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The functions of eco-certifications and labels in sustainable and green hospitality

Funktionen von Zertifizierungen und Siegeln für eine nachhaltige und umweltfreundliche Beherbergung

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Abstract: The first sustainability certifications emerged in the 1970s, and since then, their number has grown considerably across the global tourism sector. As the number of certifications has increased, so too has research on their role and impact. This paper examines the function of sustainability certification in tourism, particularly in the hotel and accommodation sector. Drawing on a systematic literature review, the study qualitatively evaluates 86 relevant studies published from 2017 to 2023. The analysis identifies four key functions of sustainability certifications for hotels: (1) guidance and regulatory function, (2) status and identification function, (3) benefit and profit function, and (4) knowledge and progress function.

Keywords: Hotel, Accommodation, Sustainable Tourism, Ecolabel, Certification, Green Tourism

Zusammenfassung: Bereits in den 1970er-Jahren wurden die ersten Nachhaltigkeitszertifizierungen entwickelt und angewendet. Seitdem ist weltweit eine sehr große Zahl von Nachhaltigkeitszertifizierungen und -labeln im Kontext der Tourismuswirtschaft entstanden. Parallel dazu hat auch die Forschung zu diesem Thema stark zugenommen. Dieses Paper geht der Frage nach, welche Funktionen Nachhaltigkeitszertifizierungen im Tourismus, insbesondere in der Hotellerie und Beherbergung, erfüllen. Grundlage der empirischen Untersuchung sind 86 Studien aus den Jahren 2017–2023, die über einen systematischen Literatur-Review als relevant identifiziert wurden. Auf dieser Basis wurde eine qualitative Literaturanalyse durchgeführt, mit der Forschungsfrage, welche Funktionen Nachhaltigkeitszertifizierungen für Hotels erfüllen. Dabei konnten vier Funktionen herausgearbeitet werden: 1. Lenkungs- und Regulierungsfunktion, 2. Status- und Kennzeichnungs-

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funktion, 3. Nutzen- und Gewinnfunktion und 4. Erkenntnis- und Fortschrittsfunktion.

Schlüsselwörter: Hotel, Beherbergung, Nachhaltiger Tourismus, Label, Zertifizierung, Umwelt

1 Introduction

Tourism has a significant impact on the environment. In 2013, it generated 4.5 GtCO2e in CO2 emissions — approximately 8 % of global emissions — with accommodation alone responsible for 6 % of this figure (Lenzen et al. 2018). As tourism continues to grow, its environmental impacts are increasing. Calls for tourism to be sustainable, socially equitable, and environmentally friendly have been ongoing for decades, and are reflected in international and bilateral agreements such as the 2030 Agenda for Sustainable Development, the 2015 Paris Agreement on climate protection, and the Convention on Biological Diversity, among others. Countries and companies are expected to implement these agreements and help achieve their goals. Both United Nations Environment Programme (UNEP) and the United Nations World Tourism Organization (UNWTO) emphasize that a green and social economy — including the greening of the tourism industry — is crucial to achieving these goals (Bucar et al. 2019).

Consumers are also contributing to this effort. Consumer organizations often recommend choosing goods and services with environmental certifications, which signal above-average sustainability performance. In this context, this article examines the role of certifications and labels in sustainable tourism, with a particular focus on accommodation.

Sustainability certifications are mentioned as a tool that can be used to achieve sustainability goals in tourism. Fifteen years before the Sustainable Development Goals (SDG) were adopted in 2015, the WTO identified within a collection of best practices sustainability certifications as a good tool for promoting sustainable tourism. Examples include the orange flag for destinations in the Italian countryside and the austrian eco label for tourism (World Tourism Organization 2000). Sustainability certifications serve to enable sustainable consumption and production patterns in tourism, as described in SDG 12. There are many opportunities to contribute to other Sustainable Development Goals along this path to sustainability, for example, reducing water consumption (SDG 6), sustainable economic growth (SDG 8), reducing greenhouse gases that contribute to climate change through the use of renewable energies and more efficient energy use (SDG 13), and protecting ecosystems in the sea (SDG 14) and on land (SDG 15), to name just a few.

In the context of international tourism, labels and symbols can ensure understanding across national and language boundaries. This also applies to international sustainability certifications such as the Blue Flag, Green Globe, or the EU Ecolabel (World Tourism Organization 2001).

2 History of certifications

The first environmental certification, "Blue Angel," was introduced by the German government in 1977. The first ecolabel developed for the European tourism industry was the "Blue Flag," introduced in France in 1985 by the nonprofit organization Foundation for Environmental Education. Its goal was to encourage local authorities to provide clean and safe beaches and marinas for the local population and tourists (Bucar et al. 2019). The Blue Flag is now used worldwide. Paragraph 80 of the Brundtland Commission's report on sustainable development (1987) emphasized the negative impacts of tourism, prompting the development of further sustainability certifications in tourism. Bucar et al (2019) noted that as of 1987, there were only seven such certifications worldwide, a number that had increased to 203 by 2019 and continues to rise today. While often credited with having positive effects, these certifications have also drawn criticism. For example, Font (2002) observed that the sheer number of certifications can sometimes confuse consumers, leading many to ignore green messages altogether.

This aligns with Buckley's (2002) model of systematic development in the certification market, which outlines eight distinct phases. In the first phase, universities, nongovernmental organizations (NGOs), and private research groups identify a sustainability problem, which is then reported in the media and helps build broad consensus among the public, industry, and government. This stage is followed by the first companies introducing environmental labels for their products, with others soon adopting similar practices and charging higher prices. In response, consumers and consumer protection groups raise concerns that the labels are meaningless or misleading, leading to lawsuits. Eventually, industry bodies or the government are called upon to formalize environmental certification (Buckley 2002).

In recent years, calls for greater reliability have increased. Several framework guidelines and initiatives are already in place. For example, ISO standards distinguish between three types of labels: Type I label — certification (ISO 14024), Type II label — self-declaration (ISO 14021), and Type III label — product information (ISO 14025) (Schories 2022). In addition, EU directives are designed to prevent false advertising and protect consumers from being misled. In 2024, the "Empowering consumers for the green transition" directive (Directorate-General for Environment

2023) was adopted and must now be implemented by the member states. The European Union's Directive on green claims pursues the same objective.

Parallel to government regulations, in 2003, the Rainforest Alliance proposed the creation of a global accreditation body (Jamal et al. 2006). Accreditation aims to certify certifiers according to uniform criteria, thereby improving the credibility of certification systems (Font et al. 2003). The US-based Partnership for Global Sustainable Tourism Criteria was founded in 2007, publishing the Global Sustainable Tourism Council (GSTC) criteria in 2008. This voluntary international cooperation aims to improve consistency among certification programs and establish minimum requirements. The GSTC is recognized by the UNWTO and sustainable tourism experts worldwide. Despite these efforts, the proportion of certified accommodation facilities remains low. According to Hoffmann et al. (2022), only 4 % of accommodation providers on TripAdvisor are certified as sustainable.

3 Criticism of certifications

Sustainability certifications are viewed critically for a variety of reasons. One point relates to the sustainability concept underlying certification, which must be repeatedly negotiated and defined, and includes objectives that may be contradictory. This may help explain why certifications often focus on ecological aspects, even though comprehensive criteria have been established across all areas of sustainability (Reino 2011). Pragmatic trade-offs between sustainability requirements and economic benefits often lead to certification compromises (Suckert 2015) related to practical feasibility and the willingness of certification holders to comply. As a result, ecolabels can end up representing the lowest common denominator (Müller 2007). Achieving sustainable development in tourism requires striking a balance between maintaining the highest standards and making compromises that enable broader impact (Hartmann 2018). This reflects a conflict of values shaped by the dominance of an ecologically conservative paradigm. Furthermore, standards are ambiguous and assessment methods are inconsistent and open to interpretation (Font and Harris 2004; Jamal et al. 2006) Business representatives can use voluntary certifications to minimize government control (Jamal et al. 2006). However, their voluntary nature could prevent these regulatory measures from being adopted to achieve sustainability policy goals. Certifications or awards are designed to represent sustainability through social recognition (Wiegand 2018). While certification is not the only method of recognizing sustainability, it can differentiate between sustainable and unsustainable companies, deriving their influence from stakeholders (Wiegand 2018).

The second area of criticism concerns travelers' responses to certified offers. Currently, only a small proportion of travelers make the effort to search for sustainability information and take it into account when planning their trips. This means that the potential of the 40–50 % of German customers who are receptive to sustainable travel remains largely unexploited (Hartmann 2018). Consumers have little trust in sustainability certifications and rarely consider them, in part because the growing number of ecolabels in tourism is based on widely different criteria and often lacks transparency (Kirstges 2017). Travelers therefore lack confidence in the reliability of certifications and are also concerned they could lead to loss of comfort or higher prices (Petrescu and Bălăcescu 2016). Some ecologically minded travelers criticize the small number of certified offerings.

In Europe, only about 1 % of accommodation providers are certified as sustainable (Hartmann 2018), with approximately 4 % worldwide (Hoffmann et al. 2022). This may be because accommodation providers question the benefits of voluntary certification, perceiving little customer interest and criticizing the time and financial costs associated with the process. The range of certified offers remains limited, potentially because the trend toward certification is still emerging and providers may underestimate its strategic importance (Strasdas et al. 2016). Nevertheless, certifications play a key role in competitive positioning (Hartmann 2018; Wiegand 2018).

Certification organizations are also subject to criticism. Because most certification systems are operated by NGOs or individuals, they often lack the resources to promote individual certifications to consumers and suppliers (Reino 2011; Strasdas et al. 2016), while at the same time pursuing their own economic goals. As a result, certifiers seek to build a reputation among their target audience and tailor their certifications as closely as possible to the needs of individual companies (Wiegand 2018).

In practice, this means that the environment, nature, and the local population are given lower priority than other interests (Jamal et al. 2006). The situation differs when the certification organization does not pursue its own economic interests (Wiegand 2018), which is usually the case with government organizations. Another criticism is that the available certification programs show little progress in terms of accuracy, relevance, and transparency. Given current political conditions, improvements are unlikely without an enforceable framework (Buckley 2012). Furthermore, opportunities for supporting sustainable tourism labels through incentives and legislation appear to be limited (Reino 2011). The question remains whether certification can truly address sustainability challenges under the current conditions and whether it can serve as an effective means of self-regulation and self-monitoring (Jamal et al. 2006).

The introduction described various expectations placed on sustainability certification. These include that sustainability certification should contribute to making

tourism more sustainable, provide guidance to customers, and be internationally understandable. Criticism and doubts about the instrument were also expressed. These include the fact that the criteria are not sufficient to prove a high level of sustainability, that there is no overview due to the large number of certification systems, and that customers tend to be irritated. Businesses, in turn, find certification to be burdensome and expensive. Given this situation, should certification gradually disappear? Since this is not the case, it is assumed that several functions exist, as certifications have continued to exist over the decades despite all the criticism and doubts. This research project deals with the question of the functions of sustainability certifications at the meta level. The aim is to identify and describe them.

4 Methodological approach

Based on the developments and criticisms of certification discussed above, this paper investigates: Why do accommodation providers seek certification? What functions do certifications serve for different stakeholders? Sub-questions address: How are these functions described? How many exist? What approaches emerge from prior research?

This research paper systematically addresses the role of green certifications for hotels. The potential functions of these certifications are derived from evaluation research, particularly the work of Rolfes and Wilhelm (2021), exploring functions in the context of evaluations. Based on a systems theory perspective, these functions are described as political control, symbolization, and learning. These functions appear applicable to tourism certifications, as the certification and evaluation processes share several similarities, including procedural steps, assessment and analysis methods, use of indicators or criteria to evaluate the object, and the communication of results both internally and externally. In both cases, the goal is either to improve a previously established standard or to assess the quality achieved. It is assumed that certifications serve multiple functions, which requires further examination. The investigation is divided into two steps:

1. Identifying and naming potential functions through a comprehensive review of the literature on tourism certification.
2. Evaluating these initially proposed functions through a qualitative analysis of 86 recent research articles.

The confirmatory step employed a qualitative literature review approach. In the first step, both comprehensive and older literature was considered, while the second step focused exclusively on studies published between 2017 and 2023, iden-

tified through a systematic literature review. The procedure followed the recommendations of Pahlevan-Sharif et al. (2019) for systematic literature reviews in tourism research. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) framework, which has been successfully adapted in numerous tourism studies, was applied to ensure a standardized and rigorous process. Search terms were carefully selected to identify relevant articles on sustainability certification in tourism. Suitable search terms were narrowed down for the search for articles on certification for sustainability in tourism. The idea was that synonymous terms such as travel or vacation could be used instead of tourism. Another possibility would be to certify only parts of the tourism supply chain. This would include all forms of accommodation, such as hotels, hostels, lodges, guesthouses, taverns, and inns. Certification is often described as labeling. What terms could be used instead of sustainability? Since the research should focus on the environment, the terms climate, environment, and SDGs were integrated. The term green was found more frequently in searches and could also be used as a search term. Ultimately, the terms shown in Figure 1 were used:

Figure 1: Search terms for the systematic literature
Source: Own compilation

The following search term was formulated for the search on Scopus:

Advanced query: TITLE-ABS-KEY ((certifi* OR label*) AND (hotel OR hostel OR accommodation OR lodging OR shelter OR guesthouse OR inn OR tavern OR tourism OR hospitality OR (vacation AND home) OR (vacation AND apartment)) AND (sus-

tainability OR environment* OR sdg* OR climate)) AND (LIMIT-TO (DOCTYPE, "ar")) AND (EXCLUDE (SUBJAREA, "NEUR") OR EXCLUDE (SUBJAREA, "VETE") OR EXCLUDE (SUBJAREA, "IMMU") OR EXCLUDE (SUBJAREA, "NURS") OR EXCLUDE (SUBJAREA, "PHAR") OR EXCLUDE (SUBJAREA, "HEAL") OR EXCLUDE (SUBJAREA, "BIOC") OR EXCLUDE (SUBJAREA, "MEDI")) AND (LIMIT-TO (LANGUAGE, "German") OR LIMIT-TO (LANGUAGE, "English")).

The final search in Scopus was conducted on October 22, 2023. No restrictions were placed on the type of publication or publication procedure, nor were any restrictions placed on the publication period. It showed N=615 documents. The Environmental Discovery System (EDS) metadata database was used as an additional search option. A search using the simplified query "AB certification AND AB tourism AND AB sustainabl* only English" found a total of N=459 entries on the search date of November 29, 2023. To ensure that literature that may not have been published by a publisher or in a catalog was also taken into account, an additional search was performed using Google Scholar. Literature from the first 500 hits was included. Of these, N = 384 appeared relevant based on the title and were selected. The total number of entries comprises N = 1458 hits. The number of literature sources was reduced in accordance with the PRISMA method by removing duplicates and irrelevant literature. In the end, 295 sources were identified as relevant and were available in full text. To further narrow the search, only articles published between 2017 and 2023 were included. This reduced the pool to 146 papers, 86 of which specifically addressed hotels and accommodation.

All 86 studies were read in full, and their content was categorized according to function. All sources were organized and stored using Zotero software. An Excel database was created from the 86 articles. In this database, the articles were analyzed according to their characteristics, such as methods, theories, data basis, and subject of investigation. For example, 153 different certificates were named. Quantitative studies had case numbers ranging from 30 to over 3000. Information on this is included in the appendix. It became evident that the articles are very different, so a classic evaluation, as is common in systematic literature reviews in medicine, for example, cannot be carried out. However, there is a very broad and comprehensive basis for a qualitative content analysis. Therefore, this approach was chosen.

For the study in this article, statements relevant to the research questions were systematically excerpted from the selected literature. These were statements on the certification process, communication, and different perceptions among guests, hotel managers, or respondents in general, as well as financial implications in the context of certification.

Reference is made here to the recently published systematic review by Elhoushy et al. (2025). In contrast to the work presented here, there is no restriction to hotel

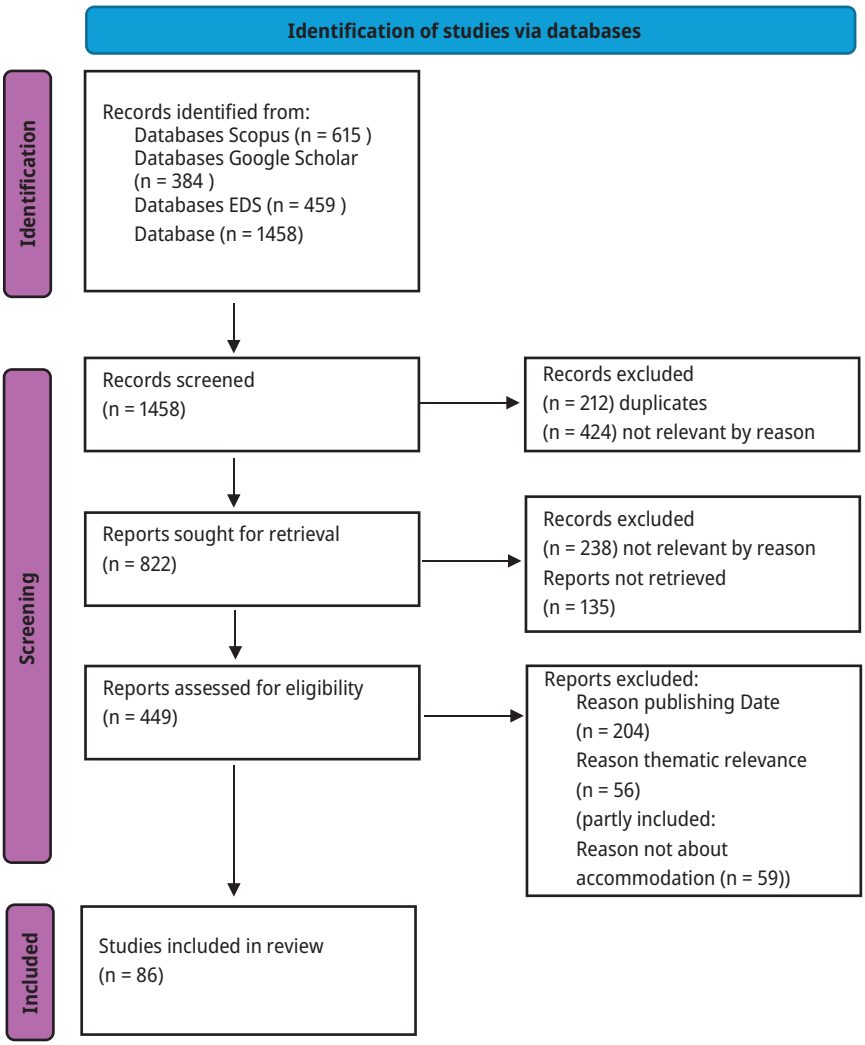

Figure 2: Process of systematic literature search and narrowing down according to the PRISMA model
Source: Own compilation

certifications. (Elhoushy et al. (2025)) pursues two objectives: firstly, to systematize the research literature of the last 20 years into three core topics: prerequisites for certification, decisions and challenges, and results. Secondly, the challenges associated with sustainability certifications are categorized into nine categories. In their study, the authors focused in particular on the perspective of companies. The article presented here also takes customers, government, and society into account.

It should be noted that the data collection for this publication is based on a systematic literature review, but the subsequent qualitative evaluation was not carried out in the usual categories, so that there are considerable differences between the above-mentioned article and its approach. In this respect, both articles are based on very similar data and therefore complement each other in their findings.

5 Results

5.1 Identifying and naming potential functions

In the first step, the four functions were derived and named in relation to their alignment with the concepts of symbolization, political control, and learning in the context of hotel sustainability certifications.

H1: Certifications steer hotels toward sustainability through indirect regulation.

H2: Certifications create status and identification through stakeholder recognition.

H3: Certifications generate economic benefits and profits for providers.

H4: Certifications drive knowledge and sustainability progress internally/externally.

This involved reviewing which functions have already been described in tourism literature and determining the most appropriate naming in the context of hotel sustainability certifications.

5.1.1 Guidance and regulatory function

Certification programs are an integral part of political strategies aimed at promoting sustainable tourism development, by reducing negative environmental and social impacts "*Certification has the potential to reduce tourism's negative environmental and social impacts, ensure that the tourism industry is held accountable to stakeholders and provide marketing benefits to those firms that meet the certification standards*" (Font et al. 2003). The ecological certification is a tool that contributes to environment protection (Petrescu and Bălăcescu 2016). Environmental certifications define, monitor, and ensure that a company, process, product, or system meets certain binding standards (Ryglova 2007; Qubbaj and Signes 2022). In this way, self-regulation is brought into line with political objectives. Literature shows ways in which the decision to pursue certification can be supported through: subsi-

dies, privileges, or fines linked to certification status (Buckley 2002; Jamal et al. 2006; Furqan et al. 2010; Bonilla-Priego et al. 2011).

Supply chain management and reporting requirements could be a motivation for companies to seek certification, as several sources confirm (Ayuso 2007; Font et al. 2008; Bucar et al. 2019) "*The argument put forward here is that besides government regulation, sustainability behaviour and reporting will increase due to green procurement clauses*" (Bonilla-Priego et al. 2011).

In summary, several studies confirm a political control function integrating government regulation (reporting, incentives) with market pressures. The term "guidance and regulatory function" more accurately reflects this role than "political control function" and aligns with H1.

5.1.2 Confirmatory analysis: H1 guidance and regulatory function

H1: Certifications steer hotels toward sustainability through indirect regulation.

Several sources emphasized that certification is a voluntary measure, with no direct enforcement. Instead, it is promoted indirectly through links to financial benefits or by making certification a requirement for securing government contracts. "*Some financial investments were also easier to get through the final decision makers when the reason for them was eco-label criteria*" (Kusiák 2020). "*Respondents noted that being part of the Green Key certification scheme seemed vital to their firms' ability to attract new business from government agencies*" (Mzembe et al. 2020). Willingness depends on provider awareness, consumer attitudes, and incentive policies (Çelik and Çevirgen 2021), tax cuts, (Abdou et al. 2020; Spenceley 2019) or policy recommendations (Spenceley 2019). No evidence exists for mandatory certification.

The aim of sustainability certification is to influence products or services in ways that align with and support the overarching goals of sustainable development, climate protection, and the achievement of the Sustainable Development Goals (SDGs). "*The findings of the present study indicate that the investigated respondents perceived that their hotels' operations were proactive in implementing green hotel practices, regarding energy conservation, water conservation and waste management, but not regarding the use of renewable energies, which led to achieving the targets of the SDGs and, by extension, achieving the environment-related SDGs*" (Abdou et al. 2020) similarly also in (Iorgulescu 2020; Çelik and Çevirgen 2021, Serrano-Baena et al. 2021 and Mousavi 2022). At the same time, certification is intended to prevent undesirable developments that undermine sustainability (Kizanlikli et al. 2023).

Studies have confirmed ecological sustainability. "*While cumulative improvements in resource use can be achieved through participating in an environmental*

certification program" (Becken and McLennan 2017), reduced waste, cut water and energy use, increased energy efficiency (Nižić and Matoš 2018; Chen 2019; Eskerod et al. 2019), advanced progress toward the SDGs, and contributed to mitigating climate change (Becken and McLennan 2017; Serrano-Baena et al. 2021; Rodríguez-García et al. 2023). Economic benefits include cost reduction (Boronat-Navarro and García-Joerger 2019), efficiency gains, more sustainable procurement (Ngawenja Mzembe et al. 2021; Trišić et al. 2021), and competitive advantages (Roberto Rodríguez-García et al. 2023). Social sustainability improved working conditions (Crespi-Vallbona et al. 2023).

Several studies point to obstacles in establishing certifications: No perceived added value (Crespi-Vallbona et al. 2023), high costs (Fudurich and MacKay 2020; Mzembe et al. 2020; Salem et al. 2023), bureaucracy (Mzembe et al. 2020), individuality loss fears (Leroux and Pupion 2018; Spenceley 2019) and complexity (Boronat-Navarro and García-Joerger 2019). Local context mismatches persist (Iman Gawad 2022) alongside sustainability misunderstanding (Linneberg et al. 2019).

H1 guiding and regulatory function is confirmed. Certifications steer sustainable development primarily toward economic and ecological goals via indirect mechanisms such as contracts or incentives, with government as lead actor supported by investors or partners.

5.1.3 status and identification function

H2: Certifications create status and identification through stakeholder recognition.

The symbolization function, which emerged through evaluation research, concerns the relationship between the evaluated institution and external actors. In practical terms, this refers to the interaction between the certificate holder and its environment, including customers, investors, society, and politics. The purpose of certification is to identify which products or services qualify as sustainable and environmentally friendly by meeting certain criteria. A successful sustainability certification signals to the outside world how a product, service, or company differentiates itself from competitors. Product labels convey additional information to potential buyers, mostly related to the environment and nature (Buckley 2002; Bucar et al. 2019). One example cited in the literature is the EMAS environmental management and environmental audit system, which is used throughout the EU to improve organizational environmental management beyond legal compliance and provide independent verification. "*The external communication is opportunistic through an expectation of reputation and corporate image from resource efficiency actions*" (Bonilla-Priego et al. 2011).

For many organizations, certification indicates that a product or service is sustainable, and can therefore be used in marketing and customer communications. Certifications are recognized by customers and considered during the booking process. Ideally, consumers develop a positive attitude toward the certified product or service (Buckley 2002, Font 2002; Furqan et al. 2010), "*The view of Green Business Ltd. is that consumers want to see that someone is looking after sustainability (…) Business consumers actively look for establishments with environmental certification*" Reino 2011). Beyond customers, hotel chains also communicate certification status to shareholders, who may value Corporate Social Responsibility (CSR) criteria (Bonilla-Priego et al. 2011).

In summary, sustainability certifications serve a symbolic role for hotels. More specifically, this can be described as a "status and identification function", which is particularly useful in external communication and marketing. For customers and investors alike, certification is associated with added value — a benefit that is only realized through the certification label, as demonstrated in the literature analysis.

5.1.4 Confirmatory analysis: H2 Status and identification function

With regard to H2, it has been found that certified products signal their sustainability status to external stakeholders through labeling and communication. In a further step, an evaluation was conducted on the extent to which the literature indicated that certifications are pursued or introduced to obtain status or to identify a product or service as sustainable. (Becken and McLennan 2017) emphasized this function, noting that it remains uncertain whether comparable levels of sustainability would be achieved without certification. Certificates can serve as proof that a certain level of sustainability has been achieved, although in some certification systems, sustainability performance can be difficult or impossible to assess (Robinson and Singh 2019). For H2 to hold, it is essential that sustainability certifications are recognized by the relevant actors, particularly customers and providers. However, relatively few of the publications addressed this.

According to the studies, residents had little knowledge of certifications (Dragomir et al. 2020), while guests had some experience with them and tended to perceive them positively. "*Considering their level of awareness respect to the hotel ecolabel, almost one-third knew that the facility was certified. Of this percentage, 44.1 % had this information before visiting it*" (Preziosi et al. 2021).

Awareness depends on communicated effectiveness, with around 30 studies mentioning the communicating of sustainability certifications. Information on certification is essential for investors (Bernard and Nicolau 2022), guests, business partners (Mzembe et al. 2021), and external staff (Bandara et al. 2018). Hotel managers

should therefore inform their guests about certifications (Chen 2017), as they can be used for advertising purposes (Cembruch-Nowakowski 2020; Nistoreanu et al. 2020). However, the information provided must be objective and accurate (D'Souza et al. 2021). The significance of sustainability certification could be reduced if respondents prioritize a hotel's geographical location and brand over environmental considerations (Kusiák 2020). Nevertheless, certification can help reduce the attitude–behavior gap, provided that information is available (Chi et al. 2022). The design of certification labels also contributes to successful communication (Kizanlikli et al. 2023), with rating pictograms proving more effective than conventional sustainability labels (Vinzenz 2019) and larger, well-known logos providing an advantage (Penz et al. 2017). "*The hospitality industry ought to communicate in an efficient manner the objectives of environmental certifications to make customers recognize the importance and value of operating environmentally certified hotels to reduce ecological degradation and trigger favorable customer responses*" (Martínez et al. 2019).

Communication about certifications drives the identification function, conveying sustainability to interested customers and business partners. Environmental communication influences the perception and behavior of hotel guests (Acampora et al. 2022; Sadom et al. 2022). Through effective communication, hotels can demonstrate genuine commitment and enhance these perceptions ((Martínez García de Leaniz et al. 2018; Martínez et al. 2019). Smaller companies communicate more extensively about their sustainability (Tiago et al. 2021), particularly nature-related aspects, while better environmental performers show more active communication ((Beebejaun 2022). Multiple channels increase awareness. "*Our results provide valuable insights into the determinants of customer satisfaction and intention to review a green practice and suggest the need to communicate a green orientation*" (Gasbarro and Bonera 2021).

To achieve a strong status, certification must be associated with a good reputation. The research yielded some interesting findings in this regard. Membership in a recognized certification scheme, like Green Key, is associated with reputational benefits, but requires protection from free riders or excessive membership (Mzembe et al. 2020). Regular reviews ensure compliance (Abdou et al. 2020), while national-accreditation and GSTC standards enhance credibility (Nistoreanu et al. 2020; Iorgulescu 2020). Certifications must align with company's values (Mzembe et al. 2020).

The status and identification function relies on trust (more than 10 sources) requiring consistent assessment (Dragomir et al. 2020; Mousavi 2022; Xue et al. 2023). Different stakeholder groups show trust in certification, including shareholders (Bernard and Nicolau 2022), guests (Bianco et al. 2023; Qubbaj et al. 2023), and especially environmentally conscious customers (de Leaniz et al. 2018). Customers value third-party verification and ISO standards (Apostolakis et al. 2020), linking trust to booking intention (D'Souza et al. 2021). Hotels pursue certification voluntarily to

avoid greenwashing perceptions (Nistoreanu et al. 2020; Blasi et al. 2022), though label clarity remains problematic (Bilbao-Terol and Bilbao-Terol 2020), (Rodríguez-García et al. 2023). "*The results confirmed the fourth hypothesis, that the participants who viewed rating pictograms had significantly stronger trust in the sustainability certification*" (Vinzenz 2019).

Image amplifies marketing effectiveness. Certification boost image (Dragomir et al. 2020), targeting younger nature-seeking guests (Nistoreanu et al. 2020) and sustainability-interest customers (Becken and McLennan 2017). Customers perceive certified hotels positively (Chen 2017; Ajani et al. 2019), though communication is often lacking (Ettinger et al. 2018), despite the fact that EMAS and ISO 14001 certifications must be communicated on websites, but this is often not implemented (Heras-Saizarbitoria et al. 2020; Mazurek-Kusiak and Bednarska 2022). This suggests H2 is underutilized due to communication gaps. Hypothesis H2 was partially confirmed. Certifications create status through communication and trust, but limited stakeholder awareness and inconsistent communication significantly constrain this function's effectiveness.

5.1.5 Benefit and profit function

H3: Certifications generate economic benefits and profits for providers.

Unlike H1 and H2 (adapted from evaluation research), H3 emerged directly from the tourism certification literature as a dominant economic motivation. Many of the reviewed studies suggested that sustainability certifications are pursued to achieve a monetary benefits or profit. This economic motivation manifests in the areas of customers, sales, and marketing, where certifications reportedly improve customer satisfaction, ratings, willingness to pay, and booking behavior (Bilbao-Terol and Bilbao-Terol 2020; Nelson et al. 2021; Alreahi et al. 2023; Bello et al. 2023; Qubbaj et al. 2023), "*More than half of the participants stated that the presence of an eco-label had influenced their booking decision during the choice experiment*" (Baumeister et al. 2022).

Certified hotels charge higher room rates (de Leaniz et al. 2018; Rivera and Roeschmann 2019; Bello et al. 2023; Bianco et al. 2023; Qubbaj et al. 2023), tied to increased willingness to pay (Ajani et al. 2019; Martínez et al. 2019; Boronat-Navarro and Pérez-Aranda 2020; Dragomir et al. 2020; Kusiák 2020; Nelson et al. 2021; Mazurek-Kusiak and Bednarska 2022; Bello et al. 2023; Ko et al. 2023). Certification also attracts sustainability- interested customers and boosts booking probabilities (D'Souza et al. 2021; Gasbarro and Bonera 2021; Merli et al. 2019a; Mzembe et al. 2020); "*Green certificates motivate customers' willingness to pay a premium for green hotels, as they increase their trust in such hotels*" (Qubbaj et al. 2023). "*Findings from*

this study confirm the initial research hypothesis that hotel green attributes are identified by guests as 'excitement' attributes" (Preziosi et al. 2022).

Customers show increased willingness to spend, customer satisfaction, purchase intent, and greater loyalty to the company (Merli et al. 2019a; Gasbarro and Bonera 2021; Acampora et al. 2022); Chi et al. 2022; Sadom et al. 2022a; Preziosi et al. 2022; Mao et al. 2023; Qubbaj et al. 2023). Certification drives repeat booking intentions and word-of-mouth advertising (Merli et al. 2019b; Preziosi et al. 2019) and synergy effects when municipalities are also certified (Rivera and Roeschmann 2019). Financial markets respond with higher share prices (Bernard and Nicolau 2022), increased company value (Cavero-Rubio and Amorós-Martínez 2020).

However, results are mixed. "*Hoteliers should concentrate their efforts not only on green practices but also in delivering a high-quality service. Indeed, if non-environmental features are not delivered correctly, satisfaction and, as a result, loyalty may suffer. As a result, green practices may improve customer satisfaction only if there is no service failure*" (Acampora et al. 2022). (Bilbao-Terol and Bilbao-Terol 2020) found no economic advantages while (Salem et al. 2023) identified both positive and negative effects. Only 12 % of customers were willing to pay more for greater energy efficiency (Nižić and Matoš 2018).Certification labels are not decisive for all customers (Penz et al. 2017; Martínez et al. 2019; Dragomir et al. 2021; Mazurek-Kusiak and Bednarska 2022) and the link between sustainability certification, higher prices, and greater demand is not always clear-cut (Chi et al. 2022). Higher occupancy rates, guest numbers, or the ability to charge higher room rates are not always associated with certification (Duglio et al. 2017; Bilbao-Terol and Bilbao-Terol 2020). Certification alone does not lead to guest satisfaction (Merli et al. 2019b), and in some cases may even reduce it. Guest satisfaction can also decline as a result of certification if expectations are not met. "*Therefore, to overcome the problem of misalignment between an accommodation facility's green practices and guest awareness about their sustainability engagement, the accommodation facilities could leverage on communication channels, tools and messages to strengthen their green image*" (Gasbarro and Bonera 2021);

Long-term benefits outweigh initial costs (Crespi-Vallbona et al. 2023), driving asset management, work efficiency, and sales (Cavero-Rubio and Amorós-Martínez 2020). and operating costs reductions through sustainability practices (Becken and McLennan 2017); "*Third, as pointed out by the consultant, the costs associated with a higher tiered LEED certification may outweigh the cost efficiencies. Finally, all the feedback did have a unifying theme that sustainable practices of energy, water conservation, recycling, and other practices should and have in fact in multiple cases shown a reduction in operating costs*" (Robinson and Singh 2019).

The contradictory findings suggest research gaps in research design, long-term effects, communication strategies, and possibly a bias where more successful com-

panies seek certification more frequently. The large number of studies here demonstrates a strong focus on benefits and gains, confirming H3's benefit and profit function and its linkage to H2 (status and identification function) via information and communication.

5.1.6 Knowledge and progress function

H4: Certifications drive knowledge and sustainability progress internally/ externally.

The third function to be adapted is the learning function. Within the evaluation process, participants gain insights into how they can improve their practices. The certification process should also fill this role, as it is designed to improve the sustainability performance of a product or service. "*As the findings from this study evidenced the potential of green marketing strategies namely, environmental advertising and eco-labelling in uncovering the psychological aspect that is, a green attitude which leads to frugality, it may offer means to achieve fundamental positive sustainability change and addressing overconsumption issue not only in industry but also at the society level*" (Sadom et al. 2022). As an internal measure, the certification process helps companies manage and document resources, strengthen legal compliance, conduct self-assessments, and train staff to meet established criteria. For example, in the "*Step-by-step best practice model for hoteliers to encourage sustainable practices in hotels*" Step four is as follows: "*Train, motivate and convince your employees to contribute towards the success of your green business strategy*" (Kapiki 2012).

External groups such as suppliers, guests, and locals are also involved in the certification process. Through education, they are motivated to change their behavior, thereby contributing to higher environmental protection standards and greater social and cultural responsibility (Furqan et al. 2010; Bucar et al. 2019). Communicating sustainability measures can further support mutual understanding between providers and consumers. To improve communication, it is proposed that: "*Provision (on their website) of detailed information about the development process to enhance understanding and credibility*" (Reino 2011).

Given the historical context of sustainability certification, which is to promote sustainable economic practices, the learning function is a crucial component. For all actors, learning should generate insights that lead to improvements. For this reason, in the context of certification, the function is more accurately described as a "knowledge and progress function". H4 identified Certifications foster learning and progress across internal operations and external stakeholder behavior.

5.1.7 Confirmatory analysis Knowledge and progress function

As discussed, sustainability certifications were introduced in tourism to guide the industry toward greater sustainability, while preventing or minimizing undesirable developments, with a particular focus on offerings and providers. The literature consistently indicated that sustainability certifications drive the tourism industry toward greater sustainability (Rodríguez-García et al. 2023). Several studies found that certification typically triggers hotels to improve sustainability efforts (Martínez et al. 2019). "*In the case of hotels, it has been proven that the main categories in which BREEAM has the greatest impact are Health and Well-being, Land Use, Ecology and Waste and Transportation. Therefore, if we compare these categories with the SDGs that BREEAM and the UNWTO indicate, we can affirm that the certificate applied in hotels contributes directly to the achievement of SDG 3, 6, 7, 12 and 15 and indirectly in SDG 8, 11 and 13*" (Serrano-Baena et al. 2021).

Progress occurs across different areas of accommodation services. In terms of environmental sustainability, certifications are associated with reductions in ecological footprint, resource consumption, and overall environmental impact (Becken and McLennan 2017; Reid et al. 2017; (Eskerod et al. 2019; Mzembe et al. 2021). Studies also mentioned savings in energy, waste, and water consumption — not only in the hotel itself but also at partner companies (Kusiák 2020). Through certification, hotels mitigate criticism and improve their environmental balance (Duglio et al. 2017; de Leaniz et al. 2018). "*This study offers insights on how organizational managers can steer their organizations towards adoption of the externally generated sustainability initiatives that can lead to better sustainability performance outcomes*" (Mzembe et al. 2021).

While the dimension of social sustainability is not covered in the selected studies, economic benefits are well-documented, with numerous studies noting improvements in business organization, asset management, work efficiency, turnover (Cavero-Rubio and Amorós-Martínez 2020; Mzembe et al. 2021), and operational efficiency through enhanced training of hotel managers and elevated certification levels (Lin et al. 2023). As a whole, certified hotels demonstrate higher performance than non-certified hotels, especially when a higher level of sustainability is achieved. "*We found that the attainment of a sustainability certificate resulted in higher property-level performance for hotels, especially those with first-mover advantage, by creating switching costs barriers*" (Bianco et al. 2023).

Certifications also have a significant internal impact on both business performance and the people involved. They often involve staff training (Bandara et al. 2018) and require hotel managers to deal with the demands of certification. This can lead to a deeper understanding of sustainability, efficiency, and environmental and sustainability awareness (Trišić et al. 2021; Acampora et al. 2022; Sadom et al. 2022).

"*Some managers have learned that long-term economic sustainability and growth are interrelated with environmental policies*" (Yilmaz et al. 2019).

As with the status and identification function, information bridges environmental awareness, frugality, social responsibility, and behavioral intentions, thereby reducing the attitude–behavior gap (Ettinger et al. 2018; Boronat-Navarro and Pérez-Aranda 2020; Chi et al. 2022; Sadom et al. 2022). Specific messaging — such as highlighting contributions to protecting the planet (Martínez et al. 2019) or appeals like "*save water for the future*" (Bandara et al. 2018) — has proven effective. The use of QR codes to provide information at various locations in the hotel is also considered helpful (Crespi-Vallbona et al. 2023). Respondents were found to prefer certificates that avoid political value judgments over environmental labels with specific political messaging. "*The empirical findings instead assign greater significance on to information levels, users' familiarity and friendliness levels in order for this new technological disruption to catch up in mass tourist destinations*" (Apostolakis et al. 2020).

H4 confirmed. Certifications generate learning across internal operations and external stakeholders, though social sustainability remains unaddressed and progress often emerges as an unintentional byproduct.

Certifications demonstrate H1-H4 functions across ecological, economic, and learning dimensions, though *social sustainability remains unaddressed*– with H3 (profit) emerging as a novel contribution.

6 Conclusion

The analysis indicates that sustainability certifications for accommodation in tourism fulfill four different functions: the **guiding and regulatory function**, the **status and identification function**, the **benefit and profit function**, and the **knowledge and progress function**. Particularly strong evidence was found for the benefit and profit. The benefit and profit function was identified as an additional function from the literature reviewed. The status and identification function was confirmed, but with the clear indication that it depends on accompanying communication. This condition is not always met. The guiding and regulatory function, which played a major role in the development of certification systems, is clearly limited by its voluntary nature and, in some cases, lack of acceptance by providers and consumers. The knowledge and progress function also emerges as an outcome of the certification process, although it is not mentioned in the analyzed literature as a motivation for certification. The evaluation of the literature has shown that each of the four functions comprises several purposes. Table 1 summarizes the results at a glance.

Table 1: Functions of sustainability certifications in tourism

Function / Hypothesis	Purposes	Confirmed	Reference literature
H1: Guiding and regulatory function Certifications steer hotels toward sustainability through indirect regulation.	Promoting sustainable development	✓	Abdou et al. 2020; Becken and McLennan 2017
	Reducing and mitigating negative impacts on sustainability		Font et al. 2003, Petrescu & Bălăcescu 2016; Bonilla-Priego et al. 2011
	Regulating by allocating subsidies/financing linked to certification		Buckley 2002; Jamal et al. 2006; Kusiák 2020; Mzembe et al. 2020
H2: Status and identification function Certifications create status and identification through stakeholder recognition.	Identifying the sustainability of the offering	✓ in combination with communication	Reino 2011; Becken and McLennan 2017
	Improving marketing and reputation		Bonilla-Priego et al. 2011
	Displaying sustainability as a status		Mzembe et al. 2020
	Building trust		Dragomir et al. 2020; Mousavi 2022; Xue et al. 2023
	Providing evidence in the context of sustainability reporting requirements or to lenders and customers		Ayuso 2007; Font et al. 2008; Bucar et al. 2019
	Supporting communication on environmental and sustainability issues		Martínez et al. 2019; Bernard and Nicolau 2022; Kizanlikli et al. 2023Gasbarro and Bonera, 2021; Beebeejaun Ambareen, 2022

Table 1 (continued)

Function / Hypothesis	Purposes	Confirmed	Reference literature
H3: Benefit and profit function Certifications generate economic benefits and profits for providers.	Achieving higher prices	✓	Bilbao-Terol and Bilbao-Terol 2020; Nelson et al. 2021; Alreahi et al. 2023; Bello et al., 2023; Qubbaj et al. 2023)
	improving customer loyalty, recommendation rate, and intention to rebook		D'Souza et al. 2021; Gasbarro and Bonera 2021; Merli et al. 2019a; Baumeister et al. 2022; Mzembe et al. 2020
	Improving market positioning		Merli et al. 2019a; D'Souza et al. 2021; Gasbarro and Bonera 2021
	Enhancing ecological and economic balance, using fewer resources		Becken and McLennan 2017; Robinson and Singh 2019
H4: Knowledge and progress function Certifications drive knowledge and sustainability progress internally/externally.	Internal: Improving production and knowledge among stakeholders while reducing adverse effects on sustainability	✓	Kapiki 2012; Duglio et al. 2017; Martínez García de Leaniz et al. 2018; Yilmaz et al. 2019; Kusiák 2020; Serrano-Baena et al. 2021
	External: Raising awareness and disseminating knowledge about sustainability and encouraging sustainable behavior		Furqan et al. 2010; Ettinger et al. 2018; Bucar et al., 2019; Sadom et al 2022

Source: Own compilation

It is important to note that communication plays an important role in the context of functions in general, not just in terms of benefits and status. Communication generally flows in two directions. On the one hand, it flows internally between hotel owners, managers, employees, and service partners. On the other hand, it flows externally, where it is directed at politicians, administrators, consumers, guests, investors, marketing platforms, and the general public. Different approaches and content are important for each target group. Many of the studies examined point to this fact.

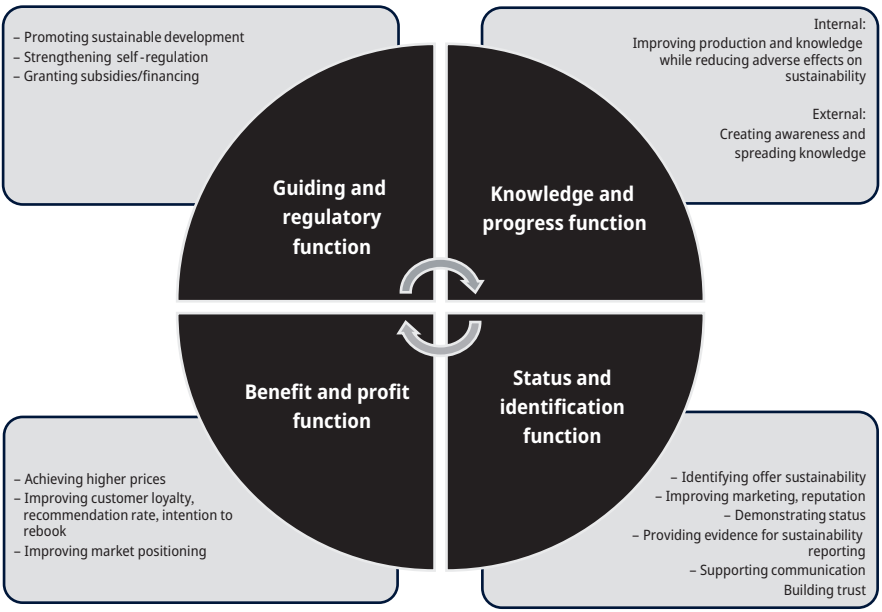

Figure 3: Functions of sustainability certifications for hotels and accommodation facilities with their respective sub-functions
Source: Author's own compilation

With regard to the articles examined, which focused on the tourism sector of accommodation, four functions were described and sub-aspects were presented. The functions do not exist in isolation, but are interdependent to varying degrees. The links between the status and identification functions and the benefit and profit functions are particularly close. All functions also require various types of communication, directed both internally and externally.

7 Discussion

The analysis shows that the topics of economics and ecology were addressed in diverse ways within the context of sustainability. By contrast, very few of the examined articles mentioned social sustainability. Among the identified functions, the benefit and profit function, seen from an economic perspective, was the most frequently addressed as shown in Section 5.1.5.

With regard to the skepticism and criticism expressed about certification, it can be said that some of the points are unjustified. Companies have claimed that certification is costly and useless. However, the evaluation shows that companies can enjoy a number of advantages associated with the benefit and profit function. Some studies have shown that, in the long term, the benefits outweigh the costs of certification.

An additional advantage arises when certified accommodation providers communicate their certification effectively. This is when the status and identification function comes into play. A series of studies shows that customers interested in sustainability are guided by certifications as shown in Section 5.1.1. However, studies from several countries have pointed to very low proportions of certified accommodation providers (Hartmann 2018; Hoffmann et al. 2022). The reasons for the low certification rate among accommodation providers should be further investigated in future research. The literature review showed that sustainability certifications are always voluntary, but that linking them to the granting of subsidies or loans can increase willingness to participate (Buckley 2002; Jamal et al. 2006; Furqan et al. 2010; Bonilla-Priego et al. 2011). This increase would be necessary to ensure that guests interested in sustainability always have a choice.

The criticism from travelers that there are too many different labels and that they cannot obtain sufficient information about the level of sustainability should be addressed once again. The 153 identified labels support the justified criticism regarding excessive fragmentation. The question of the level of sustainability cannot be assessed on the basis of this study. Some studies referred to the attitude–behavior discrepancy between interest in sustainable tourism and actual booking behavior. It is not yet clear whether this is caused by the large number of certifications, the low percentage of certified offers (Hartmann 2018; Hoffmann et al. 2022), a lack of trust (Kirstges 2017), or other reasons in the decision-making process.

The legitimate concern that greenwashing is taking place should be investigated. The European Union addresses this through Directive (EU) 2024/825, 2024: Amending Directives 2005/29/EC and 2011/83/EU as regards empowering consumers for the green transition, which mandates third-party verification of sustainability certifications and prohibits unsubstantiated environmental claims. How companies will implement these regulations and whether customers will accept them warrants further investigation.

In the literature reviewed, it is striking that there are few studies on long-term developments and that social aspects have been the focus of research by only a very small number of authors. Thus, the social dimension remains underexplored compared with the economic and ecological pillars. Impacts on integration, equal opportunities, tourism acceptance, participation, and job opportunities are impor-

tant research topics in this context for the future (Font et al. 2003; Crespi-Vallbona et al. 2023).

It remains unclear whether sustainability certifications for other parts of the tourism service chain fulfill the same four functions or whether there are differences in this regard.

8 Recommendations

Recommendations for practice can be derived from the conducted meta-analysis for concision the meta-analysis carried out. **Hotel managers** benefit from sustainability certification, as confirmed by the benefit and profit function in the area of economic indicators and ecological improvements. They should communicate their certification to the appropriate parties both internally and externally, as this will enable the status and identification function to take effect. According to several studies, this aspect is still underestimated (Martínez et al. 2019). In addition, certification contributes to the further development of their accommodation facility toward greater sustainability, as the knowledge and progress sections have shown.

Travelers, especially those interested in sustainability, can use sustainability certifications as a guide, because the status and identification function means that certification can create trust. A requirement is, of course, that providers are verified in transparent certification systems. Customers are willing to pay more for certified accommodation, which is why it is sometimes slightly more expensive, as shown in the benefit and profit function (Qubbaj et al. 2023). Several studies have shown that certified hotels achieve greater sustainability (Becken and McLennan 2017). Guests are also encouraged to participate, as shown in the explanations of the knowledge and progress functions (Sadom et al. 2022).

Governments should consider how they can strengthen their guiding and regulatory functions. Voluntary certification for accommodation facilities can be supported by better funding conditions and lending, as is already the case in some countries. This support would be worthwhile, as certification would raise the level of sustainability through the knowledge and progress function, thereby contributing to the achievement of politically set sustainability goals. While certification support raises sustainability levels, its impact on social sustainability goals remains unclear due to limited evidence. The status and identification function nevertheless shows that reporting requirements can be met (Buckley 2012). This could be standardized by mutual agreement between administrations and accommodation providers.

9 Limitations

This article does not examine the various certifications and labels for accommodation providers, their implementation processes, or their balance of sustainability criteria. In addition, the literature review only considered studies that addressed sustainability labels, without examining certification quality or ISO standards. The focus was also restricted to accommodation, specifically hotels — certification for food, buildings, destinations, tour operators, beaches, and marinas was not considered. During the research, it was observed that numerous studies worldwide have addressed the Blue Flag ecolabel, suggesting that a separate evaluation of this topic would be worthwhile. Open research questions remain where the reviewed studies reached contradictory conclusions. In addition, future research should therefore broaden its scope to include social dimensions and their interaction with existing economic and ecological frameworks.

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Appendix

Table A1: Type of publications evaluated

Type of Publication	Number of Publication
Bachelor Thesis	1
Book Chapter	1
Conference Paper	1
Master Thesis	3
Peer Review Paper	76
Policy Research Working Paper	1
Scientific Paper	4

Source: Own compilation

An evaluation was conducted to determine the countries and continents from which the corresponding authors originate and the universities to which they are affiliated. A particularly large number of articles were written by first authors from the following countries: Spain, United States of America, Italy, Canada, Romania, China, Portugal, Australia, and Austria. This shows that the topic of certification in tourism is considered relevant in all parts of the world, with particular interest evident in Europe, specifically in Spain, Italy, and Romania. The countries from which the first authors come were also recorded, along with their respective institutions and universities. Here, the spread is even greater than for the countries, so that it is difficult to speak of a concentration. The institutions are therefore not listed in detail. The distribution across continents is shown in the following table.

Table A2: Origin of the corresponding author by continent

Continent	Number of Publications
Africa	5
Asia	11
Australia	4
Europe	56
North America	11
South America	0

Source: Own compilation

Similar to the authors' origins, the research most frequently refers to Europe, followed by Asia, North America, and global studies. Less research refers to Africa and Australia, and none to South America. Furthermore, an evaluation was carried out to determine which scientific discipline the scientists could be roughly assigned to. It is noteworthy that significantly more researchers can be assigned to the fields of economics and marketing than to the natural sciences or social sciences, as it would have been expected that the topic of sustainability in tourism through certification and labeling would be relevant to all these disciplines.

The number of publications on this topic is increasing over time. The most frequent publications appear in the following journals: Sustainability (Switzerland), Journal of Cleaner Production, and Journal of Sustainable Tourism.

In terms of research methods, around a quarter chose a qualitative approach and another quarter chose a mixed methods approach. Half of the publications were based on quantitative analyses. The data basis of the studies varies greatly. A wide variety of methods are mentioned in publications on the subject of sustainability certification.

Table A3: Methods mentioned in publications

Method	Method
5 point likert prozess	Mixed methods
Aforementioned methods	Statistical methods
Analytic hierarchy process (AHP) method	Convenience sampling method
Assessment methods	Semi-structured interview method (
Bibliometric studies	Common method variance (CMV)
Blinded reverse translation method	Maximum Likelihood Estimation Method (ML)
Bootstrapping method	Partial Least Square Structural Equation Modelling (PLS-SEM)
Case study approach	PRISMA methodological
Case-study methodology	Quantitative methodology
Choice modeling methodology	Structural equation modelling-SEM
Combining quantitative and qualitative data analysis	Participatory observation and prolonged entanglement enhanced the credibility and validity
Common method bias (CMB)	PESTEL Analysis
Comparative methods	Pooled regression model
Confirmatory Factor Analysis (CFA)	Probit regression method
Conometric methodology of panel data	Promax rotation with Kaiser normalization
Constant comparative method	Propensity score- matching methodology
Consultation process	Pruposive or judgemental sampling
Contextual analysis approach	Purposive sampling method,
Contingent Valuation Method	Quantitative content analysis
Data envelopment analysis (DEA)	Quasi-experimental methods
Data mining and machine learning techniques	Shapiro-Wilk testslnRevPAR
Descriptive analysis	

Table A3 (continued)

Method	Method
Descriptive and experimental research design	Simultaneous equation methods
Descriptive and inferential statistics	Random-effects methodological approach
Direct Oblimin Method rotation	Sample design prozess
Drop-off and pick-up method	Sample selected
Econometric method	Sampling continued until thematic saturation or
Empirical approach	redundancy was reached.
Empirical Research Methods	Sampling method of criterion samplin
Event study method	Score weighting method
Experimental method	Score-matching methodology
Explorative evolutionary research design	Screening method
Exploratory experience survey	SPSS regression method
Exploratory methods	Stated preferences discrete choice modeling
Factors extraction method	(SPDCM)
Fixed-effect model	STR Global's internal methodology
Hedonic price method	Structural model
Hypothesis PLS-SEM modeling	Subtle methods
Incorporating a desk review	Summative approach
In-depth analysis	Survey of the 'Green Certificate' enterprises
Convergent parallel mixed method design'	Qualitative study method
Cross-data validity checks	Quantitas Intelligent Business Analyzer (QIBA)
Inductive analysis	Sustainable measurement methods related to
Involving in-depth interviews	Sustainable buildings
Iterative approach	SWOT Analysis
K-means cluster analysis	Synthetic control method SCM
Kolmogorov-Smirnov z-test	Term frequency (TF)–inverse document frequency
Lab experiment using eye-tracking techniques	(IDF) text classification method
Linear methods	The contingent valuation method
Literature review methodology	The logical design and interpretation method
lnRevPAR and another for lnrating	The monographic or descriptive method
Matching method	The principles of a grounded theory approach,
MCMC method	undertook an open, inductive coding process
Method of diagnostik survey	The structural equation models
Method of scientific induction and deduction	Thematic Analysis
Methodology based on oversimplified indicators	Total Interpretive Structural Modeling-Polarity
Methods of data triangulation	(TISM-P)
Mood analysis	Treatment-effects methods
Multigroup analysis	Two-stage least squares (2SLS) methods
Multiple triangulated qualitative methods	Two-step clustering method
Multivariate analysis	Word association method
Naturalistic methods	
Nearest-neighbor method	
Non-parametric Mann-Whitney U-test and	
Kruskal-Wallis $\chi 2$ test	

Table A3 (continued)

Method	Method
Non-probability sampling method)	
Novel methodology (stated preferences discrete choice modeling)	
One-way analysis of variance (ANOVA Paired samples t-test	
Panel data econometric methods	
Panel data model	
Principal Component Analysis (PCA)	
Snowball sampling method	

Source: Own compilation

All mentions of methods listed here have been reproduced in the spelling used by the respective authors. No verification or assessment has been carried out at this point.

In addition to the methods, the theories mentioned were also collected. A large number of studies do not name a specific theory. A total of 70 theories are named by the 51 different authors.

Table A4: Collection of all theories mentioned

Theory	Theory
Theory of planned behavior (TPB)	Social identity theory
Institutional theories	Stimulus-organism-response theory
Actor Network Theory	Diffusion of Innovations Theory
Adopted a fixed-effects econometric model	Three-Factor Theory of Customer Satisfaction
Attitude-behaviour gap theory	Management to investigate international hotel expansion
Cognitive fit theory	
Deductive research philosophy has been utilised in this research because it is based upon the theories of various researchers	Principles of a grounded theory approach
	Profiting from innovation (PFI) theory
	Random utility maximization theory
Ecological modernization theory	Resilience theory
Economic theories on learning	Resource mobilization theory
Economic theory	Resource-based theory
Ecotourism theory	Rough set theory
Entity theory	Schwartz's values theory
Established theory such as the resource-based view	Self-regulation theory
	Service value theory
Going beyond the "cost to be green" – "pay to be green" theoretical framework	Slack resources theory
	Social capital theory

Table A4 (continued)

Theory	Theory
Habit theory	Social cognitive theory
Hedonic Pricing Model	Social theory
Image theory	Stakeholder theory
Implicit theory	Standard economic theory
incremental theory	Sustainability construct
Information processing theory	Sustainable tourism theory
Institutional economic theory	The signaling theory
integrative club theory	The theory of value and choice behavior
Intention-behavior gap	Theory of cartels and clubs
Knowledge-based theory	Theory of commons
Market segmentation	Theory of education
Maslow's Hierarchy of Human Needs	Theory of entrepreneurial orientation
Means-end theory	Theory of hedonic prices in the field of Tourist services
Microeconomic theory of tourism demand	Theory of information asymmetry
Mindfulness and materialism	Theory of market signaling
Natural resource-based view theory	Theory of the three pillars of sustainability
Neo-institutional theory	Theory of tourist behaviour
Primary theory in strategic	Tourism theorists
	Translation theory
	Value-Belief Norm theory of environmental concern

Source: Own compilation

No further assessment of the theories or methods mentioned was carried out. All of the sustainability certifications and labels mentioned were collected from a total of 144 full texts. Some dealt with only one certification, while others mentioned several. Some studies did not mention any specific certification names. A total of 153 different certifications were mentioned. The following certification names were mentioned multiple times: Green Key, The Certification for Sustainable Tourism of Costa Rica (CST), ISO 14001, Green Seal, Blue Flag, Green Star Custom Certification, Green Globe, Green Tourism Business Scheme (GTBS), EU Eco-Label, Ecotourism Australia (EA), LEED (Leadership in Energy and Environmental Design), Legambiente Turismo Eco-Label, EarthCheck, Nordic Ecolabel or "Swan", EMAS (Eco-Management and Audit Scheme), Eco-Label, Global Sustainable Tourism Council (GSTC), Fair Trade Tourism (FTT), Travelife Standard for Hotels and Accommodations, Global Reporting Initiative (GRI), Biosphere Responsible Tourism, Green Mark, BREEAM (Building Research Establishment Environmental Assessment Method), and Nature's Best Sweden.

Table A5: List of certifications mentioned once or twice in the evaluated literature

Certification Name	Certification Name
Ecolabel Luxemburg, Eco-lighthouse, EcoMark, Ecotel, Ecotourism Africa, EcoVadis, Energy Saving, Environmentally Friendly, Esok (Kenia), Eurostars Hotel Company — Seal of Quality, Fair Labor Responsible Hotel Certification, Fair Tur Label, Fattal Group Sustainability Practices and Standards, GB Tool, GBI (Green Building Index), Gili Green Award Premium, Global Ecosphere Retreats Standard Kenya (The Long Run), Good Travel Seal, Green Alaska Sustainable Tourism Certification, Green Building Council of Australia (GBCA), Green Building Council of India, Green Building Label, Green Destinations, Green Event Hungeria, Green Growth 2050, Green Hotels Association, Green Star Hotel Programme Egypt, Green Tourism Active, GREEN Trees (Thai's Rating of Energy and Environmental Sustainability), Greening Awards 2014 from the Hotels Association of Sri Lanka, Greenleaders, GreenLeaderSustainable Destination, Greenleaf, Environmental/EcoStandard, GREENSHIP, GRIHA (Green Rating for Integrated Habibtat Assessment), GSTC Destination, Hawaii Ecotourism Association (HEA) Ecotourism Certification Program, Heritage Environmental Management Company,	Hilton LightStay, Hilton Standards, HK-BEAM, Hoteles Justos Laborablemente Responsables (HJLR), HQE, Hungarian Tourism Agency Qualified Partner, Indian Green Building Councile Rating Systems (IGBC), Indonesian Sustainable Tourism Council (IST), International Organization of Standardization (ISO), ISO 22000: Food Safety Management Certifed Hotels, ISO 50001, ISO 9001, Japan's CASBEE (Comprehensive Assessment System for Building Environmental Efficiency), LOTUS, Mellow Mood Hotels Environmental Certification, MESST Mediterranean Standard for Sustainable Tourism, NABERS (National Australian Built Environment Rating System), National Ecolabel of Tourist Accommodation of Latvia, Norwegian Ecotourism, NPOP (National Program for Organic Production), Ø-Label (National Organic Certification), Österreichisches Umweltzeichen, PNEA Certification, Readers Choice, Responsible Tourism Tanzania (RTT), Seaside Awards, Serve360, Seychelles Sustainable Tourism Label (SSTL), Slovenia Green Certificate, Solar Award, Sustainable Hotel Certificate, Sustainable Hotel Certificate by Croatian Hospitality Association (UPUHH), Sustainable Tourism Eco-Certification Program (STEP), Sustainable Tourism Stewardship Council (STSC), Taiwan Green Mark Hotel, Three Star System, TOFTigers,

Table A5 (continued)

Certification Name	Certification Name
	Travel Green Wisconsin (TGW), UN Global Compact, US Environmental Protection Agency's (EPA), VERDE, Vireo Srl, Virginia Green (VG), White Flag International, WTTC

Source: Own compilation

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