

Public Awareness and Willingness for Recycling in the Kingdom of Bahrain: Factors Influencing Households' Participation

*Afnan Mahmood Freije ¹, Hussain Abdulla Ali ¹, Maryam Mohamed Al Ansari ¹, Mustafa Ebrahim Ali ¹.

¹ Department of Biology, College of Science, University of Bahrain, Sakhir Campus, P. O. Box 32038, Kingdom of Bahrain

ABSTRACT

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Correspondent Author:

Afnan Mahmood Freije

afreije@uob.edu.bh

KEYWORDS

Awareness, challenges, public, recycling, willingness to recycle.

The Kingdom of Bahrain is facing escalating concerns about the current municipal solid waste (MSW) management. These concerns are aggravated by the increased MSW generated per capita as well as the current recycling rate in Bahrain which does not exceed 1%. The residential areas produce substantial amount of MSW and therefore can be considered as good places to start any recycling program. A total of 300 randomly selected household representatives were selected to answer a questionnaire that was designed to identify their socio-economic status, measure their awareness, their recycling practice, to determine their willingness, and recognize any challenges and obstacles that hinder the recycling practice. The results have revealed that the correspondents have shown high awareness (75%) concerning recycling, however their willingness to participate in recycling was limited to 54.3%. In addition 46.3% of the respondents have never recycled any of the most recyclable materials such as paper, glass, plastic, aluminum and tin cans, food waste, garden waste, batteries, and medicine. Nevertheless, the majority of the respondents (87.3%) were willing to engage in recycling or composting scheme mainly if obstacles such as lack of proper recycling infrastructure and spaces to store different bins in their living spaces were resolved. In view of the results obtained from the current study, several recommendations were suggested including the implementation of effective legislations regarding waste recycling as well as public engagement through awareness campaigns.

وعي و استعداد العامة لإعادة التدوير في مملكة البحرين : العوامل المؤثرة على مشاركة الأسر

أفنان محمود فريجه ¹، حسين عبدالله علي ¹، مريم محمد الأنصاري ¹، مصطفى إبراهيم علي ¹

¹ قسم علوم الحياة، جامعة البحرين، كلية العلوم، الصخير، صندوق بريد 32038، مملكة البحرين

المُستخلص

تواجه مملكة البحرين تصاعد المخاوف بشأن إدارة النفايات البلدية الصلبة (MSW) الحالية. وتتفاقم هذه المخاوف بسبب الزيادة في إنتاج الفرد للنفايات البلدية الصلبة المولدة إلى جانب المعدل المنخفض لإعادة التدوير الحالي في البحرين التي لا تتجاوز 1%. في المناطق السكنية التي تنتج كمية كبيرة من النفايات الصلبة، وبالتالي يمكن أن تعتبر أماكن جيدة لبدء أي برنامج إعادة تدوير. وقد تم اختيار ما مجموعه 300 من ممثلي الأسر المختارة عشوائياً للرد على الاستبيان الذي تم تصميمه لتحديد الوضع الاجتماعي والاقتصادي، وقياس نسبة الوعي، وممارسة إعادة التدوير، والتعرف على التحديات والعقبات التي تحول دون ممارسة إعادة التدوير. وقد كشفت النتائج عن نسبة وعي عالية بين المستطلع آراءهم (75%) بشأن إعادة التدوير، ولكن استعدادهم للمشاركة في إعادة التدوير فاقدهم اقتصر على 54.3%. وبالإضافة إلى أن 46.3% من المستطلع آراءهم لم يقوموا أبداً بإعادة تدوير أبداً أي من المواد الأكثر إعادة تدوير مثل الورق والزجاج والبلاستيك والألمنيوم وعلب الصفيح، وفضلات الطعام، ونفايات الحديقة، والبطاريات، والأدوية. ومع ذلك، فإن غالبية المستطلع آراءهم (87.3%) على استعداد للانخراط في إعادة التدوير إذا تم حل العقبات الأساسية التي تمنعهم من إعادة التدوير مثل عدم وجود البنية التحتية المناسبة لإعادة التدوير ومساحات لتخزين صناديق مختلفة في أماكن معيشتهم. بناءً على ما تقدم من نتائج فقد قدمت الدراسة عدة توصيات على سبيل المثال تطبيق قوانين فعالة فيما يختص بإعادة تدوير المخلفات إلى جانب تنظيم حملات توعية للعامة.

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الباحث المراسل: أفنان محمود فريجه

بريد الكتروني: afreije@uob.edu.bh

الكلمات الدالة

الوعي، التحديات، العامة، إعادة التدوير، الرغبة في إعادة التدوير.

Introduction

Municipal solid waste (MSW) generation is considered as one of the important global environmental issues that have arose due to the insufficient solid waste management system and the rabid increase in waste generation rate. This has resulted in a rapid decline in the quality of urban areas environment in many countries (Moh and Abd Manaf, 2014).

The MSW refers to all waste produced by a community apart from the waste generated from municipal activities, treatment plants, industrial and agricultural processes (Visan and Plesea, 2010). It was estimated that 1.7–1.9 billion tons of MSW were generated worldwide in 2006 (Al-Sabbagh, et al. 2012). The future projections has estimated that the world's waste production could reach up to 27 billion tons by 2050. With such increase in population and rapid increase of shifting to urban and industrialized life style, MSW would become critical environmental issue for the near future (UNDESA, 2012).

Al-Humoud (2005) had pointed out the challenges that cause the limiting of recycling activities in the Gulf Cooperation Council (GCC) (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates) states as high waste generation rate, mixing of different types of waste, lack of waste segregation at point of generation, lack of integrated and multi-disciplinary approach, lack of public awareness, absence of waste treatment facilities, and lack of recycling facilities. The MSW generation rate in different states of the GCC ranged between 0.73 and 1.3 kg/person/day in which Qatar scored the highest generation rate, whereas Oman had the lowest generation rate. The MSW generation rate was as follow Bahrain (1.26 kg/person/day), Kuwait (1.4 kg/person/day), Oman (0.73 kg/person/day), Qatar (1.3 kg/person/day), Saudi Arabia (1.25 kg/person/day), and United Arab Emirates (1.18 kg/person/day) (Alhumoud, 2002; Koushki and Alhmoud, 2002).

The Kingdom of Bahrain residential MSW has increased significantly over the last thirty years. The rate of MSW has increased from 1.6 kg/capita/day to 2.7kg/capita/day with an annual MSW production

of about 0.735 million tons (Tolba and Saab, 2008; Al-Ansari, 2012; Al-Sabbagh, et al. 2012). Several factors have contributed to such an increase mainly the increase in population, rapid urbanization, lack of legislations and enforcements as well as increased family income and subsequent increase in the purchasing power (Al-Ansari, 2012; Al-Sabbagh, et al. 2012).

The MSW in Bahrain is characterized by high percentage of organic material (35%), recyclable paper (28%), minerals (12%), plastics (6%), and glass (5%) making the Bahraini MSW a good recycling feedstock (Tolba and Saab, 2008). Nonetheless, the current recycling rate in Bahrain does not exceed 1% while, in comparison, the United States and the European Union recycle 34.5% and 33% of their MSW respectively (Visan and Plesea, 2010; AL-Ghata, 2014; EPA, 2014). This is because many of the developed countries have established an increased awareness among their communities regarding the environment preservation and the public willingness to recover some of the raw resources by recycling the MSW (Visan and Plesea, 2010). However, raising the public's awareness and willingness concerning the MSW recycling and to form new links are far from an easy process. It is important to consider that the people themselves cannot be expected to start recycling without providing a basic programs and facilities that educate them about the economic and environmental importance of MSW recycling (Aljaradin, et al. 2011; Keramitsoglou and Tsagarakis, 2013).

Public's awareness and knowledge as well as willingness have played an important role in the implementation of the legislation set by governments. It is the starting point for the fundamentals and bases of developing material-cycle and resource-efficient society that is willing to take appropriate actions of MSW recycling. Public Awareness regarding MSW is defined as the knowledge that can be acquired by individuals regarding recycling, sustainable production and consumption, and resource efficiency (Afroz, et al. 2013). Therefore, addressing public's awareness and willingness concerning recycling is the first step to formulate a frameworks and structures with which consequent plans and strategies can be modulated

(IGES, 2013). Therefore proper Municipal Solid Waste Management (MSWM) is required (UNEP, 2007). Municipal solid waste management should be continuous repeated operations, begins with the process of storage, collection, continued with the process of transportation to any treatment facilities for reusing and/or recycling followed by disposal at landfills, taking into consideration environmental aspects, public health, and economy, and it should also be responsive to public attitude. The goal of MSWM is the recovery of more valuable products from waste with the use of less energy and a more positive environmental impact in order to protect and save environmental quality, enhance resources sustainability, care for public health, and support the economy (Bagchi, 2004). Sustainable solid waste management systems must be implemented to meet these goals, by authorities in close coordination with both private and public sectors (Henry et al., 2005).

Several factors may affect public participation in municipal waste recycling. Factors can be classify to three categories; intrinsic, extrinsic and Socio-economic. Although intrinsic factors such as pro-recycling attitudes, values and personal motivation are important but researches pointed out that participation in waste recycling is mostly affected by practical issues rather than on intrinsic motivations (Fiorillo, 2013). Public participation is encouraged by the accessibility to the recycling facilities and easiness of the system (Boldero, 1995; Berger, 1997). Successful recycling programs should focus on enhancing and increasing public awareness and environmental knowledge on recycling activities (Ehrampoush, 2005). However, raising the public's awareness and willingness concerning the MSW recycling are far from an easy process (Aljaradin et al., 2011). It is important to consider that the people themselves cannot be expected to start recycling without providing a basic programs and facilities that educate them about the economic and environmental importance of MSW recycling (Keramitsoglou and Tsagarakis, 2013). Therefore, achieving effective solutions recycling programs will require taking into account local conditions, cultural and socio-economic factors (Timlett and Williams, 2011; Lane and Wanger, 2013).

Several theories, hypothesis, and models

regarding recycling behaviors were developed in order to understand the attitudes and perceptions of barriers of householders including the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980), the Theory of planned Behavior (TPB) (Ajzen, 1991), and a theory of waste behavior for the construction industry (Teo and Loosemore, 2001). In addition general theories of public opinion formation and change (Visser et al., 2007), a theory of framing and opinion formation (Chong and Druckman, 2007), and the two-step flow model (Katz and Lazarsfeld, 1955) were also formulated. In general, those theories provide framework regarding factors that influence behavioral choices.

Due to the fact that the land space of the Kingdom of Bahrain is small, the current MSW management method poses an accumulated threat to the environment and sustainability. The method used in Bahrain to manage the MSW is by collection and disposal in landfill (Al-Ansari, 2012). The landfill that has been established in Asker in 1987 was located on an impermeable layer of rock with no leachate drainage layer, lining system, gas collection or monitoring boreholes. About 2.4 km² of the landfill has already been filled with an average waste depth of 15 m which is equal to 60% of its capacity. Based on some estimation it is expected that the Asker landfill will be full by 2015 (Al-Sabbagh, et al., 2012). Such issue has changed the perception of officials to adapt minimization strategies and diverting materials from disposal (Lane and Wanger, 2013) in most developed countries that have successfully adapted recycling strategies to manage MSW (IGES, 2013). Their successfulness comes through strict legislations and well established infrastructure (Afroz, et al., 2013). Inefficient management of MSW could result in considerable public health hazards and subsequent increase in expenditures in both short and long terms (Visan and Plesea, 2010).

Since waste management is one of the main environmental issues in the kingdom of Bahrain, adoption of efficient waste management systems and programs is highly important. Solid waste recycling is one of the waste management options that could be applied in Bahrain. Therefore, the purpose of this study is to measure the awareness, and willingness

of the community with regard to household waste recycling. It also aims to identify gap areas and obstacles that hinder the society from carrying on such an important task in order to suggest solutions for improving the public recycling practice in Bahrain.

1. Materials and Methods

The instrument

This study was based on a primary survey using a questionnaire that was filled during face to face interviews. distributed in April 2014 to 300 randomly selected household representatives from the five governorates of the Kingdom of Bahrain to examine public awareness and willingness for recycling.

The instrument was developed based on several studies regarding household waste recycling (Aljaradin et al., 2011; Fiorillo, 2013). The questionnaire was written in English and in Arabic and was distributed and filled during face to face interviews. The first part of the questionnaire included general information regarding the respondents' socio-economic situation such as age, gender, nationality, marital status, occupation education level, income level type and residential area. The second section has included a series of questions (11) exploring the residents' awareness and level of knowledge concerning household waste recycling. This section has contained factual information and definitions for example, definitions of recycling and composting as well as other facts that touch the person's knowledge about the method of household waste disposal in the Kingdom of Bahrain, benefits of waste recycling over landfill and incineration. These questions have trichotomous types of answers: yes, no and don't know. The second section also included questions (6) that aimed to investigate the respondents' behavior concerning practices associated with household waste management and recycling. Those questions looked at whether the respondent's practice recycling and composting, use recycling facilities provided nearby, and investigate size and frequency of garbage bags generated in their household. Those questions were based on a four point ordinal scale (never, sometimes, often and always) and multiple choice questions.

The third section of the questionnaire has 4 questions that explore the public willingness to engage in waste recycling process. This section included the person's willingness to provide a space for recycling bins at their accommodation, their willingness to pay for the service and to choose appropriate method of household waste collection. This part has a multiple choice questions and questions that employ Likert-type scale response (never, sometimes, often and always) including Q15. Does your household separate waste collection and place materials in assigned recycling bins? and Q16. Do you collect the organic waste for composting. The last section of the questionnaire included 12 questions regarding aspects concerning challenges and obstacle in term of costs, availability of waste recycling resources, financial incentives, rewards or penalties, and residents' preferences to agents or institutions for a recycling program implementation. This part included 5 multiple choice questions and 7 four point ordinal scale questions (agree, disagree, strongly disagree and strongly agree) as listed below:

21. Do you believe that recycling practice in Bahrain should be imposed top-down by municipal authorities?
24. Do you believe that the cumulative effect of individual actions is not as harmful as industrial sources?
25. Do you believe that waste minimization (reuse and reduce consumption) is as important as recycling.
26. Do you believe that the expense of collecting recyclable materials adding more labor and transportation costs, is one reason municipalities may resist developing a curbside recycling program?
27. Do you believe that the income received through the sale of the recyclable material is not beneficial to municipalities in order to initiate recycling program?
29. Do you believe that there is a gap between your intentions and actions in regard to environmental protection?
31. Do you believe that it is the responsibility of the future generation to find a solution to environmental problems?

2. Testing the instrument

A reliability analysis was carried out in order to examine the internal consistency of its questions. Several items were deleted from the questionnaire including age, occupation, and residential area of the respondent as well as questions number 3,4,5,6,11,14,19,30, and 33 to get the Cronbach's alpha value of 0.7 in order to consider the instrument consistent and reliable in achieving the study objective.

3. Statistical analysis

Statistical analysis was performed using the Statistical Package for Social Science (SPSS 18.0 for windows, SPSS Inc., Chicago, IL) and statistical package form Excel 2007 (Microsoft Corporation). Results were presented as percentage of the mean. The values were also statistically analyzed using one-way analysis of variance (ANOVA). Differences with p value <0.05 were considered statistically significant.

Results

Socio-economic characteristics

The overall socio-economic characteristics of the respondents are presented in Table 1. The results have shown that most of the respondents were males (61.7%), whereas females respondents were 38.3%. Most of the respondents were from the age group 26-35 representing 36.7%, while the age group 56-65 were represented by 5.7% only. In addition, most of the respondents were Bahraini (93%), married (74%), employed (86.3%), and earning between 501-1000 Bahraini dinars per month (46.3%). Furthermore, most of the respondents were those holding a Bachelor degree (33.3%), their family size ranged between 4 and 6 members (50.3%), living in small houses (40.3%), and 39% of them living in the Central Governorate.

Variables		NoRespondents (N=300)	%
Age	20-25	58	19.3
	26-35	110	36.7
	36-45	73	24.3
	46-55	42	14.0
	56-65	17	5.7
Gender	Male	185	61.7
	Female	115	38.3
Nationality	Bahraini	279	93.0
	Non-Bahraini	21	7.0
Marital Status	Married	222	74.0
	Single	78	26.0

Educational Level	Below secondary School	18	6.0
	Secondary School	52	17.3
	Diploma Degree	65	21.7
	Bachelor Degree	100	33.3
	Master Degree	45	15.0
	Doctorate	20	6.7
Occupation	Employed	259	86.3
	UN Employed	10	3.3
	Self Employed	0	0.0
	Student	23	7.6
	Retired	8	2.7
Monthly Income (Bahraini Dinars)	Less than 300	30	10.0
	300-500	49	16.3
	501-1000	139	46.3
	1001-3000	65	21.7
	More than 3000	17	5.7
Family Size	1-3	90	30.0
	4-6	151	50.3
	7-10	48	16.0
	More Than 10	11	3.1
Residential Area	Capital	42	14.0
	Muharraq	49	16.3
	Central	117	39.0
	Northern	50	16.6

	Southern	42	14.0
Type of Residential Place	Flat	97	32.3
	House	121	40.3
	Small size villa	37	12.3
	Middle size villa	34	11.3
	Large size villa	11	3.7

Table 1. Socioeconomic characteristics of the respondents.

2. Awareness and knowledge for recycling

Percentage of participants' correct answers regarding questions concerning knowledge and awareness of household waste recycling are shown in Table 2. The overall average of correct answers was 75% of which the highest score (97.7%) was recorded for the first question defining recycling, while the lowest score (48%) was registered for question number 10 regarding over stating recycling impact on the environment (Table 2).

Table 2. Percentage of participants' correct answers regarding questions concerning knowledge and awareness of household recycling.

Questions	% of correct answers
1. Recycling is the processing of discarded materials into useful products.	97.7
2. Recycling is usually a better alternative compared to incineration (burning of waste) or landfill.	94.0
3. The need to recycle used materials is a pressing environmental issue nowadays.	87.3
4. Waste recycling reduces demand for virgin raw materials.	75.7
5. In General, products made from recycling consume less energy in manufacturing.	53.7
6. Landfill is the most common way in the Kingdom of Bahrain to dispose of solid waste.	64.0
7. Less waste material going to landfill means a reduction in environmental and economic costs, as well as health and environmental risks.	89.0
8. Recycling substantially reduces the use of landfills and conserves natural resources.	87.0
9. Environmental problems will only be solved by technological progress	58.7
10. Environmental impact of recycling is frequently overstated.	48.0
11. Composting is the process in which the organic waste such as garden waste and food is converted into garden soil fertilizer.	69.7
Mean	75.0

A significant difference ($p < 0.05$) was recorded between educational levels and awareness in which awareness level increased as educational level increased reaching 82% among PhD holders in comparison with 67%

Table 3. Significant variation ($p < 0.05$) in respondent answers regarding awareness, participation, willingness, obstacles, and challenges of recycling questions.

Questions	Age		Gender		Nationality		Marital status		Educational level		Occupation		Monthly income		Family size		Residential area	
	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value	Chi-square	p-value
Q12	93.3	<0.001									40.7	0.018					65.9	<0.001
Q13					12.3	0.031	13.0	0.023									29.6	0.003
Q14					23.2	<0.001							37.5	<0.001			32.5	0.001
Q15	37.6	0.004											36.6	<0.001			23.0	0.028
Q16	40.1	0.002											26.4	0.010			22.0	0.038
Q17	46.7	0.004															47.0	0.043
Q18									39.0	0.007					23.3	0.025	26.1	0.049
Q19			9.6	0.048														
Q20							12.0	0.017									31.0	0.013
Q21					8.6	0.035												
Q24	28.9	0.049																
Q26									33.5	0.004								
Q27	31.9	0.023							34.2	0.003								
Q28					10.7	0.005			31.7	<0.001			27.7	0.001				
Q29	36.3	0.007			18.1	<0.001									18.4	0.031	25.1	0.015
Q30	29.9	0.039																
Q32													23.5	0.023				

among below secondary school certificates holders (Table 3 and Figure 1).

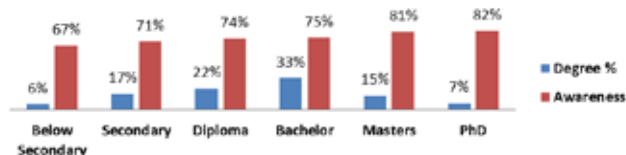


Figure 1. The relationship between educational levels and awareness among participants

3. Participation and willingness for recycling

The results of the present study have shown that 54.3% of the respondents household have never participated in any segregation and placement of the waste materials in the proper recycling bins (Tables 4 and 5). In addition 46.3% of the respondents have not recycled any of the following materials that they were asked about including glass, paper, plastic, aluminum and tin cans, food waste, garden waste, batteries, medicine (Figure 2 and 3). Most of the respondents (46.0%) have put one bag of mixed waste for collection every day, while 25.7% have put less than one bag, 15.3% two bags, 8.3% three bags, 1.3% four bags, and 3.3% more than five bags of mixed waste for collection every day. Furthermore, 64.3% of the respondents have never transported their waste bags for recycling from their home to the nearest recycling facilities, while only 11% transported them every 6 months, 5.3% every 2 weeks, and 8.7% every week.

Table 4. Questionnaire respondents' response rate regarding their participation.

Q12 Which of the following materials do you recycle? more than one item can be chosen	No. of Respondents	Percent
Glass	76	25.3
Paper	131	43.7
Plastic	93	31.0
Aluminum, tin cans	100	33.3
Food waste	51	17.0
Garden Waste	46	15.3

Batteries	37	12.3
Medicines	14	4.7
None	139	46.3

Q14 What is the size of the waste bags used by your household?	No. of Respondents	Percent
5 gallons = 20 Ltr	84	28.0
20gallons = 80 Ltr	59	19.7
30 gallons = 120 Ltr	124	41.0
50 gallons = 200 Ltr	33	11.0
Total	300	100

Table 5. Percentage of participants' answers regarding questions concerning awareness (N=300).

Questions	% Never	% Often	% Sometimes	% Always
Q15	54.3	6.0	29.7	10.0
Q16	74.0	6.0	16.3	3.7

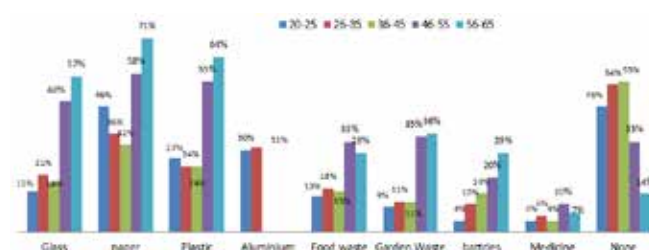


Figure 2. The relationship between the type of recyclable materials and the age group of participants

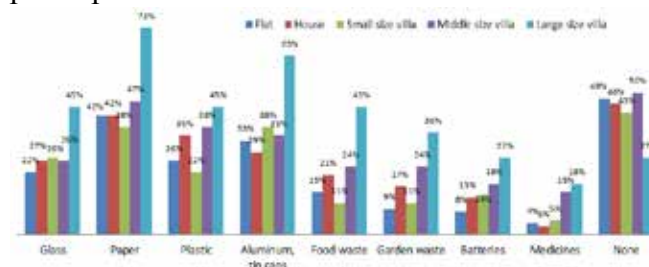


Figure 3. The relationship between the type of recyclable materials and the size of accommodation of participants

The present study has also revealed that papers were the most recycled item (43.7%) among respondents, whereas medicines were the least recycled item (4.7%) (Table 3). The results have also shown that 21.9% of the respondents that never recycled their household waste were from the age group 26-35 years old, while respondents that always recycled their household waste (4.1%) were from the age group of 46-55 years old (Figure 2). In addition, respondent from the age group of 56-65 were the main group that segregate and recycle materials such as papers (71%), plastic (64%) and glass (57%), whereas 30-31% of the respondent from the age group of 20-25 and 26-35 mainly segregate aluminum and tin cans (Figure 3). A significant relationship between different age groups and composting ($p < 0.05$) was also recorded (Table 3). Most of the people (15%) who performed composting were from the age group of 46-55 in which 36% of them live in large villas, whereas 62-85% of the respondents have never collected their organic waste for composting (Figures 4 and 5).

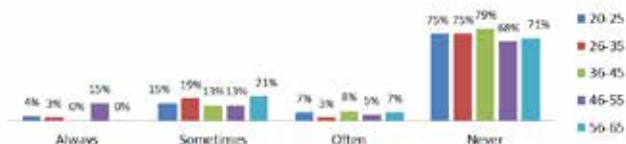


Figure 4. The relationship between the age group of participants and performing composting

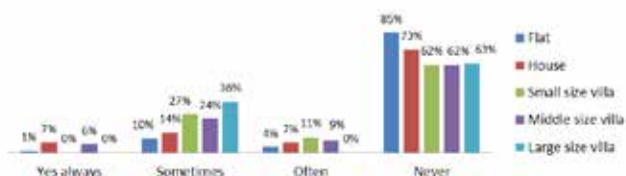


Figure 5. The relationship between performing composting and residential size

Furthermore, a significant differences ($p \leq 0.05$) was recorded between residential type and segregation of waste materials (Table 3 and Figure 3). The highest segregation rate of papers (73%), aluminum and tin cans (63%), plastics (45%) and

glasses (45%) was recorded among respondents living in large villas. However, the majority of the participants (52.3%) accepts to put 1 to 2 bins to separate household waste at home, whereas 3% only would accept to put 5-6 bins or more. Nevertheless, 53.3% of the respondent preferred door to door method for collecting separated household waste, whereas 27.3% only were willing to pay a minimum amount (5 BD =13 US Dollars) monthly for a third party to take over their household waste separation and collection (Table 6).

Q18 How many bags or bins for recyclables are you willing to keep in your house	No. of Respondents	Percent
None	57	19.0
1-2	157	52.3
3-4	70	23.3
5-6	9	3.0
7-8	7	2.3
Total	300	100

Q19 If a new recycling system is to be implemented, which of the following waste bag collection method would you prefer?	No. of Respondents	Percent
Door to door	160	53.3
At Center points	46	15.3
At every neighborhood	57	19.0
Return with fund	35	11.7
Return without fund	2	0.7
Total	300	100

Q20 If there is a third party to take over your waste separation. How much would you be willing to pay monthly?	No. of Respondents	Percent
Nothing	185	61.7
5 BD	82	27.3
10 BD	18	6.0
15 BD	8	2.7
20BD	7	2.3
Total	300	100

A significant relationship between waste bag size and the size of the property ($p < 0.05$) was registered (Table 3 and Figure 6). Small waste bags (5 gallons) were the most preferable option of flats respondents (38%), while large villa respondents (36%) preferable choice was the 30 gallons bags distributed by the municipalities. However, the 30 gallons bags were the most used size by all residential types as follow: flats (38%), houses (45%), small villas (32%), medium villas (47%), and large villas (36%).

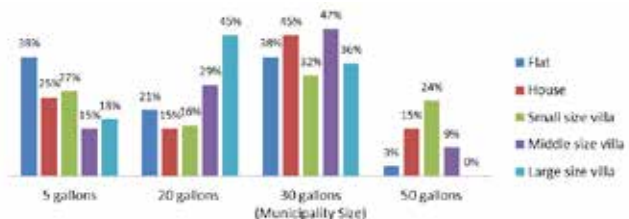


Figure 6. The relationship between waste bag size and residential property size

A significant relationship ($p < 0.05$) between different age groups as well as the type of residence and the transporting of waste bags to recycling facilities was recorded (Table 3, Figures 7 and 8). The rate of transportation of the waste bags to the nearest recycling bins location every month was 5% among the age group 20-25, whereas it reaches up to 29% within the age group 56-65. Furthermore, 71% of the respondents from the age group 20-25 have never transported waste bags in

comparison to 50% among the age group 56-65. In addition, an average of 50% of respondents have never transported their waste bags to a recycling facility (Figure 6).

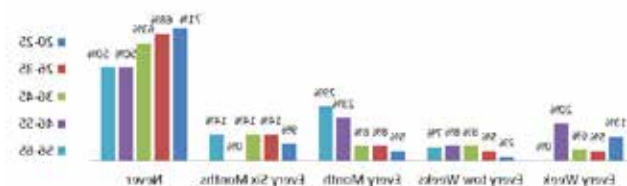


Figure 7. The relationship between age group and transporting of waste bags to recycling facilities

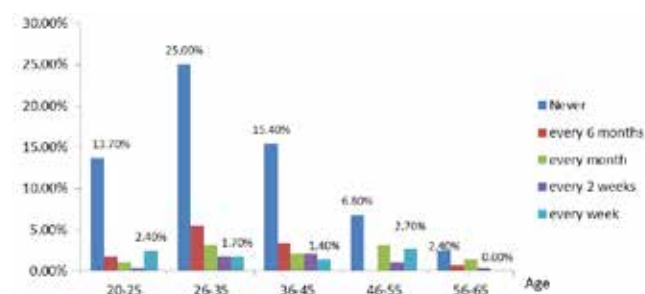


Figure 8. The relationship between age group and the rate of transporting of waste bags to recycling facilities

3.4 Challenges and obstacle of recycling

The present study has revealed that 55.3 % of the participants believe that the ease of access to recycling facilities, the inconvenience of storing recyclables into multiple bins, and the availability of enough space to store recyclables are the most contributing obstacles that discourage the recycling practices at the Kingdom of Bahrain (Table 5). In addition, 87.3% of respondents believe that providing recycling bins in their area would probably increase the recycling practices of the population. Although, 66.7% of the respondents have agreed that recycling practice in Bahrain should be imposed top-down by municipal authorities, 70.6% of the respondents stated that the cumulative effect of individual actions on the environment was not as harmful as industrial sources (Tables 4 and 5).

Moreover, 68% of the participants believe

that cost feasibility is one of the reasons that prevent municipalities from developing a curbside recycling program ($p < 0.05$), while 48.7% of participants believe that the income received through the sale of the recyclable material is not beneficial to municipalities in order to initiate recycling program ($p < 0.05$) (Table 3). However, 59% of the participants think that incentive rewards can encourage recycling. Nevertheless, 28.7% of the respondent stated that they don't buy recyclable products whereas 55.6% stated that they do buy them sometimes (Tables 7 and 8). Most of the respondents (87.3%) have said that the presence of recycling bins for waste in their area would increase their recycling practice, whereas 12.7% did not agree on that. In addition 30.3% of the respondents said that they have sufficient knowledge of what, where, when, and how to recycle in comparison to 40.7% that admitted of not having enough information about recycling while 29% of them were not sure. The majority of the respondents (59%) agreed that giving incentive rewards by the municipal authorities for recyclers would encourage recycling practice, while 13.3% thought that penalties is the best major to be adopted on non-recyclers, but only 12.2% agreed on the fact that enforcing fees on non-recyclers would encourage recycling, whereas 15.7% of the respondents think that none of the above majors should be used.

Table 7. Percentage of participants' answers regarding questions concerning household waste recycling obstacles and challenges.

Q22 Which of the following reasons is a major obstacle to your recycling practice?	No. of Respondents	Percent
Ease of access to recycling facilities	63	21.0
Inconvenience of storing recyclables into multiple bins	27	9.0
Not enough space to store recyclables	44	14.7

All the above	166	55.3
Total	300	100

Q32 Do you buy recyclable products?	No. of Respondents	Percent
Not at all	86	28.7
Most of the times	24	8.0
Sometimes	167	55.6
Always	23	7.7
Total	300	100

Q33 Which of the following reasons would prevent you from buying recyclable products?	No. of Respondents	Percent
Inferior Quality	47	15.7
High Cost	22	7.5
Appearance	23	7.7
All the above	50	16.7
None of the above	158	52.7
Total	300	100

Table 8. Percentage of participants' answers regarding questions concerning willingness to recycle, obstacles and challenges (N=300).

Questions	% Strongly Disagree	% Disagree	% Agree	% Strongly agree
Q21	14.3	19.0	38.7	28.0
Q24	7.3	22.0	48.3	22.3
Q25	4.0	10.3	54.7	31.0
Q26	9.0	23.0	44.7	23.3
Q27	9.7	41.6	37.7	11.0
Q29	15.0	11.0	58.6	15.3
Q31	19.0	32.3	27.7	21.0

Discussion

Most developed countries have successfully adapted recycling strategies to manage MSW (IGES, 2013). Their successfulness comes through strict legislations and well established infrastructure (Afroz *et al.*, 2013). Inefficient management of MSW could result in considerable public health hazards and subsequent increase in expenditures in both the short and the long term (Visan and Plesea, 2010). There are many strategies concerning waste management which differ in their usage from one country or region to another. The most effective, widely-used model is the waste hierarchy which consists of the 3Rs principle; Reduce, Reuse and Recycle, energy recovery and landfill management concepts (Visan and Plesea, 2010). It seems that achieving effective solutions and programs will require taking into account local conditions, cultural and socio-economic factors (Timlett and Williams, 2011). Researchers constantly tried to study these factors and how they affect the recycling rate, participation and factors that act as obstacles for such an advancement (Lane and Wanger, 2013).

The present study has revealed that the average awareness of the group studied concerning MSW recycling was relatively high (75%) in comparison to some countries in the region such as Jordan in which the average awareness of the residents was reported to be 35.8% (Aljaradin *et al.*, 2011). Nevertheless, the majority of the respondents in the present study (54.3%) were not practicing recycling or composting whereas the remaining could be described as casual recyclers; those who recycle from time to time.

This recycling behavior was significantly related to the age of the recyclers and the type of residence. The results of the present study were consistent with the findings of several researchers in which the age was considered as an important factor in determining the recycling behavior among the respondents showing that the elder people were more active recyclers and composters whereas the unwilling to recycle by young people can be attributed to the inadequate information and skills and/or lack of time for the more busy young

people (Kelly *et al.*, 2006; Saphores *et al.*, 2006; Ojala, 2008). Some researchers for example, found that the socio-demographic characteristics are directly attributed in recycling awareness and participation (Coggins, 1994). Belton *et al.* (1994) and Williams and Kelly (2003) have found that the younger generations in lower socio-economic groups in UK tend to be non-recyclers which could be due to their familial commitments. In contrast, Chung and Poon (1999, 2001), have found that, most of the lower socio-economic status in China recycles most of their MSW because they were able to benefit financially from selling the recyclables. It is important to understand the main factors influencing the willingness to participate in recycling program and move from zero recycling participation to a success that achieve environmental program targets (Collins *et al.*, 2006). The level of awareness, level of income and enthusiasm are the main barriers in advancing the knowledge gained to participate in recycling program (Collins *et al.*, 2006). Although MSW segregation considered as a voluntary activity, it requires a significant time and energy (Bruvoll *et al.*, 2002).

The type of residence was also a determinant factor in recycling and composting habits, most considerably between apartments and properties that have access to open space like houses and villas with gardens and enough space to store different bins or bags for recycling purposes. In the present study, the type of the household and the educational level of the respondents were significantly related to the willingness to assign different bins or bags for recycling purposes. Occupants with lower educational levels were reluctant to keep bins for recycling, while those with higher educational levels were more aware about the importance of having different bins for segregation of the MSW and willing to assign more than one bin for recycling purposes.

Similarly, availability of space for the people who live in houses or villas has shown an increase in the willingness to have more than one bin or garbage bag in their households for recycling and composting. Those results are consistent with the results reported by other researchers in which recycling and composting behavior and the

likelihood to have more storage room for large number of recycling bins were influenced by factors such as owner occupants' status and type of residence which explains the higher recycling and composting rates in these categories (Kinnaman and Fullerton, 2000; Alexander et al., 2009; Timlett and Williams, 2011).

In addition, lack of nearby facilities have also contributed, to some extent for those who recycle since most of them (5-29%) have stated that they transport their recyclable materials once a month to a recycling facility. The most recyclers have also appeared to recycle paper material (71%) more than any other type of MSW, most probably due to the fact that paper is considered to be one of the easiest recyclable item which does not require any big storage and preparation and therefore one of the well-known recycled material (Perrin and Barton, 2001). In contrast, the least recycled materials among the respondents were batteries and medicine which can be attributed to the inefficient involvements of the mass media, public campaigns and the Non-Governmental Organizations (NGOs) to raise the public's awareness and knowledge of recyclers that appear to be unaware of how to recycle less common materials (Gamba and Oskamp, 1994; Vicente and Reis, 2008; Saphores et al., 2012).

Nearly more than half of all age groups and households who recycle or willing to assign bins for the recycling preferred door-to-door garbage collection method even though, a drop off system is more flexible as it saves time and spaces, needs less sorting time and allows residents to recycle at whatever time and day they like. Door-to-door is considered more demanding, this could be regarded to the recyclers' attitudes in which carrying or drive distances to dump waste bags is considered socially unacceptable. At this stage the social norms and the role of social pressure would have an impact on recycling behavior. Researchers have shown that stimulation of the community participation in recycling could be perceived as a social norm when the neighbors' visualize recycling action (Tucker et al., 1998; Barr et al., 2003).

It is also important to consider the challenges and obstacles about any fundamental design and

the influential factors concerning a recycling program affecting the residents' agreement about any proposed program. The necessity of having adequate facilities at home, such as sufficient storage space for extra bins and availability of nearby recycling services were viewed as major barriers to initiate a recycling practice. Similar results were reported by several studies that also have found that the frequency of engagement in recycling behavior depends on the availability or close proximity of a recycling center rather than on environmental concern (Derksen and Gartrell, 1993; Schultz et al., 1995; Saphores et al., 2006; Nisbet and Gick, 2008).

The implementation of rewards and penalties to provide different incentives was proposed by the questionnaire in order to meet recycling objectives. Approximately 61.7% of all age groups respondents refused to pay for a third party to take over household waste separation; instead they preferred incentive from municipal authority to encourage them to engage in recycling practice. On the contrary, some studies have found that adopting incentives strategies would facilitate the behavioral change of non-recyclers but they are considered as short-term attractive solutions (Schultz et al., 1995; Shaw and Maynard, 2008). However, imposition of fees and penalties has demonstrated an increase in the rate of recycling as they made participation mandatory (Chu et al., 2006; Sidique et al., 2010). Berglund (2006) believes that financial incentives could motivate the willingness to participate in segregation of MSW. Whereas, Saphores et al. (2006) suggest that gender, education, convenience, and environmental beliefs but not income or political affiliation are key points in determining the willingness to participate in MSW recycling. Fishbein and Ajzen (1975) have observed MSW recycling behavior even in the absence of monetary incentives which reflects the awareness and acceptance of a social norm that in turn modifies the behavior. Additionally, Kinnaman (2006) regarded this behavior, where people not only perform MSW recycling but also they are willing to pay for better recycling programs as something connected with 'warm-glow'. Kreps (1997) suggested that this voluntary behavior could

be emphasized by economic incentives

Finally, the majority of the respondents believe that their cumulative actions toward the environment are not as harmful as the action of the industrial sectors and that there is a gap between the intentions and actions of the public regarding the protection of the environment. However, their intension would be enhanced if an accessible recycling bins were located in their areas which would increase their recycling practice and therefore help in protecting the environment.

Western countries managed to achieve advanced steps in solid waste management and implementation of waste recycling such as Germany which was able to reduce waste dumped to landfill from 14.7 million in 1999 to 0.3 million in 2007 achieving 98% reduction (Fiorillo, 2013). On the other hand developed countries still struggling with this issue due to many obstacles that face shifting to sustainable waste management system. Recycling has not yet become a universal way of life in most of the developing countries. Therefore, the recycling rates in many developing countries including Malaysia (5%), Singapore (11%), China (13%), and Thailand (14%) are much lower than those of some developed countries such as Japan (40%), and Germany (52.8%); thus they are facing loss of resources, rapid utilization of the landfill space, and reducing the length of life span of landfills in those countries (MHLGM, 2011; Fiorillo, 2013).

In view of the results obtained from the current study, the following recommendations are suggested:

1. Encouragement of recycling projects and investments by the authorities.
2. Implementation of effective legislations regarding waste recycling.
3. Public engagement in reduction and segregation of waste generation from the source throughout awareness campaigns.
4. Establishment of adequate infrastructure such as near-by municipal waste collection center or points with segregation facilities.

Thus, in order to establish policies designated to deal with the growing concern about MSW, the

public awareness should be integrated with some basic facilities and programs. The governmental policies, mass media, NGOs, all educational institutions should implement the ideology of creating sustainable solutions to enable the public to take actual actions towards recycling MSW. With the help of religious institutions, the moral and social norms should be reinforced to help conditioning public's recycling behavior and perception. At some point, the municipal authority might then initiate a recycling program after careful investigation of the basic needs of different educational levels, age and residential types. The municipal authorities could subsidize the household owners who wish to purchase bins for recycling while, a common recycling bins could be installed for each apartment complex to ease recycling. At beginning, the program may start voluntarily because, people without particular information and experience in recycling prefer more flexible and voluntary systems. After that, the authority may evaluate the progress and thereafter decide either; to pay incentives for the residents or to apply fees to effectuate the program. Regardless of the factors stated earlier, poor results in effective MSW recycling program could occur if there are ineffective national policies and strategies. The market price should be attractive for recycled products, as opposed to the initial ones; they are of inferior quality. Engagement of the recycling infrastructure should meet the market requirements, so that the costs of processing and transportation of recyclables can be covered.

Conclusion

In order to establish policies designated to deal with the growing concern about MSW, the public awareness should be integrated with some basic facilities and programs. The governmental policies, mass media, NGOs, all educational institutions should implement the ideology of creating sustainable solutions to enable the public to take actual actions towards recycling MSW. With the help of religious institutions, the moral and social norms can be reinforced to help conditioning public's recycling behavior and perception. At some

point, the municipal authority might then initiate a recycling program after careful investigation of the basic needs of different educational levels, age and residential types.

Recycling has become increasingly imperative; waste generation has escalated and resources are becoming scarce, making recycling essential. The willingness to recycle is an important component for a sustainable waste management. This study was designated to measure the publics' awareness concerning recycling of municipal solid waste in the Kingdom of Bahrain. In addition, it sheds the light on the publics' willingness and the challenging factors affecting their recycling behavior. Based on the results of the current study, the majority of the participants have shown high knowledge and awareness in context of MSW recycling. However, most of them were not involved in recycling or composting due to lack of some basic facilities such as nearby recycling bins. It was apparent that the residents of Bahrain are having potentials to engage in recycling practice if all the circumstances were favorable. They believe that paying incentives and having enough space in their households or presence of recycling bins in their neighborhood would increase their recycling practice rather than paying penalties or a third party to separate the waste. If any recycling program is proposed, then door to door is the most favorable method of garbage collection. The concerns of municipal authority on the income after selling recycled goods appeared not to be an important factor of the participants as the majority claimed they would buy recycled products as long as they perceived quality, and appearance.

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