Determinants Of Residents' Recycling Behaviour

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ABSTRACT

Environmental concerns, combined with the scarcity of landfill sites have made recycling a more desirable alternative to traditional methods of garbage disposal. The purpose of the paper is to determine the factors that influence recycling behaviour. We also examine the socio-demographic characteristics of those who recycle. Logistic regression and means-end-based laddering techniques are used. The results of this research should be helpful in designing public campaigns to promote recycling.

Keywords: Determinants of recycling; Means-end analysis; Laddering; Logistic regression

INTRODUCTION

*I*n recent years, recycling has become more popular with both residents and governments, mainly due to environmental concerns and the scarcity of new landfill sites. In North America, the Province of Ontario has been a leader in recycling programs and has introduced legislation requiring municipalities to divert 60% of their garbage from landfill sites. Local municipalities, however, are nowhere near meeting this requirement. For example, the Region of Niagara is one of the most progressive of Ontario's municipalities with respect to recycling but only has 42% diversion.

The purpose of this research is to determine the factors that influence recycling behaviour. Logistic regression and the means-end-based laddering technique are used to analyze the results of a survey of the residents of the Region of Niagara, a typical Ontario region of 400,000 population. The socio-demographics of those who recycle are also examined. The importance of the factors should be helpful in the design of new programs.

LITERATURE REVIEW

The literature on recycling behaviour as to what determines residents to recycle is extensive. Initial efforts typically concentrated on traditional demographic variables. Overall, the findings were rather inconsistent or provided limited explanatory content at best. For example, with respect to gender, some studies found that women recycle more than men (e.g., Knussen et al., 2004; Tonglet et al., 2004b; Meneses and Palacio, 2005), whereas other studies found no differences (e.g., Domina and Koch, 2002; Corral-Verdugo, 2003; Robinson and Read, 2005). With respect to age, some studies found that older persons participated in recycling programs to a larger extent than younger people (e.g., Williams and Kelly, 2003; Tonglet et al., 2004a; Smallbone, 2005; Hansmann et al., 2006; Martin et al. 2006), whereas other studies found no differences (e.g., Corral-Verdugo, 2003; Do Valle et al., 2004; Ferrara and Missios, 2005). With respect to income, some studies found that households with higher incomes recycled more than lower income households (e.g., Domina and Koch, 2002; Corral-Verdugo, 2003; Robinson and Read, 2005; Smallbone, 2005; Martin et al., 2006), whereas other studies found no such relationship (e.g., Do Valle et al., 2004). Likewise household size was found to be significant by some (e.g., McQuaid and Murdoch, 1996; Tonglet et al., 2004b) but not by others (e.g., Jenkins et al., 2003; Ferrara and Missios, 2005). With respect to education, most studies found no differences (except, for example, studies by Scott and Willits, 1994; Jenkins et al., 2003) as did studies of the professions. In some cases, home ownership and living in a single-family housing were found to be determinants of recycling (e.g., Jenkins et al., 2003; Ferrara and Missios, 2005; Robinson and Read, 2005) whereas other studies found no relationship (Jakus et al., 1996, 1997).

Another group of studies considered incentives to recycle such as coupons, brochures and prizes. Such incentives have been criticized as being ineffective (e.g., Katzev and Pardini, 1987; Spaccarelli et al., 1989; Noehammer and Byer, 1997), or, even when they worked, to be temporary because once they were removed, recycling behavior returned to its original state (e.g., Katzev and Johnson, 1984; Stern and Oskamp, 1987). Other authors, however, found the incentives to be effective (e.g., Dahab, Gentry, and Su, 1995).

Somewhat related research focused on bag limits and user fees but the results were again mixed. For example, Hong et al. (1993), Thogersen (2003) reported a positive relationship between the amount recycled and marginal pricing whereas Reschovsky and Stone (1994), Jenkins et al. (2003), Ferrara and Missios (2005) found either negligible or a negative impact of such policies on recycling.

Other studies examined inconvenience and the personal effort required to recycle (e.g., McCarty and Shrum, 2001) Easy access was shown to have a positive impact on the amount recycled (e.g., Perrin and Barton, 2001; Speirs and Tucker, 2001; Domina and Koch, 2002; Gonzales-Torre and Adenso-Diaz, 2005) as did convenient recycling schemes (e.g., Ebreo and Vining, 2000; Woodard et al., 2005; Martin et al., 2006). Some studies found collection frequency to be important (e.g., Noehammer and Byer, 1997; Ferrara and Missios, 2005), whereas other studies did not (Everett and Peirce, 1993) did not. Lack of storage space in the household or not enough material to recycle were other factors mentioned by non-recyclers as   obstacles to re-cycling (e.g., Evison and Read, 2001; Perrin and Barton, 2001; McDonald and Oates, 2003; Robinson and Read, 2005).

There were also studies that examined the effect of mass-media communication and local promotional campaigns (e.g., McDonald and Oates, 2003; Robinson and Read, 2005; Grodzinska-Jurczak et al., 2006). Some found that social influence was not a factor in encouraging non-recyclers to recycle (e.g., Vining and Ebreo, 1990) whereas others found that recycling behavior was influenced by the views of those who were considered to be important (e.g., Read, 1999; Tucker et al., 2001; Bruvoll et al., 2002; Do Valle et al., 2004; Barr and Gilg, 2005).

Another stream of research investigated the relationship between attitudes and recycling. Some studies (e.g., Knussen et al., 2004; Mannetti et al., 2004; Tonglet et al., 2004b) found attitudes to be significant predictors of recycling whereas other studies found no such relationship (e.g., Davies et al., 2002). Related research that concentrated on less-specific environmental attitudes, such as a general environmental concern, also could not differentiate between recyclers and non-recyclers (e.g., Lee and Holden, 1999; Domina and Koch, 2002; Barr and Gilg, 2005).

Another group of studies analyzed recycling from the perspective of consumers' environmental knowledge. The research however was inconclusive; some studies found that recycling knowledge was positively related to recycling behavior (e.g., Perrin and Barton, 2001; Do Valle et al., 2004; Mee et al., 2004; Hansmann et al., 2006), whereas others found no such relationship (Bagozzi and Dabholkar, 1994).

Finally, there was also research that focused on intrinsic motivators such as personal goals and beliefs. For the most part, positive relationships between these variables and ecological behaviour were determined (e.g., DeYoung 1985/1986, Ebreo and Vining, 2000; Bruvoll et al., 2002; Corral-Verdugo, 2003; Cleveland et al., 2005). A few studies, however, found no relationship (e.g., Oskamp et al., 1998).

The inconsistency of the results indicates there is no one variable that can be identified as the key determinant of recycling. Thus recycling behaviour is likely to be influenced by a variety of factors such as socio-demographics, attitudes, personal values, situational variables, intentions, etc. Consequently, recycling behavior can be modeled from a wide-ranging perspective be it factor analysis (Howenstine, 1993; Tonglet et al. 2004a,b), multiple regression analysis (Bagozzi and Dabholkar, 1994; Sterner and Bartelings, 1999; Corral-Verdugo, 2003; Tonglet et al. 2004a,b; Berglund, 2006), laddering technique (Bagozzi and Dabholkar, 1994) or structural equations (McCarty and Shrum, 1993; Mannetti et al., 2004, Cleveland et al., 2005; Fraj and Martinez, 2006). In this study, we likewise use a comprehensive approach by examining the simultaneous impact of socio-demographics, attitudes, and personal goals on recycling.

SAMPLE AND SURVEY

To determine the relationships among recycling-specific variables of interest, we surveyed over 400 residents in the Region of Niagara, Ontario, Canada. Respondents were chosen at random from the local telephone directory and included those who recycled and those who did not. University students trained in interview techniques conducted the survey during the last two weeks of June 2005. Our sample size produces a level of accuracy of plus or minus five percentage points, nineteen times out of twenty. In the sample, 382 residents (92%) declared themselves as regular recyclers and 33 (8%) as non-recyclers. These results are similar to Ferrara and Missios' (2005) survey of 12 Ontario municipalities.

Our procedure consisted of three parts. For those who recycled, the first part included behavioural questions as to how, what, and how much they recycle (expressed as a percentage of the recycled material - Table 1).

In the second part, the Means-End Chain (MEC) theory and the laddering technique (Gutman, 1982; Reynolds and Gutman, 1988) were used to determine their recycling goals.

The respondents were also asked to list all the positive and negative features of the current recycling program in the Region and to suggest changes that would make the program more effective. They were asked who or what had the greatest influence on their decision to recycle and why they thought others did not recycle (Table 2).

Non-recyclers were asked why they did not recycle and also why they thought others did not recycle. The third part requested socio-demographic characteristics and is presented in Table 3 for recyclers and in Table 4 for non-recyclers.

Measures used in this study were based on the theoretical framework of the Theory of Planned Behaviour (TPB) (Ajzen, 1991). We measured personal recycling behaviour as the amount of material typically recycled by a household (Variable 3 in Table 1), expressed as a binary variable taking the value of one, if the amount was greater than 50%, and zero otherwise. The objective of this study was not to test the TPB, a task that typically requires the use of interval-type data. Our study has deliberately been designed as a qualitative approach, albeit followed by rigorous coding procedures and quantitative analyses. With the exception of the socio-demographic and recycling-related behavioral measures, where pre-determined categories were used, the remaining items allowed the respondents to offer their own reasons for participation or non-participation and describe freely what they like or don't like in their current municipal recycling program. Interestingly, despite the open-ended approach used, the attitudinal measures provided a number of elements typically found in the TPB models. Categories that emerged from the first three questions (Table 2) could loosely be described in terms of attitudes towards recycling as well as the perceived behavioural control and situational factors, e.g., recycling is easy/convenient, recycling is time consuming/inconvenient, the recycling program is well (or not well) organized, everything in the program is good (or bad), they do not pick up all items in one week, they do not pick up everything, they should promote recycling, they should impose fines for not recycling, etc. The next question (Variable 4 in Table 2) measured the influence of others on the individual's decision to recycle (the subjective norm), and the last question (Variable 5 in Table 2) assessed the individual's perception of those who do not recycle (the moral norm). Finally, we considered two additional groups of variables – recycling goals and socio-demographic variables. Recycling goals were used by Bagozzi and Dabholkar (1994) in their expanded model of the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980) – a predecessor of the TPB. The consequences of recycling used by Tonglet et al., (2004a) in their expanded model of the TPB, such as "recycling saves energy", or "recycling reduces the amount of waste that goes into landfill", could also be considered as goals (reasons) for recycling. As to the socio-demographic variables, they are not assumed to be explicitly incorporated into the TRA and TPB frameworks. Ajzen and Fishbein (1980) did recognize, however, that socio-demographic variables may influence behaviour in an indirect way, through other mediating components of the model. In our study, we used socio-demographics as control variables when analyzing their impact on the recycling behaviour.

Table 1: Description of recycling-related behavioral variables

Variables	Sample results
1. Measure of recycling activity:	
Yes, we do recycle	92%
No, we do not recycle	18%
2. Method of recycling:	
Curbside blue/gray box	92%
Drop-off location in my building	6%
Neighborhood recycling center/bin	5%
Composting	19%
Other way/location	12%
3. Measure of recycling intensity:	
A large amount of recycled material	
50% or more	52%
A small amount of recycled material	
Less than 50%	43%
4. Recycled products:	
Paper products/newspapers	99%
Aluminum products	73%
Plastic products	89%
Glass products	75%
Kitchen waste	54%
Styrofoam	41%
Hazardous material	22%
Other material (e.g., garden waste)	41%

Table 2: Description of recycling-related attitudinal variables

Variables	Sample results
1. What do you like about the current recycling program in the Region?	
It's easy	23%
It's well organized	29%
Everything is OK	30%
Everything is bad	4%
I have no idea	9%
2. What don't you like about the current recycling program in the Region?	
Boxes are expensive	6%
It's time consuming	8%
They don't pick all boxes	14%
Everything is OK	35%
I have no idea	34 %
3. What can the Region do to make recycling more attractive?	
Promote recycling	11%
Impose fines for not recycling	4%
Provide more containers and for free	23%
Everything is OK	15%
I have no idea	45%
4. Who had the greatest influence on your decision to recycle?	
Family/friends	27%
City/media/promotions	28%
Myself	39%
I have no idea	6%
5. In your opinion, why do you think others don't recycle?	
They are lazy	59%
Lack of education	10%
Lack of time	16%
Personal reasons	7%
I have no idea	7%

ANALYSIS AND RESULTS

To analyze the results, we first applied bivariate cross-tabulations to determine whether any significant associations existed between socio-demographic/attitudinal variables and the amount recycled. Second, we used a binary logistic model to analyze relationships between the amount recycled and the attitudinal variables, with socio-demographics as control variables. Third, we applied the means-end chain theory (MEC) and the laddering technique (Gutman, 1982; Reynolds and Gutman, 1988) to determine the recycling goals of the residents. Finally, we examined associations between the attitudinal variables and the recycling goals.

(i) Cross-tabulations: We used the chi-square statistic (χ^2) to test the significance of the observed associations in cross-tabulations of socio-demographic/attitudinal variables and the amount recycled, which was classified into two categories: "a large amount" (50% or more) and "a small amount" (less than 50% of material), as it is presented in Table 1.

For the socio-demographic variables, our results turned out to be consistent with previous research that home ownership and place of living are significantly ($p < 0.05$) associated with intensity of recycling. Among home owners, 59% recycled "a large amount', whereas only 33% of renters belonged to this category. Similarly, among residents who lived in a house, 59% recycled "a large amount", while only 26% of those living in an apartment were strong recyclers.

Also age turned out to be significantly related, a result obtained in many (but not all) studies. Among residents who recycled "a large amount", 10% were 18 to 25 years old, 31% belonged to the 26-45 age cohort, 45% were 46 to 65 years old, and 14% were more than 65 years of age.

Gender, income, education, profession, and household size, however, were not significant. Neither were three additional variables that we used in our study, person responsible for recycling, place of birth, and years of residence in the current location.

For the attitudinal variables, only advice given to the Region to make recycling more attractive (Variable 3 in Table 2) and perceived reasons why others do not recycle (Variable 5 in Table 2) were significantly associated with the amount recycled. Among residents who recycled "a large amount", 39% did not offer any advice, 23% suggested improvements to the program such as bigger/free boxes and more frequent pickups, 17% thought that no changes were needed, 15% opted for better education and promotion of recycling, and 6% proposed fines for not recycling.

Table 3: Socio-demographic measures of 382 recyclers

Gender		Education		Place of birth	
Female	59%	College or more	59%	Canadian-born	82%
Male	38%	High school or less	37%	Foreign-born	15%
Age		**Family income ($CAD)**		**Household size**	
Age 18 to 25	11%	Under 30,000	14%	1 person	15%
Age 26 to 45	33%	30 to 50,000	15%	2 people	33%
Age 46 to 65	38%	51 to 100,000	23%	3 people	18%
Age 65+	15%	Over 100,000	7%	4 people	16%
				5 people	16%
Place of living		**Profession**		**Years in the community**	
House	86%	Retired/unemployed/		Less than 2 years	2%
Apartment	12%	/housewife (stay-home)	37%	2-10 years	10%
_____		Worker/administration/store		11-25 years	24%
Home ownership		clerk (regular-hours-work)	24%	More than 25 years	53%
Own	80%	Professional/business owner			
Rent	16%	(irregular-hours-work)	22%		
		Student	8%		

Table 4: Socio-demographic measures of 33 non-recyclers

Gender		Education		Place of birth	
Female	73%	College or more	45%	Canadian-born	67%
Male	27%	High school or less	48%	Foreign-born	33%
Age		**Family income ($CAD)**		**Household size**	
Age 18 to 25	15%	Under 30,000	12%	1 person	36%
Age 26 to 45	33%	30 to 50,000	12%	2 people	33%
Age 46 to 65	18%	51 to 100,000	3%	3 people	18%
Age 65+	33%	Over 100,000	3%	4 people	3%
				5 people	6%
Place of living		**Profession**		**Years in the community**	
House	45%	Retired/unemployed/		Less than 2 years	0%
Apartment	55%	/housewife (stay-home)	36%	2-10 years	30%
_____		Worker/administration/store		11-25 years	21%
Home ownership		clerk (regular hours work)	9%	More than 25 years	48%
Own	30%	Professional/business owner			
Rent	67%	(irregular hours work)	9%		
		Student	12%		

Among residents who recycled "a large amount", only 8% had no idea why others do not recycle; a majority (58%) thought that they were simply lazy, 17% pointed to a possible lack of time, 10% - to lack of environmental knowledge, and 7% - to some unspecified personal reasons.

Table 5: Logistic regression results; Dependent variable: The amount recycled; n = 382

	Model 1	Model 2
What can the Region do?[1]		
Promote		1.496**
Impose_Fines		2.530*
All_Is_OK		.848*
Improve_Boxes		.181
Why others do not recycle?[1]		
Laziness		.907†
Lack_of_Education		.585
Lack_of_Time		1.503**
Personal_Reasons		.618
Control variables		
Age[2]		
Age18_25	-.387	-.304
Age25_45	-.818**	-.863**
Age65+	-.528	-.638†
Place of living[3]		
Live_In_House	1.126**	1.400**
Home ownership[4]		
Owner	.708*	.515
Hosmer and Lemeshow χ^2	*.315*	*13.735*
	(p = .989)	*(p = .089)*
Overall χ^2	*30.30***	*59.41***
Δ Overall χ^2		*29.11***
-2LL	*448.80*	*406.50*
Overall % correct	*62.4%*	*67.3%*
Nagelkerke R^2	*.112*	*.215*

Regression coefficients: ***p < .001; **p < .01; *p<.05; †p < .10; two-tailed tests*

[1] *'I have no idea' used as base category*

[2] *'Age45_65' used as base category*

[3] *'Live in apartment' used as base category*

[4] *'Renter' used as base category*

(ii) Binary Logistic Regression: We used binary logistic regression to estimate the coefficients of a model with the dependent variable taking a value of 1, when the amount of recycled material is large (50% or more), and 0 otherwise (Variable 3 in Table 1). In the first step, the three significant socio-demographic variables, home ownership, place of living, and age, were entered with the reference categories "rent", "live in an apartment", and "45-65 years old", respectively. The results of the binary logistic regression are shown in Table 5 (Model 1).

As expected, both being an owner and living in a house are positively and significantly correlated to the probability of recycling "a large amount" of material. The age variable is also significant - those who are 25 to 45 years old are less likely to recycle "a large amount" of material compared to residents in the 45 to 65 age category. The model's fit (-2LL = 448.80; Nagelkerke R^2 = .112; percent predicted correct = 62.4%; Hosmer and Lemeshow χ^2 = .315, p = .989) is quite acceptable considering that the amount of explained variation in the dependent variable reported in other studies on household recycling behavior was often between .10 to .20 (e.g., Bagozzi and Dabholkar, 1994; Sterner and Bartelings, 1999; Berglund, 2006), percent predicted correct was frequently between 50%-60% (Salkie et al., 2001), and -2LL values were often above 500.00 (Jenkins et al., 2003; Ferrara and Missios, 2005; Berglund, 2006).

In the second step, the two significant attitudinal variables 3 and 5 (Table 2) were added to the model with the "I have no idea" as the reference category. The results are shown in the Table 5 (Model 2).

Among the socio-demographic variables, only place of living and age remained significant, thus suggesting that the ownership status may, after all, not be important in describing recycling behaviour. The significant and positive coefficients of the first three categories of the attitudinal variable "Advice given to the Region as to the ways to improve the recycling program" (Variable 3 in Table 2) suggest that people who can articulate their opinion with this regard are better recyclers than those who have no idea what advice to offer. Finally, residents who think that others do not recycle because of laziness or lack of time, recycle more than those who cannot give any reason for such behaviour (Variable 5 in Table 2).

In the expanded model (Table 5, Model 2), the measures of model fit improved. The -2LL value decreased to 406.50, Nagelkerke R^2 increased to .215, percent predicted correct increased to 67.3%, and Hosmer and Lemeshow χ^2 = 13.735 remained insignificant (p = .089), as desired. Model 2 explains a significant incremental variance in the amount recycled over Model 1 ($\Delta\chi^2$ = 29.11; p < .001)

(iii) Laddering: We used the means-end chain theory-based laddering technique (Gutman, 1982; Reynolds and Gutman, 1988) to determine the importance of the reasons that influence the decision to recycle. The laddering technique in its conventional form elicits from respondents three interconnected layers of information: attributes (A), consequences (C), and values (V). The A-C-V approach works best for physical products/services, or when the consequences of acting are concrete and tangible (Bagozzi and Dabholkar, 1994). Recycling, however, involves rather abstract goals, which limits the traditional laddering approach. More recently, the approach has been modified to involve a wide variety of intangibles not readily described by physical properties such as weight loss goals (Pieters et al., 1995), recycling goals (Bagozzi and Dabholkar, 1994), or studying for exams (Gutman, 1997). In these studies, the attributes (A), consequences (C), and values (V), are considered to be elements in a goal hierarchy whereby the recipient breaks up a complex and intangible problem into a series of smaller problems that can be managed better over an extended period of time.

We began by asking respondents whether they recycled or not. If the answer was positive, they were asked to provide their motives for recycling followed by the reasons as to why the motive was important to them. The respondents who did not recycle were asked why they did not recycle followed by another question as to why they thought others did not recycle. This procedure matched closely the laddering approach used by Bagozzi and Dabholkar (1994). The 382 recyclers mentioned a total of 1,122 motives and reasons which we subsequently reduced by content analysis to 18 recycling goals (Table 6). Our list of goals turned out to be almost identical with the list obtained by Bagozzi and Dabholkar (1994).

The results were then aggregated across all respondents and arranged in a matrix that displays the number of times each goal leads to each other goal. Following a procedure described by Pieters et al. (1995), we calculated

levels of abstractness of goals and ordered the goals from concrete goals at the bottom of the hierarchy of goals to abstract goals at the top (Table 6).

To gain additional insight as to the importance of different goals, two additional measures of goal prominence were computed, centrality and prestige (Knoke and Burt, 1982). Considering the percentage of recycling goals mentioned, as well as the prominence measures (Table 6), we removed from further analyses the least important goals: *G4, G5, G8, G10, G11, G12*, and *G13*.

(iv) Associations between the attitudinal variables and recycling goals: It might be hypothesized that goals should influence the decision to recycle indirectly through their impact on the attitudinal variables (Bagozzi and Dabholkar, 1994). To explore this hypothesis, we used cross-tabulations to test the statistical significance of associations between the recycling goals and the attitudinal variables. We focused only on those variables that had previously been found significantly associated with the amount recycled, "What can the Region do to make recycling more attractive?" and "In your opinion, why do you think others do not recycle?"

Only one goal was statistically significantly ($p < .05$) associated with the first variable, namely goal G14 ("It's the right thing to do"). Among the residents who recycled mainly because they thought it was simply the right thing to do (G14), 23.8% wanted better promotion, 14.3% wished the boxes were improved, 3.3% wanted the Region to impose fines for not recycling, while 52.4% had no idea what to suggest.

Two other goals were statistically significantly ($p < .05$) associated with the second variable – goal G3 ("Avoid filling up landfills") and goal G16 ("Provide for future generations"). A majority (63%) of those who wanted to avoid filling up landfills (G3) thought that non-recyclers were lazy, 20.7% pointed to lack of time, and 9.8% - to lack of education. Only 2.1% could not name a reason why others do not recycle. A similar distribution of answers was among those hoping to provide for future generations (G16) – 64.4%, 17.2%, 8.0%, and 1.1%.

Thus, out of the 11 retained goals, only three were significantly associated with the two attitudinal variables related to the amount recycled. The multinomial logistic regressions of the attitudinal variables on the recycling goals confirmed these results.

We also investigated whether direct relationships between the recycling goals and the amount recycled could be established. For this purpose, we used cross-tabulations and binary logistic regression. Only one goal (G9: "Reduce pollution") was found to be significantly and directly associated with the amount recycled.

Table 6: Recycling goals and their levels of abstractness and prominence indices

Recycling goal		%[*]	Level of abstractness	Prominence indices: Centrality	Prestige
(*G18*)	Sustain life	13%	1.000	0.095	0.095
(*G17*)	Promote better health/avoid sickness	12%	0.978	0.086	0.084
(*G16*)	Provide for future generations	24%	0.943	0.164	0.155
(*G15*)	Save or earn money	16%	0.885	0.114	0.101
(*G14*)	It's the right thing to do	19%	0.732	0.132	0.097
(*G13*)	Build self-esteem	6%	0.654	0.049	0.032
(*G12*)	Save the planet	3%	0.643	0.026	0.017
(*G11*)	Save resources	9%	0.636	0.062	0.039
(*G10*)	Help the economy	6%	0.609	0.043	0.026
(*G9*)	Reduce pollution	12%	0.605	0.080	0.049
(*G8*)	Help community	4%	0.600	0.028	0.017
(*G7*)	Enhance aesthetic experience	12%	0.596	0.088	0.052
(*G6*)	Reduce messy trash	16%	0.475	0.114	0.054
(*G5*)	It's practical and easy to do	9%	0.452	0.058	0.026
(*G4*)	Obey the law	10%	0.306	0.067	0.021
(*G3*)	Avoid filling up landfills	25%	0.288	0.149	0.043
(*G2*)	Reuse materials	19%	0.159	0.118	0.019
(*G1*)	Save the environment	69%	0.141	0.528	0.075

[*] *Percentage of recycling goals mentioned (out of 382 recyclers).*

CONCLUSIONS

The purpose of this research was to determine the factors that influence recycling behaviour and to examine the socio-demographic characteristics of those who recycle.

In our sample, a very high percentage (92%) declared themselves as regular recyclers. The most widely recycled material was paper products and newspapers (recycled by 99% of respondents), followed by plastic (89%), glass (75%), and aluminum products (73%), kitchen and yard waste (54%), styrofoam (41%) and hazardous (22%). The respondents were, for the most part, pleased with the recycling program and the complaints were minimal. They offered very few suggestions to improve the program.

In terms of the socio-demographic factors, age and place of living (house vs. apartment) were the only significant predictors of recycling. Those 45 to 65 years old were more likely to recycle compared to the other age categories. Among the recyclers, 84% lived in a house and 16% in an apartment whereas among the non-recyclers, 45% lived in a house and 55% in an apartment. Thus, residents of single-residential dwellings are substantially more likely to recycle than those who live in apartments. Twice as many respondents living in a house thought that the recycling program was easy and well organized compared to those living in an apartment. Apartment dwellers were more than twice likely to have no idea as to what they liked about the program. Gender, income, education, profession, household size, place of birth, home ownership, and years of residence in the current location were not significant.

In terms of attitudes, people who offered advice as to what the region should do to improve recycling were more apt to recycle than those who had no advice to offer. Similarly, residents who thought that those who do not recycle because of laziness or lack of time, recycled more than those who offered no reason as to why others did not recycle.

Personal goals turned out to have a limited influence on recycling. Only one goal (G9: "Reduce pollution") was found to be significantly and directly associated with the amount recycled. The explanation is straightforward: residents will not recycle if they find it inconvenient to do so even if they have very well articulated personal recycling goals. These results are consistent with other studies which find inconvenience to be an important barrier to recycling (Perrin and Barton, 2001; Corral-Verdugo, 2003). More effort should therefore be made to improve the convenience within multi-family residential complexes.

In terms of public programs to encourage participation, it is useful to think of three kinds of individuals. First, those who are totally committed and will recycle even in the face of considerable inconvenience or expense; second, there are those who are hostile to recycling and who are unlikely to participate in any recycling program; and third, those who are favorable of recycling, but whose participation in recycling programs is dependent on convenience, personal cost and on the perception that recycling is the social norm. Since the first group will recycle regardless and since the second one will not recycle regardless, the focus should be on the third group by making recycling more convenient. These results are consistent with US studies (e.g., Smallbone, 2005) that the focus should be on the third group who would be willing to recycle if doing so were more convenient. For education programs to be effective, they must be supported by improvements in convenience, such as the provision of free containers and more frequent collections.

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