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Community Behaviors to Reduce Accumulation of Municipal Solid Waste in Al-khums City

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ABSTRACT

Municipal Solid Waste has become a crucial environmental issue in the developing countries within the blossoms of the national economy. In the developing countries, with cultural transitions and economic focused development, there are many uncounted non economical risks that actually happen such as waste problems. This research investigated the MSW related behaviors of households community in Al Khums city, Libya, along with the facility problems. This research used qualitative methods. Data were taken from the community (public area such as houses, shops, schools, offices, restaurants) and staffs who work in waste management in the city of Al-Khums. The current study employed three methods of data collection: observation, questionnaire and interview. The result shows that there is awareness on MSW in Al Khums city and the residents show good MSW related behavior for there are only few associative significance among conditional and behavioral variables was found. The regulations have degrees of impacts on shaping MSW related behavior in the society. The harmful effects of wastes were found in the workers who experienced impacts of waste. These workers, with their maximum intensity on their contacts with the waste, experienced impacts of waste to their health. Amount of waste also became problem in the households, schools, and restaurants environments. These problems could be handled by providing an MSW specific system and workers to these special environments.

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INTRODUCTION

Waste generation is an inherent and unavoidable feature of human society. The processes of living, eating, working, playing all utilize consumer products whose production and use generate waste. It is almost impossible to think of a process that does not create some waste. There is sawdust from cutting lumber, metal shavings from drilling and soldering circuit boards, sledges from chemical processes, leftover food from restaurants, waste paper by the ton from environmental hearings and other legal proceedings, dirty diapers, and other household garbage, societal wastes range from the refuse production of specialized goods such as electronics, computers cars, petrochemicals, and plastic. Virtually every aspect of our daily lives generates waste. Waste cannot be avoided. (Mbuligwe, 2002).

Municipal solid waste (MSW) consists of all types of solid waste generation by households and commercial establishments and collected usually by local government bodies. The majority of substances composing MSW in developing countries includes

paper, kitchen waste, plastics, metals, textiles, rubber, glass, and wood/garden wastes (Getahun *et al.*, 2011). As such, the waste contains a high proportion of renewable materials which can be used for energy recovery or the production of solid, liquid and gaseous fuels.

A greater proportion of the MSW in China is disposed of commonly via landfills. Other waste disposal options such as composting and anaerobic digestion account for only a small percentage of the bulk of waste disposed. In spite of the advantages derived from incineration of MSW (Luo *et al.*, 2009).

Community participation is a crucial element in solid waste management (Anschutz, 1996). Solid waste management (SWM) is an integral part of the urban environment and planning of the urban infrastructure to ensure a safe and healthy human environment while considering the promotion of sustainable economic growth (Visvanathan & Trankler, 2003). The prediction of municipal solid waste generation plays an important role in a solid waste management. Yet achieving the anticipated

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prediction accuracy with regard to the generation trends facing many fast growing regions is quite challenging. In addition to population growth and migration, underlying economic development, household size, employment changes, and the impact of waste recycling would influence the solid waste generation interactively (Dyson & Chang, 2005).

Waste can be treated and recycled using a large number of different technologies. But the following categories specify the main groups of treatments: 1) biological treatment, for example composting and anaerobic digestion; 2) incineration with or without energy recovery; 3) land filling (ISWA & UNEP, 2002).

Literature Review:

Municipal Solid Waste (MSW):

Municipal solid waste definition states that MSW includes wastes from residential, commercial, institutional, and some industrial sources. But this definition does not include a wide variety of other non-hazardous wastes that often are landfilled along with MSW. Examples of these other wastes are municipal sludge, combustion ash, non-hazardous industrial process wastes, construction and demolition wastes, and automobile bodies (Tchobanoglous & Kreith, 2002) (Palestinian National Information Centre, 1999). Generation of MSW

The quantity of MSW generated depends on a number of factors such as food habits, standard of living, degree of commercial activities and seasons. Data on quantity variation and generation are useful in planning for collection and disposal systems (Kaushal *et al.*, 2012).

MSW generation is essential due to discarding of unwanted materials away for disposal. Huge quantities of municipal solid wastes are generated in all the megacities of the world. The volume of municipal solid waste generated varies with the lifestyle of the people. It has been estimated that each American generates wastes about 4000 times his body weight every year in his life; each West European 1000 times; and each citizen of the developing countries like India about 150 times. The United States alone generates more than 200 million tons of wastes a year-an amount "enough to fill a convoy of garbage-trucks stretching eight times around the globe (Khan & Ahsan, 2003).

Methods:

This research is a descriptive qualitative research within samples from Al Khums residents who lives in the environment of households. Observations on the landfill conditions and the amount of waste had been done .Qualitative questionnaires were spread among communities in the environment of households during four seasons to assess respondents' experiences on their behaviors related to solid waste, and the conditions of the environments related the

solid waste. Interviews were performed also during the spreading questionnaires activities. Samples were determined by using data saturations those results 94 respondents from the total 420,354 residents in Al Khums. Plastic bags distributions also had been done within the spread of the questionnaires to assess the sorting willingness of the community.

RESULT AND DISSECTION

Community In Al-Khums City:

This research absorbed data from respondents from different types of characteristic of socio-environmental conditions of each season to obtain all of the happening circumstances on waste related behavior that produces wastes that will be dumped in Al Khums city landfill. There are five types of environment as the circumstances for MSW related behavior. The absorbance of the waste related behavior situations have calculated and analyzed to see the association of the conditions variables and the behaviors variables.

General Condition of Municipal Solid Waste in Al Khums:

Municipal Solid Waste has become a crucial environmental issue in the developing countries within the blossoms of the national economy. By the increasing income per capita, the residents will consume more foods and beverages that will produce more wastes. Products from many factories are usually distributed in the plastic packaging. Convenience stores are using plastic bags to make their customers more convenience on carrying products they have bought. There are also increases on the varieties of the products provided to be consumed. People also have more money to spend. Generally, it could be said that there is a new consumption culture occurred by the rapid blossoms in economic conditions which is also one characteristic of developing countries. This new consumption culture produces excretive consequences known as wastes.

Municipal Solid Waste-Related Conditions and Behaviors in the Environment of Households:

Households in Al Khums city were constructed on the soil in the village and on the cement bases in the city. The residents put the wastes into plastic bags and then the wastes will be collected by MSW workers. In the village, the waste bags were put besides the houses because the government does not provide any container in the environment of households.

In the city, the government installed some containers in the corner of the housing complexes. Waste collectors collect the waste in varied ranges of time; everyday, twice a week, three times in a week, and once a week. The waste then carried by trucks

into the Al Khums city landfill to be mounded then burnt.

The MSW condition and the residents behavior in Al Khums city. The differences of the MSW conditions and how the percentage combinations of each variable changed in each season will be one of the scientific valid conditions of this research for its empirical evidentiality. MSW related behavior in five environmental types also have been assessed in the different seasonal condition to know how the government regulations, the environmental types and the seasons construct the Al Khums community MSW related behavior.

This research assessed community behaviors and MSW related conditions in Al Khums during four seasons. The first season had been assessed was the winter. This season is the season with the highest precipitation (57 millimeters, 2 inches, 8 days/month), highest humidity levels (74 %) and lowest temperatures (18 o C in the day and 9 o C) among seasons.

After the winter season, the spring season comes. This season has many different

environmental condition characteristics with the winter season. The land surface is dryer in the spring season, the humidity level is lower (70 %), and the precipitation level is also lower (22 millimeters, 1 inches, 3 days/month) in Al Khums city. The day temperature average is 23 o C and the night temperature average is 30 o C.

Summer then came after winter with its hottest temperatures and lowest precipitations during all the seasons. The day temperature average is 31 o C and the night temperature average is 22 o C. Humidity level average is 71 %. In summer, there is no precipitation in this city. In this season, there is no activity in restaurants and in schools.

Autumn came as the last season in this research with the decreasing temperatures (29 o C average in the day and 19 o C in the night), but increasing precipitation (21 millimeters, 1 inches, 3 days/month). This season has the lowest humidity level (68 %). Activities performed in every type of environment in this season.

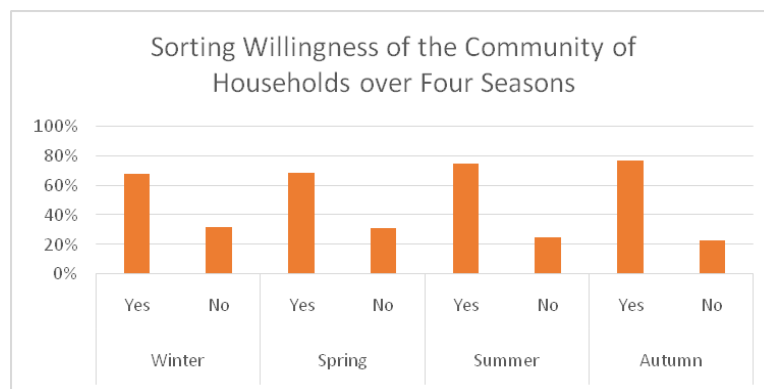


Fig. 1: Sorting Willingness (% of Total Respondents).

Figure 1. Shows respondents' experiences on sorting willingness. By this figure, it can be seen that within household environment, 68 % of respondents had their willingness of sorting waste; but another 32 % of them did not had such a willingness in winter.

The figure 1. Above also shows that sorting willingness in the spring had been experienced by 69 % of respondents (n=94). The percentage was increased only 1 % from 68 % in the winter. The difference between these two conditions has no meanings. To obtain the whole situation on this behavior, the sorting willingness in the summer and the autumn should be absorbed to see the percentage combinations on sorting willingness. In the summer, the sorting willingness of the people was qualitatively increasing by 6 % to 75 % among the total respondents on spring. It was not a large scale increase, but it showed the sorting willingness more occurred in the summer than in the spring.

In autumn, there were 77 % respondents from the environment of households who experienced

sorting willingness in autumn and 23 % respondents who did not experience this behavior.

In spring, there were 76 % respondents who experienced sorting willingness with distributed bags for free, and there were 24 % respondents who experienced sorting willingness with distributed bags with given incentives. In summer, there were 68 % respondents who experienced sorting willingness with distributed bags for free, and there were 32 % respondents who experienced sorting willingness with given incentives.

In autumn, there were 32 % respondents who experienced sorting with distributed bags with given incentive and the other 68 % who experienced sorting willingness for free.

These facts indicate that the communities of households in Al Khums are ready for sorting the solid waste with distributed bags for free.

By the fact that organic wastes were the wastes with the highest amount, this research absorbed leftover treatments from the respondents in figure 3. ,

(n = 94). 72 % of the total leftovers are used as the food of their animals or pets, 21 % go to the disposal, 4 % are reused as organic fertilizers, and 3 % are used for other usages. This re-usal behavior in the

residents is a good condition in MSW because there is awareness to choose to re-use the waste rather than to dispose it to the containers. It is a good culture of waste disposal.

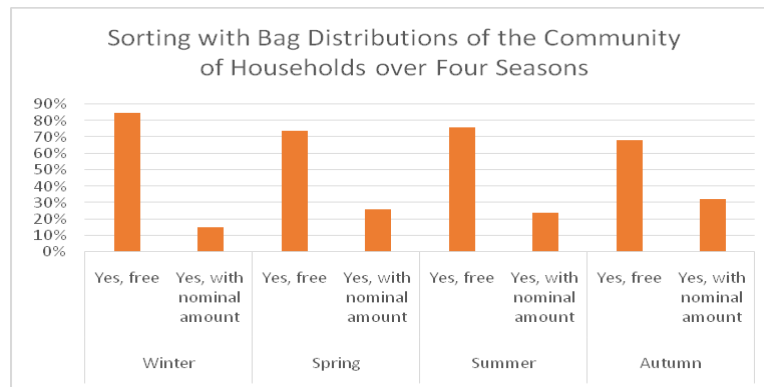


Fig. 2: Shows respondents’ experiences in the behavior of sorting with bag distributions. By this figure, it can be seen that in winter, among household respondents, 15 % of them experienced sorting with distributed bags with given incentives and 85 % of them experienced sorting waste with distributed bags which are for free.

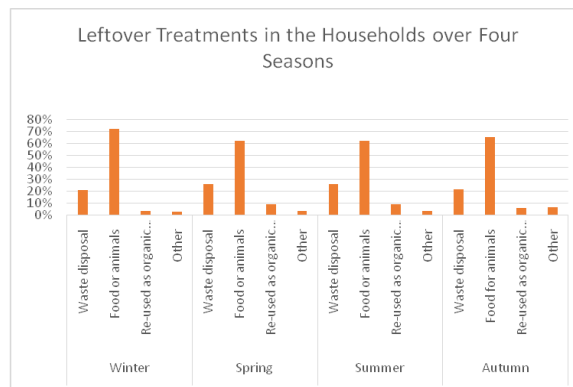


Fig. 3: Leftover Treatments (% of Total Respondents).

In the summer, the usage of leftovers for food or animals by the respondents (n=94) was decreased by 9 % into 62 % from its percentage in the spring and 10 % from its percentage in the winter. This 9 % wastes increase were going to the waste disposal which has made this type of usage reached 26 % from the total percentage. This figure 5.9 shows that there are 9 % respondents who used their waste to be re-used as organic fertilizers, and that there are 4 % respondents who used the waste for other usages.

In autumn, the treatment of leftover for food or animals was 65 % from the total respondents’

answers, waste disposal as the leftover treatment had 22 % answers, the leftover treatment of re-used as organic fertilizer had 6 % respondents’ answers, and the other kinds of leftover treatments had 7 % respondents’ answers.

These facts show that the community of households in Al Khums has habits on re-using the leftovers in the forms of organic solid waste for food for animals. This behavior can be developed for the other types of waste with recycling factories from the government.

Table 1: Frequency Distributions of Suggestion Analysis on MSW Perceptions of Al-Khums.

		Frequency	Percent
Valid	no suggestion	30	31.9
	Systemic and ‘no landfilling’ solution	10	10.6
	Practical solution	39	41.5
	Power related systemic solution	15	16.0
	Total	94	100.0

In this table 1. Suggestion analysis is also provided to absorb the existence of the perception of waste management in the residents. There were 64 respondents (n = 94) or 68.1 % of the total respondents who provided suggestions for MSW management. Suggestions provided showed that the respondents have good understandings about the generation of the wastes and the procedure of the waste management. Further, there were 25 respondents who are in the good understanding of the whole municipal waste management system. These respondents provided exact suggestions such as 'stop landfilling', 'recycling', 'remanufacturing', and 'involvement of the private sectors in the waste management'. The respondents' suggestions show that the community will not be a problem for the implementation of the MSW management.

Considering the fact that the minimum economic capacity of the respondents from the household communities, this research observed the facilities that had been provided by the government as the consequence from deciding municipality on the solid waste.

By pictures above, it can be seen that the government does not provide any waste container in the rural area and this condition makes the neighborhood looks dirty. The society cannot be expected to provide their own containers independently for their minimum economic capacity, but their efforts on putting the waste into plastic bags and mounding it are in the good direction of being parts of MSW system.

The most experienced types of waste in the environments of households are the kitchen waste which is in the form of organic waste. This type of waste can cause many problems if it directly been put in the container for its undeniable decomposing condition. The decomposing organic waste can cause odors, insects and rodents, and even corrosion that worsen the condition of containers.

Fortunately 73 % of the respondents experienced the behavior of re-use as food for animal as their leftover treatment for kitchen waste. This behavior is a good traditional behavior which is also potential to be developed as leftover treatment for the other types of waste such as plastics, metals, rubbers, and glasses with the provision of its facilities by the government.

Heckett (1994) found that low waste disposal fees are a significant determinant of waste generation in US. Compare to MSW in Libya with no disposal fee, MSW related behaviors in Libya are better than in the Southeastern US. The community of households experienced reuse activities for the type of waste with the highest amount; the kitchen waste, which are organic waste.

In the research of Henry (1994), retail sales are also a significant determinant for waste generation. The economic sphere of Al Khums is simpler than in the Southeastern US where the waste generation mostly comes from the basic activity of human being

such as eating. And this situation is easier to be controlled since the community of households in Al Khums did not perform too much packed convenience goods consumption activities.

Collective community awareness is a mental situation that a community can achieve in the matter of how a mental situation will be reflected in the praxis of a group of humans related to their environment. Awareness, which can be defined as a mental situation related to a person's moral sphere where a human independently choose to do an activity or a set of activities by the existence of values obtained through accumulation of living experiences, can also replace knowledge that should be obtained through various specific learning processes. Although knowledge provides the fastest cognitive play of constraints that prevents human mind to do harmful activities by means of the absorbance of risks, awareness can be the alternative when the processes of obtaining knowledge has many socio cultural constraints happened by the history of any socio cultural structure which can never be changed easily.

When knowledge which is known as the peak of cultural achievement of a human being cannot be easily accessed, for example, in the typical communities where the knowledge is restricted and monopolized by the dominating class of actors such as the government to protect the community through persistent controls, awareness must be obtained for the sake of preservation of the civilization in the forms of cultural aspects of human beings which the impacts will be reflected on what have been popularly called as their environment.

Top-down governance that of the government in Al Khums city as what had been mentioned in the beginning of the analysis is one of the examples of the happening of the restriction to knowledge in order to protect and facilitate the society in a certain area. The occurring MSW system happens without any participation from non-governmental actors; although some of these actors know the MSW system. This condition was shown by the suggestion analysis part; where the suggestions refer exactly to the condition of the MSW system provided by the government was provided by almost half of the total respondents in the Environment of Households.

Al Khums city consists of five types of society that of a set of environmental characteristic which are: society in the Environment of Households, society in the the Environment of Offices, society in the the Environment of Schools, society in the shop environment, and society in the the Environment of Restaurants. Each of the society has each set of its characteristics.

This research shows that the society in Al Khums city, though not all of them possess knowledge, have a slight of awareness which reflected on their MSW related behaviours such as caring the waste, participating on the waste

separation, and keeping the place clean. It is shown by more than 80% of respondents who had these behaviours in all of the seasons.

From pictures taken from the location, it is also shown that the society already puts the waste together in plastic bags, and then gathers the waste bags in one place together to make the collectors'

works easier. There are also people who put their waste bags in front of their houses to be easily collected by the collectors. These situations show that the society is following 'the rule of the MSW system', but the government does not provide waste containers in a sufficient quantity, especially in the villages.

Impacts on MSW Related Behavior in Al Khums City:

Variables	Community	The Impacts of Season to the MSW Related Behaviors and Conditions
Sorting Willingness	Household	The behaviors of sorting willingness in the spring season, the summer, and the winter season had been experienced by 68% - 70% respondents, but it was increased to 77% by the autumn. The difference between the types of wastes in the spring season, the summer, the autumn, and the winter season almost has no meaning.
Street Cleanliness	Household	Street cleanliness were fluctuatively experienced by the respondents. Most of the respondents sometimes experienced street cleanliness (33% - 46%) in each season. Summer is the season with the least cleanliness experienced by respondents (22% of them never experience street cleanliness in this season).
Leftover Treatments	Household	Leftover treatments are constant during all the seasons with reuse of leftover as animal food as the treatment of the highest percentage (68-77%). The difference between leftover treatments in the spring season, the summer, the autumn, and the winter season almost has no meaning.
Waste Container Problems	Household	Waste containers problems are constant for all the seasons. But some components of waste container problems such as odors, insects-rodents, permanently staining, failure to unload, had significant associations with seasons. It means that seasons had causal relation with the waste container problems.
Impacts of Waste	Household	Impacts of waste had been experienced by 48-52% of respondents. The difference between respondents' experiences on impacts of waste in the spring season, the summer, and the winter season almost has no meaning.
Placing Waste in the Right Place	School	Placing waste in the right place was constantly experienced by 63-67% of respondents during all seasons. The difference between the behaviors of placing waste in the right place in the spring season, the summer, and the winter season almost has no meaning.
Impacts of Waste	School	Impacts of waste was experienced by 76-79% of respondents in all the seasons. The difference between respondents' experiences on impacts of waste in the spring season, the summer, and the winter season almost has no meaning.
Care about Wastes	School	Care about waste was experienced by 87-88% of respondents in all seasons. The difference between the behaviors of care about waste in the spring season, the summer, and the winter season almost has no meaning.
No leftover	School	No leftover was mostly experienced by respondents in autumn (92%). In other seasons, this behavior was experienced only by 79% of respondents.
Keep the place clean	School	Keep clean the place was mostly experienced by respondents in autumn (88%). In other seasons, the behaviour was experienced by 71-79% of respondents.
Waste separation	School	Waste separation was experienced constantly by 43% of respondents during all the seasons.
Placing Waste in the Right Place	Office	Placing waste in the right place was always experienced fluctuatively by respondents, and the highest percentage of this experience was found in spring (83%). But it decreased in autumn to 45%.
Impacts of Waste	Office	Impact of waste was experienced constantly (61-66%) by respondents in winter, summer and autumn. Its peak was in spring (89%).
Care about Wastes	Office	The behavior of care about waste was constantly experienced by respondents during all seasons (72-94%). Its peak was in spring. Respondents practiced better MSW related behavior in the summer when 100% respondents had experiences on the behavior of care about waste.
No leftover	Office	This behavior was experienced constantly in all seasons (63-83%). And autumn was the season where this behavior peaked at 83%.
Placing Waste in the Right Place	Shops	Placing waste in the right place was always constantly experienced by 54-62% of respondents. Its peak was in autumn (80%).
Impacts of Waste	Shops	Impacts of waste were constantly experienced by 57-68% of respondents. The least percentage was in autumn (57%).
Waste separation	Shops	Waste separation was experienced constantly by 13-27% of respondents. And the lowest percentage was in autumn.
Placing Waste in the Right Place	Restaurants	This behavior was constantly experienced by 87-100% of respondents. Its peak is in autumn 100%.
Impacts of Waste	Restaurants	Impact of waste was constantly experienced by 62-87%, and its peak was in spring.
Care about Wastes	Restaurants	This behavior was constantly experienced by 74-100% respondents. And its peak was in autumn.
No left over	Restaurants	This behavior was experienced constantly by 87-100% of respondents. Its peak was in autumn (100%).
Keep clean the place	Restaurants	This behavior was constantly experienced by 100% of respondents in all seasons.

Respondents showed constant experiences on the behaviour of sorting willingness, no leftover, keeping the place clean, and placing waste in the right place which had been experienced by more than 75% respondents in all of the seasons, meanwhile the only behaviour that had not been experienced by the majority of respondents is the behaviour of waste separation. This situation shows that the society is generally aware about MSW, but waste separation, which is specific to MSW system, cannot be absorbed without information from the government as the main actor who should maintain the municipality on the solid waste in this area.

Conclusions:

Community Behaviours on Municipal Solid Waste In Al Khums City:

By the range of time of the existence of Municipal Solid Waste and the local cultures of Al Khums community, the community of Al Khums, as the non-governmental actors in the governance map of Al Khums, showed awareness as the foundation of their Municipal Solid Waste related behaviours, and these behaviours that of the society in Al Khums keep the cleanliness of the area by means of controlling the solid waste appropriately.

Although more than 50% of the respondents from community members had minimum knowledge about municipal solid waste particularly, the existence of the municipal solid waste that had been installed into the area had driven the society into praxis of being parts of municipal solid waste system by having sorting willingness, practicing sorting waste with bag distributions, and participating on the waste separations. The community also showed good

behaviours of keeping the place clean and not leaving any leftover in the waste generators.

There was a special situation in the household community; the re-use of the organic leftovers as the food for animals which is a result of local traditional culture which in the more modern society has become of the discourses of waste management.

Generally, the solid waste are controlled by the works of the waste collectors and the awareness-based municipal solid waste related behaviours, but, improvements, especially from the governments' side, are still needed.

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