

**Solid Waste Management: A Case Study in the College of Arts and Sciences of the  
University of the Philippines Manila**

An Undergraduate Thesis

By

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In partial fulfillment of the requirements for the degree of Bachelor of Arts major in Social Science, this thesis entitled “**Solid Waste Management: A Case Study in the College of Arts and Sciences of the University of the Philippines Manila**” has been presented by **J. Maywin J. Alhambra** and is hereby recommended for approval.



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## ABSTRACT

The College of Arts and Sciences of the University of the Philippines Manila, located in Padre Faura, Ermita, Manila is an institution that educates many of the brightest minds in the country. It is therefore necessary that the environment within the College is one of cleanliness and is suitable for education and for work, especially because an average college student spends about seven to eight hours a day.

Solid Waste Management is an important concept that should be taken into consideration by every individual. It should not be taken for granted because inefficiency of which could cause lots of problems not only for an individual but for an entire community.

*Key words:* Solid Waste Management, Republic Act 9003, Resource Recovery Techniques, University of the Philippines Manila, College of Arts and Sciences

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- Mei -

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## Chapter I INTRODUCTION

Population has constantly been rising and along this population growth is the continuous growth in the amount of wastes incurred and created. Sanitation has therefore been a primary concern both in rural and urban communities, as well as in other institutions. Proper disposal and management of these wastes prevents the spread and outbreak of infections and diseases, and at the same time, it also provides an option for several people to save money and resources through recycling and reusing some of the wastes instead of disposing them. Proper solid waste management also keeps communities and institutions clean and free of eyesores and litter, making it a suitable environment for habitation.

### Statement of the Problem

This research is an evaluation of the solid waste management program implemented and practiced in the College of Arts and Sciences of the University of the Philippines Manila.

### Significance of the Study

An average college student spends about seven (7) to eight (8) hours a day in the college premises. It is where they get education, eat lunch, hangout with friends and classmates, among others. It is therefore necessary to ensure that this place where the young adults spend half of their days and get exposure be a place suitable and conducive both to learning and socializing.

The study is of significance since it would determine the effectiveness of the solid waste management in the College of Arts and Sciences of the University of the Philippines Manila, the participation of the students, faculty and employees in the different solid waste management programs implemented in the school, if any, and provide ideas for further improvement of the already existing programs, if possible.

The study also aims to strengthen and increase the awareness of students, faculty members and employees regarding the possible health risks of improper solid waste management and disposal. It would also look at the achievements of the College of Arts and Sciences, if any, in its attempt to proper solid waste management.

#### Research Objectives

In general, this study aims to determine if the College of Arts and Sciences of the University of the Philippines Manila follows and applies proper solid waste management as defined and prescribed by the Republic Act of 9003, signed on December of 2000.

In Specific terms, this research seeks to achieve the following objectives:

- 1) To describe the existing solid waste management programs implemented and promoted by the government.
- 2) To identify what solid waste management program is being applied and used in the College of Arts and Sciences of the University of the Philippines Manila.

- 3) To describe how the College of Arts and Sciences of the University of the Philippines disposes the wastes created by its students, faculty members and employees.
- 4) To determine how the students, faculty members and employees participate in the waste management program of the university.
- 5) To determine the awareness of the students, faculty members and employees on the solid waste management of the university.
- 6) To present the different reactions, comments and suggestions of the students, faculty members and employees on the solid waste management program in the university.
- 7) To evaluate the solid waste management program of the university, and;
- 8) To provide recommendations, if necessary, on how to further improve the solid waste management implemented in the College of Arts and Sciences of the University of the Philippines Manila.

## Methodology

### A. Assumption

The assumption is that every individual person in the College of Arts and Sciences of the University of the Philippines Manila produce wastes and are responsible to abide to the solid waste management law or the Republic Act 9003.

## B. Hypothesis

The solid waste management program implemented in the College of Arts and Sciences of the University of the Philippines Manila is effective, relevant, efficient, and sustainable.

## C. Theoretical Framework



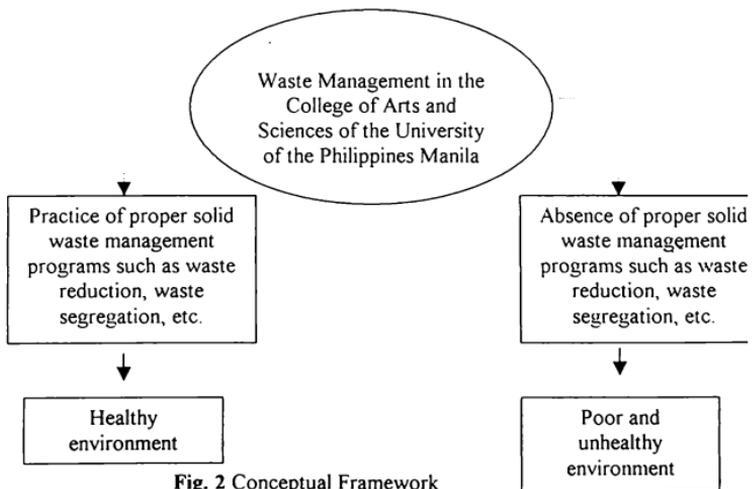
**Fig. 1** Theoretical Framework

The theoretical framework here presented is based on the ILO Training Manual of 1995 on Monitoring and Evaluation. It is the basis of evaluating the solid waste management program implemented in the College of Arts and Sciences of the University of the Philippines Manila. The theoretical framework presents two possibilities – that the College of Arts and Sciences practice a proper

and effective solid waste management program or the College does not practice proper solid waste management program.

As provided by the Training Manual of ILO, 1995, there are guidelines in assessing and evaluating a certain program. The first is its *Effectiveness*, measuring to what extent the program/project achieved its objective(s) and reached its target groups(s). Second is the *Relevance* of the program, if the program/project continue to make sense. Third is the *Efficiency* of the program, whether the expected program/project results continue to justify the cost incurred. And finally, the *Sustainability* of the program, determines the likelihood that program/project benefits will be sustained after the withdrawal of external support.

#### D. Conceptual Framework



**Fig. 2** Conceptual Framework

Supposing the College of Arts and Sciences practices a solid waste management program to some extent, it is the agenda of this study to evaluate whether the program is effective or not and whether the program provides results satisfactory to the community and its residents. As can be seen in the framework, the absence or presence of certain solid waste management programs determines whether the institution is a healthy or a not so healthy environment for the students, faculty and its workers.

Based on the guidelines of evaluation presented in the Training Manual of ILO, the solid waste management program implemented in the College of Arts and Sciences of the University of the Philippines will be done along these criteria.

The independent variable in this research study is the Solid waste management program and the dependent variable is the institution's cleanliness and conduciveness for work and education. The intervening variables of the study were the time of the year, the number of students, faculty members and workers, and the awareness level of the students, faculty members and workers.

#### E. Operational Definition

The following are some of the important terms and ideas to be discussed in the research study:

- **Collection.**

As defined by the Republic Act 9003, it is the act of removing solid waste from the source or from a communal storage point.

- **Composting.**

As defined by the Republic Act 9003, it refers to the controlled decomposition of organic matter by microorganisms, mainly bacteria and fungi, into a humus-like product

- **Disposal.**

It is defined by the Republic Act 9003 as the discharge, deposit, dumping, spilling, leaking or placing of any solid waste into or in a land.

- **Ecological Solid Waste Management.**

The Republic Act 9003 defines it as the systematic administration of activities, which provide for segregation at source, segregated transportation, storage, transfer, processing, treatment, and disposal of solid waste and all other waste management activities, which do not harm the environment.

- **Evaluation.**

Involves the comprehensive analysis of the operation with the aim of adapting the strategy and planning to circumstances. (Gohl, et. al., 1993)

- **Leachate.**

As defined by the Republic Act 9003, it is the liquids produced when waste undergo decomposition, and when water percolate through solid waste undergoing decomposition. It is a contaminated liquid that contains dissolved and suspended materials.

- **Monitoring.**

The process of systematic and critical review of an operation with the aim of controlling the operation and adapting it to circumstances. (Gohl, et. al., 1993)

- **Municipal Waste**

The Republic Act 9003 defines it as wastes produced from activities within local government units, which include a combination of domestic, commercial, institutional and industrial wastes and street litters

- **Philcare Employees.**

These are the janitorial service men that work around the University and the Colleges. They are the ones who oversee the cleanliness of the University and College premises.

- **Recycling.**

Considered by many to be the most effective way of reducing the amount of wastes, recycling is the processing of useful waste materials so that it would be available again for use. It usually involves the reprocessing of something thrown away into something useful, which would adapt or convert into something else, or using something again for the same purpose. It conserves resources and energy needed in the waste disposal. (Tesar, J. 1991)

The Republic Act 9003 defined recycling as the treating of used or waste materials through a process of making them suitable for beneficial use and for other purposes, and includes any process by which solid waste materials are transformed into new products in such a manner that the original product may lose their identity, and which maybe used as raw materials for the production of other goods or services.

- **Re-use.**

This is a waste management method wherein something is used again, often for a different purpose and usually as an alternative to throwing it.

The Republic Act 9003 definition for this term is the process of recovering materials intended for the same or different purpose without the alteration of physical and chemical characteristics.

- **Sanitary Landfill.**

This is the commonly used method especially in municipalities. It involves the use of large areas of land in disposing wastes. There are basically two types of landfill disposal: open dumps and sanitary landfills. Open dumps are characterized with the scattered deposit of wastes in one area. Sanitary landfills, on the other hand, involve geological isolation of waste, appropriate engineering preparations prior to dumping, presence of staff on the site, organized deposit and daily coverage of waste.

As defined by the Republic Act 9003, it refers to a waste disposal site designed, constructed, operated and maintained in a manner that exerts

engineering control over significant potential environment impacts arising from the development and operation of the facility.

- **Segregation.**

This involves the proper separation of wastes and categorizing them as wet, dry, biodegradable, non-biodegradable, recyclable, etc. This process would make it easier for disposal and would also give a clear picture of the things that are really disposable or not.

- **Segregation at Source.**

The Republic Act 9003 defines it as the solid waste management practice of separating, at the point of origin, different materials found in solid waste in order to promote recycling and re-use of resources and to reduce the volume of waste for collection and disposal.

- **Solid Waste.**

More known as garbage, these are unwanted or unusable, discarded by-products coming from different sources. These are the results of human activity and daily living, from processing, marketing, storing and preparing food. When not properly collected, managed and disposed, these will pose health risks to the community. (Tesar, J. 1991)

As defined by Article 2 of the Republic Act 9003, solid wastes shall not include:

(1) Waste identified or listed as hazardous waste of a solid, liquid, contained gaseous or semisolid form which may cause or contribute to an increase in mortality or in serious or incapacitating reversible

illness, or acute/chronic effect on the health of persons and other organisms

(2) Infectious waste from hospitals such as equipment, instruments, utensils, and fomites of a disposable nature from patients who are suspected to have or have been diagnosed as having communicable diseases and must therefore be isolated as required by public health agencies, laboratory wastes such as pathological specimens (i.e. all tissues, specimens of blood elements, excreta, and secretions obtained from patients or laboratory animals) and disposable fomites that may harbor or transmit pathogenic organisms, and surgical operating room pathologic materials from outpatient areas and emergency rooms; and

(3) Waste resulting from mining activities, including contaminated soil and debris.

- **Solid Waste Management.**

These are activities that deal with waste before and after it is produced, including its minimization, transfer, storage, separation, recovery, recycling and final disposal.

As defined by the Republic Act 9003, it shall refer to any resource recovery system or component thereof, any system, program, or facility for resource conservation; any facility for the collection, source separation, storage, transportation, transfer, processing, treatment, or disposal of solid waste

- **Waste Minimization.**

This is the significant reduction of wastes produced and incurred by people usually benefiting the producer. The costs for both the purchase of goods and for waste treatment and disposal are reduced and the liabilities associated with the disposal of waste are lessened.

This concept, as defined by the Republic Act 9003 is termed source reduction and it refers to the reduction of solid waste before it enters the solid waste stream by methods such as product design, materials substitution, materials re-use and packaging restrictions.

#### F. Data Collection Approaches/Techniques

The researcher applied the ethnographic design in approaching the problem, formally and informally talking with the people within the institution about their experiences and reactions with the way garbage and wastes are collected and disposed. Under this design, the researcher conducted the participant observation method. She also interviewed key informants and collected stories and accounts from the students, faculty members and workers of the said institution. The researcher also conducted a descriptive and evaluative study of the solid waste management program of the College.

#### G. Instruments and Data Analysis

In the process of gathering information, facts and data, the researcher used a survey questionnaire that she distributed to the different students, faculty members and workers of the College of Arts and Sciences. Apart from this survey questionnaire for the students, faculty members and workers, the researcher also performed interviews using an interview guide or schedule with

selected students and personnel. She also conducted an interview with key informants.

#### H. Population and Sampling

The researcher performed the research in an institution-based manner wherein she derived her research population in the College of Arts and Sciences of the University of the Philippines Manila. The researcher has chosen the said respondents because she believes that the College should be clean and suitable for learning and interaction and therefore, it should be made sure that it practices solid waste management properly. She also believes that the population of the College of Arts and Sciences continues to increase, therefore, a considerable increase in the amount of wastes created.

Since the College of Arts and Sciences is a large one, with a total population of 1,619 for students and xx for faculty, administrative and other staff, the researcher chose only 10% of the total student population. The chosen students per course were at random so as to prevent any biased opinion or statements. The criteria for the sample population were as follows: he or she must be a bonafide student of the University of the Philippines; he or she must have at least one or two classes in the College of Arts and Sciences; he or she must be a student of the College for at least two years. Included in the sample population were the janitors of the College of Arts and Sciences, together with the guards. The criteria for this group were as follows: he or she must be a regular

employee of the university or college; he or she must have at least worked for a minimum of two years in the College. Those not included in the sample population are the students, faculty members and employees that are new to the university. The gender and age of the respondents does not matter and will not affect the results of the study.

#### I. Scope and Delimitations

The researcher focused on the solid waste management program implemented in the institution and how the students, faculty members and janitors respond, react and participate in the said program. These people are the ones which experience first-hand the solid waste management program of the College of Arts and Science and this somehow gives the researcher the assurance of acquiring a more or less accurate account of the implemented program in the University.

It is the concern of the study to identify the different kinds of wastes created, with a great focus on solid wastes. The study enumerated the different kinds of wastes but it only discussed thoroughly those wastes considered as solid wastes. It also enumerated the different means of treating the solid wastes.

This study also discussed the Republic Act number 9003 or the Philippine Ecological Solid Waste Management Act of 2000.

Since the study is an evaluative one, the study's focus was the solid waste management program implemented in the institution. It also discussed when the

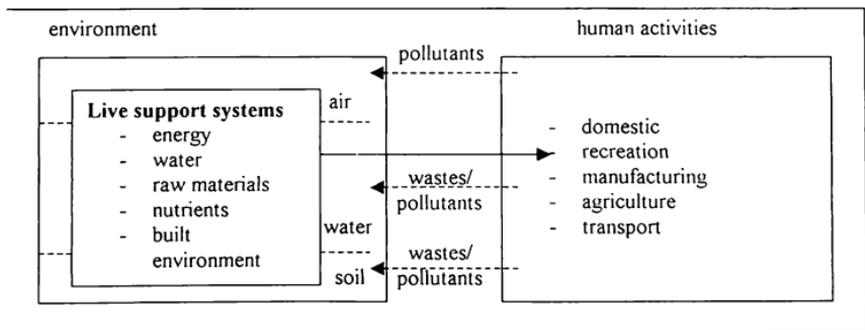
program started, its objectives, its importance, its implications and its effects on the institution and its residents. The study also determined how actively the people of the institution participate in the said solid waste management program as well as their comments and responses. The study also included the participation and contribution of the local government in the solid waste disposal management program of the University of the Philippines Manila.

#### J. Ethical Considerations

Any information gathered, opinions heard and data collected were treated with honesty and integrity. The researcher honored any request for confidentiality by the survey and/or interview respondents, if they wished that their identities not be exposed.

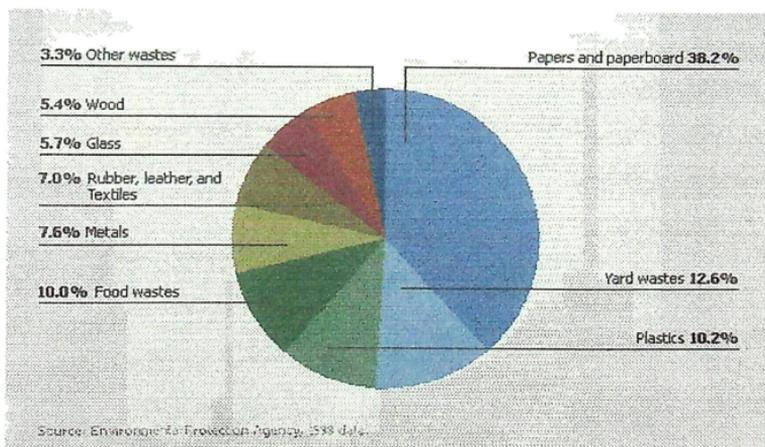
## Chapter II REVIEW OF RELATED LITERATURE

Production and generation of wastes by man on Earth is something inevitable and unavoidable mainly because the basic acts of living, eating, working and even dying parallels with waste generation. According to Hans Tammemagi, "It is almost impossible to think of a process that does not create some waste," and this is so true, in all parts of the planet. Different types, kinds, forms and amounts of wastes are being generated and produced in different institutions like the household, business establishments and food chains. How these generated wastes are being disposed of is an important question to be answered and looked at. Improper disposal of wastes incurred by the different sectors in the country would cause diseases and an outbreak of a number of infections, and the worst scenario would be the earth being a planet of garbage. The problem of disposing wastes is directly related to the growth of population in the planet and the fast urbanization of communities and countries. (Tammemagi, H.1999)



**Figure 3** The interactions between Man and the environment (University of Greenwich, 1994)

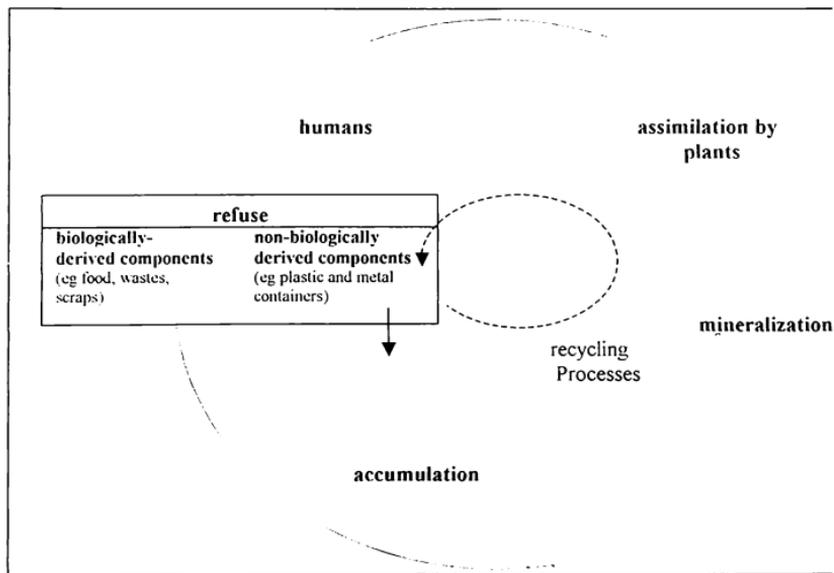
According to the Biotechnological Innovations in Energy and Environmental Management by the University of Greenwich, there is a constant interaction between man and his physical environment. As presented in Figure 2, we can see that the environment provides man with everything that he needs: energy, water, nutrition, raw materials, etc. Through these provisions from the environment, man has been able to survive and perform a wide range of activities. Sadly, all these activities that man perform create wastes, garbage and pollutants, which eventually go back to the environment. (University of Greenwich, 1994)



**Fig. 4** Components of Municipal Solid Waste (Huang, 2002)

Solid wastes come from different areas, groups of people, communities and seasons. Among these are municipal wastes, medical wastes, industrial wastes, hazardous wastes, radioactive wastes and plastic wastes. For the purpose of this study,

we focused on the municipal wastes. These are those wastes created in the households of a community and this includes the wastes from stores and business establishments within the community. In addition to these municipal wastes in communities are the plastic wastes that are found to be very useful due to its durability and flexibility. However, these characteristics of plastic wastes are also the same characteristics that prove to be a problem in terms of disposing them, since these materials are often made up of toxic chemicals and cannot be treated same as other wastes. (Tesar, J. 1991)



**Figure 5** The potential recycling of biologically derived components of refuse and the single use of non-biologically derived products. (University of Greenwich, 1994)

As can be seen in Figure 5 that not all the wastes created and produced by humans undergo the same level and process of degradation. Biologically derived components such as food, wastes and scraps are degraded by microorganisms, which are then re-assimilated and used by animals and humans after a certain time. On the other hand, non-biologically derived components such as plastic and metal containers do not undergo the same process of degradation and unless they are treated and/or recycled, they would remain as they are and will not be degraded, and in time will continue to accumulate and pile up. It is in this light that governments must ensure that proper solid waste management of these biologically and non-biologically derived components be practiced and considered (University of Greenwich, 1994)

Solid Waste Management is divided into two categories -- collection and disposal. The collection operation is about the storage, transfer and transport of wastes and is often broken down into four independent unit operations. These are pick-up, haul, at-site and off-route. (Clark, R.; Gillean, J. 1981) The wastes are oftentimes picked up by garbage trucks that are often large, have enclosed compartments and powered by a hydraulic compressor used to compact the wastes gathered. (Huang, 2002) On the other hand, the disposal operation consists of all the activities needed to the total removal of waste. The disposal operation can be broken down further as incineration, composting and sanitary landfill. Incineration is the process of burning solid wastes using high-temperature incinerators.

Composting is the process of condensing and reusing wastes coming from the yard or the kitchen table and turning it into fertilizers. (Hynes, 2002)

This is done through the biochemical degradation of organic materials into a sanitary, nuisance-free humus-like material and is often done with the use of aerobic microorganisms under a controlled condition. (Clark, R.; Gillean, J. 1981) This is done by arranging the wastes into layers in a bin and letting air circulate, and then putting in manure, meal or greenery to provide nitrogen, generate heat and facilitate rotting, and it is then covered to prevent infection and swarming of insects. As heat and steam build up, the waste decomposes over time into a nutrient-rich substance called compost. (Huang, 2002)

Sanitary landfills (dumping on land) are the most convenient way of disposing of wastes and are considered as probably the earliest refuse disposal method. (Clark, R.; Gillean, J. 1981) Sanitary landfills replaced the former open dumpsites and these are often sprayed with disinfectants, using bulldozers to compact and reduce the size of the wastes being dumped. When these wastes are already compacted and dumped, it is then covered with a layer of soil that is also compacted through the use of bulldozer. (Tesar, J. 1991)

A number of experts propose an alternative to these: the integrated waste management system that involves four practices – source reduction, recycling, combustion and landfills. Source reduction is simply the limiting of the amount of wastes produced and at the same time reducing the toxicity of the wastes that are produced. Not producing wastes would mean not having to dispose of anything, thus conserving energy and resources. Reducing toxicity may be done by making changes in the manufacturing, production, packaging of products and making them durable and

longer lasting so as not having to throw them away soon. Recycling, on the other hand, is the use of materials over and over again as long as it still provides some utility, or by converting it into something useful again, rather than simply disposing it. This method also saves resources and energy. (Tesar, J. 1991)

Recycling is done either through shredding of the materials, using magnets to separate metals from the pile, air classification (depending on the volume of the wastes), screening, washing and the wet pulping process. The process is as follows:

“Incoming refuse is mixed with water and ground into a slurry in the wet pulper, which resembles a large kitchen disposal unit. A magnetic device pulls out large pieces of metal and other nonpulpable materials before the slurry from the pulper is loaded into a centrifuge called a liquid cyclone. Here the heavier noncombustible materials, such as glass, metals, and ceramics, are separated out and sent on to a glass- and metal-recovery system; other, lighter materials go to a paper-fiber-recovery system. The final residue is either incinerated or is used as landfill.” (Hartman, 2002)

Improper disposal of these wastes could pose harm not only in the health of the people but also to the immediate environment. Municipal wastes for instance, mostly from households, produce poisonous wastes that are often overlooked upon and thus, not treated seriously as they should be. All-purpose cleaners for example produce ammonia and chlorine that both damages lung tissue and cause cancer to the people exposed to it. Mothballs cause kidney problems. Many other household products cause problems to the health of the people in the community, and among these are: permanent ink markers, paint thinners and removers, paint, air freshener, rust solvent, herbicides, oven cleaners, grease, automotive oil, pesticides and many more. In addition to the health problems

caused by the toxicity of these wastes is the problem regarding illness due to unsanitary disposal, or those infections caused by insects, rats, flies, etc. (Tesar, J. 1991)

“A Short Guide to Participative Impact Monitoring” written by Gohl, Germann, Prey and Schmidt (1993) has stressed the importance of constant monitoring and evaluation of programs. Monitoring must be performed by the main actors in a situation or those which are involved and within, instead of outsiders. Continuous monitoring would provide the actors some basis for evaluation. This is the reason why the two concepts are often intertwined with each other (M+E). (Gohl, et. al., 1993)

Edward Suchman’s “Evaluative Research: Principles and Practice in Public Service and Social Action Program” (1967) has presented what is known as the Evaluation Process (Fig. 6)

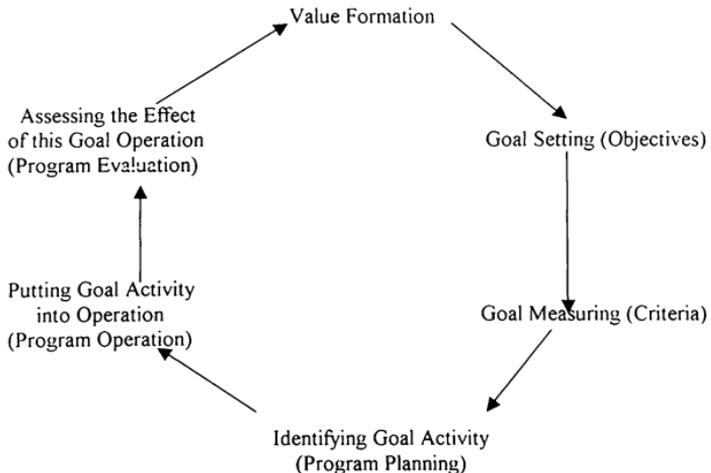


Fig. 6 Evaluation Process (Suchman, E., 1967)

As can be seen in Figure 6, the evaluation process always begins from the formation of values, setting what is “good” and what is “bad.” Having this idea in mind, it is the next step to formulate certain goals or objectives that would abide by the values we have set. After the goal setting would be measuring the attainment level of our goal, whether it is possible to be attained or not. Then comes project planning or the identification of goal activity, the means as to how to achieve the goal setting or objectives that we have set. With this already in mind, program operation or the actual performance of the goal activity takes place. Then comes Program Evaluation wherein we assess the effects of the program activity, whether it has achieved the set goals and objectives, and whether it would be practical to push through and continue the said program activity. (Suchman, E.)

“The Mokattam Garbage Village” written by Laila R. Iskandar Kamel (1994) talks about the experience of the Egyptian Village of Mokattam with garbage. Coming from a very unproductive scene, the Mokattam Village, due to different interventions by the NGO’s and the Church emerged as a Garbage Village, a village earning money out of garbage. The book described the different recycling processes in the village as well as the different materials that they recycled. Using this literature, the researcher was able to compare the solid waste management activities in the Mokattam Village of Egypt and the College of Arts and Sciences.

“A Study on Urban Environmental Management Through Community and Non-Governmental Organizations” written by Danilo Lapid on August 1992, presents several case studies of areas within the Metropolitan Manila with regarding their physical and

social environments. The study shows that with regards to garbage collection and disposal, the residents of the different Metropolitan cities have different reactions and concerns. Some do not really care about the situation while some are greatly affected and bothered by the lack of proper waste disposal in their area. The study is of importance because it provided the researcher a basis for comparison of the attitudes and participation of the College of Arts and Sciences and the residents of the studied cities in Metro Manila. The garbage problem is aggravated by external and internal factors. The external factors are the inefficient collection and disposal, while the internal factors involve the lack of participation and concern of the students manifested in improper disposal of wastes and non-participation in programs. The study also discussed the Zero Waste Approach, which is a simple community based model to solve the never-ending problem of waste collection and disposal. This Approach is made up of six (6) procedures that can be applied to the College of Arts and Sciences. The researcher mentioned and discussed these six procedures, as well as explained how these can be applied to the case of the College, in the Recommendations chapter.

The Republic Act 9003 or the Philippine Ecological Solid Waste Management Act was signed into a law on the 21st of December 2000. It was stated in Article 1 of the said Act that it is now the responsibility of the Philippine government to adopt and practice a solid waste management program that would meet the ten standards prescribed, also by the said Act. The researcher checked, using the Republic Act 9003 whether the College of Arts and Sciences abide to it or not.

Since the study is about solid waste management and its application in the College of Arts and Sciences, these related literature were useful for the researcher. Not only did it provide information about the different nature of wastes, its sources and its characteristics, it also identified the many different ways that the wastes can be treated and managed. It also discussed how the physical environment and its inhabitants are related to each other, how they affect each other, and how important cleanliness and sanitation is in providing a conducive area for living as well as working. It is important in this study because it further stressed the importance of assessing and improving, if needed, the solid waste management in the College. Based on the following related literature, the researcher had a basis in checking whether the College of Arts and Sciences properly manages, collects and disposes its wastes.

For purposes of comparison and evaluation, the researcher has tried to look for similar studies or even related ones that she could use. However, there is a scarcity of related and similar works. This is one reason why this research study is important. The scarcity of related and similar works regarding university solid waste management only shows that not much attention and consideration has been given to solid waste management implementation in universities and other similar educational institutions. This should not be the case because it is important. The researcher hopes that by conducting this study, others will be aware of the importance of solid waste management in educational institutions and try to do the same.

### Chapter III – WASTES AND SOLID WASTE MANAGEMENT

By definition, wastes are generations of products that are not profitably utilized. Every individual person creates and generates wastes that eventually pile up and contribute to the already existing garbage crisis in the planet. Basically, there are four general categories of wastes: municipal, medical, industrial and agricultural. The wastes generated in these categories vary in quantity and composition and the reasons for this would be the changing characters of the people in the community and/or the changing seasons. (Tesar, J., 1991)

Municipal wastes are those wastes created by people in the household, stores, parlors or any establishment in a certain community. In addition to these would be the used tires, used batteries, used oil and other parts, which are used and utilized by the vehicles of the people in the community. (Tesar, J., 1991)

Hospitals and other medical related institutions produce wastes, which are categorized as medical wastes. In addition to the regular wastes, they produce wastes that could be dangerous to the health of the people. Among these would be used needles, used bandages, cottons or band-aids, urine bags, blood, tissues, and more which they have utilized in performing surgeries, treatments or autopsies. Apart from these, medical wastes also include radioactive wastes that are often used in hospitals when they perform examinations in the brain, liver, or any other internal organ of the patients. (Tesar, J., 1991)

The wastes created and generated in factories and mines are categorized as industrial wastes. Among the wastes produced in these places are lead wastes, metallic wastes, waste rocks, and carbon dioxide, to name a few. (Tesar, J., 1991)

Agricultural wastes are those produced in the farm and any other related institutions such as poultry and slaughter houses. Among the wastes created and generated in these areas are pesticides, animal manure, straws, husks, bones, blood (of animals), etc. (Tesar, J., 1991) Agricultural wastes could also pose severe health risks especially when ammonia from manure is not properly disposed. This will contribute to the acidification of lakes and soils. Leachate from fertilizers also contributes to the production of algae, due to anoxia, which leads to deaths of marine life. (University of Greenwich, 1994)

### Solid Waste Management

When the wastes derived from human and animals are not properly dealt with, contamination of the environment will occur and this will lead to the risk of disease outbreaks. The incidence of disease organisms and their biological vectors is increased by increased production and accumulation of biological wastes. (University of Greenwich, 1994)

Solid Waste Management is the process of collecting, transporting, processing and/or disposing solid wastes with the purpose of managing them. Solid waste management is conducted and implemented by countries and communities with the hope of reducing the dangerous and unwanted impacts of these generated waste materials on

the well being of the human population, as well as the environment. Apart from trying to protect the environment and its inhabitants, solid waste management also tries to look for means in saving scarce resources of our planet by recovering and utilizing already used resources, instead of throwing them away. (Waste Management, 2004)

There are two independent areas in the management of solid wastes. First is the collection stage, which includes storage, transfer and transport of the solid waste materials. Second is the disposal stage, which includes any accompanying treatment of the solid waste. The first stage in SWM, the collection stage, can further be subdivided into unit operations. The first unit operation is the collection and this can further be broken down into four unit operations: pick-up, haul, at-site and off-route. The actual collecting time and the effective working time of the collection crew since the first container of solid waste is loaded to the truck comprise the pick-up operation. The second unit operation is the haul operation and this begins the moment the garbage truck loads its final container of solid waste. The time the truck spends at the disposal site and the time it takes for it to travel back to pick-up the first container of solid waste is also part of the haul operation. The at-site operation is the time spent by the garbage truck at the disposal operation. On the other, all the other activities including meals and rest periods, are part of the off-route operation. (Clark, et.al., 1981)

In collecting solid waste materials, the collection crew makes use of different tools in performing their tasks. Among the most common are garbage trucks, gloves, masks, and boots among others. Gloves, masks and boots are used by the collection crew

for purposes of sanitation and to prevent infection and sickness. Garbage trucks or dustcart or dustbin wagon are trucks specially designed for the purpose of collecting wastes. There are basically three basic models of these trucks: front loaders, rear loaders and side loaders. The front loaders have prongs on the front which is used to gather the garbage. The rear loaders have openings at the rear part of the truck where the collection crew can throw the garbage bags and these usually operate with a compactor which pushes the accumulated garbage towards the front of the truck. The side loaders are versions of either the front or the rear loader. (Garbage Truck, 2004)

In collecting solid wastes, the garbage truck usually follows a sequence. Shown in Fig. 7 is the said sequence. At the motor pool, the crew meets and rides the truck to go to the route. The "loaders" then gather the waste materials to the truck. When the truck is already full, it is driven to the discharge point. After unloading, the truck then goes back to the route and resumes collection until the truck is again full or all the wastes are collected. When all the days' work is done, the truck goes back to the motor pool. (Clark, et al., 1981)

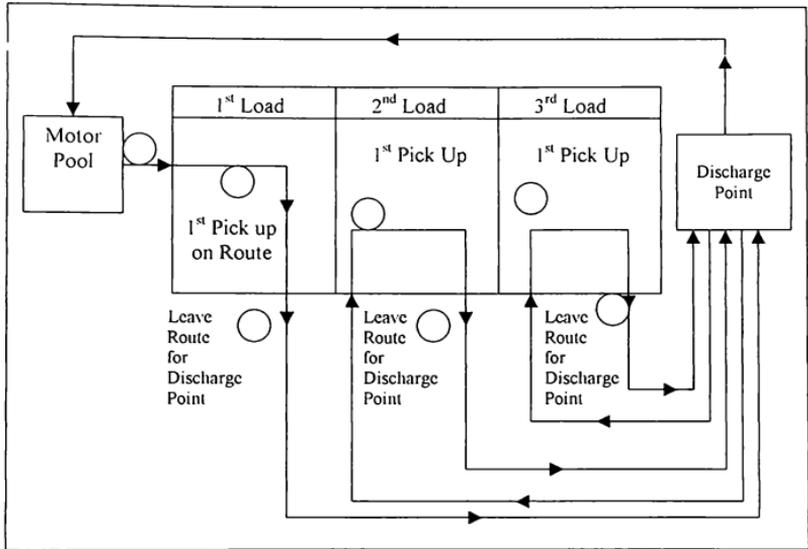
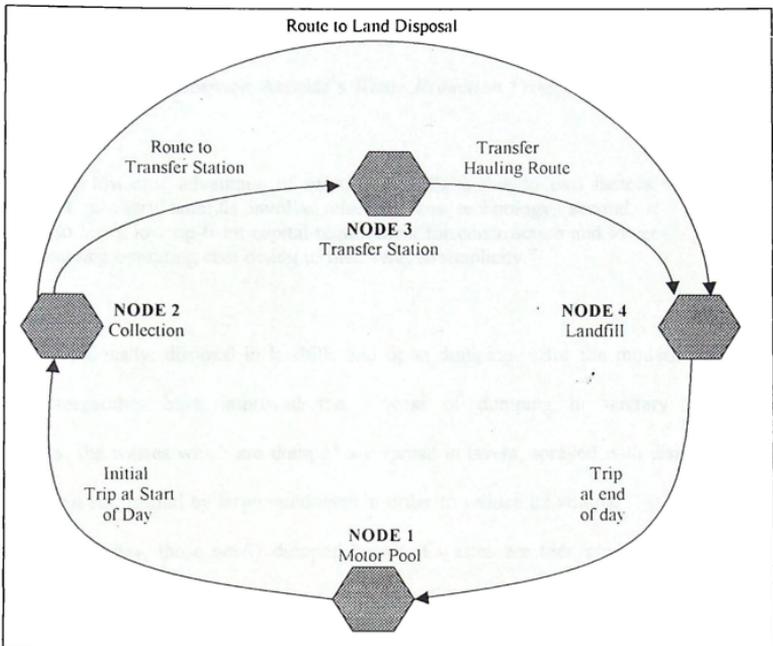


Fig. 7 Collection sequence followed by a truck and crew in collecting solid waste. (Clark, et al., 1981)

The local government usually carries out the second stage of SWM, the disposal stage. There are several ways of disposing solid wastes and the use of these disposal methods and techniques are each faced with much controversy and issue regarding their effectiveness and environmental impacts. Among these disposal methods are dumping on sanitary landfills, composting and incineration.

The figure below shows a schematic diagram of the solid waste system.



**Fig. 8** Schematic Showing relationships among system components (Clark, et al., 1981)

### *Sanitary Landfills*

Probably the most traditional and earliest method of disposing wastes is in the form of dumping in sanitary landfills. (Landfill, 2004) Also considered as the cheapest way of disposing wastes, dumping on sanitary

landfills continues, up to the present, to be one of the most common disposal methods both in developed and underdeveloped countries. (Huang, 2002)

According to Robenson Avenida's *Waste Reduction Program at the Community Level*,

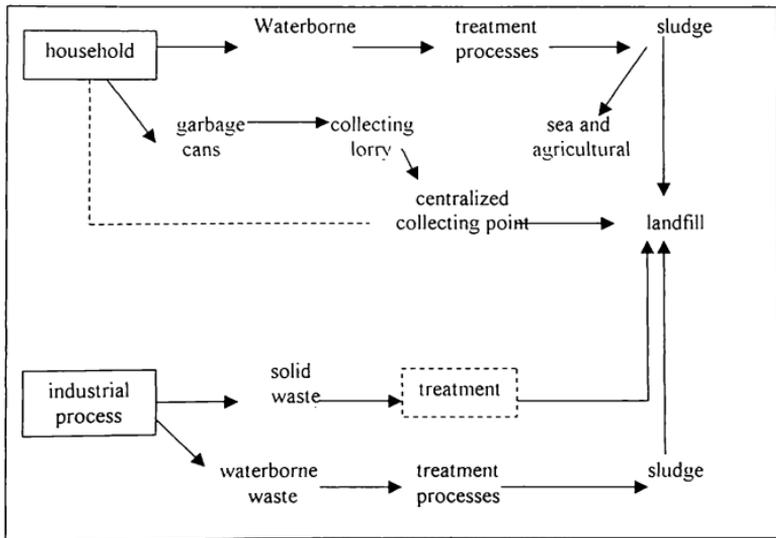
“The low-cost advantage of sanitary landfills is due to two factors: first, sanitary landfills involve relatively low technology, second, it also has a low up-front capital requirement for construction and lower ongoing operating cost owing to their relative simplicity.”

Traditionally, disposal in landfills end upon dumping. But the modern era and modern researches have improved the process of dumping in sanitary landfills. Nowadays, the wastes which are dumped are spread in layers, sprayed with disinfectants and are then compacted by large bulldozers in order to reduce its volume. At the end of each operating day, these newly dumped layers of wastes are then covered with a top layer of soil and are again run over by the large bulldozers. (Tesar, J., 1991) The purpose of this soil dumping is to reduce unwanted odors or vermin, as well as to prevent animals like dogs, insects, rats, rodents, cockroaches, and many others to feed on the wastes, so as to prevent the spread of infections and diseases. (Waste Management, 2004)

However economical, dumping on sanitary landfills is still faced with controversies and one of these concerns is the presence of leachate. Leachate is the water or liquid content, which seeps from the rotting wastes that eventually pollutes and infects the groundwater beneath the sanitary landfills. It is also believed that this leachate picks up other dangerous elements and contaminants as it seeps further downward. (Tesar, J.,

1991) Modern-run landfills now have an answer to the problem of leachate. Now, contouring the fills with plastic or clay reduces the contamination of groundwater and surface water. (Huang, 2002)

When a sanitary landfill can no longer accommodate wastes, it is then covered with a clay or plastic liner and is then covered with soil of 2 feet thick, and is then planted with grass and other plants. These closed landfills are suitable for building parks, golf courses or any similar establishments. (Tesar, J., 1991)



**Fig. 9** Generalized flow of solid and water borne wastes in modern societies (Clark, et al., 1981)

Figure 9 above shows the different wastes coming from both households and industrial process and how they are collected and treated by different means and methods. However, these differences in ways of treatment and collection all produce the same product called sludge, and eventually all end up in the same location, the landfills. (University of Greenwich, 1994)

### *Incineration*

Incineration is the process of destroying waste materials by burning and there are a number of advantages and disadvantages of doing so. Proponents of incineration argue that the process gradually reduces the amount of solid wastes by 90 percent and they believe that through burning with high temperatures, the production of toxic pollutants can be prevented.

There are two types of incineration processes used in disposing wastes – central incineration and onsite incineration. Central incineration is the one commonly used by municipalities while onsite incineration is the one performed by individual households or establishments.(Clark, R.; Gilleen, J. 1981) There are two types of combustion facilities used by the government – mass burn systems and refuse-derived fuel facilities. The mass burn system is used with very little pre-processing and only those large items are removed. On the other hand, the refuse-derived fuel facilities remove not only large materials but also toxic materials, recyclable items – glass and metals. The problem with burning wastes is that these incinerators are very costly, difficult to operate, its risk adds

up to the already existing pollution, and the creation of bottom ash – those that collect at the floor of the combustion machine. (Tesar, J 1991)

Among the downsides of incineration is the high level of capital needed in building and creating incinerators as well as the high costs of maintaining it. Building an incinerator can cost up to \$250 million. These incinerators are difficult to operate and could be very dangerous both to the operators and to the people nearby if not properly used.

Another downside of incinerating solid wastes is the presence of unburned particles like fly ash, heavy metals, acid gases, dioxins and nitrogen oxides which are toxic by-products of the burning process. There is also the presence of bottom ash that accumulates at the base of the incinerator. In disposing of these unburned particles, they are usually put together and transported to sanitary landfills. However, many oppose this practice and suggest that these be transported in hazardous waste landfills instead of transporting them in ordinary sanitary landfills. Hazardous waste landfills are believed to better contain these by-products through specialized liners. (Tesar, J., 1991)

Due to modern research, improvements have been made and uses for incinerator ash are discovered. The mid-1990 experiments created glassy pebbles out of the incinerator ash by using electric plasma torches. These glassy pebbles are now used in Germany and France in the production of concrete. Other uses for incinerator ash would be lye and this is done by chemical separation. (Waste Management, 2004) Also due to improvements in technology, wet scrubbers, bag filters and

electrostatic precipitators now control the non-gaseous by-products of incineration. (Huang, 2002)

### Resource Recovery Techniques

Since the creation of the Earth, the human population has been endowed with a fixed amount of natural resources for them to utilize and use for their survival. Being fixed, these resources also come in a limited supply. Previous human activities have vastly degraded and wasted a huge proportion of our natural resources. Ideas of conserving natural resources have come at a much later date. It is in this light that resource recovery techniques are formulated. The resource recovery techniques are practiced more commonly on metropolitan areas where landfills are starting to pile up and natural resources are starting to run low.

The usual composition of garbage, in addition to biodegradable food scraps, peelings and leftovers would be tins, cardboard boxes, plastic wrappers, plastic containers and glass vessels. These items that are non-, biodegradable and are man-made, take a long time before it degrades, if it does at all. (University of Greenwich, 1994)

Collecting materials for reusing and recycling used to be an expensive and costly endeavor but nowadays, improvements have been made and organizations now encourage the segregation of garbage according to characteristics and compositions. (University of Greenwich, 1994)

There are a number of resource recovery techniques used and applied. Probably the most common and well-known techniques would be recycling and reusing of the waste materials.

## *Recycling*

By definition, recycling is the reuse of those materials that are already used and are discarded as wastes. (Recycling, 2004) Considered by Tesar as the most effective way of reducing the amount of waste disposed, recycling preserves and saves a considerable amount of natural resources by utilizing discarded materials. (Tesar, J., 1991) Recycling waste materials is cost-effective since it is definitely cheaper to recycle than to extract virgin materials and produce new products. Recycling waste materials do not require too much energy and raw materials. Recycling also reduces pollution either by reducing the demand for high-pollution alternatives or by minimizing the pollution acquired during the manufacturing process. (Recycling, 2004)

Recycling materials such as aluminum is said to decrease air pollution by 95%, water pollution by 97% and energy use by 95%, paper recycling decreases air pollution by 74%, water pollution by 35%, water use by 58% and energy use by 70%. These estimated figures show that recycling really is an effective way of conserving the limited resources and energy of the planet as well as reducing the pollution and other harmful effects of manufacturing into our habitat. (Tesar, J., 1991)

Almost everything can be recycled. However, for purposes of this discussion, only those that are commonly recycled materials will be mentioned. Among the most common materials recycled are steel and aluminum, plastics, paper, glass and certain chemicals. Around 68% of all steel materials are recycled and these are usually used in sheet-steel products like cans, automobiles and appliances. On the other hand, aluminum

is one of the most commonly recycled materials, especially those in the form of beverage containers. These cans are brought to collection centers (sometimes within the supermarkets) and are crushed, baled and shipped to mills or reclamation plants. When these cans arrive the reclamation plants, they are then shredded and heated in order to reduce the total volume and remove any coatings or moisture that could hinder the recycling process. After heating, they are then put into a furnace, melted and formed into ingots or bars that are then transported to another mill where it is rolled into sheets. These sheets are sent to another plant and there, these are cut into disks which make up the new cans. Another commonly recycled material is plastic which are much difficult to process and recycle compared to metal, paper or glass. One problem is because of the existence of seven categories of plastics that cannot be combined or mixed during the recycling process. There is this need to identify precisely what category the plastic materials belong to. The recycling process usually begins with cleaning, shredding into flakes and then melting these flakes into pellets which are then further melted to create the final product. Paper and paper products such as cardboard containers, wrapping paper, office paper and newspaper usually make up the bulk of recycled paper. These paper are collected and then mixed with hot water and is processed until it turns into a pulp. After being turned into a pulp, it is put into a vat where the ink separates from the paper fibers and floats to the surface. The pulp, now separated from the ink, is mixed with new wood fibers and is turned into paper again. The ink collected is separated and is reused as ink or burned as boiler fuel. Recycling glass materials is economical because it melts at lower temperatures and therefore saves fuel and operating costs. The glasses that

are to be recycled must be sorted according to color, and are then melted in a furnace and finally formed into a new product. The most common type of recycled glasses is container glasses colored flint (clear), green and brown (amber.) (Hartman, 2002)

### *Reusing*

Very much related with recycling is the reusing of materials. As the name itself implies, it is the reusing of materials already thrown away or the reusing of materials that are already used. This is different from recycling because it takes the waste material and uses it again for exactly the same purpose. This process is sometimes also referred to as closed-loop process. The continuous use of these materials for the same purpose extends the useful life of a material but in a lesser versatile form. (Waste Management, 2004)

### *Composting and Digestion*

Food scraps, dried leaves, peelings, and any other organic waste materials are presorted and separated from the other waste materials. These wastes are then ground up, placed in piles in a composting area, and are then degraded biologically. (Huang, 2002)

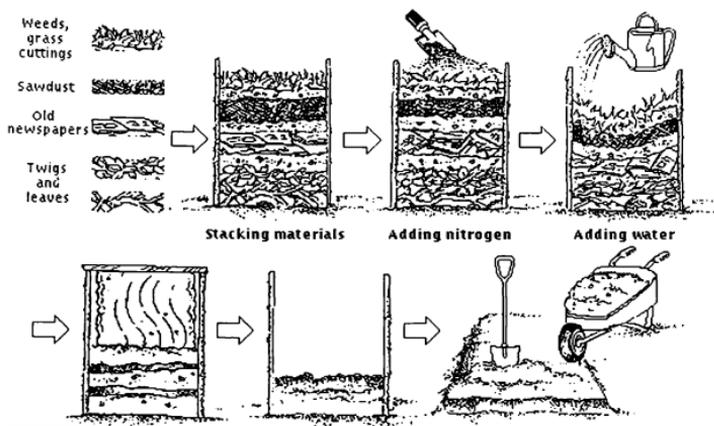


Fig. 10 The Process of Composting (Hynes, 2002)

There are basically two categories of composting waste materials – aerobic and anaerobic. Aerobic composting makes use of air in decomposing the waste materials while anaerobic composting does not require the use of air and often produces the gas, methane, which is used as a form of power. (Compost, 2004)

There are two methods in composting organic waste materials aerobically – the active (hot) and the passive (cold) methods. The latter method relies on nature alone and decomposition takes a long period of time. On the other hand, the former method makes use of composters, which provide a perfect environment for organic waste materials to decompose at a much faster rate, making use of such ingredients like carbon, nitrogen,

oxygen and water. Decomposers are also utilized to further increase the rate of the composting process. Among these decomposers are bacteria, microorganisms, snails, ants, earthworms, millipedes, centipedes, sow bugs, springtails, fungi, molds, protozoa and slugs. (Waste Management, 2004) Three weeks after the composting process, the compost, or the decomposed remnants of the organic waste materials, are then cured and marketed as fertilizers used in agriculture and gardening. (Hynes, 2002)

**Chapter IV – THE REPUBLIC ACT 9003 – THE PHILIPPINE ECOLOGICAL  
SOLID WASTE MANAGEMENT ACT OF 2000**

As an answer to the growing problems of the country with regards to solid wastes, the Republic Act No. 9003 was drafted and finally approved on January 26, 2001. Also known as the Ecological Solid Waste Management Act of 2000, Republic Act No. 9003 is a consolidation of the House Bill No. 10651 and Senate Bill No. 1595. Signed by Gloria Macapagal-Arroyo, President of the Philippines, Aquilino Pimentel, President of the Senate, Lutgardo Barbo, Secretary of the Senate, Arnulfo Fuentabella, Speaker of the House of Representatives, and Roberto Nazareno, Secretary General of the House of Representatives, it is the aim of the said Act to reduce the amount of garbage generated and at the same time implement proper management of the already existing wastes. (\*Republic Act 9003)

**Policies**

Article 1 Section 2 of the RA 9003 has presented the ten (10) different policies that should be adopted by the State in the management of solid waste. First, the State should ensure the protection of the public health and environment. Second, the State should encourage resource conservation and recovery by making maximum use of the available resources. This involves recycling and/or reusing of discarded materials instead of throwing them away to rot. Third, guidelines and targets for solid waste avoidance and volume reduction should be set and prescribed. This involves source reduction and the different waste minimization techniques that are performed prior to collection, treatment

and disposal. Fourth, there should be proper segregation, collection, transport, storage, treatment and disposal of the solid waste materials. Fifth, the State should encourage researches and promote development programs that would contribute to the development and improvement of the already existing solid waste management practices. Sixth, the State should arouse, mobilize and encourage the people and the private sector to participate in the solid waste management practices. Seventh, the local government will still be the one responsible for the primary enforcement of solid waste management provided that the national government, non-government organizations and the private sector provide support and cooperation. Eighth, market-based instruments should be applied so as to encourage the cooperation of waste generators. Ninth, the State should institutionalize public participation in the solid waste management programs. Tenth, solid waste management must be integrated into the academic curricula of formal and non-formal education so as to improve the awareness and participation of the people.

#### National Solid Waste Management Commission

The Republic Act 9003 has also established the National Solid Waste Management Commission or NSWMC, which is under the Office of the President. According to the Act, the Commissioner will be made up of 17 members, 14 of which will come from the government and 3 from the private sector. The 14 members taken from the government sector would be the department heads of the following agencies: Department of Environment and Natural Resources (DENR), Department of the Interior and Local Government (DILG), Department of Science and Technology (DOST),

Department of Public Works and Highways (DPWH), Department of Health (DOH), Department of Trade and Industry (DTI), Department of Agriculture (DA), Metro Manila Development Authority (MMDA), League of provincial governors, League of City Mayors, League of Municipal Mayors, Association of barangay councils, Technical Education and Skills Development Authority (TESDA), and, the Philippine Information Agency. On the other hand, the private sector shall be represented by one person from NGO's who principally promotes recycling, one person from the recycling industry and one from the manufacturing or packaging industry. There will be a Chairman and vice-chairman in the person of the Department Secretary and a private sector representative.

This newly created Commission is tasked to oversee the proper implementation of solid waste management as well as to prescribe policies to achieve the objectives of the said Act. The Commission which is to meet at least once a month is expected to undertake several activities and these are: a) prepare the national solid waste management framework; b) approve local solid waste management plans in accordance with its rules and regulations; c) review and monitor the implementation of local solid waste management plans; d) coordinate the operation of local solid waste management boards in the provincial and city/municipal levels; e) to the maximum extent feasible, utilizing existing resources, assist provincial, city and municipal solid waste management plans; f) develop a model provincial, city and municipal solid waste management plan that will establish prototypes of the content and format which provinces, cities and municipalities may use in meeting the requirement of the National Solid Waste Management Framework; g) adopt a program to provide technical and other capability building

assistance and support to local government units in the development and implementation of source reduction programs; h) develop and implement a program to assist local government units in the identification of markets for materials that are diverted from disposal facilities through re-use, recycling, and composting, and other environment-friendly methods; i) develop a mechanism for the imposition of sanctions for the violations of environmental rules and regulations; j) manage the Solid Waste Management Fund; k) develop and prescribe procedures for the issuance of appropriate permits and clearances; l) review the incentives schemes for effective solid waste management, for purpose of ensuring relevance and efficiency in achieving the objectives of this Act; m) formulate the necessary education promotion and information campaign strategies; n) establish, after notice and hearing of the parties concerned, standards, criteria, guidelines, and formula that are fair, equitable and reasonable, in establishing tipping charges and rates that the proponent will charge in the operation and management of solid waste management facilities and technologies; o) develop safety nets and alternative livelihood programs for small recyclers and other sectors that will be affected as a result of the construction and/or operation of solid waste management recycling plant or facility; p) formulate and update a list of non-environmentally acceptable materials in accordance with the provisions of the Act; q) encourage private sector initiatives, community participation and investments resource recovery-based livelihood programs for local communities; r) encourage all local government agencies and all local government units to patronize products manufactured using recycled and recyclable materials; s) propose and adopt regulations requiring the source separation and post

separation collection, segregated collection, processing, marketing and sale of organic and designated recyclable material generated in each local government unit; and t) study and review the standards, criteria and guidelines for promulgation and implementation of an integrated national solid waste management framework as well as the criteria and guidelines for siting, design, operation and maintenance of solid waste management facilities.

According to Section 10 of the Act, it is the different local government units which is responsible for the implementation and enforcement of the solid waste management plans, starting with the segregation and collection in the different barangays. The segregation categories would be biodegradable, compostable and reusable wastes. The wastes gathered and segregated will then be the responsibility of the different municipalities.

#### Provincial Solid Waste Management Board

Section 11 of the Act promotes the creation of a Provincial Solid Waste Management Board in every province and headed by their respective governors. Those that would comprise the Board will be the different mayors of the different cities and municipalities, a representative from the Sangguniang Panlalawigan, the provincial health and/or general services officers, the provincial environment and natural resources officer, the provincial engineer, congressional representatives, an NGO representative of each concerned government agency. In Metro Manila, however, the chairman of the Board is the chairperson of the MMDA and its members include all the mayors in its component

cities and municipalities, an NGO representative, a representative from the recycling industry and a representative from the manufacturing or packaging industry. These members work together to achieve and perform the functions and responsibilities of the Board.

The Act has enumerated twelve (12) functions and responsibilities that the Board must perform. First is the development by the different cities of Solid Waste Management Plans, which will be evaluated and checked by the Board to see if the plan is complementary to the plans submitted by other cities. The plan will then be submitted to the National Solid Waste Management Commission for approval. The second function would be the provision of any logistical and operational support, which is considered necessary to the cities and municipalities in accordance to the recycling of waste materials. Third is to recommend measures in minimizing and fighting against pollution while at the same time preserving the natural ecosystem of the cities and municipalities. Fourth is to recommend activities to raise funds and generate resources for the approved solid waste management plans. Fifth is to identify areas within its responsibility that have similar solid waste management problems. It is also the responsibility of the Board to ensure that its component cities and municipalities coordinate their efforts to ensure higher chances of success. The development of an incentive scheme is another function, as well as the scheduling of joint meetings of the provincial, city and municipal Solid Waste Management Boards for the purpose of monitoring, evaluating and integrating the plan. It is also the Board's responsibility to represent its province in the national government. Tenth, the Board must oversee the plan's implementation. It is also the

Board's task to review every two years the plan and check whether it is still sustainable, viable, effective and relevant in upholding its goals. Finally, the Board is also responsible for clustering local government units for solving common problems pertaining to solid waste management

#### City and Municipal Solid Waste Management Board

If there is a National and Provincial Solid Waste Management Boards, there also exists, in Section 12 of the Act, a City and Municipal Solid Waste Management Board which is composed of the city or municipal mayor as the head, a representative from the Sangguniang Bayan or the Sangguniang Panlungsod, the President of the Association of Barangay Councils in the municipality or city, the Chairperson of the Sangguniang Kabataan Federation, an NGO representative, representatives from the recycling, manufacturing and/or packaging industries, and one from concerned government agencies.

The City and Municipal Solid Waste Management Board is tasked with the following: the development of a city or municipal solid waste management plan that will ensure a long term management of the area's solid waste; the adoption of measures to effectively implement the solid waste management programs in the different barangays; the monitoring of the city or municipal solid waste management plans; the adoption of measures that would generate revenue and funds for the solid waste management plan; the scheduling of regular meetings of the different barangays; the overseeing of the implementation of the city or municipal solid waste management plan; the regular review

(every two years) of the sustainability, viability, effectiveness and relevance of the plan; the development of specific guidelines for the plan's implementation; the presentation of proposals for the better collection, transfer, storage, processing, recycling or disposal of the solid wastes; the provision of support necessary for the recycling programs; the recommendation of measures to fight and prevent pollution as well as to preserve the natural environment; and, the coordination of the efforts of the different barangays in the implementation of the plan.

#### National Solid Waste Management Status Report and National Solid Waste Management Framework

Six months after the implementation of the Republic Act 9003, the Department shall present a National Solid Waste Management Status Report in order to be able to create the National Solid Waste Management Framework six months after its submission.

#### Segregation, Collection, and Transport of Wastes and the Transfer Stations

The Act has also tackled and described how proper segregation shall be done. Specifically in Section 21, the Act stated that the segregation of wastes shall be done and conducted at the source be it a household, institutional, industrial, commercial or agricultural source. These wastes will be categorized according to its qualities: compostable, non-recyclable, recyclable or special and as Section 22 indicates, there should be the presence of separate containers for the different categories of wastes.

The Act also provided the requirements for the collection of solid waste. As stated in Article 3, Section 23, those people involved in the collection or any activity which is directly related and connected to the solid wastes must be equipped with equipment that would protect them from the hazards of the wastes. These people must also be provided with proper training to ensure that the solid wastes are handled properly and that the collection will be done in the proper way in which containers will not be damaged and spillage and leaks will not occur.

Section 24 of the same Article has presented the requirements for the transport of the solid wastes. It indicates that there should be separate schedules as well as garbage trucks in collecting the different kinds of wastes. It should not be the case wherein the different wastes are gathered at the same time and schedule. If ever this will be done, the garbage trucks collecting the wastes must have appropriate compartments to ensure that the wastes do not mix and combine. This waste compartment must have a cover to ensure that the wastes are kept inside while in transit. These garbage trucks must bear the body number, the name, and the telephone number of the contractor or agency running it so as to be able to identify them from others collecting solid wastes.

Section 25 of Article 3 presents the guidelines that transfer stations must follow. According to the Act, no waste shall be kept in storage for more than twenty-four (24) hours. Transfer stations must also be studied to ensure that it is capable of handling and accommodating the wastes brought by the garbage vehicles upon collection.

## Recycling Program

Article 5 of the Republic Act talks about the recycling program and the different requirements connected to it. Section 26 in particular talks about the DTI, DILG and other concerned agencies' task of publishing a list of markets for processing and purchasing recyclable materials. This list will also include tips and plans as to how to improve the size of these markets as well as product standards for recyclable and recycled materials. It is also the DTI's responsibility to implement a certain coding system in packaging materials. Through this coding system, waste will better be facilitated and much easier to identify as recyclable and/or reusable. After a year of implementation of the Act, the Commission should have also released a list of those products that are non-environmentally acceptable. If these products are proven to be non-environmentally acceptable, and provided that it has an alternative product with a price no more than ten percent (10%) of the disposable product, they will then be prohibited. Annually, the Commission must renew and re-check the list of non-environmentally acceptable products. Also under this Article, the Commission with the cooperation of the National Ecology Center, DTI and the Department of Finance, should promote the development of local markets for recyclable goods. The Commission and its comrades must provide incentives as well as grant loans to those who would want to establish facilities that would manufacture recycled materials, to ensure guarantees that both the national and local government purchase a percentage of the output of the facilities (to ensure a regular market), and to maintain a list of prospective buyers as well as improve the marketability of the recycled products. Section 32 of the same Article presents the creation of

Materials Recovery Facility (MRF) in every barangay or groups of barangays. It is in the Materials Recovery Facility that different and mixed wastes will be brought for final sorting, segregation, composting and recycling.

### Composting

Article 5 talks about the responsibility of the DA to publish a list of existing markets for compost and fertilizers within six months of effectivity of the Act. It also stated that the compost products that will be sold in the different markets must conform to the standards set by the DA for fertilizers.

### Solid Waste Management Facilities

Article 6 states a creation of a list of all solid waste disposal facilities and/or sites in the entire country. Section 37 of the Article states that open dumps will no longer be allowed to operate and as Section 38 indicates, before anyone can commence operation, or even build a new solid waste facility, he must first be able to obtain an ECC or Environment Compliance Certificate provided by the Department. All the existing open dumps must be converted to controlled dumps, or else, it will be forced to shutdown. Section 39 presented the guidelines for controlled dumps and according to it, they should have a regular inert cover, a surface water and peripheral site drainage control, a provision for aerobic and anaerobic decomposition, a restriction of waste deposition to small working areas, a fence for little control, a record of its activities, a provision of maintained access road, a controlled waste picking and trading, a post closure site cover

and vegetation and a hydro geological siting. All these should be met for a controlled dumpsite to adhere to the Republic Act of 9003. On the other hand, Section 40 presented the criteria for finding an appropriate site for establishing a sanitary landfill. First, the selected site must be consistent with the overall land use plan of the local government units. Second, the site must be accessible to major roadways. Third, the site must have an adequate quantity of earth cover material that will be used in covering the layers of garbage deposited in the landfill. Fourth, the residents of the place where in the site will be built must be considered. Fifth, the site's location must be a place that will not affect the environment such as aquifer, groundwater reservoir or watershed area. Sixth, the site should be large enough to accommodate the wastes that will be deposited for a period of five (5) years. Sixth, the site should be able to satisfy budgetary constraints, it should coordinate with recycling and resource recovery projects and finally, it should have a separate area for containing household hazardous wastes.

Once the location for a sanitary landfill has been chosen, the sanitary landfill may now be created, provided, that it adheres to Section 41 of the RA 9003. For establishing a sanitary landfill, Section 41 enumerates seven (7) components that one should have: A Liner is a system of clay layers that are used to contain leachate and prevent contamination of the groundwater beneath; a leachate collection and treatment system involves the installation of pipes that would drain and collect the leachate for treatment; a gas control and recovery system which collects gas for treatment or productive use as energy source; a groundwater monitoring well system are wells placed in certain depths that would serve as a representative of the ground water quality beneath the landfill; a

cover which is made up of two – a daily soil cover and a final cover made of geosynthetic materials to control infiltration of water and other elements, a closure procedure and a post closure care procedure. When all these criteria are met, a sanitary landfill may now be established.

### Incentives

Those who participated in the solid waste management including re-use, recycling and reduction will be given incentives coming from the Solid Waste Management Fund. This system of incentives will serve as an encouragement to local government units, enterprises, private entities, NGO's and other groups to participate in the solid waste management and develop ways for better management. According to Section 45, there will be five (5) kinds of incentives – the fiscal incentives, non-fiscal incentives, financial assistance programs, extension of grants to local government units and incentives to Host local government units. All these incentives are consistent with the E.O. 226 also known as the Omnibus Investments Code. Fiscal incentives include Tax and Duty Exemption on Imported Capital Equipment and Vehicles, Tax Credit on Domestic Equipment, and Tax and Duty Exemption of Donations, Legacies and Gift.

### Solid Waste Management Fund

Chapter five of the Republic Act 9003 provides for the creation of the Solid Waste Management Fund which will be used to finance technologies and processes that would enhance the solid waste management, to provide as awards and incentives, to fund

research programs, to inform, educate, communicate and monitor the processes of waste management, to get technical assistance and to fund capability building activities. The Fund will not be used as salaries and wages of the people involved in the solid waste management. Money of the Fund will come from fines and penalties imposed, proceeds of permits and licenses, donations, endowments, grants and contributions as well as amounts appropriated under the annual General Appropriations Act.

### Penal Provisions

Chapter six of the Act indicates the penal provisions as well as the fines and fees that come with these acts. Section 48 listed sixteen (16) acts specifically mentioned that are prohibited and subject to fines if caught. (1) littering, throwing and dumping of waste materials in public places; (2) operating, collection or transporting equipment in violation of the sanitation operation; (3) the open burning of solid waste; (4) causing or permitting the collection of non-segregated or unsorted wastes; (5) squatting in open dumps and landfills; (6) open dumping as well as burying of biodegradable and non-biodegradable materials in areas prone to flooding; (7) unauthorized removal of recyclable materials for collection; (8) the mixing of source-separated recyclable materials; (9) establishment or operation of open dumps, or closure in violation of Section 37; (10) the manufacture, distribution or use of non-environmentally acceptable packaging materials; (11) the importation of consumer products packaged in non-environmentally acceptable materials; (12) importation of toxic wastes with misinterpretation as “recyclable”; (13) the transport and dump log in bulk of collected wastes in areas not prescribed; (14) site preparation,

construction or expansion without an Environmental Compliance Certificate or ECC; (15) the construction of any establishment within 200 meters from an open dump, controlled dump or sanitary landfill, and, (16) the construction or operation of landfills on any aquifer, groundwater reservoir or watershed. The listed prohibited acts in Section 48 are all with fines and penalties when caught. People who are caught will pay fines for as low as 300 Philippine pesos up to 1,000,000 Philippine pesos depending on the gravity of his act. If ever a corporation or a partnership did the act, it is the chief executive officer, president, or general manager who will be liable.

#### Public Education and Information

Section 55 of the Republic Act indicates that the Commission, in coordination with DECS, TESDA, CHED, DILG and PIA must conduct a campaign in informing and educating the people about solid waste management which will heighten and increase public awareness of the ill-effects and the dangers of the solid waste problem as well as encourage the public to endorse, patronize and purchase products which are made from recycled materials. Through DECS and Non Government Organizations, the theories and practices of waste management must be integrated in the school curricula of all year levels.

## **Chapter V – THE COLLEGE OF ARTS AND SCIENCES, UNIVERSITY OF THE PHILIPPINES MANILA**

The College of Arts and Sciences of the University of the Philippines Manila is part of a greater system. It is part of the prestigious school for students gifted with great minds, of scholars that usually land great jobs in great companies. Since it is a part of the University of the Philippines system, it is therefore necessary to present a brief background of the University in which the CAS is part. On the later part of this chapter will be the presentation of data about the College itself and the population of the students and employees within the College.

### The University of the Philippines

The University of the Philippines had started to exist and operate since 1908 in accordance to the First Philippine Legislature. The Act of June 18, 1908, Act No. 1870 or the Philippine University Bill, has provisioned for the creation of a “University of the Philippine Islands”. The author, W.Morgan Shuster, specified the different functions of the University and these are to provide and impart knowledge and instruction in literature, the sciences, arts, and philosophy. Other functions of the University were to provide technical and professional training to its students. (University of the Philippines Diliman, 2003)

Originally, the University of the Philippines was located between the streets of Padre Faura and U.N. Avenue, then known as Isaac Pearl. The lot, which ranges about 10 hectares, was purchased in 1910 for the amount of P260,000. (Cartagena, N , 1987)

Three colleges were built at the time of the University's construction: the College of Fine Arts, the College of Liberal Arts, and the College of Medicine and Surgery. Additional colleges were then added in the following years upon construction and among these were the College of Law and the College of Engineering. (University of the Philippines Diliman, 2003)

Due to the increasing number of the student population, the Board of Regents by 1939 saw the need to move to a new site large enough to accommodate the growing needs and demands of the University and its student population. During the same year, the University has started to construct the Colleges in the newly found site, a 493-hectare lot located in Diliman, Quezon City. The outbreak of the Second World War as well as the coming of the Japanese in 1942, however, halted the operation and disturbed the University and campus activities, up to the point of even closing certain colleges except the College of Medicine, the College of Engineering and the College of Pharmacy. (University of the Philippines Diliman, 2003)

Due to the growing demands of the student population for specialized fields of study, reforms were forwarded and new institutes of learning have been established. The College of Arts and Sciences was then created, alongside the Graduate School of Arts and Sciences, with the goal of imparting knowledge about the humanities, natural sciences and the social sciences. (University of the Philippines Diliman, 2003)

The University of the Philippines Manila used to be known as the Health Sciences Center, and together with the unit in UP Visayas, these two were declared by Onofre D. Corpuz as autonomous units of the University of the Philippines (University of the Philippines Diliman, 2003)

The present UP system is a public institution of higher learning established to provide advanced education, give professional and technical training, and undertake research and extension services. It is an institution supported by the people and must therefore relate its activities to the needs and aspirations of the people.

The University of the Philippines Manila

One of the six autonomous universities under the University of the Philippines System, the University of the Philippines Manila has a total land area of 14 hectares, bounded by Taft Avenue (now Jose W. Diokno Avenue) to the east, Padre Faura Street to the north, Pedro Gil street to the south and M Adriatico Street to the west. The now 12 units composing the University used to operate as individual units, which are then molded into one upon the creation of the Health Sciences Center in 1977. Two (2) years after its creation, it was declared as an autonomous university and by 1983, it was declared by then UP President Onofre Corpuz as the University of the Philippines Manila. (University of the Philippines Manila, 2002)

## The College of Arts and Sciences, University of the Philippines Manila

The College of Arts and Sciences of the University of the Philippines Manila is made up of two buildings -- the Rizal Hall (RH) and the Gusaling Andres Bonifacio (GAB). Senator Orlando Mercado donated P40-million that was used to build the College of Arts and Sciences Annex Building inaugurated on the 23rd of September, 1996. (University of the Philippines Manila, 2002) The Rizal Hall is made up of three (3) floors while the Gusaling Andres Bonifacio is made up of five (5) floors plus a rooftop. A map of the College can be in the Appendix Section of the study.

### *Departments and Offices*

Within the College of Arts and Sciences, there are a total of sixteen (15) offices and Departments where the official businesses of the campus take place. Among the departments are the Department of Social Sciences (DSS), the Department of Science and Math (DPSM), the Department of Arts and Communication (DAC), the Department of Behavioral Sciences (DBS), and the Department of Biology (DB). The offices to be found within the College of Arts and Sciences are the Office of the Dean, Office of the Assistant Dean for Planning and Development (OADPD), Office of the Assistant Dean for Academic Affairs (OADAA), Office of Student Services (OSS), Office of Alumni Affairs (OAF), Graduate Program (GP), Manila Studies Program (MSP), Library, Office of the College Secretary (OCS) and Office of the Administrative Officer (OAO).

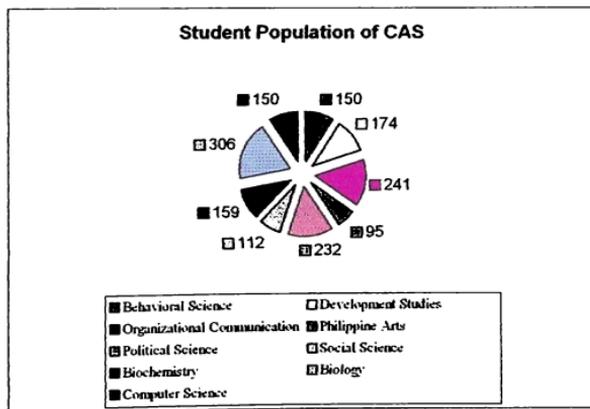
*Student Population*

There are nine (9) degree courses offered in the College of Arts and Sciences. Six (6) of which are in the Bachelor of Arts namely Behavioral Science, Development Studies, Organizational Communication, Philippine Arts, Political Science and Social Sciences. The remaining three (3) degree courses are in the Bachelor of Sciences and these are the courses in Biochemistry, Biology and Computer Science.

As of the recorded number of students enrolled in the second semester of the academic year 2004-2005, the College schools a total of 1,619 scholars, all of which are spending lots of hours and days within the campus premises. The table below shows the number of students enrolled per year level for every course and this information has been provided by the Office of the College Secretary.

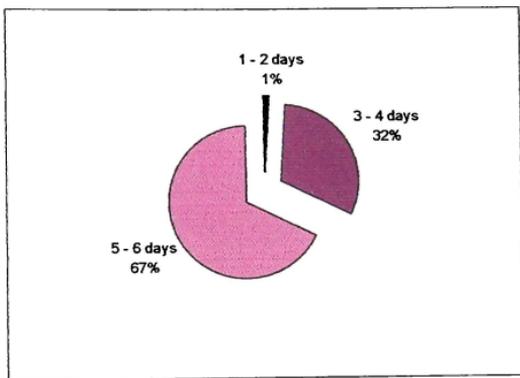
	1st Year	2nd Year	3rd Year	4th Year	Total
<b>Bachelor of Arts</b>					
Behavioral Sciences	36	34	35	45	150
Development Studies	45	23	53	53	174
Organizational Communication	58	53	55	75	241
Philippine Arts	29	18	16	32	95
Political Science	62	47	55	68	232
Social Sciences	30	25	24	33	112
<b>Total</b>	<b>260</b>	<b>200</b>	<b>238</b>	<b>306</b>	<b>1004</b>
<b>Bachelor of Science</b>					
Biochemistry	40	34	34	51	159
Biology	79	76	65	86	306
Computer Science	41	36	29	44	150
<b>Total</b>	<b>160</b>	<b>146</b>	<b>128</b>	<b>181</b>	<b>615</b>
<b>Total Population of CAS</b>					<b>1619</b>

**Table 1** College of Arts and Sciences Enrollees, Second Semester, Academic Year, 2004-2005



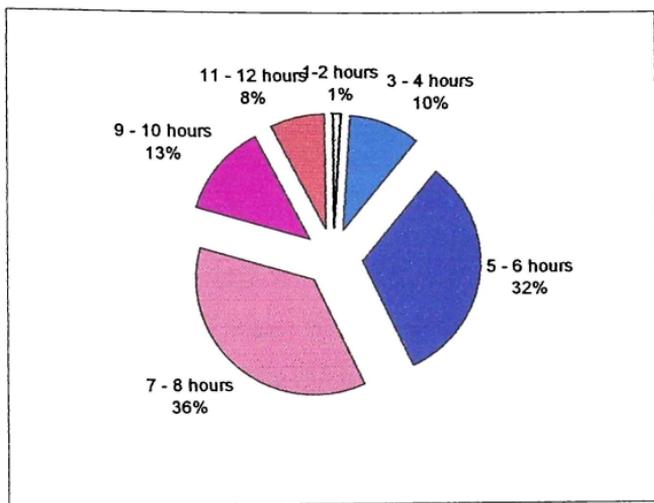
**Fig. 11** Student Population of CAS

The chart shows that 1% of the students spend around 1 to 2 days in the campus, 32% spend 3 to 4 days, while 67% spend 5 to 6 days a week in the College premises. This just shows that majority of the student population spend almost their entire student lives inside and within the premises of the College.



**Fig 12** Number of Days a Student Spends in the CAS a week

An average student spends almost his entire day inside the College premises during school days (class hours and vacant hours combined). Of the 100 students surveyed, 1 % spend 1 to 2 hours in the College, 10 % spend 3 to 4 hours, 32 % spend 5 to 6 hours, 36 % spend 7 to 8 hours, while 13 % spend 9 to 10 hours a in the College premises per day. The figures show that an average student spends lots of hours in the premises of the College. The environment of the place he or she spends almost his entire day must therefore be safe and suitable to healthy living.



**Fig. 13** Number of Hours students spend in the CAS

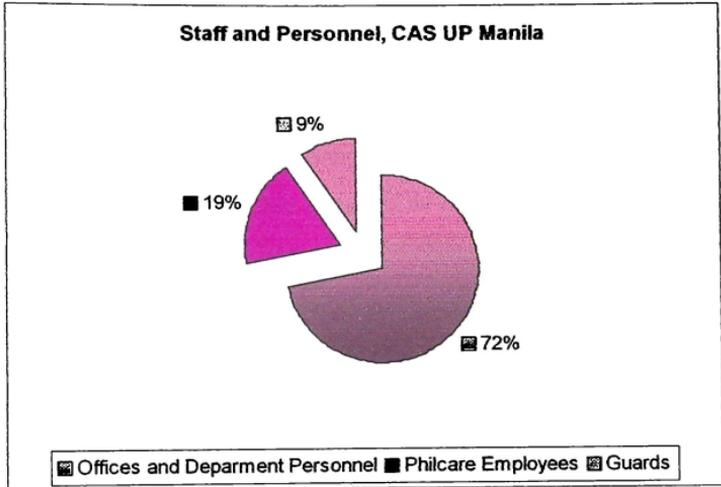
### *Staff and Personnel Population*

There are a total of fifty-four (54) staff and personnel working in the different Offices and Departments within the College premises. The table below shows the distribution of the administrative staff to the different offices and departments within the College of Arts and Sciences and this information has been provided by the Administrative Officer of the CAS, Engr. Edison I. Aurelio.

Offices and Departments	Number of Administrative Staff and Personnel
Department of Science and Mathematics (DPSM)	7
Department of Behavioral Science (DBS)	2
Department of Social Sciences (DSS)	3
Department of Arts and Communications (DAC)	3
Department of Biology (DB)	5
Office of the Dean	4
Office of the Assistant Dean for Academic Affairs (OADAA)	1
Office of the Assistant Dean for Planning and Development (OADPD)	2
Office of the Administrative Officer (OAO)	5
Office of the College Secretary (OCS)	10
Office of Student Services (OSS)	1
Office of Alumni Affairs (OAF)	1
Manila Studies Program (MSP)	2
Graduate Program (GP)	2
Library	6
<b>TOTAL</b>	<b>54</b>

**Table 2** Number of Staff and Personnel in every Office and Departments in the CAS

Aside from the fifty-four (54) employees comprising the administrative staff, there are other employees that spend hours of their daily lives inside the premises of the College. These are the Philcare Personnel, which all in all total to fourteen (14) employees and the guards.



**Fig. 14 Staff and Personnel Distribution in the CAS**

All in all, the College of Arts and Sciences accommodates a lot of students, employee, staff and personnel and all these spend their entire days inside the College premises. Proper solid waste management is therefore a must to ensure that these people work and study in an environment free of litter and garbage.

## Chapter VI – CASE STUDY: SOLID WASTE MANAGEMENT IN THE COLLEGE OF ARTS AND SCIENCES, UNIVERSITY OF THE PHILIPPINES

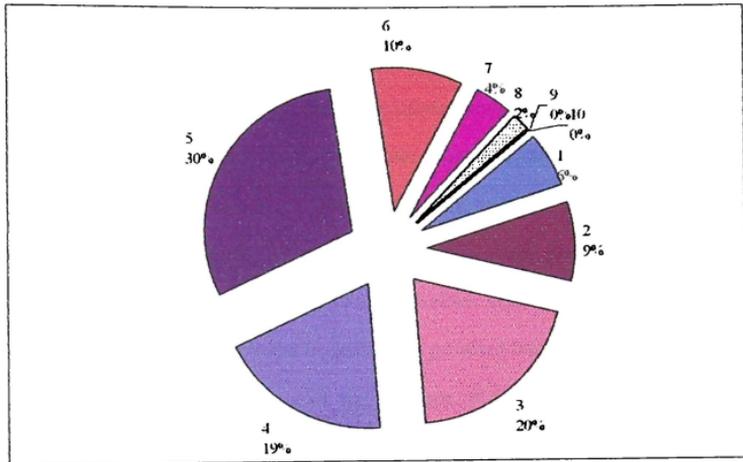
The researcher has chosen the area in which she gets education as the community to be studied -- the College of Arts and Sciences of the University of the Philippines Manila. The researcher has performed a series of rounds within the College premises and has listed and jotted down physical observations regarding the solid waste management in the area. The researcher also took some pictures of the conditions in the College with regards to its solid waste management practices.

### Characteristics of Wastes in the College (as identified by the students)

The students were asked to rate their waste generation on a daily basis, with 10 as the highest (meaning, they generate so much wastes per day) and 0 the lowest, (meaning, they generate almost no waste a day.) The table below shows how the students rated their waste generation in a daily basis.

Rating	No. of Students
1	6
2	9
3	20
4	19
5	30
6	10
7	4
8	2
9	0
10	0

**Table 3** Student Rating of their Waste Generation



**Fig. 15 - Student Rate on their Waste Generation**

The table and chart above shows that most of the students gave low ratings of their waste generation inside the College premises. This indicates that most students believe that they do not contribute much to the wastes generated inside the College. Only few gave ratings of six (6) and above, admitting that they contribute much to the wastes accumulated in the College. The students think that they do not contribute much to the solid waste accumulation in the College. This provides a problem because this means that the students are not aware that they are a major actor and participant in the solid waste management in the College.

There are a wide variety of wastes being produced in the College premises everyday. Based on the results of the one hundred (100) survey forms released, the researcher found out information about the solid wastes generated in the College (based on the perception of the students.) The chart below shows that the most common waste material produced in the College is that of plastic wrappers (candy, sandwich, items, junk food, etc.) The other waste materials that comprise and make up the bulk of the wastes in the College are: paper materials, tissue papers, plastic cups and plastic straws, food leftovers, plastic mineral water bottles, sanitary napkins, aluminum cans, and tetra packs. It was the students themselves who identified and provided information about the bulk of the wastes they produce while inside the premises of the College. It is these waste materials that could be usually found inside the waste bins and garbage plastics from the College.

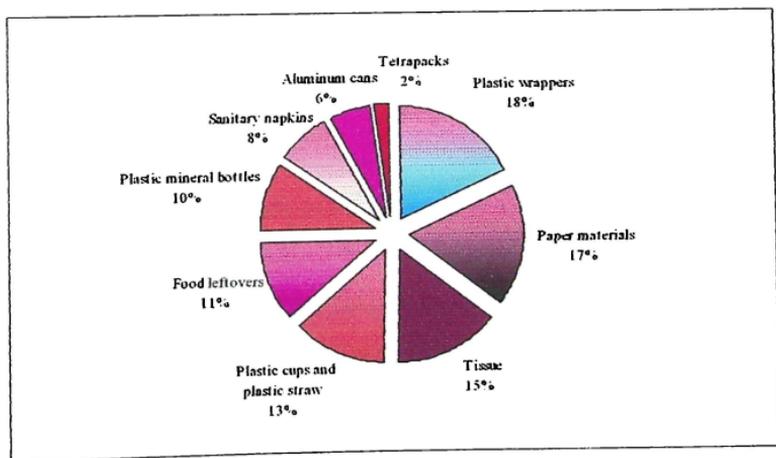
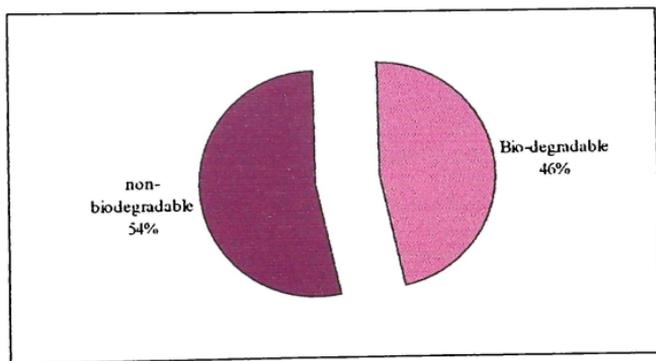


Fig. 16 Wastes produced in the College of Arts and Sciences

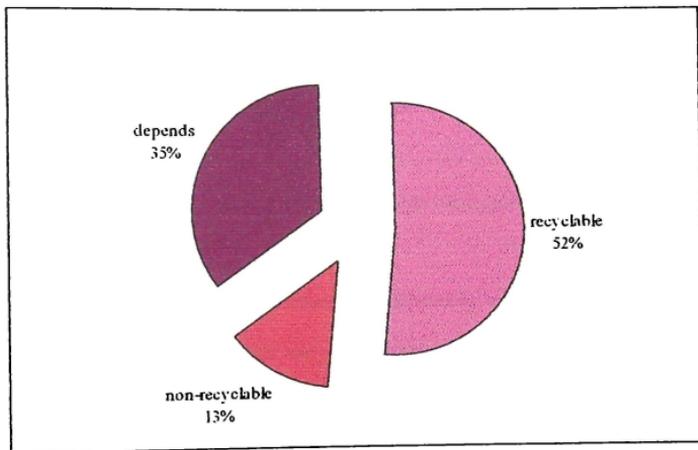
Based on the students' enumerated waste materials, we could see in the chart below that half of the bulk of the waste materials in the College are biodegradable, while the other half are non-biodegradable. The non-biodegradable waste materials are made up of plastic wrappers, plastic cups and plastic straws, sanitary napkins, aluminum cans, plastic mineral water bottles and tetrapacks. On the other hand, the biodegradable wastes are made up of paper materials (notebooks, sheets, yellow pads, food wrappers, etc.), tissue papers and food leftovers.



**Fig. 17** Bulk of Wastes in the College of Arts and Sciences

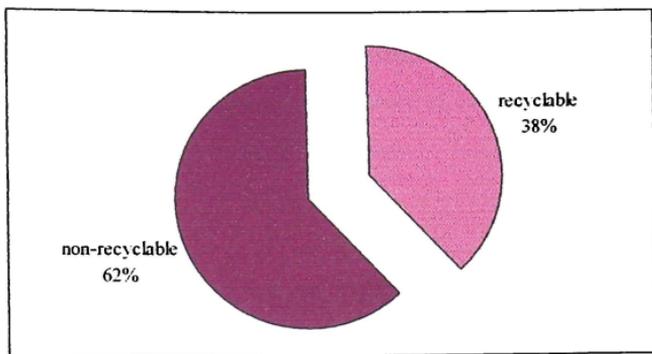
In the fifty percent (50%) of non-biodegradable wastes generated in the College, fifty-two percent (52%) are recyclable, meaning, they could be processed to be used and utilized again either for the same purpose or for another. These recyclable materials include aluminum cans, plastic mineral water bottles and plastic cups and plastic straws. Thirteen percent (13%) of the non-biodegradable wastes cannot be recycled and this is

made up of the sanitary napkins. On the other hand, thirty-five percent (35%) are wastes that could be recycled if, and only if, they are not yet thoroughly damaged and if they could still be utilized. Wastes under this category are the plastic wrappers and tetrapacks.



**Fig. 18** Recyclable and non-recyclable non-biodegradable wastes

In the fifty percent (50%) of the biodegradable wastes generated in the College, thirty-eight percent (38%) are recyclable and these include paper materials found in the College premises. Sixty-two percent (62%) of the biodegradable wastes cannot be recycled and this is made up of food leftovers and tissue papers disposed by the students.



**Fig. 19** Recyclable and non-recyclable biodegradable wastes

The biology students who perform their laboratory experiments in the third floor of the Rizal Hall building makes use of different chemicals and specimens for their studies. Since this research is about solid waste management, we would not discuss the processes of disposing the chemicals they use. However, it is important that we look at how they dispose of their specimens. According to an interview with a third year biology student Marvin, every biology student is required to have a specimen for one semester. These specimens may either be cats or frogs. When he was asked what they do with the specimens after they make use of them, he said that they usually bury them in the front garden of the College of Arts and Sciences (near Oblation.) Sometimes, he also said, they burn the specimens outside the College. Based on the interview answers of our Biology student, we are now aware that whatever specimens that the Biology students use, they are not included in the solid wastes being disposed and collected at the end of the day.

There are still other wastes generated in the College that are not mentioned by the students. These other wastes include the yard wastes coming from the plants and trees found within the College premises. For purposes of clear discussion, this will be discussed separately in the latter part of this chapter.

### Solid Waste Management

For purposes of easy assessment and description, the researcher has divided the College into separate areas: Rizal Hall, Gusaling Andres Bonifacio, School Canteen, Washrooms and Restrooms, Classrooms and the Quadrangle and UP Garden.

Since students are not allowed to stay inside the classrooms unless they have a scheduled class, they usually spend their time in the corridors of the two CAS buildings – the Rizal Hall and the Gusaling Andres Bonifacio. Cleanliness and the presence of immediate disposal bins must therefore be made available to keep the corridors litter free. Upon entry to the Rizal Hall, there is no visibility of trashcans in the entire first floor corridor, unless you enter the quadrangle. Everyday, there are so many students passing through, loitering and staying in the Rizal Hall first floor and the RH lobby. It is probably the most frequently passed route in the campus, yet there is no presence of trashcans and waste bins. On the other hand, there are 3 trashcans in the 2nd floor corridor: one near the cybernook, one in front of the Department of Behavioral Sciences, and one in the RH extension, near the Department of Social Sciences. Five (5) trashcans can be found in the 3rd floor corridor of the Rizal Hall. The Gusaling Andres Bonifacio,

on the other hand, only have 3 trash cans in the first floor, and one trashcan for the succeeding floors (second to fifth.)

There are a number of classrooms in the College premises and surprisingly, most of the classrooms do not have waste bins inside them. If ever there are rooms with waste bins, they are so minimal and the waste bins are not even regularly in position. It is for this reason that students need to go out and look for the nearest waste bin for them to dispose their wastes. Due to this, students just tend to leave their waste materials lying in the classrooms instead of going outside.

In terms of restrooms and washrooms, there are several which are strategically located within the entire College. Every cubicle in each washroom all has their own waste bins that provide the students and faculty with immediate disposal areas. Some of the cubicles in the female washrooms even contain ads and notes, as well as reminders regarding the proper disposal of their tissue and sanitary napkins. Apart from the individual cubicle waste bins, there are also waste bins inside the washroom. One good thing about the waste bins in the washrooms and restrooms is that the janitors do not wait for it to pile up before they clean them up and gather them. The waste bins in the washrooms are always nearly empty. For purposes of clarification, this research is concerned with the solid wastes in the College so the lack of water in the restrooms is not part of this study and will not affect the results.

The college canteen located in front of the Gusaling Andres Bonifacio is regularly made up of five (5) different stores from which students purchase their food and drinks. However, during times when the College has activities and fairs, additional booths from

additional businesses are installed in the canteen. Among the stalls that regularly comprise the College canteen are Smokeys, Nescafe, Nutrilicious and two stalls for meals. All the stalls in the College use paper, cardboard and plastic in serving and packaging their goods. The absence of waste bins and trashcans in the canteen is evident. There are always lots of paper plates, plastic cups, food leftovers, tissues, straws, etc. piled in the canteen tables. Carlo, one of the Philcare employees always has to clear up and clean the tables after students are done eating.

Around the entire College of Arts and Sciences, there are only four (4) labeled trashcans (biodegradable and non-biodegradable.) The biodegradable trashcan is colored in green while the non-biodegradable trashcan is colored in black. Two of these labeled trashcans can be located in the catwalk to the Rizal Hall entrance (near the guard house), while the other two can be found in the quadrangle. Aside from these four trashcans, all the other trashcans in the university are not labeled.

There are fourteen (14) Philcare employees working in the College. These employees are provided by an agency and though some of them do not work in the College for a long time, most of them are regularly employed in the College. As provided by Engr. Aurelio, there are different Philcare employees assigned to different parts and areas in the College. The table below shows the number of employees assigned per area.

Areas in the College	Number of Assigned Philcare Employees
Rizal Hall Ground Floor	2
Rizal Hall 2nd Floor	2
Rizal Hall 3rd Floor	2
GAB Ground Floor	1
GAB 2nd - 4th Floor	1
Comfort Rooms	2
Grounds	1
Library	1
SSWC	2

**Table 4** Number of Assigned Philcare Employee per area in the College

Every morning, these janitors clean the College premises and ensure that all wastes bins are with garbage plastics. These janitors are also assigned at collecting and bringing the garbage bags within their area of responsibility to the front gate of the campus at the end of every school day. These bags are then piled up together, and around 7 o'clock to 9 o'clock pm, the garbage collectors arrive to pick them up.

The researcher has interviewed the Administrative Officer, Engr. Aurelio, about the different programs and policies that he implements in the College with regards to solid waste management. When the researcher asked Engr. Aurelio whether there is really a solid waste management program implemented in the College, he humorously asked "*meron nga ba?*" According to Engr. Aurelio, the College and its Philcare employees practice waste segregation in the College and they do so by providing waste bins labeled with "biodegradable" and "non-biodegradable." He also added that at the end of every day, the Philcare employees further segregate the waste materials before

they bring the garbage bags at the front gate. Engr. Aurelio admits that the practice of segregation in the College is not 100% implemented nor effective. He also mentioned that the College participates in the recycling program. He added that this participation in the recycling program serves as an added motivation for the Philcare employees to segregate the waste materials because it is an additional source of income for them. Every Friday, recyclers go to the College of Arts and Sciences to collect the recyclable materials gathered during the entire week. Before, the Philcare employees had to go to the Philippine General Hospital (PGH) to deliver their gathered recyclable materials. But now, they no longer have to go to the hospital because the people who purchase scrap materials directly go to the CAS. Among the recyclable materials purchased are plastic cups and cartons that are not damaged. Before, paper plates were also included in the sold recyclable materials but since the Chinese lessened the demand for these materials, the Philcare employees no longer sell used paper plates.

In addition to waste segregation and participation in the recycling program, the College also practices composting especially of yard wastes. These yard wastes that usually come from the College Quadrangle and garden are swept every morning by one of the Philcare personnel. He then places these swept yard wastes in a garbage plastic which he seals and stores in the area of the College near the Office of the College Secretary. There, they leave the collected yard wastes to rot until they are ready to serve as fertilizers. Through this and the previous solid waste management techniques, the College was able to cut back on the wastes being picked up by the garbage collectors at night.

The researcher asked Engr. Aurelio whether the College allots specific funds for the implementation and improvement of the solid waste management program in the College. He said that aside from the money that the University regularly provides every semester for the purchase of waste bins and garbage plastics (and other tools related to keeping the College clean), there is no allotted fund for solid waste management.

Engr. Aurelio admits that there is no complete and efficient implementation of any of the solid waste management programs. However, he is certain that he, his colleagues and the College are trying their best to improve and develop the solid waste management in the College.

#### Solid Waste Management Programs Implemented in the Past

The researcher asked Engr. Aurelio about the past solid waste management programs and he said that there was one program implemented. About three (3) years ago, styrophor has been used in the canteen to serve and package the goods but now. These styrophor materials are non-recyclable and it comprised the bulk of the solid waste material collected in the College. Because of this problem, the Administrative Officer decided to experiment with a trial program which would last for two semesters. This program was called the “no styrophor policy.” According to the AO, for two semesters, the “no styrophor policy” was successful and suave. It has met no complaints from the food stalls in the canteen and they all agreed to shift to paper and plastic wrappers.

However, there were some complaints from the students but these were not minded and the trial program was pushed through. Since the policy proved to be successful in cutting back the amount of wastes accumulated in the College, it no longer became a trial program rather, it was promoted as a solid waste management program.

To get the side of the vendors in the canteen, the researcher has interviewed the different owners and operators of the food stalls and asked them whether they were affected by the no styrophor policy implemented in the College. Hapag Pinoy which is operating for a year and three months now said that they personally did not want the no styrophor policy because they prefer styrophor in serving their meals since it is easier and more presentable, as well as more durable. However, they had no choice but to abide to the policy. On the other hand, the Nescafe food stall which is operating for two years now said that they are in favor of the no styrophor policy because it not only lessens the amount of wastes in the College, but also, it made them use paper in serving their products. According to the couple running the Nescafe food stall, paper was a more favorable material and it is easier to dispose. They are also aware that these materials are recyclable.

#### Plans for the Future

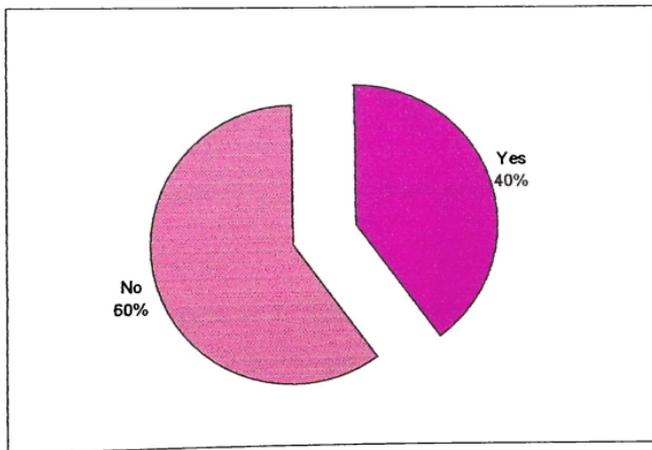
The Administrative Officer is aware that there are still more room for improving the current solid waste management in the College that is why he and his colleagues are still researching and experimenting different techniques of improving it. He also acknowledges the fact that part of the failure in the solid waste management in the

College is lack of student awareness and participation. Together with the other professors in the University, seminars are planned in order to increase student awareness. Students, according to them, should be the very first persons to participate in the solid waste management program. No matter how hard the management tries to improve the conditions of the College, if the students themselves do not participate, there will be no success. He also added that the Management is very open and in fact, waiting, for suggestions from students, professors or anyone who believes that the solid waste management program in the College can be improved.

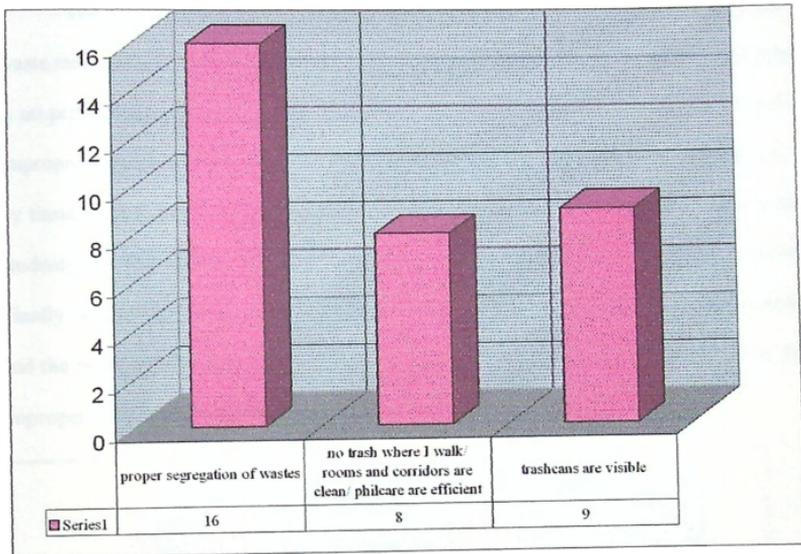
## Chapter VII – RESPONDENTS' COMMENTS AND SUGGESTIONS

The researcher has released a total number of one hundred (100) survey forms to students of the different year levels and courses within the College of Arts and Sciences. Through the released survey forms, the researcher has gathered the necessary data needed in this research. It is through these released and returned survey forms that the respondents provided their comments, reactions, perceptions and suggestions about the currently existing solid waste management in the College of Arts and Sciences. The survey form released has a total of eleven (11) questions.

The surveyed students were asked whether they think there is proper solid waste management in the College. Results show that 40 % said yes, while 60 % said no.



**Fig. 20** Is there Proper Solid Waste Management in the College?

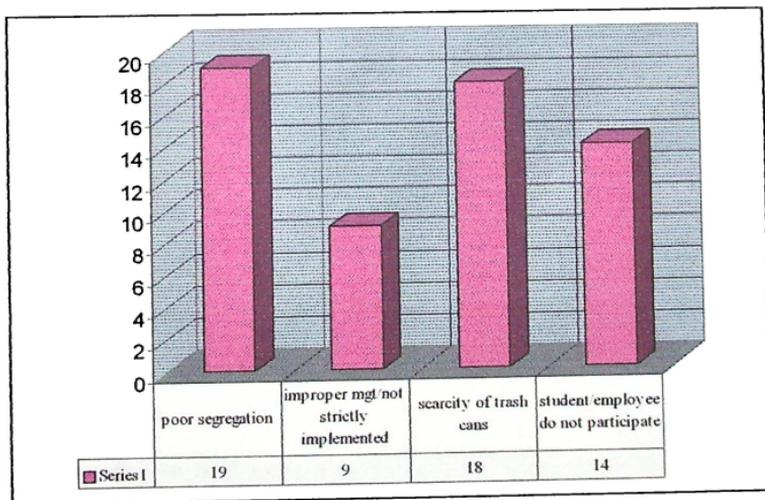


**Fig. 21** Reasons why students think that there is proper solid waste management in the College

The forty percent (40 %) who believe that there is proper solid waste management in the College said so because of the following reasons: proper segregation, efficiency of the Philcare employees and the visibility of trashcans. As the chart shows, sixteen (16) students believe that there is proper segregation of wastes in the College premises. On the other hand, eight (8) students stated that they believe there is solid waste management in the College because there are no trash and litter in the rooms and corridors and that the

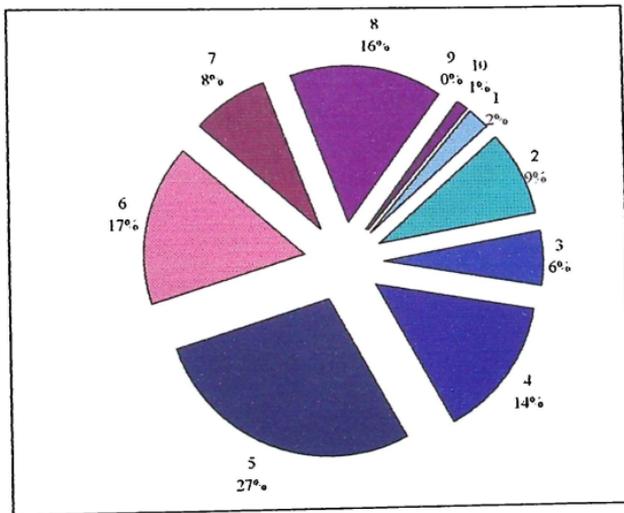
Philcare personnel are efficient in doing their jobs. Nine (9) students believe that the mere presence of trashcans equates to proper solid waste management.

The sixty percent (60%) of students who believe that there is no proper solid waste management in the College said so because they can see and they witness that there is no proper segregation of wastes being done in the College. Other reasons include the improper management and the lax implementation of rules with regard to waste disposal by those in position. The students also believe that the scarcity of trashcans leaves the students no other choice but to dispose their wastes anywhere and in anyway possible. Finally, according to the students themselves, the lack of discipline both of the students and the employees in disposing waste materials is a major concern and contributor to the improper solid waste management practiced in the College.



**Fig. 22** Reasons why students believe that there is no proper solid waste management in the College

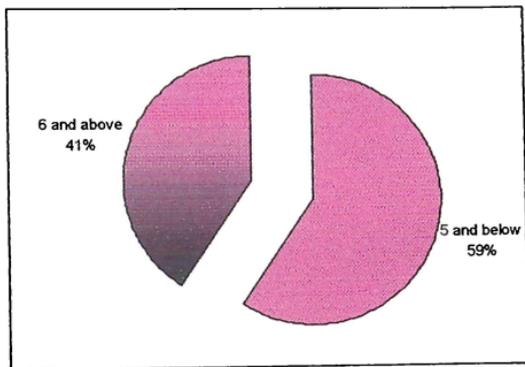
The students were asked to rate the current solid waste management program in the College, with 10 being the highest rate (meaning, there is excellent solid waste management in the College) and 0 the lowest rate (meaning, there is poor solid waste management in the College). The chart below shows how the students rated the SWM in the College of Arts and Sciences.



**Fig. 23** Students' Rating of the College's Solid Waste Management (0 to 10)

The chart above shows that the surveyed students have varying comments and views regarding the solid waste management in the College. There are mixed opinions and overlapping reactions. But it is evident that majority of the surveyed students gave a rating of five (5), the safest rating. Probably when equated to academic grades, it would

translate to a three (3.0). It would also be important to note that some students rated zero (0) and they said that those who are involved in the solid waste management in the College deserve the rating.



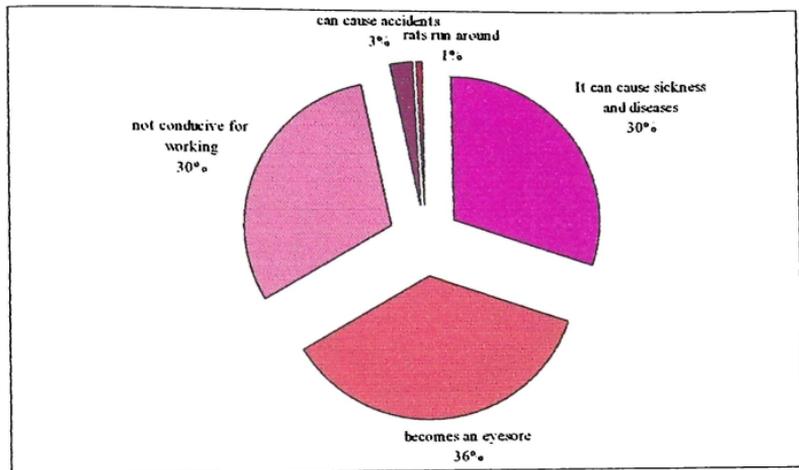
**Fig. 24** Student's Rating of Solid Waste Management in the College, (0-5 and 6-10)

As shown in the chart, fifty-nine percent (59 %) of the surveyed student population gave ratings of five (5) and below. The students have provided several reasons why they think that the College deserves a low rating when it comes to its solid waste management. Among these reasons that the students themselves presented were: (1) the lack of participation of the students; (2) the programs (if ever they exist) are not visible enough; (3) policies regarding solid waste management are not clear; (4) the efforts exerted by the school and its personnel are not enough; and that (5) the Philcare personnel do not perform their job well because they let the trashcans overflow with garbage.

Among the problems that can be caused by the improper solid waste management in the College are sicknesses and diseases, it becomes an eyesore to the College, and it makes the College not conducive for working and studying. The students enumerated other problems that they believe can be contributed by improper solid waste management. They believe that improper solid waste management can cause accidents and that it also is one of the factors why rats, rodents and cockroaches inhabit the campus.

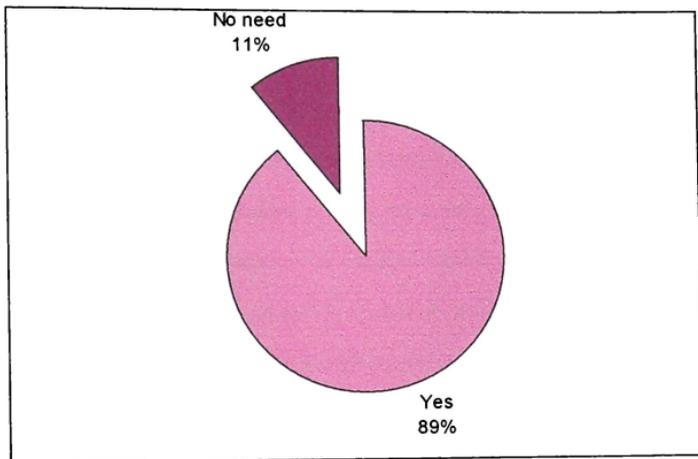
Problems Caused by Improper Solid Waste Management	Frequency Distribution	Percentage
It can cause sickness and diseases	59	30%
It becomes an eyesore	70	36%
It makes the College not conducive for working	59	30%
It can cause accidents	5	3%
It causes cockroaches, rodents and rats to run around the College	1	1%

**Table 5** Problems Caused by Improper Solid Waste Management



**Fig. 26** Problems caused by improper solid waste management

The students were asked whether they believe that the solid waste management in the College must be improved. Eighty-nine percent (89%) of the surveyed students said yes, it needs improvement, while eleven percent (11%) of the surveyed students feel contented with how the solid wastes are managed and handled in the College premises and believe that there is no need to improve the current system.



**Fig. 27** Is there a need to improve the current solid waste management in the College?

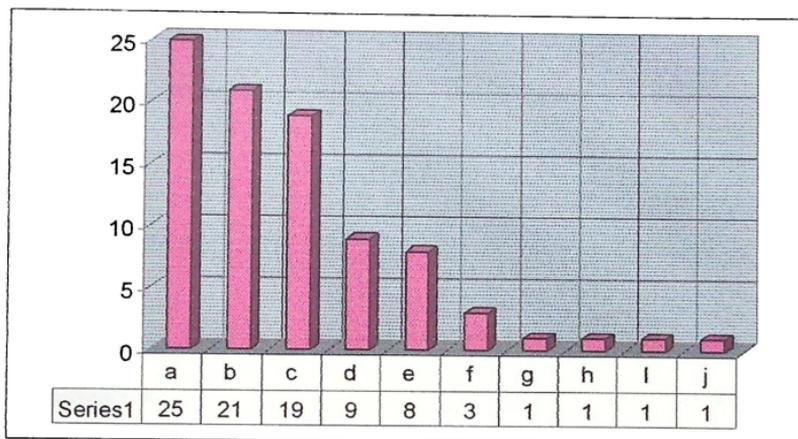
Those students who believed that the current solid waste management program in the College must be improved presented suggestions. The table below shows the different suggestions of the students.

Suggestions of Students according to occurrence:		
a	Improvement of segregation	25
b	Positioning of more trash cans	21
c	Implementation of strict rules and policies	19
d	Monitor the students and impose fines	9
e	Orientation of the students on SWM	8
f	Participate in recycling programs	3
g	Put covers and lids on the trash cans	1
h	Make garbage bins more attractive	1
i	Employ more janitors	1
j	Allocate more budget	1

**Table 6** Suggestions of Students to improve the current SWM in the College

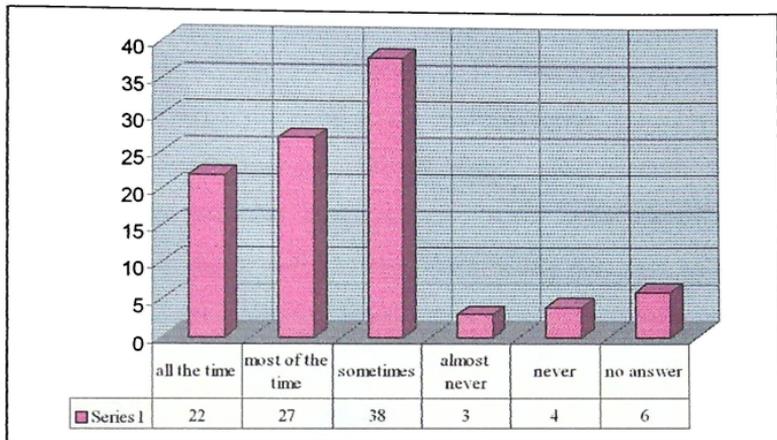
The most common suggestion from the students is the improvement of the segregation practice in the campus. Many believed that there is the scarcity of trashcans labeled "non-biodegradable" and "biodegradable". It is then followed by suggestions of positioning more trashcans. Many of the respondents complained about the scarcity of trashcans, especially in the classrooms and the restrooms. The implementation of strict rules and policies followed in the list. The students believe that the people in authority are not strict in imposing rules and policies regarding proper solid waste management. The students suggest that these people in position be firm and strict. It is in this line that the following suggestion took form – the monitoring of students' participation in the solid waste management program of the College. The students suggested the presence and creation of a group made up of volunteers that would monitor students who do not follow proper solid waste management (for example, do not throw wastes in the proper labeled waste bins.) According to the students' suggestions, those who will be caught will be imposed with fines and penalties. The students also believe that the absence of public and student awareness with regards to solid waste management and the implications of its lacking contribute to the low level of student participation in any program. The students suggested that the College conduct orientations and seminars that would inform the students about the processes of solid waste management, about the program implemented or will be implemented in the campus and how they can participate and contribute to its successful implementation. Among the other suggestions of the students were the putting of covers and lids on the trashcans around the campus, making the waste bins more attractive, and the participation in recycling and other resource recovery programs. Some

students also suggested that the College (or the University) allocate more budget and funds for the improvement of the solid waste management in the College and its facilities. Students also believe that employing additional Philcare employees will contribute to the improvement of the solid waste management practices in the campus.



**Fig. 28** Suggestions of Students to improve the current SWM in the College

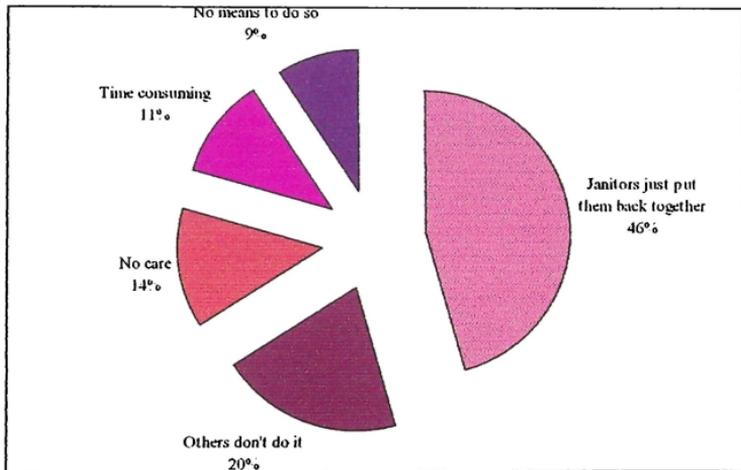
When the students were asked whether they participated in the proper solid waste management in the College, twenty-two (22) answered yes, they participate all the time, twenty-seven (27) answered they participate most of the time, thirty-eight (38) answered sometimes, three (3) almost never, while four (4) answered never. The others did not provide answers.



**Fig. 29** How often students Participate in the SWM in the College?

The results of the survey propose that most of the students practice solid waste management if not at all times, most of the time. However, it is also alarming that almost half of the surveyed students admittedly state that they practice solid waste management only sometimes, almost never or not at all. Those students who answered sometimes, almost never and never do not participate very well in the solid waste management in the campus and they presented reasons as to why they do so. The chart below shows that the most common reason that the students provided is that trying to segregate their wastes is of no use since the janitors just put them all back together at the end of the day. This is followed by the reason that students do not try to segregate their waste nor dispose them properly because other fellow students do not do the same so why should they. Students see that others can go about littering and not caring for the College environment so they

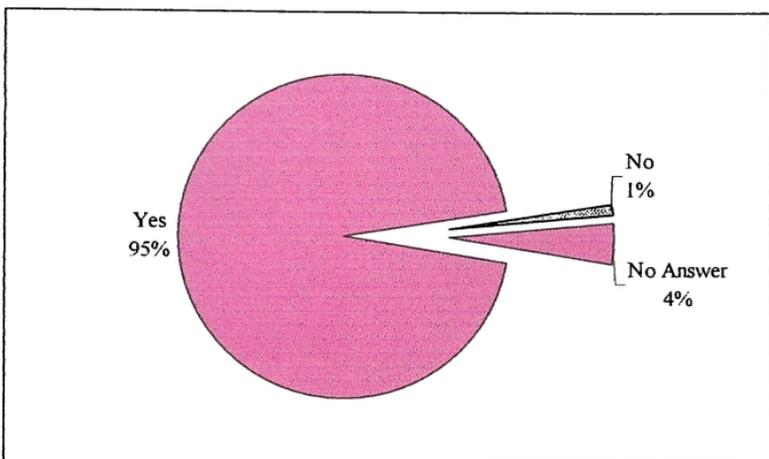
find no use in trying to clean up themselves. Another reason that the students provided is that they really do not care whether there is proper solid waste management in the College or not, as long as they are able to dispose of their wastes. It is sad to know this fact, especially coming from an “iskolar ng bayan”. Other reason is that waste segregation is time consuming. Further still, others reason out that they had no choice but to improperly dispose their generated wastes because they have no means of disposing them properly. Some say that trashcans are either always full or is missing.



**Fig. 30** Reasons why Students do not participate in the SWM

Out of the one hundred (100) students surveyed, ninety-five percent (95%) agreed to participate to any program that the campus would implement with regards to improving the current solid waste management program. On the other hand there are one

percent (1%) of the surveyed students who answered that he will not participate in any program that the campus would implement regarding the solid waste management because he really does not care whether there is proper solid waste management in the College or not. Moreover, four (4 %) of the surveyed students did not answer the question whether they will participate or not.



**Fig. 31** Will you participate in SWM in the College or not?

This chapter has presented the different views and perceptions of the students of the College of Arts and Sciences themselves. It is based on their everyday experiences inside the campus. It is therefore worthy of consideration and attention by those in the position since it is these students that experience first hand the conditions of solid waste

management in the College. They are the ones that are directly affected by it and any inefficiency or lack of solid waste management will primarily affect them.

## Chapter VIII– CONCLUSIONS AND RECOMMENDATIONS

### Conclusion

Making use of the Evaluation process illustrated by Edward Suchman (see Figure 6), we are now going to apply it to the solid waste management in the College of Arts and Sciences. As stated, the first process begins with the formation of values, setting what is “good” and what is “bad.” In the case of the solid waste management in the CAS, what is “good” is the presence of proper solid waste management and what is “bad” is improper solid waste management. The next step is to identify goals or objectives and the goal of the solid waste management program is to ensure that the community is free from garbage and waste materials and at the same time, the community be able to handle of its waste in a manner that is environmentally friendly. If we are to assess and evaluate the solid waste management program in the College and whether it abides by the goals that we have set, we could see that the College practices the program of solid waste management. However, there are still areas and practices to be improved. The final step in the evaluation process is measuring the effects of the program. The solid waste management program implemented in the College has lessened the amount of wastes disposed and collected. Its processes and the activities of those involved has no doubt made a good contribution in cutting down the volume of wastes. In general, it has achieved the goals and objectives of proper solid waste management and to some extent, it has been successful. In line with this, we could see that the program should be continued and improved. One of the areas that should be improved is the participation of the students. The College should definitely strengthen the level of awareness of the

students and they could do these by conducting seminars and talks about the relevance of proper solid waste management. The researcher also suggests that there be funds allocated for the development of the solid waste management program. (Suchman, 1967)

Based on the work of Danilo Lapid "A Study on Urban Environment Management Through Community and Non-governmental Organizations", the researcher can conclude that the case of resident participation in the solid waste management in the College of Arts and Sciences as well as the problems involved in handling and implementing it are not very much different from the case of the different communities in the Metro. As a matter of fact, they are very similar in that although some people are aware of the troubles and problems that could be caused by improper disposal of wastes, there are still many who do not care as long as they are not harmed. The students of the College of Arts and Sciences are aware of the dangers of improper solid waste management but still, some refuse to consider these and just throw away their trash in any manner that they prefer. This lack of awareness and participation of the residents of the different communities in the Metro are the ones that contributed to the growth of problems regarding solid wastes. If the students of the College continue to act the same, it is for certain that they will, sooner or later, encounter problems like this in the future. (Lapid, 1992)

If we are now to assess whether the College of Arts and Sciences has abided to the conditions and terms of the Republic Act 9003, we can say that generally, it has, although there are some flaws and deviations in certain aspects. The College has ensured

the protection of the public health and the environment within its areas. It has also encouraged resource conservation and recovery although not fully. It has also encouraged recycling and/or reusing programs. In addition, it practices segregation (though it is not properly and strongly implemented). On the other hand, the College failed in mobilizing and encouraging the students to participate in the solid waste management programs implemented. Furthermore, the researcher can conclude that the College somehow abided to Section 21 of the Act which states that the segregation of wastes shall be done and conducted at the source, although, as stated many times before, it still needs improvement and further cooperation and participation from the student population. It has failed in a way to abide to it because the College lacks waste bins that are properly labeled as compostable, non-recyclable and recyclable (Republic Act 9003)

### Recommendations

The researcher has come across some similar studies and thought that somehow, it could be applied to the case of the College. Some of these are the following:

The College of Arts and Sciences can apply to it the experience of the University of the Philippines, Diliman Campus regarding its solid waste management program. The UP Diliman Campus has developed a community-based educational program on solid waste management and it is its purpose to increase the respondents' awareness and knowledge about solid waste management as well as enhance participation. Informing the students about the solid waste management through the educational program aims for the attainment of three goals: cognitive, affective and psychomotor skill. The cognitive

goal aims at helping the students to acquire and gain basic understanding of solid waste management. The affective goal aims at motivating and stirring up the feelings of the students to improve and participate in solid waste management. While, the psychomotor skill aims at helping the students acquire and develop the skills needed in order to participate and implement the solid waste management. (Rabago, 2002)

Just like what was done in the Diliman Campus, the officials in the College of Arts and Sciences can also conduct educational programs about solid waste management and this can be enhanced by the distribution of brochures, handouts and fliers to the students. The College could also put up streamers, billboards, labels, stickers and neon signboards to trigger the minds of the students and encourage participation. Better yet, the College could also show educational videos and transparencies about solid waste management, its importance and the implications of its absence. (Rabago, 2002)

Based on the experience of the Diliman Campus, there are basically three waste segregation schemes that can be applied for solid waste management in a university community setting as long as the students participate and are trained in the segregation of wastes. These three waste segregation schemes are: (a) separate collection schedules for biodegradable and non-biodegradable wastes; (b) separate triple waste bins or containers for the different types of wastes; (c) proactive drop-in scheme of already segregated wastes at a segregation center. (Rabago, 2002)

People might think that solid waste management is not important in the College. However, it is untrue. Even only within its campus, the College should strengthen and

improve the implementation of solid waste management, in particular, the Ecological Waste Management Act of 2000. As Section 55 and 56 states, it should:

*“aim to develop public awareness of, and the community-based solutions to, the solid waste problem; concentrate on waste reduction, resource conservation and recovery, recycling, segregation at source, reuse and composting activities; encourage the public... to endorse and patronize environmentally acceptable products and packaging materials; and strengthen the integration of environmental concerns, particularly on solid waste management, in the school curricula at all levels.*

The College can also apply and implement the Zero Waste Approach which is a simple community-based model to solve the problem of solid waste management. There are basically six (6) steps involved in this process. The first step is the promotion of the Sanitary Health Education (SHE) campaign which aims to inform and educate the people about the effects of improper and indiscriminate disposal and handling of solid wastes. The College can do this by distributing leaflets, manuals, guidelines, or conducting seminars and symposiums. The second step is the campaign for waste separation by making use of three different and properly labeled waste bins. One container will hold the excess food which can serve as animal feeds, the second container will hold all the biodegradable wastes and the third, the non-biodegradable wastes. The third step is the system of collection and disposal wherein the non-biodegradables are sold to people who are interested to buy them for recycling while the biodegradables can be used as fertilizer or enhancer. The fourth step is the system for Material Redemption Recovery Storage

System (MRRSS). Those wastes which were not sold nor fed to animals are centralized in a redemption center for further processing. (Lapid, 1992)

The researcher made use of the standards of evaluation used by Ms. Larina de Gula San Diego in her undergraduate thesis "Study on the Efficiency of Solid Waste Management in Valenzuela City" on 2003.

a. Strict leadership

Based on observation and on the comments of the students themselves, the researcher can conclude that there is no strict and strong implementation and leadership from the people involved in SWM in the College.

b. Different programs regarding solid waste management are promoted

The researcher can conclude that the College has promoted and implemented a number of SWM programs which became successful and efficient. The researcher commends the effort of the implementors to devise new ways and techniques of reducing the volume and amount of wastes to be disposed every night. However, the researcher would like to point out that it does not end here and that there are still many other programs that are awaiting to be implemented.

c. People's level of awareness and active participation

Probably, it is in this area that the College failed. Students are not participating in the solid waste management or if ever they are, they are

inconsistent. The researcher believes that it is the lack of awareness that causes these instances to happen. The College does nothing in informing its students about the existing programs as well as the problems involved in improper solid waste management. The researcher believes that it is the responsibility of the College to remind the students of the implications of this problem.

d. Minimal scattered wastes (physical cleanliness)

In this aspect, the researcher would like to commend the Philcare employees in doing a good job in keeping the College clean and litter free. In general, they are hard-working and efficient in doing their job.

e. Share of budget

The researcher would like to suggest that the College increase the share of budget to buy additional labeled and color coded waste bins as well as other facilities and materials that could enhance the handling of solid waste management in the College.

f. Cooperation and unity between the Executive and the students

In this aspect, the researcher could say that the College failed. Just like in the third standard, the College definitely lacks the support and cooperation of its students.

In general, the researcher concludes that the College of Arts and Sciences practice solid waste management and she commends the efforts of the people involved in the process – the Philcare personnel, the students, the Administrative Officer and the concerned faculty members. However, it is evident that the College still needs to polish the program and as much as possible try to involve the student population in implementing the solid waste management. No matter how hard the people in position try to implement programs that would resolve the problem of solid waste management, as long as the students do not participate in them, the programs will be useless. The implementors should first try to reach out to the students and explain to them the consequences of improper solid waste management. After this, they can now implement the program they think is best for the condition of the College and they should make sure that they are not lax in the implementation because students have the tendency to forget.

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## **Interview Sources**

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# Appendix

## A

Hello! I am J. Maywin J. Alhambra, a fourth year student taking up BA Social Science (Area Studies). I am now currently working on my undergraduate thesis with the topic **“Solid Waste Management: A Case Study in the College of Arts and Sciences of the University of the Philippines Manila”**. As a simple background, Solid Waste Management (SWM) are activities that deal with waste before and after it is produced, including its minimization, transfer, storage, separation, recovery, recycling and final disposal. It is in this reason that I would like to ask for your cooperation, answers and opinions about the solid waste management in our campus. It is in my agenda that the findings of this undergraduate thesis work for our benefit.

Thank you and God bless!

.....

Name: \_\_\_\_\_ Age: \_\_\_\_\_ Student Number: \_\_\_\_\_

Course: \_\_\_\_\_ Year Level: \_\_\_\_\_

1. On the average, how many days a week do you spend in the CAS?  
 1-2       3-4       5-6       Others, pls. Specify \_\_\_\_\_
  2. On the average, how many hours a day do you spend in the CAS?  
 1-2     3-4     5-6     7-8     9-10     11-12     Others, pls. Specify \_\_\_\_\_
  3. If you were to rate your waste generation (on a daily basis) having 10 as the highest (meaning you generate so much waste) and 0 the lowest (generating minimal waste), what rate would you give your self?  
 0               3               6               9  
 1               4               7               10  
 2               5               8
  4. What are the wastes that you dispose while inside the college premises? (on a daily basis)  
 plastic mineral water bottles  
 tissue  
 papers  
 food leftovers  
 sanitary napkins  
 plastic wrappers (candy, sandwich, items, junk food)  
 tetra packs  
 plastic cups and plastic straws  
 softdrinks' and coffees' can  
 others, please specify
-



\* if yes, what could these problems be? (you may choose more than one)

- it can cause sickness and diseases
  - it becomes an eyesore to the College
  - it makes the college not conducive for working
  - others, please specify
- 
- 

10. Do you think that the solid waste management in the College must be improved?  
 Yes  No need

\* If yes, what can you suggest in order to improve the system?

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11. If ever there would be improvements in the solid waste management in the College, would you be willing to participate in it?  Yes  No

\* If no, why

- Improvements will only be good at the start, eventually, it will be forgotten and things will go back to how they were
- I'm sure there are many who will not participate so why should I?
- I really don't care

\* \* \* Thank you very much! \* \* \*

# Appendix B

1. Pangalan ng Tindahan
2. Pangalan ng mga Tindera
3. Gaano Katagal na sa UP CAS ang tindahan?
4. Anu-anong waste materials ang nagmumula sa inyong tindahan?
5. Naabutan niyo ba ang no-stryo policy?
6. Anong reaksiyon ninyo rito?
7. Naapektuhan ba nito ang inyong benta?  
Meron pa bang ibang mga polisiya na ipinatupad ang College na may kinalaman sa Solid waste management?