

Higher Education Institution's Solid Waste Management: Practices, Needs, and Opportunities

Cecilia A. Geronimo, Audie L. Geronimo

Abstract : *Solid waste management is everybody's concern. Every individual is a producer of waste that is why in the University all contributors of waste were involved in the study. Production of wastes is one thing, the type of waste produced is another, especially, solid waste and yet the produced waste is managed is another issue.*

The study used mixed methods through questionnaire and interviews to gather data on status, practices, needs, and opportunities of solid waste management.

The findings revealed that the status of solid waste in the University in terms of its types are biodegradable, non-biodegradable and recyclable; with regards to the quantity of waste produced every day, during weekdays an average of 50 bags, where bag has a dimension of 100 square centimeters, Saturdays an average of 20 bags and Sundays about 10 bags. There is a disposal area, where all the waste bags are dumped, with a total area of 200 sq. meters, tools such as shovel, spade, cart, and rake are used and segregation of waste is being enforced; participation in trash to cash program is encouraged to lessen the waste to be disposed and collected by the waste collector or hauler, and allotted budget of approximately six thousand pesos per dump truck load per week.

The students and non-teaching personnel agreed on most of the items which described needs and opportunities of solid waste management while the faculty members agreed on practices and strongly agreed on the needs and opportunities on solid waste management in the University. There are needs to be addressed and plans to improve the current practices on solid waste management and optimize the identified opportunities to be recognized as a Clean and Green University.

Index Terms: *Biodegradable, Non-biodegradable, Practices, Needs, Opportunities*

I. INTRODUCTION

The increase in a number of students, faculty members, and non-teaching personnel have directly increased solid waste generated in the University. Disposal of the waste generated in everyday activities was not given priority attention. There are offices that handle this solid waste management like the Sentro ng Edukasyon para sa Ekonomiya at Kalikasan (SEEK) and General Engineering Services Office (GESO) now Facilities Maintenance and Management Office (FMMO). The SEEK is in-charge in drafting/developing policies, programs and projects on Zero

Waste Management while FMMO has utility workers who are implementing and maintaining the cleanliness of the University, still their involvement is not enough, cooperation and participation of all stakeholders of the University are very important.

The solid wastes produced in the University are plastic bottles, paper food containers, plastic forks, and spoons, paper cups, paper cartons, plastic sandbags, food leftovers, leaves of trees, broken tables, armchairs, cabinets and other condemned materials. There is an existing disposal area beside an academic building and creek. Every day, each utility workers are disposing of a minimum of two white plastic bags at the disposal area. It is noticeable that the contents of these plastic bags are plastic bottles, paper food containers, plastic forks and spoons, paper cups and food leftovers. Lately, plastic bottles are put in the wire mesh containers located in every building.

There are junk shops that collect the solid wastes in the disposal area without any expenses/payment on the part of the University, but when SEEK issued memoranda about the "garbage in garbage out", "Trash converted into Cash" and "allowing food stall owners to bring outside their wastes", they stopped their garbage collection. This time, the University is paying the collection of solid wastes.

The researchers aimed to determine the other needs to implement the zero waste management aside from the current practices and opportunities if solid waste management may be improved and use these as a basis for further planning.

The general problem of the study is "How may the practices, needs, and opportunities of solid waste management in the University be evaluated and consequently be used as a basis for the development of action plan?"

Specifically, the study sought answers to the following questions:

1. What is the status of solid waste management at the University in terms of:
 - 1.1 types of wastes;
 - 1.2 quantity of wastes;
 - 1.3 facilities, tools, technology used; and
 - 1.4 budget allotted on waste disposal?

2. What is the level of agreement on the practices, needs, and opportunities in the solid waste management of the University as perceived by the faculty members, students, and non-teaching personnel?

Revised Manuscript Received on May 22, 2019.

Cecilia A. Geronimo, College of Engineering, Bulacan State University, City of Malolos, Bulacan, Philippines, 3000, bsuyp.externalaffairs@yahoo.com

Audie L. Geronimo, College of Engineering, Bulacan State University, City of Malolos, Bulacan, Philippines, 3000, audie_8888@yahoo.com



3. What action plan may be proposed to improve the solid waste management of the University?

Conceptual Framework

The researchers considered the Input-Process-Output model in the conduct of the study. The model guides and outlines the various inputs such as the review of the related literature and studies on solid waste management, provisions of RA 9003 which is known as Ecological Solid Waste Management Act, status on solid waste management of the University and level of agreement on the solid waste management practices, needs and opportunities as perceived by faculty members, students and non-teaching personnel. Process involved in the study are construction and validation of questionnaire, data gathering through questionnaire, and unstructured interview, data tabulation and processing with the use of descriptive statistics which lead to the desired output which are the evaluated practices, needs and opportunities in solid waste management and the proposed action plan to improve the current solid waste management of the University.

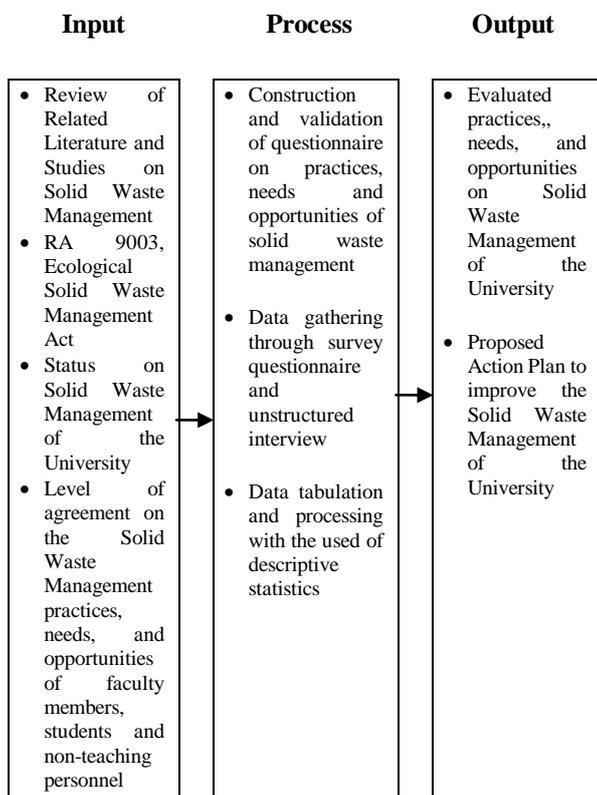


Fig.1. The conceptual paradigm of the study

II. METHODOLOGY

Research Design

The descriptive mixed method was used in the study to evaluate the solid waste management of the University. The status of solid waste management was described in terms of types of wastes, quantity of wastes, facilities, tools, the technology used, and budget allotted on waste disposal. A locally constructed and validated questionnaire was used to determine the level of agreement of the faculty members, students and non-teaching personnel on the practices, needs,

and opportunities of solid waste management in the University. The researchers believed that this method was helpful in providing better responses to the stated research problems. The findings of the survey questionnaire were used as a basis for the development of an action plan to improve the solid waste management of the University.

Respondents of the Study

The respondents of this study were the faculty members, students, and non-teaching personnel of the University. They were chosen to participate in this study because their responses are important since they are the producers of these solid wastes. There are one hundred seventy-two (172) students, seventy-eight (78) non-teaching personnel, and fifty (50) faculty members who participated in this study.

Research Instrument

This study relied on locally constructed and validated questionnaires on the status of solid waste in terms of its types, quantities, facilities, tools and technology used and budget allotted on waste disposal and solid waste management practices, needs, and opportunities. The main questionnaire which was developed to determine the level of agreement on solid waste management in terms of practices, needs, and opportunities consists of 34 items, categorized into three; practices with 13 items, needs with 13 items, and opportunities with 8 items. The five-point Likert scale was used to clearly interpret the result of the computation; scale 1 to 5, the range for the numerical equivalent and descriptive equivalent or verbal interpretation.

Scale	Range	Verbal Interpretation
5	4.51-5.00	Strongly Agree
4	3.51-4.49	Agree
3	2.51-3.50	Slightly Agree
2	1.51-2.50	Disagree
1	1.00-1.50	Strongly Disagree

Data Gathering Procedure

The researchers requested their graduate students and staff in the distribution and retrieval of questionnaires to faculty members, students, and non-teaching personnel. The respondents were duly informed on the importance of their responses for the attainment of the study's objectives. The gathering of data took a month since convenient sampling was used in the study. Also, interviews were conducted among the officials, faculty members, non-teaching personnel, and students to answer the specific problem number one and validate the responses in the level of agreement on solid waste management.

Data Processing and Statistical Tools Used

The researchers consolidated and encoded the responses of the faculty members, students, and non-teaching personnel through different tables. Descriptive measures were done to identify the frequency of responses and weighted mean on the perception of the faculty members, students, and non-teaching personnel on the solid waste management. In the evaluation of the perception



of the faculty members, students, and non-teaching personnel the five-point Likert scale was utilized.

III RESULTS AND DISCUSSION

1. Status of Solid waste management

Interviews were conducted with officials, faculty, non-teaching personnel, and students, specifically to determine the types of waste; quantity of waste; facilities, tools, the technology used; and budget allotted for disposal of waste:

Utility Worker A. Madalas ko pong nakukuhang basura sa mga basurahan ay papel na laminated cups, plastic na kutsara at tinidor at yung plastic na bote na inilalagay sa bilog at butas-butang na lalagyan. (Most of the time the solid waste taken from the trash bins are paper laminated cups, plastic spoons and forks and plastic bottles put in the circular wire mesh container.) Mayroon din mga dahon ng puno, balat ng kendi at biscuit at mga papel na may sulat. (There were leaves of trees, candy and biscuit wrappers, and used papers.)

Utility Worker B. Sa araw-araw po mula Lunes hanggang Biyernes ay nakakapagtapon po ako ng dalawang bag ng basura, at kapag sa Sabado at Linggo ay isang bag ng basura lang po. (Everyday, from Monday to Friday, I disposed two bags of waste and one bag of waste during Saturdays and Sundays.)

Utility Worker C. Gumagamit po ako ng kariton sa pagdadala ng plastic bags na may basura sa ating disposal area. (I used cart to bring plastic bags of waste in the University disposal area.)

Non-teaching Personnel A. Maayos po ngayon ang pamamahala sa basura dahil may kanya-kanya pong lalagyan ang Nabubulok, Di-Nabubulok at Nireresiklo. (It is easier to manage solid waste now because segregation is being practiced there are three containers with label of Biodegradable, Non-Biodegradable, and Recyclable.) Kapag unang Lunes po ng buwan, binibigyan ng sertipiko at pera ang mga opisina at kolehiyo na sumali sa "Trash to Cash Program". (Every first Monday of the month there are certificates of Recognition and cash awarded to offices and Colleges who joined the Trash to Cash Program.)

Utility Worker D. Mayroon din pong kumukuha ng mga basura, sa katunayan ay ako po ang nagbabantay kung gaano kadami ang nahahakot na basura, kadalasan ay gabi sila kumukuha ng basura para hindi sagabal sa mga mag-aaral at kawani ng Unibersidad na nagdadaan sa isang gate na katabi ang disposal area. Sa akin pong pagkakaalam ay truck load ang basurang dapat maikarga o makuha humigit kumulang 14 to 16 cubic meter po ang laman ng truck. Binabayaran po ito ng Unibersidad. (There is a waste hauler, collecting the solid waste, I am in charge of supervising and checking the volume of waste put in the hauling truck. Usually, collection and hauling of waste is in the evening so that it will not disrupt the students and employees of the University passing

through the side gate which is near the disposal area. The usual volume of truck load ranges from 14 cum. to 16cum. The University pay for the collection and hauling of solid waste.

Non-teaching Personnel B. The University has few facilities, tools, and technologies used in the solid waste management. It has a disposal area beside the creek and near the side gate. Simple tools were issued to General Engineering Services Office like shovel, spade, rake and cart. **Faculty A.** Every first Monday of the month, certificate of recognition and cash were awarded to participants of Trash to Cash Program sponsored by SEEK in cooperation with Robinson's Place in Malolos. Our office received already certificate and cash from their program.

Administration A. The payment for collection and hauling of solid waste was included in the Program Project Management Plan of the Office and approved for implementation.

Administration B. It can be observed that everywhere in the campus/building floor there are three trash bins on steel frames with the label of NABUBULOK, DI-NABUBULOK at NIRERESIKLO. There are tarpaulins with text of "ZERO WASTE MANAGEMENT" the goal of SEEK; in study areas – "ITAPON MO ANG BALAT SA BASURAHAN." In classrooms. – "Maintain the Cleanliness of this room, put your waste in the trash bins". Also, there are big wire mesh containers where PET/HDPE bottles are placed.

Student A. The whole campus is clean with trash bins visible everywhere.

Student B. There are plants on pots along the pathway and waterfalls with plants surrounding it. Very refreshing, I hope there will be waterfalls in the Rizal Park and in front of our CSSP building.

2. The following tables show the level of agreement on the practices, needs, and opportunities as perceived by the faculty members, students, and non-teaching personnel

Higher Education Institution's Solid Waste Management: Practices, Needs, and Opportunities

Table 1. Descriptive Measure of the Level of Agreement on Solid Waste Management (SWM) in terms of Practices

A. Faculty	Weighted Mean	Descriptive Rating
1. I put my garbage in the trash bin or bring it home if the trash bin is not available.	4.62	Strongly Agree
2. Trash bins are with plastic bags that the utility workers bring in the disposal area when already full of garbage	4.22	Agree
3. Leaves are dried and pulverized to be used as fertilizer.	4.12	Agree
4. Trash bins are placed in a group of 3 and labeled as biodegradable, non-biodegradable and recyclable for segregation of waste.	4.52	Strongly Agree
5. The community is advised to throw plastics bottles inside wire-mesh containers	4.18	Agree
6. The university made a contract with a private company to facilitate the collection of waste.	4.08	Agree
7. The Sentro ng Edukasyon para sa Ekonomiya at Kalikasan office drafted policies on Zero Waste Management	4.32	Agree
8. Information and reminders to students and employees on Zero Waste Management are printed on tarpaulins and posted in strategic places.	4.06	Agree
9. The Head of the Sentro ng Edukasyon para sa Ekonomiya at Kalikasan issued memoranda on proper waste management to Deans, Directors, Heads and Food stall owners/operators.	4.18	Agree
10. The Sentro ng Edukasyon para sa Ekonomiya at Kalikasan office awards recognition certificate and gives cash incentives to participants of the Trash to Cash program	4.18	Agree
11. The Sentro ng Edukasyon para sa Ekonomiya at Kalikasan office promote 3Rs (Reduce, Reuse, Recycle)	4.56	Strongly Agree
12. Wastes are collected every day.	4.34	Agree
13. Chemical and other hazardous wastes are properly disposed of.	4.14	Agree
General Weighted Mean	4.27	Agree

Table 1 presents the level of agreement of the faculty members in terms of practices on solid waste management. The statement "I put my garbage in the trash bin or bring it home, if the trash bin is not available" got a weighted mean of 4.62 with descriptive rating of strongly agree while the lowest weighted mean 4.06 with descriptive rating agree was the statement "Information and reminders to students and employees on Zero Waste Management are printed on tarpaulins and posted in strategic places". The general weighted mean of 4.27 with a descriptive rating of agree was the perception of the faculty members in terms of practices on solid waste management.

It is evident that the faculty members agreed that the University stakeholders are carrying out good practices on solid waste management.

Table 2. Descriptive Measure of the Level of Agreement on Solid Waste Management (SWM) in terms of Practices

B. Students	Weighted Mean	Descriptive Rating
1. I put my garbage in the trash bin or bring it home if the trash bin is not available.	4.54	Agree
2. Trash bins are with plastic bags that the utility workers bring in the disposal area when already full of garbage	4.12	Agree
3. Leaves are dried and pulverized to be used as fertilizer.	3.91	Agree
4. Trash bins are placed in a group of 3 and labeled as biodegradable, non-biodegradable and recyclable for segregation of waste.	4.34	Agree
5. The community is advised to throw plastics bottles inside wire-mesh containers	4.05	Agree
6. The university made a contract with a private company to facilitate the collection of waste.	3.95	Agree
7. The Sentro ng Edukasyon para sa Ekonomiya at Kalikasan office drafted policies on Zero Waste Management	4.11	Agree
8. Information and reminders to students and employees on Zero Waste Management are printed on tarpaulins and posted in strategic places.	4.16	Agree



9. The Head of the Sentro ng Edukasyon para sa Ekonomiya at Kalikasan issued memoranda on proper waste management to Deans, Directors, Heads and Food stall owners/operators.	4.03	Agree
10. The Sentro ng Edukasyon para sa Ekonomiya at Kalikasan office awards recognition certificate and gives cash incentives to participants of the Trash to Cash program	3.92	Agree
11. The Sentro ng Edukasyon para sa Ekonomiya at Kalikasan office promote 3Rs (Reduce, Reuse, Recycle)	4.26	Agree
12. Wastes are collected every day.	4.10	Agree
13. Chemical and other hazardous wastes are properly disposed of	4.13	Agree
General Weighted Mean	4.12	Agree

Table 2 shows the level of agreement of the students in terms of practices on solid waste management. The statement “I put my garbage in the trash bin or bring it home if the trash bin is not available” got a weighted mean of 4.54 with descriptive rating of agree while the lowest weighted mean of 3.91 with a descriptive rating of agree was the statement “Leaves are dried and pulverized to be used as fertilizer”. The general weighted mean of 4.12 with a descriptive rating of agree was the perception of the students in terms of practices on solid waste management.

As revealed from the table, the students agreed that the University is having acceptable practices on solid waste management.

Table 3 Descriptive Measure of the Level of Agreement on Solid Waste Management (SWM) in terms of Practices

C. Non – Teaching Personnel	Weighted Mean	Descriptive Rating
1. I put my garbage in the trash bin or bring it home if the trash bin is not available.	4.37	Agree
2. Trash bins are with plastic bags that the utility workers bring in the disposal area when already full of garbage	4.01	Agree
3. Leaves are dried and pulverized to be used as fertilizer.	4.00	Agree
4. Trash bins are placed in a group of 3 and labeled as biodegradable, non-biodegradable and	4.23	Agree

recyclable for segregation of waste.		
5. The community is advised to throw plastics bottles inside wire-mesh containers	4.15	Agree
6. The university made a contract with a private company to facilitate the collection of waste.	4.12	Agree
7. The Sentro ng Edukasyon para sa Ekonomiya at Kalikasan office drafted policies on Zero Waste Management	4.05	Agree
8. Information and reminders to students and employees on Zero Waste Management are printed on tarpaulins and posted in strategic places.	4.03	Agree
9. The Head of the Sentro ng Edukasyon para sa Ekonomiya at Kalikasan issued memoranda on proper waste management to Deans, Directors, Heads and Food stall owners/operators.	4.13	Agree
10. The Sentro ng Edukasyon para sa Ekonomiya at Kalikasan office awards recognition certificate and gives cash incentives to participants of the Trash to Cash program	4.18	Agree
11. The Sentro ng Edukasyon para sa Ekonomiya at Kalikasan office promote 3Rs (Reduce, Reuse, Recycle)	4.59	Strongly Agree
12. Wastes are collected every day.	4.23	Agree
13. Chemical and other hazardous wastes are properly disposed of.	4.09	Agree
General Weighted Mean	4.17	Agree

Table 3 reveals the level of agreement of the non-teaching personnel in terms of practices on solid waste management. The statement “The Sentro ng Edukasyon para sa Ekonomiya at Kalikasan office promotes 3Rs (Reduce, Reuse, Recycle)” got a weighted mean of 4.59 with a descriptive rating of strongly agree while the lowest weighted mean of 4.00 with a descriptive rating of agree was the statement “leaves are dried and pulverized to be used as fertilizer”. The general weighted mean of 4.17 with descriptive rating of agree was the perception of the non-teaching personnel in terms of practices on solid waste management.

It may be gleaned from the table that the non-teaching personnel agreed that there was a manifestation that the University stakeholders are having very good practices on solid waste management.



Higher Education Institution's Solid Waste Management: Practices, Needs, and Opportunities

Table 4. Descriptive Measure of the Level of Agreement on Solid Waste Management (SWM) in terms of Needs

A. Faculty	Weighted Mean	Descriptive Rating
1. The University should conduct Waste Reduction Awareness Programs to educate officials, faculty members, students, office staff especially utility workers and food stall owners/operators.	4.68	Strongly Agree
2. I should know the policies and regulations on Solid Waste Management	4.68	Strongly Agree
3. I should be involved and cooperate in minimizing waste in the University.	4.62	Strongly Agree
4. The University should allot sufficient budget to implement Zero Waste Management.	4.68	Strongly Agree
5. Additional trash bins should be placed in the areas where most of the University population prefer to gather together.	4.68	Strongly Agree
6. There should be an increase in the number of garbage collectors.	4.50	Agree
7. There is a need to disposed chemical properly.	4.76	Strongly Agree
8. There is a need to build a Material Recovery Facility in the Campus.	4.68	Strongly Agree
9. Food and stall owners/operators should be advised that their cooperation and participation are required in the proper waste disposal management system of the University.	4.64	Strongly Agree
10. There should be coordination with the local government unit for proper waste disposal.	4.70	Strongly Agree
11. The University administrators, faculty members, non-academic staff and even students should be encouraged to bring food containers, spoons, and forks to lessen waste and save money.	4.60	Strongly Agree
12. There should be a regular contest on Zero waste Management where participation of all concerned is encouraged.	4.60	Strongly Agree
13. The University should allot a space for decomposing of biodegradable materials and assign personnel to take charge of the production and use of the fertilizers from such waste.	4.76	Strongly Agree
General Weighted Mean	4.66	Strongly Agree

Table 4 presents the level of agreement of the faculty in terms of needs on solid waste management. The statement “There

is a need to disposed chemical properly” and “The University should allot a space for decomposing of biodegradable materials and assign personnel to take charge of the production and use of the fertilizers from such waste” got a weighted mean of 4.76 with descriptive rating of strongly agree while the lowest weighted mean of 4.50 with descriptive rating of agree was the statement “There should be an increase in the number of garbage collectors”. The general weighted mean of 4.66 with the descriptive rating of strongly agree was the perception of faculty members in terms of needs on solid waste management.

As observed from the table, faculty members strongly agreed that there is an urgent need to improve the solid waste management in the university.

Table 5. Descriptive Measure of the Level of Agreement on Solid Waste Management (SWM) in terms of Needs

B. Students	Weighted Mean	Descriptive Rating
1. The University should conduct Waste Reduction Awareness Programs to educate officials, faculty members, students, office staff especially utility workers and food stall owners/operators.	4.51	Agree
2. I should know the policies and regulations on Solid Waste Management	4.45	Agree
3. I should be involved and cooperate in minimizing waste in the University.	4.52	Strongly Agree
4. The University should allot sufficient budget to implement Zero Waste Management.	4.40	Agree
5. Additional trash bins should be placed in the areas where most of the University population prefer to gather together.	4.47	Agree
6. There should be an increase in the number of garbage collectors.	4.33	Agree
7. There is a need to disposed chemical properly.	4.40	Agree
8. There is a need to build a Material Recovery Facility in the Campus.	4.45	Agree
9. Food and stall owners/operators should be advised that their cooperation and participation are required in the proper waste disposal management system of the University.	4.58	Strongly Agree
10. There should be coordination with the local government unit for proper waste disposal.	4.49	Agree
11. The University administrators, faculty members, non-academic staff and even students should be encouraged to bring food containers, spoons, and forks to lessen waste and save money.	4.47	Agree



12. There should be a regular contest on Zero waste Management where participation of all concerned is encouraged.	4.44	Agree
13. The University should allot a space for decomposing of biodegradable materials and assign personnel to take charge of the production and use of the fertilizers from such waste.	4.53	Strongly Agree
General Weighted Mean	4.46	Agree

Table 5 reveals the level of agreement of the students in terms of needs on solid waste management. The statement “The University should allot a space for decomposing of biodegradable materials and assign personnel to take charge of the production and use of the fertilizers from such waste” got a weighted mean of 4.53 with descriptive rating of strongly agree while the lowest weighted mean of 4.33 with descriptive rating of agree was the statement “There should be an increase in the number of garbage collectors”. The general weighted mean of 4.46 with the descriptive rating of agree was the perception of the students in terms of needs on solid waste management.

The table manifested that there are still needs to improve the solid waste management in the university.

Table 6. Descriptive Measure of the Level of Agreement on Solid Waste Management (SWM) in terms of Needs

C. Non – Teaching Personnel	Weighted Mean	Descriptive Rating
1. The University should conduct Waste Reduction Awareness Programs to educate officials, faculty members, students, office staff especially utility workers and food stall owners/operators.	4.41	Agree
2. I should know the policies and regulations on Solid Waste Management	4.40	Agree
3. I should be involved and cooperate in minimizing waste in the University.	4.45	Agree
4. The University should allot sufficient budget to implement Zero Waste Management.	4.42	Agree
5. Additional trash bins should be placed in the areas where most of the University population prefer to gather together.	4.44	Agree
6. There should be an increase in the number of garbage collectors.	4.38	Agree
7. There is a need to disposed chemical properly.	4.46	Agree
8. There is a need to build a Material Recovery Facility in the Campus.	4.24	Agree
9. Food and stall owners/operators should be advised that their cooperation and participation are required in the proper waste disposal management system of the University.	4.44	Agree
10. There should be coordination with the local	4.45	Agree

government unit for proper waste disposal.		
11. The University administrators, faculty members, non-academic staff and even students should be encouraged to bring food containers, spoons, and forks to lessen waste and save money.	4.28	Agree
12. There should be a regular contest on Zero waste Management where participation of all concerned is encouraged.	4.36	Agree
13. The University should allot a space for decomposing of biodegradable materials and assign personnel to take charge of the production and use of the fertilizers from such waste.	4.33	Agree
General Weighted Mean	4.39	Agree

Table 6 shows the level of agreement of the non-teaching personnel in terms of needs on solid waste management. The statement “There is a need to disposed chemical properly” got a weighted mean of 4.46 with descriptive rating of agree while the lowest weighted mean of 4.28 with a descriptive rating of agree was the statement “The University administrators, faculty members, non-academic staff and even students should be encouraged to bring food containers, spoons, and forks to lessen waste and save money”. The general weighted mean of 4.39 with descriptive rating of agree was the perception of the non-teaching personnel in terms of needs on solid waste management.

It is noticeable from the table that the non-teaching personnel agreed that there is a need to improve the management of solid waste.

Table 7. Descriptive Measure of the Level of Agreement on Solid Waste Management (SWM) in terms of Opportunities

A. Faculty	Weighted Mean	Descriptive Rating
1. Waste management has become an avenue for entrepreneurial opportunities.	4.54	Strongly Agree
2. Recycling waste is a possible source of extra income for the University.	4.72	Strongly Agree
3. Solid waste can be used as materials for creative arts.	4.70	Strongly Agree
4. I should participate in the Trash to cash program to gain recognition of my active participation on Solid Waste management and to earn additional income from the cash incentives.	4.46	Agree
5. I am aware of the environmental development of the University if solid waste management program is implemented	4.54	Strongly Agree



Higher Education Institution's Solid Waste Management: Practices, Needs, and Opportunities

6. Composting biodegradable wastes in the campus can contribute to the enhancement of the University's environment.	4.60	Strongly Agree
7. A green and clean University can be attained if the use of fertilizers from composted solid waste is implemented	4.48	Agree
8. A green and clean University is beneficial to the health and well-being of the administration, faculty, and staff most especially students.	4.68	Strongly Agree
General Weighted Mean	4.59	Strongly Agree

Table 7 presents the level of agreement of the faculty members in terms of opportunities in solid waste management. The statement "Recycling waste is a possible source of extra income for the University" got a weighted mean of 4.72 with a descriptive rating of strongly agree while the lowest weighted mean of 4.48 with the descriptive rating of agree was the statement "A green and clean University can be attained if the use of fertilizers from composted solid waste is implemented". The general weighted mean of 4.59 with the descriptive rating of strongly agree was the perception of the faculty members in terms of opportunities in solid waste management.

As seen from the table, the faculty members agreed that there are lots of opportunities in solid waste management in the university.

Table 8. Descriptive Measure of the Level of Agreement on Solid Waste Management (SWM) in terms of Opportunities

B. Students	Weighted Mean	Descriptive Rating
1. Waste management has become an avenue for entrepreneurial opportunities.	4.29	Agree
2. Recycling waste is a possible source of extra income for the University.	4.47	Agree
3. Solid waste can be used as materials for creative arts.	4.43	Agree
4. I should participate in the Trash to cash program to gain recognition of my active participation on Solid Waste management and to earn additional income from the cash incentives.	4.42	Agree
5. I am aware of the environmental development of the University if solid waste management program is implemented	4.34	Agree
6. Composting biodegradable wastes in the campus can contribute to the	4.49	Agree

enhancement of the University's environment.		
7. A green and clean University can be attained if the use of fertilizers from composted solid is implemented	4.43	Agree
8. A green and clean University is beneficial to the health and well-being of the administration, faculty, and staff most especially students.	4.51	Strongly Agree
General Weighted Mean	4.42	Agree

Table 8 manifests the level of agreement of the students in terms of opportunities on solid waste management. The statement "A green and clean University is beneficial to the health and well-being of the administration, faculty and staff most especially students" got a weighted mean of 4.51 with descriptive rating of strongly agree while the lowest weighted mean of 4.29 with descriptive rating of agree was the statement "Waste management has become an avenue for entrepreneurial opportunities". The general weighted mean of 4.42 with descriptive rating of agree was the perception of the students in terms of opportunities on solid waste management.

As presented from the table there are additional good opportunities on solid waste management in the university.

Table 9. Descriptive Measure of the Level of Agreement on Solid Waste Management (SWM) in terms of Opportunities

C. Non – Teaching Personnel	Weighted Mean	Descriptive Rating
1. Waste management has become an avenue for entrepreneurial opportunities.	4.24	Agree
2. Recycling waste is a possible source of extra income for the University.	4.44	Agree
3. Solid waste can be used as materials for creative arts.	4.32	Agree
4. I should participate in the Trash to cash program to gain recognition of my active participation on Solid Waste management and to earn additional income from the cash incentives.	4.22	Agree
5. I am aware of the environmental development of the University if solid waste management program is implemented	4.29	Agree
6. Composting biodegradable wastes in the campus can contribute to the enhancement of the University's environment.	4.29	Agree



7. A green and clean University can be attained if the use of fertilizers from composted solid waste is implemented	4.29	Agree
8. A green and clean University is beneficial to the health and well-being of the administration, faculty, and staff most especially students.	4.44	Agree
General Weighted Mean	4.32	Agree

Table 9 shows the level of agreement of the non-teaching personnel in terms of opportunities on solid waste management. The statement “Recycling waste is a possible source of extra income for the University” and “A green and clean University is beneficial to the health and well-being of the administration, faculty and staff most especially students” got a weighted mean of 4.44 with descriptive rating of agree while the lowest weighted mean of 4.22 with descriptive rating of agree was the statement “I should participate in the Trash to cash program to gain recognition of my active participation on Solid Waste management and to earn additional income from the cash incentives”. The general weighted mean of 4.32 with the descriptive rating of agree was the perception of the non-teaching personnel in terms of opportunities on solid waste management.

It was observed from the table that the non-teaching personnel agreed that there are many opportunities on solid waste management in the University.

IV CONCLUSIONS AND RECOMMENDATIONS

The following conclusions were drawn from the findings of the study:

1. The level of agreement on practices of solid waste management, the faculty members and students both with highest agreement on “I put my garbage in the trash bin or bring it home, if the trash bin is not available” while the non-teaching personnel and students had the lowest agreement on “Leaves are dried and pulverized to be used as fertilizer”.
2. For the level of agreement on the needs of solid waste management, the faculty members and non-teaching personnel had the highest agreement on “There is a need to disposed chemical properly” while the faculty members and students had the lowest agreement on “There should be an increase in the number of garbage collectors”.
3. For the level of agreement on opportunities, the faculty members and non-teaching personnel had the highest agreement on “Recycling waste is a possible source of extra income for the University” and also the non-teaching personnel and students had the highest agreement on “A green and clean University is beneficial to the health and

well-being of the administration, faculty, and staff most especially students”.

Proposed Action Plan

Project 1. The Site Development Plan of the Disposal Area with a Material Recovery Facility (MRF). The specific objective is to prepare plans, design and construct a MRF in the location of the disposal area. Its activities are (1) assign architect and civil engineer who can prepare the plans, designs and detailed estimates of materials to be used and manpower needed and; (2) approval of plans, designs and detailed bill of materials and program of works. The personnel to be involved in this project are (1) the director of Facilities and Maintenance Management Office and; (2) Civil engineer, architect, electrical engineer, Chief Administrative Office-Administration, Vice President for Finance, Administration and Resource Generation, and President. The equipment/tools/materials to be used are included in the Bill of Quantities (BOQ) and Program of Works (POW). Budget is as indicated in BOQ and POW. Constructed MRF based on plans is the expected output.

Project 2. Composting Area. It aims to produce organic fertilizer out of the dried leaves and food leftovers. The main activity is to make compost pits for disposal of biodegradable waste and utility workers are the person to be involved in this project. There are equipment/tools/materials that will be used such as shovel and rake. There must be a budget for the salary of utility workers assigned in the MRF. Organic fertilize will be produced year round.

Project 3. Planting ilang-ilang and sampaguita seedlings are suggested to eliminate the unpleasant odor within the area and it should be included in the Program Project Management Plan. And there should be a budget for the salary of utility workers and for the purchase of the plants. The planting of ilang-ilang and sampaguita seedlings maybe done during wet months.

Project 4. Designate Pollution Control Officer who will coordinate with the DENR for the proper disposal of chemicals used in the laboratory. The activities are to check and monitor the laboratory activities which usually disposed of chemicals. The personnel involved in this project are the president, HRMO director, Laboratory technician and Pollution control officer. An office order with duties and responsibilities and budget for the salary of Pollution Control Officer are likewise included. The project will be year-round subject to renewal of PCO. The expected output is compliance with laws on the environment.

Project 5. Clean and Green University. The objective is to maintain a clean and green University for the health and well-being of students, faculty members, non-teaching personnel, and administration. There are three (3) activities in this project (1) always clean the buildings, grounds and surroundings of the University; (2) remove/dispose of unnecessary papers, materials, objects and; (3) grow/landscape ornamental and herbal plants on canopies, open spaces, and walls. The personnel to be involved are the utility workers, faculty members, students, non-teaching personnel, and administrative council. Inclusion in the Program project management plan



the cleaning materials, plants, pots to be procured. The budget for purchase of ornamental and herbal plants, pots, cleaning materials, and salary of utility workers must also be provided. It is expected that within one year, the result will be a healthy University community and clean and green University campus.

Project 6. Information education campaign on zero waste management. This is to continue conducting awareness about the benefits of zero waste management, craft additional policies about zero waste management. The activities are to prepare power point presentation about zero waste management and include in the calendar of activities of the university the seminar on 5S, Occupational Health and Safety (OHS) among employees and other related seminars. The person involved are the Administrative Council, faculty members, non-teaching personnel, students, and SEEK. The equipment/tools/materials to be used are program flyers, computer with ink, flash drive, and certificates. Honoraria for guest speakers/lecturer/snacks/refreshments for participants must be the allotted budget. The expected output within one year since it will be included in the school calendar of activities is the awareness on zero waste management of University community.

Project 7. Income generating projects from solid waste to convert trash into cash. Its activities are to sell all recyclable materials. The personnel to be involved in this project are the waste disposal committee, SEEK, utility workers, and college/office staffs. The materials needed are documents for selling and certificates. The budget for salary must be provided for the utility workers/staff assigned in MRF and SEEK. It is expected that there will be generated income every last Saturday of the month.

REFERENCES

- [1] Bernardo, Eileen C. (2008). Solid-waste management practices of households in Manila, Philippines
- [2] Bharadwaj, Yadav, Varshney, (November 2015) *Non-Biodegradable Waste – Its Impact & Safe Disposal*
- [3] Budhiarta, Siwar, Basri (2012), Current Status of Municipal Solid Waste Generation in Malaysia.
- [4] Desa, Kadir, Yusooff, (October 2012) Environmental Awareness and Education: A Key Approach to Solid Waste Management (SWM) p.184
- [5] Emelumadu, Azubike, Nnebue, FAzubike, Sidney-Nnebue (2016) Science and Education: An Open Access and Academic Publisher, Practice, Pattern and Challenges of Solid Waste Management in Onitsha Metropolis, Nigeria
- [6] Gador, Romel (2009) Solid Waste Management Practices of Davao City
- [7] Guerreroa, Maas, Hogland (October 2012) Solid Waste Management Challenges For Cities In Developing Countries
- [8] Hoornweg, Bhada-Tata, (March, 2012). Urban Development Series Knowledge Papers, What A Waste: A *Global Review of Solid Waste Management pp4-5.*
- [9] Monney, Isaac (2014) Ghana's Solid Waste Management Problems: The Contributing Factors and the Way Forward
- [10] Ranada (October 2015), Rappler, Why PH Is World's 3rd Biggest Dumper of Plastics in the Ocean
- [11] SK Ajim Ali (2016) International Journal Of Environmental Sciences, Status Of Solid Waste Generation And Management Practice In Kolkata Municipal Corporation, West Bengal p.1173
- [12] Sun Star Baguio (April 2017), La Trinidad Heightens Waste Segregation Campaign
- [13] Villanueva (January 2013), Philippine Star, Proper solid waste management: Education, engineering, enterprise and enforcement.
- [14] Yedla, Sudhakar, (April 2016).East Asia Forum, Economics, Politics and Public Policy in East Asia and the Pacific, *India's waste management problems are piling up.*
- [15] www.insightsociety.org > Home > Vol 2, No 2 (2012)
- [16] <http://www.environmental-auditing.org/Portals/0/AuditFiles/Solid%20Waste%20Management%20of%20KMC%2015%20Nepal.pdf>
- [17] <http://www.ipublishing.co.in/ijesarticles/fourteen/articles/volsix/EIJES6112.pdf>

- [18] https://www.researchgate.net/publication/304716473_Knowledge_Attitudes_and_Practices_on_Solid_Waste_Management_among_Undergraduate_Students_in_a_Philippine_State_University
- [19] http://cdn.intechopen.com/pdfs/40498/InTech-Environmental_awareness_and_education_a_key_approach_to_solid_waste_management_swm_a_case_study_of_a_university_in_malaysia.pdf
- [20] https://www.researchgate.net/publication/301283637_NON-BIODEGRADABLE_WASTE_-_ITS_IMPACT_SAFE_DISPOSAL