

## Waste characterisation and management at Mnemba Island Lodge (Zanzibar)

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### ABSTRACT

Waste handling and disposal within the tourism industry does not receive the necessary attention. This study undertakes a waste characterisation and assessment of the current practices at Mnemba Island Lodge, which is situated on an island off the north-western tip of Zanzibar (Tanzania). The Lodge is known for its exclusive tourist experience in a pristine natural environment and its contribution towards environmental and conservation programmes. By implementing a recycling and waste management programme the Lodge will expand its commitment towards its vision of "Caring for the Land, Caring for the Wildlife and Caring for the People". The Lodge will as a result become compliant with National Legislation (Tanzanian Environmental Management Act, 20 of 2004) and local government requirements. The study presents data on the quantities and volumes of waste gathered over the 7-day sample period. The research generated recommendations as well as created a baseline for future benchmarking.

### 1. INTRODUCTION

Waste management within the tourism industry is not seen as high priority and often negligible effort and attention is given to the important management aspect. This study deals with the domestic waste management at the Mnemba Island Lodge. Mnemba Island Lodge is situated on the east of Unguja Island (main island of Zanzibar) and is surrounded by beautiful coral reefs (Figure 1). Mnemba Island Lodge is part of the &Beyond Group of Lodges. &Beyond, with its headquarters in Johannesburg, is a globally recognised luxury responsible tourism company that operates a series of luxury lodges in wilderness areas throughout southern and eastern Africa, and the Indian subcontinent. The company is driven by a set of core values: 'Care of the land. Care of the wildlife. Care of the people.' These core values are driven by a business philosophy of taking less and giving more (&Beyond, no date & 2015). Taking less relates to reducing the footprint of the business, while giving more in turn means giving to the land, the wildlife and the communities which form an integral part of the tourism experience.

Through better management of waste generated by the Lodge, the impact on the environment will be reduced. This study included all aspects of domestic waste management on the island: the categorization, handling, sorting, recycling and disposal of waste. If recycling is promoted and practised effectively, it can in turn provide numerous job opportunities in local villages of Zanzibar. In Matemwe Village, the nearest settlement to Mnemba Island on Zanzibar, the Honeyguide Foundation is proactively combating the accumulation of trash by linking up with local trash collectors, schools and the local football teams of Matemwe (Honeyguide Foundation, 2010) for collection of recyclables. The mission is safeguarding the environment by keeping the natural habitat and beaches clean; this will assist to sustain the rise of tourism in the area and is an initiative to promote waste management within the communities (Honeyguide Foundation, 2010). Improved waste management would in the long-run result in improved conservation and sustainability and would have a positive effect on the communities and the economy.

The Mnemba Island Lodge is nestled within a natural area which is part of the 11 ha island. The 12 chalets are situated on the edge of the forest, which covers the island; each chalet has an ocean view. Small footpaths that run through the forest join the chalets and are used by guests and staff. Most of the guest activities on the Island are either beach or ocean based, consequently the forest pathways are primarily used by staff for operational functions. Although the guests on the island are the main purpose for the existence of the Lodge, the guests themselves are not the main waste generators, as the operational functions and staff members themselves are the primary producers of waste. Waste is generated in the kitchen, staff accommodation (separate houses for the senior staff) and the staff village for the rest of the staff. The operations entail servicing the chalets, housekeeping, gardening, kitchen staff, security staff and contract workers for maintenance.

The kitchen area, storeroom, staff assembly area and offices are adjacent to the dining area, shop and the dive-master's facility. At the back of this complex, a central waste area was created where recycling and composting takes place. Waste from the chalets and the central complex are handled here.

Two types of waste is generated in the kitchen: 'fresh' waste, consisting of waste generated during preparation of meals is stored in a drum in the kitchen until full and then taken for composting. This waste consists mainly of peels of fruit and vegetables. The second type is cooked food waste from plates, other leftovers and fish and meat waste is regarded as landfill waste due to the fact that it can attract vermin and flies. This is collected and stored in a different drum until disposal. Health and Safety Regulations does not allow these to be composted on the Island.

Waste generated in the central area and the chalets are brought to the recycling area consisting mostly of paper, cardboard, cans, glass and plastic.

Waste disposal takes place once a week leaving with an early boat to the main land where a service provider collects it. As far as possible, recyclable waste is separated into categories. An arrangement is in place with the service provider to recycle applicable waste. The landfill waste collected by the service provider is disposed of in a landfill site. The term landfill site is used by the management of the Lodge, but investigation into the Matemwe site confirmed that it is an open dump. Waste management in Zanzibar is in a poor state and waste is dumped on dumping sites which can be describes as "widespread area(s) where informal and scattered dumping takes place" (Kalin, and Skoog, 2012). The Matemwe dumping site is the nearest disposal site for the waste generated on Mnemba Island.

Hazardous waste was excluded from this research but it was noted as a major concern. Appropriate recommendations were given to deal with the concern in an acceptable manner to comply with the principle of care for the environment and legislation.

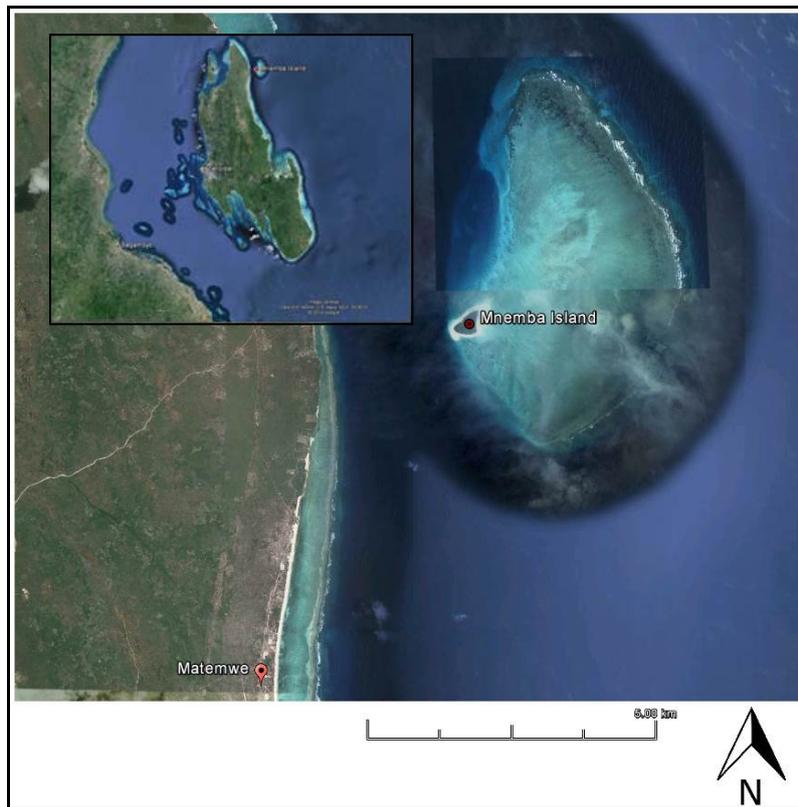


Figure 1. Location of Mnemba Island in relation to Matemwe village and Zanzibar mainland (Insert: Location of Zanzibar and Mnemba Island in relation to each other and mainland Tanzania) Source: Google Earth

## 2. AIM AND OBJECTIVES

The project aims to evaluate the current domestic waste management programme and practices at the Mnemba Island Lodge through the following objectives:

- Reviewing the current waste management policies and practices. This was done in order to determine the level of awareness and understanding of domestic waste management amongst staff members through interviews.
- Categorizing the domestic waste. The current sorting practices as well as the methods of disposal of the different waste streams were recorded. The sorting of incoming waste was done to differentiate more accurately between the different waste streams.
- Measuring the quantities of the different categories of waste generated. After the categorisation of the waste, the waste in each waste stream was quantified. An assessment was done during the field visit to determine which type of domestic waste is generated and how it is separated and disposed of.
- Making recommendations for improvement of the current programme.

## 3. LITERATURE REVIEW

Beyer *et al.* (2006), conducted a study over a seven-day period in two-, three- and four star hotels in Vietnam and Laos respectively. The waste for the three- and four star hotels were sorted and measured whereas the waste from the two-star hotel was estimated according to questionnaires filled in by the staff and the calculations made on answers rather than direct measurement. The result showed that each guest creates between 0.43 - 0.53kg of waste per night. This includes all recyclable and landfill waste. The study found that compostable waste was the largest portion (60-70%) of the total waste. The waste audit was conducted

as a baseline for the feasibility of a composting project and to indicate to the local authorities the importance of composting (Byer *et al.* 2006).

Hatem *et al.* (2010) investigated the management of solid waste in smaller hotels (30 rooms or less) in the Wales, United Kingdom. Landfill was found to be the most common disposal method from the interviews held with the hotels. The hotels put their mixed waste in bags from where it is taken to the landfill site by either government or a private company. The hotel management didn't see recycling and waste minimization as viable options mainly due to the lack of understanding and knowledge of better practices and legislation. The local authorities in the area didn't have a recognized recycling programme running. This study shows that environmental education and awareness plays an important role in the minimizing of the effect of waste on the environment. Although most of the hotels interviewed showed a positive attitude towards recycling, the know-how and the support from local government was a problem (Hatem *et al.*, 2010).

A previous study on the waste management system in Zanzibar showed that organic waste is the largest portion of the waste (86%). Other types of waste identified were plastic (4%), metal (2%), diapers (2%), cardboard (1%), glass (1%) and other waste (4%) (Ally *et al.*, 2014). This study also showed that the Municipal Solid Waste Management capacity was only 45%- 50% of the volumes generated. The study made a series of recommendations for the improvement of waste management and the implementation of composting that would reduce the organic waste to landfill sites. It was also found that the community need to be educated in terms of waste handling, sorting and recycling.

From the literature mentioned above some progress has been made on waste management worldwide but not enough to ensure that the growth of the population versus domestic waste management are adequately addressed for the future management of this important issue.

#### 4. RESEARCH DESIGN AND METHODS

This project was a hybrid design single case study that focussed on domestic waste management of Mnemba Island Lodge. A quantitative approach was followed to gather data and information regarding types of domestic waste generated, handled and disposed. This project determined the current status and provides recommendations for future improvements.

Information gathering was done through formal interviews with the General Manager, cleaning team manager, garden team manager and kitchen team manager as a result of their departments being involved in domestic waste handling. Informal interviews with other staff members from the kitchen, garden and housekeeping teams were also conducted, and questionnaires were disseminated to the housekeeping-, gardening-, kitchen staff and the butlers. All data was collected during a seven day sample period by means of quantifying the different domestic waste streams. The waste was sorted and weighed into categories at the waste storage area before removal. Included in the overall data was the waste that was not collected and stored in the dedicated waste storage area but appeared when waste was collected for disposal. The quantities of this waste were estimated. The data was collated and graphically presented. The resultant data serves as a baseline for developing an improved domestic waste management strategy as well as for future comparative purposes. The estimation of domestic waste generated during different guest occupancies is also possible, until waste management practice is modified, as the data was converted to waste generated per person per night.

Available documentation on the Lodge waste management and Sustainability Basic Operating Procedure (BOP) were analysed. Gaps were identified and feedback was given as part of the recommendations. Domestic waste sites were visited and a waste categorization plan was developed. To determine the way in which the sorting was done, employees were observed and assisted to sort the domestic waste into different categories in order to separate recyclables from non-recyclables. The quantities of different categories of domestic waste were measured. A site map was completed with the locations of the different domestic waste storage areas and recommendations were proposed where deemed necessary. The recommendations of

this research will assist Mnemba Island Lodge to meet the terms of legal compliance with applicable environmental legislation and other local governmental requirements.

## 5. RESULTS, AND RECOMMENDATIONS

### 5.1 Results and recommendations

#### 5.1.1 Results

The results of the data collected in terms of the waste volume and the categorisation of the types of waste are indicated in Table 1 and Figure 2a below.

The categories identified were: cardboard, paper, glass, tins and cans, plastic, and compost waste.

Table 1. Seven-day waste disposal cycle measured in kg

Type waste	Friday - Monday 4-day cycle	Tuesday- Thursday 3-day cycle	7-Day cycle	Volumes (black bags)
Landfill site	115,75	114,9	230,65	22
Recyclables	20,6	26,8	47,4	7.85
Compost	290,9	218,18	509,08	14
<b>Total waste generated</b>			<b>787.13Kg</b>	<b>43.85bags</b>

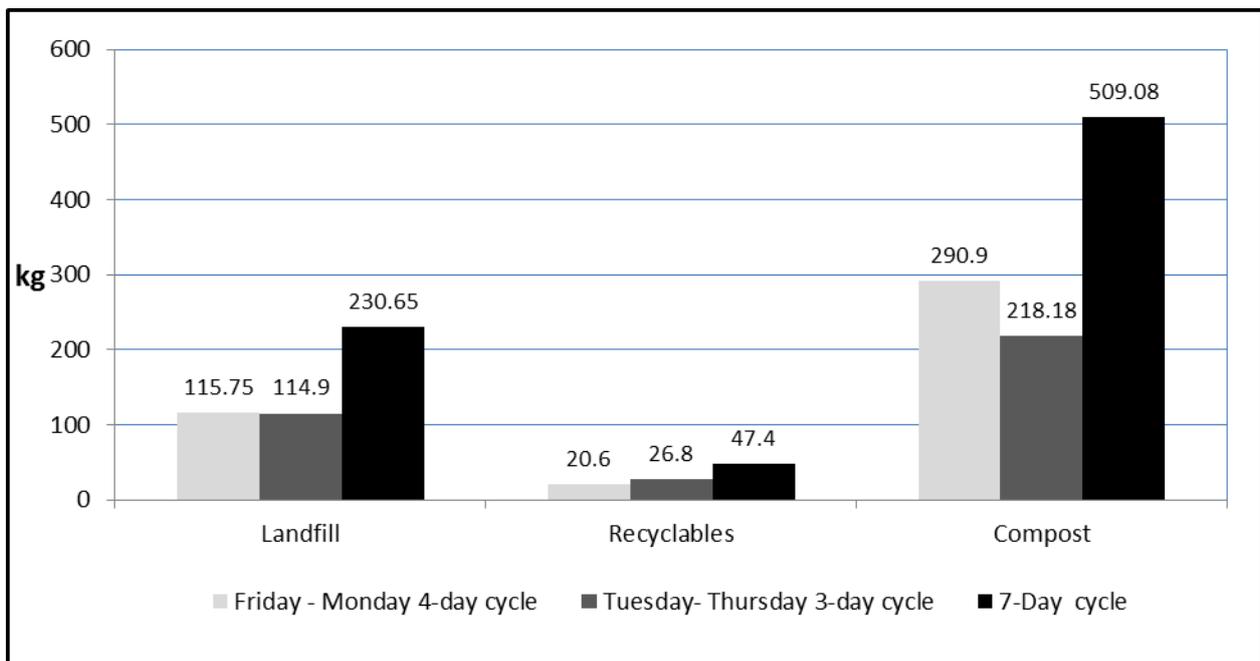


Figure 2a. Weight and categorisation of waste collected during the 7-day waste disposal cycle

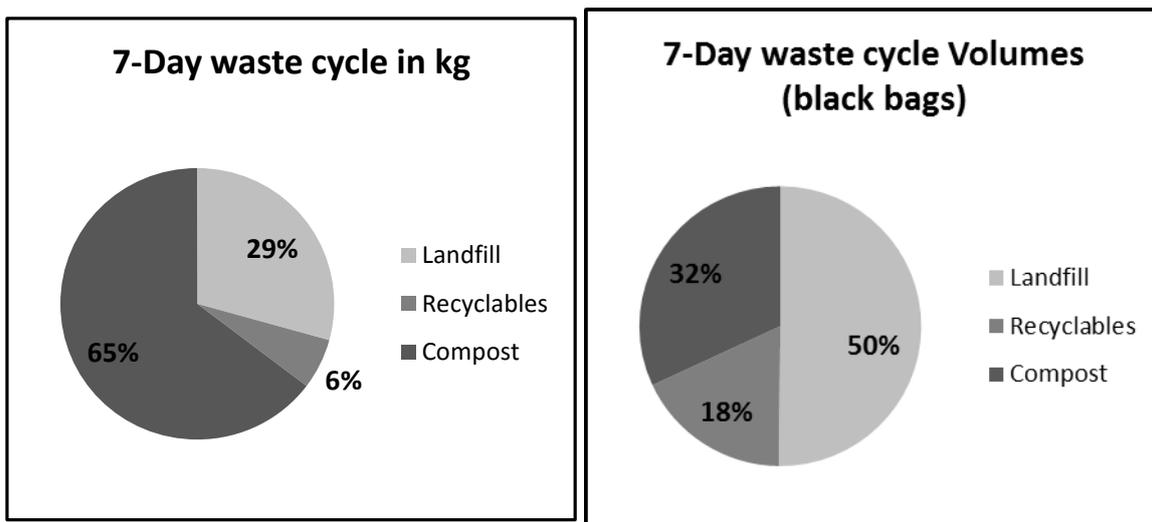


Figure 2b. Results of the 7-day waste disposal cycle waste categorisation

The graphs in Figure 2a & 2b reflect the waste that was brought to the waste disposal storage area near the kitchen and which was measured late afternoon on Monday and Thursday. Both the weight and the volumes were recorded. It is clear that there is significant success in the current waste disposal methods as depicted in the first pie graph, however, if it is changed from kg to volumes in the second pie graph there is still much room for improvement regarding sorting and management of waste. To add value to the study, the records should show weight as well as volumes of waste generated and disposed of through composting, recycling and the waste sent to a landfill site. The reason it is important to have volumes, is that during the transport of the waste on the boat as well as when disposed space needs to be taken into consideration and not weight only.

#### 5.1.2 Observations

Waste generated at the staff housing area was not stored or sorted in the central waste storage area and it therefore could not be sorted and was sent off to the landfill site on Friday morning. The staff waste was loaded on the boat, therefore it was counted in black bags with an estimated weight in kg that contributed to the landfill waste.

Cardboard waste was not measured to form part of the statistics for recycling or landfill. Although 3 baskets filled with compressed cardboard left for landfill during the 7-day sample period, no weight or volume was determined. It was observed that some of the cardboard is re-used by the staff for personal needs.

#### 5.1.3 The following methods of handling waste were observed:

- Tins were not flattened before being put in the bags.
- A black bag was filled with glass bottles until full and then the bag was tied.
- A bag was filled with plastic bottles until full, then compressed and tied. This was measured in kg and as one bag in volume.
- Landfill waste (cooked food and plate food waste) was stored in black drums weighed as 15kg each.
- Wet waste was measured as 1 x 160l drum = 70kg (5l of wet waste was measured 2.2kg) (160l divided by 5 = 32 x 2.2kg = 70.4kg).

#### 5.1.4 Recommendations

It is recommended that accurate records of waste are kept to track improvement. It would be advisable for all waste to be gathered at the central waste storage area before it is loaded for disposal (including the staff village). This would lead to correct sorting and measurement of recyclables. Due to the fact that more waste

was removed off the Island the day after waste was sorted and recorded, the origin of the unrecorded waste is unclear. This is due to the staff village waste not being brought to the waste area to be measured and recorded before being sent off to the landfill site. Nevertheless, the amount of waste generated per guest per day will still be far under the target set in the Sustainability BOP of the &Beyond Group. Continuous recordkeeping will produce more reliable figures per month.

## 5.2 Results and recommendations on staff awareness on waste management

The information received from the questionnaires was used to determine the level of understanding of the staff regarding waste sorting and storage in the waste storage area, including the understanding of the importance to recycle. Nineteen questionnaires were distributed and 19 completed questionnaires were received back. Eight respondents were from the kitchen, 3 from gardeners, 4 from housekeeping staff and 4 from butlers.

### 5.2.1 Results

According to the questionnaire results represented in Figure 3, the staff has a good understanding regarding waste sorting, storage and the importance of recycling. The average respondent score was 81% that indicates a high overall awareness of waste management. Possible reasons of the slightly higher scores in the garden and housekeeping staff may be attributed to the fact that these two groups of staff are responsible for the general cleanliness of the guest areas and as a result are more directly involved with waste management practices on the island.

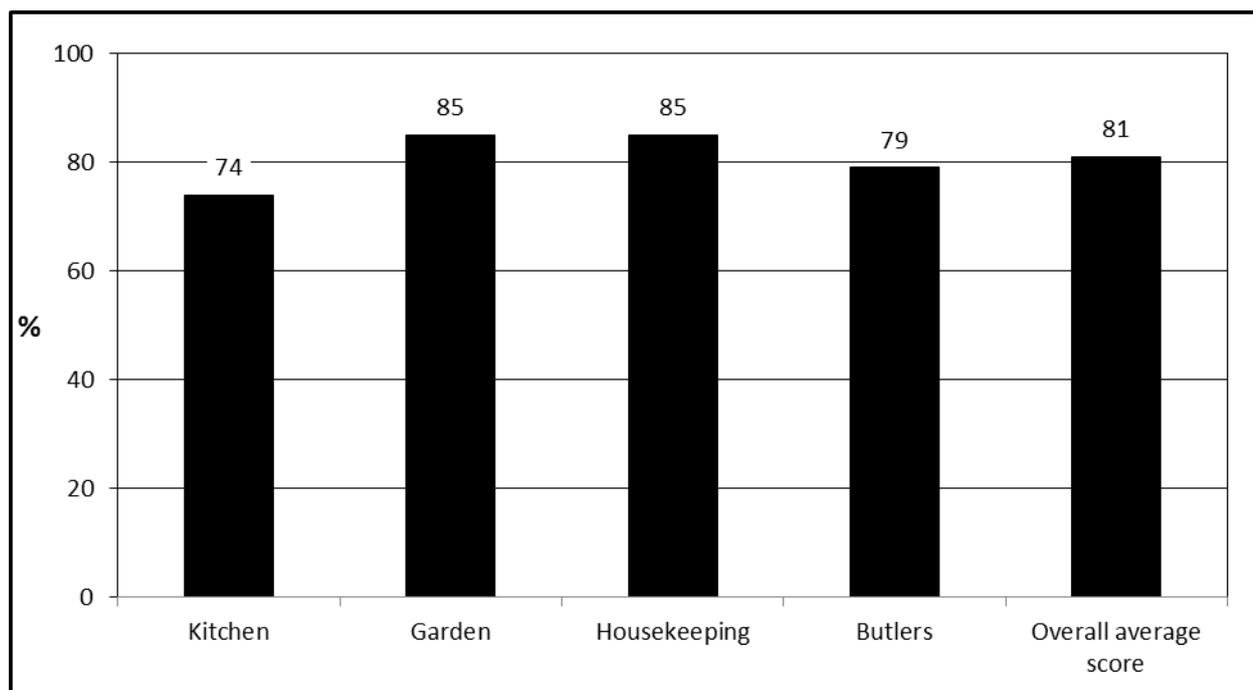


Figure 3. Average positive response scores emanating from the questionnaires (n=19).

### 5.2.2 Recommendations

Training on separation at source of the different recyclables is advisable as a practical demonstration, illustrating accurate sorting of waste into the different bins. All housekeeping, gardening, butlers and kitchen staff should attend the training and the practical demonstration. This would lead to better sorting at source and improve the management of the waste storage area. Through correct sorting of recyclables, the quantity of waste going to the landfill site will be less than it is currently. Providing clear signage especially in the waste sorting area, will aid in the continued success of this initiative (Kelly *et al.*, 2006).

The development of Basic Operating Procedures specific for the island addressing the handling and disposing of waste and frequent communication sessions with the different teams will ensure that effective separation at source can be implemented. The communication sessions should also include a practical demonstration. Waste sorting should be seen as a team effort and not a task for one individual. Everyone who is an employee, no matter what position they hold, is equally responsible to sort waste at source. The success of a recycling scheme depends on education, publicity (awareness) and promotion of that scheme (Du Plessis & Joubert, 2008).

### 5.3 Results and recommendations regarding the per capita generation of waste.

In order to determine a per capita waste quantity generated during the 7-day data collection period the number of guests and staff staying overnight on the island had to first be established. The number of overnight guests and different categories of staff for the 7-day period are indicated in Table 2 below.

Table 2. Mnemba Island Occupancy for the 7 -day period data collection period.

Date	Guests	Staff	Security	Contractor workers	Total for per day
15-Aug-15	17	45	6	9	77
16-Aug-15	18	45	6	9	78
17-Aug-15	18	45	6	9	78
18-Aug-15	18	45	6	9	78
19-Aug-15	20	45	6	9	80
20-Aug-15	15	45	6	9	75
21-Aug-15	13	45	6	9	73
Total Island occupation for the 7 day period	119	315	42	63	539

The table above indicates that the total number of overnight people during the period under investigation was 539. Although the guests are the economic engine for the Lodge, only 119 overnight guests were accommodated during this period while the total staff was 420 for the same period. As the waste volumes are not separated for guests and staff the total overnight figures need to be utilised for the calculation of the per capita waste generation quantity.

The &Beyond Sustainability Best Operating Practice (BOP) target for waste is 50kg per guest per month. As the Lodge has 12 rooms (2 beds per room) which were occupied for a total of 119 bed nights at an occupancy rate of 70.83%. The total weight of the waste generated during this period was 787.13kg for the 7 night period.

The waste per guest night is equal to  $787.13 \div 119 = 6.614\text{kg/guest per bed night}$  giving you a monthly weight of 198.45kg of waste per guest (6.614 per guest per day x 30 days (month) =198.45 per guest per month).

This standard is however artificially inflated as the waste should be divided by the number of staff on the island as well. Using the results from Table 3, the weight of the total waste should be divided by the total number of people staying overnight on the island (guests and staff).

If the calculations are done per person on the island based on people per day, the calculations will be the following:

Waste per person  $787.13 \div 539 = 1.46\text{kg/person}$  (all staff and guests) with a monthly total being 43.8kg/ person (1.46 x 30 = 43.8kg per person per month.)

The results indicate that the Lodge is well within the guideline provided by the BOP. The results however, also indicate that the BOP target is far too low and should be in the region of 50kg per overnight person per month or 200kg per guest per month (or 1.5 kg/person per night or 7kg/guest per night).

Ultimately the BOP needs to be clear regarding the calculations to prevent a misinterpretation of the success of the waste management programme. The Lodge may be in the unique position that guests do not produce a lot of waste because they do not have free access to shops and they are limited by the strict airline baggage restrictions. An additional contributing factor is that a very high percentage of consumables including food come from local sources in Zanzibar and are brought onto the island fresh thereby limiting packaging waste. However, as a result of the high level of service and experience offered to guests more waste is generated than in a normal household.

## 6. CONCLUSION

All the recyclable material needs to be recycled. This includes plastic, paper and glass. Organic matter should be composted on the island. The total amount of domestic waste that will be disposed of will then only consist of non-recyclables. An increase in the quantity of recycled waste will reduce domestic waste removed to the Matemwe dumping site. This project provides a baseline of waste generated, handling and disposal methods at Mnemba Island Lodge. The project included data of the quantities and volumes of waste gathered over the 7-day sample period. This data were used to determine a waste generated per person on the island during the 7-day sample period that may serve as a benchmark for other nearby lodges. The eco-tourism industry is under increasing pressure to “green” services, and the management of the waste is a critical part of this move towards greater sustainability in the pristine and fragile environment of Mnemba Island, Zanzibar.

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