

Evaluating the Adoption of Cleaner Production Technology for Sustainable Green Hotels in the Philippines

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Abstract – With the increasing trend of waste production in the hotel industry, a turn to green waste management would greatly alleviate costs and carbon footprint. Although policies are being updated to accommodate the transition to eco-friendlier management, there is little literature about technologies used to reduce pollution. This study assessed the economic effectiveness and cost improvement of the hotel industry in Western Visayas using cleaner production technology practices. This study utilized a descriptive survey research approach. The 156 participants, which consisted of hotel owners, managers, and employees, were chosen using a stratified random sampling technique using G* power version 3.0. The statistical tools employed were frequency counts, percentages, rankings, averages, standard deviation, and one-way ANOVA. Results revealed that the top five cleaner production technology practices implemented that suggest sustainability were: “modify facilities/equipment”, “adequate proper control operations”, “improves facilities/equipment layout”, “provides training and incentive programs”, and “improves wastes segregation and storage”.

The study shows no significant differences observed in the scope of practices for stars 3-5. On the contrary, there is a significant difference seen in the scope of 2-star hotel practices. The use of cleaner production technology and green practices has also decreased the hotel's use of energy, water, and solid waste management. Importantly, the cost of consumption in each hotel unit decreased. The findings of this study will enable hotels to adopt efficient waste sorting techniques, paving the way for a greener transition in the hospitality industry. By doing so, future research, projects, and policy implementations may be directed to a better tomorrow.

Keywords – Cleaner production technology, sustainability, green practices, hotel industry.

1. Introduction

The hospitality sector is anticipated to expand considerably during the coming years in several regions worldwide. The United States, European nations, and Gulf Cooperation Council nations are said to be part of this expansion. The amount of waste generated by the hotel industry would continue to increase as their operations also progress. The cost of solid waste in the hospitality sector considers numerous factors which include the cost of labor as well as the disposal and transportation of waste. As a result, better waste management could lead to substantial cost funds for businesses, with the amount of savings changing based on the location and the region's waste management regulations. Other positive effects of environmentally responsible waste management include better recognition of the company, decreased carbon footprints from waste transportation, and improvements to health and safety.

Despite receiving a lot of attention in policy circles, there is little empirical study regarding environmental technologies which is important in pollution reduction methods that promote the voluntary deployment of such technologies [6].

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In contrast to other technologies, pressure from regulations typically serves as a motivator for businesses to create or use environmental technologies [7]. Additional environmental improvements are frequently viewed as not being necessary to the operation of the organization once regulatory requirements have been satisfied.

However, the adoption of environmental technologies is not a mere response to regulation. Environmental technologies are governed by a broad spectrum of other aspects, just like other technologies. Technology adoption is a set of procedures and features that influence how organizations choose, implement, and maintain the utilization of technology [8]. There is a plethora of literature on the determinants of technology adoption. Yet only a small portion of this literature discusses environmental technology; most of it emphasizes specific determinants of technology [9]. Therefore, a study on the factors that influence the use of environmental technology is necessary. The theoretical underpinnings of the adoption of environmental technology are briefly outlined in this study.

The hotel business has implemented policies following the new trend. The hotel management must manage any environmental issues that would affect their operations. The workforce at hotels also serves as important greening players and a solid foundation for integrated environmental management systems. Environmental preservation will certainly become a requirement for all hotels in a few years. It is time for the hotel industry to assume its environmental obligations to lessen the negative environmental effects of international tourism, particularly those caused by the many hotels in Western Visayas.

Hotels serve an integral part in the tourism sector and are established to meet the demands of their visitors and provide a comfortable stay, but they also have a big impact on the environment, regardless of their size, scope, or degree of operation.

Hotels can significantly worsen the physical and/or social environment by increasing the demand for already overloaded sewer, water, waste disposal, and power services. Hotels consume a substantial amount of energy responsible for global warming, freshwater, and the discharge of wastewater and solid waste into the environment. Sound environmental management practices have become a necessity in hotels especially located in ecologically sensitive areas and world heritage sites that attract many tourists.

2. Statement of the Problem

The purpose of this study was to assess the viability of cleaner production technology implementation in hotels at Western Visayas. The researchers aimed to explore and provide answers to several key questions throughout the study.

First, they investigated the precise cleaning production technology procedures that the Western Visayas hotels that had been selected were utilizing. This would provide an understanding of the strategies and approaches employed by these establishments to promote cleaner and more sustainable operations.

Additionally, the researchers aimed to determine to what extent cleaner production technology practices were being implemented in the selected hotels, grouping them based on their hotel accreditation. By categorizing the hotels, the study aimed to determine if the implementation of cleaner production technology varied depending on their accreditation status.

Furthermore, the researchers aimed to investigate whether there was a significant difference in the extent of cleaner production technology implementation among the selected hotels when grouped according to their hotel accreditation. This analysis would shed light on any potential disparities in the adoption and implementation of cleaner production practices based on accreditation levels.

To provide a comprehensive evaluation, the study also examined the changes in consumption and monetary savings resulting from the implementation of cleaner production technology in the selected hotels. Specifically, the researchers looked at energy consumption, water consumption, and solid waste management. By comparing the consumption and cost-saving patterns before and after the adoption of cleaner production technology, the study aimed to assess the tangible benefits of these practices.

Finally, the researchers sought to identify alternative policies that could be derived from the utilization of cleaner production technology. This would involve examining the findings and recommendations from the study to propose innovative approaches and strategies that could be implemented more widely within the hotel industry to promote sustainable practices.

Overall, this study aimed to provide a comprehensive assessment of cleaner production technology implementation in the hotel industry in Western Visayas, addressing key questions and offering potential policy recommendations for a more sustainable future.

3. Hypothesis

The main hypothesis of this study is that there is no significant difference in the extent of implementation of cleaner production technology practices of selected hotel industries in Western Visayas when grouped according to hotel accreditation.

4. Conceptual Framework

The Logical Framework Model follows the chain of reasoning with program evaluation adapted from the Missouri Housing Trust Fund Logic Model of the environmental sustainability of green practices of the hotel industries [10].

The research paradigm comprised inputs-process-outputs (outcomes) representing the entire premise of the study. The inputs encompass the cash, hotel industry, and community resources that assist in the formulation of the problem and transform them into effective results.

Through the identified inputs, the variables are processed by conducting various detailed activities to be participated in and done by the hotel management – the owner, manager, and staff.

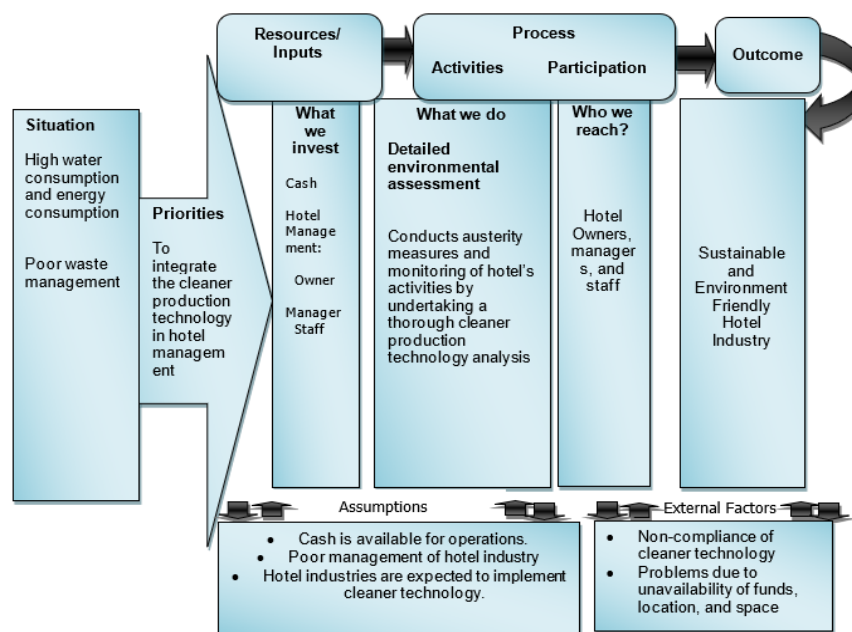


Figure 1. The conceptual framework of the study

5. Methodology

This study employed a descriptive survey research design. Descriptive technique of research entails gathering information to respond to inquiries about the present state of the subject under study [11]. In addition, this study was performed to assess the effectiveness of the adoption of cleaner production technology in selected hotel industries in Western Visayas. Likewise, the Input-Process-Output Model of program evaluation was used. Prior to group activity, there are certain conditions called inputs. Group interactions, on the other hand, are called processes. The outcomes of group work are outputs, which the team or the organization values [12].

The data needed in this study were gathered using a questionnaire checklist as well as pre- and post-assessment of the selected hotels in the implementation of the cleaner production technology.

The participants of this study were the 156 hotel employees that include owner/manager, and staff of different hotels accredited by the Department of Tourism having with two (2) to five (5) stars hotels in Western Visayas chosen through stratified random sampling method based on the following inclusion criteria: (a) either male or female; (b) assigned in all units; and (c) those employed in the hotel for one year or more. In addition, the sample population was identified using the software called G* power version 3.0 with an effect size of 0.2; the level of significance was set at 0.05 alpha. Further, less than a year of working experience in the hotel industry was automatically excluded from the study.

The unit of analysis was those hotels that adopted and implemented the cleaner production technology in the same year, and these are as follows: four (4) hotels with 2-star; four (4) hotels with 3-star; two (2) hotels with 4-star; and one (1) hotel rated with 5-star which were started implemented the cleaner production technology in the year 2014. Additionally, multiple computer-processed statistical tests were run on the data collected for this study, including frequency, percentages, ranks mean and standard deviation, and one-way ANOVA. The completed questionnaire will be retrieved, and the results will be counted, computer-processed, analyzed, and interpreted.

6. Results and Discussion

Most Important Cleaner Production Technology Practices of Selected Hotels in Western Visayas

As presented in Table 1, the top five (5) most important cleaner production technology practices of selected accredited hotels in Western Visayas are as follows: “modifies facilities and equipment”, ranks 1 with a mean of 4.40. Second, in rank is “adequate proper control operations” with a mean of 4.37. Third in rank with a mean of 4.35 is “improves facilities/equipment layout”. Fourth in rank is “provides training and incentive programs”, with a mean of 4.34. Lastly, it “improves waste segregation and storage” with a mean of 4.32, respectively.

Table 1. Most important cleaner production technology practices of selected hotels in Western Visayas

Important Cleaner Production Technology Practices	Mean	Rank
Modifies facilities and equipment	4.40	1
Adequate proper control operations	4.37	2
Improved facilities/equipment layout	4.35	3
Provided training and incentive programs	4.34	4
Improves wastes segregation and storage	4.32	5
Reduces energy use	4.25	6
Replaces toxic materials with less toxic	4.23	7.5
Promotes sustainable building	4.23	7.5
Introduces sustainable offers and technologies	4.22	9
Reduces water use	4.21	10.5
Reduces harmful substances	4.21	10.5
Increases automation	4.20	12
Encourages eco-design	4.19	13
Recycling friendly design	4.18	14
Uses renewable materials	4.17	15
Uses more efficient, less materials-intensive packaging	4.16	16
Expands waste recycling	4.14	17

Likewise, all the indicators showed a mean ranging from 4.14 - 4.40 which means that the majority of the hotel managers and employees practiced proper implementation of cleaner production technology to address the current concerns in the environment today. Furthermore, the result implies that accredited hotels in Western Visayas implemented various practices to improve the total quality of life not only of their clients but also the quality of life of their personnel protect the environment and promote an eco-friendly and sustainable environment in general. The hotel industry must also conduct more extensive studies into the behaviors, motives, and perceptions of cleaner production technology practices among the industry’s executives and consumers to satisfy the needs for cleaner production technology today and improve opportunities for the future.

The outcome of this study also concurred with another study [13], which found that sustainable efforts may benefit hotels in many ways which include appearing to be more appealing to guests, building rapport and maintaining a good reputation, and being more cost-effective. The author also highlighted that adopting sustainable methods generates favorable publicity through advertising, recognition, and awards, thereby increasing consumer demand. Furthermore, according to findings from a study by Dickson [14] which is relative to the current study, in the industry of meetings and events, sustainability is especially difficult since most businesses do not support or give strategic training and accreditation to meetings and event planners. More importantly, there are no established compliance criteria for this matter. This makes sustainability particularly challenging for the meetings and events industry.

The Extent of Implementation of Cleaner Production Technology Practices of Selected Accredited Hotels in Western Visayas

As presented in Table 2, results revealed that the 2-star hotels have a “high extent” on the practices such as “improves wastes segregation and storage” and “reduces water use” with the mean of 4.13 and 4.19. Likewise, fifteen (15) practices enumerated in the table have a “very high extent”. Further, the 2-star hotels have practiced to a “very high extent” implementation of cleaner production technology with an area mean of 4.38.

The 3-star hotels revealed that out of seventeen (17) enumerated practices, only three (3) practices came out to be of “very high extent” such as “improves facilities/equipment layout”, “replaces toxic materials with less toxic” and “Uses renewable materials” with the mean of 4.34 and 4.25.

In addition, the rest of the practices listed in the table showed a “high extent” result ranging from 3.41 - 4.20. Likewise, the 3-star hotels in Western Visayas practice to a “high extent” with an area mean of 4.11.

Table 2. Mean score rating on the extent of cleaner production technology practices of accredited hotels in Western Visayas

	Mean	2 star Description	Mean	2 star Description	Mean	2 star Description	Mean	2 star Description
Modifies facilities and equipment	4.52	Very high extent	4.17	High extent	4.40	Very high extent	4.20	High extent
Adequate proper control operations	4.25	Very high extent	4.03	High extent	4.31	Very high extent	4.30	Very high extent
Improves facilities/equipment layout	4.50	Very high extent	4.34	Very high extent	4.40	Very high extent	4.10	High extent
Provides training and incentive programs	4.27	Very high extent	4.10	High extent	4.31	Very high extent	4.20	High extent
Improves waste segregation and storage	4.13	High extent	4.07	High extent	4.06	High extent	4.20	High extent
Reduces energy use	4.30	Very high extent	4.07	High extent	4.15	High extent	4.20	High extent
Replace toxic materials with less toxic	4.30	Very high extent	4.25	Very high extent	4.06	High extent	4.10	High extent
Promotes sustainable building	4.33	Very high extent	4.02	High extent	4.18	High extent	4.10	High extent
Introduces sustainable offers and technologies	4.33	Very high extent	3.97	High extent	4.18	High extent	4.20	High extent
Reduces water use	4.19	High extent	4.06	High extent	3.90	High extent	4.30	Very high extent
Reduces harmful substances	4.27	Very high extent	4.11	High extent	4.09	High extent	4.40	Very high extent
Increases automation	4.27	Very high extent	4.11	High extent	4.12	High extent	4.40	Very high extent
Encourages eco-design	4.30	Very high extent	4.02	High extent	4.18	High extent	4.30	Very High extent
Recycles friendly design	4.58	Very high extent	3.97	High extent	4.25	Very high extent	4.30	Very high extent
Uses renewable materials	4.63	Very high extent	4.25	Very high extent	4.00	High extent	4.40	Very high extent
Uses more efficient, less materials-intensive packaging	4.66	Very high extent	4.12	High extent	4.25	Very high extent	4.40	Very high extent
Expands waste recycling	4.66	Very high extent	4.12	High extent	4.34	Very high extent	4.40	Very high extent
Area Mean	4.38	Very high extent	4.11	High extent	4.19	High extent	4.26	Very high extent
Overall Mean							4.24	Very high extent

Legends:

Scale	Description
4.21-5.00	Very high extent
3.41-4.20	High extent
2.61-3.40	Moderate extent
1.81-2.60	Adequate extent
1.00-1.80	Low extent

In addition, the 4-star hotels practiced to a “very high extent” on modifications of facilities and equipment, conducted adequate proper control operations, improvement on the layout of facilities and equipment. Also, the hotel managers and owners provide proper training and incentive programs, recycling-friendly design on hotel operations, use more efficient and fewer materials incentive packaging, and expand waste recycling with the mean ranging from 4.25 – 4.40. In addition, the 4-star hotel practices cleaner production technology to a “high extent” with a mean of 4.19.

In the same manner, the 5-star hotel gives too much focus on practices resulting in a “very high extent” such as adequate proper control operations, reductions on the use of water and harmful substances, increased automation of facilities and equipment, and uses more efficient, fewer materials incentive packaging. Also, practices recycling-friendly design in hotels, use renewable materials, and encourages eco-design for the entire hotel operations. Modification of facilities and equipment, promoting sustainable building, and reducing water and energy consumption among others were also practiced by the 5-star hotel to preserve natural resources and to promote an eco-friendly environment. By implementing the above practices, the 5-star hotel contributes to the promotion and preservation of the entire environment.

Generally, the extent of practices of cleaner production technology of selected accredited hotels in Western Visayas specifically with a 2-to-5-star rating came out to be of a “very high extent” with an overall mean of 4.24. The result implies that the Department of Tourism accredited hotels in Western Visayas properly implemented and practiced the different cleaner production technology to save consumption of energy and water and reduce wastewater generation, and solid waste management, and this further save, protects, and promotes an eco-friendly and sustainable environment.

The results of the study corroborated with the findings of Houdré [15] which emphasized that sustainability is an aspect that is rapidly developing into a necessity for the hotel industry, for both new initiatives and those that are currently in operation. This need arises not only by the need to act immediately to minimize the negative environmental consequences produced by the industry but also by the number of products that utilized the delivery of services and the increasingly environmentally aware

shopping habits of customers who seek out products associated with the idea of sustainability. A range of natural resources, both renewable and nonrenewable, are used in the services and operations of lodging facilities, which harm the environment due to gas emissions, effluents, and the formation of solid waste when it is disposed of [16]. To provide services that both satisfy consumer demand and respect the carrying capacity of the environment, there is a need to look for alternatives for the expansion of activities in the hotel business. Han *et al.* [17] and Laroche *et al.* [18] both emphasized how the rise in environmental awareness around the world has changed consumer behavior and sparked a rise in the demand for environmentally friendly products. This behavior has also been observed when people look for hotel options that are committed to the environment and engage in sustainable practices [19]. This trend is not limited to consumer products. Sustainable hotel practices can influence a customer's decision to use a particular service [20]. A growing number of hotels are implementing sustainable practices, realizing how critical it is to do so to remain competitive in the market, as well as a means of preserving the environment and natural resources, while also attempting to draw in customers for these initiatives [17], [19], [21].

Hotels are wary of fully committing to green initiatives because the hotel industry relies on its guests to dictate its environmental, social, and decision-making processes [22]. Even with the leaders' concerns about the possible economic impact of implementation, green initiatives can be effectively carried out and become a profitable investment [23]. The implementation of this can be attributed to several factors, including the rise in customer demand for green initiatives and environmental awareness, the development and publication of a cost-benefit analysis, the establishment of government incentive programs, the active involvement of environmental organizations, and consumer participation.

As presented in Table 3, the results revealed that there is no significant difference in the extent of practices of cleaner production technology among accredited hotels with 3-5-star ratings. Therefore, the null hypothesis advanced in the study is accepted. On the contrary, results demonstrated a significant difference in the extent of practices of cleaner production technology between 2-star rating hotels. Therefore, the null hypothesis is rejected.

Table 3. Significant difference between the extent of implementation of cleaner production technology practices of the accredited hotels in Western Hotels in Western Visayas

		Sum of Square	df	Mean Square	F	Sig.	Remarks
Star2	Between Groups	6.404	3	2.135	3.669	.014	Significant
	Within groups	88.441	152	.582			
	Total	94.845	155				
Star3	Between Groups	2.213	3	.738	1.701	.169	Not significant
	Within Groups	65.898	152	.434			
	Total	68.110	155				
Star4	Between Groups	3.785	3	1.262	2.341	.076	Not significant
	Within Groups	81.901	152	.539			
	Total	85.685	155				
Star5	Between Groups	.109	3	.036	.174	.914	Not significant
	Within Groups	31.785	152	.209			
	Total	31.895	155				

p<0.05level of significance

Customers' concern for the environment and their willingness to pay extra for the hotel's sustainable operations were found to be correlated [22]. Because of this, the hotel industry can no longer view its customers as passive consumers seeking only extravagant accommodations; rather, they are ecologically conscious consumers looking for emotional fulfillment by making a positive impact on social and environmental changes.

Change in the Consumption and Cost Savings of Cleaner Production Technology Practices of Hotels in Western Visayas

A. Energy Consumption of Accredited Hotels in Western Visayas

The change in hotel consumption and cost savings of accredited hotels in Western Visayas implemented cleaner production technology is shown in Table 4. The researcher determines the consumption and cost savings of hotels before and after the implementation of cleaner production technology and to get the change in consumptions and change in cost per year of its accredited hotels.

As presented in Table 4, the results revealed that there are variations in the amount of electricity

consumption as well as in the cost of consumption per year. Hotels in Roxas City (Hotel A and B) showed a lower amount of electricity consumption and its associated costs. In addition, hotels located in highly urbanized cities like Iloilo City as well as hotels in Boracay Island revealed higher electricity consumption as compared to the City of Roxas regardless of its accredited status by the Department of Tourism. Furthermore, the result revealed high electricity consumption was recorded before the implementation of cleaner production technology for hotels in Western Visayas. In the same manner, a decrease in electricity costs was also noted after the hotels implemented cleaner production technology practices. Further, results revealed that accredited hotels in Western Visayas saved thousands of pesos per year. The result implies that most of the tourists/clients visited the highly urbanized city like Iloilo City as well as the most famous tourist destination in the world- Boracay Island for different purposes such as business purposes or leisure purposes. This is manifested in the hotel's electricity consumption and its associated costs for the given period of one year. It was also implied that hotels implemented cleaner production technology saving energy consumption as well as lessening their expenses for electricity.

Table 4. Energy Consumption of Accredited Hotels in Western Visayas

Accredited Hotels	Classification	Consumption (Kwh/Year)		Change in Consumption/year	Cost (Peso/Year)		Change in Peso/Year
		Before	After		Before	After	
A	2 Star	32,842.00	32,497.00	345.00	394,104.00	389,964.00	4,140.00
B		213,467.25	200,616.75	12,850.50	2,620,836.00	2,476,224.00	144,612.00
C		768,476.00	722,224.00	46,252.00	9,221,712.00	8,666,688.00	555,024.00
D		675,384.00	637,359.00	38,025.00	8,104,608.00	7,648,308.00	456,300.00
E	3 Star	711,557.50	668,722.50	42,835.00	8,538,690.00	8,024,670.00	514,020.00
F		597,708.30	561,726.90	35,981.40	7,172,499.60	6,740,722.80	431,776.80
G		597,708.30	561,726.90	35,981.40	7,172,499.60	6,740,722.80	431,776.80
H		731,481.11	687,446.73	44,034.38	8,777,773.32	8,249,360.76	528,412.56
I	4 Star	313,085	294,238	18,847.00	3,757,024	3,323,662.00	433,362.00
J		284,623.00	267,489.00	17,134.00	3,494,448.00	3,301,632.00	433,362.00
K	5 star	882,331.30	829,215.90	53,115.40	10,587,975.60	9,950,590.80	637,384.80

Lessening plug loads, sealing the building envelope, and retrofitting lighting fixtures are a few energy-saving strategies for the front of the house. Effective equipment and equipment scheduling, precise sensor calibration, avoiding simultaneous heating and cooling, and preserving ideal building ventilation are a few instances of back-of-the-house energy efficiency strategies. Renewable energy technologies (solar, geothermal, wind, etc.) have recently made technological strides that have enhanced the economics of utilizing these alternative energy sources at facility level. The disparity in a hotel's operational scope and target market might be regarded as an explanation for variation in waste composition.

The results of the study are compared to a study by Kuo et al. [24], which explicitly stated that in addition to the constantly growing number of hotel structures due to the growth of tourism, enormous volumes of water are needed to accommodate the needs of hotel guests. A survey carried out by the CTCI Foundation in 2004 specified that all these data exhibit a significant consumption of both water and energy resources by the hotel sector [25]. Furthermore, the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [26] indicates that the "commercial residential construction" sector has the greatest potential for reducing greenhouse gas emissions. Hence, cost reduction in the 21st century through more thorough environmental management measures and energy saving should be the aim of hotel managers worldwide [27].

However, the results for 4-5-star hotels suggest a notable inconsistency. This finding may be related to how the lodging industry classifies its energy use.

Since it is challenging to find separate electricity data for the two sectors, electricity is treated as entirely part of the accommodations sector in this study. According to this study's findings, which concur with those of Gössling et al. [28], the primary uses of energy in the lodging sector were seawater desalination, lighting, air conditioning, heating, and freezing, as well as food preparation. However, they [28] failed to consider the energy requirements of machinery used in utilities like elevators and massive water pumps. As the author argues, the results regarding energy use are therefore cautious.

B. Water Consumptions of Accredited Hotels in Western Visayas

The researcher measured the cubic meters of water consumed and the cost per cubic meter in terms of pesos both before and after implementing cleaner production technology. They also assessed the changes in water consumption and its associated costs.

As presented in Table 5, results revealed that there are variations in the water consumption of accredited hotels in Western Visayas. There was a sudden decrease in the water consumption of hotels when they started implementing cleaner production technology practices. Likewise, a change was recorded in terms of costs per cubic meter. The lower the water consumption, the lower the expenses paid to the water supplier. In addition, accredited hotels saved thousands of pesos per year in terms of water consumption after implementing cleaner production technology. Further, the result implies that accredited hotels located in highly urbanized cities and famous tourist destinations have recorded higher consumption of water as compared to non-highly urbanized cities.

Table 5. Water consumption of accredited hotels in Western Visayas

Accredited Hotels	Classification	Consumption (Kwh/Year)		Change in Consumption/year	Cost (Peso/Year)		Change in Peso/Year
		Before	After		Before	After	
A	2 Star	25,305.00	24,603.00	702.00	506,100.00	492,060.00	14,040.00
B		14,598.75	14,193.75	405.00	291,975.00	283,875.00	8,100.00
C		52,555.50	51,097.50	1,458.00	1,051,110.00	1,021,950.00	29,160.00
D		48,180.00	44,663.00	3,157.00	9,63,600.00	893,260.00	70,340.00
E	3 Star	48,662.50	47,312.50	1,350.00	973,250.00	946,250.00	27,000.00
F		40,876.50	39,742.50	1,134.00	817,530.00	794,850.00	22,680.00
G		19,465.00	18,925.00	540.00	389,300.00	378,500.00	10,800.00
H		50,025.05	48,637.25	1,387.80	1,000,501.00	972,745.00	27,756.00
I	4 Star	21,411.50	20,817.50	594.00	428,2300.00	416,350.00	11,880.00
J		19,465.00	18,925.00	540.00	389,300.00	387,500.00	10,800.00
K	5 Star	60,341.50	58,667.50	1,674.00	1,206,830.00	1,173,350.00	33,480.00

Comprehensive water conservation initiatives by hotels are highly advantageous. Water waste can be reduced through aerating, lowering the pressure, and recycling water.

Replacing existing appliances such as toilets, showers, faucets, and laundry areas with water-efficient ones is one of the most popular methods hotels have decreased their water usage.

Similarly, hotels “process” water for facility operations besides using it for domestic purposes like bathrooms, food and beverage, and laundry. On top of that, hotels collect and, in some cases, treat the sewage produced by visitors and back-of-the-house operations as well as grey and black water from domestic use. Retrofitting fixtures, implementing reuse initiatives for towels and linens, enhancing HVAC and plumbing systems, and using recycled or rainwater for irrigation are just a few of the typical water conservation techniques used by hoteliers.

The results of the present study are related to the finding conducted by Alexander and Kennedy [5], wherein the study depicted that installing low-flow showerheads and aerated faucets made a hotel save \$1.50 per room monthly, and applying water-saving toilets helped the same hotel conserve 180,000 gallons of water annually. Another investigation by González and León [4] emphasized that technologies for recycling grey water, which repurpose wash water, have also been demonstrated to reduce the overall water consumption of hotels by about 23%. The payback period for these systems is typically 14 years, though it may be different depending on the nation. Also, it has been realized that bathroom signs encouraging customers to limit their water consumption are effective. Localized watering systems in gardens are another measure that hotels frequently use [4].

The hotel sector also places a lot of emphasis on waste management and water conservation [3]. The concept of “water conservation” describes initiatives to cut back on water usage. The US Environmental Protection Agency defines waste reduction as the prevention or reduction of waste through minimizing waste, recycling, or the purchase of recycled and environmentally friendly items [2]. Recycling initiatives in hotels can prevent up to 80% of waste from ending up in landfills [3]. One of the key objectives of sustainable hotel practices is to reduce emissions, which may be accomplished through managing energy, resources, and waste. Typically, emissions consist of methane (CH₄) and carbon dioxide (CO₂). Based on the US Environmental Protection Agency, the outside of commercial or industrial buildings, smokestacks, and other vents all release pollution into the atmosphere [1].

C. Waste Management of Accredited Hotels in Western Visayas

The researcher identifies the total quantity of cubic meters as well as the cost for disposal per cubic meter in terms of pesos before and after the implementation of cleaner production technology.

Results showed that there are variations in solid waste management.

Before the accredited hotels implemented the cleaner production technology, a higher total quantity of dry waste was recorded as compared to after the hotel implemented the cleaner production. In addition, results showed that hotels situated in highly urbanized cities and famous tourist destinations generated high solid waste (dry waste) due to the bulk number of tourist arrivals in the area. In the same manner, as to the cost for disposal, there are no changes at all regardless of the total quantity of cubic meters of dry waste generated and disposed of because of the fixed rate applied to all establishments per month. In other words, there is no difference in the cost of disposal of dry waste. Further, the result implies that the more the number of tourist arrivals in the respective hotels, the drier waste is generated.

Hotels also produce waste from construction and renovation, consumables, durables, hazardous materials, and recyclable oil. To reduce processing and transportation costs, hoteliers use a range of trash reduction, reuse, and recycling techniques. Manufacturers are reported to have increased their offers of ‘waste-to-energy’ processing services, where waste is converted into cheaper forms of alternative energy like biodiesel fuel or natural gas and sold back to hoteliers.

7. Conclusion

Hoteliers are aware of the important consequences of implementing cleaner production technology practices and the rewards these initiatives can offer to hotel operations, such as making the look appealing to visitors, building a good reputation, and being economical. In addition, implementing cleaner technology measures financially sound investment for hoteliers for economic savings and delivers public positive relations through marketing, recognition, and rewards and ultimately increasing the demands of customers. Further, the selected accredited hotels in Western Visayas made some gradual modifications in their facilities and equipment to save cost savings and contribute to economic savings and promote an eco-friendly environment.

Selected accredited hotels in Western Visayas have common practices and implement cleaner production technology for the improvement of hotel operations. Stricter and proper implementation of cleaner production technology has brought a positive impact on the entire hotel operations, guest satisfaction, and an environmentally friendly environment.

Thus, practicing and implementing cleaner production technology of selected accredited hotels have significant effects on the health of individuals as a member of society and help to save the environment from global warming. Better service, increased revenue, enhanced public relations, and cost savings are also associated with it.

Accredited hotels with 2-star ratings are at variance extent of practices in the implementation of cleaner production technology with 3–5-star rating hotels. Thus, the extent of implementing such practices of cleaner production technology brought some positive benefits which brought significant changes in the total quality of life of human individuals and of the environment. In addition, a rapid modification was implemented by 3-stars to 5-star hotels as compared to 2-star hotels due to the availability of facilities and equipment and amenities offered by the hotels. Hotel size also affects the extent of practices of cleaner production technology as well as the knowledge willingness and availability of funds of hotels to do some modifications in the entire hotel operations.

The amount of energy, water, and waste management used shifts heavily between different hotel types and is determined by factors such as hotel size, class or category, customer profile (guests traveling for business or pleasure), location, and the kinds of services and amenities offered to visitors. The consumption of energy, water, and waste management within the hotel industry is quite diverse and can be complicated to comprehend in detail. Most currently approved hotel facilities just keep track of their overall energy usage, paying little attention to various end applications. Energy and water consumption and waste management and conservation practices, in addition to direct savings, will also enhance the reputation of hotels among guests and other stakeholders especially those who are concerned with global as well as local security, reducing global energy and water consumption and its direct effects on the guests.

8. Recommendation

Given the findings and concluding observations, the following recommendations are proposed:

First, hotels should work to improve employee understanding of the idea of cleaner production technology, create staff training manuals on cleaner production technology, and acknowledge the importance of cleaner production technology for environmentally friendly hotels.

Second, the development of a water-cooling and recycling system is one example of a task that needs significant financial investment.

Hotel management should be competent and resourceful to engage in these operations. The limits of hotel management may occasionally be exceeded. Therefore, it is suggested that the government provide tax exemption schemes or other beneficial incentives to encourage hotel management to boost their willingness to use cleaner production technology practices effectively and consistently across the entire hotel sector operations. The hotel manager/owner should establish a good reputation and image for the public by strictly implementing cleaner production technology. In addition, the Local Government Unit (LGU) should work hand in hand with the different hotel establishments by providing some incentive programs for being the most active establishment in practicing and adopting cleaner production technology. The social awareness of environmental issues and concerns, together with the regulations that are implemented, has led to changing attitudes of hoteliers towards environmental protection.

Next, the Department of Tourism should make necessary efforts by monitoring the practices implemented by various hotels in Western Visayas through the help of the municipal/city tourism office in the respective area. As the accrediting body of the entire hospitality industry, the DOT should conduct seminars/training and conferences for proper information dissemination of the significant effects of practicing and implementing cleaner production technology. In addition, the DOT should exert its best effort for the total promotion of the tourism industry such as publishing and advertising the various hotels situated in the entire Western Visayas so that tourists both local and foreign have enough knowledge as to the cleaner production technology practices of every hotel.

For future research, the present study may be replicated among different hospitality establishments in other regions in nationwide order to corroborate the findings of this investigation.

Lastly, it is recommended that the proposed framework for cleaner production technology– be the Kickstarter in developing strategic, business, and tactical plans for the hotel industry in Western Visayas.

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