Investigating the Barriers in Implementing AHU Condensate Water Utilisation Strategy for Improving Water Conservation in Hotel Facilities in Sri Lanka

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Abstract. Among emerging water conservation strategies, utilising Air Handling Unit (AHU) condensate water, a byproduct generated during the cooling and dehumidification process of HVAC systems, presents a promising yet largely untapped strategy for water conservation in hotel facilities in Sri Lanka. While the international studies confirm the technical feasibility and economic viability of AHU condensate water utilisation strategy, its limited adoption in Sri Lankan hotels suggests that the challenges lie not in feasibility but in overcoming the barriers that hinder its implementation. However, identifying these barriers is crucial because, without addressing them, the theoretical potential of AHU condensate utilisation cannot be translated into practical implementation. Therefore, this study aims to identify the barriers in implementing AHU condensate water utilisation concept in hotel facilities in Sri Lanka, providing a comprehensive understanding of the constraints limiting its adoption. The study adopted a qualitative approach by conducting expert interviews among five industry experts on the area of Heating, Ventilation and Air Conditioning (HVAC) systems, thermodynamics, fluid mechanics, and energy efficiency. Thematic analysis was conducted manually to analyse the data, and the research identified twenty barriers which could be categorised under four key categories as financial barriers, technical barriers, environmental barriers and organisational barriers. The findings revealed that high capital costs, design and installation complexity, insufficient staff expertise, fluctuating condensate generation due to climatic conditions, contamination risks, and limited government support were the major barriers affecting the implementation of AHU condensate water utilisation in Sri Lankan hotel facilities.

Keywords. *Barriers, AHU condensate water utilisation, Water conservation, Hotels, Sri Lanka.*

1. Introduction

Fresh water is one of the most critical natural resources (Algarni et al., 2018). However, freshwater resources are under significant global stress, and water scarcity has become a prominent and widespread natural hazard due to climate change, irrigation inefficiency and population growth (Abeysingha & Rajapaksha, 2020). The building sector is a major consumer of freshwater resources in a country (Ismail et al., 2024). Among different types of buildings, the hotels are considered as high water-consuming facilities due to their diverse operations, including kitchens, restaurants, swimming pools, gardens, laundry and spas (Antonova et al., 2023). Therefore, it intensifies the need for innovative water conservation strategies within hotel facilities (Wijesundara et al., 2024). To address excessive water consumption, hotels have implemented a range of approaches, including wastewater treatment, rainwater harvesting, and graywater recycling (Syahputra et al., 2023). However, alternative water sources within building systems are increasingly being explored to further enhance water conservation in hotels. Therefore, emerging attention has been given to the recovery of condensate water produced by Air Handling Units (AHUs). AHU condensate is a natural by-product of air-conditioning systems, formed during the cooling and dehumidification of humid air, and has been explored for collection and reuse (Ahmed, 2025).

https://doi.org/10.31705/ICFMF2026.31

The implementation of AHU condensate water utilisation is not always straightforward, as several technical, financial, environmental, and organisational barriers can influence its adoption in building facilities. Therefore, identifying barriers in implementing AHU condensate water utilisation is essential for developing effective strategies to improve water conservation in Hotel Facilities in Sri Lanka. Understanding these barriers helps to uncover the challenges that limit the adoption of this alternative water source. Given the lack of context-specific empirical research that systematically investigates these barriers within the Sri Lankan hotel facilities, this study aims to identify the barriers in implementing AHU Condensate Water utilisation to improve water conservation in Hotel Facilities in Sri Lanka.

The rest of the paper is structured as follows. The next section reviews the literature related to AHU condensate water utilisation. The research methodology is explained in the next section, followed by the research findings and the conclusion.

2. Literature Review

This section reviews the existing literature on the concept of AHU condensate water utilisation strategy, potential applications, and the barriers to its effective implementation.

2.1 INTRODUCTION TO AHU CONDENSATE WATER UTILISATION STRATEGY

AHU is one of the most important pieces of equipment in HVAC systems. Especially large-scale buildings use AHUS to provide both heating and cooling for multiple zones (Yu et al., 2014). Glawe (2013) stated that condensate is the water that forms when a surface cools below the air's dew point, with higher humidity increasing the amount of moisture that condenses. When the dew point temperature of the ambient air is greater than the cooling coil dew point temperature, condensate water is generated during the cooling and dehumidification process (Deng et al., 2024). AHU systems generate a considerable volume of condensate water under tropical climatic conditions (Licina & Sekhar, 2012). Hence, AHU condensate water presents a viable water-saving option, applicable at both the individual household and larger building scale.

2.2 APPLICABLE AREAS OF AHU CONDENSATE WATER UTILISATION STRATEGY

Cooling systems generate a significant condensate water volume, which most of the time is connected to the drainage system (Lemouari et al., 2009). However, condensate water might be utilised for a range of purposes, including irrigation or a non-potable water supply for toilet flushing and cooling tower makeup (Algarni et al., 2018). Landscape/garden irrigation is a predominant application in which condensate can be effectively utilised without any treatment (Dhamodharan et al., 2023). The quantity of condensate produced by large commercial central HVAC units is sufficient to supply irrigation water for the surrounding landscapes. Hosseinkhani & Kargari (2022) stated that a promising method involves capturing condensates from air-conditioning systems, treating them, and reusing them for multiple purposes, including potable water supply and various engineering applications. However, Chan (2023) highlights that condensate reuse has strong potential, but it still needs appropriate treatment processes to meet drinking water standards and ensure safety compliance. One of the most feasible applications of AHU condensate in buildings is toilet flushing, as this end-use does not require potable-quality water (Chen et al., 2021). Further, Sri Komala et al. (2025) stated that it may be possible to use condensate water for decorative fountains and water features, evaporative coolers, rinse water for washing vehicles and equipment, and water for laundry operations.

2.3 BARRIERS IN IMPLEMENTING AHU CONDENSATE WATER UTILISATION STRATEGY

Implementing water conservation strategies like AHU condensate water utilisation in facilities, particularly in developing countries, poses significant barriers (Rinomhota, 2025). Financial barriers to AHU condensate reuse in facilities include high upfront retrofit and equipment costs (Pandey et al., 2018), uncertain payback periods, and ongoing treatment and maintenance expenses (Algarni et al., 2018; Siam et al., 2019). Incorrectly sized AHU condensate water storage tanks will result in either wasted condensate or wasted initial investments in terms of the initial costs of the system (Algarni et al., 2018). High initial investment costs represent a primary financial obstacle (Salgot & Folch, 2018). Limited financial resources and a lack of government assistance further compound these challenges (Rinomhota, 2025).

Beyond financial constraints, hotels encounter technological and knowledge barriers, including insufficient expertise and skills among staff (Ersoy, 2024). Inadequate stakeholder support and limited awareness of potential cost savings hinder implementation efforts (Sucheran, 2018). Algarni et al. (2018) identify design and installation complexity as a primary obstacle to wider AHU condensate water reuse deployment. A major barrier to adopting AHU condensate water utilisation strategy in facilities is the lack of skills, knowledge, and experience within the organisation and the industry as a whole.(Graci & Dodds, 2008). As highlighted by Mbasera et al. (2017), the success of any programme relies heavily on having knowledgeable human resources in environmental management. Also, the lack of employee support for implementing AHU condensate water reuse in hotels is a major barrier (Nisar et al., 2021). The implementation of AHU condensate reuse depends on the active staff participation supported by appropriate training and education (Nisar et al., 2021).

HVAC condensate is conducive to environmental contamination during the process of collection and transport (Algarni et al., 2018). Microorganisms suspended in air drawn from inside and outside the building through the AHU can collect on the cooling coils during condensate formation (Bakker et al., 2020). Condensate contacts metals along the flow path, such as cooling coils, drain pans, pipes, valves, meters, tanks and other appurtenances (Dhamodharan et al., 2023). The acidic nature of the condensate prompts reactions with metals, especially iron and steel, to form metal ions. In many cases, the trace concentration of metals in the condensate is inconsequential. However, under limited circumstances, the metals can accumulate to toxic levels (Algarni et al., 2018). For example, when condensate is piped through metal pipes for irrigation, metals could build up in the soil to a toxic level over a long period (Soleimani et al., 2023). Even under optimal conditions, HVAC condensate can contain metal, nitrites and ammonia (AlGhamdi et al., 2024). Also, Algae growth in storage tanks can clog downstream pipes and components. The storage tanks can also host hazardous microbes such as Legionella (Bourdon et al., 2019).

In regions with minimal or no government regulations, voluntary initiatives tend to diminish due to reduced regulatory pressure. This observation is relevant to AHU condensate water utilisation strategy in facilities, as the absence of national policies and standards to implement AHU condensate reuse effectively (Glawe & Wooten, 2016). Mbasera et al. (2017) concluded that many facilities in developing countries face challenges in implementing water conservation strategies due to a lack of governmental support and appropriate regulations.

Accordingly, the barriers identified in the literature review are summarised in Figure 1.

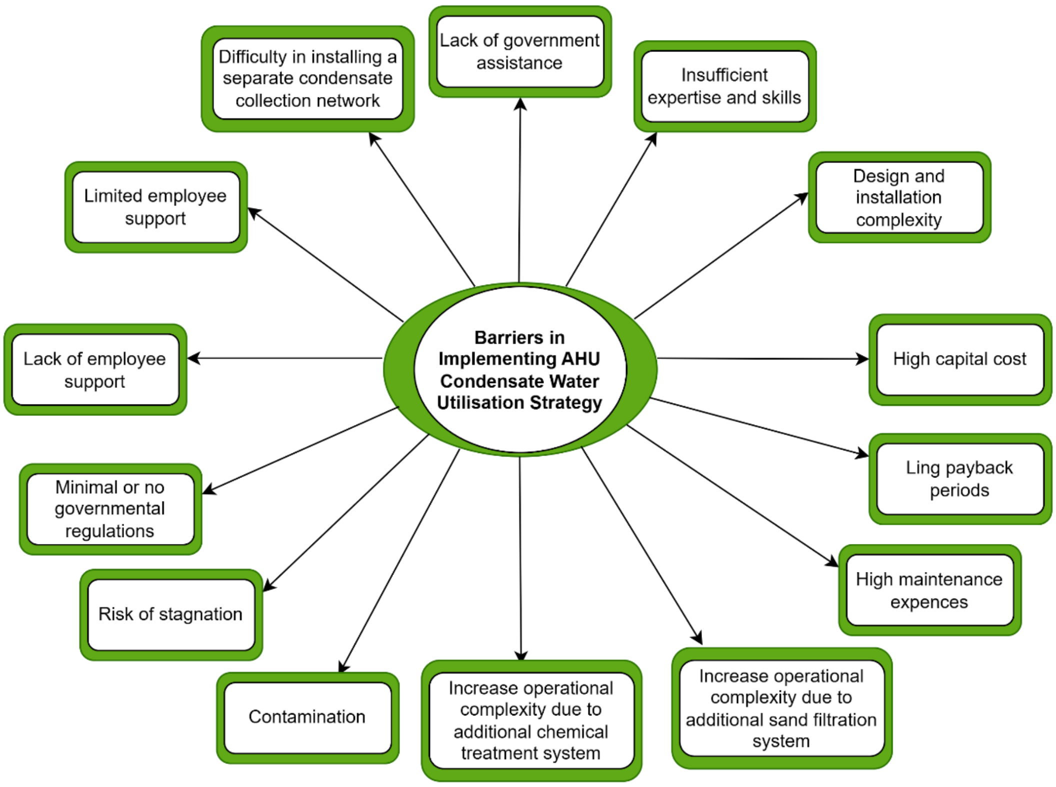

Figure 1: Barriers in implementing AHU condensate water utilisation strategy

Sources: (Algarni et al., 2018; Rashid et al., 2024; Bakker et al., 2020; Bourdon et al., 2019; Dhamodharan et al., 2023; Ersoy, 2024; Glawe & Wooten, 2016; Graci & Dodds, 2008; Nisar et al., 2021; Pandey et al., 2018; Rinomhota, 2025; Salgot & Folch, 2018; Siam et al., 2019)

However, these studies primarily focus on global commercial, institutional, or industrial buildings, and there is a lack of research examining these barriers in the hotel sector. No studies have examined the implementation of AHU condensate water utilisation in Sri Lankan hotels. This highlights a significant research gap and underscores the need to investigate the barriers specific to Sri Lankan hotel facilities.

3. Methodology

This study aims to analyse the barriers hindering the successful implementation of AHU condensate water in hotel facilities in Sri Lanka. Accordingly, the research question was formulated as *"What are the barriers affecting the implementation of AHU condensate water specialised for water conservation in hotel facilities in Sri Lanka?".* To effectively achieve the research aim, a qualitative approach was employed, and to gather in-depth insights on the barriers to AHU condensate water utilisation strategy, this study conducted expert interviews with 05 experts who possess specialised knowledge in HVAC systems, thermodynamics, fluid mechanics, and energy efficiency, with a minimum of 07-year industrial experience. The expert sample was limited to five (05) respondents, as similar views and recurring issues were consistently highlighted during the interviews, indicating that sufficient depth of information had been achieved and no significant new insights were emerging. Moreover, the selected experts represented different professional backgrounds, including HVAC design, mechanical engineering, building services and academia, enabling the collection of diverse technical and practical perspectives relevant to the research objectives. Therefore, the sample size was considered adequate for this qualitative study, which focused on obtaining detailed expert insights rather than statistical generalisation. Semi-structured interviews were selected for their ability to collect key data while allowing flexibility to explore participants' views and experiences in greater depth. The interview guideline was developed based on the barriers identified through the literature review and consisted of three main sections. The first section gathered the background information of the respondents, including their professional experience and area of expertise. The second section focused on validating the barriers identified from the literature in the Sri Lankan hotel context. The third section encouraged experts to share additional barriers, practical experiences, and professional insights related to the implementation of AHU condensate water utilisation in hotel facilities. Interviews were conducted via Zoom and physical meetings following a semi-structured format, with a 40 to 50-minute time duration. The details of respondents are summerised in Table 1.

Table 1: Details of the Respondents of the Semi-Structured Interviews

Code	**Year of industry/academia experience**	**Field of expertise**	**Postgraduate qualification in advanced mechanical engineering and building services**
E1	07 years	Design Analysis Engineer/ Senior Lecturer	Ph.D. Mechanical Engineering, M.Phil. Mechanical Engineering
E2	12 years	HVAC Design Engineer/ Mechanical Services and Projects	M.Sc. in Building Services Engineering
E3	32 years	Mechanical Engineer	-
E4	12 years	Mechanical Engineer/ Senior Lecturer	Ph.D. Mechanical Engineering, M.Phil. Mechanical Engineering
E5	07 years	Mechanical Engineer/ Senior Lecturer	Meng. in Urban Engineering

All interviews were audio recorded and subsequently transcribed. To ensure transcription accuracy, each transcript was cross-checked against the original recordings. The verified transcripts were then examined repeatedly to familiarise the researchers with the data and to identify recurring patterns and emerging themes within and across the interviews. Then, the collected data were analysed using the thematic analysis technique. According to Brooks et al. (2015), thematic analysis is the best method for the analysis of data collected through semi structured expert interviews.

The coding process was carried out manually, focusing on the identification of repeated patterns that reflected expert perspectives. This approach enabled the grouping of barriers while capturing both commonalities and variations among expert views. Drawing on the coding outcomes, themes were developed under key barrier categories, namely financial, environmental, technical, and social dimensions. All quotations linked to each identified barrier were systematically organised using an Excel spreadsheet, and individual summaries of coded responses were prepared for each expert. To strengthen the credibility of the analysis, these summaries were returned to the respective participants (experts) as part of a member-checking procedure, allowing them to review and confirm the accuracy and relevance of the interpretations.

4. Research Findings

A comprehensive literature survey was first carried out to identify the barriers to implementing AHU condensate water utilisation in hotel facilities in Sri Lanka (Refer Table 2). All the barriers identified in the literature review were checked with the experts' opinions. The experts were asked whether the identified challenges in the literature review are valid for the Sri Lankan context. Further, their practical experience with each barrier was analysed in detail.

The responses were compiled in Table 2, where a tick (☐) indicates that the expert agrees the barrier is relevant, and a cross (×) indicates disagreement. Analysis of the responses showed that all experts agreed on most technical, financial, environmental, and organisational barriers. The exception was the barrier related to long payback periods (FB2), for which only two of five experts agreed, indicating some uncertainty regarding the financial feasibility of AHU condensate water utilisation in the Sri Lankan hotel context.

Table 2: Barriers in implementing AHU Condensate Water Utilisation in Hotels in Sri Lanka

Barriers		**E1**	**E2**	**E3**	**E4**	**E5**
Technical barriers						
TB1	Difficulty in installing a separate condensate collection network	☐	☐	☐	☐	☐
TB2	Increase operational complexity due to additional sand filtration and chemical treatment system	☐	☐	☐	☐	☐
TB3	Insufficient expertise and skills	☐	☐	☐	☐	☐
TB4	Design and installation complexity	☐	☐	☐	☐	☐
Financial barriers						
FB1	High capital cost	☐	☐	☐	☐	☐
FB2	Long payback periods	×	☐	×	☐	×
FB3	High maintenance expenses	☐	☐	☐	☐	☐
Environmental barriers						

EB1	Contamination	☐	☐	☐	☐	☐
EB2	Risk of stagnation	☐	☐	☐	☐	☐
Organisational barriers						
OB1	Minimal or no government regulations	☐	☐	☐	☐	☐
OB2	Lack of employee support	☐	☐	☐	☐	☐
OB3	Limited awareness	☐	☐	☐	☐	☐
OB4	Lack of government assistance	☐	☐	☐	☐	☐

As the next step, experts were asked to suggest any additional barriers to utilising AHU condensate water in hotel facilities in Sri Lanka, not captured in the literature review. Table 3 provides the list of barriers that were newly identified through expert interviews and categorised under technical, environmental, and social barriers.

Table 3: Barriers of Implementing AHU condensate water utilisation in hotel facilities in Sri Lanka-Expert Interviews

Barriers		**E1**	**E2**	**E3**	**E4**	**E5**
Technical Barriers						
TB5	Space constraints	☐	☐	☐	-	-
Financial Barriers						
FB6	Ongoing expenses	-	☐	-	☐	☐
Environmental Barriers						
EB3	Uncertainty of condensate volume due to Relative Humidity	-	☐	☐	☐	☐
EB4	Uncertainty of condensate volume due to temperature	-	☐	☐	☐	☐
Organisational barriers						
OB5	Negative guest perception towards the use of recycled condensate water	☐	-	☐	-	☐

Accordingly, the barriers of AHU condensate water utilisation strategy in Sri Lanka, confirmed and identified through expert interviews, are explained below.

- Technical barriers

All experts mentioned that the implementation of AHU condensate water utilisation strategy is difficult for people without having specialist knowledge to comprehend because it includes a complex process. Therefore, this was one of the primary barriers identified by experts. E1 stated that *AHU condensate water utilisation is not a widely understood concept in Sri Lanka, resulting in a limited availability of educational resources and a lack of comprehensive understanding of the technology within hotel facilities.* Similarly, E5 stated that *Insufficient expertise and skills among staff, i.e., lack of trained personnel, affect system maintenance and* *operation.* AHU condensate water utilisation involves complex engineering (mechanical, plumbing) and environmental considerations. Because of the specialised knowledge and training required to manage these systems effectively, there is a shortage of personnel with in-depth expertise in this area. Moreover, all experts highlighted that one of the primary barriers is the establishment of a separate network for collecting AHU condensate water. Similarly, E2 mentioned that *because existing plumbing layouts are often not designed to accommodate alternative water sources, integration challenges with existing plumbing systems.* In most buildings, plumbing systems are originally designed for a single water supply source, making retrofitting difficult. As a result, integrating AHU condensate water systems with existing infrastructure can create significant technical challenges, including system redesign, structural modifications, and potential disruption to building operations. Similarly, E4 mentioned that *older hotel buildings often face difficulties in implementing AHU condensate water reuse because the existing plumbing and drainage systems were not originally designed to collect and transport condensate water, making retrofitting complex and costly.* Furthermore, E1 stated that *retrofitting existing buildings may be technically challenging due to space constraints and system integration issues.* All the experts pointed out design and installation complexity as a major barrier, especially when incorporating AHU condensate water utilisation systems into existing hotel infrastructure. Moreover, E1, E3 and E4 emphasised the need for filtration and chemical treatment to ensure the safe use of AHU condensate water. Similarly, E2 stated that s*and filtration combined with chemical treatment is essential to remove impurities and maintain acceptable water quality before reusing*. Without adequate treatment, the reuse of condensate water may lead to system clogging, corrosion, odour issues, and water quality deterioration, which could ultimately compromise both building performance and user safety.

- Financial barriers

According to all experts' perceptions, one of the major critical barriers is the financial barriers in the Sri Lankan context. Also, they highlighted that the above-mentioned technical barriers indirectly contribute to financial constraints. Furthermore, all experts emphasised that the high capital cost of installing an AHU condensate water network includes initial retrofitting costs, additional piping, storage tanks and treatment systems. Most hotel buildings were originally designed only for potable water supply and wastewater discharge, without provisions for condensate recovery systems. Therefore, implementing condensate reuse involves installing new equipment and modifying existing plumbing and mechanical systems. These changes lead to higher initial capital costs. Moreover, E4 and E5 identified that *Ongoing treatment and maintenance expenses add operational complexity and costs.* Continuous requirements such as chemical dosing, filter replacement, and regular monitoring are added to the workload of engineering staff and raise long-term operational expenditure. Similarly, E2 and E4 stated that *Long and uncertain payback periods reduce investment alternatives, mainly where water tariffs are low.* Long and uncertain payback periods reduce the attractiveness of investment in AHU condensate water reuse systems, particularly in contexts where water tariffs are relatively low. This further reinforces that the economic viability of AHU condensate reuse systems is strongly influenced by local conditions, particularly low water tariffs in Sri Lanka. Since water is relatively inexpensive, the cost savings achieved through condensate reuse remain minimal. As a result, even though these systems reduce water consumption, the financial benefits are not significant enough to recover the initial investment within a short period.

- Environmental barriers

According to the perception of all experts, environmental barriers play a significant role in limiting the effective utilisation of AHU condensate water in hotel facilities in Sri Lanka. E1 mentioned that there was *inconsistent condensate generation.* i.e., condensate generation varies with occupancy and weather conditions. Therefore, the HVAC operating schedule makes it difficult to guarantee a continuous and predictable water supply for reuse applications. Similarly, E5 mentioned that *Hotels operating in up-country districts, like Nuwara Eliya and Badulla, face lower condensate generation due to lower temperatures and lower relative humidity, reducing the feasibility of AHU condensate water reuse.* Similarly, E3 highlighted that *seasonal variations significantly impact condensate availability, with monsoon and dry periods causing fluctuations in both quantity and quality of the collected water.* This variability complicates the planning of reuse strategies and increases the reliance on conventional water sources, limiting the overall effectiveness of AHU condensate utilisation in hotel facilities. Furthermore, E2 identified another environmental barrier as *Risk of stagnation during low HVAC operation.* i.e., during periods of low or intermittent AHU operation, stored condensate may stagnate, increasing the risk of microbial growth. Moreover, all the experts emphasised that potential microbial growth and water quality variability raise safety concerns.

- Organisational barriers

All the experts expressed that limited awareness among organisational stakeholders is a main barrier, i.e., many stakeholders are unaware of the potential benefits and feasibility of condenser reuse. Similarly, E4 identified that *a lack of employee support for the implementation of AHU condensate water utilisation in hotels, noting that resistance to change and the perception of additional responsibilities reduce employee acceptance of the system.* When staff view the system as increasing their workload or complicating routine operations, they may be reluctant to actively support its implementation and maintenance, which can ultimately affect the successful operation of the system. E3 mentioned that the l*ack of government assistance*, i.e., limited incentives, subsidies or technical guidance, hinders adoption. Government intervention is essential to promote sustainable water management practices in the hotel sector. Incentive schemes, financial subsidies, and technical support programs could reduce the burden on hotels and encourage wider adoption. Therefore, the lack of government assistance not only limits implementation but also slows down progress toward environmental sustainability goals. The presence or absence of regulatory frameworks is another key factor affecting the implementation of condensate reuse practices in hotels. Similarly, E4 identified that m*inimal or no government regulations regarding the hotel sector, i.e., the absence of clear standards and guidelines, create uncertainty.* Without regulatory direction or compliance requirements, decision-makers may hesitate to adopt such systems due to concerns about legal responsibility, quality standards, and long-term policy support. Also, this highlights that even if condensate reuse is technically feasible and environmentally beneficial, its adoption remains dependent on external regulatory support. Therefore, the absence of government regulations can be seen as a systemic barrier that restricts industry-wide implementation. This implies that introducing clear standards, policies, and enforcement mechanisms could significantly influence stakeholder confidence and accelerate the adoption of condensate reuse in the hotel sector.

5. Discussion

The findings of this study confirm that the implementation of the AHU condensate water utilisation strategy in hotel facilities in Sri Lanka faces multifaceted barriers, aligning with and expanding upon previous international literature. Financial barriers identified in this study, such as high capital costs, ongoing maintenance expenses, and uncertain payback periods, are consistent with the observations of Algarni et al. (2018), Salgot & Folch (2018), and Siam et al. (2019), who highlighted economic constraints as a significant deterrent to adopting condensate water reuse in building facilities. However, research findings suggest that in the Sri Lankan hotel context, these financial concerns are amplified by additional technical barriers, including design and installation complexity and insufficient expertise among staff, which were also emphasised in global studies by Ersoy (2024). Environmental barriers such as fluctuating condensate volume, stagnation, and microbial contamination corroborate the concerns raised by Bakker et al. (2020). Notably, the variation in condensate availability due to local climatic conditions, as highlighted by our experts, adds a contextual nuance that is less discussed in global literature, emphasizing the importance of location-specific strategies in tropical versus temperate regions. Organisational barriers revealed in this study include limited awareness among staff, lack of employee support, and minimal regulatory guidance, aligning with Mbasera et al. (2017), and Nisar et al. (2021), who identified human and institutional factors as critical for the adoption of sustainable water practices. The Sri Lankan hotel sector appears particularly affected by these organisational constraints, indicating that beyond technological feasibility, stakeholder engagement and policy support are crucial determinants for successful implementation. Overall, the comparison between the literature and research findings underscores that while AHU condensate water utilisation is technically viable, practical adoption in Sri Lankan hotels is hindered by the interplay of financial, technical, environmental, and organisational barriers. This highlights the need for integrated strategies combining financial incentives, targeted staff training, and regulatory frameworks tailored to the local context to bridge the gap between theoretical potential and practical implementation.

6. Conclusion and Future Research Agenda

This study identified the barriers to implementing AHU condensate water utilisation in hotel facilities in Sri Lanka. Expert insights highlighted financial and technical constraints such as high capital costs, complex design and installation, and limited staff expertise as the primary obstacles, while environmental concerns like microbial contamination and water stagnation, and organisational barriers including minimal employee support, limited stakeholder awareness, and weak regulatory guidance, further hinder adoption.

Academically, the research provides context-specific evidence by validating and categorising 20 barriers, filling a gap in understanding the barriers of condensate water utilisation in the Sri Lankan hotel sector. From a practical perspective, the findings offer valuable insights for hotel engineers, including maintenance teams and policymakers. The study highlights that the successful implementation of AHU condensate water systems requires not only technical feasibility but also financial planning, staff capacity building, and institutional support. Specifically, reducing implementation barriers may require cost optimisation strategies, targeted training programmes for hotel engineering staff, improved system design integration in new buildings, and the development of clear regulatory guidelines and incentives to encourage adoption in the hospitality sector.

Looking ahead, future research should move beyond theoretical identification of barriers to conduct detailed case-based investigations in selected hotel facilities. Such studies will enable the validation of barriers encountered in practice, provide empirical evidence of operational challenges, and support the development of tailored strategies to overcome them. By bridging the gap between conceptual feasibility and practical implementation, future work can facilitate the effective utilisation of AHU condensate water, thereby advancing water conservation and sustainable practices in hotel facilities in Sri Lanka.

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