

BREAKING WAVES OF INNOVATION: LEAN AND GREEN PATHWAYS FOR ORGANISATIONAL SUSTAINABILITY IN ECOTOURISM

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ABSTRACT

The ecotourism industry is one of the fastest-growing tourism sectors. Yet, research on its business and operational strategies remains limited. Lean and Green, an evolution of Lean philosophy, combines operational efficiency with environmental responsibility to deliver a holistic management approach. Therefore, this study aims to examine how Lean and Green can support organisational sustainability in ecotourism. A systematic literature review (SLR) identified relevant practices and their impacts on the triple bottom line (TBL). These findings informed the development of a Lean and Green Impact Matrix, mapping contributions across economic, environmental, and social dimensions. This framework offers a theoretical pathway for achieving sustainability in ecotourism and practical guidance for its application. The study deepens a theoretical understanding of Lean and Green within the ecotourism context. It lays the groundwork for future research into its practical implementation and contribution to sustainable organisational performance.

Keywords: Organisational sustainability; Lean and Green; Lean; Sustainable business practices; Ecotourism

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1 INTRODUCTION

Organisational sustainability, also referred to as sustainable business practices (SBP), is the capacity of a business to operate in changing circumstances while simultaneously ensuring long-term success [1]. Additionally, it is the ability to meet the current needs of a business without compromising the ability to meet future needs [2]. Organisational sustainability attempts to address the triple bottom line (TBL) of sustainability—social, economic, and environmental wellbeing. This is a balance of the TBL of sustainability and how it is used to achieve a business that will not only survive but thrive and develop in the long term.

In the current economic climate, organisational sustainability has become increasingly relevant as a response to the increasing global threats of environmental degradation, socio-economic inequalities, and the climate crisis [3]. It is not purely about using less paper to save the trees, or reuse-reduce-recycle. Sustainability stands for the holistic approach to business that generates good publicity and healthy planetary habits, to ensure long-term sustainability [4]. Some of the benefits of SBP are increased customer satisfaction and increased market value, as an increasing number of consumers are showing an interest in eco-friendly products and services [4]. SBP can be approached in many different ways; however, to yield the best results, a holistic approach that addresses all three factors of a sustainable business is necessary.

Ecotourism is the combination of nature and tourism that focuses on providing the consumer with an experience of the natural environment and culture. It is focused on sustainably using the natural environment so that tourists might enjoy it. However, the sustainable environment is prioritised above economic growth. The purpose of any ecotourism organisation is to reach a state of sustainability using resource conservation, societal and cultural prosperity, and economic stability and growth [5]. With this being said, there is a growing interest in the ecotourism industry due to the change in tourist behaviour. More and more tourists are interested in sustainable travel options, making ecotourism uniquely suited.

One approach toward achieving organisational sustainability is the combination of Lean and Green (LG). Lean refers to the philosophy of continuous improvement of processes, the reduction of eight forms of ‘Lean’ waste, and the elimination of non-value adding practices in an organisation [6]. LG is an extension of this philosophy to include a focus on environmental sustainability, not only to create a “greener” operation but to use this additional focus further to improve the efficiency and economic performance of an organisation [7].

Currently, Lean and Green literature points primarily to the application of LG in a broader sense in manufacturing, service, or agricultural businesses. However, some writers recognise the need for sector-specific research regarding the implementation or approach of LG [8].

Thus, the primary focus of this paper is to identify how LG is relevant to the organisational sustainability and growth of businesses within the ecotourism industry.

2 LITERATURE REVIEW

2.1 Ecotourism

Ecotourism is defined as responsible travel to natural area that conserves the environment, sustains the well-being of the local people, and involves interpretation and education [9]. Ecotourism consists of at least five key characteristics [5, 10], which are as follows:

- It is a form of tourism.
- Attractions are primarily nature-based, but can include associated cultural resources and influences.

- Educational and learning outcomes are fostered.
- It is managed so that environmental and socio-cultural sustainability outcomes are more likely to be achieved.
- The importance of an operations financial sustainability is recognised (it must at least be financially viable). [5, 10]

The five characteristics are the requirements used to evaluate the applicability of this research to the ecotourism context.

2.2 Lean and Green

LG methodologies represent a strategic integration of Lean management principles, which prioritise waste reduction and operational efficiency, with Green practices that focus on minimising environmental impacts and fostering sustainability [11]. Lean principles, such as continuous improvement, value stream mapping, and systematic waste elimination, aim to optimise processes and enhance productivity [12]. At the same time, Green practices emphasise resource conservation, pollution mitigation, and eco-friendly operations [11]. The synergy between these approaches enables organisations to achieve operational excellence while simultaneously sustaining the environment [13]. For instance, Lean tools like Kaizen and 5S can be adapted to address environmental challenges, such as reducing energy consumption and waste generation, while green practices like water conservation and greenhouse gas reduction complement Lean's focus on process optimisation [14-16]. This integration not only enhances organizational performance but also aligns with broader sustainability goals, making LG a critical framework for modern business practices.

The TBL framework, encompassing economic, environmental, and social dimensions, is inherently connected to LG practices. Lean methodologies contribute to the economic dimension by improving profitability and operational efficiency [12], while Green practices address the environmental dimension by reducing ecological footprints and promoting sustainable resource utilisation [11]. Furthermore, social sustainability is supported through Lean's emphasis on employee engagement, workplace safety, and community wellbeing. By integrating LG practices, organisations can achieve balanced TBL performance, ensuring long-term viability and stakeholder satisfaction. Empirical evidence demonstrates that LG initiatives not only reduce costs and enhance product quality but also improve corporate reputation and address environmental and social responsibilities [2, 4, 13].

3 RESEARCH METHOD

This study employed a two-phase approach. Phase one (data gathering) took the form of a systematic literature review (SLR) to identify, evaluate, and synthesise relevant academic contributions related to LG for organisational sustainability. Phase one yielded the findings depicted in the PRISMA flow diagram illustrated in Figure 1. Phase two (data analysis) used content analysis to identify and investigate themes identified in phase one.

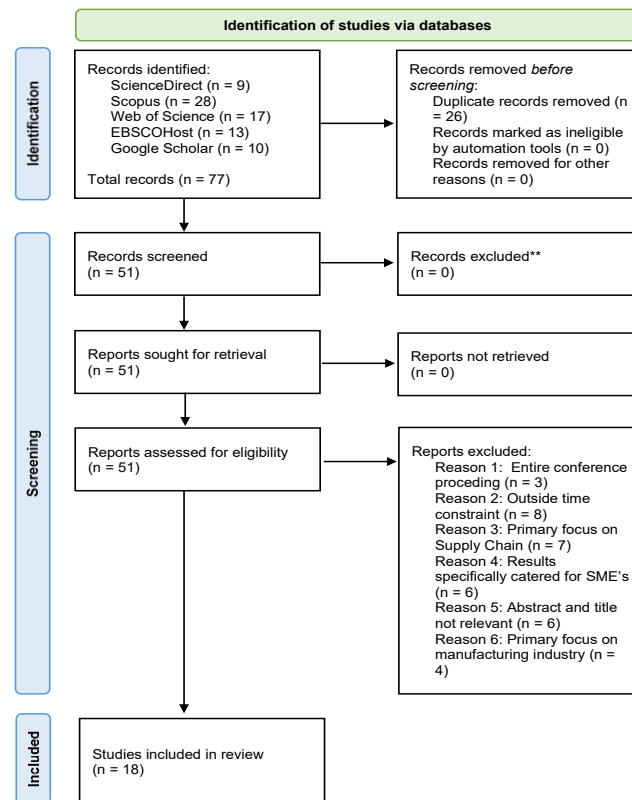


Figure 1: PRISMA Flow Diagram

3.1 Phase 1: Data gathering - Systematic literature review

The systematic literature review consists of three distinct stages: 1) Planning the review, 2) Conducting the review, and 3) Reporting the review [17]. The planning stage included a search protocol which defined the parameters of the literature review. The review protocol is seen in **Error! Reference source not found.**

Table 1: Systematic literature review protocol

Purpose of the Study	The study aimed to identify the specific tools, methods, and strategies encompassed in Lean and Green that have an impact on organisational sustainability, and to evaluate how this is suitable for the ecotourism industry by relating the findings to the fundamental ecotourism characteristics.
Inclusion Criteria	- Literature on the use of lean and green management concepts to achieve organisational sustainability. - Literature with a primary focus on sustainable business practices. - Literature based on service organisations, ideally tourism organisations.
Exclusion Criteria	- Literature with a primary focus on manufacturing organisations. - Literature with a primary focus on supply chain and supply chain management - Literature with an inaccurate understanding of Lean.
Time frame	2016 - 2025
Search Databases	- Science Direct - Scopus - Web of Science - EBSCOHost - Google Scholar (For additional sources, the first 10 results were included for relevance)

Keywords	Lean & Green	Organisational sustainability keywords
	'Lean and green'	Organisational sustainability Corporate sustainability Sustainable business practices
Search string	"Lean" AND "Green" AND ("organisational sustainability" OR "corporate sustainability" OR "sustainable business practice")	
Quality Assessment Criteria	- Literature must be peer-reviewed - An accurate scientific method should be used - Correct knowledge and understanding should be prevalent	

The systematic review protocol seen in Table 1 was used to screen publications and identify the 18 papers that were included for full-text screening. The replicability of the research demonstrates its internal validity [18]. The thorough SLR protocol followed ensured that the study could be replicated if the exact steps are followed. The search yielded 18 eligible reports that adhered to the inclusion criteria and quality assessment criteria. A list of the included literature can be found in Appendix A.

3.2 Phase 2: Data analysis - Content analysis

The text-based data collected was subjected to a content analysis. The content analysis was based on a four-step inductive qualitative content analysis [30]. The four steps are as follows:

- (1) Establishing an overview of the data material [30].
- (2) Identifying and extracting meaning units of relevance to the study aim [30].
- (3) Combining and condensing meaning units into descriptive categories [30].
- (4) Generating explanatory themes by linking categorised meaning units [30].

This analysis was guided by the research questions posed in this research and used to identify the design requirements of a conceptual matrix explaining the detailed impact of LG on organisational sustainability in terms of the TBL.

- Research Question 1: What lean tools, methods, and strategies are identified in the text, and what is their impact on organisational sustainability?
- Research Question 2: What green tools, methods, and strategies are identified in the text, and what is their impact on organisational sustainability?
- Research Question 3: What combined 'lean and green' tools, methods, and strategies are identified in the text, and what is their impact on organisational sustainability?

Each paper was read and examined to critically assess the content to answer the three research questions. The content analysis resulted in eight themes. These themes, along with their elements, are displayed in Table 2. Column 1 provides the overarching 'Lean and Green' theme that is identified, while column 2 illustrates the specific practical elements that fall under each theme.

Table 2: Identified Themes

Lean and Green theme	Practical elements	References
Waste reduction	Lean waste elimination	[2, 4, 8, 14-16, 19, 21, 23-29]
	Reducing material waste	[2, 8, 16, 24, 26-28]
	Life cycle analysis	[24, 28]
	Reduced greenhouse emissions	[16, 24, 26-28]
	Responsible resources	[4, 14-16, 24, 26, 27]
Resource efficiency	Optimised resource utilisation	[4, 14-16, 24, 26-28]
	Streamlining processes	[4, 14-16, 24, 25, 27, 28]
	Sustainable value stream mapping	[15, 16, 24, 27, 28]

Lean and Green theme	Practical elements	References
	Sustainable resource practices	[4, 13-16, 19, 24-28]
Continuous improvement	Kaizen	[13-16, 24, 25, 27, 28]
	Problem-solving innovation (spaghetti diagrams, A3, visual process)	[15, 24, 25, 28]
	Defect detection and prevention (poka yoke, jidoka)	[15, 23, 24, 27]
	5S/ 7S	[8, 13, 15, 24, 25, 27]
Operational efficiency	JIT	[8, 14, 15, 23-25, 27]
	Kanban	[8, 15, 23-25, 27]
	TPM	[8, 14, 15, 23-25, 27]
Respect for people	Training	[13-15, 23, 25, 26, 28]
	Leadership commitment	[2, 13-15, 21, 25, 28, 29]
	Improved health and safety	[13, 15, 19, 21, 23, 26]
	Lean and green culture	[13-16, 21, 23, 28]
	Alignment of organisational strategies with lean and green practices	[13-16, 19, 21, 28]
	Promoting top-down approach to drive cultural change	[13-16, 21, 23, 28]
Green supply chain	Green logistics	[4, 19, 21, 23, 24, 28]
	Sustainable resource practices	[4, 13-16, 19, 24-28]
Integrated lean and green	Simultaneous implementation	[2, 14, 15, 27, 28]
	Aligning lean practices with circular economy goals	[15, 16, 27]
	Integrated frameworks	[13-15, 24, 28]
Customer and stakeholder engagement	Involving customers in sustainability initiatives	[2, 25, 28]
	Engaging stakeholders	[13, 19, 28, 29]

The themes are discussed in section 0. The themes are seen as combined LG methods, tools, and strategies. All the tools, methods and strategies identified, whether they were lean or green, were evaluated and used to create the combined list. No direct contradictions were seen; different papers aligned in terms of the overarching themes but differed in the practical elements mentioned. The practical elements did, however, support one another and were more of an expansion than a contradiction.

4 FINDINGS AND DISCUSSIONS

The study aimed to identify the specific tools, methods, and strategies encompassed in LG that have an impact on the organisational sustainability of an organisation, and to evaluate how this is suitable for the ecotourism industry and corresponds with the fundamental ecotourism characteristics. This section presents the findings in terms of the three research questions stated in Section 3.2. The research questions are closely related and are discussed collectively.

4.1 Themes and impact analysis

Columns 1 and 2 of Table 3 are an extension of the themes identified in Table 2. The impact matrix is used to illustrate the value of these themes in achieving organisational sustainability, as explained in columns 3 (social aspects), 4 (economic aspects), and 5 (environmental aspects).

Table 3: Lean and green impact matrix

Lean and Green theme	Practical elements	Social	Economic	Environmental
Waste reduction	Lean waste elimination	Improves workplace conditions by reducing clutter and hazards.	Reduces operational costs by eliminating inefficiencies.	Minimises resource consumption and waste generation.
	Reducing material waste	Reduces the strain on the local community in terms of waste removal.	Optimises material costs and improves profitability.	Decreases landfill waste and conserves natural resources.
	Life cycle analysis	Encourages sustainable product design, benefiting communities.	Improves product efficiency and reduces long-term costs.	Identifies environmental impacts across product lifecycles for mitigation.
	Reduced greenhouse emissions	Improves public health by reducing air pollution.	Reduces regulatory fines and energy costs.	Mitigates climate change and improves air quality.
	Responsible resources	Promotes ethical sourcing and community wellbeing.	Enhances brand reputation and reduces resource costs.	Ensures sustainable use of natural resources.
Resource efficiency	Optimised resource utilisation	Improves employee productivity and satisfaction.	Reduces operational costs and increases profitability.	Minimises resource depletion and environmental impact.
	Streamlining processes	Enhances teamwork and reduces workplace stress.	Improves efficiency and reduces production costs.	Reduces energy and material waste.
	Sustainable value stream mapping	Engages employees in sustainability initiatives.	Identifies cost-saving opportunities in processes.	Optimizes energy and material usage.
	Sustainable resource practices	Promotes community awareness of sustainability.	Reduces costs associated with resource inefficiencies.	Conserves resources and reduces environmental degradation.
Continuous improvement	Kaizen	Fosters a culture of collaboration and innovation.	Improves operational efficiency and reduces costs.	Reduces waste and enhances resource efficiency.
	Problem-solving innovation (spaghetti diagrams, A3, visual process)	Encourages employee engagement and skill development.	Identifies inefficiencies, reducing operational costs.	Minimises waste and improves process sustainability.
	Defect detection and prevention (poka yoke, jidoka)	Improves workplace safety and employee satisfaction.	Reduces costs associated with defects and rework.	Minimises resource wastage and environmental harm.
	5S/ 7S	Enhances workplace organisation and safety.	Improves efficiency and reduces operational costs.	Reduces waste and promotes sustainable practices.
Operational efficiency	JIT	Reduces stress on employees by aligning production with demand.	Minimises inventory costs and improves cash flow.	Reduces overproduction and associated waste.
	Kanban	Improves communication and teamwork.	Enhances workflow efficiency and reduces costs.	Minimises resource waste and energy usage.
	TPM	Improves equipment	Reduces downtime and maintenance costs.	Minimises energy consumption and emissions.

Lean and Green theme	Practical elements	Social	Economic	Environmental
		reliability and workplace safety.		
Respect for people	Training	Empowers employees and improves job satisfaction.	Enhances productivity and reduces turnover costs.	Promotes sustainable practices through education.
	Leadership commitment	Drives cultural change and employee engagement.	Aligns organisational goals with sustainability, improving profitability.	Ensures long-term environmental stewardship.
	Improved health and safety	Enhances employee wellbeing and reduces workplace accidents.	Reduces costs associated with health and safety incidents.	Promotes sustainable and safe practices.
	Lean and green culture	Fosters a collaborative and sustainability-focused workplace.	Improves operational efficiency and reduces costs.	Encourages eco-friendly practices and waste reduction.
	Alignment of organisational strategies with lean and green practices	Improves employee morale and stakeholder trust.	Enhances competitiveness and profitability.	Promotes long-term environmental sustainability.
	Promoting a top-down approach to drive cultural change	Encourages employee buy-in and collaboration.	Aligns organisational goals with sustainability, improving efficiency.	Ensures consistent implementation of eco-friendly practices.
Green supply chain	Green logistics	Improves community relations through sustainable practices.	Reduces transportation costs and improves efficiency.	Minimises emissions and environmental impact.
	Sustainable resource practices	Promotes ethical sourcing and community wellbeing.	Reduces costs associated with resource inefficiencies.	Conserves resources and reduces environmental degradation.
Integrated lean and green	Simultaneous implementation	Enhances employee engagement and collaboration.	Improves operational efficiency and reduces costs.	Optimises resource use and minimises waste.
	Aligning lean practices with circular economy goals	Promotes community awareness of sustainability.	Reduces costs associated with resource inefficiencies.	Conserves resources and reduces environmental degradation.
	Integrated frameworks	Encourages cross-functional collaboration and innovation.	Improves efficiency and reduces operational costs.	Promotes holistic sustainability practices.
Customer and stakeholder engagement	Involving customers in sustainability initiatives	Builds trust and improves customer satisfaction.	Enhances brand reputation and market competitiveness.	Encourages adoption of eco-friendly products and practices.
	Engaging stakeholders	Fosters collaboration and community support.	Improves organisational alignment with sustainability goals.	Promotes widespread adoption of sustainable practices.

Table 3 shows a summarised impression of the impact different Lean and Green elements have on the triple bottom line. Columns 3, 4 and 5 give a brief discussion of the effect each element has on each of the TBL pillars. The Lean and Green themes are discussed in more detail in the sections below.

4.1.1 Waste reduction

Literature emphasises waste reduction as a central theme and common goal of both Lean and Green efforts. Lean waste targets operational inefficiencies, such as overproduction, excess inventory, and defects, using methods like pull production, lot size reduction, and kaizen [2, 14, 15]. Material waste focuses on reducing resource consumption, emissions, and pollution through practices like energy efficiency, greenhouse gas reduction, and tools like life cycle assessment [24].

One way of interpreting the overlap between lean and green is that, instead of solely focusing on lean waste, the definition of waste can be expanded into lean waste and material waste [4]. Integrated frameworks like Green Lean Six Sigma [24] and the House of EcoLean [15] demonstrate that synergy can be achieved by addressing both types of waste for sustainable outcomes.

The research highlighted that lean management's role is in systematically reducing waste, enhancing efficiency, and achieving short-term sustainability benefits, while green practices address long-term environmental impacts [14]. It is also demonstrated how lean practices, such as continuous improvement and waste elimination, complement green initiatives like pollution prevention and resource reduction, leading to superior operational and environmental performance [4]. Similarly, lean methods such as 5S, value stream mapping, and total productive maintenance have been identified as effective tools for minimising waste and improving energy efficiency, with documented reductions in mixed waste and emissions, as well as improved overall sustainability [2, 8]. The House of EcoLean framework is introduced, which integrates lean principles like Kaizen and pull systems with ecological practices to optimise resource utilisation and eliminate waste, aligning operational efficiency with environmental sustainability [15].

Furthermore, Lean Six Sigma's use of tools like life cycle analysis and sustainable value stream mapping highlights its ability to eliminate defects and streamline processes, thereby reducing resource consumption and environmental impact [23, 24]. The LG combination highlights the alignment of lean production with circular economy goals, focusing on waste reduction through continuous improvement and resource efficiency, which advocates the use of LG for organisational sustainability [16]. Collectively, these studies demonstrate that waste reduction is not only a cornerstone of lean methodologies but also a critical enabler of environmental and operational sustainability.

4.1.2 Resource efficiency

Resource efficiency emerges as a critical theme across the included literature, underscoring its significance in achieving operational excellence and sustainability. Lean practices, such as value stream mapping (VSM) and enhanced value stream mapping (EVSM), systematically reduce waste and optimise resource utilisation [2, 4, 8, 14, 24]. Green practices complement these efforts by minimising environmental impacts through reduced water, material, and energy consumption, while promoting eco-friendly materials and sustainable production processes [2, 4, 24]. Frameworks like Green Lean Six Sigma (GLSS) and the House of EcoLean integrate lean tools with ecological principles, addressing both operational and environmental inefficiencies to enhance resource utilisation and sustainability outcomes [15, 24].

Sector-specific applications further illustrate the importance of resource efficiency in diverse contexts. In agriculture, Lean Green practices reduce chemical usage and optimise production processes, contributing to environmental sustainability and improved profitability [26]. Similarly, service industries leverage Lean tools such as continuous flow and work standardisation to enhance resource utilisation. Circular economy principles align with lean methodologies by emphasising regenerative systems and narrowing material and energy loops to minimise resource input and waste [16]. Integrated management systems (IMS) streamline processes across quality, environmental, and social dimensions, fostering resource efficiency [13]. Collectively, these approaches demonstrate how the integration of LG practices, alongside circular economy principles, can drive sustainable development by ensuring efficient resource use while mitigating environmental impacts [13, 14, 24].

4.1.3 Continuous improvement

Continuous improvement is consistently identified across the literature [2, 7, 10-12, 16, 18-20, 22-25, 27] as a critical mechanism for advancing organisational sustainability and achieving alignment with the TBL. Economically, continuous improvement drives operational efficiency by systematically reducing waste, defects, and costs [2, 11, 18, 21, 23]. Lean methodologies such as Kaizen and Total Productive Maintenance (TPM) are highlighted for their ability to enhance productivity and profitability [11, 18, 21, 23]. From an environmental perspective, continuous improvement integrates green practices, including waste reduction, energy efficiency, and pollution prevention, which collectively minimise ecological impacts [11, 12, 18, 21, 23]. Tools such as Value Stream Mapping (VSM) and Sustainable Value Stream Mapping (SUS-VSM) are particularly effective in identifying and optimising ecological aspects of processes [12, 18, 22].

The social dimension of sustainability is equally supported by continuous improvement practices, which foster employee engagement, training, and involvement, thereby enhancing workplace satisfaction and morale [11, 18, 23, 27]. Furthermore, these practices promote social equity by improving working conditions and contributing to community welfare [11, 18, 23, 27]. Collectively, methodologies such as Kaizen cultivate a culture of ongoing enhancements that align operational objectives with broader sustainability goals [11, 12, 18, 23]. By addressing the economic, environmental, and social dimensions of the TBL, continuous improvement emerges as a foundational strategy for ensuring long-term organisational resilience and competitive advantage [11, 12, 18, 23, 27].

4.1.4 Operational improvement

Operational improvement is consistently highlighted across the documents as a pivotal mechanism for advancing organisational sustainability and achieving alignment with the TBL, encompassing economic, environmental, and social dimensions. Economically, operational improvement drives cost efficiency, profitability, and resource optimisation. Lean methodologies such as Just-In-Time (JIT), Total Productive Maintenance (TPM), and Value Stream Mapping (VSM) are frequently referenced for their capacity to streamline processes, minimise waste, and enhance financial performance [11, 18, 21, 23]. For instance, JIT reduces inventory costs and improves responsiveness. At the same time, TPM ensures equipment reliability and mitigates downtime, thereby contributing to economic sustainability [11, 18, 21]. Furthermore, these practices enhance product quality and customer satisfaction [11, 18, 23].

From an environmental perspective, operational improvement facilitates ecological sustainability by mitigating environmental impacts through energy efficiency, waste reduction, and pollution prevention. Green practices embedded within operational processes, such as Sustainable Value Stream Mapping (SUS-VSM) and proactive environmental management, are demonstrated to reduce emissions and conserve resources, aligning

operational objectives with environmental priorities [11, 12, 18, 23]. For example, SUS-VSM identifies opportunities for reducing resource consumption and emissions, thereby supporting environmental sustainability [12, 22]. Socially, operational improvement enhances workplace conditions, fosters employee engagement, and contributes to community welfare, thereby advancing the social pillar of sustainability. Practices such as Kaizen and employee involvement promote inclusivity and collaboration, cultivating a culture of continuous improvement and enhancing workplace satisfaction [11, 18, 23, 27]. Collectively, the integration of LG practices into operational strategies emerges as a critical enabler for achieving long-term organisational resilience, competitive advantage, and alignment with sustainability objectives [11, 12, 18, 23, 27].

4.1.5 Respect for people

The principle of Respect for People (RFP) is integral to achieving organisational sustainability, as it emphasises employee empowerment, cultivates mutual trust, and promotes a culture of ongoing improvement [31]. This holistic approach, which balances human-centric and technical elements, reinforces organisational resilience and supports sustainable long-term growth.

The reviewed documents collectively underscore the critical role of respect for people, the human element, and employee involvement in advancing organisational sustainability and achieving the TBL, encompassing economic, environmental, and social dimensions [13, 20, 24, 29]. Employee engagement is consistently identified as a foundational element for the effective implementation of LG practices, fostering a culture of continuous improvement and collaboration. In the economic dimension, employee involvement enhances labour productivity and operational efficiency, contributing to cost reduction and profitability. For instance, Wu et al. [14] highlight that integrating lean practices with human resource initiatives, such as training and recognition, systematically reduces waste and improves profitability. Similarly, it is emphasised that the role of employee engagement in driving operational efficiency and reducing costs, thereby reinforcing the economic pillar of sustainability [8]. In the environmental dimension, employee involvement is pivotal in driving innovative solutions for waste reduction, energy efficiency, and pollution prevention. It is noted that Kaizen events and quality circles empower employees to identify and address environmental inefficiencies, contributing to the ecological pillar of the TBL [8]. Lizarelli et al. [25] further elaborate on how social lean practices, such as employee involvement and training, foster a culture of environmental responsibility, enabling organisations to achieve resource efficiency and reduce emissions.

Respect for people and human resource development are integral to aligning organisational goals with sustainability objectives, particularly in the social dimension. It is highlighted that social lean practices, such as leadership support and structured problem-solving approaches, improve workplace morale and inclusivity [23]. It is emphasised that leadership and management practices that prioritise respect for people create an inclusive and supportive environment, enhancing employee satisfaction and fostering a sense of shared responsibility for sustainability goals [29]. The importance of training programs and awareness initiatives in equipping employees with the skills and knowledge necessary to implement LG practices effectively [24]. Across the reviewed literature, the human element emerges as a vital enabler for achieving organisational resilience, competitive advantage, and alignment with the TBL. Employee involvement in lean systems enhances labour productivity and operational efficiency [11]. The role of employee engagement in driving both operational and environmental improvements is of high importance [18, 23]. Foo et al. [29] underscore the importance of leadership practices in creating a culture of respect for people. Collectively, these findings demonstrate that respect for people and employee engagement are indispensable for achieving organisational sustainability.

4.1.6 Green supply chain

The integration of LG practices within supply chain management and logistics is consistently identified across the reviewed literature as a strategic approach to advancing organisational sustainability and achieving the TBL—economic, environmental, and social dimensions. These practices emphasise waste reduction, resource optimisation, and environmental stewardship, fostering synergies that enhance operational efficiency while mitigating ecological impacts. It is highlighted that the influence of lean practices, such as pull production and lot size reduction, on green practices, which subsequently improve sustainable performance measures [7]. Similarly, the role of LG practices in enhancing supply chain performance by reducing greenhouse gas emissions, optimising resource consumption, and strengthening corporate reputation is underscored [25]. This idea further develops green supply chain management (GSCM), emphasising its capacity to reduce environmental impacts while simultaneously improving operational efficiency and ensuring compliance with regulatory standards [20].

The integration of LG logistics also demonstrates its significant contribution to the TBL. LG logistics practices, such as waste elimination, standardisation, and visual management, enhance economic performance by reducing operational costs and improving service delivery [26]. Environmental benefits are further realised through reduced emissions, increased energy efficiency, and sustainable resource utilisation, which proposes a Green Lean Six Sigma framework for optimising logistics processes [22]. Social benefits are also emphasised. The role of LG logistics in fostering employee engagement and improving workplace conditions is also noted [23]. The ability to create sustainable competitive advantages by aligning operational efficiency with environmental and social objectives is also mentioned [12]. Collectively, these findings illustrate that LG supply chain and logistics practices are integral to achieving the TBL and driving long-term organisational sustainability.

4.1.7 Integrated lean and green

The integration of LG practices, their simultaneous implementation, and the development of integrated frameworks are consistently identified as pivotal strategies for advancing organisational sustainability and achieving the TBL. The "House of EcoLean" framework is introduced, which systematically combines lean methodologies, such as Kaizen and 5S, with ecological principles, including resource optimisation and waste reduction. This structured integration not only enhances operational efficiency but also minimises environmental impacts [12]. Similarly, it is proposed that the Green Lean Six Sigma (GLSS) framework, which integrates lean principles, green practices, and Six Sigma methodologies, be used to address sustainability challenges [24]. The framework demonstrates significant improvements in operational efficiency, ecological outcomes, and long-term sustainability [22].

Wu et al. (2018) highlight that the combined application of LG practices yields both immediate operational advantages and long-term sustainability outcomes, such as enhanced profitability, reduced environmental impacts, and improved corporate reputation [11]. This notion is further corroborated by the demonstration that lean practices facilitate the adoption of green practices, resulting in superior performance across the TBL [2]. The study emphasises that the integration of LG practices enhances organisational competitiveness by reducing waste [2]. These findings collectively underscore the importance of aligning LG methodologies to achieve comprehensive and multidimensional sustainability objectives. The role of such frameworks within service industries is explored, highlighting their capacity to incorporate critical factors such as leadership commitment, employee engagement, and strategic alignment [28]. These elements collectively drive improvements across the TBL, ensuring long-term sustainability and resilience [26].

4.1.8 Customer and stakeholder engagement

Customer and stakeholder engagement is consistently identified as a pivotal factor in advancing the organisation's sustainability and achieving the TBL, encompassing economic, environmental, and social dimensions. The importance of auditing tools in evaluating corporate social responsibility (CSR) and stakeholder engagement is stressed, highlighting their role in fostering trust, regulatory compliance, and community support, which are essential for sustainable practices [19]. Similarly, the influence of customer demand and stakeholder pressure in driving the adoption of green and lean practices is emphasised [22]. These practices align the organisation's objectives with broader sustainability goals.

The significance of stakeholder engagement, which advocates sustained communication and ethical relationships as foundational elements of Green Lean Six Sigma (GLSS) frameworks, is expanded [26]. Such practices are posited to enhance customer satisfaction while ensuring strategic alignment with stakeholder expectations, thereby contributing to sustainability across the TBL. Collectively, these findings underscore the critical role of customer and stakeholder engagement as a strategic enabler of organizational sustainability.

4.2 Ecotourism application

The application of LG in the ecotourism context is discussed based on its relevance to the five characteristics of ecotourism businesses identified in section **Error! Reference source not found.**

(1) Ecotourism is a form of tourism.

LG is a holistic management approach for various organisations, including manufacturing and service organisations [25]. Thus, LG could theoretically be applied to tourism. The LG approach considers the various aspects of business, regardless of the type of business. It can be beneficial in the tourism context since it considers client satisfaction as a primary goal and as the most significant 'value' in the delivery of a service or product. Additionally, it focuses on the sustainability elements of the business and how to improve them and monopolise it in such a way that the triple bottom line will be benefited.

(2) Attractions are primarily nature-based but can include associated cultural resources and influences.

The LG approach focuses on cultural elements by addressing the social responsibility of the organisation, as well as the internal social standing by looking at corporate culture and employee involvement. The LG approach pays special attention to the human element, as discussed in the Lean philosophy [4]. Respect for people considers not only the internal culture of the staff and stakeholders but is expanded to include the external culture as it pertains to the social responsibility of the business [25]. This speaks to the social element of the triple bottom line.

(3) Educational and learning outcomes are fostered.

Specialised training is highly important in the LG approach as it is key in the implementation of the LG methods [14, 16]. Thus, LG aids in the training of staff, but also in ensuring an overall understanding of the organisation and its operations throughout the business. This allows for learning internally. Additionally, it fosters deeper understanding of the conservation efforts of the business and how it is achieved and why it is important. Which allows education staff to better inform tourists of the full extent of their role in the experience and how it affects the natural environment.

(4) Ecotourism is managed so that environmental and socio-cultural sustainability outcomes are more likely to be achieved.

LG offers an approach that prioritises each of the pillars in the TBL; all elements are equally important. The TBL focus ensures a symbiotic relationship where all of the factors are interdependent[21]. It emphasises the dependence of all three elements on one another and how no one can sustainably exist without the others [11].

(5) The importance of the operation's financial sustainability

Again, there is a focus on achieving organisational sustainability throughout the organisation. However, the lean contribution uniquely focuses on the financial gain in an organisation and its importance in creating sustainable economic growth [11]. Lean and Green enables an ecotourism business to operate efficiently and sustainably, contributing positively to conservation efforts while also increasing productivity and profitability [14].

The LG approach focuses on the fundamental characteristics of an ecotourism organisation. It is focused on establishing a positive TBL while simultaneously ensuring cost reduction and efficient operations. The identification of specific LG elements and their impact on the TBL shows the relevance of LG for organisational sustainability, but also how the ecotourism philosophy of a positive TBL might be well served with the implementation of LG.

5 CONCLUSION

Prior work in this field has focused on Lean and Green in a more general sense. For example, the different approaches to Lean and Green in manufacturing or service industries. This study focuses on a more sector-specific use of Lean and Green, interpreting the various elements of Lean and Green to determine an approach specifically for the organisational sustainability and sustainable business practices of ecotourism businesses. The systematic literature review conducted allowed for the identification of the main themes or areas of focus when attempting the implementation of LG, for organisational sustainability. This revealed a list of themes and the practical elements that contribute to the triple bottom line elements, and in turn, the sustainability of an organisation.

The findings further identify the relationship between LG and organisational sustainability by creating a conceptual Lean and Green impact matrix to understand better the impact of the different practical elements on the three pillars of the triple bottom line. The incorporation of Lean and Green into the triple bottom line framework shows the versatility and range of LG for all the elements of organisational sustainability and sustainable business practices. Therefore, this study highlights how LG impacts an ecotourism business in terms of holistic sustainability. The academic implication of this study is the conceptual understanding of LG and its impact on the triple bottom line and organisational sustainability. Additionally, it provides a blueprint for practical tools and elements for implementation in an organisation.

6 RECOMMENDATIONS FOR FUTURE RESEARCH

A theoretical contribution is made by measuring the impact matrix against fundamental characteristics of ecotourism to show the applicability; however, a more in-depth understanding of LG elements in ecotourism operations and processes would be beneficial to further motivate the value. Therefore, further research might explore the specific implementation of LG in the ecotourism context.

Although the fundamental characteristic of ecotourism is considered, no detailed explanation of the workings of an ecotourism business is provided. Thus, by gaining an understanding of the specific operations and inner workings of an ecotourism business, a better practical contribution to the implementation and application of LG in such a business can be achieved.

7 REFERENCES

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Appendix A

Table 4: List of included literature

	Citation	Title
1	[14]	A two-dimensional, two-level framework for achieving corporate sustainable development: Assessing the return on sustainability initiatives
2	[4]	Combining lean and green practices to achieve a superior performance: The contribution to sustainable development and competitiveness—An empirical study within the Portuguese context.
3	[19]	Compilation of Best Practices for Auditing the Sustainable Development of Organisations.
4	[20]	Drivers for the adoption of an integrated sustainable green lean six sigma agile service system (ISGLSASS) in the service organisations.
5	[8]	Exploring the role of lean thinking in sustainable business practice: A systematic literature review.
6	[21]	Green and lean sustainable development path in China: <i>Guanxi</i> , practices and performance.
7	[22]	Green and sustainability corporate initiatives: A case study of goods and services design.
8	[15]	House of EcoLean: A synergetic framework for structured integration of Lean and Green.
9	[23]	Impacts of Lean Six Sigma on organisational sustainability: A survey study.
10	[2]	Influence of lean-green practices on organisational sustainable performance.
11	[24]	Integral measures and framework for green lean six sigma implementation in a manufacturing environment.
12	[16]	Lean and Green: Aligning the Circular Economy and Kaizen through Hoshin Kanri.
13	[25]	Lean and its impact on the sustainable performance of service companies: Results from a pilot study.
14	[13]	Lean-integrated management system: A model for sustainability improvement.
15	[26]	A model of quality management applied in lean green agriculture methodology: A research in Peru.
16	[27]	The application of lean methods in corporate sustainability—a systematic literature review.
17	[28]	Toward sustainability through green, lean and six sigma integration in the service industry: Review and framework.
18	[29]	Unfolding the impact of leadership and management on sustainability performance: Green and lean practices and <i>guanxi</i> as the dual mediators.