PROPOSED INSTITUTIONAL SOLID WASTE MANAGEMENT FOR LYCEUM OF THE PHILIPPINES UNIVERSITY-LAGUNA

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ABSTRACT

The research intended to propose an institutional solid wastes management based on the identified solid waste generation and perceived solid waste management practices indicator. The study is a descriptive-quantitative analysis on perception of employees on solid waste management practices indicator. The monthly projection of solid waste generation was based on the actual estimates of solid waste volume the researchers gathered. Frequency and percentages were used in presenting the representative employees obtained from the sample size computation using G-power. Weighted mean was used to quantify the perception of the employees on the solid waste management practices indicator. Results show that Lyceum of the Philippines-University Laguna (LPU-Laguna) has a total of 26 collecting containers on a daily basis. PHL building has the highest solid waste generation comprising of 30.73 percent of total solid waste generated by the campus. High-value solid wastes were identified and these include water bottles, soda bottles, other PET bottles and aluminum cans. Percieved solid waste management practices has an overall weighted mean of 3.30 with a verbal interpretation of agree. The proposed institutional solid waste management will start with the improvement of solid wastes collection. Providing storage area for collection of solid wastes was a necessity. Collection of solid wastes will be classified as for transport and transfer and as for processing and recovery before the final disposal. Study recommended that color coding bins may be provided for proper segration of solid wastes and plans on the processing and recovery methods of high-value solid wastes since the study found out a huge daily collection of these solid wastes. The study firther recommended the institution to reimplement the proposed institutional solid waste management and conduct survey to record improvements on the solid waste management practices.

***Keywords**: Institutional solid waste management, solid waste generation, high-value solid wastes, soli wastes manangement practices*

INTRODUCTION

Solid waste, in any form, is a problem that must be properly managed. Every one of us knows that garbage is harmful, so we need to dispose our garbage properly (Smythe et.al, 2010). Proper waste disposal is of great importance to both rural and urban areas. Not doing this may bring us to danger in many ways and surely everybody knows this. Time and again, people are always being educated about the importance of waste but then this process should not stop because every now and then, people forget.

Moerressey (2003) mentioned that there are many ways on how people can minimize the waste. One is through recycling. When you recycle at an earlier time, this will be very helpful. Aside from lessening your work load, you will also be earning.

Most countries in the world experience challenges in managing waste. The challenges range from reducing generation of waste, separation, change of habits, collection, transport, treatment, reuse and disposal of the waste (Dong and Soon, 2010). The alarming news about recycling is about the effects of improper waste disposal impacting the environment and the lives of people. Recycling does not mean that you have to do it yourself. There are many recycling centers today where you can take the wastes that you produce in your home and business. Some recycling centers even pay you for it by weight or sometimes by the type of waste materials that you take them.

Waste disposal is now the main problem being faced by the world today. In third world countries, problems are more evident. The Philippines, for instance, experienced floods that took the lives of many Filipinos. One of the causes of this flooding is the improper waste disposal.

Solid waste should be managed through a number of activities—waste prevention, recycling, composting, controlled burning, or land filling. Using a combination of these activities together in a way that best protects your community and the local environment is referred to as integrated solid waste management (Lohri et.al, 2013). Educational institutions, on the other hand, must practice solid wastes management, since they are responsible in moulding minds of the future generation.

Recycling and composting activities, if organized properly by the local government, can generate many environmental and economic benefits. For example, it can create jobs and income, supply valuable raw materials to industry, produce soil-enhancing compost for agriculture, reduce the need to site or build more landfills and combustors, and prevent greenhouse gas emissions. An organized approach to recycling and composting can also

have many benefits for your community. Involving scavengers or waste pickers in formal recycling activities can empower them, increase their income and reputation, and improve their quality of life, health, and safety (Hayal et.al, 2014)

The solid wastes management steps are storage at source, separation, on-site storage, collection, transportation, treatment, reuse, recycling, and ultimate disposal. The problems and constraints of the solid wastes management system are also identified to find a sustainable management concept. In solving this emerging socio environmental issue and the initiatives taken by some non-government organizations and community based organizations. (Ahsan et al., 2014)

The possibilities and solutions for a sustainable municipal solid waste management in the community aims to formulate an action plan to start reaching for a sustainable development in the waste sector, with citizen participation. Specific research questions were to find requests and ideas from the community members (Mofide et.al, 2008). Anupam (2010) identified that municipal solid waste management is one of the most serious and most neglected areas of urban development which creates environmental hazards confronting municipalities. Necessary and beneficial relationship drawn among development factors revealed the collaborative web model for sustainable municipal solid waste management.

Human activities generate waste and the amounts tend to increase as the demand for quality of life increases. The concept of zero emissions can be applied successfully with today's technical possibilities in the agro-based processing industry. Further on, solutions for solid waste management will be reviewed in the discussions of sustainable waste management. (Swati, 2009). Foday et.al (2014) found that solid waste generation and physical composition were two important factors in designing the cost effectiveness and environmentally compatible solid waste management system in Freetown given the fact that waste management authority's activities were very unsatisfactory.

The Environmental Sanitation Policy makes the management of municipal solid waste the responsibility of local authorities, specifically, the waste management and environmental health departments, and the private sector. The high and middle income groups favour the private sector while the low-income areas favour the waste management department. Additionally, while the local authorities claim higher community involvement in waste management, the respondents indicate very low involvement. (Simon, 2001). This study will give an assurance that learning the methods of solid waste management is transferable and contributes to spread the discipline of solid waste management practices in the community.

Figure 1. Conceptual Framework

The conceptual framework as shown in Figure 1 links the estimated solid waste generation and perception of respondents on the solid waste management practices indicator to the proposed institutional solid waste management. An identified estimated solid waste generation of LPU campus can be a reat key component in the successful institutional solid waste management.

Objectives of the Study

The study aims to provide an estimated solid waste generation of Lyceum of the Philippines University - Laguna, quantify the perception of the employees' in the solid waste management practices indicator and propose an institutional solid waste management.

METHODOLOGY

The study is a descriptive research and used quantitative analysis in describing the perception of employees in the solid waste management practices indicator. The monthly projection of solid waste generation was based on the actual estimates of solid waste volume gathered by the researchers. The proposed institional solid waste management was developed based on the characteristics of existing solid waste management practices inside LPU campus. Frequency and percentages were used in presenting the representative employees obtained from the sample size

computation using G-power. Weighted mean was used to quantify the perception of the employees on the solid waste management practices indicator.

RESULTS AND DISCUSSION

Solid waste generation of LPU-Laguna

LPU-Laguna is composed of three main buildings with detached gym and huge entrance pavilion. It also has spacious parking lots and soccer field. The maintenance team is collecting all solid waste generated by all classrooms, offices, and school vicinities. They are using a collecting container and this was the basis used by the researcher to estimate the solid waste generation of the campus. Reseacher spent three consecutive days to estimate the average daily frequency of solid wastes collection. The data gathered were also the basis for the weekly and monthly projection of solid waste generation. Table 1 below shows the frequency of solid waste generation of Lyceum of the Philippines University-Laguna.

Table 1. Frequency of Solid Waste Generation (Per Collecting Container)

LPU-L Building	Frequency of Solid Waste Generation (Per Collecting Container)			%
	Daily	Weekly	Monthly	
Culinary Bldg.	5	30	130	19.25
JPL Bldg.	6	36	156	23.09
PHL Bldg.	8	48	208	30.73
Gym	4	24	104	15.38
Campus Entrance	3	18	78	11.55
Total	26	132	776	100

Among the area of the campus, PHL building has the highest solid waste generated with an average of eight collecting containers daily, giving a projections of 48 for weekly and 208 for monthly containers, respectively. PHL building is housing the Campus Cafeteria, College of Arts and Sciences, College of Engineering, and College of Allied Medicine Offices. Palestra Consortio Office, Guidance and Testing Center, and the Graduate School. The Capital Market and the Library are also found in the building, as well as some classrooms and laboratories. The high solid waste generated can be

attributed to the presence of the cafeteria which is frequently visited by students, faculty, and staff. PHL building was the highest solid wastes contributor with a 30.73% of total solid waste generation of LPU-Laguna.

Most of the solid wastes generated in the three-day collection of data were trashes. Plastic bottles, plastic wrappers, plastic cups, and other PET plastics are those considered trashes (Fooday, 2014) and mostly present on the collecting bins of the maintenance team. Other solid wastes collected were classified as rubbishes, which include tin cans, scrap papers, paper cups, paper plates and boxes. Among the rubbishes, only the tin cans can be recycle and reuse. Garbages such as left over foods, wood sticks and plant wastes were minimized since the cafeteria distributed the left overs to some employees as pet foods or mixing agent for hog feeds. Plant wastes, such as dry leaves and twigs were place at the backyard and letting it decomposed. In addition to the identified solid wastes, researcher also found out that theres a lot of high-value solid wastes that have been left behind and no continuos plan for sustaining its use. Zurbrugga 2012, classified high-value solid wastes as treasure and will be use as additional income generating by a certain institution. Table 2 below shows the identified high-value solid waste generation of LPU and its average daily collection.

Table 2. High-Value Solid Waste Generation of Lyceum of the Philippines University-Laguna

High-Value Solid Wastes	Average Daily Collection (per piece)
Water Bottels	216
Soda Bottles	176
Other PET Bottles	159
Aluminum Cans	112

Saeeda et.al. (2011) termed high-value solid wastes because of its potential multiple recycling property that converts into amazing new things. PET bottles were recycled and used as the raw materials in making plastics table, chairs, and other products made-up of mixed recycled molded plastics. Soda bottels and water bottles on the hand can be used as raw materials in making making floorings of houses and even can mould boats out of it. Smyth et.al. 2010 find a better way on how a certain institution will help the community by donating the collected aluminum cans, soda container, in the charity for person with disability (PWD). The lid of the can was made of a stronger alloy and used as materials in making wheelchair.

Educational institutions like Lyceum of the Philippines University-Laguna are priveleged because there are many possible means to maximize solid wastes management. Students are coming to learn new discipline that can be transferred to the next generation. Integrating solid waste

management in the curriculum or syllabi of social and natural sciences will be a great idea in restoring solid waste management practices.Hayal et.al. (2014) mentioned in their study that the involvement of students in the implementation of solid waste management will be a great idea, since the curriculum or the syllabus deliver lessons on solid waste management. In Lyceum of the Philippines University-Laguna some organizations, headed by the Institutional Social Responsibily Office, have projects linking to solid waste management. The collection of water bottles, for example, were given to GMA 7 as part of their environmental sustainability project. The NSTP program headed by the College of Arts and Sciences conducted a series of barangay clean-up and they observed waste segration. Once the solid waste management becomes a practice in the institution, it will be a great contribution to improve the society awareness of solid waste management (Schultz et. al., 2010)

Employees' perception on the solid waste management practices

The cooperation of employees' in the implementation of solid wastes management was necessary to improve the increasing number of solid waste generation in the campus. A modified survey questionnaire by Smyth et.al, 2010, was used to quantify employees' perception on the solid waste practices of the campus.

Table 3. Perceived Solid Wastes Management Practices of Lyceum of the Philippines University-Laguna

Survey Questionnaire Result	Weighted Mean	Valid Interpretation
1. Reimlemention of solid waste management in the campus.	3.3	Agree
2. Prohibit the burning of solid waste in Lyceum vicinity.	2.8	Agree
3. Interaction to the municipality of Calamba about the collection of solid waste of PU – L.	2.9	Agree
4. Scheduled arrangement of collection of solid wastes arranged by the municipality of Calamba.	3.1	Agree
5. Institution has provided a profitable solid wastes generation program and uses the funds as incentives for maintenance team.	3.7	Strongly Agree

6. Create active organization to monitor solid waste management system in LPU-Laguna.	3.3	Agree
7. Make allocation of funds to build its own waste storage in LPU – L to easily haul solid wastes.	3.4	Agree
8. Emphasize waste reduction and re-use in all Offices and classrooms.	3.4	Agree
9. Implement a program for the awareness of solid waste disposal for the students.	3.0	Agree
10. Strict implementation of the proper segregation of waste in LPU- Laguna.	3.4	Agree
Total	3.3	Agree

Smyth et.al. 2010

Table 3 shows that the overall perception of the employees' in the solid wastes management practices were 3.30 with a verabal interpretation of agree. Reimplementation of solid waste management is necessary, since there is no present measures that solid waste manangemant are being practice. A 2.8 weighted mean was obtained pertaining to the prohibition of burning of solid wastes in the Lyceum vicinity. The maintenance team conducted burning of dry leaves and twigs two times a week to avoid over filed up of garbage collected.

Since there was a space for solid wastes of LPU-Laguna, the maintenance team relied on the capacity of the dump site. Although it was identified that the increasing volume of wastes were collected. Interaction of the municipality of Calamba as well as setting of schedule of solid wastes collection must be arranged to solve the problem of continuous filling up of solid wastes in the land fill space provided located at the back of LPU campus.

Planning profitable solid wastes is also a solution in minimizing solid wastes. Funds collected must be given as incentives to the maintenance team for their hard work and first hand persons in the implementation of the institutional solid waste management. It also important to alot some funds for solid waste awareness campaign. If the management were to support the institional solid waste management, they are suppose to allocate some budget for the realiaton of the plan. Strict implementation of segration for example, the needs for providing of color coding bins for solid wastes segration and a storage area of high-value solid waste. Solid waste management can be integrated in the NSTP program as well as in social and natural science. All the success of the Institional Solid Wastes Management

starts with the cooperation and sustainability on the program. Not only the communities will benefited but also the world that we live in (Smyth et.al., 2010)

Proposed Institutional Solid Waste Management

Based on the solid wastes generation data and the perceived solid waste management practices of the employees' , the researchers drawn a proposed institutional solid waste management flowchart (Figure 2). It will suggest that the waste generation will be collected by the maintenance team three to four times daily, depending on the amount of solid wastes generated by each offices or classroom. Color coding bins must be installed for practicing solid waste segregation, collection can be easier and much time and energy can be saved. Providing storage area for collected solid waste was necessary to avoid filling up of the temporary land fill provided by the school which was located at the back of the campus. Collection of solid wastes will become organized since it is already segragated and packed. Solid wastes for transfer and transport maybe collected by the municipal or baranggay solid waste council while the high-value solid waste were process for recovery and other means of soild wates reusing and recyling technique. Final disposal of the campus solid wastes will become organized and will lead to sustainable solid waste management practices.

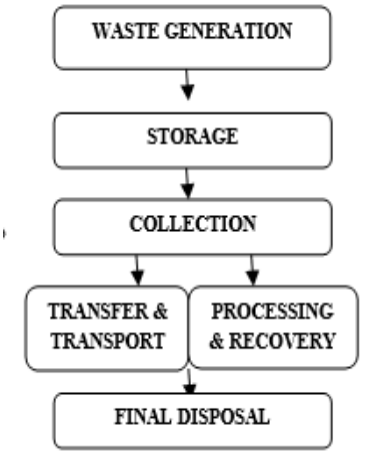

Figure 2. Proposed institional solid waste management flowchart

As an educational institution promoting solid wastes management will be essential part in moulding students' mind to make this as a practice. The simple flowchart of the proposed solid wastes mangement that was presented is the key components in establising an environment friendly institution primarily of responsibility taking good care of our own solid wastes. Nepomucena, 2002 identified solid wastes mangement as simply the institutional social responsibility practices that must be one of the requirements in giving annual operation permit. Ferria et.al., 2015 also agree that each agencies even our own household must start doing a solid waste management for it is the responsibility of the human race to protect our home for better future of our generation. This is in relation to the issue of increasing carbon printing that continously occuring today.

CONCLUSION AND RECOMMENDATION

The solid waste generation of the Lyceum of the Philippines-University Laguna has a total of 26 collecting containers on a daily basis. The projected 132 weekly and 776 monthly collecting containers were identified. Among Lyceum of the Philippines-University campus, PHL building has the highest solid waste generation comprising 30.73 percent of total solid waste generated by the campus. High-value solid wastes were identified and it was includes water bottles, soda bottles, other PET bottles and aluminum cans. Percieved solid waste management practices has an overall weighted mean of 3.30 with a verbal interpretation of agree were quantified. The proposed institutional solid waste management will be started in the improvement of solid wastes collection. Providing storage area for collection of solid wastes was necessarity. Collection of solid wastes will be classify as for transport and transfer and as for processing and recovery before the final disposal.

It was recommended that color coding bins will be provided for proper segration of solid wastes. Make a great plans on the processing and recovery methods of high-value solid wastes since the study found out a huge daily collection of these solid wastes. Reimplement the proposed institutional solid waste management and conduct survey to record improvements on the solid waste management practices.

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