Sustainable Water Conservation as Climate Change Adaptation: A Study of Hotels and Office Buildings in Accra

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ABSTRACT

Sustainable Water Conservation as Climate Change Adaptation: A Study of Hotels and Office Buildings in Accra examines the urgent need for effective water conservation measures in the face of climate-induced water scarcity, particularly in rapidly urbanizing areas. The study adopts a qualitative multiple case study approach with a sample of six hotels and three office buildings. The study was underpinned by the Norm Activation Model (NAM) and the Technological Acceptance Model (TAM), with data acquired through semi-structured interviews and thematically analysed. Findings reveal a pervasive awareness of climate change and its impact on water resources; yet many hotels and office buildings prioritize financial savings over adaptive water-conservation strategies. These facilities employ several technology and process-based water-saving measures, highlighting a preference among hotels for technological solutions, contrasted to the more customer engagement-driven techniques identified in office buildings. Financial constraints, regulations, and a lack of service providers were also noted as impediments to the greater implementation of water conservation techniques. The research provides helpful recommendations for hotels, business buildings, and policymakers. It underscores the need to align climate change awareness with pragmatic water management practices to foster sustainability and resilience in urban contexts. Further, the study underlines the need for greater research into the hurdles to implementing water conservation technologies and the long-term efficacy of established measures. Overall, this research contributes to a deeper understanding of how climate consciousness can be integrated into water management practices to enhance environmental sustainability.

Keywords: Sustainable Water Conservation, Climate Change Adaptation, Urban Hotels and Office Buildings.

BACKGROUND

Human activities, especially resource extraction and ecosystem exploitation, are important drivers of climate change, severely altering global water supplies (Mensah & Blankson, 2013). Climate change has changed hydrological cycles, resulting in irregular rainfall patterns, extended droughts, and growing water scarcity (United Nations, 2020). These disruptions present significant challenges, and delaying adaptation measures increases the financial and logistical difficulty of addressing them (United Nations Compensation Commission (UNCC), 2023). Effective water conservation measures are, thus, vital, needing the combined efforts of governments, organisations, corporations, and individuals (Mensah & Blankson, 2013). Businesses, particularly those in the tourism and commercial sectors, must therefore adopt sustainable water management methods to avoid climate risks (Kasim et al., 2014).

Hotels are among the major consumers of water in the tourism sector, with their operations contributing to excessive water use and wastewater creation (Untaro et al., 2016). Although individual hotels may have a relatively lesser environmental footprint, their combined impact on water resources is enormous (Dinarès & Saurí, 2015). In Ghana, the hospitality sector plays a key economic role, contributing roughly 3.9 billion

Ghanaian cedis (GHS) to GDP in 2020 and producing $2.3 billion in tourism revenue in 2022 (Statistica, 2023; Ghana Tourism Industry, 2022). However, this economic boom has raised the demand for water in hotels, necessitating solutions for conservation and effective management (Agodzo et al., 2023). Similarly, office buildings contribute significantly to water usage, particularly in cooling systems such as heating, ventilation, and air conditioning (HVAC) (Dodoo & Ayarkwa, 2019; Koranteng et al., 2021). High cooling demands, along with poor plumbing and irrigation systems, result in severe water loss in both hotels and office buildings (Koranteng et al., 2021). Without sustainable solutions such as rainwater harvesting, greywater recycling, and smart irrigation, water usage is likely to remain unsustainable (Shen et al., 2020).

Sustainable water solutions have become the solution to water shortage, with Africa experiencing some of the most severe repercussions of climate change-induced water stress (Intergovernmental Panel on Climate Change, 2022). In Ghana, variable rainfall patterns and declining water quality have compounded these difficulties, being detrimental to both residential and commercial water supplies (Logah et al., 2017; Agodzo et al., 2023). However, despite the deployment of several water conservation techniques, limited study exists on their effectiveness within Accra's hotels and office buildings (Abdou et al., 2020). Technological advancements such as blockchain, the Internet of Things (IoT), and sensor-based water monitoring systems give prospects for better water management, although their adoption remains limited due to financial and policy constraints (Dogo, 2019; Shen et al., 2020).

Further, water conservation is crucial to reaching the Sustainable Development Goals (SDGs), notably in climate adaptation and urban resilience (United Nations, 2022). Despite this, the significance of hotels and office buildings in sustainable water management remains underexplored. Addressing these gaps requires evaluating the extent to which climate change consciousness promotes water conservation in hotels and office buildings, the constraints involved with adopting sustainable solutions, and the prospects for scaling up existing conservation measures. The study, therefore, seeks to address the following objectives.

1. To evaluate the extent to which climate change consciousness affects sustainable water saving in hotels and office buildings.
2. To identify the creative measures taken by hotels and office buildings to preserve water.
3. To evaluate the problems connected with the application of sustainable water conservation techniques in hotels and office buildings.

Scope of study

This study investigates water usage in hotels and office buildings in Accra, Ghana, to discover sustainable water-saving techniques and estimate the influence of climate change on their operations. It examines the implementation of novel water conservation strategies, such as rainwater harvesting and water-efficient technology, while examining operational and policy-related issues. The study focuses on how landscaping, plumbing, and HVAC systems contribute to overall water demand and evaluates the implications of urbanization on water management. By interviewing managers, facility operators, and important stakeholders, the study captures primary data on water conservation methods and issues, assuring relevance to Accra's urban and environmental setting. The study attempts to integrate water management strategies with climate adaptation objectives to support sustainable urban growth.

Literature Review Summary

The hotel business in Ghana has undergone tremendous growth due to political stability, an investor-friendly climate, and the discovery of oil. As a crucial contributor to foreign exchange reserves and jobs, the sector plays a vital role in economic development (Anheier, 2017; Mogotsi & Saruchera, 2023). However, its strong reliance on water presents sustainability concerns, particularly in the context of climate change. Climate resilience, the ability of structures to endure and adapt to climate-related hazards, has therefore become increasingly significant, particularly considering the threats of flooding in Accra. Poor drainage systems and unrestrained urban

expansion further exacerbate vulnerability to floods, posing dangers to infrastructure and business continuity (Lamba et al., 2017).

Beyond the immediate concerns of floods, the tourism and hospitality industries contribute to global greenhouse gas (GHG) emissions, which exacerbate climate change. Although research suggests that many company executives acknowledge the concerns posed by climate change, their commitment to mitigate its repercussions remains insufficient. The long-term viability of the hospitality industry depends on combining economic gains with environmental stewardship, although many hotels emphasize cost savings above climate adaptation (Midgley, 2017; Moyo, 2016). This dichotomy between economic maximization and environmental responsibility is obvious in the sector's attitude to water conservation. In contrast, hotels in South Africa have voluntarily embraced self-regulation measures that include environmental sustainability in their business models without direct government interference (Nyide, 2017). This underscores the role of corporate social responsibility in encouraging sustainability within the hotel sector.

Further, the necessity for climate-conscious management of hotels and commercial buildings is becoming increasingly critical. With urbanization on the rise, hotels and office spaces have intensified environmental degradation, notably through excessive water and energy usage. The hotel sector faces increased pressure to integrate sustainability into its organizational culture, as failing to do so could compromise long-term viability (Oriade et al., 2021).

In Ghana, the need for sustainable water management is particularly important given the country's vulnerability to recurring droughts and irregular rainfall patterns, which are exacerbated by climate change. Office buildings, which account for major water demand, might help relieve urban water shortages by applying conservation methods. The Ghana Public Utilities Regulatory Commission (PURC) encourages water-efficient practices, although adaptation remains limited due to insufficient regulatory enforcement and a lack of financial incentives (Anheier, 2017). Green building certifications, which assess structures based on water and energy efficiency, have gained relevance globally. However, in Ghana, their implementation is constrained due to budgetary constraints and the absence of significant regulatory backing for sustainable construction methods (Agyekum et al., 2020).

Nonetheless, water conservation innovations can be grouped into two basic types: technological and process-based. Technological solutions, such as low-flow fixtures, water treatment plants, and automated sensors, demand major investment but offer long-term benefits. Process-based options, including staff training, linen reuse programs, and behavioural change campaigns, are less capital-intensive but rely on employee and guest engagement (Mogotsi & Saruchera, 2023). A study of hotels in Lake Naivasha indicated that larger firms are more likely to deploy resource-intensive technology due to better access to financial resources (Njenga et al., 2021). Hotels and office buildings may also apply both pricing and non-pricing solutions for water management (Lamba et al., 2017). However, pricing remains a fundamental barrier in Ghana, where access to cost-effective water-saving solutions is limited. Smart building technology and the integration of renewable energy sources can boost water conservation efforts, but they require regulatory support and financial incentives (Orikpete et al., 2023).

Thus, despite the increased emphasis on sustainability, many hotels and office buildings implement selective conservation measures while neglecting others. For example, whereas hotels in Ghana had installed low-flow showerheads, they continued to irrigate lawns using potable water (Nuong et al., 2022). Green marketing initiatives could help overcome this discrepancy by boosting customer knowledge and making sustainability a competitive advantage. Addressing financial hurdles is also critical, as reducing the cost of water-efficient devices and leveraging charitable financing could boost adoption rates (Midgley, 2017; Moyo, 2016).

This study, therefore, applies the Technology Acceptance Model (TAM) and the Norm Activation Model (NAM) to examine water conservation techniques in hotels and office buildings. TAM (Davis, 1989) discusses technology adoption based on perceived usefulness and simplicity of use. In the context of sustainable water practices, hotels and office buildings are more likely to adopt water-saving innovations if they regard them as

advantageous and simple to execute (Anheier, 2017). External factors, such as organizational culture and government policies, also impact adoption patterns. Given Ghana's water scarcity concerns, policies that promote conservation and reward technological adoption could act as significant drivers (Payton, 1988). The Norm Activation Model (Schwartz, 1973) complements TAM by studying the role of environmental awareness in promoting behavioural change. As climate-related water concerns grow more severe, a heightened sense of responsibility may drive firms to embrace sustainable practices (Mogotsi & Saruchera, 2023). The seam of TAM and NAM shows that water conservation in hotels and office buildings is motivated not only by financial reasons but also by a growing awareness of climate change.

Ultimately, the adoption of water conservation methods in Ghana's hotel and business sectors is driven by legal, economic, and behavioural considerations. While climate consciousness and technical improvements give prospects for adaptation, overcoming financial and institutional barriers is important for widespread adoption.

METHODOLOGY

A qualitative approach and a multiple case study design were adopted for this study. This technique enables an in-depth investigation of water conservation practices in Accra's hotels and office buildings (Antonova et al., 2022; Ulus & Hatipoglu, 2016). The research location, Accra, was selected due to its urbanization and economic significance (Owusa Ansah, 2024; United Nations Economic Commission for Africa, 2021). Convenience sampling was utilized for selecting six hotels and three office buildings, whereas purposive sampling aided the selection of 10 individuals with rich information on the issue under study (Palinkas et al., 2015; Etikan et al., 2016). Data was obtained through semi-structured interviews (Creswell, 2014) and was analyzed thematically using NVivo (Clarke & Braun, 2013). This research approach allows a comprehensive knowledge of climate change consciousness and water management practices in Accra's hospitality and business sectors.

Presentation and Discussion of Findings

Background of Hotels and Office Buildings

The study examines a selection of 6 hotels and 4 public office buildings in Accra, focusing on their adaptation strategies to climate change. The study's participants include four sustainability officers, three hotel managers, and three engineers, all of whom play crucial roles in managing client relations, daily operations, facility maintenance, and sustainability initiatives. Their diverse experiences provide valuable insights into how hotels and office buildings are adapting to climate change, offering perspectives that encompass both operational and policy-driven considerations.

Impact of Climate Change on Hotels and Office Buildings

The findings indicate that climate change primarily affects hotels and office buildings through indirect channels, influencing water availability, operational costs, and customer satisfaction.

Water Availability and Quality

The study found that hotels and office buildings generally do not experience significant challenges with water availability and quality due to their established resilience measures, including backup water supply systems.

> *"We don't have issues with floods, and the water supply is almost always stable due to the availability of a backup water supply that supports the supply from Ghana Water. Climate change does not affect the availability and quality of water."* (Participant 1, Field Interviews, 2024)

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> *"For the quality of water, there is not much to do from the hotel's end as supply is taken from the Ghana Water Company, but so far, so good. We have not had any evidence of unclean water running through our water channels, much less being used in hotel operations."* (Participant 3, Field Interviews 2024)

Although the main water supply remains stable, landscaping emerges as a challenge due to erratic rainfall patterns.

> *"Regarding rainfall patterns, we have lawns we have to keep green all the time. If less rainfall is available, it means we have to use Ghana Water, and if that becomes erratic, we have to rely on water tankers, which are four times the cost of Ghana Water."* (Participant 5, Field Interviews, 2024)

> *"During rainy seasons, there is enough water supply for the lawns, but in dry seasons, the decrease in the availability of water requires using water from boreholes, which is not so good due to high salt concentration."* (Participant 2, Field Interview, 2024)

While water for essential operations is secured, the cost and suitability of water use for non-essential purposes, such as landscaping, remain a concern.

Operational Cost

Climate change indirectly raises operational costs for hotels and office buildings, particularly due to unpredictable weather patterns that influence resource consumption.

> *"It's affecting us on so many different fronts, e.g., availability of raw materials. We have noticed a change in rainfall patterns; they are not as predictable as before. I think right now we are paying more than double the price we used to pay for tomatoes. Getting tomatoes is harder; we have to pay more, same for cereals. Sometimes we have to compromise a little bit more on quality."* (Participant 5, Field Interviews, 2024)

Extended dry seasons also necessitate increased cleaning, leading to additional costs.

> *"Cleaning is done at most twice a week unless it is in the extremely dry season, when there is a lot of dust, and this means more resources will be invested into cleaning. Because we have a lot of trees, there will be a lot of leaves falling, which increases the number of bins our waste organization collects and increases how much we have to pay."* (Participant 7, Field Interviews 2024)

> *"In the hotter seasons, we have 194 rooms; we have to use cold [air conditioning] all the time, so when the water is hot, our AC consumes more energy."* (Participant 1, Field Interviews 2024)

These findings highlight how climate change indirectly increases costs through higher energy consumption, increased waste management expenses, and greater reliance on external water sources.

Client Satisfaction and Revenue

The study found that climate change affects customer satisfaction and revenue differently depending on the hotel type. Business hotels, which primarily serve corporate clients, appear to experience minimal disruption.

> *"It will not be very telling for us because we are a business hotel. We have luxury hotels for luxury people who come for holidays, but we oversee the business aspect of clients. So, it is not so much for holidays; it is for business, so we don't see that effect because of climate change."* (Participant 4, Field Interviews 2024)

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However, luxury and leisure hotels report both benefits and drawbacks. While extreme weather conditions increase guest numbers seeking comfort in hotel amenities, resulting in increased revenues, they also lead to customer dissatisfaction among foreign visitors unfamiliar with Ghana's climate.

> *"... extreme climate change events, extreme heat, and dust in the dry season have been a time of increased revenue. There is a high turnover of clients who patronize the hotel and pool to get away from the heat and dust."* (Participant 7, Field Interviews 2024)

> *"foreign clients find it quite difficult to adapt to the weather temperatures, especially in periods when there is consistent heat… it sometimes leads to loss of customers and consequently loss of revenue as customers who would want to have an outdoor event are forced to take their event somewhere else during periods of heavy rains."* (Participant 5, Field Interviews 2024)

Thus, the findings highlight a dual impact of climate change on hotels. Business hotels remain largely unaffected, while luxury hotels face both gains and losses. Extreme heat boosts pool usage but may deter foreign guests, while unpredictable rains disrupt outdoor events, reducing revenue.

Hotel and Office Building Contribution to Climate Change

Water-intensive landscaping practices contribute to local water scarcity, particularly during dry seasons when reliance on municipal water increases.

> *"I wish I could get a timetable for rain. We don't have any facility to store water so that we can use it later, and when it is dry, that is when we need water most for our landscaping."* (Participant 6, Field Interviews 2024).

Also, hotels and office buildings consume huge energy, primarily due to air conditioning and refrigeration systems.

> *"Our building is underground, so there is no air coming from anywhere. So once the weather is hot, every office has to use the AC. For instance, when the light is off, everyone leaves the office because it is very warm, so the AC consumes a lot."* (Participant 9, Field Interviews 2024)

Waste disposal practices, particularly the lack of segregation, increase environmental impact. Both hotel and office buildings underscore how detrimental their waste management practices are to climate change.

> *"Liquid waste is disposed of through the central sewage lines into the sea."* (Participant 7, Field Interviews 2024)

> *"One major hotel activity that has a huge impact on the climate is the large volume of garbage produced due to the high number of guests and events hosted."* (Participant 5, Field Interview 2024)

The findings highlight key contributors to emissions and climate change in hotels and office buildings, focusing on water use, energy consumption, and waste management. Excessive water use for landscaping, particularly during dry seasons, increases financial strain and exacerbates shortages, aligning with Midgley (2017), who notes that resource misuse heightens vulnerability. Energy consumption is also a major concern, as buildings lacking natural ventilation rely heavily on air conditioning. Underground office buildings require continuous cooling, increasing energy demand, a challenge emphasized by Koranteng et al. (2021). Hotels also face similar issues, particularly in guest spaces, where unrestricted air conditioning use further raises emissions. Additionally, inadequate waste segregation and disposal, including sewage discharge into the sea, contribute to environmental strain. Anheier (2017) stresses the importance of proper waste management in reducing an organization's footprint. Addressing these challenges requires integrated sustainability strategies, incorporating water conservation, energy-efficient designs, and improved waste management.

Climate Change Consciousness and Sustainable Water Conservation

Climate change awareness varies across hotels and office buildings, influencing their sustainability efforts.

> *"As a hotel, it is the best thing to do. It is a global initiative to save nature, and it should always be beneficial to the company."* (Participant 5, Field Interviews 2024)

> *"The very life of the tourism industry depends on a healthy environment. If not, you won't survive as a hotel."* (Participant 8, Field Interviews 2024)

However, while they admit awareness of climate change, gaps in staff compliance with sustainability initiatives persist.

> *"Even in my own institution, where about 90 or 95% of employees have at least a primary education, it is difficult. If you ask them to cut their shower time, they will tell you, 'We have free water in a hotel.'"* (Participant 4, Field Interviews 2024)

These findings highlight the importance of integrating sustainability measures within organizational culture while considering both financial and environmental incentives.

The findings reveal that while climate change consciousness exists in hotels and office buildings, its influence on water conservation is often overshadowed by economic concerns. Thus, despite the awareness, commitment to sustainability varies. Some hotels integrate climate considerations in their designs, while others lack such plans, reflecting Su et al.'s (2013) assertion that awareness does not always translate into sustainability efforts. Larger hotels can afford long-term investments in water-saving technologies, unlike smaller facilities focused on cost-cutting (Kinyanjui, 2019). This contradicts the Norm Activation Model, which links awareness to pro-environmental action. While managers acknowledge climate issues, financial priorities dominate decision-making (Gabarda-Mallorquí et al., 2018). Ultimately, economic factors outweigh sustainability concerns, limiting voluntary adoption of water conservation practices (Nyide, 2017).

Water Conservation Practices in Hotels and Office Buildings

Hotels and office buildings have implemented various water conservation strategies in response to growing

water scarcity. These strategies encompass technological advancements, waste management practices, energy efficiency measures, and customer engagement initiatives.

Findings reveal that hotels and office buildings have adopted multiple water-saving measures, including borehole and well water use, reverse osmosis systems, and water-saving aerators:

> *"In terms of water consumption, we have a borehole and a well; we are trying to see if we can rely on the well for irrigation, and the borehole is attached to a reverse osmosis machine, so the idea is to reduce sole dependence on municipal water as a water source."* (Participant 4, Field Interviews 2024)

> *"We do have a water treatment plant; we have water-saving aerators or a flow control, which we have installed from 24 litres per minute down to 6.5 litres per minute. One more thing is we have our water filtration system, and we maintain our water parameters."* (Participant 9, Field Interviews 2024)

Behavioural interventions and operational adjustments complement these technological solutions:

> *"We educate our staff on conserving water, so they must be mindful of leakage and report it.* (Participant 7, Field Interviews 2024)

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> *"Every staff member goes through training; every staff member goes through waste management, sustainability checks training on their day of joining, their orientation."* (Participant 9, Field Interviews 2024)

These strategies demonstrate a holistic approach to water conservation that integrates both technology and staff engagement.

Waste Management Strategies

Hotels and office buildings have implemented waste reduction initiatives, such as segregation, recycling, and plastic reduction, as evident in the narratives below.

> *"We do the separation of the bottles and food waste. We have just gotten someone who has a piggery to come for the food waste. We have the metal scrap dealer who comes for scrap. The waste segregation has reduced our waste load. We have someone in our garbage room who does the trash sorting, and we save between 3-4,000 every month because of the waste segregation... And also, we are phasing out plastics, so takeaway packs are changed to bagasse."* (Participant 5, Field Interviews 2024)

The reduction of plastic waste remains a key focus:

> *"We also try to avoid using maximum plastic. You know plastic also impacts the climate. So we are planning to avoid plastics; we have avoided all plastic cutlery, and we have reduced our plastic PET bottles. We are planning to invest in our bottling plant for next year, 2025."* (Participant 10, Field Interviews 2024)

Some hotels have also explored wastewater processing solutions, such as septic tanks and water treatment for landscaping purposes

> *"For instance, to address the situation of our high level of waste, we have a septic tank that caters to our liquid waste and organic waste."* (Participant 9, Field Interviews 2024)

Energy Conservation Strategies

Given Ghana's reliance on hydropower, energy conservation indirectly supports water sustainability. Hotels and office buildings have adopted motion sensors, LED lighting, and energy-efficient heating and cooling systems.

> *"Energy usage is that you have to use it at an optimum level… We have implemented motion sensors in all the toilets; the lights go off when there is no movement."* (Participant 7, Field Interviews 2024)

> *"70% of the bulbs in the hotels are LED. At first, they were fluorescent and incandescent, but what we have now consumes between 5 and 10 watts, which has contributed to energy reduction."* (Participant 3, Field Interviews 2024)

Cooling systems have also been optimized for efficiency; however, this is different for both hotels and office buildings.

> *"We use a centralized air-conditioning system. If you use split units, such as a split air-conditioning system for each room, it gives too much of a carbon footprint. A centralized system is always better for the hotel industry."* (Participant 5, Field Interviews 2024)

> *"Initially, we were using a central system AC, which used a lot of power, but now we are using the split service, which means that you have to switch it off when you leave the office."* (Participant 9, Field Interviews 2024)

This implies a difference in goals and operational limits between hotels and business buildings when it comes to cooling systems. Hotels prefer centralized air conditioning to boost efficiency and lower overall carbon footprints, possibly because they need to maintain consistent cooling for guest comfort. In contrast, workplaces prioritize energy conservation and cost savings by employing split systems, which allow for greater individualized control and the option to turn off units when spaces are vacant. This shows that sustainability techniques in cooling systems are context-dependent, moulded by industry-specific needs and operational patterns. Overall, these interventions demonstrate a combination of high-tech solutions and behavioural incentives for energy conservation.

Further, the study highlights that customer priority influences adaptation measures, with hotels favouring indirect conservation strategies over confrontation with customers.

> *"Poor customer water conservation habits are evident as some customers feel entitled to misuse resources like electricity and water because they have paid for a room."* (Participant 5, Field Interviews 2024)

To mitigate this, hotels employ subtle tactics like reducing water pressure when guests are absent:

> *"We occasionally turn off our water pump when a number of clients are absent from their rooms."* (Participant 7, Field Interviews 2024).

Additionally, technology is increasingly used to encourage conservation without guest involvement.

> *"Once the guest checks in, the temperature will move to 23, and once they leave, it will adjust automatically... lights will go off through motion sensors."* (Participant 4, Field Interviews 2024)

Office buildings take a more direct approach, such as reminders to switch off electrical gadgets, yet human behaviour remains a challenge.

> *"You can tell them one thing today, and tomorrow they will say they forgot."* (Participant 9, Field Interviews 2024).

The findings, therefore, highlight a blend of technological and process-based water conservation strategies in hotels and office buildings. Technological interventions, such as reverse osmosis systems, aerators, and bathroom sensors, align with previous studies emphasizing technical solutions for water efficiency (Eshun & Appiah, 2018; Kinyanjui, 2019). Hotels demonstrate greater adoption of these technologies compared to office buildings, particularly through borehole water use and wastewater recycling for irrigation. Energy conservation efforts, including energy recovery from chillers and efficient lighting systems, reflect broader global sustainability trends. Waste reduction measures, such as plastic elimination and waste segregation, also mirror prior research on hotel sustainability (Mbise & Ossum, 2023).

Further, process-based strategies, including staff training, signage, and reduced cleaning days, aim to influence

behavior. However, while office buildings use direct enforcement, hotels favor subtle methods due to customer sensitivities, as opined by Kinyanjui (2019). The findings underscore the conflict between sustainability efforts, customer satisfaction, and economic priorities, particularly in hospitality settings.

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Challenges in Sustainability Implementation

Despite the diverse interventions discussed above and significant progress made, several challenges impede the adoption of sustainable practices. A key concern is the unavailability of service providers:

> *"Fewer service providers to facilitate the initiatives. There were times I would have a lot of plastic segregated, but they wouldn't come because it is too expensive for them. Besides, they have to fuel their car to come."* (Participant 4, Field Interviews 2024)

> *"Even with E-Waste EPA was taking it, but at a point, they stopped. With the bagasse, only a few companies make them; once the shipping delays, you will run out, and you have to bow your head in shame and buy plastic."* (Participant 5, Field Interviews 2024)

In addition to service support, government support is also perceived as inadequate, with participants emphasizing the absence of policy enforcement and financial incentives:

> *"As for government, little to no support, the only government institution supporting was EPA. It got to a time when their tricycles broke down, so the onus is on you to look for alternatives."* (Participant 10, Field Interviews 2024)

> *"There should be a strict rule for every company to have a waste recycling plant; if the government starts insisting, it will be a great thing, but there is nothing major with the government's support. It is very expensive, and that will be our hotel's independent initiative."* (Participant 3, Field Interviews 2024)

The findings highlight financial, regulatory, technological, and service-related barriers to implementing sustainable water conservation in hotels and office buildings. A major challenge is the high initial cost of adopting conservation technologies, despite long-term operational savings. This aligns with Shen et al. (2020), who found that firms hesitate to invest in sustainability due to upfront expenses. The Technology Acceptance Model (TAM) explains this reluctance, as managers recognize the benefits (perceived usefulness) but find high costs and reliability concerns (e.g., solar lighting), reducing ease of adoption (Davis, 1989).

Service-related challenges also emerged, particularly in maintaining waste segregation due to unreliable providers. This finding supports Kinyanjui (2019), who emphasized external service availability as crucial for sustainability. Additionally, weak regulatory frameworks and the lack of government incentives impede green initiatives, concurring with Opoku et al. (2019). Addressing these challenges requires stronger policies, financial support, and reliable service networks to enhance adoption and long-term sustainability.

Addressing Sustainability Challenges

Participants proposed various solutions, including the adoption of greywater recycling systems, alternative water supply sources, and financial incentives for sustainable investments:

> *"We do not have any greywater recycling. But this is one of the best things every hotel in the country or in the world should have the recycling systems. However, it is costly and takes up space."* (Participant 6, Field Interviews 2024)

> *"The hotel industry can look at moving to an alternative water supply system like the underground water drill for operations like laundry, gardening, water for flushing, among others, and rely on water from the Ghana Water Company for food preparation and bathing."* (Participant 5, Field Interviews 2024)

Some participants also called for tax incentives to encourage sustainability:

"Certain tax waivers and tax breaks should be given to the hotel industry so that they are not so engulfed in operation costs, to give the best of services at affordable costs, and still be able to pay their workers better." (Participant 1, Field Interviews 202)

These recommendations emphasize the need for a collaborative approach between the government and the hospitality industry, underscoring the role of financial incentives, regulatory enforcement, and technological investments in promoting sustainability.

The findings indicate that addressing sustainability challenges in the hotel industry, particularly water conservation, requires practical, cost-effective, and policy-driven strategies. A key recommendation is the adoption of greywater recycling systems, which reuse water from sinks and showers, making them ideal for hotels. Additionally, participants advocated for alternative water sources, such as underground water drilling for non-potable uses, to reduce reliance on municipal water and lower operational costs. Government enforcement was highlighted as essential, with calls for stronger policy measures and financial incentives to encourage hotels to adopt sustainable water management systems. Findings depict frustrations with symbolic government actions, emphasizing the need for substantial investment rather than superficial commitments. This aligns with Lamba et al. (2017), who critique weak sustainability policies.

Overall, achieving sustainability in the hotel industry requires collaboration between the public and private sectors, with regulatory frameworks and financial incentives playing a crucial role in overcoming existing financial and logistical barriers.

CONCLUSION

The study, Sustainable Water Conservation as Climate Change Adaptation: A Study of Hotels and Office Buildings in Accra, examined the impact of climate change on hotels and office buildings, the extent to which climate change consciousness influences sustainable water conservation, the innovative practices adopted, and the challenges associated with these efforts. The study found that climate change severely affects hotels and office buildings, resulting in increased operational expenses due to prolonged dry seasons, higher energy demand, and disruptions in water supply. While some hotels and office buildings have integrated environmental considerations into their operations, others approach climate adaptation largely through a commercial lens rather than an environmental one. The study also showed that water conservation measures in hotels and office buildings are broad, including the usage of reverse osmosis systems, water-saving aerators, boreholes, and behavioral interventions such as educative stickers and encouraging towel reuse. Energy efficiency solutions, such as LED lights and motion sensors, were also widespread. However, influencing client behavior remains a problem, particularly for hotels that prioritize client satisfaction.

Several impediments further inhibit the implementation of sustainable water conservation techniques, including financial limits, inadequate service providers, weak regulatory enforcement, and technology limitations. The study reveals that while hotels and office buildings acknowledge the necessity of sustainable water management, commercial factors generally outweigh environmental motivations.

Based on these findings, hotels and office buildings should prioritize cost-effective and user-friendly water conservation technology such as low-flow fixtures, rainwater harvesting, and greywater recycling. Awareness initiatives for both staff and guests can develop a culture of environmental responsibility. Policymakers should also create incentives, such as tax breaks, for sustainable activities and enforce higher water efficiency standards. Further, future research should analyze the long-term effectiveness of water-saving techniques and explore sustainability strategies across diverse building types and areas. Strengthening regulatory frameworks and investing in sustainable solutions are critical steps in achieving climate resilience in Ghana's hospitality and commercial sectors.

Ethics, Conflicts of Interest, and Data Availability

There are no conflicts of interest to declare.

REFERENCES

1. Abdou, A. H., Hassan, T. H., & Dief, M. M. E. (2020). A description of green hotel practices and their role in achieving sustainable development. Sustainability, 12(22), 1–21.
2. Agodzo, S. K., Bessah, E., & Nyatuame, M. (2023). A review of the water resources of Ghana in a changing climate and anthropogenic stresses. Frontiers in Water, 4.
3. Agyekum, K., Adinyira, E., & Ampratwum, G. (2020). Factors driving the adoption of green certification of buildings in Ghana. Smart and Sustainable Built Environment, 9(4), 595-613.
4. Anheier, H. K. (2017). Nonprofit organizations: Theory, management, policy. Routledge.
5. Antonova, N., Ruiz-Rosa, I., & Mendoza-Jiménez, J. (2022). Water resource management in hotels using a sustainable balanced scorecard. Sustainability, 14(13).
6. Clarke, V., & Braun, V. (2013). Successful qualitative research: A practical guide for beginners. Sage.
7. Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approaches. Sage.
8. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 319–340.
9. Dinarès, M., & Saurí, D. (2015). Water consumption patterns of hotels and their response to droughts: Barcelona's experience. Documents d'Anàlisi Geogràfica, 61(3), 623–649.
10. Dodoo, A., & Ayarkwa, J. (2019). Effects of climate change for thermal comfort and energy performance of residential buildings in a Sub-Saharan African climate. Buildings, 9(10), 215.
11. Dogo, E. M., Salami, A. F., Nwulu, N. I., & Aigbavboa, C. O. (2019). Blockchain and internet of things-based technologies for intelligent water management system. In Artificial intelligence in IoT (pp. 129-150). Cham: Springer International Publishing.
12. Etikan, I., Musa, S. A., & Alkassim, R. (2016). Comparison of convenience and purposive sampling. American Journal of Theoretical and Applied Statistics, 5(1), 1–4.
13. Gabarda-Mallorquí, A., Fraguell, R. M., & Ribas, A. (2018). Exploring environmental awareness and behavior among hotel guests applying water-saving measures. Sustainability, 10(5).
14. Intergovernmental Panel on Climate Change (IPCC). (2022). Climate Change 2022: Impacts, adaptation and vulnerability. IPCC.
15. Kasim, A., Gursoy, D., Okumus, F., & Wong, A. (2014). The importance of water management in hotels. Journal of Sustainable Tourism, 22(7), 1090–1107.
16. Kinyanjui, D. N. (2019). Adaptive responses to climate change in hotel water resource management. International Journal of Environment and Climate Change, 9, 287–296.
17. Koranteng, C., Simons, B., & Gyimah, K. A. (2021). Potential measures towards the reduction of cooling loads of office buildings in Ghana. Frontiers in Engineering and Built Environment, 1(2), 161-172.
18. Logah, F. Y., Amisigo, A. B., Obuobie, E., & Kankam-Yeboah, K. (2017). Floodplain hydrodynamic modelling of the Lower Volta River in Ghana. Journal of Hydrology: Regional Studies, 14, 1-9.
19. Mensah, I., & Blankson, E. (2013). Determinants of hotels' environmental performance. Journal of Sustainable Tourism, 21(8), 1212–1231.
20. Midgley, J. (2017). Social development: Theory and practice. Sage.
21. Mogotsi, K., & Saruchera, F. (2023). The influence of lean thinking on philanthropic organisations' disaster response processes. Journal of Humanitarian Logistics and Supply Chain Management, 13(1), 42-60.
22. Moyo, B. (2016). Philanthropy in Africa: Functions, origins, and challenges. Routledge.
23. Nuong, D. M., RAGAVAN, N. A., Zaazie, P., Niber, A., & Anandene, D. (2022). Green practices among hotels in the Sunyani municipality of Ghana. Journal of Business and Environmental Management, 1(1), 1-22.
24. Nyide, C. J. (2017). The role of environmental management accounting and voluntary self-regulatory initiatives in improving resource efficiency in South African hotels. Business and Economic Horizons, 13(1), 30-41.

25. Njenga, S. N., Gichuhi, D., & Koome, P. (2021). Influence of millennials innovativeness on organization change in the hospitality industry in Naivasha sub-county, Kenya. International Journal of Research in Business and Social Science, 10(7), 379-388.
26. Oriade, A., Osinaike, A., Aduhene, K., & Wang, Y. (2021). Sustainability awareness, management practices and organisational culture in hotels: Evidence from developing countries. International Journal of Hospitality Management, 92, 102699.
27. Orikpete, O. F., Ikemba, S., & Ewim, D. R. E. (2023). Integration of renewable energy technologies in smart building design for enhanced energy efficiency and self-sufficiency. The Journal of Engineering and Exact Sciences, 9(9), 16423-01e.
28. Owusu-Ansah, K. K. (2024). Sustainable Development: Implications for Urban Employment in Emerging Global Cities, a Case Study of Accra, Ghana. University of Wyoming.
29. Palinkas, L., et al. (2015). Purposeful sampling for qualitative data collection and analysis. Clinical and Translational Science, 8(4), 534–541.
30. Payton, R. L. (1988). Philanthropy: Voluntary action for the public good. Macmillan.
31. Schwartz, S. (1973). Normative influences on altruism. Advances in Experimental Social Psychology, 10, 221–279.
32. Sedegah, D. D., Agyekum, M. W., & Kyeremeh, B. (2023). Local-level water conservation and management in rural Ghana. Irrigation and Drainage, 1095–1108.
33. Shen, L., Qian, J., & Chen, S. (2020). Effective communication strategies for sustainable hospitality. Sustainability, 12(17).
34. Su, Y., Hall, C., & Ozanne, L. (2013). Hospitality industry responses to climate change. Asia Pacific Journal of Tourism Research, 18(1–2), 92–107.
35. Ulus, M., & Hatipoglu, B. (2016). Human factors in organisational sustainability in tourism. Sustainability, 8(3), 232.
36. United Nations. (2020). Water and Climate Change Report 2020. United Nations.
37. United Nations. (2022). Sustainable Development Goals Report 2022. UN Publishing.