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Research Article

Solid Waste Pollution of Beaches in the Eastern Region of Benghazi City

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Abstract

The solid waste accumulation patterns on the eastern region of Benghazi city (Sidi Khalifa Beach, Driana Beach, and Talmitha Beach), were assessed from May to October of 2016. These beaches are easily accessible, frequently used, and employ a public cleaning service. The study was conducted during the summer months, where vacationers are highly active and easily found along the beaches of the sea. The beaches were visited three times a month for each of the studied areas. The study divided the beaches into squares, separated based on the weight of organic materials, solids, and plastic, groups A, B, and C, respectively. From the study, it was found that most of the waste on the three beaches (Sidi Khalifa, Driana and Talmitha) from May to September 2016 were plastic waste, solid waste, and organic waste being the least. The study showed that the amount of waste on Sidi Khalifa beach was highest in August, followed by June, July, and lastly September, while the lowest quantity of waste on the beach was found in May. It was also found that the amount of waste on Driana and Talmitha beaches highest in September, followed by August, July, June, and the lowest quantity of waste on these beaches was found in May.

Keywords: *Solid Waste Pollution; Beaches; Benghazi City*

Introduction

Beaches are a natural resource and their exploitation as a tourist attraction generates demand for services, jobs and income for local populations. Unplanned urban developments and population growth in urban centers close to the seashore lead to degradation of coastal environments through contamination by solid (non-biodegradable) wastes and domestic sewage. Although there is a consensus on the necessity of monitoring solid waste pollution in the aquatic environments, the methods applied in qualitative and quantitative studies vary widely, even among works with similar objectives. These differences have resulted in a large amount of assessment methods of beach contamination by solid wastes [1-5].

Therefore, creating, testing and recommending a method that not only allows comparisons of places and periods, but also the detection of source signals, will be important to reach the objectives of the source-prevention principle. This will also allow the optimization of time, resources, and processing of samples and data.

The coast of Pernambuco State spans 187 km [6]. Tamandaré is located on its southern portion and has approximately a 9 km coastline, characterized by a natural restriction caused by coastal reefs. Small rivers contribute to the coastal region [7].

Beaches are subject to solid waste contamination at the strandline. Litter depositional dynamics are influenced by the specific beach morphology and sources of solid wastes. The amount of items on the strandline of Boa Viagem beach in Recife, Brazil, was evaluated during dry and rainy seasons of 2005 to characterize their sources and depositional patterns. The strandline was surveyed once a month to count and classify all visible solid waste items within a belt-transect. Plastics were used for detailed analysis of the wastes accumulated. There were quantitative, but not qualitative, differences in litter accumulation at different times and locations of the beach. The main source of debris was land-based. In general, the beach was low-polluted in the dry season and medium polluted during the rainy season. The method is a low-cost and highly efficient characterization of solid waste contamination of urban beaches [8].

Beach pollution by solid wastes is a global phenomenon. Studies related to the solid waste contamination of beaches, including plastics, nylon, polystyrene, organic debris, glass, metals and paper items [6,9-15], have been completed in many countries and illustrate the diverse character of this pollution. Solid waste contamination and accumulation on beaches are closely related to human intervention and natural variables [4].

Tropical beaches are an important space for leisure, as their exploitation promotes local development. In Brazil, beaches are a hot attraction due to warm weather and tourism, which contributes to the local and national economy. Boa Viagem beach in Recife, Brazil, has significant environmental and social status. It is easily accessible and used throughout the year [16], resulting in significant solid waste contamination. Littering at the beach creates public health issues and reduces the number of visitors by affecting the ability to attract tourists and locals [17-20]. There are rubbish bins to attempt to minimize direct discarding to the environment, but the beach is still contaminated. Due to public pressure, litter on the beach is collected daily, temporarily resolving the site of garbage, but this is very costly to the local government.

In a developing environment, much is being done to provide collection, safe storage, and proper sanitary disposal of household waste; yet the problem still persists. This study by Sangodoyin examined the various ways in which solid waste is managed in Southwest Nigeria and outlines some of the problems encountered. These problems include the continuous expansion of sprawling areas, funding limitations, variation in eating relaxed sanitation laws. These issues, among others, make solid waste management and environmental pollution control in the area extremely complex. They suggest socioeconomic factors should be recognized, urban planning modified, and a well-equipped and adequately staffed Waste Disposal Agency developed [21].

The waste generated as consequence of household activities such as the cleaning, cooking, repairing empty containers, packaging, and plastic bags, is domestic waste. Humans, for centures, have always produced waste including the discarded bones of animals slaughtered for food, stone axes found in Olduvia and the increase in waste that characterizes contemporary society, dating back to the industrial revolution [22].

Waste is more easily recognised than defined. Something can become waste when it is no longer useful to the owner or it is overused and no longer fulfils its purpose [23]. A great mixture of substances, including fine dust, cinder, metal, glass, paper, textiles, putrescible vegetable materials, and plastic, characterize solid waste [24]. As time passes, the accumulation of solid waste exceeds the ability to control it. There is no single solution to the problem of waste management. The process of waste management usually consists of generation, storage, treatment and disposal, with transportation inserted between certain stages (as needed). Hence, a combination of source reduction, recycling, incineration and burying in land fills and conversion is currently the optimal way to manage domestic waste [22].

Ijebu-Ode, a town in South-West Nigeria, is engulfed in filth in both conspicuous and inconspicuous places, due to having a poor waste management system. One of the issues is wrong perceptions and unconcerned attitudes of its residents towards waste management. In order to provide solutions to these problems, it is therefore imperative for this study to examine the perception of the inhabitants of Ijebu-Ode and offer realistic solutions domestic waste management in Ijebu-Ode. This study was conducted with the intent to provide insight to citizens, government officials and non-governmental organizations who express interest in resolving the domestic waste crisis Ijebu-Ode.

Aim of the Study

Libya, among other countries, suffers from increasing quantities of solid waste along its shoreline. The study aims to identify the constituents of the solid waste of some beaches of the eastern region of Benghazi city and to quantitatively and qualitatively examine the difference in the percentage of pollution due to solid waste from one area to another.

Materials and Methods

Study site and sample collection

This experiment was conducted using three beaches in the eastern part of Benghazi City, including:

- **Sidi Khalifa Beach:** Sidi Khalifa is a town located 17 km north of the Benghazi City, Libya. It is an agricultural and industrial suburb and is one of the 32 districts of the Benghazi municipality.
- **Driana Beach:** Driana is a small town in Libya, 32 km north of Benghazi City. Its name was derived from the ancient Roman city Hadrianopolis built near it. The town has a population of about 4532 people and is a popular tourist attraction for the Roman ruins near the city, a tourist conference with fountains, and many resorts.
- **Tlemitha Beach:** Tlemitha is a town located about 70 km east of the Benghazi City. Tlemitha is one of the most beautiful archaeological areas with a 25 km coastline and located in the Green Mountain.

This experiment was performed during the period spanning from May to October 2016. This period in which the study was conducted was chosen strategically since the summer period is when tourists and vacationers are most active at the beaches of the sea. The beaches were visited three times a month for each of the studied areas (Sidi Khalifa Beach, Driana Beach and Tlemitha Beach).

The method used

Each beach was divided into three parts, A, B and C, based on the different degrees of conservation, well preserved, intermediate, and poorly preserved, respectively. These degrees of conservation were determined based on the degree of habitat integrity [25]. Data was then recorded three times a month for each location at each beach.

The physical division of the beach into squares was made using ropes and sticks at each beach. All solid waste was collected from each square each individual beach. The solid waste was then separated into distinct types, including organic materials, solids, and plastic. These distinguished groups were then weighed and labelled A, B, and C respectively.

The data was collected in May, June, August, September, and October 2016 (rainy season; austral winter) when beach use is lower and riverine flow is higher. In each square, there are all types of wastes. For example, in the square A, we collected organic, plastic and solid wastes, then we weighed it separately and finally we weighed all together. And this process was done every month starting from May to September and taking the mean for these wastes. We repeated these operations in squares B and C every month starting from May to September and with all types of wastes that we collected from them and finally, we took the mean for these wastes.

Each separated division of the beach was inspected three times a month for visible objects (> 5 cm) in a 1 metre wide belt-transect centred along the main strandline. Two observers worked concomitantly after being monitored to confirm consistency in method used.

The litter was classified into plastic, paper, glass, wood, organic matter, steel, aluminium and building materials. The plastic items were divided according to their most probable use as fishing, beach use, household utensils, hospital waste and sanitary material.

Classification of solid waste

Solid waste is a solid or semi-solid material that is disposed of and considered not worth preserving or recycling. Solid materials generally refer to materials that are resistant to degradation or degrade very slowly and are classified into 3 main groups:

1. Food waste (organic matter): Residues of vegetables, fruits, bread, and organic waste.
2. Solid wastes: Includes iron, wood, and glass.
3. Plastic waste: Plastic materials.

Statistical analysis

Data collected from the experiment (Percentage of organic waste, solid waste and plastic waste for each beach from May to October) was entered into an excel document. The collected information was validated by comparison and manual checking with the original paper from which the data was exported to SPSS for statistical analysis. This was important to identify the amount and type of solid waste accumulating at beaches of the eastern region of Benghazi City and to determine the most polluted area and the degree of pollution, quantitatively and qualitatively. Data were analyzed using SPSS software (Social Package Statistic Software, version 18). A one way Anova test was performed to identify the most polluted beach and the percentage of pollution and to compare one beach to another quantitatively and qualitatively. Data was considered significant at P-values below 0.05 the confidence interval was set at 95%.

Results

The results of the study performed indicated that the type of solid waste accumulation varied from site to site.

The descriptive statistics

Table 1 shows the results of various types of waste collected from the beach of Sidi Khalifa, Driana and Talmitha. It was found that the largest amount of waste contaminants on the beaches of the eastern part of Benghazi City were plastic waste, followed by solid waste, and lastly organic waste, as shown in the figure 1.

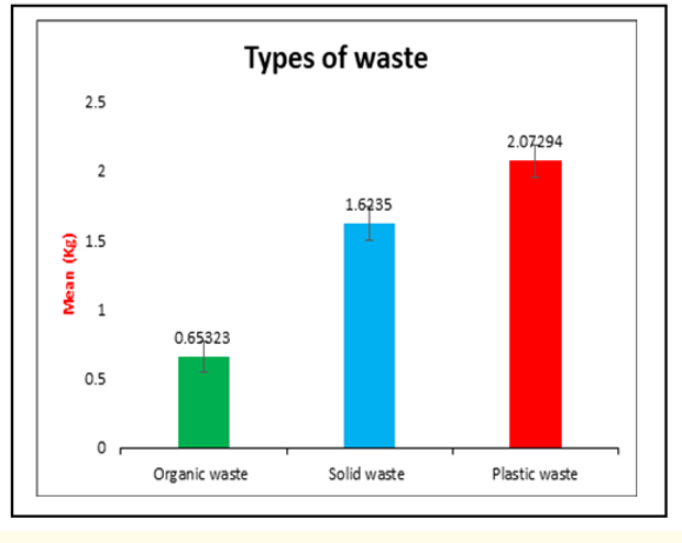

Figure 1: *Types of waste obtained from the beaches of Sidi Khalifa, Driana, and Talmitha.*

No.	Types of wastes	Average
1	Organic waste	0.65322
2	Solid waste	1.6235
3	Plastic waste	2.07294

Table 1: *Types of waste obtained from the beaches of Sidi Khalifa, Driana, and Talmitha.*

Table 2 shows the results of various types of waste collected from the beach of Sidi Khalifa, Driana and Talmitha. It was found that the largest amount of waste contaminants on the beaches of the eastern part of Benghazi City were plastic waste, followed by solid waste, and lastly organic waste. This pattern was evident at all three beaches studied, as shown in the figure 2.

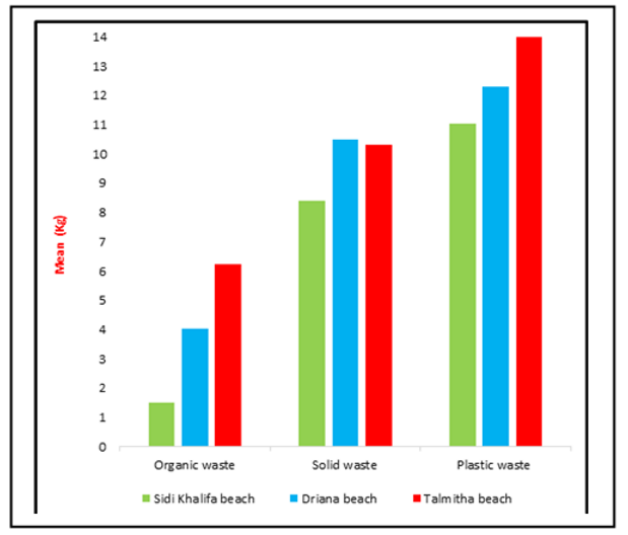

Figure 2: *Types of waste obtained in Sidi Khalifa Beach, and Driana Beach, and Talmitha Beach.*

No.	Beach name	Plastic waste	Solid waste	Organic waste
1	Sidi Khalifa Beach	11.033	8.403	1.512
2	Driana Beach	12.283	10.504	4.031
3	Talmitha Beach	13.997	10.316	6.215

Table 2: *Types of waste collected from Sidi Khalifa Beach, and Driana Beach, and Talmitha Beach.*

Table 3 shows the results of various types of waste collected from the beach of Sidi Khalifa, Driana and Talmitha, during the month of May. It was found that the largest amount of waste contaminants on the beaches of the eastern part of Benghazi City in May 2016 were plastic waste, followed by solid waste, and lastly organic waste. This pattern was evident at all three beaches studied, as shown in the figure 3.

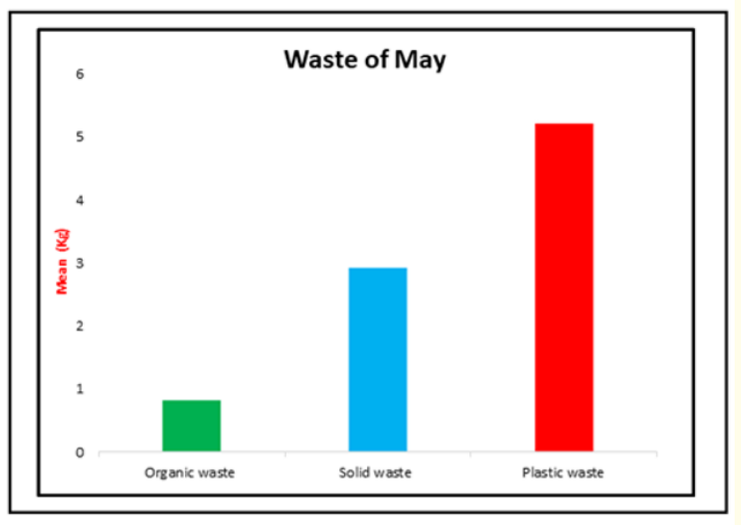

Figure 3: *Types of waste obtained during the month of May on the beaches of Sidi Khalifa, Driana, and Talmitha.*

No.	Types of wastes	The quantity
1	Organic waste	0.817
2	Solid waste	2.925
3	Plastic waste	5.204

Table 3: *Types of waste obtained during the month of May on the beaches of Sidi Khalifa, Driana, and Talmitha.*

Table 4 shows the results of various types of waste collected from the beach of Sidi Khalifa, Driana, and Talmitha, during the month of June. It was found that the largest amount of waste contaminants on the beaches of the eastern part of Benghazi City in June 2016 were plastic waste, followed by solid waste, and lastly organic waste. This pattern was evident at all three beaches studied, as shown in the figure 4.

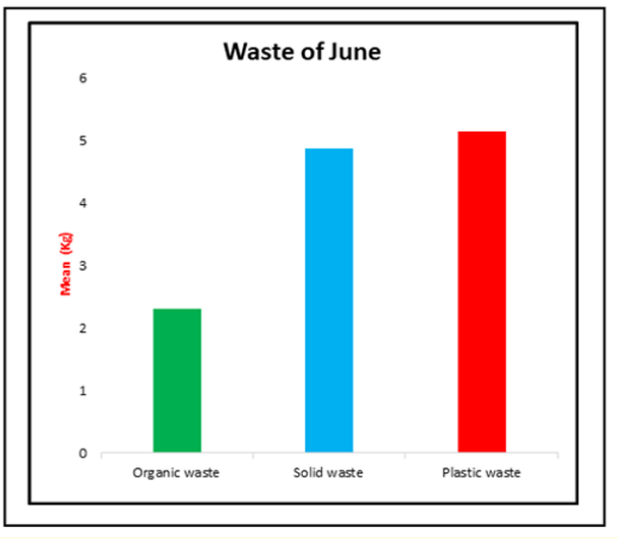

Figure 4: *Types of waste obtained during the month of June on the beaches of Sidi Khalifa, Driana, and Talmitha.*

No.	Types of wastes	The quantity
1	Organic waste	2.306
2	Solid waste	4.872
3	Plastic waste	5.156

Table 4: *Types of waste obtained during the month of June on the beaches of Sidi Khalifa, Driana, and Talmitha.*

Table 5 shows the results of various types of waste collected from the beach of Sidi Khalifa, Driana and Talmitha, during the month of July. It was found that the largest amount of waste contaminants on the beaches of the eastern part of Benghazi City in July 2016 were plastic waste, followed by solid waste, and lastly organic waste. This pattern was evident at all three beaches studied, as shown in the figure 5.

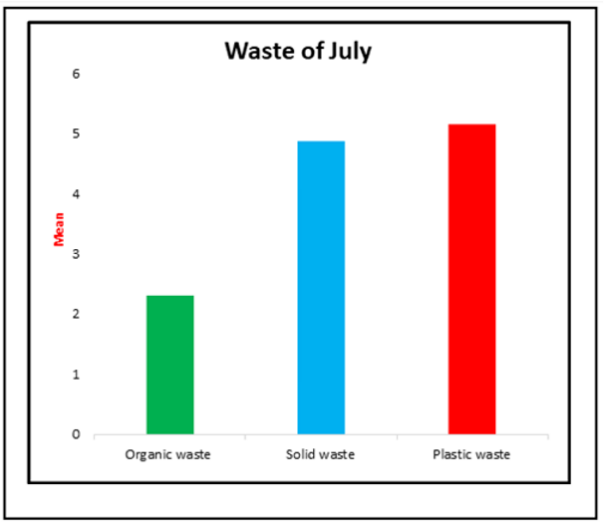

Figure 5: *Types of waste obtained during the month of July on the beaches of Sidi Khalifa, Driana, and Talmitha.*

No.	Types of wastes	The quantity
1	Organic waste	2.023
2	Solid waste	4.958
3	Plastic waste	6.549

Table 5: *Types of waste obtained during the month of July on the beaches of Sidi Khalifa, Driana, and Talmitha.*

Table 6 shows the results of various types of waste collected from the beach of Sidi Khalifa, Driana, and Talmitha, during the month of August. It was found that the largest amount of waste contaminants on the beaches of the eastern part of Benghazi City in August 2016 were plastic waste, followed by solid waste, and lastly organic waste. This pattern was evident at all three beaches studied, as shown in the figure 6.

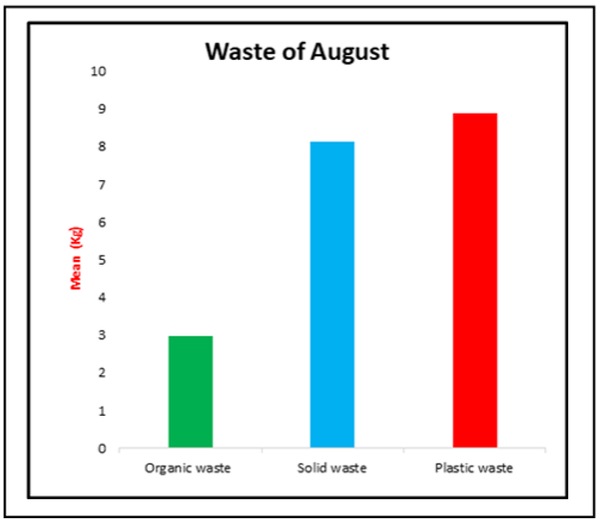

Figure 6: *Types of waste obtained during the month of August on the beaches of Sidi Khalifa, Driana, and Talmitha.*

No.	Types of wastes	The quantity
1	Organic waste	2.973
2	Solid waste	8.119
3	Plastic waste	8.884

Table 6: *Types of waste obtained during the month of August on the beaches of Sidi Khalifa, Driana, and Talmitha.*

Table 7 shows the results of various types of waste collected from the beach of Sidi Khalifa, Driana and Talmitha, during the month of September. It was found that the largest amount of waste contaminants on the beaches of the eastern part of Benghazi City in September 2016 were plastic waste, followed by solid waste, and lastly organic waste. This pattern was evident at all three beaches studied, as shown in the figure 7.

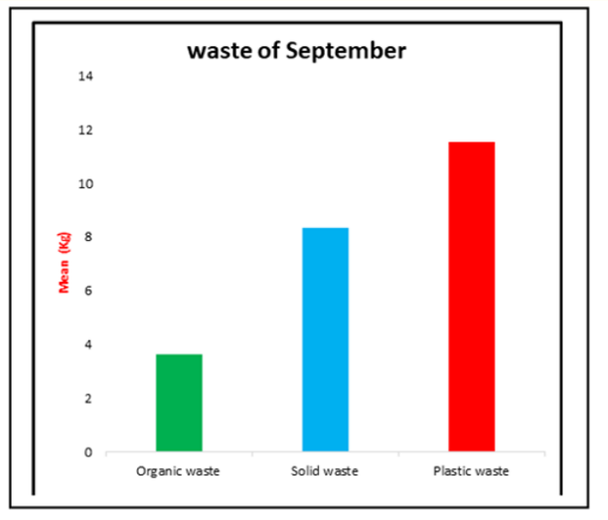

Figure 7: *Types of waste obtained during the month of September on the beaches of Sidi Khalifa, Driana, and Talmitha.*

No.	Types of wastes	The quantity
1	Organic waste	3.639
2	Solid waste	8.349
3	Plastic waste	11.52

Table 7: *Types of waste obtained during the month of September on the beaches of Sidi Khalifa, Driana, and Talmitha.*

Deductive statistics

The researchers relied the ANOVA test for statistical analysis of the study data to identify major differences.

Variable division of squares for each region:

- Zero hypothesis: There are no significant differences in the division of squares (A, B, and C).
- Alternative Hypothesis: There are significant differences in the division of squares (A, B, and C).

Standard deviation	Mean	The number	Divided squares
0.578301	1.22672	18	Square (A)
0.768075	1.57094	18	Square (B)
0.645958	1.68844	18	Square (C)

Table 8: *The descriptive statistics of the variable division of squares.*

Table 9 shows the results of the variance test in the division of the three squares (A, B, and C). The statistical semantic test (0.109) was greater than the moral level (0.05), suggesting that there are no significant differences in the division of the three squares, as shown in the figure 8.

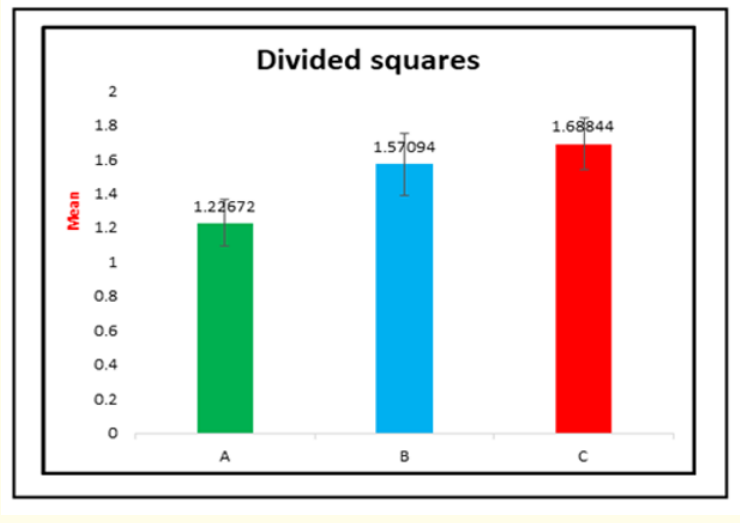

Figure 8: *The descriptive statistics of the variable division of squares (A, B, C).*

Division of squares (A, B, C)	Source of variation	Sum of the squares	Degree of freedom	Variation	f	P-value
	Between groups	2.073	2	1.036	2.318	0.109
	Inside groups	22.808	41	0.447		
	Total	24.881	43			

Table 9: *Results of the analysis of variance (ANOVA) for the variable division of squares.*

Variable types of waste

1. Organic waste
2. Solid waste (including glass, metal, iron, and wood).
3. Plastic waste.

Zero hypothesis: There are no significant differences in the types of waste (organic, solid, or plastic).

Alternative hypothesis: There are significant differences in types of waste (organic, solid, and plastic).

Table 10 shows the descriptive statistics of the variable types of waste including plastic, solid and organic waste.

Types of wastes	Number	Mean	Standard deviation
Organic waste	18	0.65323	0.467966
Solid waste	18	1.6235	0.531226
Plastic waste	18	2.07294	0.480507

Table 10: *The descriptive statistics of the variable types of waste.*

Table 11 shows the results of the variance test for the different types of waste, including organic, solid, and plastic. The statistical semantic test was 0.00 and is less than the moral level (0.05), suggesting that there are significant differences in the three types of waste studied.

Types of waste (organic- solid-plastic)	Source of variation	Sum of the squares	Degree of freedom	Variation	f	P-value
	Between groups	18.954	2	9.477	38.836	0.00
	Inside groups	12.445	51	0.244		
	Total	31.399	53			

Table 11: *Results of the analysis of variance (ANOVA) for the different types of waste.*

Table 12 shows the following:

1. There is a statistically significant difference, at the level of 0.05, between the average organic waste and solid waste categories collected.

2. There is a statistically significant difference, at the level of 0.05, between the average organic waste and plastic waste categories collected.

3. There is a statistically significant difference, at the level of 0.05, between the average solid waste and plastic waste categories collected, as shown in the figure 9.

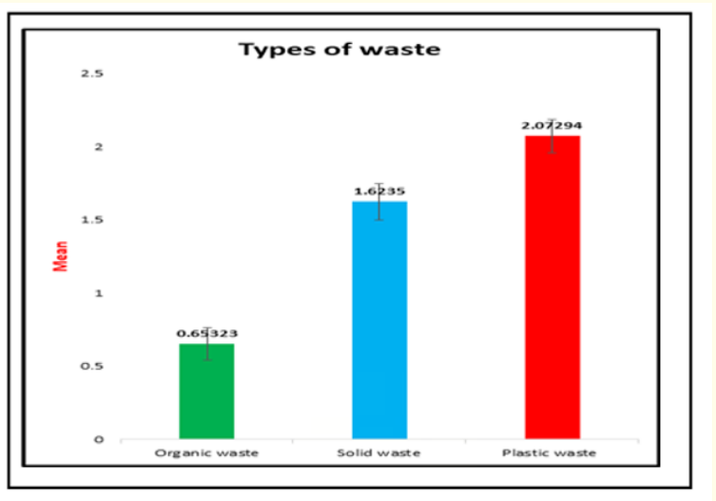

Figure 9: *Results of the micro-squares experiment Least Significant Differences (LSD) of the types of waste.*

Types of waste (I)	Types of waste (J)	Mean Difference (I-J)	Standard error for mean	P-value
Organic waste	Solid waste	-0.970272	0.164663	0.000
	Plastic waste	-1.419717	0.164663	0.000
Solid waste	Plastic waste	-0.449444	0.164663	.00900

Table 12: *Results of the micro-squares experiment Least Significant Differences (LSD).*

Table 13 shows the combined amount of waste, including solid, plastic, and organic, on Sidi Khalifa beach during the different months studied. From the study, we found the largest amount of waste on Sidi Khalifa beach in August, followed by June, July, September, and the lowest quantity of waste was found in May, as shown in the figure 10.

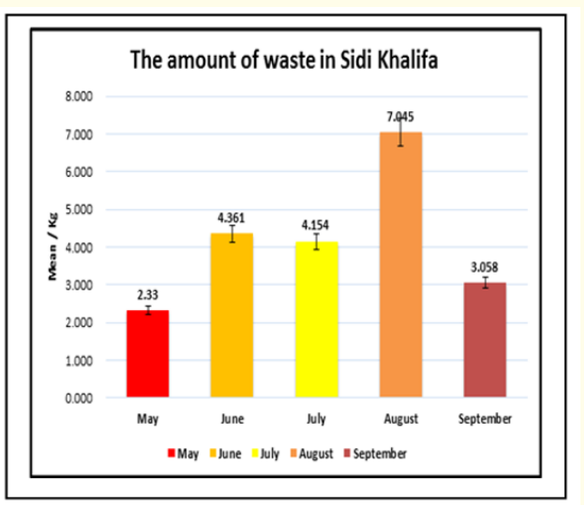

Figure 10: *The combined amount of waste on Sidi Khalifa beach.*

The amount of waste in Sidi Khalifa Beach		
N0.	**Months**	**The quantity**
1	May	2.330
2	June	4.361
3	July	4.154
4	August	7.045
5	September	3.058

Table 13: *The combined amount of waste on Sidi Khalifa beach.*

Table 14 shows the combined amount of waste, including solid, plastic, and organic, on Driana beach during the different months studied. From the study, we found the largest amount of waste on Driana beach in September, followed by August, July, June, and the lowest quantity of waste was found in May, as shown in the figure 11.

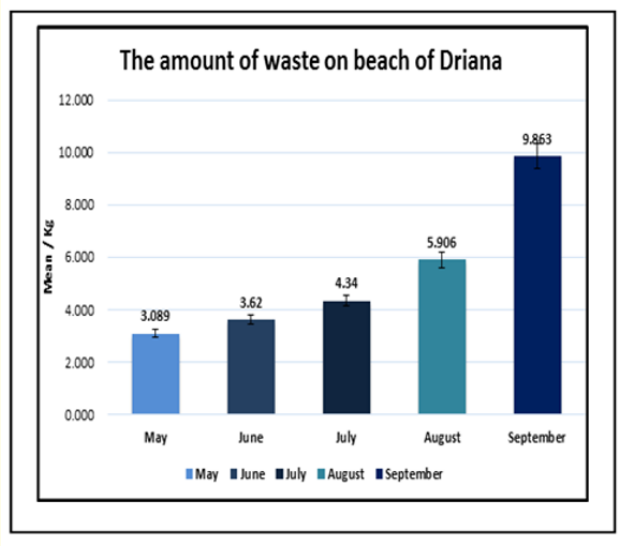

Figure 11: *The combined amount of waste on Driana beach.*

The amount of waste in Driana Beach		
N0.	**Months**	**The quantity**
1	May	3.089
2	June	3.620
3	July	4.340
4	August	5.906
5	September	9.863

Table 14: *The combined amount of waste on Driana beach.*

Table 15 shows the combined amount of waste, including solid, plastic, and organic, on Talmitha beach during the different months studied. From the study, we found the largest amount of waste on Talmitha beach in September, followed by August, July, June, and the lowest quantity of waste was found in May, as shown in the figure 12.

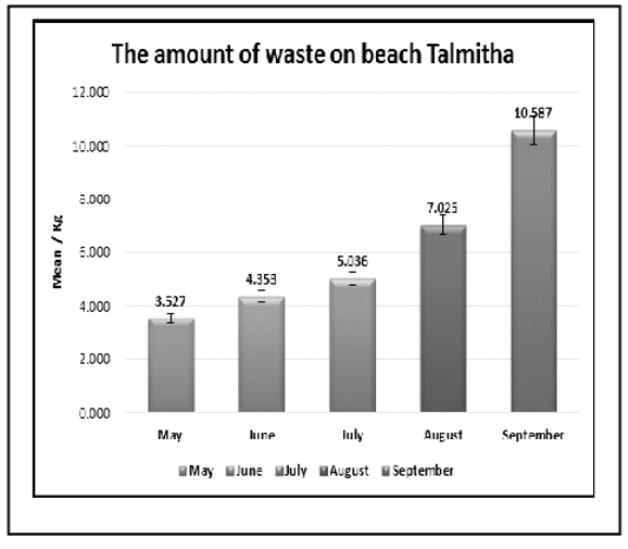

Figure 12: *The combined amount of waste on Talmitha beach.*

The amount of waste in Talmitha Beach		
N0.	**Months**	**The quantity**
1	May	3.527
2	June	4.353
3	July	5.036
4	August	7.025
5	September	10.587

Table 15: *The combined amount of waste on Talmitha beach.*

Discussion

Waste accumulation across beaches of the eastern region of Benghazi City have increased significantly over time. Without a doubt, the waste management approaches currently employed have recorded very little success. Hence, only a handful of cities seem to be making significant progress in addressing the wastes management challenges inherent in their localities. The reason for this failure is that the approaches do not account for differences between cities across the country. In addition, the lack of coordination and expertise on waste management issues by the environmental agencies and other government organizations has lead to inefficient waste management. It is clear, from the study, that the bulk of the problems associated with waste management in the country are a direct result of missing proper waste management policies and resources. Therefore, in order to achieve sustainability in the sector, various aspects of government services, such as engineering, urban planning, geography, economics, public health and law, must be brought together to establish adequate

policies needed to achieve an effective waste management system. The development of clear policies, as well as adequate enforcement, is likely to serve as a significant step towards sustainability in waste management.

This study was conducted during beginning in May and ending in October 2016. This period was selected purposely, as it covers the summer period where vacationers and tourists are most active on the beaches. The three beaches, Sidi Khalifa Beach, Driana Beach and Tlamitha Beach were visited three times a month.

The study revealed that the largest amount of waste on the beaches of the eastern part of the City of Benghazi are plastic waste, followed by solid waste, and lastly, organic waste.

The combined amount of waste on Sidi Khalifa beach

From the study, we found the largest amount of waste on Sidi Khalifa beach in August, followed by June, July, September, and the lowest quantity of waste was found in May.

The combined amount of waste on Driana beach

From the study, we found the largest amount of waste on Driana beach in September, followed by August, July, June, and the lowest quantity of waste was found in May.

The combined amount of waste on Talmitha beach

From the study, we found the largest amount of waste on Talmitha beach in September, followed by August, July, June, and the lowest quantity of waste was found in May.

From the study, we found that the largest amount of waste on the three beaches, Sidi Khalifa, Driana and Talmitha, during the study period, was plastic waste followed by solid waste and the lowest amount being organic waste. However, according to a study conducted in Tamandaré, Pernambuco State, Brazil, their beaches were frequently covered by solid wastes. Solid waste carried by the wind and tides reached native vegetation, where it remained imprisoned and continued to accumulat in large amounts, making the beach aesthetically displeasing. The origin of the largest part of this solid waste was the local rivers, which spilled into larger bodies of water [26]. Adeyemi., *et al.* observed that solid waste constitutes a major problem in most developing countries [27]. Adeyemi added that waste management is one of the most intractable problems facing city administrators and environmental agencies. Ogwueleka, in 2009, reported that solid waste management is by far one of the greatest challenges facing environmental bodies in the country [28]. As a result of these management challenges, Adefemi and Awokunmi reported a breakdown of law and order in relation to waste management. They observed that urban centres are experiencing an increased rate of environmental deterioration as a result of indiscriminate dumping of solid waste [29].

Omuta, in 1987, noted that one notable flaw in waste management administration in developing countries is the unavailability of a proper waste management policy. His suggestion for waste management to work was that various aspects of government services, such as engineering, urban planning, geography, economics, public health and law, among others, must be brought together under a proper policy to deliver an effective waste management system [30].

Ezeah and Roberts (2013) observed that the state of solid waste management in Nigeria has been a major concern to stakeholders [31]. Ogu (2000) highlighted that 80 - 90% of waste generated in some low level income communities in Africa are not even collected for safe disposal [32]. Imam., *et al.* (2008) reported that piles of wastes are dumped by the road side and other open spaces thereby posing environmental risks. It is in response to these flaws that Imam., *et al.* submitted that solid waste management has indeed becomes an important issue in Nigeria [33]. Corroborating this view, Izugbara and Umoh reported that the waste management crisis in the country is

already visible. They added that to a large extent, waste management contributes to social, political and environmental costs. These costs are thought to have enormous implications for the economy and the population [34].

Arukwe added that the only management practice adopted widely throughout Nigeria involves disposal of waste on open dumps [35]. Moore, in 2008, found that the synthetic polymers, commonly known as plastics, have been entering the marine environment in quantities paralleling their level of production over the last half century [36]. However, in the last two decades of the 20th Century, the deposition rate accelerated past the rate of production, and plastics are now one of the most common and persistent pollutants in ocean waters and beaches worldwide. Thirty years ago, the prevailing attitude of the plastic industry was that "plastic litter is a very small proportion of all litter and causes no harm to the environment except as an eyesore" [12]. This, as we now know, is far from correct.

The number of tourists in the Tlemitha beach in May are 2, while in June are 10 and in July are 50 and the highest number of tourists were in August were 95 and in September are 60 tourists. The number of tourists in the Driana beach in May are 1, while in June are 6 and in July are 20 and the highest number of tourists were in August were 60 and in September are 45 tourists. The number of tourists in the Sidi Khalifa beach in May are 1, while in June are 8 and in July are 35 and the highest number of tourists were in August were 85 and in September are 55 tourists. The most tourists from the people of these regions, and the percentage of tourists from the areas near it is 25% and there is no foreign tourism due to the war conditions in Libya.

Conclusion

The study revealed that the largest amount of waste on the beaches of the eastern part of the City of Benghazi are plastic waste, followed by solid waste, and lastly, organic waste.

We also found the largest amount of waste on Sidi Khalifa beach in August, followed by June, July, September, and the lowest quantity of waste was found in May. The largest amount of waste on Driana beach in September, followed by August, July, June, and the lowest quantity of waste was found in May. Lastly, we found the largest amount of waste on Talmitha beach in September, followed by August, July, June, and the lowest quantity of waste was found in May.

It is therefore imperative for each nation to develop adequate waste removal policies, provide sufficient resources, and establish a effective method for waste management. With the average age of living increasing, it is of tremendous importance to establish sufficient waste removal systems to combat the increased amount of waste produced each year. Coastal areas provide recreation opportunities for local people and for tourists who travel at present the whole world. Tourism causes pressures on coastal ecosystems by excessive influx of visitors. People movements rely on transportation systems which range from pathways for walkers to landing strips for airports.

These movements contribute to the wandering of pests, construction and building with associated pollution and eutrophication and disposal of litter and other waste in tourist areas. The paradox is that, most often, tourism will disturb and threaten local populations and wildlife and their habitats, which attracted them to the area in the first instance [37].

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