urban areas are more likely to experience flooding events than rural areas (Bukvic and Harrald, 2019).

Rural and urban areas also generally have different perspectives when it comes to preferred responses to climate change (Bukvic and Harrald, 2019). There may be a perception from residents of both location types that urban areas contribute more to climate change than rural areas, which in some ways is true (Zelenakova et al., 2015). Many have made the call that there need to be distinct policies for rural and urban areas to address climate change and emphasize that what works in one area may not work in another (Lal et al., 2011). Even more generally than climate change, studies have identified an urban-rural political divide in Canada, as urban and rural residents often differ on preferred political parties and typically have different voting tendencies (Roy et al., 2015).

With all this being said, we can see why it is important that we consider the ways in which rural and urban populations in the Port Hope area differ on climate change and the policy responses they would like to see local governments take.

Methods

As previously mentioned, a community survey has been conducted to identify local perceptions and insights about climate change and its effects on Port Hope and surrounding areas. This survey was designed by a previous group of McMaster students and was publicized through a variety of means including email, social media, and the local Port Hope newspaper. This survey was split into five categories. The first section covers general questions on participant's demographics. The second section focuses on the level of awareness of climate change in general. The next section is similar to the previous one but specifically designed to understand community views of the Port Hope situation. Subsequently, the fourth section focuses on revealing perspectives on local government and climate change actions. Lastly, the final section touches on social media usage patterns of participants.

Given the fact that we are working on a very limited time frame, having only received the data on April 1st, the data analysis here is more of a general overview of rural vs. urban survey respondents. Answers for each question were split into rural and urban responses. From this overview, we hope to provide a series of potential policy directions that the municipality of Port Hope can pursue in light of the different (or similar) ways that urban and rural respondents perceive the issues at hand.

General Demographic Information

As it is seen in figure 1, 32.2% of survey respondents lived in rural areas, while 67.8% of respondents inhabited urban areas, for a total of 199 respondents. It should be noted, however, that participants were not given any criteria as to how to define urban vs. rural areas. As we know, the definition of rural can be highly variable, and so it's unclear how participants were classifying themselves as rural or otherwise. As previously mentioned, the county of Northumberland is primarily rural in terms of land area, but 80% of its approximately 86,000 residents live in urban cities with over 10,000 residents (Statistics Canada, 2016). There is thus a small that rural residents are over-represented in the survey. That said, it is possible that survey respondents live in Port Hope as defined by the census, but perceive themselves to live in a rural area.

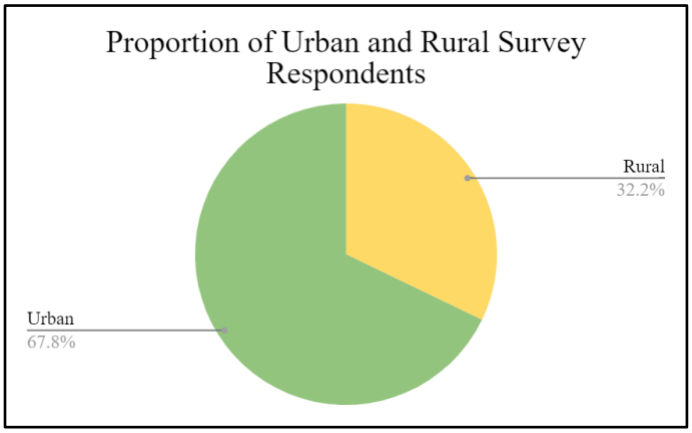

Fig 1. Urban vs. Rural Survey Respondents

The vast majority of survey respondents from both rural and urban areas either live in Port Hope, work in Port Hope, or both live and work in Port Hope. Respondents falling into these categories made up 82.8% of rural respondents, and 97% of urban respondents. This is a very promising result, as it demonstrates that survey results primarily reflect the opinions of local residents with intimate connections to Port Hope. There were 4 rural respondents that lived in the general area surrounding Port Hope. Interestingly, neither group was particularly likely to work in Port Hope. Approximately 75.1% of rural respondents categorized themselves as living in Port Hope, and yet only 29.7% of them worked in Port Hope. Similarly, approximately 96.6% of urban respondents lived in Port Hope, while only 40.3% worked there. Overall, only 29.6% of all respondents worked in Port Hope, compared to the 88.9% who identified as living in Port Hope. More details about the connection of survey respondents to Port Hope is given in figure 2.

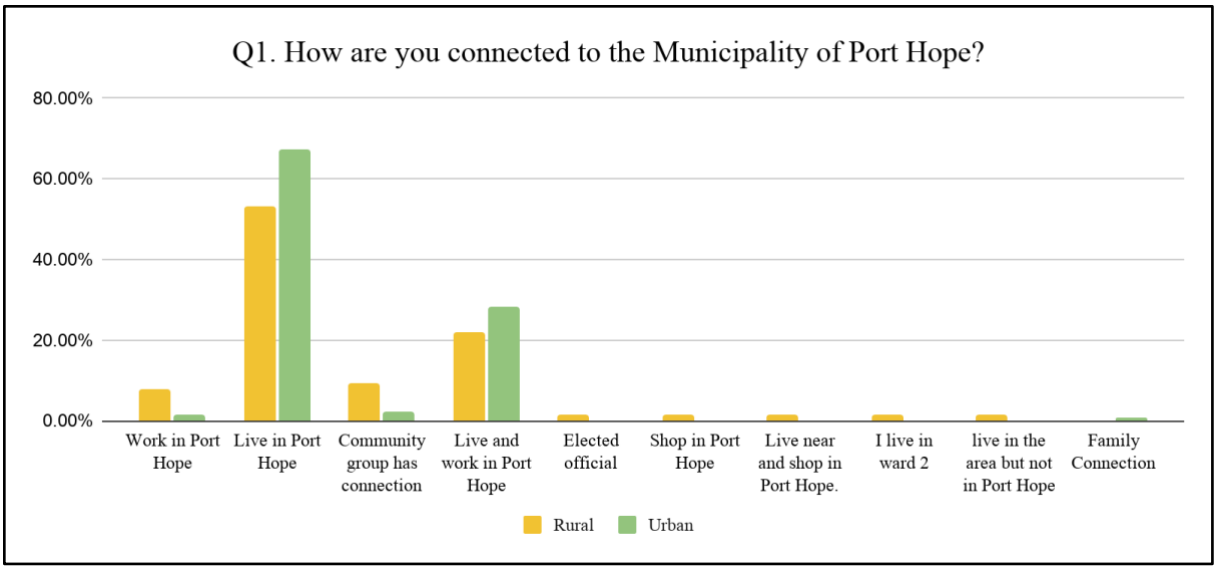

Fig 2. Survey respondent connection to Port Hope

Shown in Figure 3 is the distribution of respondents across all employment sectors that had 3 or more respondents - these categories making up approximately 88.9% of all respondents. Overall, approximately 64% of respondents were in the labour force, which is slightly higher than the rate of 59% identified for Port Hope in the Canadian census (Statistics Canada, 2017). The distribution of employment sectors is very similar across both urban and rural respondents, with the largest difference between these groups in a single sector being approximately 5%. As we can see, the most popular employment sector for both urban and rural residents is being retired, as retirees make up 40.6% of rural respondents and 35.6% of urban respondents. Retirees can be a very important demographic to capture in engagement initiatives, as they are generally more likely to be involved in civic engagement or in volunteering than working populations (Bogaard et al., 2014).

Interestingly, respondents employed in agriculture make up only 1.5% of total respondents, and there is little difference in its distribution between rural and urban respondents. This is interesting as much of the area surrounding Port Hope, especially rural areas, are made up largely of agricultural land. It is also somewhat concerning, as climate change stands to have a massive impact on local agriculture (Krantzberg, 2019). Moreover, student representation in the survey is also very low and is nonexistent in rural areas. This is particularly concerning, as it is often students that are the fiercest climate change activists, and are also the group that stands to lose the most from the impacts of climate change, being young (O'Brien et al., 2018). However, it is promising for this survey that it captured a very wide array of perspectives from different employment sectors.

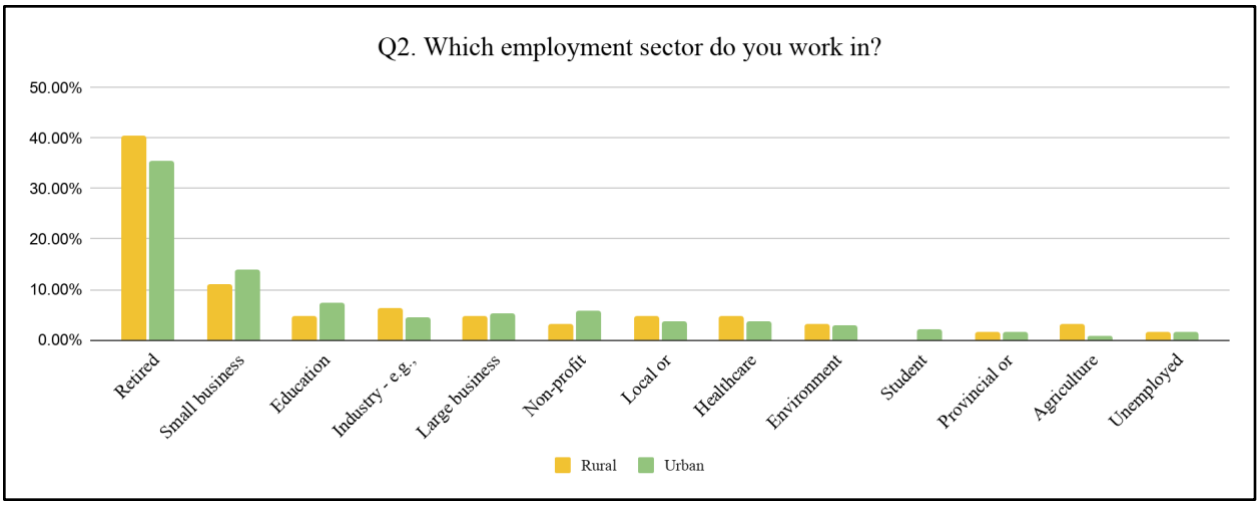

Fig 3. Survey Employment Sector

Figure 4 shows the age distribution of survey respondents. Overall, survey respondents were generally older, with 68.8% of all respondents being above 50 years of age. Rural respondents were slightly older than urban respondents, with approximately 78.1% of rural respondents being over 50 years of age. The biggest difference was seen in the 26-49 age group, who represented 20.3% of rural respondents and 31.9% of urban respondents. Moreover, there was a significant lack of respondents under 25 years of age in both urban and rural areas. Combined with low student participation, this may indicate that current outreach and engagement efforts are not being very effective in engaging individuals from this age group, which is problematic. The importance of youth participation in the fight against climate change cannot be understated and is well-emphasized in the literature (O'Brien et al., 2018). Although the population of Port Hope is generally older (Statistics Canada, 2017), survey respondents skewed older than what you would expect from census data. As such, it will be important to examine engagement efforts to look at how to reach both urban and rural youth and younger age groups in the Port Hope area.

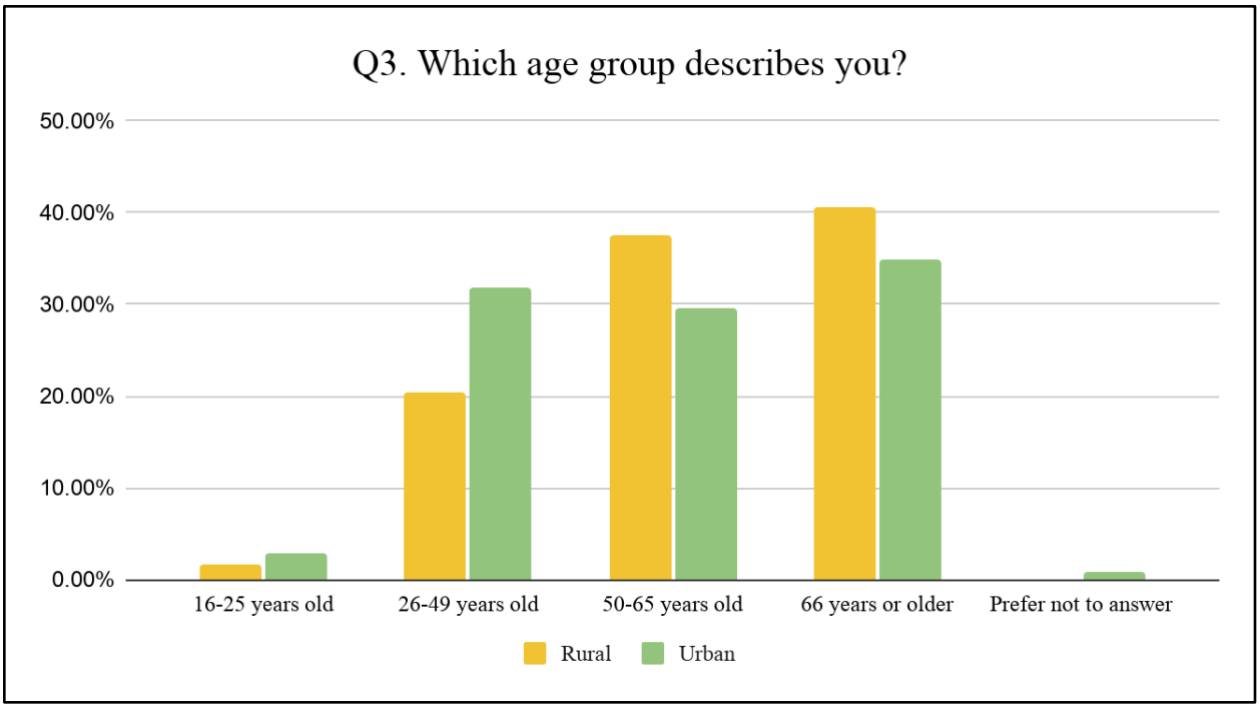

Fig 4. Survey Employment Sector

Engagement to environmental organizations of respondents is given in figure 5. The majority of both rural and urban respondents were not involved in any environmental organizations. However, participation in such organizations was far higher among rural respondents than urban respondents, at 32.8% for rural respondents and only 18.5% for urban respondents. This is a bigger difference than what is seen in the literature, as Statistics Canada found that rural respondents were generally more likely to be involved with volunteer organizations than urban respondents, although this difference was less than 10% (Turcotte, 2004). A wide range of different organizations were represented in participant responses, with Blue Dot Northumberland, Port Hope for Future, the Port Hope Working Group, and Willow Field Naturalists being the most popular organizations. Organizations covered an array of different subjects from wildlife and conservation groups to community groups, water protection, and climate-oriented political groups. Interestingly, education and income, both of which the urban respondents have slightly more of, have been associated with higher levels of participation in environmental organizations (Torgler et al., 2011), although that relationship is less clear in these results.

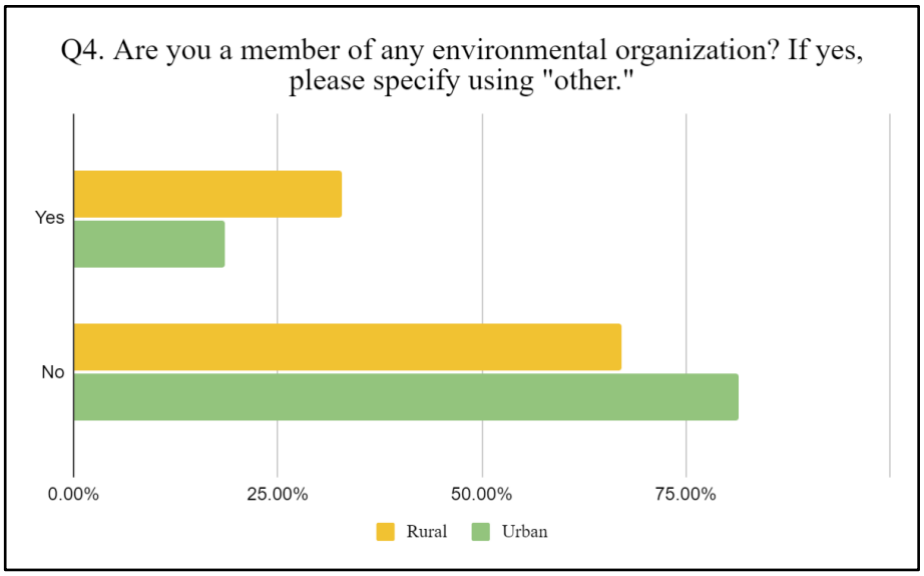

Fig 5. Environmental Engagement among Participants

Figure 6 shows that survey respondents were generally very well educated, as 87.9% of respondents have pursued education above a high school level. Interestingly, this is much higher than the overall rate in Port Hope, which is only 52.4% (Statistics Canada, 2016). It should be noted that it seems that community environmental engagement efforts are mostly reaching more educated individuals in the area, and lower education levels are not being represented. Education levels are fairly consistent across urban and rural areas, with a slightly higher proportion of urban respondents holding bachelor's degrees, while a greater proportion of rural respondents hold professional degrees. In this sense, human capacity and capabilities seem relatively high and very even between urban and rural areas, which is promising for policy implementations.

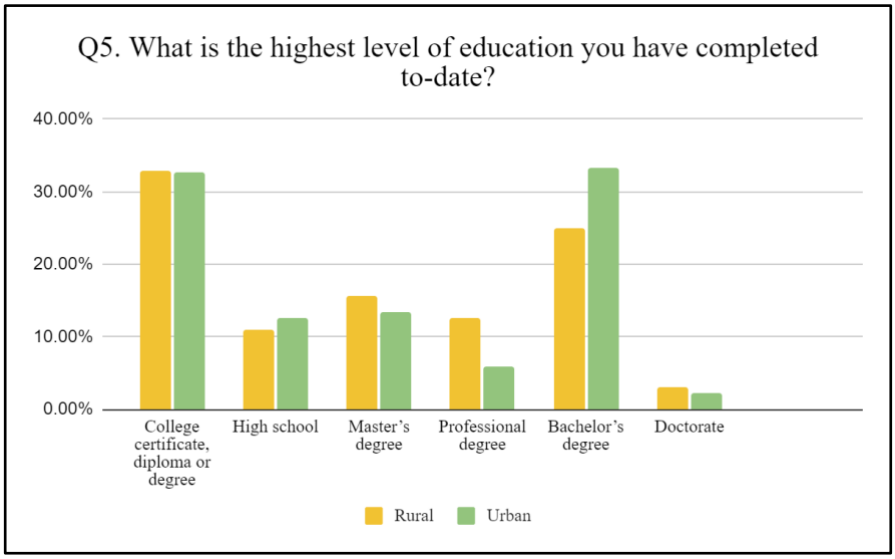

Fig 6. Educational Attainment Among Participants

Figure 7 shows household incomes for survey participants. As we can see, there are slight differences between the urban and rural respondents, with a higher proportion of urban respondents finding themselves in the top two income ranges (45.2% vs. 40.63%). However, overall data for rural and urban respondents were very similar, with urban respondents trending slightly more to the top of the income range, while rural respondents tended towards the middle ranges. There were very few survey respondents (either urban or rural) in the bottom income category, as only 4.5% of survey respondents reported household incomes under $20,000. This is different from Port Hope census data, which indicates that 9.3% of the population falls in this category (Statistics Canada, 2016). This is yet another indication that climate engagement efforts may be missing those that are socioeconomically disadvantaged in the community. Unfortunately, many survey participants chose not to respond to this survey question, which may skew the survey results.

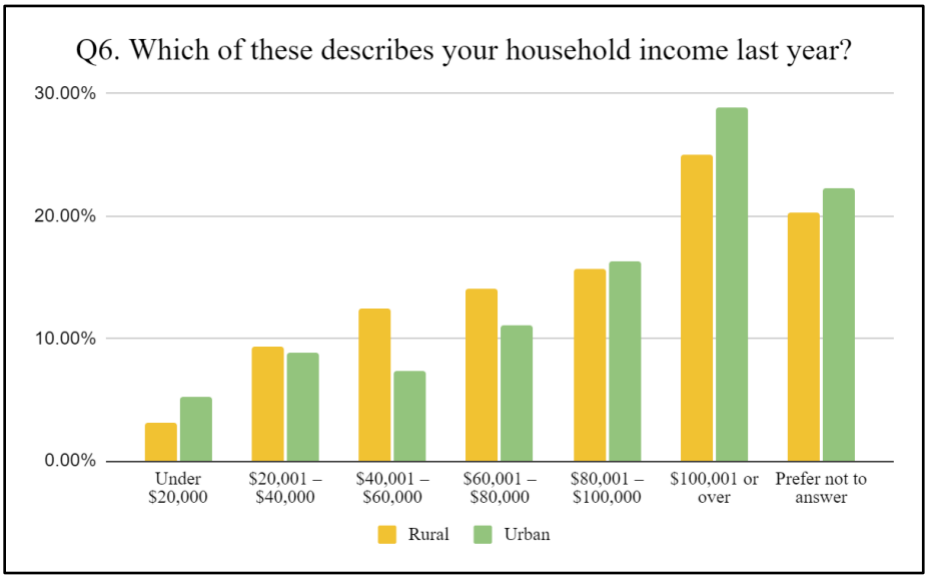

Fig 7. Household Income Among Participants

Overall, we can see that responses to questions in this section of the survey are very similar between rural and urban groups. Employment sectors and education levels were almost the same, while there were slight differences in income levels and age groups - though these differences are overall minor. The biggest difference was seen in membership to environmental groups, where a rural resident was approximately 15% more likely to be a member of an environmental group than an urban one. Overall, the survey largely targeted individuals with direct geographic connections to the Port Hope area.

Awareness and Perceptions of Climate Change

The majority of participants regularly seek out news about climate change. According to figure 8, 67.8% of participants actively follow climate change news. Correspondingly, the values are almost the same for participants from rural and urban areas. Their news sources were also fairly similar, with a few slight differences. One of the larger differences was observed in newspaper preference. 60.9% of survey

respondents from rural areas follow news on newspaper, while approximately 50.4% of urban respondents have indicated newspaper as their preferred. The numbers for other sources including television, radio, internet, social media, municipal council, friends and families varied relatively less, between 1% to 6% which indicates more or less the same pattern.

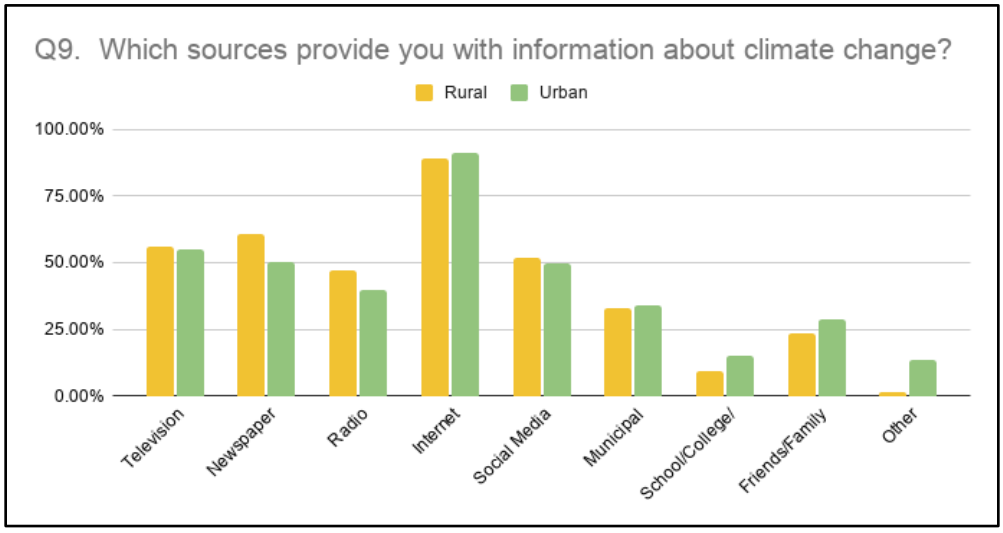

Fig. 8. Main Information Sources of Survey Respondents

As figure 9 shows, deforestation and usage of fossil fuels have been identified as the top two causes of climate change by respondents both from rural and urban areas. Intensive agriculture was placed as the third reason for climate change. However, rural and urban views are slightly different on the role of intensive agriculture. While 49% of urban respondents stated intensive agriculture is one of the reasons for climate change, only 38% of rural respondents agreed with them. It is important to note that almost 10% of respondents from both areas think climate change is not related to human activity. This is much lower than the overall Canadian rate of almost one-third of people who are not convinced that climate change is caused by humans (Zimonjic, 2018), though this figure has been found to vary depending on the study.

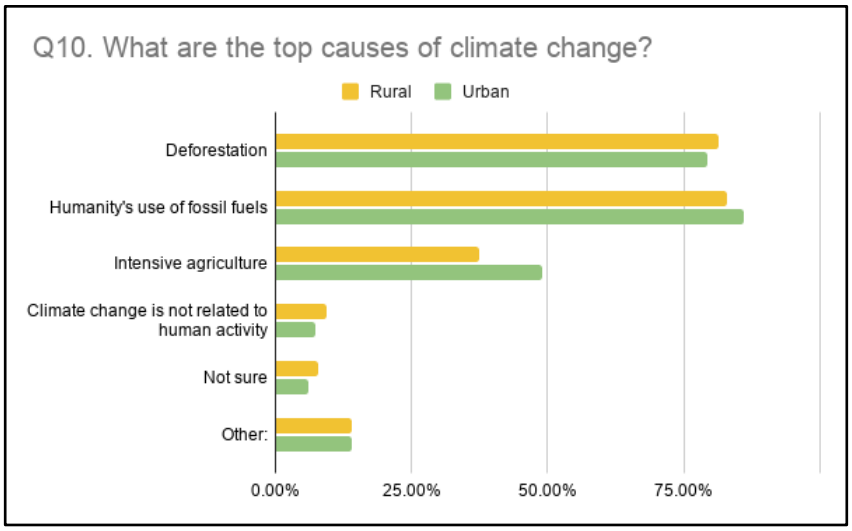

Fig. 9 Top Causes of Climate Changes According to Rural and Urban Respondents

The majority of respondents agree that thermal and electrical energy demand, population growth, and consumer behavior are the three top factors that contribute to climate change the most - and these views are generally consistent between rural and urban groups (Figure 10). The biggest difference in this category relates to energy demand, which was identified by 56.3% of urban respondents and only 46.9% of rural respondents as a top contributing factor to climate change. For the other factors, no difference greater than 6.5% was observed. Interestingly, respondents from both areas put generally low emphasis on building design and maintenance, food production, and landfills as contributing factors to climate change.

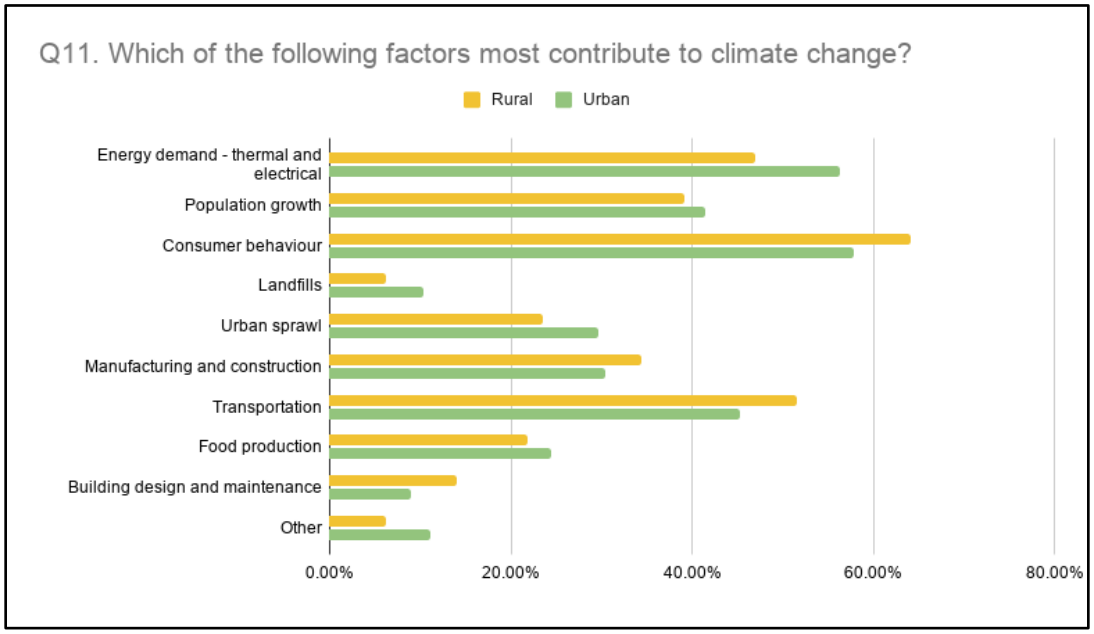

Fig. 10 Top Factors Contribute to Climate Changes According to Rural and Urban Respondents

Figure 11 shows that over half of the respondents agreed that climate change is inevitable and tipping points have already been reached. On the contrary, approximately only 17.6% of the respondents disagreed with this statement. These results are extremely consistent between rural and urban populations. This indicates that respondents' perspectives on the existence of climate change are not clearly changing related to whether they live in rural or urban parts of the town.

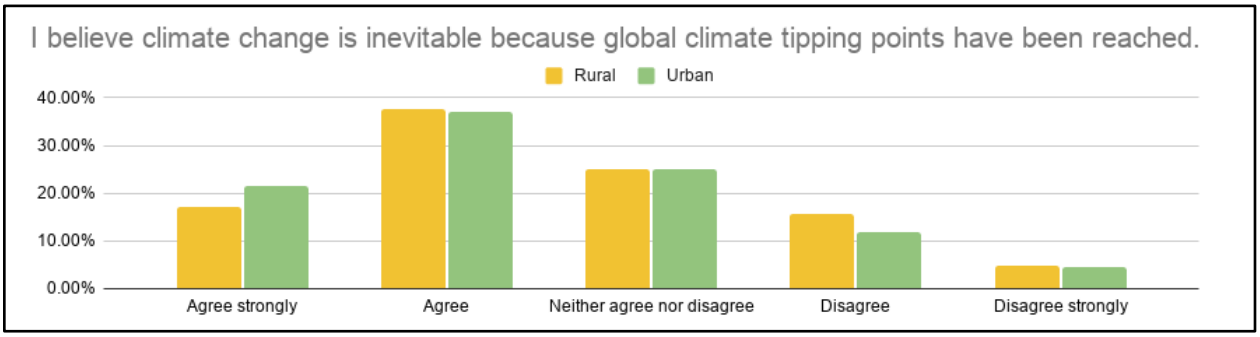

Fig. 11 The Distribution of Opinion on Whether Climate Change is Inevitable

In this section, we once again see very similar perspectives between rural and urban groups. They both received information from the same sources, with the internet being their primary source. What's more, respondents generally agreed on the top causes and contributing factors to climate change, identifying the same top 3 factors in each instance. One of the only differences was that urban respondents placed slightly more emphasis on the importance of intensive agriculture in causing climate change. Moreover, perspectives on the inevitability of climate change were almost identical between urban and rural respondents, with the majority agreeing that relevant tipping points have already been reached.

Climate Change in Port Hope ~ Community Perspective

As it is seen in figure 12, the vast majority of respondents, approximately 77.8%, have indicated that the increased number and severity of extreme events is a likely negative impact of climate change in Port Hope. This result is not surprising since the town and surrounding area previously experienced such devastating events in the past. Considering the majority of respondents being above 50 years of age, there is a good chance that many of the respondents witnessed the flood that happened in 1980 (GRCA, 2009). Extreme weather events such as this flood are linked to climate change impacts by respondents. There is some segregation on some negative impacts between rural and urban respondents. For example, the difference between urban and rural perspectives on increased flooding risk is 18.3% (rural is 46.9%, urban is 65.2%). This may be explained by the fact that the city of Port Hope is directly on the shore of Lake Ontario, while rural areas are generally more inland. Rural respondents also placed greater emphasis on the potential loss of natural habitat and wildlife than urban respondents. From this data, it appears that urban respondents put more emphasis on a higher number of different impacts, whereas rural respondents had two options that were clearly the most popular.

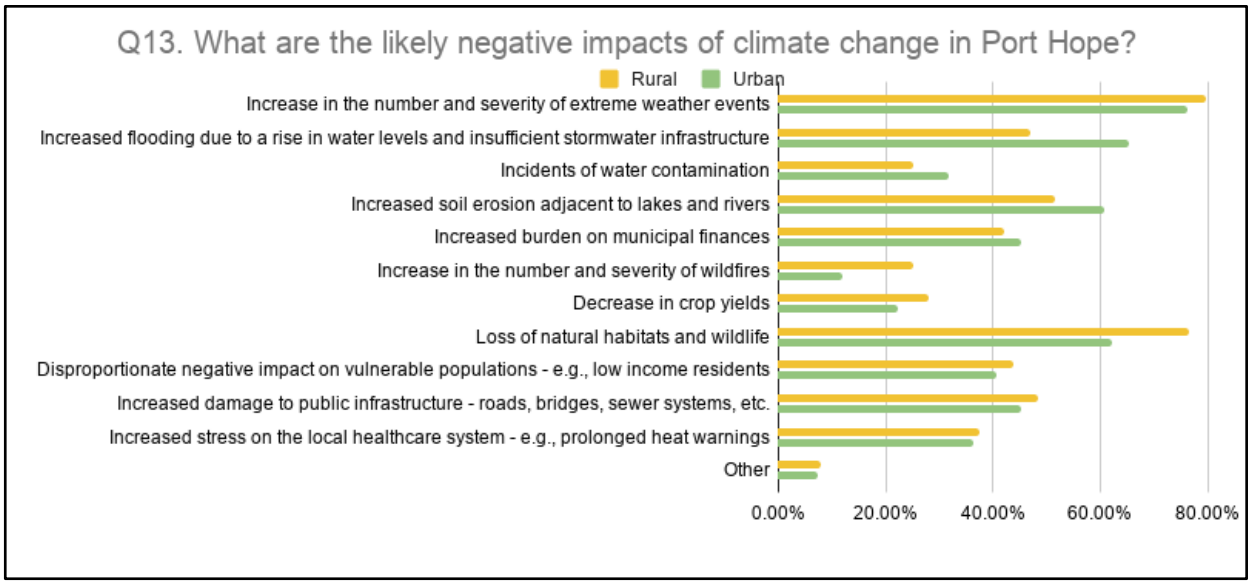

Fig. 12 Opinions on Negative Impacts of Climate Change in Port Hope

It is promising to see a strong common vision on both rural and urban perspectives about the responsibilities of individuals combating climate change. According to figure 13, approximately 86% of respondents believe that climate change consequences can be mitigated with lifestyle changes of individuals. This result also indicates most of the respondents are open to the new implementation effects on their daily life. On the contrary, only about 8% of respondents did not agree with this statement.

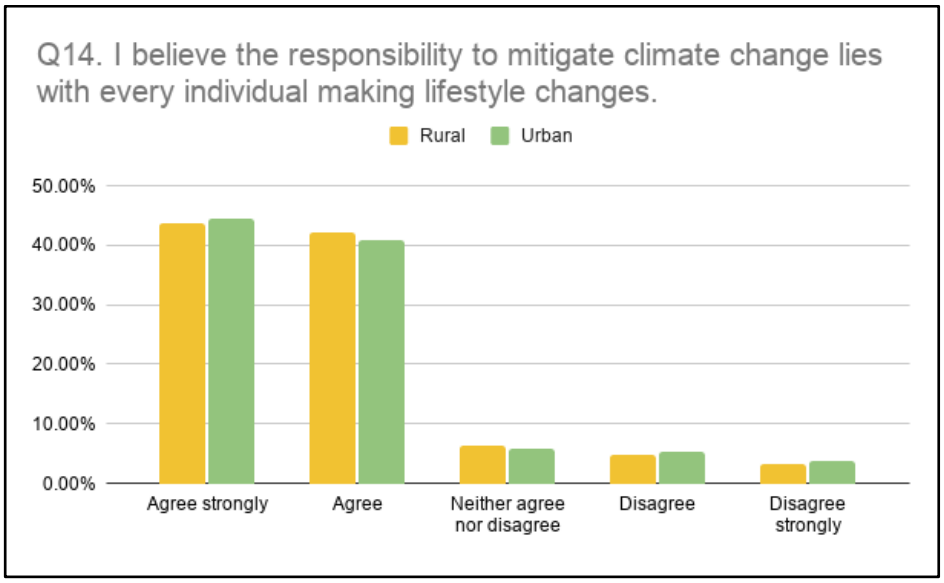

Fig. 13 The Distribution of Opinion on Individual Changes Help to Mitigation of Climate Change

Respondents were asked what kind of individual changes would help reduce GHG emissions and their responses are given in figure 14. More than half of respondents agreed that reducing car usage, improving the efficiency of home utilities, purchasing fewer products and services with a significant carbon footprint, creating more green spaces, and supporting local businesses are the top potential actions individuals can take. Relatively differentiated views were observed for reducing car usage. Accordingly, only 53.3% of rural respondents agreed to reduce car usage, whereas 64.4% of urban respondents indicated the less car usage would help to reduce GHGs. This could indicate that rural respondents feel as though they need to use their cars, while urban respondents may have more options available to them. Differently, purchasing fewer products and services with a significant carbon was the most common response among rural respondents (76.6%), who selected it at a higher rate than urban respondents. Contrarily, urban respondents primarily preferred to improve their existing heating and cooling systems efficiency (57%), compared to rural respondents (43.8%).

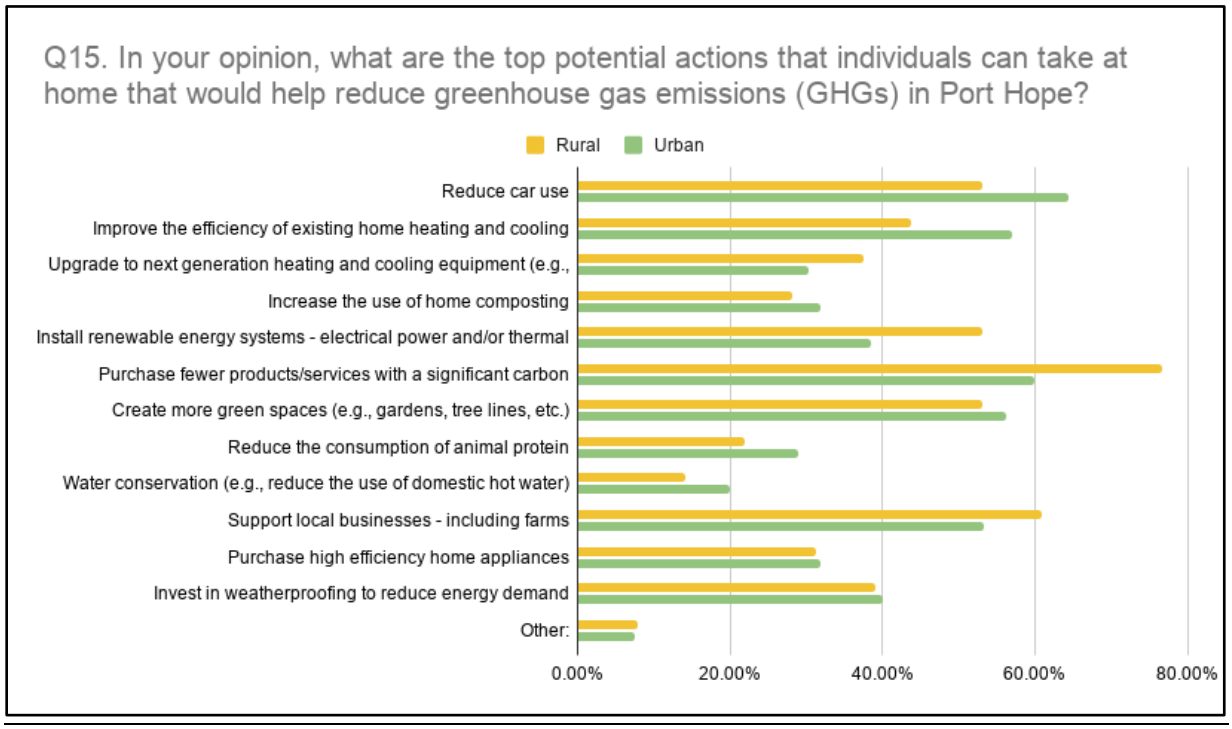

Fig. 14 Top Potential Individual Actions to Reduce GHG for Individuals

Figure 15 shows that more than 80% of the respondents preferred either pure electric vehicles or hybrid vehicles to own. Only around 12% of respondents preferred to use fossil fuel vehicles. This result is promising and indicates a great potential of public participation in case electric vehicles or hybrid vehicles are promoted. Such initiative has great potential to create a low carbon city and contributes to mitigating climate change effects (Nanaki & Koroneos, 2016). These results did not differ greatly between rural and urban respondents.

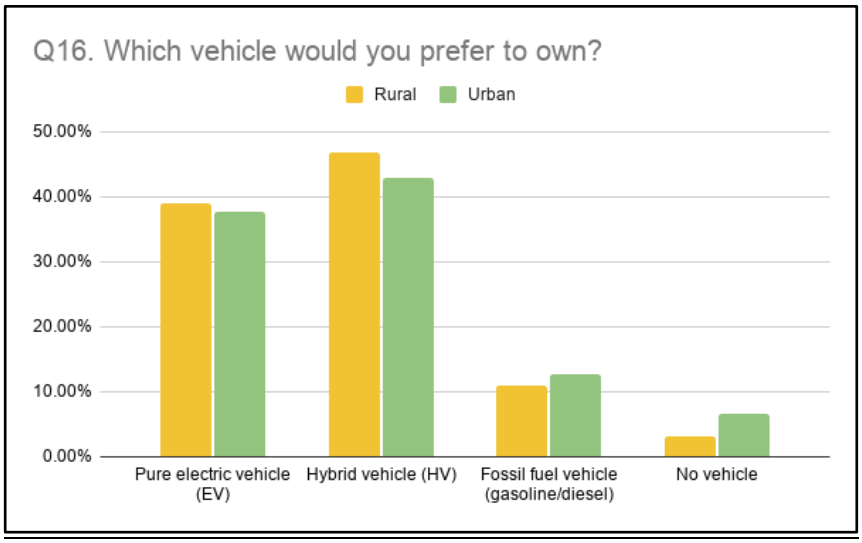

Fig. 15 Type of Vehicle Ownership Distribution

Respondents' preference and tendency to use hybrid and electric vehicles may have a great impact on overall emissions because transportation is primarily provided by private vehicles. Figure 16 shows that 96.7% of rural and 94.8% of urban respondents seldom used public transportation. This pattern has also been observed in respondents ' thoughts on the quality of public transportation. One-third of rural respondents did not even express any thought about it and another third found it non-existent in their area. The majority of the rest either described public transportation as mediocre or good. For urban respondents, their evaluation is more varied. But still, more than half of them defined it as either poor (28.9%) or didn't know (25.2%).

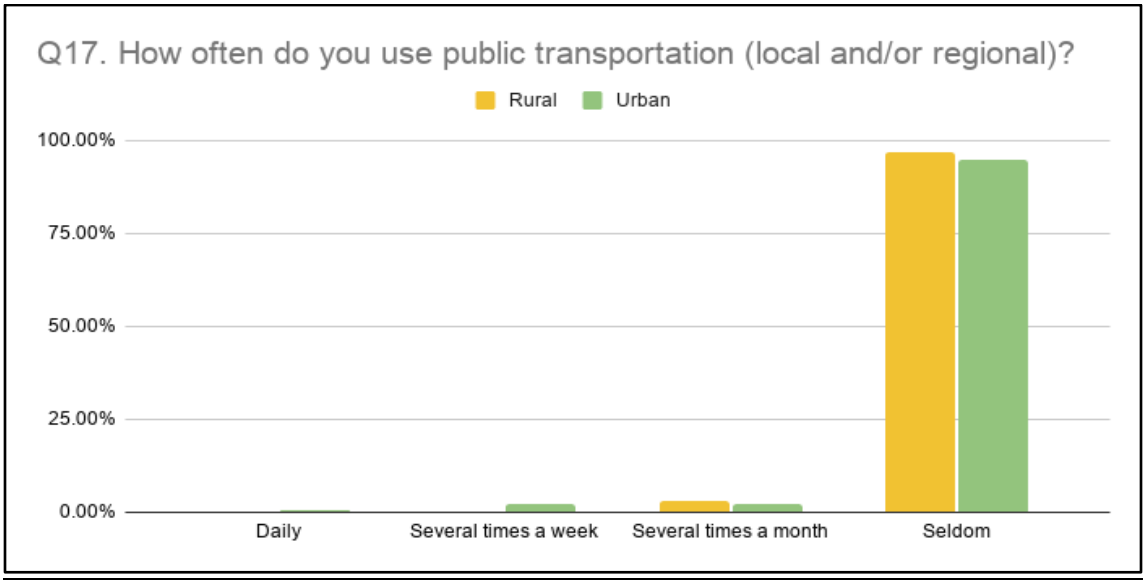

Fig. 16 Frequency of Public Transport Usage

One of the clearest differences of opinion between rural and urban perspectives was observed on this question. In figure 17, 43.7% of urban respondents described public transportation as poor or very poor, whereas only 7.8% of rural respondents found it to be so. This huge difference is almost equal to another huge difference which is the “non-existent” option. This option was chosen by 28.1% of rural respondents, although only 2.9% of urban respondents selected it. This result is a clear indicator that the rural population of Port Hope has far less public transportation opportunities (Municipality of Port Hope, n.d.).

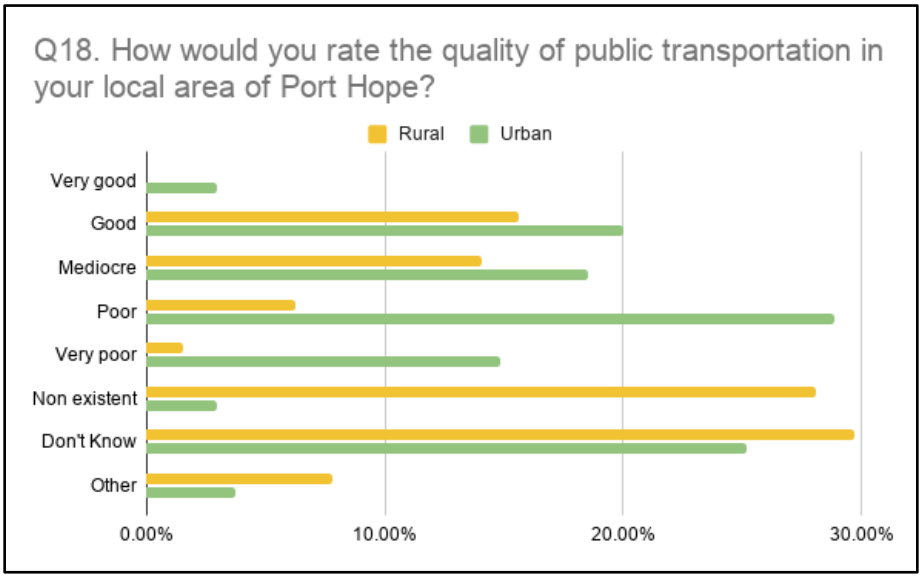

Fig. 17 Evaluation of Public Transportation Quality in Port Hope

Disagreements on public transportation in Port Hope have appeared once again on rural and urban preference for improvement opportunities. According to figure 18, only 12.5% of rural respondents preferred increased public transport frequency. This is not surprising considering their common view on public transport is either non-existent or not available. It seems their first demand is more routes (29.7%) and more bike lanes (29.7%) instead of more frequent transportation. Similarly, urban respondents agreed on more routes (35.6%) and bike lanes (33.3%). However, one of their other top demands was increased transportation frequency (36.3%), which was not identified as important by rural respondents. The top solution for both urban and rural respondents was the creation of an on-demand minibus that could be scheduled by rides, receiving 40% of urban and 35.9% of rural support.

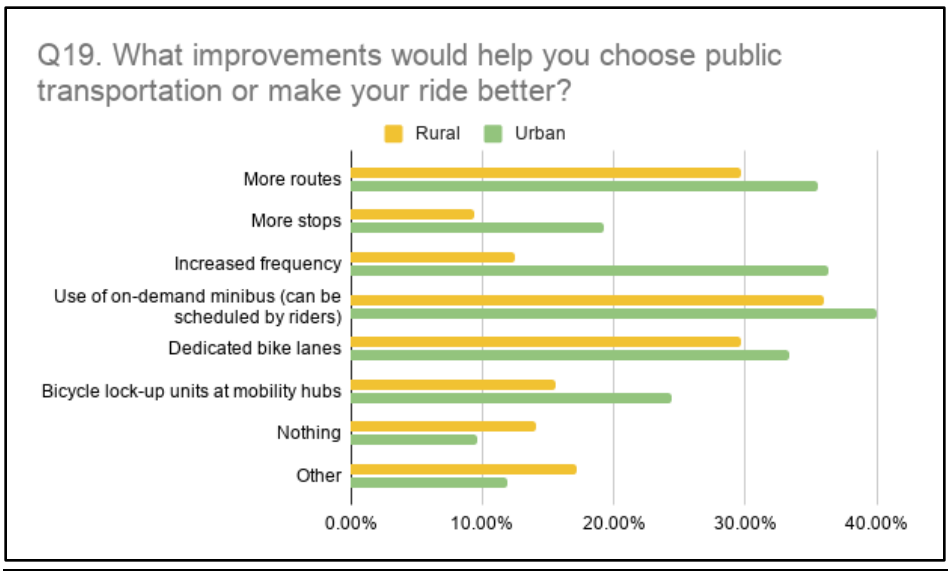

Fig. 18 Opinions on Improving Public Transportation

Respondents' ideas started to be more parallel again about the top actions to take by Port Hope businesses to reduce their GHGs emissions. According to figure 19, six different actions have been identified almost equally as top priorities by more than 30% of both rural and urban respondents. These options were promoting eco-friendly products and services, reducing consumption of fossil fuels in production, contributing to a more sustainable economy that supports Port Hope businesses, shifting to non-carbon energy sources, working with all levels of government to access support needed to decarbonize, and conducting annual energy and emissions audits to monitor and improve progress. These options all shared a relatively equal amount of favour from both urban and rural respondents, with the exception of contributing to a more sustainable local economy that supports Port Hope businesses, which received more urban support.

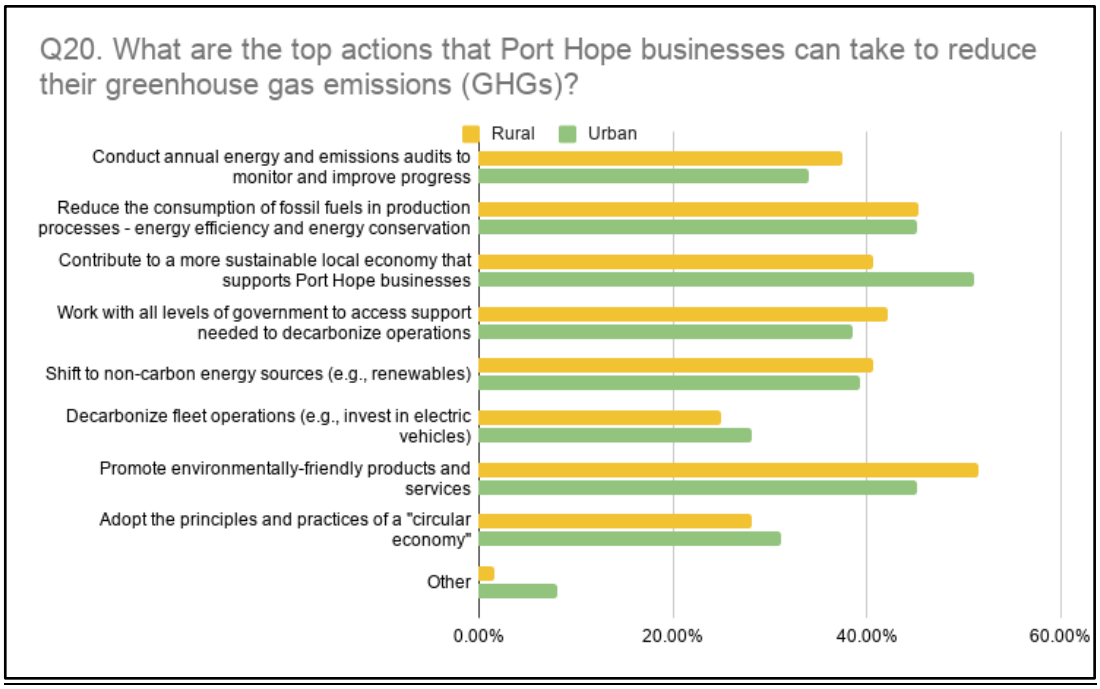

Fig. 19 Top Actions for Port Hope Businesses to Reduce GHGs

Here, we once again see broad agreement between urban and rural respondents in figure 20. Most respondents from both groups thought that eco-friendly products were too expensive but that they were worth it, with 32.8% of rural respondents and 37.8% of urban respondents selecting that choice. Interestingly, only 20.5% of rural and 24.4% of urban respondents thought that eco-friendly products were outright too expensive. This indicates that 80% and 75.6% of these groups were happy to pay elevated prices for eco-friendly goods. Interestingly, rural respondents were 9.3% more likely to be prepared to pay more for such products if necessary. This is interesting as demographic information would indicate to us that rural respondents were overall slightly less-well-off than their urban counterparts. Similarly, urban respondents overall were about 8.9% more likely to perceive eco-friendly products as being too expensive, which may be in part due to a higher cost of living associated with urban areas (Kurre, 2003).

Q21. Do you think eco-friendly products are too expensive for you to switch over? (Eco-friendly products may be more expensive due to resource management or production costs.)		
Opinion	**Rural (%)**	**Urban (%)**
Yes	20.5	24.4

Yes ... but it's worth it	**32.8**	**37.8**
No	17.2	15.6
No ... and I'm prepared to pay even more if necessary	21.9	12.6
Other:	7.8	9.6

Fig. 20 Opinions on eco-friendly products and prices

There was general agreement among both urban and rural respondents that the government should incentivize private companies in Port Hope to reduce their greenhouse gas emissions. In fact, figure 21 shows that 77.9% of all respondents selected Yes or Yes, yet with caveats. Many of the caveats cited related to tying funding to specific measurable outcomes. Urban respondents were 15.9% more likely to be against government funding than rural respondents, while rural respondents were 11.4% more likely to select Yes outright.

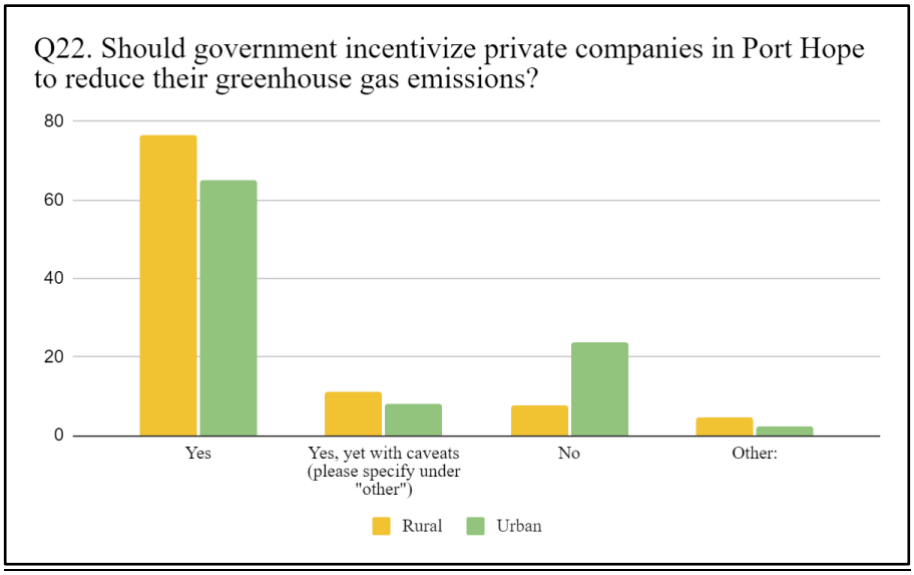

Fig. 21 Opinions on government incentivization

Here in figure 22, we see once again that rural and urban respondents were generally in agreement on this issue. That said, the results are somewhat concerning. Most respondents felt that both the private and public sectors were not doing a good job to address climate change, although responses were slightly more positive for the public sector than the private. We also see that there is a general lack of knowledge surrounding performance in addressing climate change, as nearly 20% of respondents in both categories felt that they didn't know how well each sector was doing.

Results in this section were largely similar between rural and urban respondents, though some differences were observed. Rural and urban respondents generally agreed on the top negative impacts of

climate change. An increase in the number and severity of extreme weather events was the most-identified negative consequence by both groups. There were some differences, as urban groups placed a higher importance on flooding, while rural respondents put a greater emphasis on the loss of natural habitat. There was strong agreement from both rural and urban respondents that there was a responsibility to mitigate climate change among individuals. Despite this, when it came to potential individual actions that could be taken in the face of climate change, there was some differentiation between rural and urban respondents. That said, rural and urban respondents were largely in consensus when it came to actions that businesses could take in the face of climate change. Both groups thought that the government should be incentivizing private companies to reduce emissions, though rural respondents were slightly more in favour of this. Groups were almost identical in the way they rated the performance of both the private and public sectors to address these issues thus far. The most division observed in this section was seen on the issue of public transit, with rural and urban respondents expressing different views on the quality of transportation and the potential solutions they would like to see.

Performance in addressing climate change	**Rating**	**Rural**	**Urban**
Private sector	Very good	1.6	0.7
	Good	21.9	23
	Not good	**45.3**	**46.7**
	Don't know	17.2	18.5
	Other	4.7	4.4
Public sector	Very good	0	1.5
	Good	28.1	25.2
	Not good	**45.3**	**48.9**
	Don't know	21.9	17.0
	Other	4.7	5.9

Fig. 22 Rating of sector's performance in addressing climate change

Climate Change in Port Hope ~ Local Government Perspective

As is a somewhat recurring theme, we see very similar responses to this question from both urban and rural respondents. As it is seen in figure 23, most of the options were thought to be good reasons for addressing climate change at the local level, as 4 different options received well over 50% support from survey respondents. Respondents generally did not feel that the fact that local areas exhibit higher GHG emissions than rural areas was a good reason to address climate change at the local level. That said, the only non-minor difference was seen in support for local communities knowing what's best for their village, town or city - a reason that was supported by 67.2% of rural respondents and 57% of urban respondents. This may speak to a more intimate sense of community or place-based knowledge at the rural level (Kassam et al., 2017). Promisingly, these results indicate that both urban and rural respondents think that there is good reason for the local government to address climate change at the local level.

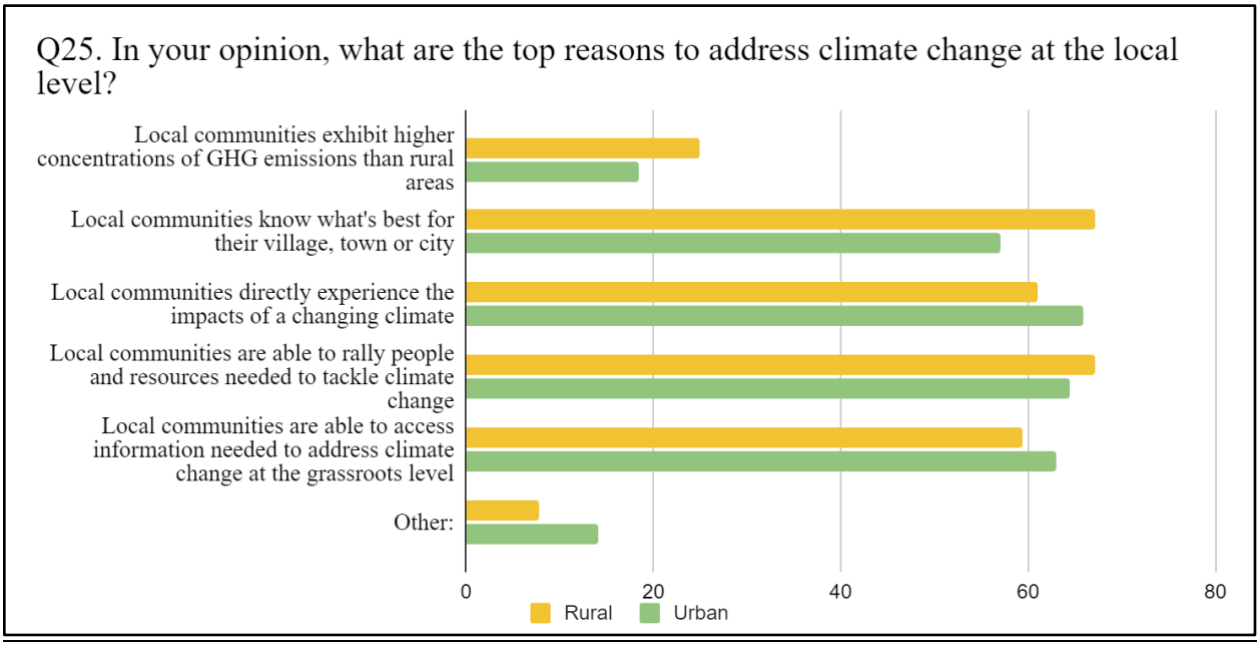

Fig. 23 Top reasons to address climate change at the local level

Although there is a generally high level of agreement between urban and rural survey participants on this question, with most differences falling between 1-4%, the survey results are once again a cause for concern (figure 24). Overall knowledge of municipal actions was very low, as no single action was known to over 40% of survey respondents - surprising given the fact that Port Hope is a relatively small city. While the most-identified action was engaging citizens around climate change, the second most popular choice from respondents was that they were not aware of any actions or that nothing effective was being done, which was selected by 35.9% of rural respondents and 31.9% of urban respondents. This points to a significant lack of visibility in the community as to local actions taken to address climate change.

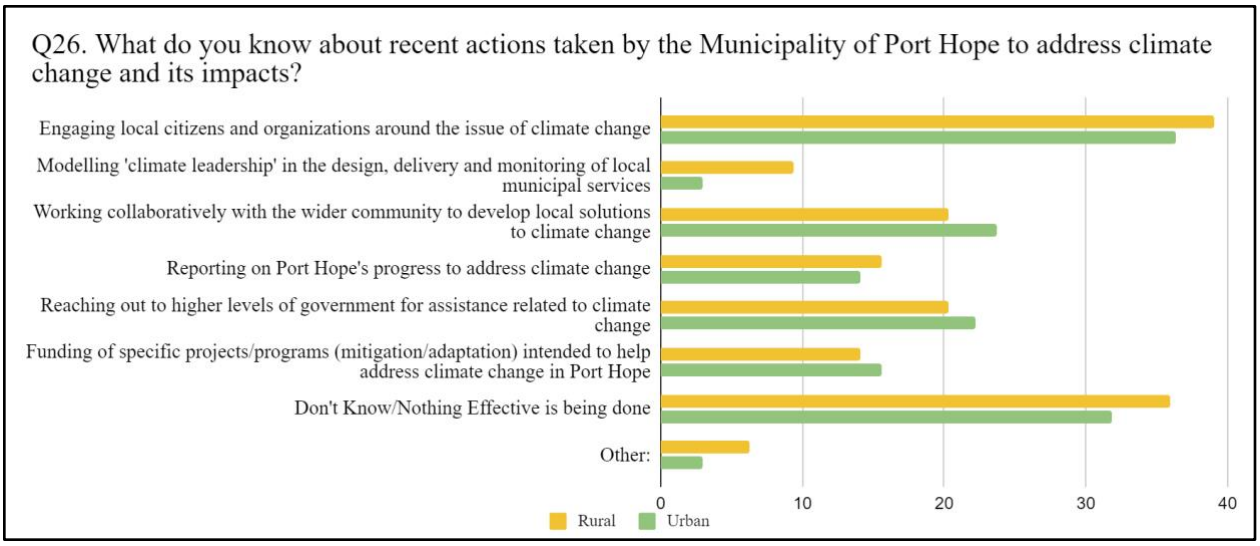

Fig. 24 Knowledge of Municipality's recent actions

As it is seen in figure 25, the top mitigation actions were the same for both groups, those being protecting and expanding the local tree canopy, ensuring municipally owned and operated assets utilize best practices in decarbonization, and working with all levels of government to access the funding needed to address climate change. Further, we can also see that most of the mitigation actions received over 50% support from both groups, indicating that there are a plethora of different things that local respondents would like to see the municipality take on to address climate change.

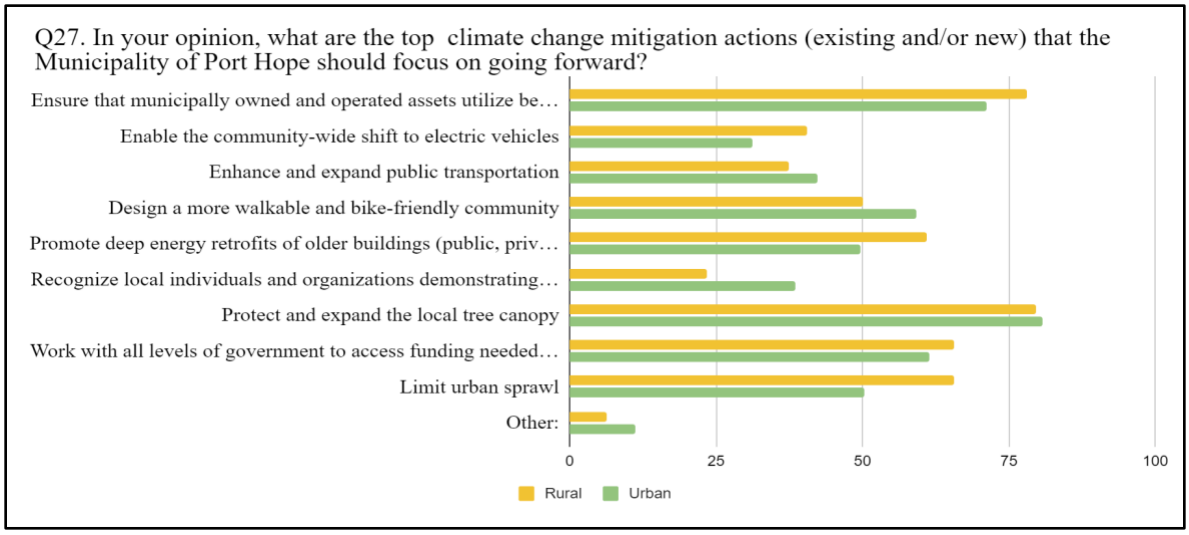

Fig. 25 Top Climate Change mitigation actions identified by respondents

That being said, we see small divisions between urban and rural respondents in their identification of top potential climate change mitigation actions. Rural respondents placed a slightly greater emphasis on limiting urban sprawl, being 15.3% more likely to select it as a top action than urban respondents -

although the majority of both groups identified it as a top action. Rural respondents also put more importance on the deep energy retrofits of public buildings. On the other hand, urban respondents placed an almost 10% greater emphasis on making Port Hope more walkable and bike-friendly, and were 15.1% more likely to select recognizing local individuals and organizations as a top priority, although an admittedly small proportion of both groups selected that option.

In figure 26, we can see that there is some slight division between urban and rural respondents when it comes to choosing the top adaptation action for the municipality of Port Hope, but the overarching sentiments are the same. The top actions selected by both groups were saving wetlands in the Ganaraska watershed, encouraging tree planting and protection, and amending bylaws to allow for more sustainable practices. There were some differences, as we can see that 18.3% more urban respondents identified upgrading stormwater infrastructure as a top priority. This could be due to the fact that the urban areas may perceive themselves as more susceptible to flooding than the rural zones, as previously identified. Moreover, 11.4% more urban respondents identified increasing access to cooling centres as a top priority, which could in some way be related to the increased heat-island effect in urban areas (Takebayashi et al., 2020). Conversely, rural respondents were more likely to select agriculture-related adaptation actions, being 10% more likely to select water conservation in anticipation of drought and 14.8% more likely to select helping farm communities adopt new practices as top priorities. Again, this may reflect the agricultural lean of the rural areas.

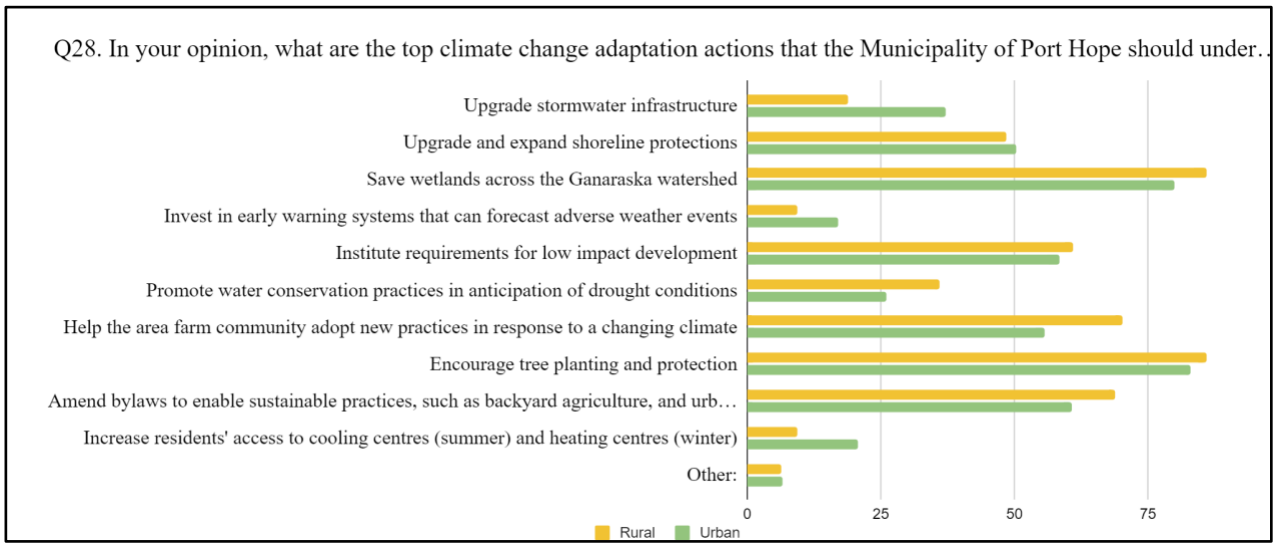

Fig. 26 Top Climate Change adaptation actions identified by the respondents

The information received from the previous two questions shows us that while there may be some differences between urban and rural respondents for the identification of top mitigation and adaptation measures, there is general consensus on the top actions between the two different groups. This is promising, as it indicates that many actions will respond to the needs expressed by both of these populations.

Issue	Priority Level	Rural	Urban	Difference	Issue	Priority Level	Rural	Urban	Difference
Local Economic Development and Job creation	**High**	**48.44%**	**46.67%**	1.77%	New Housing to accommodate population growth	High	15.63%	20.74%	5.12%
	Medium	43.75%	42.96%	0.79%		**Medium**	**42.19%**	**42.22%**	0.03%
	Low	6.25%	5.93%	0.32%		Low	35.94%	27.41%	8.53%
	Other	1.56%	4.44%	2.88%		Other	6.25%	9.63%	3.38%
Quality of Life Improvements	**High**	**45.31%**	**52.59%**	7.28%	Lifting increases to taxes and other charges	High	34.38%	36.30%	1.92%
	Medium	43.75%	35.56%	8.19%		**Medium**	**43.75%**	**45.19%**	**1.44%**
	Low	7.81%	8.89%	1.08%		Low	20.31%	14.07%	6.24%
	Other	3.13%	2.96%	0.16%		Other	1.56%	4.44%	2.88%
Affordable Housing	**High**	**51.56%**	**67.41%**	15.84%	Municipal Infrastructure - upgrades/new	High	32.81%	40.00%	7.19%
	Medium	39.06%	25.19%	13.88%		**Medium**	**56.25%**	**49.63%**	6.62%
	Low	9.38%	5.19%	4.19%		Low	6.25%	5.93%	0.32%
	Other	0.00%	2.22%	2.22%		Other	4.69%	4.44%	0.24%
First Nations rights and reconciliation	**High**	**43.75%**	**45.19%**	1.44%	Supports for local agricultural community	**High**	**67.19%**	**62.96%**	4.22%
	Medium	31.25%	37.78%	6.53%		Medium	31.25%	28.89%	2.36%
	Low	21.88%	14.07%	7.80%		Low	0.00%	5.19%	5.19%
	Other	3.13%	2.96%	0.16%		Other	1.56%	2.96%	1.40%
Investments in public transportation	High	25.00%	24.44%	0.56%	Supports for vulnerable populations	**High**	**56.25%**	**61.48%**	5.23%
	Medium	**50.00%**	**51.11%**	1.11%		Medium	34.38%	30.37%	4.00%
	Low	15.63%	20.00%	4.38%		Low	9.38%	6.67%	2.71%
	Other	9.38%	4.44%	4.93%		Other	0.00%	1.48%	1.48%
Climate Change in Port Hope	**High**	**62.50%**	**59.26%**	3.24%					
	Medium	29.69%	28.89%	0.80%					
	Low	7.81%	8.15%	0.34%					
	Other	0.00%	3.70%	3.70%					

Fig. 27 Port Hope priority ranking by survey respondents

In figure 27, we see the proportion of survey respondents that have attributed X priority ranking to each key issue identified in the survey. Once again, rural and urban respondents were very similar in their priority ranking, with the most popular priority type being the same between the two areas across all issues. The only significant difference between the two groups observed was under the "Affordable Housing" item, where 15.8% more urban respondents graded it as a high priority item while rural respondents were 13.9% more likely to rank it as a medium priority item. Items identified as high priority were as follows:

Rural High Priority (Descending order)	**Urban High Priority (Descending order)**
1. Supports for local agricultural community	1. Affordable Housing
2. Climate Change in Port Hope	2. Supports for local Agricultural Community
3. Supports for vulnerable populations	3. Supports for Vulnerable Populations
4. Affordable Housing	4. Climate Change in Port Hope
5. Local economic Development and Job Creation	5. Quality of Life Improvements
6. Quality of Life Improvements	6. Local Economic Development and Job Creation
7. First Nations rights and reconciliation	7. First Nations rights and reconciliation

Fig. 28 High Priority Items Identified by Respondents

As it is given in figure 28, support for the local agricultural economy was among the sectors receiving the highest priority for both urban and rural respondents, at 63% and 67.2% respectively. Here, respondents may be recognizing the current fragility and decline of small and medium-sized farms (Smith Cross, 2017) as a sign that help is needed from the government, or strongly feel as though it must be supported by the municipal government in the face of potentially devastating climate change effects (Union of Concerned Scientists, 2019). In fact, the top 4 highest-priority items were the same for both rural and urban respondents, those being support for the local agricultural community, climate change in Port Hope, support for vulnerable populations, and affordable housing. Encouragingly, Climate change in Port Hope was considered a high priority item by a high amount of both urban (59.3%) and rural (62.5%) respondents, indicating that there is a strong community sentiment towards addressing climate change.

All of the other items not listed on the aforementioned table were most identified as medium priority by both urban and rural respondents, these being New housing to accommodate population growth, Lifting increases to taxes and other charges, Municipal infrastructure - upgrades/new, and Investments in public transportation. Survey respondents for the most part considered all of the items suggested in this question at least somewhat important, as no actions were most-identified as low priority.

That being said, there were items that had a significant amount of survey respondents identify them as low priority. In descending order, they were new housing to accommodate population growth, investments in public transportation, First Nations rights and reconciliation, and lifting increases to taxes and other charges. Interestingly, First Nations rights and reconciliation received a high amount of both high priority and low priority selections, indicating that it could be a very contentious or controversial issue among respondents.

Overall, respondents agreed on the top reasons to address climate change at the local level and had similar degrees of knowledge concerning local actions. Furthermore, both urban and rural respondents agreed on the priority level of each sector, identifying all of the same high and medium-priority actions. Interestingly, no actions were seen as low priority. Further reinforcing their similarities, respondents also generally agreed on the top climate change adaptation and mitigation strategies, holding the same top 3 actions in each category. There were some differences, however. For example, rural respondents put a greater emphasis on limiting urban sprawl and helping the local farm area adopt new practices, whereas urban respondents put slightly more importance on recognizing local individuals and organizations and increasing access to heating and cooling centres.

Social Media Use

Time spent on social media is very similar across rural and urban areas and is generally well-distributed across the time ranges. According to figure 29, most participants (60%) spend an hour or less on social media per day, which is in line with the general population (Statista, 2020).

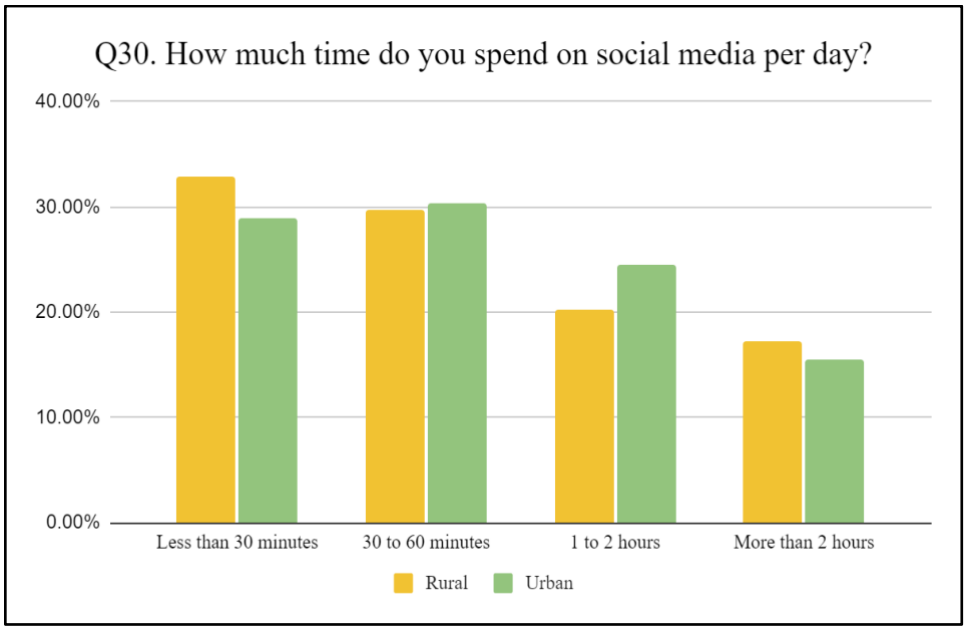

Fig. 29 Time Spent on Social Media Among Participants

The most popular social media platform by far among both urban and rural participants was Facebook, followed by Youtube. According to figure 30, rounding out the top five platforms were Instagram, Linkedin, and Twitter. Interestingly, rural respondents were almost 9% more likely to use Youtube than urban respondents, while urban users were approximately 5.52% more likely to use Instagram than rural respondents. Outside of these two platforms, there was generally little difference between urban and rural social media usage, although almost 6% more urban users reported not using any social media than rural users, who all used at least some form of social media.

Platform	Rural Respondents	Urban Respondents
Instagram	34.38%	40.00%
Facebook	**73.44%**	**73.33%**
Youtube	57.81%	48.89%
Linkedin	20.31%	24.44%
Twitter	21.88%	24.44%
Tiktok	6.25%	5.93%
Pinterest	14.06%	14.81%
Snapchat	6.25%	5.19%
None	0.00%	5.93%
Other:	9.38%	8.15%

Fig. 30 Social Media Platforms used by participants

The most popular format for climate change information was short videos, a format that was preferred by both rural and urban respondents. In figure 31, for both demographics, the next-most-popular information format was pictures, although urban and rural respondents differed significantly in how likely they were to prefer information in that format: while almost 50% of urban respondents preferred this method, only 31.25% of rural respondents did. This would suggest that rural respondents have a clearer first choice for the format of information, while urban respondents were more open to options outside of short videos, like pictures. Very, very few respondents wanted to receive information through bookmarking and content curation networks, Pinterest. A significant number of respondents, both rural and urban, had "Other" preferred information formats - most popular among these other options were emails, newspaper articles/news reports, and postings on the town of Port Hope website.

Preferred Format	Rural Respondents	Urban Respondents
Short videos (Tiktok, Instagram,	**60.94%**	**59.26%**

Facebook, etc.)		
Long videos (Youtube)	28.13%	22.22%
Pictures (Instagram, Facebook, Twitter etc.)	31.25%	49.63%
Texts (Twitters)	15.63%	16.30%
Discussion Forums (Reddit, Quora)	10.94%	10.37%
Bookmarking and content curation networks (Pinterest)	0.00%	1.48%
Consumer review networks (Yelp, TripAdvisor, Google Maps)	10.94%	5.19%
Other:	23.44%	18.52%

Fig. 31 Preferred format for receiving climate change information in Port Hope

As we can see in figure 32, few Port Hope social media accounts are followed by respondents, although subscription levels are very similar between rural and urban respondents. The only difference is seen in subscription rates to the municipality YouTube channel, which rural respondents are more likely to be subscribed to. The @MunicipalityofPortHope Facebook account was by far the most subscribed to account, with no other platform remotely approaching its popularity. In fact, respondents were more likely to be subscribed to no Port Hope accounts than they were to be subscribed to any of the other Port Hope media accounts.

Q33. Which Port Hope social media accounts do you follow?		
Account	**Rural**	**Urban**
Instagram @porthopeontario	15.63%	15.56%
Instagram @exploreporthope	14.06%	17.78%
Twitter @PortHopeInfo	9.38%	7.41%
Twitter @porthopeontario	12.50%	9.63%
Facebook @MunicipalityofPortHope	**54.69%**	**55.56%**
Youtube Channel @The Municipality of Port Hope	17.19%	11.85%
Youtube Channel @Port Hope Tourism	7.81%	8.89%
None	17.19%	18.52%
Other:	15.63%	7.41%

Fig 32. Followed Port Hope Social Media Accounts

In figure 33, we once again see very similar social media trends between rural and urban survey respondents. Rural respondents were slightly more likely to be polarized in terms of frequency of viewing climate change videos and/or images on social media, with more respondents selecting “Always” and “Never”. Overall, only 34% of participants were likely to see climate change-related videos and images either “Always” or “Often”. The most popular frequency among respondents was “Sometimes,” which was selected by 33.7% of respondents.

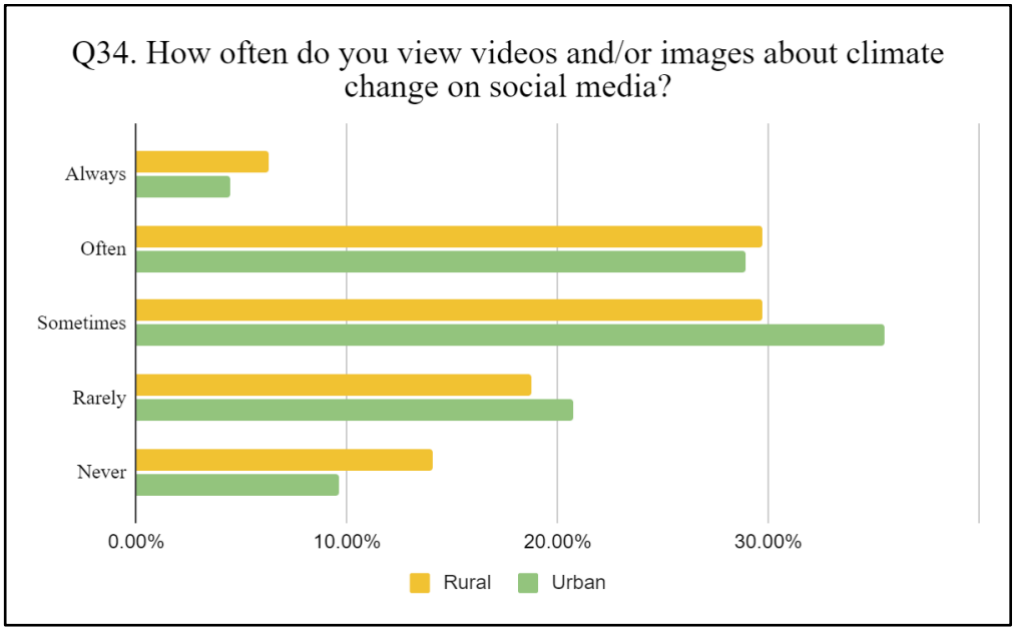

Fig. 33 Frequency of viewing climate change content on social media

Here in figure 34, we see that rural and urban respondents are generally similar in their likelihood to follow Port Hope’s social media accounts on climate change in the future. “Likely” and “Neutral” attracted the highest number of responses, garnering 34.7% and 29.6% of overall responses each, respectively. Rural respondents were more generally slightly more likely to follow such accounts, with 51.6% of respondents selecting either “Very Likely” or “Likely,” compared to 46.7% of urban respondents - although the difference is relatively small. A small but not insignificant number of respondents felt that they were either not likely or very unlikely to follow Port Hope accounts on climate change, with these responses garnering 13.1% of total responses. This is surprising, as current social media subscriptions are very low among survey respondents, which indicates that there is significant room for the growth of Port Hope’s social media presence as it relates to climate change.

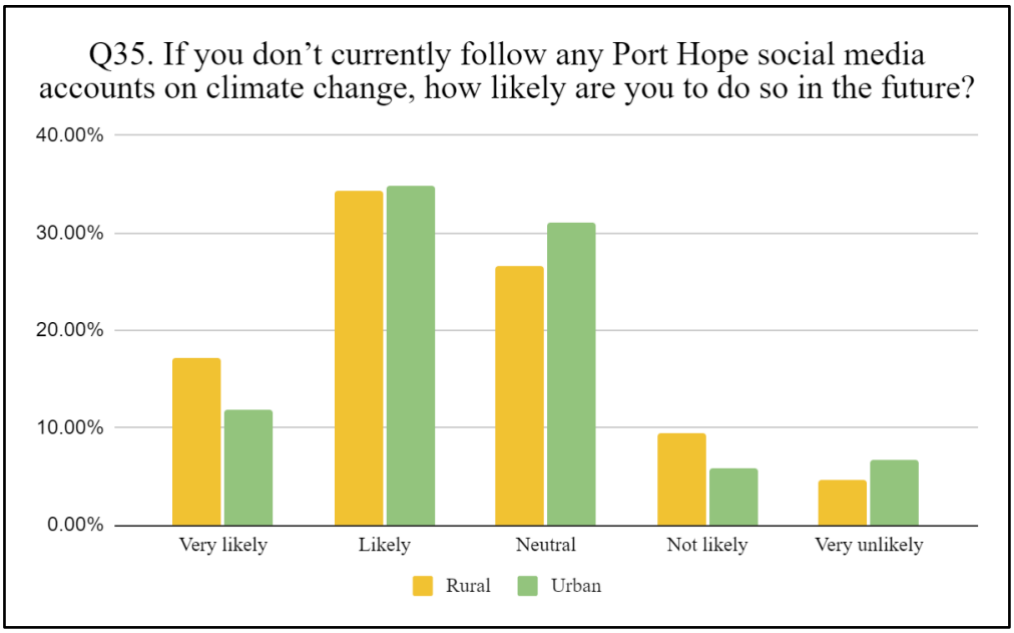

Fig. 34 Likelihood to follow Port Hope social media accounts on climate change

Responses in this category were very similar between urban and rural respondents. They generally used social media the same amount, used the same platforms, followed the same Port Hope accounts, and had the same preferred content formats. Furthermore, they generally experienced the same amount of climate change content on social media and were similarly open to following Port Hope climate change accounts in the future.

Key Finding

Key Finding: Urban and Rural similarities

Overall, we can see that there are only small differences between the urban and rural respondents to this survey and that they generally agreed on most issues. For every category, these two groups shared in their most popular responses, identified the same top priorities, similar top adaptation and mitigation strategies, were made up of very similar demographics, and had similar social media usage and feelings about climate change. There were some small differences that were identified during the analysis, particularly as they relate to individual actions and public transit, but not really enough to say that there exists a significant rural-urban divide on overarching climate change issues in the Port Hope area. It should be important to recognize this similarity of priorities and opinions when engaging in climate change action or climate change planning, and realize that these two differing places share many common goals and preferred strategies for action. However, we should not lose sight of the fact that there are still some minor differences between their preferences and perspectives.

It should be noted that, almost 20% of respondents in both urban and rural have stated that they did not know what the private sector and public sector was doing to address climate change. This is an important finding indicating the lack of knowledge in this issue. Similarly, 40% of survey respondents have

also stated that they did not know what the Municipality of Port Hope was doing to address climate change and its impact. These two findings are clear indicators that general knowledge about climate change is low. Moreover, 13.1% of respondents have stated that their likelihood to follow Port Hope social media accounts is either not likely or very unlikely. Given the general lack of knowledge and unwillingness to follow the climate change situation in social media, the reasons behind these issues should be further researched and discussed.

Recommendations

Recommendation 1: Enhancing Climate Change Outreach and Engagement Initiatives through Digital Means

These surveys highlight the need for increased climate change-related outreach and engagement initiatives, both to increase the diversity of people that are consulted in climate change actions, and to increase local awareness on climate change-related issues and actions.

Participant responses to questions 2 and 3 show that there is a glaring lack of engagement with students and young people in this survey, as no rural students participated in the study and only 2.5% of survey respondents were aged 16-25. This is problematic because according to Canadian census data, individuals within that age group make up approximately 10.5% of Port Hope's population, and so this is an age group that is significantly underrepresented by this survey (Statistics Canada, 2017). Their absence could indicate a potential lack of young people's participation in climate change-related initiatives in Port Hope as a whole. Despite this, we know that they are a critical demographic to engage with in climate change advocacy, because they will inherit both the solutions and issues associated with climate change. Interestingly, they are typically a very active group in climate advocacy, and often lead climate change-related initiatives (O'Brien, 2018).

This survey also lacks diversity from an income perspective, as those with higher incomes are over-represented in the survey data, with those in the $80,000-100,000 income range almost doubling their census prevalence, while those in the lower brackets are underrepresented (Statistics Canada, 2017). While it's true that this is generally in-line with the literature that shows that individuals with higher incomes are more likely to engage in climate advocacy (Torgler et al., 2011), it's also true that those with lower incomes are much more vulnerable to the negative impacts of climate change (Hallegatte et al., 2018) - and so it is of utmost importance that we engage with these populations in climate change planning. There is also a conspicuous lack of engagement from individuals with low education levels, which may be related to the lack of low-income groups (Wolla and Sullivan, 2017). These shortcomings are present in both rural and urban respondents, and so there is urgency for them to be addressed in both contexts.

Additional to diversity concerns, there are issues in terms of overall awareness and climate engagement among survey respondents, both rural and urban. To that point, over 30% of both rural and urban respondents felt like they did not know what the municipality of Port Hope was doing to address climate change, a lack of awareness that was slightly higher in rural respondents. Moreover, approximately 20% of respondents also felt as though they did not know how well the private or public

sectors in the area were doing in addressing climate change. Further complicating things, urban respondents had much lower rates of engagement with climate change-oriented organizations, as only 18.5% of urban respondents were members of environmental organizations. It is reasonable to think that these numbers are even lower outside of the survey, as these respondents were likely already more involved/interested in climate change than the general population. This was far less of a problem in rural areas, as approximately 32.8% of rural respondents were members of environmental organizations. Thankfully, information from this survey can be combined with engagement and activism literature to help us go about remedying these problems.

To engage more with low-income groups, it is key to overcome the participatory barriers that they often face to engagement (McBride et al., 2006). The same can be said for youth and young people, who also experience significant barriers to civic engagement (D'Agostino and Visser, 2010). Thankfully, one strategy stands out that can help both low-income individuals and young people to overcome barriers to civic engagement: digital engagement platforms.

Digital engagement platforms have the unique potential to contribute to educating, informing, and empowering the aforementioned groups while simultaneously overcoming typical barriers that often impede traditional engagement for low-income groups (Vicente et al., 2017) and youth. These digital platforms allow for individuals to access information, meet, discuss, and vote on issues virtually (Schroedel, 2020), and are already used in many small cities in North America. They are also used at a larger scale - for example, Barcelona and Helsinki have implemented the civic engagement platform Decidim, which is used by tens of thousands of respondents of each city (Decidim, 2019). Some of these dedicated technologies can be accessed for free, so the community may be able to kickstart such initiatives at low cost. Alternatively, digital engagement strategies can capitalize on social media, using it to create dedicated spaces for civic engagement and interaction on the topics at hand (Cho et al., 2020). This could be an effective solution if the technological demands of adopting a new technology are deemed too high. It should be noted that encouraging this sort of digital participation is different from merely posting on social media - rather, it is about creating dedicated digital spaces, like groups, for dialogue and interaction between members of these communities, local actors, experts, and individuals in power. It's important that participants in these interactive spaces are able to feel that what they are saying is being listened to and is having a real impact on policy direction (Barry, 2016).

As it pertains to youth and young people, studies have identified that to increase their civic engagement it is critical to give youth some level of agency/ownership and a special place that they can voice their concerns, like youth boards or councils (Justice, 2020; Camino and Zeldin, 2002). The greater feeling of importance and ownership you can give to young people, the more likely they are to remain meaningfully engaged (Justice, 2020; Buissink, 2017). A good avenue for kickstarting this engagement is by reaching out through local school systems (Camino and Zeldin, 2002). This appears to be mainly an issue of engaging youth, as climate awareness is generally not an issue among young people (Reinhart, 2018). Therefore, it will be important for these digital spaces to create places that are specifically for youth, so that they can feel as though they have a unified voice and are able to make a difference.

Importantly for rural respondents, digital engagement allows individuals to overcome the distance barriers that may impede participation, and can often be accessed through mobile devices to increase accessibility for youth and low-income. There are multiple organizations in Toronto, like Digital Public Square, that are already engaged in creating digital participation platforms, and so there is regional capacity for this sort of development (Kennan, 2019). We are of the opinion that municipal government should be heavily involved in this initiative, as a way to give it weight and allow decisions facilitated by these platforms to have real legislative or policy impacts (Barry, 2016).

There is also the issue of low general engagement and awareness of climate change issues, especially for urban respondents. However, survey answers can inform us on how to go about remedying that issue. Respondents generally spend a significant amount of time on social media, with the most popular platforms being Facebook, Instagram, and Youtube. Despite this, most saw climate change-related content only sometimes, with an almost equal amount seeing it rarely or never. Further, respondents were subscribed to a relatively low number of Port Hope social media accounts, with the exception being the @MunicipalityofPortHope Facebook account, to which 55% of respondents were subscribed. Despite this current lack of followers, respondents were generally very open to following Port Hope climate change-related accounts in the future, with only 13.1% of respondents saying they were unlikely to do so. Combined, these factors indicate that there is significant room for growing and expanding Port Hope's climate change-related presence on social media.

Port Hope should more actively share information on climate change and climate change-related actions on social media, to reach both rural and urban respondents. This is reflected in climate change engagement literature, where social media has been pointed to as a critical tool for fostering climate change awareness and engagement (Mavrodieva et al., 2019). Looking at the survey data, content should take the shape of short videos and pictures. Urban respondents were especially receptive to short videos and pictures, although there is no major indication that the messaging should be different for rural or urban areas. These should primarily be promoted through the Facebook account initially, as it currently has the most followers. It could then branch out and link to other relevant accounts. Investments should be made to help produce high-quality content, and perhaps even to boost local social media posts to increase viewership and awareness for a small fee. To attain those who do not have social media, prominent alternative sources listed by respondents were the newspaper and the municipal website.

To summarize, it will be important for Port Hope climate change planning to actively engage more youth and low-income groups. This can be done by giving them special platforms to organize and voice their concerns, which can be facilitated by the adoption or promotion of digital means of civic engagement. Further, there is a clear opportunity for more aggressive or active social media campaigning to increase overall engagement and awareness of local climate change actions. These efforts should be initiated from the @MunicipalityofPortHope facebook account and be primarily in the form of short videos or pictures. Overall, these two recommendations point towards Port Hope strengthening its digital capabilities as a means of increasing local engagement and awareness, both in the interest of diversity and overall awareness.

<u>Recommendation 2: Agriculture and Tree Planting</u>

One of the strongest points of agreement for respondents both urban and rural was observed in the choice of top climate change adaptation actions that respondents think the Municipality of Port Hope should undertake. The vast majority of both rural and urban respondents agreed that the municipality should encourage tree planting and provide protection to the local tree canopy (85.5% and 83.0% respectively), while the majority also supported helping farmers adopt new practices to address climate change (though this was slightly more popular among rural respondents than urban). Equally as important, two thirds of respondents to Q.29 highly prioritized supporting the local agricultural community (64.1%), making it the top prioritized option. Considering factors like the high level of demands for expanding the local tree canopy, providing protection for wetlands near the Ganaraska river and helping farmers to adapt new practices in the face of climate change, a community desire for a plan that both supports local farmers and enhances local tree communities has emerged.

Thus, farmers should be encouraged and even incentivized to plant trees in small clumps or along the borders of agricultural lands to address the outstanding community demand for tree planting and protection which is a common concern of respondents. Not only will this help address community concerns, but it can provide numerous benefits to local inhabitants and the farmers themselves. First, it can assist with the conservation and preservation of local species and habitats - identified by respondents as an important priority - and an increased diversity of farm outputs while maintaining the same level of livestock productivity (Teklehaimanot et al, 2000; Smith, 2007). Besides, such revegetation initiatives can even lead to comprehensive agroforestry options, if desired by farmers, which can be economically feasible for local governments to provide required funds and services for future returns (Smith, 2007). Moreover, trees could be planted that generate sellable products like fruit or nuts, which could further help diversify farmer's income (MacFarland, 2020). This could further help secure farmers against the potentially destructive impacts of climate change on local crops, as agricultural diversity enhances resilience (Lin, 2011) and trees have actually been found to have protective effects on nearby crops (MacFarland, 2020). To that end, planting trees in small clumps can create microclimates that can help to stabilize conditions for nearby crops (FAO, 1992; MacFarland, 2020). Using trees in small clumps or along borders of farmland has been identified by the USDA as an effective way of simultaneously achieving positive agricultural, social, economic, and environmental outcomes (MacFarland, 2020).

Planting trees and creating woodlands would not only just improve agricultural outcomes, green spaces, and local livability and beauty, but it would also provide soil stabilization to reduce erosion and the potential damages of floods before they happen (Krause et al., 2001). This is especially important for the local farmlands, as flooding in the agricultural areas stands to further impact Port Hope downstream on the Ganaraska, as soil and contaminant runoff can severely damage local infrastructure. In that way, planting trees would proactively reduce local flood risks by not only reducing runoff but by reducing the chances of erosion that could threaten downstream infrastructure (Krause et al., 2001). Avoiding such threats, which were unfortunately already experienced by Port Hope residents and many other residents from the surrounding area, can help to protect residents near Ganaraska river (GRCA, 2009). Moreover, they can provide other water and soil-related benefits including lowered salinity, improved water quality, improved water supply, and increased soil fertility (FAO, 1992). Finally, planting trees on farmland that may be near wetlands can help enhance wildlife habitat, protect vulnerable species, improve wetland

water quality, and increase overall biodiversity - thereby helping achieve another principal community goal (NRCS Wisconsin, n.d.).

Although planting trees on and around agricultural land sounds like a very promising and simple solution, it sometimes leads to negative outcomes if conservation needs and their integrity are disregarded (Holl & Brancalion, 2020; Weldman et al., 2015). But such undesirable outcomes on biodiversity and ecosystems can be avoided by the integrated work of scientists and policymakers, and there are multiple local environmental groups in the Port Hope area that could assist with tree planting and reduce costs. Port Hope has already implemented a focus on tree planting in their municipal plan, and so there is capacity in the community to be able to do this right (Port Hope, 2017). As such, this can represent a valuable opportunity to foster community engagement while addressing local priorities and preferred actions in the face of climate change.

The local agricultural communities and their sustainable development are at the centre of this issue, but there is also a responsibility for both local government and the community to take on their parts. This is agreed on by survey respondents, as the majority of them - both urban and rural - supported government action to support local businesses, and also recognized the responsibility that individuals hold to address climate change. Governmental supports have always played a crucial role in stabilizing the agricultural economy, reducing the potential outcomes of uncertain risks including harsh weather conditions or pests, and providing farmland protection (Eagle et al., 2015). These supports can be introduced in either form of emergency funds for them to use in case of aforementioned circumstances,or in a form of program funds and subsidies that can be accessed (Prime Minister of Canada, 2020). It would thus be possible for the local government to advocate or provide small tree-planting subsidies to local farmers in order to offset the initial cost of planting the trees, which can vary depending on a multitude of factors. It would be important for farmers to be informed of the availability of such subsidies and funds that can give the initial encouragement for agricultural development. At this point, community supported agriculture should be considered as its potential benefits are more engaged community members and local farmers which can lead to a more sustainable local food system (Brehm & Eisenhauer, 2008). Thus, in addition to providing subsidies for tree-planting, local governments should look to encourage community participation in the task. Tree planting is a low-barrier activity compared to some other climate initiatives, and as such a diverse range of community members could participate in the task. This would provide a way to reduce the costs of tree planting for farmers while simultaneously providing an enjoyable, community-building opportunity for the locals. Furthermore, increased community engagement on such a task would certainly help to solve diversity concerns and lack of public engagement mentioned in the first recommendation.

To summarize, survey results indicate a strong preference among local respondents for supporting local agriculture and securing local farmlands in the face of climate change. Simultaneously, they also show that respondents have a strong desire to protect and enhance local tree numbers. These solutions can be tackled together, through the integration of community action and farming subsidies for tree planting on agricultural lands. Planting more trees on agricultural lands stands to provide great benefits to local farmers and can help us address some of the community's top priorities.

Conclusion

In conclusion, this paper went over the data from the Port Hope community survey, examining it from a rural-urban perspective. We found that overall, rural and urban respondents were very similar across the board. They were made up of similar demographics shared common points of view, and often identified the same things as top priorities and actions. Among the only major differences observed were differences in perspective on public transportation in the Port Hope area. From this data, we were able to come to two policy recommendations for local actors. The first was to look to digital means to enhance the diversity of climate change engagement and the overall levels of awareness in the community. Secondly, we recommended that the community look to support farmers to plant more trees on and around agricultural lands through both government subsidies and through community engagement.

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Climate change in Port Hope community survey

Developed by Jinqiu Wang and Jinshuo Yao
Based on community leader interviews conducted by Sufiyan Bharcuha

Introduction and Survey Participant Consent Form
TIME REQUIRED: Approximately 15-20 Minutes | SURVEY CLOSES: April 15, 2021

You are invited to participate in a public survey commissioned by the Climate Change Working Group (formerly the COEESWG) sanctioned by the Municipality of Port Hope, Ontario. You must be 18 years and older to participate. The purpose of the survey is to gather local information and insights about climate change in Port Hope and the surrounding area. Your input will help inform the Working Group's recommendations to Municipal Council leading to an Environmental Sustainability Master Plan for Port Hope.

The Working Group has engaged a research team at McMaster University to design and conduct this survey founded on preliminary interviews with key local stakeholders. The team is based in the W Booth School of Engineering Practice and Technology and is co-led by professors Gail Krantzberg and Andrea Hemmerich. It includes master's level graduate students enrolled in community-engaged project learning.

This unique survey will help the Working Group identify:
- local perceptions and experiences of climate change
- examples of current initiatives and their impact
- gaps, barriers and opportunities
- priority actions moving forward (mitigation and adaptation)
- potential roles of municipal government and other stakeholders - including Port Hope community groups

The purpose of this research is to better understand your perceptions and concerns regarding climate change and related activities within the Municipality of Port Hope. We would like your opinion about priorities for the municipality and how you expect the municipality to lead the community towards collaborative climate action based on national and provincial targets and local consideration. We would like to know what impacts of climate change you have observed in your community and local region. We would like to hear about actions that have been undertaken by the Municipality of Port Hope, businesses and individuals. We will identify gaps, barriers and opportunities to enhance adoption of mitigation and adaptation strategies that address key community concerns.

Your participation will consist of completing a questionnaire. The time required to complete this questionnaire will vary among individuals, but typically it is not greater than 15 minutes. Your participation is entirely voluntary, and you may choose to not participate. Information gathered during this survey will be completely confidential and will not be used to identify respondents. No signature to consent to takin the survey is required.

We do not forecast any risks associated with this survey. If you encounter any questions that make you uncomfortable, you can choose to not respond, and you can withdraw at any time during the study without any penalty to you.
The survey will address data gaps and local community priorities that will be used by the Centre of Excellence for Environmental Sustainability Working Group, as part of their mandate to recommend to Municipal Council, actions leading to an Environmental Sustainability Master Plan for Port Hope. Information gathered during this survey is anonymous. You will be asked to say “yes” that you consent to the survey Results
The results of the survey will be made available on social media through Port Hope.

Questions about the Study: If you have questions or need more information about the study itself, please contact me, Dr. Gail Krantzberg at: krantz@mcmaster.ca

This study has been reviewed and cleared by the McMaster Research and Ethics Board. If you have concerns about the questions or your rights as a participant, or about the way this survey is being conducted, please contact:

* Required

REQUIRED: I have read the Participant Consent information above and agree to take part in this survey.*
Mark only one oval.

- Yes (Skip to question 2)
- No

General Questions

In this section we gather information that will be used to compare knowledge, perceptions and attitudes toward climate change in Port Hope across several demographic groups. Please specify or elaborate using the "other" option.

Q1. How are you connected to the Municipality of Port Hope?
Mark only one oval.

- Live in Port Hope
- Work in Port Hope
- Live and work in Port Hope
- Community group has connection
- Other:

Q2. Which employment sector do you work in? Mark only one oval.

- Small business
- Large business
- Industry - e.g., manufacturing Education
- Healthcare
- Environment
- Local or regional government Provincial or federal government Tourism
- Agriculture
- Non-profit
- Student
- Unemployed
- Retired
- Other:

Q3. Which age group describes you? * Mark only one oval.

- 66 years or older
- 50-65 years old
- 26-49 years old
- 16-25 years old

- Under 16 years old
- Prefer not to answer

Q4. Are you a member of any environmental organization? If yes, please specify using "other." Check all that apply.

- Yes
- No
- Other:

Q5. What is the highest level of education you have completed to-date? Mark only one oval.

- High school
- College certificate, diploma or degree
- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate

Q6. Which of these describes your household income last year? Mark only one oval.

- Under $20,000
- $20,001 – $40,000
- $40,001 – $60,000
- $60,001 – $80,000
- $80,001 – $100,000
- $100,001 or over
- Prefer not to answer

Q7. In what area do you live? Mark only one oval.

- Urban area
- Rural area

Awareness and Perceptions of Climate Change

Q8. Do you actively seek out news about climate change? Mark only one oval.

- Yes
- No

Q9. Which sources provide you with information about climate change? Choose all that apply.
Check all that apply.

- Television
- Newspaper
- Radio
- Internet
- Social Media
- Municipal Council or Government Information
- School/College/University

- Friends/Family
- Other:

Q10. In your opinion, what are the top causes of climate change? Check all that apply.

- Deforestation
- Humanity's use of fossil fuels
- Intensive agriculture
- Climate change is not related to human activity
- Not sure
- Other:

Q11. In your opinion, which of the following factors most contribute to climate change? Check all that apply.

- Energy demand - thermal and electrical Population growth
- Consumer behaviour
- Landfills
- Urban sprawl
- Manufacturing and construction Transportation
- Food production
- Building design and maintenance
- Other:

Q12. Do you agree/disagree with the following statement? I believe climate change is inevitable because global climate tipping points have been reached.
Mark only one oval.

- Agree strongly
- Agree
- Neither agree nor disagree
- Disagree
- Disagree strongly

Your Views on Climate Change in Port Hope ~ Community Perspective

Q13. Looking head, and in your opinion, what are the likely negative impacts of climate change in Port Hope?
Check all that apply.

- Increase in the number and severity of extreme weather events
- Increased flooding due to a rise in water levels and insufficient stormwater infrastructure Incidents of water contamination
- Increased soil erosion adjacent to lakes and rivers
- Increased burden on municipal finances
- Increase in the number and severity of wildfires
- Decrease in crop yields

- Loss of natural habitats and wildlife
- Disproportionate negative impact on vulnerable populations - e.g., low income residents Increased damage to public infrastructure - roads, bridges, sewer systems, etc. Increased stress on the local healthcare system - e.g., prolonged heat warnings
- Other:

Q14. Do you agree/disagree with the following statement? I believe the responsibility to mitigate climate change lies with every individual making lifestyle changes.
Mark only one oval.

- Agree strongly
- Agree
- Neither agree nor disagree
- Disagree
- Disagree strongly

Q15. In your opinion, what are the top potential actions that individuals can take at home that would help reduce greenhouse gas emissions (GHGs) in Port Hope?
Check all that apply.

- Reduce car use
- Improve the efficiency of existing home heating and cooling systems
- Upgrade to next generation heating and cooling equipment (e.g., residential heat pumps) Increase the use of home composting
- Install renewable energy systems - electrical power and/or thermal energy
- Purchase fewer products/services with a significant carbon footprint
- Create more green spaces (e.g., gardens, tree lines, etc.)
- Reduce the consumption of animal protein
- Water conservation (e.g., reduce the use of domestic hot water)
- Support local businesses - including farms
- Purchase high efficiency home appliances
- Invest in weatherproofing to reduce energy demand
- Other:

Q16. Which vehicle would you prefer to own? Mark only one oval.

- Pure electric vehicle (EV)
- Hybrid vehicle (HV)
- Fossil fuel vehicle (gasoline/diesel)
- No vehicle

Q17. How often do you use public transportation (local and/or regional)? Mark only one oval.

- Daily
- Several times a week
- Several times a month

- Seldom

Q18. How would you rate the quality of public transportation in your local area of Port Hope? Mark only one oval.

Very good Good Mediocre Poor

Very poor Non existent Other:

20. Q19. What improvements would help you choose public transportation or make your ride better? Choose all that apply.

Check all that apply.

- More routes
- More stops
- Increased frequency
- Use of on-demand minibus (can be scheduled by riders)
- Dedicated bike lanes
- Bicycle lock-up units at mobility hubs
- Other:

Q20. In your opinion, what are the top actions that Port Hope businesses can take to reduce their greenhouse gas emissions (GHGs)?

Check all that apply.

- Conduct annual energy and emissions audits to monitor and improve progress
- Reduce the consumption of fossil fuels in production processes - energy efficiency and energy conservation
- Contribute to a more sustainable local economy that supports Port Hope businesses
- Work with all levels of government to access support needed to decarbonize operations
- Shift to non-carbon energy sources (e.g., renewables)
- Decarbonize fleet operations (e.g., invest in electric vehicles)
- Promote environmentally-friendly products and services
- Adopt the principles and practices of a "circular economy"
- Other:

Q21. Do you think eco-friendly products are too expensive for you to switch over? (Eco- friendly products may be more expensive due to resource management or production costs.)

Mark only one oval.

- Yes
- Yes ... but it's worth it
- No
- No ... and I'm prepared to pay even more if necessary
- Other:

Q22. Should government incentivize private companies in Port Hope to reduce their greenhouse gas emissions?

Mark only one oval.

- Yes
- Yes, yet with caveats (please specify under "other")
- No
- Other:

Q23. How would you rate the private sector's current performance in addressing climate change in Port Hope?
Mark only one oval.

- Very good
- Good
- Not good
- Other:

Q24. How would you rate the public sector's current performance in addressing climate change in Port Hope?
Mark only one oval.

- Very good
- Good
- Not good
- Other:

Your Views on Climate Change in Port Hope ~ Local Government Perspective

Q25. In your opinion, what are the top reasons to address climate change at the local level? Check all that apply.

- Local communities exhibit higher concentrations of GHG emissions than rural areas
- Local communities know what's best for their village, town or city
- Local communities directly experience the impacts of a changing climate
- Local communities are able to rally people and resources needed to tackle climate change
- Local communities are able to access information needed to address climate change at the grassroots level
- Other:

Q26. What do you know about recent actions taken by the Municipality of Port Hope to address climate change and its impacts? Please choose all that apply.
Check all that apply.

- Engaging local citizens and organizations around the issue of climate change
- Modelling 'climate leadership' in the design, delivery and monitoring of local municipal services
- Working collaboratively with the wider community to develop local solutions to climate change

- Reporting on Port Hope's progress to address climate change
- Reaching out to higher levels of government for assistance related to climate change
- Funding of specific projects/programs (mitigation/adaptation) intended to help address climate change in Port Hope
- Other:

Q27. In your opinion, what are the top climate change mitigation actions (existing and/or new) that the Municipality of Port Hope should focus on going forward? (Mitigation is the reduction of activities that result in greenhouse gas emissions.)
Check all that apply.

- Ensure that municipally owned and operated assets utilize best practices in decarbonization - including the adoption of renewable energy sources
- Enable the community-wide shift to electric vehicles
- Enhance and expand public transportation
- Design a more walkable and bike-friendly community
- Promote deep energy retrofits of older buildings (public, private and institutional) Recognize local individuals and organizations demonstrating climate leadership Protect and expand the local tree canopy
- Work with all levels of government to access funding needed to address climate change
- Limit urban sprawl
- Other:

Q28. In your opinion, what are the top climate change adaptation actions that the Municipality of Port Hope should undertake? (Adaptation is taking actions that make us more resilient to the current and future impacts of climate change.)
Check all that apply.

- Upgrade stormwater infrastructure
- Upgrade and expand shoreline protections
- Save wetlands across the Ganaraska watershed
- Invest in early warning systems that can forecast adverse weather events
- Institute requirements for low impact development
- Promote water conservation practices in anticipation of drought conditions
- Help the area farm community adopt new practices in response to a changing climate
- Encourage tree planting and protection
- Amend bylaws to enable sustainable practices, such as backyard agriculture, and urban intensification
- Increase residents' access to cooling centres (summer) and heating centres (winter)
- Other:

Q29. In your view, what should be the priorities of Port Hope Municipal Council given the growing importance of climate change in Port Hope? Add any comments under "other."
Local economic development and job creation. Mark only one oval.

- High priority
- Medium priority
- Low priority
- Other:

New housing to accommodate population growth Mark only one oval.

- High priority
- Medium priority
- Low priority
- Other:

Quality of life improvements Mark only one oval.

- High priority
- Medium priority
- Low priority
- Other:

Limiting increases to taxes and other charges Mark only one oval.

- High priority
- Medium priority
- Low priority
- Other:

Affordable housing Mark only one oval.

- High priority
- Medium priority
- Low priority
- Other:

Municipal infrastructure - upgrades/new Mark only one oval.

- High priority
- Medium priority
- Low priority
- Other:

First Nations rights and reconciliation Mark only one oval.

- High priority
- Medium priority
- Low priority
- Other:

Supports for local agricultural community Mark only one oval.

- High priority
- Medium priority
- Low priority
- Other:

Investments in public transportation Mark only one oval.

- High priority
- Medium priority

- Low priority
- Other:

Supports for vulnerable populations Mark only one oval.

- High priority
- Medium priority
- Low priority
- Other:

Climate change in Port Hope Mark only one oval.

- High priority
- Medium priority
- Low priority
- Other:

Your Use of Social Media

In this section, we gather information about your social media habits. This will be used to help promote events and increase community-wide awareness about climate change.

Q30. How much time do you spend on social media per day? Mark only one oval.

- Less than 30 minutes
- 30 to 60 minutes
- 1 to 2 hours
- More than 2 hours

Q31. Which social media services do you normally use? Check all that apply.

- Instagram
- Facebook
- Youtube
- Linkedin
- Twitter
- Tiktok
- Pinterest
- Snapchat
- Other:

Q32. In what format would you prefer receiving information about climate change in Port Hope? Choose all that apply.
(Check all that apply.)

- Short videos (Tiktok, Instagram, Facebook, etc.) Long videos (Youtube)
- Pictures (Instagram, Facebook, Twitter etc.) Texts (Twitters)
- Discussion Forums (Reddit, Quora)

- Bookmarking and content curation networks (Pinterest) Consumer review networks (Yelp, TripAdvisor, Google Maps)
- Other:

Q33. Which Port Hope social media accounts do you follow? Check all that apply.

- Instagram @porthopeontario
- Instagram @exploreporthope
- Twitter @PortHopeInfo
- Twitter @porthopeontario
- Facebook @MunicipalityofPortHope
- Youtube Channel @The Municipality of Port Hope Youtube Channel @Port Hope Tourism
- Other:

Q34. How often do you view videos and/or images about climate change on social media? Mark only one oval.

- Always
- Often
- Sometimes
- Rarely
- Never

Q35. If you don't currently follow any Port Hope social media accounts on climate change, how likely are you to do so in the future?

- Mark only one oval.
- Very likely
- Likely
- Neutral
- Not likely
- Very unlikely

Q36. THANK YOU! Please use the box below to provide any additional comments