Attitudes and opinions towards public littering in the Kingdom of Bahrain

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ABSTRACT
Public littering is widely recognized as an ongoing global problem with several implications on human health and the integrity of the environment. Waste management is one of the main challenges to sustainable development in the Arabian Gulf countries. Identifying factors that influence littering behaviour is critical for designing effective strategies to reduce or prevent littering. The present study investigated attitudes and opinions regarding public littering in the Kingdom of Bahrain using a questionnaire-based assessment to 408 respondents. Findings showed that around (74.26 – 80.54%) of the respondents indicated that they never litter in public places while those with (11.33 – 12.50%) admitted to litter when there is no littering facilities. The majority of the respondents (92.96%) recognized that the cleanliness of public places is a shared responsibility between the governmental bodies and the public. Respondents showed positive attitude towards participating in cleaning campaigns. Age and gender were found to influence attitude and behaviour towards public littering in Bahrain. The study recommended adopting effective litter prevention project that may include public policies, technology, and educational and awareness programmes in Bahrain. Further research opportunities to draw a comprehensive picture about littering in Bahrain are also outlined.

1. Introduction
‘Litter’ can be broadly defined as throwing trash or any visible solid waste improperly in the wrong places. It may originate from natural sources such as animals and plants or from anthropogenic sources. It may include a wide variety of wastes such as plastics, paper, glass, metals, vegetation, dead animals, construction materials and so on (Armitage & Rooseboom, 1999). However, the word ‘littering’ refers specifically to the human behaviour of disposing waste improperly (Schultz, Bator, Large, Bruni, & Tabanico, 2011).

Littering in public places is recognized as a problem that has adverse environmental and socioeconomic impacts. The magnitude of such problem depends on the composition and quantity of litter. For instance, litter may degrade the aesthetic value of public places and it may pose a health hazard for humans and other living organisms. Moreover, collecting, treating and disposing litter is perceived as a financial burden (Arafat, Al-Khatib, Daoud, & Shwahneh, 2007; Keizer, Lindenberg, & Steg, 2008).

Socioeconomic factors such as gender (Al-Khatib, Arafat, Daoud, & Shwahneh, 2009), age (Arafat et al., 2007; Nkwocha & Okeoma, 2009; Schultz et al., 2011), educational (Al-Khatib et al., 2009; Eastman, Núñez, Crettier, & Thiel, 2013) and income levels (Al-Khatib et al., 2009; Nkwocha & Okeoma, 2009) have been associated with littering attitude and behaviour among individuals. However, Cialdini, Reno, and Kallgren (1990) have found no significant differences among gender or age groups in relation to littering behaviour, while educational level might not be directly related to pro-environmental behaviour according to Kollmuss and Agyeman (2002).

Such inconsistency among studies could be attributed to the complexity of human behaviour and social norms variations among different societies (Nkwocha & Okeoma, 2009; Ong & Sovacool, 2012). Environmental factors such as availability of trash cans, and pollution of places may also drive people towards more littering (Cialdini et al., 1990; de Kort, McCalley, & Midden, 2008; Al-Khatib et al., 2009; Schultz et al., 2011).

Thus, socioeconomic factors were found somewhat insufficient to predict or describe the littering behaviour. As a result, many studies had focused on other factors such as availability and design of trash cans (de Kort et al., 2008), cleanliness of the place,
packaging design (Wever, van Onselen, Silvester, & Boks, 2010) and the influence of the surrounding inhabitants (Schultz et al., 2011).

Different approaches have been adopted worldwide to reduce or to prevent littering in public places such as imposing fines and sanctions, conducting cleaning campaigns, raising public awareness, locating well-designed trash cans in public places, and promoting anti-littering culture through education at early ages (Kollmuss & Agyeman, 2002; Al-Khatib et al., 2009; Wever et al., 2010).

However, the effectiveness of such measures can vary from one place to another. In Japan, the city of Yokohama has used the education approach to promote pro-environmental behaviour among students which resulted in reducing their financial expenditure on collection of litters. On the other hand, Singapore has been applying heavy penalties to prevent littering in public places and still spends lots of money on collecting litters. Although both approaches are relatively successful in maintaining public places clean, it is necessary to analyse in detail all costs and benefits of any approach prior to adoption (Ong & Sovacool, 2012).

The present study aims to find out the main reasons behind littering in public places in Bahrain and thus to suggest the most effective solutions to prevent littering in public places. The study was designed to investigate the places and item types people usually litter, as well as public attitude towards the cleanliness of public places. The influences of some socioeconomic factors such as age, marital status, residential area, occupation, gender, nationality and education level on littering attitude and behaviour were also investigated. The present study is the first of its kind in Bahrain as far as we know. Thus, it may provide valuable information about causes and possible solutions for littering in public places in Bahrain.

2. Materials and methods

2.1. The instrument

The present study was performed on a structured questionnaire developed in both Arabic and English languages in light of the study of Arafat et al. (2007) and Al-Khatib et al. (2009). The questionnaire consisted of two parts. The first part covered the demographic data of the respondents including age, marital status, residential area, occupation, gender, nationality and education level.

The second part contained eight questions regarding littering in public places. The respondents were asked to answer five questions about where, what and why they litter in public places, whereas the next two questions were directed to assess the respondents’ attitude towards littering in general. The last question was formulated to find out the respondents’ opinion regarding the most effective measures that could be adopted in order to prevent littering in Bahrain.

The questionnaire was pretested on a small group and a reliability analysis was used to examine the consistency and reliability of the questions. The alpha value for the questionnaire was found to be 0.779. The questionnaire was then distributed in November 2016 on a face-to-face basis. In addition, an electronic Google form was prepared using ‘Google Forms’ and the link was distributed through the social media ‘WhatsApp’ application in order to allow some respondents to fill in the questionnaire online.

Statistical analysis was performed using the Statistical Package for Social Science (SPSS 22.0 for windows, SPSS, Inc., Chicago, IL). Cronbach’s alpha was calculated in order to determine the internal consistency of the questionnaire. Results were presented as percentage of the mean. The values were also statistically analysed using Pearson chi-square test of independence. Differences with \( p \)-value < .05 were considered statistically significant.

2.2. The study group

The present study was carried out in the Kingdom of Bahrain. The study sample size was calculated to be 384 people referring to the equation of Lindell and Whitney (2001) in which a confidence limit of 95% and a confidence interval of 5% was used for the estimation. The population of the citizens in Bahrain was estimated to be around 1.4 million in 2015 (Central Informatics Organization, 2016).

The socio-economic characteristics of the respondents (408) are listed in Table 1. Equal numbers of males and females (50%) participated in the study. Most of the participants (53.02%) were from the age group > 40, whereas 26.88% were from the age group \( \leq 20 \), followed by the age group 21–40 representing 20.10%. In addition, Bahraini represented most of the respondents (93.97%) compared to 6.03% non-Bahraini. Furthermore, most of the respondents were Married/divorced/widowed (53.02%), employed/retired (51%), holding a diploma or bachelor degree (62.06%), and living in the Capital and Northern Governorate.

3. Results

Most of the respondents (74.26–80.54%) said that they never litter in public places, while 11.33–12.50%...
said that they only litter when there is no litter box at the nearby (Table 2).

In question 4, the participants were asked if they throw litter, which types of litter they usually throw (they could choose more than one item). The most commonly littered item was paper (33.82%), followed by fast food wrappers (25.49%), plastic (25%), aluminium and tin cans (14.11%), cigarette butts (8.85%) and glass (6.12%) as (Figure 1).

Participants were asked in question 5 about the main driving force for them to litter. Most of the respondents (46%) gave no reason for littering, whereas 35% expressed that they litter mainly because they could not find enough number of

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**Table 1.** Socioeconomic characteristics of the respondents.

| Variables             | No. of respondents (N = 408) | %     |
|-----------------------|------------------------------|-------|
| Age                   |                              |       |
| ≤ 20                  | 107                          | 26.88 |
| 21–40                 | 80                           | 20.10 |
| >40                   | 211                          | 53.02 |
| Gender                |                              |       |
| Male                  | 199                          | 50    |
| Female                | 199                          | 50    |
| Nationality           |                              |       |
| Bahraini              | 374                          | 93.97 |
| Non-Bahraini          | 24                           | 6.03  |
| Marital Status        |                              |       |
| Married/divorced/widowed | 211           | 53.02 |
| Single                | 187                          | 46.98 |
| Educational Level     |                              |       |
| Secondary and below   | 111                          | 27.89 |
| Diploma/bachelor      | 247                          | 62.06 |
| Master/doctorate      | 40                           | 10.05 |
| Occupation            |                              |       |
| Employed/retired      | 203                          | 51    |
| Unemployed            | 28                           | 7.04  |
| Student               | 167                          | 41.96 |
| Residential Area      |                              |       |
| Capital               | 151                          | 37.94 |
| Muharraq              | 52                           | 13.06 |
| Northern              | 151                          | 37.94 |
| Southern              | 44                           | 11.06 |

**Table 2.** Percentage of littering in various places among respondents.

| Questions                                      | Answers                          | Percent     |
|------------------------------------------------|----------------------------------|-------------|
| 1. Do you throw litter in the streets and highways? | a. Yes                           | 1.23        |
|                                                 | b. Never                         | 74.26       |
|                                                 | c. Sometimes                     | 11.76       |
|                                                 | d. Most of the times             | 0.25        |
|                                                 | e. Only when there is no nearby litter box | 12.50       |
| 2. Do you throw litter in the public places?    | a. Yes                           | 1.47        |
|                                                 | b. Never                         | 78.92       |
|                                                 | c. Sometimes                     | 7.60        |
|                                                 | d. Most of the times             | 0.49        |
|                                                 | e. Only when there is no nearby litter box | 11.52       |
| 3. Do you throw litter near beaches/coastal area? | a. Yes                           | 0.99        |
|                                                 | b. Never                         | 80.54       |
|                                                 | c. Sometimes                     | 5.67        |
|                                                 | d. Most of the times             | 1.48        |
|                                                 | e. Only when there is no nearby litter box | 11.33       |

**Figure 1.** Littering tendency of respondents (%) based on thrown litter types.
littering boxes, while 9% of them said that they litter if the place is already dirty (Figure 2).

The vast majority of respondents (92.96%) stated that the municipality and citizens are equally responsible for keeping the public places clean. Moreover, 27.89% of the participants claimed that they have participated in cleaning campaigns in Bahrain, whereas 42.96% of the respondents were willing to participate in future campaigns. However, 33.90% were not sure if they would participate in such campaigns, 17.09% were not willing to participate, and 6.03% thought cleaning campaigns would not make any difference (Table 3).

The most effective measure according to respondents to prevent littering in Bahrain was to place enough number of litter boxes in public places (82.84%), followed by benefiting from other countries’ experience (76.72%), integrating littering behaviour schemes in the educational institutions (75%), organizing public awareness campaigns (71.82%), introducing fines as penalty (67.65%), and adopting public service penalties (63.48%) (Figure 3).

Chi-square test results showed a significant correlation ($p < .05$) between age and littering of plastic, food wrappers and containers, willingness to participate in cleaning campaigns, and suggestions about the types of effective measures to be taken to prevent littering. A significant dependence was also found between gender and littering of paper, cigarette butts, and types of effective measures necessary to prevent littering. Nationality was also seen as a significant factor affecting paper littering, and types of effective measures to be taken to prevent littering. Marital status also had a significant influence on plastic littering, and types of effective measures required to prevent littering. Educational level affected littering of aluminium and tin cans, cigarette butts and most effective measures required to prevent littering. Occupation was significantly dependent on most effective measures required to prevent littering, while governorate type was significantly dependent only on willingness to participate in the cleaning campaigns (Table 4).

### 4. Discussion

Littering is widely recognized as an ongoing global problem with several implications on human health and the integrity of the environment (Al-Mosa, Parkinson, & Rundle-Thiele, 2017a). Likewise, public littering is considered as an important environmental problem in the Middle East that can result in serious negative impacts such as aesthetic blight, health issues and an economical burden (Arafat et al., 2007; Al-Khatib et al., 2009; Al-Mosa, Parkinson, & Rundle-Thiele, 2017b). Waste management, including public littering, is one of the main challenges to sustainable development in the Arabian Gulf countries (Al-Ansari, 2012; Al-Maaded, Madi, Kahraman, Hodxic, & Ozerkan, 2012).

Self-reported data on undesirable behaviour seem to be undermined and could be regarded as a low estimate, especially in societies with high littering frequency (Fisher, 1993; Eastman et al., 2013). Therefore, the self-reported data collected in the present study should be interpreted carefully by making comparisons with other self-reported studies.
Most of the respondents in the present study said that they never litter (74.26%) or they only litter when there is no litter box available (12.5%), whereas only 1.23% admitted that they always litter and 11.76% said that they sometimes litter. In comparison, approximately 30% of Nablus citizens in the Palestinian territory said that they never litter, while 70% admitted that they mostly litter (Arafat et al., 2007; Al-Khatib et al., 2009). In addition, approximately 45% of respondents from a large American study admitted that they litter in public places (Schultz et al., 2011), while 25% of participants from two different studies from Brazil and Australia admitted that they litter on beaches (Salvin, Grage, & Campbell, 2012). The results presented here showed that only 1.23% admitted of frequent littering which may be considered as very low, whereas a large ratio, nearly two-third of the participants, claimed that they do not litter and therefore, underreported results were suggested.

Statistical analyses revealed that there is a relation between age and tendency to litter suggesting that older citizens are more cautious about threatening their social status. This behaviour is consistent with the reports in other studies (Torgler, Garcia-Valinas, & Macintyre, 2008).

It was found that paper is the most frequently littered item followed by food wrappers and plastic. This may be explained by the fact that most of the items commonly used by individuals in public places are usually made of these materials while glass and aluminium are used less common. Moreover, only a small proportion of the respondents reported littering of cigarette butts. This may seem to be in contradiction with the findings by Schultz et al. (2011) in which 65% of smokers actually litter cigarette butts. However, that study did not focus on smokers and their percentage in the study sample is unknown. Thus, the low frequency of littered cigarette butts reported by the present study may indicate that the number of smokers among the study sample is relatively small.

In the present study, a great proportion of the respondents provided no reason for littering. This may be referred to the fact that most of them reported that they never litter. However, the study revealed that the most reported reason behind littering is the absence of a litter box in consistent with the findings of several studies (Arafat et al., 2007; Nkwocha & Okeoma, 2009; Schultz et al., 2011). Another common reason for littering was related to the place itself. Some of the respondents stated that they litter when the place is already dirty. Such result is supported by a number of studies as well (Cialdini et al., 1990; Schultz et al., 2011).

At an attitude level, the present study found that the vast majority of the respondents (93%) believe that both citizens and the government are equally responsible for the cleanness of public places. Such result may be perceived as pointing out that littering is widely recognized as an irresponsible behaviour. Additionally, about one quarter of the respondents have already participated in previous cleaning campaigns and about 43% of the respondents are willing to participate in the future. Similar findings were reported by Arafat et al. (2007). However, beliefs and attitudes may be not necessarily translated into behaviour (Schultz et al., 2011).

According to the respondents’ opinion, the most effective measure to prevent littering is to provide enough litter boxes, which is giving as the most reported reason for littering (i.e. lacking of a litter box). Fines and penalties were found to be less appealing. Eastman et al. (2013) found that those who litter more frequently do not support imposing fines on litterers. Overall, in the present study the gap found between the most favoured measure (providing litter boxes) and the least favoured

![Figure 3. Participants’ opinions (%) regarding possible effective measures to be taken and solutions of littering in the Kingdom of Bahrain.](image-url)
Table 4. Significant variation (\( p < 0.05 \)) in respondent answers regarding street and coastal littering.

| Questions                                                                 | Age Chi-square | Age p-value | Gender Chi-square | Gender p-value | Nationality Chi-square | Nationality p-value | Marital status Chi-square | Marital status p-value | Educational level Chi-square | Educational level p-value | Occupation Chi-square | Occupation p-value | Residential area Chi-square | Residential area p-value |
|---------------------------------------------------------------------------|----------------|-------------|-------------------|----------------|------------------------|----------------------|--------------------------|----------------------------|--------------------------|--------------------------|----------------------|-----------------|----------------------------|--------------------------|
| Q1. Do you throw litter in the streets and highways?                       | 13.82          | 0.008       |                   |                |                        |                      |                          |                            |                          |                          |                      |                 |                            |                          |
| Q2. Do you throw litter in the public places?                              | 16.02          | 0.042       |                   |                | 11.67                  | 0.020                | 10.03                    | 0.04                      | 37.03                    | 0.000                    | 40.7                | 0.018          | 27.29                      | 0.007                    |
| Q3. Do you throw litter near beaches/coastal area?                         | 4.67           | 0.03        |                   |                | 7.060                  | 0.022                | 4.25                     | 0.04                      | 40.7                     | 0.018                    |                     |                 |                            |                          |
| Q4b. If you throw litter, which of the following types do you throw? Answer: Paper |                |             |                   |                |                        |                      |                          |                            |                          |                          |                      |                 |                            |                          |
| Q4c. If you throw litter, which of the following types do you throw? Answer: Plastic | 8.57           | 0.014       |                   |                | 16.04                  | 0.000                | 8.49                     | 0.014                     | 24.64                    | 0.006                    | 24.11               | 0.000          | 18.22                      | 0.033                    |
| Q4d. If you throw litter, which of the following types do you throw? Answer: Aluminium and tin cans |                |             |                   |                | 21.19                  | 0.020                | 24.64                    | 0.006                     |                          |                          |                      |                 |                            |                          |
| Q4e. If you throw litter, which of the following types do you throw? Answer: Fast food wrappers and containers |                |             |                   |                | 20.17                  | 0.003                | 24.64                    | 0.006                     |                          |                          |                      |                 |                            |                          |
| Q5. If you litter, which of the following is the main driving force for you to litter? |                |             |                   |                | 20.17                  | 0.003                | 24.64                    | 0.006                     |                          |                          |                      |                 |                            |                          |
| Q6. Who do you believe is responsible for cleaning the streets, public places, and coastal areas? |                |             |                   |                |                        |                      |                          |                            |                          |                          |                      |                 |                            |                          |
| Q7a. Are you willing to participate in such campaigns in the future?         | 20.17          | 0.003       |                   |                | 11.60                  | 0.003                | 17.37                    | 0.001                     |                          |                          |                      |                 |                            |                          |
| Q7b. Which of the following measures would you think be most effective in preventing littering in Bahrain? Answer: Fines |                |             |                   |                |                        |                      |                          |                            |                          |                          |                      |                 |                            |                          |
| Q8a. Which of the following measures would you think be most effective in preventing littering in Bahrain? Answer: Public services penalties | 8.28           | 0.016       | 17.60             | 0.000         | 8.07                   | 0.01                | 17.12                    | 0.000                     |                          |                          |                      |                 |                            |                          |
| Q8b. Which of the following measures would you think be most effective in preventing littering in Bahrain? Answer: Public awareness campaigns |                |             |                   |                |                        |                      |                          |                            |                          |                          |                      |                 |                            |                          |
| Q8c. Which of the following measures would you think be most effective in preventing littering in Bahrain? Answer: Availability of enough litter boxes | 8.12           | 0.017       | 14.19             | 0.000         | 8.12                   | 0.017               | 14.19                    | 0.000                     |                          |                          |                      |                 |                            |                          |
| Q8d. Which of the following measures would you think be most effective in preventing littering in Bahrain? Answer: Integrating littering behaviour schemes in the educational institutions |                |             |                   |                | 9.24                   | 0.01                | 14.19                    | 0.000                     | 4.25                     | 0.04                     | 13.23               | 0.001          |                            |                          |
| Q8e. Which of the following measures would you think be most effective in preventing littering in Bahrain? Answer: Benefiting from other countries experience |                |             |                   |                | 10.71                  | 0.001                | 4.25                     | 0.04                      |                          |                          |                      |                 |                            |                          |
measure (penalties) is not quite large (83% and 68% respectively). Such findings highlight the necessity for a whole integrated approach combing a variety of measures and strategies of waste management to litter prevention in Bahrain. Several studies argued imposing measures intended to prevent the littering problem such as empowerment, cognitive, social and technical solutions (Oluyinka, 2011; Oluyinka & Balogun, 2013).

Demographic variables can influence respondents’ attitude and behaviour towards littering. Several studies indicated that young respondents generally litter more frequently than old adults (Nkwocha & Okeoma, 2009; Schultz et al., 2011). Similarly, this study found that respondents below 20 years litter paper and food wrappers more frequently than older adults (those above 40 years). However, respondents younger than 20 years old exhibited more ambition to participate in cleaning campaigns while adults (those in the range of 21–40 years) were somewhat not sure about it while participants above 40 years were not willing to participate in such campaigns. Thus, younger generation may be more open to be involved in cleaning campaigns. Hence, utilizing youth energy can help prevent litter and reducing littering in public places.

In addition, a significant relationship was found between age groups and types of the imposition of measures to prevent littering. A positive correlation was found between public awareness campaigns and educational measures for the age group less than 20, whereas a positive correlation was found between education and providing enough littering boxes for the age group of 21–40 years old. This shows that different age groups may see the solution for littering problem from different perspectives (Oluyinka & Balogun, 2013).

Al-Khatib et al. (2009) who reported that single and divorced individuals tend to litter more frequently compared to married and widowed ones. This study also found that respondents who are single tends to litter plastic more frequently. In addition to that, the present study revealed that singles are less favour of educational measures.

Influence of occupation on littering follows similar pattern to that of age in terms of preferred measures to be taken to prevent littering. For instance, public awareness campaigns and educational measures are less favoured by students in comparison with employed and retired respondents. This situation may be explained by the fact that young respondents are mostly students.

Gender has an influence on the preference of measures suggested to prevent littering as well as the littering behaviour (Arafat et al., 2007). A clear difference has been found in the present study between the two genders in terms of their expectation about the effectiveness of the prevention measures. Additionally, males tend to litter more cigarette butts compared to females, which is seen as an outcome of the situation that the number of male smokers are relatively higher than females in Bahrain.

In terms of nationality, only one significant relationship was found. Public service penalties are recognized as a more effective solution by Bahrainis compared to people of other nationalities. The interpretation of such finding might be difficult because only 23 respondents were non-Bahrainis, which is a quite small number compared to about half a million non-Bahrainis living in Bahrain (Central Informatics Organization, 2016).

Several studies found that when education level increases, the littering frequency decreases (Nkwocha & Okeoma, 2009; Eastman et al., 2013). Similarly, this study found that respondents with secondary school certificate or below litter more aluminium cans and cigarette butts. Further, those with low education level are less optimistic about the effectiveness of imposing fines. This may be explained based on the findings that individuals with low education level litter more frequently and those who litter more frequently do not support imposing fines (Eastman et al., 2013).

5. Conclusion and recommendations

The present study aimed to explore the primary aspects of the littering in public place in Bahrain. A questionnaire was prepared to determine the places where people litter, types of littered items, and reasons behind littering. Additionally, it was designed to assess respondents’ attitude towards littering as well as to interrogate their opinions about possible strategies to overcome littering. A total of 408 responses were collected and analyzed.

The results revealed that most commonly littered item was paper. The main reason behind littering was the limited number of litter boxes. Moreover, the majority of respondents stated that the cleanliness of public places is a shared responsibility between the governmental bodies and the public. Furthermore, respondents showed positive attitude towards participating in cleaning campaigns. Finally, the most effective solution perceived to prevent littering was seen as providing enough litter boxes at public places. It was found from the investigation of the impact of demographic variables on littering that age groups and gender type can influence attitude and behaviour towards public littering in Bahrain.
This study was limited to self-reported attitudes and behaviour. Thus, it is recommended that further research may be performed to outline a general picture about littering in Bahrain. For example, an observational study may be conducted in order to determine the main reasons behind littering or to assess the extent of the littering problem in Bahrain. Moreover, a meta-analysis study on countries’ experience in preventing littering may be conducted to figure out the most effective solution to prevent littering in Bahrain. It is also recommended that an integrated approach to litter prevention in Bahrain which may include public policies, technology, and educational and awareness programmes can be adopted. Finally, it is suggested that youth’s energy is utilized properly by making them involved in public awareness and cleaning campaigns.

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References

Al-Ansari, M. (2012). Municipal solid waste management systems in the Kingdom of Bahrain. International of Water Resources and Environmental Engineering, 4(5), 150–161.

Al-Khatib, I., Arafat, H., Daoud, R., & Shwahneh, H. (2009). 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. Waste Management, 29(1), 449–455. doi:10.1016/j.wasman.2008.02.004

Al-Maaded, M., Madi, N., Kahraman, R., Hodxic, A., Ozerkan, N. (2012). An overview of solid waste management and plastic recycling in Qatar. Journal of Polymers and the Environment, 20(186–194. doi:10.1007/s10924-011-0332-2

Al-Mosa, Y., Parkinson, J., Rundle-Thiele, S. (2017a). Littering reduction: A systematic review of research 1995–2015. Social Marketing Quarterly, 23(3): 203–222. doi:10.1177/1524500417697654

Al-Mosa, Y., Parkinson, J., Rundle-Thiele, S. (2017b). A socio-ecological examination of observing littering behavior. Journal of Nonprofit and Public Sector Marketing, 29(3): 235–253. doi:10.1080/10495142.2017.1326354

Arafat, H., Al-Khatib, I., Daoud, R., & Shwahneh, H. (2007). Influence of socioeconomic 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. doi:10.1177/0734242X07076942

Armitage, N., & Rooseboom, A. (1999). The removal of litter from stormwater conduits in the developing world. Water Science and Technology, 39(9), 277–284. doi:10.2166/wst.1999.0493

Central Informatics Organization. (2016). Bahrain Open Data Portal. Data.gov.bh. Retrieved 27 November 2016, from http://www.data.gov.bh/

de Kort, Y., McCalley, L., & Midden, C. (2008). Persuasive Trash Cans: Activation of Littering Norms by Design. Environment and Behavior, 40(6), 870–891. doi:10.1177/0019056807311035

Eastman, L., Núñez, P., Crettier, B., & Thiel, M. (2013). Identification of self-reported user behavior, education level, and preferences to reduce littering on beaches – a survey from the SE Pacific. Ocean & Coastal Management, 78, 18–24. doi:10.1016/j.ocecoaman.2013.02.014

Keizer, K., Lindenberg, S., & Steg, L. (2008). The spreading of disorder. Science, 322(5908), 1681–1685. doi:10.1126/science.1161405

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? Environmental Education Research, 8(3), 239–260. doi:10.1080/135046202202145401

Lindell, M., Whitney, D. (2001). Accounting for common method variance in cross-sectional research designs. Journal of Applied Psychology, 86(1): 114–121. doi:10.1037/0021-9010.86.1.114

Nkwocha, E., & Okeoma, I. (2009). Street littering in Nigerian towns: Towards framework for sustainable urban cleanliness. African Research Review, 3(5), 147–164.

Olyunka, O. (2011). Attitude towards littering as a mediator of the relationship between personality attributes and responsible environmental behavior. Waste Management, 31: 2601–2611.

Olyunka, O., Balogun, S. (2013). Self-monitoring and responsible environmental behaviour: The mediating role of attitude towards littering. Frontiers in Psychological and Behavioral Science, 2(1): 31–38.

Ong, I., & Sovacool, B. (2012). A comparative study of littering and waste in Singapore and Japan. Resources, Conservation and Recycling, 61, 35–42. doi:10.1016/j.resconrec.2011.12.008

Salvin, C., Grage, A., & Campbell, L. (2012). Linking Social drivers of marine debris with actual marine debris on beaches. Marine Pollution Bulletin, 64, 1580–1588.

Schultz, P., Bator, R., Large, L., Bruni, C., & Tabanico, J. (2011). Littering in context: Personal and environmental predictors of littering behavior. Environment And Behavior, 45(1), 35–59. doi:10.1177/0019056811412179

Torgler, B., Garcia-Valinas, M., & Macintyre, A. (2008). Differences in preference towards the environment: The impact of a gender, age and parental effect, Discussion paper No. 221. Brisbane: School of Economics and Finance, Queens University of Technology, pp. 1–37.

Wever, R., van Onselen, L., Silvester, S., & Boks, C. (2010). Influence of packaging design on littering and waste behaviour. Packaging Technology and Science, 23(5), 239–252.