

Strategies for Improving Recycling at a Higher Education Institution: A Case Study of the University of the West Indies, Cave Hill Campus, Barbados

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Abstract: Enhancing the sustainability of the management of waste from Higher Educational Institutions (HEIs) is becoming an increasingly important issue, globally. Using the University of the West Indies (UWI), Cave Hill campus, in Barbados as the case study HEI, and a combination of questionnaires, key informant interviews and waste audits, the study aimed to understand waste management practices on campus, as well as to gain an insight into how waste is managed at the national level. The results suggest that the key challenge facing sustainable waste management at the University and the country in general was limited financial resources. Key motivators for recycling at the UWI were its benefits to keeping the Campus clean and the generation of funds. The major barriers were a lack of motivation, high bin contamination and a lack of knowledge regarding the Recycling Initiative. Bin location had a significant impact on recyclable and contamination levels. Per capita overall and recyclable arisings at the University were 393.93 grams and 308.35 grams respectively. Recommendations included increased education and initiative awareness and strategies to reduce bin contamination. At the national level, increased public awareness programs and involving everyone in the process were key strategies proposed to overcome the challenges.

Keywords: Recycling, university of the West Indies, higher education institutions, sustainable waste management, Barbados.

1. INTRODUCTION

Effective waste disposal is a critical issue for Small Island Developing States (SIDS), such as in the Caribbean, since the improper disposal and accumulation of waste has the potential to pose significant threats to public health and environmental quality. In the Caribbean there have been significant challenges with regards to appropriate waste management. These challenges include: limited financial and human resources, ineffective policy frameworks, high operating costs of traditional waste collection systems and small economies that limit the viability of recycling or alternative waste treatment systems [1].

Rising population levels in the Caribbean island of Barbados, coupled with a high level of urbanization has contributed to unsustainable waste management practices, which poses a serious threat to the environment and public health. Around 1,100 Tonnes of waste is sent to landfill each day, around 60% of which is estimated to be potentially recyclable. Compounding the issue is that waste management has traditionally received low priority in the country, and as a result there have been limited resources made available [2]. However, increased information on the harmful impacts of waste on the environment coupled with the growing concern over the lack of landfill space has led to

an increased focus on waste reduction and recycling programs [3]. A number of waste reduction strategies have been implemented. For example, the deposit-refund system (DRS) has been an important market based instrument aimed to minimize littering. It is based on a rebate of \$0.25Barbados (\$0.125US), on returned glass bottles and \$0.10-15 Barbados (\$0.05-0.075US) on plastics as stipulated in the Returnable Containers Act Cap 395. There have also been attempts to increase the levels of recycling.

Using the Cave Hill Campus of the University of the West Indies (UWI) as the case study, this project aimed to examine waste management policies and practices, with a focus on recycling, both on campus and nationally, and to develop strategies for improvement. Specifically, the study aimed to:

- Understand how waste is managed at the University and at the national level
- Evaluate the impact of bin location and current signage on per capita recyclable arising and contamination levels at the University
- Examine the perceptions, attitudes and beliefs of the University's staff and students towards the management of waste on Campus
- Develop recommendations to improve recycling policies and practices at the UWI Cave Hill Campus.

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2. SOLID WASTE MANAGEMENT IN BARBADOS

There is no comprehensive solid waste management legislation in the country. Indeed, waste disposal is governed by a number of pieces of legislation, including the:

- Health Services Act (Cap.44)-1969—"An Act relating to the promotion and preservation of the health and preservation of the inhabitants of Barbados"
- Health Services (Nuisances) Regulations, 1969-These Regulations prohibit nuisances which may include solid waste that is left or placed in a manner that may be injurious or dangerous to health
- Health Services (Disposal of Offensive Matter) Regulations, 1969-These Regulations restrict the disposal of offensive matter to approved disposal sites only.

The Environmental Protection Department (EPD), the national regulatory agency, oversees the operation and enforcement of all environmental issues pertaining to solid waste. The EPD also develops policies for the regulation of solid waste management on the island. The Sewerage and Solid Waste Project Unit (SSWPU) was established to implement the Integrated Solid Waste Management Programme (ISWMP) and at the time of the study managed solid waste management policy issues. The ISWMP was developed to address and enhance the overall management of solid waste in Barbados. At the time of the study, the Sanitation Service Authority (SSA) was responsible for the collection and disposal of non-hazardous solid waste from homes and government agencies around the island.

2.1. Recycling in Barbados

At the time of the study, the private sector was the main driver for recycling, while government regulates their operations. Most of the recycling and re-use initiatives were focused on pet bottles, newsprint, glass and non-ferrous materials except lead and batteries. Recyclable materials are either returned to a depot or collected by the recycler. Table 1 highlights the major recyclers and the items they recycle.

2.2. Sustainable Waste Management at Higher Education Institutions

Due to their size and the range of activities that take place, universities and colleges can often be like mini towns or cities [4]. As a result, globally, there is an increasing focus on the higher education (HE) sector as a target for enhanced sustainability [5-8]. For example, there are set carbon reduction targets for the sector both in Canada [9], as well as in the UK [10]. A sustainable higher education institution (HEI) is one that aims to engage in and promote activities that minimize negative ecological, economic, societal and health impacts, currently and into the future [6, 11]. These institutions have a moral obligation to engage with these concepts [12]. According to [6], HEIs can play a key role in the sustainability agenda due to the inherent expertise amongst staff and students, their role as facilitators for future leaders and their wide ranging engagement with a range of stakeholders in the community. Education for sustainability first appeared on the international agenda at the Stockholm Conference on the Human Environment in 1992 [13]. However, there were a number of international environmental declarations that embodied the concepts, including the World Conservation Strategy [14], the Brundtland Report [15], and Agenda 21 [16]. Around this time, the importance of HEIs in promoting sustainable development emerged in a number of specific declarations, including the Talloires Declaration (1990), the Halifax Declaration (1991), the Swansea Declaration (1993), the Kyoto Declaration (1993), the Copernicus Charter (1993) and Students for a Sustainable Future (1995) [17]. Indeed, environmental stewardship programs in North American universities have been in existence since the 1980s [18]. By 1990, some 78% of all HEIs had a recycling programme [19], with the number having moved from around 50 universities in 1990, to approximately 2700 colleges and universities by 1996 [19, 20].

Within the overarching sustainability agenda, the sustainable management of waste plays a key role. While there have been a number of waste characterization studies

Table 1. Major recyclers in Barbados.

| Entity | Items Recycled |
|--|--|
| B's Recycling | All plastics, all glass, all car parts, washing machines, stoves and cardboard |
| Ace recycling | Paper, cardboard and car batteries |
| Sustainable Barbados Recycling Centre (SBRC) | Paper, cardboard, all plastics, glass, tins and green waste |
| Caribbean E Waste Management | Electronic waste |
| Machinery and Allied engineering services | Automotive oil, gas and diesel |
| Recycling Preparation Inc (RPI) | Non-ferrous metals (Brass, copper, aluminium and stainless steel) |
| Paradise Green Energy | Waste cooking oil |
| Solid Waste Solutions and Services | Waste cooking oil |
| Ink Tech Inc | Collects and refills ink jet cartridges |

[6, 9, 18], there have been limited such studies in developing regions, such as the Caribbean [12].

Waste characterization studies at colleges and HEIs offer the opportunity not only for an evidence-base for the ‘greening’ of the campuses, but also of the surrounding communities. This shift therefore can lead to reduced economic costs and environmental impacts of activities on campus [21-25]. Indeed, previous studies have shown that around 55-90% of waste produced on campuses, is comprised primarily of paper, packaging and food, and could potentially be recycled or have some value recovered from it [8, 12, 18].

Clay [26] asserted that while financial incentives would not encourage recycling amongst students, more information and better recycling facilities would [26] also found that educating students and staff about the benefits of recycling and the positive effects it would have for future generations created enthusiasm about recycling.

Alternatively, inconvenience, the effort required and a lack of time are the major reasons why students do not recycle [28-30]. Other factors include: bureaucracy, decentralised management leading to limitations in integration, unclear chains of responsibility, high turnover of staff and students [31]; and lack of funding [6, 32]. Overcoming these limitations requires [6, 21, 31, 33-36]:

- An understanding of how HEIs work, especially how internal decision-making takes place
- Adequate funding
- Commitment and support from senior management
- Institution-wide co-ordination
- Regular and targeted communication to enhance knowledge
- Adequate infrastructure (e.g. recycling bins)
- Having a reliable and competent waste contractor
- Leadership (e.g. the appointment of a single individual or team with responsibility for developing and implementing initiatives)

For example, [36] found that making students aware of food waste served to improve the sustainability of their behavior.

It has been noted [3] that a change in signage did not have an impact on recycling accuracy. These findings were in contrast to research conducted by [37], who found that placement of signage focusing on types of recyclables significantly decreased contamination in bins. Similarly, [38] argued that it was important to have good signage in appropriate areas.

Bin location also has an effect on recycling levels. For example, [3] noted that recycling bins located next to rubbish bins recorded significantly lower levels of contamination compared to those which were not situated in close proximity. While others [e.g. 26, 39] indicated that recycling rates are highest for bins placed in communal areas and closer to the point of resource consumption.

2.3. Recycling at the University of the West Indies

Recycling, to varying degrees, takes place on all three campuses of the UWI, with the Cave Hill Campus implementing the practice on a larger scale than that of the Mona and St. Augustine Campuses.

The Recycling Initiative was launched on 8 April 2009 at the UWI Cave Hill Campus. It is worth noting however, that prior to its implementation, there had been small-scale recycling at the University, carried out by the Centre for Resource Management and Environmental Studies (CERMES).

The Initiative aimed to encourage the University’s staff and students to recycle selected recyclables, notably glass, aluminium, and plastic, as well as paper and printer cartridges [40]. Some 18 recycling stations for plastics, glass and aluminium cans, were located around the campus in areas which are highly used such as major teaching areas and recreational areas, in addition to 21 departmental offices/faculties/schools. Plastics, glass and aluminium recyclables, were collected by Cave Hill’s Properties and Facilities Department and sold on to a private recycling company. Individual departments handled the recycling of paper and printer cartridges by directly contacting private companies. Despite some successes, the Initiative has encountered various challenges (e.g. contaminants particularly food scraps, being placed in the recycling bins, which created health hazards and difficulties with collection by the private contractor) and reduced earnings for the University [40].

3. RESEARCH METHODS

The study was conducted over an eight-month period, from 30 April-30 December 2013. Questionnaires and key informant interviews were used to acquire information on the perceptions, beliefs and attitudes of the Cave Hill community towards the management of waste, as well as to gain insight into how waste is managed at the University and at the national level. A waste audit conducted on selected recycling bins was used to understand levels of recycling and waste bin contamination levels at the University.

3.1. Surveys

A questionnaire was developed to determine the perceptions, attitudes and beliefs of staff, students and visitors towards the management of waste, particularly recycling. A total of 150 questionnaires were distributed by hand on Campus to 80 staff members, 44 students and 26 visitors. The 44 students surveyed are representative of 0.5% of the total student body whereas the 80 staff surveyed are representative of approximately 8% of the total staff at UWI, Cave Hill. Questionnaires were distributed to staff during the summer holiday of 2013 and were either collected in person within a two-day period or were returned to the researcher on the same day. There was a 100% return rate. Table 2 shows the total number of surveys distributed to staff according to faculty. Staff were surveyed on the basis of availability, as a result, staff from the Faculty of Social Sciences had the highest response rate (n = 22). Table 3 shows the total number of questionnaires which were distributed to students according to faculty. The data were entered into Microsoft Office Excel 2007 and later exported to SPSS (version 19) for analysis.

Table 2. The number of surveys distributed to staff in each faculty.

| Faculty | Number of Surveys Distributed |
|------------------------|-------------------------------|
| Social sciences | 22 |
| Law | 13 |
| Science and Technology | 15 |
| Humanities | 12 |
| Medical Science | 8 |

Table 3. The number of surveys distributed to students in each faculty.

| Faculty | Number of Surveys Distributed |
|------------------------|-------------------------------|
| Social Sciences | 10 |
| Law | 6 |
| Science and Technology | 14 |
| Humanities | 10 |
| Medical Science | 4 |

3.2. Key Informant Interviews

Six key informants were interviewed. Interviews A-C were internal and Interviews D-F, external. They were deemed key/critical due to the role they played in waste management on Campus and at the national level. All the informants were sent relevant documents beforehand and then contacted by phone to arrange a mutually agreeable time and date for the interviews.

3.3. Waste Audit

Working in collaboration with the Properties and Facilities Department at the University, a waste audit was carried out to determine the percentage of materials recycled, as well as the level of contamination in a sample of the recycling bins on Campus. It was undertaken on six of the 18 recycling stations, on 6th October 2013 (Table 4). The recycling stations were chosen on the basis of 'levels of activity' by location and were categorized according to 'high traffic area' or 'low traffic area', i.e. areas which are traversed or used by a large proportion of the Campus community *versus* those which experienced low activity levels.

The contents of the bin from each selected recycling station were emptied into three separate garbage bags for analysis labelled according to the types of recyclables they contained (plastics, aluminium and glass). The bags containing the recyclables were also labelled according to bin number and transported to a bay in the Properties and Facilities Department for sorting and auditing. After spreading tarpaulins onto the floor, six separate labels were used to represent the main types of waste to be assessed (Fig. 1). These labels included plastic (high and low grade), glass, metals (aluminium and steel) and waste. Plastics were separated into 'high' value plastics such as Polyethylene

Terephthalate (PET), Polypropylene (PP), Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE) and 'low value' plastics such as Polyvinyl Chloride PVC and Styrofoam. The recyclables were separated from the waste as illustrated in Fig. (1), where they were weighed using an electronic balance. Notes were made on recyclables and contamination examples in each of the three categories. To determine the percentage split between the recyclables and waste for each category, the recyclables and waste were weighed separately and compared. For example if in the plastic category of Recycling bin A, 1 kg of recyclables were found in comparison to 1 kg of waste, the recyclable and contamination levels for Recyclable bin A would be 50/50. Photos were also taken during the waste audit.

Table 4. Locations of the audited recycling bins at UWI Cave Hill campus.

| Recycling Bin | Location | Activity Level |
|---------------|--|--------------------|
| A | Student Kiosk | High traffic areas |
| B | Students' Guild | High traffic areas |
| C | Faculty of Law | Low traffic areas |
| D | Faculty of Social Sciences | High traffic area |
| E | Main Library | High traffic area |
| F | Department of Biological and Chemical Sciences | Low traffic area |

3.4. Data Analysis

For the audit and questionnaires, the data were entered into the data analysis program SPSS (version 19), where descriptive analyses were carried out to identify contamination levels, and types of recyclables, as well as key barriers and drivers for recycling, respectively. Additionally, bivariate analyses (Chi-square) were undertaken to compare the practices, attitudes and beliefs of the participants.

Per capita arisings were determined by extrapolating quantities of arisings per annum and dividing the value by the number of University staff and students.

For the interviews, the transcripts were read in their entirety and codes (i.e. key phrases and words) identified and grouped to determine key themes.

4. RESULTS

4.1. Questionnaires

Some 98% of staff were aware of the Recycling Initiative. Most noted that natural resources are important because there were the mainstay of the island's tourism product. Just over one-third of respondents (35%) stated that recycling was beneficial in that it kept the Campus clean, while one-third (33%) noted it was beneficial because it made money. Only 10% stated that recycling protects the environment.

The barriers to recycling varied among staff, students and visitors (Fig. 2). For staff the concern was primarily around the motivation to recycle (50%). For students, it was about knowing where to recycle (38%), while the location of bins proved to be the major concern for visitors (44%).

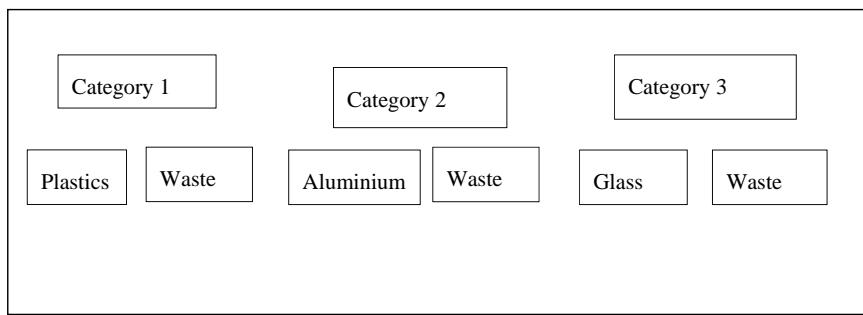


Fig. (1). A schematic of the layout of the recyclables and waste on the tarpaulin.

Use of posters (89%) and the UWI website (77%) were noted as potentially key strategies that could be used to increase awareness about recycling. The need for better signage for the Recycling Initiative was highlighted by the majority of respondents across all respondent categories. More bins as well as student and staff validation were also recommended to encourage increased participation in recycling (Fig. 3).

When asked to provide additional comments about waste management on Campus, the need for re-education or awareness raising about the Initiative was highlighted by the majority of respondents across all three categories (Fig. 4).

There was a statistically significant difference ($df = 20$, $\chi^2 = 46.952$, $P < 0.001$) between the age of the respondents and the benefits of recycling. However, there were no statistically significant relationships between recycling, and gender or types of respondents.

4.2. Waste Audit

By weight, glass was the most recycled item (72%), with plastics being lowest (56%) (Fig. 5). Contamination rates were highest in the plastic category (44%), and lowest for glass (28%).

Recyclables were highest (86%) from the bins located near the library, where as they were at their lowest (33%) in bins situated in Social Sciences (Fig. 6). Contamination was highest in Social Sciences (67%) and at their lowest (14%) in bins situated by the main library.

Contamination levels were relatively high in the majority of the bins (83%) examined with levels between 32 to 67% (Fig. 6). The main contaminants in the glass compartment of the recycling bins included plastic bottles, plastic cups, snack wrappers and aluminium cans. Overflowing recycling bins were common.

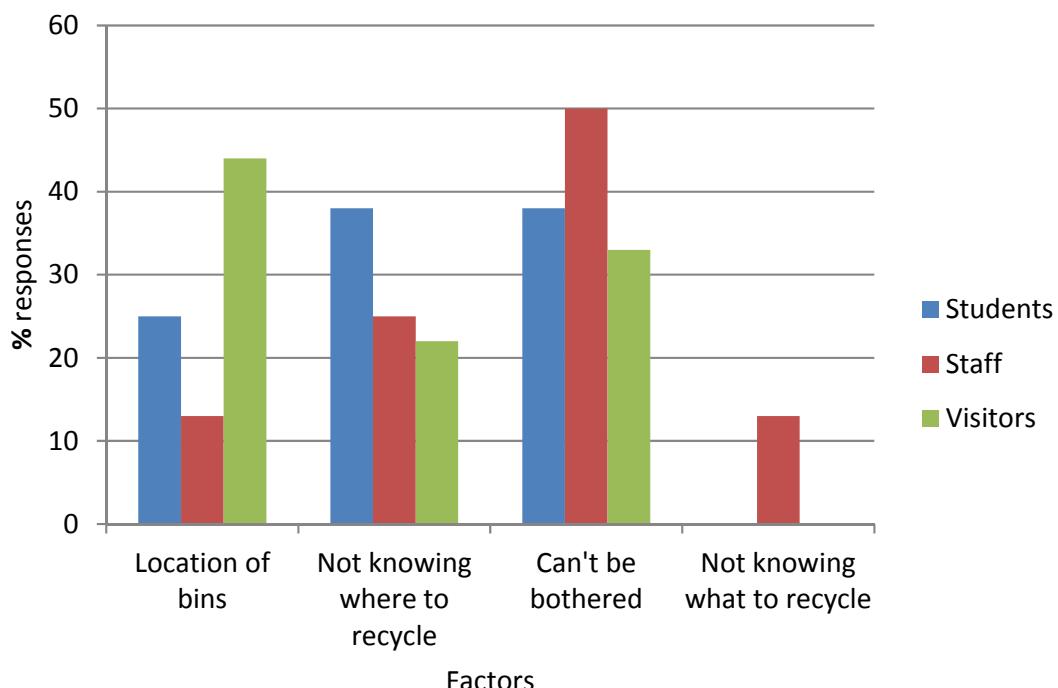


Fig. (2). Factors preventing recycling at the UWI, Cave Hill campus.

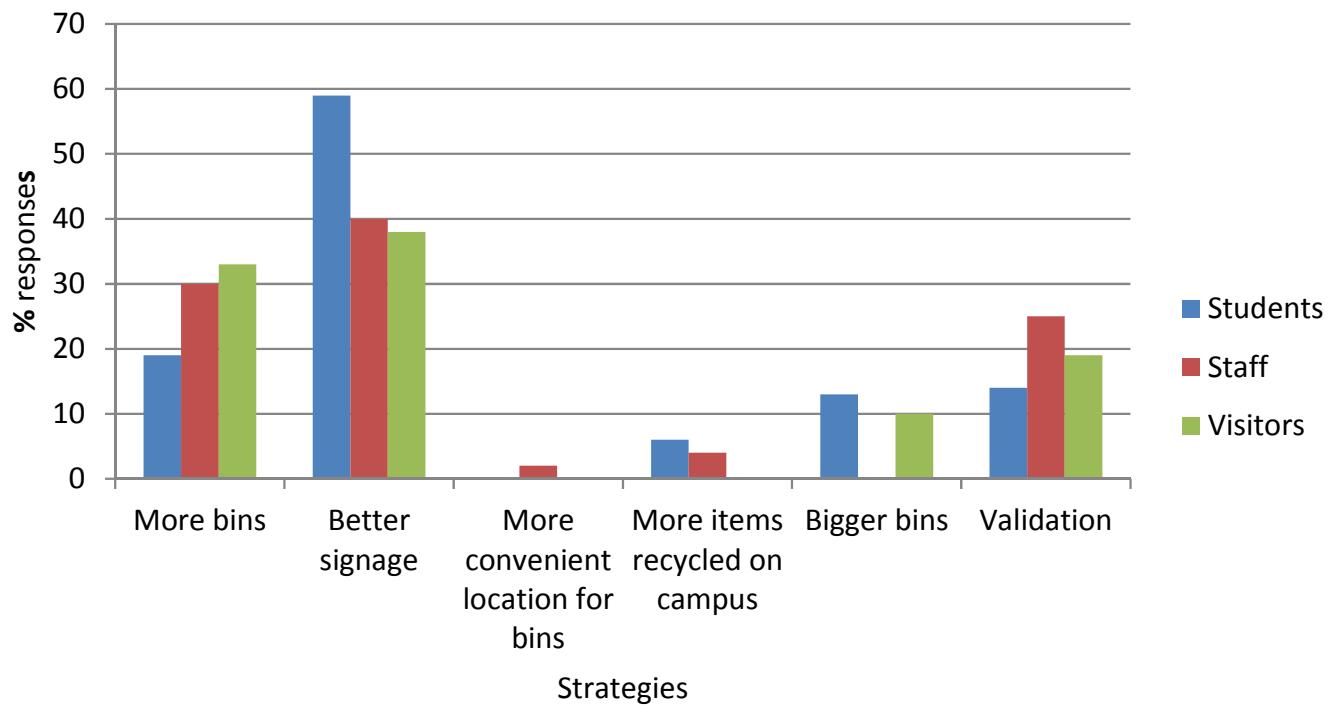


Fig. (3). Potential strategies to encourage recycling on Campus.

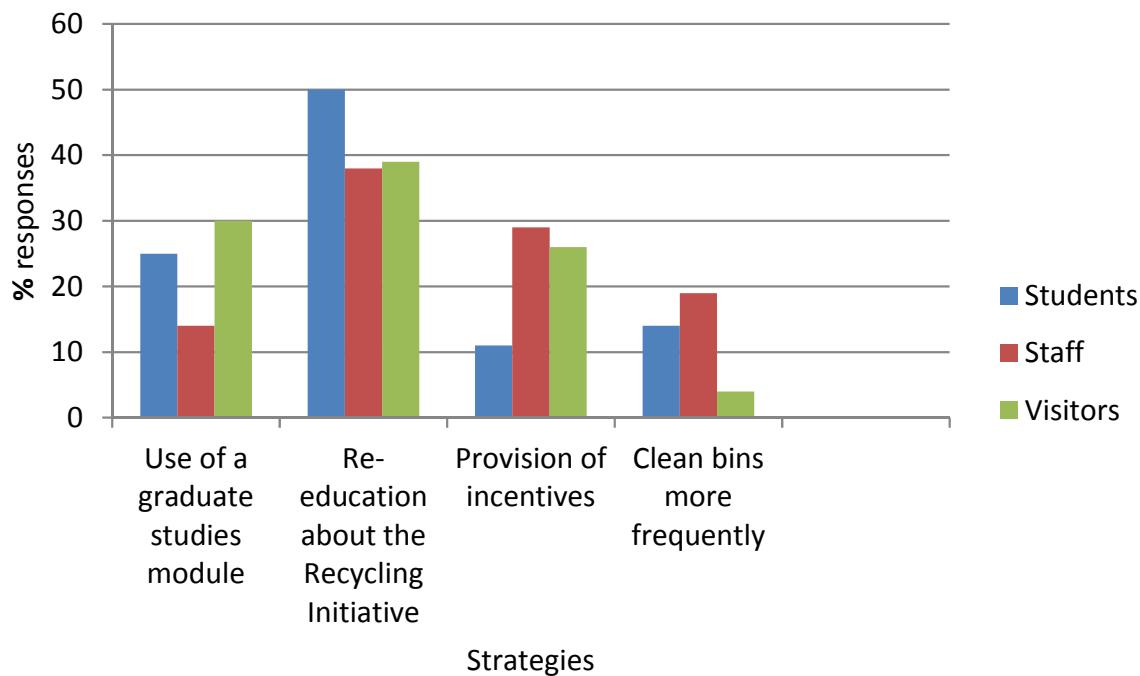


Fig. (4). Proposed strategies to improve the recycling initiative.

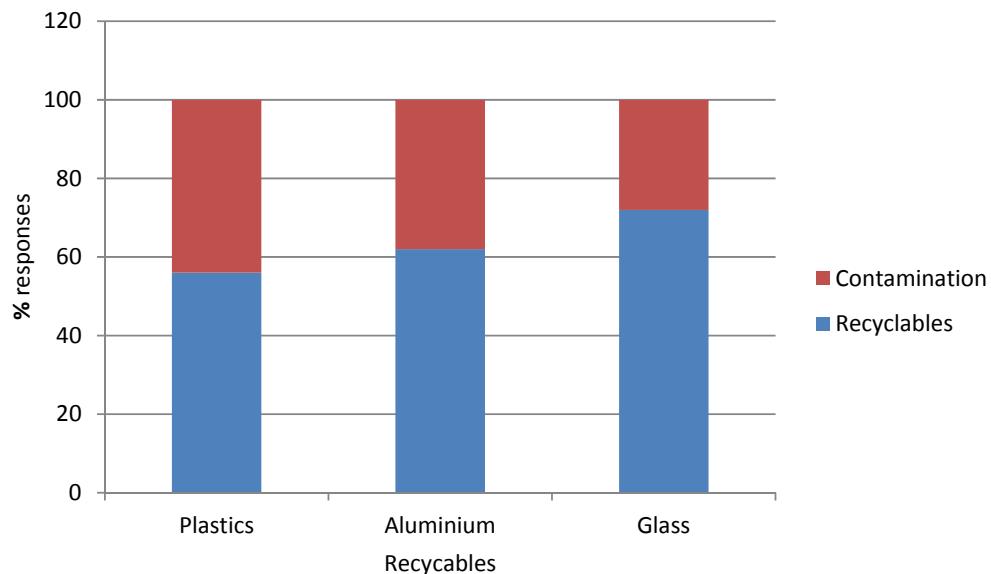


Fig. (5). A comparison of recyclable and contamination levels of the three recycling categories.

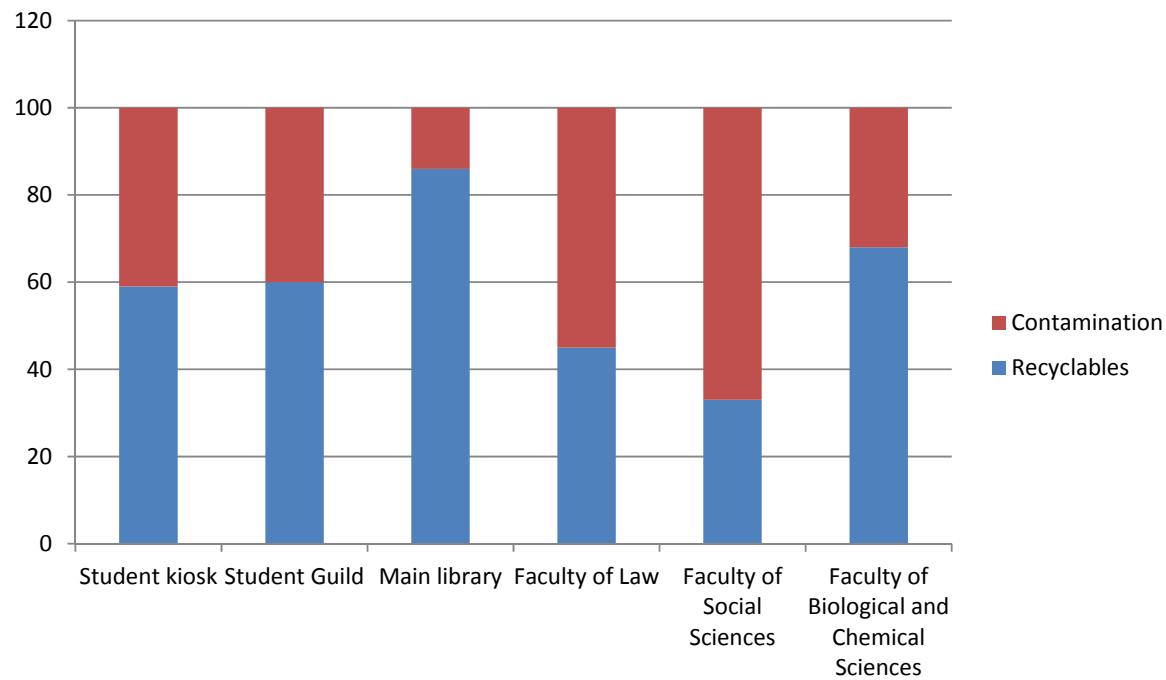


Fig. (6). A comparison of the recyclable and contamination levels at selected bin locations.

4.2.1. Per Capita Arisings

During the academic year 2013/2014, there was a total student enrolment of 8,270 comprising 7,303 undergraduates and 967 graduates. There were approximately 1,020 UWI

members of staff including academic, administrative and support (H. Davis Pers. Comm). Thus the total UWI community was equivalent to 9,290 persons (8,270 students and 1,020 staff). Weekly overall and recyclable levels were 70.3 Kgs and 55 Kgs respectively. The estimated annual

overall and recyclable levels were calculated by multiplying the weekly rates by 52, therefore the annual overall rates and recyclable levels at the University were 3.6 Tonnes and 0.28 Tonnes respectively. Per capita overall and recycling arisings were calculated by dividing the overall and recyclable levels separately by 9,290. Per capita overall and recyclable arisings were 0.39 Kgs and 0.31 Kgs respectively. Approximately 78% of the overall contents of the recycling bins at the university were recyclables, whereas 22% were contaminants.

4.3. Key Informant Interviews

There were a number of key themes identified by the interviewees related to the manner in which waste was managed on Campus, as well as nationally.

4.3.1. Current Waste Management Challenges

Both the internal and external key informants stated that the major challenge facing the sustainable management of waste was the limitation in financial resources. For example, informant A noted that “the lack of financial resources available is significantly affecting my department’s productivity as a result of reduced manpower since I had to make staff cuts”. High operational costs and lack of equipment were also noted as major challenges. For example, Informant F stated that “a sanitation (waste) truck costs approximately half a million dollars and second to Transport Board buses, are the hardest working vehicles on the road and as a result they constantly need repairing or replacing”. All the external informants stated that illegal dumping and littering were also waste management challenges.

4.3.2. Future Waste Management Challenges

A lack of financial resources was stated by all as the main predicted future waste management challenge. Informant A asserted that the current economic recession would lead to more staff cuts in the future, “which would further reduce efficiency”. A lack of governmental support was also predicted to be a major challenge associated with waste management at the national level. Indeed, Interviewee F noted that “waste management is usually put on the back burner”, so it would be “no surprise if that trend persists especially in the expected challenging times ahead”.

4.3.3. Overcoming Waste Management Challenges

Increasing public awareness programs was the key approach suggested to overcome the current and future waste management challenges. The external informants stated that getting everyone involved in the process would greatly help the nation’s waste reduction cause. Interviewee E strongly advocated for people empowerment stating, “it is time community people are fully involved in the waste management process, since, it will make them feel like they can be a part of the solution, rather than only the problem”. Informant F stated that, “the shortage of waste management equipment in the public sector can be addressed if the Barbadian government could acquire leases on waste management equipment such as garbage trucks from the private sector”. At the national level, projects had been targeted towards community out-reach, including school oriented activities, as well as recycling fairs.

5. DISCUSSION

5.1. Motivators of Recycling

The major motivators of recycling at Cave Hill were maintaining cleanliness and the generation of income. Thus the key drivers of recycling at the UWI were its profitability, maintenance of a clean Campus environment, and protection of the natural resources on which Barbados’s main economic sector, tourism, is dependent. These results are similar to those of [40] where the majority of respondents indicated that the main reasons for recycling are the monetary gain and environmental protection offered. The results are encouraging since they indicate the UWI community was conscious of the environmental and financial benefits of recycling as it relates to the University, as well as to the wider Barbadian community.

5.2. Barriers to Recycling

Similarly to previous studies [e.g. 6, 31, 34], there were a number of barriers to recycling. For example, as noted by [6], high contamination levels and the overflowing recycling bins posed a barrier to effective waste management on the Campus. The main contaminants observed were food, plastic bags, coffee cups and napkins. The high contamination levels observed were problematic since they posed health risks and also resulted in a reduction in potential earnings from recycling. Of all the types of contaminants observed, food was the most problematic. Issues about contamination are similar to the findings of [3]. The high contamination levels observed in the plastic category of recyclables could be attributed to the poor signage on bins. The low recyclables levels observed in the plastic category could be as a result of the high demand for plastic bottles which existed in the country due to the DRS, as individuals made money from returning bottles, rather than throwing them away. The high levels of bin contamination and reasonable recyclable levels observed indicate that awareness of the Recycling Initiative had not necessarily translated to high levels of participation and compliance.

Bin location had an effect on quantities of recyclables and contamination levels. This finding was not consistent with the work done by others [e.g. 26, 39] which revealed bins placed in communal areas recorded higher rates of recycling, but differs from [3]. The high contamination levels present in the bins located in Social Sciences might have been due to the faculty being a ‘high traffic area’ with the largest student population on Campus. Alternatively, the low contamination in the bins of the main library could be attributed to the absence of facilities or machines which sold food.

Another major barrier to staff recycling was a lack of motivation, with many stating that they simply couldn’t be bothered to recycle. A possible reason for this could be that, individuals are often not motivated by ventures in which they perceive that there are no direct benefits. Another possible reason for the low level of motivation could be the lack of awareness of the overall benefits of recycling on Campus.

The general consensus amongst the internal informants was that there was a lack of public awareness on Campus about the Recycling Initiative. This finding was noted to be

particularly common amongst new staff and students. Further compounding the problem were limitations in funding, dedicated personnel and an office or a team to facilitate recycling and greening at the University. These challenges are similar to those outlined by others [e.g. 32, 34, 35]. The apparent lack of knowledge of where to recycle was one of the challenges to students engaging in recycling. This is a surprising outcome given the high visibility of bins and their placement in particularly highly used areas around the University. One probable reason for this may be that students were not formally introduced to the Initiative upon enrolment. As a result, they generally tended to be unaware. The location of bins was stated as a major barrier to recycling by visitors. This finding was not surprising since there was a lack of signage on Campus displaying information on the Recycling Initiative, such as where the recycling bins are located and the types of items recycled.

5.3. Recycling Promotion

The survey highlighted the need for awareness raising about the Initiative [27, 36]. The University community indicated that the use of posters and the University's website were key tools which could be used to raise awareness at Cave Hill. Posters should be placed on notice boards in highly frequented areas such as the Guild, Student Cafeteria and the main library [41]. While there had previously been some awareness raising about the Initiative, this had been reduced to due to a lack of financial resources and manpower [40].

Respondents also stated that some form of validation about the Initiative was required to encourage recycling. Feedback such as what the income was used for and the total amount of monies made could be made available. Additionally, the challenges faced should also be made available (e.g. on bin contamination). Indeed, [42] argued that publicly posted feedback significantly increased recycling rates.

Collaboration with Student Services could also be beneficial at promoting recycling. Students and staff at the University could be encouraged to recycle through frequent email blasts *via* the Office of Public Information [41]. Brochures, posters and signs regarding recycling could be used to raise awareness. This awareness raising should focus on encouraging effective segregation of waste, particularly of food waste [37, 38]. Additionally, the Cave Hill Online (CHOL) website because of its frequent use, could be employed as a tool for the promotion of recycling. The website could be designed in such a way that when students visit, they would be fully informed of the University's Recycling Initiative. The University could further promote recycling by having a seminar at the beginning of every semester on the benefits of recycling to the University and Barbados as a whole. Additionally the matriculation ceremony could be used as a vehicle to inform new students about the Initiative. A course on waste reduction practices could also be offered, in an effort to raise recycling awareness and participation on Campus. In future, a 'greening office' could be put in place to aid in the promotion and utilization of environmentally friendly practices. University staff should also be educated *via* office

posters, brochures and signs about the benefits of recycling and effective recycling practices at the University. Sensitizing the staff more than likely will increase their awareness and support for recycling and should inevitably result in higher levels of recycling participation. Utilizing increased awareness as a means of enhancing recycling is in keeping with other studies [27, 36, 38].

A monitoring system on the recycling bins is the first strategy which could be employed at the UWI in an effort to reduce the bin contamination levels. Regular waste audits would be important as this would provide an indication of what the recyclable and contamination levels were. Bins could be audited by CERMES students once every semester as part of the Measurement and Analysis course, to record and document the recyclable and contamination levels present [41]. The monitoring of the data would also be important in assessing if the strategies put in place such as signage and shifting bins had been effective in reducing bin contamination and increasing recyclable levels at the University. Effective bin signage is another strategy which could be employed to reduce bin contamination. Signage should be simplistic using mainly pictures to highlight what is being recycled at the University and what is not.

Providing validation about the Recycling Initiative could also be another strategy employed to reduce bin contamination rates. Validation should provide information on the progress of the Initiative. Information such as how much money is earned through recycling and what is being done with the funds could be made available through the University's various social media. A study conducted by [42] revealed that posting feedback had a positive impact on recycling rates. However, reporting the challenges associated with the Recycling Initiative are just as important as reporting the positives. The Campus community should be fully informed of the challenges associated with the initiatives, as this could potentially reduce bin contamination rates. Finally, a forum for feedback could be provided in order to enable the voicing of queries, concerns and offer potential solutions to solve problems [6].

CONCLUSION

This study has examined recycling at the UWI Cave Hill Campus in effort to provide recommendations which could potentially improve recycling policies and practices at the University. Keeping the Campus clean and making money were the major motivators for recycling. Alternatively, the key barriers were a lack of motivation, high bin contamination and a lack of knowledge regarding recycling. Another major finding from the study was that the plastic category recorded the highest contamination levels which were in sharp contrast to the glass category which recorded the lowest. Additionally it was discovered that bins located in 'high traffic areas' experienced higher levels of contamination than bins located in 'low traffic areas'. At the time of the study, the major waste management challenge affecting the UWI and Barbados as a whole was limited financial resources. A range of recommendations to improve recycling policies and practices at the University were proposed including: increasing education and awareness, and strategies to minimize contamination levels. As argued by

others [e.g. 21-25, 43], improved recycling would not only enhance the environment on Campus, and generate income, it would also serve to benefit the community and country generally by reducing resource consumption and minimizing the impacts on the natural environment.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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Declared none.

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