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Research Article

Solid Waste Management Practices in Gingoog City: An Assessment of Compliance with the Republic Act 9003

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About Article

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ABSTRACT

The study aimed to assess the compliance of the people of Gingoog City, Northern Mindanao, Philippines, with Republic Act 9003 or the Ecological Solid Waste Management Act of 2000. This descriptive research was conducted at the seven (7) identified barangays in Gingoog City, with 78 residents selected as participants using a purposive sampling technique. A survey was carried out using a self-administered and validated questionnaire with open-ended questions. The data was analyzed using descriptive statistics (i.e., frequency distribution and percentage). Out of 78 participants, 35 are professionals, 23 are students, and 20 are plain homemakers. The results revealed that 58% of the participants are aware of the existence of RA 9003 and the corresponding penalties thereof if not followed. However, only 26% of the participants said that they are practicing solid waste segregation and disposal properly. Moreover, in terms of the implementation and monitoring system of the law by the government authority, the majority of participants are not satisfied (68%). It implies that the concerned office in the implementation and monitoring of the law or ordinance is not performing diligently its mandated functions. To improve the degree of compliance with the said law, some of the suggestions made by the participants include strict implementation of the penalty should be imposed on those who violate the law; more seminars should be conducted for the residents to increase awareness and the impact of non-compliance to the environment; and there must be a Materials Recovery Facility (MRF) in every barangay to maintain proper segregation of wastes.

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1. INTRODUCTION

Solid waste management is one of the major challenges in environmental protection, both in developing and highly industrialized countries. In fact, from the 17 Sustainable Development Goals (SDGs) of the United Nations, six (6) of them tackle environmental matters. The six (6) goals are; 1) protect and preserve our environment and ecosystem, 2) ensure availability of clean and drinkable water, 3) preserve our marine resources, 4) ensure safe and livable communities, 5) fight against climate change, and 6) promote responsible use of our natural resources.

In the Philippines, for instance, although existing literatures show that a lack of public awareness is one of the primary reasons why there is low compliance with the Ecological Solid Waste Management Law, only a few studies have reported on the effective implementation of the law in local government units since its implementation in 2001. This is the gap that this study hoped to fill in. Hence, this study was conducted. The Philippines has a total of 1,642 cities and municipalities; however, only a few are reported to have complied with the solid waste management law. The lack of appropriate knowledge and inconsistent implementation and monitoring of SWM laws at the local levels are the main causes of a very low compliance rate among the less developed and developing nations, including the Philippines. Furthermore, the volume of waste materials produced daily is increasing, while the capacity of the local government units to address the challenge is limited.

2. LITERATURE REVIEW

In the 1970s, Solid Waste Management (SWM) was a popular subject of discussion in the world as an alternative means of waste disposal to protect the people against environmental hazards (Iqbal *et al.*, 2022a). In modern times, the effects of improper solid waste practices have been a hot subject of discourse. The rapid urbanization, industrialization, and growing population have significantly increased solid waste generation, contributing to widespread environmental destruction, including contamination of air, soil, and water (Bilal, 2025). Several studies have been conducted on the implementation and compliance with the solid waste management laws around the world. Government administrators have different ways of carrying out their solid waste materials segregation and disposal. Some are still practicing traditional methods, while others are gearing towards a modern strategy of solid waste management.

2.1. Local approaches to solid waste management

From the local viewpoint, the majority of less developed and developing countries are still practicing the conventional ways of solid waste management. Open dumping and burning of solid waste materials are common. Cheng *et al.* (2022) elaborated that municipal solid waste (MSW) management has become a critical challenge around the world, particularly for less developed countries, due to the growing population and industrialization. Goh *et al.* (2022) asserted that municipal solid waste (MSW) output has increased due to population growth, economic expansion, new product and service development, and unsustainable consumer behavior, such as intensive packaging generation (Galavote *et al.*, 2024). One similar finding among studies emphasized that the majority of less developed countries around the world are experiencing pressing problems with solid waste management. This is mainly because of the growing population and the influx of globalization. This is what the studies of Cheng *et al.* (2020) and Goh *et al.* (2022) had in common. The national and local governments are struggling to keep up with the fast-changing demographic and economic trends of the time.

In the case of developing countries, SWM is also a great challenge, particularly in their urban areas. According to Eshete *et al.* (2023), in most cities of developing countries like Ethiopia, inappropriate solid waste management is a source of environmental contamination and diseases. In other words, inadequate drainage and the absence of solid waste disposal facilities are primary concerns of most urban areas in developing countries. As a result, flooding and waterlogging are prevalent in Nepal, which pose a serious health and economic threat (Nepal *et al.*, 2022). This problem is common, particularly in developing countries where solid waste infiltrates and blocks drains. Similarly, Vinti *et al.* (2023) concluded that inaccurate solid waste management (SWM) will lead to environmental pollution and diseases. For instance, solid waste burning can contaminate the environment, which can cause a serious threat to our bodies. Eshete *et al.* (2023) and Vinti *et al.* (2023) share similar findings in their studies. One thing that is common for developing countries is the lack of appropriate knowledge on the proper ways of segregation and disposal of solid waste materials, which in turn causes pollution, environmental contamination, and flooding. This is a big challenge for both the national and local governments of developing countries.

2.2. Global approaches to solid waste management

From a global perspective, industrialized and developed countries are adopting a more sophisticated way of solid waste management. According to Iqbal *et al.* (2022b), developed countries have focused on waste recycling or the 3R (reduce, reuse, and recycle), incineration, and thermal valorization. Indeed, developed countries take the lead in municipal solid waste (MSW) management. For instance, Sweden and Japan have adopted comprehensive waste classification rules, strict waste recycling policies, and extended waste producer responsibility systems, which resulted in high solid waste recycling initiatives and waste-to-energy conversion attainment (Mekonnen & Tokai, 2020). Another way of MSW treatment is segregating household wastes by source separation, just like what is being done in Greece. Tsimnadis *et al.* (2023) asserted that the source separation strategy supports a closed-loop model of waste. It means that raw materials and disposable items can undergo recycling and can be used for the second time while attaining a high reduction of waste disposal at landfills. After all, the collection of solid wastes is being taken charge of by municipal government units and specific government agencies. Iqbal *et al.* (2022), Mekonnen & Tokai (2020), and Tsimnadis *et al.* (2022) share a similar finding about how developed economies managed their solid waste products. Developed countries are innovating continuously on how to manage their solid waste materials effectively and efficiently. This is how the less

developed countries differ from developed countries. While the less developed countries are still practicing the traditional and ineffective ways of SWM, developed countries are already using modern technology and machines in solid waste segregation and disposal. Good governance and technological breakthroughs are the main drivers for effective solid waste management in most developed or rich countries.

2.3. The philippine experience

Meanwhile, in the Philippines, Republic Act 9003 was enacted to provide efficient, effective, and proper management of solid waste materials. The act is also known as the Ecological Solid Waste Management Act of 2000, which was implemented during the administration of former President Gloria Macapagal Arroyo. Despite this law, open, unrestrained dumps, an example of poor solid waste management practices, are still prevalent in the Philippines. Castillo and Otoma (2013) pointed out that the Department of Environment and Natural Resources (DENR) is the one that enforces environmental laws in the Philippines (Gamao & Caelian, 2023). However, in terms of solid waste management, local government units are given the primary responsibility under the Republic Act 7160 or the Local Government Code of 1991. According to Nicavera (2021), fifteen (15) out of thirty-two (32) local government units in a first-class province are non-compliant with RA 9003 (DENR Report, 2016; Gamao & Caelian, 2023). Some barangays in Gingoog City experienced flash floods in December 2022, due to improper solid waste management practices and the lack of public awareness about the law.

Decentralization, as one of the policy reforms in the Philippines, was introduced in 1991 through the enactment of RA 7160. Decentralization is the transfer of functions, powers, responsibilities, and accountabilities to lower-level institutions for better governance (Brillantes, 2004). Through this reform, most basic services were devolved to LGUs for better governance. To be specific, LGUs were given the power, authority, and accountability from the national government to manage their resources, financing, and revenue generation. RA 9003; for example, as a national law, LGUs are given the power to issue local ordinances to implement the law fully at the local level. However, as time passed by, the Solid Waste Management Law was not seriously being taken into consideration not only by the residents but the local policy-makers. This study sought to find out the level of awareness of residents of Gingoog City on RA 9003; to find out the level of compliance of Gingoog residents on the implementation of Republic Act 9003; to find out the satisfaction level of residents on the implementation and monitoring of RA 9003 by the City Government of Gingoog. The study also sought to draw policy interventions or recommendations to the lawmakers of the City Government of Gingoog on solid waste management.

3. METHODOLOGY

3.1. Research design

This study primarily used the descriptive research design. According to Nassaji (2015), descriptive research aims to describe a phenomenon and its characteristics. He also added that this type of research is more concerned with what rather than how or why something has happened. In gathering data, the researcher may adopt or rely on observation and survey instruments. Moreover, under this type of research design, the data can be gathered qualitatively but can be analyzed quantitatively. That is with the use of frequencies, percentages, averages, or other statistical analyses to determine relationships.

3.2. Research locale

The study was conducted in Gingoog City, Province of Misamis Oriental, Northern Mindanao, Philippines. Specifically, the areas covered are seven (7) barangays in Gingoog City, which include Barangay A, Barangay B, Barangay C, Barangay D, Barangay E, Barangay F, and Barangay G. The City of Gingoog is situated on the northern coast of Misamis Oriental. Geographically, it is 74 kilometers west of Butuan City and 122 kilometers east of Cagayan de Oro City. With a total land area of 404.6 square kilometers, 1.71 percent of the city is classified as urban areas, while around 56 percent is considered public forest lands. Politically, it is composed of 79 barangays, of which 29 are classified as urban, and 50 as rural barangays. As of 2020, it has 136,698 total population (PSA).

3.3. Research participants

The target population tapped as participants of the study are residents of 79 barangays in Gingoog City. However, due to time constraints, only seven (7) barangays and 78 residents are being selected as the sample size. A purposive sampling technique was adopted. Oliver (2015) emphasized that purposive sampling is a type of nonprobability sampling in which participants are chosen based on specific characteristics and the purpose of the study. Participants are selected into three (3) categories: students, professionals, and homemakers.

3.4. Research instrument

This study utilized a self-administered and validated survey questionnaire as the primary instrument in data gathering. The survey questionnaire was developed by the researcher in an open-ended manner. The questionnaire has four (4) items to be answered in essay form. It was designed for the participants to express their thoughts about the topic freely. The researcher himself formulated the survey questionnaire and has undergone some steps to make the instrument reliable and can answer the research questions of the study. First, the researcher, through the literature review, has gained some ideas in formulating questions related to the topic. Second, the researcher has consulted an expert in the development of a survey questionnaire. Lastly, the researcher has conducted a pilot test on small groups of participants to gather some comments to improve the questionnaire.

3.5. Data Gathering procedure

The researcher followed some steps in gathering data for the study. First, letter requests were made to seek approval from the Punong Barangays to survey their target residents. The researcher himself visited the seven (7) barangay offices and explained to the council the objectives of the study. Second, the researcher asked for the profiles of the residents who would be

included as participants in the study. To be specific, students, professionals, and homemakers are target participants of the study. Third, the researcher himself distributed the questionnaires to the target participants and explained to them the purpose of the survey. Fourth, the researcher conducted a short interview with the participants to validate their responses to each question. Fifth, the researcher collected the filled-out survey questionnaires. He also assured the participants of the confidentiality of their identities and their responses, and that the survey was conducted for academic purposes only.

3.6. Data analysis

The data collected were grouped per problem statement or research question and recorded in a tabular form. For the first research question, "Are you aware of Republic Act 9003 or the Ecological Solid Waste Management Act of 2000? Tell me something about the law.", all responses that said "Yes, I am aware of RA 9003" were grouped in one column while those who responded, "No, I am not aware of the law", were put together in the opposite column under one table. Similarly, for the second research question, "Do you practice proper solid waste management in your household? Describe how you did it.", all responses that confirm they are practicing proper solid waste management were grouped in one column, while those responses that do not confirm they are practicing proper solid waste management were grouped in the opposite column under one table. Moreover, for the third research question, "Are you satisfied with the implementation and monitoring of the said law by the City Government of Gingoog? Elaborate your answer.", all responses that say they are satisfied were put together in one column while all responses that say they are not satisfied were grouped in one column in one table. Finally, for the fourth research question, "What can you suggest to improve the compliance of the said law in your barangay?", all suggestions involving the City Government of Gingoog or the particular barangay were grouped in one column while those suggestions involving the residents or the people were put together in the opposite column under one table. After grouping the data, frequencies and percentages of responses were calculated using Excel.

3.7. Ethical considerations

In the conduct of the study, some ethical considerations were made. The researcher made sure that the privacy of participants and the confidentiality of their responses were preserved. No participant had been forced to answer the survey questionnaire. It was their own voluntary will to participate in the study. In answering the questionnaire, participants are given the option not to write their names. Moreover, the real names of the seven (7) barangays in Gingoog City were preserved to protect the names and identities of these barangays and their council members. Before the distribution of survey questionnaires, a letter of approval was sought by the researcher from the concerned Punong Barangays.

4. RESULTS AND DISCUSSION

Table 1. Frequency and percentage distribution of participants in terms of age

Age	Frequency	Percent	Valid Percent	Cumulative Percent
25 and below	19	24.359	24.359	24.359
26-30	9	11.538	11.538	35.897
31-40	32	41.026	41.026	76.923
41 and above	18	23.077	23.077	100.000
Missing	0	0.000		
Total	**78**	**100.000**		

The results (Table 1) depicted the frequency and percentage distribution of participants by age. Out of 78 participants, the majority are aged between 31-40 years old (41%). Followed by those in bracket 25 years old and below (24.36%), then those in bracket 41 years old and above (23%), and lastly, those aged 26-30 years old (11.53%). This implies that participants in the age bracket of 31-40 years old dominated the survey.

Table 2. Frequency and percentage distribution of participants in terms of sex

Sex	Frequency	Percent	Valid Percent	Cumulative Percent
Male	46	58.974	58.974	58.974
Female	32	41.026	41.026	100.000
Missing	0	0.000		
Total	**78**	**100.000**		

In terms of sex, Table 2 shows that 46 of the participants are male (58.97%), while 32 participants are female (41%). This implies that male participants dominated the survey. A study by Araune (2024) revealed that males have shown higher compliance with the proper solid waste disposal compared to females. But in terms of segregation and reuse, females exhibited

higher compliance than males. Due to their inclination to handle waste-related tasks, females were noted for their high compliance in domestic solid waste disposal. On the contrary, Smith *et al.* (2018) discovered that gender did not come out as an important factor influencing solid waste management practices while examining waste management behaviors among city residents in rich countries (Fernandez *et al.*, 2024).

Table 3. Frequency and percentage distribution of participants in terms of education

Educ	Frequency	Percent	Valid Percent	Cumulative Percent
College level	31	39.744	39.744	39.744
Bachelor's degree	42	53.846	53.846	93.590
Master's degree	5	6.410	6.410	100.000
Missing	0	0.000		
Total	**78**	**100.000**		

The results also showed the frequency and percentage distribution of participants in terms of educational attainment. Out of 78 participants, 42 are bachelor's degree holders (53.85%). Followed by 31 participants who are college level (39.74%), while only 5 participants have a Master's degree (6.4%). Surprisingly, there are no doctors among the participants, or high school graduates only. Some studies correlate educational attainment with the level of compliance with solid waste practices. A study by Rodriguez *et al.* (2024) shows that persons with a graduate degree have a greater probability of always separating waste materials compared to individuals with a non-graduate degree.

Table 4. Frequency and percentage distribution of participants in terms of category

Category	Frequency	Percent	Valid Percent	Cumulative Percent
Student	23	29.487	29.487	29.487
Professional	35	44.872	44.872	74.359
Homemaker	20	25.641	25.641	100.000
Missing	0	0.000		
Total	**78**	**100.000**		

Moving on to the frequency and percentage distribution of participants in terms of category. Table 4 displays that 35 of the participants are professionals (44.87%), followed by 23 participants who are still students (29.49%), and only 20 participants are homemakers (25.64%). It implies that professionals had the highest participation rate in the study. However, Fatikasari (2023) emphasized that in the promotion of solid waste management and recycling initiatives, homemakers can act as agents of change within their societies. The wife can educate her family members and neighbors about appropriate waste management practices and contribute meaningfully to waste reduction efforts in the community (Azwa *et al.*, 2024).

Table 5. Frequency and percentage distribution of participants in terms of barangay

Barangay	Frequency	Percent	Valid Percent	Cumulative Percent
Brgy A	8	10.256	10.256	10.256
Brgy B	10	12.821	12.821	23.077
Brgy C	14	17.949	17.949	41.026
Brgy D	12	15.385	15.385	56.410
Brgy E	17	21.795	21.795	78.205
Brgy F	9	11.538	11.538	89.744
Brgy G	8	10.256	10.256	100.000
Missing	0	0.000		
Total	**78**	**100.000**		

The researcher also determined the area of residence or the barangay where the participants were living. Table 5 depicts the frequency and percentage distribution of participants in terms of barangay of residence. Out of 78 participants, 17 are

coming from Barangay E (21.80%). It means that the majority of the participants of the study are living in Barangay E. On the other hand, Barangay A and Barangay G got 8 participants each (1.26%).

After conducting a survey, the researcher examined the responses and grouped them according to similarities and differences. The following are the findings of the study based on the actual experiences of the participants on the compliance of RA 9003 or the Ecological Solid Waste Management Act of 2000:

i. Are you aware of Republic Act 9003 or the Ecological Solid Waste Management Act of 2000? Tell me something about the law.

The results revealed that out of 78 participants, 45 said they are aware of the law and the corresponding penalties if one of the provisions is violated (58%), while 33 responded that they are not informed (42%). One participant said that, "*It is the law that provides the necessary policy framework, institutional mechanisms, and mandate to the local government units (LGUs) to achieve 25% waste reduction*". This indicates that most people in Gingoog City knew the existence of the Ecological Solid Waste Management Act of 2000 and its purpose. Related studies emphasized that people's awareness of the law contributed much to the successful implementation of the said law. Joshi and Ahmed (2016), noted that an inadequate public awareness, insufficient technical knowledge, and poor law enforcement are significant barriers on the successful solid waste management (SWM) programs in coastal areas of Mati City, Davao Oriental where these challenges are more pronounced (Verzosa *et al.*, 2024). Similarly, Galarpe and Heyasa (2017) stressed that a lack of public awareness, a lack of stakeholder participation, and a lack of policy implementation have led to the prevalence of poorly managed systems, as can be seen by the utilization of open landfills and dumpsites.

ii. Do you practice proper solid waste management in your household? Describe how you did it.

The results show that in terms of actual practice, out of 78 participants, 58 responded that they are not practicing proper solid waste management at home (74%), while only 20 said that they are doing proper solid waste management at home (26%). One participant said that, "*We practiced it but not religiously. Sometimes we do, other times we do not*". Another participant answered, "*Sometimes, when we feel like. We separate the biodegradable and the non-biodegradable regardless if it is recyclable or not.*" This indicates that the majority of the people in Gingoog City do not practice proper solid waste management in their households. This claim can be associated with the study of Pasco et al. (2024) that solid waste segregation at the household level has already been initiated in Sitio Malaking Parang, San Juan, Taytay, and Rizal. However, the residents' knowledge of household solid waste segregation was not accurate and comprehensive, and they did not retain the importance of these actions. Thus, the researchers introduced them to the needed interventions to improve their practices of proper waste segregation.

iii. Are you satisfied with the implementation and monitoring of the said law by the City Government of Gingoog? Elaborate your answer.

In terms of the implementation and monitoring by the City Government of Gingoog, the majority of the participants are not satisfied. Out of 78 participants, 68 said they are not satisfied (87%), while only 10 responded that they are satisfied (13%). One participant said, "*No, because they are not implementing the Ecological Solid Waste Management Act. Only one (1) dump truck is used for all waste products. There is no segregation and proper disposal of waste*". This indicates that the majority of the people in Gingoog City are not satisfied with the implementation and monitoring of RA 9003 by its local government. Indeed, the drop-off point in Barangay E, where sacks and sacks of unsegregated waste are dumped. Similarly, another participant said, "*Honestly, no. Based on my experience, I have seen some of the implementers violate the regulations they have put in place. Ironically, most of them do not generally comply with it.*" This can be supported by the study of Sapuay (2014), that solid waste management has not been a key priority for most local government units in developing countries. Furthermore, Paul (2009) pointed out that due to technological, organizational, and financial constraints faced by the majority of local government units, the implementation and compliance with R.A. No. 9003 remains unsuccessful (Dalugdog, 2021). Dalugdog (2021) concluded that when the government lacks funds, it cannot cope with the increasing volume of waste. In a bigger picture; Khan *et al.* (2024) and Stafford (2020) emphasized that while most Municipal Solid Waste (MSW) and sewage are collected, reused, and recycled in industrialized countries, collection and proper disposal of solid waste materials are not yet a reality for most developing countries, let alone well-designed municipal treatment facilities (Zhang *et al.*, 2024a). As a result, Yadav and Samadder (2018) revealed that the efficiency of MSW collection in developing countries (40%) is less than half that in developed countries (90%) (Zhang *et al.*, 2024b).

iv. What can you suggest to improve compliance with the said law in your barangay?

Based on the responses, all participants gave their suggestions and recommendations to improve the level of compliance with RA 9003. The following are some of their significant suggestions:

- A strict implementation of the penalty should be applied to those who violate the law.
- Practice the 3Rs of waste management – Reduce, Reuse, and Recycle.
- More seminars should be conducted for the residents to increase awareness and the impact of non-compliance on the environment.
- The barangay council must educate its constituents about the harmful effects of not following the proper solid waste segregation and disposal.
- In every barangay, there should be someone assigned to monitor the proper waste segregation and disposal.
- There must be a Materials Recovery Facility (MRF) in every barangay to maintain proper segregation of wastes.

Similarly, Dalugdog (2021), in his study, recommended that a continuous information dissemination campaign must be conducted to strengthen the knowledge of the residents about solid waste management. Likewise, the enforcement officers must be strict in the implementation and enforcement of R.A. No.

9003. Thus, a training program must be proposed to encourage the residents to be cooperative in the implementation and enforcement of this Act. Furthermore, the City Environment and Natural Resources Office (CENRO), in coordination with the Department of Interior and Local Government (DILG), must assign a person or office concerned to monitor and evaluate the implementation and enforcement of this Act.

5. CONCLUSIONS

As a conclusion, Republic Act 9003 has been implemented for so many years already in the Philippines, but noticeably, the level of implementation in some municipalities or cities is still low. In the case of Gingoog City, the level of compliance is low, and the satisfaction level of residents with the implementation and monitoring by the City Government is also low. This is due to a lack of public awareness, a lack of stakeholder participation, and a lack of policy implementation. It has also been discovered that even though solid wastes are segregated at home, during disposal, these wastes are being mixed as there is no proper facility by the City Government to manage the processing of various waste products. In addition, residents' knowledge of household solid waste segregation was not accurate and comprehensive, and they did not retain the importance of these actions. To sum up everything, inadequate public awareness, insufficient technical knowledge, and poor law enforcement are the causes of low compliance with the Ecological Solid Waste Management Act among the people. Therefore, it has been recommended that the City Government of Gingoog, including its barangay officials, should conduct an evaluation on the implementation of the said law and improve the existing practices on solid waste segregation and disposal. Premakumara (2015) highlighted that policy making at the national level does not necessarily warrant its implementation at the local level. He also emphasized that effective enforcement of RA 9003 depends on the degree of leadership, supportive organizational framework, technological and budgetary capacity, strong stakeholders' participation, and functional enforcement and reward systems. The findings of the study can also serve as a basis for other local government units in the Philippines in the monitoring and evaluation of the implementation of RA 9003 in their respective places. Whether the implementation is effective or not, other LGUs can benchmark from the results of this study in Gingoog City for future planning and policy review. However, the findings cannot be generalized without further replication. For future research, a study on solid waste management shall also include best practices in some municipalities or cities in the Province of Misamis Oriental and nearby provinces to inspire other LGUs in improving their implementation of RA 9003.

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