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Implementation and Challenges of Solid Waste Management in Communities of a Component City in the Philippines

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Abstract. Waste management is a worldwide issue other than climate change and global warming. In the ASEAN, there is an extraordinary increase in solid waste traced to urbanization, industrial development, and economic growth. While the Philippines enacted the Ecological Solid Waste Management Act, local governments passed the Environment Code. This study determined the extent of implementation of the city ordinance on solid waste management of communities in terms of the variables assessed by a sample size of 67 implementers and 384 residents identified by stratified random sampling. It also investigated the challenges encountered by the respondents in the implementation. Likewise, the differences were determined according to the geographical location of coastal, upland, and lowlands and when respondents were grouped according to designation. Using descriptive analysis, the results revealed that, as a whole, implementation of the provisions of the city ordinance is, to a great extent, with waste generation as the highest while handling and on-site storage the lowest, but several challenges were encountered. The comparative analysis revealed no significant difference in the extent of implementation when respondents were grouped according to designation in all areas except waste disposal. However, there was a significant difference when communities were grouped by geographical location, with lowland residents rating higher than the rest. Three groups of challenges emerged from the study: administrative, procedural, and policy issues.

Keywords. Public administration, solid waste management implementation, descriptive-comparative, component cities, Negros Occidental, Philippines

1.0. Introduction

As the global community is trying to successfully address large-scale environmental problems such as climate change and global warming (Kulin & Johansson Seva, 2019), waste management has also been a worldwide issue (Essuman, 2017). The major challenge of governments around the globe remains to be the management of household waste as it is a threat to the health of individuals and the environment (Lagerkvist & Dahlen, 2019; Limon et al., 2020).

An extraordinary increase in solid waste generation was traced to fast urbanization, extensive industrial development, and significant economic growth in the ASEAN region since 2000 (Panda et al., 2017). It was observed that disposal of solid waste is done in ways harmful

to health and the environment, such as depositing of waste on open grounds, unhygienic landfilling, and open burning where considerable impurities enter the environment through the form of harmful discharges in the air, water, and soil (Yadav & Samadder, 2018).

In the Philippines, RA 9003, otherwise known as the Ecological Solid Waste Management Act of 2000, was enacted to provide efficient and organized administration of waste management activities. Notwithstanding this law, there is the practice of open unrestrained dumps, a poor solid waste management practice in local governments that have the primary responsibility for waste management as provided in RA 7160, otherwise known as "The Local Government Code of 1991" although the Department of Environment and Natural Resources (DENR) enforces environmental laws (Castillo & Otoma, 2013).

This component city enacted its Environment Code in 2012. Nevertheless, in 2016, DENR reported that fifteen (15) out of thirty-two (32) local government units in a first-class province are non-compliant with the provisions of RA 9003, including all component cities in the northern part (Nicavera, 2021). In January 2021, some communities in the north experienced flooding believed to be partly caused by improper waste management (Guadalquiver, 2021). This motivated the researcher to conduct this study.

Several studies were reviewed: Kulin and Johansson Seva (2019) and Vergara and Tchobanoglous (2012) on solid waste management and the role of government in protecting the environment; Castillo and Otoma (2013) and Ali and Sion (2014) studied solid waste management in local government units; Naseem et al. (2016) and Nanlohy et al. (2015) focused their studies on environmental protection. Studies conducted in this province include that of Salmingo et al. (2017) on web-based applications to implement solid waste management systems, while Go and Caelian (2020) assessed the implementation of solid waste management in a highly urbanized city focusing on compliance with prohibited acts as provided under RA 9003. Limited studies focused on the implementation of an ordinance on solid waste management system enacted by a local government unit, hence a gap in the literature.

2.0. Framework of the Study

This study theorized that the proper implementation of the provisions of the city ordinance on solid waste management is influenced by geographical location. It proposed that government authorities should provide the appropriate monitoring mechanisms for implementation so that the enacted ordinance attains its objectives.

The Theory of Good Governance espoused by the World Bank (1992), which defines governance as how power is exercised in managing a country's resources for development, was the anchor of this study. These principles are openness and integrity (setting as a good example), participation (knowing the public concerns and interests), appropriate contact with the public (acting appropriately with the public), effectiveness and efficiency (taking decisions and measures necessary), legitimacy (empowered with legislation), capacity for learning and self-improvement (improves its performance and structures), and accountability (render an account to stakeholders). These principles were applied in the analysis of the study, demonstrated by the implementers and the lawmaking body in their practice and enactment of the city ordinance.

This was supplemented by the Open Systems Theory popularized by Bertalanffy (1950), which views every organization as a system that constantly needs to interact with its environment. The absence of interaction with the other components of the system will render the organization futile in its implementation of any program.

In this study, this environment consists of the city government officials, implementers, and the residents, comprising fishermen, professionals, farmers, landowners, people in

business, private firms, barangay officials, and members of the academe, all participating in the implementation of the solid waste management system. The Open Systems Theory employed strategies that demand compliance in the form of the ordinance, communication in the form of feedback, and challenges encountered, including their expectations to exchange information with the government as part of the environment. Proper implementation of the ordinance with the participation of all the stakeholders results in attaining environmental sustainability, thereby overcoming challenges and validating the open systems theory adopted.

3.0. Methodology

This is a descriptive-comparative study that utilized a survey questionnaire in the gathering of primary data. The descriptive design describes a situation regarding the specified variables (Creswell & Creswell, 2018). The descriptive design is appropriate since the study generates data to measure the extent of implementation of the waste management system and the challenges encountered by respondents in the communities.

A comparative research design was utilized to investigate the differences within and across variables with different contexts (Goodrick, 2014) using the geographical location of the communities and the designation of the respondents.

The respondents of the study were the 67 implementers, and a sample size of 384 residents of the communities classified according to the category of coastal, upland, and lowlands identified through stratified random sampling. A researcher-made survey questionnaire based on the provisions of the City Ordinance and the Solid Waste Management Act (RA 9003) as to implementation was used to gather the primary data. The survey instrument was translated into the local dialect to ease the understanding of the respondents in answering the instruments.

Part I of the instrument was for the profile of the respondents, while Part II contained survey questions to measure the extent of implementation of the city ordinance on the waste management system as assessed by the implementers and residents of the communities. A checklist was used to determine the challenges encountered by the respondents in implementation. A scale of 1-5 was used as a guide in answering the questions on the extent of implementation of the solid waste management ordinance.

The survey instrument was tested for validity using Lawshe's (1975) content validity ratio (CVR), considering it is researcher-made. Experts from the Provincial Environment Office and the Department of Environment and Natural Resources (DENR) rated every item as "essential," "useful but not essential," and "not necessary." Items classified as essential by the experts were included in the final copy of the research instrument (Ayre & Scally, 2014). The validity ratio was 1.0, interpreted as valid.

A reliability test was conducted by a pilot test on 30 residents not identified as respondents in the study. It was computed with the use of the Cronbach Alpha coefficient. The reliability score was 0.962, which means that the questions were reliable.

Before conducting the study, the researcher secured permission and approval from the Local Chief Executive and the presiding officer of the Legislative Council of the City through a letter explaining the purpose of the study. With permission granted, the survey questionnaires were administered with the help of enumerators oriented by the researcher, explaining the purpose and manner of data gathering. Health protocols were observed considering the pandemic, and the respondents' informed consent was taken before the data gathering. After collecting the instrument, the data were encoded and sent to the statistician for processing and analysis.

Descriptive analysis was used to determine the extent of implementation of the city ordinance in terms of the variables using the mean and standard deviation. Descriptive analysis was used to determine the challenges in implementation using the frequency count and percentage distribution. Meanwhile, to determine the differences in the extent of implementation when respondents were grouped by designation and geographical location, comparative analysis was used.

The normality tests using Kolmogorov-Smirnov revealed that the implementation of the variables [KS=0.050, p=0.019]; waste generation [KS=0.085, p=0.000], handling, and on-site storage [KS=0.066, p=0.000], collection, transfer, and transport [KS=0.085, p=0.000], waste processing and resource recovery [KS=0.191, p=0.000], and disposal [KS=0.164, p=0.000] are not normally distributed; hence, non-parametric statistical tools were used.

To determine the difference in the extent of implementation of the city ordinance when respondents were grouped according to designation, the Mann-Whitney U test was used. When grouped according to the geographical location of their communities, the Kruskal Wallis test was used. To address general principles of respect for persons, benevolence, justice, and soundness of the study, the researcher upheld the ethical guidelines.

4.0. Results and Discussion

Profile of Respondents

There were 451 respondents to the study, comprising 13.2% as implementers and 86.8% as residents of the communities classified as coastal (22.8%), upland (48.1%), and lowland (29.0%).

Table 1. Demographic Profile of the Respondents

Variable	N	n	%
Implementer			
City	13	13	2.5
Barangay	54	54	10.7
<i>Subtotal</i>	<i>67</i>	<i>67</i>	<i>13.2</i>
Variable	N	n	%
Barangay Category			
Coastal	33,480	84	22.8
Upland	75,776	191	48.1
Lowland	42,977	109	29.0
<i>Subtotal</i>	<i>152,233</i>	<i>384</i>	<i>86.8</i>
Total	152300	451	100.0

Extent of Implementation of the City Ordinance on Solid Waste Management System

As a whole, the extent of implementation of the city ordinance on solid waste management is to a great extent. Waste generation was rated highest (M=3.78: SD=0.74), while handling and on-site storage was rated the lowest (M=3.68: SD= 0.77), although both are interpreted as to a great extent. In terms of designation, both groups of respondents rated almost

the same, interpreted as great. In terms of geographical location, the highest rating was on lowlands, interpreted to a great extent. However, the lowest was in coastal barangays, although interpreted as great. Waste processing and resource recovery and disposal were only moderate in coastal communities.

The findings imply that the respondents adhere to most of the provisions of the city ordinance on solid waste management. However, some areas need strong enforcement by the government to achieve a very great implementation. Findings further revealed that the implementation of the city ordinance is strong in terms of waste generation as it is the responsibility of the residents but found to be inadequate in handling and on-site storage handled by implementers, which indicates that residents are implementing the provisions of the city ordinance far better than implementers do. This further indicates that although the city is becoming urbanized, with more households generating waste, residents have become engaged and practiced their social responsibility of protecting the environment. In contrast, the city government, through the implementers, portrayed inadequacies in implementation.

The finding reinforced Nanlohy et al. (2015) and corroborates the study of Caceres et al. (2015) that the best way to deal with waste management is to minimize waste generation. It also strengthened the study of Babaei et al. (2015) and agreed with Lagerkvist and Dahlen (2019) that household waste remains a major problem for the government because it threatens the health and the environment. Meanwhile, the findings of Laor et al. (2018) and Ziraba et al. (2016) affirmed that the public plays an important role in waste management and that the government should provide the infrastructure. The studies of Limon et al. (2020) and Reyes and Furto (2013) confirmed that one of the major problems is the lack of storage areas, such as garbage containers, among others.

When grouped as to designation, the finding validates de de Lorena Diniz Chaves et al. (2014) and Mir et al. (2021) that major bottlenecks in waste implementation at the local level are due to the low administrative capability of the implementers to assist local governments in addition to the lack of a comprehensive continuous capacity building program. Likewise, Biyani and Anantharaman (2017) confirmed that the performance of implementers is severely affected by the lack of effective storage, appropriate treatment, and waste disposal. Further, Grazhdani (2016) and Ziraba et al. (2016) recommended that implementers should be provided with adequate salaries, health allowances, safety instruments, and protective gear to care for their health because the handling of waste is very toxic.

As to geographical location, the findings imply that since lowlands are urban areas, implementation of the city ordinance on solid waste management is adequate, considering that dissemination of information is easier compared to coastal areas, the location of which is not very accessible and are prone to many of the disasters including flooding. Coastal communities revealed a moderate extent of implementation, especially in the areas of waste processing and recovery as well as waste disposal.

The findings of the lowest mean ratings on coastal areas are supported by the findings of Rezazadeh et al. (2014) and Oliveira and Turra (2015), who found that the main problem is the lack of disposal sites, ineffective recycling, and the presence of tourists unaware of the waste management program of the coastal communities. Also, difficulties are encountered in highlands/uplands because of characteristics of the typology, small roads, and lack of disposal sites as ventilated in the study of Laor et al. (2018). This is augmented by Singh (2021) that although there is rough terrain, there are no dump yards due to land constraints, poor infrastructure, and the unorganized sector, especially farmers.

Table 2. A. Extent of Implementation of the City Ordinance on Solid Waste Management System in Communities of a Component City in Negros Occidental

Variable	Waste Generation			Handling and On-site Storage			Collection, Transfer, and Transport		
	M	SD	Int	M	SD	Int	M	SD	Int
Designation									
Implementer	3.72	0.65	Great	3.72	0.77	Great	3.81	0.72	Great
Resident	3.79	0.75	Great	3.67	0.77	Great	3.74	0.75	Great
Barangay Category									
Coastal	3.54	0.64	Great	3.55	0.69	Great	3.64	0.63	Great
Upland	3.71	0.73	Great	3.59	0.71	Great	3.62	0.82	Great
Lowland	4.09	0.72	Great	3.93	0.85	Great	4.04	0.60	Great
Whole	3.78	0.74	Great	3.68	0.77	Great	3.75	0.74	Great

Table 2. B. Extent of Implementation of the City Ordinance on Solid Waste Management System in Communities of a Component City in Negros Occidental

Variable	Waste Processing and Resource Recovery			Disposal			Implementation		
	M	SD	Int	M	SD	Int	M	SD	Int
Designation									
Implementer	3.72	0.69	Great	3.50	0.50	Great	3.71	0.59	Great
Resident	3.71	0.74	Great	3.75	0.79	Great	3.72	0.66	Great
Barangay Category									
Coastal	3.31	0.67	Moderate	3.40	0.65	Moderate	3.50	0.57	Great
Upland	3.67	0.73	Great	3.71	0.79	Great	3.64	0.65	Great
Lowland	4.09	0.58	Great	3.95	0.72	Great	4.01	0.60	Great
Whole	3.71	0.73	Great	3.71	0.76	Great	3.72	0.65	Great

Difference in the Extent of Implementation of the Ordinance on Waste Management according to Designation

Results of the Kolmogorov-Smirnov test revealed that the variables waste generation, handling and online storage, collection, transfer, transport, waste processing and resource recovery, and disposal are not normally distributed. Hence, non-parametric statistical tools were appropriate.

Thus, the Mann-Whitney U test determined the difference in the implementation of the solid waste management system in communities of a component city in terms of the variables when respondents are grouped according to the designation, while Kruskal Wallis was used when according to geographical location.

Results revealed that there is no significant difference [U=12495.0, p=0.708] in the implementation of the solid waste management system in the communities of a component city in the areas of waste generation [U=11915, p=0.335], handling and on-site storage [U=12673.0, p=0.846], collection, transfer, and transport [U=12501.5, p=0.712] and waste processing and resource recovery [U=12441.0, p=0.667] when respondents are grouped according to the designation. However, a significant difference in the implementation of the solid waste management system in the area of disposal [U=10059.5, p=0.004] exists when respondents are grouped according to the designation. Residents gave significantly higher ratings than implementers.

This finding of no significant difference in the extent of implementation of the solid waste management system in the areas of waste generation, handling and on-site storage, collection, transfer and transport, and waste processing and recovery indicates that both stakeholders practiced most of the provisions in the city ordinance. The significant difference in disposal implies that residents expressed their desire for proper disposal of their wastes.

This finding strengthens the study of Essuman (2017) that worldwide, most countries are finding the best ways of handling waste management problems, as confirmed in the study of Castillo and Otoma (2013) that despite the enactment of RA 9003, otherwise known as the Ecological Solid Waste Management Act of 2000 and RA 7160 or the Local Government Code of the Philippines, there is poor solid waste management in the Philippines. Meanwhile, the significant difference in waste disposal is supported by the study of Ali and Sion (2014), that a solid waste management system includes all elements, including disposal. The recommendation of Salmingo et al. (2017) is appreciated that a web-based application may be effective in monitoring the implementation of the waste management system. Likewise, it conforms to the studies of Kulin and Johansson Seva (2019) and Vergara and Tchobanoglous (2012) on the role of government in the solid waste management system, specifically in establishing disposal facilities.

Table 3. Difference in the Implementation of the Solid Waste Management System in Communities of a Component City according to Designation

Variable	U	df	p
Waste Generation	11919.5	-0.964	0.335
Handling and On-site Storage	12673.0	-0.194	0.846
Collection, Transfer, and Transport	12501.5	-0.369	0.712
Waste Processing and Resource Recovery	12441.0	-0.430	0.667
Disposal	10059.5*	-2.893	0.004
Implementation	12495.0	-0.375	0.708

Note: *the difference is significant when $p < 0.05$

Difference in the Extent of Implementation of the Ordinance on Waste Management in terms of Geographical Location

There is a significant difference [$\chi^2(2) = 41.909$, $p = 0.000$] in the implementation of the solid waste management system in communities of a component city in the areas of waste generation [$\chi^2(2) = 40.185$, $p = 0.000$], handling and on-site storage [$\chi^2(2) = 24.082$, $p = 0.000$], collection, transfer, and transport [$\chi^2(2) = 25.833$, $p = 0.000$], waste processing and resource recovery [$\chi^2(2) = 71.037$, $p = 0.000$], and disposal [$\chi^2(2) = 35.534$, $p = 0.000$] when respondents are grouped according to geographical location. Post hoc test revealed that lowland residents rated significantly higher than coastal and upland residents.

The significant difference indicates that residents of lowland areas find it easier to comply with most of the provisions of the city ordinance on solid waste management systems in all its areas because there are no constraints such as those identified in coastal and upland areas. These constraints include the terrain, absence of infrastructure, high slopes, small roads, threat to biodiversity, and absence of organized and scientifically planned settlements. Open dumping, unsanitary landfilling, and open burning in uplands and coastal areas usually exist.

Studies by Singh (2021), Laor et al. (2018), and Trondillo et al. (2018) support these findings. The findings of Yadav and Samadder (2018) are also affirmed.

Table 4. Difference in the Implementation of the Solid Waste Management System in Communities of a Component City according to Geographical Location

Variable	χ^2	df	p
Waste Generation	40.185*	2	0.000
Handling and On-site Storage	24.082*	2	0.000
Collection, Transfer, and Transport	25.833*	2	0.000
Waste Processing and Resource Recovery	71.037*	2	0.000
Disposal	35.534*	2	0.000
Implementation	41.909*	2	0.000

Note: *the difference is significant when $p \leq 0.05$

Challenges Encountered by the Respondents in the Implementation of the Ordinance on Waste Management

The major challenge encountered by the respondents in the implementation of the provisions of the city ordinance on solid waste management is waste generation. It was rated highest, where 306 (56.6%) respondents claimed that neighbors do not practice the 3Rs (Reduce, Reuse, Recycle), resulting from a lack of information.

The finding is validated in the studies of Edjabou et al. (2015), Najam et al. (2015), Acanto (2016), and Limon and Villarino (2020) that there is recklessness and negligence among residents in both urban and rural communities that had affected not only public health but also the environment to a great extent.

The other challenge also considered serious is that wastes are not segregated when collected and practiced all over the communities by implementers, which has led to some other challenges, especially in waste processing and resource recovery. This challenge often arose due to subcontracting collection services to private contractors resulting from inefficiency (Jerie & Tevera, 2014).

Other challenges to waste generation include garbage receptacles not being provided, nobody taking care of the recyclable wastes, and simple ignorance of the nature of waste.

Meanwhile, challenges to the implementation of handling and on-site storage as provided in the city ordinance are some garbage receptacles are not along collection routes, and some storage containers and receptacles are not anymore covered, which occurred because of irresponsible handling usually done during collection services especially when contractors are employed to perform the function of waste collection.

Although RA 9003 mandated local government units to comply with the law, which led to the enactment of ordinances, it was found that implementation is inadequate at 56% concentrated on selected areas, as revealed in the study of Castillo and Otoma (2013). While in India, bins are provided for biodegradable and inert waste, and waste collection and transport infrastructure created jobs and generated income through tourism, as found in the study of Kumar et al. (2017), which can be replicated in LGUs.

In the area of collection, transfer, and transport, implementation was found to be a great extent; however, challenges were encountered. These challenges are irregular collection schedules, insufficient number of collection trucks, no sanitary loading of waste on garbage trucks, no protective health equipment used by garbage collectors, and irregular transport of hazardous waste.

Table 5. Challenges Encountered by the Respondents in the Implementation of the Ordinance on Solid Waste Management

Variable	f	%
<i>Waste Generation</i>		
Our neighbors do not practice the 3Rs (Reduce, Reuse, Recycle).	306	56.6
Wastes are not segregated when collected.	271	50.1
The community does not provide garbage receptacles.	202	37.3
Nobody takes care of our recyclable wastes.	163	30.1
I do not understand what is meant by biodegradable waste.	133	24.6
<i>Handling and On-site Storage</i>		
Some garbage receptacles are not along collection routes.	246	45.5
There was no orientation on handling and storage of wastes.	227	42.0
Some storage containers and receptacles are not covered anymore.	226	41.8
Agricultural wastes are burned, especially on sugar farms.	226	41.8
There are stores and commercial establishments without garbage receptacles.	186	34.4
Some hazardous wastes are stored near residential sites.	146	27.0
<i>Collection, Transfer, and Transport</i>		
It is not easy to report uncollected wastes.	257	47.5
There is an irregular collection schedule for our household wastes.	245	45.3
There is an insufficient number of collection trucks.	233	43.1
Garbage collectors use no protective health equipment.	204	37.7
Loading waste on garbage trucks is not sanitary.	179	33.1
The transport of hazardous waste is irregular.	150	27.7
<i>Waste Processing and Resource Recovery</i>		
There is a materials recovery facility (MRF) in our community.	262	48.4
Recyclables stay very long in our homes.	212	39.2
Food waste is thrown into garbage cans.	211	39.0
No one is designated waste coordinator in our community.	200	37.0
Inappropriate segregation scheme in the markets.	170	31.4
Non-compostable wastes emit foul odors, and there are flies in the vicinity.	158	29.2
Some wastes in restaurants are so much at one time.	156	28.8
Animal manure spread anywhere on the farm.	140	25.9
<i>Disposal</i>		
Open burning of wastes is prevalent in large sugar plantations.	277	51.2
There is no crematory in the local government unit.	222	41.0
There is a lack of mandatory implementation of hazardous wastes.	212	39.2
The sanitary landfill is not available all the time.	192	35.5
Hazardous wastes are not segregated in the landfill.	154	28.

These are confirmed in the study of Ogundele et al. (2018), where the authors concluded that these had contributed to the spread of communicable diseases, flooding, and other environmental problems. As affirmed in the study of Mir et al. (2021), waste management issues in developing countries involve collecting wastes from cities where one-third to half of the waste generated remains uncollected, particularly in Asia.

Meanwhile, challenges encountered in waste processing and resource recovery, such as recyclables staying very long in homes, food waste being thrown into garbage cans, and inappropriate segregation schemes, validated the moderate extent of implementation in coastal areas. Respondents confirmed the presence of a materials recovery facility (MRF), but processing is a problem, and resource recovery is inadequate.

The finding of a moderate extent of processing and resource recovery affirmed the study of Limon et al. (2020) that using the materials recovery facility in local communities is rarely practiced. Challenges encountered by respondents include food waste being thrown into

garbage cans, inappropriate segregation schemes, waste in restaurants being so many, and recyclables staying very long.

Challenges in waste disposal include open burning of wastes, sanitary landfill is not available all the time, and lack of mandatory implementation of hazardous wastes is common. The studies of Kumar et al. (2017), De and Debnath (2016), and Ogundele et al. (2018) all confirmed that reckless disposal of waste leads to flooding and environmental catastrophe.

5.0. Conclusion

The proper implementation of the provisions of the city ordinance on solid waste management systems led to environmental sustainability. However, it is not enough for government to enact ordinances; it should provide the appropriate mechanisms for effective implementation.

The difference in implementation when respondents are grouped according to designation implies that government implementers improve work performance. The significant differences in implementation when communities are grouped according to geographical location in all areas need policy decisions so that activities should be designed to respond to peculiar characteristics of specific locations.

Challenges encountered by respondents are indicative of a more serious look at local ordinances in LGUs. The implementation of the provisions of the city ordinance on solid waste management is a shared responsibility; the effective implementation lies on the shoulders of all levels of government as well as the general public. Inadequate implementation implies complacency of government, although the ordinance was enacted for the common good.

6.0. Practical Application

The study significantly contributes to the little existing literature on the implementation of city ordinances on solid waste management. The legislative council may utilize the findings of the study in drafting the implementing rules and regulations to effectively enforce the ordinance and provide more regulations to monitor and enhance the implementation. Further, findings were utilized by the researcher to prepare a strategic plan to enhance the implementation of the provisions of the city ordinance on solid waste management.

7.0. Directions for Future Research

Despite the study's limitations, the results raised several issues related to the implementation of the local ordinance. Hence, future researchers are encouraged to focus on situations in geographical locations and to use other variables to determine differences in the implementation of the provisions of solid waste management. A serious look at the causes of environmental degradation is a good subject of future research.

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