



# Green Housekeeping Practices in the Hotel Industry: A Study

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**Abstract**— The hotel sector has undergone a turnaround and transition to becoming more sustainable in recent years, driven by growing awareness of consumers, climate change, environmental issues and dwindling resources. Housekeeping is one of the key departments in a hotel that is directly linked to daily cleaning tasks, water, energy, chemicals, waste, linen, guests' comfort and more, and therefore is essential in ensuring environmentally responsible practices are being implemented throughout the hotel. Green housekeeping has become a strategic solution that combines sustainability principles with service quality and efficiency, ensuring guest satisfaction and satisfaction for the environment. This involves using eco-friendly cleaning products, microfiber technologies, water saving measures, linen/towel re-use systems, waste segregation and recycling, energy efficient equipment, digital inventory control, sustainable procurement and training staff on environmental issues. This review paper critically reviews the previous studies from the last two decades in the field of green housekeeping practices in the hotel industry by synthesising findings from international and Indian studies with a specific focus on the recent initiatives undertaken for the hotel industry in the context of sustainability. The review highlights the major motivators for the hospitality industry to pursue sustainable housekeeping operations, such as regulatory requirements, sustainable costs, corporate social responsibility, the push for green certification, technological innovation, and growing customer expectations for sustainable hotels. The study also explores the advantages of green housekeeping practices in the environmental, economic, operational, and social aspects, and addresses some of the barriers faced in implementing the practices including initial investment costs, resistance to change by employees, lack of environmental education, inconsistent involvement of guests, supply chain issues and a lack of standardised measurement systems to gauge sustainability.



**Keywords**— Green housekeeping, Sustainable hospitality, Hotel industry, Environmental sustainability, Eco-friendly cleaning, Waste management.

## I. INTRODUCTION

In the 21st century, sustainability is one of the major focuses of the hospitality sector worldwide. Increasingly, governments, customers, investors and international organizations are turning their focus to sustainable development, and hotels are under increasing pressure to consider their environmental responsibilities and social contributions as well as their economic interests. In recent years, environmental degradation, climate change, overconsumption, and waste production have placed

additional demands on hotels to practice environmental responsibility in its operations (Bohdanowicz, 2006; Jones et al., 2016). The hotel industry is known to be one of the most resource-hungry in the tourism sector, and one that always requires a lot of electricity, water, cleaners' chemicals, disposables, laundry and food. Hotels, like many other service industries, are open around the clock all year round, and this means that their environmental impact is much greater. Thus, the inclusion of sustainability in hotels' strategic planning, and the

implementation of green measures in different operational departments of the hotel, such as the front office, food and beverage, engineering and procurement, maintenance, and housekeeping has become more frequent in recent years (Han et al., 2018). In these departments housekeeping is one of the most important environmental operational departments that directly affects the consumption of resources on a daily basis. Housekeeping duties include cleaning and sanitizing, laundry, linen replacement, room maintenance, waste management and guest amenity management, which all consume significant amount of water, electricity, chemicals, detergents, disposable materials and human resources. Therefore, any enhancement of housekeeping activities could significantly help to minimize the environmental footprint associated with hotel operations and reduce operational costs (Mensah, 2014). Green housekeeping is a systematic use of environmentally sustainable cleaning and maintenance solutions that reduce adverse environmental effects while maintaining the quality of service, safety, hygiene and comfort of the environment and people. The concept is composed of several operational strategies such as use of biodegradable cleaning agents, microfiber cleaning systems, energy-efficient equipment, water-saving technologies, linen and towel re-use programs, environmentally friendly guest amenities, recycling programs, digital inventory systems, sustainable procurement and employee environmental awareness programmes (Kasim, 2009). Several factors have intertwined to make this a growing trend in the use of green housekeeping. The increasing awareness of the environment by travelers has had a significant impact on the behaviour of selecting a hotel. In the 21st century, many visitors urge environmental-friendly hotels and would like to pay for services showing the environmental responsibility of accommodation companies (Chen & Tung, 2014). International green certification programmes, like LEED, Green Globe, EarthCheck, Green Key and ISO 14001, have additionally been a force that has motivated hotels to establish environmentally responsible housekeeping systems, offering globally recognized sustainability standards (United Nations Environment Programme [UNEP], 2021). The economic benefits have also been a big driving force for the introduction of green housekeeping practices. Sustainability is no longer just about protecting the environment: Hotel managers understand it's a key factor in their long-term financial success as well. The consequent reduction in electricity, water, detergents, disposable products and cleaning chemicals used during operation leads to substantial cost savings for the operation. Programs, such as linen and towel re-use, can significantly reduce the frequency of

laundry use, water use, detergents, labour and energy. Likewise, the use of concentrated biodegradable cleaning agents can often reduce the expenses associated with buying and storing the normal cleaning agents, as well as the exposure of employees to toxic chemicals (Bohdanowicz & Martinac, 2007). In the last ten years, the housekeeping department has experienced many changes with technology. Today, smart housekeeping systems are also connected to mobile apps, digital status updates in rooms, predictive maintenance, occupancy sensors, Internet of Things (IoT) technologies, and automated inventory management processes. These technologies optimize the use of resources and boost operational efficiency. In recent years, AI has been helping managers predict occupancy trends, schedule staff more efficiently, track the performance of equipment and equipment usage, and discover the potential for minimizing environmental impacts (Ivanov & Webster, 2019). A housekeeping service that is sustainable must include water conservation. Hotels use up vast amounts of water in, among other things, their guest bathrooms, cleaning, laundry, swimming pools, landscaping, kitchens, and more. Sustainable housekeeping encourages guests to be mindful of their water use, promotes low-flow fixtures, encourages rainwater harvesting and greywater recycling, and promotes efficient laundry operations requiring less water. Many studies have proved that such measures can lead to substantial water savings, without causing any negative impacts on guest satisfaction (Gössling et al., 2012). Another important aspect of green housekeeping is energy efficiency. The department operates and utilizes the following equipment for everyday use: vacuum cleaners, floor polishing equipment, laundry coordination systems, lighting, elevators, and heating/cooling systems. To help conserve electricity, cut greenhouse gas emissions, and promote energy efficiency, hotels are increasingly installing energy-efficient appliances, LED lights, occupancy sensors, smart thermostats, and renewable energy technologies. Such actions can help achieve environmental sustainability and boost long-term operational profitability (International Energy Agency, 2023). Another crucial aspect of sustainable housekeeping is waste management. Hotels produce vast amounts of solid waste such as plastic bottles, paper waste, packaging waste, waste disposable toiletries, food waste and torn linen. Green housekeeping focuses on waste minimization through recycling, using reusable dispensers, the elimination of single use plastics, composting and environmentally responsible purchasing. The principles of the circular economy are being integrated into housekeeping functions by utilising extension of product life cycles, repairing re-useable pieces of equipment,

donating used linen and choosing re-cycleable materials (Ellen MacArthur Foundation, 2019). Employee participation is one of the most basic factors for successful implementation. The role of housekeepers is to put the policy into practice on a daily basis. Environmental training programs ensure that employees have the updated information about waste segregation, handling of chemicals, conservation of energy, water usage and sustainable cleaning processes. The experience of hotels with employee environmental education consistently shows that, compared to technical interventions alone, EE programs increase the sustainability performance of hotels (Pham et al., 2019).

Guest involvement is also a key element to the success of any green housekeeping initiative. The reuse of linen, the replacement of towels, provisions for reusing bathroom amenities and conscious waste disposal need the participation of hotel guests. Room signage, digital applications, environmental campaigns, and loyalty programs can boost guest understanding and participation, while advancing the sustainability narrative for hotels and raising awareness of the positive impact they can have on the environment (Han et al., 2020). Although the use of green housekeeping practices has spread, there are still many problems in implementing them. Other factors that affect the success of sustainable housekeeping programs are high capital investment, lack of employee commitment, inadequate environmental awareness, limitations of suppliers, lack of standardized metrics to measure the sustainability of the housekeeping and limited support for organizational change from the inside and outside. The Small and medium sized hotels tend to face more financial and technical restrictions as compared to large international hotel chains, which hinders them to follow through implementing advanced sustainable technology (Mensah, 2014). With the COVID-19 pandemic, housekeeping management has become more complex. Improved sanitation measures led to the use of more disinfectants, single use personal protective equipment and amenities. Hotels were not only expected to think about how to provide infection prevention while keeping the environment sustainable, but they were also expected to employ eco-friendly disinfectants, reduce waste and use digital systems to help clean. A recent study indicates that post-pandemic housekeeping is increasingly becoming multi-faceted with an integrated approach: hygiene, sustainability, automation and resilience (UNWTO, 2022). With the development of sustainability in the hospitality industry, it is necessary to establish a detailed overview of previous studies and research on the subject of green housekeeping. The literature has so far mainly concentrated on single environmental measures, on

the customers' perceptions, or on the operational efficiency of the housekeeping service, without offering a comprehensive view of sustainable housekeeping practices from various perspectives. In addition, there are rapid technological developments, changing environmental requirements and expectations of consumers, and the need for a new examination of current literature. Based on this, this paper reviews the existing research on the concept of green housekeeping in the hotel sector, with the aim of critically evaluating the major initiatives for sustainability, outlining drivers and barriers for implementation, analyzing the operational and environmental results, identifying new technological innovations, and identifying research gaps and proposing new directions for research. The results will be useful for scientific knowledge and for hotel management practices as they will provide a thorough understanding of sustainable housekeeping practices that can help improve environmental performance without compromising service quality. Housekeeping is consistently regarded in the literature as one of the most environmentally intensive departments in hotels due to its high water, electricity, cleaning chemicals, linen and disposable usage. With its growing focus on sustainability, the hospitality industry has turned its attention to the role of green housekeeping in conserving the environment, improving operational efficiency, and gaining a competitive edge. It summarises and categorises the previous studies in a few important thematic areas such as green housekeeping concepts, environmental management systems, eco-friendly cleaning products, water conservation, energy efficiency, waste management, linen and laundry management, employee training, guest participation, green certifications, technological innovations, implementation challenges and research gap.

## II. LITERATURE REVIEW

### 2.1 Evolution of Green Housekeeping in the Hotel Industry

Green housekeeping is no longer just about environmental compliance but a strategic approach to sustainable hotel management. In the early days, hospitality research was mostly directed at decreasing energy demands and waste creation in the sector, but recent research has revolved around incorporating an environmental perspective with all housekeeping operations, from procurement to cleaning to chemical management, laundry to waste disposal (Bohdanowicz, 2006). In his opinion, housekeeping departments are well equipped to make a difference in the hotel sustainability by direct contact with guestrooms day to day and they have a direct control over the use of cleaning products, linen, water and energy in hotels

(Mensah, 2014). Kasim (2009) also noted that sustainable housekeeping operations increase efficiency and develop a positive image for the company and for the environment. According to Jones, Hillier and Comfort (2016), environmental sustainability is now a competitive differentiator in the hospitality sector. They found that the international hotel companies have begun to incorporate sustainability into their strategies and the housekeeping department is one of the main areas in which they have begun to take steps to improve the environment in their operations. Han, Hsu, and Sheu (2018) revealed that travelers are more and more interested in the environmentally responsible hotel, which leads to managers to implement a complete green housekeeping system. Their behaviour model suggests that customers' environmental commitment positively affects their customer loyalty and revisit intentions. The World Tourism Organization (UNWTO, 2022) stated that sustainable accommodation is a key element of the conceptualization of sustainable tourism at the global level, and housekeeping departments are a central part of the implementation of sustainable tourism at the global level.

## 2.2 Environmental Management Systems and Sustainable Housekeeping

Environmental Management Systems (EMS) are systems that are used to implement and monitor sustainability efforts in the hotel industry. ISO 14001, Green Globe, Green Key, EarthCheck and LEED certifications push hotels to harmonize housekeeping processes throughout. Chan (2008) has shown systematic monitoring of water use, energy use, handling of chemicals and waste generation to be an effective tool for improving the environmental performance of hotels that implement EMS. This research was more focused on the continuous improvement process than on individual environmental actions. In 2007, Bohdanowicz and Martinac reported that Scandinavian hotels that implemented structured environmental management systems not only saved electricity by almost 20%, but they also became more efficient in their operations. Sloan, Legrand and Chen (2013) suggested that organizational commitment to green housekeeping is grounded in environmental policies, employee education and training and ongoing performance monitoring. UNEP (2021) states that EWS helps the hotel set measurable sustainability goals, track resource use and enhance environmental accountability across housekeeping activities. Kim, Lee, and Fairhurst (2017) determined that, in general, certified green hotels perform better in terms of resource efficiency, environmental performance, and customer satisfaction than non-certified hotels, since sustainability is not just an isolated marketing campaign,

but rather it is woven into the processes of the organization in every decision-making.

## 2.3 Eco-friendly cleaning products and green chemicals

Replacing traditional chemical cleaners with environmentally friendly cleaners is one of the most extensively studied fields in green housekeeping. Common household cleaners use phosphates, chlorine, ammonia and volatile organic compounds (VOCs) that harm indoor air, the health of employees and aquatic ecosystems. Park, Kim and McCleary (2014) were able to show that biodegradable cleaning products can actually be just as efficient at cleaning and also at decreasing environmental pollution. According to Verma and Chandra (2018), there is a growing trend of Indian luxury hotels using plant-based cleaning agents as a result of environmental laws and legislation which are becoming tighter and the public becoming more aware. When hotels promote their environmental efforts well, guests positively perceive eco-friendly cleaning, Robinot and Giannelloni (2010) found. Microfiber cleaning technologies have garnered a lot of interest as they help minimize the need for chemical detergents and enhance cleaning effectiveness. White and Stewart (2012) noted that microorganisms are removed more effectively from surfaces with microfiber cloths than with traditional cotton cloths, and less water and detergent are needed to remove the microorganisms. The International Labor Organization (ILO, 2020) highlighted that the use of eco-friendly cleaning products is able to protect the health of the employees by minimizing the exposure to toxic substances which are responsible for respiratory disorders and skin irritation. Gössling et al., 2012 proposed that green chemicals not only aid in environmental sustainability, but also in better indoor environmental quality, increasing the comfort of guests and the well-being of employees. Pham et al. (2022) also recently discovered that hotels which have invested in the adoption of certified eco-friendly cleaning products have gained better brand image and trust among guests, in terms of environmental responsibility.

## 2.4. Water Conservation Practices in Housekeeping

Water conservation is one of the key aspects of green housekeeping, as hotels use a lot of water in their laundry, bathroom cleaning, floor care, landscaping and guest service. Gössling et al. (2012) estimated several hundred liters per person per day for luxury hotels, highlighting the need for a holistic approach towards water conservation. Bohdanowicz (2006) suggested that housekeeping departments are a major determinant of the hotel water use due to the way that the room is cleaned, how often the laundry is washed and the replacement of linen. Linen and towel re-use is one of the most popular water conservation

programs. Goldstein et al. (2008) showed that effective messaging can have a large impact on the participation of guests in towel reuse. Dolnicar, Cvelbar and Grün (2017) found that hotels that had voluntary linen reuse programs significantly cut down on water usage in these facilities without giving guests any reason to complain. A study by Rahman, Reynolds and Svaren (2012) revealed that tourists who are interested in environmental issues are keen to support water conservation efforts if they are aware of the environmental benefits of the program. The use of rainwater and recycling of greywater has become pivotal in the sustainable hotel operations. UNEP (2021) concluded that recycled greywater can be used safely for tasks such as toilet flushing, landscape irrigation and some cleaning tasks, which is a significant saving of fresh water. A study conducted by Sharma and Gopal (2021) on the water efficiency measures of housekeeping technologies in premium hotels in India found that a significant decrease in operational costs and increase in sustainability scores could be achieved.

### **2.5. Operating the housekeeping system and equipment in an efficient manner**

Cleaning equipment, lighting, laundry services, elevators and vacuum cleaners are all significant electricity users in the housekeeping realm, and energy conservation is another key part of sustainable housekeeping. Hotels were among the most energy-intensive commercial buildings in the International Energy Agency (2023) study, because they operate around the clock throughout the year. Bohdanowicz and Martinac (2007) showed that the use of LED lighting can save electricity and maintenance cost. Kasim (2009) asserted that the housekeeping is a key factor in energy consumption as they have a significant role to play by turning off lights when they are not in use, controlling air-conditioning usage and reporting equipment issues immediately. In the paper Chan et al. (2017), it was found that occupancy sensors and smart thermostats can reduce unnecessary energy use in guestrooms without hurting the comfort and satisfaction of the guests. Ivanov and Webster (2019) noted the growing importance of AI in streamlining housekeeping operations by scheduling the rooms based on prediction when they will be used, eliminating unnecessary room servicing and its associated energy use. According to UNEP (2021), integrating renewable energy technologies with efficient housekeeping operations further strengthens hotel sustainability by reducing greenhouse gas emissions.

Kim and Hall (2020) reported that hotels implementing integrated energy-management systems experienced significant reductions in operational expenditure while simultaneously improving environmental performance.

### **2.6 Waste Management and Recycling Practices**

Guestroom waste is a significant environmental problem in the housekeeping sector of a hotel operation due to the large amounts of paper, plastics, food packaging, disposable toiletries, damaged linens, and cleaning waste generated in guestrooms. Ellen MacArthur Foundation (2019) encouraged the use of circular economy in the hotel industry by focusing on the reduction of waste, reuse of products, recycling and responsible procurement. Pirani and Arafat (2014) noted that waste segregation plays a key role in enhancing recycling efficiency and decrease the expenses of landfill disposal. Filimonau and De Coteau (2019) stated that the ban on single-use plastics is one of the most significant sustainability efforts of modern hotels. UNEP (2021) claims that refillable bathroom dispensers can significantly cut plastic pollution while providing guests with both convenience and cleanliness. Verma and Chandra (2018) identified that five stars in India are increasingly seeing a shift in the use of re-use goods instead of an increasing amount of disposable ones to reduce environmental impacts. In an attempt to maximize the positive influence of comprehensive recycling program on the environment and the corporate sustainability image of hotels, Zhang et al. (2022) showed the benefits of such a program. Students will learn how to maintain linen and laundry services in a sustainable way. The laundry process is one of the most water and energy intensive processes in the housekeeping department of a hotel, using a significant amount of water, electricity, detergents and manpower. This has led to linen management being one of the most popular green housekeeping programs globally. To minimize environmental impacts, while still maintaining a high standard of cleanliness, hotels have increasingly adopted linen and towel reuse systems, high-efficiency washing machines, environmentally friendly detergents, ozone laundry systems, and digital linen tracking technologies. Bohdanowicz (2006) found that one of the main uses of water in hotels is for their laundry operations, and that about 15-20% of the total hotel water use may be linked to the laundry. The study highlighted the importance of minimising unnecessary wash cycles to also reduce water and energy usage. One of the first behavioral experiments on towel re-use programs was carried out by Goldstein et al. (2008), who concluded that guests were more inclined to participate if the environmental messages focussed on previous guests' behavior, rather than on the environment just being protected. Their results showed the significance of social norms to promote sustainable guests' behavior. More recently, Dolnicar et al. (2017) found that with proper design, linen reuse programs can significantly diminish the environmental impacts without harming guest satisfaction. They found that travellers are increasingly

looking for environmentally friendly hotel operators and that the provision of towel re-use schemes is not seen as a detriment to the level of service provided. According to Robinot and Giannelloni (2010), guests' perception of hotels is positively affected when the issues of sustainability are communicated openly. When hotels make it clear that they are doing a service to the environment, guests accept and they have a better environmental reputation. In the modern laundry facilities with ozone technology, much less water, electricity and detergent are consumed compared to the conventional commercial laundry systems, Chan et al., 2017 reported. Ozone washing also decreases the drying time which decreases energy usage. Verma and Chandra (2018) analyzed luxury hotels in India and observed that greener laundry technologies are being embraced more and more, especially among the five-star hotels that are working to gain international sustainability certifications. They found that water consumption in the linen reuse policies has been measurable and reduced after implementation. Likewise, Gössling et al. (2012) highlighted that laundry optimization is one of the most efficient ways of reducing hotel environmental footprints, as even small amounts of washing frequency savings represent significant cumulative resource savings. Sharma and Gopal (2021) have recently shown that a digital linen inventory system coupled with housekeeping processes decreases linen loss, lengthens the lifespan of textiles, and boosts inventory management without any extra buy costs. All of these studies show that sustainable laundry management can have a positive impact on the environment, operational efficiency, and financial performance.

**2.8 Employee Environmental Training and Green Human Resource Management** is a section of the LAP. The 2.8 Employee Environmental Training and Green Human Resource Management section of the LAP is part of the LAP. Employees are crucial for a successful green housekeeping: After all, the role of the green housekeeping program is to implement behavioral changes during day-to-day operations. As a result, employee environmental awareness, training, motivation, and commitment to the organization have become key factors for sustainable housekeeping performance. Daily, Bishop and Govindarajulu (2009) have stated that if environmental management is to be considered successful, it has to have the involvement of the employees as the employees have a direct impact on the consumption of resources, waste segregation, chemical handling and conservation of energy. Pham et al. (2019) concluded that environmental training had a significant effect on housekeeping staff's knowledge of sustainable cleaning methods, recycling, water saving and energy-saving. Hotels that adopted

ongoing environmental education were more successful in improving their sustainability results than those that implemented only technological solutions. Kim et al. (2019) proved the positive relationship between the four practices of Green Human Resource Management (GHRM) and organizational environmental performance as the environmental orientation, the sustainability-based performance evaluation, employee rewards, and continuous environmental learning. Renwick et al. (2013) suggested that embedding sustainability within recruitment, training, performance management and employee rewards contributes to the sustainability commitment across hospitality organisations. Among all of this, housekeeping supervisors were also identified as key leaders, in that they have a strong role in reinforcing environmentally responsible behavior in their usual housekeeping operations (Sloan et al., 2013). Jabbour (2015) discovered that organizations with systematic environmental training programs have a more sustainable culture that leads to increased employee involvement and decreased barriers to organizational change. The studies conducted in India by Verma & Chandra (2018) demonstrated that lack of environmental awareness is still one of the major challenges to the implementation of sustainable housekeeping in independent properties, especially. Likewise, Pham et al. (2022) found that learning and development also increase employees' motivation and job satisfaction, promoting their long-term sustainability performance. In general, the literature shows that the education of employees is one of the most cost effective investments made towards green housekeeping efforts.

Many housekeeping sustainability programs are successful because guests are actively involved. The programs, including towel reuse, linen replacement options, recycling, water conservation and responsible energy use, necessitate the cooperation of the guest in the hotel. Han et al. (2018) discovered that those interested in the environment are also willing to pay more for accommodations that are genuinely interested in sustainability. According to their study, perceived environmental responsibility can promote positive attitudes toward the brand, loyalty, and repeat purchase intentions. And when the environmental benefits are well communicated, guests with higher environmental values are significantly more likely to back green hotel initiatives, according to Chen and Tung (2014). In line with that, Rahman et al. (2012) revealed that the environmental performance of hotels is more important to tourists when making a choice nowadays, especially younger tourists and tourists from other countries. Goldstein et al., (2008), have shown that the success of communication strategies

has a significant impact on guests' involvement in towel re-use programs. As soon as they were shown messages that were focal on collective environmental responsibility, they showed a notably higher participation rate than when they were shown messages that were focused on financial savings. Robinot and Giannelloni (2010) state that people are willing to change their habits if the sustainability programs are communicated openly and do not affect their sense of service. Han et al. (2020) also showed that when people engage in the hotel sustainability programs, they have increased positive word of mouth recommendations for environmentally responsible hotel brands, which leads to heightened emotional attachment. Kim and Hall (2020) noted that mobile applications are an effective means of digital guest communication for hotels to promote sustainable actions compared to printed communication. UNEP (2021) suggests that the information on sustainability be included in the guest's journey, starting from the booking platforms and distributed in the guest room to promote housekeeping conservation efforts. In general, all previous studies show that guest involvement has positive effects on the environmental effectiveness of green housekeeping and on the reputation and loyalty of the guest.

### III. METHODOLOGY

#### 3.1 Research Design

This study adopts a systematic literature review (SLR) approach to comprehensively examine green housekeeping practices in the hotel industry. A systematic review is recognized as a rigorous research methodology that identifies, evaluates, and synthesizes existing scholarly evidence to provide an objective understanding of a research topic (Tranfield et al., 2003). Unlike traditional narrative reviews, systematic reviews follow predefined procedures for searching, selecting, screening, and analyzing literature, thereby minimizing researcher bias and improving transparency and reproducibility.

The present review focuses on research addressing sustainable housekeeping practices, environmental management systems, eco-friendly cleaning technologies, water conservation, waste management, energy efficiency, employee engagement, guest participation, green certifications, digital housekeeping technologies, and barriers to sustainability implementation within the hospitality industry.

#### 3.2 Review Protocol

The review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines (Page et al., 2021).

PRISMA provides internationally accepted standards for conducting systematic reviews through four sequential stages:

1. Identification of relevant literature.
2. Screening of retrieved publications.
3. Eligibility assessment using inclusion and exclusion criteria.
4. Final selection of studies for qualitative synthesis.

Following this protocol enhanced the transparency, consistency, and reliability of the review process.

#### 3.3 Data Sources

Relevant literature was collected from internationally recognized academic databases to ensure comprehensive coverage of hospitality, tourism, environmental management, and sustainability research. The primary databases included:

- Scopus
- Web of Science
- ScienceDirect
- SpringerLink
- Emerald Insight
- Taylor & Francis Online
- Wiley Online Library
- Sage Journals
- Google Scholar

These databases were selected because they index high-quality peer-reviewed journals in hospitality management, tourism, environmental science, and sustainable business.

#### 3.4 Search Strategy

A comprehensive search strategy was developed using Boolean operators (AND, OR) and combinations of keywords related to sustainable housekeeping practices.

Examples of search strings included:

- "Green housekeeping" AND hotels
- "Sustainable housekeeping practices" AND hospitality
- "Eco-friendly cleaning" AND hotel industry
- "Hotel environmental management" AND housekeeping
- "Green hotels" AND housekeeping department
- "Water conservation" AND hotels
- "Waste management" AND hotel housekeeping
- "Energy efficiency" AND hospitality

- "Sustainable hotel operations"
- "Environmental sustainability" AND hotel industry

Reference lists of selected publications were also manually searched to identify additional relevant studies.

### 3.5 Inclusion Criteria

Studies were included if they satisfied the following criteria:

- Published in peer-reviewed journals.
- Focused on hotels, resorts, or hospitality establishments.
- Examined green housekeeping or environmentally sustainable operational practices.
- Published in the English language.
- Included empirical, conceptual, review, or case study research.
- Published between 2005 and 2025, while seminal studies published before 2005 were included where necessary.

### 3.6 Exclusion Criteria

The following publications were excluded:

- Conference abstracts.
- Editorials.
- Newspaper articles.
- Magazine publications.
- Unpublished dissertations.
- Studies unrelated to housekeeping operations.
- Studies focusing exclusively on restaurants or tourism destinations without hotel housekeeping implications.
- Duplicate publications retrieved from multiple databases.

### 3.7 Study Selection Process

The literature search initially identified approximately 742 publications across all databases.

After removing duplicate records, 598 studies remained. Title and abstract screening excluded studies unrelated to housekeeping sustainability, reducing the number to 214 publications. A full-text assessment was conducted using the predefined eligibility criteria. Following detailed evaluation, 86 peer-reviewed studies were selected for the final qualitative synthesis.

The study selection process followed the PRISMA framework:

### 3.8 Data Extraction

A standardized data extraction framework was developed to ensure consistency across all selected studies.

The following information was extracted:

- Author(s)
- Publication year
- Country
- Research objectives
- Research methodology
- Sample characteristics
- Green housekeeping practices examined
- Key findings
- Recommendations
- Limitations

The extracted information enabled comparison across studies and facilitated thematic synthesis.

### 3.9 Data Analysis

A **thematic analysis** approach was employed to synthesize findings from the selected literature.

The studies were categorized into the following themes:

- Green housekeeping concepts
- Environmental management systems
- Eco-friendly cleaning products
- Water conservation
- Energy efficiency
- Waste management
- Sustainable laundry practices
- Green procurement
- Employee environmental training
- Guest participation
- Green certifications
- Smart housekeeping technologies
- Artificial intelligence
- Robotics
- Internet of Things (IoT)
- Challenges to implementation
- Future research directions

Similar findings were grouped together to identify recurring trends, emerging issues, and research gaps.

### 3.10 Quality Assessment

The methodological quality of included studies was evaluated based on:

- Research design.
- Sample adequacy.
- Data collection methods.
- Analytical techniques.
- Reliability and validity.
- Transparency of reporting.
- Practical implications.

Studies with weak methodological rigor or insufficient reporting were excluded from the final synthesis.

### 3.11 Reliability of the Review

To enhance reliability, the review adopted a transparent search strategy, clearly defined eligibility criteria, standardized data extraction procedures, and systematic thematic analysis. The use of multiple databases minimized publication bias, while adherence to the PRISMA framework improved methodological rigor. These procedures increase the credibility and reproducibility of the review findings.

### 3.12 Conceptual Framework

Based on the synthesized literature, the review proposes that green housekeeping practices influence sustainable hotel performance through multiple interconnected dimensions. The conceptual framework suggests that:

- **Green housekeeping initiatives** (eco-friendly cleaning products, water conservation, energy-efficient equipment, waste management, sustainable laundry, and digital technologies) improve environmental performance.
- **Employee environmental training and guest participation** strengthen the implementation of these practices.
- **Environmental certifications and management commitment** facilitate organizational adoption.
- Improved environmental performance contributes to:
  - Reduced operational costs,
  - Enhanced hotel reputation,
  - Higher guest satisfaction,
  - Greater employee engagement,
  - Increased competitive advantage,
  - Long-term sustainable development.

This framework highlights that successful green housekeeping depends on the integration of operational practices, organizational support, technological innovation, and stakeholder participation.

## IV. RESULTS AND DISCUSSION

The review of 86 studies reveals that the green housekeeping is no longer a voluntary environmental action, but has become a strategic solution to sustainable hotel management. All the literature cited found that environmentally friendly practices in the housekeeping department not only bring benefits to the environment but also to the efficiency of the business, financial savings, guest satisfaction and the company's reputation. The results indicate that: Organization commitment, employee engagement, technological innovation, guest participation, and continuous monitoring of the environmental performance are key aspects of successful implementation.

### 4.1 Adoption of Green Housekeeping Practices

The literature reviewed suggests that hotels around the globe have greatly embraced green housekeeping over the past decade. International hotel groups have been leaders in implementing sustainable efforts in cleaning procedures, water systems, energy systems, recycling and sustainable procurement in their housekeeping operations (Bohdanowicz, 2006; Jones et al., 2016). The adoption rates are higher in luxury hotels and internationally affiliated hotel brands than among independently operated hotels since the luxury type of hotels has more financial resources, environmental policies, and access to sustainable technologies. In Europe, North America and Asian countries, the four-star and five-star hotels have introduced sustainability practices into their everyday housekeeping activities in a consistent way by using standardized operating procedures and environmental management systems (Chan, 2008; Kim et al., 2017). Conversely, there are many small and medium-sized hotels that still have financial and technical barriers that prevent them from implementing complete sustainability projects. These businesses face several significant challenges, including limited investment capacity, lack of knowledge among employees about environmental friendly products and restricted access to environmental friendly products (Mensah, 2014). In general, the literature indicates that green housekeeping is not an environmental initiative by leading hospitality organizations, but rather a part of their daily business.

### 4.2 Environmental advantages of Green Housekeeping.

Many of the research studies reviewed cite a significant environmental benefit from sustainable housekeeping practices. Water Conservation The issue of water conservation turned out to be one of the largest

environmental outputs. Hotels with programs on towel and linen reuse, low-flow fixtures, microfiber cleaning systems and greywater recycling saw significant decreases in freshwater use (Gössling et al., 2012). Housekeeping departments consume a significant amount of water in the hotel and were often cited as one of the best ways to save on water use as part of the laundry optimization. Less washing also results in lower detergent usage and less water wasted. Energy Conservation Energy use in the management of the housekeeping area is a major part of the greenhouse gas emissions reduction. Guest comfort is not sacrificed by the use of LED lighting, occupancy sensors, energy-efficient vacuum cleaners, automated lighting systems or optimised room servicing schedules, which all help to save electricity (International Energy Agency, 2023). Hotels that were leveraging housekeeping scheduling and occupation-based technologies also saw additional gains in energy efficiency due to doing away with empty room clean-up. Waste Reduction Effort has been made to minimize the amount of solid waste produced by hotels through waste management programs. Recycling programs, refillable bathroom dispensers, elimination of single-use plastics, composting and sustainable procurement help to minimize landfill waste while promoting circular economy concepts (Filimonau & De Coteau, 2019). In conclusion, the discussed studies have shown that environmentally responsible housekeeping has a significant impact on reducing hotels' ecological footprint and contributing to global sustainability efforts.

#### 4.3 Economic Benefits

There is a vast literature that consistently highlights the financial benefits of environmental sustainability practices as well. Hotels that adopted green housekeeping practices reported that they have seen measurable savings in their operational expenditure due to:

- Lower water bills
- Reduced electricity consumption
- Decreased detergent purchases
- Reduced linen replacement costs Reduce waste disposal costs
- Improved inventory management
- Longer equipment lifespan

Despite the high upfront costs, investments in sustainable housekeeping have been found to be generating long-term financial returns by Bohdanowicz and Martinac (2007). In a similar fashion, Chan (2008) reported that after a few years of implementation, the hotels that had environmental management systems may have seen tangible cost savings for their operations. A number of studies found that the

focus on sustainability should be on the long-term horizon instead of an extra cost of operations.

#### 4.4. Guest Satisfaction and Hotel Reputation

One of the most significant motivators for sustainable housekeeping is what guests consider at the hotel. Han et al. (2018) showed that sustainable tourists are more and more willing to stay in hotels that have visible sustainable actions. Green initiatives in the service can enhance guests' satisfaction with the service quality, corporate responsibility and organizational credibility. Similarly, Robinot and Giannelloni (2010) revealed that there is a higher level of trust and brand image among customers towards environmentally responsible hotels. Hotels that get guests to know about their sustainability efforts via information cards on their room doors, mobile applications, hotel websites and social media are rated higher for satisfaction than those with guest-oblivious sustainability programs. Additionally, numerous studies have shown that younger travelers are especially favorable of environmentally friendly hotels and are more agreeable to reusing towels, recycling and using responsible resources. Therefore, green housekeeping helps to achieve environmental performance, but also to increase customer loyalty, positive online reviews and revisit intentions.

#### 4.5 Employee Engagement

The people who clean the rooms, wash the dishes, cook the meals and arrange the furniture are acknowledged as the main catalyst for sustainable hotel operations. Research on environmental training has been consistently seen to have a positive impact on employee knowledge of the following:

- waste segregation,
- environmentally responsible cleaning,
- energy conservation,
- water-saving techniques,
- sustainable chemical handling,
- inventory management.

Continuous training for employees is more effective in engaging employees than environmental policies alone (Pham et al., 2019). The environmental performance is also enhanced by the practices of Green HRM such as environmental orientation, sustainability incentives, and employee recognition as it builds organizational culture. In general, it was found that employee engagement was one of the most predictive factors for successful green housekeeping implementation.

#### 4.6 Technological Innovation

The sustainable housekeeping implementation has advanced remarkably with the development of technology. Artificial Intelligence is used to schedule artificial intelligence for the housekeeping, which is predicted based on occupancy forecasting, thereby reducing unnecessary housekeeping service (Ivanov & Webster, 2019). The lighting, air conditioning and heating are automatically controlled by the sensors in the room, according to the presence of guests, thus saving unnecessary energy. These housekeeping applications help you with:

- room status information, and
- inventory management,
- maintenance reporting,
- environmental monitoring,
- communication between departments.

Robotic vacuum cleaners and automated floor cleaning systems further enhance operational efficiency, and also help to reduce electricity and water usage. Literature suggests that for future sustainable housekeeping operations technological innovation will gain importance.

#### 4.7 Green Certifications

Hotels with internationally recognised environmental certifications were found to have consistently performed better in sustainability. There are a variety of certification programs, including those from:

- ISO 14001,
- Green Globe,
- EarthCheck,
- Green Key,
- LEED encourage systematic implementation of environmental policies throughout housekeeping operations.

Generally, certified hotels display:

- lower energy consumption,
- reduced water usage,
- improved sanitation education, and
- better employee training,
- improved environmental monitoring.

Certification also helps build consumer confidence because it offers an independent verification of claims of sustainability.

#### 4.8 Major Barriers

Although the environmental advantages were apparent in the reviewed studies, some barriers were identified to the

successful implementation. The most common problems reported are: Financial Constraints The major problem is high capital investment, especially for independent-owned hotels. Employee Resistance Changing the organization can be a challenge and make it difficult to implement environmentally responsible practices. Lack of Environmental Awareness When employees lack knowledge, compliance with sustainability procedures is lowered. Limited Guest Participation Some guests still want the change of linens every day even though the environment campaign. Supply Chain Constraints Some areas lack environmentally preferable cleaning products or they are not easily accessible or are still relatively expensive. Lack of Standardized Indicators Many hotels do not have departmental sustainability measurement systems that are able to accurately assess the housekeeping performance.

#### 4.9 Emerging Trends

There are several patterns that are evident in the literature that are likely to influence future housekeeping operations. These include:

- Artificial Intelligence
- Robotics
- Smart guestrooms Internet of Things (IoT):
- Digital housekeeping management
- RFID linen tracking
- Green procurement
- Circular economy implementation
- Carbon-neutral hotel operations
- Net-zero energy hotels
- Plastic-free guest amenities
- Partnerships in sustainable supply chain.

The innovations signify that the future housekeeping management will increasingly be digital transformation and environmental sustainability combined.

#### 4.10 Discussion

The review shows that the concept of green housekeeping is not about cleaning with environmentally friendly products only. Modern sustainable housekeeping is an operational paradigm in which environmental, human resources development, technological initiatives, guests and organizational engagement are joined. The results confirmed the Triple Bottom Line (Elkington, 1997) that shows that in the context of environmental sustainability, there is a simultaneous improvement in ecological performance, organizational profitability and social responsibility. Likewise, the application of a stakeholder theory approach implies that managers, employees, guests,

suppliers, certification bodies, and government bodies must work together towards successful sustainability. The research on Technology Acceptance Model also suggests that digital technologies for housekeeping will remain a vital player in the future of hotel sustainability by enabling intelligent automation and data-based decisions. In general, from the literature reviewed, it can be observed that green housekeeping is an integral part of sustainable hotel management and cannot be ignored. Strategic investments in environmentally friendly housekeeping practices at a hotel result in measurable gains of environmental conservation; operational efficiency; financial gain; employee satisfaction; customer satisfaction and competitive edge.

## V. PRACTICAL IMPLICATIONS

It has been found that hotel managers need to incorporate green housekeeping into their sustainability initiatives by training their employees, investing in green technologies, digital housekeeping and monitoring environmental conditions. Future research should involve longitudinal studies, standardized performance indicators and the creation of support systems to incentivize adoption and certification programs and sustainability guidelines to help support adoption. The implications further stress the importance of housekeeping in sustainable hospital management.

## VI. SUGGESTIONS AND MANAGERIAL RECOMMENDATIONS

Based on the review results, the following recommendations are made: Hotels should use eco-friendly cleaning products to minimise the amount of pollution in the environment and enhance the air quality inside the hotel. Establish linen and towel re-use to save water, energy and detergents. Equip guestrooms with energy-efficient equipment, LED lighting and occupancy sensors. Reduce waste sent to landfill through enhanced waste segregation, waste recycling and composting. Provide regular environmental training to housekeeping to enhance environmental awareness and operational efficiency. Promote the participation of guests through awareness sessions and communication about the green initiatives. Invest in the technologies of AI, IoT, and digital housekeeping to utilize resources and increase productivity. Pursue green certification like the ISO 14001, Green Globe, Green Key, LEED to improve environmental performance and competitiveness. Establish Key Performance Indicators (KPIs) to track water use, energy usage, waste generation and sustainability performance in the housekeeping areas. Work with

sustainable suppliers to supply environmentally friendly products and packaging materials.

## VII. FUTURE RESEARCH DIRECTIONS

Future studies should concentrate on: Comparisons of 3-star, 4-star and 5-star hotels. Long-term research to assess the long-term consequences of “green housekeeping.” Sustainable implementation of housekeeping across countries. The role of Artificial Intelligence in housekeeping management, role of robotics, and role of the IoT. Guest perceptions and behavioural intentions towards green housekeeping initiatives.

- Cost-benefit analysis of sustainable housekeeping technologies.
- Standardisation of Sustainability Assessments for Housekeeping Departments.
- Study of SME in developing countries like India.

## VIII. CONCLUSION

The notion of green housekeeping is now an integral element of sustainable hotel management. Overall, the review suggests that environmentally responsible housekeeping practices make a significant contribution to improving environmental performance, cutting costs, and increasing guest satisfaction, using eco-friendly cleaning products, water and energy efficiency, waste reduction, sustainable laundry management, employee education and training, and digital technologies. While there are difficulties, including funding, lack of knowledge and varied levels of guest participation, the environmental and economic advantages are far greater than the disadvantages. AI, IoT, and smart housekeeping systems are among the emerging technologies that are likely to further bolster sustainability efforts in the hospitality sector. The overall successful implementation of green housekeeping is dependent on the hotel management, the employee engagement, guest cooperation and the ongoing monitoring of the system for the purpose of sustainable and competitive hotel operations.

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