

PARTICIPATION IN AND WILLINGNESS TO PAY FOR CURBSIDE RECYCLING IN
THREE SMALL CITIES IN BRITISH COLUMBIA

by:

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Abstract

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Recycling programs have become a more and more commonly implemented measure in many communities as cities try to increase the number of residents who participate in recycling. This is particularly important in smaller cities, which generally provide fewer services than large cities, owing to smaller municipal budgets. The City of Kamloops recently implemented a curbside collection program for all single family dwellings, while the City of Vernon has had such a program for some time now, and the City of Merritt recently upgraded their depot system. This research examined the rates of participation and willingness to pay for recycling programs in these three small cities. A mail out survey was distributed to 300 households in each of the three cities; Kamloops, Vernon and Merritt and yielded a response rate of approximately 30 percent. Linear regression analysis of the survey data yielded useful participation and willingness to pay results. Overall and material specific participation rates were found to be significantly influenced by the presence of a recycling program (curbside only, or both depots and curbside), and by the age of the respondent. Willingness to pay to maintain a curbside collection program was most significantly influenced by city, age of the respondent, educational attainment of the respondent and family size of the respondent. In contrast, the factors tied most closely to support for the implementation of a curbside collection program were; the respondent rating the improvement of environmental quality as a high priority in their municipality among other issues and the income level of the respondent. In addition to the quantitative regression analyses, qualitative interviews were also conducted with recycling officials from each of the three cities. The common themes which arose from these interviews were that convenience and access to services are key drivers in gaining resident participation and willingness to pay. These findings have similarities and differences to the general literature, much of which is based on larger cities, and bring to light important factors influencing participation in and willingness to pay for recycling in small cities.

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Dedication:

I would like to dedicate this work to my family: my husband Brandon, my mom Lorraine, my dad Barry, and my sister Laura. This would never have been completed without your continued support and encouragement.

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Glossary:

Base Case: the set of variables which are removed from the model to which the remainder of the model outputs are compared

Contingent Valuation Method (CVM): a way of inferring a person's (or household's) willingness to pay for an improvement in environmental quality by presenting a scenario and requesting a response. (from Field & Olewiler 2005 and Blaine et. al. 2005)

Cost Effectiveness (analysis): takes a policy target as given then examines the total costs of different alternatives that reach the target. A policy is cost effective if it achieves the target at the lowest possible costs to society. (from Field & Olewiler 2005 and Aadland & Caplan 2006)

Depot Program: in this study, a set of locations where residents may drop off recyclable materials which the city maintains and collects from as opposed to curbside collection

Design for Environment: is an approach where the focus of environmental concerns is being shifted from waste disposal concerns (ie. recycling) back 'upstream' to product and process design issues. (from Calcott & Walls 2005)

Dillman Approach: an approach to designing, writing and distributing mail out surveys which will yield the highest possible return rate and most concise responses

Direct Incentive: a direct factor that enables or motivates a particular course of action (<http://www.answers.com/topic/incentive#>) For example a charge per unit of garbage set out gives a direct incentive to reduce solid waste quantities (Jenkins et. al., 2003)

Dummy variables: (also called indicator, binary, categorical, qualitative or dichotomous variables) are variables which assume a paired value such as: 0 or 1, yes or no, male or female (Gujarati, 1995)

Environmental Rating: a rating, from 1 (lowest) to 5 (highest), given by survey respondents on the priority they place on different issues in their municipalities, including improving environmental quality.

Free Units: set amounts (by size or weight, i.e. 2 bags) of garbage that are allowed to be placed at the curb each week before an additional amount per bag is charged (Ferrara & Missios, 2005)

High (income, age or educational attainment): In this study the designation of high is given to the two response categories at the top of the choice scale. (high income: \$ 80,000 or greater, high age: 55 years or greater, educational attainment: university graduate or higher)

Indirect Incentive: an indirect factor that enables or motivates a particular course of action (<http://www.answers.com/topic/incentive#>) For example a charge per unit of garbage set out gives an indirect incentive to recycle (Jenkins et. al., 2003)

Large city: for this study, a city with a population of more than 100,000 people

Low (income, age or educational attainment): In this study the designation of low is given to the two response categories at the bottom of the choice scale. (low income: \$ 39,000 or less, high age: 18 to 34 years, educational attainment: high school graduate or less)

Moderate (income, age or educational attainment): In this study the designation of moderate is given to the two response categories in the middle of the choice scale. (moderate income: \$ 40,000 to \$79,000, moderate age: 35-54 years, educational attainment: some college or trade school or college or trade school graduate)

Open-ended (CVM): offers a scenario and requests that the respondent ‘fill in the blank’. (from Androkovich et. al. in press)

Opportunity Cost: the opportunity cost of using resources in a particular way is the highest valued alternative use to which those resources might have been put and thus which society (or the individual) forgoes by using the resources in the specified way. (from Field & Olewiler 2005)

Pay-as-you-throw: another term used to describe unit pricing of solid wastes where a charge per container is applied at the disposal site

Probit Analysis: estimates the probability (between 0 and 1) of the outcome for the dependant variable with respect to an unobservable variable that is to be determined by the explanatory variables given. (Gujarati, 1995)

Participation: the act of taking part or sharing in something
(<http://www.thefreedictionary.com/participation>)

Participation ratio: the number of households using the program at least once every 4 weeks divided by the total number of households served by the program. (from Shaw et. al. 2006)

Payment Card (CVM): offers a scenario and requests that the respondent choose the most fitting response from a given list of choices. (from Blaine et. al. 2005)

Protest Response: a response which shows objection to the subject matter. In this study, a response to a survey question or the survey itself which shows an objection to the ideas being presented

Recycling Intensity: the extent to which a household participates in recycling, (ie. The recycling intensity of a household that separates out 75% of acceptable materials from their wastes is lower than that of a household that separates 99% of acceptable materials. (from Jenkins et. al. 2003)

Referendum (CVM): also called double bounded dichotomous choice, offers a scenario and requests a yes or no answer. (from Blaine et. al. 2005)

Revealed Preference: are the actual actions that are directly observed to be taken by the respondent. (from Aadland & Caplan 2006)

Selectivity Bias: with questionnaire type surveys, as in this study, the issue of non-response. Analysis is conducted on the data collected and does not account for or represent the remaining non-respondents (Gujarati, 1995)

Set out rate: the number of households using the collection program divided by the total number of households served by the program. (from Shaw et. al. 2006)

Small city: for this study, a city with a population of less than 100,000

Social net benefit: the positive difference between the total social costs and total social benefits of a curbside recycling program (from Aadland & Caplan 2006)

Stated Preference: are the actions that the respondent reports that they currently take or will take in future. (from Aadland & Caplan 2006)

Take back mandates: regulations or policies outlining the amount consumers should get back when they return recyclable materials for refund (from Calcott & Walls 2005)

Unclaimed deposits: deposits paid on recyclable materials that never get claimed or refunded to the consumer because the product never gets recycled (from Calcott & Walls 2005)

Unit Limit: (or bag limit) the number of units or containers of garbage allowed to be set out at each collection (Ferrara & Missios, 2005)

Unit pricing: (or volume based pricing) for solid waste disposal services wherein households are charged for garbage collection according to the number of containers they set out. (Jenkins et. al., 2003)

Utility: (in economics) the total amount of satisfaction received by consuming a good or service (<http://www.investopedia.com/terms/u/utility.asp>)

Willingness to Pay: the maximum amount that an individual is willing to pay to acquire some good or service. The good or service may be one that is bought or sold (a market good) or it may be one that is not bought or sold (a non-market good). (From <http://450.aers.psu.edu/glossary>)

Chapter 1: Introduction

Changing societal views of the environment, among other factors, have prompted many governments to implement stricter waste reduction targets to minimize negative environmental effects (Vining & Ebreo 1992 and Harder et. al. 2006). The diversion of recyclable wastes is seen as one means for meeting such targets (Vining & Ebreo 1992) and numerous municipalities have put curbside recycling programs into place to divert waste from landfills (Woodard et. al. 2006). Three small cities within the B.C. interior at different stages in this process are Kamloops, which recently implemented curbside recycling in addition to its drop-off depots, Vernon, which has had curbside collection and drop-off depots in place for some time and Merritt, which has recently upgraded its depot collection service.

In both Kamloops and Vernon there is no sorting of recyclables required for their collection systems, but they differ in terms of a number of other aspects. In Vernon pickup is bi-weekly, blue bags are used, there are no limits on the amount of recyclables that can be set out, and non recyclable items are tagged and left behind. In Kamloops pickup is weekly, they use wheeled bins, there is a limit of one wheeled bin full each week and there is no apparent penalty for non recyclable items being left out for pickup. In Merritt sorting into bins is required at the drop off depot and fewer materials are accepted than in Kamloops or Vernon. Due to the fact that each city has a recycling program at a different stage than the others there is likely a much more extensively developed set of policies in Vernon because their program has been up and running the longest. There is likely a great deal for Kamloops and Merritt to learn as they develop policies to keep their programs running effectively. In Kamloops, although they are learning as they go, the results seem to be positive. Three months after the implementation of the curbside program, David Duckworth reported in an interview with Kamloops This Week (Sunday June 15, 2008), that the city expected to collect roughly the same amount of recyclables after the first 6 months that it would have collected over an entire year in the past. A few months after that there were reports of talk of program expansion and a pilot project for multifamily residences in Kamloops This Week (Thursday September 11, 2008).

The effectiveness of these programs, and many others like them, is dependent upon the participation and willingness to pay of residents. Although there is a large body of literature that examines curbside recycling, its focus seems to center on large cities. Ofori-Amoah (2007), points out that relatively little attention has been given to small cities in urban (city) geography literature, and Bell and Jayne (2006) note a woeful neglect of the small city in the literature on urban systems, or ‘systems of cities’ (Simmons & McCann 2006). Since, as Bell and Jayne point out, small cities are, “numerically speaking, the typical size of urban form the world over”, this research will focus on small cities like the ones mentioned above. The aim of this research is to determine the extent to which participation in recycling, and willingness to pay, are influenced by a variety of variables including: attitudes towards the environment, household income, family size, education, age, gender, home ownership, city, recycling system and education. Is participation in recycling activity higher in cities with a curbside system, relative to a depot system? Is there a statistically significant increase? Jenkins et. al (2003) showed that it was, in the set of large cities they examined. Is the increase in participation due to new households recycling that did not before, households that previously recycled doing so to a greater extent (due to increased convenience), or the ability to recycle additional materials? Harder et. al. (2006) reported that participation increased with an increased number of materials collected. They felt the result may be due to the fact that with a wider range of materials collected there were many more possible products that could be included. It may be that a combination of all of the above factors is the answer.

Examining willingness to pay for recycling within all cities can provide information on the value people place on the environment as well as the price of convenience of the curbside recycling system. If the evidence indicates a higher willingness to pay for curbside relative to depot recycling, among households of similar socioeconomic characteristics, the willingness to pay differential can be interpreted as the value those households assign to having the convenience of curbside recycling.

A review of curbside recycling literature follows. First, covering papers which discuss the program variables found to be most influential in increasing participation rates, comparison of reported versus observed participation, and examination of which

socioeconomic factors have the greatest influence on participation. Next, it goes on to review papers which cover a comparison of different valuation methods for determining willingness to pay and, a determination of the social net benefit of recycling programs. Last, it touches on where markets and policies fit in to effective waste diversion.

PARTICIPATION

Jenkins et. al. (2003) analysed whether participation in recycling a number of specific materials improved with varying recycling program features and unit pricing of waste. They note that two basic trends have emerged as a result of efforts to decrease waste being land filled, the introduction of curbside recycling programs and the introduction of unit pricing of waste. Both avenues provide incentives for decreasing wastes, but there may be differences between the two due to the fact that one is a direct incentive while the other is indirect. This study examined data from 20 metropolitan areas in the United States at the household level. Data were collected from a mail out survey conducted by Equifax Inc. in 1992 with a 65 percent return rate. From the total of 4600 households surveyed the authors selected only communities with ongoing recycling programs, and excluded all samples from communities with drop off centers only for a final sample size of 1049 observations. Communities with drop off centers only were excluded to “reduce the bias associated with avid recyclers being more likely than others to know about drop off programs” (pg. 300). The study focused on five materials; glass bottles, plastic bottles, aluminum cans, newspaper and yard waste. All of the communities had curbside recycling for at least one of the five materials. A variety of features were found to have a significant impact on recycling efforts. Recycling intensity increased for most materials with the availability of drop off depots and for all materials with the availability of a curbside recycling program. It also increased for newspaper when the number of materials included in a curbside scheme was increased. These increases were due to the fact that increased access to recycling translated into increased convenience. The longer a program was in place, the greater the efforts in newspaper and yard waste recycling, possibly due to the development of a recycling routine over time. Making a curbside recycling program mandatory (relative to being non-mandatory) had no effect on recycling intensity likely due to a lack of enforcement. The unit price of waste disposal was not a

significant determinant of increases in recycling effort, possibly due to the fact that it is an indirect influence to recycle. As household income increased recycling of newspaper increased and as education level rose a small effect was seen on the intensity of glass bottles, aluminum cans and newspapers being recycled. Increased population density and age had positive effects on recycling intensity. The authors do however point out two flaws in the study. First it may have been biased due to the exclusion of those who failed to respond to the survey and second, there was a lack of community level information on the promotion of the different curbside and drop off programs in each community.

Ferrara and Missios (2005) examined evidence from Canada on recycling and waste diversion effectiveness. They note that governments have been changing policies to increase recycling operations due to increased landfill costs and general public environmental concerns. Some areas even have multi-stream programs which collect yard waste, household organic wastes and dry recyclables. Also, user fees for waste disposal have been introduced into thousands of municipalities in North America in recent years. The authors believe that understanding the link between policies and actual recycling practices will allow municipalities to increase waste diversion. They focused specifically on the intensity of recycling, for different materials, with different features of recycling and garbage collection schemes. The data set was collected by a survey research center at the University of Toronto. A total of 1800 interviews of households from 12 municipalities throughout Ontario were analysed. The survey included questions on price, collection frequency, mandatory or voluntary, home ownership, education, income, household size and age. They found that user fees increased recycling intensity for all 6 recyclable materials they assessed.¹ Also frequency of collection and a mandatory versus voluntary scheme were found to increase the recycling intensity for some materials.²

Harder et. al. (2006) discuss two measured parameters, number of materials collected and number of households per street, not generally associated with participation rates in

¹Jenkins et. al. (2003) found that access to a curbside recycling program had a significant impact on recycling rates for 5 different materials, but that unit pricing had no impact on the recycling rates of the same 5 materials.

² Mandatory curbside schemes were found to increase levels of participation in recycling (Folz 1999), as were economic incentives, weekly collection schedules (Noehammer and Byer 1997) and programs which provide residents with containers (Everett and Peirce 1993).

curbside recycling schemes. They re-examined 3 major existing data sets each made up of approximately 1400 households, and found that the number of materials included in the recycling scheme and the number of households on the same streets within the scheme influenced the rate of participation in these schemes. As the number of materials collected by the scheme increased so did the rate of participation and as the number of households on the same street increased the participation rate dropped. It was felt that a reason behind increased participation with an increased number of materials may be due to the fact that with a wider range of materials collected there were many more possible products that could be included, and some households may not have purchased or used certain recyclable products. The explanation for the decrease in participation as the number of houses per street increased may be linked to dwelling size or attachment to neighbourhood.³

Shaw et. al. (2007) examined the relationship between set out rates and participation in curbside recycling. They proposed the use of participation ratios as a tool for enhancing curbside recycling. The set out rate was calculated as the number of households using the scheme or collection system (at least once in a four week period) over the total number of households served by the scheme. The participation ratio was then determined by dividing the number of households using the scheme at least once in the four week period by the total number of households served by the scheme. The participation and set out rate relationship was found to be sensitive to behaviours so this information was then used to help target educational campaigns at the correct audience. Shaw et. al. outline a set of factors important to improving policy related to engaging non participants which include having information on: awareness, storage space, time constraints, interest, education and convenience. They also suggest that other facilities, such as drop off depots and thrift shops, for materials not included in curbside collection programs should be promoted to avid recyclers or residents that are actively involved.

³ Folz (1999) found that people who live on shorter streets may experience a greater attachment to their neighbourhood which Harder et. al. (2006) speculated could be translated to a greater sense of ownership and motivation to participate in preservation of the area through recycling.

Woodard et. al. (2006) examined participation in curbside recycling schemes and its variation with material types.⁴ Overall participation was found to be higher in curbside recycling schemes that collected more types of recyclable materials. A future research question that the authors put forth is the determination of what drives households to recycle. They speculate on whether it may be due to the increased satisfaction of knowing the amount of wastes discarded is being decreased, or that they are increasing their contribution of recyclables. They also note that some residents that were recorded as non-participants may have been recycling in other ways.

Woollam et. al. (2006) investigated the curbside recycling behaviour of two different Welsh case study authorities. Their aim was to determine who took part in the recycling schemes, and how much material was recovered from those that did take part. Their methods were to count the number of households which put out recyclables for collection and map those participants using G.I.S. Participation was then mapped and assessed using the ACORN rating scale at street level, and the Townsend 'z' score at the electoral division level (CACI 2005). The higher the ACORN classification the more deprived the street, and the more positive the Townsend 'z' score the more deprived the electoral division is considered to be. A weak correlation was found between the Townsend index scores, which represent socioeconomic status, and set out rates. This shows that higher socioeconomic status may result in higher set out rates for recycling. Some differences in set out rates were also found between similarly rated socioeconomic areas showing that the data was variable. A very weak correlation was also found at the street level between the ACORN index scores, and set out rates. This shows that some streets were associated with higher set out rates. The authors point out that there are risks in inferring statistical characteristics on individuals' behaviour, called risk of ecological fallacy by Langbein and Lichtman (1978), but they feel that their data sets deal with this risk.⁵

⁴ They reviewed some general facts about recycling in North America, pointing out that mean recycling participation in 1996 in the United States was 73% (Folz 1999), that 50% of recycling schemes in the United States are mandatory (Everett and Peirce 1993), and participation has been found to be higher when items are comingled (Oskamp et. al. 1996).

⁵ Other studies have found that participation and materials collected rises when a program is mandatory as opposed to voluntary (Everett and Pierce 1993). Some well planned and designed voluntary schemes may however get comparable levels of participation to mandatory ones (Noehammer and Byer 1997).

Beatty et. al. (2007) examined curbside recycling in the presence of alternatives, such as drop off recycling depots. The study focused on recyclables that can be returned for refund such as beverage containers, and aimed at measuring the extent to which added curbside recycling access affects the quantity recycled. The authors point out that the number of curbside programs in the United States has grown from around 2000 in 1990 to more than 9,700 in 2000. They also stress that past studies have often failed to account for curbside recycling programs cannibalizing from drop off depots and other modes, and that this may have resulted in a substantial overestimate in past determinations of the benefits of curbside programs.⁶ Overall the increased availability of curbside recycling related to an increase in materials returned, but looking at beverage containers specifically only a small positive effect was seen. It was concluded that curbside recycling was cannibalizing a large portion of beverage container returns to drop off depots. Also, a trend was noted in the number of consumers choosing the convenience of recycling beverage containers using curbside rather than going to depots for redemption payments as employment and income increased.

Dahlen et. al. (2007) compared different collection systems for sorted household waste in Sweden. The authors asked three questions: one, what are the effects of weight based billing, two, what are the effects of a curbside recycling program versus a drop off program and three, how can the different systems be compared? Their methods were to sample, classify and weigh sorted household waste from 6 different municipalities in Sweden. Each municipality had different waste collection and recycling schemes and samples were taken from single family and multifamily dwellings. Two of the municipalities had extensive curbside collection, both wet and dry while one had curbside collection of just dry recyclables and the last three had drop off depots and one of the six had weight based billing. Samples were taken over a period of 8 years but sampling was not regular or at the same time for each site. They found that weight based billing for waste collection decreased household waste left out for collection by up to 50 percent but questioned whether improper disposal had increased. Where dry curbside recycling existed more metal, plastic and paper

⁶ Kaufman et. al. (2004) found that between 2000 and 2002 the number of curbside programs in operation dropped by nine percent and Hong and Adams (1999) found that although waste disposal fees and participation in curbside recycling increased, there were not significant reductions in waste. Storage space and distance to recycling facilities were two other factors found to be important in households recycling decisions by Ando and Gosselin (2005).

were separated from wastes and where wet and dry curbside recycling existed dry sorting was increased in comparison to areas with only drop off depots.

In summary, a fairly extensive number of factors, across a range of different studies, have been found to positively influence participation in curbside recycling. Some of these include: high income, high education, user fees, increased number of materials collected, and increased convenience, to name a few. Often these factors do not influence all of the recyclable materials included but they provide a wider insight. A review of some willingness to pay literature, the other focus of this study, follows.

WILLINGNESS TO PAY

Blaine et. al. (2005) compared two different valuation methods for determining household willingness to pay for curbside recycling. The study compared two different contingent valuation methods, payment card and referendum, to determine the amount that residents of Lake County Ohio would be willing to pay in order to have their curbside recycling program continue in the face of budget cuts. A total of 2000 surveys, which followed a modified Dillman (1978) approach, were mailed out, half of which used the payment card method, and the other half used a referendum style question.⁷ There were a total of three mailings, the initial and two reminders and the final response rate was a very high 73 percent. Blaine et. al. found that the payment card method resulted in a lower willingness to pay than the referendum method, but not to a significant extent. They note that attitudes seem to be very sensitive to prices, and that actual willingness to pay is likely somewhere between the two ranges given by the payment card and referendum methods. The payment card results showed that 57 percent of respondents were willing to pay at least \$1.00 per month and 34 percent were willing to pay at least \$2.00 per month to maintain curbside recycling. The referendum results showed that 52 percent of respondents were willing to pay \$2.00 per month and 79 percent were willing to pay \$1.00 per month. City council decided on a fee of \$1.50 per household per month or \$18 per household per year.

⁷ The payment card method gave respondents some background and a choice of several payment increments to choose from, while the referendum was just a yes or no answer to a particular price point.

Aadland and Caplan (2006) examined the question of whether curbside recycling is a waste resource or a waste of resources. They attempt to estimate the social net benefit of curbside recycling programs as opposed to the often considered cost effectiveness. They used what they called stated and revealed preference information to determine the net social benefit of curbside recycling. Stated preference was defined as what people report that they do or would do, and revealed preference was defined from answers to specific questions about value ranges. Overall they estimated that the net social benefit of curbside recycling was almost zero. Some cities were found to have positive net benefits, or were willing to pay for a curbside recycling program, whereas others were found to have negative net benefits, meaning they would have to be paid in order to make it worthwhile to them to have curbside recycling. Aadland and Caplan did conclude, however, that in order to determine if a curbside recycling program is a cost effective and efficient use of resources that it would need to be examined on a city by city basis. They point out that some differences between cities may be due to population demographics, varying degrees of resident education or perceptions of constraints on landfill space.

Motivations to recycle were mainly ethical and monetary. Willingness to pay was one measure used in the study and it was defined as the amount of income a household would forgo to participate (in curbside recycling) without a loss of utility or wellbeing. It was measured using a double bounded dichotomous choice model where people were asked a question and then given a range of values to choose an answer from. Across the 40 communities in the sample the average willingness to pay was \$2.97. The most common indicators of high willingness to pay were if the respondents were: young, female, highly educated, ethically motivated, members of an environmental organization and rated their community curbside recycling program as good or excellent.

In summary, the determination of accurate willingness to pay is challenging, and a number of different factors have a significant influence. The choice of a valuation method used to collect willingness to pay data is important as it may have an effect on the results obtained. Variables such as age, gender, education, income and ethics have been noted to

increase willingness to pay. A review of some policy literature, a less central but still important aspect of participation in, and willingness to pay for, recycling, follows.

POLICY

Calcott and Walls (2005) examined roles for markets and policy instruments in regard to waste, recycling and design for environment. They discuss the fact that policies should provide good incentives for up and downstream decisions. Good upstream policies are those that support product designs that reflect environmental concerns, and good downstream policies are those that encourage waste diversion or recycling. Incentives to encourage such behaviours may include waste disposal fees, deposit refund systems or a combination both. The authors define design for environment as shifting the focus from what consumers can do with a product, once used such as discard or recycle, to what producers are producing initially.

Recycling markets do not operate perfectly especially, for example, when people are away from home where recycling is often less convenient. Calcott and Walls use a model to identify policies which make recycling more efficient and answer three questions. First, do tax deposit-refund schemes need regulations such as take back mandates, second, are deposit-refund schemes necessary when curbside recycling is available and third, who should keep the unclaimed deposits from deposit-refund schemes? If recycling markets functioned perfectly consumers would pay more up front for products designed to be recyclable which would cover the total social costs. Markets do not function perfectly and this model explains two of the realistic imperfections in recycling markets; recycling is often collected without payment and the transmission of incentives does not occur. It was determined that regulation of deposit-refund schemes was not necessary. Also, deposit-refund schemes are useful even when curbside recycling exists because they continue to encourage increased production of design for environment products. Finally it was concluded that producers should not be permitted to keep unclaimed deposits as a penalty for producing products that end up in landfills. The authors also found that a modest disposal fee had a positive impact and that in combination with other factors it contributed to an optimal environmental design.

In summary, the various factors positively influencing participation and willingness to pay are going to be put to best practice if they can be incorporated into effective policies. Effective policies should result in a reduction in landfill wastes and a decrease in the extent of the cities negative environmental impacts. Once the initial, or baseline extent, of participation and willingness to pay are established changes can be made, if necessary, to improve policies and therefore effectiveness. The chapter to follow examines the methods used to carry out this research and the preliminary descriptive outcomes of those methods.

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Chapter 2: Determination of Preferences for Participation and Willingness to Pay for Recycling

INTRODUCTION

This chapter includes a full discussion of the research methodologies used in order to determine households' preferences to participate in and willingness to pay for recycling. In order to collect this information three hundred random addresses were selected from each of the three cities for a total of nine hundred surveys sent out altogether. This sample size was selected based on funding constraints, and a survey of the literature to determine the smallest acceptable number of responses, which is approximately 30 percent. Data were collected using a set of three similar surveys (see Appendices 2B, 2C & 2D) which were modelled after those of Ferrara & Missios (2005) and Blaine et. al. (2005). The surveys assessed single and multifamily dwellings in each city and were distributed by mail. They included cover letters and postage paid return envelopes and were followed up by a reminder card approximately three weeks later. Responses were entered into an Excel database where the basic descriptive analysis was also conducted. This chapter is broken into five sections; survey methodology and design, survey response, survey analysis, discussion and conclusion.

SURVEY METHODOLOGY AND DESIGN

Random address selection was conducted using an online random number generator (<http://www.randomizer.org/form.htm>), phone books for each city and an online postal code lookup website (<http://www.canadapost.ca/Personal/Tools/Pcl/Quick.aspx>). Using the online random number generator, 10 sets of 30 numbers were generated and saved to an Excel spreadsheet. The random number range was specified to between 1 and 400. This range was chosen because 400 was the largest number of entries estimated to be present on an average phone book page. Each number set remained unique, and the numbers were not sorted once generated. The Kamloops and Merritt addresses were selected from the White Pages of the Kamloops and Area 2008/09 phone book and Vernon addresses were selected from the White Pages of the Vernon and Area 2007/08 phone book. Address selection began on the first page containing entries for the particular city. Each address was selected by counting down to the corresponding random number from the spreadsheet, marking the address and

recording it in the spreadsheet. Once a selection was made the process was repeated starting at the top of the next page. Once the last page of entries for a particular city was reached the entire process continued starting again at the first page of entries for that city until all 300 addresses were selected. Selections were color coded for each time selection started back at the beginning again. In the event that the random number was reached and it was a business address or an address was not listed, the next available residential address was marked and recorded. If the random number was higher than the number of entries on the given page the last available residential entry was marked and recorded. When a random number corresponded with an entry that had been previously selected, the next available residential address was marked and recorded. All adjustments were noted in the Excel spreadsheet. The Canada Post online postal code website was used to find postal codes for all of the addresses that had been entered into the spreadsheet. Each address was copied from the spreadsheet into the search page, the postal code was found, and then it was copied from the search page into the address spreadsheet. If a postal code was not found for a particular address, that address was incomplete, and so was dropped from the spreadsheet and replaced by a new one. The new address was selected by looking up the next available residential address from the original phone book page the address was chosen from. The new address was then added to the spreadsheet and its corresponding postal code was looked up and also added.

Each survey included main section headings (where applicable) including: attitudes and concerns, recycling overview, depot participation, curbside participation, willingness to pay and socioeconomic determinants.

The first section on environmental attitudes and concerns posed questions such as the following:

Rate the following issues on a scale of low to high priority in your municipality. (by entering a check in the appropriate box). (*1 is lowest priority and 5 is highest priority*)

- | | 1 | 2 | 3 | 4 | 5 |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| A. Improving city streets (patching or snow removal) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| B. Improving the quality of drinking water | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- | | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| C. Reducing crime | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| D. Improving environmental quality | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| E. Improving the quality of health care | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| F. Investing in arts and culture | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| G. Improving the quality of education | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Are you or anyone in your household currently a participant in any community environmental organizations?

- Yes No

Do most of your neighbours recycle?

- Yes No

Who makes the recycling decisions in your household?

- Female head of household
 Male head of household
 Family decision

Vining & Ebreo (1992) found that general concern for the environment and specific attitudes about recycling become more favourable as opportunities to recycle increase. They also point out that recycling is a behaviour that is influenced, not only by personal motives, attitudes and beliefs, but also by social and societal factors. The aim of the initial two questions in this section was to assess the degree of general environmental concern of the household. First, by determining the priority of improving environmental quality among other municipal concerns, and second, by determining if behaviours indicative of environmental concern already exist. The third question was meant to determine whether social pressures to recycle were present, as they were an important variable in Vining & Ebreo's (1992) research. Lastly, question four was to examine who sets the waste disposal example for the household.

The second section of the survey discussed the general costs and benefits of recycling programs in order to give all of the respondents the same basic information.

The third section covered depot participation frequency and extent, while the fourth section covered curbside participation frequency and extent.

How often do you recycle using the depots (third section)/curbside collection program (fourth section)? (please check one)

- Occasionally Almost every week
 Once per month More than once per week
 Every other week

What percentage of your household wastes would you estimate that you separate out to recycle at the depot (third section)/using curbside recycling (fourth section)? (please check one)

- Less than 25% 50-75%
 25-49% Greater than 75%

Approximately what percentage of the following items do you recycle at the depots/through the curbside recycling program? (ie. 100% of newspapers, 50% of glass, etc.) (*On a percentage scale 0 – 100%*)

| | None | 25% | 50% | 75% | 100% |
|----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Newspaper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cardboard | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Mixed paper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plastic (#1-7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Glass | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Metal | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

The first question assesses how frequently respondents used the relevant recycling system. The second gave an estimation of how much people are recycling using the particular recycling system (depots or curbside). Some respondents used both systems and hence answered both the third and fourth sections of the survey. As can be seen in the third question above, participation will also be further broken down into different material types recycled including paper, cardboard, newsprint, glass, metal and plastics.

The fifth section dealt with willingness to pay for recycling in two different contexts, either willingness to pay to maintain a curbside program that is already in place, or willingness to pay to implement a curbside program where none exists. Willingness to pay was evaluated using a contingency valuation method referred to as the payment card method. This approach offers a range of bids for respondents to choose from with set top and bottom limits. Results from the payment card method may, however, be biased by the distribution of bids offered and set end points (Boyle 2003). Two other commonly used contingent valuation methods are open ended and referendum style approaches. The open ended approach allows the respondent to 'fill in the blank' as to how much they would be willing to pay for a particular item or service. Response rates to such questions have been reported to be quite low as they are difficult to respond to (Carson et. al. 2000). The referendum approach, on the other hand, gives the respondent a set amount and they are asked to answer yes or no to whether they would be willing to pay that amount. This valuation format has been reported to return higher mean estimates of willingness to pay than the other two formats (Ryan et. al. 2004). Although there are difficulties associated with the payment card method it was chosen as the best method for use in this study. Since the prices for curbside recycling were known it was felt that the distribution of the bids could be chosen with minimal concern over biasing responses. The bids were set in increments of \$5, ranging from \$0 more per year to \$25 more per year, for willingness to pay to maintain. Then for willingness to pay to implement they were set in increments of \$10, ranging from \$10 per year to \$50 per year, around the actual prices in the other small cities. Also, in this study, the endpoints were left open for comment so that those respondents who felt that they were restrictive could note what they felt was reasonable.

Respondents were first broken into two groups, those with access to curbside recycling and those without access to curbside recycling. Respondents were then asked if they would be willing to pay and if so how much, using a list of payment options to choose from. The following questions are asked of those who currently have access to curbside recycling:

Would you be willing to accept an increase in your households city utility fees, beyond the current fee charged per year, in order to maintain the current curbside recycling program?

- Yes No

Followed by,

What is the maximum increase, over and above the current fee, that would be acceptable for your household to pay each year to maintain the current curbside recycling program?

- Less than \$5 more per year (please specify)_____
- \$5 - \$9 more per year
- \$10 - \$14 more per year
- \$15 - \$19 more per year
- \$20 - \$24 more per year
- Greater than \$24 more per year (please specify)_____

The next two questions are asked of those who do not currently have access to curbside recycling.

Would you be willing to accept an increase in your households' city utility fees in order to implement a curbside recycling program?

- Yes No

Followed by,

What is the maximum amount that your household would be willing to pay each year to implement a curbside recycling program?

- Less than \$10 per year (please specify)_____
- \$10 - \$19 per year
- \$20 - \$29 per year

- \$30 - \$39 per year
- \$40 - \$49 per year
- Greater than \$50 per year (please specify) _____

If a respondent indicated that he or she was not willing to pay to maintain or implement, they were then directed to another question which collected information on why they were not willing to pay.

For what reason are you not willing to pay more for curbside recycling?

- Income/financial situation of my household
- City utilities are already too high
- The depots are sufficient
- Would rather see money spent on other services
- The current fee of \$33 per year is sufficient
- Other _____

The second choice (city utilities are already too high) was considered a protest response, and all of these responses were dropped from the data set. Protest responses made up 18 percent of the not willing to pay responses from Kamloops, 26 percent from Vernon and 23 percent from Merritt.

The sixth section collected information on socioeconomic determinants and included questions regarding gender, age, type of dwelling, home ownership, household size, household income and level of education. For example:

What type of dwelling do you reside in?

- Detached (single family) home
- Apartment building
- Condominium
- Townhouse
- Duplex

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

- Some high school or less
- High school graduate

- Some College or Trade school
- College or Trade school graduate
- University graduate (Bachelor's Degree)
- Post Graduate Studies

Once the final drafts of the three surveys were prepared they were forwarded to David DiFrancesco, a Digital Art and Design professor at TRU. He formatted the survey and made it look polished and professional. Once completed all of the surveys were sent to the TRU print shop where they were printed and bound.

A hand signed general cover letter (see Appendix 2A) was included with every survey explaining that it was a part of a Master's student research project at Thompson Rivers University and that it was pertaining to participation in, and willingness to pay for, curbside recycling in three small cities. The letter also outlined the survey length, return procedure, anonymity of responses and goals. Finally, it provided Human Ethics Committee and researcher contact information for anyone with questions or concerns about the project.

All of the addresses for each city were transferred to label format in Publisher, printed in duplicate on self adhesive backed paper, cut and stuck onto the mail out and return envelopes. Each envelope was stuffed with a cover letter, the appropriate survey and a return envelope.

A general reminder card (see Appendix 2E) was sent out to all addresses after one month, with the exception of those which had been returned marked as an incorrect address or resident moved. The card noted that the addressee had received a survey a few weeks ago, and that it would be greatly appreciated if they would fill it out and return it if they had not yet done so.

Finally, following the return of the surveys, data entry and analysis, three interviews were conducted, one with a representative from each of the city's Environmental Services branches. First, they were provided with an explanation of the project and a summary of the research results. Next they were asked to answer two main questions: "What are your perceptions of the factors that influence recycling activity in your city?" and "Do you feel that there is a further demand for recycling services in your city or for the materials collected

on the market?” Last I offered to forward copies of my final defence presentation and the final draft of my thesis if they were interested and felt that it may be of some use to them.

SURVEY RESPONSE

The average survey response rate within the literature surveyed was 51.5 percent (Blaine et. al. 2005, Jenkins et. al. 2003, Aadland & Caplan 2006, Folz 1999, Everett & Peirce 1993, Kurz et. al. 2007, Vining & Ebreo 1992, Barr 2007 and Ando & Gosselin 2005). Others suggested that the response rate is more likely to fall around 30 percent (R. Androkovich, pers. comm., 2008), which it in fact did. This is likely due to the fact that many of the studies noted above had access to larger sample sizes than did this study, and not all of them used mail out survey methodology, as was used here, some were done via telephone.

A total of 256 completed surveys were returned and recorded: 97 from Kamloops, 89 from Vernon and 70 from Merritt. Of the 900 surveys that were mailed out 806 are assumed to have made it to their intended destinations, as 94 were returned and noted to have incorrect addresses, resident who moved, etc. Of those 94, 19 were from Kamloops, 32 from Vernon and 43 from Merritt. Percent return rates were better than expected for all three cities with a response rate of 34.5% for Kamloops, 33.2% for Vernon and 27.2% for Merritt. The overall response rate works out to 31.8% over all three cities. Table 2.1 provides a summary.

Table 2.1. Summary of surveys returned and response rates

| City | Number of surveys returned completed | Number of surveys returned not completed | Response Rate |
|-----------------|---|---|----------------------|
| Kamloops | 97 | 19 | 34.5% |
| Vernon | 89 | 32 | 33.2% |
| Merritt | 70 | 43 | 27.2% |
| Overall | 256 | 94 | 31.8% |

Respondent postal codes were collected as a part of the survey process and were used to track the randomness of the distribution of surveys and of the responses received. Tracking was conducted using GIS mapping and Figures 2.1, 2.2 and 2.3 below represent the cities of Kamloops, Vernon and Merritt respectively. If numerous surveys were sent to or received from the same postal code only one point will appear on the map for that particular code. This is why the maps do not have numbers of points equal to Table 2.1 marking distributed and returned surveys.

Figure 2.1 shows a generally random distribution of surveys in Kamloops with higher concentrations in the more central area and lower concentrations in the outskirts.

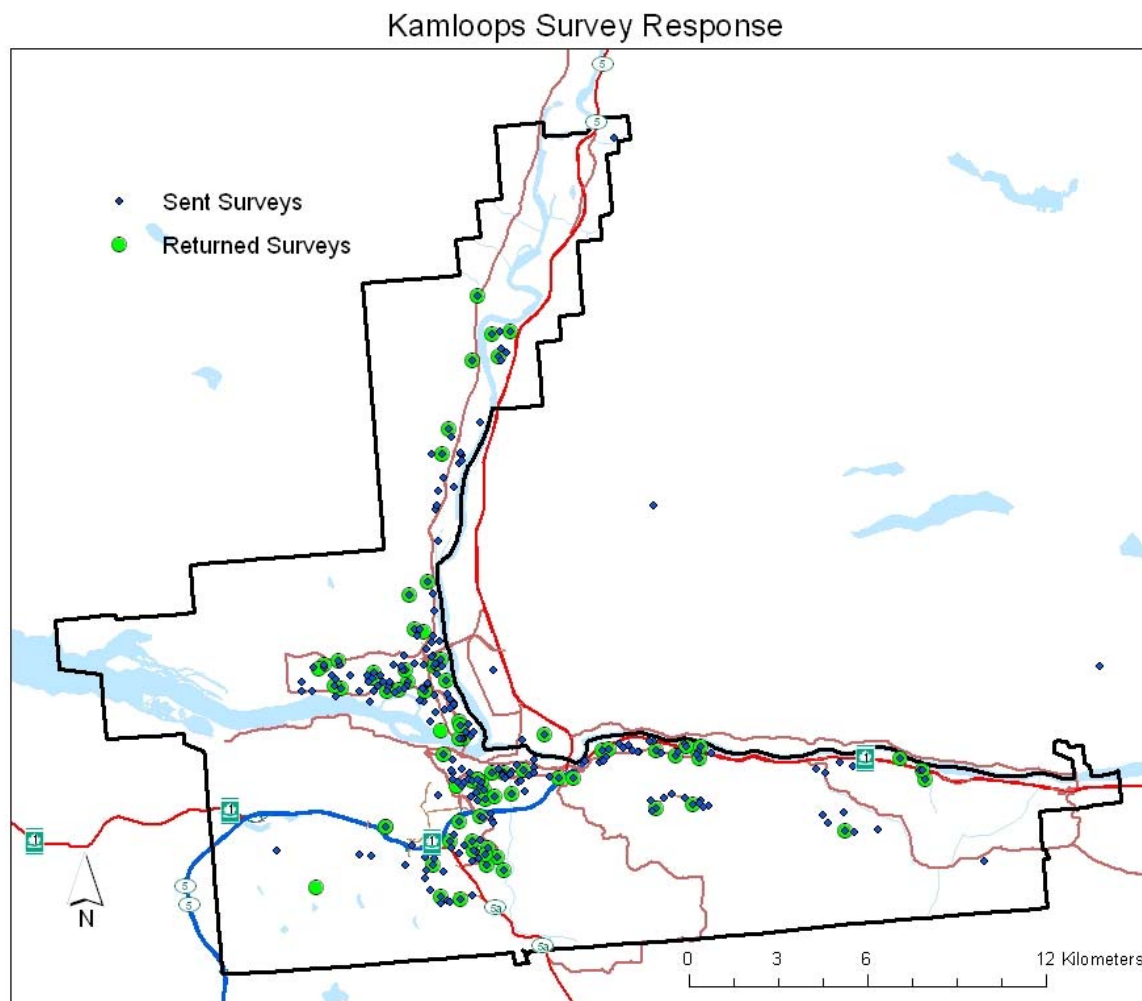


Figure 2.1. Kamloops survey distribution and response (Map by Dave Whiting)

Table 2.2. Surveys sent and returned in Kamloops

| City | Surveys sent* | Surveys Returned |
|----------|---------------|------------------|
| Kamloops | 281 | 97 |

*the number of surveys to have actually been received by households

Figure 2.2 shows a generally random distribution of surveys again with higher concentrations in the more central area and lower concentrations in the outskirts.

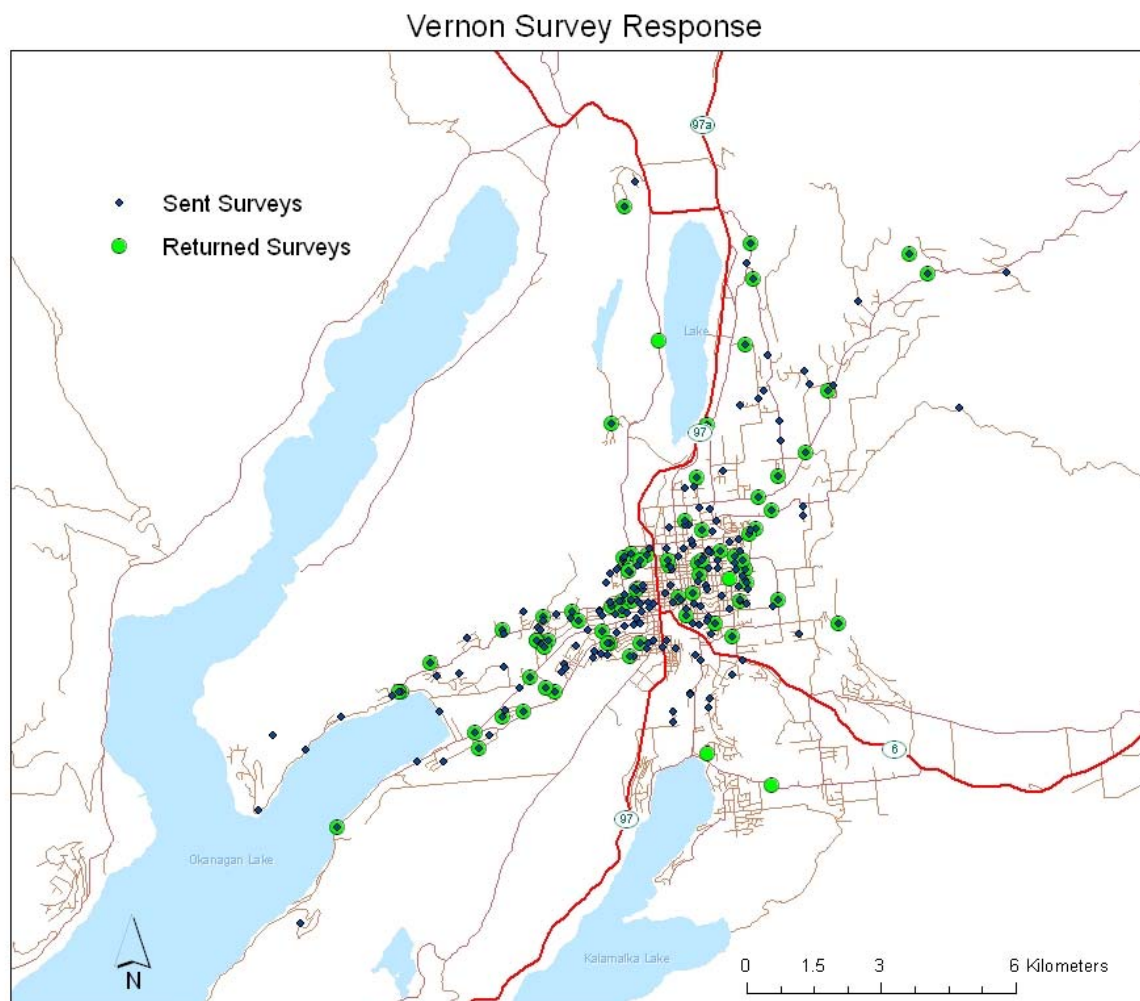


Figure 2.2. Vernon survey distribution and response. (Map by Dave Whiting)

Table 2.3. Surveys sent and returned in Vernon

| City | Surveys sent* | Surveys Returned |
|--------|---------------|------------------|
| Vernon | 268 | 89 |

*the number of surveys to have actually been received by households

Figure 2.3 shows a fairly random distribution of surveys with higher concentrations around the outskirts and lower concentrations in the central business area.

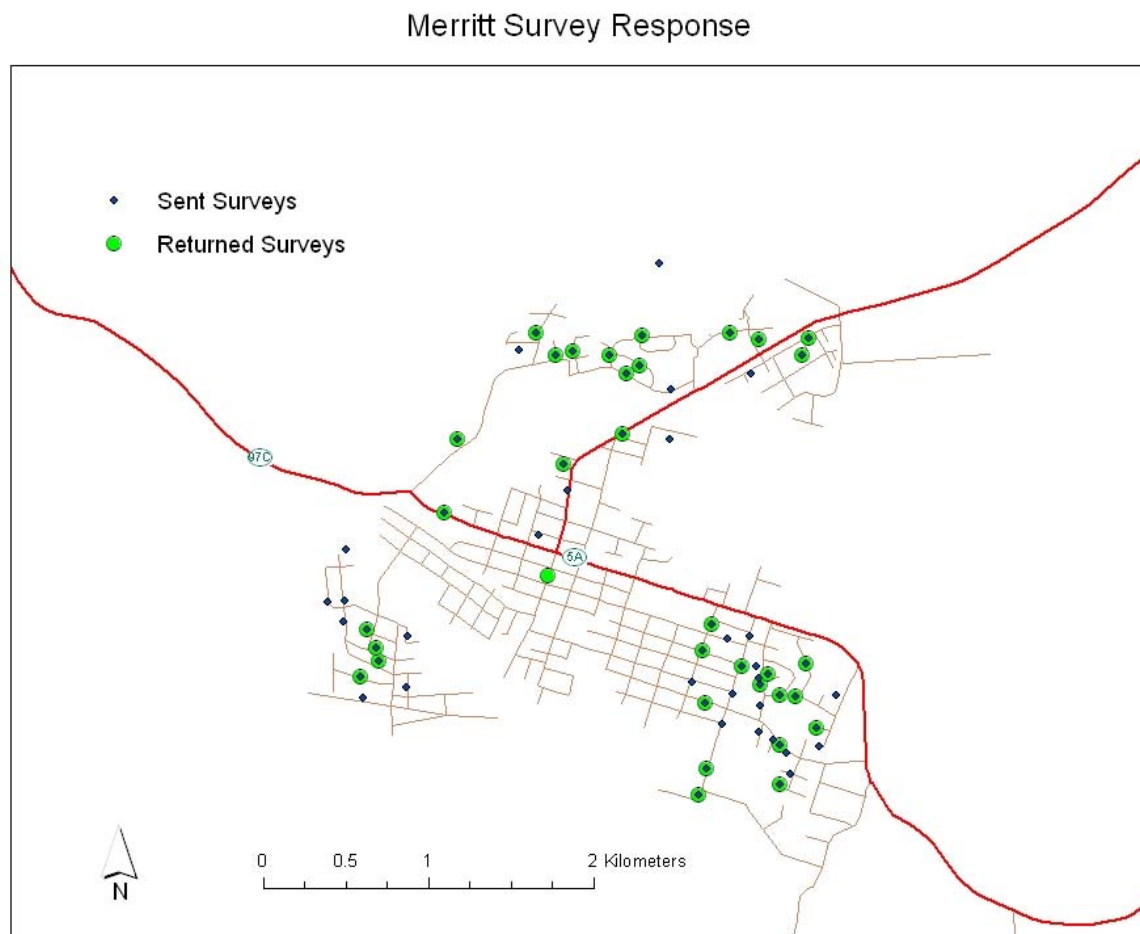


Figure 2.3. Merritt survey distribution and response. (Map by Dave Whiting)

Table 2.4. Surveys sent and returned in Merritt

| City | Surveys sent* | Surveys Returned |
|---------|---------------|------------------|
| Merritt | 257 | 70 |

*the number of surveys to have actually been received by households

SURVEY ANALYSIS

Survey data was compiled in Excel spreadsheets and analysed using ‘R’ and ‘SHAZAM’ (2001). For hypothesis one the dependent variable analyzed was overall participation, in relation to rates of recycling among different program types. For the second hypothesis the dependent variable analyzed was participation by material (paper, cardboard, newsprint, glass, metal and plastics) in relation to rates of recycling among different program types. In hypothesis three the dependent variable analyzed was willingness to pay to maintain a curbside program, and for the fourth hypothesis it was willingness to pay to implement a curbside program. Both of these were run to determine the value of recycling to residents in each city. The independent variables tested were attitudes towards the environment, city, recycling system, gender, age, dwelling type, home ownership, family size, household income, and education.

Analysis of participation and willingness to pay was carried out using multiple linear regression models, both with dummy variables incorporated. Probit models, as in Ferrara & Missios (2005), were considered as they are well suited to binary data and have limits between zero and one but multiple linear regression models were ultimately chosen due to the fact that probit models would not converge with the few low end responses that were found in this data set.

With three cities and two recycling systems in place there are multiple combinations which can be examined. The following figure shows the possibilities for comparison of the three cities:

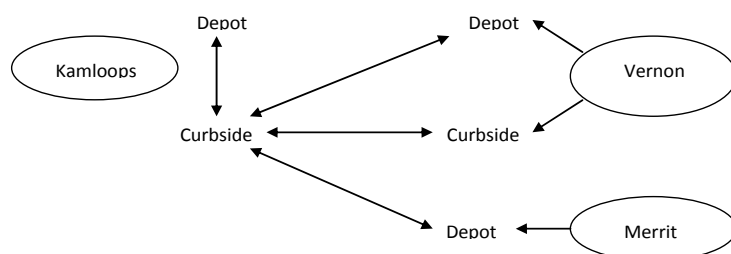


Figure 2.4. Three cities curbside comparison.

DESCRIPTIVE RESULTS

Section one of the survey assessed attitudes and concerns. Respondents from the City of Kamloops ranked improving environmental quality second highest on the list of priorities in their municipality, with improving health care coming first. City of Vernon respondents ranked improving environmental quality third with improving health care ranking first and reducing crime and improving drinking water tying for second. Respondents from the City of Merritt ranked improving environmental quality third highest on the list of priorities in their municipality, with reducing crime and improving health care coming first and second respectively. Over 90% of respondents from all three cities reported that their household recycles. Participation in community environmental organizations however, was very low (<10% of respondents) in all three cities. A total of 81% of Kamloops respondents reported that their neighbours also recycle. This percentage was somewhat higher in Vernon (94%) and drastically lower in Merritt (38%). Respondents from all three cities estimated that of all of the materials in their households that could be recycled, they were recycling between 70 and 80%. In the majority of households in both Kamloops and Merritt the female head of household made most of the recycling decisions, while in Vernon the majority of recycling decisions were reported to be made by the family. Of the small percentage of respondents who reported that they do not recycle, the highest ranked reason for not doing so fell into the ‘other’ category in both Kamloops and Vernon, while the highest ranked reason from Merritt respondents was that they had no storage space to keep recyclables.

Section three of the survey assessed participation in depot recycling (see Table 2.5). A total of 62% of respondents from Kamloops, 81% of Vernon respondents and 93% of Merritt respondents reported using recycling depots. The most common frequency of use in both Kamloops and Vernon was once per month, while in Merritt it was almost every week. The average total estimated percentage of wastes separated out and recycled at the depots was less than 25% in Kamloops and Vernon, and between 50 and 75% in Merritt. The most common material reported to be recycled at the depots in Kamloops and Merritt was cardboard, and in Vernon it was glass.

Section four of the survey assessed participation in curbside recycling (see Table 2.5), and was therefore not included in the Merritt survey as it did not apply. A total of 81% of

Kamloops respondents, and 92% of Vernon respondents, reported using curbside recycling. Both cities reported the most common frequency of recycling to be every other week. The majority of Vernon respondents reported their recycling bags to be over 75% full when they put them out, while the majority in Kamloops was a tie between 50 to 75% full and over 75% full. Respondents from both cities estimated that they were separating out and recycling 50 to 75% of the total wastes produced by their households. Newspaper was the material reported to have the highest average amount recycled in both cities, but was followed fairly closely by most other materials. A total of 71% of Kamloops respondents and 61% of Vernon respondents reported having recycled prior to the implementation of the curbside programs in their communities. In both cities curbside recycling was the preferred system and was also considered the most convenient.

Table 2.5. Reported participation in depot and curbside recycling by city

| City | Reported participation in depot recycling | Reported participation in curbside recycling |
|-----------------|--|---|
| Kamloops | 62% | 81% |
| Vernon | 81% | 92% |
| Merritt | 93% | NA |

A few questions in section four were included in only the Kamloops survey, and pertained to the implementation of curbside and other possible curbside services. A total of 69% of respondents reported that they were provided with sufficient information about the curbside recycling program, and 75% said that they found the recycling container easy to store and move. The average reported percentage of green wastes composted was 49%, and 60% of Kamloops respondents reported that they would participate in a green waste collection program.

Section five (four for Merritt) of the survey assessed willingness to pay for the maintenance or implementation of curbside recycling programs (see Figures 2.5 & 2.6).

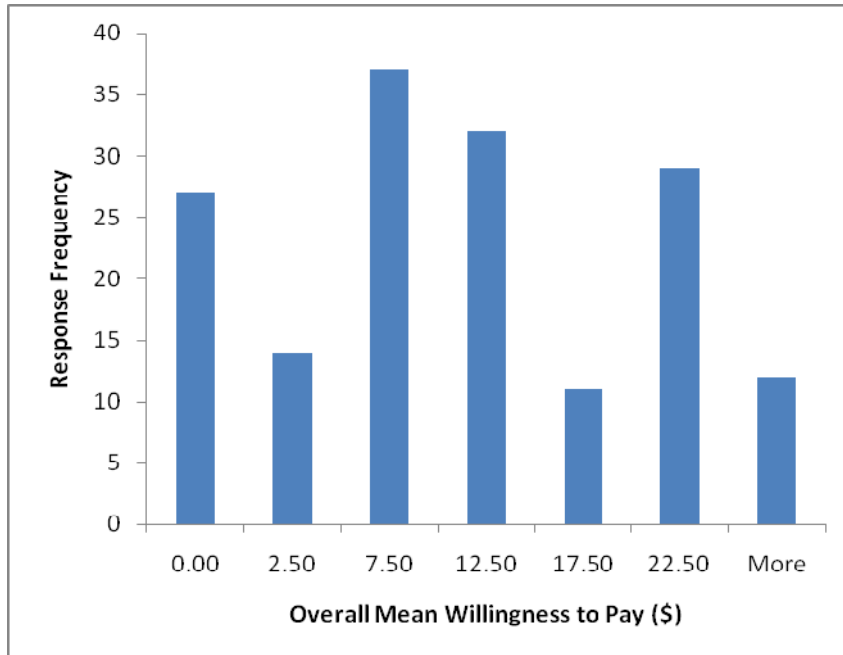


Figure 2.5. Response frequency versus overall midpoint willingness to pay to maintain curbside recycling in Kamloops and Vernon.

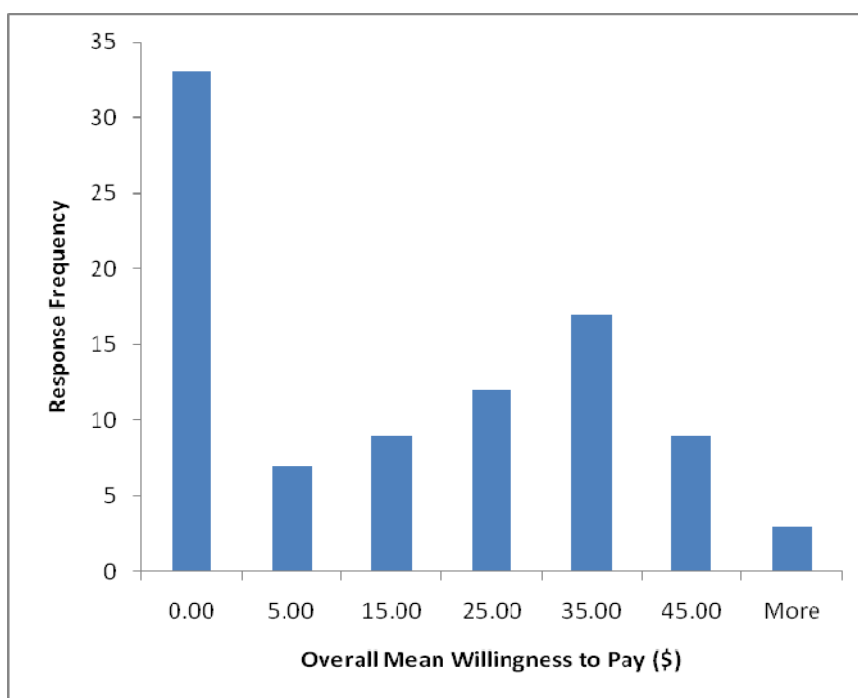


Figure 2.6. Response frequency versus overall midpoint willingness to pay to implement curbside recycling in Kamloops and Merritt

The Kamloops and Vernon surveys had questions regarding willingness to pay to maintain a curbside recycling program, and the Kamloops and Merritt surveys had questions regarding willingness to pay to implement a curbside recycling program. A total of 79% of Kamloops respondents and 99% of Vernon respondents reported having access to curbside recycling. Of those that had access 64% of Kamloops respondents and 74% of Vernon respondents would be willing to accept a fee increase to maintain their curbside service (see Table 2.6). In Kamloops the most acceptable fee increase range was \$5 to \$9 more per year, while in Vernon the most acceptable amount was a tie between \$10 to \$14 more per year and \$20 to \$24 more per year. A total of 15% of Kamloops respondents and 51% of Merritt respondents reported that they would be willing to accept a fee increase to implement a curbside recycling program (see Table 2.6). In Kamloops the most acceptable fee increase range was a tie between less than \$10 per year and \$30 to \$39 per year, while in Merritt the most acceptable amount was \$30 to \$39 per year (see Table 2.7). The most common reason given by those who were not willing to pay in Kamloops and Vernon was that the current

fees are sufficient and in Merritt it was that the depots are sufficient, hence there were not too many protest responses.

Table 2.6. Reported percentages of respondents willing to pay to maintain or implement curbside recycling

| City | Respondents willing to pay more to maintain curbside recycling | Respondents willing to pay more to implement curbside recycling |
|-----------------|---|--|
| Kamloops | 64% | 15% |
| Vernon | 74% | NA |
| Merritt | NA | 51% |

Table 2.7. Comparison of current & midpoint average reported amounts respondents were willing to pay to maintain or implement curbside recycling

| City | Currently Paying (\$/year) | Willing to pay to maintain (\$ more) | Willing to pay to implement (\$/year) |
|-----------------|-----------------------------------|---|--|
| Kamloops | \$33.00 | \$11.90 | \$31.10 |
| Vernon | \$22.00 | \$21.16 | N/A |
| Merritt | \$0.00 | N/A | \$28.51 |

Section six (five for Merritt) of the survey assessed socioeconomic variables. In Kamloops 62% of the respondents were female, in Vernon 52% and in Merritt 55%. The most common age of Kamloops respondents was 45 to 54 years, and in Vernon and Merritt it

was 65 and over. In all three cities the most common dwelling type was a single family (detached) home and 84% of respondents from Kamloops, 94% from Vernon and 86% from Merritt reported that they owned rather than rented their home. The average number of members per household was 2 in Vernon, and 3 in Kamloops and Merritt. The largest percentage of respondents from Kamloops and Merritt reported being college or trade school graduates, while in Vernon the largest percentage reported having completed some college or trade school. The largest percentage of Kamloops respondents reported a yearly income of over \$100,000, while in Vernon there was a tie between the ranges \$20,000 to \$39,000 and \$40,000 to \$59,000 per year, and in Merritt there was a tie between the ranges \$60,000 to \$79,000 and \$80,000 to \$99,000 per year.

DISCUSSION

In section one of the survey, respondents from the city of Kamloops ranked improving environmental quality second highest on the list of priorities in their municipality, while respondents from the Cities of Vernon and Merritt ranked it third. The higher Kamloops rating may be due to the fact that residents had, at the time, only had curbside recycling in place for approximately eight months, so it had often been in the local news and was relatively new and therefore on people's minds. The very low reported percentage of neighbours who recycle in Merritt is due to the fact that they do not have curbside and have to take their recyclables to depots. Respondents could not see if their neighbours were recycling because they could not observe a bin at the curbside they would have to see them at the depot. The very high percentage of respondents from all three cities that reported that their households recycle and the high estimates of total material recycled may be due to skewed response data. Often with voluntarily returned surveys respondents tend to have an interest in, or be concerned about the subject, and therefore the participatory survey responses tend to be over represented. Merritt respondents who reported that they do not recycle cited no storage space to keep recyclables as the most common reason for not doing so. This is likely due to the fact that Merritt residents have to recycle at depots, so materials have to be stored in the home until they can be taken back.

In section three of the survey 62% of respondents from Kamloops, 81% of Vernon respondents and 93% of Merritt respondents reported using recycling depots. These figures make logical sense as many city of Kamloops residents now have curbside, and there are no materials that are recyclable at depots only as in Vernon where glass is not accepted in their curbside collection program. Merritt is highest because depot recycling is the only option. The most common frequency of use in both Kamloops and Vernon was once per month, likely once recycling bins/bags are full. In Merritt recycling was most often reported to be done almost every week, likely due to the fact that residents must take it to depots and it requires storage space in the home. Wastes separated out and recycled at the depots were reported to be less than 25% in Kamloops and Vernon, and between 50 and 75% in Merritt, again due to the recycling systems each city has in place. Cardboard was most commonly reported to be recycled at the depots in Kamloops and Merritt likely due to size, and in Vernon glass is most common at the depots because it is banned from curbside collection.

In section four of the survey 81% of Kamloops and 92% of Vernon respondents reported using curbside recycling. Both cities reported the most common frequency of recycling to be every other week which again corresponds with bins/bags being full, and is supported by the following findings also. The majority of Vernon respondents reported their recycling bags to be over 75% full when they put them out, while the majority in Kamloops was a tie between 50 to 75% full and over 75% full. The estimate that both cities were separating out and recycling 50 to 75% of the total wastes produced by their households seems reasonable as there are recyclable materials that are not accepted in either collection program, and there are also other types of recyclables (ie. green waste) that not all households may participate in recycling. A total of 71% of Kamloops respondents and 61% of Vernon respondents reported having recycled prior to the implementation of the curbside programs in their communities, showing that curbside programs do appear to increase participation in recycling. In both cities curbside recycling was the preferred system and was also considered the most convenient, likely due to ease of use compared to depots.

In section five (four for Merritt) of the survey 79% of Kamloops respondents and 99% of Vernon respondents reported having access to curbside recycling, which seems reasonable as multifamily dwellings in Kamloops do not have curbside service. The lower

percentages of respondents who would be willing to accept a fee increase to maintain their curbside service is likely due to the fact that some participants would rather spend their time than their money on recycling and is linked to socioeconomic variables. The lower acceptable fee increase range in Kamloops compared to Vernon is probably a reflection of the fact that Kamloops residents currently pay more per year for curbside service than do Vernon residents. The lower numbers of Kamloops and Merritt respondents interested in implementing a curbside recycling program are likely due to the fact that Merritt residents have just had an expanded recycling program and a “pay as you throw” system implemented. Respondents from both cities who were agreeable to the implementation of a curbside program were most often willing to pay the same amount as what is currently charged in Kamloops. This is the result of feeling that they should not have to pay any more or less than others who have the service already.

In section six (five for Merritt) of the survey 62% of Kamloops respondents were female, in Vernon 52% and in Merritt 55% showing a fairly even distribution. The most common age of Kamloops respondents was 45 to 54 years, and in Vernon and Merritt it was 65 and over. This may have skewed the results somewhat, as it is not completely representative of the demographics.

This chapter outlined the research methodology used in this study, discussing it in order of the steps which it was completed in. It gave an overview of the survey design, reported survey response rates, summarized how survey analysis would be carried out, provided preliminary descriptive statistics and discussed what they tell us. The following chapters will examine, in further depth, participation in and willingness to pay for recycling in the three small cities surveyed.

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APPENDIX 2A: Cover Letter

(Distributed printed on TRU letterhead and personally signed)

Dear Sir or Madam,

I am currently a graduate student enrolled in the Master of Science in Environmental Science program at Thompson Rivers University working on my thesis. I am inviting you to participate in a research project studying participation in, and willingness to pay for, recycling in small cities. Through your participation I hope to gain an understanding of the main factors that motivate residents of small cities to recycle and how much they are willing to pay to introduce or maintain such programs.

Along with this letter is a short survey that asks a variety of questions about your recycling habits. I am asking you to look over the survey and, if you choose to do so, complete it and send it back to me in the enclosed, postage paid, return envelope. It should take you less than 15 minutes of your time to complete.

Your responses will be completely anonymous. You should NOT put your name on the questionnaire. Regardless of whether you choose to participate, please let me know, by phone or mail, if you would like a summary of my findings.

The results of this project will be used to help inform city policy makers about what changes may be helpful to improving their recycling programs. I hope that the results of the survey will be useful for other small cities in Canada.

If you have any questions or concerns about completing the questionnaire or about being a part of this study, you may contact me or my supervisor at one of the addresses or phone numbers listed below. The Human Ethics Committee at Thompson Rivers University has approved this study. If you have any concerns about your rights as a participant in this study you may contact the Human Ethics Committee via email (rtapley@tru.ca) or by telephone (250-828-5495).

Sincerely,

Dana Taylor, M.Sc. Candidate

Research Centre
Thompson Rivers University
Box 3010 McGill Rd.
Kamloops, B.C.
V2C 5N3
Phone: 250-371-5945

Dr. Peter Tsigaris, Thesis Supervisor

International Building
Thompson Rivers University
Box 3010 McGill Rd.
Kamloops, B.C.
V2C 5N3
Phone: 250-371-5732

APPENDIX 2B: Kamloops Survey

(Distributed in booklet format)

Recycling

in Three Small Cities in B.C.'S Interior.

Kamloops**Research Centre**

Thompson Rivers University
Box 3010 McGill Rd.
Kamloops, B.C.
V2C 5N3

To the respondent:

Thank you for participating in this survey about recycling being conducted in three small cities in the interior of B.C.. Completing the survey should take less than 15 minutes of your time.

The primary purpose of this survey is to determine: (1) which recycling system, depots or curbside, has the most significant impact on participation rates (2) if the frequency and extent of participation in recycling activity changes following the implementation of a curbside recycling program and (3) the willingness to pay for a curbside recycling program relative to a depot recycling program at the household level. When the study is completed the results will be made available to the public.

All personal information will remain completely anonymous.

D. Taylor, B.Sc.,

M.Sc. Candidate
Research Center
250 371-5945

P. Tsigaris, Ph. D.,

Thesis Supervisor
Department of Economics
250 371-5732

This project is supported by:

The City of Kamloops

The Community University
Research Alliance

Thompson Rivers University

**1 Section One:
Attitudes and Concerns**

1) Rate the following issues on the scale of low to high priority in your municipality by entering a check in the appropriate box.

(1 is lowest priority and 5 is highest priority)

| | 1 | 2 | 3 | 4 | 5 |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| A. Improving city streets (patching or snow removal) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| B. Improving the quality of drinking water | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C. Reducing crime | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| D. Improving environmental quality | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| E. Improving the quality of health care | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| F. Investing in arts and culture | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| G. Improving the quality of education | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

2) Are you or is anyone in your household currently a participant in any community environmental organizations?

Yes No

3) Do most of your neighbours recycle?

Yes No

4) Does your household recycle?

Yes No

5) Of all the materials in your household that could be recycled i.e. batteries, paint, paper, green waste, etc., what percentage do you recycle?

25% 50% 75% 100%

6) Who makes the recycling decisions in your household?

- Female head of household
 Male head of household
 Family decision

Answer Question 7 ONLY IF you answered 'No' to Question 4

7) For what reason(s) do you choose not to recycle?

- I do not have the time to recycle
- I do not have the space to store recyclables
- It will make no difference if I recycle
- I have no way to transport recyclables to the depot
- Other (please specify)_____

**2 Section Two:
Recycling Overview**

The disposal of wastes results in damage to our environment. Waste reduction can be accomplished in a wide variety of ways including recycling. The aim of recycling is to significantly reduce the volume of wastes going to our landfills and in turn reduce our impacts on the environment. Since it began in March of this year the curbside recycling program has diverted an average of 100 metric tonnes of recyclables per week from the Kamloops landfill. That's over 5,000 metric tonnes per year.

**3 Section Three:
Participation Frequency and Extent at Depots**

8) Does your household use recycling depots?

- Yes No

9) How often do you recycle using the depots? (please check one)

- Occasionally Almost every week
- Once per month More than once per week
- Every other week

10) What percentage of your household wastes would you estimate that you separate out to recycle at the depot?

- Less than 25% 50-75%
- 25-49% Greater than 75%

11) Approximately what percentage of each of the following items do you recycle at the depots? (i.e. 100% of newspapers, 50% of glass, etc.)

| | None | 25% | 50% | 75% | 100% |
|-------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Newspaper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cardboard | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Mixed paper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | | | | | |
|-----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Plastics (#1-7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Glass | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Metal | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**4 Section Four:
Participation Frequency and Extent
with Curbside**

12) Does your household use curbside recycling?

Yes No

**13) How often do you recycle using the curbside collection program?
(please check one)**

Occasionally Every other week
 Once per month Almost every week

**14) On average how full is your recycling container each time you put it out for
curbside collection? (please check one)**

Less than 25% full 50 - 75% full
 25 - 49% full Greater than 75% full

**15) What percentage of your total household wastes would you estimate that
you separate out to recycle using curbside recycling? (please check one)**

Less than 25% 50 - 75%
 25 - 49% Greater than 75%

**16) Approximately what percentage of each of the following items do you
recycle through the curbside recycling program? (i.e. 100% of newspapers,
50% of glass, etc.)**

| | None | 25% | 50% | 75% | 100% |
|----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Newspaper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cardboard | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Mixed paper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plastic (#1-7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Glass | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Metal | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

17) Were you provided with sufficient information as to what materials are acceptable in your curbside recycling program?

Yes No

18) Do you find the recycling container provided to you easy to store and move to the curb?

Yes No

19) Approximately what percentage of your households green wastes do you recycle i.e. compost?

None 25% 50% 75% 100%

20) Would you participate in a curbside collection program for green waste, i.e. compost?

Yes No

21) Did you recycle at the city depots prior to the implementation of the curbside program?

Yes No

22) What recycling system do you prefer?

Depots Indifferent Curbside

23) Have you found the curbside recycling collection program more convenient than trips to the recycle depot?

Yes No Not applicable

5 Section Five:

Willingness to pay

Curbside recycling collection was implemented for Kamloops residents, at homes where curbside garbage collection services were already in place, on March 17 of this year. The 23,000 households that receive curbside recycling service pay a collection fee of \$33 per year via their city utility bill. Residents now have the convenience of recycling glass, newspapers, metal, plastics (numbered 1-7), cardboard and mixed waste paper through the curbside collection program. Those residents who do not yet have recycling collection

can still take their recyclables to one of the 4 drop-off depots. The following hypothetical scenarios are not meant to justify a tax increase but are meant to assess the value of the curbside recycling program to area residents.

24) Does your household have curbside recycling service?

Yes No

Recycling fees are completely revenue neutral, they cover operational costs only.

25) Assume that after the first year of service the city was to encounter difficulties in keeping the curbside recycling program running due to increasing costs. Would you be willing to accept an increase in your households city utility fees, beyond the current fee of \$33 per year, in order to maintain the current curbside recycling program?

Yes No

26) What is the maximum increase, over and above the current fee of \$33 per year, that would be acceptable for your household to pay each year to maintain the current curbside recycling program?

- Less than \$5 more per year (please specify)_____
- \$5 - \$9 more per year
- \$10 - \$14 more per year
- \$15 - \$19 more per year
- \$20 - \$24 more per year
- Greater than \$24 more per year (please specify)_____

Answer Questions 27 and 28 ONLY IF you answered 'No' to Question 24.

27) Would you be willing to accept the increase in your households city utility fees in order to implement a curbside recycling program?

Yes No

28) What is the maximum amount that your household would be willing to pay each year to implement a curbside recycling program?

- Less than \$10 per year (please specify)_____
- \$10 - \$19 per year
- \$20 - \$29 per year
- \$30 - \$39 per year

- \$40 - \$49 per year
- Greater than \$50 per year (please specify) _____

Recycling fees are completely revenue neutral, they cover operational costs only.

Answer Question 29 ONLY IF you answered 'No' to Questions 25 or 27.

29) For what reason are you not willing to pay more for curbside recycling?

- Income/financial situation of my household
- City utilities are already too high
- The depots are sufficient
- Would rather see money spent on other services
- The current fee of \$33 per year is sufficient
- Other _____

6 Section Six:

Socioeconomic Variables

30) What is your gender?

- Female Male

31) What is your age? (please check one)

- 18-24 45-54
- 25-34 55-64
- 35-44 65 and over

32) What type of dwelling do you reside in?

- Detached (single family) home
- Apartment building
- Condominium
- Townhouse
- Duplex

33) Do you rent or own your home?

- Rent Own

34) What is your postal code? _____

35) How many members are there in your household?

_____ individuals

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

- Some high school or less
- High school graduate
- Some College or Trade school
- College or Trade school graduate
- University graduate (Bachelor's Degree)
- Post Graduate Studies

37) What range does your yearly household pre-tax income fall under?

- Less than \$20,000
- \$20,000 to \$39,000
- \$40,000 to \$59,000
- \$60,000 to \$79,000
- \$80,000 to \$99,000
- Over \$100,000

Your comments would be appreciated:

Thank you for your assistance
Please return your completed questionnaire
in the enclosed postage paid envelope to:

Research Centre
Thompson Rivers University
Box 3010 McGill Rd.
Kamloops, B.C.
V2C 5N3

APPENDIX 2C: Vernon Survey

(Distributed in booklet format)

Recycling

in Three Small Cities in B.C.'S Interior.

Vernon**Research Centre**

Thompson Rivers University

Box 3010 McGill Rd.

Kamloops, B.C.

V2C 5N3

To the respondent:

Thank you for participating in this survey about recycling being conducted in three small cities in the interior of B.C.. Completing the survey should take less than 15 minutes of your time.

The primary purpose of this survey is to determine: (1) which recycling system, depots or curbside, has the most significant impact on participation rates (2) if the frequency and extent of participation in recycling activity changes following the implementation of a curbside recycling program and (3) the willingness to pay for a curbside recycling program relative to a depot recycling program at the household level. When the study is completed the results will be made available to the public.

All personal information will remain completely anonymous.

D. Taylor, B.Sc.,

M.Sc. Candidate

Research Center

250 371-5945

P. Tsigaris, Ph. D.,

Thesis Supervisor

Department of Economics

250 371-5732

This project is supported by:

The City of Kamloops

The Community University
Research Alliance

Thompson Rivers University

**1 Section One:
Attitudes and Concerns**

1) Rate the following issues on the scale of low to high priority in your municipality by entering a check in the appropriate box.

(1 is lowest priority and 5 is highest priority)

| | 1 | 2 | 3 | 4 | 5 |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| A. Improving city streets (patching or snow removal) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| B. Improving the quality of drinking water | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C. Reducing crime | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| D. Improving environmental quality | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| E. Improving the quality of health care | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| F. Investing in arts and culture | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| G. Improving the quality of education | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

2) Are you or is anyone in your household currently a participant in any community environmental organizations?

Yes No

3) Do most of your neighbours recycle?

Yes No

4) Does your household recycle?

Yes No

5) Of all the materials in your household that could be recycled i.e. batteries, paint, paper, green waste, etc., what percentage do you recycle?

25% 50% 75% 100%

6) Who makes the recycling decisions in your household?

- Female head of household
 Male head of household
 Family decision

Answer Question 7 ONLY IF you answered 'No' to Question 4

7) For what reason(s) do you choose not to recycle?

- I do not have the time to recycle
- I do not have the space to store recyclables
- It will make no difference if I recycle
- I have no way to transport recyclables to the depot
- Other (please specify)_____

**2 Section Two:
Recycling Overview**

The disposal of wastes results in damages to our environment. Waste reduction can be accomplished in a wide variety of ways including recycling. The aim of recycling is to significantly reduce the volume of wastes going to our landfills and in turn reduce our impacts on the environment. Since it began in 1996 the recycling program has diverted an average of 3,300 tonnes of recyclables per year from Vernon's landfill.

**3 Section Three:
Participation Frequency and Extent at Depots**

8) Does your household use recycling depots?

- Yes No

9) How often do you recycle using the depots? (please check one)

- Occasionally Almost every week
 Once per month More than once per week
 Every other week

10) What percentage of your household wastes would you estimate that you separate out to recycle at the depot?

- Less than 25% 50-75%
 25-49% Greater than 75%

11) Approximately what percentage of each of the following items do you recycle at the depots? (ie. 100% of newspapers, 50% of glass, etc.)

| | None | 25% | 50% | 75% | 100% |
|-----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Newspaper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cardboard | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Mixed paper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plastics (#1-7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | | | | | |
|-------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Glass | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Metal | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**4 Section Four:
Participation Frequency and Extent
with Curbside**

12) Does your household use curbside recycling?

Yes No

**13) How often do you recycle using the curbside collection program?
(please check one)**

Occasionally Every other week
 Once per month Almost every week

**14) On average how full is your recycling container each time you put it out for
curbside collection? (please check one)**

Less than 25% full 50 - 75% full
 25 - 49% full Greater than 75% full

**15) What percentage of your total household wastes would you estimate that
you separate out to recycle using curbside recycling? (please check one)**

Less than 25% 50 - 75%
 25 - 49% Greater than 75%

**16) Approximately what percentage of each of the following items do you
recycle through the curbside recycling program? (i.e. 100% of newspapers,
50% of glass, etc.)**

| | None | 25% | 50% | 75% | 100% |
|----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Newspaper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cardboard | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Mixed paper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plastic (#1-7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Glass | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Metal | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**17) Did you recycle at the city depots prior to the implementation of the
curbside program?**

Yes No

18) What recycling system do you prefer?

Depots Curbside Indifferent

19) Have you found the curbside recycling collection program more convenient than trips to the recycle depot?

Yes No Not applicable

5 Section Five:**Willingness to pay**

Curbside recycling collection has been in place for Vernon residents since 1996. Both detached and multifamily homes have access to this service and all city residents who receive curbside recycling service pay a collection fee via their city utility bill. Residents have the convenience of recycling materials including newspapers, metal, plastics (numbered 1-7), plastic film, cardboard and mixed waste paper through the curbside collection program. Recyclables can also be taken to the drop-off site next to the landfill. The following hypothetical scenarios are not meant to justify a tax increase but are meant to assess the value of the curbside recycling program to area residents.

20) Does your household have curbside recycling service?

Yes No

21) Assuming the city was to encounter difficulties in keeping the curbside recycling program running due to increasing costs. Would you be willing to accept an increase in your households city utility fees, beyond the current fee charged per year, in order to maintain the current curbside recycling program?

Yes No

22) What is the maximum increase, over and above the current fee that would be acceptable for your household to pay each year to maintain the current curbside recycling program?

- Less than \$5 more per year (please specify) _____
- \$5 - \$9 more per year
- \$10 - \$14 more per year
- \$15 - \$19 more per year
- \$20 - \$24 more per year
- Greater than \$24 more per year (please specify) _____

Answer Questions 23 and 24 ONLY IF you answered 'No' to Question 20.

23) Would you be willing to accept the increase in your households city utility fees in order to implement a curbside recycling program?

- Yes No

24) What is the maximum amount that your household would be willing to pay each year to implement a curbside recycling program?

- Less than \$10 per year (please specify) _____
 \$10 - \$19 per year
 \$20 - \$29 per year
 \$30 - \$39 per year
 \$40 - \$49 per year
 Greater than \$50 per year (please specify) _____

Answer Question 25 ONLY IF you answered 'No' to Questions 21 or 23.

25) For what reason are you not willing to pay more for curbside recycling?

- Income/financial situation of my household
 City utilities are already too high
 The depots are sufficient
 Would rather see money spent on other services
 The current yearly fee is sufficient
 Other _____

6 Section Six: Socioeconomic Variables

26) What is your gender?

- Female Male

27) What is your age? (please check one)

- 18-24 45-54
 25-34 55-64
 35-44 65 and over

28) What type of dwelling do you reside in?

- Detached (single family) home
- Apartment building
- Condominium
- Townhouse
- Duplex

29) Do you rent or own your home?

- Rent Own

30) What is your postal code? _____**31) How many members are there in your household?**
_____ individuals**32) What is the highest level of education that you have completed?**

- Some high school or less
- High school graduate
- Some College or Trade school
- College or Trade school graduate
- University graduate (Bachelor's Degree)
- Post Graduate Studies

33) What range does your yearly household pre-tax income fall under?

- | | |
|---|---|
| <input type="checkbox"/> Less than \$20,000 | <input type="checkbox"/> \$60,000 to \$79,000 |
| <input type="checkbox"/> \$20,000 to \$39,000 | <input type="checkbox"/> \$80,000 to \$99,000 |
| <input type="checkbox"/> \$40,000 to \$59,000 | <input type="checkbox"/> Over \$100,000 |

Your comments would be appreciated:

Thank you for your assistance
Please return your completed questionnaire
in the enclosed postage paid envelope to:

Research Centre
Thompson Rivers University
Box 3010 McGill Rd.
Kamloops, B.C.
V2C 5N3

APPENDIX 2D: Merritt Survey

(Distributed in booklet format)

Recycling

in Three Small Cities in B.C.'S Interior.

Merritt**Research Centre**

Thompson Rivers University
Box 3010 McGill Rd.
Kamloops, B.C.
V2C 5N3

To the respondent:

Thank you for participating in this survey about recycling being conducted in three small cities in the interior of B.C.. Completing the survey should take less than 15 minutes of your time.

The primary purpose of this survey is to determine: (1) which recycling system, depots or curbside, has the most significant impact on participation rates (2) if the frequency and extent of participation in recycling activity changes following the implementation of a curbside recycling program and (3) the willingness to pay for a curbside recycling program relative to a depot recycling program at the household level. When the study is completed the results will be made available to the public.

All personal information will remain completely anonymous.

D. Taylor, B.Sc.,
M.Sc. Candidate
Research Center
250 371-5945

P. Tsigaris, Ph. D.,
Thesis Supervisor
Department of Economics
250 371-5732

This project is supported by:

The City of Kamloops

The Community University
Research Alliance

Thompson Rivers University

**1 Section One:
Attitudes and Concerns**

1) Rate the following issues on the scale of low to high priority in your municipality by entering a check in the appropriate box.

(1 is lowest priority and 5 is highest priority)

| | 1 | 2 | 3 | 4 | 5 |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| A. Improving city streets (patching or snow removal) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| B. Improving the quality of drinking water | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C. Reducing crime | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| D. Improving environmental quality | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| E. Improving the quality of health care | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| F. Investing in arts and culture | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| G. Improving the quality of education | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

2) Are you or is anyone in your household currently a participant in any community environmental organizations?

Yes No

3) Do most of your neighbours recycle?

Yes No

4) Does your household recycle?

Yes No

5) Of all the materials in your household that could be recycled i.e. batteries, paint, paper, green waste, etc., what percentage do you recycle?

25% 50% 75% 100%

6) Who makes the recycling decisions in your household?

- Female head of household
 Male head of household
 Family decision

Answer Question 7 ONLY IF you answered 'No' to Question 4

7) For what reason(s) do you choose not to recycle?

- I do not have the time to recycle
- I do not have the space to store recyclables
- It will make no difference if I recycle
- I have no way to transport recyclables to the depot
- Other (please specify)_____

**2 Section Two:
Recycling Overview**

The disposal of wastes results in damage to our environment. Waste reduction can be accomplished in a wide variety of ways including recycling. The aim of recycling is to significantly reduce the volume of wastes going to our landfills and in turn reduce our impacts on the environment. The newly expanded drop-off depots are one way that Merritt residents can divert an increased amount of waste from area landfills.

**3 Section Three:
Participation Frequency and Extent at Depots**

8) Does your household use recycling depots?

- Yes No

9) How often do you recycle using the depots? (please check one)

- Occasionally Almost every week
 Once per month More than once per week
 Every other week

10) What percentage of your household wastes would you estimate that you separate out to recycle at the depot?

- Less than 25% 50-75%
 25-49% Greater than 75%

11) Approximately what percentage of each of the following items do you recycle at the depots? (ie. 100% of newspapers, 50% of glass, etc.)

| | None | 25% | 50% | 75% | 100% |
|-----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Newspaper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cardboard | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Mixed paper | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plastics (#1-7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Glass

Metal

4 Section Four: Willingness to pay

Currently Merritt residents can recycle glass, newspapers, metal cans, milk jugs, corrugated cardboard and mixed waste paper at the Civic Centre drop-off recycling depot. Recently the City of Kamloops implemented a curbside recycling program and the City of Vernon has had one in place since 1996. Residents in these cities pay a yearly fee as a part of their city utility bill for curbside recycling collection, for example \$33 per year in Kamloops. In addition to being convenient these programs have greatly reduced waste going to city landfills, for example it is estimated that the Kamloops recycling program will divert over 5,000 metric tonnes of recycling in its first year of operation. The following hypothetical scenario is not meant to justify a tax increase but is meant to assess the value of a curbside recycling program to area residents.

12) Would you be willing to accept an increase in your households city utility fees in order to implement a curbside recycling program?

Yes No

13) What is the maximum increase that your household would be willing to pay each year to implement a curbside recycling program

- Less than \$10 per year (please specify) _____
- \$10 - \$19 per year
- \$20 - \$29 per year
- \$30 - \$39 per year
- \$40 - \$49 per year
- Greater than \$50 per year (please specify) _____

Answer Question 14 ONLY IF you answered 'No' to Question 12.

14) For what reason are you not willing to pay more for curbside recycling?

- Income/financial situation of my household
- City utilities are already too high
- The depots are sufficient
- Would rather see money spent on other services
- Other _____

**5 Section Five:
Socioeconomic Variables**

15) What is your gender?

- Female Male

16) What is your age? (please check one)

- 18-24 45-54
 25-34 55-64
 35-44 65 and over

17) What type of dwelling do you reside in?

- Detached (single family) home
 Apartment building
 Condominium
 Townhouse
 Duplex

18) Do you rent or own your home?

- Rent Own

19) What is your postal code? _____

**20) How many members are there in your household?
_____ individuals**

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

- Some high school or less
 High school graduate
 Some College or Trade school
 College or Trade school graduate
 University graduate (Bachelor's Degree)
 Post Graduate Studies

22) What range does your yearly household pre-tax income fall under?

- Less than \$20,000 \$60,000 to \$79,000
 \$20,000 to \$39,000 \$80,000 to \$99,000
 \$40,000 to \$59,000 Over \$100,000

Your comments would be appreciated:

Thank you for your assistance
Please return your completed questionnaire
in the enclosed postage paid envelope to:

Research Centre
Thompson Rivers University
Box 3010 McGill Rd.
Kamloops, B.C.
V2C 5N3

APPENDIX 2E: Reminder Card

(Distributed printed at postcard size, on pale green cardstock)

REMINDER

Greetings,

December 2008

A few weeks ago you received a survey regarding your views on recycling in small cities. If you have already completed and returned your survey, please accept our sincere thanks. If you have not completed the survey, please do so soon.

Your response is very important to our study. We are grateful for your help because we want to ensure that the results of the survey are representative of the views of people across all three small cities. Completing the survey should take less than 15 minutes of your valuable time. Please do so and return it in the postage paid envelope provided to you.

Thank you again for your time and if you have any questions or inquiries or if your survey has been misplaced, please do not hesitate to call me at 250-682-8689.

Dana Taylor

Chapter 3: Factors that Influence Participation Rates for Curbside Recycling

INTRODUCTION

This chapter will address two issues associated with participation in recycling. The first issue is the determination of what socioeconomic factors have a significant influence on overall participation rates. The second is the determination of what socioeconomic factors have a significant influence on participation rates by material type. One important question addressed is the following: Does having a curbside recycling system increase participation significantly relative to having only depots once socioeconomic variables are controlled for? Another inquiry that can be addressed is: Is there a significant advantage, or greater reduction in wastes, by having both curbside and depot recycling available?

Determining which socioeconomic factors have the most significant impact on overall rates of participation in recycling should, in my opinion, aid policy makers in designing effective recycling systems in terms of increasing participation rates. Access of respondents to three recycling systems was compared: households that used only depots, those that used only curbside, and those that used both curbside and depots. As stated, one particular area of focus was on the impact of recycling systems influencing participation rates with the following factors taken into account: income, education, family size, home ownership, age, gender and attitudes towards the environment.

Specific environmental concerns have been found to be predictors of recycling behaviour (Vining & Ebreo 1992) as has participation in environmental organizations (Aadland & Caplan 2006). Being female, young and well educated has also been positively correlated with an increase in participation (Aadland & Caplan 2006) which may vary in influence depending upon who the recycling decision maker in the household is. Particular dwelling types such as multifamily homes have been negatively correlated with participation and willingness to pay (Ando & Gosselin 2005), whereas other variables such as home ownership and increasing household income have been positively correlated with such factors (Ferrara & Missios 2005 and Jenkins et. al. 2003).

The second issue addressed was determining the factors affecting the rates of participation in recycling each of the different types of recyclable materials. Again a

particular area of focus was on recycling systems and their influence on participation rates with socioeconomic factors accounted for. The factors controlled for were the same as those described above.

Ferrara and Missios (2005) assessed participation in recycling programs by material compared with a large range of variables similar to those included in this study. They found that unit price, free units and home ownership were all significant to participation for all of the materials examined including newspaper, glass, plastic, aluminum, tin cans and cardboard (with the exception of toxic chemicals for unit price). Weekly collection was significant to participation in glass, aluminum and toxic chemical recycling while unit limit was significant only to plastic and toxic chemicals. Mandatory recycling was significant to all materials, with the exception of glass, and education was significant, at some point in its range (from high school graduate to post graduate), to all materials with the exception of newspaper. Income, at some point in its range (from \$20,000 to over \$100,000), was significant to newspaper, plastic and toxic chemicals and household size was not significant to any of the variables. Finally, age 65 and over was significant to glass recycling and age 50 to 65 was significant to toxic chemical recycling. Overall Ferrara and Missios (2005) found different significant variables for participation in newspaper, cardboard, plastic and metal recycling than this study, and unfortunately mixed paper was not included in their study. Similar results were found, however, for participation in glass recycling. Age 65 and over was significant in both studies.

Some research has found that an increase in the number of materials accepted in a curbside collection program is positively correlated with participation (Harder et. al. 2006). If this is the case then the cities with larger programs may see higher participation rates. This relationship may not, however, be a direct cause and effect scenario. Cities with larger recycling programs are likely to have had them in operation for longer periods of time than cities of the same size with smaller programs, and therefore awareness about them is greater and fosters higher participation rates.

METHODS

All survey design and data collection methods can be found in Chapter 2 along with a summary of the descriptive statistics.

Model Specification

In order to provide an explanation of the first objective, overall participation in recycling, the specification to be estimated including all cities surveyed was:

$$y_i = b_0 + \sum_{j=1}^n b_j x_{ji} + u_i$$

Where:

- y_i is the degree of participation of household i in recycling

(ie. 0%, 25%, 50%, 75% or 100% participation)

- b_i 's are the parameters to be estimated by the multiple linear regression

- u_i is a random error term

- the base case for the model, which all outcomes are in relation to, is represented by a respondent who: has access to depot recycling only, has a low income, has a low educational attainment, and is of low age.⁸

The variables x_{1i} , and x_{2i} identify the type of recycling program available to the respondent where:

- x_{1i} is a dummy variable assigned a value of 1 if the household uses curbside recycling only, otherwise 0

⁸ Information on three other factors was originally intended to be included, but was dropped due to highly skewed responses. These were dwelling type, member of an environmental organization and neighbours recycle. The first two were dropped due to extremely low variation, responses were almost exclusively 'single family dwelling' for the first, and almost exclusively 'not a member of an environmental organization' for the second. The last variable was dropped due to a very high number of N/A responses.

$-x_{2i}$ is a dummy variable assigned a value of 1 if the household uses both curbside and depots, otherwise 0

It is expected that respondents who have access to both curbside and depots will show higher rates of participation than those who have access to only depots or only curbside. This is because respondents with access to both curbside and depot programs can not only conveniently put the majority of their household recyclables into curbside bins but they also have the option of taking large items or items not acceptable in curbside to the depots for recycling. Respondents who have access to only curbside or only depots do not have those extra options.

The variables x_{3i} through x_{11i} identify the socioeconomic factors influencing the respondent where:

$-x_{3i}$ is a dummy variable assigned a value of 1 if the respondent has a moderate income, 0 otherwise

$-x_{4i}$ is a dummy variable assigned a value of 1 if the respondent has a high income, 0 otherwise

$-x_{5i}$ is a dummy variable assigned a value of 1 the respondent has a moderate education, 0 otherwise

$-x_{6i}$ is a dummy variable assigned a value of 1 the respondent has a high education, 0 otherwise

$-x_{7i}$ measured the family size in terms of number of people residing there

$-x_{8i}$ measured ownership or rental of the household, 1 if owner, otherwise 0

$-x_{9i}$ is a dummy variable assigned a value of 1 if the respondent is of moderate age, 0 if the respondent is of low or high age

$-x_{10i}$ is a dummy variable assigned a value of 1 if the respondent is of high age, 0 if the respondent is of low or moderate age

$-x_{11i}$ is a dummy variable assigned a value of 1 if the respondent is female, 0 if the respondent is male

It is expected that respondents with access to curbside recycling and those with higher education will show higher rates of participation as Jenkins et. al. found in their 2003 study.

The variable x_{12i} , identifies the attitudinal variable influencing the respondent where:

$-x_{12i}$ is a dummy variable assigned a rating, from 1 (lowest) to 5 (highest), given by survey respondents on the priority they place on different issues in their municipalities, including improving environmental quality.

It is also expected that respondents who place a high priority on environmental quality (ie. give it a high rating) will show a higher degree of participation in recycling due to the fact that they show concern for the environment.

To examine the first objective, participation in overall recycling, and determine if the availability of a curbside system has a significant impact on participation rates relative to the depot system (controlling for all other socioeconomic factors) the coefficient b_1 must be both positive and significantly greater than zero.⁹ To determine if the availability of both systems (curbside and depots) has a significant impact on participation rates relative to having access to depots only, the coefficient b_2 must both positive and significantly greater than zero. In order to compare both versus curbside only the difference between $b_2 - b_1$ can be tested. The first objective will be met by determining if there is a significant difference in recycling participation between the different recycling programs with all other factors equalized. The b_i parameters were estimated using linear regression analysis (ordinary least squares).

In order to provide an explanation of the second objective, participation in recycling by material type, the specification to be estimated will be similar to the previous section with a few exceptions. The variable y_i will represent the degree of participation in newspaper, cardboard, mixed paper, glass, plastic or metal recycling for household i and the x 's will

⁹ Assumes 'depot recycling only' is the base case.

remain the same. The b_1 parameters were again estimated using linear regression analysis (ordinary least squares).

In summary the potential determinants of overall and specific participation are the following: recycling system, household income, education, family size, home ownership, age, gender and attitudes towards the environment. The methods of estimating all participation parameters were linear regressions.

RESULTS

First, the socioeconomic factors that influenced the degree of participation (to 0, 25, 50, 75 or 100 percent) in recycling were compared. Linear regressions including all of the socioeconomic variables were run against total reported percentage recycled. Rates of participation in recycling were found to be influenced positively in households that used curbside only, those that used both (curbside and depots) and being of greater age (p values = 0.01, 0.00 and 0.01 respectively), relative to those in the base case. As seen in Table 3.1 all cases and material types using both systems (depot and curbside) resulted in a higher participation rate relative to using depots only. The other socioeconomic variables tested including income, education, home ownership, family size, gender and environmental rating were not found to have any significant impact on the rate of participation in overall recycling. Linear regressions were also run for each city overall and can be found in Appendices 3A, 3B & 3C.

T-tests were run on all of the paired variables (recycling system, education, income and age) tested against the overall and by material results (Table 3.2). These were to determine if any particular variable had a more significant influence than the counterpart it was paired with (i.e. high age being more significant than moderate age). A t-test comparing the two recycling systems, use of curbside only versus using both (depots and curbside), found that there was no significant difference between them in terms of a relative increase in participation rates. Another t-test comparing the two age factors, moderate and high, found that there was a difference significant to 5% between them. This shows that being of high age has a more significant influence on recycling participation rates than does being of moderate age.

Participation in newspaper recycling was affected positively by households using curbside only, as well as those using both systems (depots and curbside), and by high age (p values = 0.02, 0.00 and 0.02 respectively). A t-test comparing the participation rates of households using the curbside system only, relative to those using both recycling systems, was marginally significant (p-value = 0.1). This implies that households that use both systems relative to those that use only curbside for newspaper had a higher participation rate. A t-test comparing middle and high age factors was also found to have a significant difference in terms of participation (p-value = 0.05). Respondents of higher age participated more relative to those of middle age.

Participation rates for cardboard recycling were influenced by households using curbside only, those using both (depots and curbside) and higher age (p values = 0.08, 0.00 and 0.05 respectively) relative to those that use depots only and are of lower age. A t-test found no significant difference in participation rates between households using curbside only and those using both. However, curbside only was marginally significant relative to depot usage, while households using both systems resulted in a much stronger significance relative to depots only. Another t-test comparing middle and high age variables found a difference significant to 10 percent.

Mixed paper recycling was found to have a significantly positive relationship between participation and curbside only, both (depots and curbside) and high age (p=0.06, 0.00 and 0.02 respectively). Again a t-test comparing the age factors found a difference significant to 10 percent and a borderline significance of 12 percent between using curbside only and using both recycling systems.

Participation in plastic recycling was found to have a significantly positive relationship to curbside only, both (depots and curbside) and high age (p=0.01, 0.00 and 0.03 respectively) as with all the previously discussed material types. T-tests comparing the recycling program and age factors found differences significant to 5 percent and 10 percent respectively.

For all of the above materials the other socioeconomic variables tested including income, education, home ownership, family size, gender and environmental rating were not found to have any significant impact on the rate of participation in their recycling.

Glass recycling was found to have significantly positive relationships between participation and: curbside only, both (depots and curbside) and environmental rating (all p-values = 0.00). The t-test comparing recycling programs (curbside only versus both) found no significant difference between them in terms of influencing participation rates. For glass the other socioeconomic variables tested including income, education, home ownership, age, family size and gender were not found to have any significant impact on the rate of participation in its recycling.

Participation in metal recycling was found to have no significant relationships. A t-test comparing the education factors found a difference significant to 10 percent between them, while recycling program type was not an important factor influencing participation rates. None of the other socioeconomic variables tested including income, education, home ownership, age, family size, gender or environmental rating were found to have any significant impact on the rate of participation in its recycling.

Full results can be found in Tables 3.1 and 3.2. Linear regressions were also run for each city by material and can be found in Appendices 3A, 3B and 3C

Table 3.1. Coefficients from linear regressions of socioeconomic variables for recycling overall and by material

| Variable | Overall | Newspaper | Cardboard | Mixed Paper | Plastic | Glass | Metal |
|--------------------------------|-----------------|------------------|------------------|--------------------|----------------|----------------|---------------|
| Intercept | 50.06(13.15)*** | 48.40(16.58)** | 61.32(14.65)*** | 47.74(17.10)** | 46.48(17.24)** | 33.00(18.14)# | 48.06(23.90)* |
| Curbside Only | 14.19(5.22)** | 14.93(6.51)* | 9.73(5.63)# | 12.70(6.61)# | 18.34(6.60)** | 20.96(7.15)** | 13.99(9.42) |
| Both | 17.64(4.07)*** | 21.90(5.33)*** | 13.81(4.83)** | 20.13(5.54)*** | 28.66(5.58)*** | 22.89(5.74)*** | 4.42(7.65) |
| Moderate Income | -1.81(5.08) | -10.27(6.58) | -5.51(5.78) | -1.44(6.77) | -0.18(6.76) | -4.03(7.20) | -13.14(9.50) |
| High Income | 2.50(5.48) | -3.04(6.96) | -0.07(6.10) | 4.76(7.13) | 3.18(7.14) | 2.80(7.60) | -8.77(10.06) |
| Moderate Education | 2.94(5.56) | 6.62(7.24) | 0.98(6.35) | -4.67(7.43) | 0.93(7.43) | 3.60(7.75) | -1.40(10.33) |
| High Education | -0.70(5.99) | 3.10(7.86) | 0.62(6.87) | -3.48(8.04) | 3.59(8.11) | 4.98(8.41) | 10.07(11.08) |
| Family Size | -0.15(1.68) | 1.73(2.13) | 2.04(1.89) | -0.06(2.18) | -0.13(2.16) | -0.81(2.33) | 1.30(3.07) |
| Home Ownership | -6.70(6.07) | 0.27(7.58) | -5.96(6.61) | 3.75(7.97) | -5.14(7.76) | -4.39(8.42) | -0.76(11.07) |
| Moderate Age | 9.34(7.63) | 8.29(9.21) | 5.88(8.09) | 11.55(9.42) | 8.95(9.46) | 11.01(10.18) | 4.73(13.39) |
| High Age | 20.51(8.16)* | 22.88(9.98)* | 17.52(8.77)* | 24.10(10.25)* | 22.01(10.31)* | 17.80(10.98) | 11.07(14.44) |
| Gender | -3.72(3.76) | 5.43(5.06) | 6.18(4.48) | 0.30(5.18) | 1.34(5.21) | -2.94(5.44) | -2.68(7.13) |
| Environmental Rating | 1.51(1.61) | 1.87(2.10) | 2.04(1.85) | 2.16(2.17) | 2.17(2.17) | 6.57(2.31)** | 3.38(3.06) |
| Observations | 167 | 153 | 148 | 152 | 149 | 162 | 159 |
| Overall Mean | 73.50 | 88.89 | 89.36 | 83.55 | 81.38 | 79.94 | 68.55 |
| Adjusted R² | 0.14 | 0.12 | 0.06 | 0.11 | 0.16 | 0.14 | -0.004 |
| F-statistic | 3.23*** | 2.77** | 1.75# | 2.50** | 3.27*** | 3.12*** | 0.95 |
| Residual Standard Error | 22.3 | 27.77 | 24.21 | 28.41 | 28.41 | 30.94 | 40.66 |

Note: Standard errors are in parenthesis. Levels of significance shown as: # 10%, * 5%, ** 1%, *** 0.1 %

Table 3.2. T-test results of paired differences in socioeconomic variables for recycling overall and by material.

| Material | Curbside = Both | Moderate Income = High Income | Moderate Education = High Education | Moderate Age = High Age |
|------------------------|----------------------------|--|--|--|
| Overall | -3.45(4.16) | -4.30(4.19) | 3.64(4.19) | -11.17(5.31)* |
| Newspaper | -6.97(4.05)# | -7.24(5.82) | 3.53(4.98) | -14.58(7.09)* |
| Cardboard | -4.08(3.59) | -5.46(5.18) | 0.38(4.62) | -11.62(6.66)# |
| Mixed paper | -7.42(4.74) | -6.22(5.73) | -1.17(5.01) | -12.49(7.03)# |
| Plastic | -10.30(4.90)* | -3.39(5.78) | -2.65(4.86) | -12.99(6.98)# |
| Glass | -1.91(5.67) | -6.85(6.36) | -1.37(5.03) | -6.72(6.79) |
| Metal | 9.58(8.22) | -4.40(8.24) | -11.45(6.99)# | -6.28(9.07) |

Note: Standard Errors are in parenthesis. Levels of significance are shown as # 10%, *5%, **1%, ***0.1%.

Regression trees are an alternative to multiple linear regressions for developing descriptive and predictive models. The top of the upside down tree represents all of the observations, which are divided into two branches at a node each time a split occurs, and terminate in a leaf. Groups nearer the termination points are more homogeneous than those higher up and values at the termination points are the mean of the observations at that leaf. A common method for determining prediction error in regression trees is cross validation, where the observations are divided and the model is fitted to each group (Quinn & Keough, 2002). Due to the small size of this data set, the observations were not divided and the regression trees were not cross validated. They have, however, been included to provide an alternate representation of the data.

A regression tree of the factors influencing rates of participation in recycling in all three cities was run and the results are below (see Figure 3.1). By following this tree it can be seen that respondents of moderate or low age (left branch) without access to both curbside and depots (left branch), without access to curbside only (left branch), but with access to

depots only (right branch) and who are homeowners (right branch) have the second lowest participation rate, as shown by each of the termination points of the regression tree, at 55%. By following the tree along a similar path it can be seen that respondents of moderate or low age (left branch) with access to both curbside and depots (right branch) or with curbside only (left branch then right branch), have much higher participation rates of 77% and 78% respectively. Finally by following the tree along a different path it can be seen that respondents who are of high age (right branch) who have a family size of less than 3.5 (left branch), and gave a high environmental rating (right branch) have the highest participation rate at 82%.

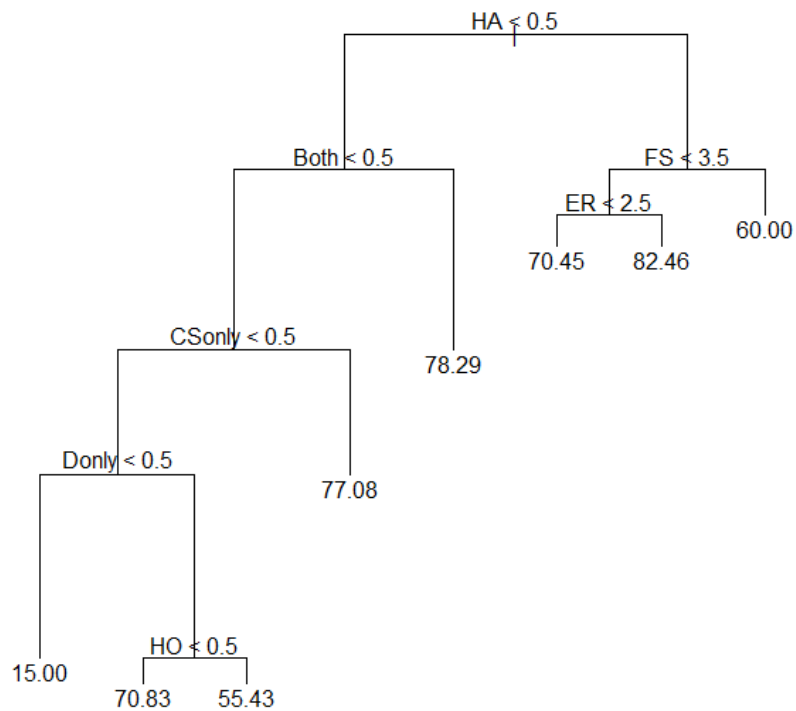


Figure 3.1. Decision Tree for Overall Participation Rates

Legend: HA=High Age, Both=Curbside and Depots, FS=Family Size, ER=Environmental Rating, COnly=Curbside only, Donly=Depots only, and HO=Home Ownership (terminal values = overall rates of participation)

The methods and analysis employed herein were modified from those used in previous works, Ferrara & Missios (2005) and Blaine et al (2005). A larger sample size would have been ideal but was limited due to funding and time. On reflection some of the survey questions could have been worded in a different way in order to make them more understandable for respondents. Having a few particular questions that were somewhat difficult to understand resulted in some of the data collected being very limited in its usefulness due to high numbers of blank (NA) responses. One of the issues with the data is

that the responses that were received are likely biased in support of recycling participation. Respondents who bother to take the time to fill out the survey are likely concerned about recycling and therefore are also likely already participants in recycling programs, while those who did not return the survey are likely not concerned with such things and do not participate in them. The main difficulty in conducting this research was designing a survey that would collect a sufficient amount of information for analysis while keeping all of the respondent's personal information completely anonymous.

DISCUSSION

The above results indicate that having access to curbside recycling only was one of the three factors found to have a significant impact on the rate of overall participation. Having access to both curbside and depot recycling was also just as important a factor in influencing participation rates. The third and final significant influence on the overall rate of participation was age.

The rate of participation overall for respondents using curbside recycling only is significant, in comparison with depots, due to the convenience factor. Sorting and travel time to the depots are not necessary for those who feel that they do not have the time to do so. Also, bins are large and emptied weekly, so storage becomes less of an issue as was found by Ando & Gosselin (2005).

The overall participation rate for respondents who had access to curbside and depots was significant in comparison with depots only, but not when compared with curbside only. In other words, those that accessed curbside only and those that accessed both systems had similar impact on the participation rates. If respondents access both it is likely due to increased ease through options and to having a range of material sizes which need recycling. Although most day to day recyclables can be easily fit into bins some materials are too bulky and therefore are much easier to return to the depots.

The overall rate of participation for those aged 55 or greater was found to be significantly different from both the low age and moderate age categories and can be explained in two ways. First, respondents of higher age are more likely to be retired and have

more time to put towards recycling efforts than would respondents in the low or moderate age categories. Second, in my opinion those respondents aged 55 or higher are more likely to have been brought up to reuse and ‘waste not, want not’ therefore they may tend to already be less wasteful than younger respondents.

The results reported above show that of the six different material types examined here, four of them share the same three significant influences on participation rates as the overall assessment. These four materials include newspaper, cardboard, mixed paper and plastic. The three factors found to have a significant impact on the rates of participation in comparison to the base case are: having access to (and using) curbside recycling only, having access to (and using) both curbside and depot recycling and being aged 55 or greater. Therefore the same discussions as seen above for the overall rate of participation also applies here for the rates of participation in newspaper, cardboard, mixed paper and plastic recycling.

There were, however, some other differences noted amongst these materials. The degree of participation was higher, at the 10 percent significance level, for newspaper with both curbside and depots in comparison with having curbside only. From a policy perspective this is an important finding showing that maintaining both curbside and depot collection is improving participation rates compared to operating with curbside only. Also, being aged 55 or greater was significantly better for participation than being under 55, at the 5 percent level of significance.

For cardboard and mixed paper being aged 55 or greater was again significantly better for participation than being younger, at the 10 percent level. This is likely due to the same reasons as mentioned above.

For plastic having both curbside and depots was significantly better than having curbside only at the 5 percent level of significance. Again from a policy perspective this is an important finding supporting the maintenance of both curbside and depot collection as it is improving participation rates compared to operating with curbside only. Lastly, being aged 55 or greater was significantly better for participation than being aged 54 or less, to 5%, again due to time and upbringing factors.

Glass, the fifth material examined, was found to be influenced by two factors in common with the first four materials, but one completely different from all of the others. The three factors found to have a significant impact on the rate of participation in glass recycling were having access to curbside recycling only, having access to both curbside and depot recycling and giving 'the improvement of environmental quality' a high ranking among other issues in the municipality. Again the same discussions as seen above for the overall rate of participation apply here for the first two factors influencing the rate of participation in glass recycling. The third factor of environmental rating is likely explained by the fact that in Vernon glass is not an accepted material in their curbside collection program (due to practical and safety issues) and must be taken to depots to be recycled. Therefore, respondents there who recycle glass have to make an extra effort to go out and drop it off at the depots so they may have motivations other than convenience for their actions, such as an attitude that reflects concern for the environment. Ferrara & Missios (2005) also note that policies that promote increased curbside recycling also promote increased non-curbside recycling as well.

Participation in recycling metal, the sixth material examined, was not found to be significantly influenced by any of the socioeconomic variables examined here. This may be due to the fact that refund recycling already exists for items like pop cans that make up a large portion of household metals. Respondents may be more interested in recycling these materials for refunds at depots than putting them into curbside collection.

The two education factors (moderate and high), however, although not found to have a significant impact on participation rates, were found to be significantly different from one another when compared with a t-test.

The regression tree of overall participation demonstrates that for respondents of low and moderate age the convenience of having access to curbside recycling (or to both curbside and depots) is an important factor in increasing participation, compared to those who have access to depots only. It also demonstrates that giving a high environmental rating and having a large family size are the more influential factors in increasing participation among respondents who are of high age. This finding makes sense as saving time and increased convenience may not tend to be of as much importance to those who are retired.

Prior to the implementation of curbside recycling, the City of Kamloops had a depot recycling program which consisted of five locations throughout the city where materials, including newspaper, corrugated cardboard, boxboard, mixed paper, metal cans, glass jars and plastic milk jugs, could be returned for recycling. With the curbside program in place for single family homes, recycling can now be placed at the curb every week next to household garbage. In addition to the above listed materials, plastic containers (#1-7), aluminum foil and many more paper products can also be recycled. The creation and implementation of the curbside program may have altered the existing recycling population in three ways: by increasing the number of residents recycling who did not do so previously, by providing residents who did recycle increased convenience, and by providing the option to return more materials. Access to facilities and convenience are factors that have been found to be positively correlated with participation in curbside versus depot recycling (Barr 2007).

The majority of the literature that I have reviewed relating to the factors that impact rates of participation in recycling has been conducted in large cities with a few cases including both large and small cities. Some factors seem to have similar influences in large cities to what I have found in small cities, but others do not. Ofori-Amoah (2007) points out that in most instances, with the exception of a few specific aspect studies, we do not know if the patterns and trends that have been identified in large cities also exist in small ones. In addition Bell and Jayne (2006) note that problems can arise with the adoptions of big city policies and ideas in small city contexts so changes may be necessary. To illustrate this difference I refer back to chapter one to compare a selection of the reviewed literature to the findings of this study.

As noted in Chapter one Jenkins et. al. (2003) analysed the determinants of household recycling intensity using data from 20 metropolitan areas in the United States. The data were also collected by mail-out survey, and the authors selected only communities with ongoing recycling programs and excluded all samples from communities with drop off centres only. They found that recycling intensity increased for most materials with the availability of drop off depots, for all materials with the availability of a curbside recycling program and that

increased age had a positive effect on recycling intensity. All of the points noted thus far correspond with my research findings. In contrast to what I found in my research Jenkins et. al. (2003) reported that as household income increased recycling of newspaper increased and as education level rose a small effect was seen on the intensity of recycling of glass bottles, aluminum cans and newspapers. These results may have been picked up by their larger data set.

Ferrara and Missios (2005) examined data on recycling and waste diversion effectiveness from 12 municipalities (7 small cities and 5 large cities) in Ontario. Their study focused on the intensity of recycling, for different materials when factors such as collection frequency, user fees, mandatory programs and garbage limits are varied. This study focused more on recycling programs available, but many of the other variables they included were also examined here, such as home ownership, education, income, family size and age. Ferrara and Missios found that university education influenced the rate of newspaper and metal recycling, and a high school education was found to influence the rate of glass recycling. Also income was found to impact the recycling of newspaper and plastic while family size and age both had little impact in any category. Lastly, home ownership was found to have a strong positive relationship with recycling intensity. Essentially all of their findings differ from the outcomes of my research. This may be due to the fact that their main focus was different from mine, that their final data set included over 4 times more responses than mine, or that their survey was done by phone as opposed to mail out.

Harder et. al. (2006) re-examined 3 major existing data sets (each made up of approximately 1400 households) and discussed two measured parameters not generally associated with participation rates in curbside recycling. They found that as the number of materials collected by a recycling scheme increased so did the rate of participation. These results are similar to my findings for the small cities of Kamloops, Vernon and Merritt. Merritt, the city with the smallest number of materials collected has the lowest participation rate of the three (71%). Kamloops has the intermediate number of returnable materials and the intermediate participation rate (76%). Finally, Vernon has the highest number of accepted returnable materials and the highest rate of participation (81%).

Woodard et. al. (2006) examined participation in curbside recycling schemes and its variation with material types. Overall they found that participation was higher in curbside recycling schemes that collected more types of recyclable materials. These findings are also reflected in the results of Jenkins et. al. (2003) and Harder et. al. (2006), above, as well as in my research.

Beatty et. al. (2007) examined curbside recycling in the presence of alternatives, such as beverage container drop off recycling depots. Their data consisted of quarterly observations taken from California's Department of Conservation from 1996 to 2000. A total of 1052 observations from 44 counties were included. Overall the increased availability of curbside recycling related to an increase in materials returned. Again these findings are similar to the results of Jenkins et. al. (2003), above, as well as to this research.

Overall, recycling system factors such as the availability of curbside recycling seem to be important in both large and small cities. In contrast other socioeconomic influences on participation in recycling seem to differ between the two.

The following chapter will examine another facet of recycling within the three small cities. It will analyse and discuss the household willingness to pay for curbside recycling programs in these areas.

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Appendix 3A. Coefficients for linear regressions of participation in Kamloops by material

| Variable | Newspaper | Cardboard | Mixed Paper | Plastic | Glass | Metal |
|--------------------------------|------------------|------------------|--------------------|------------------|------------------|----------------|
| Intercept | 7.32 (22.82) | 44.53 (14.96)** | 5.44 (20.44) | 10.34 (23.04) | 7.56 (22.62) | 33.11 (35.40) |
| Curbside Only | 30.80 (10.29)** | 12.38 (6.43)# | 31.20 (9.41)** | 39.24 (10.36)*** | 37.09 (10.33)*** | 35.96 (16.08)* |
| Both | 38.77 (10.45)*** | 17.30 (6.85)* | 40.84 (9.84)*** | 44.92 (10.49)*** | 39.12 (10.39)*** | 30.27 (16.22)# |
| Moderate Income | 0.74 (10.57) | 0.98 (6.69) | 12.53 (9.90) | 14.28 (10.65) | 5.65 (10.60) | -3.92 (16.45) |
| High Income | -1.06 (10.26) | -2.04 (6.45) | 6.38 (9.10) | 16.18 (10.35) | 13.57 (10.32) | 4.43 (16.08) |
| Moderate Education | 15.89 (10.39) | -1.59 (6.53) | -1.21 (9.74) | 5.05 (10.38) | -2.20 (10.45) | -18.93 (16.43) |
| High Education | 19.03 (11.17) | 11.52 (6.91) | 9.39 (9.99) | 22.60 (11.21) | 8.24 (11.16) | 3.81 (16.95) |
| Family Size | 1.62 (3.20) | 1.20 (1.96) | -2.03 (2.85) | -3.03 (3.09) | -5.53 (3.11) | -5.62 (4.78) |
| Home Ownership | -6.05 (11.66) | -1.52 (7.41) | 18.77 (10.73)# | -1.38 (11.68) | -0.01 (11.69) | 0.56 (18.18) |
| Moderate Age | 13.17 (11.03) | 21.94 (7.61)** | 9.83 (9.61) | 17.00 (11.19) | 23.15 (10.76)* | 16.44 (16.95) |
| High Age | 29.76 (12.75)* | 26.79 (8.13)** | 19.51 (11.67) | 19.29 (13.37) | 16.65 (12.72) | 8.67 (19.90) |
| Gender | 0.32 (6.59) | 2.30 (4.17) | -1.59 (5.84) | 0.73 (6.58) | -1.11 (6.53) | 0.89 (10.22) |
| Environmental Rating | 5.84 (3.34)# | 2.56 (2.11) | 4.78 (3.00) | 2.86 (3.37) | 8.33 (3.33) | 6.16 (10.22) |
| Observations | 63 | 58 | 62 | 62 | 66 | 65 |
| Overall Mean | | | | | | |
| Adjusted R² | 0.26 | 0.30 | 0.42 | 0.37 | 0.41 | 0.12 |
| F-statistic | 2.56 | 2.78 | 4.23 | 3.62 | 4.33 | 1.64 |
| Residual Standard Error | 22.79 on 42 DF | 13.94 on 38 DF | 19.98 on 41 DF | 22.79 on 42 DF | 22.94 on 45 DF | 35.72 on 44 DF |

Note: Standard errors are in parenthesis. Levels of significance shown as: # 10%, * 5%, ** 1%, *** 0.1 %

Appendix 3B. Coefficients for linear regressions of participation in Vernon by material

| Variable | Newspaper | Cardboard | Mixed Paper | Plastic | Glass | Metal |
|--------------------------------|------------------|------------------|--------------------|------------------|-----------------|-----------------|
| Intercept | 53.01 (24.37)* | 50.50 (26.26)# | 73.57 (30.13)* | 57.89 (23.39)* | 27.77 (30.54) | 103.87 (47.81)* |
| Curbside Only | 57.03 (17.22)** | 49.98 (18.38)* | 42.32 (21.29)# | 44.07 (16.26)* | 59.67 (22.20)* | 27.45 (34.36) |
| Both | 65.24 (13.43)*** | 59.41 (14.41)*** | 42.00 (16.61)* | 70.20 (12.60)*** | 59.91 (17.82)** | 41.66 (26.97) |
| Moderate Income | -23.04 (10.50)* | -14.39 (11.24) | 4.35 (12.98) | -10.67 (9.78) | -3.19 (13.06) | -29.72 (21.97) |
| High Income | -17.03 (11.42) | -11.75 (12.19) | 4.63 (14.13) | -15.38 (10.69) | -13.57 (14.25) | -26.99 (21.97) |
| Moderate Education | 9.84 (12.46) | 6.21 (13.35) | -13.19 (15.41) | -1.98 (11.87) | 7.17 (14.33) | -6.50 (22.69) |
| High Education | 3.11 (12.24) | 4.30 (13.08) | -8.38 (15.13) | 2.36 (11.57) | 18.28 (14.48) | 22.61 (22.24) |
| Family Size | -0.21 (3.58) | -1.85 (4.05) | -3.66 (4.43) | 0.98 (3.39) | 1.64 (4.70) | 1.38 (7.18) |
| Home Ownership | -8.29 (13.87) | -7.87 (14.78) | -4.79 (17.15) | -17.66 (12.86) | -13.72 (18.70) | -38.95 (28.34) |
| Moderate Age | 2.37 (9.04) | 1.42 (10.07) | 11.36 (11.17) | -4.86 (8.53) | -2.86 (10.93) | 9.22 (16.75) |
| High Age | NA | NA | NA | NA | NA | NA |
| Gender | 4.58 (8.33) | 5.39 (9.17) | -1.59 (10.30) | 0.19 (8.19) | -13.50 (10.30) | -24.69 (15.46) |
| Environmental Rating | -1.24 (3.40) | 0.08 (3.64) | -2.07 (4.22) | -1.49 (3.27) | 3.62 (4.24) | -6.13 (6.48) |
| Observations | 60 | 57 | 60 | 56 | 66 | 64 |
| Overall Mean | | | | | | |
| Adjusted R² | 0.38 | 0.27 | 0.09 | 0.44 | 0.13 | 0.05 |
| F-statistic | 3.47 | 2.46 | 1.42 | 3.91 | 1.69 | 1.23 |
| Residual Standard Error | 22.50 on 34 DF | 23.96 on 33 DF | 27.82 on 34 DF | 20.77 on 30 DF | 30.54 on 40 DF | 46.23 on 38 DF |

Note: Standard errors are in parenthesis. Levels of significance shown as: # 10%, * 5%, ** 1%, *** 0.1 %

Appendix 3C. Coefficients for linear regressions of participation in Merritt by material

| Variable | Newspaper | Cardboard | Mixed Paper | Plastic | Glass | Metal |
|--------------------------------|------------------|------------------|--------------------|----------------|----------------|----------------|
| Intercept | 46.84 (33.94) | 62.78 (27.34)* | 57.44 (33.14)# | 70.71 (34.60)* | 48.24 (36.41) | 4.41 (31.34) |
| Curbside Only | NA | NA | NA | NA | NA | NA |
| Both | NA | NA | NA | NA | NA | NA |
| Moderate Income | -5.76 (14.30) | -4.32 (11.52) | -10.89 (13.96) | -6.55 (14.58) | -17.37 (15.34) | -14.58 (13.20) |
| High Income | 9.55 (15.52) | 12.45 (12.50) | 1.11 (15.15) | -3.34 (15.82) | 1.80 (16.65) | -9.24 (14.33) |
| Moderate Education | 13.01 (16.16) | 8.90 (13.02) | 14.14 (15.78) | 5.62 (16.48) | 16.88 (17.34) | 26.23 (14.33)# |
| High Education | -0.99 (17.95) | -6.88 (14.46) | -3.17 (17.52) | -9.48 (18.30) | -3.36 (19.25) | 4.85 (16.57) |
| Family Size | 4.40 (4.03) | 5.61 (3.24)# | 2.35 (3.93) | 1.58 (4.11) | 0.25 (4.32) | 6.62 (3.72) # |
| Home Ownership | 4.39 (14.66) | -4.89 (11.81) | -4.28 (14.32) | -9.12 (14.95) | -7.07 (15.73) | 14.76 (13.54) |
| Moderate Age | -0.54 (17.94) | -20.01 (14.45) | 16.86 (17.51) | 4.09 (18.29) | -5.80 (19.24) | -3.35 (16.56) |
| High Age | 41.10 (19.92)* | 17.57 (16.05) | 53.16 (19.45)** | 39.40 (20.31)# | 25.83 (21.37) | 42.22 (18.39)* |
| Gender | 8.92 (11.43) | 4.04 (9.20) | -0.01 (11.15) | -3.55 (11.65) | 3.00 (12.26) | 6.95 (10.55) |
| Environmental Rating | -3.22 (4.49) | 1.35 (3.62) | -4.73 (4.39) | -2.11 (4.58) | 4.02 (4.82) | 0.65 (4.15) |
| Observations | 65 | 65 | 65 | 65 | 65 | 65 |
| Overall Mean | | | | | | |
| Adjusted R² | 0.13 | 0.22 | 0.19 | 0.15 | 0.15 | 0.33 |
| F-statistic | 1.75 | 2.45 | 2.22 | 1.89 | 1.87 | 3.49 |
| Residual Standard Error | 31.36 on 41 DF | 25.26 on 41 DF | 30.26 on 41 DF | 31.97 on 41 DF | 33.64 on 41 DF | 28.95 on 41 DF |

Note: Standard errors are in parenthesis. Levels of significance shown as: # 10%, * 5%, ** 1%, *** 0.1 %

Chapter 4: Factors that Influence Willingness to Pay for Curbside Recycling

INTRODUCTION

This chapter will address two further issues, both associated with willingness to pay for recycling. The third issue addressed by this research is the determination of willingness to pay to maintain a curbside recycling program where one already exists. Issue three examines how much more (if any), households would be willing to pay to maintain their curbside services and which socioeconomic factors are important in determining household willingness to pay. The fourth issue in this research is the determination of willingness to pay to implement a curbside recycling program where one does not yet exist. Issue four assesses the household willingness to pay to implement curbside recycling and the influence that socioeconomic factors have on that willingness. The null hypothesis is that within the three small cities, willingness to pay to maintain (or implement) curbside recycling will not be any different from willingness to pay to have access to depot recycling only, controlling for socioeconomic variables. The alternate hypothesis is that within the three small cities willingness to pay to maintain (or implement) curbside recycling will differ from willingness to pay to have access to depot recycling only.

The section of the survey addressing the willingness to pay issues followed closely Blaine et. al. (2005) who compared two different contingent valuation methods (payment card and referendum) for determining household willingness to pay to maintain curbside recycling. They wished to determine if, and how much, respondents would be willing to pay in order to have their curbside recycling program continue in the face of budget cuts. Blaine et. al. (2005) asked half of their respondents the study question using the payment card method and the other half of the respondents using the referendum method. This study used only one of the two contingent valuation methods (payment card) and asked half of the respondents if they were willing to pay to maintain a curbside program and the other half if they were willing to pay to implement a curbside program.

A 2006 study by Aadland & Caplan examined the social net benefit of curbside recycling. Willingness to pay was measured by comparing mandatory versus voluntary programs in a survey using dichotomous choice questions. This research is fairly similar in

that the three small cities compared here essentially fall into the two different categories that they set out, mandatory or voluntary. The main difference lies in the survey method and final aim.

Residents of Kamloops are not charged an extra fee of any kind (over and above City Utilities) to use the city recycling depots in contrast to the curbside collection program, which currently costs each household to which it is provided \$36 per year. In Vernon and Merritt there is also free recycling at depots, but of the two, only Vernon has curbside pickup, which costs \$22 per year. Households that do not have access to curbside collection and still choose to recycle are spending their time, effort and money (on fuel) to return recyclables to the depots. If the amount that people are willing to pay for curbside recycling is significantly greater than the amount of time and effort they were willing to spend on depot recycling, then that is a reflection of the value that residents of these three small cities place on convenience. If, however, the opposite is true then cost effectiveness for each city may quickly become an issue.

Essentially willingness to pay for curbside recycling can be equated to the value people place on the recycling system in terms of environmental improvement and for having the convenience of curbside collection of recyclables. The next question that follows in this direction is whether the current pricing of curbside collection (convenience) is the correct price for that service?

METHODS

All survey design and data collection methods can be found in Chapter 2 along with a summary of the descriptive statistics.

Model Specifications

In order to provide an explanation for the next two objectives: willingness to pay to maintain and willingness to pay to implement curbside recycling, the specification to be estimated (including all relevant cities surveyed) was:

$$WTP_i = b_0 + \sum_{j=1}^n b_j x_{ji} + u_i$$

Where:

- WTP_i is the willingness to pay (to maintain or implement) curbside recycling of household i (as chosen from the provided ranges in the survey questions)

- b_j 's are the parameters to be estimated by the multiple linear regression

- u_i is a random error term

-the base case for the model is represented by a respondent who has access to depot recycling only, has a low income, a low education and is of low age¹⁰.

The variables x_{1i} through x_{9i} identify the socioeconomic factors influencing the respondent where:

- x_{1i} is a dummy variable assigned a value of 1 if the respondent has a moderate income, 0 otherwise

- x_{2i} is a dummy variable assigned a value of 1 if the respondent has a high income, 0 otherwise

- x_{3i} is a dummy variable assigned a value of 1 the respondent has a moderate education, 0 otherwise

- x_{4i} is a dummy variable assigned a value of 1 the respondent has a high education, 0 otherwise

¹⁰ Information on three other factors was originally intended to be included, but was dropped due to highly skewed responses. These were dwelling type, member of an environmental organization and neighbours recycle. The first two were dropped due to extremely low variation, responses were almost exclusively 'single family dwelling' for the first and almost exclusively 'not a member of an environmental organization' for the second. The last variable was dropped due to a very high number of N/A responses in the willingness to pay to implement category and very low variation in the willingness to pay to maintain category.

- x_{5i} measured the family size in terms of number of people residing there

- x_{6i} measured ownership or rental of the household, 1 if owner, otherwise 0

- x_{7i} is a dummy variable assigned a value of 1 if the respondent is of moderate age, 0 otherwise

- x_{8i} is a dummy variable assigned a value of 1 if the respondent is of high age, 0 otherwise

- x_{9i} is a dummy variable assigned a value of 1 if the respondent is female, 0 otherwise

It was expected that respondents with moderate to high income as well as moderate to high education would be more willing to pay to maintain or implement a curbside recycling program.

The variable x_{10i} identifies the attitudinal variable influencing the respondent where:

- x_{10i} is a dummy variable assigned a value of 1 through 5, it is a rating, from 1 (lowest) to 5 (highest), given by survey respondents on the priority they place on different issues in their municipalities, including improving environmental quality.

It is also expected that respondents who place a high priority on environmental quality (ie. give it a high rating) would be more willing to pay to maintain or implement curbside recycling.

The variables x_{11i} , x_{12i} and x_{13i} identify the city of the respondent where:

- x_{11i} is a dummy variable assigned a value of 1 if the household is located in Kamloops, otherwise 0

- x_{12i} is a dummy variable assigned a value of 1 if the household is located in Vernon, otherwise 0

- x_{13i} is a dummy variable assigned a value of 1 if the household is located in Merritt, otherwise 0

Finally, it was expected that respondents from Vernon would be more willing to pay to maintain curbside recycling than respondents from Kamloops as they have had their system in place for much longer, and currently pay \$15 less than Kamloops residents.

It was also expected that respondents from Kamloops would be more willing to pay to implement curbside recycling than respondents from Merritt. This is due to the fact that they are seeing firsthand the benefits it is providing to their neighbours as well as the fact that a pay-as-you-throw system has just been implemented in Merritt likely making residents less open to further new fees.

In order to provide an explanation of the third issue, willingness to pay to maintain curbside recycling, the variable WTP_i will represent the willingness to pay to maintain curbside recycling for household i . To test the hypothesis that willingness to pay to maintain a curbside system is significantly higher than willingness to revert to the use of a depot system (controlling for all other socioeconomic factors) the appropriate questions from the survey (see Chapter 2, pages 20 and 21) were analyzed. The third issue will be addressed by determining if there is a significant difference in willingness to pay to maintain curbside recycling as opposed to reverting to depot use, with all other factors controlled for. The b_i 's were the socioeconomic, attitudinal and city parameters are also estimated by multiple linear regression analysis.

An explanation of the fourth issue, willingness to pay to implement curbside recycling, can be provided by estimating a specification similar to the previous section with a couple of exceptions. The variable WTP_i will represent the willingness to pay to implement curbside recycling for household i and the x 's (independent variables) will remain the same. The b_i parameters were again estimated using linear regression analysis (ordered least squares).

In summary the determinants of willingness to pay to implement or maintain curbside recycling are the following: household income, education, family size, home ownership, age, gender, attitudes towards the environment and city. The methods of estimating all willingness to pay parameters were linear regressions (ordered least squares).

RESULTS

Willingness to pay was examined from two different angles, the first being willingness to pay to maintain an existing curbside program. Linear regressions including the majority of the variables were run against willingness to pay to maintain curbside recycling in Kamloops and Vernon¹¹. Willingness to pay to maintain curbside recycling (when curbside and depots are both available) was found to have a significant positive relationship to high educational attainment, high age, environmental rating and City of Vernon (p values = 0.01, 0.02, 0.09 and 0.00 respectively). It was also found to have a significant negative relationship to family size (p value = 0.09). The results of the linear regressions for maintaining curbside recycling can be found in Table 4.1.

The second angle from which willingness to pay was examined was willingness to pay to implement a curbside program. Linear regressions including the majority of the variables were run against willingness to pay to implement curbside recycling in Kamloops (for those respondents who do not currently have access) and Merritt¹⁸. Willingness to pay was positively influenced (when only depots are available) by moderate and high incomes and environmental rating (p values = 0.06, 0.08 and 0.00 respectively). Implementation was also found to have a significant negative relationship to home ownership (p value = 0.08). The results of the linear regressions to implement curbside recycling can also be found in Table 4.1.

¹¹ The base case for these regressions is low income, low educational attainment, low age, and City of Kamloops

Table 4.1. Results of linear regressions by factors influencing willingness to pay (to maintain or implement) a curbside recycling program

| Variable | WTP to maintain | WTP to implement |
|--------------------------------|------------------------|-------------------------|
| Intercept | 11.26 (6.60) | 12.06 (11.84) |
| Moderate Income | -0.34 (3.66) | 10.66 (5.47)# |
| High Income | 2.73 (4.26) | 11.76 (6.63)# |
| Moderate Education | 3.21 (3.07) | -1.56 (6.03) |
| High Education | 7.07 (2.67)** | 6.20 (7.29) |
| Family Size | -2.38 (1.38)# | -2.28 (1.68) |
| Home Ownership | 4.49 (3.86) | -10.78 (5.99)# |
| Moderate Age | -3.82 (5.04) | 1.53 (6.24) |
| High Age | -13.52 (5.56)* | -9.37 (7.42) |
| Gender | -0.32 (1.78) | 6.15 (4.65) |
| Environmental Rating | 1.52 (0.88)# | 5.04 (1.56)** |
| City of Vernon | 6.44 (1.96)*** | NA |
| City of Merritt | NA | -5.07 (4.32) |
| Observations | 129 | 69 |
| Overall Mean | 14.21 | 22.13 |
| Adjusted R² | 0.21 | 0.22 |
| F-statistic | 3.96*** | 2.72** |
| Residual Standard Error | 11.58 | 16.91 |

Note: Coefficients are followed by standard errors in parenthesis, which have been corrected for heteroskedasticity. Levels of significance shown as: # 10%, * 5%, ** 1% and *** 0.1%.

A set of three T-tests were run on the paired variables within each model to determine if there were any significant differences between them (Table 4.2). For the willingness to pay to maintain model (page 85) moderate and high education were found to be significantly different from one another ($p=0.09$), as were moderate and high age ($p=0.01$). Moderate and high income, however, was not found to be significantly different from one another.

The same set of three T-tests was run on the paired variables within the willingness to pay to implement model to determine if there were any significant differences between them (Table 4.2). For this model only moderate and high age were found to be significantly different from one another ($p=0.05$). Moderate and high income and moderate and high education were not found to be significantly different from one another ($p=0.81$ and 0.11).

Table 4.2. T-test comparisons of paired variables

| Willingness to Pay | Moderate Income = High Income | Moderate Education = High Education | Moderate Age = High Age |
|--|--------------------------------------|--|--------------------------------|
| To Maintain Curbside Recycling | -3.08 (2.33) | -3.86 (2.29)# | 9.70 (3.41)** |
| To Implement Curbside Recycling | -1.09 (4.46) | -7.76 (4.82) | 10.90 (5.37)* |

Note: Test values are followed by standard errors in parenthesis.

Levels of significance are shown as: 10% #, 5% *, 1% **, 0.1% ***

A regression tree showing the relative weights of the factors influencing willingness to pay to implement a curbside recycling program in Kamloops and Merritt was also run and the results reported are below (see Figure 4.2). By following this tree it can be seen that respondents who gave an environmental rating of greater than 3.5 (right branch), who live in the city of Kamloops (right branch), and are of moderate age or low age (left branch) would be willing to pay a total of \$43.50 per year to implement a curbside recycling program that was accessible by them. On the other hand, respondents who gave an environmental rating of less than 3.5 (left branch), were of high age (right branch) and were female (right branch) were essentially not willing to pay (\$1) to implement a curbside recycling program that was accessible by them.

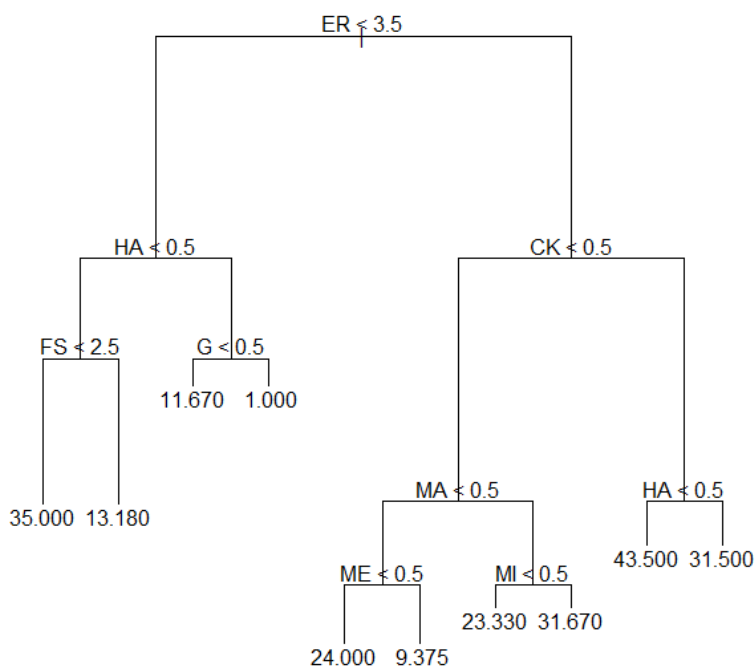


Figure 4.2. Regression tree of variables influencing willingness to pay to implement a curbside collection program

Legend: ER=Environmental Rating, HA=High Age, CK=City of Kamloops, FS=Family Size, G=Gender, MA=Moderate Age, ME=Moderate Education, MI=Moderate Income

INTERVIEW RESPONSES

The environmental services representative that I interviewed from the city of Kamloops was Mr. Glen Farrow. When asked what he perceived to be the most influential factors on recycling activity in Kamloops, his answer was that it is all based on convenience. He reported that diversion is up substantially since the introduction of curbside recycling to single family households in the city, and that the multi-family dwellings that do not yet have curbside service are still not participating too much. One factor that he felt was a drawback affecting the new system is that residents were offered their choice of garbage container sizes. This extends the limits on the amount of waste that can be put out, which on one hand may be necessary for very large families, but on the other hand allows residents who may not need it, the capacity to dispose of greater amounts of waste when they could be recycling more. He also noted that he often gets questions from residents regarding why certain materials, which are recyclable, are not included on the list of items acceptable for collection, such as plastic bags and film. The explanation for this was that certain materials, such as plastic bags and film, tend to clog up the machines used for sorting the recyclables and therefore, they are not wanted in the collection because they cause problems. In addition, there are numerous recyclable materials which have little or no market value, these increase the costs of shipping (to the coast) and processing, which are already approximately \$80 per tonne, but return no revenue. In the current economy these are not acceptable budget expenses. When asked if he felt that there was demand for the expansion of recycling services in Kamloops Mr. Farrow said that he felt there is definitely a demand for services to multi-family dwellings. He explained that a pilot project had been planned for 2009 but that funding was turned down by city council. In addition he noted that commercial cardboard services are also important. He felt, however, that due to the fact that full bans are not yet in place and landfill tipping fees are much lower here than at other sites (\$25 per tonne as compared to \$60 per tonne), that such a program may take more time. As far as the current market demand for recyclable materials Mr. Farrow noted that the returns are improving after a very steep drop but that they were not yet back to the levels they had been prior to the drop. A couple of other programs that came up during the interview were the city's Household Hazardous Waste collection day, as well as the ongoing electronics drop off sites, which he

reported have been successful over the past few years. The last topic that came up was that of green waste collection. He reported that the city has a very successful set of drop off stations for green waste but that a collection program is being considered as a future possibility for the city. Mr. Farrow suggested that it may fit nicely into the collection scheme on alternating weeks with recyclables pickup and that if another proposed program, water meters, were to come into effect that there would likely be an influence seen in the volume of green waste produced.

The environmental services representative that I interviewed regarding the City of Merritt was Mr. Jamie Vieira of the Thompson Nicola Regional District (TNRD). When asked about his perceptions of the factors that influence recycling activity in Merritt he reported that he felt it has increased since the depot bins are now being emptied on a more regular basis (three times a week as opposed to once) and cost sharing between the city and the TNRD has been implemented. He noted that he couldn't speak directly about past years, as the TNRD only took over the collection of Merritt's recyclables a year ago, but that there had been reports of problems with overfull bins and litter. Mr. Vieira also noted that the recent introduction of pay-as-you-throw fees at the landfill has had an influence on participation in recycling as well. When asked if he felt that there was a demand for recycling services he responded that the new garbage and recycling projects were not so much being implemented due to demand but more due to the objectives outlined in the TNRD's current Solid Waste Management Plan. Finally, when market demand was discussed he reported that the TNRD has seen the same trends as the City of Kamloops and that they will continue to ship all of the recyclables they collect to Kamloops.

The environmental services representatives that I interviewed regarding the City of Vernon were Ms. Karmen Peace and Mr. Dale Danallanko from the North Okanagan Regional District (NORD). When asked about their perceptions of the factors that influence recycling activity in Vernon, they reported that they felt participation was good, due to a very convenient collection system with no limits on the amount to be set out each week. They felt that the high percentage of seniors in the city helped to increase participation, but that in contrast, some of the low income areas of the city showed very low participation. They felt

that there is a social pressure on Vernon residents to be 'green' but that there does not seem to be as much inclination to pay to do so. Peace and Danallanko also said that the tipping fees for waste that they need to charge in order provide greater incentive to decrease waste and increase recycling are not acceptable to city council and increases have has to happen in much smaller increments. They found that multi-family collection was a bit more challenging than curbside due to aesthetics issues with the bins used instead of bags. When asked about further demand for curbside collection they reported that there was some in the outlying areas but that due to cost effectiveness issues they likely would not expand curbside services further. Both felt that if all of the garbage collection services were brought together (a number are currently run separately), that an increase in blue bag recycling would likely be the result. When the question of market demand was addressed Peace and Danallanko reported the same trend as seen in the other two cities. Essentially they are paying to process recyclables, which they do at their own facility in the city, and that utility fees that they currently charge cover costs only. Tipping fees have been implemented for most materials at the landfill, while recyclables are free to drop off, but they feel that those fees need to be increased further. The hope is that the markets will return and that they will eventually be able to expand the recycling program further to also include materials such as Styrofoam and textiles.

DISCUSSION

The third issue of concern was to determine the factors that influence willingness to pay to maintain a curbside recycling program relative to a depot recycling program at the household level. The null hypothesis was that willingness to pay to maintain a curbside program would not differ from willingness to pay to have depots only, taking socioeconomic variables into account. The alternate hypothesis was that willingness to pay to maintain a curbside program would differ from willingness to pay to have depots only, taking the socioeconomic factors into account.

Respondents that were of high age, with a high education, from the city of Vernon and those who gave a high environmental rating were found to be more willing to pay to

maintain a curbside recycling program (when curbside and depots are both available) than those of lower age, lower education, from the city of Kamloops or those who gave a low environmental rating. Respondents with large family sizes were less willing to pay to maintain a curbside recycling program (when curbside and depots are both available) than those with smaller families.

The fourth issue of concern was to determine the factors that influence willingness to pay to implement a curbside recycling program relative to a depot recycling program at the household level. The null and alternate hypotheses are the same as those outlined above for willingness to pay to maintain a curbside recycling program.

Respondents who gave a high environmental rating and those with moderate or high income were found to be more willing to pay to implement a curbside recycling program (when only depots are available) than those who gave a low environmental rating and those with lower income. Home owners were less willing to pay to implement a curbside recycling program (when only depots are available) than renters.

Small cities comparison

In theory, for a household to decide to use recycling depots its willingness to pay for recycling (likely due to environmental concerns) must be greater than the opportunity costs of the gas and time taken to sort and drive to the depot. A household whose willingness to pay is not greater than its opportunity costs will not recycle. With the introduction of curbside recycling (a lump sum cost) the opportunity costs are decreased dramatically thereby leaving essentially only the willingness to pay (stemming from environmental concerns) which can be equated with the willingness to pay for curbside recycling. Therefore, the difference between the willingness to pay for curbside relative to depot recycling can be equated to the opportunity cost of using a recycling depot or the willingness to pay for the convenience of having curbside recycling.

There was a definite variation in willingness to pay between the three cities but all three cannot be directly compared. For willingness to pay to maintain a curbside program, the Vernon and Kamloops comparison, (descriptive results, Chapter 2) showed that respondents

from Vernon were most often willing to pay a midpoint average of approximately \$15 - \$20 more per year than were Kamloops respondents. This may, however, be explained by the fact that Vernon residents currently pay \$11 per year less than Kamloops residents do for curbside recycling making the willingness almost equal. In addition, it implies that the 'price of convenience' is reflected in the willingness to pay of both Kamloops and Vernon residents. When assessing willingness to pay to implement a curbside recycling program (Kamloops and Merritt comparison) descriptive statistics showed that respondents from Merritt were willing to pay approximately \$5 less per year than were Kamloops respondents. This may be linked to the recent implementation of a 'pay-as-you-throw' garbage system in Merritt where residents now have to pay a per bag fee to dispose of their garbage. This new system, which has likely been put in place partially to encourage increased recycling, may have been enough of a change that residents are not feeling open to the idea of further fee increases. In Kamloops, however, many residents who do not yet have curbside recycling are hearing about the benefits and conveniences from those who do (and still having to take their recyclables to the depots) and so are willing to pay more to implement such a program.

Small versus large city comparison

Few studies have examined the factors that influence willingness to pay (to maintain or implement) curbside recycling in small cities. Most research has been conducted on larger cities. As with participation, some factors seem to have similar influences in large cities to what I have found in these three particular small cities, but others do not. As mentioned in Chapter three the importance of this result lies in the fact that policies that work for large cities may not be so easily applied to smaller ones, and changes may be necessary. Therefore to illustrate this difference I will again refer back to Chapter one to compare a selection of the reviewed literature to the findings of this study.

Aadland and Caplan (2006) surveyed over 4,000 households from across 40 western United States cities, all with populations over fifty thousand which resulted in a mix of small and large cities. They found that cities with the highest willingness to pay tended to have the highest social net benefits from recycling. Whether the recycling program was mandatory or voluntary did not seem to be a reliable predictor of willingness to pay. Of the 12 select cities

they reported specific information on, 5 were small while the other 7 were large. Of the six cities with the highest willingness to pay half were small cities, while the other half were large.

Blaine et. al. (2005) surveyed 2,000 households from across Lake County, Ohio which has a population of approximately 234,000 making it a large local government area. When assessing willingness to pay using the payment card method they found that respondents who participated were more willing to pay and that the income, gender and age of respondents were also important factors. The only socioeconomic factor in this research, found to be significantly associated with willingness to pay to maintain curbside recycling, was age (participation was not a variable). Only income was found to be significantly associated with willingness to pay to implement a program in this research (participation was not a variable).

Finally, Chapter five will move onto a discussion of participation and willingness to pay in the context of their potential applications and recommendations for policy improvement, as well as the weaknesses and strengths of the study and future directions for research.

LITERATURE CITED

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Blaine, T.W., Lichtkoppler, F.R., Jones, K.R., Zondag, R.H., 2005. An assessment of household willingness to pay for curbside recycling: A comparison of payment card and referendum approaches. *Journal of Environmental Management* 76, 15-22.

Chapter 5: Conclusion

The factors that significantly influenced the overall rate of participation in curbside recycling, issue one, were found to be having access to curbside recycling only, having access to both curbside and depot recycling and high age. Access to curbside recycling has been provided to essentially all Vernon residents and all of the single family dwellings in the Kamloops area, but not to the Merritt area. So for Merritt if overall participation in recycling is to be increased then the first step could be to consider the implementation of a curbside program. For Vernon since a curbside program is already in place for both single and multifamily households the next step may be to focus on the moderate and low age groups, who report lower overall participation, by implementing targeted educational campaigns. In Kamloops the next steps could be to implement curbside programs for those who do not currently have access to them, as well as to implement targeted educational campaigns to the lower age groups. Tucker & Speirs, (2003) note that improvements must be supported by effective education campaigns focused on the shortfalls of households use (of curbside recycling programs). If increased education about the different recycling options is made available, the benefits of doing so and how recycling is already making an impact are the focus then increased overall participation should be the result. In addition maintaining access to both the curbside program and drop off depots will likely keep participation rates higher for both Kamloops and Vernon. Phasing out depots is not recommended as rates of participation appear to be higher with both systems than with just one or the other as seen in Vernon (to some degree) and in Merritt.

In issue two, the factors that significantly influenced the rate of participation in curbside recycling of each of the different material types, were very similar to those found for the first issue examined. Four of the materials: newspaper, cardboard, mixed paper and plastic, shared the same three significant influences on participation rates as the overall assessment. The three factors found to have a significant impact on the rate of participation in glass recycling were having access to curbside recycling only, having access to both curbside and depot recycling and giving 'the improvement of environmental quality' a high ranking among other issues in the municipality. No significant influences were found for metal, the sixth material. As the findings of hypothesis two are so similar to those of hypothesis one the

recommendations for potential applications of these findings are the same as those discussed above.

The factors that significantly influenced the willingness to pay to maintain a curbside recycling program, issue three, were found to be both positive and negative. The factors which had a significant positive influence on willingness to pay to maintain included: city (of Vernon), high education and environmental rating. The factors which had a significant negative influence were age and family size. Education and environmental rating were found to be two prominent factors correlated with high willingness to pay. So, as with the participation issues examined, increased education with a focus on quick and inexpensive ways to do so, could make a positive influence. Such campaigns should be directed towards larger families and those with mature members.

In issue four the factors that significantly influenced the willingness to pay to implement a curbside recycling program were also found to be both positive and negative. The factors which had a significant positive influence on willingness to pay to implement a curbside recycling program included: environmental rating, moderate income and high income. The factor which had a significant negative influence was home ownership. Although education is not a prominent factor in this hypothesis it is likely an important tool in increasing participation and in this case such efforts should be focused on lower income home owners.

A comparison of some particular variables found to be significant to overall participation, and those found to be significant to willingness to pay to maintain or implement a recycling program, revealed some interesting points. While being of high age was found to be positively significant to participation it was found to be negatively significant to willingness to pay to maintain and negatively related, (although not significant), to willingness to pay to implement. In my opinion this shows that the seniors in these three cities have, and are willing to spend the time to recycle, but are not willing to pay any more, or even as much as they already do, for recycling services. It was also interesting that education and environmental rating were found to be significant to willingness to pay but not to participation. I also think that these variables come into play more strongly when one

is considering whether they would be willing to spend their money on a service as opposed to their time to do it themselves.

When representatives from each of the three cities within the study were interviewed regarding their views on the most important factors influencing participation the responses reflected many findings of this research. The main factors reported were convenience, by the City of Kamloops, access, by the City of Merritt/TNRD and convenience along with social pressure to be green, by the City of Vernon/NORD. Since the implementation of the curbside recycling program Kamloops has seen a substantial increase in recycling participation. This is likely as a result, in part, of the convenience of now having bins at curbside. After the TNRD began collecting depot recyclables much more frequently in the City of Merritt residents were able to drop off materials much more often without finding the bins overfull. With the introduction of waste disposal fees they were also much more likely to increase recycling to decrease wastes and the costs associated with disposing of them. Since the City of Vernon has no limits on the amount of recyclables that can be put out for curbside collection each week their program is very convenient and with a social pressure to be green many residents likely feel some extra obligation to participate. All three cities reported that revenues for recyclables dropped substantially, and are returning but have not yet reached the prior level, which reflects what has happened in global markets recently. Lastly, when asked about further demand for collection services both the City of Kamloops and the City of Merritt/TNRD felt that expansion was likely and the City of Vernon/NORD reported that expansion is unlikely. This makes sense as the City of Vernon has had recycling programs in place for much longer than either the City of Kamloops or the City of Merritt and has had the time to expand already whereas the other two are just starting out.

When the creation of new or the adjustment of current recycling policies within the any of the three small cities is necessary the findings of Campbell (1996) may warrant consideration. He views sustainable development as the center of three fundamental planning aims: economic development, environmental protection and social equity. He also notes that most problems amongst these aims are due to misunderstandings arising from the disparate languages of environmental, economic and political thought. Campbell feels that many planners may strive to balance all three aims but that professional and fiscal constraints may

drastically limit what can be achieved. He does continue, however, to say that planners need to act as translators, assisting each group to understand the priorities and reasoning of the others. In addition to this newer method of working towards sustainable development he notes that technological improvements, such as recycling among others, do help to reduce the consumption of natural resources. Overall, consideration of Campbell's work and the findings of this research may be worthwhile before policy adjustments are made. Further research into the factors that most significantly influence rates of participation in and willingness to pay for recycling in small cities is also recommended.

One weakness of this study is the small sample size returned from each city. Although 300 surveys were sent to each of the three cities returns averaged around 30 percent, under 100 surveys were returned from each city. A larger sample size would have been preferred but was not feasible due to research funding. One way that this issue was dealt with was grouping by recycling system for participation or by access to curbside recycling for willingness to pay in order to increase sample sizes being tested. Another issue was that of selectivity bias, it is likely that the survey responses received tend more towards respondents giving positive or constructive feedback and lacking in those giving negative feedback. This is due to the fact that potential respondents who received the survey and are involved and interested in recycling are more likely to return the survey with positive feedback than those who do not have an interest. If a potential respondent has no real interest in recycling they will be less apt to be interested in filling out and returning a survey regarding recycling, unless protest is the aim. Finally, there is also an issue with the willingness to pay data. A spike of zero responses representing those not willing to pay (to maintain or implement) is found in both data sets (see Figures 2.5 and 2.6) but is more prevalent in the willingness to pay to implement data. Although there are statistical ways of correcting for this issue they were felt to be beyond the needs of this particular project.

The strengths of this study are that it evaluated a little explored topic, participation and willingness to pay for recycling in small cities. Also, it has produced results that are useful and implementable to the local policies of the three small cities it examined.

Participation in and willingness to pay for, curbside recycling have been fairly extensively researched from a number of various angles. For participation this includes

respondent reported as well as observed participation as in Shaw et. al. (2007), and exploration of a wide range of other factors that may influence it as in Hamburg et. al. (1997), Harder et. al (2006) and Woodard et. al. (2006). Different valuation methods have been used to compare reported willingness to pay in order to determine if they elicit varying responses as in Blaine et. al (2005). Other research has aimed to determine models which predict whether a city ought to implement, maintain or pass on curbside recycling based on the costs versus benefits (Aadland & Caplan, 2006).

The majority of this research, however, seems to have been in large or a combination of large and small cities with very little focus on small cities alone in comparison to larger centers. New research avenues that could be explored include the examination of current literature to determine the percentage of small city studies and the comparison of those studies to large city research. Following that, other small cities could be suggested for assessment so that the influential factors if different from those of large cities could be determined and policies adjusted accordingly.

There are three main future research directions in this area of study that ought to be concentrated on. The first direction is an examination of the current literature to determine what percentages of studies actually focus on recycling related policy in small cities. This could be fairly easily accomplished through a thorough literature review, and a meta-analysis of the respective findings. The second direction is to carry out research focused on small cities. This could be achieved by selecting a reasonable number of small cities with and without curbside recycling programs, and surveying them as was done here. The third direction is to examine the effectiveness of education programs implemented in small cities in order to increase participation in recycling. In order to attain such information a full review of the literature would be needed and small cities with educational programs aimed at increasing participation would have to be identified (or such programs would have to be put in place and monitored).

It was found that people in three small cities in the interior of BC value curbside recycling and are willing to pay either to implement such a system or to maintain that system. Thus households in the interior of BC place a value on having a cleaner environment, and also to the convenience of the curbside recycling system. It is important that the research

discussed above be followed up on as it may help to make a small but important impact on the reduction of global warming and our influence on the environment. There has been for some time a slow shift in societal views of the environment, and many governments have responded to this shift and implemented waste reduction targets to increase sustainability and decrease negative impacts. Many municipalities have put curbside recycling programs into practice to divert waste from landfills (Woodard et al, 2006). The findings and recommendations contained herein, on how to increase participation and willingness to pay, which will in turn increase the diversion of wastes through recycling, are practical and implementable as a part of local policy in small cities. By increasing participation in and willingness to pay for recycling, and hence the volume of wastes diverted, local negative impacts can be reduced.

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