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Choice experiment survey to estimate the economic value of visibility improvement for Canadians

Final Report

Prepared for Environment and Climate Change Canada

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For more information on this report, please contact ECCC at: ec.enviroinfo.ec@canada.ca

Choice experiment survey to estimate the economic value of visibility improvement for Canadians Final Report

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Supplier name: Kantar

November 2020

Environment and Climate Change Canada (ECCC) commissioned Kantar to design and conduct a choice experiment survey in order to assess the economic value that Canadians' associate with a noticeable visibility improvement, expressed in monetary willingness-to-pay per household for a 1-unit deciview (DV) change. The findings of this study are meant to refine the accuracy and representativeness of the economic values associated with visibility in the Air Quality Valuation Model (AQVM2), whose estimates are used in cost-benefit analyses of air pollution regulations.

Cette publication est aussi disponible en français sous le titre: Enquête par la méthode de choix multi-attributs pour estimer la valeur économique d'une amélioration de la visibilité auprès des Canadiens

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Definitions of Key Terms

Acronym	Definition
AAPHI	Addressing Air Pollution Horizontal Initiative
AHC	Annual Household Cost
AQHI	The Air Quality Health Index
AQVM2	Air Quality Valuation Model
CAWI	Computer Assisted Web Interviewing; the technology used for data collection
DV	Deciview; a measure of visibility that corresponds to incremental but perceptible changes in visual perception
ECCC	Environment and Climate Change Canada
PNG	Portable Network Graphic; the type of photograph output used in the survey
WTP	Willingness to Pay
VAQR	Visual Air Quality Rating

1. Executive Summary

1.1 Research Purpose and Objectives

Air pollution can lead to haze that can reduce or obscure visibility and economic literature has established that reduced visibility can be associated with reduced citizen well-being along with lost revenues in the areas of outdoor recreation and/or tourism. To improve visibility, it is necessary to reduce pollution levels, which can come at a cost to Canadian consumers. Generally, these costs are indirect and come in the form of additional expenses incurred by businesses for installing pollution control devices on vehicles and manufacturing equipment. The additional costs to businesses are eventually passed on to Canadians through higher prices on everyday items such as food, electricity, and transportation. Reducing pollution and thus improving visibility means that Canadians will experience unavoidable increases to general cost of living.

To estimate the value of changes in pollution levels, Environment and Climate Change Canada (ECCC) currently uses the Air Quality Valuation Model (AQVM2). This model measures the impacts of pollution on visibility, crop productivity, and cleaning costs for households.

The current inputs into the visibility module within AQVM2 use data that was last collected in 2002 in the lower mainland of British Columbia only and were applied throughout Canada. Furthermore, the existing empirical literature pertaining to the valuation of visibility improvement is very limited, especially in Canada. The collection of current and more methodologically robust data will allow ECCC to provide more accurate information to decision-makers, which is consistent with ECCC's responsibilities, Treasury Board Secretariat's guidelines on cost-benefit analysis under the Cabinet Directive on Regulation and the Government of Canada's commitment to evidence-based decision-making.

The overall objective of this research was to obtain current and robust data regarding Canadians' willingness to pay (WTP) for improved visibility that can better characterize the differences that may exist across the Canadian population. The findings of this study will be used to refine the accuracy and representativeness of the economic values associated with visibility in AQVM2, whose estimates are used in cost-benefit analyses of air pollution regulations.

1.2 Summary

A discrete choice experiment was undertaken with the goal of understanding how attributes of visibility, health risk and annual cost to household affect WTP per household for a 1-unit DV change. The levels chosen for investigation for this study are outlined in Table 1.2.a. below.

Table 1.2.a. Visibility Attributes and Levels

Visibility (Deciview/Visual Range)	Health Risk	Annual Household Cost
9 DV (155-160 km)	Low	$30 ($2.50 per month)
13 DV (105-110 km)	Moderate	$60 ($5.00 per month)
17 DV (70-75 km)		$90 ($7.50 per month)
21 DV (45-50 km)		$180 ($15.00 per month)
25 DV (30-35 km)		$360 ($30.00 per month)
29 DV (20-25 km)		None
33 DV (10-15 km)		

Visual stimuli (pictures) were used to depict various levels of visibility to the respondents. As there is no "typical" visibility for Canada, a wide visual range was chosen for testing (5-35 DV) to allow for evaluation of the most likely air quality scenarios in Canada.

The Air Quality Health Index (AQHI) was used to represent health risk to respondents and two levels of health risk were included in the final design: low and moderate. No constraints were imposed on which health risk levels could be combined with which visibility levels.

A complete enumeration approach was used while designing the choice sets. The complete enumeration approach was chosen as it better addresses the objective of the research: to estimate a robust nationally-averaged WTP value (annual $ per Canadian household) for a 1-unit deciview (DV) change and to identify statistically significant variables in explaining the willingness to pay.

A design with balanced alternative effects (complete enumeration) does a better job of estimating the specific visibility levels in the context of the price, whereas a design with imbalanced alternative effects (full factorial) would be better for estimating the gaps.

In general, the goal of the experimental design is two-fold:

1. Level balance – each level to appear the same number of times as each other level within an attribute.
2. Orthogonality – levels across attributes to be independent of each other in how they appear across choices.

In this study's design, the following constraints were implemented with the goal of a more realistic comparison for respondents:

- For each task, the baseline scenario was on the left with the test scenario on the right
- The test scenario always had better visibility than the baseline scenario.
- The baseline scenario always had $0 cost
- The test scenario always had cost of at least $30 per year.
- The baseline scenario always had visibility no better than 17 DV.
- The test scenario always had visibility no worse than 25 dv.

The discrete choice exercise was estimated using a Hierarchical Bayes Multinomial Logit model and was estimated using Sawtooth Software's CBC Hierarchical Bayes Module v5.5.6. The model used an iterative Monte Carlo Markov Chain approach to estimate the model for 200,000 iterations with the first 100,000 iterations used as a burn-in to calibrate the process and the last 100,000 iterations used to provide a robust estimate of the model. The final model estimated linear effects for visibility and annual household cost and categorical effects for the two levels of health risk. This model generated a robust estimate of the WTP per household for each one-unit decrease in the DV scale for the entire sample and for various subgroups of interest.

Two WTP values were calculated per respondent. The first WTP was when the heath risks are both moderate since we assume the baseline state has a moderate health risk. In this calculation, the overall utility of the health risk was zero since both the baseline and improved health risk level were the same. The second WTP value was the WTP for a one unit decrease in DV that results in a low health risk. This calculation included the change in utility in moving from a moderate risk to a low risk.

When health risk is zero, on average, Canadians are willing to pay $107.04 annually or $8.92 per month for an improvement of one DV to visibility. The median is $1.10 per month and the standard deviation is $21.27 per month indicating a wide variability in the amount that Canadians are willing to pay for 1 DV improvement in visibility.

There are noticeable differences among different demographic groups, more specifically, younger Canadians (18-34), households with children or with individuals with health conditions impacted by air quality and/or those who currently live in areas with high visibility are all willing to pay more than their respective counterparts.

Not unexpectedly, Canadians are willing to pay more when there is an associated improvement to health. On average, Canadians are willing to pay $581.76 annually or $48.48 per month for an improvement of one DV to visibility that includes a perceived associated decrease in health risk from moderate to low. There are noticeable differences among different demographic groups when it comes to WTP with an associated improvement to health. Specifically, younger Canadians (18-34), women, households with children or with individuals with health conditions impacted by air quality and/or those living outside of Atlantic Canada are all willing to pay than their respective counterparts.

In order to provide more clarity around the WTP differences with improved health risks, the analysis reviewed the ratio of WTP on its own, compared to WTP with an associated improvement to health risk. Absolute WTP values identify how much Canadians care about visibility and how much they care about health. The ratio analysis allows one to understand how much Canadians care about visibility compared with health. Not unexpectedly, virtually all Canadians care more about health than visibility however, the ratio analysis helps to identify Canadians that “care” more about visibility and these include middle aged Canadians (35-54), Atlantic Canadians, rural Canadians, and Canadians with children in the home and/or living in areas with good visibility (9 DV or less).

1.3 Methodology

The findings of this study are based on online surveys conducted from September 8 to 29th, 2020. The survey was conducted among Canadians aged 18 years and older. Respondents were randomly selected from an online panel and invited via email and/or personal online panelist dashboard to participate in the survey. The results of panel surveys are considered a non-random sample, meaning they are not a random selection from the general population of Canada, rather they are a subset of people who are, in this case, people who have signed up to participate in online surveys. As such, margin of error does not apply.

The data have been weighted to reflect the demographic composition of the Canadian population for age, gender, region, education, and population of residence. Surveying was conducted in the respondent’s official language of choice and took an average of 15 minutes to complete.

Contract Value

The total contract value for the project was **$122,887.15** including applicable taxes.

Statement of Political Neutrality

I hereby certify as a representative of Kantar that the deliverables fully comply with the Government of Canada political neutrality requirements outlined in the Communications Policy of the Government of Canada and Procedures for Planning and Contracting Public Opinion Research. Specifically, the deliverables do not include information on electoral voting intentions, political party preferences, standings with the electorate or ratings of the performance of a political party or its leaders.

Tanya Whitehead

Kantar

Senior Director, Public Practice Leader

2. Economic Value of Visibility Improvement for Canadians

Background and Objectives

Air pollution can lead to haze that can reduce or obscure visibility and economic literature has established that reduced visibility can be associated with reduced citizen well-being along with lost revenues in the areas of outdoor recreation and/or tourism. To improve visibility, it is necessary to reduce pollution levels, which can come at a cost to Canadian consumers. Generally, these costs are indirect and come in the form of additional expenses incurred by businesses for installing pollution control devices on vehicles and manufacturing equipment. The additional costs to businesses are eventually passed on to Canadians through higher prices on everyday items such as food, electricity, and transportation. Reducing pollution and thus improving visibility means that Canadians will experience unavoidable increases to general cost of living.

To estimate the value of changes in pollution levels, Environment and Climate Change Canada (ECCC) currently uses the Air Quality Valuation Model (AQVM2). This model measures the impacts of pollution on visibility, crop productivity, and cleaning costs for households. AQVM2 is also used to generate values that are used for input into cost-benefit analyses within Regulatory Impact Analysis Statements for regulations under Addressing Air Pollution Horizontal Initiative (AAPHI), such as the oil and gas sector regulations[1] and the multi-sector air pollutants regulations[2]. The main objective of such cost-benefit analyses is to demonstrate the benefits of air pollution regulations versus their costs.

The current inputs into the visibility module within AQVM2 use data that was last collected in 2002 in the lower mainland of British Columbia only and were applied throughout Canada. Furthermore, the existing empirical literature pertaining to the valuation of visibility improvement is very limited, especially in Canada. In fact, at the time of design, the most recent primary studies in Canada, were published before 2012 or address historical valuation metrics, and as such it is not possible for ECCC to draw from a recent study to update the AQVM2 economic values. The collection of current and more methodologically robust data will allow ECCC to provide more accurate information to decision-makers, which is consistent with ECCC's responsibilities, Treasury Board Secretariat's guidelines on cost-benefit analysis under the Cabinet Directive on Regulation and the Government of Canada's commitment to evidence-based decision-making.

The overall objective of this research was to obtain current and robust data regarding Canadians' willingness to pay (WTP) for improved visibility that can better characterize the differences that may exist across the Canadian population. More specifically, this study was designed to collect the necessary data that will allow ECCC to assess the economic value that Canadians associate with a

[1] Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector) on April 26, 2018 (Canada Gazette, Part II, Vol. 152, Extra. SOR/DORS/2018-66 (pages 44 – 124))
[2] Multi-Sector Air Pollutants Regulations (MSAPR) on June 29, 2016 (Canada Gazette Part II, Vol. 150, No.13. SOR/DORS/2016-151 (pages 1872 – 2175))

noticeable visibility improvement, expressed in monetary willingness to pay per household for a 1-unit deciview (DV) change.

The findings of this study will be used to refine the accuracy and representativeness of the economic values associated with visibility in AQVM2, whose estimates are used in cost-benefit analyses of air pollution regulations.

Study Design

A discrete choice experiment approach was undertaken for this research with the goal of understanding how attributes of visibility, health risk and annual cost to household affect willingness to pay per household for a 1-unit DV change. The DV scale is a visual index designed to be linear with respect to perceived visual changes over its entire range.[3] The DV scale is zero for pristine conditions and increases as visibility degrades. A 10% improvement in visual range (in km) roughly corresponds to a decrease of 1 DV, regardless of the initial visual range. The levels chosen for investigation for this study are outlined in Table 2.1.a. below. More detail on each is provided in their respective sections below.

Table 2.1.a. Visibility Attributes and Levels

Visibility (Deciview/Visual Range)	Health Risk	Annual Household Cost
9 DV (155-160 km)	Low	$30 ($2.50 per month)
13 DV (105-110 km)	Moderate	$60 ($5.00 per month)
17 DV (70-75 km)		$90 ($7.50 per month)
21 DV (45-50 km)		$180 ($15.00 per month)
25 DV (30-35 km)		$360 ($30.00 per month)
29 DV (20-25 km)		None
33 DV (10-15 km)		

Mode and Sample Selection

This study was designed to use an online panel sample. While we recognize that the use of an online panel sample results in a non-random sample, and that mail and telephone options may address the non-random limitation, we nevertheless found the online with panel option to be the best design for the objectives of the study. The design of the study in presenting visual images is not well suited for a paper-based (mail) or telephone approach and would limit the range of experimental conditions. As such, the resulting methodology would require a mail/telephone recruit to online. Response rates for mail and telephone surveys are very low in Canada[4] and would result in significant response bias and require large weights to adjust for response bias. Further, given the WTP methodology would require a mail/telephone recruit to online approach, one could argue that the sample was not truly probabilistic as the starting sample for the survey would be “Canadians who agreed to complete an online survey”.

The concern generally with non-random sample is that it may not represent the population. To address the representation concern, the study included quotas on completions to attempt to ensure

[3] Interagency Monitoring of Protected Visual Environments (IMPROVE), 1993, Vol.2, No.1. Deciview, A Standard Visibility Index

[4] Kantar data indicates mail response rates in the 2-5% range and telephone response rates in the 3-9% range

our final sample was representative of the population based on Statistics Canada Census data. Further, we implemented random selection when matching the outgoing sample to the population. The online quota sampling approach, while non-probabilistic in nature, provided the best mode for a willingness to pay study while continuing to have a sample that is representative of the Canadian population based on age within gender within region. Details on final sample composition and weighting adjustments are outlined later in the report.

The sample for this survey was sourced from Kantar's Profiles panel. Respondents were invited to participate in the survey by email and/or personal online dashboard via Profile's website. Profile's panel has nearly 100,000 panellists located across Canada representing every region. The panel includes Canadians who have opted-in to participate in online surveys, and as per standard requirements this research excluded panellists who have participated in a Government of Canada survey or other similar surveys within the past 30 days. Recruitment for the panel primarily occurs through our longstanding partnerships with large Canadian brands like Hudson's Bay Rewards, Aeroplan, Wal-Mart and PETRO-POINTS.

Visibility

Visual stimuli (pictures) were used to depict various levels of visibility to the respondents. As there is no "typical" visibility for Canada, a wide visual range was chosen for testing (5-35 DV) to allow for evaluation of the most likely air quality scenarios in Canada. Five DV is near pristine air quality, so would only happen on the cleanest of days and 35 DV would also be rare and only typically happen during wildfires. As it is only possible to reduce visibility in an image, not enhance it, the visual range of the design was subsequently narrowed to 9-33 DV to accommodate available base imagery (details on base imagery are included below). Further, while 1 DV represents the smallest change in visibility detectable, a pretest among colleagues at Kantar, UBC and ECCC indicated that most people could only perceive a difference between 3 and 5 DV. As outlined in Table 2.1.a., final visibility levels in the research included 9, 13, 17, 21, 25, 29, and 33 DV.

The original or "base" images were sourced from the Air Quality Science Unit, Prediction and Services West Division of Meteorological Service of Canada / Environment and Climate Change Canada. The original images were used in a public evaluation of the local Visual Air Quality Rating (VAQR) in 2013. The images used in this study were chosen for convenience. More specifically, they were images that were available to the project at no cost, that had a measured DV associated with them and also included sufficient detail that would make it possible to perceive changes in visual range in both an urban and rural setting (i.e., mountains in the background). Kantar worked with a variety of scientific experts to ensure the chosen imagery accurately represented a baseline level of visibility for a rural and urban location and then engaged a visual design expert to digitally alter images to depict different levels of visibility for each selected location.

Digital Alteration of the Images

The photo manipulation involved a four-step process that is described below.

Stage 1 - Base Photo Preparation

Photographs from Burnaby and Chilliwack were used as base representations of urban and rural environments respectively for the study. These locations were chosen as these were the locations in which the Air Quality Science Unit, Prediction and Services West Division of Meteorological Service of Canada / Environment and Climate Change Canada had a range of images with confirmed DV

measures. A DV 9 photo for the urban and a DV 10 photo for the rural representation were retouched in Photoshop to remove clouds and improve contrast. Haze levels were cleared so that each base photo most closely represents a DV 9 reference photo. Detailed photo manipulation included the following:

1. Split photograph into 5 distinctive layers in Photoshop.
2. Split each photo into layered sections to be separately adjustable.
3. Layers for rural environment: sky, mountains, nearby hills, farmland, and immediate foreground.
4. Layers for urban environment: sky, mountains, city skyline, neighbourhood, and immediate foreground.
5. Remove or add haze to different layers by adding or lessening contrast to mid-tones in Adobe Camera Raw.
6. Define haze on different layers by adding or lessening texture and clarity in Adobe Camera Raw.
7. Adjust colour of haze on different layers by adjusting exposure, contrast, highlights, shadows, and colour temperature according to represented DV photos.

Stage 2 – Preparing photos for urban and rural DV

Next, base 9 DV photos for the urban and rural areas were first digitally manipulated in Photoshop to correlate to the following seven (DV) levels 9, 13, 17, 21, 25, 29, and 33. Photos representing DV levels 9, 10, 11, 12, 13, 15, 16, 22, 23, 24, 28, and 29 along with model generated photos for DV levels 9, 13, 17, 21, 25, and 33 were used as reference levels. The 5 layers of base-level photograph were adjusted to accurately represent the seven levels of haze (DV). Detailed photo manipulation involved the following:

1. Adjusting haze levels by adding or lessening contrast to mid-tones in Adobe Camera Raw.
2. Further defining haze level on different layers by adding or lessening texture and clarity in Adobe Camera Raw.
3. Adjust colour of haze on different layers by adjusting exposure, contrast, highlights, shadows, and colour temperature in Adobe Camera Raw.
4. Add artificial haze as needed where Adobe Camera Raw could not compensate.

Stage 3 – Photo retouching revisions

Photos for the digitally altered DV levels of 9, 13, 17, 21, 25, 29, and 33 were reviewed against reference photographs, combined with project team and external reviewer feedback, and adjusted. Adjustments included refinements for the environment related to haze levels and adjustments to different layers ’level of haze by adding or pulling back the transparency of the haze as well as removing or adding artificial haze.

Stage 4 – Preparation for web survey

The final images were cropped and prepared for the web survey with the following specifications:

1. Crop photos to 500 x 332 pixels
2. Convert each photo to 24-bit depth

3. Finalize photograph output to be non-transparent, 72dpi PNG (Portable Network Graphic)

Health Risk

Two levels of health risk were included in the final design: low and moderate. No constraints were imposed on which health risk levels could be combined with which visibility levels. The Air Quality Health Index (AQHI) was used to represent health risk to respondents. AQHI uses an index by estimating the daily change in mortality risk for ten cities from 1998-2000 and plotting it on a 10-point scale[5]. The higher the number, the greater the risk and the need to take precautions. It is a personal health protection tool for individual Canadians including those at higher risk and focuses only on health risk, i.e., it does not attempt to consider any issues other than the day-to-day health impact of air pollution. High and very high levels on the AQHI were excluded from the final design after pre-testing found that respondents with high or very high health risks options were unable to separate the two constructs of health and visibility and as such were unwilling to consider any payments for scenarios which included high or very high levels on the AQHI.

AQHI was chosen for this research as it was developed through a national process and was designed to apply across the country and uses a scale that is both continuous and categorical. More specifically, AQHI provides a number from 1 to 10+ to indicate the level of health risk associated with air quality and also provides categories that go with the numbers of low, moderate, high, and very high. The categories have standardized definitions which are regularly used in the general public and are outlined in Table 2.2.a. below.

Table 2.2.a. Air Quality Health Index

Risk	Air Quality Health Index	Health Messages	
		At Risk Population*	General Population
Low	1-3	**Enjoy** your usual outdoor activities.	**Ideal** air quality for outdoor activities.
Moderate	4-6	**Consider reducing** or rescheduling strenuous activities outdoors if you are experiencing symptoms.	**No need to modify** your usual outdoor activities unless you experience symptoms such as coughing and throat irritation.
High	7-10	**Reduce** or reschedule strenuous activities outdoors. Children and the elderly should also take it easy.	**Consider reducing** or rescheduling strenuous activities outdoors if you experience symptoms such as coughing and throat irritation.
Very High	10+	**Avoid** strenuous activities outdoors. Children and the elderly should also avoid outdoor physical exertion.	**Reduce** or reschedule strenuous activities outdoors, especially if you experience symptoms such as coughing and throat irritation.

[5] http://www.airqualityontario.com/press/faq.php#:~:text=The%20Air%20Quality%20Health%20Index%20is%20a%20scale%20that%20lists,risk%20associated%20with%20air%20quality.&text=Scientists%20created%20the%20index%20by,on%20a%2010%20point%20scale.

Annual Cost to Household

The average annual cost to a household required to achieve the visibility presented was included at 6 levels:

– $30 ($2.50 per month)

– $60 ($5.00 per month)

– $90 ($7.50 per month)

– $180 ($15.00 per month)

– $360 ($30.00 per month)

– None

The cost was presented in both annual amounts and monthly amounts to ease comprehension to respondents. It was also presented in a manner that would bring about a permanent improvement in visibility and that the cost was unavoidable. Specifically, “this cost is unavoidable – while you would NOT be charged a specific fee or additional tax, you would experience the cost through increases in your cost of living”. The payment vehicle was chosen to be most reflective of how the increased costs would be applied in practice. In this case the implementation of policies/regulations would not result in increased taxes to the consumer; rather it may increase production costs, which are often passed along to consumers.

Complete Enumeration Approach

A complete enumeration approach was used while designing the choice sets. The complete enumeration approach was chosen as it better addresses the objective of the research: to estimate a robust nationally averaged willingness-to-pay value (annual $ per Canadian household) for a 1-unit deciview change and to identify statistically significant variables in explaining the willingness to pay.

A design with balanced alternative effects (complete enumeration) does a better job of estimating the specific visibility levels in the context of the price whereas a design with imbalanced alternative effects (full factorial) would be better for estimating the gaps.

Each respondent was randomly assigned to one of the design versions. Once the respondent chose one of the two options, that design version was removed from the set of available versions until the respondent had been shown the full list. The order of tasks within each version were randomly ordered. However, the attributes (visibility, health risk, setting and annual household cost) remained consistent throughout the activity.

Respondents were exposed to a combination of the following attributes and levels, with a total of 1,600 possible permutations.

Model Restrictions

In general, the goal of the experimental design was to have level balance, that is, for each level to appear the same number of times as each other level within an attribute and to have orthogonality, for levels across attributes to be independent of each other in how they appear across choices.

However, in this design we had the following constraints with the goal of more realistic comparisons for respondents:

Visibility

- Baseline option (left side of the screen) must be level 33, 29, 25, 21, or 17 DV
- Test option (right side of screen) must be level 25, 21, 17, 13, or 9 DV
- Test option must always show better visibility

Health Risk

- High and very high-risk levels were excluded
- No restrictions on low and medium risk levels

Annual Household Cost

- Baseline option must always be no cost
- Test option must be $30 ($2.50 per month), $60 ($5.00 per month), $90 ($7.50 per month), $180 ($15.00 per month) or $360 ($30.00 per month).

Questionnaire Design

The questionnaire was designed to generate estimates of WTP per household for a 1-unit decrease in DV (roughly equivalent to a 10% improvement in visual range). The design included control mechanisms such as scripts to minimize respondent biases, follow up questions to distinguish between legitimate zero willingness to pay and protest responses and ways to isolate WTP for health-related improvement from WTP for visibility-related improvement.

The questionnaire included background knowledge information to the respondent and general understanding by respondents was confirmed during pretest. This included scripts and other background information that were presented upfront to survey respondents in order to reduce known bias risks that might occur. For example, participants were asked to read a script that outlined how the implementation of pollution reducing measures translated into costs for consumers and information that explained that visibility is not always a good indicator of health risk; and then answer true and false questions about what they had just read. If they answered incorrectly, they were looped back to the script and asked to read again. For full details on the survey instrument, see Appendix A.

Data Collection

Pretest

A pretest was undertaken in March 2020 that included 47 completes, of which at least 10 were in French. Minor wording changes were made to some of the instructions after the pretest and, as such, the completions were not included in the final data set. In March 2020, the first wave of COVID 19 pandemic hit Canada and fieldwork for this project was placed on hold.

Data Collection

Data collection was conducted online from September 8 to 29th, 2020. Given the COVID-19 pandemic was an ongoing factor during fieldwork, there are a number of considerations when interpreting results. First, economic uncertainty, high unemployment rate, and possible budget constraints may have reduced WTP among some respondents. Conversely, higher interest in outdoor recreational activities and environmental conservation may have increased WTP among some respondents.

The 15-minute online survey was conducted using computer assisted web interviewing (CAWI) technology. CAWI ensures the interview flows as it should with pre-programmed skip patterns. It also controls responses to ensure appropriate ranges and data validity. Surveys were conducted in English or French as chosen by the respondent. All participants were informed of the general purpose of the research, the supplier and that all of their responses would be confidential. At the end of the survey, respondents were informed of the sponsor to avoid inducing bias in responses.

Respondents were randomly selected from Kantar's online panel and invited to participate in the survey by email and/or personal online dashboard via Kantar Profile's website. Panellists who participate in surveys are incentivized through a points system that is redeemable for a variety of gift cards. As such points were provided as remuneration for participating in the survey.

To allow for robust sub-analyses, a sample of 2,000 Canadians was assembled, with interlocking quotas on completions for age within gender within region to ensure the sample was representative of the general Canadian population aged 18+ with a threshold of +/- 5 percent (Table 2.4.a).

Table 2.4.a. Sample Quotas (+/-5%)

	Atlantic	Quebec	Ontario	Prairies	BC	Totals
Males 18-34	17	62	114	59	38	289
Males 35-54	21	78	128	63	43	334
Males 55+	27	89	136	57	51	360
Females 18-34	16	60	113	56	37	282
Females 35-54	22	76	132	61	45	335
Females 55+	30	98	154	61	55	400
Totals	134	463	777	358	268	2000

Weighting

To aim for the sample to be representative of the Canadian adult population 18+, the design first implemented controls using quota sampling. Quota variables included gender, age, and region. In addition to the previously mentioned quotas, the final sample was weighted using various demographic information available from Statistics Canada outlined below. Weighting did not include an income variable because population level data for income was only available at the household level and weights were being applied at an individual level.

The representativeness of the sample was validated on 4 dimensions:

1. Region, gender, and age
2. Region and population of residence

3. Region and education
4. Education, gender, and age

The validation of the education, gender and age dimensions identified low counts for ‘Some high school or less education’ and “Apprenticeship or other trades” across all gender and age combinations. As such, these groups were merged with ‘High school diploma or equivalent’ for weighting purposes.

There was almost no weighting required for region by age and gender. Weighting was applied to bring education level in line with the general population. Weights were applied to increase the representation of those with some high school or a high school diploma among all regions, and to decrease representation of those with a University certificate or degree among all regions. Similarly, weights were applied to increase representation of those with some high school or a high school diploma among all age groups, and to decrease representation of those with a University certificate or degree among all age groups. Weighting was also applied to all regions to increase the representation of those living in rural areas (under 1000 residents).

“Don’t know” and refused cases were re-coded to groups with lowest counts. For education this was ‘Some high school or less education’. For region, where postal code was available, allocation was done based on postal code, and those without postal code were re-coded to ‘Under 1000’. For Gender, males came up slightly lower to females in their respective regions, hence “Don’t know” cases were allocated to males for gender.

Weighted and Unweighted Tables by Dimensions

Table 2.5.a. Dimension 1 – Region, Gender and Age Unweighted and Weighted

Base	Unweighted 2000		Weighted 2000	
Effective Base[6]	**2000**		**1394.2**	
	Base	%	Base	%
Atlantic Canada Males				
18 to 34	16	1%	16	1%
35 to 54	21	1%	21	1%
55+	28	1%	28	1%
Atlantic Canada Females				
18 to 34	16	1%	16	1%
35 to 54	22	1%	22	1%
55+	31	2%	31	2%
Quebec Males				
18 to 34	61	3%	61	3%
35 to 54	76	4%	76	4%
55+	90	5%	90	5%
Quebec Females				
18 to 34	57	3%	57	3%
35 to 54	74	4%	74	4%
55+	99	5%	99	5%
Ontario Males				
18 to 34	118	6%	116	6%
35 to 54	125	6%	125	6%
55+	136	7%	138	7%
Ontario Females				
18 to 34	110	6%	110	5%
35 to 54	131	7%	130	6%
55+	152	8%	156	8%
Prairie Provinces Males				
18 to 34	58	3%	57	3%
35 to 54	59	3%	62	3%
55+	58	3%	58	3%
Prairie Provinces Females				
18 to 34	54	3%	54	3%
35 to 54	61	3%	61	3%
55+	62	3%	62	3%
BC & Territories Males				
18 to 34	41	2%	41	2%
35 to 54	46	2%	45	2%
55+	53	3%	53	3%
BC & Territories Females				
Females 18 to 34	38	2%	39	2%
Females 35 to 54	48	2%	47	2%
Females 55+	59	3%	58	3%

[6]Statistically speaking, a weighted sample generally has more sampling error than an unweighted sample of the same size. A weighted sample's "effective base" size is the size of an unweighted random sample that would have the same sampling error as the weighted sample.

Table 2.5.b. Dimension 2 – Region and Population of Residence Unweighted and Weighted

Base	Unweighted 2000		Weighted 2000	
Effective Base	**2000**		**1394.2**	
	Base	%	Base	%
Atlantic Canada				
1000+ residents	102	5%	72	4%
Under 1000 residents	32	2%	61	3%
Quebec				
1000+ residents	426	21%	367	18%
Under 1000 residents	31	2%	89	4%
Ontario				
1000+ residents	732	37%	668	33%
Under 1000 residents	40	2%	107	5%
Prairie Provinces				
1000+ residents	321	16%	278	14%
Under 1000 residents	31	2%	75	4%
BC & Territories				
1000+ residents	269	13%	242	12%
Under 1000 residents	16	1%	40	2%

Table 2.5.c. Dimension 3 – Region and Education Unweighted and Weighted

Base	Unweighted 2000		Weighted 2000	
Effective Base	**2000**		**1394.2**	
	Base	%	Base	%
Atlantic Canada				
Some high school or less education / High school diploma or equivalent / Apprenticeship or other trades	42	2%	74	4%
College, CEGEP, or other non-university certificate/diploma	36	2%	31	2%
University certificate/diploma or degree	56	3%	28	1%
Quebec				
Some high school or less education / High school diploma or equivalent / Apprenticeship or other trades	159	8%	259	13%
College, CEGEP, or other non-university certificate/diploma	104	5%	83	4%
University certificate/diploma or degree	194	10%	114	6%
Ontario				
Some high school or less education / High school diploma or equivalent / Apprenticeship or other trades	204	10%	378	19%
College, CEGEP, or other non-university certificate/diploma	194	10%	168	8%
University certificate/diploma or degree University certificate/diploma or degree	374	19%	228	11%
Prairie Provinces				
Some high school or less education / High school diploma or equivalent / Apprenticeship or other trades	134	7%	193	10%
College, CEGEP, or other non-university certificate/diploma	71	4%	69	3%
University certificate/diploma or degree	147	7%	92	5%
BC & Territories				
Some high school or less education / High school diploma or equivalent / Apprenticeship or other trades	85	4%	147	7%
College, CEGEP, or other non-university certificate/diploma	68	3%	53	3%
University certificate/diploma or degree	132	7%	82	4%

Table 2.5.d. Dimension 4 – Education, Gender and Age Unweighted

Base	Unweighted 2000		Weighted 2000	
Effective Base	**2000**		**1394.2**	
	Base	%	Base	%
Males 18 to 34				
Some high school or less education / High school diploma or equivalent / Apprenticeship or other trades	92	5%	175	9%
College, CEGEP, or other non-university certificate/diploma	55	3%	49	2%
University certificate/diploma or degree	147	7%	68	3%
Males 35 to 54				
Some high school or less education / High school diploma or equivalent / Apprenticeship or other trades)	92	5%	163	8%
College, CEGEP, or other non-university certificate/diploma	71	4%	67	3%
University certificate/diploma or degree	164	8%	99	5%
Males 55+				
Some high school or less education / High school diploma or equivalent / Apprenticeship or other trades	136	7%	225	11%
College, CEGEP, or other non-university certificate/diploma	76	4%	56	3%
University certificate/diploma or degree	153	8%	86	4%
Females 18 to 34				
Some high school or less education / High school diploma or equivalent / Apprenticeship or other trades	83	4%	123	6%
College, CEGEP, or other non-university certificate/diploma	51	3%	60	3%
University certificate/diploma or degree	141	7%	93	5%
Females 35 to 54				
Some high school or less education / High school diploma or equivalent / Apprenticeship or other trades	72	4%	123	6%
College, CEGEP, or other non-university certificate/diploma	101	5%	90	4%
University certificate/diploma or degree	163	8%	120	6%
Females 55+				
Some high school or less education / High school diploma or equivalent / Apprenticeship or other trades)	149	7%	242	12%
College, CEGEP, or other non-university certificate/diploma	119	6%	83	4%
University certificate/diploma or degree	135	7%	81	4%

Online Completion Rate

A total of 9658 invitations were sent to panelists, of which n=2,000 completed the survey. The overall completion rate achieved for the online study was 67%. The following table outlines the sample disposition and response rate as per the former Marketing Research and Intelligence Association guidelines.

Table 2.7.a. Completion Rate

Total Invitations Sent	9658
Contacts	2979
Completes	2000
Break Offs[7]	367
Over Quota[8]	480
Non-Qualifiers[9]	132
Completion Rate	67%
Incidence Rate	80%

Non-response Bias

A non-response bias analysis is the process that results in the quantification of estimated nonresponse bias, and identification of potential sources of nonresponse bias on estimates. To ensure a representative sample, this research used completion quotas and as such a non-response bias analysis cannot be undertaken.

Margin of Error

As mentioned previously, panel sample was used for this study. Panel surveys are considered a non-random sample and as such margin of error does not apply.

Analysis

Discrete Choice Modelling (Contingent Choice)

The discrete choice exercise was estimated using a Hierarchical Bayes Multinomial Logit model. A detailed description of this approach can be found here https://datajobs.com/data-science-repo/Hierarchical-Bayes-%5BAllenby-and-Rossi%5D.pdf

The model is called “hierarchical” because it consists of two models that are jointly applied. One model is used for within-respondent analysis, dealing with the internal heterogeneity in the choice selections. The other model is for a cross-respondent analysis and deals with external heterogeneity.

The combination of the two models working simultaneously provided respondent-level estimates of preference of the study’s attributes of visibility, health risk, and annual household cost while factoring in each respondent’s age, region, gender, household income and the health impact for yourself and your family.

The Hierarchical Bayes Multinomial Logit model was estimated using Sawtooth Software’s CBC Hierarchical Bayes Module v5.5.6. The model used an iterative Monte Carlo Markov Chain approach

[7] Respondents who partially completed the survey
[8] Respondents who did not qualify for the survey because they fell into demographic groups that already had the requisite number of completes
[9] Respondents who did not qualify for the survey based on exclusionary criteria (e.g., industry screen out for market research employees)

to estimate the model for 200,000 iterations with the first 100,000 iterations used as a burn-in to calibrate the process and the last 100,000 iterations used to provide a robust estimate of the model. The final model estimated linear effects for visibility and annual household cost and categorical effects for the two levels of health risk. This model generated a robust estimate of the willingness to pay per household for each one-unit decrease in the deciview (DV) scale for the entire sample and for various subgroups of interest.

The linear coefficients for visibility and annual household cost were normalized to minimize scale bias of the estimates. The visibility level values were calculated as – (DV – mean (DV))/10 where the mean DV was 21.

Table 2.6.a. Visibility Level Coding

Urban or Rural Image Visibility	Visibility Shown	Model Value
33 DV	10-15 km	-1.2
29 DV	20-25 km	-0.8
25 DV	30-35 km	-0.4
21 DV	45-50 km	0
17 DV	70-75 km	0.4
13 DV	105-110 km	0.8
9 DV	155-160 km	1.2

The annual household cost level values were calculated similarly as (Cost/Month – mean (Cost/Month))/10 so that both level values are on the similar scales centered on zero.

Table 2.6.b. Annual Household Cost Level Coding

Annual Household Cost	Model Value
None	-1.0
$30 ($2.50 per month)	-0.75
$60 ($5.00 per month)	-0.50
$90 ($7.50 per month)	-0.25
$180 ($15.00 per month)	0.5
$360 ($30.00 per month)	2.0

In Discrete Choice models, the willingness to pay value is defined as the price necessary for the relative preference for an item to remain constant when other utility values are changed (Breidert, Hasler & Reutterer, 2006). This model compared baseline levels of DV at no price and an improved level of DV at an associated household cost with varying levels of health risk. Willingness to pay was defined as the price level necessary for the improved DV preference to be equal to the baseline DV

preference so if we start with the exponentials of the utility function for the improved and baseline options:

$$e^{Improved(DV,\ Cost,\ Health\ Risk)} = e^{Baseline(DV,\ Cost=\$0,\ Health\ Risk)}$$

and removed the exponential from both sides of the equation and applied the actual values and utilities, setting the improved DV value to be the baseline DV minus one unit of DV:

$$DV_{Baseline}*Utility_{DV} + Cost_{\$0}*Utility_{AHC} + Utility_{HRLevelBaseline} = (DV_{Baseline} - 1)*Utility_{DV} + Cost_{Improved}*Utility_{AHC} + Utility_{HRLevelimproved}$$

Then to solve for $Cost_{improved}$ or WTP, we combined terms:

$$WTP = ((DV_{Baseline} - DV_{Baseline} + 1)*Utility_{DV} + Cost_{\$0}*Utility_{AHC} + Utility_{HRLevelBalseline} - Utility_{HRLevelimproved}) / Utility_{AHC}$$

And when we applied the normalizations, the WTP calculation is:

$$WTP = (10*(-0.1*\ Utility_{DV} - Utility_{AHC} + Utility_{HRLevelBaseline} - Utility_{HRLevelImproved})/\ Utility_{AHC}) + 10$$

Table 2.6.c. Formula Variable Definitions

Acronym	Definition
DV	Deciview
AHC	Annual Household Cost
HR	Health Risk

Two WTP values were calculated per respondent. The first WTP was when the health risks are both moderate since we assume the baseline state has a moderate health risk. In this calculation, the overall utility of the health risk was zero since both the baseline and improved health risk level were the same. The second WTP value was the WTP for a one unit decrease in DV that results in a low health risk. This calculation included the change in utility in moving from a moderate risk to a low risk.

Willingness to pay for 1 DV improvement in visibility with no change to health risk

On average, Canadians are willing to pay $107.04 annually or $8.92 per month for an improvement of one DV to visibility. The median is $1.10 per month and the standard deviation is $21.27 per month indicating a wide variability in the amount that Canadians are willing to pay for 1 DV improvement in visibility. In total, 18 per cent[10] of Canadians are unwilling to pay any amount for improvements to visibility which is contributing to the large variation. As a reminder, protest responses were removed from the data – details of this process can be found elsewhere in the report.

While there is wide variation in the amount Canadians are WTP, it should be noted that that the annual value is in line with other Canadian research by Haider et al, 2019[11] in which they report

[10] Protest responses removed
[11] Climate change, increasing forest fire incidence, and the value of visibility: evidence from British Columbia, Canada in the Canadian Journal of Forestry Research (July 2019)

"respondents are willing to pay a baseline amount of $92.52–$111.60 per year per household (Can$ 2002) for a 5%–20% increase in the visual range".

The current research also examined WTP variation based on differences in age, gender, region, education, income, language spoken most often at home, community size, children in the household, health impact from air quality and baseline or typical visibility for the respondent. Differences in WTP varied based on age, having children in the household, having a member of the household (either family or self) whose health is impacted by air quality and/or those whose baseline visibility is generally higher. More specifically:

– Younger Canadians (18-34) are willing to pay significantly more for visibility improvements than their older counterparts (35+). Specifically, those 18-34 are willing to pay $165.96 annually ($13.83 per month) for 1 DV improvement to visibility while those who are 35-54 are willing to pay $96.60 annually ($8.05 per month) and those 55+ are willing to pay $70.92 annually ($5.91 per month);

– Households with children are willing to pay more for visibility improvements compared to households without children ($158.16 annually/$13.18 per month vs $85.08 annually/$7.09 per month);

– Households with individuals whose health is impacted by air quality are willing to pay more than those without (($143.64 annually/$11.97 per month vs $71.88 annually/$5.99 per month); and

– Households where the existing visibility is quite high generally (9 DV) are also more willing to pay than those with generally lower visibility ($155.64 annually/$12.97 per month vs $88.68 – 107.04 annually/$7.39-8.92 per month)

Table 2.6.c. Willingness to pay for 1 DV improvement in visibility with no change to health risk

	Monthly Mean WTP for 1DV improvement	Monthly Median WTP for 1DV improvement	Standard Deviation for Monthly WTP for 1DV improvement	Standard Error for Monthly WTP for 1DV improvement	Annualized WTP for 1 DV improvement (monthly * 12)
Total (A)	8.92	1.10	21.27	0.49	107.04
AGE					
18-34 (B)	13.83 CD	1.60	29.74	1.27	165.96 CD
35-54 (C)	8.05 D	0.96	18.89	0.76	96.6 D
55+ (D)	5.91	0.98	13.38	0.50	70.92
GENDER					
Male (E)	8.03	0.95	19.87	0.65	96.36
Female (F)	9.83	1.26	22.61	0.73	117.96
REGION					
Atlantic (G)	4.98	1.14	18.21	1.62	59.76
Quebec (H)	10.32	1.15	22.55	1.09	123.84
Ontario (I)	8.25	0.99	20.51	0.76	99.00
Prairies (J)	8.33	0.99	18.81	1.04	99.96
BC + Territories (K)	11.07 G	1.91	24.95	1.52	132.84 G

EDUCATION					
High School or Less (L)	8.40	1.08	19.73	0.93	100.80
College/CGEP(M)	9.18	1.23	21.99	0.86	110.16
University+ (N)	9.03	0.97	22.64	0.82	108.36
LANGUAGE					
English (O)	8.58	1.11	20.96	0.54	102.96
French (P)	11.41	1.09	25.13	1.35	136.92
Others (Q)	11.50	1.48	22.66	3.17	138.00
CHILDREN					
Yes (R)	13.18 S	1.63	27.60	1.18	158.16 S
No (S)	7.09	0.97	17.81	0.49	85.08
COMMUNITY					
Urban (T)	8.65	1.05	21.22	0.52	103.80
Rural (U)	10.63	1.30	23.19	2.32	127.56
HEALTH IMPACT					
YES (V)	11.97 Y	1.56	25.79	0.85	143.64 Y
Self (W)	12.02 Y	1.35	26.36	1.14	144.24 Y
Family (X)	12.49 Y	1.63	26.39	1.09	149.88 Y
No (Y)	5.99	0.85	15.46	0.53	71.88
BASELINE					
18-33 DV (Z)	7.39	0.85	21.85	1.03	88.68
17 DV (a)	8.18	1.25	18.12	0.92	98.16
13 DV (b)	8.92	1.24	20.83	0.92	107.04
9 DV (c)	12.97 Zab	1.63	25.96	1.37	155.64 Zab
INCOME					
<$60k (d)	8.21	1.02	19.67	0.71	98.52
$60k-$99k (e)	10.26	1.08	24.49	1.04	123.12
$100k-$149k (f)	7.85	1.14	20.59	1.21	94.20
$150k+ (g)	8.67	1.71	18.08	1.61	104.04

Note: Letters denote statistically significant difference within the column for each demographic group (p = 0.05). For example, a D next to the result for 35-54 year olds under Monthly WTP for 1DV improvement denotes this value is significantly greater than the value for 55 and older.

Willingness to pay for 1 DV improvement in visibility with an associated improvement to health risk

On average, Canadians are willing to pay $581.76 annually or $48.48 per month for an improvement of one DV to visibility that includes a perceived associated decrease in health risk from moderate to low. This research also examined WTP variation based on differences in age, gender, region, education, language spoken most often at home, community size, children in the household, health impact from air quality and baseline or typical visibility for the respondent. Differences in WTP that includes an associated decrease in health risk from moderate to low varied exist based on age, gender, region, having children in the household and/or having a member of the household (either family or self) whose health is impacted by air quality.

– Younger Canadians (18-34) are willing to pay significantly more for visibility improvements that included an associated decrease in health risk than their older counterparts (35+). Specifically, those 18-34 are willing to pay $897.72 annually ($74.81 per month) for 1 DV improvement to visibility while those who are 35-54 are willing to pay $498.36 annually ($41.53 per month) and those 55+ are willing to pay $412.56 annually ($34.38 per month);
– Women are willing to pay significantly more for visibility improvements that included an associated decrease in health risk than men ($664.56 annually/$55.38 per month vs $499.56 annually/$41.63 per month);
– Households in the Atlantic are willing to pay significantly less for visibility improvements that included an associated decrease in health risk ($294.12 annually/$24.51 per month) compared to other regions in Canada) ($525.36-682.08 annually/ $43.78-56.84 per month)
– Households with children are willing to pay more for visibility improvements with associated health improvements compared to households without children ($811.20 annually/$67.60 per month vs $473.88 annually/$39.49 per month); and
– Households with individuals whose health is impacted by air quality are willing to pay more than those without ($695.04 annually/$57.92 per month vs $435.12 annually/$36.26 per month).

Table 2.6.d. Willingness to pay for 1 DV improvement in visibility with an associated improvement to health risk

	Monthly Mean WTP for 1DV improvement	Monthly Median WTP for 1DV improvement	Standard Deviation for Monthly WTP for 1DV improvement	Standard Error for Monthly WTP for 1DV improvement	Annualized WTP for 1 DV improvement (monthly * 12)
Total (A)	48.48	11.50	87.54	2.02	581.76
AGE					
18-34 (B)	74.81 CD	21.96	121.07	5.16	897.72 CD
35-54 (C)	41.53	10.11	74.86	3.02	498.36
55+ (D)	34.38	9.65	57.88	2.17	412.56
GENDER					
Male (E)	41.63	9.51	83.27	2.74	499.56
Female (F)	55.38 E	15.79	91.32	2.97	664.56 E
REGION					
Atlantic (G)	24.51	8.82	47.04	4.17	294.12

Quebec (H)	56.84 GI	12.46	95.18	4.60	682.08 GI
Ontario (I)	43.78 G	10.07	80.65	3.00	525.36 G
Prairies (J)	52.83 G	13.19	86.03	4.74	633.96 G
BC + Territories (K)	53.21 G	14.46	105.07	6.42	638.52 G
EDUCATION					
High School or Less (L)	45.38	12.64	78.91	3.70	544.56
College/CGEP(M)	47.38	10.45	85.76	3.35	568.56
University+ (N)	51.08	11.38	97.03	3.53	612.96
LANGUAGE					
English (O)	46.00	11.46	80.66	2.08	552.00
French (P)	59.68 O	11.62	113.94	6.12	716.16 O
Others (Q)	58.27	26.73	81.05	11.35	699.24
CHILDREN					
Yes (R)	67.6 S	18.02	114.78	4.92	811.20 S
No (S)	39.49	10.46	69.78	1.92	473.88
COMMUNITY					
Urban (T)	46.89	11.09	89.00	2.19	562.68
Rural (U)	44.97	11.28	66.9	6.69	539.64
HEALTH IMPACT					
Yes Self/Family (V)	57.92 WY	15.56	99.31	3.26	695.04 WY
Self (W)	50.02 Y	13.21	84.90	3.67	600.24 Y
Family (X)	63.88 WY	18.47	104.76	4.32	766.56 WY
No (Y)	36.26	9.77	68.00	2.33	435.12
BASELINE					
18-33 DV (Z)	38.70	8.11	74.77	3.51	464.4
17 DV (a)	52.96 Z	13.95	91.31	4.63	635.52
13 DV (b)	50.36	12.67	89.76	3.97	604.32
9 DV (c)	58.29 Z	17.6	101.6	5.36	699.48
INCOME					
<$60k (d)	42.01	10.28	70.42	2.53	504.12
$60k-$99k (e)	55.22 d	11.82	106.55	4.51	662.64
$100k-$149k (f)	46.89	11.73	91.13	5.34	562.68
$150k+ (g)	49.11	20.08	82.75	7.37	589.32

Note: Letters denote statistically significant difference within the column for each demographic group. For example, a D next to the result for 35-54 year olds under Monthly WTP for 1DV improvement denotes this value is significantly greater than the value for 55 and older.

Ratio of willingness to pay for 1 DV improvement in visibility with an associated improvement to health risk compared to 1 DV improvement in visibility

In order to provide more clarity around the WTP differences with improved health risks, we reviewed the ratio of WTP on its own, compared to WTP with an associated improvement to health risk.

Absolute WTP values identify how much Canadians care about visibility and how much they care about health. The ratio analysis allows us to understand how much Canadians care about visibility compared with health. Not unexpectedly, virtually all Canadians care more about health than visibility. The analysis below helps us to identify "how much more" various Canadians care about health over visibility.

Ratios which are smallest provide some indication of which groups care the most about visibility, relative to how much they care about their health. Based on the ratio analysis, the following groups tend to care more about visibility:

- Canadians living in on the coast (east, west, or north) care more about visibility than inland Canadians.
- Rural Canadians care more about visibility than urban Canadians, likely a function of their baseline visibility being generally higher and supported by the finding that Canadians living in areas with good visibility (9 DV or less) care more about visibility than those living in poorer visibility (10 DV or more.
- Canadians with health conditions impacted by air quality care more about visibility than those without, likely signalling the challenge in separating visibility and health completely.
- Canadians in the lower income brackets care slightly more than those in higher income brackets about visibility.

This analysis highlights a number of interesting findings that generally show the gap between groups tends to be narrower compared to when we look at absolute monetary WTP. It also highlights that a person's baseline impacts perceptions and desires for visibility and that perceptions of health are difficult to remove in situations of poor visibility. More specifically, those who already have good visibility are willing to pay more for improvements.

Table 2.6.e. Ratio of willingness to pay for 1 DV improvement in visibility comparted to 1 DV improvement in visibility with an associated improvement to health risk

	Monthly WTP for 1DV improvement with improvement to health risk	Monthly WTP for 1DV improvement with no change to health risk	Ratio WTP with improvement to health risk of WTP no health risk vs
Total (A)	48.48	8.92	5.4
AGE			
18-34 (B)	74.81 CD	13.83 CD	5.4
35-54 (C)	41.53	8.05 D	5.2
55+ (D)	34.38	5.91	5.8
GENDER			
Male (E)	41.63	8.03	5.2
Female (F)	55.38 E	9.83	5.6

REGION			
Atlantic (G)	24.51	4.98	4.9
Quebec (H)	56.84 GI	10.32	5.5
Ontario (I)	43.78 G	8.25	5.3
Prairies (J)	52.83 G	8.33	6.3
BC + Territories (K)	53.21 G	11.07 G	4.8
EDUCATION			
High School or Less (L)	45.38	8.40	5.4
College/CGEP(M)	47.38	9.18	5.2
University+ (N)	51.08	9.03	5.7
LANGUAGE			
English (O)	46.00	8.58	5.4
French (P)	59.68 O	11.41	5.2
Others (Q)	58.27	11.50	5.1
CHILDREN			
Yes (R)	67.6 S	13.18 S	5.1
No (S)	39.49	7.09	5.6
COMMUNITY			
Urban (T)	46.89	8.65	5.4
Rural (U)	44.97	10.63	4.2
HEALTH IMPACT			
Yes Self/Family (V)	57.92 WY	11.97 Y	4.8
Self (W)	50.02 Y	12.02 Y	4.2
Family (X)	63.88 WY	12.49 Y	5.1
No (Y)	36.26	5.99	6.1
BASELINE			
18-33 DV (Z)	38.70	7.39	5.2
17 DV (a)	52.96 Z	8.18	6.5
13 DV (b)	50.36	8.92	5.6
9 DV (c)	58.29 Z	12.97 Zab	4.5
INCOME			
<$60k (d)	42.01	8.21	5.1
$60k-$99k (e)	55.22 d	10.26	5.4
$100k-$149k (f)	46.89	7.85	6.0
$150k+ (g)	49.11	8.67	5.7

Note: Letters denote statistically significant difference within the column for each demographic group. For example, a D next to the result for 35-54 year olds under Monthly WTP for 1DV improvement with no change to health risk denotes this value is significantly greater than the value for 55 and older.

Removal of Protest Responses

The survey was designed to identify when a respondent was not willing to pay to improve visibility and determine whether it was a true zero (unable to pay) or a protest response. Respondents that selected the baseline or "status quo" option across all eight choice scenarios were asked for the reason for always selecting the baseline option. The intent of this question was to determine if the respondent truly was not willing or able to pay any amount of money for a visibility improvement, or if the responses were made in "protest" or because insufficient information was given to make an informed decision. It was determined that if the reason was given as "I would like to see improvements but do not think I should pay for them", "I object to the way the question was asked", or "I did not have enough information to base my decision" then the respondent was removed from the sample and further analysis. In total, six per cent were considered protest responses and were removed from the above analysis.

As stated previously, the survey was designed to identify when a respondent was not willing to pay to improve visibility and determine whether it was a true zero (unable to pay) or a protest response. Among those that consistently chose no changes to the baseline visibility option, the majority (36%) stated this was because they would like to see improvements but did not think they should have to pay for them. Fewer said that improvements were necessary, but the options were too expensive (21%), that the baseline option was acceptable and no improvements in visibility were necessary (18%). A minority answered that the baseline option was acceptable and no improvements in health were necessary or that they did not have enough information to decide (both 10%). In summary, six percent were considered protest responses while eighteen percent were true zero responses.

Further, among the few who said they did not have enough information to decide, the most common information they said they would need included:

– More details, information, or facts (14%);
– More information on air quality (5%);
– Statistics for health and air quality (5%);
– How the cost to improve air quality was calculated (5%); or
– Need to know how air quality could be improved (5%).

Typical or Average Visibility

When asked to select the image that best represented the typical or average visibility range that they experienced in the summer, respondents were most likely to select the two highest visibility options. Few selected low visibility options.

– 13 DV (105-110 km) (27%);
– 9DV (155-160 km) (22%);
– 17 DV (70-75 km visibility) (20%);
– 21 DV (45-50 km visibility) (10%);
– 25 DV (30-35 km visibility) (6%);
– 29 DV (20-25 km visibility) (4%);
– 33 DV (10-15 km visibility) (2%); and

– Don’t know (10%).[12]

As expected, those who live in a rural area are more likely to report the highest visibility condition of 9 DV (155-160 km visibility) than those who live in an urban area (43% vs. 18%). Those who live in the Atlantic provinces are most likely to report an average visibility of 9 DV (155-160 km visibility) (39%) while those in Ontario are least likely to report this visibility compared to other provinces (19% vs. 23-26%).

Tabulated Data

Detailed tables are included under a separate cover.

Conclusion

The overall objective of this research was to obtain current and robust data regarding Canadians’ WTP for improved visibility that can better characterize the differences that may exist across the Canadian population. More specifically, this study was designed to collect the necessary data that will allow ECCC to assess the economic value that Canadians associate with a noticeable visibility improvement, expressed in monetary willingness to pay per household for a 1-unit DV change.

The results of this research indicate, on average, Canadians are willing to pay $107.04 per household annually or $8.92 per month for an improvement of one DV to visibility. There is, however, large variation in the amount that individual Canadians are WTP and noticeable differences among different demographic groups. More specifically, younger Canadians (18-34), households with children or with individuals with health conditions impacted by air quality and those who currently live in areas with high visibility are all willing to pay more than their respective counterparts.

[12]Note: Numbers do not add to 100% due to rounding

Appendix A: Survey Instrument

B001 - SCR: SCREENING BLOCK — **Begin block**

Scripter notes: Mobile Programming
PROGRAMMING INSTRUCTION: MOBILE PHONES WILL NOT BE ALLOWED FOR THIS STUDY. MEDIUM SIZED TABLETS WILL BE ALLOWED

Q001 - LANG: LANGUAGE — **Single coded**

Not back

In which language would you like to proceed?
Dans quelle langue aimeriez-vous être interviewé(e)?

Normal

1	English / Anglais
2	French / Français

Q002 - INTRO: INTRODUCTORY DISPLAY — **Text**

Not back

Thank you for agreeing to take part in our survey. Kantar is currently conducting a survey on outdoor visibility (i.e., how far one can see in the distance) and Canadian preferences for improvements in visibility.

This survey should take approximately 15 minutes to complete. Your participation in this study is voluntary and your responses will be kept anonymous and only combined with the responses of others for analysis and reporting. You will never be identified.

Should you wish to verify the legitimacy of this survey, you may contact Carol Adam at carol.adam@kantartns.com.

Thank you for your time and assistance with this survey

Scripter notes: HYPERLINK: Patrick.kasparian@kantar.com IN THIRD PARAGRAPH

Q003 - IMG_ASSIGNMENT: IMAGE ASSIGMNENT — **Single coded**

Not back | Dummy

Normal

1	URBAN
2	RURAL

Scripter notes: RANDOMLY ASSIGN TO EACH PARTICIPANT. 50% in each quota group

Q004 - CONSENT: CONSENT — Single coded

Not back

This survey is different from other surveys you may have taken. To be able to answer the following questions, it is important that you take the time to read the introductory information, which sets the stage for the questions we are about to ask. Please confirm that you are willing to carefully read the introductory pages before beginning this survey.

Normal

1	I will read the introductory pages carefully	
2	I do not wish to participate in this study	☐ GO TO SCREEN OUT

Q005 - GEN: GENDER — Single coded

Not back

What is your gender?

Normal

1	Male	
2	Female	
3	Prefer to self describe **Open*	
4	Prefer not to answer	☐ GO TO SCREEN OUT

Q006 - YR_BORN: YEAR BORN — Numeric

Not back | Min = 1900 | Max = 2001

In what year were you born?

Scripter notes: ADD Prefer not to answer BUTTON

Q007 - AGE: AGE — Single coded

Not back

Would you be willing to indicate in which of the following age categories you belong?

Normal

1	17 or under	☐ GO TO SCREEN OUT
2	18 to 24	
3	25 to 34	
4	35 to 44	
5	45 to 54	
6	55 to 64	
7	65 or older	
8	Prefer not to answer	☐ GO TO SCREEN OUT

Scripter notes: ASK ONLY IF CODE 2 (PREFER NOT TO SAY) AT YR_BORN

Q008 - PROV: PROVINCE — **Single coded**

Not back

In which province or territory do you live?

Normal

1	Alberta	
2	British Columbia	
3	Manitoba	
4	Newfoundland and Labrador	
5	New Brunswick	
6	Northwest Territories	
7	Nova Scotia	
8	Nunavut	
9	Ontario	
10	Prince Edward Island	
11	Quebec	
12	Saskatchewan	
13	Yukon Territory	
14	Prefer not to answer	☐ GO TO SCREEN OUT

Q009 - REG: REGION — **Single coded**

Not back | Dummy

Normal

1	ATLANTIC
2	QUEBEC
3	ONTARIO
4	PRAIRIES
5	BC
6	TERRITORIES

Scripter notes: PROGRAMMER PLEASE USE PROV TO CODE REGION

B001 - SCR: SCREENING BLOCK — **End block**

B002 - MAIN: MAIN SURVEY	Begin block

Scripter notes: Variables
Visibility:

- 33 dv (14.4 km visibility)
- 29 dv (21.5 km visibility)
- 25 dv (32.1 km visibility)
- 21 dv (47.9 km visibility)
- 17 dv (71.4 km visibility)
- 13 dv (106.6 km visibility)
- 9 dv (159.0 km visibility)

•Setting (randomly assigned to respondent – ensuring half of each quota gets each setting)
o Rural
o Urban

•Health Risk (based on AQHI):
oLow (1-3) – Ideal air quality for outdoor activity for both the general and at risk populations.
oModerate (4-6) – At risk population should consider reducing strenuous outdoor activities if cough or irritation experienced.

•Cost (Based on annual additional cost per household):
o None
o$30 ($2.50 per month)
o$60 ($5.00 per month)
o$90 ($7.50 per month)
o$180 ($15.00 per month)
o$360 ($30.00 per month)

Q010 - SCRN_A: SCREEN A **Text**

Not back

In Canada, visibility (i.e., how far in the distance one can see) is influenced by a number of factors, including weather conditions, time of day, elevation, and pollution levels. Pollution can come from a variety of natural and human sources such as fires, transportation, industrial or agricultural production, and electricity generation. Along with visibility, pollution can sometimes affect air quality and health risks.

To improve visibility, it is necessary to reduce pollution levels, which can come at a cost to Canadian consumers. Generally, these costs are indirect and come in the form of additional expenses incurred by businesses for installing pollution control devices on vehicles and manufacturing equipment. The additional costs to businesses are eventually passed on to Canadians through higher prices on everyday items such as food, electricity, and transportation. Reducing pollution and thus improving visibility means that Canadians will experience unavoidable increases to general cost of living.

This survey aims to gain a better understanding of Canadians' willingness to support improvements in visibility. It is important to note the differences between **visibility** and **health risk**. While there is often a relationship between visibility and health risk, this is not always the case. For example, rainfall reduces visibility but does not affect health.

Q011 - READ1_TF: READ 1 TRUE OR FALSE STATEMENT CHECK **Single coded**

Not back

In general, the implementation of measures improving visibility results in higher costs for consumers.

True or false...?

Normal

1	True
2	False

Scripter notes: ALTERNATE QUESTIONS BETWEEN SCREEN A READ 1 AND SCREEN A READ 2. RESPONDENT ONLY GETS ONE OPTION. IF THEY GET IT WRONG THEY LOOP BACK TO SCREEN A.

READ 1
IF FALSE IS SELECTED PLEASE DISPLAY: Sorry, that is not correct. Please try again AND LOOP BACK TO SCREEN A

Q012 - READ2_TF: READ 2 TRUE OR FALSE STATEMENT CHECK **Single coded**

Not back

Poor visibility always means that there is also negative impact on health.
True or false...?

Normal

1	True
2	False

Scripter notes: ALTERNATE QUESTIONS BETWEEN SCREEN A READ 1 AND SCREEN A READ 2. RESPONDENT ONLY GETS ONE OPTION. IF THEY GET IT WRONG THEY LOOP BACK TO SCREEN A.

READ 2
IF TRUE IS SELECTED PLEASE DISPLAY: Sorry, that is not correct. Please try again AND LOOP BACK TO SCREEN A

Q013 - SCRN_B: SCREEN B - Research Instructions and Definitions **Text**

Not back

In this survey, we will present you with eight sets of options that display various levels of visibility and health risk from different states of air quality you may experience living in Canada. These situations are examples only and may not represent the situation where you live.

Each option has three components:

First, visibility will be presented in a visual format. In the next screen, you will be shown images that exhibit various levels of visual range. Visual range is an expression of visibility impairment defined as the distance in kilometers at which a large, black object disappears from view.

INSERT TWO IMAGES AS EXAMPLES HERE

Second, health risk will be described using a 2-category scale: low and moderate. The scale provides directions for a generally healthy person or the "general population" as well as an "at risk" person defined as young children, elderly or someone who has health conditions that may be affected by air quality.

[INSERT SCALE IMAGE]

Third, we will present the average annual cost to your household required to achieve the visibility presented. This would be the total cost to your household each year to bring about a permanent improvement in visibility. **Please note this cost is unavoidable** – while you would NOT be charged a specific fee or additional tax, you would experience the cost through increases in your cost of living.

Q014 - EX_SCR: EXAMPLE SCREEN **Text**

Not back

To practice, please review each of the options in the example below.

The first option shows the current level of visibility, health risk, and cost. **Assume that the current level will stay the same in the future.** The second option represents an ongoing improvement in visibility and/or health risk if action is taken to reduce pollution. This option also includes the associated annual costs (through increased cost of living) to your household for the required reduction in pollution. The proposed improvement in visibility would apply for the entire year, although it may be harder to notice during some days due to variable weather conditions such as snowstorms in winter.

This is only an example, please click the right arrow button below to continue.

[INSERT GRID]
OPTION 1
OPTION 2

Scripter notes: Notes about the setup of the above grid:
1)Images will be as large as possible.
2)Images displayed in the example will be either Rural or Urban as assigned at the beginning of the survey.

B003 - CH_SETS: CHOICE SETS **Begin block**

Q015 - CS_INTRO: CHOICE SET INTRODUCTION **Text**

Not back

The next few screens will show you eight sets of options. Please review the visibility, health risk, and annual household cost and select your preferred option.

Q016 - CS_PREF: CHOICE SET PREFERRED OPTION — **Single coded**

Not back

Please select your preferred option.

Normal

1	INSERT CHOICE SETS HERE – options driven by the excel sheet

Q017 - CS_CURRENT: CS- CURRENT SITUATION CHOSEN — **Single coded**

Not back

Why did you always select the current option?

Select the best response.

Normal

1	The current option is acceptable and no improvements in visibility are necessary.
2	The current option is acceptable and no improvements in health risk are necessary.
3	Improvements are needed but the options were too expensive.
4	I would like to see improvements but do not think I should pay for them
5	I object to the way the question was asked.
6	I did not have enough information on which to base my decision.
7	Other: please specify **Open*

Researcher notes: ANALYSIS NOTE: Options “I would like to see an improvement in visibility but do not think I should pay for it“, “I would like to see an improvement in health risk but do not think I should pay for it”, “I object to the way the question was asked” and “I did not have enough information to base my decision” will be treated as a protest response and thus will be removed from the sample.
Scripter notes: PROGRAMMING INSTRUCTION: ASK ONLY IF RESPONDENTS SELECT THE CURRENT OPTION FOR ALL CHOICE SETS.
Data processor notes: ANALYSIS NOTE: Options “I would like to see an improvement in visibility but do not think I should pay for it“, “I would like to see an improvement in health risk but do not think I should pay for it”, “I object to the way the question was asked” and “I did not have enough information to base my decision” will be treated as a protest response and thus will be removed from the sample.

Ask only if **Q017 - CS_CURRENT**,7

Q018 - CS_OTH_INFO_NEEDED: CS OTHER INFORMATION NEEDED — **Open**

Not back

What other information would you need?

B003 - CH_SETS: CHOICE SETS — **End block**

B002 - MAIN: MAIN SURVEY — **End block**

B004 - DEMO: DEMOGRAPHICS — **Begin block**

Q019 - DEMO_INTRO: DEMOGRAPHICS INTRODUCTION **Text**

Not back

Thank you. The next few questions are for classification purposes only. They will be combined with the responses of others to identify any differences in opinions that may exist among different groups of Canadians.

Q020 - BASELINE: BASELINE **Single coded**

Not back

Think about the **typical** or **average** visibility range that you experience in the summer. Which of the following images best reflects this visibility?

Normal

1	INSERT 7 VISIBILITY IMAGES HERE: IMAGES DISPLAYED IN THE EXAMPLE WILL BE EITHER RURAL OR URBAN AS ASSIGNED AT THE BEGINNING OF THE SURVEY
999	Don't know **Fixed *Exclusive*

Q021 - EDU: EDUCATION **Single coded**

Not back

What is the highest level of formal education that you have completed?

Normal

1	Grade 8 or less
2	Some high school
3	High school diploma or equivalent
4	Registered Apprenticeship or other trades certificate or diploma
5	College, CEGEP or other non-university certificate or diploma
6	University certificate or diploma below bachelor's level
7	Bachelor's degree
8	Post graduate degree above bachelor's level
9	Prefer not to answer

Q022 - LANG_SPOKE: LANGUAGES SPOKEN **Multi coded**

Not back | Min = 1

What language do you speak most often at home?

Please select all that apply

Normal

1	English
2	French
996	Other (specify): **Open *Fixed*
998	Prefer not to answer **Fixed *Exclusive*

Q023 - EMP: EMPLOYMENT STATUS **Single coded**

Not back

Which of the following categories best describes your current employment status? Are you…

Please select one answer only

Normal

1	Working full-time, that is, 35 or more hours per week
2	Working part-time, that is, less than 35 hours per week
3	Self-employed
4	Unemployed, but looking for work
5	A student attending school full-time
6	Retired
7	Not in the workforce (Full-time stay-at-home spouse, unemployed, not looking for work)
8	Part-time student/coop/apprenticeship
9	Other
10	Prefer not to answer

Q024 - HHINCOME: HOUSEHOLD INCOME **Single coded**

Not back

Which of the following categories best describes your total household income? That is, the total income of all persons in your household combined, before taxes?

Normal

1	Under $20,000
2	$20,000 to just under $40,000
3	$40,000 to just under $60,000
4	$60,000 to just under $80,000
5	$80,000 to just under $100,000
6	$100,000 to just under $150,000
7	$150,000 and above
8	Prefer not to answer

Q025 - HHCOMP: HOUSEHOLD COMPOSITION **Single coded**

Not back

Including yourself, how many people 18 and over are currently living in your household?

Normal

1	1
2	2
3	3
4	4
5	5
6	6 or more
998	Prefer not to answer **Fixed *Exclusive*

Q026 - CHILDREN: CHILDREN IN HOUSEHOLD **Single coded**

Not back

How many children under the age of 18 are currently living in your household?

Normal

1	1
2	2
3	3
4	4
5	5
6	6 or more
997	None **Fixed *Exclusive*
998	Prefer not to answer **Fixed *Exclusive*

Q027 - POP_SIZE: POPULATION OF RESIDENCE **Single coded**

Not back

Please indicate the population size of the town or city that you currently reside in.

Normal

1	Under 1000 residents
2	1000 - 29,999 residents
3	30,000 – 99,999 residents
4	100,000 or more residents
999	Don't know **Fixed *Exclusive*
998	Prefer not to answer **Fixed *Exclusive*

Q028 - HI_SELF: HEALTH IMPACT - SELF **Multi coded**

Not back

When it comes to air quality, young children, elderly, and people with heart or breathing problems are considered part of the “at risk” population. Would you consider yourself or a family member to be part of the “at risk” population?

Select all that apply.

Normal

6	Yes – myself
7	Yes – my child(ren)
8	Yes – my parent(s)
9	Yes – another family member
10	No**Exclusive*
999	Don't know **Exclusive*
998	Prefer not to answer **Exclusive*

Q029 - PC_CONSENT: POSTAL CODE CONSENT **Single coded**

Not back

Our client Kantar would like to analyze the results of this survey using geographical areas. Would you agree to share your postal code with Kantar for that purpose?

Normal

1	Yes, I agree to share my postal code with Kantar for this purpose
2	No, I do not agree

Ask only if **Q029 - PC_CONSENT**,1

Q030 - POST_CODE: POSTAL CODE **Alpha**

Not back

Please enter your postal code:

Scripter notes: PLEASE ADD A Prefer not to answer OPTION
SHOW EXAMPLE “A1A1A1(No spaces)” BESIDE BOX.

B004 - DEMO: DEMOGRAPHICS **End block**

Q031 - END_DISP: END DISPLAY **Text**

Not back

Thank you for completing the survey. The Government of Canada is conducting this research survey in order to better understand Canadian preferences for improvements in visibility. The results of this study will help inform the development of future governmental policies. Kantar was hired to administer this survey, and a final report written by Kantar will be available to the public from Library and Archives Canada (http://www.bac-lac.gc.ca/).

All responses are voluntary and completely confidential. Your answers will remain anonymous.

Environment and Climate Change Canada (ECCC) is committed to respecting the privacy rights of individuals who participate in surveys like ~~such as~~ this one. All personal information created, held or collected by ECCC is protected under the Privacy Act The personal information you provide is being collected in accordance with the Public Communications (PSU 914) Standard Personal Information Bank.

Any questions or comments regarding this privacy notice or the administration of the Privacy Act at ECCC may be directed to Environment and Climate Change Canada’s Access to Information and Privacy Division.

If you are not satisfied that we have adequately respected your privacy, you may ~~wish to~~ contact the Office of the Privacy Commissioner by calling their information centre at **1-800-282-1376** or by visiting their contact page.

Scripter notes: HYPERLINK THE FOLLOWING:

http://www.bac-lac.gc.ca/

Privacy Act LINK TO:
https://urldefense.proofpoint.com/v2/url?u=http-3A__laws-2Dlois.justice.gc.ca_eng_acts_p-2D21_&d=DwMFAw&c=zdK58V2JKULZdB8nuBRpog&r=cZZEiudIJwbJoCQcI2cgwbvwjpAitnaiVGEqg6Wtg2g&m=nqSNVgdDwwB0ZG18jZp0g4Sh8AZMAHIir0SMXXTYI7A&s=ofqvJB2bw1083xGm1Od2C3AceUP_idtS_3UxfwSaVto&e=

Public Communications (PSU 914) LINK TO:
https://urldefense.proofpoint.com/v2/url?u=https-3A__www.canada.ca_en_treasury-2Dboard-2Dsecretariat_services_access-2Dinformation-2Dprivacy_access-2Dinformation_information-2Dabout-2Dprograms-2Dinformation-2Dholdings_standard-2Dpersonal-2Dinformation-2Dbanks.html&d=DwMFAw&c=zdK58V2JKULZdB8nuBRpog&r=cZZEiudIJwbJoCQcI2cgwbvwjpAitnaiVGEqg6Wtg2g&m=nqSNVgdDwwB0ZG18jZp0g4Sh8AZMAHIir0SMXXTYI7A&s=KgIz2rn7vcdJNjmI6tR7zYGNkAiBW8mpp2YzREyCFww&e=

Access to Information and Privacy Division LINK TO:
mailto:ec.aiprp-atip.ec@canada.ca

contact page LINK TO:
https://urldefense.proofpoint.com/v2/url?u=https-3A__www.priv.gc.ca_en_contact-2Dthe-2Dopc_&d=DwMFAw&c=zdK58V2JKULZdB8nuBRpog&r=cZZEiudIJwbJoCQcI2cgwbvwjpAitnaiVGEqg6Wtg2g&m=nqSNVgdDwwB0ZG18jZp0g4Sh8AZMAHIir0SMXXTYI7A&s=L3uiqwDvD7978QrFmT0WPDXwfebGKdg1RhVlEuXKOd4&e=

Appendix B: Air Quality Images

Urban Images

Figure 4.1.a. 9 DV (155-160 km)

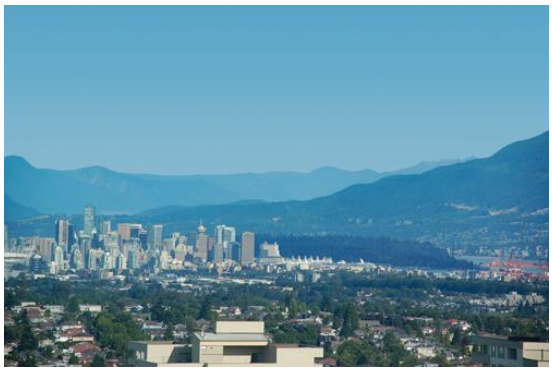

Figure 4.1.b. 13 DV (105-110 km)

Figure 4.1.c. 17 DV (70-75 km)

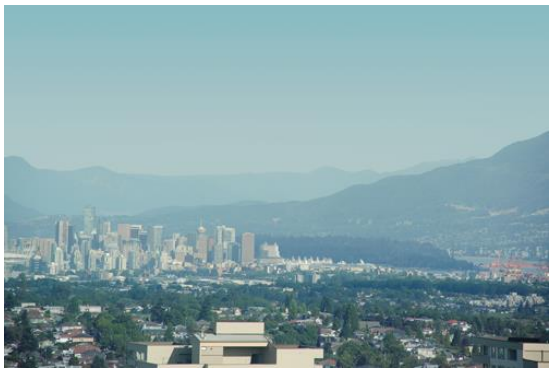

Figure 4.1.d. 21 DV (45-50 km)

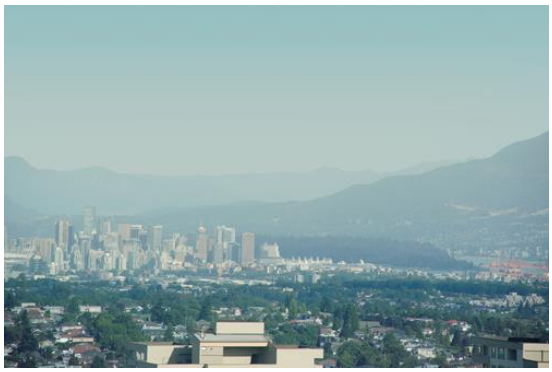

Figure 4.1.e. 25 DV (30-35 km)

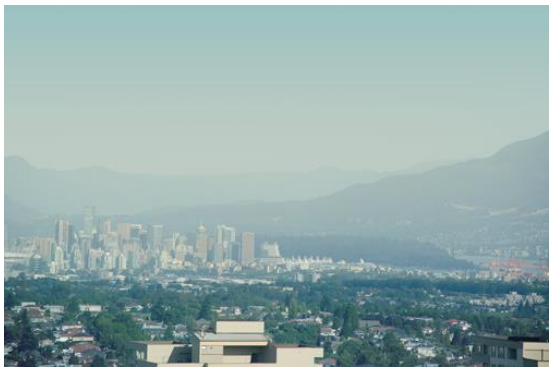

Figure 4.1.f. 29 DV (20-25 km)

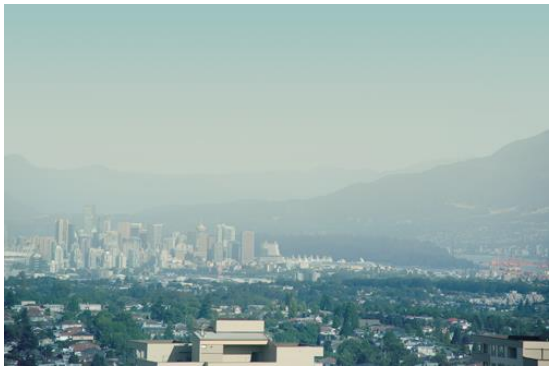

Figure 4.1.g. 33 DV (10-15 km)

Rural Images

Figure 4.2.a. 9 DV (155-160 km)

Figure 4.2.b. 13 DV (105-110 km)

Figure 4.2.c. 17 DV (70-75 km)

Figure 4.2.d. 21 DV (45-50 km)

Figure 4.2.e. 25 DV (30-35 km)

Figure 4.2.f. 29 DV (20-25 km)

Figure 4.2.g. 33 DV (10-15 km)

Appendix C: Choice Sets

Programmer Instructions: 100 design versions, 8 tasks per respondent, 2 choices per screen

1. Randomly assign a respondent to one of the design versions, removing that version from the set of available versions until all versions have been shown and then repeat full list.

2. Randomly order the tasks within version for each respondent

3. DO NOT randomize the order of attributes within task, take them exactly as they are in the design (see example task for question layout)

4. DO NOT randomize the order of the options on the screen.

5. Make sure that the grid fits on most screens without scrolling

Task Example

Task Example		
Please select your preferred option.		
	Option 1 – Current Situation	**Option 2**
Visibility		
	45-50 km visibility	155-160 km visibility
Health Risk	Low	Moderate
Annual Household Cost	None	$90 ($7.50/month)