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THE IMPACT OF FINANCIAL PERFORMANCE ON KEY ENVIRONMENTAL PERFORMANCE OF HOTELS IN SERBIA WITH ENVIRONMENTALLY SUSTAINABLE PRACTICES

Abstract

This study examines 47 hotels in Serbia that implement environmentally sustainable practices and are listed on the Etic Hotels platform. The analysis draws on data for key environmental performance indicators (carbon footprint and Etic Green Score) sourced from the Etic Hotels website and the hotels' official websites, as well as financial statement data for 2023 obtained from the Serbian Business Registers Agency (APR). The research has two primary objectives: (a) to assess whether Serbian hotels listed on the Etic Hotels platform exhibit relatively stronger or weaker environmental performance, and (b) to evaluate the influence of operational efficiency indicators-specifically profitability and cost-efficiency on key environmental performance measures, including carbon footprint and the Etic Green Score.

The stated objectives were addressed using (a) cluster analysis, which enabled the classification of hotels in Serbia into two groups "green" (more environmentally sustainable) and "red" (less environmentally sustainable) and (b) multiple linear regression to investigate the relationships between financial performance and environmental performance indicators. All statistical analyses were conducted using the STATA/SE 13 software package.

The results of the analysis revealed the following: (a) "green" hotels dominate the Etic Hotels database (39 out of the 47 observed hotels). These hotels are characterized by a carbon footprint below the sample average (≈14.14 kgCO2e) and an above-average Etic Green Score (≈6.19/10). In contrast, eight hotels fall into the "red" cluster, exhibiting below-average environmental performance. (b) There is no statistically significant effect of financial performance, specifically profitability (ROA and ROE) and cost-efficiency (total cost-efficiency (TCE) and operating cost-efficiency (OPE)) on carbon footprint. However, ROE and OPE show a positive and statistically significant effect on the Etic Green Score, whereas

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TCE has a negative and statistically significant effect. ROA, however, does not have a statistically significant effect on the Etic Green Score.

The findings for 2023 indicate that among the 47 hotels in Serbia, there is an awareness of the importance of environmental performance and a willingness to report on it. However, this practice remains underdeveloped, as it is not yet widespread among all hotels in Serbia, 441 of which are listed on the website of the Ministry of Tourism and Youth. It is expected that the introduction of mandatory sustainability reporting regulations, aligned with green transition trends, by 2030 will support the full establishment of environmental and broader sustainability reporting practices within the Serbian hotel industry. This development would represent an initial step toward implementing new models of circular and regenerative sustainable business practices in the Serbian hotel sector.

Key words: *hotels, profitability, cost-efficiency, environmental performance, environment*

JEL classification: *Q56, L83, M21, M41*

УТИЦАЈ ФИНАНСИЈСКИХ ПЕРФОРМАНСИ НА КЉУЧНЕ ЕКОЛОШКЕ ПЕРФОРМАНСЕ ХОТЕЛА У СРБИЈИ СА ЕКОЛОШКИ ОДРЖИВИМ ПРАКСАМА

Апстракт

Истраживањем у овом раду је обухваћено 47 хотела са еколошком одрживом праксом у Србији који се налазе на Etic hotels сајту. Коришћени су подаци о кључним еколошким перформансама (карбонски отисак анд перформанса Etic green скор) са Etic hotels сајта и сајтова хотела, као и подаци из финансијских извештаја посматраних хотела са АПР-а за 2023. годину, са циљем: а) утврдити да ли су на Etic hotels сајту присутни хотели из Србије са бољим или лошијим кључним еколошким перформансама и б) испитати утицај финансијских перформанси (перформанси профитабилности и економичности) на кључне еколошке перформансе (царбон фоотпринт и етиц греен сцоре) ових хотела.

Постављени циљеви су реализовани применом а) кластер анализе (што је омогућило разврставање хотела у Србији у два кластера "зелени" - еколошки одрживији хотели и "црвени" - еколошки мање одрживи и б) вишеструке линеарне регресије за испитивање постојања утицаја између финансијских перформанси и еколошких перформанси. Наведене технике спроведене су коришћењем софтверског пакета STATASe 13.

Резултати извршеног истраживања су показали следеће: а) на сајту Etic hotels доминирају "зелени" хотели (39 од испитаних 47), као и да њих карактерише карбонски отисак испод просечне вредности (≈14,14kgCO2e) и виша перформанса Etic green скор од просечне вредности (≈ 6,19/10), док 8 хотела припада "црвеном" кластеру са еколошким перформансама испод просечних вредности; и б) не постоји статистички значајан утицај финансијских перформанси и то рентабилности (укупних средстава и сопствених средстава) и економичности (укупне и пословне економичности)

на карбонски отисак, док постоји позитиван статистички значајан утицај рентабилности сопствених средстава и пословне економичности на перформансу Etic green скор, и негативан статистички значајан утицај укупне економичности на перформансу Etic green скор, док рентабилност укупних средстава у контексту утицаја на перформансу Etic green скор није значајна.

Резултати истраживања за 2023. годину указују да је у 47 хотела у Србији присутна свест о значају еколошких перформанси и да извештавају о њима, али да је оваква пракса још увек у развоју јер није присутна у свим хотелима у Србији, којих има 441 на сајту Министрства за туризам и омладину. Очекује се да ће увођење обавезне примене релевантне регулативе за извештавање о одрживости, која прати трендове зелене транзиције, до 2030. године омогућити да извештајна пракса о еколошким и другим одрживим перформансама заживи у хотелијерству у Србији. Ово би био први корак ка увођењу нових модела циркуларног и регенеративног одрживог пословања у хотелима у Србији.

Кључне речи: *хотели, профитабилност, економичност, еколошке перформансе, животна средина*

Introduction

Globally, awareness of the importance of environmental protection is increasing, with particular attention to issues such as ozone layer depletion, climate change, and global warming. In the tourism sector, the principles of environmentally sustainable business practices must be integrated across all tourism entities, especially hotels, which are often significant environmental polluters. Consequently, hotels should implement environmental performance management systems, adopt effective environmental policies, strategies, projects, activities, and measures for environmental preservation, and continuously monitor and analyze their outcomes. Increasing demand for the green transition has led to the evolution of hotel concepts from "eco" hotels to "green" hotels, and currently to "sustainable" and "regenerative" hotels. Large international hotel chains have recognized the significant role of environmentally sustainable business practices in enhancing operational efficiency. However, the management of many hotels does not consistently link improvements in environmental performance to business efficiency. Improvements in environmental performance are reflected in corporate image and reputation, which in turn can influence financial performance, including profitability, economic efficiency, and profits. Conversely, increasing revenues and profits over time can drive profitability growth while providing opportunities to allocate a larger portion of net profit toward investments in ecological initiatives, sustainable development, and regenerative business practices. The principles of regenerative business in the tourism sector remain a significant challenge for "green" hotels, which are expected to provide services that contribute to the revitalization and regeneration of local communities, enhance destination value, and promote economic prosperity.

The research presented in this paper is both theoretical and empirical in nature. The theoretical component reviews prior studies examining the relationship between

operational efficiency in the tourism and hospitality sector and environmental performance, environmental preservation, and the regeneration of local communities. Additionally, the theoretical research includes the systematization and analysis of documents and regulations-global, European, professional, and Serbian national-relevant to reporting on environmental and other sustainability performance indicators of hotels in Serbia. Reporting on environmental sustainability in accordance with relevant regulations, together with the establishment of systems for managing the environmental aspects of sustainable development, contributes to the preservation of the natural environment, as well as the social, cultural, and economic characteristics of tourism destinations. The empirical component assesses the level of sustainability of Serbian hotels listed on the Etic Hotels platform and identifies the dominant group-those that are more environmentally sustainable versus those that are less sustainable. The second part of the empirical research examines the impact of financial performance on key environmental performance indicators for hotels listed on the Etic Hotels platform for 2023, based on the expectation that hotels with higher profitability and cost-efficiency will exhibit superior environmental performance compared with less efficient hotels.

In line with the research objectives, the paper is organized into four main sections in addition to the introduction and conclusion: a literature review summarizing prior studies; an analysis of the conceptual and regulatory framework for reporting on environmental and other sustainability performance indicators; a description of the sample and research methodology; and the presentation and discussion of research results.

1. Literature review

In today's global economy, sustainable development and environmental responsibility have emerged as central principles of corporate operations. This is particularly evident in the tourism and hospitality sector-an industry heavily dependent on natural resources-where there is a growing need to align economic efficiency with environmental protection, specifically the ecological performance of hotels. Hotels play a key role in the green transformation process, yet they are also significant consumers of energy, water, and materials, and generators of waste and CO_2 emissions. Consequently, assessing operational efficiency alongside ecological performance has become essential for understanding hotel competitiveness and business sustainability (Bruns-Smith et al., 2015), as well as for enhancing their environmental and social impact.

Numerous studies indicate that operational efficiency contributes not only to improved financial performance but also to enhanced environmental performance in hotels. Dias et al. (2024) report that environmental certification provides hotels with multiple benefits, ranging from cost reductions and strengthened brand image to increased competitiveness. Radović et al. (2023) confirm that hotels in Serbia holding the Green Key certificate achieve higher business excellence rankings and lower risk levels. Similar conclusions were drawn by Stanišić et al. (2019), who emphasize that profitability indicators are directly linked to environmental initiatives and investments in new technologies that enhance energy efficiency and overall eco-efficiency.

In examining the determinants of operational efficiency, authors such as Agiomirgianakis et al. (2012, 2013) and Škuflić and Mlinarić (2015) emphasize the

importance of internal resources, including financial resources (sources of financing), natural resources (capitalization and size), and intangible resources (intellectual capital and innovation). The efficient use of these resources is particularly critical in the hotel industry, as hotels are characterized by a high proportion of fixed, capital-intensive costs, which require rational management and careful cost planning. Dmitrić et al. (2019) demonstrate that hotels with greater liquidity and more efficient working capital management achieve higher profitability, while Pervan and Višić (2012) emphasize that increased asset utilization contributes to higher profitability.

Operational efficiency is commonly measured using indicators such as return on assets (ROA), labor productivity, and total asset turnover ratio (Dmitrić et al., 2019; Škuflić and Mlinarić, 2015), further incorporating eco-indicators, including energy consumption per guest, waste generation per overnight stay, and the share of renewable energy sources in total consumption (Campos et al., 2024). The integration of economic and environmental indicators enables a comprehensive assessment of business performance and has emerged as a key criterion for sustainable operations in the hotel sector.

Recent literature shows a growing interest in the intersection of environmental sustainability and operational efficiency. Lin et al. (2023) and Chen (2019) analyze the efficiency of "green" hotels in the EU, indicating that investments in green technology may temporarily reduce operational efficiency, but in the long term contribute to greater value creation and enhance the hotel's reputation. Robinson et al. (2016) and Balaji et al. (2019) emphasize that hotels with environmental labels achieve higher average daily room rates and a stronger brand image, although they may experience lower occupancy rates. These findings underscore the importance of balancing economic and environmental objectives in hotel management.

In the context of Serbia, Stanišić et al. (2019) and Radović et al. (2023) confirm that hotels implementing environmental sustainability practices-including energy efficiency, recycling, and optimization of resource consumption-achieve superior outcomes in terms of cost efficiency and guest satisfaction. These findings confirm that environmental responsibility should not be regarded merely as a cost, but rather as an investment in long-term competitiveness.

Further research (Campos et al., 2024; Ekmekçi and Ersoy, 2025) indicates that the key determinants of environmental performance include fossil fuel usage, energy and water consumption, and waste management. The implementation of measures-including the adoption of renewable energy sources, optimization of resource consumption, and recycling-enables hotels to simultaneously reduce their environmental footprint and enhance operational efficiency.

The literature review suggests a significant interdependence between hotels' environmental performance and the financial outcomes of operational efficiency. Environmental performance in the hospitality industry constitutes a key aspect of sustainable business, as it enables the reduction of negative environmental impacts through the efficient management of essential resources, including energy, water, and waste. The adoption of green technologies and international certifications not only enhances the hotel's image and reputation but also facilitates cost reduction and increased profitability (Radović and Čerović, 2021; Arbelo et al., 2025). Successful implementation, however, requires a strategic approach, ongoing management education, and systematic monitoring

of sustainable development standards to prevent "greenwashing" (Legrand et al., 2017; Elhoushy et al., 2025). Although initial costs are involved, the long-term benefits are manifold, ranging from reduced operational expenses to the creation of additional value through improved resource management and the sustainable development of the tourism sector. These practices further contribute to environmental protection objectives and the promotion of green tourism, consistent with sustainable development principles (Radović and Čerović, 2021; Arbelo et al., 2025; Bruns-Smith et al., 2015).

2. Conceptual and Regulatory Framework for Reporting on Environmental Performance in Hotels in Serbia

The green transition in the tourism and hospitality sector has progressed globally from the "green" phase (late 20th to early 21st century), through the "sustainable" phase (2015–2020), to new approaches emphasizing circular and regenerative tourism and hospitality (post-2020).

The United Nations Environment Programme (UNEP) Annual Report 2024, *We are all in this together* (UNEP, 2024), indicates that countries worldwide must exhibit greater ambition and implement actions at the national level to enhance environmental performance, with business entities-including hotels-playing a central role in this process. This underscores the increasing recognition of the importance of reporting on environmental performance, both at the national level and within individual business entities.

Environmental performance reporting, as a component of non-financial performance reporting, emerged during the final decade of the 20th century (Krstić, 2022). Its purpose is to provide insight into the activities undertaken by business entities, including hotels, with the objective of balancing operational activities and their environmental impacts (Spasić, 2020). Environmental performance reporting is increasingly integrated into emerging concepts of corporate reporting, developed to complement financial reporting, including business reporting, integrated reporting, non-financial performance reporting, and sustainability reporting. Consequently, numerous international, professional, and national organizations are engaged in the adoption of guidelines and the development of regulations aimed at ensuring, directly or indirectly, that sustainability performance reporting becomes an integral component of mandatory annual reporting for business entities, including hotels.

2.1. The Concept of Sustainable Development and the Regulatory Framework for Reporting on Environmental Performance in Hotels in Serbia

By adopting the UN Agenda 2030 (UN, 2015), United Nations member states committed to implementing and achieving the 17 Sustainable Development Goals (SDGs), which are derived from the Millennium Declaration and the Millennium Development Goals 2000–2015 (UN, 2000). Sustainable development entails a long-term commitment to enhancing living conditions across the economic, social, and environmental dimensions. In implementing Agenda 2030, the UN has encouraged not only member states but also numerous international organizations, institutions, and various national actors to support the global achievement of the SDGs.

In Serbia, *documents supporting sustainable development and establishing the regulatory framework for reporting on environmental and other sustainability performance in hotels* can be classified into four levels: (a) global documentantion, (b) European documents and regulations, (c) professional regulations, and (d) national legal documents and regulations (Table 1).

Table 1: Documents and Regulatory Framework for Reporting on Environmental and Other Sustainability Performance Relevant to Hotels in Serbia

I Global documentation	
A) General Documentation:	***B) Hotel-Oriented Documentation:***
• Kyoto Protocol (1997) • GHG Protocol (2011) • Paris Agreement (2015) • Agenda 2030 (2015)	• Global Code of Ethics for Tourism (2015) • Framework Convention on Tourism Ethic (2020) • Net-zero Roadmap for Travel and Toursim (2021) • Guiding Principles for Sustainable Investment in Tourism (2025)
II European Documents and Regulations	
A) General European Documents and Regulations	***B) Hotel-Oriented Documentation:***
• European Green Deal (EGD) (2019) • EU Taxonomy (2020) • European Climate Law (2021) • Directive EU CSRD 2022/2464 (2022) • European sustainability reporting standards (ESRS) (2023) • Directive EU CSDDD 2024/1760 (2024) • Omnibus COM 81 and 80 (2025)	• European Agenda for Tourism 2030 (2022) • European Travel Commission (ETC) Strategic Framework 2030 (2022) • Urban Agenda for the EU Sustainable Tourism Partnership action plan 2024 (2024) • New EU Tourism Strategy set for release in early 2026 (2025)
III Professional Regulations	
• ISO standards of the International Organization for Standardization • GRI standards • IFRS Accounting Standards S1 i S2 (2023) • Key International standards on auditing (ISAs: 701, 706 i 720) • International standard on assurance engagements (ISAE) 3000	
IV Documents and Legal Regulations in Serbia	
• Green Agenda for the Western Balkans (2020) • Climate Change Law of Serbia (2021) • Law on Accounting (2021) • Environmental Protection Law (2024) • Toursim Development Strategy of the Republic of Serbia for the period 2016 – 2025. • Rulebook micro and other legal entities (2020) • Guidelines for non-financial reporting in Serbia (2025)	

Source: Table compiled by the authors

Global documentation consists of instruments adopted by the United Nations and other international organizations that primarily aim to initiate the development of national sustainable development strategies. The Kyoto Protocol (UN, 1997) did not succeed in establishing a foundation for sustained progress in combating climate change, thereby requiring a revised approach. Of particular relevance for measuring carbon footprints and performance related to reducing air pollution worldwide is the Greenhouse Gas

Protocol (GHG Protocol), which defines the principles and methodologies for measuring and reporting emissions across three categories: Scope 1, Scope 2, and Scope 3 (GHG Protocol, 2011). This protocol represents the most widely used methodology for GHG accounting, although it is not the sole reporting framework available. The UN Paris Agreement, drafted in 2015 and signed in 2016, is based on a voluntary commitment endorsed by countries worldwide. Agenda 2030, adopted in 2015, further reinforces the importance of sustainable development through its 17 Sustainable Development Goals (SDGs) (UN, 2015), which emphasize a long-term commitment to improving living conditions across economic, social, and environmental dimensions. For development to be sustainable, growth must be inclusive, ensuring that no one is left behind.

Global regulations relevant to hotels include documents that establish, within an international context: (a) an ethical framework (UN WCTE, 2015; UN WTO, 2020), (b) a framework for decarbonization, environmental performance measurement, and sustainability reporting (UN WTTC, 2021), and (c) a framework for investment in the tourism and hospitality sector (UN Tourism, 2025). *The 2021 Net-Zero Roadmap for Travel and Tourism* (UN WTTC, 2021) was developed by the World Travel & Tourism Council (WTTC) as a proposed target framework for the travel and tourism sector. This document outlines an action framework for decarbonization, guiding principles, key levers, and a set of potential measures for hotels.

European regulations on sustainability reporting are mandatory for EU member states, although Serbia also adopts and implements these regulations, as it does with global frameworks. Foremost among these is the European Green Deal of 2019, which aims to achieve the objectives of the Paris Agreement (European Commission, 2019). The *EU Taxonomy*, established under Regulation 2020/852, provides a classification system for environmentally sustainable economic activities, helping to mitigate the risks of greenwashing and guiding investors in directing capital toward activities essential for the green transition. The EU Taxonomy also serves as a tool for financial and non-financial entities to plan and communicate their business strategies, transition pathways, and investment or lending activities aimed at facilitating the shift to a low-carbon economy (Regulation EU 2020/852, 2020). This regulation is complemented by the European Climate Law, adopted in 2021, which legally enshrines the European Green Deal's goal for the economy and society to achieve climate neutrality by 2050. The law further establishes an intermediate target of reducing net greenhouse gas emissions by at least 55% by 2030 relative to 1990 levels (Regulation EU 2021/1119 – European Climate Law, 2021). Additionally, in 2021, the European Commission published its climate action plan, the Fit for 55 package (European Commission, 2021).

With the adoption of the EU Directive in 2022-*the Corporate Sustainability Reporting Directive* (CSRD) - sustainability reporting became formally regulated (Directive EU 2022/2464, 2022). This directive consolidates and replaces Directive EU 2013/34 on financial reporting and Directive EU 2014/95 on non-financial reporting. In 2024, the EU adopted the Corporate Sustainability Due Diligence Directive. The directive aims to ensure that companies operating within the internal market contribute to sustainable development and facilitate the transition toward a sustainable economy and society (Directive EU 2024/1760, 2024). The directive also seeks to reduce financial and administrative burdens for small and medium-sized enterprises. Between the adoption of these two directives, the European Commission published the *European Sustainability*

Reporting Standards (ESRS) in 2023. The ESRS comprise twelve standards covering reporting principles and requirements, including several focused on climate and pollution. These standards require companies listed on stock exchanges with more than 500 employees to submit their 2024 sustainability report in 2025. From 2025 onwards, the obligation to apply the standards will extend to other large companies and, beginning in 2026, to small and medium-sized enterprises.

However, the objectives set by these directives were substantially modified with the adoption of the Omnibus package of measures in 2025 (Omnibus COM 81 and 80). By raising the threshold for mandatory sustainability reporting to companies with more than 1,000 employees and an annual turnover exceeding €450 million, approximately 80% of companies were exempted from the obligation to disclose sustainability-related information (European Commission, 2025a; European Commission, 2025b). Consequently, the potential of the CSRD and CSDDD Directives to encompass a broader share of the market and supply chain was diminished. The removal of the reporting obligation for medium-sized companies, focusing solely on the largest entities, can be interpreted as a regression in promoting transparency, sustainability, and corporate accountability, which the CSRD and CSDDD Directives originally sought to enhance. In October 2025, the European Parliament rejected the negotiating mandate for the Omnibus package, which had previously been approved by the Council of the European Union in February of the same year, thereby delaying its implementation and further progress in simplifying the CSRD and CSDDD Directives (European Parliament, 2025). The next stage involves a new vote at the Plenary Session of the European Parliament, scheduled for November 2025, after which negotiations between the European Parliament, the European Commission, and the Council of the EU may commence.

European regulations addressing environmental and sustainable practices in hotels include two key agendas: the European Tourism Strategy and the European Standards for Sustainability Reporting. The European Tourism Agenda 2030 (2022) is based on the European Commission's Transition Pathway for Tourism and outlines a programme of actions to be implemented by EU member states, the European Commission, and stakeholders within the tourism ecosystem. The Urban Agenda for the EU Sustainable Tourism Partnership Action Plan 2024 provides a set of activities to be implemented specifically by EU member states, cities, and tourism entities. Together, these agendas form the foundation of the EU Tourism Strategy 2022, while the adoption of a new EU Tourism Strategy is expected in early 2026.

Professional regulation applicable to all business entities, including hotels, and related to the measurement, reporting, and verification of information on environmental and other sustainability performance includes:

- *ISO standards* of the International Organization for Standardization provide a scientific and technological foundation that supports the development of legal, environmental, safety, and health frameworks. The certification of a product or service according to an ISO standard ensures reliability, quality, and safety, thereby enhancing the confidence of users of tourism services. Within the hotel industry, the following standards are particularly significant: ISO 14001 Environmental Management System, ISO 50001 Energy Management System, ISO 9001 Quality Management System, ISO/IEC 20000-1 Service Management, among others;

- *GRI Standards* – Global Reporting Initiative (GRI) standards are the most widely adopted standards for sustainability reporting in the hospitality industry. The first version of the standard was published in 2016, and a revised version was released in 2021, now consisting of *universal standards, thematic standards*, and *sector-specific standards*;
- *Accounting standards* – The IFRS Foundation, in cooperation with the International Accounting Standards Board (IASB) and the International Sustainability Standards Board (ISSB), has developed two standards: IFRS S1 – *General Requirements for Disclosure of Sustainability-related Financial Information*, and IFRS S2 – *Climate-related Disclosures*.
- *Auditing standards* – The key International Standards on Auditing (ISAs), which facilitate external verification of environmental and other sustainability-related performance information and have been adopted by the International Auditing and Assurance Standards Board (IAASB), include: ISA 701 – *Communicating Key Audit Matters in the Independent Auditor's Report*; ISA 706 – *Emphasis of Matter Paragraphs and Other Matter Paragraphs in the Independent Auditor's Report*; and ISA 720 – *The Auditor's Responsibilities Relating to Other Information in Documents Containing Audited Financial Statements*. Additionally, the International Standard on Assurance Engagements (ISAE) 3000 – *Assurance Engagements Other Than Audits or Reviews of Historical Financial Information* – is also relevant for verifying sustainability-related information

In Serbia, global and European documents and regulations have served as the foundation for adopting national laws and strategies related to environmental sustainability, as well as for reporting by business entities on environmental and other sustainability performance. The Green Agenda for the Western Balkans, signed in 2020, represents a regional development strategy designed to assist Western Balkan countries in addressing the challenges of climate change and the green transition, and to align national environmental regulations with European standards and norms. The Agenda defines five priority areas requiring action from Western Balkan countries: 1) decarbonization, 2) circular economy, 3) combating water, air, and soil pollution, 4) sustainable food production, and 5) biodiversity, including the protection and restoration of natural ecosystems (Green Agenda for the Western Balkans, 2020). The Tourism Development Strategy 2016–2025 encompasses an analysis of the current state and level of tourism development, a comparative assessment of tourism in competitor countries, an evaluation of strengths and weaknesses in the tourism sector, a business mission, vision, and development objectives, the identification of priority tourism products, a proposal of key tourist destinations, an assessment of impacts on cultural heritage and natural resources, and a proposal for a comprehensive tourism development policy. Regarding environmental sustainability, Serbia has adopted the Law on Climate Change 2021 (Sl. glasnik RS, 26/2021) and the Law on Environmental Protection 2024 (Sl. glasnik RS, 135/2004, 36/2009, 72/2009, 43/2011, 14/2016, 76/2018, 95/2018, and 94/2024).

Also, the Law on Accounting (Sl. glasnik RS, 73/2019 and 44/2021) introduces the obligation to report on sustainable development for large entities, which includes large hotels with more than 500 employees. An exception to the obligation to disclose

non-financial information is provided to dependent legal entities that are included in the parent company's consolidated annual report. Also, if they want, small and medium-sized entities, including hotels, can compile a report on sustainable development on a voluntary basis. Micro legal entities apply the by-law issued by the minister in charge of finance - Rulebook on the method of recognition, valuation, presentation, and disclosure of positions in individual financial reports of micro and other legal entities (Rulebook micro and other legal entities) (Sl. glasnik RS, 89/2020). In October 2025, the Ministry of Finance issued an Explanation regarding the guidelines for non-financial reporting in Serbia (https://www.mfin.gov.rs/upload/media/kQoEF9_691ed576a394b.pdf), which is a starting point for improving sustainability reporting and aligning with ESRS. The guidelines do not have a binding character, but they are a recommendation for entities for use in order to facilitate the transition to the mandatory reporting model adopted by the European Commission and support for improving the quality, clarity and relevance of the disclosure of non-financial information.

Although Serbia currently lacks an officially adopted Environmental Protection Strategy, the Ministry of Environmental Protection published a draft version in September 2024, covering the period 2024–2033 and referred to as the Green Agenda of the Republic of Serbia. Large business entities in Serbia, including hotels, most frequently report on sustainable development in accordance with global professional standards (GRI Standards) or accounting standards (IFRS S1 and S2), while also considering the requirements of European directives.

The CSRD (EU 2022/2464) obliges large companies to report on sustainable development beginning with the 2025 fiscal year, while listed small and medium-sized enterprises (SMEs) with fewer than 250 employees are required to comply starting in the 2026 fiscal year. In contrast, the CSDDD (EU 2024/1760) alleviates financial and administrative burdens for SMEs while establishing mandatory due diligence for all reporting entities to prevent and remediate adverse impacts on human rights and the environment.

The Omnibus package of measures from February 2025 (Omnibus COM (2025) 81 and 80) exempts 80% of enterprises from the obligation to report on sustainable development under the EU CSRD (2022/2464) by postponing the reporting requirement for companies scheduled to begin reporting in 2026 or 2027, namely small and medium-sized enterprises (SMEs). Additionally, the package introduces the concept of dual materiality for taxonomy reporting. Consequently, its temporary postponement in October 2025 has added further complexity to the implementation of sustainability reporting obligations in both the EU and Serbia.

2.2. Circularity and Regenerativity: Emerging Approaches to Sustainable Business in the Serbian Hospitality Industry, where Sustainable Development Reporting is Imperative

The circular economy is closely associated with the sustainable economy model (Goss et al., 2024). It constitutes an economic system in which production resources, waste, emissions, and energy outflows are significantly minimized by slowing, closing, and extending energy and material cycles throughout production processes (life cycles). Within a circular economy, emphasis is placed on innovative thinking across all stages of production and service delivery (design thinking), systems thinking, prolonging product lifespans, and recycling. This is

achieved primarily through product design that maximizes longevity, as well as through maintenance, servicing, and end-of-life recycling. When a product reaches the end of its life, its constituent materials continue to circulate through recycling. The EU aims to establish a circular and climate-neutral economy by 2050, which has prompted the introduction of a range of regulations in recent years, including ecodesign requirements and the right to repair. Numerous plans, strategies, directives, and regulations have been adopted across EU countries to facilitate the transition to a circular economy (see Table 7), and these measures are also monitored by Serbia. This framework clearly demonstrates that reporting on sustainable performance is an essential component of circular economy development, including within the hotel industry.

Table 2: Documents and regulations in the EU related to the circular economy

Plans and frameworks:	***Strategies:***
• Circular action plan (2015, 2020) • Clean Energy For All Europeans (2016) • A New Industrial Strategu for Europe (2020) • Beating cancer plan (2020) • Hydrogen strategy (2020) • Pharmaceuticals strategy for Europe (2020) • EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil' (2021) • Circular economy Monitoring framework (2018, 2023) • Consultation on Circular Economy Act (2025)	• Plastics strategy (2018) • Pharmaceuticals strategy for Europe (2020) • EU's chemicals strategy for sustainability (2020) • EU's biodiversity strategy for 2030 (2020) • European industrial strategy (2021) • EU strategy for sustainable and circular textiles (2022) • European Agenda for Tourism 2030 (2022) • AI Strategy plan (2025)
Laws:	
Nature Restoration Law (2024)	
Directives:	***Regulations:***
• Directive (EU) 2018/851 on Waste Framework directive • Directive (EU) 2018/852 on packaging and packaging waste • Directive (EU) 2019/904 on the reduction of the impact of certain plastic products on the environment • Directive (EU) 2023/2413 for promotion of energy from renewable sources • Delegated Directive (EU) 2023/544 amends the ELV (End-of-Life Vehicle) Directive 2000/53 as regards the exemptions for the use of lead in aluminium alloys for machining purposes, in copper alloys and in certain batteries • Directive (EU) 2024/825 Green Claims Directive for empowering consumers for the green transition through better protection against unfair practices and through better information • Directive (EU) 2024/1799 on repair of goods	• Regulation (EU) 2018/858 New End-of-Life Vehicle Regulation • Regulation (EU) 2023/1542 Batteries Regulation (2023) • Regulation (EU) 2023/2055 - EU microplastics restriction (2023) • Regulation (EU) 2024/1157 on shipments of waste (2024) • Regulation (EU) 2024/1781 a framework for the setting of ecodesign requirements for sustainable products (ESPR) (2024) • Regulation (EU) 2025/40 on packaging and packaging waste (2025)

Source: Table compiled by the authors

The Circular Economy Package in the EU was adopted with the objectives of enhancing global competitiveness, promoting sustainable economic growth, and creating new employment opportunities. It comprises two EU action plans for the circular economy (2015 and 2020), encompassing measures across the entire life cycle of products, from production and consumption to waste management and the market for secondary raw materials. Building on the 2015 Circular Economy Action Plan, the 2020 Circular Economy Action Plan (CEAP II) focuses on resource-intensive sectors with high potential for circularity, including tourism and hospitality. The plan aims to retain resources within economic cycles for as long as possible and address key product value chains, including electronics and information and communication technologies (ICT), batteries and vehicles, packaging, plastics, textiles, and food. The circular economy model is designed to minimize the use of natural resources and energy while reducing waste generation, pollution, and other negative environmental impacts. These action plans have served as the foundation for the adoption of numerous strategies, laws, directives, and regulations within the EU, providing detailed guidance to member states for the development of a circular economy.

In the context of Serbia's transition to a circular economy, the Roadmap for Circular Economy in Serbia 2020 was adopted, identifying the following priority sectors: (a) manufacturing, (b) agriculture and food, (c) plastics and packaging, and (d) construction. Tourism and hospitality were not included among the priority sectors. Several related strategies have also been adopted, including the Energy Development Strategy of the Republic of Serbia until 2025 with projections until 2030 (2015), the Sustainable Urban Development Strategy of the Republic of Serbia until 2030 (2019), and the Industrial Development Strategy of the Republic of Serbia for the period 2021–2030 (2020). The Waste Management Act was adopted in 2023. Public consultations on the Circular Economy Law commenced in 2025, with the adoption of this significant legislation expected in 2026. This indicates that the development of a circular economy in Serbia is still in progress.

With the adoption of the New Urban Agenda 2016 (UN, 2016) and related documents, the circular economy evolved into a demand for a regenerative sustainable economy, focusing not only on reducing environmental pollution but also on restoring and enhancing natural resources and ecosystems, promoting social equity, and supporting economic vitality (Čegar et al., 2014). The regenerative economic model aims to overcome the extractive nature of traditional capitalism - focused on profit maximization - and instead, prioritizes resource replenishment, environmental preservation, and the well-being of communities. A central component of this model is systemic thinking, circularity, and an integrative approach that balances environmental, social, and economic factors in the delivery of production and services.

Viewed through the lens of the regenerative economy, the hotel industry has emerged as a critical sector that prioritizes the restoration and enhancement of natural ecosystems, promotes social equity, and fosters long-term economic sustainability. According to Kohut et al. (2024), the principles of the regenerative economy that can be applied in the hotel industry include the following:

a) Systems thinking, which requires a holistic perspective that recognizes the interconnectedness of environmental, social, and economic systems. This approach encourages long-term, sustainable, and resilient business practices

rather than short-term profit maximization.

b) Circularity: In the hotel industry, circularity involves minimizing waste, utilizing renewable energy sources, reducing environmental degradation and pollution, maximizing resource efficiency, leveraging digital technologies, fostering collaboration, and networking among stakeholders, and promoting the reuse and recycling of resources.
c) Equity and inclusiveness: These principles aim to reduce inequalities by promoting social inclusion and ensuring that the benefits of regeneration reach all segments of society, particularly vulnerable and marginalized communities.
d) Regenerative hospitality practices: These practices not only aim to prevent harm but also actively seek to regenerate ecosystems and resources, thereby enhancing natural and social capital over time.

The development of a regenerative hotel industry in accordance with the principles of regenerative sustainable development remains in its early stages and is still a novel concept within Serbian hotel practice. Even hotels in Serbia that belong to large international chains-such as the Radisson Collection Old Mill, IN Hotel, Hilton, and Radisson Red Arena-although holding Green Key and other relevant certifications, have not yet fully met the requirements of circular and regenerative sustainable development. Circular and regenerative practices in the hotel industry primarily involve the adoption and implementation of appropriate regulatory frameworks, including regulations for reporting environmental and other performance metrics, as well as innovative business approaches and collaboration with local communities. To date, hotels in Serbia have not fully achieved the fundamental prerequisites necessary for the implementation of regenerative sustainable practices.

3. Sample Description and Research Methodology

The aim of this paper is twofold: (a) to determine whether the Etic hotels website (https://etichotels.com) is dominated by hotels from Serbia with higher or lower key environmental performance, as measured by carbon footprint and Etic green score, and (b) to examine the impact of financial performances, including profitability and cost-efficiency performance, on the key environmental performance of Serbian hotels that report on environmental sustainability. In accordance with the aim of this research, the following hypotheses were formulated:

H1: The Etic Hotels website is dominated by hotels in Serbia with higher key environmental performance.

H2: Financial performance, including profitability and cost-effectiveness, has a positive impact on the carbon footprint (Model 1)

H2/a: Profitability performance (ROA and ROE) has a positive impact on the carbon footprint.

H2/b: Cost-efficiency performance (total cost-efficiency - TCE and operating cost-efficiency - OPE) has a positive impact on the carbon footprint.

H3: Financial performance (profitability and cost-efficiency performance) has a positive impact on the etic green score (Model 2).

H3/a: Profitability performance (ROA and ROE) has a positive impact on the etic green score.

H3/b: Cost-efficiency performance (total cost-efficiency (TCE) and operating cost-efficiency - OPE) has a positive impact on the etic green score.

Return on Assets (ROA) is calculated by dividing operating income by total assets. Return on Equity (ROE) is calculated by dividing net income by shareholders' equity. Total cost-efficiency (TCE) is ratio total revenues to total expenditures (costs). Operating cost-efficiency (OPE) is ratio operating revenues to operating expenditures (costs). The research utilized secondary data for 2023 obtained from the Etic Hotels website, from the websites of individual hotels regarding their key environmental performance, and from the financial statements of hotels for 2023 available on the website of the Business Registers Agency (https://pretraga.apr.gov.rs/).

On the website of Etic hotels ETIC, hotels that have aligned their operations with the Hotels Green Standard (EHGS) are promoted. The EHGS was established to ensure responsible and sustainable travel. Etic Hotels is an online platform that leverages artificial intelligence and machine learning to systematically analyze large volumes of publicly available hotel data worldwide, enabling tourists to make informed and responsible decisions. The EHGS certification process constitutes a structured assessment of the sustainability performance of travel and tourism businesses and their supply chain partners. Hotels can monitor improvements and document achievements that contribute to sustainability certification and effective hotel management. The EHGS comprises 44 core criteria and more than 380 indicators of compliance. Applicable indicators vary depending on the type of certification, geographical region, and local factors. The standard is updated biannually. The EHGS is harmonized with other internationally recognized sustainability certification programs. This harmonization process ensures the maintenance of fundamental criteria while simultaneously addressing regional issues through the adoption of locally developed standards.

The EHGS is founded on four certification pillars aligned with etic, environmental, and social values. The first pillar addresses the environment and evaluates the hotel's commitment to conserving resources, minimizing environmental impact, and prioritizing energy-saving practices. The second pillar focuses on social responsibility, aiming to empower local communities through fair trade, labor law compliance, and community engagement. This pillar ensures that hotels contribute to local economic development, promote cultural preservation, and uphold etic treatment of their workforce. The third pillar focuses on cultural heritage and site protection, thereby advocating for cultural diversity and preservation. The fourth pillar, of particular significance, relates to sustainable management and evaluates the hotel's adherence to sustainable management systems, health and safety standards, legal compliance, employee training, and high-quality customer experiences. Collectively, the pillars of the Etic Hotels Green Standard allow tourists to participate in the green transition within the tourism industry by selecting EHGS-certified accommodations.

The selection of hotels from Serbia for the Etic Hotels survey was based on key environmental performance metrics: carbon footprint and etic green score.

The ETIC Green Standard incorporates the methodology for calculating the carbon footprint of a hotel stay. The carbon footprint associated with a stay is determined using

the Cornell Hotel Sustainability Benchmark Index and the most recent greenhouse gas (GHG) conversion factors published by the UK government in 2022. This methodology provides accurate information regarding the environmental impact of tourist stays at hotels. At the core of the methodology is an algorithm that considers several parameters, including country of stay (region or city), hotel rating, number of rooms occupied, and duration of the visit. Using this approach, an accurate estimate of the carbon footprint generated by a tourist's hotel stay can be obtained. With reliable information on the carbon footprint of a hotel visit, tourists can make informed decisions consistent with their values and contribute to a greener future. Hotels on the Etic Hotels website are classified according to the following certification levels:

1. Gold – with a Etic Green Score of 8.0 or higher (8–10)
2. Silver – with a Etic Green Score of at least 6.0 (6–8)
3. Bronze – with a Etic Green Score below 6.0 (4–6).

Additionally, the selection of hotels from Serbia on the Etic Hotels website was also based on the carbon footprint, an environmental performance metric that allows travelers to choose accommodations aligned with values promoting a more sustainable future. Hotels on the Etic Hotels website are ranked according to their carbon footprint across four levels:

- Carbon footprint level 0–20 tCO2
- Carbon footprint level 20–30 tCO2
- Carbon footprint level 30–40 tCO2
- Carbon footprint level 40–50 tCO2

Hotels from Serbia with environmental performance corresponding to a Silver certification of the Etic Green Score (6–8) and a carbon footprint level of 0–20 tCO2 O_2 were selected for the study. The final sample comprises 47 hotels implementing environmental sustainability practices in Serbia (Table 3)[5].

Table 3: List of hotels in the research sample

No	Green Hotels	Environmental Performance		Financial Performance			
				Profitability Performance		Cost- Efficiency Performance	
		Carbon footprint (kgCO2e)[6]	Etic Green Score (/10)	ROA (%)	ROE (%)	TCE	OPE
	Hotel Radisson Collection Old Mill	13,70	5,40	1,65	/	0,96	1,22
	IN Hotel	13,82	6,10	24,06	21,29	1,53	1,54
	Hotel Mona	13,19	5,90	7,42	11,64	1,20	1,34
	Hotel Hilton	15,39	6,10	7,72	42,10	1,17	1,29
	Hotel Mercure Excelsior	14,43	5,60	6,10	4,45	1,14	1,18
	Radisson Red Arena hotel	/	/	/	/	0,12	0,14
	Crowne Plaza Delta Hospitality	15,68	5,80	5,19	3,89	1,07	1,31

[5] The initial sample comprised 67 hotels, as listed on the Etic Hotels website. Of these, 20 hotels were excluded from the analysis due to the unavailability of the required 2023 financial statements, namely the balance sheet and income statement.

[6] On the Etic Hotels website, the carbon footprint is reported in tCO2, whereas on the individual websites of the selected hotels it is reported in kgCO2e (kilograms of carbon dioxide equivalent).

Hotel Indigo Profileonplus doo	13,76	6,10	5,00	4,48	1,26	1,51
Courtyard Bg. City Center by Marriott	13,37	5,40	5,02	5,42	1,02	1,02
Belgrade Art Hotel	13,23	6,10	5,33	5,82	1,11	1,11
Garni Hotel Royal Crown	13,74	6,10	6,30	5,53	1,04	1,04
Hotel Ema	15,65	6	8,28	/	1,00	1,00
Aveny	13,27	6,4	12,55	23,57	1,17	1,17
Hotel Helvetia	14,41	6,2	/	/	0,99	0,99
Sky hotel Belgrade	12,97	6,6	4,44	4,83%	1,09	1,09
Mark Hotel Belgrade	12,96	6,1	/	33,89	1,05	1,05
Mama Shelter Belgrade	15,25	6,6	16,69	77,99	1,03	1,03
Abba Hotel	15,58	6,2	4,05	12,53	1,11	1,11
Hotel Tesla Smart Stay	13,2	6	23,63	59,52	1,12	1,12
88 Rooms Hotel	14,65	6	/	/	0,12	0,12
Golden Tulip Zira Belgrade	13,22	6,6	2,43	295,12	1,01	1,01
Square Nine Hotel	15,39	6	1,56	2,85	1,09	1,09
Saint Ten Hotel	14,78	6,4	14,81	22,61	1,21	1,21
Hotel Moskva Belgrade	13,83	6	5,44	14,56	1,38	1,38
Envoy Hotel	15,67	6,2	7,06	21,78	1,04	1,04
Xenon	14,06	6,2	24,50	24,50	1,23	1,23
Heritage Hotel	15,38	6,6	24,50	24,50	1,23	1,23
Euro Garni Hotel	12,93	6,2	5,90	6,27	1,14	1,14
Hotel M Beograd	14,1	6,4	5,56	4,96	1,14	1,14
Hotel Prag	15,23	6,1	9,77	9,58	1,16	1,16
Nova City Hotel Signature Collection	14,64	6,6	23,57	70,73	1,20	1,20
Sterling Hotel	14,26	6,4	3,15	/	1,00	1,00
Zepter Hotel Vrnjacka Banja	14,35	6,1	9,80	/	1,01	1,01
Grey Hotel Kopaonik	14,52	6,4	/	/	0,45	0,45
Viceroy Kopaonik	14,03	6,9	/	/	0,59	0,59
Ambasador Hotel	14,7	6,1	7,16	9,33	1,11	1,11
Centar Hotel	15,01	6,2	62,64	58,35	1,45	1,45
Hotel Leopold I	14,15	6,2	/	486,08	2,30	2,30
Hotel ABC	13,38	6,6	17,99	29,26	1,12	1,12
Hotel Putnik	13,42	6,2	/	0,05	0,57	0,57
Hotel Prezident	13,35	6,1	/	/	0,99	0,99
Hotel Palisad	13,13	6,5	2,04	0,91	1,03	1,03
Hotel Mir	13,2	6,1	2,38	2,06	1,05	1,05
Hotel Srbija Lux	15,57	6,2	25,02	35,88	1,05	1,05
Mona Plaza	13,46	6	2,75	0,10	1,03	1,03
Hotel Olimp	13,09	6,8	/	22,10	1,57	1,57
Hotel Iris	13,52	6,1	3,22	3,15	1,11	1,11

Source: Table compiled by the authors

Considering the aim of the research and the significance of the relationship between financial performance and environmental outcomes, this paper applies methodological

procedures typical of the social sciences and a systematic analysis of the research problem. To achieve the stated research objectives and test the proposed hypotheses, the following methods are employed:

a) Cluster analysis – Hotels in Serbia were grouped into two clusters (more environmentally sustainable "green" hotels and less environmentally sustainable "red" hotels) based on their environmental performance, thereby testing Hypothesis H1.

b) Multiple linear regression – This method was employed to examine the impact of financial performance (profitability and cost-efficiency rations) on environmental performance, thus testing Hypotheses H2 and H3.

All analyses were conducted using the STATASe 13 software package.

4. Research Results and Discussion

Cluster analysis is a method in which units are grouped according to similarity, ensuring that units within a cluster are as similar as possible while units in different clusters are as distinct as possible. Grouping is based on the values of multiple variables for each observation unit. There are two main types: hierarchical, in which a dendrogram is generated based on the calculated distances between units to provide a graphical representation of the similarity structure, and non-hierarchical, in which the number of clusters is predetermined and units are iteratively assigned to cluster centers until the distribution stabilizes. The hierarchical approach thus emphasizes structural representation, whereas the non-hierarchical approach allows a more flexible formation of a finite number of clusters (Newbold et al., 2010).

Prior to conducting cluster analysis, it is essential to assess the degree of correlation among the observed variables (Table 3). When a high correlation exists between the indicators, data normalization and careful selection of the clustering method are justified.

Table 3: Pearson's correlation coefficient for selected variables

	Carbon Footprint ($kgCO_2e$)	Etic Green Score (/10)	ROA	ROE	TCE	OPE
Carbon Footprint ($kgCO_2e$)	1,0000					
Etic Green Score (/10)	0,142 (0,346)	1,0000				
ROA	0,094 (0,578)	-0,170 (0,314)	1,0000			
ROE	0,076 (0,655)	-0,166 (0,326)	0,149 (0,409)	1,0000		
TCE	-0,019 (0,900)	0,114 (0,450)	0,590** (0,0000)	0,623** (0,0000)	1,0000	
OPE	0,006 (0,966)	0,249*** (0,095)	0,408* (0,012)	0,577** (0,0000)	0,981** (0,0000)	1,0000

Note: The p-value of the (), *Correlation is significant at the 0,01 level, **Correlation is significant at the 0,05, ***Correlation is significant at the 0,1

Source: Author's calculation in StataSe 13

The correlation analysis results indicate that there is no interdependence between the profitability performance indicators (ROA and ROE) and the carbon footprint, nor between the cost-effectiveness performance indicators (TCE and OPE) and the carbon footprint. Similarly, no correlation was observed between profitability performance indicators (ROA and ROE) and the Etic Green Score, whereas a slight correlation exists between financial performance indicators at a 10% significance level, suggesting the presence of environmental practices in the surveyed hotels. When examined together, the indicators of profitability performance and business economy performance exhibit a strong and statistically significant interdependence.

The next step of the research involved conducting cluster analysis to group hotels based on their Carbon Footprint and Etic Green Score. This approach allows for the identification of homogeneous groups of hotels that differ in environmental performance, providing a foundation for more detailed analysis of their characteristics and insights into the relationship between business efficiency and environmental sustainability. The optimal number of clusters was determined using a non-hierarchical cluster analysis (K-means method). The results of the 2023 K-means cluster analysis indicate that hotels were grouped into two clearly differentiated clusters according to their level of environmental sustainability. The first cluster, representing more environmentally sustainable ("green") hotels in Serbia, includes 39 out of the 47 hotels in the sample and is characterized by a carbon footprint below the average value (≈14.14 kgCO2 e) and an Etic Green Score above the average value (≈6.19/10). The second cluster, representing less environmentally sustainable ("red") hotels in Serbia, includes 8 hotels with environmental performance below average, specifically a carbon footprint above the average value and an Etic Green Score below the average value. Accordingly, the optimal carbon footprint values for cluster classification are approximately 14 for the Carbon Footprint and 6 for the Etic Green Score, which distinguish "green" hotels from "red" hotels. In accordance with this:

- *The first cluster of more environmentally sustainable ("green") hotels in Serbia comprises the following establishments:* IN Hotel, Hotel Mona, Hotel Hilton, Hotel Mercure Excelsior, Radisson Red Arena hotel, Crowne Plaza Delta Hospitality, Hotel Indigo Profileonplus doo, Courtyard Belgrade City Center by Marriott, Belgrade Art Hotel, Garni Hotel Royal Crown, Hotel Ema, Aveny, Hotel Helvetia, Sky hotel Belgrade, Mark Hotel Belgrade, Mama Shelter Belgrade, Abba Hotel, Hotel Tesla Smart Stay, 88 Rooms Hotel, Golden Tulip Zira Belgrade, Hotel Moskva Belgrade, Envoy Hotel, Xenon, Heritage Hotel, Euro Garni Hotel, Hotel M Beograd, Hotel Prag, Nova City Hotel Signature Collection, Sterling Hotel, Zepter Hotel Vrnjacka Banja, Grey Hotel Kopaonik, Centar Hotel, Hotel ABC, Hotel Putnik, Hotel Prezident, Hotel Palisad, Hotel Mir, Hotel Srbija Lux, Mona Plaza, Hotel Olimp, Hotel Iris and
- *The second cluster of less environmentally sustainable ("red") hotels in Serbia comprises the following establishments:* Hotel Radisson, Collection Old Mill, Square Nine Hotel, Saint Ten Hotel, Viceroy Kopaonik, Ambasador Hotel and Hotel Leopold I.

The results support Hypothesis H1, indicating that the Etic Hotels website is predominantly composed of hotels from Serbia with superior key environmental

performance, reflecting their commitment to sustainable business practices and the mitigation of negative environmental impacts.

Following the formation of clusters, multiple linear regression was conducted to examine the impact of financial performance (profitability and economic performance) on environmental performance, thereby testing Hypotheses H2 and H3, as well as their sub-hypotheses (H2/a, H2/b, H3/a, and H3/b). Prior to the analysis of the regression results, Table 4 presents descriptive statistics for the selected variables to illustrate their characteristics. For this purpose, the following descriptive measures were calculated: arithmetic mean, standard deviation, minimum, and maximum values.

Table 4: Descriptive statistics of selected variables

Variable	N	Mean	Standard deviation	Minimum	Maximum
Carbon Footprint ($kgCO_2e$)	46	14,14391	0,892797	12,93	15,68
Etic Green Score (/10)	46	6,193478	0,3108427	5,4	6,9
ROA	37	0,1093787	0,1158804	0,0155546	0,6263546
ROE	37	0,3950517	0,902701	0,0005389	4,860833
TCE	47	1,076351	0,3338472	0,1240874	2,304839
OPE	47	1,098894	0,3425178	0,1240874	2,304839

Source: Calculation of authors in the software package StataSe 13

The descriptive statistics presented in Table 4 indicate notable differences among the observed variables, both in terms of mean values and the range and variability of the results. The Carbon Footprint averages 14.14 kgCO2e, with a relatively low variability (SD = 0.892797), indicating a stable series with minor fluctuations, as confirmed by the difference between the minimum and maximum values (2.75). The Etic Green Score averages 6.19/10, with relatively low variability (SD = 0.3108427), indicating a stable series with minor fluctuations, as reflected by the difference between the minimum and maximum values (1.5).

Regarding financial ratios, the ROA averages 10.94% with a standard deviation of 0.11 and a range of 1 to 62%. ROE averages 39% with a standard deviation of 0.902701 and a wide range of 0.0005 to 4.860, indicating the existence of some "green" hotels with exceptionally high ROE values. TCE and OPE exhibit very similar results, with averages values of 1.07 and 1.09 and comparable standard deviations (0.3338472 and 0.3425178), with both variables sharing the same range of 0.12 to 2.30, confirming their correlation and near-identical trends. These results indicate that, within the sample of 47 "green" hotels, hotels with stable environmental performance but marked heterogeneity in financial performance can be clearly distinguished.

Model validation was conducted using diagnostic tests for heteroscedasticity, autocorrelation, and multicollinearity. Heteroscedasticity was assessed using the Breusch-Pagan test, which examines whether the variance of residuals varies across countries or over time. Multicollinearity was evaluated using the Variance Inflation Factor (VIF), which identifies high correlations among independent variables that could compromise the reliability of the estimates, while the normality of the data was tested using the Shapiro-Willk test. The results of these diagnostic tests are presented in Table 5.

Table 5: Results of tests to verify the validity of the model

Test	p-value		Conclusion	
	Model 1	*Model 2*	*Model 1*	*Model 2*
Breusch -Pagan	0,9230	0,7926	There is no heteroscedasticity	There is no heteroscedasticity
VIF	3,94	3,94	No serious multicollinearity	No serious multicollinearity
Shapiro-Wilk W test for normal data	0,03399	0,03399	There is a problem of data normality	There is a problem of data normality

Source: Calculation of authors in the software package StataSe 13

To address the issue of data normality, Driscoll-Kraay standard errors were employed. The results are presented in Table 6.

Tabela 6: Results of linear regression analysis

Model 1 (ROA, ROE, TCE, OPE → Carbon)		*Model 2* (ROA, ROE, TCE, OPE → Etic)	
Independent variable	**Dependent variable** (Carbon)	**Independent variable**	**Dependent Variable** (Etic)
Constant	2,730913	Constant	1,857317
ROA	0,0234474 (0,314)	*ROA*	0,0004112 (0,963)
ROE	0,005879 (0,517)	*ROE*	0,0115826 (0,010)
TCE	-0,3831221 (0,171)	*TCE*	0,2099387 (0,082)
OPE	0,2807515 (0,238)	*OPE*	-0,2479564 (0,026)
Prob > F	0,1430	Prob >F	0,0118

Source: Calculation of authors in the software package StataSe 13

The results of the regression analysis, with the carbon footprint specified as the dependent variable (Model 1), indicate that none of the analyzed financial indicators exerts a statistically significant effect. Specifically:

- ROA ($\beta = 0.023$; $p = 0.314$), and ROE ($\beta = 0.0058$; $p = 0.517$), do not have a significant effect on the carbon footprint, indicating that *the H2/a hypothesis is not supported***.**
- TCE ($\beta = -0.383$; $p = 0.171$) and OPE ($\beta = 0.281$; $p = 0.238$) also do not have a significant impact on the carbon footprint, suggesting that *the H2/b hypothesis is not supported.*
- The overall model result (Prob > F = 0.1430) confirms that the model is not statistically significant, implying that the variability of the hotels' carbon footprint is not explained by their financial performance.
- These findings suggest that the financial performance of hotels operates independently of their environmental performance in terms of carbon dioxide

emissions. This may be attributed to limited commitment to implementing regulatory frameworks for greenhouse gas reduction, partial adoption of standardized energy efficiency measures, or the perception that CO_2 emissions are not yet considered a key indicator of business success in the hotel industry.

- Therefore, it can be concluded that *the H2 hypothesis is not supported.*

In contrast, in Model 2, where the Etic Green Score is specified as the dependent variable, the results indicate that the model is statistically significant (Prob > F = 0.0118). Specifically:

- A notable result is the positive and statistically significant effect of ROE (β = 0.0116; p = 0.010) on the Etic Green Score, indicating that "green" hotels with a higher return on equity tend to achieve higher Etic Green Scores a 1% increase in ROE corresponds to an increase of 0.012% in the Etic Green Score). ROA in the model is not statistically significant (p > 0.05). Therefore, *the H3/a hypothesis is partially supported.*
- OPE exhibits a negative but statistically significant effect (β = - 0.248; p = 0.026), whereas TCE demonstrates a positive effect at the 10% significance level (β = 0.210; p = 0.082). Accordingly, the *H3/b hypothesis is partially supported.*
- The results indicate that sustainability, as measured by the Etic Green Score, is primarily influenced by profitability, whereas excessive focus on business economy may conflict with environmental and ethical practices. This indicates that financially stronger hotels have greater capacity to invest in sustainable and ethical initiatives, but a strong emphasis on cost reduction may limit the adoption of green practices, as short-term efficiency is prioritized over long-term sustainability.
- It can be concluded that *the H3 hypothesis is partially supported.*

Based on the regression analysis, it can be concluded that a hotel's financial performance does not significantly influence its carbon footprint, indicating that carbon dioxide emissions are not associated with profitability or cost-effectiveness. This suggests that financial and environmental CO2 objectives operate independently, likely due to insufficient commitment by hotels to implement regulatory frameworks aimed at reducing greenhouse gas emissions and applying energy efficiency measures within the hotel sector. However, the analysis reveals a significant positive relationship between profitability performance (ROE) and the Etic Green Score, indicating that more profitable hotels possess greater capacity and willingness to implement environmentally and ethically responsible initiatives. Although financial performance does not account for variations in the carbon footprint, it remains relevant for promoting sustainable and ethical practices in the hotel industry. The results further indicate that hotels in Serbia must prioritize the achievement of positive environmental and social outcomes alongside profit and financial performance in long-term management strategies.

Conclusion

Considering the imperative requirements for the development of circular and regenerative sustainability in the hotel industry, the results of this study can be interpreted as moderately unsatisfactory. The research indicates that hotels in Serbia report key environmental performance data on the Etic Hotels website. Testing of H1 revealed no statistically significant effect of profitability performance (ROA and ROE) or cost-efficiency (TCE and OPE) on the carbon footprint. This finding is concerning for Serbian hotels, as it would be expected that hotels with higher profitability and superior business efficiency would invest more in environmental performance, thereby reducing their carbon footprint. Testing of H2 demonstrated a statistically significant positive effect of ROE, a statistically significant negative effect of OPE, and a marginally significant positive effect of TCE on the Etic Green Score, whereas ROA did not have a significant impact. These results suggest that higher ROE holders can positively influence the Etic Green Score, reflecting their interest in supporting environmentally responsible initiatives. TCE also exhibits a positive effect on the Etic Green Score at the threshold of statistical significance, while OPE generated through hotel operations shows a negative statistical effect.

These findings suggest that hotels in Serbia have not yet developed adequate models of circular and regenerative business. The current importance of regenerativity in the hotel industry requires the translation of regenerative economy principles into practical regenerative applications within the sector. Regenerative practices in the hospitality industry should be built on: (a) a regulatory framework established by the Government of Serbia that promotes regenerative business practices, including the encouragement of renewable energy use, the implementation of stricter environmental standards, and the adoption of circular business models; (b) innovation across business operations, supply chains, and service delivery to align with regenerative principles, such as the utilization of renewable energy, the design of products for durability and recyclability, and the development of business models emphasizing services rather than ownership; and (c) collaboration with local communities to co-create shared visions and locally tailored, sustainable solutions. The key challenges to achieving regenerative hospitality in Serbia include the need for changes in stakeholder behavior, the transition from linear to circular business models, and potential resistance stemming from established business practices. Nevertheless, the hospitality industry also presents significant opportunities, including fostering innovation, conserving natural resources, and contributing to the development of more equitable societies.

The primary limitation of this study lies in the collection of data required to calculate business efficiency performance, as obtaining financial statements from all hotels registered with APR proved challenging, particularly for hotels operating as branches without a legal obligation to publish financial statements. Consequently, the sample of monitored hotels (47) was smaller than the total number of hotels listed on the Etic Hotels website (67). Furthermore, the study is cross-sectional, including only data for 2023, which limits its analytical depth. Additionally, the sample comprises only hotels listed on the Etic Hotels website, whereas the competent Ministry of Tourism reports a total of 441 hotels in Serbia. Therefore, the results for 2023 cannot be generalized to the entire hotel population in Serbia. Considering that only large hotels are currently

required to prepare sustainability reports under the Accounting Act of 2021, and that the implementation of EU directives is postponed (following the adoption of the Omnibus package in February 2025 and its subsequent return to the EU Parliament in October 2025), medium and small enterprises are likely to be included at a later stage. These factors indicate that the first prerequisite for the development of regenerative practices in Serbian hotels has yet to be fully realized.

Future research could focus on analyzing the trend of the impact of financial performance on key environmental performance in Serbian hotels over multiple consecutive accounting periods. Furthermore, with the implementation of mandatory sustainability reporting for not only large but also medium and small hotels, and their disclosure alongside financial statements, it will be possible to examine the relationship between financial performance and environmental performance across different hotel categories, as well as potential differences between these groups. Finally, as regenerative hospitality practices continue to develop in Serbia, paralleling global trends, there is an opportunity to investigate the specific characteristics of regenerative practices in Serbia and neighboring countries.

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