



Enhanced solid waste management by understanding the effects of gender, income, marital status, and religious convictions on attitudes and practices related to street littering in Nablus – Palestinian territory

Issam A. Al-Khatib^a, Hassan A. Arafat^{b,*}, Raeda Daoud^c, Hadeel Shwahneh^c

^a Institute of Environmental and Water Studies (IEWs), Birzeit University, Ramallah, Occupied Palestinian Territory

^b Chemical Engineering Department, An-Najah National University, Nablus, Occupied Palestinian Territory

^c College of Graduate Studies, An-Najah National University, Nablus, Occupied Palestinian Territory

ARTICLE INFO

Article history:

Accepted 21 February 2008

Available online 7 April 2008

ABSTRACT

Litter is recognized as a form of street pollution and a key issue for solid waste managers. Nablus district (West Bank, Palestinian Territory), which has an established network of urban and rural roads, suffers from a wide-spread litter problem that is associated with these roads and is growing steadily with a well-felt negative impact on public health and the environment. The purpose of this research was to study the effects of four socio-economic characteristics (gender, income, marital status, and religious convictions) of district residents on their attitudes, practices, and behavior regarding street litter generation and to suggest possible remedial actions. All four characteristics were found to have strong correlations, not only with littering behavior and practices, but also with potential litter prevention strategies. In particular, the impact of religious convictions of the respondents on their littering habits and attitudes was very clear and interesting to observe.

© 2008 Elsevier Ltd. All rights reserved.

1. Introduction

Problems with the pollution of roads, public transport facilities, and other public or semipublic spaces exist in many countries, cities, and communities. This is unpleasant from the viewpoint of city hygiene and because of the financial costs associated with the cleanup of these places. Pollution, in many cases, is caused by littering – the careless, incorrect disposal of minor amounts of waste (Cone and Hayes, 1980; Geller et al., 1982; Keenan, 1996; Stokols and Altman, 1987; Hansmann and Scholz, 2003). Litter is a special type of municipal solid waste (MSW). It is distinct from other types of MSW in that it is a solid waste that is not deposited in proper receptacles. Litter includes any solid or liquid domestic or commercial refuse, debris or rubbish. Without limiting the generality of the above, this includes soft drink bottles (both plastic and metal), glass, metal, cigarette butts, small pieces of paper, fabric, chip and confectionery wrappers, fast-food packaging, bottle caps, other bottles, plastic straws, wood, food, abandoned vehicles, abandoned vehicle parts, construction or demolition material, garden remnants and clippings, and soil sand or rocks. Similarly, any other material, substance or thing deposited in a place if its size, shape, nature or volume makes the place where it is deposited disorderly or detrimentally affects the proper use of that place, whether or not it has any value when or after being deposited, is

considered to be litter (Aarne and Alan, 1981; Vasilind et al., 2002; New South Wales Environment Protection Authority (NSW EPA), 2003).

For example, it is estimated that several trillion-cigarette butts are littered worldwide every year – billions of cigarettes flicked, one at a time, on our sidewalks, beaches, nature trails, gardens, and other public places every single day (CigaretteLitter.org, 2006). Cigarette butts also present a threat to wildlife. Cigarette filters have been found in the stomachs of fish, birds, whales and other marine creatures who mistake them for food (Santos et al., 2005a). A total of 200 million cigarette butts and 20 million cigarette packets are discarded in the United Kingdom each day, many onto the ground, accounting for 40% of street litter (Mindell, 2001).

Litter has gone from being viewed primarily as an aesthetic problem to a broader environmental issue (Wang and Pereira, 1980). It is described as something in the wrong place, a wasted material or resource, wrong and bad for the environment, harmful, bringing fear of illness and disease (e.g., syringes and toxic waste), and a result of a consumerist, materialistic society. New sources of litter are becoming increasingly evident. Changing consumer patterns in relation to take-away food and increased use of unsolicited advertising materials are examples of activities that now influence litter (Vasilind et al., 2002).

Three types of negative impacts are associated with litter, none of which are easily quantifiable. One impact is aesthetic blight. Although there is little disagreement with the fact that more litter is uglier than less litter, little work has been done to translate this

* Corresponding author. Tel.: +972 92344267; fax: +972 92344319.
E-mail address: harafat@najah.edu (H.A. Arafat).

fact into dollars (US Brewers Association Inc., 1972; Powers, 1974; Syrek, 1975). The second type of impact is medical. Armstrong and Molyneux (1992) observed that 5% of all injuries at their hospital in Liverpool, England, were caused by glass and that most glass related injuries occurred on the street. The third type of impact is the cost associated with litter collection and the economic losses (direct and indirect) caused by the presence of litter in public places. For example, dumped rubbish and roadside litter costs Victorian councils nearly \$22,000 a day to clean up (Victorian Litter Fact Sheet, 2008).

Several causes can contribute to an increase in public littering rates, such as the lack of social pressure to prevent littering, absence of realistic penalties or consistent enforcement, social rebellion, and lack of knowledge of the environmental effects of littering. Other causes also include poor packaging design of commercial products, amount of litter already present at a particular site, presence and wording of signs referring to litter, and the number and/or placement and appearance of waste collection bins at the site (Kapoor, 2001; Somerville et al., 2003; Hasan, 2004; Gray and Gray, 2004; Santos et al., 2005a). Similarly, an array of socio-economic factors can affect public attitude towards littering, frequency of littering, and the effective approaches to hinder the littering tendency within an individual (Willoughby et al., 1997; Santos et al., 2005b; Liu and Sibley, 2004; Arafat et al., 2007; Storrier and McGlashan, 2006). These factors are region- and culture-dependent, and it is very important to study them if an effective littering-prevention program is to be designed (Liu and Sibley, 2004). To get a better comprehension of the complexity of street litter problems, integration between socio-economic and environmental studies is essential. The participation of the community in the production and use of scientific knowledge is considered the best approach to environmental management (Kapoor, 2001).

In developed countries, many studies have been conducted to evaluate and apply strategies to reduce pollution by behavioral control of littering (Paltas and Hayward, 1976; Meichenbaum et al. 1968; Burgess et al., 1971; Reich and Robertson, 1979; Reiter and Samuel, 1980; Cialdini and Reno, 1990; Singhapakdi and La-Tour, 1991). In developing countries, on the other hand, littering behavior has received relatively little research attention. Many countries, including the Palestinian Territory (and the Middle East in general), suffer from a widespread littering problem. This paper categorizes some of the variables that influence the littering behavior in the Palestinian Territory and attempts to recommend some remediation measures to reduce and tackle the problem. Hence, this work will be of significance to decision makers in the Palestinian Territory (and other developing countries as well) to tackle this problem. The aims of this work are: (i) to investigate the perception of people on aspects related to street littering; and (ii) to correlate the littering attitudes and practices of people in the Palestinian Territory with four socio-economic characteristics (gender, income, marital status, and religious convictions).

2. Methodology

This study was carried out in Nablus district, located in the northern part of the West Bank–Palestinian Territories. The population of Nablus district is projected at 363,630 in 2006 (Palestinian Central Bureau of Statistics (PCBS), 1999). The study was carried out during June and July of 2005. The study population consisted of all adults and children above 12 years old residing in the district.

The sampling guide published by Magnani (1997) was used to estimate the sample size, in which two steps were involved: calculating the number of sample elements required in order to satisfy the measurement requirements for a given indicator, and calculating how many households would have to be contacted in order to

find the number of elements needed in the first step. Formulas for these calculations were utilized. The sample size was 1000 people from a wide spectrum of social and economic status (SES). A multi-stage sampling procedure was utilized in the selection of the study subjects (Fowler, 1984). The estates were stratified according to the SES (low, lower-middle, upper-middle and high). The stratification criteria were based on general status of housing and type of residence. From each stratum, a predetermined number of subjects were randomly selected for survey (Scheaffer et al., 1990). In each selected estate, blocks or homes were randomly selected at every group block or home. A central point for each estate was determined. While at the central point, a direction was randomly selected; the nearest block or home in the selected direction was the first one to be included; once a block or home was selected, the next one to be selected depend upon the chosen direction.

The main tool used in data collection was a structured questionnaire specifically designed for this study. The questionnaire covered socio-economic characters of the respondent as well as variables related to the respondent's littering attitudes and practices. The questionnaire included four independent variables: (1) gender, (2) marital status, (3) level of income and (4) level of religious convictions. As for the latter, the interviewees were asked in the questionnaire to categorize themselves as "a person with strong religious convictions", "a person with moderate religious convictions", or "a person with weak or no religious convictions". Six dependent groups of variables were included in the survey: (1) street littering frequency, (2) types of litter items usually thrown, (3) the main driving cause to litter, (4) the most effective technique in preventing the interviewee from throwing litter in the streets, (5) willingness to volunteer in a public street cleaning campaign, and (6) the interviewee opinion on responsibility for street cleanness. After the questionnaire was pre-tested, it was administered to the respondents in the local language, which is Arabic. The interview was conducted from door-to-door and the questions were targeted to the head of the household, the spouse, any other adult, or a child provided he/she was 12 years or older.

Pre-testing of the survey was conducted with an expert evaluator from An-Najah National University and responses were coded for statistical analysis. The pre-testing was to determine the effectiveness of the survey questionnaire, and to help determine the strengths and weaknesses of the survey concerning question format, wording and order. Most of the basic demographic and socio-economic information was elicited using multiple-choice questions. Respondent gender was sight-coded by the interviewer. The interviewer read the questions to the participants and recorded responses on the questionnaire. The respondents were assured that their anonymity would be protected, and consent to the study was considered implicit in agreeing to be interviewed for the survey. For these reasons, no written consent for participation was obtained. Analysis of data was performed by the use of Statistical Package for Social Sciences (SPSS) computer program version 11.0. Descriptive statistics such as means and ranges were computed. Appropriate test of significance (Analysis of Variance (ANOVA) test) was performed to determine the relationships between socio-economic variables (the four independent variables) and the respondents littering attitudes and practices (as presented in the six dependent groups).

3. Results and discussion

3.1. Sample distribution

Table 1 shows the surveyed sample distribution based on gender, marital status, level of income and level of religious convictions. About 60% of respondents were males and 40% were

Table 1

Surveyed sample distribution (numbers and percentages) based on gender, marital status, income, and level of religious convictions

Independent group	Number of respondents (percentage in parentheses)	Total
<i>Gender</i>		
Male	596 (59.6)	1000 (100%)
Female	404 (40.4)	
<i>Marital status</i>		
Single	628 (62.8)	1000 (100%)
Married	325 (32.5)	
Divorced	11 (1.1)	
Widower	36 (3.6)	
<i>Monthly family income (NIS)^a</i>		
0–1000	343 (34.3)	1000 (100%)
1001–2000	350 (35.0)	
2001–4000	221 (22.1)	
>4000	86 (8.6)	
<i>Level of religious convictions^b</i>		
Low	70 (7.0)	1000 (100%)
Medium	663 (66.3)	
High	267 (26.7)	

^a 1 USD = 4.2 NIS (New Israeli Shekel).

^b As expressed by respondents.

females. In terms of marital status, the highest percentage of respondents was single (62.8%), while the lowest percentage was of those who were divorced (1%). In terms of the level of income, the highest percentage (35.0%) consisted of those whose family has a monthly income of 1001–2000 New Israeli Shekels (NIS) (the equivalent of 250–500 USD), and the lowest percentage (8.6%) was of those whose monthly family income exceeds 4000 NIS (1000 USD). Finally, 66% of respondents categorized themselves as “moderately religious”, 27% as highly religious, and 7% as non-religious.

In the following sections, the impacts of the four socio-economic factors studied on the littering behavior of the interviewees are discussed. For each factor, the statistical ANOVA test was used to determine which of the responses (i.e., the dependent groups) were significantly correlated (i.e., with p -value < 0.05) to the socio-economic factor of concern.

3.2. Effect of the gender on littering

In order to see the effect of gender on littering, the ANOVA test was performed. The test revealed that three dependent groups have a statistically significant relationship (p -value < 0.05) with

gender, as shown in Table 2. The highest percentage (28.2%) of responses by male interviewees regarding throwing litter in the streets was “only when there is no nearby litter can”, while for females, the highest percentage (41.3%) answer was “never”. The percentage of females who claimed to never litter (41%) was almost double that for males (22%). Similarly, more males (21%) than females (17%) admitted to littering “most of the time”. This indicates that littering is more common among males, which agrees with the findings of others (Krauss et al., 1978; Meeker, 1997). This observation also finds its roots in the local customs of the Palestinian community, where littering by males carries less of a negative image than when conducted by females.

As for the impact of gender on the type of litter thrown, our study (Table 2) shows that cigarette butts were more commonly thrown by males (43.3%) than by females (3%). According to the Palestinian Central Bureau of Statistics (PCBS, 2006), Palestinian males smoke more than females, which explains our observation. About 28% of Palestinian males aged 15–29 smoke while only 1% of Palestinian females in that age group smoke. For the older age group (above 29 years), about 32% of the males smoke, compared to only 3.3% among females. While “cigarette butts” were the most common item among male interviewees, “food wastes” was the most common item among females. Both males and females identified “glass bottles” as the second most common litter item thrown, whereas males and females identified bulky items (e.g., boxes) as the least common litter item thrown.

According to female interviewees, the two most effective factors that help in preventing street littering are “increasing moral and religious convictions” followed by “the increased availability of litter cans”. For males, the same two factors were also placed as the most effective but with their level of importance reversed. Interestingly, the fear of negative image seems to have an identical impact in preventing male and female respondents from littering. Fines, on the other hand, seem to be slightly more effective for females than for males. It is interesting to see that an average of only 12% of the respondents think that fines are an effective method for litter prevention. This is probably due to the weak law enforcement in the Palestinian Territories under the current political conditions, and may not be necessarily true in other parts of the region. Generally speaking, research shows that men and women think and respond differently with regards environmental issues (Wilson and Daly, 1998; Wilson et al., 1996; UNDP, 2003; Harper, 2004). This is due to both psychological and social factors (Wilson and Daly 1998; Wilson et al., 1996). It is important therefore to elicit these differences when planning for management options.

Table 2

Variation in citizens' response based on gender

Question	Answer	Percentage of respondents (%)	
		Male	Female
Do you throw litter in the streets?	Never	22.5	41.3
	For absolute necessity	20.6	0.4
	Only when there is no nearby litter can	28.2	25.2
	Sometimes	7.7	5.7
	Mostly	21.0	17.3
If you throw litter, which of the following types of litter items do you usually throw?	Cigarette butts	43.3	2.6
	Glass bottles	30.9	40.3
	Food waste	18.7	45.5
	Bulky items	7.1	11.7
If you litter, which of the following you feel will be most effective in preventing you from throwing litter in the street?	Fines	11.8	14.0
	Negative image	9.6	9.5
	Moral and religious convictions	25.4	29.7
	Better street cleanness	15.0	16.0
	Public awareness campaigns	4.1	6.2
	Increased availability of litter cans	28.8	23.0
	Nothing will stop me from littering	5.4	1.7

3.3. Effect of marital status on littering

Table 3 presents a summary of the significant ANOVA test results (p -value < 0.05) correlating the marital status of respondents to littering habits. For married and widow(er) respondents, the most common response to the question “do you throw litter in the streets?” was “never”, while for single and divorced respondents the most common answer to the same question was “for absolute necessity”. This result agrees with previous findings by Heberlein (1971), which suggest that married individuals litter less than single ones. The majority of all groups have responded positively to the question “Would you be willing to volunteer in a public street cleaning campaign?”, although the agreement percentage was lower among the single and widow(er) respondents, compared to the married and divorced respondent groups. Overall, about 44–64% of the people surveyed claimed to be willing to participate in such a campaign. It is also interesting to see that widow(er)s are more determined in their stand regarding this issue, where only 11% of the widow(er) interviewees responded with “not sure”, compared to 31% of single respondents. It is possible to attribute at least some of the above findings to maturity and social stability. Widow(er)s (who are, more commonly, at an advanced age) and married individuals are expected to be at a higher level of social maturity and stability, which will reduce their tendency to litter. It is important to remember that individuals in the “singles” group include most of the children, teenagers, and college students who were interviewed during this study. These young individuals are more likely to litter.

3.4. Effect of the monthly income on littering

Table 4 shows a summary of the significant ANOVA test results (p -value < 0.05) correlating the respondent's monthly income to littering habits. In the monthly income groups of (1001–2000 NIS), (2001–4000 NIS), and (more than 4000 NIS), the most common response to the question “Do you throw litter in the streets?” was “for absolute necessity”, while in the monthly income group of (0–1000 NIS) the most common answer to the same question was “never”. This contradicts the observation that littering is higher in the area occupied by people with a lower average annual income and literacy (Santos et al., 2005b; Rhodes, 2008). One would expect that high income, which is usually associated with higher social and educational status, should contribute to litter reduction. It is possible to explain this observation based on the “subconscious psychological self-defense” theory (Abu-Zant, 2006). When confronted with such question as “Do you throw litter in the street?”, a disadvantaged interviewee may consider the question as an “accusation” or an “impression” formed by the asker. The interviewee may further believe that this “impression” stems from their low economic status. Being inconvenienced with the question, the interviewee is likely to take a subconscious psychological self-defense position and answer with “never”.

According to interviewees with family income of (1001–2000 NIS) and (more than 4000 NIS), the two most effective factors that help in preventing street littering are “increasing moral and religious convictions” followed by “the increased availability of litter cans”. For interviewees with monthly income of (0–1000 NIS) and (2001–4000 NIS), the same two factors were also placed as the most effective with their level of importance reversed. It is interesting to notice from Table 4 that fines were thought of as the most effective litter prevention measure by a larger percentage of respondents (18.4%) in the higher income bracket (>4000 NIS), compared to only 11.4% of respondents who believed the same in the lowest income group (<1000 NIS). Still, for all income levels, fines came in third or fourth on the list of most effective litter prevention techniques.

Finally, there is a common agreement among all respondents of all income levels that street cleanness is a shared responsibility of the citizens and the local authorities. It was also interesting to see that the respondent groups with the lowest monthly income (0–1000 NIS) and the highest monthly income (more than 4000 NIS) contained the highest percentage of respondents who believe that street cleanness is the responsibility of the local municipalities alone.

3.5. Effect of religious convictions on littering

The ANOVA test revealed that four dependent groups have a statistically significant relationship (p < 0.05) with the level of religious convictions of the respondents, as shown in Table 5. Table 5 reveals that the type of litter thrown by people is related to their level of religious convictions, in an interesting way. It was found that “cigarette butts” litter was the highest among respondents with a low religious level, “glass bottles” litter was the highest among interviewees with a medium religious level, while “food waste” litter was the most common among people with a high religious level. Smoking is considered a religiously forbidden act by conservative Muslims. This explains why a low percentage of interviewees who identified themselves as having strong religious convictions identified cigarette butts as a litter item which they throw, whereas food waste was the most common litter item for this group. In the Palestinian community which has a high percentage of smokers (among males in particular), it is interesting to see that cigarette butts and glass bottles were the most common among respondents with low and medium levels of religious convictions.

There was a general agreement among respondents, with various levels of religious convictions, that the main leading reason for street littering was the “insufficient availability of litter cans”. The second leading reason for street littering was the “dirtiness of the streets” for respondents with medium and high levels of religious convictions, compared to “laziness”, as reported by respondents with a low level of religious convictions.

Generally speaking, there was a positive attitude among most interviewees towards participating as volunteers in public cam-

Table 3
Variation in citizens' response based on marital status

Question	Answer	Percentage of respondents (%)			
		Single	Married	Divorced	Widow/er
Do you throw litter in the streets?	Never	25.8	36.3	18.2	52.8
	For absolute necessity	26.4	29.2	36.4	13.9
	Only when there is no nearby litter can	20.9	17.8	18.2	11.1
	Sometimes	8.6	3.4	9.1	8.3
	Mostly	18.3	13.3	18.2	13.9
Would you be willing to volunteer in a public street cleaning campaign?	Yes	44.3	54.8	63.6	47.2
	No	25.0	26.9	18.2	41.7
	Not sure	30.7	18.3	18.2	11.1

Table 4
Variation in citizens' response based on the level of their family monthly income

Question	Answer	Percentage of respondents (%)			
		0–1000	1001–2000	2001–4000	>4000
Do you throw litter in the streets?	Never	37.3	26.6	25.8	26.7
	For absolute necessity	21.3	30.6	26.2	37.2
	Only when there is no nearby litter can	17.2	21.4	22.2	14.0
	Sometimes	5.8	7.7	8.1	4.7
	Mostly	18.4	13.7	17.6	17.4
If you litter, which of the following you feel will be most effective in preventing you from throwing litter in the streets?	Fines	11.4	15.0	8.6	18.4
	Negative image	10.8	11.1	7.6	3.9
	Moral and religious convictions	29.3	27.5	22.9	27.6
	Better street cleanness	8.1	16.8	22.4	18.4
	Public awareness campaigns	4.0	4.8	7.6	1.3
	Increased availability of litter cans	30.6	21.6	29.0	25.0
	Nothing will stop me from littering	5.7	3.3	1.9	5.3
In your opinion, street cleanness is the responsibility of whom?	The citizens only	12.8	7.4	6.4	2.4
	The municipality only	18.1	15.7	13.3	24.7
	Both the citizen and the municipality	69.1	76.9	80.3	72.9

Table 5
Variation in citizens' response based on the level of religious convictions

Question	Answer	Percentage of respondents (%)		
		Low level of religious convictions	Medium level of religious convictions	High level of religious convictions
If you throw litter, which of the following types of litter items do you usually throw?	Cigarette butts	51.7	30.8	20.1
	Glass bottles	15.0	38.7	27.2
	Food waste	23.3	24.5	37.3
	Bulky items	10.0	6.1	15.4
	Insufficient availability of litter cans	43.1	58.4	53.6
	Habit	13.8	8.0	6.8
If you litter, which of the following is the main driving cause for you to litter?	Laziness	16.9	5.2	3.4
	Dirtiness of the street (i.e., feeling that abstaining from littering will not help much)	7.7	19.9	24.3
	Lack of law enforcement	7.7	7.0	9.8
	For fun	10.8	1.4	2.1
Would you be willing to volunteer in a public street cleaning campaign?	Yes	29.0	42.9	65.5
	No	40.6	29.9	13.1
	Not sure	30.4	27.2	21.3
In your opinion, street cleanness is the responsibility of whom?	The citizens only	2.9	8.6	10.1
	The municipality only	53.6	15.9	9.4
	Both the citizen and the municipality	43.5	75.5	80.5

paigns for street cleaning. The rejection rate for participation in such campaign was highest (41%) among respondents with a low level of religious convictions, and lowest (15%) among interviewees who identified themselves as highly religious. It is possible to say that religious convictions contribute to a better acceptance of the concept of volunteering in such a common-good act. This perhaps emphasizes the importance of incorporating litter prevention as a topic in religious education (which is a mandatory topic in the Palestinian curriculum for Muslim students in public schools). Moreover, street cleanness was agreed by the majority of interviewees with medium and high levels of religious convictions to be a joint responsibility of both the citizens and the local municipalities, while the majority of interviewees with a low level of religious convictions mentioned that street cleanness is the responsibility of the local municipalities only. These observations reveal a unique character of Middle Eastern communities. That is the tendency of its citizens to consciously and sub-consciously associate good citizenry with higher religious standards.

3.6. Implications of study results

Judging by the responses for the first question in Tables 2–4, a high percentage (about 70%) of the interviewees admitted to littering on the streets, although at variable frequencies and for various reasons. It is worth mentioning that this data is likely to underestimate the number of people who actually litter, since some of the respondents may have felt constrained by the question, and therefore answered dishonestly. Overall, this reflects a wide-spread littering practice. This is further supported by a qualitative field observation by the authors that litter of all kinds (glass, metal, organic, etc.) was very visible throughout the streets of the city of Nablus. Medical waste was also sometimes observed in streets near healthcare centers. As a result, many Palestinians have suffered from wounds caused by broken glass and other sharp litter objects, as streets serve as playgrounds for many children in Nablus district, which is also the situation in all other Palestinian districts and many cities in developing countries. This study indicates the extensive amount of broken glass on the

streets of Nablus district, as glass bottles constituted 30–40% of litter items thrown, as seen in Table 2. According to a study conducted by Al-Khatib et al. (2006), out of 240 children surveyed in Nablus district, 87.1% had been injured by broken glass litter at some point in their lives.

There are many factors that can contribute to reducing the littering behaviour among people. The majority of interviewees in this study have indicated that the main two factors that do or can help in hindering them from littering were “moral and religious convictions” and “increasing the availability of litter cans”. Given the fact that Islam is the religion of the majority of the residents in the area and that Islam, like other religions, places strong emphasis on cleanliness to the extent that it considers the removal of dirt from streets as an “act of worship”, the role of religious clergy in this regard becomes very important. It will be vital, for example, for clerics to take advantage of religious ceremonies to frequently discourage people from littering, which will help in reducing the littering phenomenon. Particular focus should be given to enhance moral convictions among residents since the littering practice was found to be more common among residents with low moral and religious convictions. Interestingly enough, the results in Table 2 show that there are more people who will abstain from littering driven by moral or religious convictions (about 27%), compared to those who will abstain as a result of a typical anti-litter public awareness campaign (5% only) via TV or other media outlets. Similarly, Table 5 shows that as the level of religious convictions increases, so does the willingness to volunteer in a public street cleaning campaign, and the feeling of shared responsibility for street cleanness.

On the other hand, community satisfaction with the adequacy of litter disposal facilities was not high, indicating that those using public places may be forced to litter due to the absence of nearby litter bins. As the second most vital factor in litter reduction, local authorities (municipalities and village councils) should increase the number and optimize the distribution of litter bins on the streets and other public places as a measure to discourage people from littering. Nonetheless, although increasing the number of litter bins is expected to help, there have been reports in the literature suggesting that this may not be a total solution. One study indicates that most littering occurred within 5 m (16.5 ft) of a garbage can (Dart Container Corporation, 2008).

The strong sense of belonging members of the community clearly had with their local public places appeared to result in willingness to volunteer in a public street cleaning campaign. A high percentage of respondents are willing to volunteer in such campaign. This agrees with a survey conducted by Harris and Associates Inc. (1970) in which the public was not only demanding to see the government involved but very willing to become personally involved in developing a solution (Robinson, 1976). The opinion of survey respondents about street cleanness being a responsibility of both the citizen and the municipality also highlighted the community expectation that more could be done to raise the efficiency of litter management.

Finally, there is an urgent need for a holistic approach to littering and litter reduction in the Palestinian territory. This requires a focus of both litter clean-up strategies (effect) and litter prevention programs (cause). Since the gender, income, and marital status profiles of the litterer are correlated to their littering practices, multiple messages will be more effective in the reduction of this phenomenon among citizens in the Palestinian territory, as well as other developing countries. Public awareness at all levels, with emphasis on males, youngsters, and single residents, as the primary target groups, should be a way of bringing about litter reduction in the Palestinian territory. Moreover, there is an urgent need to develop a framework or strategy that encompasses the full range of inter-relationships between municipalities and village

councils and their litter management responsibilities. There is also a need for strong leadership by an organization that has litter as its primary focus. It is likely that additional funding resources should be located for new projects and programs that address the cause of littering, proactive infrastructure, education, behavioral research, and policy development.

4. Conclusions

Despite its scientific relevance and importance for solid waste management and pollution prevention, studies on littering are very scarce in the Palestinian territory and in most developing countries. This paper investigated the major causes of litter, the common behaviors related to littering and the commonly littered items. One of the primary benefits of this paper is that it helps the Palestinian territories (and probably other developing countries with a similar social setup) to target litter prevention and abatement efforts to the probable offenders and sources of litter. The results suggest that cigarette butts, glass bottles and food waste comprise the largest portion of litter in Nablus district.

Public perception and attitude studies related to street littering are very important for establishing administrative and strategic priorities. As a general pattern, a high percentage of residents admitted to littering on the streets. Littering behavior was found to be directly related to the four socio-economic characteristics that were studied in this work. These are gender, family income, marital status, and religious convictions. For example, it was found that males litter more than females, and widow/ers and married individuals litter less than single and divorced ones. People who identified themselves as “strongly religious” were found to litter less than those who have weak or no religious convictions. These socio-economic characteristics were also found to impact the type of litter thrown by people. For example, females and strongly-religious individuals rarely throw cigarette butts as litter items.

The results of this study emphasized that an integrated approach to litter prevention is likely to be the most effective method of tackling the litter problem in Palestinian communities. Integrated approaches include cognitive, social, and technological means. A cognitive solution, for example, would be convincing people not to litter. Our study indicates that the community’s religious leadership would be an ideal ally in doing that. A social solution can include things as substantial fines for those caught littering. Finally, a technical solution would simply be providing more litter bins and cleaning up after littering has occurred.

References

- Aarne, V.P., Alan, E.R., 1981. Unit Operations in Resource Recovery Engineering. Prentice-Hall Inc., Englewood Cliffs, NJ.
- Abu-Zant, M., 2006. Head, Department of Social Sciences, An-Najah University, Nablus – Palestinian Territory (Personal interview).
- Al-Khatib, I.A., Salahat, B., Najem, A., Mayyaleh, E., 2006. Injuries Caused by Street Glass among Children in Nablus District in Palestine. Report, Institute of Community and Public Health, Birzeit University, Palestine.
- Arafat, H., Al-Khatib, I., Daoud, R., Shwahneh, H., 2007. Influence of socio-economic factors on street litter generation in the Middle East: effects of education level, age, and type of residence. *Waste Management & Research* 25 (4), 363–370.
- Armstrong, A.M., Molyneux, E., 1992. Glass injuries to children. *British Medical Journal* 304, 360.
- Burgess, R.L., Clark, R.N., Handee, J.C., 1971. An experimental analysis of anti-litter procedures. *Journal of Applied Behavior Analysis* 4, 41–75.
- Cialdini, R.B., Reno, R.R., 1990. A focus theory of normative conduct: recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology* 58 (6), 1015–1026.
- CigaretteLitter.Org, 2006. Available from: <<http://www.cigarettelitter.org/>> (accessed 02.01.07).
- Cone, J.D., Hayes, S.C., 1980. Environmental Problems/Behavioral Solutions, Brooks/Cole, Monterey, CA.
- Dart Container Corporation, 2008. Litter. Available from: <<http://www.dartcontainer.com/web/enviro.nsf/pages/enlitter.html>> (accessed 09.02.08).

- Fowler Jr., J., 1984. *Survey Research Methods*. vol. 1. Sage, Beverly Hills, CA.
- Geller, E.S., Winett, R.A., Everett, P.B., 1982. *Preserving the Environment: Strategies for Behavior Change*. Pergamon Press, Elmsford, NY.
- Gray, N.F., Gray, R.O., 2004. Litter deposition on minor rural roads in Ireland. *Municipal Engineer* 157 (3), 185–192.
- Hansmann, R., Scholz, R.W., 2003. A two-step informational strategy for reducing littering behavior in a cinema. *Environment and Behavior* 35 (6), 752–762.
- Harper, C.L., 2004. *Environment and Society: Human Perspectives on Environmental Issues*, third ed. Que Corporation, p. 391.
- Harris and Associates Inc., 1970. *Survey of Public Attitudes Towards Urban Problems and Toward the Impact of Scientific and Technical Development*.
- Hasan, S.E., 2004. Public awareness is key to successful waste management. *Journal of Environmental Science and Health Part A – Toxic/Hazardous Substances and Environmental Engineering* 39 (2), 483–492.
- Heberlein, D.A., 1971. Moral Norms, Threatened Sanctions, and Littering Behavior. PhD Dissertation, University of Wisconsin (University Microfilms No. 72-2639).
- Kapoor, I., 2001. Towards participatory environmental management? *Journal of Environmental Management* 63, 269–279.
- Keenan, M., 1996. The A, B, C of litter control. *Irish Journal of Psychology* 17 (4), 327–339.
- Krauss, R.M., Freedman, J.L., Whitcup, M., 1978. Field and laboratory studies of littering. *Journal of Experimental Social Psychology* 14, 109–122.
- Liu, J.H., Sibley, C.G., 2004. Attitudes and behavior in social space: public good interventions based on shared representations and environmental influences. *Journal of Environmental Psychology* 24, 373–384.
- Magnani, R., 1997. *Sampling Guide*. Food and Nutrition Technical Assistance Project (FANTA), Academy for Educational Development, 1825 Connecticut Ave., NW Washington, DC 20009-5721.
- Meeker, F.L., 1997. A comparison of table-littering behavior in two settings: a case for a contextual research strategy. *Journal of Environmental Psychology* 17, 59–68.
- Meichenbaum, D.H., Bowers, K., Ross, R.R., 1968. Modification of classroom behavior of institutionalized female adolescent offenders. *Behavior Research and Therapy* 6, 343–353.
- Mindell, J., 2001. Lessons from tobacco control for advocates of healthy transport. *Journal of Public Health Medicine* 23 (2), 91–97.
- New South Wales Environment Protection Authority (NSWEPA), 2003. Litter laws in detail. Department of Environment and Conservation. Available from: <<http://www.environment.nsw.gov.au/litter/litterlaws/litterlaws.htm>> (accessed 18.03.06).
- Palestinian Central Bureau of Statistics (PCBS), 1999. *Residents of Palestinian localities, 1997–2010*, Ramallah, Palestine.
- Palestinian Central Bureau of Statistics (PCBS), 2006. *Family Health Survey*, Ramallah, Palestine.
- Paltes, M.M., Hayward, S.C., 1976. Application and evaluation of strategies to reduce pollution: behavioral control of littering in a football stadium. *Journal of Applied Psychology* 61 (4), 501–506.
- Powers, R.W., 1974. President, Keep America Beautiful, Inc., Testimony before the California Senate Committee on Natural Resources, Washington, DC.
- Reich, J.W., Robertson, J.L., 1979. Reactance and norm appeal in anti-littering messages. *Journal of Applied Social Psychology* 9 (1), 91–101.
- Reiter, S.M., Samuel, W., 1980. Littering as a function of prior litter and the presence or absence of prohibitive signs. *Journal of Applied Social Psychology* 10 (1), 44–45.
- Rhodes C.L., 2008. Does “Only Trash Litter?”: Revisited. Department of Earth Sciences, University of South Alabama, USA. <<http://www.usouthal.edu/geography/fearn/480page/06Rhodes/06Rhodes.htm>>.
- Robinson, S.N., 1976. Littering behavior in public places. *Environment and Behavior* 8 (3), 363–384.
- Santos, I.R., Friedrich, A.C., Barretto, F.P., 2005a. Overseas garbage pollution on northeast Brazilian beaches. *Marine Pollution Bulletin* 50 (7), 782–786.
- Santos, I.R., Friedrich, A.C., Wallner-Kersanach, M., Fillmann, G., 2005b. Influence of socio-economic characteristics of beach users on litter generation. *Ocean and Coastal Management* 48, 742–752.
- Scheaffer, R.L., Mendenhall, W.A., Off, L., 1990. *Elementary Survey Sampling*. PWS Kent, Boston.
- Singhapakdi, A., LaTour, M.S., 1991. The link between social responsibility motive appeals, and voting intention: a case of anti-littering campaign. *Journal of Public Policy & Marketing* 10 (2), 118–129.
- Somerville, S.E., Miller, K.L., Mair, J.M., 2003. Assessment of the aesthetic quality of a selection of beaches in the firth of forth, Scotland. *Marine Pollution Bulletin* 46 (9), 1184–1190.
- Stokols, D., Altman, I. (Eds.), 1987. *Handbook of Environmental Psychology*, vols. 1–2. John Wiley, NY.
- Storrier, K.L., McGlashan, D.J., 2006. Development and management of a coastal litter campaign: the voluntary coastal partnership approach. *Marine Policy* 30, 189–196.
- Syrek, D.B., 1975. *California Litter: A Comprehensive Analysis and Plan for Abatement*. Institute for Applied Research (for the California State Legislature), Carmichael, California.
- UNDP, 2003. *Mainstreaming Gender in Water Management: A Practical Journey to Sustainability: A Resource Guide*, NY, USA, UNDP.
- US Brewers Association Inc., 1972. *Community Litter Prevention guide*, Washington, DC.
- Vasilind, P.A., Worrell, W.A., Reinhart, D.R., 2002. *Solid Waste Engineering*. Forest, Lodge Road, Brooks/Cole, Pacific Grove, CA.
- Victorian Litter Fact Sheet, 2008. Litter Statistics. Available from: <http://www.litter.vic.gov.au/resources/documents/Fact_Sheet_Littering_Statistics_HR.pdf> (accessed 05.02.08).
- Wang, L.K., Pereira, N.C., 1980. *Solid waste processing and resource recovery*, Handbook of Environmental Engineering, vol 2, The Humana Press Inc., Clifton, NJ.
- Willoughby, N.G., Sangkoyo, H., Lakaseru, B., 1997. Beach litter: an increasing and changing problem for Indonesia. *Marine Pollution Bulletin* 34 (6), 469–478.
- Wilson, M., Daly, M., 1998. The Evolved Psychological Apparatus of Human Decision-Making is One Source of Environmental Problems. In: Caro, T. (Ed.), Oxford University Press, Oxford.
- Wilson, M., Daly, M., Gordon, S., Pratt, A., 1996. Sex differences in valuations of the environment. *Population and Environment: A Journal of Interdisciplinary Studies* 18, 143–159.