



Promoting Environment at Grassroots: Barangay Institutional Mapping of Solid Waste Management

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Received: 29 July 2019; Revised: 21 October 2019; Accepted: 24 October 2019

Abstract

This research aims to address the need for an effective local urban solid waste management framework. To accomplish this, it focused on the institutional networks that flow within and link out of the *barangay* (Philippine village) as the micro level of Local Government. The paper describes networked institutions as composed 3 variables adapted from Ostrom's institutional analysis and development framework. These are 1) actors, 2) actions, and 3) lines of connections. It uses qualitative comparative method with a Most Different and Most Similar (MDSD) research design to analyze cases of network similarities between performing barangays, similarities between non-performing barangays, and differences across performing and non-performing. The locus is Metro Manila, capital of the Philippines, unique to be the location of barangays with increasing solid waste production, along with qualified models of solid waste management.

Analyses arrived at three significant findings: First, model barangays have clear relationships with institutional and non-institutional support from outside its solid waste management space. Second, model barangays have institutional implementing units complemented by non-institutional groups. Third, model barangay solid waste management is not simply about waste handling, but also network management. Finally, model barangays are composed of groups which are actors interlinked in a solid waste management network. Barangays are better able to implement grassroots solid waste management through a network with established lines within and outside their space. It is recommended that barangay officials need support and encourage the formation of social groups, and to link with them to achieve better results. This is facilitated through collaboration with between institutional and non-institutional groups.

Keywords: Solid Waste Management, Barangay, Institutions, Network, Village Management

Introduction

The political geography of the Philippines places the heart of power and wealth in Metro Manila. This Metropolis is the center of government. It houses Malacañang Palace, the Supreme Court, the Senate, and the House of Representatives. Metro Manila is also a hub of business and commerce. The cities of Manila, Makati, Pasay, Pasig, Quezon City and Taguig are all areas of commerce within the Metro.

Underneath all these goods is the spread of garbage. The City of Manila, from which the metro is named is among the top producers of solid waste in the country (Alave, 2011). Six (6) of its districts are listed as dirtiest among cities of Luzon (Agoncillo, 2016). With garbage being collected from these areas averaging tons between 40 and 50, the situation is quite alarming (The Philippine Star, 2016).

However, Metro Manila also has barangays which are good examples of clean and sustainable living. The Metro Manila Development Authority hailed several barangays as models in implementing Republic Act (RA) 9003 also known as the Ecological Solid Waste Management Law. Among these are barangay Potrero in Malabon (Senate of the Philippines, 2016), and barangay Fort Bonifacio in Taguig (Brizuela, 2015). The former was once a flood prone area riddled with solid waste, now an awarded barangay for its efforts on environmental management. The latter is the location of a major thoroughfare which was formerly a huge unofficial garbage



dump. At present, the same area is now a functional Materials Recovery Facility (MRF) that looks more of a garden park than a junkshop or dumpsite.

Looking into worst case and best-case barangays in terms of solid waste management, this research addresses the problem of the missing variable: the role of governance at the grassroots level. The author envisions structures and relationships within the system rooted at the level of the masses as a way of knowing how some barangays are successful, while others are not.

The Grassroots Governance Solution: Institutional Mapping

An institutional map for local governments (cities, municipalities, and barangays) can be used to address the problem of increasing garbage production and the need for clean, sustainable living in Metro Manila. It is a governance tool that can be used to empower barangays with a way to organize their own systems to stimulate social capital and to uphold the barangay as a working institution towards sustainable living (United Nations Development Programme, 2012).

Communities can be made better given proper policies and implementation tools. Neighborhoods in countries such as the United States and Australia have policies on maintaining household yards with growing plants (University of Florida, 2015; The State of Queensland Residential Tenancies Authority, n.d.). Some countries though have warnings to tourists against simply drinking tap water or even eating ice, due to the contamination of the water table (World Bank Group, 2015). Local development in the Philippines can be made better through institutions and working arrangements of such institutions with each other.

The advent of the Metro Manila Development Authority's (MMDA) Barangay Power Award brought to the public eye the idea that barangays, whether belonging to rich communities or not so well to do ones can accomplish noble ecological goals. The MMDA had awardees since 2012 providing a set locus of sources for a case study on how these barangays were able to promote clean and healthy areas in their vicinity. The grassroots approach is based on the idea that those who live in the community have more concern and knowledge regarding their own conditions (Dias, 2017). Structures within and outside barangays towards achieving a goal can be mapped out. And this map can serve as reference for other barangays to follow. This helps to fulfill the goals of Republic Act 9003 (Ecological Solid Waste Management Act of 2000). The institutional map can also be used as a training tool in Sustainability Education, and for advocacy seminars with local governments in promoting proper solid waste management at the grassroots level as a fluid paradigm of resilience (Chandler & Coaffee, 2017).

This research focuses on the governance side of environmental sustainability, particularly the presence of particular institutions, actions, and interactions that lead to better service delivery. In this case, better solid waste management. Sociologist Robert Merton (Ryan, 2005) proposed to understand social groups and institutions and on how they function for society, leading to structural functionalism. Political science, as a discipline, grew from institutionalism to the new institutionalism (Robertson, 1993), with camps debating on whether institutions work towards delivery of public goods and services or not. Putnam (1994) brings together human behavior and organizations through his theory on social capital. Promoting organizations as resources that can be used by individuals within society. Lazer and Friedman (2007) supported the idea that these institutions can be networked for better performance in administering to the public's needs. Ostrom identified 7 variables in analyzing institutions. These include: biophysical conditions, attributes of community, rules-in-use, action situation, interaction, outcomes (Ostrom, 2011).



Through institutional arrangements, the barangay can become an effective agent of sustainability through proper implementation of solid waste management (Hollingsworth, 2000). In support of this goal, this paper will answer the following questions: First, which institutions outside the barangay are able to help them in their task of implementing solid waste management. Second what institutional structures have been created in model barangays in order to better implement solid waste management? Third, what are the actions or activities that these institutions do in order to address solid waste management? And fourth, how are these institutions positioned strategically with each other for the better implementation of solid waste management. The author hypothesizes that model barangays have institutional arrangements that help facilitate the implementation of the solid waste management policy.

Methods and Materials

Design

This research used comparative politics research design. It features the barangay as an aspect of Philippine politics. For one, it is not just a small unit in the Philippine political system, but an institution, capable of organizing its constituents towards positive action on a community concern, in this case, sustainability. The other aspect of the barangay is that as a small unit, it is a microcosm for the nurture of social capital (Sanz, 2016) capable of working together with the official institution (barangay officials) in the delivery of public goods (sustainable community).

As a qualitative comparative study, the research follows case study research design. It uses semi-structured interviews and focus group discussions guided by indicators from Ostrom's (2009) framework (See figure 1). Ostrom used 7 variables, however, this research adapts to it by limiting only to the following three: Actors (Institutional Structures), Actions (Institutional Activities), and Positions (Institutional Arrangements) (Ostrom, 2011), all of which focuses on institutions as actors which are part of a network. Since institutions are also composed of individual people, this research identifies the following stakeholders and thus experiential primary sources: barangay officials (either elected in the form of Barangay Chair or Council Member, or civil servant such as Barangay Secretary), personnel involved in solid waste management implementation (waste collectors and street sweepers).

Subjects and Study Site

Data was from two of what this research calls 'politico-qualitative' loci, locations chosen based on quality relevance. One is on non-performing barangays, the other is on model barangays. The subject of study is barangay institutions, specifically, barangay officials and employees since they are the ones who experience dealing with governance decisions and implementation at the community level. As a qualitative research, it describes the experience of the power holders, finding out institutional means that enable towards better policy implementation. The study sites are in Metro Manila: two from Manila City, one from Malabon City, and another from Taguig City. These locations were chosen based on data on high incidence of garbage (non-performing barangays), and Metro Manila Development Authority Awards on Barangay Power (model barangays). Each barangay whether non-performing or model had participant selections coming from three areas: resident, Barangay Official, and Waste Worker.

Interview participants were 8 from each non-performing barangay, composed of: Barangay Chair, Barangay Secretary, members of the Barangay Council, waste collectors, and street sweepers. The focus groups per model



barangay were mixed group, each composed of 8 participants. Participant selection criteria were as follows: barangay chair or council member or barangay secretary, waste collectors or street sweepers. Data for the focus group were also validated through field notes during ocular visit at the Materials Recovery Facility of each barangay.

Data Collection Procedure

Data collection followed the two stages. First, barangays visited were the non-performing ones. There were two activities done after briefing of participants and securing of consent. Each participant was given a graphing paper and asked to list the institutions which they interact with in terms of implementation or compliance with proper waste disposal. Once the list was accomplished, participants spread out these institutions in the graphing paper, showing distance and ease of access or interaction. Interview followed based on these drawings.

The second activity was the actual interview. Each interview was semi-structured. Having a set of questions and were allowed follow up questions to encourage details. The graphs were discussion points for the interview. Questions were towards institutions that were written in their respective lists. Instead of interview, focus group discussion was used in model barangays. Interviews ensured against collusion in the non-performing case, while focus group discussion gave attention to the process in the model barangay. The focus group discussion was supplemented by field notes on ocular visits at each of the model Materials Recovery Facility.

Ethical Consideration

All participants were given complete information and signed informed consent forms before beginning interviews and focus group discussions. For the purpose of ethical research practice, barangay names and individual person participant names were not be mentioned, and if needed will be protected using code names. Each barangay whether non-performing or model had participant selections coming from three areas: resident, Barangay Official, and Waste Worker.

Mode of Analysis

The collected data, once transcribed, undertook two steps of analysis. First was structured analysis, and second was within-case and cross-case analysis combined with Most Similar, Most Different design of analysis. Structured analysis involved reading and rereading the transcribed material and generating codes (De Guzman, 2013). The codes then were tabulated per case. The 2nd step involved comparing cases using MDSD. In MDSD, the two non-performing barangays were compared for commonalities, the same treatment was applied to the two model barangays. These arrived at one set common codes for non-performing and one set for the model. Finally, both sets were compared for their differences. This process detects based patterns of commonalities on the following: Actor, Action, and Position. Once similarities are established, these will be compared across group. Differences will be noted between two groups (non-performing and model barangays) using cross-case method.

Figure 2 shows the second level of analysis. The research made use of within-case analysis to map policies and implementation procedures done by each barangay (as represented in each face of the cube, see Fig 2). These results were juxtaposed to process cross-case similarities and/or differences between the four barangays. The themes and process categories were used to frame the map of institutional arrangements as model for an institution of Clean and Healthy Barangay. The combination of analysis of data from within barangays (within-case) added with analysis of data between different barangays (cross-case) leads to the outcome of this study, which is an institutional map.

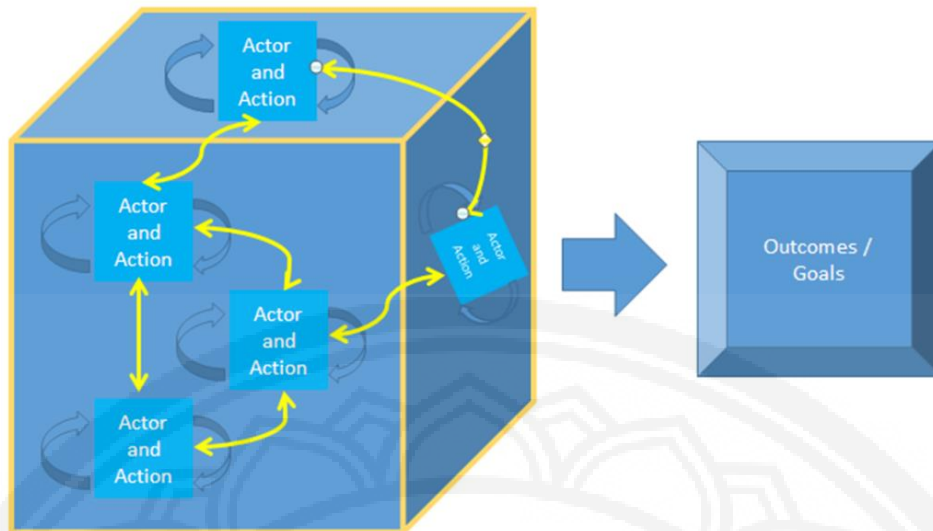


Figure 1 An Illustration Adapted from Ostrom's Institutional and Development Analysis Framework

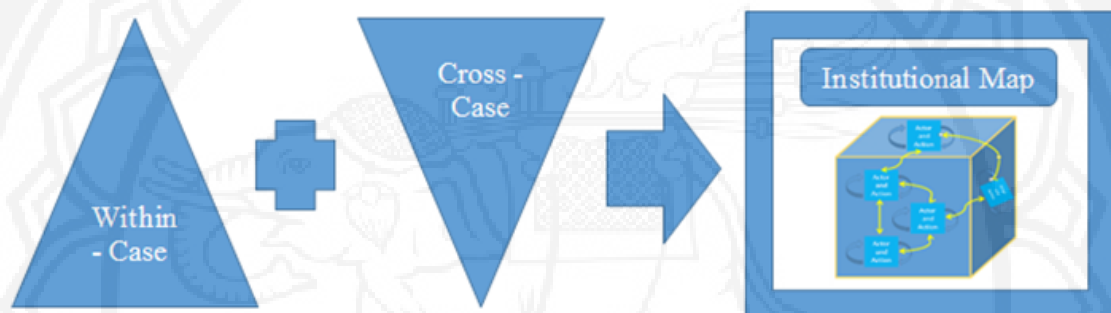


Figure 2 Research Framework – Comparative Analysis

Results

Institutional Map Components

From studying reported dirtiest barangays along with barangays considered as models in solid waste management, both within the locus of the metro, two (2) institutional maps were generated (see Fig 3 and Fig 4). The first maps out the non-performing barangay, and the second, maps out the model or performing barangay.

The map is a simulacrum of the network of institutions, their actions, and positions with each other. To better illustrate this, the map used the following symbols, as can be seen in Figure 3:

Square or rectangular frames describe two areas. The bigger frame which embraces all other components contains the solid waste management system. It comprises spaces from the national, to the local government, and to the sub local area of the barangay. The smaller frame contains the barangay space. Circular frames show groupings or affiliations of actors. Two directional arrows lines show the interaction of these groups with each other. Straight lines show visible interaction that leads to implementation. Dotted lines show interactions that can be described as occasional, or less visible.

Pentagons were used to represent general government levels. These include the national government, the local government, and the barangay. Related to these shapes are trapezoids which represent departments and offices in respective government levels. Ovals are associations and groupings of people.



Mapping Non-Performing Barangays

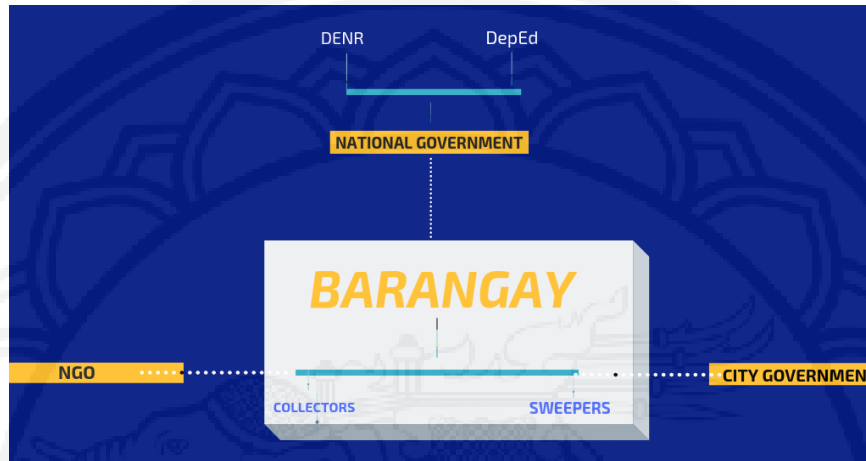
Republic Act 9003 decentralizes the practice of garbage segregation to the very point of origin. If certain powers can be decentralized from the national government to the local level, the duty of segregation in terms of solid waste management is decentralized to the households. The ideal is that solid waste can stop being a problem if it has already been initially managed at source (Ezeah & Roberts, 2012). From this point, collection and treatment of garbage can be easily facilitated. In doing so, some parts from the flow of waste is redirected from a linear flow and instead becomes part of a cyclic or circular flow (Allesch & Brunner, 2014). It is meant to address the problem that landfills are overflowing with mixed garbage. Wherein, biodegradable waste need not reach the landfill, in addition, reusable materials should go to junkshops and other recycling facilities.

Table 1 Result of Most Different, Most Similar (MDSD) Comparative Analysis = Basis for the Model Map

Actors	Role in Model (Performing Barangay)	Action Situation	Relationship / Interaction
Barangay Government	Active Grassroots Solid Waste Manager	Institutional Network Administrator	Center of Network, Both in and Out of the Space
Collectors (Waste Collectors)	Collects Segregated Waste from Households, Rejects Unsegregated, Gives Tickets to and Reports Repeat Offenders	Implementing Unit	Household, Barangay
Sweepers	Cleans Public Areas, Reprimands Violators	Implementing Unit	Public Space (Street), Barangay
Evaluators	Monitors Amount of Diverted Waste	Implementing Unit	MRF, Collectors, Sweepers, Barangay
City (Local) and National Government	Provides External Support	Institutional Support	Interacted through Sub-Units
City Council	Create Supporting Policies, Sends Manpower or Material Support	Institutional Support: Sub-Unit	Barangay, Other City Offices
City Environment and Natural Resources Office (CENRO)	Create Supporting Policies, Helps Monitor	Institutional Support: Sub-Unit	Barangay
City Treasurer's Office	Helps Reinforce as Third Party where Households Pay Fine for Violation	Institutional Support: Sub-Unit	Barangay, Households and Other Violators
Senate	Create Supporting Policies, Sends Manpower or Material Support	Institutional Support: Sub-Unit	Barangay
House of Representatives (HoR)	Create Supporting Policies, Sends Manpower or Material Support	Institutional Support: Sub-Unit	Barangay
DENR	Create Supporting Policies, Helps Monitor	Institutional Support: Sub-Unit	Barangay
Department of Education	Teaches Methods and Strategies	Institutional Support: Sub-Unit	Barangay, Schools
NGOs	Teach Methods and Strategies, Helps Organize	Non-Institutional Support	Barangay
(Civic Group) Women's/Ladies Brigade	Assist Collectors, Sweepers, Waste Warriors, Eco Police	Non-Institutional Support	Barangay, Other Civic Groups
(Civic Group) Homeowners / Household Associations	Assist Collectors, Sweepers, Waste Warriors, Eco Police	Non-Institutional Support	Barangay, Other Civic Groups

**Table 1** (Cont.)

Actors	Role in Model (Performing Barangay)	Action Situation	Relationship / Interaction
(Civic Group) Waste Warriors	Monitors Household Collection, Tickets Violators	Non-Institutional Support	Barangay, Other Civic Groups
(Civic Group) Eco Police	Monitors Public Areas	Non-Institutional Support	Barangay, Other Civic Groups
(Civic Group) Schools	Youth become Police to Family and Friends	Non-Institutional Support	Barangay, Other Civic Groups

**Figure 3** Institutional Map of Non-Model Barangay

In the Philippines, the government unit directly involved is the barangay. For years, garbage collection from barangays to landfill is done by dump trucks hired by the city government. And garbage goes unsegregated from households to the truck, and from truck to landfill (Ranada, 2015). The law now mandates that garbage must be segregated before collection. But culture on the side of households, and complacency on the side of the garbage collector turn the ideal of RA 9003 into simply a dream. For in practice, the tonnage of garbage continues to increase. A tour across the city would show that many barangays underperform or are non-performing.

Solid waste governance can be divided into two spaces, the space within the area of the barangay, and the one outside of it. Each space occupied by institutions. The non-performing barangay map (see Fig 3) have collectors and sweepers within its space. Outside this space are three groups; the National Government, Local Government in the form of the City Government, and Non-Government Organizations (NGOs).

The map (Fig 3) shows that the National Government have identifiable sub-units under it to which the barangays interact with: Department of Environment and Natural Resources (DENR) and Department of Education (DepEd). With regards the City Government, the identified interaction was through the sub-unit of the City Environment and Natural Resources Office (CENRO). Interactions with these institutions are left to chance at best. In principle, there would be other units. Yet, experientially, the non-performing barangays are able to identify and narrate interactions with the ones mentioned.

The CENRO (Local Government Level Institutional Support) along with the DENR (National Level Institutional Support) provide information and technical assistance. But based on how the participants respond, the interaction is minimal, and adds little during the interviews. In comparison, NGOs are appreciated only if they are present. One participant explained: *“So just like I said that the foundation is our partner in Barangay in the SWM.*



In resolutions, the foundation is our partner NGO in environmental projects. They provide the residents and the barangay officials with seminars. They also provided their own eco aid other than our own eco aid here in the barangay. Then if we need anything else like a pushcart, they provide us or help us with it..”

Within the barangay, its main arm in implementing solid waste management is the collectors and the sweepers. Garbage collection from among the barangay households is either collected by assigned collectors, or local kids who do *kalakal*, or brought by locals directly to the trucks when they arrive. *Kalakal* is a Filipino word used to describe the selling of recyclable materials. Local kids, and even adults who need money go house to house, collecting trash. Occasionally, the households give them money in loose change, and the recyclables are sold to the nearby junkshop. *“The eco aids segregate the garbage and when they segregate garbage they get to sell the steel, plastic, and papers for extra income so segregating helps some of the eco aids.”* (Interview Participant). Public space cleanlines, particularly the streets are done by street sweepers. However, the ocular visits show that the streets are maintained to be with litter instead of without.

In the non-performing barangay, segregation at source is left to chance, or even degenerates to a culture of complacency. Occasionally, the barangay enforces. *“The street sweepers collect the garbage then they throw it in the garbage truck.”* (Interview Participant). Sometimes, people segregate. Some people follow the policy, some do not. Sometimes, the enforcers just give up. *“The people do not follow that they should be the one to segregate. Our eco patrols are the ones who segregate. The people are being pampered...”* (Interview Participant). The process of the weakening implementation is narrated through experience: *“Before, they don’t collect the garbage if it is not segregated. But sometimes the people still do not follow and there are times that we have no choice but to still collect the garbage even if it is not segregated. Then we segregate it...”* (Interview Participant)

The Model Map

Table 1 shows the result of comparatively analyzed data based on differences between performing and non-performing barangay. This leads to a characterization of a model solid waste management barangay based on the similarities found in the performing barangays. A model barangay is unique in two levels of the solid waste management space. Within the barangay’s area, there is the barangay office and their appointed collectors and sweepers. There are also civic groups or non-government/non-institutional groups that supplement these: Women’s Brigade, Eco Police, Household Associations or Homeowners Associations, Waste Warriors, and Schools. In the area outside the barangay solid waste management space are the National Government Institutions and the City Government, each comparatively having more identifiable sub-units.

Just as the non-performing barangay, the model also have collectors and sweepers. Narratives and observation of the community show improved processes in the model. Community members narrate: *“Each collector has a staging area. They each have their own designated area for collection each day. They collect the compost, residuals, and garbage they can sell. That’s what they only bring to the MRF. That is where the garbage truck will pick it up once during the night compared to the previous four times...”* (Interview Participant). The collectors in the model barangays are unique since they do not just collect, they enforce the rule. The collectors are more often the waste warriors, who are volunteers, they receive a small compensation which is supplemented by the earnings from *kalakal*. They will not accept unsegregated waste, and if such happens that the household brings out such, the waste warriors will issue a ticket of a fine. The payment is at the local city hall, not the barangay. And city hall sends information to the barangay regarding those who paid. This part of the system makes it inclusive to the less privileged members of the community, and adds to the sustainability (Marello & Helwege, 2014). The map



(Fig 4) separate the cells for each of these groups. Even if sometimes, one barangay happen to have collectors as waste warriors, and some other barangay have waste collectors as eco police.

However, both focus group discussions and ocular visits identify a third – evaluators. These are people from the barangay, sometimes a duty taken by the secretary or the treasurer or one council member (Table 1). The evaluator monitors the amount of waste diverted, how much is collected and then transfered to trucks, how much is collected and turned to compost, how much are recycled, and how much can be re-used (most often stored in the Materials Recovery Facility until some community members asks for an item).

It is noticeable that within the barangay's solid waste management space, the official barangay institution and the civic groups overlap. *"There is this something called Waste Warriors. We call the collectors Waste Warriors. They are part of the Eco Police because they are trained. They report to us about concerns on garbage. They are the ones who do the field work. We have someone we call as a lookout, a spotter..."* (Interview). Circulating among all these groups, whether official members of waste management in the barangay or volunteers are the women's' groups and homeowners' associations. *"We chose women that can do help us in our daily routines in the community. They also take down notes of our activities..."* (Interview Participant). These groups are composed of concerned residents, household members who are aware of the impact of the proliferation of garbage. The members of these groups are either collectors as waste warriors or as Eco police. *"The Ladies Brigades teaches and trains, and monitors regarding the solid-waste. They go along with the barangay's daily routines on each area to make sure that collection is properly done. They are only volunteers that help the barangay keep the community clean. They do not get paid..."* (Interview Participant).

They do not simply interact, they are fused, or almost as one. These overlaps are because a member of the Women's Brigade can also be a member of the Homeowners' Association. Aside from this, the performance of the task overlap out of civic concern, cooperation, initiative, and more so as innovation. Each of these groups help in the community, and this help was given recognition by the barangay or even absorbed by the barangay.

There are three ways to distinguish the roles of the groups, and both ways are important. First is social composition, second is purpose, and third is compensation. The first tell from which part of the community of the barangay was this civic group formed. Women's Brigade, Homeowners, School all have visible sources: gender, household interests, education. Eco Police and Waste Warriors are also different. They are volunteers out of concern for the community's proliferation or non-proliferation of waste.

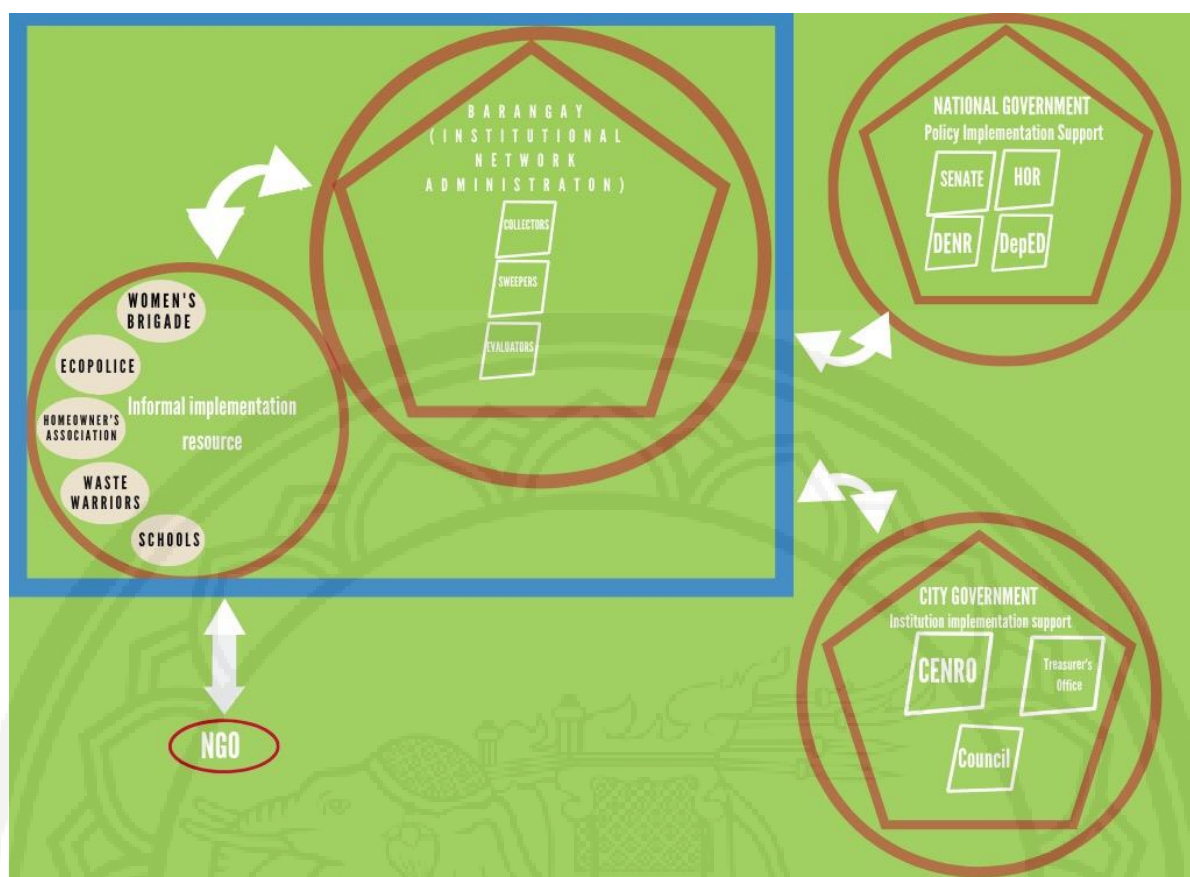


Figure 4 Institutional Map of Model Barangays

Another point of distinction are roles or duties. Women's Brigade and Homeowners have differing interests, and this makes them more involved in the community helping either the collectors, sweepers, waste warriors, or eco police. The schools also do their part through solid waste management education. And their students go home and they do not just practice, they also become the new enforcers. telling about the right way to dispose of trash when family members and friends violate (author's field notes). They happen to overlap on the garbage concern.

The Waste Warriors are different though since they advocate by enforcing the regular duty of segregation at source through education and reminders. They also do this through the rejection of waste during collection if such waste are unsegregated. They give the offending household a ticket if the continue to not segregate, and the same household is reported to the barangay office (author's field notes). A waste warrior gave details of the fine: *"First offense, they just give a simple reminder. If there is a ticket, that is 300 pesos. The second offense has a penalty of 500. Third offense has a penalty of 1000 pesos, community service, or the worst-case could be jail."*

Supporting waste warriors are the Eco police. They oversee cultural monitoring of habits of waste management of people within the barangay's space. They also issue tickets; their main purpose is to ensure that people follow the law on ecological solid waste management (table 1). The discussion describes their activities as such: *"And that's where the eco-police comes in, they do on the spot checking if your garbage is segregated or not. And if your garbage is not segregated, then they could give a ticket for five hundred pesos for households and three thousand for business establishments, but some get off with just warnings..."* (Interview Participant).

Eco Police are discipline enforcers of public spaces. They are similar to Street Sweepers in that regard, Eco Police reprimand and remind people not to litter. They tell people to place trash in the proper waste containers.



One participant narrated that oftentimes, a stranger passing by will dispose a piece of trash (i.e. candy wrapper) and said stranger throws it on the ground, the Eco Police actually approaches and reprimands. On a different case, one barangay reports that other barangays bring their garbage across the border to theirs. The Eco Police had CCTV Cameras installed along the suspected area and thus gained evidence. Once done. The garbage was returned to the offending barangay.

Eco police and street sweepers both interact with the public space (Fig 4). Waste warriors and collectors interact with the households. What distinguishes the Eco police and waste warriors from the other two is that even if all four groups are volunteers, there is a compensation for the sweepers and for the collectors. It is not a regular, nor a high compensation. More often a few hundreds of Philippine pesos. These are augmented through the money that is generated from the kalakal.

In the model, the barangay is visibly connected to more institutions outside its solid waste management space, thereby bringing in more support. Identified under the National Government are the two national legislatures (Senate and House of Representatives or HoR), and two national departments (Department of Environment and Natural Resources or DENR, and Department of Education or DepEd). For the local government or city government, there is also the addition of the City Council and the Treasurer's Office.

The presence of DENR and CENRO have a more recognized presence in the model barangays (Table 1). These, respectively, are national and local environmental offices. There is a two way conduit from each of them towards the barangay. As narrated by barangay members, these offices provide policy support, guidelines, training and evaluation. The barangays report their diversion rate data to them, and thus ensure that procedure in solid waste management is followed.

The City Treasurer's Office is also mentioned because it is through this office that household discipline is facilitated. Once a household is ticketed and reported to the barangay, they lose the benefit the issuance of barangay certificate. They are technically not in good standing. In order to fix this, the household must go city hall and pay at the treasurer's office the fine as mandated by the law. Once paid, they can show the receipt to the barangay. This shows a more official, rather than a personal involvement of the barangay. The barangay does not bully households just to get the money. There is a third party involved, in fact, a higher office, which makes the process more official.

A unique national government executive office is the Department of Education. Local schools within barangays support the education of the youth in terms of proper waste disposal. In addition, local public schools also practice the use of an MRF within their own institutions. *"Other than community training, we also have school training. If the communities we are partnered with have schools, then we give those schools training separately for the teachers and the students..."* – Interview Participant (NGO)

Among institutions, legislatures in the national and in the local government are much more present in the model rather than the non-performing barangay. These institutions form support for the barangay units by sending needed resources such as funding, training, supplies, and manpower.

Discussion

From the previous data, it is observed that both model and non-model barangays interact with the other actors, and this interaction extends towards two solid waste management spaces. One is the area within the barangay, where the barangay interacts with the households and community groups. The other area is outside the barangay,



where outside NGOs, the City LGU and the National Government exist, These reach in to interact with the barangay. In addition interaction can be described as either less visible or weak (as is the case in the non-performing barangay) or visible/frequent (model barangay).

The non-model barangay though is analyzed as working alone within its space. Compared to the model, where civic groups exist. The groups in the model are formalized through the barangay's office. This is more evident in the presence of uniquely named groups instead of collectors. It has also been observed that even non-performing barangays happen to have a uniquely named group as the model. A good sample is the ecopolice, which is not just unique in name, but also in the duty that they do. Because of these, the outcomes differ. Non-performing barangays both exhibit a lack of civic group presence or engagement. In addition, it also has weak implementation of Republic Act 9003. Comparatively, waste collection founded on civic action accomplish the implementation of the law in a more efficient manner. Thus, segregation at source is only a possibility in non-performing barangays in comparison to the assurance coming from the model.

Outside the barangay space, sub institutions such as NGOs, the CENRO from the local government, and the DENR from the national level also interact with the barangay, whether it be a non-performing one, or a model one. However, their presence is more observable at the model barangays (table 1).

Model barangays have the experience of interacting with three sub-units of the city or local government. These include the city council and CENRO which helps by sending policy support through guidelines and manpower as trainers. Sometimes, the city councilors are also able to send material support. In addition to these, the model barangays have an active local public school, who help in information dissemination, and who help in the implementation by correcting family and friends.

Comparing both maps, the key parts show that implementing impetus comes from two solid waste management spaces, a space from within and from outside its area. From outside, there is the need for official upper level institutions to coordinate the projects. Segregation may be decentralized, but power and management should not. This responsibility is in the management of the barangay as solid waste management network administrator. It facilitates help coming from outside such as among the offices of the legislative institutions, and the executive departments. The barangay, being the smallest unit of the local government have both the City Local Government Unit, along with the National Government as partner institutions. Within each of these partners are various offices that help in promoting zero waste. Most powerful among these are legislators from the national government.

However, the City Government is also of importance, since it is the nearest unit to the barangay. It becomes a supervisor over the supervisor. The barangay unit may supervise the community within the space. But all in all, the barangay officials are also community members, they are neighbors of the household being policed. Reinforcement, particularly negative reinforcement, such as ticketing and fines can end up becoming an issue. Having the sub-units of the city as part of the process creates a neutral third party in the process of corrective action.

From within, the barangay needs the presence of their own civil groups such as homeowners' associations and women's' brigades. This affirms studies, such as that of Rydin and Pennington (2000) that groups fuel socio-political capital. In this case, the presence of these civic groups working together, assisting, cooperating, having initiative to help with duties, volunteerism, all add to the barangay's social capital. It helps create better policy implementation at the grassroots, particularly in ecological solid waste management. This also coincide with studies by Hargreaves, Hielscher, Seyfang, & Smith (2013) which posit that the existence of these socio-political groupings ensures political action in terms of the policy implementation and compliance, and coordination.



In contrast to a study by Vickers (2010), not all members of the community support proper solid waste management, such as in the findings regarding non-performing barangays. In contrast Oguntoyinbo (2012) avers that the social groups and associations create a social mechanism to ensure that other members of the community comply, a situation visible in the findings regarding model barangays. In this discourse, it is recurrent from visiting barangays that many members cling to the belief that segregation should be done by waste workers, not by residents at their respective homes. Yet there are those who are concerned with the effects of garbage production. Social groups empower towards support of implementation and compliance of better solid waste management practices.

The same maps also show difference in the relationship of actors within and outside the barangay solid waste management space. The relationship here is defined in terms of presence and is qualitatively applied based on saturation in the interviews and discussions. Institutions and associations have presence in terms of regular interactions with the barangay community. This presence creates a strong relationship, which in turn support solid waste management implementation.

For example, women's groups have an established link with the barangay office as additional manpower in waste collection and segregation enforcement. This is an example of success of small scale communities (Creech et al., 2014). These tasks also create a presence for them within the community, they, being the people who regularly remind residents to follow the law on ecological solid waste management.

Another difference is the relationship of outside NGOs with the barangay office. Both model and non-model have outside NGO interaction, but the model already has years, and the NGO's presence is clearly felt based on references mentioned by participants. Mentioning member of the NGO as helping them push for the "no segregation, no collection policy," and even helping them brainstorm solutions for roadblocks in implementation.

Conclusion and Suggestions

Solid waste management is an important concern in terms of sustainability. It is one of the U.N. Sustainable Goals. A problem connected to this is how to best implement it at the grassroots level. Analysis of institutional maps of performing and non-performing barangays resulted to four characteristics of the model barangay.

First, the model has an established relationship with two groups outside its solid waste management space. One group are institutional supports coming from sub-units of the national government, and from the city or local government. And the other group are non-institutional supports coming from NGOs.

Second, model barangays have two sets of groups within its solid waste management space. The barangay government has institutional arms or units in the form of waste collectors, sweepers, and evaluators. But these are augmented by non-institutional groups such as women's groups, household associations, schools, waste warriors and eco police. These institutional and non-institutional groups have specified roles. Oftentimes, they overlap in what they do, but this does not result in conflict because the overlap is the result of cooperation and initiative.

Third, aside from actual waste handling, this research emphasizes management within the network. Based on the results, the barangay unit is the Institutional Network Administrator. It is the actor which implements RA 9003, and it can do so through linkages within and outside its solid waste management space. The national government, the city, NGOs, all provide support (whether institutional or non-institutional). Civic organizations within the barangay's solid waste management space also form unofficial or non-institutional support for the institutional arm of the barangay. Lastly, all the groups form an intricate web, an interlinked solid waste management network with groups taking the roles of actors with active and interconnected roles.



As a recommendation, the barangay, as a government office can benefit more by stimulating social capital through the encouragement of the formation of groups within its community, and by opening itself to other government institutions and NGOs from outside its solid waste management space. Complementing this is if the barangay can give recognition to such groups within their community, thus empowering them to move and help in enforcing ecological solid waste management. Groups from outside the barangay such as government offices and NGOs should also promote the growth of associations in target barangays, and the barangays should open their doors to them. This process will create support for better policy implementation.

Acknowledgement

The author acknowledges his research assistants during field work at the four barangays: A. Leynes, D. Rolluqui, E. Mills, H. Villegas, K. Cabarles, K. Marasigan, K. Dilla, S. Samson. During transcriptions: A. Pascual, L. Garcia, and X. Mariano, For translation from Filipino to English: J. Resus. For diagram layout: D. Languido, and L. Rosano, and genral layout: R. Felongco, and P. Ologa. The author also acknowledges professional English editing of Ms. S. Gabe.

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