

Perception of the Selected Residents on Household Composting in a Highly Urbanized Area, Manila, Philippines

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Abstract

Solid waste is one of the major problems in any congested urbanized area. Metro Manila, one of the highly-urbanized cities in Southeast Asia, generated 3.596 million tons of solid waste in 2014. Generally, this study determined the perception of the selected residents on household composting in a highly urbanized area. Specifically, this investigation was able to learn the knowledge of the residents on composting and solid waste management; described the discouraging factors they encountered concerning composting activity; and identified the perceived benefits of the said environmental action. The researchers gathered data through a series of in-depth interviews that were conducted in Barangay 521, Zone 52, District IV, Sampaloc, Manila. Twenty (20) respondents were selected through random sampling technique. Thematic analysis was used to interpret the data collected. Findings of the study showed that the residents were knowledgeable about segregation and traditional composting. They were willing to do composting activity but they were not able to implement it effectively because of several discouraging factors such as the lack of space, time constraint, and unsystematic collection of waste. The residents perceived composting as a beneficial activity because it can produce compost for agriculture, improve sanitary condition, and reduce the risk of flooding. Consequently, if these discouraging factors would be eliminated, then they would be able to perform proper ways of composting. The Local Government Units should provide appropriate trainings on how to conduct composting activity properly using advanced technologies and scientific techniques.

Keywords: Urbanized Area; solid waste; Household composting; Composting activity; Manila

Introduction

Nowadays, solid waste and its management have become one of the major problems both in developed and developing countries [1]. Asian countries have faced extensive issues when it comes to solid waste management due to population growth and increasing rate of resource consumption [2] that comes with urbanization in developing countries [3]. In the Philippine context, solid waste has reached a critical condition that needs an immediate action from all sectors of the government [4]. According to United Nations, Department of Economic and Social Affairs (DESA) – Population Division (2016), Manila is classified as a megacity with a population of 13.131 million and ranked 18th in most megacities located in the global south.

Globally, humans produce approximately 2.0 billion tons of waste every year [5]. An assessment done by the Environmental Management Bureau of the Department of Environment and Natural Resources (DENR) on solid wastes in the Philippines shows that 56.7% of the municipal solid waste came from the residential source and 52.31% were biodegradables. This dominating waste fraction of organic wastes only implied high potentials for composting [6] as a great method on reducing the volume of municipal solid waste [7].

Solid waste management however, varies significantly between urban and rural areas [8]. In the rural setting, where agricultural activities are more common, composting activity is more suitable. The opposite is true for an urban setting where the recovery of organic wastes is very low [9]. Additionally, urbanization is also responsible for land-use/land cover changes [10] and lands sealing [11] that make composting difficult in an urban setting. That is why there are more factors needed to be considered in highly urbanized area for an effective solid waste management such as the participation of the residents in the community [12], and intensive public education [13]. Appropriate implementation of solid waste management strategies is also vital to ensure the effectiveness of the action [14] because the major challenge for sustainable solid waste management is the lack of policy enforcement system [15]. This can also be enhanced through the utilization of technology [14] since the availability of technology for composting is

considered as more effective means and can be adopted in municipalities among the solid waste management strategies [4].

Composting, by definition, is a biological degradation process of organic waste where microorganisms convert the organic waste into humus-like substance which can be used to enhance soil properties [16]. This can be done at different scale using different technology and mechanization [17]. Proper handling of this method gives various advantages such as production of biofertilizer, relatively low air and water pollution, low operational cost and income generation, making it sustainable process. Incineration, landfill, pyrolysis, and gasification but coupled with improper design of composting method could lead to methane production, odour emission, and heavy metals build-up in the product posing a threat to the environment and public health [18].

To put these in context, the researchers aimed to determine the perception of the residents about household composting in highly urbanized area. This was explored through the knowledge and awareness of the residents about composting and solid waste management, the factors which discourage them to conduct composting activity, and their perceived benefits that can be obtained from the said activity.

Methods

Research Design

This study explored the perception of the residents on household composting in highly urbanized areas. To properly conduct this study, a phenomenological approach was used. Creswell and Poth (2017) in their book defined phenomenological study as describing the common meaning of a concept or a phenomenon through the lived experiences of several individuals. With this in mind, the researchers explored the experiences and problems that the residents encounter when it comes to waste management in their households and in the barangay and how these experiences discourage them to conduct composting activity. This consists of what they experienced and how they experienced these problems that discourage them to conduct composting activity in their households.

Research Locale

The research locale is set on one of the barangays located in the urban District of Manila. Specifically, this

study was conducted at Barangay 521, Zone 52, District IV, Sampaloc, Manila.

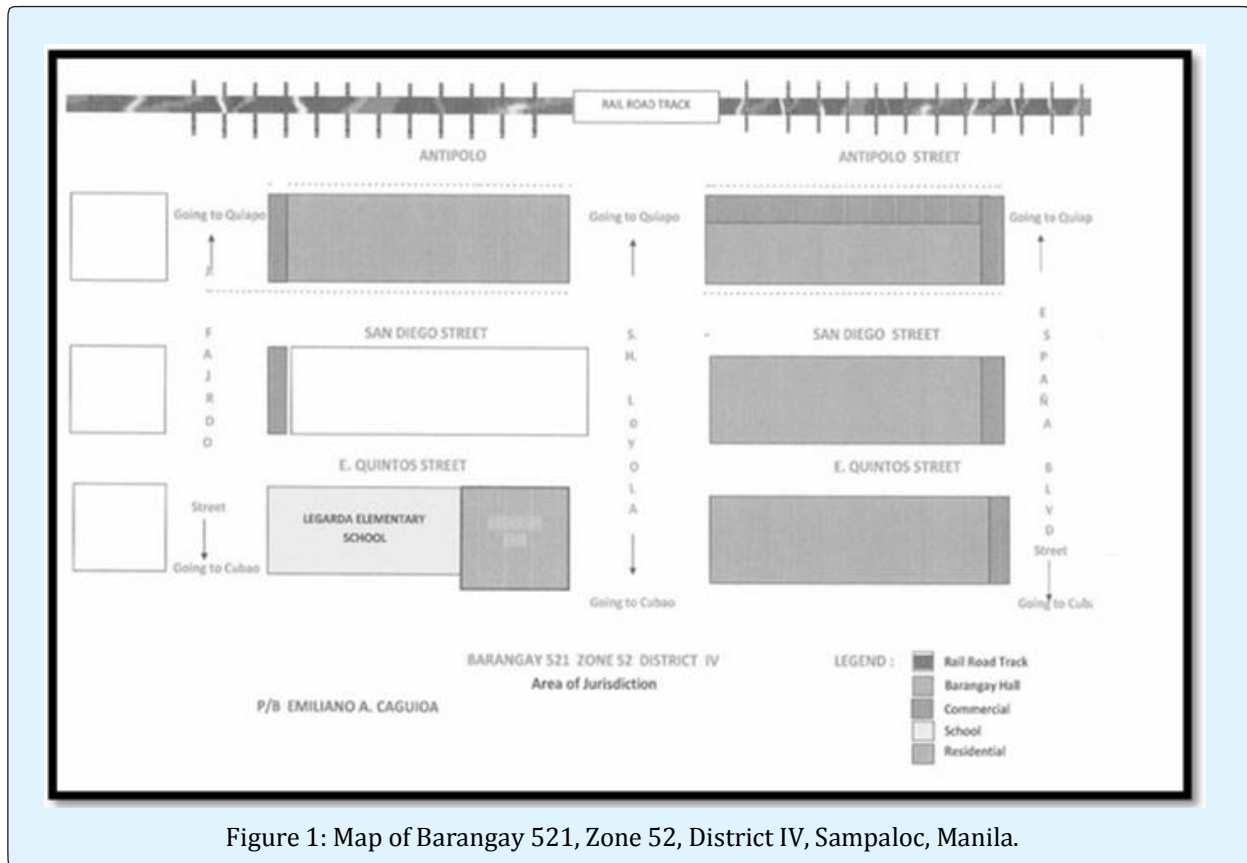


Figure 1: Map of Barangay 521, Zone 52, District IV, Sampaloc, Manila.

This barangay covers approximately two (2) hectares with a population of roughly 2500 residents 1300 of whom are male and 1200 of whom are female. This place has only six (6) streets as shown in the map (Figure 1). The barangay is under the category of flood prone area.

The estimated daily garbage collection in the barangay is equivalent to one truck of garbage waste. Biodegradable and non-biodegradable wastes are collected according to schedule (Figure 2). Biodegradable wastes are collected during Monday, Wednesday, Friday, and Sunday while the non-biodegradable wastes are collected during Tuesday, Thursday, and Saturday. The barangay has also the policy of "No Segregation, No Collection". The detailed information about the solid waste management in the barangay can be seen in Figure 3.



Figure 2: Segregated waste collection schedule.

BARANGAY SOLID WASTE MANAGEMENT								
City of Manila Barangay 521 Zone 52 District IV								
Functional Classification	Program/Project/Activity Code and Description	Implementation Office	Schedule of Implementation		Expected Output	Funding Source MOOE	Amount of Application/Allocation	
			Starting Date	Completion Date			CO	TOTAL
Social Preparation	<ul style="list-style-type: none"> Barangay Officials & Community Consultation Consultation with barangay household 	Brgy.	Jan.	Dec.	<ul style="list-style-type: none"> Brgy. Officials briefed on the project commitment of support 	Gen. Fund		
Stakeholder Identification	<ul style="list-style-type: none"> Gathering of data for community profile Identification of barangay core leaders eco-aides and volunteers 	Brgy.	Jan.	Dec.	<ul style="list-style-type: none"> Community profile featuring physical and other data relevant the project Profile of household wastes 	Gen. Fund		
Social Mobilization	<ul style="list-style-type: none"> Information campaign Recruit volunteer & Trainees Organize mobile propaganda team 	Brgy.	Jan.	Dec.	<ul style="list-style-type: none"> Informed community List of volunteers and trainers 	Gen. Fund		
Community Organizing Development	<ul style="list-style-type: none"> Conduct awareness raising in solid waste management, recycling re-use and recovery through seminar and training Establishment of project operation system from household segregation to community collection and transfer station to junk shop station. 	Brgy.	Jan.	Dec.	<ul style="list-style-type: none"> Seminars/trainings conducted at the brgy. Level Roles of key players (households brgy council, junkshop operators EMP) clearly articulated, understood and agreed upon (as cited in the MOA) 	Gen. Fund		

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Barangay Secretary

Approved by: **GLORIA P. VENTURA**
Barangay Chairwoman

Figure 3: Barangay solid waste management programs.

Respondents and Sampling Procedure

In the first set of in-depth interview, the number of respondents of this study was ten (10) only. To strengthen the qualitative data of the study, the researchers decided to conduct in-depth interview with another ten (10) respondents. In total, there are 20 respondents in the study nine of whom are male and eleven of whom are female. The age of the respondents ranges from 30 to 75 years old. They are all residents in the said barangay and were selected through random sampling technique.

Research Instruments

For the collection of qualitative data and interview, the researchers prepared interview questions validated by a solid waste management officer from the Environmental Management Bureau of DENR. Sound recorder and

camera were also used during the interviews for transcription and documentation. The researchers also used pen and paper to take note of the important statements stated by the respondents.

Data Collection Procedure

In order to collect the data, the researchers conducted in-depth interview with the selected residents. Since random sampling technique was used, the researchers did a door-to-door interview. The in-depth interviews lasted for an average of 30 minutes for each respondent. The general questions asked in the interview were the following: what is their knowledge about solid waste management and composting? What discouraged them to compost in an urban setting? What are the perceived benefits that can be obtained when conducting a composting activity?

Data Analysis Procedure

The data gathered were analyzed through thematic analysis. Braun and Clarke (2006) [19] defined thematic analysis as a method for identifying, analyzing, and reporting patterns within data. They also pointed out that the approach of thematic analysis when analyzing qualitative data is accessible and theoretically-flexible. It is composed of five phases. The first phase is the familiarization with the data that includes the transcription of verbal data. Second is the generation of initial codes. Third is the search for themes based on the codes. Fourth is the theme review and lastly, defining and naming the themes were done [19]. Verbal data in the transcriptions were translated into English language.

Results and Discussion

Knowledge and Awareness

This major theme tackled about the knowledge of the residents about how composting is done and their awareness in existing solid waste management strategies implemented in their barangay. Two (2) superordinate themes emerged and these are *Traditional Composting* and *Waste Segr.*

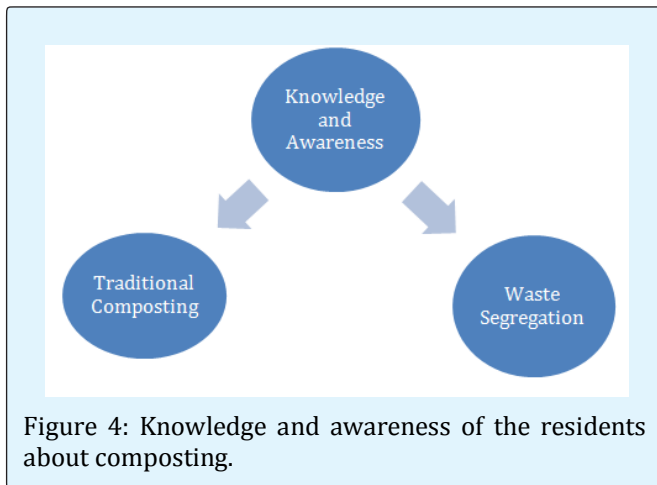


Figure 4: Knowledge and awareness of the residents about composting.

Traditional Composting

This superordinate theme is about traditional composting on what the residents know how composting is done. The residents were knowledgeable about the traditional composting where the biodegradable materials are buried in the soil. They also think that this can only be done in rural areas since these places have more available lands compared to an urban setting.

In the province, we dig up the soil, and then bury the biodegradable wastes in the soil to produce fertilizer, Resident B said.

Composting is one way of recycling organic wastes. However, this is not as simple as the residents think. Controlled parameters should be taken into consideration when conducting composting activity to achieve the optimal condition. These factors include Carbon-to-Nitrogen ratio, shredding of materials, blending of materials, temperature, reaction or pH level, moisture and aeration, and microorganisms involved [20]. Otherwise, when the best condition is not met, the process may be slowed or may not happen at all [17]. Among the existing methods of composting, based on how the residents described their method where a hole is dug and the organic wastes are buried, this is known as pit composting according to Martin and Gershuny (1992) [21] description in their book.

Waste Segregation

This superordinate theme is about the segregation of waste as one of the solid waste management strategies that the residents are familiar with the most. Aside from being aware, they are practicing this in their household. They have separate trash bins for biodegradables, non-biodegradable, and recyclables.

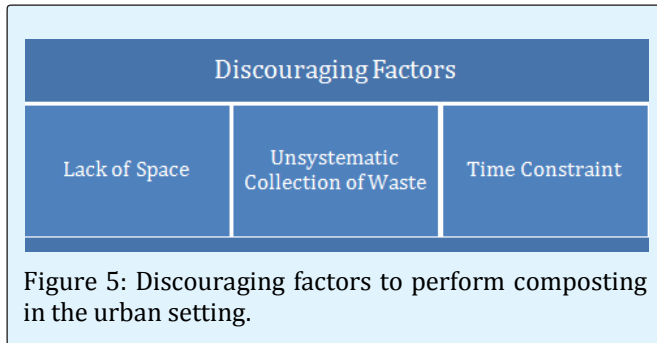
We have trash cans, one for biodegradables and one for non-biodegradable, Resident A said.

Segregation of waste is part of the Republic Act 9003 also known as the Ecological Solid Waste Management Act of 2000. It is stated in Section 21, that all wastes coming from household, institutional, commercial, and agricultural sources should properly segregated from the source itself. Section 2(a) also states that there should be separate containers for each type of waste. Segregation of waste, together with the provision of trucks for transportation of waste, ranked the highest existing in the study areas of Azuelo, et al. [4]. This is an important factor on achieving household composting in an urban setting because successful composting of biodegradable wastes is only possible if segregation of waste is done at household level [22]. Through segregation of waste, organic wastes can easily be obtained that will be used for household composting.

Discouraging Factors

This major theme discussed the factors that discouraged the residents to conduct composting activity

even though they are willing to participate most especially when it would bring good effects to the community and for the cleanliness of the surroundings. Under this major theme were three (3) superordinate themes namely *Lack of Space*, *Unsystematic Collection of Waste*, and *Time Constraint*.



Lack of Space

This superordinate theme explained that the lack of space is one of the factors that discourage the residents to conduct composting in an urban setting. They were not able to conduct composting activity because they thought that it is impossible to do this in an urban setting.

During the interview, Resident C had an immediate response,
Where? Where are we going to compost?
 Then the resident added,
In our situation, there is no available land that can be used for composting.

The residents thought that composting can only be done in rural areas where there a lot of available land or space that people can compost with. According to Haase (2009)[11], there is a direct relationship between urbanization and land sealing. This explains why in highly urbanized area, there is not enough arable land. Additionally, even though the residents are willing to recycle these organic wastes, they are discouraged by the lack of backyards or space for composting activity [23]. Despite of this lack of space, there are still barangays in Quezon City and Metro Manila that have vacant lands which can be utilized for local community compost recycling system. Field investigation showed that it is possible to promote agricultural activities in these vacant lands [24].

Unsystematic Collection of Waste

This superordinate theme is the unsystematic collection of waste in the barangay based on the perception of the residents. The residents are segregating their wastes in their household but they are discouraged by the collection of the trucks because all of the wastes being collected are mixed up.

They are not systematic when it comes to the collection of wastes. If only they follow their own rules, the collection of waste would be good. The garbage trucks arrive at the right time, but their agenda are disobeyed. Instead, the residents are the ones who find a way to follow their ordinance, Resident D said.

Commonly, the trucks take up to 3 days before the collection. As a result, the biodegradable wastes in their house would start to stink and attract pests like cockroaches and rodents.

With regards to the collection of garbage, they should have big containers that separate the three kinds of wastes; I have witnessed that abroad, Resident E said.

Even though the barangay have implemented the ordinance of having a different schedule of collection for biodegradable and non-biodegradable, solid waste management is still not effective because it is not strictly followed, even the collectors themselves, do not follow it.
...especially when it is Sunday, there is no one who will check the collection of waste. As a result, the wastes are really mixed up in the truck, Resident A said.

It is also stated in the Prohibited Acts of RA 9003 that the collection of non-segregated or unsorted wastes should not be allowed following the policy "No Segregation, No Collection." The lack of penalty for this kind of actions and the non-execution of the law is one of the most basic problems when it comes to effective solid waste management [12]. It is also found out in the study of Bennagen, *et. al.* [23] that the residents are also discouraged by the municipal collection system that is not set up to accept segregated wastes.

Time Constraint

This superordinate theme showed time as a discouraging factor to conduct composting activity in urbanized area. The residents who have a job are commonly have no time for extra activity.

I have no time for that. I can participate if only I am available, Resident F said.

It is said that the time in highly urbanized area is more limited, space is denser and the activities are more complex [25]. Because to this, the residents often choose to not participate in any extra activities they considered would take a lot of time from them. Due to lack of literature on this matter, further studies should be made about the time availability of the residents to determine when would be the best time to conduct awareness-raising campaign and seminars about proper household composting. Any available member of the household that are not constricted by other activities should be given the task of composting the organic wastes and attending the said campaign and seminar. This is a possible way to overcome the hindrance posed by time constraints.

Perceived Benefits

This major theme determined the benefits that can be obtained from solid waste management and household composting as perceived by the residents in the barangay. The superordinate themes that emerged in this major theme are *Compost Soil*, *Flood Risk Reduction*, and *Improved Sanitary Condition*.

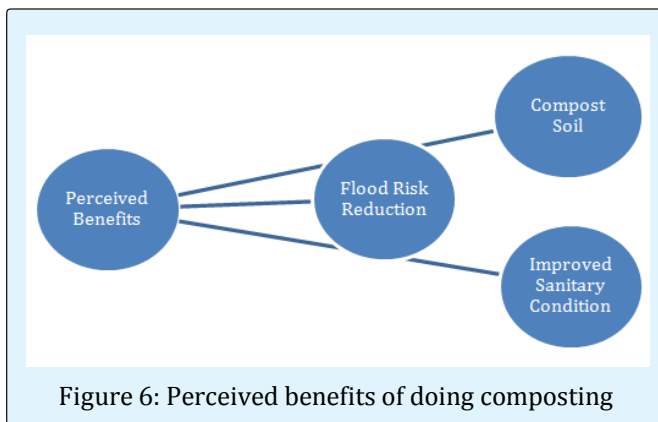


Figure 6: Perceived benefits of doing composting

Compost Soil

This superordinate theme Compost soil has been a common knowledge for everyone. This is the product of the process of composting which can be used for agricultural purposes.

Those biodegradables, you can turn them into fertilizer, Resident G said.

According to a study of Jara-Samaniego, *et al.* (2017) [26], composting with gardening pruning wastes have shown their feasibility in terms of matter mineralization and

humification where the composts obtained have the suitable characteristics for agricultural use. Furthermore, the composts obtained can be used as an organic fertilizer because they showed absence of phytotoxicity and suitable agronomic properties. However, the quality of compost product still depends on the quality of the organic wastes used in the process. Contaminated compost has the potential to introduce heavy metal into the food chain and therefore is not suitable for agricultural use [27].

Flood Risk Reduction

This superordinate theme pertains to flood risk reduction as one of the perceived benefits. The residents perceived that if people would able to reduce the waste and dispose those wastes properly, then there will be no clogging in the drainage which is primarily the cause of flooding.

As you know, we experience rainy season, you can see it is very dirty, the As you know, we are experiencing rainy season right now, you can see that it is very dirty, the garbage continue to overflow, so we really need proper waste management so we can help diminish the possibility of flooding, Resident E said.

The research locale of the study is categorized as a flood prone area. Flooding is likely becoming more frequent due to the increase of urban development and strategic measures are needed to be developed in order to mitigate the impacts brought by flood [10]. According to a study of Lamond *et al.* [28], solid waste management can be an effective response to flood risk by reducing the accumulation of waste blocking the drainage channels.

Improved Sanitary Condition

This superordinate theme discusses about the health hazards reduction as one of the perceived benefits by the residents that can be obtained from solid waste management. The residents perceived having a good sanitary condition in their houses and in the barangay would help on the avoidance of getting diseases.

If you can manage your wastes well, your family would not get diseases, because your house is clean and you have disposed your garbage properly. But if your wastes are being piled there, you will catch diseases, Resident G said.

Increased urbanization with large population density can intensify the concern when it comes to solid waste management together with sanitation and associated adverse health impacts [29]. It was also perceived that improper handling of solid waste disposal gives rise to

diseases [30]. De and Debnath [29] found out in their study that those people with unhygienic ways of living in the area often suffer from diseases like diarrhea, malaria, and dengue. This is due to their lack of awareness to harmful effects of open dumping and proper disposal method. Also, prevalence of gastrointestinal, skin, upper-respiratory, and dengue are the diseases common in disposal sites [3]. Through the practice of composting and proper solid waste management, there would be a diversion of biodegradable wastes from landfilling [7] and if the wastes are disposed properly, then there would be no dumped garbage because this commonly becomes a breeding ground for disease-causing organisms [31].

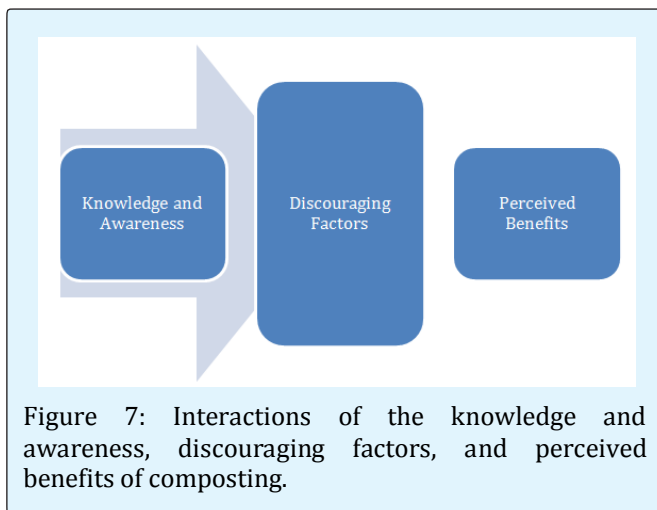


Figure 7: Interactions of the knowledge and awareness, discouraging factors, and perceived benefits of composting.

Conclusion

The study revealed that the residents were knowledgeable about solid waste management strategy like segregation of waste and traditional composting. However, they were not able to conduct composting activity because they thought that this can only be done in rural areas. The residents were willing to participate in the said activity but they were discouraged by the hindrances they have encountered. Therefore, if these hindrances can be overcome, then household composting in highly urbanized area would be feasible and the perceived benefits of the residents can be obtained. Hence, it is recommended to design an advanced composting technology that would best fit in an urban setting using scientific techniques. Furthermore, it is also recommended that the Local Government Units should conduct awareness campaign and seminars regarding proper household composting.

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