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Implementation of Pollution Control Measures on Littering in Dela Costa Homes V (DLCHV), Barangay Burgos, Rodriguez, Rizal, Philippines

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Abstract

The Dela Costa Homes V subdivision consists of 2,400 housing units. The housing units are built as row houses, each with a minimum lot size of 50 sq. m. The subdivision's Home Owners Association (HOA) coordinates with the Local Government Unit (LGU) of Barangay Burgos. The study is descriptive quantitative research that assessed the efficiency of implementing pollution control measures on littering in the research locale. The data was gathered through a Resident Assessment Survey (RAS) incorporating Waste Management Theory and Environmental Scanning through PESTEL Analysis. Random sampling was used to collect data from one hundred residents (one respondent per household). The residents commented about their experiences and wrote suggestions relative to the control measures on littering. Using Analysis of Variance (ANOVA) and Independent t-test, it is found that there is no significant difference in the efficiency of Pollution Control Measures on Littering in terms of Political, Economic, Technological, Environmental, and Legal Aspects. On the other hand, there is a significant difference in the responses of unit owners and renting occupants concerning Socio-Cultural Aspect. Respondents gave a 'Slightly Efficient' rating to the Political, Economic, Socio-Cultural, Technological and Environmental control measures. Furthermore, results show that Pollution Control Measures on Littering are not that evident for most of the residents of DLCHV either because of unawareness or lack of implementation. As for the Legal aspect, this needs the most improvement due to its 'Not Efficient at All' rating.

Keywords: Littering, Pollution Control Measures, Solid Waste Management, PESTEL Analysis, Policy

Introduction

The Dela Costa Homes V (DLCHV) subdivision is a Freedom to Build (FTB), Inc. project. It is located in Barangay Burgos, Rodriguez (Montalban), Rizal, Philippines. The subdivision consists of 2,400 housing units on 21 hectares of land. Housing units are built as

row houses, and each unit has a floor area of about 20 sq. m. on a minimum lot size of 50 sq. m. Many connote that cleanliness is evident when it comes to private subdivisions. However, based on observation, clean surroundings in DLCHV are not that apparent. Due to the growing population, environmental problems such as pollution due to littering emerge.

The developers of the Dela Costa Homes V subdivision chose the location in Rodriguez, Rizal, to provide and develop a residential area that is accessible to the public and near Metro Manila. Moreover, the land price was within the capacity of the Freedom to Build, Inc. available funds. The current alarming condition of DLCHV relative to littering is noticeable. Solid waste and litter can be seen in almost every street and free space. The community is one of the best places in the barangay to conduct small businesses and develop a community (Zheng et al., 2024). For this reason, challenges in the environment would also arise.

Due to the lack of studies on littering policies and other solid waste management practices in the area, this study focuses on enhancing the implementation of pollution control (Zara et al., 2024)v. Pollution control is broad and may include controls to prevent air, water, and land contamination (Xie et al., 2024). To address this, one step that can be done is to impede littering. Though public involvement is included or described in solid waste management and littering in other studies and literature, the implementation of such measures is not quantified.

Literature Review

'Litter' can be defined as throwing trash or any visible solid waste improperly in the wrong places. It may originate from natural sources such as animals and plants or anthropogenic sources (Freije et al., 2019). It may include a wide variety of wastes such as plastics, paper, glass, metals, vegetation, dead animals, construction, etc. Freije et al. cited that the word 'littering' refers specifically to the human behaviour of disposing of waste improperly (Ayodele & Olubaju, 2024). Their article stated that littering in public places is recognized as a problem with adverse environmental and socioeconomic impacts (X. Zhang et al., 2024)v. The magnitude of such a problem depends on litter composition and quantity. Littering has been defined as the careless and improper disposal of small amounts of waste that results in unwanted and unnatural elements remaining in the environment (Al-Khatib et al., 2009).

In the study conducted in Columbus, Ohio, most solid waste that contributes to pollution comes from littering (Bennett, 2016). It affects both the environment and human health. Many research studies incorporate respective governments' policies concerned with solid waste management and pollution control. A survey of Waste Management in ASEAN (Association of South East Asian Nations) Countries was conducted by the United Nations Environment Programme (UNEP) in 2017.

Municipal Solid Waste (MSW) has become a major concern as the amount of waste generated has increased tremendously due to rapid urbanization and industrialization, population growth, and improved lifestyles. MSW primarily comes from households but also includes wastes from offices, hotels, shopping complexes/shops, schools, and institutions, as well as municipal services such as street cleaning and maintenance of recreational areas (R.

Zhang et al., 2023). Indonesia generates the highest quantity of municipal waste, with 64 Million tonnes per year, followed by Thailand (26.77 million tonnes), Viet Nam (22.02 million tonnes), the Philippines (14.66 million tonnes), Malaysia (12.84 million tonnes) and Myanmar (841,508 tonnes), while Lao People's Democratic Republic is generating the lowest quantity of municipal solid waste (77,380 tonnes). In the Philippines, the composition of municipal solid waste is food/organic waste (52%), paper (8.7%), plastic (10.55%), metal (4.22%), glass (2.34%), and textile (1.61%). The waste generated per capita in the Philippines is approximately 0.6 kilograms per day (UNEP, 2017).

In the study of Saida Mouhoun-Chouaki et al. (2018) regarding the Soil Physicochemical properties within or near the Landfill of Ain-El-Hammam Municipality, Algeria, the compounds contained in MSW cause harmful effects on humans and the environment. Their study revealed that pollution brought by the MSW caused significant changes in some of the physicochemical characteristics of the soil under study.

Aside from soil contamination, litter thrown carelessly may go to various bodies of water. Kapinga and Chung (2020) conducted case studies in Bangladesh and India, which revealed that water pollution is caused by litter. Nevertheless, the selected case studies in the abovementioned countries depict how social pressure and public engagement helped address marine plastic problems (Cash et al., 2023). Due to plastic pollution, drainages in the area of study in Bangladesh were blocked, causing floods. Eventually, the plastics went to the rivers. The public and the government pressured the factories by banning plastics (Sharma et al., 2023). The government also extended loans and other financial benefits to the affected factory owners to switch to different enterprises and oversaw the rehabilitation of the laid-off workers. Meanwhile, many rivers in India are generally not fit for bathing (Wu & Song, 2023). The government of India addressed the improvements in the waste management system (Ashraf et al., 2023), the promotion of eco-friendly alternatives to plastic use, technological innovation, public actions and awareness, and the challenges of pollution caused by single-use plastics.

According to the Study on Policy Implementation of Waste Management in Konawe Regency, Indonesia, conducted by Muhammad Amir and Rola Pola Anto (2018) of Oleo University, the phenomenon of waste management in Konawe Regency has not been effective because it is not supported by government policy as the basis for waste management to work properly and efficiently. Their study states that the increasing volume of waste daily tends to reach 250 cubic meters (m^3) per day but is poorly managed. Indonesia already had a Law on Waste Management in 2008, yet it lacks implementation due to poor coordination among related agencies to prevent waste management issues. Not to mention, there is a lack of facilities for the collection, transport, and disposal of waste, as well as a lack of community awareness and participation in pollution prevention activities (Gao et al., 2023). The researchers emphasized the importance of scientific studies and the enhanced implementation of waste management through communication and utilization of resources. (Zhao et al., 2023)

In the Philippines, Republic Act 9003, also known as the "Ecological Solid Waste Management Act of 2000", Sections 10, 11, and 12 reiterates the role of Local Government Units (LGUs) in environment management, particularly on solid waste, while section 13 of this

Act states that multi-purpose cooperative and associations that promote the implementation and/or directly undertake projects in compliance with the provisions of this Act shall be encouraged and promoted by the LGU. In Section 16, 10-year Solid Waste Management Plans consisting of the National Solid Waste Framework shall be submitted by the LGUs. Section 48, paragraph (1) emphasizes the prohibition of littering. The Environmental Management Bureau showed that 56.7% of the Municipal Solid Wastes in the Philippines are from Residential Areas. The Department of Environment and Natural Resources leads the policy implementations on environmental protection and pollution control (Yin, 2023), together with its Bureaus, in the continuous study of solid waste management. The Department also advocates for the LGUs and every citizen to cooperate.

In the study of Abocejo (2015) entitled Village-Level Solid Waste Management in Lahug, Cebu City, he estimated that the garbage generation per day of barangay Lahug is 18,324 kg of solid waste per day, equivalent to approximately 500 tonnes per month. Moreover, Metro Manila has an anti-littering law that is continually being developed. Dela Costa Homes V has its few existing bylaws on solid waste management, such as garbage collection and penalties for littering. This study assessed the bylaws and the related and existing rules and regulations on littering.

Research Method

This study is anchored on the theory of waste management and measures the efficiency of pollution control policies using environmental scanning. In the Theory of Waste Management of Eva Pongracz et al. (2004), it is found that waste management is to prevent waste from causing harm to human health and the environment. It incorporates waste minimization and/or resource use to achieve goals. According to Francis Joseph Aguilar (1967), an American Scholar in strategic planning and general management, Environmental Scanning is defined as the acquisition of information in an organization's external environment, the knowledge of which would assist management in planning the organization's future course of action.

Aguilar conceptualized the PEST Analysis (Political, Economic, Socio-Cultural and Technological Analysis). It is part of an external analysis when conducting strategic analysis. It is a strategic tool for understanding growth or decline, potential and direction for implementation of a policy or operation of a market. It then evolved into PESTEL Analysis, which includes environmental and legal aspects.

This research used surveying to gather data by asking questions of people who thought they had the desired information. The researcher decided to conduct the study in the subject subdivision since conducting a study on a smaller scale is more interactive. Furthermore, it gave the researcher information about the respondents' assessment of implementing pollution control administered by the subdivision and involved local government units.

The research is sought to answer the following questions:

1) What is the demographic profile of the respondents in this study in terms of Age, Gender, Civil Status, Residential Status (i.e. Unit Owner or Renting), and Length of Residency?
2) How do the respondents assess the efficiency of the current environmental policy status relative to littering on the following pollution control measures: Political, Economic, Socio-Cultural, Technological, Environmental, and Legal?
3) Is there any significant difference in assessing the implementation of pollution control measures on littering in Dela Costa Homes V, Barangay, Burgos, Rodriguez (Montalban), Rizal considering the Political, Economic, Social, Technological, Environmental, and Legal aspects?

One hundred (100) respondents are residents of the Dela Costa Homes V subdivision, regardless of whether they are unit owners or temporarily renting. The researcher prepared a set of questions. The 100-sample was a round-up of 96 sample populations, which resulted in approximately 2,400 target populations (1 representative per household) at a 95% confidence level and 10% margin of error. The survey focused on the control measures done by the subdivision to prevent pollution due to littering. The questionnaires were answered accordingly using predetermined questions with predefined ranges of answers to avoid confusion. This was handed out to the residents of the Dela Costa Homes V (DLCHV) subdivision. The goal was to measure the respondents' judgment relative to the efficiency of implementing pollution control on littering in DLCHV.

Result and Discussion

Profile of the Respondents

Fifty-one percent (51%) of the respondents are classified as 25-54 years old and are considered adults. Forty-one percent (41%) of the respondents are 24 years old or below, considered youth and young adults. Eight percent (8%) are in the age bracket of 55-64 and 65 years old and above. Most respondents are males with fifty-five percent (55%), while females have forty-five percent (45%). Fifty-five percent (55%) are single, and forty-five (45%) are married. Regarding residential status, sixty-nine percent (69%) are unit owners, while thirty-one (31%) are renting/authorized occupants of the housing unit.

On the other hand, regarding the respondents' length of residency, most of the respondents have lived in DLCHV for 6 years, which is fifty-four percent (54%). Thirty-three (33%) are in the bracket of 2-5 years of residency, while thirteen percent (13%) reside in the subdivision for 1 year below.

Efficiency of the Current Environmental Policy Status on Littering of DLCHV

Overall Assessment of Respondents on Political Measures

According to the respondents, the Political Campaign of DLCHV against Pollution is Slightly Efficient (1.80). Though the HOA officials have established efforts on different platforms such as printed media and social media, most are not aware of the campaign against

pollution, particularly littering. The Support of the Local Government Unit at the Municipal and Barangay Level on Pollution Control was seen as Slightly Efficient (1.76). The leaders of the Barangay and Municipality where DLCHV is located are helping during the clean-up of solid wastes after events of floods, but not that apparent on regular days. The coordination of DLCHV to the Barangay for Environmental concerns is Slightly Efficient (2.32). Though the interpretation is slightly efficient, the score is not that low compared to other political aspects, and this is because the efforts of the HOA officials to communicate with the Barangay Officials about environmental concerns are moderately apparent. Public Forums/Meetings to address Pollution in DLCHV are rated as Slightly Efficient (1.77). The HOA officials conduct forums and meetings to address concerns, but many residents are uninvolved. Overall, the Political Measures averaged 1.91, showing that the Political control against pollution concerning littering is Slightly Efficient.

Overall Assessment of Respondents on Economic Measures

Collecting Monthly Dues for Addressing Environmental Concerns is Slightly Efficient (2.27). This is due to the regular collection of monthly dues from the residents, but the percentage of utilization of funds for environmental concerns is unclear. Financial Assistance to Street Sweepers and/or Patrols is indicated as Slightly Efficient (1.68). Street sweepers are seen occasionally, and most of the residents of the research locale are not informed about the allowances for these sweepers. On the other hand, patrols are receiving allowances, but these patrols are more focused on security rather than confronting 'litterbugs'. The mean score on the Income Generation from Traders (Bakal, Bote, Plastic) or selling used items is interpreted as Slightly Efficient (1.92).

Some residents are gaining income or small amounts of money from traders. Some also put up a garage sale in front of their houses, selling reused or recycled items. Seminars on Environmental Economics and Livelihood are Slightly Efficient (1.51). Though there are seminars conducted, most residents have no idea that there are seminars in connection with financial stability in relation to waste management. Some attend seminars led or recommended by the HOA Officials and members, but most barely mention waste management. Based on the survey result, the Economic Measures averaged 1.85, showing that the Economic control against pollution, particularly littering, is Slightly Efficient.

Overall Assessment of Respondents on Socio-Cultural Measures

The result is slightly efficient regarding information dissemination on pollution, such as signage and announcements (2.18). Though some signages and posters evoke the prohibition and penalties for littering in the most visited areas, other parts of the subdivision lack these. The Family Orientation on the Prohibition of Littering and Waste Segregation is Not Efficient (1.48). One of the interviewee's comments is that most parents or guardians do not orient their children on the effects of littering and being mindful of waste segregation. Activities for Raising Pollution Awareness, such as Contests and Exhibits, are Slightly Efficient (1.50). From the interview, it was cited that there were contests held that raised awareness against pollution and littering a few years ago, such as the Christmas tree making using recycled materials. In recent years and months, contests raising awareness of the effects of solid waste management

have not been conducted. The Involvement of Community Organizations in Lessening Pollution is Slightly Efficient (1.81). Some community organizations, such as the Supreme Student Government (SSG) Council and local churches, conducted clean-up drives but receded in recent years. The overall Socio-Cultural Measures is at 1.74, showing that the Socio-Cultural control against pollution, particularly littering, is Slightly Efficient.

Overall Assessment of Respondents on Technological Measures

Composting in Free Spaces is Slightly Efficient (1.69). As cited by a respondent, a compost pit is within the area. Compost pits like this are a technology that uses the biological properties of wastes as organic fertilizer. Though there is an existing compost pit, most respondents are unaware of it. Relative to Junkshops or other Material Recovery Facilities near or within DLCHV, the mean score indicated it as Slightly Efficient (1.93). There are two Junkshops within DLCHV and one available Material Recovery Facility (MRF) near the subdivision area.

Nevertheless, most of the respondents are not aware of the mentioned junkshops and MRF. Drainage and flood control are rated as slightly efficient (1.53). The result is due to the effects of heavy rains in the subdivision. Many are experiencing clogged drainage and flooding. Recently, the HOA Officials installed a sluice gate valve in the wall near Mango River to lessen the water level during heavy rainfall. Incorporating technological innovations and research for policy implementation resulted in a slight efficiency (1.57). The importance of innovations and research for improving pollution control in the subdivision is not evident. This is because only a few are initiating research on the matter, although the HOA administrators are open to this. The Technological Measures have an overall mean score of 1.68, showing that the Technological control against pollution concerning littering is Slightly Efficient.

Overall Assessment of Respondents on Environmental Measures

Conducting Clean-up Drives yielded a Slightly Efficient (2.04) rating. As mentioned in Socio-Cultural Measures (d), some organizations occasionally conduct clean-up drives, but residents, not members of any organizations, are rarely involved. Two respondents commented in the survey form that the excreta from animals, particularly dogs, should be addressed aside from human litter. These cause bad smells and unpleasant sights, which also cause additional litter for residents to clean. Though few participants mentioned that there are projects and individual initiatives for planting tree seedlings and ornamental plants, most respondents are unaware of any Urban Greening or Tree Planting programs that resulted as Slightly Efficient (1.61). Garbage Collection resulted to be Efficient (2.74). Many respondents gave higher scores for garbage collection.

Nevertheless, in one survey form, one recommended that solid waste collection be improved, citing that the garbage in front of a path along the main road is left for a long time. Community Plastic Waste Reduction is rated as Slightly Efficient (1.57). There is still a lot of plastic waste, as people can see in the subdivision area. The Environmental Measures have an overall mean score of 1.99, showing that the Environmental control against pollution in connection to littering is Slightly Efficient.

Overall Assessment of Respondents on Legal Measures

The Imposition of Penalties on Violators of Littering that cost P300-P1000 is rated as Not Efficient at All (1.33). Most respondents are not satisfied with the imposition of penalties. One commented that penalties for violators of anti-littering under RA 9003 have not been implemented. Almost like with the imposition of fines, Disciplinary Action for 'Litterbugs'/Violators of Littering, Community Service of 1-15 days, is assessed as Not Efficient at All (1.35). The implementation of this law is not strict. In one comment during the interview, patrols of the DLCHV are not enough, and there should be occasional help from the local police force. As stated in RA 9003 Sec. 45, Local Government Units should give Incentives to Organizations that have taken outstanding and Innovative Environmental Projects. The survey resulted in Slightly Efficient (1.61). The Municipal and Barangay LGUs once gave financial support as a prize for the cleanest district in DLCHV, but not regularly. HOA Committee or Resolution against Littering is rated Slightly Efficient (1.63). The HOA Committee has not yet released a resolution against littering, yet the committee has spearheaded the placement of some of the signages to prohibit littering. Overall, the Legal Measures have a mean score of 1.48, indicating that the Legal control against pollution concerning littering is Not Efficient at All.

Conclusion

Respondents are unsatisfied with the Political, Economic, Socio-Cultural, Technological and Environmental control measures. They gave a Slightly Efficient rating. The Pollution Control Measures on Littering are not that evident for most of the residents of DLCHV, either because of unawareness or lack of implementation. As for the Legal aspect, this needs the most improvement due to its Not Efficient at All rating. The penalties and disciplinary actions are not strictly imposed on the community. There is no HOA resolution against littering yet.

There is no significant difference in the efficiency of Pollution Control Measures on Littering in Dela Costa Homes V, Brgy. Burgos, Rodriguez (Montalban), Rizal regarding Political, Economic, Technological, Environmental, and Legal Aspects. On the other hand, there is a significant difference in the responses of unit owners and renting/authorized occupants regarding the sociocultural aspect since the p-value is less than 0.05 level of significance. The renting/authorized respondents' rate is much lower than that of unit owners. This indicates that unit owners are more aware, involved, and concerned about the Socio-Cultural Measures, which include Information Dissemination regarding Pollution, Family Orientation on Prohibition of Littering, Activities for Pollution Awareness, and Involvement of Community Organizations.

Recommendations

1. The researcher recommends that the Home Owners Association (HOA) of Dela Costa Homes V (DLCHV) strengthen the committee on environmental concerns and release a concrete resolution or anti-littering policy. The researcher strongly recommends that

DLCHV administrators improve all the Pollution Control Measures on Littering, from its campaign against littering to implementing pertinent laws, rules, and regulations. The Legal aspect must be strictly imposed by delegating patrols who will apprehend 'litterbugs'. This can be done while patrolling for security.

2. In the implementation of the DLCHV HOA Resolution, the researcher recommends that the HOA Officials coordinate with the Barangay police force to assist the designated patrols in the strict enforcement of the Pollution Control Measures on Littering policies.
3. Signage and posters relative to waste management can be added. Social media platforms can also be used to post activities related to environmental management to increase awareness of the DLCHV community.
4. The researcher recommends the HOA Office obtain suggestion boxes to get feedback from the community. Occasional interviews can also be done. The feedback can be used as a reference for further studies or policy improvements.

Declaration of conflicting interest

I hereby declare no conflict of interest in the study's conduct.

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