Household Waste Production and Disposal: Perception and Behavior of Sampled Households in Barangay Looc, Calamba City

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Abstract

This study characterizes the current solid waste management system in Calamba City, Philippines and the household waste production and disposal in one of its flood-prone barangays, Looc. The main aim of this study is to identify the extent of the problems and potentials and to examine potential future actions. We used key informant interviews and household surveys to elicit information from resource persons and households. We find that about 48.73% of the recyclables in Calamba City are left unmanaged – dumped, buried, or burned inappropriately. The estimated monetary value of these unmanaged recyclables amounts to PhP 5,839,836 (approximately USD 117,442) monthly – just PhP 3 million short of how much the city pays monthly to a waste management company to collect and dispose its mixed wastes. We also discovered that the waste management company does not have a sufficient collection capacity as it misses to collect up to a ton of mixed waste in Looc daily. Results of the household survey suggest that households have a limited awareness about proper waste disposal as they have very low willingness to pay for waste management. Wastes are largely invisible and thus value or cost of wastes is considered to be zero. In addition, the public nature of waste, *i.e.* 'waste management as public goods' seems to be absent from the community's perception. This is why people are not willing to spend time or contribute money toward collective waste management. It is clear that Calamba City can still improve its solid waste management system. It can invest into larger materials recovery facilities, expand its program for ecocenters (smaller facilities for the collection and storage of recyclables), or acquire new technologies (e.g., incineration, waste-to-energy facilities). The awareness of households to proper waste disposal practices and to the concept of "waste management as public goods" should be raised so that they get motivated to contribute to waste management.

Keywords: solid waste management, waste disposal, household wastes

1. Introduction

There is still a global waste crisis up to now despite technological innovations that have been developed to improve waste management. Half of the waste produced by Earth's 7 billion people is not properly disposed of (Lenkiewicz, 2016). This is the reason why two of the United Nation's (UN) Sustainable Development Goals (SDGs) target the reduction, recycling, and reuse of these wastes. Target 11.6 aims to "by 2030, reduce the adverse per capita environmental impact of cities by paying special attention to air quality and municipal and other waste management" while target 12.5, aims to "by 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse".

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Faulty and inefficient waste management systems could result to land, water, and air pollution together with health and flood risks. Similar to other developing countries, the Philippines is still struggling in formulating a strategy to effectively manage solid wastes. Even after the enactment of the Ecological Solid Waste Management Act in 2001 (RA 9003), household waste generation continues to rise and majority of local government units (LGU) still lack efficient collection, recycling, and disposal facilities.

Aside from technology and programs, researchers also consider the perceptions and behavior of people toward waste management as major factors in the success of a waste management system (Fearon and Adraki, 2014; Haider et. al 2015; and Mukherji et. al 2016). This study explores the behavior and perceptions of sampled households in Barangay Looc, one of the most flood-prone barangays in Calamba City, toward waste management. The study specifically aimed to: a) characterize the socio-economic profile of the households in the area; b) identify the current disposal and associated handing practices of domestic wastes; c) assess existing volume and types of wastes generated by households' consumption taking account of their seasonal variations; d) examine existing market/processing practices for waste materials with a view to identifying potential hindrance and potentials for promoting market based waste management initiatives; and e) determine households' perceived deleterious effects of wastes materials on the environment, human health and food security, and flood incidences. The study focused on household wastes since according to the National Solid Waste Management Commission (NSWMC) of the Philippines (2015), residential wastes account for more than half (56.7%) of solid wastes in cities and municipalities. These wastes represent kitchen scraps, paper and cartons, glass and plastic containers, soft and hard plastics, and broken electronic equipment.

2. Overview of Calamba City and Barangay Looc (the study site)

The study was conducted in Calamba City and one of its barangays - Looc. Calamba City is a first-class city (has a 4-year income of PhP 400 M or USD 8.6 M) in the province of Laguna Philippines. It is located 54 kilometers south of Manila (Figure 1). Barangay Looc is one of the 54 barangays of Calamba City. It is bounded by Barangay Uwisan in its north, Barangays Sampiruhan and San Juan in its south, Banadero in its west, and Laguna Lake in its east. Three rivers are located in the area: San Juan, San Cristobal, and Tala (Figure 2). The barangay has a total land area of 179.1 hectares and a population of 16,893 in 2014 (Calamba City Website, 2016). The predominant land uses in the area are residential and agricultural.

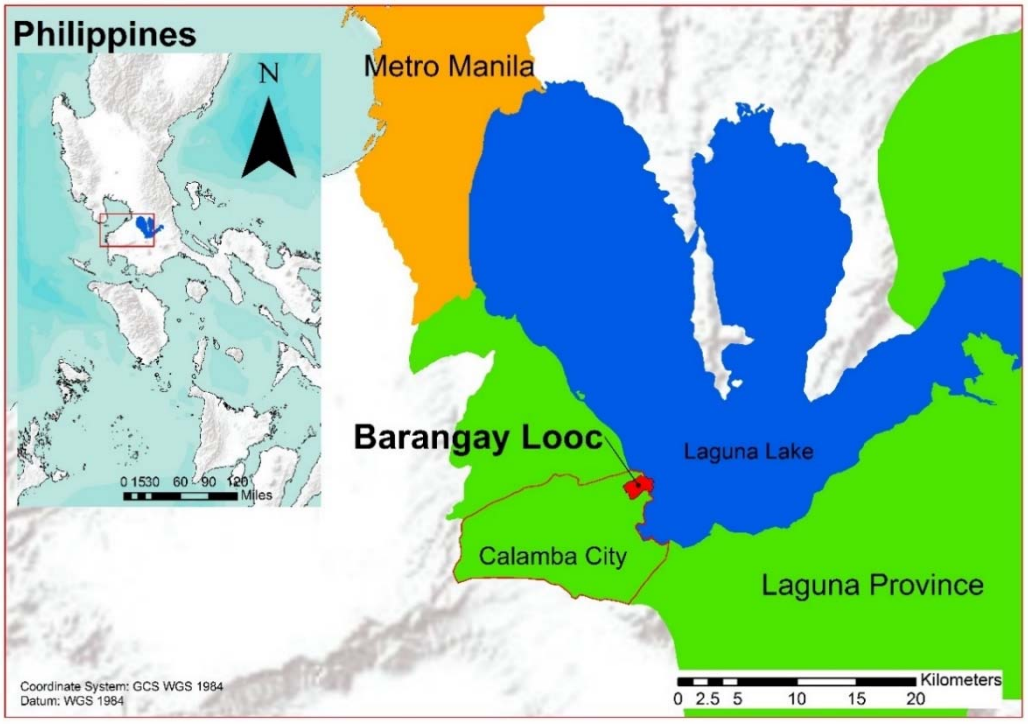

Figure 1 Calamba City and Barangay Looc

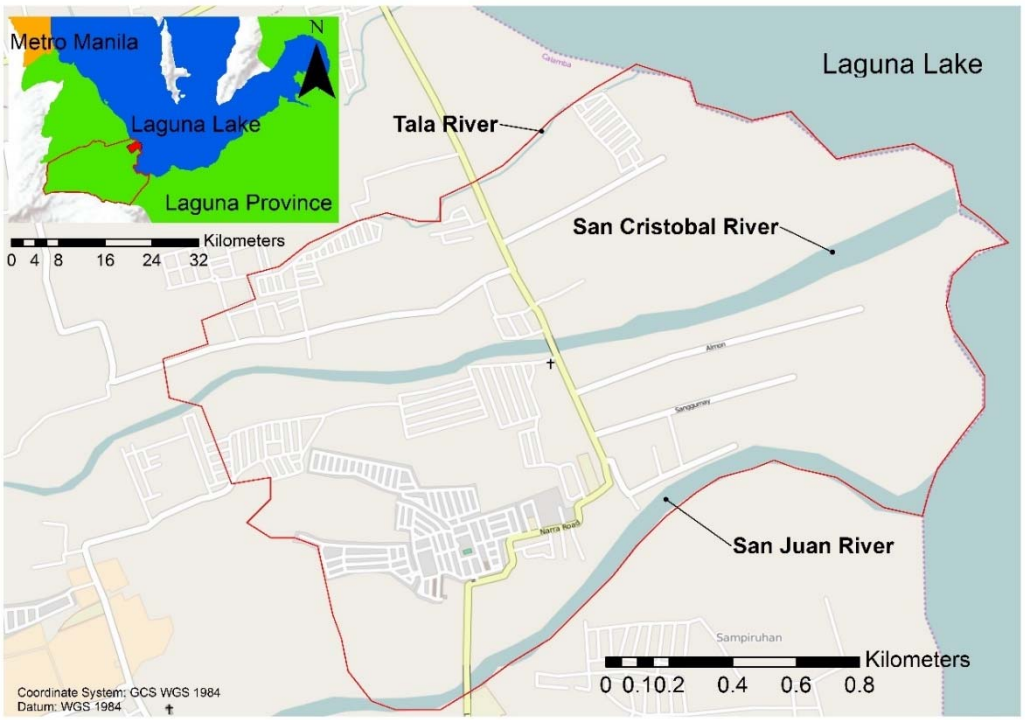

Figure 2 Barangay Looc and its three rivers

3. Methodologies

3.1 Key Informant Interviews (KIIs)

The KIIs aimed to explicate the perceptions and roles of the key players of the waste management system in Calamba City. A separate questionnaire was prepared for each of the identified key players: a) City Office departments, b) City waste collector, c) Ecocenters, d)

Materials Recovery Facilities (MRF), e) scrap collectors, and f) junkshops. The city office departments create ordinances and programs for solid waste management while the city waste collector is the contractor commissioned by the city to collect and dispose of mixed household wastes. Ecocenters, MRFs, scrap collectors, and junkshops are all related to the storage and processing of recyclables (primarily plastics, paper, glass bottles, and different kinds of metals). Ecocenters are small facilities innovated by the city mainly for recyclable storage; MRFs are bigger, more advanced facilities where recyclables are stored and processed; scrap collectors are residents who pick up recyclables in the streets or buy them from households; and junkshops are enterprises to which scrap collectors sell their recyclables. The list of key informants is in Table 1 and the KII questionnaires are in Appendix 1a.

The questionnaire for city office departments had three parts relating to a) awareness to government-run facilities, b) perception on the current waste management scenario, and c) effectiveness of projects and programs on waste management. On the other hand, the questionnaire for the waste collector, Ecocenters, MRFs, scrap collectors, and junkshops had a set of questions relating to the a) material flow in the facilities and b) perception on the current waste management scenario. The interviews were conducted from June to July 2016.

Table 1. List of the key informants

	Number
1. City Office Department	5
a. Solid Waste Management Task Force (CSWMTF)	
b. Environment and Natural Resources Office (CENRO)	
c. Public Information and Education Campaign Office (CPIECO)	
d. Health Services Department (CHSD)	
2. City waste collector	1
3. Ecocenters	8
a. Hospital (2)	
b. School (2)	
c. Subdivision (2)	
d. Resort (2)	
4. Materials Recovery Facilities (MRF)	1
5. Scrap collectors	4
a. with capital (2)	
b. without capital (2)	
6. Junk shops	5
a. for metals (1)	
b. for plastics (1)	
c. for glass cullets (1)	
d. for mixed recyclables (2)	
Total	24

3.2 Household Survey

The household survey employed an assisted questionnaire in characterizing socio-economic conditions of the households in Barangay Looc. In addition to the general socio-economic characteristics, the questionnaire also elicited the types of wastes and disposal practices, awareness on the facilities, ordinances, programs, and services on waste management, and perceptions and participation on solid waste management. The questionnaire also includes

questions on opinions on market-based instruments for solid waste management and flood impacts[3] (Appendix 1b).

Barangay Looc divides its jurisdiction into 15 "areas". A total of 120 households were selected by randomly selecting eight household in each of the 15 areas. The households were then interviewed by the barangay health workers (BHWs) assigned to the area. BHWs were asked to become the enumerators of the study because of their familiarity with the area. Enumerator training was conducted to ensure that the BHWs will be able to elicit adequate information from the households.

The first wave of interviews was conducted between the 23rd and 30th of February during dry season and the second wave of interviews between the 20th and 30th of September (rainy season). All households interviewed during the first wave were approached for the second interviews: 92 out of 120 originally interviewed households and 28 new households were interviewed in the second wave. The seasonal panel enables us to compare seasonal variations and compare waste generation dynamics in the barangay during the wet and the dry season.

4. Results from KIIs

4.1 Waste Management in Calamba City and Barangay Looc: Current Issues and Future Plans

The City Environment and Natural Resources Office (CENRO) handles the waste management system of Calamba City. CENRO was established in 2003, primarily to comply with the provisions of RA 9003 (Ecological Solid Waste Management Act of 2000). In 2014, the office of the mayor decided to create the City Solid Waste Management Task Force (CSWMTF) to focus on waste management. In July 2016, the management was given back to CENRO.

Collection and disposal of residential solid wastes in the 54 barangays is done through a private contractor, which the city pays PhP 114 M (~ USD 2.26 M) annually. CENRO schedules the waste collection – daily at thoroughfares and once a week in barangay roads and subdivisions. The waste collection and disposal company became Calamba City's official waste management concessionaire after a bidding process in 2014. The company owns 37 trucks with a total capacity of 315 tons and makes 34 truck trips per day. It disposes the collected wastes to a landfill in Norzagaray, Bulacan. According to Calamba City's Solid Waste Management Plan (CENRO, 2014), the estimated daily waste generation of households in the city in 2010 is around 200 tons. Out of the said amount, 45% is biodegradable, 36% is recyclable, 16% is residual, and 3% is special (medical and hazardous).

[3] The questionnaire was pre-tested in Barangay Sucol, Calamba City on August 27, 2015. Barangay Sucol was selected as a suitable area for the pre-test because of three criteria: 1) proximity to Laguna Lake (lakeshore barangay); 2) community type (urban); and 3) proneness to flooding. The pre-test rendered a total of three (3) respondents which only gauged the amount of time needed to finish one survey form (20 to 30 minutes), choices from the questionnaire which are lacking (e.g. inclusion of bottled water for water supply, waste container for collection, etc.), and the overall efficacy of the questionnaire in eliciting the information required for the subsequent analyses to be conducted.

Industrial companies (more than 300) have their own CENRO-accredited haulers, following the Resolution No. 283 implemented in 2011. These companies will not be able to get business permits without contracts with accredited haulers. CENRO inspects these companies once a year to ensure that they only dispose their waste through an accredited waste hauler. To reduce residual wastes, the city innovated Ecocenters in 2010, in response to one of the provisions of RA 9003 – to establish Materials Recovery Facilities (MRFs). These facilities should have recycling and composting components. Since the city does not have enough funds to establish multiple MRFs right away, it focused its attention first to the recycling component of the MRFs. CENRO conducted trainings for the creation of Ecocenters in hospitals, resorts, schools, and subdivisions primarily to collect and make use of recyclables (e.g., paper, cartons, plastics, glass bottles). Another key-player in the management of recyclables in the city are junkshops. These are enterprises to which scrap collectors bring recyclables that they have bought from households or just picked up from the streets. Currently, the city has 8 hospital-, 10 resort-, 21 school-, 11 subdivision ecocenters, 57 junkshops, and one composting facility in Calamba City Market.

The Information, Education and Communication (IEC) arm of CENRO maintains a number of programs and campaigns to ensure that the public is well-informed about ordinances related to waste management and proper waste management practices (segregation, recycling, composting). In terms of local rules and regulations related to waste management, the city has five waste management ordinances, four of which were created after the implementation of RA 9003 in 2000 (Table 2).

Table 2. City regulations related to waste management

Title/No	Series
Resolution No. 361 City Ordinance 97-217 “A resolution on the issuance of sanitation citation tickets to those violating existing ordinances related to the cleanliness, sanitation, and environmental health in Calamba City”	1997
Resolution No. 233 City Ordinance No. 01-273 “An Ordinance Enacting the City Environment Code and for Other Purposes”	2001
City Ordinance No, 10-481“An ordinance prohibiting the use of plastic bags on dry goods and regulating its utilization on wet goods and prohibiting the use of Styrofoam in the city of Calamba and prescribing penalties thereof”	2010
Resolution No. 283 “A resolution requesting all waste generators to include commercial, industrial, and institutional establishment to have their CENRO accredited waste haulers as one of the requirements in their application/renewal of business permit/license”	2010
No. 284 “A resolution requiring all waste haulers to secure accreditation from CENRO as one of the requirements in their application for business permit/license ”	2010

The city also, in pursuant to another provision of RA 9003, had established the City Solid Waste Management Board (CSWMB) in 2013 to act as the policy-making body for solid waste management in the city. The city mayor chairs the CSWMB with representatives from the local and national government agencies as well as non-government organizations as members. The CSWMB encouraged each barangay to form a Barangay Ecological Solid Waste Management Committee (BESWMC) to be in-charge of solid waste management in barangays.

CENRO has identified some key issues in the city's solid waste management system. These are the following: a) weak enforcement of existing laws and ordinances, b) budget allocation at the barangay level, c) uncooperative households, and d) manpower capability in the LGU and at the barangay level. As a response to these issues, CENRO plans to assign trained and deputized enforcers in each barangay, make a resolution for barangays to dedicate 5% of its budget for environmental projects, undertake more Information, Education, and Communication (IEC) programs, and create a group to focus on strengthening the capacity of employees assigned to waste management. In 2023, the city plans to divert 81% of its annual wastes (projected to be 142,647 metric tons) to reuse, recycling, and composting through household segregation, segregated collection, establishment of 4 cluster MRFs, and barangay and institutional ecocenters.

Barangay Looc does not have its own waste management system. It relies on the programs and ordinances of the city. The collection company sends trucks to the barangay 2 -3 times per week to pick up wastes from the households. The barangay also has several junkshops and scrap collectors.

4.2 Awareness to Government-run Facilities and Perception to Current Waste Management System

Four out of the five city office departments interviewed were familiar of government-run facilities like MRFs, composting facility, and even the city office's own ecocenter. Even so, they were not knowledgeable with their locations and number. With regard to their perceptions on the current waste management system of the city, some of the KIs think that the ecocenters and MRFs are working well and the waste management in the city is proper because the wastes are regularly collected. On the other hand, some think that the waste management system of the city still needs improvement even if the city has well-established policies and ordinances related to waste management. Most of the KIs also mentioned that one of the biggest problems is the residents' attitude and discipline. People just dispose their waste inappropriately. Moreover, the contractor does not send enough number of trucks to the barangays and so not all wastes are collected. Some specific problems mentioned by the KIs include the following: a) some establishments which are supposed to have their own waste hauler still leave their wastes in the streets; b) poor enforcement of city ordinances and policies; c) huge volume of wastes; and d) households' inability to segregate.

Table 3 summarizes the perception of ecocenters, junkshops, and the managers of the city's composting facility and waste collector. All the KIs managing ecocenters think that the current waste management of the city is proper for two major reasons - since CSWMTF responds to seminar requests and monitors the ecocenters and since wastes are collected regularly. Only two of the interviewed ecocenters think that there is a waste problem in the city and this problem is the inability or unwillingness of households to segregate their wastes. When asked about who should work together to improve the waste management in the city, the ecocenters had varied answers. The most common are "all stakeholders" and "community members (residents)".

Smaller unspecialized junkshops had conflicting views about the current waste management system of the city. One said that it is improper since the city does not collect broken and colored glasses that can pose health risks while the other one said that it is proper since the city has very good programs and policies about waste management. According to these junkshops, the collection company and the city office should work together to improve the

waste management system. The views of the bigger, more specialized junkshops were different as they think that the waste management system of the city is proper because it has good programs for junkshops and it requires junkshops to have their own waste hauler. For them, the junkshops, along with communities and other stakeholders should work together to improve the solid waste management system. For the manager of the city's composting facility, the current waste management system is proper since they have the facility to respond to the provisions of RA 9003. The KI thinks that the CSWMTF should work hard to improve the system. On the other hand, the collection company thinks that the solid waste management system of the city is proper since the city does everything to keep the city clean. One problem according to the collection company is that people do not segregate wastes. For the company, the city should help them improve the system.

Table 3. Summary of the perceptions of ecocenters, junkshops, composting facility, and waste collector with regard to the current waste management

Institutions	**Opinion on current waste management system**	**Is there a waste problem?**	**Who should work together to improve waste management?**
School Ecocenters	**Proper** - CSWMTF responds to seminar requests and monitors the ecocenter; **Proper** - wastes are collected regularly	**No**	All stakeholders; community members
Hospital Ecocenters	**Proper** - wastes are collected by own hauler; CSWMTF monitors ecocenters	**No**	Barangay officials; CSWMTF
Subdivision Ecocenters	**Proper** - wastes are collected regularly; **Proper** - system encourages segregation	**No**; **Yes** - people do not segregate	All residents; CSWMTF
Resort Ecocenters	**Proper** - wastes are collected; **Proper** - ecocenters are monitored	**No**; **Yes** - people do not segregate	All residents; all stakeholders
Junkshops	**Improper -** collection trucks do not collect broken mirrors and windows/colored glasses; **Proper** - city has very good programs and policies, especially for junkshops	**Yes** - do not collect broken mirrors and colored glasses; **No**	Collection company and the city office; all stakeholders
Specialized (bigger) junkshops	**Proper** but needs coverage improvement; **Proper** - good programs for junkshops; **Proper** - junkshops are required to have haulers	**No**; **Yes** - inappropriate ban on plastics	Communities/barangays; all stakeholders; all junkshops
Composting facility	**Proper** – city has composting facility	**No**	CSWMTF
Collection Company	**Proper** – city does everything for cleanliness	**Yes** - people do not segregate	City office and collection company

4.3 Recyclables Flow Analysis

Table 4 summarizes the mean monthly amount of recyclables accumulated by ecocenters, junkshops, and scrap collectors. It can be noted that junkshops accumulate the highest amount of recyclables at 61,029.74 kg/month. The junkshops accepting mixed wastes from households had a value of 50,368 kg/month while the specialized junkshops that usually accept recyclables from industries had a value of 68,137.57 kg/month. These results suggest that junkshops indeed have a big role in the management of recyclables in the city and that industries contribute a larger proportion of recyclables than households.

Ecocenters and scrap collectors had average monthly amounts of 1,452.24 kg/month and 1,675.62 kg/month, respectively. Subdivision ecocenters accumulate the highest amount of recyclables at 3,747.64 kg/month while school ecocenters accumulate the lowest (91.50 kg/month). These results suggest that subdivisions contribute more recyclables, probably because of the higher number of people in them or that ecocenters in schools, hospitals, and resorts are not well-monitored and managed. For scrap collectors, those using a capital had a higher value of 2,259.06 kg/month because they have a higher purchasing power than those who just pick up recyclables in the streets.

Table 4. Mean monthly amount (kg) of recyclables accumulated by ecocenters, junkshops, and scrap collectors

Institutions	**Mean monthly amount of recyclables (kg)**
All Ecocenters	1,452.24
School	91.50
Hospital	1,687.34
Subdivision	3,747.64
Resort	282.50
All Junkshops	61,029.74
Mixed	50,368.00
Specialized	68,137.57
All Scrap collectors	1,675.62
With	2,259.06
Without	1,092.18

According to the Solid Waste Management Plan of Calamba City (CENRO, 2014), 36% of the wastes generated by households in the city are recyclables. The report also indicated that the average daily per capita waste generation in the city in 2010 is 0.50 kg. This value was projected to 2016 using 2.47% growth rate (PSA, 2016a) and was multiplied by the 2016 city population (477,439), 30 days, and finally to 36% to obtain 2016 city monthly recyclables generation – 2,990,677.90 kg. The mean monthly amount of recyclables (kg) from ecocenters, junkshops, and scrap collectors were then multiplied with their current number in the city to obtain the total monthly recyclables (Table 5). The mean monthly value used for junkshops was from the ones accepting mixed wastes since these junkshops are the ones accepting recyclables from households. The number of junkshops accepting mixed recyclables was assumed to be half of the total number of junkshops in the city.

Figure 3 illustrates the flow of recyclables from the households to ecocenters, junkshops, and scrap collectors. It can be seen that majority of the recyclables go to junkshops (48.84%) and

a small percentage go to ecocenters (2.43%). The remaining 48.73% of the recyclables are unmanaged – dumped inappropriately, buried, or burned. The estimated monetary value of the unmanaged recyclables amounts to, based from the average price per recyclable obtained through KIs (PhP 3.77 or ~ USD 0.08), PhP 5,839,836 (~ USD 117,442) per month. It seems worthy to explore whether and how this potential value of recyclables can be appropriated by proper disposal and management.

Table 5. Total monthly recyclables in ecocenters, junkshops, and scrap collectors

Institutions	Number	Total monthly recyclables (kg)	Percent of city recyclables
Ecocenters	50	72,612.19	2.43
Junkshops	29	1,460,672	48.84
Scrap Collectors	203*	340,150.86	11.37

* based on the KIs there is an average of 7 scrap collectors per junkshop

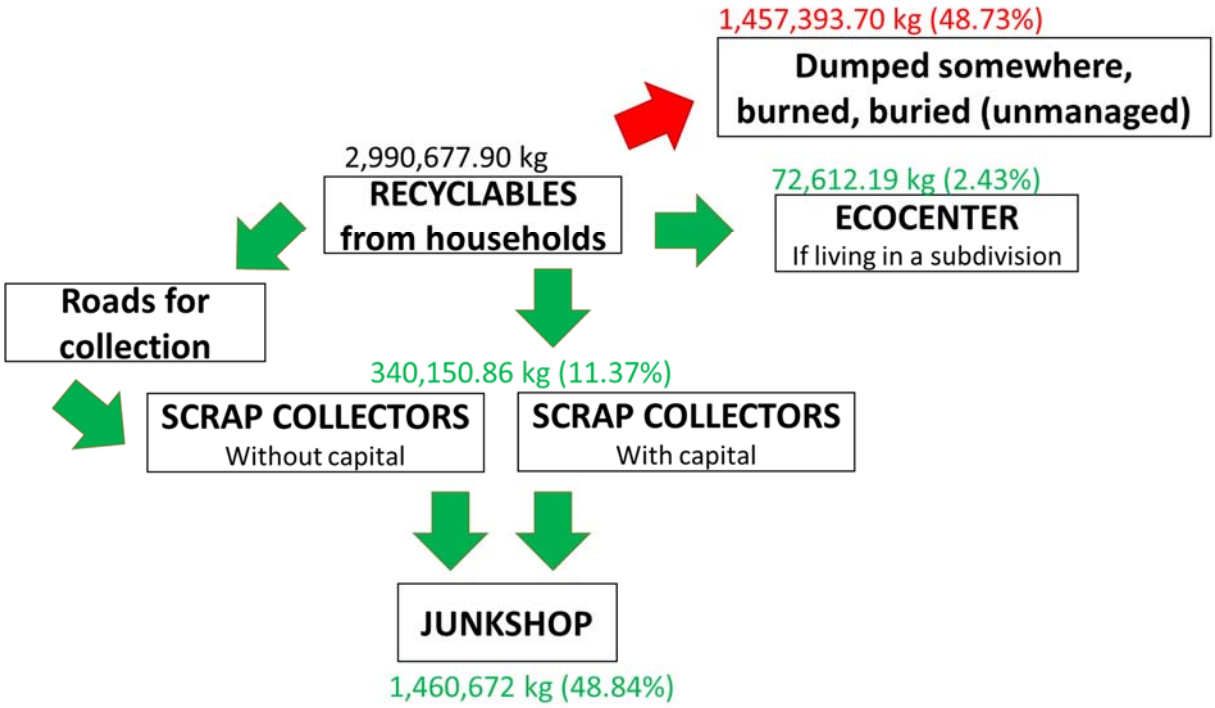

Figure 3. Flow of recyclables from households to ecocenters, junkshops, and scrap collectors.

5 Results from Household Survey

5.1 Socio-economic Characteristics and Waste Disposal Practices of the Sampled Households

In this subsection, we report the households' waste disposal practices and perception that the survey results show. For the purpose of this paper, we only use the results from second wave of the survey during the rainy season.

The distributions of the income categories and main sources of livelihood of the sampled households indicate that they are heterogeneous in terms of economic characteristics (Table 6). Majority of the households belong to lower-middle to upper middle-income categories but 30 % of them are below the basic need poverty threshold of PhP 9,064 or USD 183 (PSA,

2016b). The households of lower income categories tend to live in houses with temporary natural materials such as palm leaves and bamboos, and take drinking water from wells rather than purified sources. This implies that poorer households not only lack sufficient flow of income but also have lower asset thus vulnerable to chronic poverty under risks and uncertainty.

Self-employment such as driving tricycles, running grocery stores (*sarisari* store), and selling cooked food or providing various services (e.g., manicures, motorcycle maintenance) as well as waged employment are the main sources of livelihood. For all income categories, majority of households have diversified livelihood relying on multiple sources of income. Majority of the households have migrated from other provinces and the number of migrating families are still increasing (2.47% growth rate, PSA, 2017a).

Table 6. Descriptive statistics of the socio-economic characteristics of the surveyed households

	All	**Household by income categories***			
		Poor	**Lower**	**Middle**	**Upper**
No of obs.	120	36	44	25	13
Household size	5.17	6.83	4.84	4.2	3.8
	(2.35)	(2.92)	(1.67)	(1.38)	(1.61)
Years of education of the household head	9.9	9.4	9.9	10.1	11
	(2.3)	(2.0)	(2.3)	(2.6)	(2.7)
Monthly Income per capita (pesos)	3,551	1,244	2,651	4,538	11,089
	(3,340.1)	(391.5)	(461.2)	(898.0)	(4,839.8)
Main sources of livelihood (%)					
Agriculture and fisheries	6.7	11.1	6.8	0.0	6.7
Wage earner	25.8	25.0	25.0	28.0	26.7
Government	10.0	13.9	9.1	8.0	6.7
Self-employed	25.0	33.3	20.4	16.0	33.3
Remittance/pension	8.3	5.5	13.6	4.0	6.7
% with secondary sources of income	58.3	66.7	52.3	60.0	53.3
Migrant (%)	54.1	47.2	61.4	64.0	33.3
Years of residence	17.0	16.4	17.4	13.7	27.6
	(13.8)	(11.6)	(14.8)	(10.8)	(21.4)
% live in house with temporary structure (%)	11.7	22.2	11.36	4.0	0.0
Drinking purified water	53.3	38.9	47.7	80.8	60.0
Drinking from well	38.3%	55.6%	38.6%	20.0%	26.7%

Notes:. * We have adopted the following household income categories using monthly income per capita: below PhP 1,812.80 (poor), between PhP 1,812.81 and 3625.60 (low income), between PhP 3,625.6 and 7215.20 (middle class), above PhP 7,215.20 (upper income). These thresholds take account the monthly food and poverty thresholds of the Philippines Statistics Authority (PSA). According to PSA (2016a) a family of five needed at least PhP 6,329 (i.e., PhP 1,265.80/capita), on

average, every month to meet the family's basic food needs and at least PhP 9,064 (i.e., PhP 1,812.80/capita), on average, every month to meet both basic food and non-food needs.

5.2 Types and Quantities of Household Wastes

We have asked the respondents to enumerate quantities (either in approximate weights or numbers of pieces) using the lists of 73 wastes; leftover food, types of paper items, types of plastic bottles, types of soft plastics, and hard plastics and other items (Appendix 2 contains the complete list of wastes in each category). This list is drawn during the discussion with a group of Barangay Health Workers (BHWs) who interviewed respondents as enumerators. The respondents were asked to report the estimated quantities of each waste item held by the household at the time of interview. The figures of weights or pieces were then converted by us using the conversion rates in Appendix 2.

We gained the following general insights from eyeballing Table 7: 1) on the average, each household holds about 3kg (60% of which are plastics) or 440 pieces (90% of which are plastics) of waste in a day; 2) soft plastics constitute the majority of residual wastes and the proportion of which tends to be larger among the poor; 3) the proportion of recyclable wastes (including food, paper, PET bottles) are 78.57 % of total waste in weight. This recyclable proportion appears lower among upper income househlds and higher among the poor. This difference could be influenced partly by the waste being generated through consumption choice (e.g. consumption with reusable containers) and partly by waste disposal behavior (regular recycling and disposal).

Household waste production and waste collector capacity. Table 8 presents the waste collection schedule and capacity for Barangay Looc (CENRO, 2014). The waste collection trucks passing through Barangay Looc also go to one to five other barangays on the same day. Multiplying the average amount of wastes each household in Looc store per day (3kg) by the number of households in Looc (4,192) gives the lower bound estimate of waste to be collected by one haul of collection truck in Barangay Looc only, which amounts to – 12.58 tons. Dividing the total divided capacity (101.70 tons) into 7 collection schedules reveals that the trucks have a daily capacity of 14.53 tons – more than what Barangay Looc requires. However, because of inefficient waste stacking and collection in thoroughfares, the barangay is assumed to use only up to 80% of this capacity (around 11.62 tons). This means that the collection company misses to collect 0.95 tons of wastes per day in Barangay Looc.

Table 8. Waste collection schedule and capacity for Barangay Looc (CENRO, 2014)

Day	Areas	Truck	Capacity (tons)	Barangays served	Divided capacity (tons)
Mon.	Main road of Nayon	Forward	57.84	3	19.28
Mon.	Sanggumay St.; Kalanta St.; Villa Isabel; Villa Consolation; Muslim Cmpd; Looc Relocation	Elf	28.92	3	9.64
Tue.	Mahogany Villas; Bamboo Grove	Cargo	72.3	2	36.15
Wed.	Main road; Consolacion	Forward	57.84	5	11.568
Fri.	Centenial Homes; Sanggumay St.; Kalantas St.; Muslim Cmpd; Looc Relocation; Villa Isabel; Villa Consolation	Elf	28.92	5	5.784
Fri.	Main road and streets	Cargo	72.3	6	12.05
Sun.	Main road and streets; Astek; Molave; Blabog St.; Orocan	Elf	28.92	4	7.23
Total					**101.70**

Table 7. Household waste compositions (measured in weights and pieces)

	All		**Poor**		**Low**		**Middle**	
	120		36		44		38	
	kg	pieces	kg	pieces	kg	pieces	kg	pieces
Total waste	N=90	N=90	N=30	N=30	N=28	N=28	N=32	N=32
	3.08	435.2	3.82	1114.8	2.71	77.68	2.73	111.06
	(4.82)	(3311.9)	(7.27)	(5732.5)	(2.78)	(90.65)	(3.142)	(267.1)
Food	N=112	N=112	N=35	N=35	N=40	N=40	N=37	N=37
	0.77	3.85	1.06	5.29	0.63	3.14	0.65	3.26
	(1.31)	(6.539)	(1.84)	(9.226)	(0.72)	(3.607)	(1.173)	(5.87)
Paper	N=106	N=106	N=34	N=34	N=37	N=37	N=35	N=35
	0.21	13.55	0.11	4.32	0.22	24.07	0.30	11.39
	(0.35)	(53.01)	(0.16)	(7.989)	(0.29)	(84.39)	(0.510)	(29.45)
PET bottles	N=114	N=114	N=35	N=35	N=43	N=43	N=36	N=36
	0.57	10.1	0.45	8.09	0.81	14..4	0.39	7.06
	(1.80)	(32.20)	(2.22)	(39.7)	(1.99)	(35.57)	(0.911)	(16.28)
Soft plastics	N=102	N=102	N=32	N=32	N=35	N=35	N=35	N=35
	0.41	357.5	1.05	1015.4	0.05	37.51	0.17	75.98
	(3.18)	(3310.4)	(5.65)	(5549.2)	(0.05)	(67.31)	(0.670)	(252.1)
Hard plastics	N=109	N=109	N=32	N=32	N=38	N=38	N=39	N=39
	0.87	4.52	0.91	4.62	1.00	5.43	0.70	3.54
	(0.99)	(4.623)	(1.00)	(4.419)	(1.20)	(5.71)	(0.730)	(3.36)
Others	N=116	N=116	N=36	N=36	N=43	N=43	N=37	N=37
	0.44	8.85	0.28	9.5	0.55	10.72	0.46	0.05
	(1.42)	(11.30)	(0.40)	(12.64)	(1.64)	(11.51)	(1.764)	(9.95)

Notes: Each cell reports the number of effective responses, mean figures of the effective values and standard. Standard deviations are reported between brackets. Missing figures, either in weights or pieces, were filled by converting using the conversion rates in Appendix 2.

5.3 Waste Disposal Practices, Perception, Awareness and Attitudes Towards Waste

The first six rows of Table 9 report the disposal practices of each waste item enumerated in the survey. Number of the reported practices counts the effective observations of disposal practices either "to burn", "to store in the house for collection", "to recycle", or "to reuse and reduce". Only a few responses were recorded and for over 85 % of waste reported, respondents were not able to or unwilling to report how they are disposed. Focusing on the effective responses about disposal practices, recycling or reusing constitute the main practices. Substantial part of food wastes is used for feeding pigs and reported as disposal method of "reused and reduced".

Table 9: Reported waste disposal practices and perception about waste related problems

	All	**Poor**	**Low**	**Middle**
Waste disposal practices				
No. of reported practices	103	34	38	31
burn	0.01	0.010	0.012	0.023
	(0.05)	(0.042)	(0.047)	(0.063)
stored for collection	0.01	0.125	0.242	0.008
	(0.05)	(0.052)	(0.057)	(0.037)
recycled	0.02	0.025	0.020	0.018
	(0.05)	(0.057)	(0.053)	(0.050)
Reused and reduced	0.088	0.110	0.079	0.075
	(0.084)	(0.083)	(0.083)	(0.084)
unknown	0.861	0.842	0.864	0.875
	(0.064)	(0.052)	(0.061)	(0.074)
Aware ordinance (=1)	0.53	0.53	0.52	0.55
	(0.50)	(0.51)	(0.51	(0.51)
Perceive waste problem with flood	32%	38.9%	27.2%	15%
Perceive waste problem with health	64.1%	61.1%	68.2%	62.5%
Willingness to pay (WTP) for community waste management initiatives (hours/month)	N=109 6.55 (17.90)	N=31 9.28 (29.10)	N=41 7.14 (12.05)	N=37 3.51 (8.82)

In terms of awareness of proper waste disposal practices, only about half of the respondents are able to mention at least one of the recommended practices or rules. This general vagueness of disposal practices and relatively low level of awareness are common to households of all income categories. Over 60% of respondents associate waste disposal issues with health problems. The poorer households tend to relate waste problems with the increasing incidences of flood in the area. The last row reports the responses to the question "Should there be a community initiated waste management, how much money or time are you willing to contribute per month?". The willingness to pay figure consolidate respondent's responses to the questions in terms of person-hours per month (mean of 6.55 hours/month).

6 Conclusions and Recommendations

According to our analysis of recyclable flow, nearly 50% of recyclable wastes generated by households in Calamba City are left unrecycled and disposed of improperly, either dumped somewhere, burned, or buried. The cross examination of the estimated quantity of solid waste held by the household and the collection capacity of the waste collectors reveals that as much as 950 kg of waste are left uncollected per day. These significant gaps between the actual waste that is generated and the quantity that is properly disposed of demonstrate both the seriousness of the waste problem and substantial potential benefit of overcoming them. The city spends $2.3M annually for waste management but wastes $1.5M every year because of unmanaged recyclables.

Majority of Barangay Looc residents associate improperly managed wastes with health problems and flood risks, and people are able to report waste types and volumes fairly in detail. Yet how they actually dispose of each item is largely unknown. This could be due to their reluctance and unwillingness to respond. Nonetheless, the lack of or underreporting of known disposal practices itself demonstrate the problem in promoting the desirable waste management practices while controlling improper methods.

In the light of the actual social burden of waste disposal that include public spending for waste collection, landfill storage and treatment, and the average of 3kg of waste held per household per day, what individual residents are willing to pay (~7 hours/month) seems extremely low. This reflects their perception that waste is costless and that the management of waste is a “public problem” that should be addressed by public authority and not themselves. This might be the reason why people are not willing to spend time or contribute money toward collective waste management.

Potential actions for improvement can be initiated by the cooperation of the city and its residents. On the one hand, the city could improve the efficiency of waste collection through better scheduling, coordination with communities, junkshops, informal collectors, and improved facilities and practices. Community participation in feasible scheduling and allocation of collection capacities should be one of the immediate agenda. Moreover, although ecocenters, junkshops, and scrap collectors contribute to the reduction of wastes disposed of through the contractor, the city should invest in larger materials recovery facilities to encourage households to recycle food, paper, and plastic wastes. The city should also expand their ecocenter program or create an ordinance that will require all hospitals, resorts, schools, and subdivisions to have an ecocenter. The junkshops should be clearly categorized as those which can accept waste from industries, smaller ones that can only accommodate household recyclables, and those that specialize only in one or several types of recyclables. There should also be an information and education program for scrap collectors since they are acknowledged to be an important key-player of the city’s waste management.

On the other hand, it is important to raise awareness about the concept of “waste management as public goods”. There are two aspects of waste management that relates to the concept of public goods. Waste management provides a better environment for everyone in the community, generating benefit for everyone equally and non-exclusively, whether or not the resident contributes to it. At the same time, because of this non-exclusive nature, everyone is tempted to free-ride on others’ contributions, enjoying the benefits without shouldering the burden of waste management. The residents need to realize that willing and voluntary cooperation is needed to maintain this service. Given the fact that conventional waste tax or

subsidy is not feasible both in terms of public acceptance and public finance, the behavioral approach of raising motivation and willingness to contribute of the community members should be further explored.

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Appendix 1a

Key Informant Interview for Government-Run Facilities
Module A: KII City Office Departments

Name of Respondent:
Age: **Office:** **Title:**
Interviewer:
Date of Interview: **Time of Started:** **Time Ended:**

A. Awareness and functionality of government-run facilities and costs of waste management service

1. What is the role of your office to the solid waste management in Calamba City/Barangay Looc?
2. Are you aware of any government-run facilities in your locality? (1) MRF? (2) Eco-centre?
    a. If yes:
        1. Are the existent facilities functional?
            1.1. Yes: What are their functions?
            1.2. No: What do you think are needed to make these facilities functional?
        2. Do you think that these are efficient?
            2.1. Yes: Why?
            2.2. No: What do think are needed to make these facilities efficient? Why?
        3. Where are these facilities located? (Do you have monitoring reports?)
        4. Who manages these facilities?
    b. If no:
        1. Do you think that these facilities are needed in your locality?
            1.1. Yes, why? Who/which office should initiate the construction of these facilities?
            1.2. No, why?
3. For Calamba City Solid Waste Management Task Force (CCSWMTF) and Barangay Captain:
   How much does the government spend to provide the waste management service in your locality?
   Who/which office decides this budget?
   Do you think this is reasonable? Why?

B. Perception of the waste scenario

1. What is your opinion on the current waste management system in your locality?
    a. Proper: Why?
    b. Improper: Why?
    c. What were the criteria you used to say that the current system is proper/improper?
2. Do you think that there is a waste problem in your locality?
    a. If yes:
        1. Can you elaborate what kind of waste problem?
        2. What do you think are the causes of this waste problem?
        3. What do you think are needed to address this waste problem?
        4. What do you think are the effects (impacts) of wastes to the following?
            a. Environment
            b. Health
        5. Which office do you think should resolve these issues on waste?
    b. If no: What do you think are the more pressing problems in your locality?
        1. What do you think are the causes of these problems?
        2. What do you think are needed to address these problems?
        3. What do you think are the effects of these problems to the environment and health?
3. Who do think should be the key actors to address the waste management system in you locality?

C. Effectiveness and Efficiency of Projects, Campaigns, Programs, and Laws on Waste Management

1. What are the projects, campaigns, and programs conducted by your office pertinent to waste management? (Let the key informant enumerate)
    1.1. Do you think that these projects, campaigns, and programs are effective? Efficient?
        a. If yes, what do you think are the reasons for the success of these initiatives?
        b. If no, what do you think are the things needed to be undertaken in order to make these initiatives effective? Efficient?
    1.2. What is the extent (impacts) of these initiatives?
    1.3. Who benefits from these initiatives?
2. What do you think are the criteria for waste management initiatives to be successful?
3. What do you think are the reasons why waste management initiatives fail?
4. What are the laws/ordinances in you locality pertinent to waste management?
    4.1. Do you think that these laws/ordinances are effective? Efficient?
        a. If yes, what do you think are the reasons why these laws are effective? Efficient?
        b. If no, what do you think are the things needed to be undertaken in order to make these laws/ordinances effective? Efficient?
    4.2. What is the extent (impacts) of these laws/ordinances?

For City Office: How is RA 9003 implemented in the city?
Which specific provisions has the city implemented already?
Which provisions are yet to be implemented?
Concession agreement with Bella.

Key Informant Interview for Private-Sector Waste Management Facilities
Module A: KII Set 2 Bella

Name of Respondent:
Age of Respondent:
Name of Enterprise:
Location of Enterprise:
Name of Interviewer:
Date of Interview: **Time of Started:** **Time Ended:**

Background of Operation

1. Who owns the enterprise?
2. How are you related to the owner of the company?
3. When did the company start to operate?
4. How did you become Calamba City's waste management service provider?
5. When did you start the service?
6. Until when is the concession agreement?
7. Can we have/can we see a copy of the concession agreement?
8. What specific services do you provide to the city?
9. How much is the cost of the service provision per year or per month? What are the major costs items and how much are they?
10. Can you describe the overall waste management service and time line (from collection trucks to landfill)?

Perception of the role(s) of the junkshop in waste management

1. What is your opinion on the current waste management system in Calamba City?
    a. Proper: Why?
    b. Improper: Why?
    c. What were the criteria you used to say that the current system is proper/improper?
2. Do you think that there is a waste problem in Calamba City?
    a. If yes:
        1. Can you elaborate what kind of waste problem?
        2. What do you think are the causes of this waste problem?
        3. What do you think are needed to address this waste problem?
        4. What do you think are the effects (impacts) of wastes to the following?
            a. Environment
            b. Health
        5. Which office do you think should resolve these issues on waste?
    b. If no: What do you think are the more pressing problems in Calamba City?
        1. What do you think are the causes of these problems?
        2. What do you think are needed to address these problems?
        3. What do you think are the effects of these problems to the environment and health?
3. Who do think should be the key actors to address the waste management system in the city?
4. What do you think is/are the role/s of your company in the waste management system in the city? Do you think it is helpful? Why?

Key Informant Interview for Private-Sector Waste Management Facilities
Module A: KII Set 2 Ecocenters

Name of Respondent:
Age of Respondent:
Name of Enterprise:
Location of Enterprise:
Name of Interviewer:
Date of Interview: **Time of Started:** **Time Ended:**

Background

1. Who owns this Ecocenter?
2. When did this Ecocenter start to operate?
3. Who initiated the utilization of an Ecocenter?
4. What is the area of this facility?
5. What is the responsibility of this Ecocenter to the waste management of the school/subdivision or barangay?

Material and Income Flow

1. Can you describe the waste processing in the Ecocenter (where wastes come from, wastes recycled, where sold after)? Fill the table below and draw a process diagram.

Material	Volume/day	Origin	Transformed into?	Percent Recovered	Price

2. Can you enumerate the items that you had to purchase or pay for before starting this Ecocenter?

Item	Price	Date purchased	Expected lifespan

3. How much is the monthly operation and maintenance cost for this Ecocenter?

a. Salaries for operation, maintenance, administration, and security
b. Electricity and water bills
c. Equipment and facility maintenance
d. Supplies
e. Residual/biodegradable waste disposal

Perception of the waste scenario

1. What is your opinion on the current waste management system in your locality?
    a. Proper: Why?
    b. Improper: Why?
    c. What were the criteria you used to say that the current system is proper/improper?
2. Do you think that there is a waste problem in your locality?
    a. If yes:
        1. Can you elaborate what kind of waste problem?
        2. What do you think are the causes of this waste problem?
        3. What do you think are needed to address this waste problem?
        4. What do you think are the effects (impacts) of wastes to the following?
            a. Environment
            b. Health
        5. Which office do you think should resolve these issues on waste?
    b. If no: What do you think are the more pressing problems in your locality?
        1. What do you think are the causes of these problems?
        2. What do you think are needed to address these problems?
        3. What do you think are the effects of these problems to the environment and health?
3. Who do think should be the key actors to address the waste management system in you locality?

Key Informant Interview for Private-Sector Waste Management Facilities
Module A: KII Set 2 Junkshops

Name of Respondent:
Age of Respondent:
Name of Enterprise:
Location of Enterprise:
Name of Interviewer:
Date of Interview: **Time of Started:** **Time Ended:**

Background of Operation

1. Who owns the enterprise?
2. How are you related to the owner of the enterprise?
3. When did the enterprise start to operate?
4. What is the area of the junkshop?

Material and Income Flow

1. Can you describe the waste processing in your facility (where wastes come from, wastes recycled, where sold after)? Draw diagram.
2. Please fill the table below.

Type of materials in the junkshop and price list

Material	Unit	Volume/day	Buying price	Selling price

3. Can you enumerate the items that you had to purchase or pay for before starting this junkshop?

Item	Price	Date purchased	Expected lifespan

3. How much is the monthly operation and maintenance cost for this Junkshop?

a. Salaries for operation, maintenance, administration, and security
b. Electricity and water bills
c. Equipment and facility maintenance
d. Supplies
e. Residual/biodegradable waste disposal

6. What is the basis of costing the products procured/sold?

Perception of the role(s) of the junkshop in waste management

1. What is your opinion on the current waste management system in your locality?
    a. Proper: Why?
    b. Improper: Why?
    c. What were the criteria you used to say that the current system is proper/improper?
2. Do you think that there is a waste problem in your locality?
    a. If yes:

1. Can you elaborate what kind of waste problem?
2. What do you think are the causes of this waste problem?
3. What do you think are needed to address this waste problem?
4. What do you think are the effects (impacts) of wastes to the following?
    a. Environment
    b. Health
5. Which office do you think should resolve these issues on waste?

b. If no: What do you think are the more pressing problems in your locality?
1. What do you think are the causes of these problems?
2. What do you think are needed to address these problems?
3. What do you think are the effects of these problems to the environment and health?

3. Who do think should be the key actors to address the waste management system in you locality?
4. What do you think is/are the role/s of junkshops in the waste management system in your locality? Do you think it is helpful? Why?
5. How many junkshops are operating in the same catchment areas? Do you consider them as collaborators or rivals? Why?

Key Informant Interview for Private-Sector Waste Management Facilities
Module A: KII Set 2 MRFs

Name of Respondent:
Age of Respondent:
Name of Enterprise:
Location of Enterprise:
Name of Interviewer:
Date of Interview: **Time of Started:** **Time Ended:**

Background

1. Who owns this MRF?
2. When did this MRF start to operate?
3. What is the area of this facility?
4. What is the responsibility of this MRF to the waste management of the city?

Material and Income Flow

1. Can you describe the waste processing in the MRF (where wastes come from, wastes recycled, where sold after)? Fill the table below and draw a process diagram.

Material	Volume/day	Origin	Transformed into?	Percent Recovered	Price

2. Choose the kind of MRF from the table.

MRF Capacity Range (tpd)	Type	Investment	Civil Works[b]	Equipment	Indirect Cost[c]	O&M	Basic Equipment
≤2	Manual	1.13	1	0.03	0.1	0.1	Sorting table, weighing scale
10–15	Semi-automated	24.8[d]	20.5	2.5	1.8	2.5	Single-line conveyor, sorting table, small payloader, small baler, weighing scales (2)
40–50	Automated	68.5[e]	33	24	11.7	7	1 sorting line with conveyor system, hopper, trommel, magnetic separator; 2 payloaders, 2 forklifts, 2 balers, and 2 weighing scales
80–100	Automated	121.8[f]	52.3	57	12.5	12	2 sorting lines with conveyor system, 2 hoppers, 2 trommels, 2 magnetic separators, 2 payloaders, 2 forklifts, 1 bottle perforator, 4 balers, 1 weigh bridge, and 4 weighing scales

MRF = materials recovery facility, O&M = operations and maintenance, tpd = tons per day.
a Indicated cost does not include lot acquisition as this varies depending on the location, accessibility, and nearby land use.
b Includes site development, access road, fence and building construction, and utilities.
c Includes permitting, design, site investigation, training of personnel, and contingencies.

d 2010 cost at a consumer price index of 127.97.
e 2005 cost at a consumer price index of 100.
f 2006 cost at a consumer price index of 106.24.

Perception of the waste scenario

1. What is your opinion on the current waste management system in your locality?
    a. Proper: Why?
    b. Improper: Why?
    c. What were the criteria you used to say that the current system is proper/improper?
2. Do you think that there is a waste problem in your locality?
    a. If yes:
        1. Can you elaborate what kind of waste problem?
        2. What do you think are the causes of this waste problem?
        3. What do you think are needed to address this waste problem?
        4. What do you think are the effects (impacts) of wastes to the following?
            a. Environment
            b. Health
        5. Which office do you think should resolve these issues on waste?
    b. If no: What do you think are the more pressing problems in your locality?
        1. What do you think are the causes of these problems?
        2. What do you think are needed to address these problems?
        3. What do you think are the effects of these problems to the environment and health?
3. Who do think should be the key actors to address the waste management system in you locality?

Key Informant Interview for Private-Sector Waste Management Facilities
Module A: KII Set 2 Scrap Collectors

Name of Respondent:
Age of Respondent:
Name of Interviewer:
Date of Interview: **Time of Started:** **Time Ended:**

Background

1. How long have you been working as a scrap collector?
2. Do you collect scraps daily? If no, how many times do you collect scraps in a week?
3. What kind of scraps do you collect? Do you collect only specific scraps?
4. How many households can you visit in a day?
5. Do you collect scraps only in your barangay? If no, how many barangays can you visit in a day?
6. Do you sell the scraps right after collection?
7. Where do you sell them and what factors do you consider in choosing the junkshop or other recycling facility to which you would sell the scraps?

Material and Income Flow

1. Fill the table below:
(Ask to fill out a list of items bought and sold in a day for an honorarium.)

Material	Unit	Volume/day	Buying price	Selling price

2. Can you enumerate the items that you had to purchase or pay for before you started collecting scraps?

Item	Price	Date purchased	Expected lifespan

3. How much do you usually spend in a day, buying pet bottles, glass bottles, cans, etc.?
4. How much is your usual daily net income?
5. How much do you spend per day for snacks or water while collecting scraps? Other expenses?

Perception of the role(s) of scrap collectors in waste management

1. What is your opinion on the current waste management system in your locality?
    a. Proper: Why?
    b. Improper: Why?
    c. What were the criteria you used to say that the current system is proper/improper?
2. Do you think that there is a waste problem in your locality?
    a. If yes:
        1. Can you elaborate what kind of waste problem?
        2. What do you think are the causes of this waste problem?
        3. What do you think are needed to address this waste problem?

4. What do you think are the effects (impacts) of wastes to the following?
    a. Environment
    b. Health
5. Which office do you think should resolve these issues on waste?

b. If no: What do you think are the more pressing problems in your locality?

1. What do you think are the causes of these problems?
2. What do you think are needed to address these problems?
3. What do you think are the effects of these problems to the environment and health?

3. Who do think should be the key actors to address the waste management system in you locality?

4. What do you think is/are the role/s of scrap collectors in the waste management system in your locality? Do you think they are helpful? Why?

Appendix 1b

Household Survey Questionnaire

Block I - General Socio-Demographic and Economic Information. Questions in the first block of the HH questionnaire aimed to characterize the households in Looc based on the size of the HH, type and source of income, type of construction materials used for houses, source of water, and type of toilet facilities as indicators of the overall economic status. The size of the HH is important to identify the number of people producing various types and volume of waste. In addition, types and sources of income measure the capability of the HHs to acquire products that would then turn into wastes.

Block II - Types of Wastes and Disposal Practices in the Household. The community was assessed based on the types of wastes produced and the disposal practices and methods. The types of wastes considered in the study were categorized as: 1) biodegradable (*i.e.* predominantly food wastes, papers, and perishables); 2) non-biodegradable residuals (*i.e.* predominantly wrappers and residuals from food items and the likes); and 3) non-biodegradable recyclables (*i.e.* predominantly scraps like PET bottles, aluminum, steel, galvanized iron, etc. which can be sold).

Block III - Awareness of Facilities, Ordinances, Programs, and Services on Waste Management. Two indicators were used in the analysis of the general awareness of the community with their current waste management system: 1) waste management facilities; and 2) government ordinances, programs, and services on waste management. Awareness of the community in the existence, presence/absence criterion, affects their ability to follow measures when it comes to waste handling, particularly segregation.

Block IV - Perceptions and Participation on Solid Waste Management. Community's perception and participation to programs in solid waste management were assessed by the questions in this block. The HHs were asked if they think a waste management problem exists in the area and if they think wastes have an effect in the barangay. They were also asked if they have participated in any initiatives for waste management and if they are willing to participate to future programs related to waste management.

Block V - Economic Instruments for Solid Wastes Management. In this part of the survey, community's participation in the selection of economic instruments was elicited. Based on market-, incentive-, and policy-based studies, selection of suitable instruments is largely dependent on the suitability, capacity, and priority of the community. Thus, the community's participation will address the necessary instruments that will be utilized in order to develop alternative schemes for their waste management system.

Block VI - Floods and Solid Waste Management. HHs were asked about the impacts of previous flooding experiences that they had. They were also asked what they think are the common causes of flooding.

Socio-Economic Assessment of Domestic Wastes in Barangay Looc, Calamba City

Project Area:_____
(Barangay/Sitio) (Municipality) (Province)

_____
(Name of Enumerator) (Date) (Time Started) (Time Ended)

CERTIFICATION
(*To be filled-up after the survey form has been completed*)

I hereby certify that this data set was obtained by me personally and in accordance to the instructions given.

_____
Signature over Printed Name of Enumerator Date Completed/Edited Date Submitted

_____
Noted: Signature over Printed Name of Reviewer Date Reviewed Date Approved

The Socio-Economic Evaluation Team guarantees confidentiality of all information contained in this questionnaire

BLOCK I
General Socio-Demographic & Economic Information

A. Basic Information on Household Members

1. Name: _____ 1.a. Check if head of household ☐
1. b. If not head of household, what is your relation to the head of household? _____
1.1 Age: _____ 1.2. Gender: _____

2. Are you a migrant here?

☐NO

☐YES
2.1 Where did you live before coming here? _____
2.2 How many years have you stayed here? _____

3. Household size: _____ 3.1. Number of dependents: _____

4. Household Type (e.g. nuclear, extended) _____

5. Educational Attainment of the head of household:
☐Elementary ☐High School ☐College ☐Others (Please specify) _____

6. Employment status of the head of the household: ☐Employed ☐Unemployed

7. What is your family's primary source of living?
☐Agriculture ☐Employed in a private company/agency ☐Pension
☐Fisheries ☐Self-employed (i.e. small-scale enterprise) ☐Others: _____
☐Employed in a government office ☐Remittance

7.1. What are your family's other sources of living?

_____

_____

8. How would you classify your family?

☐POOR

8.1. If poor, how much income would a family have per month in order to be classified poor?

☐< 5,000 ☐> 15,000 but less than 20,000 ☐Others, specify _____

☐> 5,000 but less than 10,000 ☐> 20,000 but less than 30,000

☐> 10,000 but less than 15,000 ☐more than 30,000

☐AVERAGE

8.2. If average, how much income would a family have per month in order to be classified average?

☐< 5,000 ☐> 15,000 but less than 20,000 ☐Others, specify _____

☐> 5,000 but less than 10,000 ☐> 20,000 but less than 30,000

☐> 10,000 but less than 15,000 ☐more than 30,000

☐WELL-OFF

8.3. If well-off, how much income would a family have per month in order to be classified well-off?

☐< 5,000 ☐> 15,000 but less than 20,000 ☐Others, specify _____

☐> 5,000 but less than 10,000 ☐> 20,000 but less than 30,000

☐> 10,000 but less than 15,000 ☐more than 30,000

9. Housing Characteristics, Sources and Status of Drinking/Household Water Supply

9.1. House construction materials (***for observation only***)

☐Temporary (Predominantly light materials)

☐Semi-permanent (Mixed wooden-light materials; mixed concrete-light materials)

☐Permanent (Predominantly wooden/concrete/mixed wooden-concrete)

9.2. Water supply

_____ Drinking: 1 – Artesian/Pump well 4 – Piped Water 7 – Purified water
2 – Spring/Creek 5 – Rain water
3 – River 6 – Bottled Water

_____ Cooking: 1 – Artesian/Pump well 3 – River 5 – Rain water
2 – Spring/Creek 4 – Piped Water 6 – Purified water

Other uses:

_____ Bathing: 1 – Artesian/Pump well 2 – Spring/Creek 3 – River 4 – Piped Water 5 – Rain water

_____ Laundry: 1 – Artesian/Pump well 2 – Spring/Creek 3 – River 4 – Piped Water 5 – Rain water

_____ Cleaning: 1 – Artesian/Pump well 2 – Spring/Creek 3 – River 4 – Piped Water 5 – Rain water

_____Others (specify): 1 – Artesian/Pump well 2 – Spring/Creek 3 – River 4 – Piped Water 5 – Rain water

BLOCK II
Types of Wastes and Disposal Practices in the Household

Types and Sources of Wastes

1. Who in the family is handling your solid wastes?
☐ Father ☐Mother ☐Others, specify _____

2. Date of last waste collection: _____

3. Please fill the table below for the types and amount of wastes generated/held by your household on the day of the interview. Also indicate the how you treat the wastes using the codes given in the separate sheet.

	Unit (kg / pcs / cup)	**Quantity** (0, number, or ?)	**Primary Practice (Use Code)**	**Secondary Practice (Use Code)**
Food Wastes	kg / cups			
Paper wastes				
paper bag from grocery stores (brown)	kg / pcs /			
tissue	kg / pcs /			
tissue core	kg / pcs /			
receipt	kg / pcs /			
typewriting	kg / pcs /			
Boxes				
shoe boxes	kg / pcs /			
pizza	kg / pcs /			
soap	kg / pcs /			
milk	kg / pcs /			
cheese	kg / pcs /			
cake	kg / pcs /			
fruit juices	kg / pcs /			
Plastics				
Pet bottles				
500 mL	kg / pcs /			
1 L	kg / pcs /			
4L	kg / pcs /			
Coke 1.75L	kg / pcs /			
Soft plastics				
shampoo	kg / pcs /			
plastic bag	kg / pcs /			
sando bag small	kg / pcs /			
sando bag big	kg / pcs /			
toothpaste	kg / pcs /			
soap	kg / pcs /			

laundry soap	kg / pcs /			
seasoning (ajinomoto, magic sarap)	kg / pcs /			
Soy sauce	kg / pcs /			
noodles	kg / pcs /			
chips	kg / pcs /			
juice tetra pack	kg / pcs /			
biscuits	kg / pcs /			
home-made biscuits	kg / pcs /			
small mixed nuts	kg / pcs /			
candies	kg / pcs /			
coffee	kg / pcs /			
hotdogs	kg / pcs /			
dishwashing soap	kg / pcs /			
disposable s	kg / pcs /			
Hard plastics				
shampoo bottle	kg / pcs /			
bleach	kg / pcs /			
lotion	kg / pcs /			
deodorant	kg / pcs /			
moisturizer	kg / pcs /			
powder	kg / pcs /			
seasoning	kg / pcs /			
Soy sauce	kg / pcs /			
dishwashing soap	kg / pcs /			
laundry soap	kg / pcs /			
plastic utensils	kg / pcs /			
bucket	kg / pcs /			
monoblock	kg / pcs /			
Glass Wastes				
oil/seasoning	kg / pcs /			
Sauce	kg / pcs /			
liquor	kg / pcs /			
medicine (amber)	kg / pcs /			
vase	kg / pcs /			
aquarium	kg / pcs /			
windows (jalousie)	kg / pcs /			
mirror	kg / pcs /			
TV screen	kg / pcs /			
Metals				
Canned goods	kg / pcs /			
Rubber				
tires	kg / pcs /			
slippers	kg / pcs /			
shoes	kg / pcs /			

Leather				
belt	kg / pcs /			
bag	kg / pcs /			
Others				
underwear	kg / pcs /			
clothes	kg / pcs /			
diaper	kg / pcs /			
napkin	kg / pcs /			
socks	kg / pcs /			
bed	kg / pcs /			
battery	kg / pcs /			
watch	kg / pcs /			

4. Where do you store your garbage before it is disposed?

☐trash can ☐plastic bag ☐others, specify
☐garbage bag ☐store room ☐cannot say

5. What is your opinion about your method of disposing household wastes?

☐everyone else is doing it
☐can probably have problems in the end, please specify _____
☐satisfied, nothing is wrong
☐others, please specify _____
☐cannot say

BLOCK III
Awareness on the Facilities, Ordinances, Programs, and Services on Waste Segregation

A. Waste Management Facilities

1. Do you have any government-run waste management facility in your community?

☐NO

1.1. If no, what do you think is the suitable waste management facility in your community? Explain.

_____
_____

☐YES

1.2. What is the type of waste management facility present in your community?

☐Materials Recovery Facility (MRF) ☐Ecocentres

1.3. Where are these facilities located?

☐in a strategic location within the barangay
☐in a proximal area in the barangay but is not readily accessed by ordinary community members
☐in an area away from the barangay but is ran by barangay office
☐cannot say

1.4. What do you think are the functions of these facilities?
☐serve as a containment facility for recyclable materials
☐a communal area for organic waste disposal
☐convert recyclable materials into useful end products
☐an area designated for converting biodegradable wastes to fertilizer
☐cannot say

1.5. If yes, what can you say about the functionality and efficiency of these facilities?
☐no idea
☐functional and efficient
☐functional but inefficient
1.5.1. What do you think are the things to be done to improve their efficiency?
_____
_____
☐not functional
1.5. 2. What do you think are the things needed to functionalize these facilities?
_____
_____

2. Are there junk shops in the community?
☐I don't know

☐NO
2.1. Do you think the community will benefit with the existence of junkshops?
☐Yes; what do you think are these benefits?
_____
_____
☐No; why?
_____
_____

☐YES
2.2. If yes, how many junkshops are there in the community?
☐1 to 5 ☐6 to 10 ☐10 to 20 ☐more than 20

2.3. Do you sell your recyclable wastes in these junk shops?
☐Yes ☐No

2.3.1. If yes, how often do you sell your recyclables to these junkshops?
☐daily ☐monthly ☐cannot say
☐weekly ☐depends on the volume, specify _____

2.3.2. How much do you get from selling your recyclables to these junk shops?
☐PhP 10 to 50 ☐PhP 501 to 1000
☐PhP 51 to 100 ☐more than PhP 1000
☐PhP 101 to 500 ☐cannot say

B. Government Ordinances, Programs, and Services on Waste Management

1. Do you know any ordinance on waste management in your community?

☐NO

1.1 What do you think are the ordinances that should be implemented in the barangay?

_____
_____

☐YES

1.2. Kindly fill the table below.

Ordinance	Follow?	Reason	Good/bad points of ordinance
	☐Yes ☐No		
	☐Yes ☐No		
	☐Yes ☐No		
	☐Yes ☐No		
	☐Yes ☐No		

2. Do you know any waste management program in your community?

☐NO

2.1 What do you think are the programs that should be implemented in the barangay?

_____
_____

☐YES

2.2. Kindly fill the table below.

Programs	Follow?	Reason	Good/bad points of programs
	☐Yes ☐No		
	☐Yes ☐No		
	☐Yes ☐No		
	☐Yes ☐No		
	☐Yes ☐No		

3. In what ways do you think can the following be of help to manage waste in the community?

a. Local community people

_____
_____

b. LGUs/Local Leaders

_____
_____

c. Non-government organizations

_____
_____

d. Others, specify (e.g. youth, women's sector)

_____
_____

4. How often does the city collect waste from your house?

Frequency	City	
	Biodegradable	Non-Biodegradable
Daily		
Weekly:		
☐Monday		
☐Tuesday		
☐Wednesday		
☐Thursday		
☐Friday		
☐Saturday		
☐Sunday		
Others (specify): _____ _____		

5. Are you satisfied with the current waste collection services of the city?

☐Yes

☐No; what do you think must be done?

_____

_____

BLOCK IV
Perceptions, Participation, and Willingness-to-pay for a Localized Solid Waste Management System

A. Perception of the waste scenario in the barangay

1. Do you think that there is a waste problem in your barangay?

☐No

☐YES

1.1. What kind of problem is it?

_____

1.2. What do you think are the things that should be done to address this problem?

a) _____
b) _____
c) _____
d) _____
e) _____

2. Do you think that wastes have effects in the barangay?

☐No

☐YES

2.1. What are these? Kindly cite at least five (5) effects of wastes in the barangay which affect, affected, or continuously affecting your household and rank them according to the degrees of effect.

Perceived Effects of Waste	Rank

B. Level of participation and willingness to engage in waste management

3. Have you participated in any activity in the barangay pertinent to waste management?

☐NO

3.1. Are you willing to participate in activities pertinent to waste management in your barangay?

☐Yes ☐No, why? _____

☐YES

3.2. If yes, what are these activities? Kindly write the activities pertinent to waste management that you are willing to participate to.

a) _____
b) _____
c) _____
d) _____
e) _____

4. Are you willing to have a localized waste management system in your barangay?

☐NO

4.1.Why?

_____
_____

☐YES

4.2. A localized waste management system will entail costs of operations that will be shouldered by the barangay. How much are you willing to contribute to make this system operational?

PhP _____ _____ Man hours

4.2.1. How often do you want to contribute?

☐daily ☐weekly ☐monthly ☐others, specify _____

5. Do you think that waste management is important? Why?

_____
_____

BLOCK V
Economic Instruments for Solid Waste Management

1. Do you pay for the waste management service provided for you by the city government?

☐Yes How much? PhP _____

☐No; why?

_____
_____
_____

2. What comes to mind when you hear the word "tax"? Write at most five words that are accompanied by this word.

a) _____
b) _____
c) _____
d) _____
e) _____

2.1. Why did you choose these words?
a) _____
b) _____
c) _____
d) _____
e) _____

3. Waste management, in general, entails the provision of rewards and application of reprimands. The former is applied if proper waste management is implemented and the latter if otherwise. Do you think that the application of these rewards and reprimands is applicable in your barangay?

☐NO

3.1. If no, what do you think is the appropriate system that should be applied to your barangay pertinent to waste management?
_____
_____
_____

☐YES

3.2. What do you think are the appropriate rewards that should be given if proper waste management is implemented?
_____
_____
_____

3.3. What do you think are the appropriate reprimands that should be applied if a household does not have a proper waste management system?
_____
_____
_____

4. Do you have access to the internet?

☐NO

4.2. What do you think are the tools that should be used in disseminating information in your barangay? Why?
_____
_____

☐Yes

5. Do you have access in any social media?

☐No

☐YES

5.1. What are the social media that you have access to?

☐Facebook ☐Twitter ☐Instagram ☐Others, specify _____

5.2. In the selected social media, kindly write down at most five subjects that capture your interest and rank them according to the degree of interest.

Selected Social Media	Subject	Rank

5.3. Do you think that social media is an effective tool in disseminating information?

☐Yes, why?
_____

☐No, why?
_____

BLOCK VI
Floods and Solid Waste Management

1. Have you ever been affected by flooding?

☐No

☐YES

1.1. When was the most recent flooding experience that you had? _____ (Month and Year)
1.2. What was the name of the typhoon/monsoon that caused the flooding? _____
1.3. How were you affected by the flood? Kindly fill out the table below.

Category	Impacts
Livelihood/Jobs/Income	
Health	
House/Infrastructure/Properties	
Electrical service	
Others (specify):	

1.4. Based on your opinion, what are the top 5 causes of flooding?

1.
2..
3.
4.
5.

Appendix 1c

Waste Disposal Practice Codes (common for segregated and unsegregated wastes)

Codes/signs	Main practice	Code	Detailed practice
Sunog	**Burn**	10	
	Bury	20	
Likod		21	Backyard
Bukid		22	Farm side
Tabing Ilog		23	Near river banks
Iba		24	Other: specify in words
Hindi		29	Cannot say
	Leave	30	
Kalsada		31	Leave on the street
Tambakan		32	Discard in the communal container
Dumpsite		33	Bring in dumpsite/designated area
Ipon		34	Store to be collected
		35	Collect
	Throw	40	
Ilog		41	In river
Creek		42	Creek
Lawa		43	Lake
Iba		44	Other: specify in words
Hindi		49	Cannot say

Waste Recycling Practices Codes used for the segregated items

Codes/signs	Main practice	Code	Detailed practice
	Sell	50	
Magbobote		51	Sell to the collectors
Junkshop		52	Bring to sell at the junk shops
	Give	60	
Libre		61	Give is to the collectors for free
Bigay		62	Give away to others who will use/sell
	Reuse	70	
Pataba		71	Use as compost
Pakain		72	Feed animals
		73	Use as firewood

Appendix 2

Waste Conversion Table

Waste	Unit	Weight (kg)	Notes
Food Wastes	1 bowl	0.25	From BHWs
	1 cup	0.2	From BHWs
Paper Wastes			
paper bag from grocery stores (brown)	1 pc	0.0395558	
tissue	1 pc	0.03	30gsm
tissue core	1 pc	0.0053904	
receipt	1 pc	0.002	
typewriting	1 pc	0.006666667	80gsm
Boxes			
shoe boxes	1 pc	0.3	regular shoes (Milano)
pizza	1 pc	0.153	Pizza hut 13"
soap	1 pc	0.0095099	Silka
milk	1 pc	0.153	apply pizza box's weight
cheese	1 pc	0.0087278	Eden
cake	1 pc	0.153	apply pizza box's weight
fruit juices	1 pc	0.153	apply pizza box's weight
Plastics			
Pet bottles			
500 mL	1 pc	0.056	apply coke 1.75
1 L	1 pc	0.056	apply coke 1.75
4L	1pc	0.056	apply coke 1.75
Wilkins (16 L)	1 pc	0.056	apply coke 1.75
Coke 1.75L	1 pc	0.056	
Soft plastics			
shampoo	1 pc	0.0026558	Sunsilk
plastic bag	1 pc	0.0006074	for take out food
sando bag small	1 pc	0.001982	stripes
sando bag big	1 pc	0.002	
toothpaste	1 pc	0.0034247	Half Colgate
soap	1 pc	0.0006839	Safeguard
laundry soap	1 pc	0.0008858	Half tide
seasoning (ajinomoto, magic sarap)	1 pc	0.000763	Magic sarap
Soy sauce	1 pc	0.0031328	Datu puti
noodles	1 pc	0.0012888	Payless
chips	1 pc	0.004373	Piatos
juice tetra pack	1 pc	0.0059758	Zesto
biscuits	1 pc	0.0010406	Cream-o
home-made biscuits	1 pc	0.0009725	
small mixed nuts	1 pc	0.0005605	Dingdong

candies	1 pc	0.0001579	Lush
coffee	1 pc	0.0012128	Kopiko
hotdogs	1 pc	0.0012128	apply coffee
dishwashing soap	1 pc	0.0012128	apply coffee
disposable cups	1 pc	0.0023167	
Hard plastics			
shampoo bottle	1 pc	0.06	Sunsilk 350mL
bleach	1 pc	0.045	Zonrox 500mL
lotion	1 pc	0.04	Vaseline 100mL
deodorant	1 pc	0.035	White Result 75mL
moisturizer	1 pc	0.035?	
powder	1 pc	0.02	Johnson's 50g
seasoning	1 pc	0.048	
Soy sauce	1 pc	0.048	Silver Swan 1L
dishwashing soap	1 pc	0.045	apply bleach
laundry soap	1 pc	0.045	apply bleach
plastic utensils	1 pc	0.0025246	spoon
bucket	1 pc	0.6	white appox. 20L
monoblock	1 pc	1.4	without back rest
Glass Wastes			
oil/seasoning	1 pc	0.23	Oil
Sauce	1 pc	0.25	Mang Tomas 325g
liquor	1 pc	0.275	San Miguel Light 330mL
Metals			
Canned goods	1 pc	0.039	Master Sardines