



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact Factor: 6.078

(Volume 9, Issue 2 - V9I2-1388)

Available online at: <https://www.ijariit.com>

Assessment of the Effectiveness of Solid Waste Management in the Municipality of Santo Tomas, Pampanga

Allainice Sangil

sangilallainice@gmail.com

Don Honorio Ventura State University,
Bacolor, Philippines

Kian D. Dimarucut

dimarucutkian@gmail.com

Don Honorio Ventura State University,
Bacolor, Philippines

Sugar Mae I. Dumalus

sugardumalus1@gmail.com

Don Honorio Ventura State University,
Bacolor, Philippines

Erica B. Tiglao

ericatiglao2323@gmail.com

Don Honorio Ventura State University,
Bacolor, Philippines

Lovell D. Fabian

lovelldiazfabian@gmail.com

Don Honorio Ventura State University,
Bacolor, Philippines

Prince Joshua V. Manansala

princejoshuamanansala12@gmail.com

Don Honorio Ventura State University, Bacolor,
Philippines

Jerwin P. Sagmit

kutit.sagmit10@gmail.com

Don Honorio Ventura State University,
Bacolor, Philippines

Charles G. Lim

cglim@dhvsu.edu.ph

Don Honorio Ventura State University,
Bacolor, Philippines

Reggie R. Martin

rrmartin@dhvsu.edu.ph

Don Honorio Ventura State University,
Bacolor, Philippines

ABSTRACT

This study focuses on the effectiveness of the implementation of the plan for the management of solid waste. The study will be focused on the municipality of Santo Tomas, Pampanga. Residents of seven barangays have almost the same level of knowledge about implementing RA 9003. Looking into the strategies and solutions, the sampling methods approach was used as a framework. The data was gathered using sampling methods, and researchers developed questions for survey questionnaires. The study administered the assessment to the total of ninety-one (91) respondents as stakeholders and ten percent (10%) of the total population with the total of four thousand two hundred eighty-five (4,285). This research found that stakeholders who participated in the survey had a high level of solid waste management. The result data demonstrate that from the group of residents, barangay Santo Rosario obtained the overall highest mean for the three parts of the assessment. The municipality Local Government Unit has given a program which each barangay plastic sachets residuals will be donating their collected waste in Holcim Philippines a cement manufacturer and re-produces it. Based on the results a guideline in identifying safe, effective and sustainable Waste Management Practices in Santo Tomas, Pampanga was developed. This guideline will not only help the barangays to implement the practices implementing RA 9003, also it will help the community to be aware of their roles and the strategies in Solid Waste Management.

Keywords: *solid waste management, implementation, strategies in swm, awareness in smw, ecological solid waste management, Santo Tomas*

1. INTRODUCTION

Solid waste management and engineering management are interconnected in several ways. Engineering management involves applying engineering principles and practices to effectively manage resources, projects, and systems within an organization. The collection, treatment, and disposal of garbage produced by society are the main objectives of solid waste management, on the other hand. Engineering management provides the framework and tools to effectively plan, implement, and improve solid waste management practices. By integrating engineering management principles into solid waste management, organizations can enhance operational efficiency, reduce environmental impacts, and achieve sustainable waste management outcomes.

Humans generate many types of trash during their lifetimes, including urine, blood, scraps, paper, and electronic devices (The Environmental Literacy Council, 2019). One of the most abundant is solid waste, which is generated in large quantities all around the world (Hoorweg & Bhada-Tata, 2022). According to Mishra et al. (2018), solid waste is any item that has been abandoned or is otherwise unusable as a result of normal human activity. Yard waste, waste, plastics, wood, metals, papers, rubbers, leather, batteries, inert materials, textiles, paint containers, demolition and construction debris, and many other hard-to-categorize items are all included. Today, solid waste and how to properly deal with it are recognized as worldwide issues (Singh et al., 2018).

The World Bank (2020) estimates that 2.01 billion tons of municipal solid waste are generated each year, with 33 percent being disposed of in an incorrect and environmentally harmful manner and 20 percent being recycled or composted. Up to 70% more garbage will be produced worldwide by 2050, according to certain projections (Industry Dive, 2020). An estimated 35,580 tons of trash are produced per day in the Philippines (Castillo & Otoma, 2013), which equates to around 14.66 million tons annually in 2014 (Department of Environment and Natural Resources [DENR], 2018).

The Philippines is now the "third-largest generator of solid waste per year among Southeast Asian countries" (Romero, 2020), with annual waste generation of 16.6 million tons in 2018. The difficulties related to excessive waste are becoming increasingly prevalent as a result of rising population, rising living standards, and increased urbanization (Senate Economic Planning Office [SEPO], 2017).

The SDGs are an effort to redirect international development. They are a rallying cry for those who want to see poverty and injustice eliminated, the environment preserved, and the promise of a life of peace, justice, and prosperity for all people. Furthermore, it is crucial that no one lags. Simply said, "Solid Waste Management" encompasses every step of the procedure for dealing with trash. During the waste management process, garbage from many different locations is collected and disposed of. This procedure includes collecting trash, transporting it, cleaning it up, analyzing it, and finally dumping it. It requires close monitoring to ensure strict standards and regulations are met. Forthcoming (Chaven, 2022) Rates of waste products are rising everywhere in the world. According to projections, by 2022, humans will have generated a global total of 2.24 billion tons of solid waste, or 0.78 kg of trash per person, per day. Population growth and

urbanization are both major contributors to the forecasted 73% increase in annual rubbish creation from 2022 levels to 3.88 billion tons in 2050. (World Bank, 2022)

The Philippines has made efforts to better manage solid waste with the adoption of RA 9003, the Ecological Solid Waste Management Act, which mandates a comprehensive, ecological waste management program to safeguard human health and the environment. The National Solid Waste Management Commission is tasked with carrying out the plan for managing solid waste, and the National Ecology Center is responsible for providing secretarial support to the commission as well as informing, advising, educating, and training different local government units on ecological waste management. It also provides guidelines about how to implement these measures. Furthermore, per RA 9003, LGUs are accountable for efficient and effective management of solid waste, particularly trash sorting and disposal.

Each LGU is required to draft a Solid Waste Management Plan (SWMP) that details its waste management strategies for the next ten years and includes a timeline for building MRFs and landfills (DENR, 2019). The fight for efficient garbage disposal will be led by the municipal authorities. The ceremony was held by the mayor of the municipality and the current authorities of the barangays to launch a campaign to manage solid trash in the municipality and barangays through the use of these vehicles. The Municipal Environment and Natural Resources Office is responsible for carrying out the terms of the Ecological Solid Waste Management Act of 2000 (RA 9003). Sun Star Pampanga (2018 Edition)

The purpose of this study is to determine the effectiveness of the current approaches being taken in the Santos Tomas, Pampanga to the challenging issue of solid waste management. The specific objectives of this research are to a) catalog the various waste

management problems in the Philippines, b) evaluate the current approaches being taken to these problems, and c) suggest additional approaches that may prove effective.

2. BACKGROUND OF THE STUDY

Protecting human health and the environment, as well as conserving resources, are at the forefront of sustainable waste management's mission. Socially acceptable waste management approaches (Wilson et al., 2017) and preventing the export of trash-related problems into the future (through 'clean' cycles and landfills requiring minimum after care (Brunner, 2023) are additional aims. Waste management charges that are reasonable must be met first. Decision-makers employ integrated strategies that comprise a wide range of interrelated procedures such collection, transportation, treatment, recycling, and disposal to achieve these objectives (Al Sabbagh et al., 2012). This means that decision-makers must strike a balance between environmental, economic, technical, regulatory, and other societal concerns in order to ensure that trash is managed effectively and at a cost that is acceptable to society.

Decision-makers are frequently challenged by the following inquiries due to the ever-increasing variety of trash collection and treatment alternatives and the ever-shifting nature of economic boundary conditions. Is there a more efficient way to achieve waste management goals within the current system? Can the same service be provided by different, more efficient processes at a cheaper price (Rogge and De Jaeger, 2012). On the one hand, decision-makers face pressure from a variety of stakeholder groups who want more sustainability, innovative technology, or cheaper waste management in response to these questions (Wilson et al., 2017). However, decision-makers face a methodological conundrum when trying to assess both existing and potential future waste management systems. To make matters more complicated, there are numerous methods that promise assistance with strategic or policy decisions, waste management planning, and waste management optimization at all tiers of government (businesses, municipalities, and national).

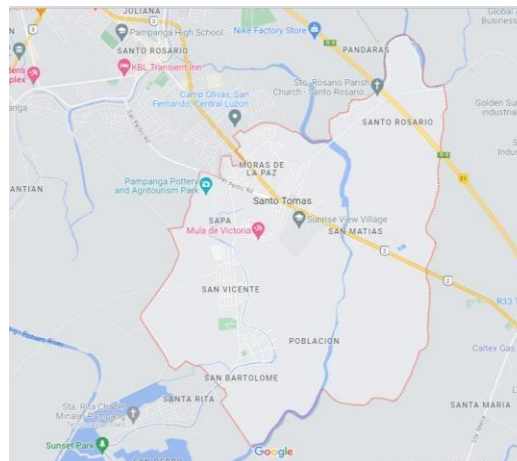


Figure-1: Santo Tomas Map

The city of Santo Tomas in Pampanga was selected as the study's primary location. Santo Tomas's Solid Waste Management agrees with the findings of the Local Government Unit that the city is having problems with its solid waste. The head of the municipal solid waste management committee has stated that source segregation is the biggest challenge they face. Furthermore, the town has established procedures to address this issue. As of the year 2017, all barangays were mandated to have their very

own trash collection vehicles. The Materials Recovery Facility (MRF) is not to be used as a landfill as of this year. Their material recovery facility (MRF) will sort recyclables before sending them to the landfill. Shampoo sachets, fast sachets, and other little plastic packaging fetch high prices per kilo. Biodegradable waste, nonbiodegradable trash, residual for potential diversion, and residual for disposal are the four categories of solid waste used in the Waste Analysis and Characterization Study.

3. STUDY AREA

The study was conducted in the municipality of Santo Tomas Pampanga. The municipality of Santo Tomas is considered the smallest and youngest town established in Pampanga. The municipality of Santo Tomas is bounded by the province's capital city, the City of San Fernando on the northwest, the municipality of San Simon on the northeast, Minalin on the southeast, and Bacolor on the west. The town of Santo Tomas includes now the seven barangays of Moras de la Paz, Poblacion, San Bartolome, San Matias, San Vicente, Santo. Rosario Pau and Sapa (Santo Nino).

Moras de la Paz consist 5,488, Poblacion consist 3,133, San Bartolome consist 3,456, San Matias consist 13, 769, San Vicente

consist 10,048, Sto. Nino (Sapa) consist 2,642 and Sto. Rosario (Pau) consists of 4,310. The total population in the Municipality of Sto. Tomas, Pampanga is 42, 846 in the year of 2020.

4. STATEMENT OF THE PROBLEM

The purpose of this research is to determine the extent to which people of Santo Tomas, in the province of Pampanga, are able to dispose of solid waste in an appropriate manner.

Specifically, this study will answer the following:

- Assess the effectiveness of Solid Waste Management in Santo Tomas, Pampanga.
- Assess the methods used by the residents in disposing of their waste.
- Identify the factors that cause these problems that Santo Tomas, Pampanga municipality may encounter in their solid waste management.

5. OBJECTIVE OF THE STUDY

The study aims to assess the effectiveness of solid waste management in the municipality of Santo Tomas, Pampanga through descriptive survey method. The specific objectives are:

1. Assess the solid waste management strategies that are effective in the Municipality of Santo Tomas.
2. To evaluate the implementation of RA 9003 "Ecological Solid Waste Management Act of 2000." in the Municipality of Santo Tomas.
3. Develop guidelines in identifying safe, effective, sustainable and culturally acceptable waste management practices in Santo Tomas, Pampanga from the results of the assessment.

6. SIGNIFICANCE OF THE STUDY

The purpose of this research was to evaluate how effectively solid waste was managed in the municipality of Santo Tomas, which is located in the province of Pampanga. In addition, the following groups will benefit from this research:

Residents of Santo Tomas: At the end of this study, the residents in Santo Tomas will determine the problems of their area in solid waste management. With that, they will be aware and can provide solutions to solve it.

Local Government Unit of Santo Tomas: With this study, the government officials will discover the problem existing in their place. And with that, they will know what they will do and what projects they should execute to resolve the problem.

Civil Engineering Students: This study will have significance to the civil engineering students for they will gain more knowledge about solid waste management. This will help them to recommend some of their ideas that will solve the said problem.

Future Researchers: This study could be used as a resource and guide for future researchers. This could also serve as their source of information and ideas.

7. SCOPE AND LIMITATION

The study's scope and limitations are made up of uncontrollable events and factors. The study's focus is on the effectiveness of solid waste management in the municipality of Santo Tomas, Pampanga. In the study, bad weather is just one of several potential natural disasters that could compromise data collection.

The city's lack of finances for solid waste management equipment is a possible threat to the local ecosystem and public health, therefore it's important to get to the bottom of the problem with how it handles its garbage.

The problems with solid waste management, and the answer to them, which is to appropriate resources and put forward political will in the city, are the only ones that will be examined in this study.

8. REVIEW OF RELATED STUDIES

The garbage produced by people is a major contributor to the pollution concerns that plague the world. Solid Waste Management (SWM) has been shown in studies to have negligible social effects in various places in the Philippines, including Naga City. This report assessed the transmission of information regarding the SWM system's installation in Naga City. Both the level of attention given to these programs by LGUs and the extent to which household heads are aware of them were assessed. The research used a mixed-methods methodology that focused on both description and evaluation. Data was collected using a combination of structured surveys, interviews, and focus groups with representatives from nine (9) Barangays and chosen schools in Naga City, Philippines. The study found that while families were "somewhat aware" of various SW management programs, the City had "not given much priority" to informing the public on various SWM programs, and the execution was only "somewhat effective" in terms of

information and dissemination.

These findings will aid local government units (LGUs), non-governmental organizations (NGOs), and other stakeholders in improving policies pertaining to SWM issues, in particular those pertaining to information dissemination. As a result, the City's waste problem can be addressed through the implementation of an SWM development plan that is superior in terms of efficacy, efficiency, sustainability, and cultural acceptability. Reference: (Beguia et al., 2019). Republic Act 9003, also known as the "Ecological Solid Waste Management Act of 2000," details the correct procedure for sorting trash and designates who is responsible for carrying it out. In 2016, researchers in Davao City conducted a study called Bagolong to assess the community's level of involvement in the execution of Republic Act 9003. One hundred residents of Davao City's ten largest barangays were randomly selected to participate in a descriptive survey, and the means were used to analyze the data. The results showed that community participation was high in terms of sanctions and educational seminars and programs, but only slightly higher in terms of physical infrastructure and financial incentives.

Despite widespread engagement, more education is required because some community responders lack a firm grasp of the repercussions of their actions. As a result, it is essential to implement a large-scale information education campaign targeting both the community and the barangay officials. According to a recent study (Bagolong & Saidamin, 2016), We need reliable and efficient solid waste management. The purpose of this research was to evaluate the effectiveness of the Solid Waste Management Program in Vigan City, Ilocos Province, Philippines. Its solid waste recovery facilities, waste types, and waste segregation, collection, disposal, and usage techniques were all highlighted. Segregation and other solid waste management techniques were strictly adhered to by all parties, and hazardous waste was handled in compliance with DENR and DOH regulations.

At the recycling center, the trash was separated into different piles. Producing organic fertilizer from compostable wastes, recycling plastic containers into plastic tables/monoblocks, using cellophane as a cotton substitute for pillows, and as a material for making souvenir items are all examples of waste being put to good use. Paper wastes are converted into paper pulp, which can be used as cooking fuel. The gathered scrap iron and metals were sold to fund the upkeep of the recovery centers. The Department of Agriculture provided free organic fertilizers to low-income farmers and charged just a token amount to those who could afford it. The urban day care centers made use of monoblocks. The destitute households were given the livelihood project of collecting plastic cellophane to make cushions and other items. Reference: (Arce et al., 2012) When it comes to encouraging garbage diversion and waste reduction, the present waste management program in the City of Palayan states the obligations of both the city and the barangays quite explicitly. In order to accomplish this, it is important for the general public to get knowledge of the "five R's" of solid waste management (reduce, reuse, recycle, dispose, and separate). "Segregation at source," which comprises classifying trash at the place of generation, is one approach to controlling solid waste.

Those interested in solid waste management in Palayan City, Philippines set out to survey locals to find out how much they knew. To measure its magnitude, scientists collected instances, tabulated percentages, and determined means and standard deviations. Palayan, in the Philippine province of Nueva Ecija, was the principal setting for the research. The responders are the people who live in the Barangays of Palayan City. The data was analyzed using common statistical techniques such as frequency distributions, weighted means, and percentages. Results showed that most people felt that recyclables should be segregated before collection and that people should buy only necessities. Respondents were also knowledgeable about the Clean Water Act of 2004 (Republic Act No. 9275) in the Philippines.

The vast majority of respondents were aware that it is against the law to litter, throw garbage, or dump waste in public places including roads, estuaries, and parks. Respondents should not only be cognizant of the issues around solid waste, but also take steps to address them. According to research (De Jesus, et al., 2021) Local governments are required by RA 9003 (the Ecological Solid Waste Management Act of 2000) to take charge of the complex issues surrounding the disposal of ecological trash. As a result, an evaluation of the efficacy and viability of existing solid waste management (SWM) policies in each municipality is necessary for Camarines Norte, Philippines to comply with this mandate. The questionnaire was the primary data collector, and the interview was used to supplement the results for this descriptive study. Based on the findings, the supply of a sufficient number of vehicles for carrying solid wastes and education on waste segregation practices at all homes and businesses were the most common SWM methods already in place across all twelve (12) towns.

The levels were found to be variable. Only four of the six towns evaluated were found to have more and very successful SWM programs. This suggests that more work needs to be done to reach the critical mass necessary for meaningful change. Composting techniques are widely regarded as superior and feasible for implementation in all communities. The involvement, political will, and dedication of the implementers in carrying out democratically passed resolutions and conducting their measures to inspire active participation by the community are crucial to achieving better solid waste management. The province's health and ecology might improve as a result of all these new policies. (Azuelo et al.)

Synthesis

Most municipal solid wastes (MSW) come from households, businesses, and other types of commercial and institutional

establishments. Examples of these wastes include discarded, paper, plastic, glass, textile scraps, wood, and more. There is an immediate need to develop another solution to ease such a problem because such materials cannot degrade naturally and take a longer time to deteriorate (Ashani et al., 2020).

Garbage and health are intricately linked; many studies have examined the health and environmental implications of garbage disposal and come to the same conclusion (Habib and Sarkar, 2017). These studies have piqued the curiosity of scientists in learning more about the link between pollution and the spread of disease-causing microbes. The environmental and health implications of solid waste on nearby communities, however, have been the subject of relatively few studies (Mekonnen et al., 2020).

The city of Kebridehar's waste management methods remained ineffective and problematic. However, nobody volunteered to do the study. Prior to the city's rapid urbanization and population increase, municipal solid waste management did a good job of handling trash, but now it's failing. Discarded plastic bottles of water and other liquids are commonplace in urban areas. In order to address the issues with current solid waste management practices, the researchers chose to conduct this sociological study, which they hope would inspire other scholars and institutions to do the same.

9. METHODOLOGY

In this chapter, which focuses on the research process, the articles that were covered in this study are broken down, detailed, and clarified for the reader. This chapter contains comments on the design of the research, the research instrument that will be used, the location of the study, the processes that are involved in data collection, and techniques for evaluating and interpreting the results. In order to compile a comprehensive database, the researchers read a wide variety of scholarly works, such as articles, theses, and research papers. The collection of measurable data and the application of statistical, mathematical, or computational tools are the cornerstones of quantitative research, which can be defined as the methodical analysis of phenomena.

9.1 Research Design

This research utilized quantitative research that will determine the problems in Santo Tomas, Pampanga with regards to proper waste disposal. The study used quantitative research to collect information from existing and potential respondents using sampling methods and sending out survey questionnaires. In this study, some of the residents were surveyed about the problems that they are encountering in solid waste management. The research design used is quantitative research; it can be used to find patterns and averages, make predictions, test causal relationships, and generalize results to wider populations. Through these encounters, the researchers would offer a creative and practical solution to address the targeted issue.

9.2 Respondents of the Study

The reliability of the survey statements was evaluated using Cronbach's alpha coefficient, and the results showed that it was greater than 0.7 for all variables. This indicates that all items are reliable, which refers to appropriate measurement reliability. According to Hair et al. (2021), a Cronbach's level of higher than 0.7 is appropriate for reliability.

The respondents are stakeholders in each barangay in Santo Tomas. Namely, (a.) Barangay Captain, (b.) Sangguniang Kabataan Chairman/Chairwoman, (c.) one (1) Religious organization representative (d.) one (1) Kagawad, (e.) one (1) teacher and, (f.) one (1) private citizen, (g.) one (1) president or representative on Parents and Teachers Association, are all listed to be the respondents in the study. Every barangay will have these seven (7) respondents. They are chosen to give representation to every stakeholder. A total of seven (7) persons per barangay. If there is a business establishment existing, one (1) representative will be chosen as respondent. The 10-year Solid Waste Management Plan was conducted through participatory approach with the Barangay Solid Waste Management Committee provided by IRR 9003.

Population and Sample Size

The assessment was conducted on the ten percent (10%) from total population of residents from the municipality of Santo Tomas, Pampanga. The municipality has a total of forty-two thousand eight hundred forty-six (42,846) population from 2020. The 10% of the total population is computed below. The total sample size was divided into seven (7) that corresponds the seven (7) barangays in Santo Tomas. Each barangay a number of six hundred thirteen residents were randomly picked to answer the assessment tool.

$$n = N * 10\%$$

$$n = 42,846 * 0.10$$

$$n = 4285 \text{ respondents}$$

9.3 Research Instrument

Residents of Santo Tomas were given questionnaires in order to ascertain the nature of the community's concerns. The results of this poll were recorded to show how locals felt about several waste management issues. The waste management expertise and habits of respondents are probed by a few questions on the survey questionnaire. They introduced themselves and the study's goal to the participants in a low-key manner. Appendix A includes the survey instruments. The Assessment Tool is modified for use with other studies that have conceptual or methodological grounding with the current investigation. A Licensed Professional Teacher with a major in Filipino adapted and translated the survey questionnaires, and a Licensed Professional Teacher with a major in English

translated them back into English. The Translation Accuracy Certificate can be found in Appendix B.

9.4 Data Gathering Procedure

1. Data collection was done through a paper survey. The research instruments for the study were survey questionnaires that the researchers developed. The survey questions, the researchers used a Likert’s scale.
2. The questionnaires were validated by a consultant or subject-matter expert in the field.
3. A letter of consent was also provided together with the survey questionnaires. This product was created to be distributed to the residents in Santo Tomas, Pampanga.
4. The questionnaires were then gathered.

9.4.5 Data Analysis Likert Scale

The 5-point and 6-point Likert scales are both commonly used in survey research. The main difference between the two scales is that the 6-point scale has an additional option, "strongly disagree," which is not present on the 5-point scale. The target population is four thousand two hundred eighty-five, they were likely to have strong opinions on the topic of the survey, a 5-point and 6-point scale was be more appropriate.

10. RESULTS AND DISCUSSION

10.1 PRACTICES IMPLEMENTING THE REPUBLIC ACT 9003 OR THE ECOLOGICAL SOLID WASTE MANAGEMENT ACT OF 2000 IN THE MUNICIPALITY

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
SAPA	4.11	4.00	3.85	4.28	4.36	4.55	4.89	4.68	4.22	4.61	4.32	4.76	4.78	4.12	4.06	4.79	4.43	4.16	4.39
SV	4.63	4.00	4.05	4.10	4.32	4.71	4.75	4.43	4.30	4.42	4.90	4.35	4.09	4.29	4.24	4.63	4.25	4.35	4.38
POB	4.88	4.56	4.60	3.96	4.32	3.00	3.78	4.24	4.12	4.70	4.12	4.37	4.65	4.33	4.31	4.56	4.51	4.46	4.30
SB	4.77	4.13	2.36	2.33	3.22	3.98	4.69	4.11	4.43	4.34	4.22	4.59	4.66	4.62	4.22	4.14	4.34	4.65	4.10
MDP	5.00	4.54	4.62	4.77	4.68	4.38	4.46	4.69	4.85	4.62	4.38	4.54	4.77	4.31	4.15	4.31	4.13	4.92	4.56
SM	4.30	4.50	4.60	4.10	4.30	4.80	4.00	3.90	4.00	4.20	4.90	4.80	4.65	4.11	4.20	3.87	3.50	4.50	4.29
SR	4.93	4.56	4.76	4.62	4.28	4.89	4.68	4.66	4.87	4.79	4.79	4.88	4.79	4.88	4.77	4.56	4.41	4.69	4.71
TOTAL	4.66	4.33	4.12	4.02	4.21	4.33	4.46	4.39	4.40	4.53	4.52	4.61	4.63	4.38	4.28	4.41	4.22	4.53	4.39

Figure 2: Sample Size’s Responses Practices Implementing RA 9003

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
SAPA	4.15	4.00	3.85	4.31	4.15	3.85	3.92	3.62	4.31	4.15	4.00	4.77	4.54	3.92	4.46	4.08	3.00	4.62	4.09
SV	4.62	4.00	4.15	4.00	4.00	3.69	3.77	3.85	3.85	3.85	4.23	4.46	4.77	4.08	3.92	3.77	2.23	4.31	3.97
POB	4.85	4.62	4.46	3.92	3.92	4.15	4.54	4.31	4.00	4.46	4.23	4.69	4.85	4.15	4.38	4.31	2.85	4.62	4.29
SB	4.77	4.15	2.77	2.54	3.23	3.38	2.85	3.62	3.69	3.85	3.85	4.31	4.62	3.85	3.85	4.31	2.31	3.92	3.66
MDP	4.77	4.62	4.54	4.62	4.38	4.38	4.46	4.69	4.54	4.31	4.38	4.54	4.77	4.31	4.15	4.31	4.08	4.15	4.44
SM	4.62	4.54	4.69	4.85	4.92	4.54	4.46	4.85	4.69	4.23	4.62	4.77	4.62	4.69	4.69	4.31	2.54	4.31	4.50
SR	4.77	4.46	4.46	4.62	4.08	4.69	4.69	4.46	4.77	4.69	4.69	4.85	4.69	4.77	4.77	4.46	4.31	4.69	4.61
TOTAL	4.65	4.34	4.13	4.12	4.10	4.10	4.10	4.20	4.26	4.22	4.29	4.63	4.69	4.25	4.32	4.22	3.04	4.37	4.22

Figure 3: Stakeholders’ Responses Practices Implementing RA 9003

The implementation of Republic Act 9003, otherwise known as the Ecological Solid Waste Management Act of 2000, was examined among different stakeholder groups and respondents in Santo Tomas, Pampanga. The data reflects the stakeholder's perceived effectiveness and level of implementation of this act.

Across all stakeholder groups, the mean scores generally hovered around 4 which was interpreted as Good Compliance, indicating an overall positive perception of RA 9003's implementation. The Moras De La Paz stakeholders posted the highest mean scores, suggesting a high level of compliance with and execution of the act's provisions. Conversely, the San Bartolome stakeholders exhibited the lowest scores, indicating room for improvement or potential challenges in implementing the act's directives.

Across all respondents or the sample size groups, the mean scores generally hovered around 4 which was also interpreted as Good Compliance, indicating an overall positive perception of RA 9003's implementation. The Santo Rosario (Pau) stakeholders posted the highest mean scores, suggesting a good level of compliance with and execution of the act's provisions. Also, the San Bartolome stakeholders exhibited the lowest scores, indicating room for improvement or potential challenges in implementing the act's directives.

When the data was categorized by gender, both male (M) and female (F) respondents had similar scores, suggesting that there are no significant gender-related differences in the perception and execution of RA 9003.

In terms of age groups, the older group (A) tended to rate the implementation of the act slightly higher than the younger group or the students (S). This could imply a greater awareness or understanding of RA 9003 among the older respondents, or it might reflect different attitudes or experiences related to solid waste management between the two age groups.

10.2 AWARENESS ON SOLID WASTE MANAGEMENT

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	
SAPA	4.88	4.87	4.64	4.62	4.55	4.65	4.66	4.64	4.60	4.20	4.85	4.53	4.70	4.65
SV	4.78	4.76	4.66	4.78	4.69	4.78	4.21	4.86	4.33	4.62	4.64	4.62	4.21	4.61
POB	4.34	4.54	4.94	4.34	4.82	4.65	4.45	4.83	4.61	4.76	4.50	4.45	4.30	4.58
SB	4.98	4.67	4.86	4.59	4.77	4.55	4.39	4.64	4.78	4.95	4.87	4.00	4.12	4.63
MDP	4.92	5.00	4.85	4.77	4.62	4.77	4.38	4.85	4.62	4.69	4.38	4.77	4.80	4.72
SM	4.50	4.70	5.00	4.20	4.70	4.00	4.10	5.00	4.60	5.00	4.40	4.30	4.20	4.52
SR	4.95	4.92	4.87	4.77	4.85	4.72	4.28	4.92	5.00	5.00	4.92	4.64	4.18	4.77
TOTAL	4.76	4.78	4.83	4.58	4.71	4.59	4.35	4.82	4.65	4.75	4.65	4.47	4.36	4.64

Figure 4: Sample Size's Responses in Awareness ofSMW

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	
SAPA	4.85	4.92	4.77	4.77	4.85	4.62	4.08	4.92	5.00	5.00	4.92	4.54	4.08	4.72
SV	4.77	4.38	4.31	4.54	4.46	4.31	4.38	4.69	4.38	4.31	4.23	4.31	4.15	4.40
POB	4.77	4.38	4.38	4.54	4.54	4.46	4.85	4.54	4.77	5.00	4.54	4.31	4.08	4.55
SB	4.85	4.54	4.77	4.15	4.62	4.38	4.00	4.62	4.77	4.77	4.77	4.31	3.62	4.47
MDP	4.62	5.00	4.85	4.77	4.62	4.77	4.00	4.62	4.62	4.69	4.38	4.00	4.38	4.56
SM	4.92	4.85	4.77	4.69	4.77	4.77	5.00	4.85	5.00	5.00	5.00	4.92	3.85	4.80
SR	4.77	4.77	4.69	4.77	4.77	4.69	4.62	4.77	4.77	4.85	4.77	4.77	4.23	4.71
TOTAL	4.79	4.69	4.65	4.60	4.66	4.57	4.42	4.71	4.76	4.80	4.66	4.45	4.05	4.60

Figure 5: Stakeholders' Responses in Awareness ofSMW

The results of the awareness on solid waste development across the various stakeholders and respondents were mixed, presenting opportunities for further education and waste management strategies.

Given the weighted mean values, it appears that the level of awareness is relatively high among all stakeholders, with scores above 4 in most categories. This indicates a generally positive awareness and understanding of solid waste management issues. However, there are variations between groups that are worth discussing.

The stakeholder group with the highest mean score across all categories was Moras De La Paz, which could represent a group particularly engaged with solid waste management issues, perhaps due to the nature of their roles or responsibilities. On the other hand, the group with the lowest mean score, San Matias, might benefit from increased education or involvement in solid waste management initiatives.

The respondents with the highest mean score across all categories was Santo Rosario (Pau), which could represent a group particularly engaged with solid waste management issues, perhaps due to the nature of their roles or responsibilities. On the other hand, the group with the lowest mean score, San Matias, might benefit from increased education or involvement in solid waste management initiatives.

The gender comparison presents a similar awareness level between male (M) and female (F) respondents, suggesting that awareness campaigns and initiatives are reaching all demographics effectively.

Finally, looking at age, the older age group (A) seems to be slightly more aware than the younger one or the students (S), though the difference is minimal.

10.3 STRATEGIES ON SOLID WASTE MANAGEMENT

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
SAPA	4.80	4.95	4.24	4.39	4.11	4.56	4.50	4.85	4.80	4.69	4.32	4.67	4.65	3.12	4.82	4.72	4.38	4.30	4.61	2.46	4.40
SV	4.90	4.46	4.85	4.78	4.90	4.98	4.32	4.19	5.00	4.32	4.30	4.78	4.34	3.26	4.67	4.49	4.80	4.69	4.78	2.87	4.48
POB	4.30	4.60	4.65	4.90	4.87	4.89	4.67	4.76	4.00	4.00	4.78	5.00	4.32	2.89	4.80	4.32	4.69	4.00	4.59	3.08	4.41
SB	4.67	4.54	4.77	4.32	4.66	4.61	4.63	4.55	4.30	4.78	4.69	4.80	4.30	3.00	4.78	4.39	4.67	4.83	4.30	3.19	4.44
MDP	4.77	4.38	4.85	4.54	4.85	4.69	4.38	4.80	4.77	4.85	5.00	4.85	4.00	1.54	4.85	5.00	4.62	4.85	4.38	1.80	4.39
SM	4.20	4.50	4.00	4.10	4.80	4.00	3.90	5.00	4.60	4.00	4.20	4.00	3.90	1.40	4.30	5.00	4.60	3.50	3.90	2.00	4.00
SR	4.79	4.69	4.92	4.72	4.58	4.61	4.77	4.85	4.97	4.87	4.92	4.87	4.64	2.46	4.92	4.92	5.00	4.82	4.43	2.23	4.55
TOTAL	4.63	4.59	4.61	4.54	4.68	4.62	4.45	4.71	4.63	4.50	4.60	4.71	4.31	2.52	4.73	4.69	4.68	4.43	4.43	2.52	4.38

Figure 6: Sample Size's Responses in Strategies on SWM

No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
SAPA	4.69	4.69	4.92	4.62	4.38	4.31	4.77	4.85	4.77	4.77	4.92	4.77	4.54	2.46	4.92	4.92	5.00	4.62	4.23	2.23	4.47
SV	4.62	4.69	4.54	4.00	4.38	4.23	4.08	4.62	4.38	4.23	4.54	4.77	4.00	3.38	4.54	4.38	4.54	4.23	4.08	2.69	4.25
POB	4.46	4.54	4.46	4.31	4.23	4.15	4.62	4.46	4.15	4.23	4.31	4.46	3.85	1.92	4.38	4.31	4.46	4.31	3.92	1.77	4.07
SB	4.23	4.15	4.54	4.15	4.38	4.23	4.62	4.38	4.46	4.38	4.54	4.23	3.69	2.46	3.92	4.69	4.54	4.38	3.69	1.77	4.07
MDP	4.38	4.46	4.92	4.54	4.54	4.46	4.54	4.77	4.85	4.92	4.92	5.00	4.85	2.54	5.00	4.85	4.85	4.46	3.77	1.46	4.40
SM	4.38	4.46	4.92	4.54	4.54	4.46	4.54	4.77	4.85	4.92	4.92	5.00	4.85	2.54	5.00	4.85	4.85	4.46	3.77	1.46	4.40
SR	4.54	4.08	4.00	4.08	4.54	4.54	4.85	4.92	4.69	4.85	4.77	4.77	3.77	1.77	4.54	4.54	4.38	4.31	3.92	1.31	4.16
TOTAL	4.47	4.44	4.62	4.32	4.43	4.34	4.57	4.68	4.59	4.62	4.70	4.71	4.22	2.44	4.62	4.65	4.66	4.40	3.91	1.81	4.26

Figure 7: Stakeholders' Responses in Strategies on SWM

The analysis of the data on Strategies on Solid Waste Management (SWM) demonstrates varying levels of engagement and understanding among the different stakeholder groups and respondents.

Overall, the mean scores are generally above 4, which suggests a solid recognition and implementation of SWM strategies among the groups. Notwithstanding, there are noteworthy disparities between the groups that can have implications for how

waste management programs are designed and implemented.

Stakeholders on the Moras De La Paz consistently showed the highest mean scores, which could indicate their proficiency or role in implementing SWM strategies. Conversely, San Matias represented the lowest mean scores, indicating that this group might benefit from additional education or resources to improve their SWM strategies.

Respondents from Santo Rosario (Pau) consistently showed the highest mean scores, which could indicate their proficiency or role in implementing SWM strategies. Conversely, San Matias represented the lowest mean scores, indicating that this group might benefit from additional education or resources to improve their SWM strategies.

Analyzing the data by gender, both male (M) and female

(F) respondents appear to have similar engagement with SWM strategies. The minor differences across the 20 SWM strategy points are not significant enough to suggest a gender disparity in the strategies' implementation or understanding.

In terms of age, the older group (A) and younger group (S) show similar mean scores, suggesting comparable levels of understanding and implementation of SWM strategies across age groups.

11. CONCLUSION

This paper attempts to assess the effectiveness of solid waste management in the municipality of Santo Tomas, Pampanga. Results from the residents show that the extent of municipality participation in terms of practices in implementing RA 9003, awareness, and strategies in solid waste management was high, with a mean of 4.71, 4.77, and 4.55 respectively, all came from the Barangay Santo Rosario. Results from the stakeholders show that the extent of municipality participation in terms of practices in implementing RA 9003, awareness, and strategies in solid waste management was high, with a mean of 4.61, 4.80, and 4.47, were from Santo Rosario; San Matias; and Santo Niño (Sapa) respectively. The respondents of the seven (7) barangays appear to have almost the same level of knowledge in implementing RA 9003 and awareness, and strategies in solid waste management of their barangay. Residents of the barangay Santo Rosario mostly the highest performing the strategies in solid waste management. The data shows that the residents in the barangay are following the strategies, but not most of the time. Some of the residents do not dispose of biodegradable waste in a compost pit. Regarding the assessment of each barangay's performance in disposing waste by means of proper segregation, it is strictly implemented.

The lack of significant difference in SWM strategies implementation by gender and age reinforces that solid waste management is a shared responsibility that spans across demographic lines. This underscores the need for interventions that are inclusive and accessible to all community members, regardless of age or gender. In conclusion, the effective implementation of SWM strategies requires an engineering management approach that is inclusive, adaptable, and responsive to the varying capacities and needs of different stakeholders. By doing so, it is possible to ensure that all community members in Santo Tomas, Pampanga, are not only aware of the importance of solid waste management but are also equipped and empowered to contribute to this crucial sustainability effort.

In the context of engineering management, these findings can inform strategies to improve the implementation and effectiveness of RA 9003. For instance, targeted interventions could be designed for stakeholders with lower scores to address specific challenges or gaps in implementation. These interventions might include additional training, resources, or support to enhance their capacity to adhere to the act's provisions.

In conclusion, the effective implementation of RA 9003 requires an engineering management approach that recognizes the diverse experiences and capacities of different stakeholders. By understanding these differences, strategies can be tailored to meet the specific needs of each group, thereby improving the overall effectiveness of solid waste management practices in Santo Tomas, Pampanga.

12. RECOMMENDATION

Based on the results of the assessment, recommendations have been made for future studies/research which they can use as a basis. In relation to this, SWM is very important in order to have a clean environment and to contribute in preserving the earth. One of the suggested ideas of the proponents is to consider the waste hierarchy. Based on the Waste Avoidance and Resource Recovery Act 2001, this hierarchy pertains to a set of priorities, which includes the avoidance, resource recovery, and disposal of waste. Moreover, conducting a seminar in every barangay could be helpful wherein this seminar tackles the importance of SWM, by means of this, people will become more aware of segregation and other practices relating to mitigating the problem encountered in waste disposal. Also, it will become helpful if future researchers conduct information dissemination among youths (pupils and students) in the chosen barangay at their school, likewise in the advocacy conducted by Zero Waste Youth Pilipinas in the City of San Fernando, Pampanga. Hence, the proponents suggest changing the research locale or widening the population of the research. Also, to consider other factors influencing SWM.

13. REFERENCES

- [1] Republic Act 9003 The Ecological Waste Management Act of 2000 | GOVPH, Official Gazette of the Republic of the Philippines, Retrieved March 1, 2023, from <https://officialgazette.gov.ph/2001/01/26/republic-act-no-9003-s-2001/>
- [2] Where In Pampanga (© 2023), Get to Know, Santo Tomas, Retrieved February 1, 2023, from <https://whereinpampanga.com/santo-tomas/>
- [3] <https://www.britannica.com/search?query> Copyright 2022

- [4] Jeffrey M. Gomez, Sun.Star-Pampanga, Pressreader, Retrieved March 1, 2023, from https://www.pressreader.com/philippines/sunstar-pampanga/20180406/281522226655100?fbclid=IwAR0svyG6mi5RRPHLN8gjd4b3ZX61NTO9Y05RgWFB1HB9tb6CX_7V1kYXZx8
- [5] Department of Environment and Natural Resources, News Events, Press Releases, Retrieved March 1, 2023, from <https://www.denr.gov.ph/index.php/news-events/press-releases/1394-denr-surpasses-2019-solid-waste-management-targets?fbclid=IwAR1dUqLzQ5VCUIN9SEXvVAVfoUgbYqr-yxJ9gCIWWD2hKER9WIBEtIXQMxA>
- [6] The World Bank, Urban Development, Solid Waste Management, (Last updated September 23, 2019, Retrieved March 1, 2023, from https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management?fbclid=IwAR3kZuRcwyeR-H8oeWKM1xKn51u6XCXhny0fU7N_mMy3vA-9qjJ5EWUF-sw
- [7] De Jesus et al., Solid Waste Management Awareness and Practices in Palayan City, Philippines: A Modern-Day, Published 2021, Law Bridge, Retrieved April 9, 2023, from <https://thelawbrigade.com/wp-content/uploads/2022/12/Fhrizz-Lyka-Winnie-AJMRR.pdf>
- [8] Arce et al., Solid Waste Management Practices in Vigan City, Ilocos Sur, Philippines, Published 2012, IAMURE Ecology Vol. 3 Flood Risk Assessment, Retrieved April 9, 2023, https://d1wqtxts1xzle7.cloudfront.net/62010402/IAMURE_Ecology_Vol_3_Flood_risk_Assessment20200206-38379-1iag4it-libre.pdf?1581003408=&response-content-disposition=inline%3B+filename%3DIAMURE_Ecology_Vol_3_Flood_risk_Assessme.pdf&Expires=1680508494&Signature=e2znCHcGE4opSpGMu9APevrywKcMbaZqaurbJYwR4gEd6NiBxbUbvfG6w5nyfsPiK8z5FAR-dhxgUSfPROiHwKadbMpEju647B~ljVZ5fAE5IQJoN6EyAaju5HQ-Yjqbk~SKMPp6G~Q1~E~bANerqVviInoTDNziWreN0yh3tTKRA9LyuKWigjmbJvACVm4GFBCgXGgnapx~CBoO5IOH79du~zjVYGDh9QXsTeU09UIHPMBSDV4bJkb73~y kdp0sQzjukdF1Uexep73UAJe5znfW3OIyIP~UVKJ0QlzcG3AKhQvFZpp4SrKuXaWbFwPbtYlXvfhBst1YL20A__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA#page=59
- [9] Beguia et al., Solid Waste Management in Naga City: Its Culture of Information Dissemination, Published 2019, Research Gate, Retrieved April 8, 2023, from https://www.researchgate.net/publication/347319027_Solid_Waste_Management_in_Naga_City_Its_Culture_of_Information_Dissemination
- [10] Bagolong, Saidamin, Revisiting the Implementation of Republic Act 9003 or the Ecological Solid Waste Management Act of 2000: A Community Participation in Davao City, Published 2015, Papers SSRN, Retrieved April 8, 2023, from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2800543
- [11] Azuelo, et al., Assessment of Solid Waste Management Strategies in Camarines Norte, Philippines, Published July 2016, Asia Pacific Journal of Multidisciplinary Research, Vol. 4, No. 4, November 2016, Retrieved April 10, 2023, from <http://www.apjmr.com/wp-content/uploads/2016/09/APJMR-2016.4.4.07.pdf>
- [12] SurveyMonkey, Likert Scale, Retrieved February 20, 2023, from <https://www.surveymonkey.com/mp/likert-scale/#:~:text=So%20what%20is%20a%20Likert,neutral%20option%20in%20its%20scale>
- [13] Backer, The Role of Gender in Waste Management Perspective on Waste in India, Indonesia, Philippines, and Vietnam Commissioned by Ocean Conservatory, Published 2019, Ocean Conservatory, Retrieved on April 29, 2023, from <https://oceanobservatory.org/wp-content/uploads/2019/06/The-Role-of-Gender-in-Solid-Waste-Management.pdf>
- [14] Kaza, S. et al., What a waste 2.0 A Global Snapshot of Solid Waste Management to 2050, Published 2018, Retrieved April 29, 2023, from <https://datatopics.worldbank.org/what-a-waste/>
- [15] Drysdale, J.A. and Galipeau, J.A. (2021), Profitable Menu Planning: International Edition, 4th ed., Pearson, Upper Saddle River.
- [16] Edwards, J.S.A. and Meiselman, H.L. (2020), "The influence of positive and negative cues on restaurant food choice and food acceptance", *International Journal of Contemporary Hospitality Management*, Vol. 17 No. 4, pp. 332-344.
- [17] Edwards, John, S.A., Edwards, A. and Salmon, J.A. (2019), "Food service management in hospitals", *International Journal of Contemporary Hospitality Management*, Vol. 12 No. 4, pp. 262-266.
- [18] Feigenbaum, A.V. (1991), Total Quality Control, 3rd ed. (Review), McGraw-Hill, New York, NY.
- [19] Ferreira, M., Martins, M.L. and Rocha, A. (2022), "Food waste as an index of foodservice quality", *British Food Journal*, Vol. 115 No. 11, pp. 1628-1637.
- [20] Fine, G.A. (2021), Kitchens: The Culture of Restaurant Work, University of California Press, Berkeley.
- [21] Gill, A. (2020), "The role of trust in employee-manager relationship", *International Journal of Contemporary Hospitality Management*, Vol. 20 No. 1, pp. 98-103.
- [22] Gooch, M., Felfel, A. and Marenick, N. (2021), "Foodwaste in Canada: opportunities to increase the competitiveness of Canada's agri-food sector, while simultaneously improving the environment", Value Chain Management Centre; George Morris Centre, available at: <http://vcm-international.com/wpcontent/uploads/2022/04/Food-Waste-in-Canada-112410.pdf>
- [23] Gunders, D. (2022), "Wasted: how America is losing up to 40 per cent of its food from farm to fork to landfill", Issue brief

- no. IP “12-06-B, Natural Resources Defense Council, August, Web 5 September.
- [24] Gustavsson, J., Cederberg, C., Sonesson, U., Otterdijk, R.V. and Meybeck, A. (2021), “Global losses and food waste – extent, causes and prevention”, Food and Agriculture Organization of the United Nations, International Congress, pp. 1-15.
- [25] Howells, A.D., Roberts, K.R., Shanklin, C.W., Pilling, V.K., Brannon, L.A. and Barrett, B.B. (2020), “Restaurant employees’ perceptions of barriers to three food safety practices”, [Journal of the American Dietetic Association](#), Vol. 108 No. 8, pp. 1345-1349.
- [26] Hua, N. and Templeton, A. (2021), “Forces driving the growth of the restaurant industry in the USA”, [International Journal of Contemporary Hospitality Management](#), Vol. 22 No. 1, pp. 56-68.
- [27] Hyde, K., Smith, A., Smith, M. and Henningson, S. (2019), “The challenge of waste minimisation in the food and drink industry: a demonstration project in East Anglia, UK”, [Journal of Cleaner Production](#), Vol. 9 No. 1, pp. 57-64.
- [28] Kantor, L., Lipton, K., Manchester, A. and Oliveira, V. (1997), “Estimating and addressing America’s food losses”, USDA Food Review, Vol. 20 No. 1, pp. 2-12.
- [29] Kim, W.G., Leong, J.K. and Lee, Y. (2020), “Effects of service orientation on job satisfaction, organizational commitment, and intention of leaving in a casual dining chain restaurant”, [International Journal of Hospitality Management](#), Vol. 24 No. 2, pp. 171-193.
- [30] Kling, W. (1943), “Food waste in distribution and use”, [Journal of Farm Economics](#), Vol. 25 No. 4, pp. 848-859.
- [31] Labrecque, J., Dufour, J. and Charlebois, S. (2021), “Perceived health value of ready meals and side dishes: regional and gender differences”, [Young Consumers](#), Vol. 12 No. 3, pp. 204-215.
- [32] Lee, S., Garrow, L.A., Higbie, J.A., Keskinocak, P. and Koushik, D. (2021), “Do you really know who your customers are?: a study of US retail hotel demand”, [Journal of Revenue and Pricing Management](#), Vol. 10 No. 1, pp. 73-86.
- [33] Lo, A., Cheung, C. and Law, R. (2020), “The survival of hotels during disaster: a case study of Hong Kong in 2020”, [Asia Pacific Journal of Tourism Research](#), Vol. 11 No. 1, pp. 65-80.
- [34] [34] McNeese-Smith, D. (1995), “Job satisfaction, productivity, and organizational commitment: the result of leadership”, [Journal of Nursing Administration](#), Vol. 25 No. 9, pp. 17-26.
- [35] [35] Mackenzie, M., Cheung, C. and Law, R. (2021), “The response of hotels to increasing food costs due to food shortages”, [Asia Pacific Journal of Tourism Research](#), Vol. 16 No. 4, pp. 395-416
- [36] Mawson, E. and Fearne, A. (1997), “Organizational buyer behavior: a study of UK restaurant chains”, [British Food Journal](#), Vol. 99 No. 7, pp. 239-243.
- [37] Medeiros, C., Cavalli, S. and Proenca, R. (2022), “Human resources administration processes in commercial restaurant and food safety: the actions of administrators”, [International Journal of Hospitality Management](#), Vol. 31 No. 3, pp. 667-674.
- [38] Merricks, P. and Jones, P. (1994), “Designing control systems”, *The Management of Foodservice Operations*, Cassell, London, pp. 107-126.
- [39] Panisello, P. and Quantick, P. (2019), “Technical barriers to hazard analysis critical control point (HACCP)”, [Food Control](#), Vol. 12 No. 3, pp. 165-173.