Wednesday, March 30, 2016

Mrs. Nancy Mora Castro
Regional Air Quality Coordinator
City of Kelowna – Regional Services
209-346 Lawrence Ave
Kelowna, BC
V1Y 6L4

Dear Mrs. Castro,

I am pleased to present to you the attached research report entitled Central Okanagan Idling and Air Quality Attitudinal Study. The report identifies Central Okanagan citizens' perceptions of and attitudes toward idling and air quality. It is my hope that the findings uncovered aid your team in future decision making processes.

In conclusion, Central Okanagan citizens think idling has an above average impact on air quality, and their municipality should take steps to limit its air pollution. They agree steps should be taken to change idling behaviours, are willing to do so, and desire access to anti-idling resources. They lean towards agreement that their municipality should implement an anti-idling bylaw. An anti-idling bylaw would be best communicated, in order, through traffic signs, social media, radio, billboards, and TV.

I would like to express my sincere gratitude for presenting this research project to me for my honours degree. I have gained many valuable skills and experiences that will aid me in my future endeavors.

Yours sincerely,

Alex Fullerton
Student Researcher
Afullerton86@gmail.com

Enclosure: Central Okanagan Idling and Air Quality Attitudinal Study

cc: Professor Lee Cartier

CENTRAL OKANAGAN IDLING AND AIR QUALITY ATTITUDINAL STUDY

Presented to

Nancy Mora Castro
Regional Air Quality Coordinator
City of Kelowna – Regional Services

Prepared by

Alex Fullerton
Student Researcher

Wednesday, March 30, 2016

ABSTRACT

There is a province-wide target in British Columbia to reduce greenhouse gas levels by 33% by 2020. One strategy to reducing greenhouse gas emissions is through the implementation of anti-idling bylaws. This study investigates Central Okanagan citizens' perceptions of and attitudes toward idling and air quality, and how an anti-idling bylaw could be communicated in the Central Okanagan. In-person and online surveys are used to gather quantitative data. Central Okanagan citizens think idling has an above average impact on air quality, and their municipality should take steps to limit its air pollution. They agree steps should be taken to change idling behaviours, are willing to do so, and desire access to anti-idling resources. They lean towards agreement that their municipality should implement an anti-idling bylaw. An anti-idling bylaw would be best communicated through traffic signs, social media, radio, billboards, and TV.

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F	**F-statistic**
t	***t*-statistic**
Z	***Z*-statistic**
χ^2	**Chi-square statistic**
n	**Sample size**
SD	**Sample standard deviation**
M	**Sample Mean**

ACKNOWLEDGEMENTS

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Thank you to the many businesses and organizations that provided assistance in the promotion of this study by utilizing their own communication channels. Thank you to the many people of Central Okanagan who participated in this study and helped promote the study to others. The study wouldn't have had as much participation if it weren't for you all.

Finally, thank you to my family, friends, and most importantly my girlfriend for your patience and support during this long journey in life. I love you all.

1.0 CHAPTER 1: INTRODUCTION

The research identified through this research report provides supplementary evidence to the Regional District of Central Okanagan Board of Directors about Central Okanagan citizens' attitudes towards idling and air quality. In this chapter the background, purpose, significance, and nature and scope of the report are presented.

1.1 Background

Air quality management in the Central Okanagan has been previously guided by the RDCO's Air Quality Management Plan set in place in 2007 (Pinna Sustainability Inc., 2015). In February 2015, the RDCO implemented an updated strategy called the Clean Air Strategy (Pinna Sustainability Inc., 2015). This strategy provides guidance to the regional municipal partners within the Central Okanagan to manage local air quality and greenhouse gas emissions (GHGs) for the next five years (Pinna Sustainability Inc., 2015).

Air pollution is made up of six main components: particulate matter (PM), ozone (O_3), Nitrogen Oxides ($NO_{x)}$, Volatile Organic Compounds (VOCs), Ammonia ($NH_{3)}$, and Greenhouse Gasses (GHGs) (Pinna Sustainability Inc., 2015). The combustion and evaporation of fossil-fuels produces particulate matter, NO_x, VOCs, and GHGs (Pinna Sustainability Inc., 2015). Approximately 90% of GHGs are from the combustion of fossil-fuels in vehicles and buildings (Pinna Sustainability Inc., 2015).

Currently, the nation-wide target is to reduce GHGs levels by 17% by 2020 in relation to the levels recorded in 2005 (Pinna Sustainability Inc., 2015). There is also a province-wide target in British Columbia to reduce GHGs levels by 33% by 2020 in relation to the levels set in 2007, and by 80% by 2050 (Pinna Sustainability Inc., 2015). Each municipality in the Central Okanagan has committed to the provincial target of 33% reduction by 2020 (Pinna Sustainability Inc., 2015). A 2007 to 2020 forecast showed if no action was taken GHGs would increase by 25% based on population growth rates and travel patterns (Pinna Sustainability Inc., 2015)

The Clean Air Strategy has a total of 42 strategies to reach this goal. The 42 strategies are categorized into 16 main strategies. The third main strategy is to reduce emissions from vehicles on the road. Within this strategy, there are five sub-strategies, one of which is to develop anti-idling bylaws and a campaign to improve vehicle efficiency (Pinna Sustainability Inc., 2015). The implementation of this sub-strategy would include instating idle-free zones, installation of anti-idling signage, issuance of penalties and fines for non-compliance, managing the timing of traffic lights, and banning drive-thrus (Pinna Sustainability Inc., 2015).

Each municipality in the Central Okanagan currently has some form of an anti-idling policy for municipal fleet vehicles, but these policies vary based on allowed idling time (Pinna Sustainability Inc., 2015). RDCO's Clean Air Strategy has formed and tasked an Air Quality Committee with the investigation of anti-idling bylaws in other municipalities, and the development and proposition of an anti-idling bylaw (Pinna Sustainability Inc., 2015). Once the anti-idling bylaw has been developed, the Air Quality Committee will present it to the board of the RDCO and its partners (N. Castro, personal communication, September 25, 2015).

Nancy Mora Castro is the chairperson of the Air Quality Committee and is seeking supplemental research which the committee can present to the RDCO Board of Directors and its partners in order to aid them in their decision on the proposed anti-idling bylaw (N. Castro, personal communication, September 25, 2015).

1.2 Purpose

The background history leading into this study and a literature review of previously conducted research on the subject reveals there has been no previously conducted research on Central Okanagan citizens' attitudes towards the subject of idling and air quality, thus the purpose of this research is summarized in the following decision statement.

> *How do the citizens of the Central Okanagan view air quality, and how could an anti-idling bylaw be communicated in the Central Okanagan?*

In order to answer the decision statement, five research objectives are developed:

RO1 To identify RDCO citizens' perceptions of idling, air pollution, and air quality.

RO2 To identify if RDCO citizens are aware that idling contributes to poor air quality, climate change, and adverse health effects.

RO3 To identify if RDCO citizens are willing to change their idling behaviours.

RO4 To identify if RDCO citizens would be receptive of an anti-idling bylaw.

RO5 To identify which communication channels and tools would be effective in providing RDCO citizens with information about change in idling policy.

1.3 Significance

The significance of this study is to increase the body of knowledge related to idling and air quality within the Central Okanagan. It also identifies current idling behaviours and effective communication channels that can be used in raising awareness of an anti-idling bylaw.

1.4 Nature and Scope of Report

This report begins with providing a description of the problem at hand, and, through literature review, identifies the knowledge gaps related to idling and air quality in the Central Okanagan which identifies research objectives to expand the current knowledge about the topic. It then describes the research methodology used to gather required data for the study. Data is then analyzed using various quantitative methods, and findings from each research objective are discussed. From the findings and discussion of the data, conclusions for each research objective and the decision statement are drawn, limitations for the study are revealed, and recommendations are suggested.

2.0 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This literature review discusses research that has been conducted in the past about how citizens of the Central Okanagan view air quality, how an anti-idling by-law could be communicated in the Central Okanagan, and relevant topics. General concepts include: climate change, greenhouse gasses (GHGs), air pollution, air quality, particulate matter, and idling.

Oxford Dictionaries defines climate change as "a change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels" (Oxford Dictionaries, 2015). GHGs are a contributing factor to climate change (Coccola, C., 2012). The primary contributors of GHGs include: water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3) (IPCC, 2014).

The abundance of GHGs in the atmosphere causes an increased amount of infrared radiation to be reflected back at Earth which would otherwise radiate into space (IPCC, 2014). This is also known as the greenhouse gas effect or global warming (IPCC, 2014). GHGs are produced by a number of sources including industrial facilities, transportation, buildings, agriculture, and landfills amongst others (Partington, P. J., & Bramley M., 2010). Every litre of gasoline that is burned produces about 2.3 kg of CO_2 (Natural Resources Canada, 2015). These gasses, amongst other things, contribute to air pollution.

The World Health Organization defines air pollution as "contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere" (World Health Organization, 2015). Not only does air pollution affect climate change, but it also affects air quality. Air quality is defined as "The degree to which the air in a particular place is pollution-free" (Oxford Dictionaries, 2015). It is measured using an Air Quality Index (AQI) that is used to standardize and interpret air quality

(Maji, S., Ahmed, S., & Siddiqui, W. A., 2015). Other airborne pollutants such as particulate matter degrade air quality.

A vehicle is considered to be idling when its engine is turned on, but the vehicle is not in motion (Mora N., 2015). The burning of fossil fuels produces undesired by-products such as particulate matter and CO_2 gas (IPCC, 2014). Thus, unnecessary idling of internal combustion engines results in lower air quality, increased air pollution, and increased GHGs ultimately contributing to climate change (Pinna Sustainability Inc., 2015). Furthermore, it results in wasted fuel and money (Natural Resources Canada, 2013).

2.2 Decision Statement

Around the world, many different idling bylaws exist. These bylaws vary in the way they are implemented, enforced, and punished for breaking. For example, in Switzerland, bylaws require engines be turned off while idling in traffic, whereas other countries allow idling in traffic but have an allowable time limit which one is able to leave their vehicle idling (Mora N., 2015).

There are 46 municipalities in British Columbia, 24% of BC municipalities, have bylaws which state that idling over a specific amount of time is prohibited. On average, the time limit is three minutes, but range between 10 seconds and 15 minutes. These bylaws cover over half of BC's population. (Coccola, C., 2012)

However, there are currently no anti-idling bylaws within the Regional District of Central Okanagan (RDCO) which prohibit idling, so idling continues to negatively contribute to local air quality (Coccola, C., 2012). The estimated population of Central Okanagan is 189,289 as of 2014 (BC Stats, 2014). The Regional District of Central Okanagan is comprised of the following municipalities: District of Peachland, City of West Kelowna, Westbank First Nation, City of Kelowna, and District of Lake Country.

There has not been any public consultation about anti-idling bylaws or research of citizens' attitudes towards anti-idling bylaws in the Central Okanagan in the past. Before implementing a bylaw, it is important to conduct the proper research to understand how its citizens feel about the

air quality in their region, and to effectively communicate to the public. Thus the RDCO faces the following decision statement.

> *How do the citizens of the Central Okanagan view air quality, and how could an anti-idling bylaw be communicated in the Central Okanagan?*

Investigation into the following topics gives a better understanding about awareness, perceptions, and attitudes of citizens when considering air pollution, air quality, and idling, as well as their receptiveness of an anti-idling bylaw and preferred communication channels.

2.3 Perceptions of Idling, Air Pollution, and Air Quality

It is important to understand citizens' perceptions of idling, air pollution, and air quality in order measure how much they value their current situation and the negative impacts if it were to change.

In Nancy Mora Castro's report, she identifies five misconceptions when it comes to idling. The first misconception is that people think frequently turning an engine on/off can lead to engine malfunctions, the cost of which is, on average, approximately $10 per year. The second misconception is the belief that it is required to warm up an engine before using it, but in fact it takes longer to warm up one's vehicle when idling compared to driving. The third misconception is that it uses more fuel to turn on/off one's engine compared to idling, when in fact the break-even point is 10 seconds; on average one could save 50.81 litres of fuel per year. The fourth misconception is that idling doesn't impact air quality significantly; however vehicle emissions are responsible for 32% of smog-forming pollution. The fifth misconception is that, because the Central Okanagan ranked in the Low Health Risk category on the Air Quality Index in 2010, there is no reason to be concerned about air quality within the Central Okanagan; however over 95% of negative health outcomes are attributable to poor air quality on days that would be considered Low or Moderate Health Risk. (Mora N., 2015)

There is a need to gain insight into RDCO citizens' perception of idling, air pollution, and air quality in order to set a baseline for communication messages.

RO1 To identify RDCO citizens' perceptions of idling, air pollution, and air quality.

2.4 Idling as a Cause of Poor Air Quality, Climate Change, and Adverse Health Effects

Idling can contribute to poor air quality, climate change, and adverse health effects. The average Canadian idles between six to eight minutes per day (Natural Resources Canada, 2009). So, it is necessary to ensure citizens' are aware of the linkage between these concepts. Thus, it is important to understand citizens' knowledge on the topic.

CO_2 from tailpipe emissions vary based on grade of fuel and the size of the engine in a vehicle (Natural Resources Canada, 2015). Since CO_2 is the primary GHG linked to climate change, vehicle type plays a large factor as to the impact of idling.

Health will be affected through changes in temperature extremes due to climate change. Also due to climate change, local weather patterns could be altered; affecting how air pollution is dissipated. Scientists estimate that smog will become more concentrated due to the increase in temperature, ultimately increasing health issues. Furthermore, heatwaves caused by climate change will further increase natural sources of air pollution such as forest fires. (Natural Resources Canada, 2015)

No research has been conducted in the past to gather information about RDCO citizens' awareness of the connection between idling, poor air quality, climate change, and adverse health effects.

RO2 To identify if RDCO citizens are aware that idling contributes to poor air quality, climate change, and adverse health effects.

2.5 Willingness to Change Idling Behaviours

In order for a new bylaw to be successful, those governed by the bylaw must be willing to change their behaviours. Only then will it be accepted, and require minimal effort to enforce.

There are three main categories of factors that influence behavioral change: personal, social, and environmental. Personal factors include factors such as beliefs, knowledge, or attitudes amongst

others. Social factors include the interactions one has with friends, family, and the community. Environmental factors include location, proximity, and economics (European Union Food Information Council, 2014).

Idling currently occurs in many instances including waiting in traffic, waiting for passengers, waiting to park, waiting to refuel, stopping to talk to friends/acquaintances, adjusting vehicle's interior temperature, running quick errands, waiting in drive-thrus, and preparing to leave the house (Mora N., 2015).

There are essentially five steps in the behavioural change process: pre-contemplation, contemplation, determination, action, and maintenance. In the pre-contemplation stage, the behavioural change has either never been considered, or has never been taken seriously. During the contemplation stage, the behavioural change has been actively thought about. In the determination stage, one prepares themselves mentally and physically for the required action. The action stage is when the alternative behaviour is being executed. Finally, the maintenance stage occurs when one continually repeats the behaviour, at first voluntarily and then involuntarily. (Lickerman, 2009)

In order for the alternative behaviour to be considered, there must be either a reward or a punishment great enough to outweigh the difficulty of changing from the current behaviour. Natural Resources Canada (2009) describes idling prevention as "one easy way to cut fuel consumption, save money, and reduce GHGs". In order to determine if citizens' idling behaviours can be changed, it must first be determined if they would be willing to change if motivated.

No research has been conducted in the past to identify what RDCO citizens' idling behaviours are or whether they would be willing to change them.

RO3 To identify if RDCO citizens are willing to change their idling behaviours.

2.6 Anti-Idling Bylaw Receptiveness

It's one thing to be willing to change behaviours, but it is another to be receptive of new laws which limit or force your behaviours. This is why it is important to gather citizens' receptiveness of proposed bylaws which do so.

As previously mentioned, there are anti-idling bylaws in place around the world. In BC, Anti-idling bylaw time limits range from as little as 10 seconds to 15 minutes. In England and Scotland, those that don't comply with the anti-idling bylaw are fined (Mora N., 2015). Most municipalities in Canada take a limited approach in enforcing anti-idling bylaws; typically information outreach and reacting to public complaints (Natural Resources Canada, 2013).

As enforcement for the majority of anti-idling bylaws is minimal, citizens' are typically receptive of the bylaw because there is little reprimanding. That being said, due to its minimal enforcement, anti-idling bylaws may not be followed by the citizens.

No research has been conducted in the past to identify if RDCO citizens would be receptive of an anti-idling bylaw.

RO4 To identify if RDCO citizens would be receptive of an anti-idling bylaw.

2.7 Effective Communication Channels and Tools

With the increasing popularity of new-age communication channels, there is a need to uncover the communication channels most frequently used today. Through a properly executed communications plan, the awareness of an anti-idling bylaw would be increased.

Relevant communication channels that exist today are: traffic signs, billboards, TV, radio, newspaper, mail, magazines, social media, open houses, municipal websites, blogs, e-mail, online videos, and podcasts. Popularity has shifted towards on-line communication channels such as social media, websites, blogs, and videos, whereas conventional communicational channels such as TV and radio have decreased in popularity. Various local governments mention the use of signage in idling hot spots has been successful to create awareness about changes in bylaws (Coccola, C., 2012).

Educational campaigns dramatically improve the knowledge, and thus the acceptance, of anti-idling. Respondents in a community-based participatory research partnership to reduce vehicle idling near public schools showed that the respondents chose to reduce idling 40% more than before the training (Eghbalnia, C. et al, 2013). This shows the need for educational programs, as they increase the likelihood that citizens will change their behaviours.

While the worldwide trend in popularity of communication channels it moving to online media, additional information is required to target RDCO citizens specifically. No research has been done as to identify how to communicate to RDCO citizens about changes in government policy.

RO5 To identify which communication channels and tools would be effective in providing RDCO citizens with information about change in idling policy.

2.8 Conclusion

In summary, while the topics of idling, air pollution, air quality, and communication channels has been thoroughly researched in the past, there hasn't been any research on the topics specifically focused on RDCO citizens.

RO1 To identify RDCO citizens' perceptions of idling, air pollution, and air quality.

RO2 To identify if RDCO citizens are aware that idling contributes to poor air quality, climate change, and adverse health effects.

RO3 To identify if RDCO citizens are willing to change their idling behaviours.

RO4 To identify if RDCO citizens would be receptive of an anti-idling bylaw.

RO5 To identify which communication channels and tools would be effective in providing RDCO citizens with information about change in idling policy.

Through identifying the research objectives listed above, a robust understanding of RCDO citizens' perception and understanding of the topics is clearly identified.

In order to reach each research objective, a research design and methodology is implemented. Both the research design and methodology are further discussed in Chapter 3 - Methodology.

3.0 CHAPTER 3: METHODOLOGY

3.1 Introduction

In this chapter, the research design and methodology used to reach each research objective is described. The research design describes the type of research conducted and why it best suits this study. The sample design describes the target population and unit of analysis, and then identifies the sample selected and how it is selected. Data collection methodology indicates the source of data and how the data is gathered. Instruments used to collect the data are evaluated based on their reliability, validity, and sensitivity. Various statistical analytical tools are used to identify frequencies, distributions, relationships, and associations in the data; however, results will be revealed and discussed in Chapter 4 – Findings and Discussion.

3.2 Research Design

All studies can be categorized into three different groups: exploratory research, descriptive research, and causal research. The Central Okanagan Idling and Air Quality Attitudinal Study is a descriptive study to identify Central Okanagan citizens' perceptions and attitudes towards idling, air pollution, air quality, and anti-idling bylaws.

Due to the vast amount of research previously conducted on the topic of idling and why people idle their vehicles, a quantitative descriptive study is chosen to describe segmentation characteristics of the population because key concepts are already understood. A quantitative descriptive study reveals associations between data.

Descriptive characteristics for this study include demographic, geographic, behavioural, and psychographic variables. Demographic variables identify age and gender; geographic variables identify physical location; behavioural variables identify knowledge, attitudes, usage rates, and readiness; and psychographic variables identify opinions and responsiveness to external influences.

3.3 Sample Design

The unit of analysis, those eligible to be chosen to participate in the study, are citizens who currently reside in the Central Okanagan and are 18 years of age or older. The Central Okanagan is divided into seven geographical groups: District of Peachland, City of West Kelowna, Westbank First Nation, Central Okanagan West Electoral Area, City of Kelowna, District of Lake Country, and Central Okanagan East Electoral Area.

As of 2014 the total population of the Central Okanagan was approximately 189,289 as seen in table 3.1.

Table 3.1 - Municipal Populations 2014[1]

Municipality	2014 Population
Kelowna	121,422
Lake Country	13,015
Peachland	5,094
West Kelowna	32,699
Unincorporated Areas	17,059
Central Okanagan Total	**189,289**

To ensure the sample accurately represents the population with a 95% level of confidence, with an acceptable error of ±6.2%, a sample size of 254 is used. Detailed calculations for determining the appropriate sample size can be found in Appendix A - Sample Size.

3.4 Data Collection Methods

To collect the relevant descriptive statistics, data comes from either primary or secondary sources. As no research on the topic has been conducted in the past, all data is collected through primary data collection means.

[1] BC Stats. (2014) *Sub-Provincial Population Estimates*. Retrieved from http://www.bcstats.gov.bc.ca/StatisticsBySubject/Demography/PopulationEstimates.aspx

A survey instrument was used to collect primary data for this study. Questions for the survey are derived from the research objectives; see Appendix B - Survey Questions for a copy of the survey.

The survey was administered both in-person and online on a participatory basis, and is a non-probability sample. The online version of the survey was promoted through Facebook, LinkedIn, municipal websites, media, and communication channels at participating organizations. The in-person survey was administered at major shopping centres. Participation in the survey is discussed in chapter 4.

3.5 Instrument Evaluation

The survey was pre-tested to minimize possible vagueness, overgeneralization, or ambiguity. Furthermore, important concepts, used in the questions, are defined in the survey to provide clarification. These steps are taken to maximize the reliability of the measures used in the survey, and to ensure consistent understanding of each question prior to response.

Each questions' scales are considered to be valid, as the scales' face validity logically reflects what are intended to be measured. For rank-order questions, all relevant options are identified and offered as an option for selection on the survey.

Survey questions use multi-point scales to measure respondents' sensitivity in order to accommodate variability in responses to the question.

3.6 Analysis

Statistical tests performed on the acquired data include: frequency and descriptive statistics, independent-samples t-tests, Chi-Square independence tests and cross-tabulations, and one-way between-groups ANOVA tests.

Descriptive statistics show frequencies of answers for each question. Chi-Square independence tests and cross-tabulations show if there is a relationship between two categorical variables. Independent-samples t-tests show if the means of a variable in two independent groups are

statistically different. One-way between-groups ANOVA tests show the variance of a mean across three or more groups within the population.

3.7 Conclusion

In summary, the decision statement led to the requirement of descriptive research to identify Central Okanagan citizens' perceptions and attitudes towards idling and air quality. Central Okanagan citizens who are 18 years of age or older are valid for participation in this study. In order to be 95% confident that the sample is representative of the population, within a ±6.2% margin of error, a sample size of 250 is used.

Electronic and in-person surveys are used to collect data for this quantitative study. Survey questions are reliable, valid, and sensitive to the data sought to collect. Data are analyzed through several statistical tests to identify frequency and descriptive statistics, relationships, and correlations. The results from the data analysis are discussed in Chapter 4 – Findings and Discussion.

4.0 CHAPTER 4: FINDINGS AND DISCUSSION

4.1 Introduction

In this chapter, results from the data analysis related to the research objectives are discussed in detail. Frequency and descriptive statistics are used to provide segmented data about the survey respondents in order to illustrate who participated in the survey, and then results and major findings from statistical analyses of the data are discussed for each research objective.

4.2 Respondents

A total of 276 respondents participated in the survey. In this analysis, respondents are grouped based on four different grouping variables: age, gender, majority of life, and municipality. Of the respondents, 113 males (46.7%) and 129 females (53.3%) participated in the survey; n = 242.

A total of 108 (44.3%) of respondents spent the majority of their lives within the Central Okanagan, whereas 136 (55.7%) did not; henceforth, respondents who spent the majority of their lives within the Central Okanagan are referred to as group "Yes," and those who did not are referred to as group "No."

Analysis shows Westbank First Nation are underrepresented, thus those respondents are grouped with West Kelowna respondents. Central Okanagan East Electoral District and Central Okanagan West Electoral District are underrepresented, thus those respondents are grouped together. Respondents' municipalities in comparison to 2014 populations are shown in table 4.1.

Table 4.1: Municipality Responses vs Population

Municipality	2014 Population	2014 Percent	2016 Study Frequency	2016 Study Percent
Kelowna	121,422	64.1%	205	74.3%
Lake Country	13,015	6.9%	12	4.3%
Peachland	5,094	2.7%	13	4.7%
West Kelowna & Westbank First Nation	32,699	17.3%	37	13.4%
Central Okanagan East & West Electoral Districts	17,059	9.0%	9	3.3%
Total	189,289	100%	276	100%

4.3 RO1: Perceptions of idling, air pollution, and air quality

Respondents were asked if their municipality should take steps to limit its air pollution. In general, Central Okanagan citizens "agree" that their municipality should take steps to limit its air pollution. Responses are analyzed based on each grouping variable, for which the mean score and standard deviation of each can be seen in Appendix C - Municipality Limit Air Pollution.

A one-way between-groups analysis of variance is conducted to compare perceptions as to whether respondents' municipality should take steps to limit its air pollution between ages. The results are presented in table 4.2. There is a statistically significant difference at the $p < .05$ level: $F(4, 234) = 2.576$, $p = .038$. Post-hoc comparisons using the Tukey HSD test indicates the mean score for respondents aged 44-55 ($M = 4.32$, $SD = .695$) is significantly different from respondents aged 56+ ($M = 3.78$, $SD = 1.037$): $p = 0.036$.

Table 4.2: Limit Air Pollution by Age

Age Group	M	SD
18 - 25	3.94	0.895
26 - 32	4.10	0.770
33 - 43	3.89	0.982
44 - 55	**4.32**	**0.695**
56+	**3.78**	**1.037**

Respondents are asked to identify their level of satisfaction of air quality within their municipality. In general, Central Okanagan citizens are between "neutral" and "satisfied" with the air quality within their municipality. Responses are analyzed based on each grouping

variable, for which the mean score and standard deviation of each can be seen in Appendix D - Air Quality Satisfaction.

Males are more satisfied with their municipality's air quality. An independent-samples t-test is conducted to compare air quality satisfaction between males and females. There is a statistically significant difference in means between males (M = 3.74, SD = 1.024) and females (M = 3.46, SD = .960): t (240) = 2.195, p = .029, two-tailed as seen in table 4.3.

Table 4.3: Air Quality Satisfaction by Gender

Gender	N	M	SD
Male	111	3.74	1.024
Female	129	3.46	0.960

Respondents are asked if steps should be taken to change idling behaviours. In general, Central Okanagan citizens "agree" that steps should be taken to change idling behaviours. Responses are analyzed based on each grouping variable, for which the mean score and standard deviation of each can be seen in Appendix E - Change Idling Behaviours.

Females agree more than males that steps should be taken to change idling behaviours. An independent-samples t-test is conducted to compare perceptions as to whether steps should be taken to change idling behaviours between males and females. There is a statistically significant difference in scores between males (M = 3.77, SD = 1.102) and females (M = 4.05, SD = .812): t (241) = 2.197, p = .029, two-tailed as seen in table 4.4.

Table 4.4: Change Idling Behaviours by Gender

Gender	N	M	SD
Male	113	3.77	1.102
Female	128	4.05	0.812

4.4 RO2: Awareness of idling effects

Respondents are asked how much of an impact they think idling has on: air quality, climate change, and adverse health effects. In general, on a scale of zero to five, Central Okanagan citizens think idling had an above average impact on air quality, climate change, and adverse

health effects. Responses are analyzed based on age, gender, and majority of life grouping variables, for which the mean score and standard deviation of each can be seen in Appendix F - Idling's Effects.

Females think idling has a bigger effect on air quality, climate change, and adverse health effects. The mean score and standard deviation of males and females for each can be seen in table 4.5.

Respondent's attitudes towards the effect of idling on air quality, climate change, and health were compared using an independent-samples t-test. Towards air quality, there is a statistically significant difference in scores for males (M = 3.18, SD = 1.288) and females (M = 3.72, SD = 1.030): t (238) = -3.514, p = .001. Towards climate change, there is a statistically significant difference in scores for males (M = 2.83, SD = 1.420) and females (M = 3.44, SD = 1.226): t (237) = -3.571, p<.0001. Towards effect on health, there is a statistically significant difference in scores for males (M = 3.08, SD = 1.389) and females (M = 3.54, SD = 1.207): t (239) = -2.757, p = .006.

Table 4.5: Idling's Effects by Gender

	Air Quality		Climate Change		Adverse Health Effects	
Gender	M	SD	M	SD	M	SD
Male	3.18	1.288	2.83	1.420	3.08	1.389
Female	3.72	1.030	3.44	1.226	3.54	1.207

Those that have not spent the majority of their lives within the Central Okanagan think idling has a bigger effect on air quality and climate change. The mean score and standard deviation of each can be seen in table 4.6. Their attitudes were compared using an independent-samples t-test. There is a statistically significant difference in scores for "Yes" (M = 3.29, SD = 1.229) and "No" (M = 3.62, SD = 1.132): t (240) = -2.189, p = .030. There is a statistically significant difference in scores for "Yes" (M = 2.94, SD = 1.413) and "No" (M = 3.32, SD = 1.309): t (239) = -2.120, p = .035.

Table 4.6: Idling's Effects by Majority of Life

	Air Quality		Climate Change	
Majority of Life	M	SD	M	SD
Yes	**3.29**	**1.229**	**2.94**	**1.413**
No	**3.62**	**1.132**	**3.32**	**1.309**

4.5 RO3: Willingness to change idling behaviours

Respondents were asked to identify the top five occurrences when they idle their vehicles. There are a total of 186 responses to the rank order question regarding idling behaviours. The top five idling behaviours can be seen in table 4.7. A detailed list of idling behaviours can be found in Appendix G - Rank of Idling Behaviours.

Table 4.7: Top 5 Idling Behaviours

Idling Behaviours	Score	Rank
Waiting in traffic	331	1
Waiting for passengers	942	2
Waiting to park my vehicle	981	3
Adjusting my vehicle's interior temperature	1042	4
Waiting in restaurant drive-thrus	1066	5

Of the respondents, 82.6% are willing to reduce their idling behaviours. Analysis is conducted to identify if any association exists between groups and respondents' willingness to reduce how often they idle if they were motivated to do so. Responses are analyzed based on age and gender. There is an association between gender, and no association between ages.

Females are more willing to reduce their idling behaviours. A Chi-square test of independence (with Yates Continuity Correction) indicates a significant association between gender and willingness to reduce idling behaviours, χ^2 (1, n = 239) = 5.416, p = .020, as seen in figure 4.1.

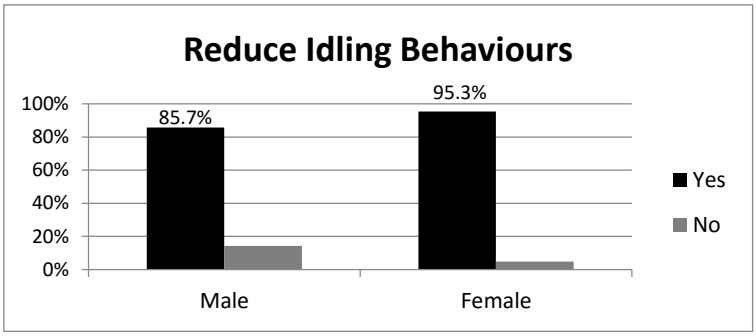

Figure 4.1: Reduce Idling Behaviours by Gender

Of the respondents, 68.1% are willing to learn more about idling effects. Analysis is conducted to identify if any association exists between groups and respondents' willingness to learn more about the effects of idling. Responses are analyzed based on age and gender. There is an association between gender, and no association between ages.

Females are more willing to learn more about idling effects. A Chi-square test of independence (with Yates Continuity Correction) indicates a significant association between gender and willingness to learn more about idling effects, χ^2 (1, n = 241) = 6.777, p = .009, as seen in figure 4.2.

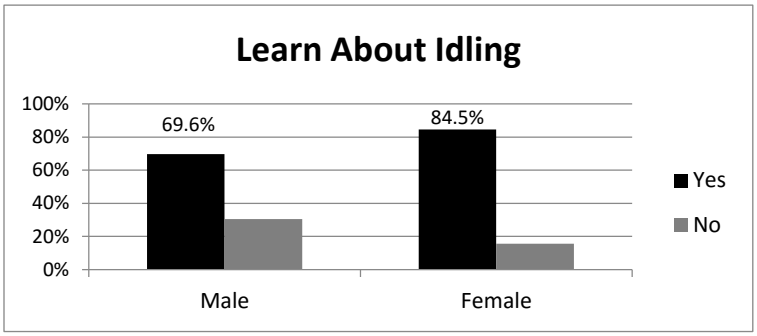

Figure 4.2: Learn About Idling by Gender

Of the respondents, 73.2% are willing to learn idling reduction techniques. Analysis is conducted to identify if any association exists between groups and respondents' willingness to learn idling reduction techniques. Responses are analyzed based on age and gender. There is an association between gender, and no association between ages.

Females are more willing to learn idling reduction techniques. A Chi-square test of independence (with Yates Continuity Correction) indicates a significant association between gender and willingness to learn idling reduction techniques, χ^2 (1, n = 241) = 4.210, p = .026. Responses by gender can be seen in figure 4.3.

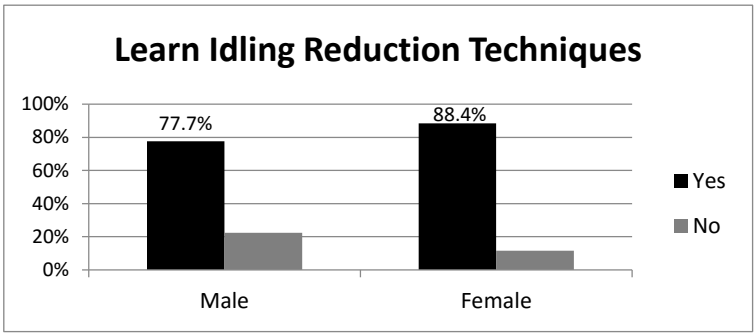

Figure 4.3: Learn Idling Reduction Techniques by Gender

4.6 RO4: Anti-idling Bylaw Receptiveness

Respondents are asked if their municipality should implement an anti-idling bylaw. In general, Central Okanagan citizens are between "neutral" and "agree" that their municipality should implement an anti-idling bylaw. Responses are analyzed based on each grouping variable, for

which the mean score and standard deviation of each can be seen in Appendix H - Implement Anti-idling Bylaw.

Data in table 4.8 shows that females agree more than males that their municipality should implement an anti-idling bylaw. An independent-samples t-test is conducted to compare perceptions as to whether respondents' municipality should implement an anti-idling bylaw between genders. There is a statistically significant difference in scores between males (M = 3.38, SD = 1.305) and females (M = 3.71, SD = 1.041): t (242) = -2.121, p = .035.

Table 4.8: Anti-idling Bylaw by Gender

Gender	N	M	SD
Male	113	3.38	1.305
Female	129	3.71	1.041

Respondents are asked what they perceive to be fair for a maximum idling time limit. Central Okanagan citizens perceive a maximum idling time limit to be 2.5 minutes. Responses are analyzed based on age, gender, and majority of life, for which the mean score and standard deviation of each can be seen in Appendix I - Fair Max Idling Time Limit.

The data shown in table 4.9 show respondents younger in age consider a longer max idling time limit to be fair. A one-way between-groups analysis of variance is conducted to compare perceptions of fair max idling time limit between ages. There is a statistically significant difference at the $p < .05$ level: F (4, 234) = 3.716, p = .006. Post-hoc comparisons using the Tukey HSD test indicates the mean score for those aged 18 to 25 (M = 7.48, SD = 3.019) is significantly different from those aged 56+ (M = 5.23, SD = 2.900): p = 0.003.

Table 4.9: Fair Max Idling Time Limit by Age

Age Group	N	M	SD
18 - 25	50	**7.48**	**3.019**
26 - 32	49	6.37	3.315
33 - 43	45	5.96	2.804
44 - 55	46	5.85	2.875
56+	44	**5.23**	**2.900**
Total	234	6.21	3.064

Respondents are asked if they previously lived in a municipality that had an anti-idling bylaw in place. Of the respondents, 47.2% responded "No," 33.1% responded "I Don't Know," and 19.7% responded "Yes." Responses are analyzed based on age, gender, and majority of life, for which the frequency and percentage of each response can be seen in Appendix J - Experienced Anti-idling Bylaw.

As shown in figure 4.4, older respondents are more aware of if they have lived in a municipality with an anti-idling bylaw in place. A Chi-square test of independence indicates a significant association between age and previously living in a municipality that had an anti-idling bylaw in place, χ^2 (8, n = 237) = 19.970, p = .010, Cramer's V = .205.

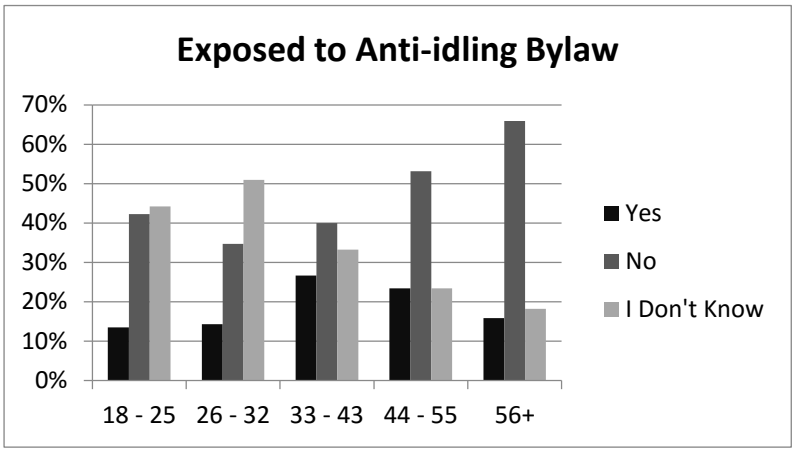

Figure 4.4: Exposed to Anti-idling Bylaw by Age

4.7 RO5: Effective Communication Channels

Respondents are asked to identify the top five communication channels that grasp their attention throughout their day. The top five communication channels can be seen in table 4.10. A detailed list of communication channels can be found in Appendix K - Rank of Communication Channels.

Respondents are asked their desire for access to anti-idling resources. Of the respondents, 66.0% responded "Yes." Responses are analyzed based on municipality, age, and gender for which the frequency and percentage of each response can be seen in Appendix L -Anti-idling Resources.

Table 4.10: Top 5 Communication Channels

Communication Channel	Score	Rank
Traffic signs	683	1
Social Media	779	2
Radio	926	3
Billboards	1085	4
TV	1199	5

4.8 Conclusion

In summary, findings gathered from each question based on the research objectives are tested between each grouping variable to identify many statistically significant differences between groups. The following chapter, Chapter 5 - Conclusions and Recommendations, provides interpretations, limitations, and recommendations based on the findings and discussion within this chapter.

5.0 CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

This chapter provides conclusions and recommendations based on the findings and discussion in the previous chapter. First, conclusions about each research objective and the decision statement are made. Limitations for which this research can be applied are discussed, and then recommendations for the client are provided.

5.1 RO1: Perceptions of Idling, Air Pollution, and Air Quality

Central Okanagan citizens "agree" their municipality should take steps to limit its air pollution. Those aged 44-55 year olds feel more strongly. There is a significant difference between respondents aged 44-55 and 56+ and their opinions on whether their municipality should take steps to limit its air pollution.

Central Okanagan citizens' satisfaction level with the air quality in their municipality is between "neutral" and "satisfied." Females are less satisfied. There is a significant difference between males' and females' satisfaction of air quality within their municipality.

Central Okanagan citizens "agree" steps should be taken to change idling behaviours. Females feel more strongly. There is a significant difference between males' and females' perceptions as to whether steps should be taken to change idling behaviours.

5.2 RO2: Awareness of Idling Effects

On a scale of zero to five, Central Okanagan citizens think idling has an above average impact on air quality, climate change, and adverse health effects. Females think idling has a larger impact on all three, and those that have not spent the majority of their lives within the Central Okanagan think idling has a larger impact on air quality, and climate change.

5.3 RO3: Willingness to Change Idling Behaviours

Central Okanagan citizens' top five idling behaviours based on frequency, in order, are: waiting in traffic, waiting for passengers, waiting to park their vehicle, adjusting vehicle interior temperature, and waiting in restaurant drive thrus.

Central Okanagan citizens are willing to reduce idling behaviours, learn more about idling, and learn idling reduction techniques; 82.6%, 68.1%, and 73.2% respectively. Females are more willing to do all three. There is a significant difference between males' and females' willingness.

5.4 RO4: Anti-idling Bylaw Receptiveness

Central Okanagan citizens are between "neutral" and "agree" that their municipality should implement an anti-idling bylaw. Females feel more strongly. There is a significant difference between males' and females' perceptions as to whether their municipality should implement an anti-idling bylaw.

Central Okanagan citizens feel that a 2.5 minute max idling time limit is fair. There is a significant difference between ages. Those younger in age consider a longer max idling time limit to be fair.

Over one-third of Central Okanagan citizens are unaware if they've lived in a municipality that had an anti-idling bylaw in place. As their age increases, so does their awareness of such bylaws. There is a significant association between respondents' age and their awareness of an anti-idling bylaw in a municipality where they previously lived.

5.5 RO5: Effective Communication Channels

Central Okanagan citizens' top five communication channels based on their ability to grasp their attention throughout their day are: traffic signs, social media, radio, billboards, and TV. Two-thirds of Central Okanagan citizens desire access to anti-idling resources.

5.6 Decision Statement Conclusions

In conclusion, Central Okanagan citizens think idling has an above average impact on air quality, and their municipality should take steps to limit its air pollution. They agree steps should be taken to change idling behaviours, are willing to do so, and desire access to anti-idling resources. They lean towards agreement that their municipality should implement an anti-idling bylaw. An anti-idling bylaw would be best communicated, in order, through traffic signs, social media, radio, billboards, and TV.

5.7 Limitations

Due to small response rates from each municipality except Kelowna, this research cannot be generalized to each municipality individually because of underrepresentation in the study. However, this research can be generalized to the Central Okanagan population as a whole. Respondents are surveyed mainly through electronic means which may skew results for effective communication channels. The sample accurately represents the population with a 95% level of confidence, with a ±6.2% margin of error.

5.8 Recommendations

It is recommended that an anti-idling bylaw be implemented in the Central Okanagan, and communication efforts to raise awareness be focused through traffic signs, social media, radio, billboards, and TV. Communication efforts should be targeted to both males and females, but with an emphasis on females as they are more willing to reduce their idling behaviors.

It is also recommended that additional resources be developed and distributed to inform Central Okanagan citizens about the effects of idling, teach them idling reduction techniques, and raise awareness of the most common instances people idle; waiting in traffic, waiting for passengers, waiting to park their vehicle, adjusting vehicle interior temperature, and waiting in restaurant drive thrus.

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APPENDIX A – SAMPLE SIZE

$$n = \frac{Z^2\sigma^2}{e^2}$$

n = Sample Size
Z= Value for given confidence interval (.95) = 1.96
σ = population standard deviation = .5
e = acceptable margin of error = ±6.2%

$$n = \frac{1.96^2 . 5^2}{.062^2}$$

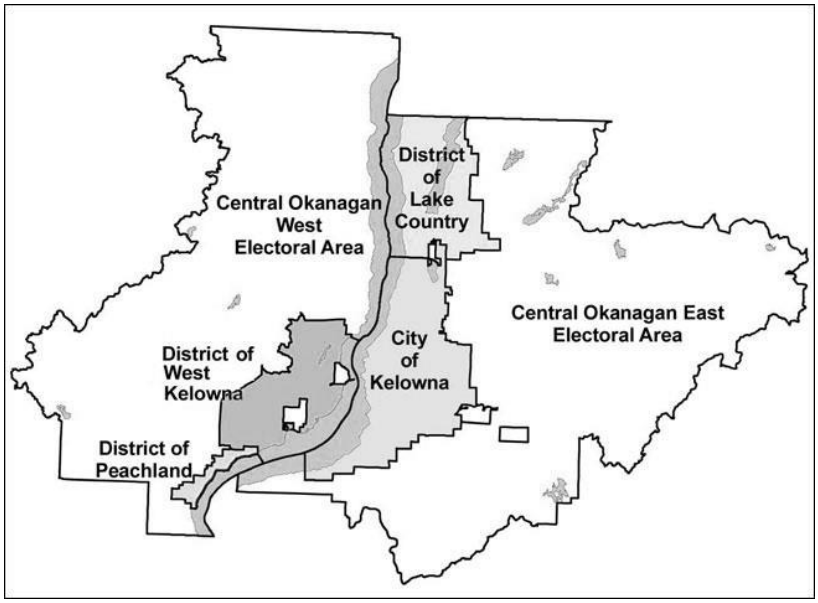
$$n = \frac{3.8416 * .25}{.003844}$$

$$n = \frac{0.9604}{.003844}$$

$$n = 250$$

APPENDIX B – SURVEY QUESTIONS

Central Okanagan Idling and Air Quality Attitudinal Study



Question 1 – Municipality

In which area do you currently reside? (Select only one)

Peachland	Lake Country	
West Kelowna	Central Okanagan East Electoral Area	
Westbank First Nation	Central Okanagan West Electoral Area	None of these
Kelowna		

If you answered **"None of these,"** you are now finished this survey. We thank you for your time.

Question 2 – Minimum Age

Are you 18 years old or older?

Yes No

If you answered **"No,"** you are now finished this survey. We thank you for your time.

Question 3 – Satisfaction - Air quality

How satisfied are you with the level of air quality in your municipality?

Very Unsatisfied Unsatisfied Neutral Satisfied Very Satisfied

Question 4 – Perception – Municipality's air pollution

Please indicate how you feel about the statement: **"My municipality should take steps to limit its air pollution"**

Strongly Disagree Disagree Neutral Agree Strongly Agree

"Idle" and "Idling"

In this survey, when we discuss "idle" and "idling" we refer to the time when your vehicle is not in motion, but your engine is running.

Question 5 – Awareness - Idling

How much of an impact do you think idling has on the following?

	None					Immense
Air Quality	0	1	2	3	4	5
Climate Change	0	1	2	3	4	5
Adverse Health Effects	0	1	2	3	4	5

Question 6 – Perception - Change idling behaviours

Please indicate how you feel about the statement: **"Steps should be taken to change idling behaviours"**

Strongly Disagree Disagree Neutral Agree Strongly Agree

Question 7 – Willingness to reduce idling behaviours

If you were motivated to do so, would you be willing to reduce how often you idle?

Yes No

Question 8 – Current idling behaviours

Please rank the following list of idling behaviours by how often you idle your vehicle, where 1 is most often and 11 is least often. (Use each number only once)

	Waiting in traffic
	Waiting for passengers
	Waiting to park my vehicle
	Waiting to refuel my vehicle
	Stopping to talk to friends/acquaintances
	Adjusting my vehicle's interior temperature
	Running quick errands
	Waiting in restaurant drive-thrus
	Waiting in car wash drive-thrus
	Waiting in bank drive-thrus
	Preparing to leave the house

Question 9 – Exposed to anti-idling bylaw

Have you previously lived in a municipality that had an anti-idling bylaw in place?

Yes No I don't know

Question 10 – Perception - Anti-idling bylaw

Please indicate how you feel about the statement: **"There should be an anti-idling by-law in my municipality"**

Strongly Disagree Disagree Neutral Agree Strongly Agree

Question 11 – Fair max idling time limit

What "maximum idling time limit" would you consider to be fair for yourself (in minutes)?

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 Greater than 5

Question 12 – Willingness to learn more about idling

Would you be willing to learn more about the effects of idling?

Yes No

Question 13 – Willingness to learn idling reduction techniques

Would you be willing to learn techniques which would help you to reduce how much you idle?

Yes No

Question 14 – Access to anti-idling resources

Would you like to have access to anti-idling resources such as signage and educational materials?

Yes No

Question 15 – Effective communication channels

Please rank the following communication channels based on their ability to grab your attention throughout your day, where 1 is most effective and 14 is least effective. (Use each number only once)

	Traffic signs
	Billboards
	TV
	Radio
	Newspaper
	Mail
	Magazines
	Social Media
	Open Houses
	Municipal Website
	Blogs
	E-mail
	Online Videos
	Podcasts

Question 16 – Age

What is your age in years?

_____

Question 17 – Gender

What is your gender?

Male Female

Question 18 – Majority of life

Have you spent the majority of your life within the Central Okanagan (in the area between Peachland and Lake Country)?

Yes No

APPENDIX C - MUNICIPALITY LIMIT AIR POLLUTION

Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Scale	1	2	3	4	5

Grouping Variable	N	M	SD
Municipality			
Peachland	11	3.55	0.934
West Kelowna & Westbank First Nation	36	4.00	1.095
Kelowna	204	4.03	0.884
Lake Country	12	4.17	0.577
Central Okanagan East & West Electoral Districts	9	4.11	0.601
Municipality Total	272	4.02	0.899
Gender			
Male	111	3.93	0.997
Female	127	4.04	0.830
Majority of Life			
Yes	107	3.87	0.932
No	133	4.09	0.883
Age Group			
18 - 25	52	3.94	0.895
26 - 32	49	4.10	0.770
33 - 43	45	3.89	0.982
44 - 55	47	**4.32**	**0.695**
56+	41	**3.78**	**1.037**

APPENDIX D - AIR QUALITY SATISFACTION

Response	Very Unsatisfied	Unsatisfied	Neutral	Satisfied	Very Satisfied
Scale	1	2	3	4	5

Grouping Variable	N	M	SD
Municipality			
Peachland	13	3.77	1.092
West Kelowna & Westbank First Nation	36	3.69	0.951
Kelowna	204	3.55	0.953
Lake Country	12	3.75	1.138
Central Okanagan East & West Electoral Districts	9	3.44	1.236
Municipality Total	274	3.58	0.973
Age Group			
18 - 25	52	3.65	0.926
26 - 32	49	3.78	0.872
33 - 43	44	3.52	0.976
44 - 55	47	3.60	0.993
56+	44	3.32	1.177
Age Total	236	3.58	0.992
Majority of Life			
Yes	107	3.68	1.015
No	135	3.51	0.976
Gender			
Male	**111**	**3.74**	**1.024**
Female	**129**	**3.46**	**0.960**

APPENDIX E - CHANGE IDLING BEHAVIOURS

Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Scale	1	2	3	4	5

Grouping Variable	N	M	SD
Age Group			
18 - 25	52	3.92	0.837
26 - 32	49	3.84	0.800
33 - 43	45	4.04	0.824
44 - 55	47	4.11	0.983
56+	43	3.81	1.160
Age Total	236	3.94	0.923
Majority of Life			
Yes	107	3.81	1.001
No	136	4.00	0.927

APPENDIX F - IDLING'S EFFECTS

Response	None					Immense
Scale	0	1	2	3	4	5

	Air Quality		Climate Change		Adverse Health Effects	
Grouping Variable	**M**	**SD**	**M**	**SD**	**M**	**SD**
Age Group						
18 - 25	3.37	1.121	2.98	1.306	3.17	1.232
26 - 32	3.43	1.137	3.14	1.354	3.18	1.364
33 - 43	3.59	1.106	3.20	1.286	3.45	1.247
44 - 55	3.70	1.214	3.47	1.349	3.72	1.263
56+	3.40	1.308	3.10	1.497	3.30	1.389
Total	3.50	1.173	3.18	1.355	3.36	1.305
Gender						
Male	**3.18**	**1.288**	**2.83**	**1.420**	**3.08**	**1.389**
Female	**3.72**	**1.030**	**3.44**	**1.226**	**3.54**	**1.207**
Majority of Life						
Yes	**3.29**	**1.229**	**2.94**	**1.413**	3.16	1.388
No	**3.62**	**1.132**	**3.32**	**1.309**	3.49	1.243

APPENDIX G - RANK OF IDLING BEHAVIOURS

Idling Behaviours	Score	Rank
Waiting in traffic	331	1
Waiting for passengers	942	2
Waiting to park my vehicle	981	3
Adjusting my vehicle's interior temperature	1042	4
Waiting in restaurant drive-thrus	1066	5
Preparing to leave the house	1104	6
Waiting to refuel my vehicle	1253	7
Running quick errands	1310	8
Waiting in car wash drive-thrus	1396	9
Stopping to talk to friends/acquaintances	1404	10
Waiting in bank drive-thrus	1447	11

APPENDIX H - IMPLEMENT ANTI-IDLING BYLAW

Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Scale	1	2	3	4	5

Grouping Variable	N	M	SD
Municipality			
Peachland	13	3.31	1.109
West Kelowna & Westbank First Nation	37	3.57	1.168
Kelowna	186	3.61	1.195
Lake Country	10	3.90	0.876
Central Okanagan East & West Electoral Districts	8	3.13	1.356
Municipality Total	254	3.59	1.179
Age Group			
18 - 25	52	3.27	1.012
26 - 32	49	3.65	0.969
33 - 43	45	3.56	1.216
44 - 55	47	3.89	1.165
56+	44	3.57	1.371
Age Total	237	3.58	1.156
Majority of Life			
Yes	108	3.42	1.201
No	136	3.67	1.155

APPENDIX I - FAIR MAX IDLING TIME LIMIT

Minutes	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	Greater than 5
Scale	1	2	3	4	5	6	7	8	9	10	11	12

Grouping Variable	N	M	SD
Gender			
Male	113	6.27	3.145
Female	127	6.30	3.102
Majority of Life			
Yes	106	6.59	3.156
No	135	6.04	3.064
Age Group			
18 - 25	50	**7.48**	**3.019**
26 - 32	49	6.37	3.315
33 - 43	45	5.96	2.804
44 - 55	46	5.85	2.875
56+	44	**5.23**	**2.900**
Age Total	234	6.21	3.064

APPENDIX J - EXPERIENCED ANTI-IDLING BYLAW

Grouping Variable	Yes		No		I Don't Know	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Gender						
Male	25	22.1%	57	50.4%	31	27.4%
Female	19	14.7%	59	45.7%	51	39.5%
Total	44	18.2%	116	47.9%	82	33.9%
Majority of Life						
Group 1	15	13.9%	58	53.7%	35	32.4%
Group 2	30	22.1%	58	42.6%	48	35.3%
Total	45	18.4%	116	47.5%	83	34.0%
Age Group						
18 - 25	7	13.5%	22	42.3%	23	44.2%
26 - 32	7	14.3%	17	34.7%	25	51.0%
33 - 43	12	26.7%	18	40.0%	15	33.3%
44 - 55	11	23.4%	25	53.2%	11	23.4%
56+	7	15.9%	29	65.9%	8	18.2%
Age Total	44	18.6%	111	46.8%	82	34.6%

APPENDIX K - RANK OF COMMUNICATION CHANNELS

Communication Channel	Score	Rank
Traffic signs	683	1
Social Media	779	2
Radio	926	3
Billboards	1085	4
TV	1199	5
E-mail	1210	6
Online Videos	1361	7
Newspaper	1415	8
Mail	1459	9
Municipal Website	1727	10
Magazines	1766	11
Blogs	1826	12
Open Houses	1984	13
Podcasts	2102	14

APPENDIX L - ANTI-IDLING RESOURCES

Grouping Variable	Yes		No	
	Frequency	Percent	Frequency	Percent
Municipality				
Peachland	7	53.8%	6	46.2%
West Kelowna & Westbank First Nation	19	54.3%	16	45.7%
Kelowna	119	68.0%	56	32.0%
Lake Country	7	70.0%	3	30.0%
Central Okanagan East & West Electoral Districts	7	87.5%	1	12.5%
Total	159	66.0%	82	34.0%
Age Group				
18 - 25	30	57.7%	22	42.3%
26 - 32	33	67.3%	16	32.7%
33 - 43	29	64.4%	16	35.6%
44 - 55	38	84.4%	7	15.6%
56+	26	61.9%	16	38.1%
Total	156	67.0%	77	33.0%
Gender				
Male	66	60.6%	43	39.4%
Female	91	70.5%	38	29.5%
Total	157	66.0%	81	34.0%