



Designing a Lean and Green organisational sustainability model: A South African Ecotourism case study

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PREFACE

This dissertation was compiled and presented in article format in accordance with the academic rules of the North-West University (approved on 21 September 2017).

Rule A.4.10.5 states: "Where a candidate is allowed to submit the research product in the form of research articles, such research product must be presented for examination purposes as an integrated unit, supplemented with a problem statement, an introduction and a synoptic conclusion as prescribed by faculty rules and the manuscript submission guidelines, or the url link to the manuscript guidelines of the journal or journals concerned."

Rule A.4.10.8. states: "Where any research article or internationally examined patent to which the candidate for a master's degree and other authors or inventors have contributed is submitted as the research product of a master's degree programme, the candidate must obtain a written statement from each co-author and co-inventor in which it is stated that such co-author or co-inventor grants permission for the research product to be used for the stated purpose, and in which it is further indicated what each co-author's or co-inventor's academic contribution to the research product concerned was."

Rule A.4.10.9. states: "Where co-authors or co-inventors as contemplated in rule 4.10.8 were involved in the development of the research product, the candidate must mention this fact in the preface, and must include the statement of each co-author or co-inventor immediately following the preface to the research product."

The following manuscript has been submitted to the African Journal of Sustainable Tourism and is presented in Appendix A:

- M. Küsel, R. Coetzee and P. Van Der Merwe, *"Regenerating African Ecotourism: A State-of-the-Art Review of Post-COVID Sustainability, Conservation, and Community Resilience."*

The following research paper has been published in the SAIE34 conference proceedings and is presented in Chapter 5:

- M. Küsel, R. Coetzee and P. Van Der Merwe, *"Breaking waves of innovation: Lean and Green Pathways for Organisational Sustainability in ecotourism"*.

The final research paper has been submitted to the International Journal of Lean Six-Sigma and is presented in Chapter 6:

- M. Küsel, R. Coetzee and P. Van Der Merwe, *“Lean and Green Support Model for organisational sustainability: A case study of a South African ecotourism business”*.

LAYOUT OF DOCUMENT

The dissertation is presented in article format. The dissertation consists of three research papers, of which two were submitted to academic journals and one to a conference proceedings. The research was conducted in phases; each phase corresponds to a research objective and a research output (an article or a conference proceeding).

The study is conducted in 6 research phases.

- Phase 1 (purple) is presented in Paper #1 submitted to the African Journal of Sustainable Tourism (presented in Appendix A)
- Phase 2 (green) is presented in Paper #2, which was published in the proceedings of the South African Institute of Industrial Engineering 35th annual conference (presented in Chapter 5)
- Phases 3 (orange), Phase 4 (blue), and Phase 6 (red) are presented in Paper #3, submitted to The International Journal of Lean Six Sigma (presented in Chapter 6)

The various phases correlate with the five steps of the qualitative case study method. This is illustrated in Figure 1.

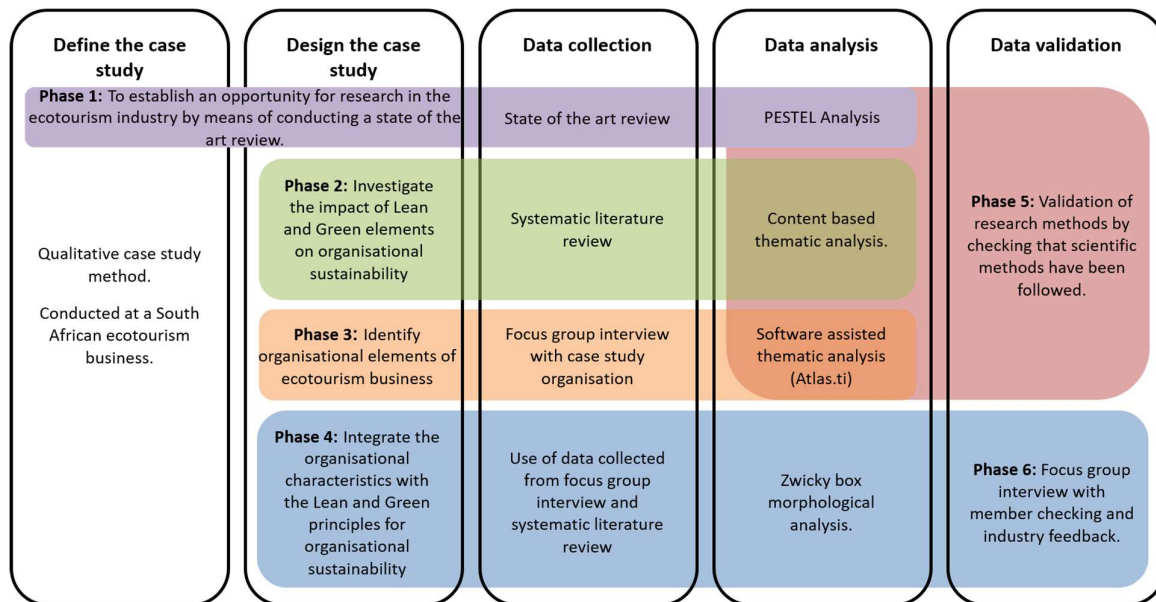


Figure 1: Research method overview

The document consists of the following chapters:

- Chapter 1: Introduction

- Chapter 2: Research Method
- Chapter 3: Literature study
- Chapter 4: Model requirements
- Chapter 5: Conceptual design – Paper #2
- Chapter 6: Final Lean-Green support model – Paper #3
- Chapter 7: Verification and validation
- Chapter 8: Conclusion and recommendations

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ABSTRACT

It is widely recognised that the Covid-19 pandemic greatly affected the ecotourism industry, highlighting the need for improved or revised management strategies to address the changing circumstances post-pandemic. Additionally, the increased focus on achieving true sustainability in terms of the triple bottom line of organisational sustainability, social, environmental, and economic sustainability. This research examines the applicability of Lean-Green management to organisational sustainability. Thus, the problem identified focuses on organisational sustainability in nature-based ecotourism organisations in the post-pandemic climate. A case study method is identified as the basis for the research, with data collection through focus groups and a systematic literature review. The focus groups are conducted to record the different organisational elements of a specific nature-based ecotourism organisation in South Africa and to provide industry insight.

Additionally, the systematic literature review examines the use of the Lean-Green framework in the context of tourism, specifically the ecotourism industry. This research presents a three-dimensional matrix, developed using the Zwicky Box morphological analysis, that shows the balance between Lean and Green for organisational sustainability in the intricate ecotourism industry. This will not only reveal the specific use of Lean and Green within ecotourism but also highlight the inherent relationship between Lean and Green and long-term success through organisational sustainability. This research contributes to the UN Sustainable Development Goals and addresses organisational sustainability in the complex environment of ecotourism. This study can be used to achieve organisational sustainability in a personalised experience format for tourism organisations, as well as to inform the expansion of Lean-Green as a research field. Future work stemming from this research may include Lean-Green as a management approach for organisational sustainability in other sectors, as well as industrial engineering in the field of ecotourism.

Key terms: Lean and Green; Organisational Sustainability; Triple Bottom Line; Ecotourism; Nature-based Tourism

LIST OF ABBREVIATIONS

NWU	North West University
UN	United Nations
TBL	Triple Bottom Line
SLR	Systematic Literature Review
TPS	Toyota Production System
JIT	Just In Time

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CHAPTER 1 INTRODUCTION

1.1 Background

The Covid-19 pandemic brought significant change and tragedy to many industries; the tourism industry is recognised as one of the most affected (Hosseini et al., 2021, Sann et al., 2024). The economic climate has changed across all industries post-pandemic; consumer behaviour has shifted, especially among service providers.

Travel restrictions prohibited tourists, especially international travellers, from travelling. This changed the 'normal' or 'predictable' behaviour of tourists since the way they chose to travel depended on their country's restrictions and the countries they were travelling to. Tourists perceived a higher health risk when travelling to tourist destinations, which affected their willingness to travel. The COVID pandemic created fear of infection, especially when travelling to highly visited areas such as tourist destinations. Therefore, many tourists would either choose not to travel or opt for more local travel (Giliberto & Labadi, 2023).

There is a shift seen in the consideration of holistic travel by tourists, before COVID sustainable tourism was a slow emerging topic starting to impact consumer behaviour, post-pandemic this trend grew more and more prominent (Li et al., 2024). Which indicates that even post-pandemic, there is a shift in how tourists view travelling. Additionally, prior to the pandemic health and safety considerations were not necessarily a primary factor considered when choosing a destination, whereas COVID changed this by increasing people's awareness of these factors that is then considered when choosing a destination (Li et al., 2024). An international poll conducted in 2024 revealed that just over 50% of global tourists seek travel accommodations that combine comfort and sustainability (Piva, 2025). This reveals a shift in tourist expectations from purely entertaining and consumption based travel to more holistic tourism options, underscoring the need for sustainable tourism options, such as ecotourism. Additionally, the global ecotourism market size increased by 13.1% from 2024 to 2025 (Piva, 2025). The industry's growth is expected to continue (Piva, 2025). Growth is beneficial; however, when active operational changes do not accompany it, there is a risk of being unable to grow sustainably. Findings from the state of the art review, as seen in Appendix A, revealed that the ecotourism industry needs more sustainable practices and changes in management strategies. The article also highlighted the reaction to the pandemic was more a short term based approach, which opens up the opportunity to look at the long term solutions for sustainable ecotourism moving forward. The following extract indicates this understanding:

“While a growing body of recent literature extensively documents the immediate operational and financial devastation caused by the pandemic, a critical theoretical and practical problem remains: the focus is overwhelmingly on short-term business survival rather than long-term structural transformation (Gössling et al., 2020, Hall et al., 2021).”

As the industry looks to recover, many policymakers and operators are attempting to revert to the precarious pre-pandemic status quo (Sharma et al., 2021). However, there is a fragmented understanding and a critical lack of synthesised, contemporary knowledge regarding how socio-ecological systems must fundamentally transition to avoid repeating these historical vulnerabilities.

One instance of the status quo not being a viable option is the change in behaviour and increased growth, which are not accompanied by changes in operations to match changing consumer needs (Giliberto and Labadi, 2023). The changes in behaviour persisted post pandemic, such as the the perception of health risk, increased interest in nature-based tourism, and and increase in interest in tourism businesses that emphasise effective crisis communication and trustworthy operations (Song et al., 2025). Additionally, Covid instilled a greater general risk awareness, since the world was in a unstable state during the pandemic a lot of people lost bookings and money due to the travel restrictions. This behaviour remains post-pandemic, with research indicating tourists still base travel decisions on the flexibility of their bookings and the terms and conditions associated with that to protect themselves from the unforeseen circumstances that might happen (McKim, 2023, Szwejcowski et al., 2024). However, the behavioural changes seen are not accompanied by changes in operations or management. The approach seen in literature is that ecotourism businesses are attempting to return to “business as usual” which does not support the long term sustainability of ecotourism businesses (Ioannides and Gyimóthy, 2020). This makes way for this research to evaluate how changes in operations might contribute to the organisational sustainability and long-term success of an ecotourism business in this industry. A growing industry such as ecotourism warrants more research, especially to achieve sustainable growth. A state of the art literature review (Phase 1, Appendix A) was conducted to further substantiate the claim for further research, particularly organisational research. As well as to demonstrate the relevance of this study to the ecotourism industry. The review concluded that the pandemic had various negative impacts and that the post-pandemic climate provides an ideal opportunity to investigate interventions that would support the organisation's sustainable growth. The following was taken from the future research section of the article (Appendix A), and articulates one of the focus areas that this research addresses:

“In order to establish the long-term sustainability and resilience of ecotourism businesses, it is important that research investigate the operational changes ecotourism businesses can make to improve financial effectiveness and explore diversification of revenue streams. Future studies must empirically investigate the long-term effectiveness of these alternative financing models in Sub-Saharan Africa (Cumming et al., 2021)”

This extract from the state of the art review article speaks to the importance of creating a more sustainable organisation by means of making operational changes. In order for a business to be sustainable long term, it needs to be financially stable, and thus the operational changes can address the organisational level of sustainability in a business.

“Additionally, it is important to focus on the social sustainability of ecotourism businesses, both internally and externally. This focus on the social sustainability of an ecotourism business will support the community buy-in and help to create positive community relations.”

Additionally, recommendations were made in the article (Appendix A – Research Article 1) to address challenges post-pandemic. This research builds on these recommendations by exploring a possible holistic approach to facilitate them. The full state of the art review article can be found in Appendix A, for reference. The recommendations call for sustainability not only in terms of the environment, but also the long term economic sustainability of the ecotourism businesses. Furthermore, the research article concluded that there is a need to institute adaptive management strategies to help build resilience against future threats and conflicts (Harilal and Tichaawa, 2025, Ramaano, 2025). This holistic focus of sustainability also includes social responsibilities. A term to describe this approach to sustainability is organisational sustainability that is explained in terms of the triple bottom line (TBL).

The research article presented in Appendix A highlighted an important realisation that there is a need for ecotourism businesses in Africa to move away from the short-term survival mindset that the pandemic caused within these businesses, and focus now on the long-term changes and sustainable transformation that should now become the priority. This will enable these businesses to not only succeed, but also learn from the vulnerabilities within the industry to better prepare for future crises and improve their overall organisation to create more diverse and reliable revenue streams and ultimately transform the businesses to be more resilient.

1.2 Research problem

The problem is that the ecotourism industry underwent significant changes due to the COVID-19 pandemic and has not addressed these changes in the evolving economy.

1.3 Research opportunity

The proposed approach to achieving sustainable and long-term change in operations and economic growth, called for in the above conclusion, is to adopt a “Lean and Green” approach. The reason for selecting Lean and Green is its holistic approach to business and its inherent ability to address the three elements of organisational sustainability. This concept is not new, but rather one focused on both an organisation's productivity and sustainability. The application of Lean and Green in ecotourism specifically is a new perspective not previously explored, making this research unique. When establishing ways in which to improve or support an ecotourism business, it was essential to identify practices that share the same overarching goal; thus, the correlation of Lean and sustainability is emphasised as follows:

- **Waste reduction and efficiency:** Lean management focuses on eliminating non-value-adding activities, thereby reducing waste and resource consumption (Aljuwaied et al., 2023). Additionally, the continuous improvement philosophy has been proven to enhance operational efficiency and, in turn, reduce the environmental footprint. (Kaban, 2023).
- **Holistic integration with sustainability:** According to Rasheed et al. (2023), combining lean management with sustainability improves supply chain performance, leading to more sustainable outcomes. Lean practices have been proven to positively affect an organisation's environmental performance by optimising processes and reducing carbon emissions (Ferrazzi et al., 2023).
- **Leadership and change sustainability:** The leadership structures in place play a significant role in successful Lean implementation; the commitment and buy-in from leaders and staff are essential for successful change. Similarly, sustainability requires this long-term vision and buy-in for success and efficacy (Szwejcowski et al., 2024).

Lean and Green offers a robust approach to organisational and environmental sustainability, enabling effective improvements in efficiency and waste reduction to minimise an organisation's environmental impact.

In order to evaluate the possible impact of using Lean and Green for organisational sustainability in ecotourism, a case study organisation is selected and used as a test case. This presents the findings in the context of a South African ecotourism business, and determines the possible affects of Lean and Green in ecotourism. Although there are different ways to achieve organisational sustainability, Lean and Green is proposed as a holistic approach that considers all three aspects of the triple bottom line and could prove beneficial in the ecotourism sector. To understand the relevance of Lean and Green separately and in combination, background information is presented in Chapter 2 as part of the literature review.

1.4 Research aim

This study aims to develop a Lean-and-Green organisational sustainability model for an ecotourism organisation in South Africa.

1.5 Research objectives

The research objectives are intended to guide the researcher to the conclusion. Each research objective corresponds with a phase in the study to ensure accurate outcomes in each section.

- I. To establish an opportunity for research in the ecotourism industry by means of conducting a state of the art literature review.
- II. To investigate the use of lean and green principles for organisational sustainability in ecotourism organisations through a systematic literature review.
- III. To identify the organisational elements of an ecotourism organisation by means of a focus group interview.
- IV. To develop a Lean and Green organisational sustainability model by means of a morphological Zwicky analysis.
- V. To verify that the model adheres to the model requirements.
- VI. To validate that the model addresses the research problem through focus groups.

1.6 Ethical consideration

Ethical approval was obtained from the North-West University Engineering Research Ethics Committee (NWU-ENG-REC). Consent from all relevant parties was obtained through informed consent letters; in this research, it was obtained from the case study ecotourism business and the participants in the focus group interviews. Additionally, the identity of the business remains confidential throughout the dissertations. The data is handled with security and protected from unauthorised access by outside parties. The researcher has undertaken the NWU researchers' code of conduct, and the signed agreement is provided in Appendix D. The ethics approval letter is also provided, along with the following ethics number: NWU-01362-25-S1. Refer to

Ethical compliance is fundamental to this study and is guided by the principles outlined by Ali et al. (2025) and the legislative requirements of the Protection of Personal Information Act 4 of 2013 (POPIA) (Townsend et al., 2023). These frameworks emphasise informed participation, confidentiality, data protection, and respect for participants. The following ethical measures were implemented to ensure that all data were collected responsibly and ethically:

- Gatekeeper permission and access. Permission to conduct the study was obtained through relevant authorities, with SANParks acting as the gatekeeper where applicable. Conservation organisations (both private and public) were formally approached through invitation and permission letters (Appendix C). SANParks also facilitated access by distributing the questionnaire link to relevant respondents.
- Informed consent: All participants received a detailed cover letter outlining the study's purpose, procedures, duration, and ethical assurances. Participation was voluntary, and informed consent was obtained prior to data collection. Participants were also informed that the data may be used for academic publications and conference presentations.
- Voluntary participation and right to withdraw. Participants were clearly informed of their right to withdraw from the study at any stage without any negative consequences.
- Exclusion of vulnerable groups. The study did not involve vulnerable populations and was limited to adult participants (18 years and older).
- Anonymity and confidentiality: All responses were anonymised, and no personally identifiable information was linked to participants. Data were treated as strictly confidential and reported in aggregate to prevent individual identification.
- Protection of personal information (POPIA compliance): Any demographic or potentially sensitive information (e.g., expenditure data related to wildlife experiences) was handled in accordance with POPIA requirements. Participants were informed that no unnecessary personal data (e.g., IP addresses or email addresses) would be collected without consent.
- Data storage, ownership, and security. Electronic data was stored on password-protected devices. Participants were informed about data storage procedures to ensure transparency and trust.
- Minimisation of harm and respect for participants. The researcher ensured that all participants were treated with respect and that no information beyond what was voluntarily provided was collected. Where sensitive questions were included (e.g., economic-related data), participants' privacy and comfort were prioritised.

- Researcher independence and transparency. The researcher maintained independence and declared no affiliations with participating conservation organisations, ensuring objectivity and minimising potential bias.

1.7 Chapter summary

The chapter lays the foundation for this study by identifying the need for research at the organisational level of the ecotourism industry, rather than focusing solely on environmental considerations. The research aims to develop a Lean-Green organisational sustainability model for a South African ecotourism business, to achieve organisational sustainability. To achieve this aim, the six research phases are followed. Each phase corresponds to a specific research objective, method, and the chapter in which it is presented.

CHAPTER 2 LITERATURE STUDY

The literature review chapter outlines the different parts of the research area. The five areas of literature reviewed are sustainability, ecotourism, the Lean philosophy, the Green philosophy, and the integration of Lean and Green philosophies. The literature review focuses on the different elements of the research and provides the reader with the context in which the research is conducted.

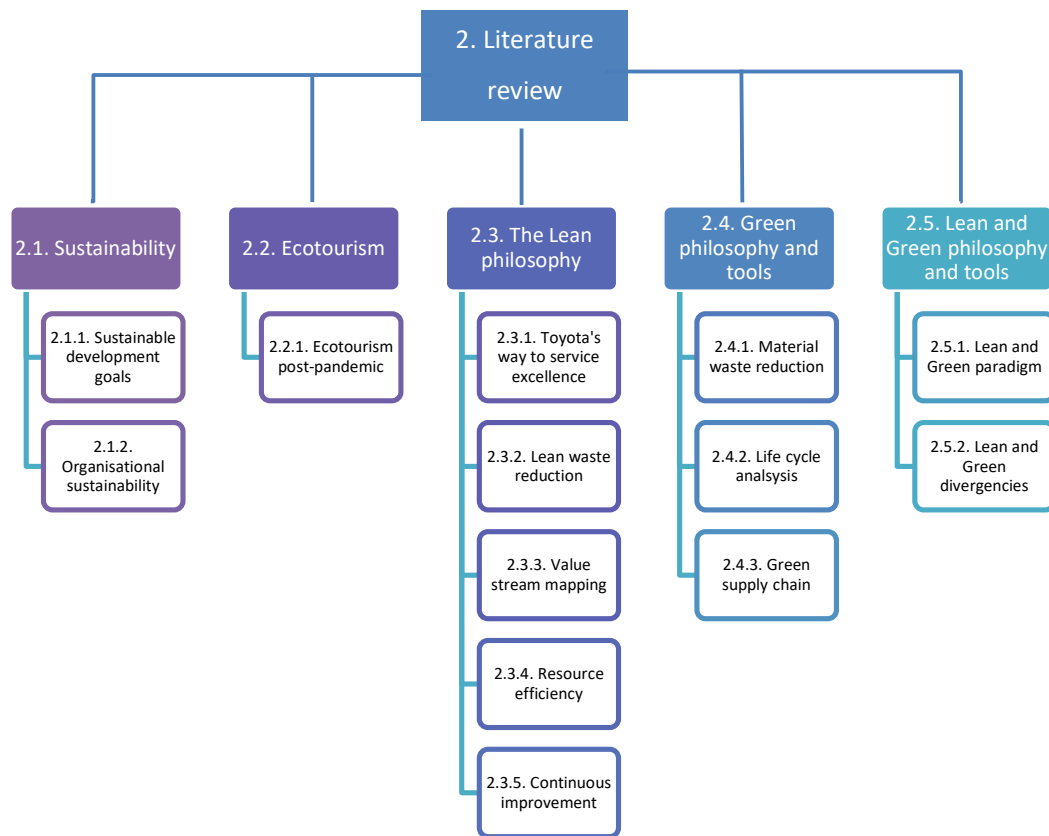


Figure 2: Overview of the literature review chapter

Although there are different ways to achieve organisational sustainability, Lean and Green is proposed as a holistic approach that considers all three aspects of the triple bottom line and could prove beneficial in the ecotourism sector. To understand the relevance of Lean and Green separately and in combination, this section provides supporting literature.

2.1 Sustainability

The purpose of this research is to achieve sustainability, specifically organisational sustainability. Therefore, this section outlines the importance and meaning of sustainability, as well as its relevance to the research.

A need for more sustainable practices and development is an ever-relevant focus for most industries, but it is uniquely essential for industries such as ecotourism, which depend on the natural environment for their appeal and profitability. This section expands on the sustainable development goals considered in this research and on the specific focus on organisational sustainability.

2.1.1 United nations Sustainable development goals (SDG)

To understand the real-world relevance of this research, the United Nations Sustainable Development Goals and the African Union's goals are considered and explained. Additionally, this research is considered in relation to these goals and the goals it can address. The agenda for sustainable development is based on the 17 Sustainable Development Goals. These goals are used as a blueprint for peace and prosperity for people and the planet, now and into the future. Additionally, the African Union's Agenda 2063 has been established as the blueprint for the African continent. This agenda embodies similar goals to the Sustainable Development Goals, but with a primary focus on a unified, concrete, and effective Africa. These sustainability goals are shown in Table 1, where the 17 UN Sustainable Development Goals are outlined in Agenda 2030, and the African Union's goals are outlined in Agenda 2063.

Table 1: Sustainable Development Goals

Nr.	Sustainable development goals	African Union goals
1	No poverty	A High Standard of Living, Quality of Life and Well Being for All Citizens
2	Zero hunger	Well-educated citizens and a skills revolution underpinned by Science, Technology and Innovation
3	Good health and well-being	Healthy and well-nourished citizens
4	Quality education	Transformed Economies
5	Gender equality	Modern Agriculture for increased productivity and production
6	Clean water and sanitation	Blue/ ocean economy for accelerated economic growth
7	Affordable and clean energy	Environmentally sustainable and climate resilient economies and communities
8	Decent work and economic growth	United Africa (Federal or Confederate)

Nr.	Sustainable development goals	African Union goals
9	Industry, innovation, and infrastructure	Continental Financial and Monetary Institutions are established and functional.
10	Reduced inequalities	World-class infrastructure crisscrossed Africa
11	Sustainable cities and communities	Democratic values, practices, universal principles of human rights, justice and the rule of law are entrenched.
12	Responsible consumption and production	Capable institutions and transformative leadership are in place
13	Climate action	Peace, Security, and Stability are preserved
14	Life below water	A Stable and Peaceful Africa
15	Life on land	A fully functional and operational APSA
16	Peace, justice, and strong institutions	African Cultural Renaissance is pre-eminent
17	Partnerships for the Goals	Full Gender Equality in All Spheres of Life
18		Engaged and Empowered Youth and Children
19		Africa is a major partner in global affairs and peaceful coexistence.
20		Africa takes full responsibility for financing its development.

The highlighted goals show the areas where this research could have a positive impact. These goals are Industry, innovation, and infrastructure; Sustainable cities and communities; Responsible consumption and production; Life on land; and modern agriculture for increased productivity and production. The impact of this research on the goals will be further discussed once the findings are presented and the effect can be better understood and determined.

2.1.2 Organisational Sustainability

Sustainability can be seen as the combination of three main elements: social, economic, and environmental (Purvis et al., 2019). Although there is debate over the origin of the concept of three elements, or pillars, of sustainability (Purvis et al., 2019), the idea is widely used to capture the delicate balance required to achieve sustainability in any field. Organisational sustainability is an organisation's ability to endure and thrive over time, balancing the economic, social, and environmental considerations. Organisational sustainability comprises several elements,

including human resource quality, innovative practices, and the integration of sustainability into core business strategies (Rahman, 2022).

“Organisational sustainability is adopting organisational strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining, and enhancing the human and natural resources that will be needed in the future” - (Deloitte and Touche, 1992)

Organisational sustainability can be approached through the lens of the triple bottom line framework. The triple bottom line consists of three pillars: economic, environmental, and social.

2.2 Ecotourism

To further understand the research, it is important to understand the ecotourism sector of tourism. This section defines and conceptualises the ecotourism industry and the research setting. The constituent parts of the tourism product include accessibility, accommodation, activities, attractions, and amenities (Camilleri, 2018). The definition of tourism is directly rooted in the definition of a tourist. A tourist is an individual who temporarily leaves their home to visit a different environment (Camilleri, 2018), where they engage in various activities. Therefore, these activities and experiences that the tourist participates in can be considered tourism. These activities and experiences, ‘tourism’, can be viewed as a product; they have value, can require payment, and generate profits. Therefore, the tourism industry has the primary objective of serving travellers or tourists (Selling an experience). Essentially, tourism consists of four main sectors: transportation, accommodation, ancillary services, and sales and distribution.

- Transportation is what makes tourism possible; it is the element that allows an individual to leave their home and visit a different environment (Camilleri, 2018).
- Accommodation is an element of hospitality; it facilitates tourism activities and experiences in a specific location, away from the tourist's home (Camilleri, 2018).
- Ancillary services will include all other direct contact with the tourist. These are services provided in the form of entertainment and amenities (Camilleri, 2018). This can be anything from cinemas and theatres to restaurants and Wi-Fi facilities.
- Sales and distribution refer to the organisations that facilitate tourism. This applies to airlines, hotels, transportation companies, and other related entities. (Camilleri, 2018).

Therefore, ecotourism may still include the general tourism elements such as transportation, accommodation, ancillary services, and sales and distribution (Camilleri, 2018). However, it will have a specific field within these elements, meaning the ancillary services provided will most likely

be nature-based and environmentally educated, and the overall organisation and its environment will be sustainably managed (Blamey, 2001).

To understand ecotourism, it is also essential to recognise that it is rooted in the broader concept of natural area tourism. Figure 3 illustrates the foundation of ecotourism. It is the combination of nature and tourism (Newsome et al., 2013).

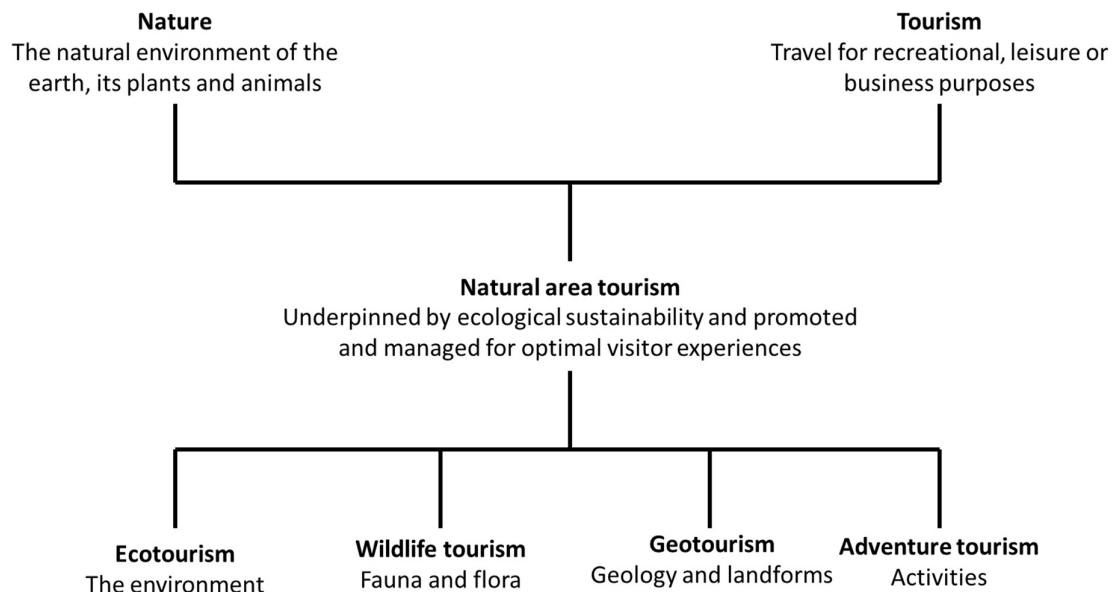


Figure 3: Characteristics of natural area tourism (Adapted from (Newsome et al., 2013))

Natural area recreation and tourism are undertaken by local communities, independent travellers and commercial tour clients (Newsome et al., 2013). This form of tourism then flows into the four categories shown in Figure 6: ecotourism, wildlife tourism, geotourism, and adventure tourism. The focus of this research is ecotourism, specifically because it has an educational element that benefits both the local community and visitors. Ecotourism assumes that the ecological impact or contribution of the tourism organisation is a net positive one; thus, the positive effects outweigh the negative. Ecotourism can be defined as follows:

“Ecotourism is nature-based tourism that involves education and interpretation of the natural environment and is managed to be ecologically sustainable.” – Allock et al., 1994

Ecotourism consists of five characteristics (Newsome et al., 2013):

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

- Educational and learning outcomes are fostered.
- It has increased the likelihood of achieving environmental and socio-cultural sustainability outcomes.
- The importance of an operation's financial sustainability is recognised (it must at least be financially viable).

2.2.1 Ecotourism post-pandemic

A state of the art review was done to contextualise the problem and understand the current state of ecotourism post-pandemic. The full review is in Appendix A. This highlights the novelty and significance of conducting this research in this industry. A short summary of some of the findings is explained in the following paragraph to highlight the importance of the previous research already conducted, and the impact it potentially has on this research.

The state of the art review contributed to the literature of sustainable tourism and the way in which the recovery of ecotourism in Africa can be reconceptualised post pandemic. The shift in focus is moving away from the short-term operational changes that enabled the survival of a business, and move toward the operational changes that will not only help a business survive but that will help to create long-term and sustainable transformation in the business. The research article showed that the pandemic enabled researchers to understand the vulnerabilities within the ecotourism industry and their over-reliance on international tourism revenue streams that puts these businesses in a place to be threatened by the possibility of future crises.

2.3 The Lean philosophy

The approach chosen to achieve the research aim is Lean and Green. However, to fully understand the Lean and Green, Lean is introduced to provide a general understanding of its philosophy and key elements. The origin of the Lean Philosophy is rooted in the principle of survival. After the Second World War, Toyota endured a period of suffering and desperation; it faced significant debt due to the war's economic impact, which devalued money (Liker, 2020). Toyota began identifying ways to minimise waste, increase productivity, and reduce overall costs (Liker, 2020). The development of lean was a lengthy process of trial and error, involving changes in operations, inventory levels, and many other elements. Still, it marked the start of a new era in manufacturing. Lean manufacturing. This new way of operating enabled Toyota to survive economic downturns and to provide high-quality products to a consumer base that could not afford them. It is, however, essential to understand the difference between Lean manufacturing and the Toyota Production System (TPS). The difference is explained as follows:

“The difference between lean manufacturing and TPS is that in lean manufacturing, the focus is on the tools, and with TPS, the focus is on the system. There are many tools (just-in-time, cells, 5S, kanban, etc.) that can be utilised to implement the TPS, but not all are mandatory.” – (Stewart, 2011, Coetzee et al., 2016)

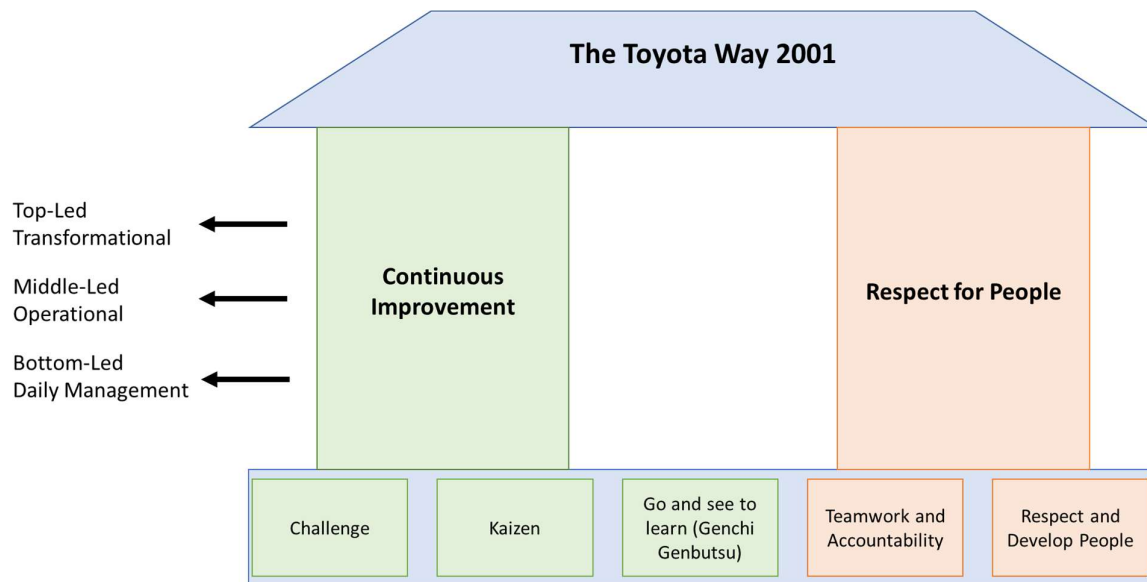


Figure 4: The Toyota Way 2001 (Adapted from (Liker, 2020))

Figure 4 illustrates the general concept of the Toyota Way by symbolising it as a house resting on a foundation of tools and two pillars: continuous improvement and respect for people.

Lean is a proven approach to business improvement. (Abrahams and Ngulube, 2023). It can drive financial success and improve productivity, making a business more competitive and overall more successful, with a human-focused culture embedded.

2.3.1 Toyota's way to service excellence

The industry context of this research is in the service environment, therefore to understand the application of Lean within the ecotourism industry, it is essential to distinguish between service- and goods-producing industries. The definition of a service industry, as given by Liker and Ross (2017):

Service industry: an industry in that part of the economy that creates services rather than tangible objects. Economists divide all economic activity into two broad categories, goods and services. Goods-producing industries include agriculture, mining, manufacturing, and construction; each produces tangible goods. Service industries include everything else: banking, communications, wholesale and retail trade, all professional services such as

engineering, computer software development, and medicine, nonprofit economic activity, all consumer services, and all government services, including defence and the administration of justice.

Within the service industry, service organisations can be categorised into four types. The four types of service organisations, as interpreted in The Toyota Way to Service Excellence, are seen in Figure 5.

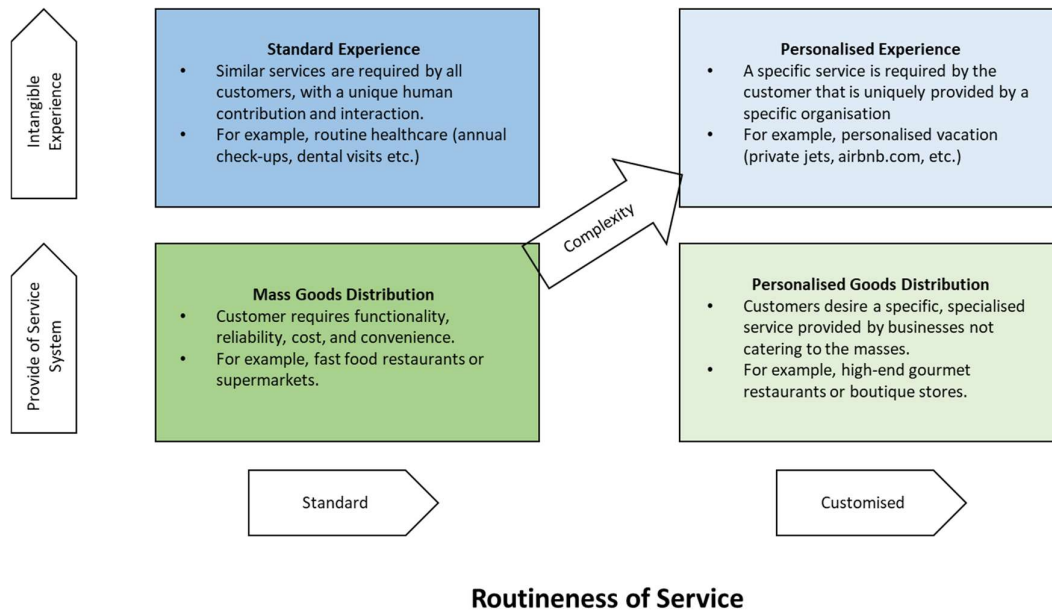


Figure 5: Example of four types of services (Adapted from (Liker and Ross, 2017))

Service excellence looks different for different service organisations. Mass goods distribution customers prioritise functionality, reliability, cost, and convenience. Similarly, standardised experience organisations' customers desire those elements, with the addition of the human touch, in their interactions with the customer. Efficient service delivery that addresses needs at a low cost, along with respectful treatment, is part of the expectations in standard experience organisations. Personalised goods distribution customers want something special they cannot get from an average company, something that distinguishes them from the masses. It should solve their unique problem of a generic set of customers. Finally, the personalised experience is the most challenging of the service types, as customers want to be wowed, pampered, and treated like the most critical customer. They want a memorable experience, and they are willing to pay extra for it. This is a luxury service, and only the person's particular experience matters, not anyone else's (Liker and Ross, 2017). Ecotourism can thus be seen as a personalised experience, where the service provided depends on the customer and their wants and needs. For a better understanding of ecotourism as an industry, refer to the state of the art review in Appendix A.

'Good' companies offer the best service they can, whereas excellent companies work continuously and systematically to improve the services they provide to satisfy their customers better. A key goal of Lean in service is to create a blueprint for achieving excellence.

There is no single approach to implementing Lean through step-by-step tool implementation; rather, it is a set of principles that help an organisation reflect on its operations and procedures to identify gaps and shortcomings that prevent the business from achieving its full potential (Liker and Ross, 2017). This research aims to achieve service excellence across the three elements of organisational sustainability. To deliver an excellent service while maintaining the sustainability of the business in its entirety.

The Toyota Way to Service Excellence provides principles and their application in service, as shown in Figure 6.

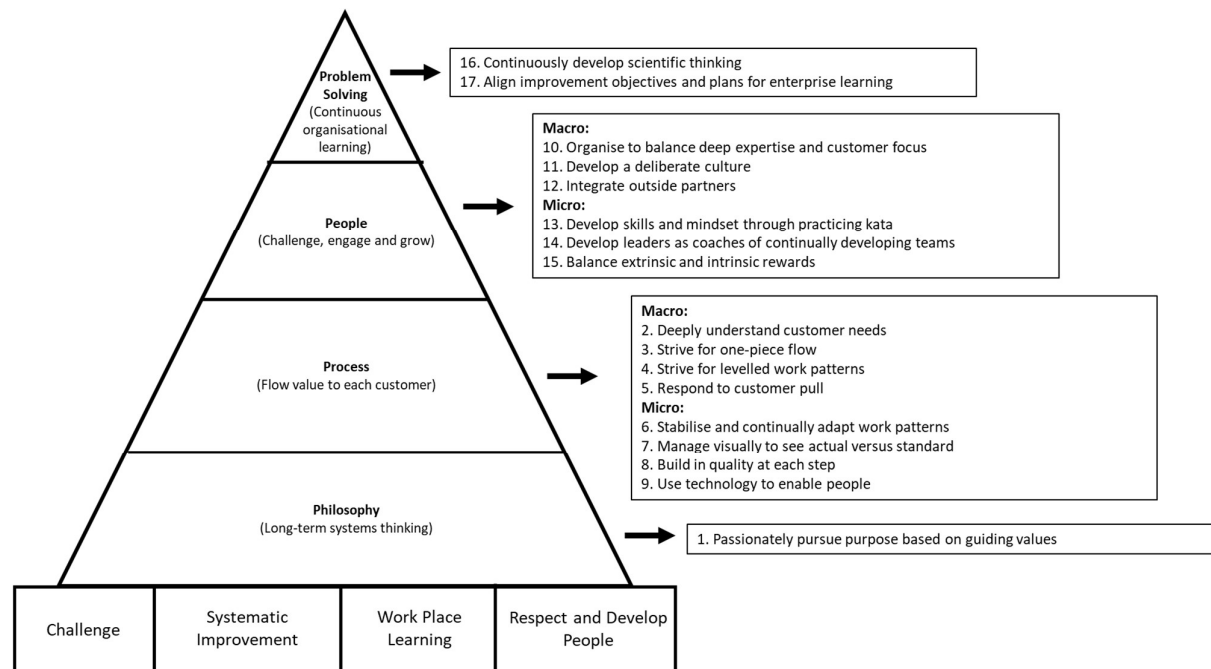


Figure 6: Toyota Way to Service Excellence 4P model (Adapted from (Liker and Ross, 2017))

The 4P model, as shown in Figure 6, provides an overview of the Lean principles as they relate to service excellence (Liker and Ross, 2017). Philosophy, at the base of the triangle, evaluates the organisation's long-term vision and how the company wants to make its contribution to society through the services it delivers (Liker and Ross, 2017). Process refers to the practical implications of the different organisational levels (Liker and Ross, 2017). At the macro level, it is the business architecture and how the value stream, as a whole, contributes to service excellence. On a micro level, it involves the active engagement of all members in continuously improving operations and

closing identified gaps. People, or Respect for People, refers to creating a culture of mutual respect within an organisation and engaging with individuals to challenge and motivate them to strive for excellence (Liker and Ross, 2017). At the micro level, this implies that organisational design must support customer-focused continuous improvement. At this level, it involves the process-level PDCA cycle (Plan, Do, Check, Act) and the development of team members through coaching and training (Liker and Ross, 2017). Finally, at the top of the triangle is problem-solving that addresses efforts across the organisation. On a macro level, this refers to overall objectives that align with company strategy through long-term business strategies (Hoshin Kanri), and on a micro level, it refers to all improvement efforts that support the delivery of service excellence (Liker and Ross, 2017). This model is a way of thinking that addresses the business as a whole and enables it to operate with a single, unified goal at all levels. This approach to business and operations adopts a holistic perspective to achieve excellence and ensure ultimate success, which is a fundamental part of developing a strategy for organisational sustainability in ecotourism (Liker and Ross, 2017).

2.3.2 Lean waste reduction

One of the fundamental tools in the Lean toolkit is understanding and eliminating waste within an organisation. There are eight forms of waste identified through lean, which reveal non-value-adding elements at the operational level. These are identified in Table 2. In the second column, the wastes are described as initially determined. The third column extends the definition to apply to service organisations as well as manufacturing.

Table 2: Lean Waste Forms

Waste Mode	Description	Service
Overproduction	Producing more than the customer demands. This means the business cannot accurately determine how much to produce, so it produces more than needed, creating waste.	Involves generating service outputs beyond immediate needs (Damrath, 2012, Tatiyanantakul and Chindaprasert, 2024) and producing more than what subsequent processes or end customers require, leading to various inefficiencies such as excess inventory, transportation waste, and increased resource consumption (Charron et al., 2014, Tatiyanantakul and Chindaprasert, 2024).

Waiting	This refers to wasting time, waiting for products or inspections to be completed before an item can proceed to the next phase in manufacturing. Whatever is being waited for creates idle time, a period when nothing is created or improved, a time when more could be done.	Refers to delays between consecutive activities (Tatyanantakul and Chindaprasert, 2024, Damrath, 2012). Time spent waiting for something to happen, whether its human waits, machine waits, material waits or waiting for information to proceed. Service waiting ultimately leads customers to wait for service providers (Charron et al., 2014).
Unnecessary Transport	Unnecessary transport refers to the excessive or unneeded transportation of materials or products in and out of storage.	Encompasses unnecessary movement of materials, products, or information (Damrath, 2012, Tatyanantakul and Chindaprasert, 2024). Operations associated with moving equipment, materials, or parts, resulting from poor purchasing decisions, oversized products, or inadequate storage space or amenities (Charron et al., 2014, Tatyanantakul and Chindaprasert, 2024).
Incorrect processing	This could be over- or under-processing of items. Overprocessing involves unnecessary steps in a process, thereby wasting time and resources. Alternatively, underprocessing occurs when necessary steps in a production process are neglected.	Characterised by adding more value to the service than customers are willing to pay for (Tatyanantakul and Chindaprasert, 2024, Damrath, 2012). Processes that add unnecessary value from the customer's perspective. This includes redundant tasks that consume valuable time without adding value (Tatyanantakul and Chindaprasert, 2024, Charron et al., 2014).
Excess Inventory	Excess inventory refers to inventory that is not needed. This is inventory that is not being worked on but is sitting idle.	Denotes excess work-in-progress beyond customer requirements (Damrath, 2012, Tatyanantakul and Chindaprasert, 2024).
Unnecessary Movement	This form of waste refers to the movement of someone who is not optimal. This can involve moving an unfinished product from one station to the next for completion,	Includes unnecessary movement of people due to poor layout of service areas (Tatyanantakul and Chindaprasert, 2024, Damrath, 2012). Waste resulting from unnecessary or incorrect movements, such

	where the stations are located at either end of the facility. This means the item is moving in a way that may not be necessary and could be improved.	as the movement of people or information that does not add value to products or services, resulting in discontinuous flow (Tatiyanantakul and Chindaprasert, 2024, Charron et al., 2014).
Defects	This occurs when a part or product is not produced correctly and needs to be reworked or scrapped entirely.	Refers to any service aspect that fails to meet customer needs (Damrath, 2012; Tatiyanantakul &. Any inventory exceeding the requirements of the production process. Excess inventory often creates problems and leads to additional waste, including increased labour, equipment maintenance, and space usage (Tatiyanantakul and Chindaprasert, 2024).
Unused people's creativity	Unused creativity or knowledge in the business refers to not taking the time to listen to employees and gather their ideas for improvement or optimisation, and thus losing time, ideas, skills, etc. that could have been used.	Arising from outdated beliefs that view employees as liabilities rather than assets, a lack of promotion through training, and skills enhancement fail to leverage employees' full potential, leading them to perform only tasks assigned to them without using creativity (Tatiyanantakul and Chindaprasert, 2024)

Lean waste reduction involves evaluating business operations to identify and eliminate operational waste (Liker, 2020). This approach is designed to improve productivity and efficiency and minimise non-value-added activities within a business. These wastes can be identified in most companies and processes.

Understanding what lean waste looks like in service makes it easier to comprehend its potential implications for ecotourism. It establishes a foundation for applying lean principles in ecotourism and the operations of these businesses, as well as for eliminating non-value-added practices and enhancing value-added practices.

2.3.3 Value stream mapping

Another tool in the lean toolkit is value stream mapping. Value stream mapping is an illustrative Lean approach defined as:

“A method to understand the material and information flow in a sequence of work processes. The current-state map illustrates how value flows to customers and the various wastes that obstruct this flow. The future-state map is an aspirational vision of how material and information need to flow to achieve business objectives.”(Liker, 2020)

A value stream is a collection of activities, from customer needs to delivery, with a specific purpose (Bicheno, 1998). Value stream mapping is not a solution to a problem but rather a tool for identifying areas for improvement. In service organisations, such as an ecotourism business, a generalised value stream approach is used to evaluate the current state from the customers' perspective and what they value (Liker and Ross, 2017).

There are seven tools identified within value stream mapping that are expected to have a positive impact on the various waste forms. Table 3 shows the waste forms and their correlation to the mapping tools. The notations refer to low (L), medium (M), and high (H) levels of correlation and practicality of the lean waste subject to each of the identified mapping tools.

Table 3: Seven value stream mapping tools (Adapted from (Hines and Rich, 1997))

Wastes/ Structure	Mapping tool						
	Process activity mapping	Supply chain response matrix	Production variety funnel	Quality filter mapping	Demand amplification mapping	Decision point analysis	Physical structure (a. volume, b. value)
Overproduction	L	M	-	L	M	M	-
Waiting	H	H	L	-	M	M	-
Transport	H	-	-	-	-	-	L
Inappropriate processing	H	-	M	L	-	L	-
Unnecessary inventory	M	H	M	-	H	M	L
Unnecessary motion	H	L	-	-	-	-	-
Defects	L	-	-	H	-	-	-
Overall structure	L	L	M	L	H	M	H

Value stream mapping can also be translated or adapted for any business system; one needs to understand the waste forms and value elements of the system. In ecotourism, as a service industry, the value lies in customer satisfaction and service excellence. (Liker and Ross, 2017). Therefore, the value stream is based on what the different 'products' or, in this case, services delivered to the customer are and how they address their needs.

This mapping tool has an extension called sustainable value stream mapping, which includes environmental and social impacts as additional metrics (Zokaei, 2013). Sustainable value stream mapping is used in the same way as the original value stream mapping tool, but it also considers social and environmental impacts when evaluating a business process. This approach, which forms part of the Lean and Green philosophy proposed in this research, provides a more holistic way to map processes and identify waste (Zokaei, 2013).

2.3.4 Resource efficiency

Resource efficiency in Lean management ties the Lean aim of delivering customer value to using fewer inputs per unit of value delivered; it focuses on materials, energy, time and capacity usage across the value stream (Al Falah and Ghouri, 2023). The concept reframes resources as assets to be optimised through continuous elimination of non-value-adding activities and the closure of material loops (Sasso et al., 2025). Organisational sustainability in ecotourism requires effective management of resources, such as water. This is to ensure environmental sustainability, in other words, the responsibility to protect the natural environment and natural resources. It is fundamental to the successful delivery of the ecotourism service to create a healthy natural environment.

Resource efficiency can be achieved in different ways. Some key principles build on the classic Lean philosophy (value, flow, pull, continuous improvement), with contributions and embedding ecological and circular ideas to preserve resources across the lifecycle (Abobakr et al., 2022). Lean methodologies combine established Lean tools, sustainability adaptations, and integrated frameworks (green Lean Six Sigma, eco-lean, circular R-strategies), supported by digital enablers (Miehe et al., 2016). These tools can be implemented to improve resource efficiency and the overall organisational sustainability of a business.

2.3.5 Continuous improvement

To achieve change throughout a business, this research defines change as organisational sustainability, a continuous process of implementing different tools at various points in the process. The Lean philosophy promotes continuous improvement to facilitate constant change. Continuous improvement is framed in the literature as a long-term, systematic philosophy and set of practices aimed at incremental and occasional breakthrough enhancement of processes and outcomes; it emphasises improving systems rather than blaming individuals (Temponi, 2005). The approach is cyclical and iterative (often PDCA/PDSA), relying on measurement to detect variation, and treats quality as a moving target that requires sustained organisational commitment (Temponi, 2005; Sahnó et al., 2015). Continuous improvement, therefore, combines clear goals

tied to customer needs, regular measurement and analysis, iterative testing of changes, and institutional learning so that improvements are retained and scaled (Temponi, 2005; Marshall, 2010). Therefore, for a Lean and Green support model to effectively change the ecotourism industry to achieve organisational sustainability, continuous improvement should be considered at every stage of implementation. Refer to Chapter 5 to examine the impact of Lean and Green on the elements of organisational sustainability, and to Chapter 6 to explore their applications in ecotourism departments.

2.4 Green philosophy and tools

In addition to the Lean philosophy, the Green element is evaluated separately to understand its unique relevance. This section explores the green philosophy and its core tools. Furthermore, the green philosophy involves considering sustainability in business to achieve environmental sustainability.

2.4.1 Material waste reduction

The first way to achieve environmental sustainability is to consider how material waste is managed and disposed of. Businesses need to minimise the physical waste generated by an organisation. This can range from packing materials to single-use items throughout operations.



Figure 7: Green wastes (Adapted from (Zokaei, 2013))

Material, or green waste, is the destruction of the natural environment and negatively impacts the overall sustainability of a business (Zokaei, 2013). Therefore, to effectively work toward sustainable operations, green waste needs to be addressed. The forms part of Lean and Green management. Green waste is essential to all businesses, but especially to those that rely on the health of their physical environment to generate profit (Jackson, 2022). Ecotourism businesses, like any business, have a fundamental need for proper waste management and disposal to ensure long-term success.

2.4.2 Life cycle analysis

One way to improve waste management and disposal methods within a business is first to assess the impacts of all products and physical materials that move through a company. To assess this impact, a life cycle analysis is used. Life Cycle Analysis (LCA), also known as Life Cycle Assessment, is a systematic method for evaluating the environmental impacts of a product or service throughout its life cycle. This includes raw material extraction, manufacturing, distribution, use, and disposal. The goal of LCA is to quantify energy and material inputs, assess related environmental outputs, and evaluate their impacts on the environment (Filimonau, 2016).

Life cycle analysis can broadly be executed in 4 steps, which are defined as follows:

- 1) Create definition and scope – define the parameters of the life cycle being analysed (Williams, 2009).
- 2) Complete a life cycle inventory - a life cycle inventory refers to a combined inventory list of all inputs and outputs of a given product or process (Williams, 2009).
- 3) Complete the life cycle impact assessment – a life cycle impact assessment interprets how the processes and products in a life cycle analysis impact human health and environmental health (Williams, 2009).
- 4) Interpret the results and make recommendations – life cycle analysis is done to systematically evaluate the life cycle of a product or process from raw materials to final disposal; therefore, the information gained from the life cycle inventory and life cycle impact analysis is used to draw conclusions about the sustainability of a product or process and make informed recommendations (Williams, 2009).

A life cycle analysis may also help identify green waste that can be addressed and reduced. Additionally, this approach is used to evaluate the sustainability of resources and raw materials procured (Filimonau, 2016). Even though ecotourism is a service, there is still a 'product', and by identifying all physical materials used to generate this 'product' and analysing its life cycle, the overall environmental impact is better understood. Understanding the effect enables the

implementation of solutions and strategies to improve waste management and disposal methods across a business, making it more sustainable and 'green'. For example, in tourism, one might examine the lifecycle of a tourist moving through the organisation and analyse the complete impact of the tourist on the environment.

2.4.3 Green supply chain

Another key tool in the Green philosophy is the green supply chain. Ahi and Searcy's review shows the literature contains many Green Supply Chain Management (GSCM) definitions that converge on integrating environmental concerns into supply chain activities and distinguishing GSCM from broader sustainability concepts (Ahi and Searcy, 2013). Classic reviews frame green supply chains as extensions of traditional, one-way supply chains that include environmental management and reverse flows, such as take-back and recycling (Fahimnia et al., 2015).

- Integrated environmental focus Green supply chain management is the incorporation of environmentally sound choices into supply-chain decision making across suppliers, production, distribution and post-use stages (Badi and Murtagh, 2019).
- Comparative perspective GSCM definitions cluster around environmental objectives and supply-chain flows, whereas sustainable supply chain management (SSCM) typically adds explicit economic and social dimensions (Ahi and Searcy, 2013).
- Strategic scope GSCM is treated as a strategic, multi-actor framework that links suppliers and customers through decisions and policies designed to improve environmental performance across the network (Singh and Trivedi, 2016).
- Field evolution Reviews describe GSCM as an emergent, rapidly evolving field that addresses topics such as performance measurement, closed-loop systems, and reverse logistics (Tronnebati and Jawab, 2020).

To truly achieve sustainability within a business, the outside resources should also be considered. This is achieved by evaluating the entire supply chain and determining how to implement green supply chain management.

2.5 Lean and Green philosophy and tools

With an understanding of Lean and Green as separate philosophies, the Lean and Green approach is explored to illustrate how this approach is specifically suited for organisational sustainability. True sustainability can only be achieved if all three elements of the triple bottom line elements are all considered and addressed. By combining Lean and Green philosophies, sustainability is addressed holistically.

2.5.1 Lean and Green paradigm

The Lean and Green paradigm combines Lean management principles with Green management strategies to create a holistic approach to operational efficiency that prioritises sustainability. The combination of these two philosophies prioritises waste reduction, cost reduction, and resource efficiency, all while adopting a sustainable approach.

The similarities between the two philosophies are emphasised within the research community, where green initiatives aim to improve environmental performance and lean initiatives aim to improve operational performance. Green focuses on limiting physical consumption and waste, while lean aims to minimise costs and operational waste. Both approaches aim to limit or eliminate waste and to improve an organisation's performance. With this in mind, the following maturity stages are used to evaluate the Lean and Green impact, as shown in Figure 8.

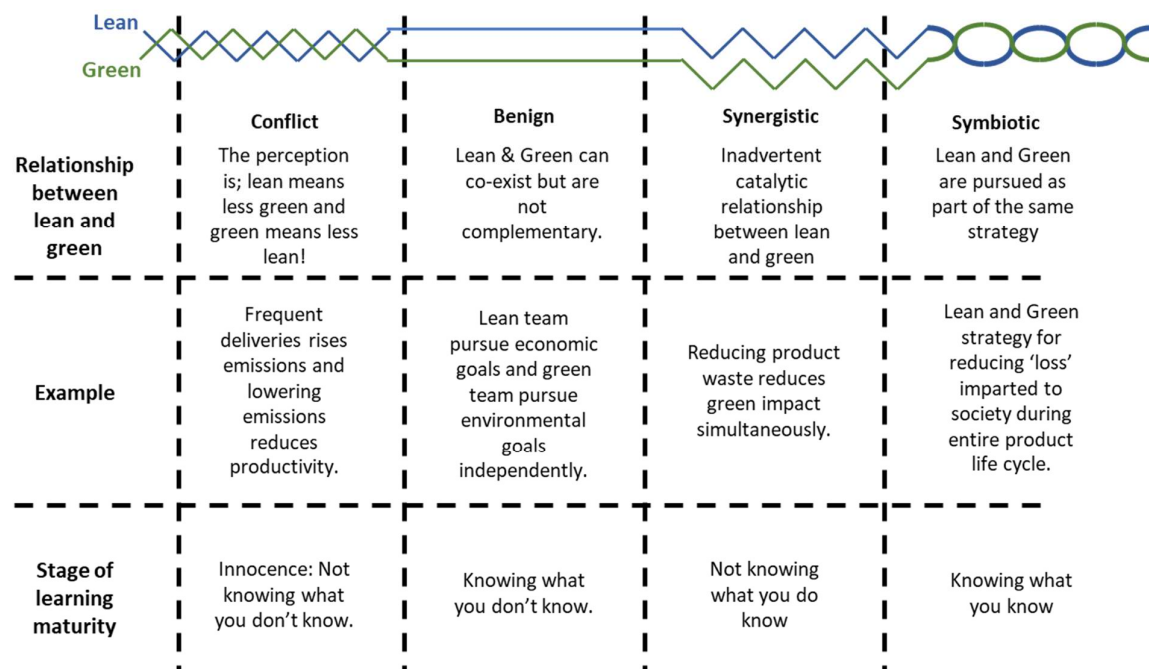


Figure 8: Stages of lean and green maturity (Adapted from (Zokaei, 2013))

The first stage of Lean and Green conflict is evident: the initial view of integration, where the two seem incompatible. For example, implementing just-in-time (JIT) practices, which improve efficiency but negatively impact sustainability by increasing transport. This seems contradictory; however, it is due to a lack of understanding. Next, a benign relationship stage is observed, in which the two are separated. Lean is implemented, and there is simultaneous, yet separate, consideration for green and sustainability. This stage, however, overlooks the potential for integrating the two. Both Lean and Green share the mantra of 'better tomorrow than today',

emphasising the overlap. A synergistic relationship is unintentional support; lean is implemented, and in the process of eliminating economic waste, there is also an unplanned positive effect on the environmental impact. The final stage is symbiotic. At this stage, the intentional pursuit of lean and green is evident; this is when a business can identify the connection between Lean and Green, intentionally apply it, and consider it in the design phase of both products and processes (Zokaei, 2013).

The Lean and Green paradigm is based on an accurate understanding and implementation of both philosophies. Understanding this fully will enable one to see the connection between the two and move forward with implementing them in a way that supports and improves both philosophies (Zokaei, 2013).

2.5.2 Lean and Green divergencies

Lean and green practices exhibit divergencies that stem from differences in their focus, drivers, and implementation strategies. Lean practices prioritise operational efficiency by eliminating production-related waste, such as excess inventory and defects, thereby reducing costs and improving productivity (King and Lenox, 2001, Inman and Green, 2018). Green practices, on the other hand, emphasise environmental sustainability by reducing ecological waste, such as emissions and hazardous materials, often driven by external pressures like regulatory compliance and customer demand for eco-friendly products (Bhattacharya et al., 2019). These differences can lead to trade-offs; for instance, Lean's Just-in-Time inventory system reduces storage costs but may increase transportation emissions, conflicting with green objectives.

Challenges in integrating Lean and Green arise from cultural misalignment, communication gaps, and competing priorities. Lean practices focus on internal process improvement, while green practices target external environmental impacts, creating tensions in implementation (Bhattacharya et al., 2019). Additionally, lean practices are often driven by internal organisational goals, whereas green practices are motivated by external pressures, further complicating their alignment (Inman and Green, 2018). Despite these divergencies, studies suggest that lean and Green practices can be complementary when managed effectively, as Lean practices can indirectly support green initiatives by fostering waste reduction and continuous improvement (King and Lenox, 2001, Bhattacharya et al., 2019).

Even though there are divergencies in these philosophies, the correlation and symbiotic relationship provide a primarily positive impact on organisational sustainability and business operations in general (Küsel et al., 2025).

2.6 Chapter summary

In conclusion, this chapter has provided a comprehensive review of the Lean philosophy, its evolution, and its application across various industries, including the service and ecotourism sectors. The Lean principles of waste reduction, value stream mapping, resource efficiency, and continuous improvement have been explored in depth, alongside their integration with Green management strategies to create a sustainable operational framework. The chapter also highlighted the challenges and synergies between Lean and Green paradigms, emphasising their potential to drive both operational efficiency and environmental sustainability. Furthermore, the unique characteristics and post-pandemic challenges of the ecotourism industry were examined, underscoring the need for innovative management practices and sustainable development. The method or tools discussed, including value stream mapping and life cycle analysis, provide a robust foundation for analysing and improving organisational processes. Additionally, the chapter provides an overview of the research methods used in this study and outlines the theoretical underpinnings of each method. This literature review sets the stage for the subsequent research, which aims to develop a Lean and Green support model tailored to the needs of ecotourism organisations, fostering long-term sustainability and resilience in this critical sector.

CHAPTER 3 RESEARCH DESIGN

This chapter presents an overview of the research methods employed in conducting the study. First, an outline of the research methodology is presented, derived from Saunders' research onion. (Saunders et al., 2023). Saunders' research onion is shown in **Error! Reference source not found.**

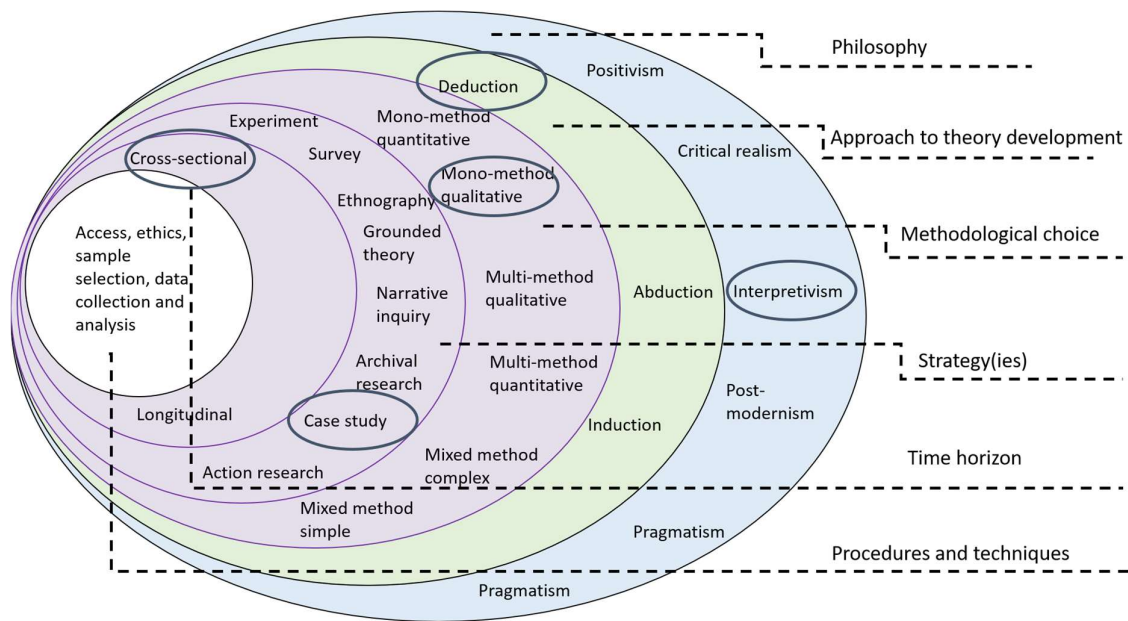


Figure 9: Research onion (Adapted from (Saunders et al., 2023))

The research philosophy for this study is interpretivism, as it involves interpreting the use of a specific approach in a particular industry. A deductive research approach to theory development is employed, where 'deductive' refers to research based on an existing theory, such as Lean and Green, and how this theory relates to a unique research question posed in this study (Seuring et al., 2021). A mono-methodological qualitative approach is employed in this study, utilising a descriptive qualitative case study method. The stages of the case study methodology are defining the case study, designing the case study, data gathering, data analysis, and data validation (Merriam, 2009). The case study is seen as a strategy to achieve the methodological approach. The time horizon defines the longevity of the approach, where cross-sectional refers to research with a shorter-term focus, where data are collected at a single point in time, and longitudinal refers to research conducted over time, where data are collected repeatedly (Seuring et al., 2021). This study is considered cross-sectional, seeing as data collection is done 'once' for the research and

not repeated. Furthermore, the techniques used in this research include focus groups conducted at the case study organisation, a systematic literature review for data collection, and analysis using applied thematic analysis.

A case study can be defined as empirical research method that investigates a contemporary phenomenon in depth within its real-world context, particularly when the boundaries between the phenomenon and its context are unclear, and that relies on multiple sources of evidence (Yin et al., 2018).

From this definition the following characteristics are identified, as well as how this research is suited to the characteristics:

- Empirical research, this research requires rigorous research methods that go beyond descriptive research. This research applies various research methods that all contribute to the validity and rigour of the research.
- Investigates a contemporary phenomenon, which implies that a case study is applicable to a real-world current problem. Which is fitting for the post-pandemic climate of this research and the investigation of organisational sustainability that is an important topic in current research.
- Real world context, which emphasises that case studies focus on actual real-world problems. Where this research focuses on specifically ecotourism in South Africa.
- Context and phenomenon, which implies that the context and the phenomenon cannot be investigated separately. In this research the investigation of organisational sustainability within in ecotourism is uniquely linked to the post-pandemic state of the economy, and thus needs to be investigated together.
- Multiple sources of evidence, which implies that case studies call for multiple sources to substantiate the research. The research conducted consists of a systematic literature review, interviews with industry professionals, as well as focus group interviews with industry professionals.

The characteristics listed above emphasises how a case study approach is suited to the research.

Additonallt, the qualitative case study method strategy is defined as follows:

“A case study is an in-depth description and analysis of a bounded system.” - (Merriam, 2009)

The bounded system for this qualitative case study is a South African ecotourism business located in the Kalahari.

The stages of the case study methodology are defining the case study, designing the case study, data gathering, data analysis, and data validation (Merriam, 2009). This is shown in Figure 10.

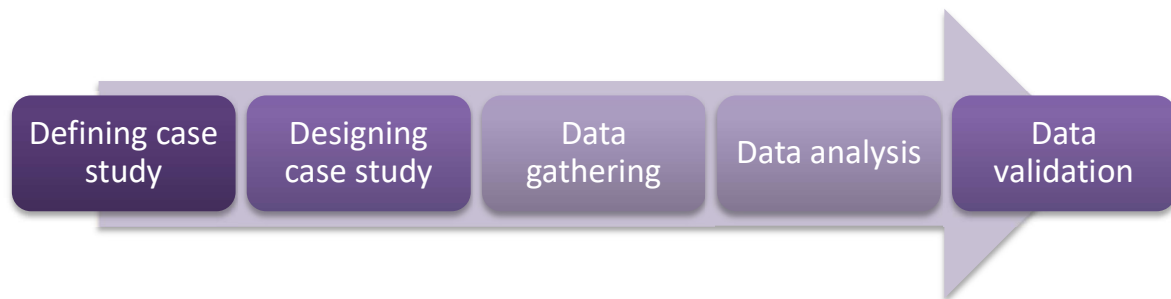


Figure 10: Qualitative case study methodology

The research phases follow the steps shown in Figure 10, and the remaining research methods are applied. This chapter provides an outline of the research method, which expands on the various phases of the research.

The different research phases are discussed in Table 4, and correlated with the applicable research objective (Column 2), research method (Column 3), dissertation chapter (Column 4), and article affiliation (Column 5). The table is colour-coded to match the research layout shown in Figure 11.

Table 4: Research phases and chapter outline

Phase	Objective	Method	Chapter	Article
Phase 1	To establish an opportunity for research in the ecotourism industry by means of conducting a state of the art review.	State of the art review	Appendix A	Article 1, submitted to the African Journal of Sustainable Tourism
Phase 2	To investigate the use of Lean and Green principles for organisational sustainability in ecotourism organisations through a systematic literature review.	Systematic literature review.	Chapter 5	Article 2, submitted to and published by the South African Institute of Industrial Engineering, 35 th conference.

Phase	Objective	Method	Chapter	Article
Phase 3	To identify the organisational elements of an ecotourism organisation by means of a focus group interview with an ecotourism business.	Focus groups.	Chapter 6	Article 3, submitted to the International Journal of Lean Six Sigma
Phase 4	To integrate the organisational characteristics with the Lean and Green principles for organisational sustainability, to determine the use of Lean and Green in ecotourism organisations by means of a morphological Zwicky analysis.	Zwicky Box morphological analysis	Chapter 6	Article 3, submitted to the International Journal of Lean Six Sigma
Phase 5	To verify the model by means of checking if the model requirements were met.	Verification checklist	Chapter 7	-
Phase 6	To validate the support model for organisational sustainability through focus group interviews for company feedback.	Member checking via Focus groups	Chapter 6	Article 3, submitted to the International Journal of Lean Six Sigma

The steps of the case study method include defining the case study, designing the case study, collecting data, analysing the data, and validating the data. The research layout is depicted in Figure 11.

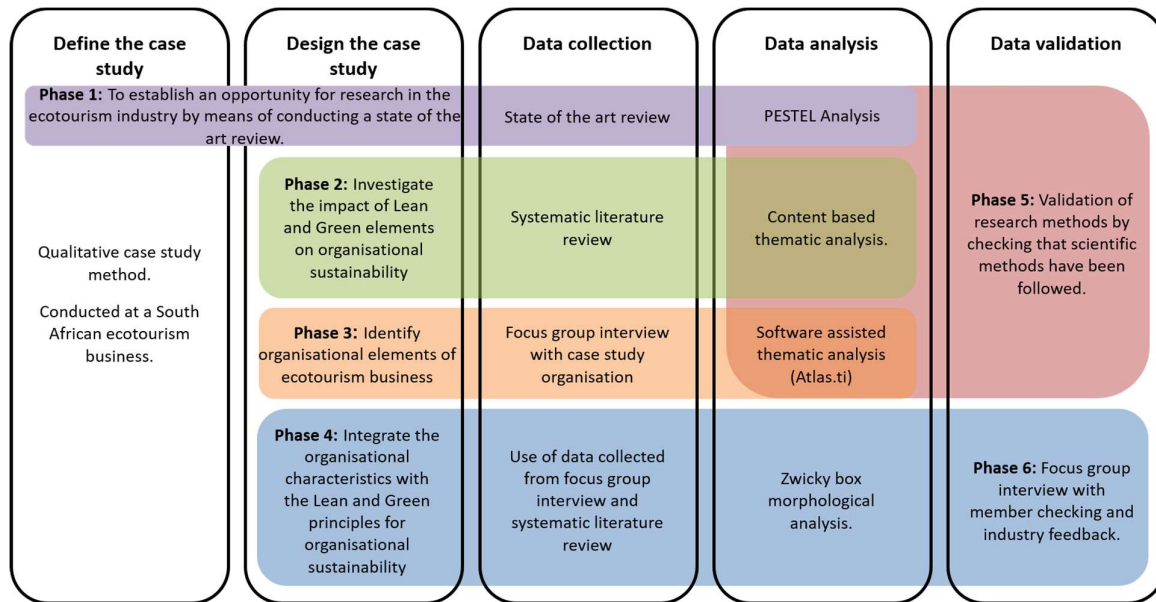


Figure 11: Research method

In order to minimise the duplication of information, the information provided in section 3.2 to 3.4 is an overview of the methods applied, and refer to the research articles found in Chapter 5 and Chapter 6 for detailed methodological approaches.

3.1 Phase 1 – Defining the problem

Phase 1, the section highlighted with purple in Figure 11, refers to the state of the art review and PESTEL analysis.

A state-of-the-art review was conducted as a data collection method to establish the research's relevance and provide background information for the foundation of this study.

This phase relates to the first research objective, which is stated as follows:

“To establish an opportunity for research in the ecotourism industry by means of conducting a state-of-the-art review.”

This study adopts a state-of-the-art review methodology to evaluate the contemporary landscape of the ecotourism industry in the aftermath of the COVID-19 pandemic. State-of-the-art reviews address current issues and provide a cross-sectional perspective on the current state of knowledge, while highlighting priorities for future research (Barry et al., 2022).

A state of the art (SoTA) review was conducted in the following six stages (Barry et al., 2022):

- 1 Determine the initial research question and field of inquiry.

- 2 Determine the timeframe.
- 3 Finalise a research question(s) to reflect the timeframe.
- 4 Develop a research strategy to find relevant manuscripts.
- 5 Analyse relevant manuscripts.
- 6 Reflexivity; subjectively present the findings and conclusions of the literature reviewed.

This six stage approach offers a systematic approach for conducting a SoTA review and provide a subjective description of the findings (Barry et al., 2022). The first four steps establish the strategy for conducting the state of the art review. Whereas the last two steps are the presentation of the research findings. The reason for selecting this research method is that it provides the necessary framework to show the current state of the ecotourism industry and how this current state informs future research.

The research protocol for the state of the art review conducted in this thesis is presented in the state of the art review article in Appendix A (found under heading 3, on pages 5 to 8 of Article 1). The protocol outlines the objectives of the state of the art review review, the databases to be used, the exclusion and inclusion criteria, and the quality assurance elements for the review.

The analysis of the findings was conducted using a PESTEL analysis, which examines the Political, Environmental, Social, Economic, and Legal factors affecting a business (Ramsudeen, 2025). PESTEL is an analytical tool used to analyse and identify the drivers of change in an organisational environment (Мельник, 2025). The PESTEL analysis provided a means to understand the current state of the ecotourism industry, which is crucial for evaluating the need for research in this sector.

3.2 Phase 2 – Empirical data collection: Literature

Phase 2, the section highlighted in green in Figure 11, refers to the systematic literature review. The systematic literature review was conducted as part of the data collection for the model development in this research.

This phase relates to the second research objective, which is stated as follows:

“To investigate the use of Lean and Green principles for organisational sustainability of ecotourism organisations by means of a systematic literature review.”

The collected data were analysed using a content-based thematic analysis, which revealed eight themes of Lean and Green that contribute to organisational sustainability. The findings of the

systematic literature review resulted in an impact matrix explaining the impact of Lean and Green themes on the three elements of the triple bottom line.

The methods and findings of the systematic literature review are provided in the second article of this dissertation, located in Article 2, Chapter 5 (found under heading 3 on pages 3 to 6 of Article 2). However, an overview of the methodology is provided here.

A systematic literature review is a research process that enables the collection of relevant data and evidence for a given topic, meeting predefined criteria to answer a specific research question or questions (Mengist et al., 2020). The reason for applying this method is its rigour and repeatability, which enable the addressing of specific research questions. The expansion of the systematic literature review steps for this specific research is explained and documented in the second article, found in Chapter 5. The analysis of the findings and data extracted from this review was conducted using thematic analysis. The thematic analysis was performed not only for the systematic review, but also for the focus groups and interviews conducted in this research. An overview of thematic analysis is provided.

For the synthesis and analysis of data, a thematic analysis was conducted.

“Thematic analysis is a method for analysing qualitative data that involves searching for recurring ideas (referred to as themes) in a data set.” - (Riger and Sigurvinsdottir, 2016)

This method will help establish the connections and recurring elements identified in the literature data. It will provide an overview of the data and enable conclusions to be drawn from the findings. According to Friese et al. (2018), thematic analysis aids in the organisation and detailed description of a qualitative dataset.

Braun and Clarke (2006) identified six phases for conducting thematic analysis. These phases are given as follows:

1. Becoming familiar with the data
2. Generating initial codes
3. Searching for themes
4. Reviewing themes
5. Defining and naming themes
6. Producing the report

3.3 Phase 3 – Empirical data collection: Focus groups

Phase 3, the section highlighted in orange in Figure 11, refers to the focus group interview as a data-collection method used to determine the industry context. The data collected aimed to establish the organisational departments of a South African ecotourism organisation, as well as the challenges it faces that hinder organisational sustainability.

This phase relates to the second research objective, which states:

“To identify the organisational elements of an ecotourism organisation by means of a focus group interview with an ecotourism business.”

The data collected from the focus group interviews were analysed using software-assisted thematic analysis in Atlas.ti, revealing differences across departments and challenges in the ecotourism business. The findings from the focus group interviews contributed to the development of the final model by introducing a third axis.

The methods and findings of the focus group interviews are expanded on in the third article of the dissertation, located in Article 3, Chapter 6 (Specifically, heading 2 found on page 2 and 3 of the article). However, a brief overview of focus group method literature is presented here.

Focus groups are a form of interview conducted in a group setting (Elizabeth et al., 2025). It enables broader discussions, allowing participants to expand on others' thoughts and opinions (Tisdell et al., 2025). The focus group interviews were conducted to determine the research context; the objective was to identify the different departments within a chosen organisation. As well as establish the inner workings and challenges of the different departments. Purposeful sampling was employed for the focus group. Purposeful sampling is the approach of selecting specific cases or participants that offer rich or specialised information (Palinkas et al., 2013). The case study organisation was selected to scope the research as a South African ecotourism organisation, which offers rich knowledge due to its size and sustainability initiatives. Additionally, specific individuals were chosen to be included, representing each department in the organisation, in order to establish an overview of the business and gain diverse perspectives on the challenges. The focus group protocol and specific questions can be found in the third research article, which is located in Chapter 6.

3.4 Phase 4 – Lean and Green organisational sustainability model

Phase 4, the section highlighted in blue in Figure 11, refers to the Zwicky box morphological analysis. The morphological analysis was conducted to establish the three-dimensional matrix

organisational sustainability support model, which serves as the basis for the final research findings. The data collected in the previous two phases are used for this analysis.

This phase relates to the third research objective, which is stated as follows:

“To integrate the organisational characteristics with the Lean and Green principles for organisational sustainability to determine the use of Lean and Green in ecotourism organisations by means of a morphological Zwicky analysis.”

The Lean and Green organisational sustainability model is presented in Chapter 6 (Article 3, heading 4 found on pages 5 to 21 of the article).. In this article, the Zwicky analysis is discussed and performed.

3.5 Phase 5 - Verification

During phase 5, the section highlighted in red in Figure 11 was verified against the model requirements. This phase relates to the fourth research objective, which is stated as follows:

“To verify the model by means of checking if model requirements were met.”

Research verification involves confirming the data collected and verifying that the requirements and objectives were met in the pursuit of the research (Creswell et al., 2016).

The data collected from the focus groups were confirmed through member checking, a qualitative research validation tool used to assess the quality of the findings. It refers to the employment of participants; in this research, it refers to the focus group participants, who serve as experts to validate the findings (McKim, 2023). This structured approach aims to maximise participants' expertise, strengthen researcher-participant relationships, and enhance the validity and trustworthiness of the study's findings. The following steps outline a structured approach to member checking:

1. **Present Findings to Participants:** Instead of presenting raw transcripts, researchers should provide participants with a strong draft of the findings, including direct quotations and integrated narratives (McKim, 2023).

For this research, the findings are presented in two forms: a final design article and a brief presentation of the results.

2. **Conduct a Brief Interview:** Researchers should conduct a 10–15-minute interview with participants to gather feedback on the findings (McKim, 2023).

The interview is conducted as an online focus group, along with a poll function, to gather feedback.

3. Allow Participants to Request Changes: Participants can request the removal or modification of sensitive or identifying information to ensure their comfort and anonymity (McKim, 2023).

Although precautionary measures were taken to remove sensitive information, an opportunity was provided to ensure participants were satisfied with the information included in the findings.

4. Reflect on Feedback: Researchers should prioritise participants' requests to remove or de-identify information (McKim, 2023).

After the polls were conducted, the findings were considered and reported in the validation section of the thesis.

5. Integrate Feedback: Based on the feedback, researchers should revise the findings to capture participants' experiences better, ensuring their voices are accurately represented (McKim, 2023).

The feedback is considered, and if there are problems with the findings that the “experts” deem incorrect, they should be addressed.

6. Document the Process: Researchers should detail the member-checking process in the final manuscript, including how participants were involved, the feedback received, and any changes made to the findings (McKim, 2023).

The final documentation of the process is included in the verification and validation section of the dissertation, presenting the findings from the final focus group interview.

3.6 Phase 6 - Validation

During phase 6, the model was validated through a second round of interviews to gather industry feedback on the feasibility of the support model for addressing the identified challenges. The reason for pivoting from the initial focus group strategy was to gain more detailed feedback on the findings and to allow participants to speak freely about their understanding of the findings and their feasibility.

This phase refers to the fifth research objective, which states:

“To validate the support model for organisational sustainability by means of focus group interviews for company feedback.”

The interviews conducted used the same participants as the focus group interview, selected with the same purposive sampling approach (Palinkas et al., 2013). This was done to allow participants to see how the model addressed their specific challenges.

“An interview is a conversation, usually between two people. But it is a conversation where one person – the interviewer – is seeking responses for a particular purpose from the other person: the interviewee.” - (Gillham, 2000)

The interview protocol and its conduct are discussed in the third research article and are available in Chapter 6 (found in Appendix A and B, on pages 30 and 31 of Article 3).

Additionally, the validation of the research method was conducted through verifying the methods used and discussing how each method contributed to addressing the research problem. Each article and the method-phase validation are presented in a chapter for each article. The overall research validation is summarised in Chapter 7.

3.7 Chapter summary

This chapter outlines the research methods employed in the dissertation and their respective locations. Since the dissertation is written in article format, the methods are divided into separate articles and distributed across various chapters. The layout was discussed in this chapter. Each technique is part of the larger qualitative case study design and contributes to achieving the dissertation's aim and objectives. The design, with all its interconnected parts, is explained in Figure 11. This chapter expands on the methods and their application in various articles.

CHAPTER 4 MODEL REQUIREMENTS

The model designed in this research is done in the third research article, found in Chapter 6, where the method and approach to model development is outlined and done. This chapter provides preliminary context to the model created and the requirements it will need to adhere to according to the research objectives. The Lean-Green support model proposed for the research is based on the research objectives presented in Chapter 1; however, to establish clear boundaries for the model-specific requirements, the objectives are set. The support model explains how a specific approach (Lean and Green) is used to achieve a specific goal (organisational sustainability) within a specific context (a South African ecotourism context). Therefore, to effectively design the model, the following three requirements must be met.

- Provide Lean and Green principles or tools that can be applied practically.

The first requirement is based on the objective of establishing Lean and Green elements that address an organisation's organisational sustainability (objective 2) and how it could be achieved. The elements included should be practical and relevant to the context of ecotourism.

- Considers industry context and applicability

The second requirement is based on the objective of collaborating with an Ecotourism business (objective 3) to gain context and understanding of the real-world applicability of the support model. The organisational context contributes to the model's uniqueness and relevance, as well as providing a practical, real-world contribution. Additionally, setting the model for a specific industry increases the likelihood of successful implementation, should that be the goal.

- Addresses all three elements of the triple bottom line

The final requirement is based on the objective of organisational sustainability (objective 4), which is defined in terms of the triple bottom line and addressing all the elements of organisational sustainability in these terms. This requirement contributes an element of rigour to ensure holistic sustainability rather than partial sustainability throughout the model.

The model requirements set out for this research help to ensure that the support model is useful and complete. The requirements set out are further evaluated in Chapter 7 as part of the model validation.

CHAPTER 5 CONCEPTUAL MODEL

5.1 Introduction

To better understand Lean and Green and their relationship to organisational sustainability, a systematic literature review was conducted. This addresses the second phase of the research approach.

Table 5: Chapter 5 Research Phase outline

Phase	Objective	Method
Phase 2	To investigate the use of Lean and Green principles for organisational sustainability in ecotourism organisations through a systematic literature review.	Systematic literature review.

5.2 Article

Title: Breaking waves of innovation: Lean and Green Pathways for Organisational Sustainability in ecotourism

Abstract: The ecotourism industry is one of the fastest-growing sectors of the tourism industry. Nevertheless, 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 that maps 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.

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<https://www.saiie.co.za/sites/default/files/2025-12/SAIIE35%20Proceedings%202025-compressed-compressed.pdf>

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.

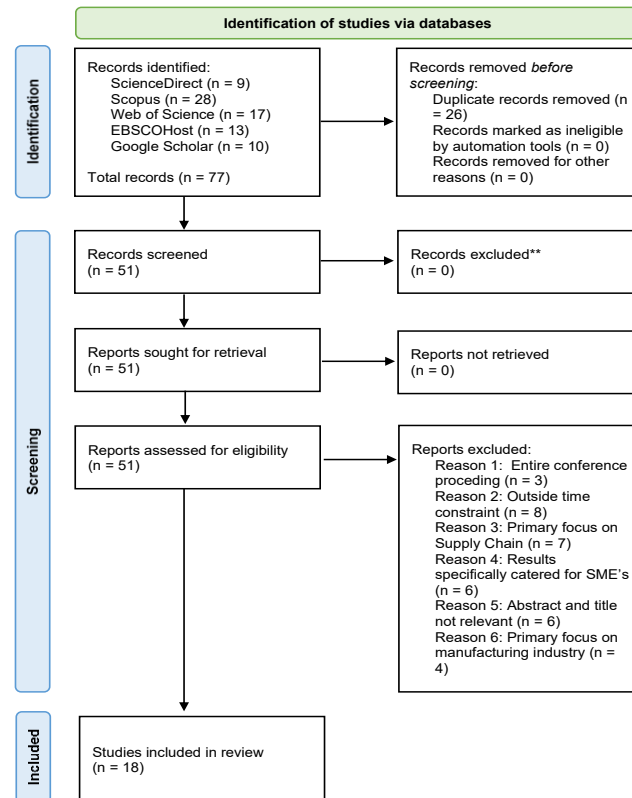


Figure 1: PRISMA Flow Diagram

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.

CHAPTER 6 LEAN-GREEN ORGANISATIONAL SUSTAINABILITY SUPPORT MODEL

6.1 Introduction

This chapter contains the final design for the Lean-Green organisational sustainability model. The article addresses three of the remaining research questions. The organisational elements are identified in focus group interviews.

Table 6: Chapter 6 Research Phase outline

Phase	Objective	Method
Phase 3	To identify the organisational elements of an ecotourism organisation by means of a focus group interview with an ecotourism business.	Focus groups.
Phase 4	To integrate the organisational characteristics with the Lean and Green principles for organisational sustainability to determine the use of Lean and Green in ecotourism organisations by means of a morphological Zwicky analysis.	Zwicky Box morphological analysis
Phase 6	To validate the support model for organisational sustainability by means of a focus group interview for company feedback.	Member checking via Focus groups

Additionally, the support model met the requirements identified in 0.

6.2 Article

Title: Lean and Green Support Model for organizational sustainability: A case study of a South African ecotourism business

Abstract:

Purpose: The purpose of this research is to develop a Lean-Green support model for organisational sustainability in a South African ecotourism business.

Design/Methodology/Approach: The case study method, along with the Zwicky Box morphological analysis, was used to illustrate the findings from the focus groups and interviews. Focus group interviews, as well as individual interviews, were conducted to collect and validate data and the final model.

Findings: The findings showed the specific use of Lean and Green across the different ecotourism departments to support organisational sustainability. These findings are presented in a three-dimensional matrix derived from the Zwicky Box analysis.

Originality: The research revealed the unique relationship between Lean and Green for organisational sustainability in an ecotourism business.

Research limitations/implications: The research limitation is that only one case study organisation is evaluated, and the research is focused specifically on the South African context, with the implication that there is an opportunity to expand on the research.

Practical implications: the research's practical implications include the principles and practices that might enable a business to achieve organisational sustainability.

Social implications: The research provides a sustainability lens that considers the social responsibility of ecotourism businesses.

Submission: This article has been submitted to the International Journal of Lean Six-Sigma for publication.

Lean and Green Support Model for organizational sustainability: A case study of a South African ecotourism business

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Practical implications: the research's practical implications are the principles and practices provided that might enable a business to achieve organizational sustainability.

Social implications: The research provides a lens of sustainability that considers the social responsibility of ecotourism businesses.

1. Introduction

Organizational sustainability (OS) is an important topic not only in boardrooms but in the research community, especially in organizations with a primary focus on sustainability, such as ecotourism products (Lozano, 2018). Ecotourism is a fast-growing sector of tourism, contributing up to 25% of the world's gross domestic product (GDP), yet it remains underserved in terms of research on management

and economic growth (Dinç et al., 2023; Pathmanandakumar, 2025). Ecotourism generates significant revenue in South Africa, contributing 4.3 million dollars in 2023 and an expected 11.5 million dollars by 2030 (Grand View Research, 2026). Ecotourism research is primarily focused on conservation, leaving gaps in business research (Purwantoro, 2024). Therefore, there is an opportunity to assess the OS of a South African ecotourism business (Dube and Nhamo, 2021; Litheko and Potgieter, 2020). The application of Lean and Green (LG) to address this gap offers a holistic approach to the three elements of OS, namely environmental sustainability, economic sustainability, and social sustainability (Küsel et al., 2025). LG offers significant value to businesses seeking management approaches that consider all elements of sustainability (Zokaei, 2013).

Lean management is an accepted approach to increasing operational efficiency and reducing costs (Abrahams and Ngulube, 2023; Womack et al., 1990). It is identified as one of the most prominent methods for operations management that prioritizes quality, flexibility, and cost reduction (Sinha and Matharu, 2019; Jasti and Kodali, 2015). This illustrates the relevance of applying this method to achieve, at least in part, OS (Caiado et al., 2018). Additionally, Lean management has a core focus on Respect for People and the social responsibility of a business (Coetzee et al., 2025).

Green management strategies refer to businesses implementing changes and decisions that improve their sustainability (Raharjo, 2019). In the current climate-conscious economy, businesses need to improve their sustainability (Raharjo, 2019). There is increasing demand for sustainable business operations that prioritize resource efficiency and minimize greenhouse gas emissions.

Thus, this research aims to develop an LG support model for a South African ecotourism business seeking OS. To effectively address this research aim, with objectives as follows:

- Define the different organizational departments of the ecotourism business
- Develop a support model that addresses all three pillars of OS: economic, environmental, and social sustainability.
- Establish the applicability of the LG support model to operational challenges of the ecotourism business.

2. Research method

The research method is the qualitative case study (Merriam, 2009). Each step corresponds to related definitions and methods that address the research objectives and aim. The steps are as follows:

Defining the case study: Defined as an in-depth study of a bounded system (Merriam, 2009). The bounded system is a South African ecotourism business based in the Kalahari near Kuruman, studied to understand the organizational context for a management approach, such as LG, to enhance the business's OS.

Designing the case study, by establishing a clear research problem, which is given as follows:

How can a South African ecotourism business approach organizational change to achieve organizational sustainability?

The case study business chosen is a South African ecotourism business (private game reserve) based in the Kalahari; the business offers a luxury hospitality product with a primary focus on conservation and sustainability.

Data gathering, including a focus group interview with a South African ecotourism business. The focus group was conducted to determine the organizational context for the model and to verify the findings of this context through member checking (McKim, 2023). Additionally, follow-up interviews were conducted to validate the practical feasibility of the final model. Purposeful sampling was used to select participants in management positions from different departments within the organization to gain organizational and departmental context (Suri, 2011).

Data analysis was done using various methods. The focus group findings were analyzed using thematic analysis. This analysis was done using Atlas.ti software (Frieze et al., 2018). The analysis revealed the different business departments and the challenges experienced. A morphological analysis was done to determine the different combinations required to fill the Zwicky box.

Data validation through member checking to confirm the accurate interpretation of the collected data. (McKim, 2023). Model validation is conducted through individual interviews with the focus group participants. The reason for conducting follow-up interviews is that interviews allow for discussion between the researcher and the interview participant, improving the likelihood that the findings presented are accurately interpreted and providing more reliable feedback on the questions (Hennink et al., 2020; Gill and Baillie, 2018). The interviews obtained an industry perspective on the practical feasibility of the final Lean-Green support model (Lindheim, 2022).

3. Literature review

The combination of these LGs aims to align traditional business priorities, such as profitability and efficiency, with environmental and social sustainability (Garza-Reyes, 2015; Zokaei, 2013). Some synergies are evident in shared goals, such as waste reduction, improved product design, and reduced lead times (Garza-Reyes, 2015; Garza-Reyes et al., 2014; Dües et al., 2013). The similarities illustrate a promising overlap with OS and achieving the elements of the triple bottom line (TBL). OS considers sustainability to be about more than environmental impact; it is about balancing social, economic, and environmental impacts (Gomes et al., 2023).

There is a unique need for OS in the ecotourism industry (Litheko and Potgieter, 2020). Ecotourism businesses are built on nature, conservation, and sustainability (Moranda, 2022). Additionally, they are tourism businesses that provide services to generate revenue, ensuring the continuation of conservation efforts. OS offers long-term business success by addressing holistic sustainability to ensure prosperity

(Rashid et al., 2024). Therefore, with growing interest in ecotourism, there is an opportunity to improve the OS of ecotourism businesses through LG management.

An LG approach toward OS is a topic that has been considered in previous research (Küsel et al., 2025). An impact matrix developed by Küsel et al. identifies the main principles and practices of LG and how each affects the three elements of OS (Küsel et al., 2025). The article considers the applicability of this research to ecotourism. The impact matrix highlights the applicability of the LG management approach to the research's desired outcome. LG elements that contribute to this positive impact were identified and listed under eight main themes.

The themes are identified and explained as follows:

- I. Waste reduction: The elimination of waste generated within a business. The theme is expanded into five practical elements: Lean waste elimination, reducing material waste, Life cycle analysis, reduced greenhouse gas emissions, and responsible resource use. Each component contributes to the overall theme of waste reduction (Kovilage, 2021; Teixeira et al., 2022; Caldera et al., 2017; Wu et al., 2018; Steinmeier et al., 2024; Reke et al., 2022; Starzyńska and Bryke, 2020; Zhan et al., 2018; de Freitas et al., 2017; Yadav et al., 2021; Lizarelli et al., 2023; Sotelo et al., 2020; Bertagnolli et al., 2021; Caiado et al., 2018; Foo et al., 2021; Küsel et al., 2025).
- II. Resource efficiency is the management of resources to ensure their efficient use. The theme is expanded into four practical elements: Optimised resource utilisation, Streamlining processes, Sustainable value stream mapping, and Sustainable resource practices (Teixeira et al., 2022; Wu et al., 2018; Steinmeier et al., 2024; Reke et al., 2022; Yadav et al., 2021; Lizarelli et al., 2023; Sotelo et al., 2020; Bertagnolli et al., 2021; Caiado et al., 2018; Küsel et al., 2025).
- III. Continuous improvement refers to the continual evaluation of processes and practices to identify opportunities for improvement or optimization. The theme is expanded into four practical elements: Kaizen, Problem-solving innovation, Defect detection and prevention, and 5S or 7S methods. These elements aid staff members in achieving systematic ways of thinking in the pursuit of continuous improvement (Souza and Alves, 2018; Wu et al., 2018; Steinmeier et al., 2024; Reke et al., 2022; Yadav et al., 2021; Lizarelli et al., 2023; Bertagnolli et al., 2021; Caiado et al., 2018; Küsel et al., 2025).
- IV. Operational efficiency refers to the performance of a business's operations to support an organization's economic growth. The theme is expanded into three practical elements: Just-in-time, Kanban, and Total production management. These practical elements aid businesses in improving operational efficiency (Caldera et al., 2017; Wu et al., 2018; Steinmeier et al., 2024; de Freitas et al., 2017; Yadav et al., 2021; Lizarelli et al., 2023; Bertagnolli et al., 2021; Küsel et al., 2025).

- V. Respect for people aims to establish a good working environment and culture, and to empower employees to add value to an organization. This theme is expanded into six practical elements: Training, Leadership commitment, Improved health and safety, LG culture, Alignment with LG practices, and promoting a top-down approach to drive cultural change. These elements contribute to the overall working environment and would aid businesses in effectively achieving change (Kovilage, 2021; Souza and Alves, 2018; Wu et al., 2018; Steinmeier et al., 2024; Zhan et al., 2018; Lizarelli et al., 2023; Caiado et al., 2018; Foo et al., 2021; Küsel et al., 2025).
- VI. Green supply chain: This theme refers to having a ‘green’ or sustainable approach to logistics to promote overall sustainability. This theme is expanded into two practical elements: Green logistics and sustainable resource practices. These elements speak to the responsible sourcing and movement of materials that are used in the business (Teixeira et al., 2022; Souza and Alves, 2018; Wu et al., 2018; Steinmeier et al., 2024; Reke et al., 2022; Starzyńska and Bryke, 2020; Zhan et al., 2018; de Freitas et al., 2017; Yadav et al., 2021; Lizarelli et al., 2023; Sotelo et al., 2020; Bertagnolli et al., 2021; Caiado et al., 2018; Küsel et al., 2025).
- VII. Integrated LG: This theme refers more to the implementation strategies to consider when implementing LG in a business. It speaks to how this implementation should be approached to maximize the chances of success. The theme is expanded into three practical elements: Simultaneous implementation, aligning lean practices with the circular economy, and Integrated frameworks. This theme was included in the impact matrix but excluded from the support model (Küsel et al., 2025).
- VIII. Customer and stakeholder engagement: this theme refers to identifying and engaging all stakeholders in a business to improve the chances of successful change. The theme is expanded into two practical elements: Involving customers in sustainability initiatives and Engaging stakeholders. These elements speak to the unique world of sustainability, including all parties to ensure true sustainability is achieved, and that real change is reached (Kovilage, 2021; Souza and Alves, 2018; Starzyńska and Bryke, 2020; Caiado et al., 2018; Foo et al., 2021; Küsel et al., 2025).

4. Findings and discussion

The findings of this research are depicted in a three-dimensional Zwicky box that shows the diverse and unique implications of combining the three model dimensions. This is seen in Figure 1.

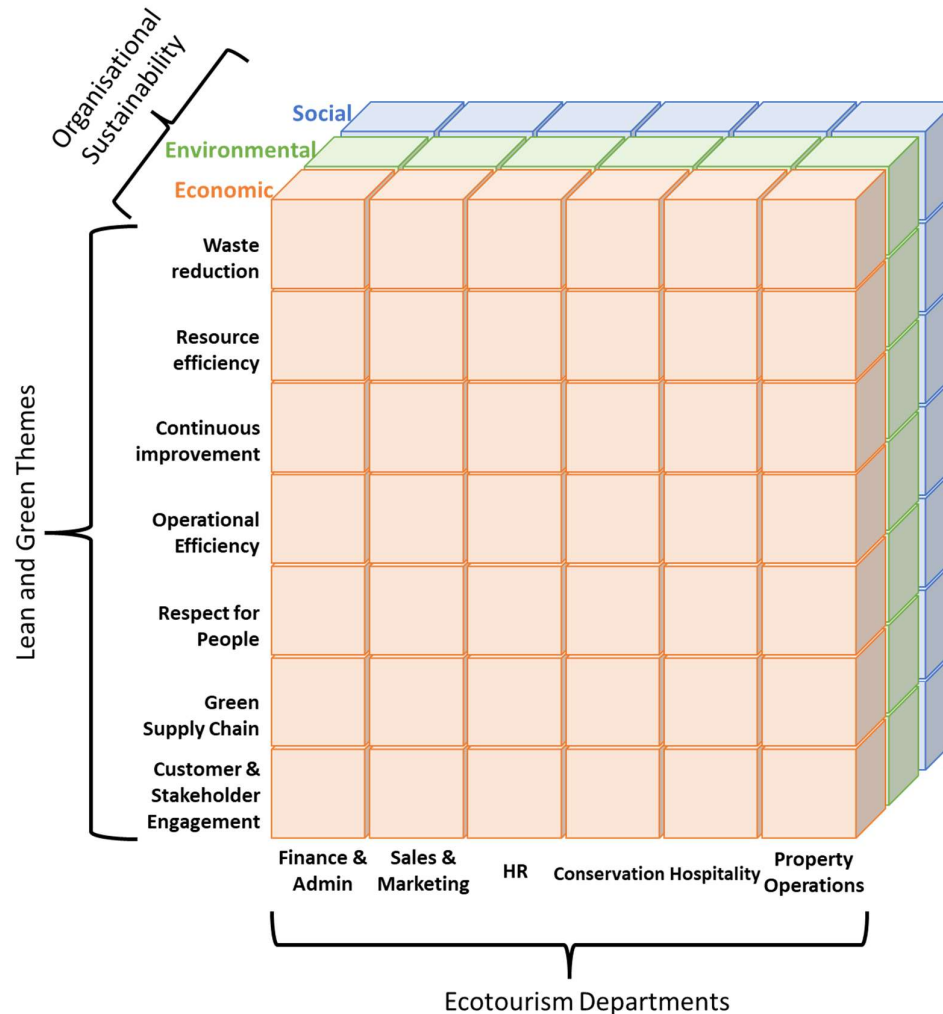


Figure 1: Lean and Green Organizational Sustainability Support Model

The X-axis refers to the different departments within an ecotourism business. These departments were identified during the focus group interviews. The X-axis provides organizational context for the model and enables a real-world perspective. The departments are identified and defined by the case study organization as follows:

- The financial department *ensures a thorough track record is kept of all funds flowing in and out (creditors and debtors), handling SARS matters, insurance, and general administration for each department.*
- The sales and marketing department is *responsible for generating business and ensuring global awareness of the organization. Building strong relationships with agents to ensure the product is promoted and sold.*
- The human resources department is *responsible for managing all people-related matters, including contracts, staff welfare, clinic operations, and disciplinary processes.*

- The conservation department is *responsible for overseeing the reserve, including the upkeep of fences, roads, the provision of drinking water for animals, and the care of all fauna and flora.*
- The hospitality department is *the guest-facing part of the operation, responsible for delivering exceptional guest experiences, including guiding and providing culinary services.*
- *The property operations department consists of three elements:*
 - *The maintenance operations that maintain all guest areas, staff accommodation, and related facilities.*
 - *The security operations that ensure the safety of guests, staff, and all assets.*
 - *The sustainability operations that drive efforts to remain compliant with the high standards set for the business, ensuring long-term environmental and operational responsibility.”*

The department descriptions were obtained from the focus group interviews.

The Y-axis shows eight LG themes identified as the primary contributors to LG for OS (Küsel et al., 2025). The eight themes, as discussed in the literature review, address the principles and practices of LG that are appropriate for achieving OS.

The Z-axis shows the three pillars of OS (Gomes et al., 2023). The three pillars, economic, environmental, and social, emphasize the importance of holistic sustainability (Gomes et al., 2023; Walraven, 2011).

4.1 Economic sustainability

Table provides the first level of the support model matrix, the economic sustainability level.

Table I: Lean-Green support model for Economic sustainability

Lean & Green Theme / Economic	Finance & Admin	Sales & Marketing	HR	Conservation	Hospitality	Property Operations
Waste Reduction	Cost control through elimination of non-value-adding processes; reduced paperwork; reduced time spent on non-value-adding practices to improve productivity and reduce financial waste	Cost-cutting by reducing overspending on ineffective campaigns; Less green waste leads to a better image in terms of sustainability, thus improving marketability	Reduce recruitment inefficiencies by applying Lean principles to the onboarding process.	Minimize unnecessary resource use in conservation programs to improve productivity and efficiency; reduce green waste to enhance the environment's aesthetics and thereby improve customer satisfaction.	Reduce food and material waste; lean waste reduction in hospitality processes improves efficiency.	Energy, maintenance, and material cost savings
Resource Efficiency	Streamline budgeting and procurement processes that improve efficiency and productivity.	Improve the allocation of financial resources to make marketing channels and digital media more cost-effective.	Efficient use of human capital	Sustainable resource allocation for conservation	Evaluate resource use and allocation within the hospitality department and assess and ensure that resources are allocated efficiently.	Energy-efficient building management, sustainable resources used for property operation
Continuous Improvement	The Kaizen cycle is applied in administrative processes to improve productivity and efficiency.	Continuously evaluate and improve conversion rates to achieve better results; use customer feedback loops to drive continuous change and improvement; apply Jidoka principles to	Invest time in regular staff development training to support employee growth and foster an innovation culture.	Establish a culture of innovation in conservation techniques	Service and process improvement; Poka-yoke mechanism to reduce errors or 'overprocessing.'	Preventive maintenance and process monitoring, Poka yoke mechanisms to aid in quality control and error prevention in property operation practices

Lean & Green Theme / Economic	Finance & Admin	Sales & Marketing	HR	Conservation	Hospitality	Property Operations
		enhance sales and marketing processes.				
Operational Efficiency	Automate reporting; Kanban for visual workflow management and improve productivity	Targeted, just-in-time marketing strategies	Reduce redundancy in HR processes; use Kanban for human resource workflow management.	Coordinated conservation efforts	Lean guest service operations; JIT principles where applicable	JIT maintenance scheduling; Total productive maintenance principles to improve maintenance operations
Respect for People	Leadership transparency and commitment, which align goals with sustainability, improving profitability	Empower marketing teams with ownership	Employee satisfaction; Improved working environments	Respect for local rangers and staff; Training to improve operations and buy-in from employees	Staff well-being and training for better employee performance	Safe, valued maintenance and cleaning teams; Training to improve property operations
Green Supply Chain	Responsible supplier evaluation	Eco-friendly promotional materials	Ethical labor sourcing	Sustainable equipment and material sourcing	Local food and amenity suppliers; Sustainable considerations for transport of goods on and off the property	Green cleaning and building materials
Customer & Stakeholder Engagement	Financial transparency	Promote sustainable tourism packages that inform customers about sustainable practices and involve them in sustainability initiatives.	Engage employees in decision-making and encourage employee contributions and input.	Collaborate with local communities to encourage social upliftment and community buy-in.	Guest involvement in sustainable products to encourage business goals and objectives; Encourage sustainability amongst	Supplier partnerships and eco-certifications of maintenance and management staff and materials

Lean & Green Theme / Economic	Finance & Admin	Sales & Marketing	HR	Conservation	Hospitality	Property Operations
					customers to drive sustainable initiatives.	

Waste reduction significantly enhances economic sustainability by lowering operational costs, increasing operational efficiency, and improving resource utilization. (Caldera et al., 2017; Oliveira et al., 2021). Lean waste reduction involves removing non-value-adding processes. (Liker, 2020). The elimination of Lean waste can range from lowering recruitment and onboarding time in the human resources department to identifying time wasted in conservation efforts (Sotelo et al., 2020). Overproduction is considered the primary driver of other forms of waste in operations, as it produces more than the customer wants (Liker, 2020). Overproduction for service or tourism might look like having too many rooms or activities scheduled that customers do not use (Liker and Ross, 2017). Therefore, in ecotourism, waste reduction begins by determining customer demand and identifying where processes exceed customer needs. Lean offers an approach to waste reduction that enables greater efficiency (Kovilage, 2021). Minimize or eliminate unnecessary processes (Yadav et al., 2021; de Freitas et al., 2017). Green waste reduction is the minimization of physical waste and greenhouse gas emissions. This plays a larger role in the environmental impact; however, it still contributes to a positive economic impact in some areas. (Zokaei, 2013). The economic implications of green waste reduction include reduced dependency on scarce resources and changing resource costs, which can facilitate financial stability (Lizarelli et al., 2023).

Additionally, minimizing single-use materials would reduce long-term material costs. Process mapping can identify operational wastes to be minimized (Liker, 2020; Liker and Ross, 2017). The physical waste produced by operations must be identified, for example, through conducting a life-cycle analysis of operational processes (Yadav et al., 2021; Caiado et al., 2018). The lens of cost reduction and positive economic outcomes, when applied to green waste, offers a unique opportunity, for example, to implement alternative energy sources to reduce energy costs (Caldera et al., 2017).

Resource efficiency, if viewed through the lens of Lean management, is the minimization of waste and improved utilization of resources, which is achieved through the application of value stream mapping to identify the current state of resource utilization and determine ways in which it could be improved (Kovilage, 2021, Teixeira et al., 2022; Caldera et al., 2017; Küsel et al., 2025). Tools such as optimized resource utilization, streamlining operational processes, and sustainable value stream mapping are applied to align resource consumption with value creation (Hines and Rich, 1997; Womack et al., 1990). Tools are used to evaluate resource-intensive processes, identify inefficiencies, and promote cost-effective changes that minimize waste (Souza and Alves, 2018; Wu et al., 2018; Yadav et al., 2021). Minimizing costs and inefficiencies helps businesses remain profitable and economically sustainable (Teixeira et al., 2022; Zhan et al., 2018; Küsel et al., 2025).

Continuous improvement is a Lean principle that drives the long-term success of not only Lean implementation but also of any change aimed at making lasting improvements (Liker, 2020). The

identification of problems and the incremental changes to address them. Tools such as Kaizen, A3 problem-solving, spaghetti diagrams, and visual process mapping are used first to identify operational challenges and evaluate how solutions and improvements could be applied to address these challenges. Additionally, defect-detection methods such as poke yoke and jidoka. The application of error-detection and proofing tools, such as Jidoka, to service environments could entail alert systems that detect failures in service and halt its supply whenever they occur (Andrés-López et al., 2015). Once challenges are identified, improvement measures can be implemented, and tools such as 5S can be used to enhance working environments, boost productivity, and reduce wasteful operations. The strive for constant and continuous improvement of operations is beneficial for harnessing a business' ability to improve profitability and success (Liker, 2020, Liker and Ross, 2017, Womack et al., 1990).

Operational efficiency is a business's ability to deliver services or goods cost-effectively without compromising quality (Lee and Johnson, 2013). Operational efficiency is achieved through the combined application of waste reduction and resource efficiency. Tools such as Kanban, just-in-time, and total productive maintenance can be applied to improve operational efficiency (Caldera et al., 2017, Yadav et al., 2021, Wu et al., 2018, Lizarelli et al., 2023, de Freitas et al., 2017, Steinmeier et al., 2024, Bertagnolli et al., 2021, Küsel et al., 2025). If a Kanban system is put in place, it could help regulate resources and time spent on operations, minimizing waste. This, applied with just-in-time principles, could aid operations in minimizing operational waste and improving overall efficiency (Lee and Johnson, 2013). Operational efficiency aids cost minimization and improved economic performance. Additionally, Total Productive Maintenance (TPM) is a systematic approach to maximizing the efficiency and effectiveness of equipment and processes by minimizing downtime and reducing waste (Andersson et al., 2015). To apply this in an ecotourism setting, the terms 'equipment' and 'processes' should be translated into the service context (Andersson et al., 2015).

Respect for people is fundamentally part of Lean manufacturing; it refers to regarding all stakeholders, such as employees, customers, suppliers, dealers, as well as the community, with value and dignity (Coetzee et al., 2019a, Liker et al., 2008). Although Respect for People may speak more to social sustainability, it remains relevant to economic sustainability as well. By valuing employees and investing in them through training and skills development, employee productivity would improve (Coetzee et al., 2019a; Liker et al., 2008; Husar, 1991;). Additionally, returns are generated from employees' innovative and creative thinking once respect is embedded in the management culture, thereby minimizing the waste of unused creativity and improving how employees perform (Coetzee et al., 2019a).

Green supply chain management refers to integrating environmentally sustainable practices into supply chain processes (Khan et al., 2018). Implementing green practices across logistics operations, storage, material handling, transport, and information processing contributes to the green supply chain and enhances environmental sustainability (Khan et al., 2018). By reducing negative environmental

impact and fostering innovation, the green supply chain contributes to long-term economic success while simultaneously addressing sustainability challenges (Yu et al., 2018).

Customer and stakeholder engagement is a driver of economic growth and success by fostering trust and collaboration, building brand reputation, and enhancing customer satisfaction, all of which positively contribute to a business's financial sustainability (Souza and Alves, 2018). Stakeholder engagement in decision-making creates transparency and improves a business's perception, thereby giving it a competitive advantage (Steinmeier et al., 2024).

4.2 Environmental sustainability

Table II provides the second level of the support model matrix, the environmental sustainability level.

Table II: Lean-Green support model for Environmental sustainability

Lean & Green Theme/ Environment	Finance & Admin	Sales & Marketing	HR	Conservation	Hospitality	Property Operations
Waste Reduction	Paperless systems; energy-conscious offices.	Digital marketing vs printed material. <i>Additionally, market the sustainability of operations to clearly set expectations that customers do not bring waste onto the property.</i>	Reduce office waste; encourage staff to adopt zero-plastic initiatives.	Reduce waste in field operations; evaluate 'transport' and 'movement' waste to minimize vehicle-related greenhouse gas emissions.	Food waste management: Promote circular-economy practices to ensure waste is handled sustainably; conduct life-cycle analysis to evaluate waste management and sustainable practices.	Minimize solid and water waste; Life cycle analysis to ensure sustainable practices.
Resource Efficiency	Energy-efficient systems.	Promote low-impact tourism; Transparent advertising to encourage tourists willing to partake in sustainability initiatives as part of their travel.	Optimize workspace energy	Sustainable land use	Water and energy efficiency; Use of environmentally friendly products where applicable; Source products locally to reduce 'transport' waste	Renewable energy adoption.
Continuous Improvement	Improve environmental reporting and analysis practices to ensure continuous improvement in sustainability outcomes.	Track marketing emissions and continuously aim for improved outcomes.	Promote eco-awareness and encourage green practices amongst staff.	Monitor biodiversity KPIs continuously and apply Kanban principles where applicable.	Environmental audits: Employ problem-solving practices to ensure hospitality operations continue to improve and sustainability impacts move in a positive direction.	Retrofit and enhance green infrastructure continually.

Lean & Green Theme/ Environment	Finance & Admin	Sales & Marketing	HR	Conservation	Hospitality	Property Operations
Operational Efficiency	Optimize facility usage	Efficient travel planning for tourists.	Problem-solving practices to ensure the sustainable practice of staff	Optimize ranger patrol routes to minimize physical impact and limit greenhouse gas emissions.	Efficient service routines: Evaluate Lean waste regarding 'movement', 'transport', 'overprocessing', and any other waste that contributes to environmental waste.	Reduce idle energy loads.
Respect for People	Encourage environmental accountability and promote sustainable practices amongst staff.	Promote green ethics and transparency with customers about sustainability initiatives.	Build an eco-oriented culture to ensure buy-in and commitment to sustainable practices.	Involve staff in conservation ethics; Create a culture of change and conservation.	Environmental awareness training.	Encourage green maintenance practices.
Green Supply Chain	Source eco-certified suppliers	Low-emission advertising channels	Partner with green consultants to ensure sustainable practices internally and externally	Eco-certified conservation partners	Local and organic sourcing of materials used throughout the hospitality department	Sustainable procurement
Customer & Stakeholder Engagement	Green reporting to investors to encourage top-down investment in sustainability initiatives	Eco-marketing to encourage customer and stakeholder alliance with sustainability and environmental contributions	Employee green programs to encourage green culture and buy-in business-wide	Engage communities in conservation to emphasize buy-in and the importance of green practices.	Educate guests on green initiatives and the importance of sustainability to the environment.	Share sustainability performance data to encourage green philosophy, continuous improvement, and engagement.

Waste reduction for environmental sustainability is focused on Green waste reduction (Marco-Ferreira et al., 2019). Administrative departments can assess their consumption, minimize waste, and identify renewable energy sources. Additionally, the marketing and sales department might consider implementing marketing strategies that show consumers what to expect in terms of sustainability, to ensure customers do not contribute to waste. In the field-focused departments, transportation waste should be evaluated and minimized (Bhattacharya et al., 2019). Life cycle analysis can be conducted in the hospitality department to assess food waste and cleaning-related waste. Circular economy initiatives can be used to minimize waste impacts (Oliveira et al., 2021). The life cycle analysis provides an opportunity to evaluate where more sustainable product procurement is appropriate. Additionally, reducing operational waste can reduce green waste (Caiado et al., 2018). Circular economy initiatives, when applied in hospitality departments, could reduce food waste and the need for waste removal, enabling the organization to achieve true zero-waste status (Bhattacharya et al., 2019).

Resource efficiency for environmental sustainability involves evaluating resource use and its environmental impacts. To achieve resource efficiency, the following practical applications are proposed: optimized resource utilization, streamlined processes, sustainable value stream mapping, and sustainable resource practices to ensure the sustainable use of natural resources, thereby conserving biodiversity and ecosystems in destination areas (Sharpley, 2006). Optimizing could mean using less of something, using it more efficiently, or using something that has an optimized effect through a sustainability lens. In ecotourism, streamlining processes involves optimizing operations to enhance efficiency, reduce environmental impact, and improve sustainability reporting (Mearns, 2018). This could be achieved by adopting data management technology to reduce administrative tasks, minimize errors, and improve data accuracy (Mearns, 2018). Additionally, other departments could implement gradual improvements to minimize time wasted in processes. This could be initiated by applying sustainable value stream mapping to map processes, identify the value stream, identify non-value-adding processes, and identify where sustainability is diminished (Mosquera-Laverde et al., 2020).

Continuous improvement applied to environmental sustainability primarily focuses on resource efficiency (Cesar et al., 2021). By considering the use and distribution of resources in terms of their environmental impact and continuously minimizing that impact, the overall environmental impact can be reduced. Continuous improvement is a mindset that can yield positive results.

If **operational efficiency** is the goal, then tools such as just-in-time, Kanban, and total productive maintenance are the tools used to reach the goal (Caldera et al., 2017; Yadav et al., 2021; Wu et al., 2018; Lizarelli et al., 2023; de Freitas et al., 2017; Steinmeier et al., 2024; Bertagnolli et al., 2021; Küsel et al., 2025). Additionally, achieving operational efficiency results in optimized business practices (Lee and Johnson, 2013). Therefore, to assess how operational efficiency is applied to achieve environmental sustainability, it is considered how optimized, more efficient operations improve environmental sustainability. For example, Kanban might improve environmental sustainability by promoting efficient

resource utilization and reducing waste. Kanban operates on a pull system, where production is based on actual demand rather than forecasts, which minimizes overproduction and waste (Mojarro-Magaña et al., 2018). In hospitality, this could mean offering turn-down service or full maid service only when a customer requests them, reducing time and resources, such as water for linen washing. Additionally, total productive maintenance could be applied to improve maintenance performance by involving all staff members. This would mean less time is wasted stopping operations when maintenance is required, since it is addressed quickly (Samadhiya and Agrawal, 2024).

Respect for people is the human element in the Lean philosophy; it is the consideration of people when improving operations. Though it speaks more to the social aspect of sustainability, environmental initiatives would be ineffective without the commitment and buy-in of the various stakeholders (Coetzee et al., 2016). Thus, the role of respect for people in environmental sustainability is to create a corporate culture, as well as the surrounding community and stakeholders, that understands the importance of green initiatives and practices and commits to making them work.

Green supply chain management is the integration of environmentally sound principles and practices across the supply chain's different phases (Hariyani et al., 2024). This includes all decisions from design and sourcing through production and service provision to the end product. Evaluation of all stages relevant to environmental sustainability is essential, as the goal is to minimize harmful environmental impacts and ecological waste (Hariyani et al., 2024). For example, when sourcing food or ingredients for the kitchens, it would be beneficial to find suppliers who grow organically near the facility to minimize the use of harmful agricultural products and reduce greenhouse gas emissions from transporting goods.

Customer and stakeholder engagement is similar to respect for people and is more properly the engagement of stakeholders to ensure the successful implementation of green and sustainability initiatives. (Souza and Alves, 2018). Additionally, this refers to transparent communication with customers to ensure their commitment to an organization's sustainability goals.

4.3 Social sustainability

Table provides the third level of the support model matrix, the social sustainability level.

Table III: Lean-Green support model for Social sustainability

Lean & Green Theme / Social	Finance & Admin	Sales & Marketing	HR	Conservation	Hospitality	Property Operations
Waste Reduction	Reduce administrative burdens on staff and create better working environments for improved morale.	Honest, minimal marketing claims that ensure minimal negative impact on the social environment.	Eliminate time-wasting tasks to improve the employee experience.	Promote local inclusion to give back to the community and minimize wasted resources.	Minimize workload stress by reducing waste in hospitality processes.	Improve working conditions by reducing the waste generated in operations.
Resource Efficiency	Fair compensation, equitable access to administrative tools, and creating an engaging culture.	Promote inclusive marketing to create equal opportunity for customers.	Optimize staff scheduling to take undue stress off staff	Fair distribution of conservation funding to benefit the staff and community.	Balanced workloads for improved working environments.	Equitable task allocation for a better working environment and employee satisfaction.
Continuous Improvement	Training on inclusivity and leadership on a semi-regular basis will benefit the employees.	Community-driven innovation that benefits the local community and makes a positive social impact.	Encourage staff-led improvements and promote the use of employee knowledge.	Integrate local knowledge into strategy; engage the local community to improve buy-in and social support for conservation efforts.	Continuous training of staff to encourage the healthy growth of employees.	Worker feedback in maintenance to promote improvement and defect detection, which boosts employee satisfaction.
Operational Efficiency	Transparent operations to encourage cooperative and empowering working environments.	Efficient communication of information, avoiding miscommunication or overcommunication.	Simplify reporting to emphasize effective, efficient communication of information, thereby promoting satisfactory working environments.	Coordination with community projects to promote community engagement.	Efficient staff deployment and training to encourage employee growth and engagement.	Optimize cross-team collaboration to improve efficiency and employee satisfaction.

Lean & Green Theme / Social	Finance & Admin	Sales & Marketing	HR	Conservation	Hospitality	Property Operations
Respect for People	Fairness, open communication, adequate training, and employee engagement.	Ethical storytelling to ensure respect for the consumer.	Empower employees; promote employee training.	Recognize indigenous and local rights to ensure external respect for people's considerations.	Encourage employee ideas and input to create a culture of respect.	Health and safety emphasis for Lean and Green-focused culture.
Green Supply Chain	Ethical supplier practices to promote pouring back into the community.	Promote local artisans to encourage customer engagement with the local community.	Fair labor standards.	Community sourcing.	Local partnerships.	Ethical subcontracting, local where possible
Customer & Stakeholder Engagement	Engage stakeholders transparently.	Co-create experiences with communities.	Open communication with staff to promote input and ideas from all employees.	Community education and benefit sharing to promote community conservation and external engagement.	Guest engagement in local culture to promote community engagement in hospitality.	Transparent reporting and feedback to promote input and improvement ideas from staff regarding property operations

Waste reduction for social sustainability would address the waste of people's potential and time. Wasted people's creativity would be classified as a Lean waste. (Coetzee et al., 2025). Establishing principles to assess and minimize wasted people's creativity will create an environment that values people and staff, thereby improving staff turnover. Additionally, minimizing physical waste will help create cleaner working environments (Liker et al., 2008, Liker, 2020). Lastly, reducing noise waste would ensure a lower impact on the surrounding community. Thus, the impact of waste reduction on social sustainability is to reduce the forms of waste that affect employee morale and job satisfaction.

Resource efficiency in terms of social sustainability would mean addressing people as a resource, with their time and input as the resource to be made more efficient. Resource efficiency can help reduce unnecessary work and operational variability, creating a more balanced workload that improves employee productivity and job satisfaction (King and Lenox, 2001). Additionally, the responsible and efficient use of resources creates a better relationship between a business and the local community by reducing competition for scarce resources (Bramwell and Lane, 2011; Cherrafi et al., 2016). Therefore, the application of practices that result in resource efficiency provides a way to improve the value consideration for staff members and an opportunity to not only create greener, more sustainable resource use within a business but also help the surrounding community.

Continuous improvement aids social sustainability by embedding employee commitments, training, and skills development into a business's everyday operations. Through the systematic application of Kaizen and structured problem-solving tools, employees actively identify improvement opportunities, which, in turn, enhance their skills and participation in the business (Imai, 1986). All these elements of improved collaboration and contribution improve workplace culture and job satisfaction (Husar, 1991). In terms of external social sustainability, continuous recruitment of community stakeholders and collaboration with them improve relationships and community engagement with the business (Liker and Ross, 2017).

Operational efficiency can positively affect social sustainability by creating a better working environment that is lower-stress for employees, improving equipment reliability and performance through TPM, and enhancing communication amongst employees through Kanban (Küsel et al., 2025). This implies that by applying operational efficiency practices, businesses not only address inefficiencies but also create a better environment for their staff and improve their internal social sustainability.

Respect for people, as previously discussed, is the Lean principle that speaks to the practices in a business that generate mutual respect among employees and the community. This could take the form of training to empower employees, leadership commitment that drives and enforces progress, and staff contributions, as well as promoting efforts that pour resources back into the community to improve support and buy-in from the local community (Küsel et al., 2025). By valuing employees, the business

will see the return on that investment through job satisfaction and employee retention. Additionally, by generating value that can be reinvested in the local community, there is greater community commitment to help the business thrive (Coetzee et al., 2019b). This Respect for People environment is achieved by providing employees with training to empower them in their roles and across the business, and by communicating openly and transparently with all stakeholders to encourage feedback and input. Additionally, promoting top-down management to drive change and continuous improvement, and encouraging input from employees and external stakeholders, increases buy-in for the business's success and sustainability (Coetzee et al., 2019b).

Green supply chain practices include, but are not limited to, sourcing responsibly and locally to promote reinvestment in the local community (Küsel et al., 2025; Kovilage, 2021; Khan et al., 2018). This approach to sourcing materials and staff promotes social sustainability and improves the business's social performance perception.

Customer and stakeholder engagement allows for all stakeholders, internal and external, to add value to the business. Engaging with stakeholders improves customer satisfaction by building trust, fostering collaboration, and encouraging community support (Küsel et al., 2025). LG practices prioritize the needs and expectations of stakeholders, such as customers, employees, suppliers, and the community, thereby helping a business align its operations with stakeholder values (Teixeira et al., 2022). Practices such as environmental reporting foster transparent communication, enhancing the business's brand and improving perceptions of the company (Teixeira et al., 2022). Additionally, the Lean philosophy promotes employee input to add value to operations, thereby further promoting engagement with internal stakeholders (Teixeira et al., 2022).

5. Validation

The model validation was conducted in two parts. The first part was theoretically applying the model to the challenges identified in the case study business, and the second part was gathering industry feedback through interviews.

5.1 Theoretical application

The challenges identified were confirmed through member checking. The theoretical application of the support model is shown in Table . The first column gives the challenge title, the second column discusses possible solutions from the support model to improve OS, and the third column provides references to the model.

The focus group's findings revealed 9 challenges identified by the participants. The challenges were identified as follows:

- i. Communication - Communication was identified as a challenge that hinders productivity and smooth operations. Participants spoke to the complex communication system and process, *"communication is always going to be a huge challenge, so, for me, it is constantly communication."* A challenge of 'overcommunication' is identified, participants said it as follows *"And too many meetings. Too many unproductive, non-constructive meetings. It is very easy to call a meeting, but it is very difficult to make it productive."* Additionally, one participant was quoted as saying, *"The main thing that slows us down is perhaps turnaround time."* The time it takes to receive the communication needed to complete a task or form is delayed.
- ii. Conflicting objectives are identified as a challenge in achieving OS. It referred to different departments not having a common vision when making decisions. It was communicated as part of the communication challenge, as quoted: *"effective communication, making sure everybody understands the rules on where they can cross boundaries and where they can't, is a challenge."* However, this, along with the understanding that there is a need to communicate in a way that ensures common objectives and goals are understood. These conflicting priorities create a divide among departments and hinder optimal performance.
- iii. Distance is identified as a challenge that is prohibiting OS. This refers to internal and external distance. It was identified that the remote location of the business is a challenge, as quoted: *"I think transport. Because we are sitting so remotely, we can't walk to get a fresh pack of tomatoes or a bottle of mayonnaise, so it needs to be planned for."* Internal is the distance within the actual reserve, making it difficult to move inventory or resources from one department to another, given the enormous size of the reserve. The internal distance also complicates communication, making it difficult to conduct in-person interactions between departments and

- employees. External distance refers to the distance of the reserve to the nearest town or commercial store. This complicates hospitality department operations; for example, if a customer requests a specific product that the reserve does not have on hand, they must travel a long distance to procure it. This negatively impacts the environment by increasing greenhouse gas emissions from cars and causing long delays that hinder productivity and operations.
- iv. Biodegradable products were identified as a challenge for the hospitality department. The following quote highlights this sentiment: *“As the biodegradable products may not be the most effective products. So, if you have high-paying clientele at a lodge and you are using sub-par products, even though they are environmentally friendly, which ticks our boxes; if it is subpar products that are not cleaning your lodges, you are not going to have the service that you should have to deliver for the kind of clients that we are servicing.”* Though the primary objective is sustainability and sustainable products, the business still must provide high-quality service. Customers complained about the biodegradable version of a product because it had a distinct smell, which contradicted the sustainability goals and the business's efforts to make more sustainable product choices.
 - v. Culture is identified as both a challenge and a way to address sustainability in the organization. To achieve the organization's goals, a culture of sustainability is needed. The challenge is that the reserve not only consists of employees but also employees and their families living on the reserve. This extends the definition of corporate culture to include families. Furthermore, building buy-in and commitment across the entire community for sustainability initiatives is difficult.
 - vi. When communicating with staff members, there is a knowledge gap among grassroots employees. The following quote highlights this: *“departments not understanding the needs of other departments. What makes them tick.”* The communication of operational context empowers people to be on equal footing; without that understanding, there is a gap between departments and across hierarchical levels. This will affect productivity and efficiency in the long term. Therefore, there is sometimes a lack of understanding of sustainability practices, leading to low buy-in.
 - vii. Employees or grassroots staff members enter a state of not feeling valued and appreciated, which creates an environment where they lack motivation and buy-in. As the following quote highlights: *“information is being retained at management level, and it's leaving our grassroots players feeling like they don't matter.”* This leads to decreased productivity. This, if left unattended, might lead to lower value being generated from the knowledge and creativity added by employees. And generates underutilized people's creativity (Lean waste)
 - viii. Waste elimination was identified as a challenge. Waste elimination is difficult due to the distance to government landfills and the environmental impact of non-degradable waste. *“Challenge for us that we may have missed is waste disposal. There is no effective, in my*

opinion, there is no ecologically-sound, productive waste disposal mechanism. If you are going to have to take it off-site, you are still going to have an impact using your vehicle, your trucks, or whatever you are using anyway. I think that is a big challenge.” This again highlights the distance challenge; there are possible solutions to investigate that might mitigate the challenge to some degree.

- ix. A challenge identified was decreased productivity in the summer months due to extreme heat in the area. As the following quote explains: *“So, from my side, if a person must work and they are doing shopping trips and it is 40 to 42 degrees, you can expect a very tired employee in the evening when they come to offload the truck.”*

The list of challenges and the model's application to each challenge are shown in Table .

Table IV: Ecotourism challenges, identified in the focus group interview

Challenges	Lean-Green Support Model	Model reference
Communication	Value stream mapping can be used to identify the various communication wastes across the business. Once identified, waste reduction can be done to eliminate 'overcommunication' or 'miscommunication' in the business. This will save time in operations and improve employee productivity. 'Jidoka' or autonomation can be established to create a better, more automated communication system that supports accurate record-keeping and communication consistency. If better communication systems were implemented, a priority would be given to improving turnaround time. Once identified, methods to minimize communication waste could decrease turnaround time within the HR department.	Economic & Social: Waste reduction, Resource efficiency, Continuous improvement.
Conflicting objectives	The long-term philosophy is an organization's determination of a long-term goal for its business and embedding it throughout its operations. This will empower all department managers and team leaders to base their decisions on the business's shared goal rather than a silo mentality. This also considers stakeholder and customer engagement to establish a core focus throughout the business. Lean and Green would set a goal to consider the impact of all decisions on all three elements of the TBL.	Economic, Social, & Environmental: Respect for people, customers, and stakeholder engagement.
Distance	Solutions can be implemented to reduce the impact of distance. For example, using customer engagement to establish special request items before a visit will ensure only one trip is required instead of several. Increased planning and forecasting initiatives can help minimize external travel. Internal distance challenges can be addressed through Lean communication planning to minimize the need for in-person meetings. Finally, creative inventory placement planning can minimize the need for travel on the property. Sustainable value stream mapping can help identify the flow of inventory across the property and establish effective maintenance planning schedules.	Economic, Social & Environmental: Waste reduction Economic & Environmental: Resource efficiency.
Biodegradable products	This can be addressed through customer and stakeholder engagement and respect for people. Establishing transparent communication with customers can help manage their expectations and foster understanding of the organization's sustainable goals.	Social & Environmental: Respect for people, customer and stakeholder engagement (Sales and marketing and hospitality departments).
Culture	This challenge is primarily addressed under the Respect for People umbrella. Implementing training protocols for the entire community can help create buy-in and commitment. This training should include basic sustainability training and an overview of the organization and its approach to waste disposal, etc. By including all parts of the community in the reserve, engagement and understanding are fostered, which positively contribute to a sustainable business culture.	Economic, Social, & Environmental: Respect for people

Challenges	Lean-Green Support Model	Model reference
Knowledge/Educational gaps	Encourage employee ideas and input to create a culture of respect. Increased or more focused training to bridge the knowledge gap will help ensure that all members of the operation start on the same page. This will help the organization avoid the residual effects of this knowledge gap and promote continuous improvement initiatives at all levels.	Economic, Social, & Environmental: Respect for people, customers, and stakeholder engagement
Value perception of staff	Fairness, open communication, adequate training, and employee engagement. Cultivate, where possible, an environment of mutual respect and transparency to make staff members feel valued and respected. This will promote staff engagement and, in turn, allow decision-makers to get the most value from their employees.	Economic, Social, & Environmental: Respect for people
Waste elimination	This can be addressed through life-cycle analysis and sustainable value stream mapping to determine the waste-management protocols in place. This analysis can be used to initiate circular-economy practices, creating a truly sustainable business that minimizes physical waste. Additionally, Lean and Green addresses this by establishing sustainability protocols, such as limiting single-use plastics and using biodegradable products where possible.	Environmental: Waste reduction
Weather circumstances	Again, even though the location and weather cannot be changed, creative scheduling solutions can help mitigate the impact. Implementing shorter work shifts in summer can minimize the time single staff members spend outside in the heat.	Social: Waste reduction, Resource efficiency

5.2 Industry feedback

The second part of validation was to gather industry feedback. Interviews were conducted to present the findings and to solicit input from industry professionals as validation. The following two questions were asked:

Question 1: *“Can the Lean and Green support model aid the business in overcoming the challenges identified?”*

The response was positive about the model's usefulness in addressing challenges and improving OS. Participants agreed that the model adequately addresses the challenges identified. Participants emphasized that the challenges were well captured. Participant C emphasized this by saying, “You can get so overwhelmed with all the different challenges, but splitting it by department, as you have, and then, according to the different sustainability areas, is quite useful, I think.” This highlights the unique perspective the model allows to address challenges sustainably. Participants A and C emphasized the importance of “the right considerations” when implementing to ensure efficacy. Participant C referred to appointing a specific person to drive the changes. It is interpreted that change management strategies should be considered.

Question 2: *“Is the model practically feasible?”*

To this question, the response was also positive. Participants concurred that the model would be practically feasible if appropriate considerations were taken into account. Referring to the appointment of individuals to drive change, it can also encompass general change management. Participant A raised concerns that the model's practical feasibility cannot be known unless it is implemented and evaluated in the actual organization, but said, in their professional opinion, that it is possible to implement. Participant B emphasized their enthusiasm that it could be practically feasible within their department. Overall, the consensus was that, in theory, it is feasible, but the emphasis was on the implementation strategy that will determine the model's success.

6. Conclusion

The positive effect of LG on an ecotourism business's OS was demonstrated in an article evaluating LG's impact on organizational performance (Küsel et al., 2025). This research showed that LG is fundamentally applicable to improving the OS within the ecotourism industry. This paper builds on previous work and extends the concept to a specific case study organization to provide better industry context and applicability. Additionally, the research findings are presented as a morphological analysis that investigated all the different actions that can be taken within the departmental and sustainability context of LG for OS. The model reveals a unique perspective not only on the use of LG for the three

elements of sustainability but also specifically in the ecotourism environment. Although this research was only applied to a single case study organization, the general departmental context allows for scalability. This research revealed not only the positive relationship between LG and OS, but also how it can be applied to organizational challenges in a real-world ecotourism business. The support model was applied theoretically to all challenges and provided actions to resolve them.

Additionally, industry professionals validated the theoretical benefits of the model. These findings were obtained through a morphological analysis that examined each intersection among the three axes in the support model. Even though the conclusions considered a holistic view of implementing LG for OS, industry feedback emphasized the need for change management strategies to ensure the model's practical feasibility. Nonetheless, the support model provides a starting point for LG management in ecotourism businesses.

6.1 Contributions

The contribution of the research is a theoretical outline of LG applied to improve OS in the ecotourism industry. The industry feedback validates this contribution. A more in-depth contribution is explained in terms of theoretical, methodological, and practical contributions.

The research makes theoretical contributions by establishing a basis for applying LG in the ecotourism context. This paper's findings show how specific LG principles and practices apply to general ecotourism departments. Additionally, the research considers the theoretical application of the LG support model to real-world industry challenges and how the model can help address them to achieve long-term, sustainable solutions.

The methodological approach used in this research demonstrates the interdependence of different research methods and how they can work together to yield research findings. This interconnectedness is evident in the application of the Zwicky Box morphological approach, which combines the findings of a systematic literature review and focus group interviews to generate a three-dimensional view of LG's impact on OS and its application for OS. This research methodology offers a rigorous scientific approach to qualitative case study research.

Finally, the practical contribution of this research is applying the findings to real-life challenges and gaining industry feedback on the application. Practicality depends on considering implementation strategies and applying change management to ensure effective implementation.

6.2 Limitations and future research

The research conducted was limited in various ways, summarised as follows: methodological, scope and boundary, and practical and resource limitations.

The methodological limitation of the research was the sample of participants available to provide feedback. Even though 6 participants were included to represent the organizational departments, this was still on the lower end of the recommended number for focus group interviews, which provides an opportunity for future research to expand on the feedback.

As for scope and boundary limitations, the research was conducted with a single case study organization, which limits the scalability and generalisability of the findings. Although the organization represents the broader industry, its challenges may differ from those of other organizations. However, the general department classification will enable future researchers to build on the research to make it more specifically applicable to ecotourism in the broader sense. This again provides an opportunity to build on the basis set in one case study by measuring it against other case study organizations.

Finally, the practical and resource limitation of the research is the lack of time and resources to implement the support model and assess the study's practical feasibility. The intent of the research was always to find the intersections of the different research elements and how they come together to provide a holistic, sustainable solution. Therefore, there is an opportunity to expand on the theoretical applications and impact, and to create an implementation framework that considers not only the practices and principles but also change management considerations to initiate effective change.

Appendix A

Table V: Focus group interview phase 1 protocol

Focus Group protocol	
Basic information	Who? – Members of management, persons who have been at the organization for 2+ years. (6-9 participants) What? – Focus group, online, to determine the organizational structure and how communication is done within departments and among different departments. Additionally, the organization's operational processes. When? – Date and time, TBD.
Introduction	Introduce themselves, explain the study's purpose, collect the signed consent form, outline the interview structure, and clarify key terms. <u>Purpose of study:</u> To understand the implementation of Lean and Green in an ecotourism business and how it can aid OS. <u>Introductory remarks:</u> • Define lean and green as a management approach that encompasses environmental, economic, and social sustainability through continuous improvement and waste reduction. • Define organizational sustainability in terms of the TBL, economic, environmental, and social aspects.
Opening questions	Opening questions to help participants feel comfortable. • “Introduce yourself by briefly answering how long you have been at the company, what is your experience in the field, and what are your key responsibilities?” • “What makes this organization operate on such a high level?”
Guiding research question	The focus and main goal of the focus group. • “What are the different organizational elements of an ecotourism business?”
Content questions	
Research question 1 (guiding interview question) “What are the different organizational elements of an ecotourism business?”	Research question 2 (guiding interview question) “How can lean-green be applied for organizational sustainability of an ecotourism business?”
Interview question: What are the different overarching departments in the organizations? Probing questions: • What are the responsibilities of each department? • How does one department work with, or communicate with, another? • How does each department contribute to the ‘product’ delivered to the customer? • What is done to contribute to organizational sustainability within each department?	Interview question: What challenges are faced in these departments? Probing questions: • What obstacles hinder the smooth operation within each department? • How do operations flow from one department to another? • What are the challenges you can identify within your department that diminish productivity? • What do you think could contribute positively to the organizational sustainability of the department based on the challenges identified?
Closing instruction	Thank the interviewee, ensure confidentiality, and address any final questions.

Appendix B

Table VI: Interview protocol

Interview protocol	
Basic information	Who? – Members of management, persons who have been at the organization for 2+ years. What? – Focus group, online, to determine the organizational structure and how communication is done within departments and among different departments. Additionally, the operations of the organization's processes. When? – Date and time, TBD.
Introduction	Introduce themselves, explain the study's purpose, collect the signed consent form, outline the interview structure, and clarify key terms. Purpose of focus group: To verify the Lean-Green support model with industry feedback. Introductory remarks: • Present the focus group findings. • Present the Lean-Green support model, and its relevance to the challenges identified.
Opening questions	Opening questions to help participants feel comfortable. • “Introduce yourself by briefly answering how long you have been at the company, what your experience is in the field, and what your key responsibilities are?”
Guiding research question	The focus and main goal of the focus group. • “Is there practical feasibility for this support model?”
Content questions	
Research question 1 (guiding interview question)	Research question 2 (guiding interview question)
	“How can a Lean-Green model support the sustainability of ecotourism businesses?”
Interview question: Can you verify that the conclusions drawn from the previous focus group were correct? Probing questions: • Were the organizational departments correctly identified? • Are the challenges explained accurately? • Are there any additional challenges that should be considered in this research?	Interview question: Can you determine the possible practical feasibility of the Lean and Green support model? Probing questions: • Can the Lean and Green support model help the business overcome the identified challenges? • Is the model practically feasible?
Closing instruction	Thank the interviewee, ensure confidentiality, and address any final questions.

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CHAPTER 7 VERIFICATION AND VALIDATION

7.1 Introduction

This chapter presents the Lean-Green support model's verification and validation, which adheres to the set model requirements. This is done in addition to the model validation and verification described in the third research article (Chapter 6).

7.2 Verification

To verify that the model adheres to the model requirements, it needs to be confirmed whether the final model addresses organisational sustainability in terms of the model requirements set in Chapter 4:

1. Provide Lean and Green principles or tools that can be applied pragmatically.
2. Considers industry context and applicability
3. Addresses all three elements of the triple bottom line: environmental, economic, and social sustainability.

How each of these requirements is addressed in the final support model is discussed in Table 7.

Table 7: adherence to Model requirement

Model requirements	Addressed?	How?	Reference
1. Provide Lean and Green principles or tools that can be applied practically	Yes	The Y-Axis of the final Lean-Green support model lists seven Lean and Green principles and practices applied to organisational sustainability.	Article 2 (Chapter 5) and Article 3 (Chapter 6).
2. Consider industry context and applicability.	Yes	The X-Axis of the final Lean-Green support model provides six ecotourism departments as identified by the case study organisation (by means of focus group interviews). Additional	Article 3 (Chapter 6).

		context was introduced by applying the support model, in theory, to the challenges identified within the case study organisation (identified in the focus group interview and verified through member checking).	
3. Address all three elements of the triple bottom line	Yes	The Z-Axis of the final Lean-Green support model represents sustainability through the triple bottom line and allows for in-depth consideration of environmental, economic, and social sustainability.	Article 3 (Chapter 6).

Thus, the final Lean-Green support model integrates all model requirements and provides an approach to organisational sustainability for a South African ecotourism business.

7.3 Validation

To establish the quality of research, validity is assessed. Validity determines the degree to which the research accurately measures what it sets out to measure and ensures that the findings are sound and applicable to the objectives set (Andersson et al., 2024).

The validation is based on three elements that, together, demonstrate the research's rigour.:

- Research problem – is the identified research problem valid, and can a gap in the literature support it?
- Research design – was the research conducted by means of valid research methods?
- Research output – Are the research outputs and findings of the research valid?

Validation of the research problem

The research problem was identified in Chapter 1:

The problem is that the ecotourism industry underwent significant changes due to the COVID-19 pandemic and is struggling to operate sustainably in the evolving economy.

The problem was validated through a state of the art review conducted to establish the current state of the ecotourism industry post-COVID (Research article #1 presented in Appendix A). The literature review concluded that there is a need for research in the management and operations of ecotourism with a focus on organisational sustainability. This conclusion was based on recommendations for future research that highlighted the need for pragmatic research to aid ecotourism organisations in functioning sustainably. Refer to article #1 in Appendix A:

Regenerating African Ecotourism: A State-of-the-Art Review of Post-COVID Sustainability, Conservation, and Community Resilience.

Validation of research design

The research design was based on the overarching qualitative case study method, with additional research processes embedded within it. The steps of this method are explained and confirmed in Table 8; in other words, it is confirmed that the research methods were adhered to.

Table 8 shows that each step in the Qualitative Case Study Method was followed by the application of reputable scientific research methods (as explained in the second column). Additionally, in the third column, it is discussed why each research method was applied and how it relates to the research objectives and the desired outcome. Finally, the fourth column discusses the confirmation of the research methods applied, and that the objectives were achieved.

Table 8: Research method application and confirmation

Qualitative case study steps	Research methods applied	Reason for the application of the method	Confirmation
Defining the case study	The case study was defined by setting the research scope and establishing that the research would be applied in a South African ecotourism organisation.	To establish the aim and objectives of the research, they should be clearly defined, and the scope should be effectively set.	The case study of a support model for a South African ecotourism organisation was conducted.

Qualitative case study steps	Research methods applied	Reason for the application of the method	Confirmation
Designing the case study	State of the art literature review	Defining the research problem	A research problem was identified and confirmed with the research
Data collection	Systematic literature review	Identifying Lean and Green elements that speak to organisational sustainability	Qualitative data was collected.
	Focus group interviews	Gaining industry context	
Data analysis	PESTEL Analysis	Analysing state-of-the-art review findings	Qualitative data was analysed. PESTEL analysis was applied to the state-of-the-art review findings. The thematic analysis approach was applied to the focus group interview and the qualitative interview data. The Zwicky morphological analysis was applied to the collective findings to establish the three-dimensional matrix which makes up the final support model.
	Thematic analysis	Analysing findings of the systematic literature review, as well as findings from the focus group interviews	
	Zwicky morphological analysis	Establishing the contents of the support model.	
Data validation	Interviews	Validating the support model and the conclusions drawn from the model	The data collected from the interview participants were verified through member checking. Additionally, the final support model was presented to the participants, who then

Qualitative case study steps	Research methods applied	Reason for the application of the method	Confirmation
			verified its usability and applicability.

Validation of research output

The validation of the research output was done in three parts:

7.3.1.1 Research objectives

Validating that the research addresses the research objectives by means of alignment of research objectives with the method used to facilitate the operationalisation of the research objectives.

Table 9 reflects on the research objectives identified in Chapter 1, how the research conducted addressed them, and how it was confirmed to be valid.

Table 9: Research objective confirmation

Research objective	Operationalisation of objectives	Reference
1. Identify the organisational elements of an ecotourism organisation.	Organisational elements were identified through the focus group interview and used to design the final support model. This was internally verified through repeatable, ethically approved group interviews.	Article 3, Chapter 6
2. Investigate the application of Lean and Green principles to the organisational sustainability of ecotourism organisations.	The impact of Lean and Green on the triple bottom line of organisational sustainability was established in an impact matrix. This was based on a systematic literature review . The Prisma flow diagram was followed to ensure that the systematic review was scientifically sound and that repeatable steps and results were gained from the research.	Article 2, Chapter 5

Research objective	Operationalisation of objectives	Reference
3. Integrate organisational characteristics with Lean and Green principles to determine the extent of their use in ecotourism organisations.	A support model was developed that considers the impact of Lean and Green on the organisational sustainability of each department, as clarified in the case study organisations, and how the practical elements address the challenges identified in those organisations. This is an integration of Lean and Green and organisational context. The support model was based on a scientifically sound method, using the Zwicky-box analysis to determine the final support model.	Article 3, Chapter 6.
4. Design a Lean-Green support model for a South African ecotourism organisation.	A Lean-Green model was finalised, refer to article 3, Chapter 6. A final support model was created by integrating Lean and Green with the different ecotourism departments and challenges.	Article 3, Chapter 6.
5. Verify and validate the support model for organisational sustainability.	Research is verified by how the research objectives were addressed, and validation is done through industry feedback from focus group interviews as a member-checking practice. Verification is done using a checklist of the established model requirements. Establishing that the methodology was scientifically sound and addressed the research objectives. Conducting a second focus group interview to establish the findings aligns with the business participants' observations and the practical feasibility of the support model.	Article 3, Chapter 6. As well as overarching verification and validation in Chapter 7.

Table 9 indicates that the research conducted addressed all the research objectives set out in Chapter 1. In the second column, the research methods used to address each objective are referenced, and their success is confirmed by citing the research outcomes. The third column shows the reference article or chapter where the research discussed in column 2 can be located for more in-depth explanations.

7.3.1.2 United Nations Sustainable Development Goals (SDG)

Validating that the research addressed the sustainability goals identified in Chapter 2 by means of narrative confirmation and interpretation.

The United Nations's sustainability development goals (SDG's) identified in Chapter 2 as relevant to the desired outcome of the research, as well as how the research incorporated these goals, are shown in Table 10. The SDG's, as explained in Chapter 2, outline specific targets this research could help address. Therefore, as additional validation of the research output, Table 10 discusses how the research addressed the identified SDG's.

Table 10: Sustainability goals

SDG's	Research addressed the SDG's
Industry, innovation, and infrastructure	This is industry-focused research, a real-world business that could grow and benefit from applying the Lean-Green support model. The application of the model could promote circular economy infrastructure in the surrounding community.
Sustainable cities and communities	The Lean-Green support model promotes sustainable business initiatives for businesses and the communities in which they operate. Thus, by applying the model, it could promote sustainability not only in business practices but also in the communities and cities in which they operate.
Responsible consumption and production	Resource efficiency is one of the main Lean and Green themes identified, which breaks down the resource use in the business. This breakdown helps understand how resources are consumed and distributed, and how to make more sustainable choices to improve resource efficiency in terms of cost and environmental impact.
Life on land	The Lean-Green support model aims to minimise environmental impact and improve sustainability. Thus, by applying the model,

SDG's	Research addressed the SDG's
	it could promote reduced environmental impact and a better quality of life for land animals.
Modern Agriculture for increased productivity and production	The Lean-Green support model focuses on increased productivity, and its application could promote this in the ecotourism environment. Additionally, it could help the business implement circular-economy principles and perhaps include self-sustaining agricultural practices to support resource replenishment at ecotourism destinations.

Table 13 concludes that theoretical outcomes may be beneficial for the selected SDG's. This is not a definitive solution to the SDG's highlighted, but it can serve as a supporting mechanism for achieving them. The research aimed to address organisational sustainability in an ecotourism environment; the unfolding and completion of the research revealed the potential environmental and sustainability benefits of applying the Lean-Green support model.

7.3.1.3 Industry challenges

Validating that the support model in its entirety addresses the challenges as identified by the participating industry professionals from the case study organisation, by means of individual interviews. (Refer to the research article 3 in Chapter 6.)

The final part of the validation was conducted through interviews with participants in the South African ecotourism organisation. The in-depth explanation of the interview outcome is presented in research article 3, located in Chapter 6. Interviews were conducted with the same participant as in the focus group, but in a one-on-one format. This allows participants to speak freely about their opinions on the challenges identified and how the proposed model addresses them. An overview of the model was provided, followed by an explanation of how it addressed the various challenges. Thereafter, questions regarding the model's benefits for addressing the challenges and its practical feasibility arise. The overall response was positive and revealed that the participants believe the model is unique in how it addresses the challenges and could possibly aid the business in addressing them. Some concerns were raised about practicality, noting that the true feasibility would only be known if the model were implemented and evaluated over time. Some participants responded that the model would be practically feasible in their department, from a management perspective, but that they could not speak to its practicality in other departments. This shows that the model could be feasible if implemented under the right circumstances and with the right considerations taken.

7.4 Conclusion

The research was verified by demonstrating that the model requirements were met. Additionally, the research was validated with respect to the problem statement, research design, and research output. The problem statement was confirmed by the first research article, which confirmed the research opportunity proposed by the problem statement. The research design was validated by assessing its coherence with the scientific method and by using well-known, repeatable research methods. Finally, the output was validated in the third research article by applying the model to the challenges identified in the case study organisation, confirming that the model could be used to address them. Additionally, follow-up interviews with participants from the case study organisation revealed a positive response to the findings and confirmed the model's feasibility and practicality. Therefore, the research is considered valid.

CHAPTER 8 CONCLUSIONS AND RECOMMENDATIONS

The final chapter concludes by outlining the research's novelty and contribution. Additionally, the findings identified throughout the research are reflected upon, along with the research's limitations, which will establish the foundation for future research.

8.1 Research study summary

As the ecotourism industry recovered and grew after the COVID pandemic, a need emerged to address the organisational sustainability of ecotourism businesses to ensure their long-term success. Many approaches to organisational sustainability have been considered to aid longevity and success in businesses. This research focuses on achieving organisational sustainability in a South African ecotourism business through Lean and Green. The research was conducted in six research phases: defining the problem, empirical data collection in two forms, model creation, verification, and validation.

The ecotourism industry helped define the research premise and was confirmed in the first phase, which was conducted as the first research paper. The first research paper was a state-of-the-art review of the post-pandemic state of ecotourism and appears in Appendix A.

Once the premise and foundation were established, the research data were collected to build on the theoretical background. This phase also contributed to the second research paper. A systematic literature review identified the elements of Lean and Green that help businesses achieve organisational sustainability. The findings of the SLR were presented in an impact matrix that illustrated the impact of Lean and Green principles and practices across the three elements of the triple bottom line. The paper concluded that the overarching effect of Lean and Green on organisational sustainability was positive and that there is an academic motivation for evaluating this impact and application in future research.

This led to the combination of the industry with Lean and Green theory. The industry context was extended to a case study organisation. The ecotourism business that formed part of this research conducted focus group interviews and individual interviews with participants. The focus group interview was conducted to identify the organisational departments within a private nature reserve that fall under the umbrella of ecotourism. Additionally, this group interview was conducted to identify some challenges within the business that hinder organisational sustainability. Member checking principles were applied to verify the findings, and the researcher's understanding of the information provided was accurate. The departments were then used as the third-dimensional element of the Lean-Green support model. The support model developed outlines the theoretical

opportunities for achieving organisational sustainability across the different ecotourism departments. The support model was developed using the Zwicky morphological analysis to explore all intersections among Lean and Green, ecotourism, and the triple bottom line. The model was presented as three matrices, each exploring one of the three sustainability elements: economic, environmental, and social. The model was then verified and validated through interviews with industry professionals and theoretical application to address the various real-world challenges identified in the focus group interview. This phase of model development was written into the third and final research article. This article can be read in Chapter 6.

The final two research phases were the verification and validation of the research conducted. Although the three research papers each include their own validation, Chapter 7 combines the overall verification of the research methodology with validation of the various steps. Verification and validation are conducted in three forms: the research problem, the research design, and the research output.

8.2 Contribution

The contribution of this research is discussed in terms of the industrial engineering literature, organisational contribution, and individuals.

Contribution to literature

The research contributes to the literature by not only investigating a growing industrial optimisation and management approach, Lean and Green, but also by evaluating its applicability in an industry not generally associated with industrial engineering. The interdisciplinary research that stretches to ecotourism and sustainable business strengthens the research and broadens its value. The Lean-Green support model was developed specifically to support organisational sustainability within an ecotourism business and demonstrates the potential value of this approach when applied in theory.

Contribution to organisations

Although the research is theoretically or empirically based, it provides organisations with a practical guideline or starting point for Lean and Green in ecotourism. The model provides a broad overview of how Lean and Green intersect across departments to achieve distinct sustainability goals. This allows organisations not only to get ideas for sustainability improvements, but also to see how they translate across the different departments within the business.

Contribution to individuals

The research promotes the empowerment and valuing of individuals to promote successful Lean and Green methods. A model is provided to strengthen and empower individuals to gain long-term strategic perspectives, principles, and practices that will improve their output, quality, and sustainability.

8.3 Research limitations and recommendations for future research

The research was limited by the case study method, which was applied to only one business in the ecotourism industry. However, the case study method revealed real-life industry challenges and the opinions and contributions of industry professionals. This provides an in-depth understanding of a business's operations and challenges, and explains how the research combines Lean and Green with organisational sustainability to help a business address its current challenges. There is an opportunity for future research to build on this work by investigating the scalability and applicability of the findings to other ecotourism businesses.

Additionally, the research was limited to one branch of the tourism industry. Limiting the research to ecotourism limits its scalability. However, the research makes a unique contribution by illustrating how an industry rooted in sustainability can benefit from support not only to promote environmental sustainability but also to advance economic and social sustainability. The focus on ecotourism is an intentional focus to ensure the success and accuracy of the final Lean-Green support model for businesses in this industry. Future research could focus on the model's scalability and its applicability to other tourism and sustainability sectors.

Finally, the research was not practically applied. This limits the study's pragmatic feasibility. However, the study was never intended to provide an implementation model. Rather, the research provides an academic foundation for future research on the implementation and rollout of Lean and Green in ecotourism. Future research might build on the theoretical understanding of Lean and Green in ecotourism and identify change-management and implementation research to ensure the success of this approach for organisational sustainability.

8.4 Concluding remarks

For true sustainability to be achieved, there needs to be a holistic view thereof. Considering not only environmental sustainability but also social and economic sustainability strengthens the chances of long-term sustainability and change. The use of Lean and Green in this holistic

approach to sustainability provides an elegant, harmonious path toward a complex, multifaceted objective.

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APPENDIX A – RESEARCH ARTICLE 1

Regenerating African Ecotourism: Analysing Post-COVID Sustainability, Conservation, and Community Resilience.

**Regenerating African Ecotourism: Analysing Post-COVID Sustainability,
Conservation, and Community Resilience.**

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Abstract

Background: The COVID-19 pandemic caused unprecedented shocks to the African ecotourism sector, threatening biodiversity conservation and community livelihoods by exposing a dangerous over-reliance on international visitor revenues.

Aim: This state-of-the-art review evaluated the contemporary post-pandemic ecotourism landscape to map vulnerabilities, highlight resilience mechanisms, and identify priorities for future sustainability.

Setting: Ecotourism.

Methods: A comprehensive search queried four major academic databases (Scopus, ScienceDirect, EBSCOHost, and Emerald Insight) for contemporary literature published between 2020 and 2025. Extracted data were synthesised using a thematic and narrative approach. **Results:** The sudden loss of international tourism revenues severely reduced conservation funding and escalated socio-economic hardships for protected-area communities. Conversely, resilience was successfully bolstered through Community-Based Tourism (CBT), local livelihood diversification, and a strategic pivot toward domestic and regional tourism markets.

Conclusion: The pandemic provided a transformative opportunity to reframe ecotourism. Escaping crisis-prone models requires holistic, multi-stakeholder cooperative governance that balances profitability with environmental and social justice.

Contribution: This review reconceptualised post-pandemic recovery by shifting focus toward long-term sustainability transformations. It provided an actionable framework for future research and policy development, directly aligning the ecotourism-crises-conservation nexus with the United Nations Sustainable Development Goals.

Keywords: Ecotourism, Community-Based Tourism (CBT), Conservation, Covid-19, post-pandemic, sustainability

1 Introduction

The ecotourism sector plays a pivotal role in the African economic context. Ecotourism is fundamentally built on nature-based attractions and, more importantly, on the area's environmental conservation and sustainability. This highlights an important purpose of the ecotourism sector: providing funding and support for the natural environment. Tourism conservation within ecotourism contributes to local employment, educational advancement, and local security (Nthiga et al., 2015). This partly highlights the significance of ecotourism's organisational sustainability for broader social sustainability. Africa's ecotourism sector has long been championed as a dual-purpose engine: driving socio-economic upliftment for marginalised rural communities and generating critical funding for the conservation of biodiverse, protected areas. (Shoo and Songorwa, 2013).

Prior to the COVID-19 pandemic in 2020, the industry operated largely on a neo-liberal, volume-driven growth model heavily reliant on international tourist arrivals. While this approach yielded significant financial returns, it masked profound systemic vulnerabilities (Newsome, 2021). Protected areas and the indigenous communities residing on their peripheries became dangerously dependent on foreign revenue streams to fund anti-poaching operations, ecological monitoring, and basic community livelihoods (Stone et al., 2021). This highlights a blind spot in ecotourism foundations: failing to diversify revenue streams leaves businesses at risk of overreliance on a single source (Newsome, 2021).

However, the unprecedented COVID-19 pandemic brought global mobility to an abrupt halt, acting as a severe macro-environmental shock that ruptured this fragile dependency. Across Sub-Saharan Africa, the sudden collapse of international tourism revenue triggered a cascading crisis within the ecotourism-crises-conservation nexus (Lindsey et al., 2020). Without the buffer of visitor fees, conservation budgets were decimated, and vulnerable communities faced escalating poverty and food insecurity. (Stone et al., 2021). This socio-economic desperation frequently forced a return to unsustainable resource extraction, such as poaching, woodfuel collection, and illegal exploitation of habitats. Furthermore, the pandemic did not occur in a vacuum; it compounded existing crises—including geopolitical conflicts and the accelerating impacts of climate change—further threatening the ecological integrity of African destinations.

While a growing body of recent literature extensively documents the immediate operational and financial devastation caused by the pandemic, a critical theoretical and practical problem remains: the focus is overwhelmingly on short-term business survival rather than long-term structural transformation (Gössling et al., 2020; Hall et al., 2021). As the industry looks to recover, many policymakers and operators are attempting to revert to the precarious pre-pandemic status quo (Sharma et al., 2021). However, there is a fragmented understanding and a critical lack of synthesised, contemporary knowledge regarding how socio-ecological systems must fundamentally transition to avoid repeating these historical vulnerabilities. Specifically, current ecotourism frameworks fail to adequately integrate indigenous resilience strategies—such as community-based tourism (CBT), livelihood diversification, and multi-stakeholder cooperative governance—into holistic, long-term recovery plans. Without a unified, comprehensive understanding of how African ecotourism can build elasticity against

profound ruptures, the sector cannot survive future global uncertainties. Therefore, this study aims to identify the current state of the ecotourism industry post-pandemic at the organisational level, as well as the operational changes organisations should implement.

The following research objectives achieve the aim:

1. To determine ongoing vulnerabilities,
2. To highlight community-led resilience mechanisms, and
3. To explicitly identify actionable priorities for future research and sustainability-driven governance to regenerate African ecotourism.

The aim is achieved by conducting a state-of-the-art literature review and a PESTEL analysis, which synthesises the most current literature from multiple databases.

2 Literature review

The focus of this research is on determining the state of ecotourism post-pandemic. The state-of-the-art literature review presents relevant literature on the topic, and this section discusses the PESTLE analysis and the context of the current state analysis to provide the necessary foundation for the research.

2.1 PESTLE Analysis

The PESTLE analysis is a method of analysing the external influences on a business by evaluating six major factors: Political, Economic, Social, Technological advancements, Legal, and Environmental (Vilas Belsare, 2025). PESTEL can be applied as a strategic planning tool for organisations (Vilas Belsare, 2025). The role of this tool is to conduct macro-environmental scanning to identify external factors affecting organisations or industries, including opportunities and threats beyond organisational control. The six factors are seen as follows:

- Political refers to the political environment of the business being analysed; this can include government policy, political stability or instability, taxation, and trade regulations (Andersen, 2025).
- Economic factors, which refer to the economic growth or lack thereof seen in and around the business being analysed, include changes in inflation and exchange rates, unemployment, consumer spending behaviour, and demand (Vilas Belsare, 2025).
- Social factors include the demographics of the business's consumer base, its cultural values, community attitudes, consumer behaviour, and other behavioural factors that influence how consumers might view the business (Vilas Belsare, 2025).
- Technological advancement assesses the innovation and digitisation in the industry, the impact of social media on the business, automation, and any other technological or automated changes in the industry that could influence or benefit the business (Andersen, 2025).
- Legal factors would include legislation about the type of business, labour laws, and, in the case of ecotourism, environmental legislation, conservation legislation, tourism regulations, etc. (Christodoulou and Cullinane, 2019).

- Environmental factors are any effect that environmental change or regulations would have on the business. This could include resource management, sustainability pressures, biodiversity conservation, or other environmental impacts on a business (Christodoulou and Cullinane, 2019).

2.2 Organisational and operational context of ecotourism

One of the five key characteristics of ecotourism is its financial viability (Newsome et al., 2002). Therefore, if the economic or financial sustainability of an ecotourism business is fundamental, the business's organisational structure and effectiveness need to be prioritised. The context of a business's operations and practices can determine its level of efficiency and financial viability. Ecotourism conservation largely depends on tourism revenue. Therefore, to ensure that conservation is supported and sustained, services and operations need to be effectively managed in the long term to maintain financial stability (Harilal and Tichaawa, 2025).

Ecotourism simultaneously balances revenue generation, natural environment and wildlife conservation, and community development (Kumar et al., 2023), and can also be viewed through the lens of the triple bottom line of sustainability: environmental, economic, and social. If this view is considered, for ecotourism to grow as an industry, the organisational sustainability of ecotourism businesses is fundamentally important (Drumm et al., 2004).

2.3 Sustainability

To understand the real-world relevance of this research, consider the possible impact of the research on the United Nations Sustainable Development Goals (SDGs). The agenda for sustainable development is based on the 17 Sustainable Development Goals (United Nations, 2026). These goals are used as a blueprint for peace and prosperity for people and the planet, now and into the future.

Sustainability can be seen as the combination of three main elements: social, economic, and environmental (Purvis et al., 2019). Although there is debate over the origin of the concept of three elements, or pillars, of sustainability (Purvis et al., 2019), the idea is widely used to capture the delicate balance required to achieve sustainability in any field. Organisational sustainability is an organisation's ability to endure and thrive over time, balancing the economic, social, and environmental considerations. Organisational sustainability comprises several elements, including human resource quality, innovative practices, and the integration of sustainability into core business strategies (Rahman, 2022).

3 Research methods and design

A qualitative research design was adopted to review the literature on ecotourism from 2020 to 2025 and map the impact of the COVID-19 pandemic on the industry. To achieve the aim of mapping the current state of ecotourism post-pandemic, a state-of-the-art literature review was conducted to gather and synthesise the relevant literature. Additionally, a PESTLE analysis was conducted to categorise the literature, inform future research in this industry, and enable lasting, sustainable change.

3.1 Research method: State of the art review

State-of-the-art reviews address current issues and provide a cross-sectional perspective on the current state of knowledge, while highlighting priorities for future research (Barry et al., 2022).

A state-of-the-art (SoTA) review was conducted in the following six stages (Barry et al., 2022):

- 1 Determine the initial research question and field of inquiry.
- 2 Determine the timeframe.
- 3 Finalise a research question(s) to reflect the timeframe.
- 4 Develop a research strategy to find relevant manuscripts.
- 5 Analyse relevant manuscripts.
- 6 Reflexivity: subjectively present the findings and conclusions of the literature reviewed.

This six-stage approach offers a systematic framework for conducting a SoTA review and provides a subjective description of the findings (Barry et al., 2022). The first four steps establish the strategy for conducting the state-of-the-art review. At the same time, the last two steps involve presenting the research findings.

3.1.1 State-of-the-art research strategy

The research protocol used for this literature review is summarised in Table 1. The table outlines the research objective, research questions, and additional guidelines for conducting the literature review.

Table 1: Search Protocol

Literature review aim	The objective of the study is to identify the current state of the ecotourism industry at the organisational level post-pandemic, and to propose operational changes for organisations.			
Research objectives	1. To map ongoing vulnerabilities, 2. To highlight community-led resilience mechanisms, and 3. To explicitly identify actionable priorities for future research and sustainability-driven governance to regenerate African ecotourism.			
Search Strategy	Academic literature sources written in English.			
Timeframe	2020 - 2025			
Inclusion Criteria	Literature with a focus on the operations and management of ecotourism businesses post-pandemic.			
Exclusion Criteria	Literature focusing on only environmental or wildlife management in ecotourism.			
Quality Assessment Criteria	• Repeatable and reputable scientific research methods were followed. • Peer-reviewed sources.			
Keywords	("conservation tourism" OR ecotourism OR "soft tourism") AND (covid OR "COVID-19" OR coronavirus) AND (management OR operations)			
Databases	Scopus	ScienceDirect	EBSCOHost	Emerald Insights

	Search was limited to the following disciplines: Business, Management and Accounting; Economics, Econometrics and Finance; Engineering; Multidisciplinary.	All included	All included	All included
Results	61	13	55	62
Duplicates across databases	36 (155 remaining)			
Final inclusion (Based on full text and its ability to answer the research questions)	50			

To capture the most current literature, a comprehensive search of contemporary academic databases was conducted (Creswell, 2003). The search protocol queried four major databases: Scopus, ScienceDirect, EBSCOHost, and Emerald Insight. The search strategy utilised the following Boolean string to identify relevant literature published between 2020 and 2025: ("conservation tourism" OR ecotourism OR "soft tourism") AND (covid OR "COVID-19" OR coronavirus) AND (management OR operations). The search strategy was supported by specific inclusion and exclusion criteria and by evaluating whether the sources addressed the research objective and the proposed questions. This is seen in Table 1.

3.1.2 Study Selection and Appraisal

Following standard protocols for a state-of-the-art review, no formal quality assessment of the study designs (e.g., evaluating the repeatability or reproducibility of the scientific methods) was conducted. Instead, the literature was appraised for its conceptual contribution to the current state of knowledge on post-pandemic ecotourism recovery. The selection process involved screening titles, abstracts, and keywords for relevance, followed by a full-text review to ensure the literature provided meaningful insights into sustainability, conservation, or community resilience within the specified timeframe.

The first phase of selection was based on the applicability or relevance of the study sources, as determined by their abstracts, titles, and keywords. Additionally, in this first scan of the sources, an informal quality assessment was conducted of the methods used in each source, their repeatability/reproducibility, and whether each source was peer-reviewed.

3.1.3 Synthesis and Analysis

Data extracted from the selected literature were synthesised using a narrative approach accompanied by tabular summaries, which is the standard synthesis method for this review typology. The extracted qualitative data underwent a thematic analysis to identify overarching patterns and themes across the literature.

3.2 PESTLE analysis

The PESTLE analysis was conducted to identify external factors affecting ecotourism in the aftermath of the COVID-19 pandemic. The analysis provides a structured overview of the overall ecotourism climate from 2020 to 2025. The following four steps are used as a framework for conducting a PESTEL analysis:

- 1 Planning: select the analysis objective and scope.
- 2 Conducting: conduct research for all six factors.
- 3 Analysis: interpret and organise data into the relevant categories.
- 4 Execution: put the data to use.

These steps serve as a map for guiding the execution of a PESTEL analysis and aid in simplifying the complexities of conducting environmental scanning through a PESTEL analysis (Karadzhov and Patarchanova, 2025).

4 Findings: SoTA

The findings of this state-of-the-art review synthesise contemporary literature to evaluate the post-pandemic ecotourism landscape in Africa, shifting the focus from short-term business survival to a necessary long-term sustainability transformation, which relates to the overall aim of the study of addressing the long-term gap and looking at the transformation of practices and policy to sustain the businesses in this industry for future crises and challenges. The thematic analysis of the extracted data reveals three overarching themes:

Theme 1 - the vulnerabilities in the ecotourism-crises-conservation nexus.

Theme 2 – the community-based tourism (CBT) and livelihood diversification.

Theme 3 - the sustainability transition and cooperative governance.

The themes are represented across various geographical regions, as shown in Figure 1.

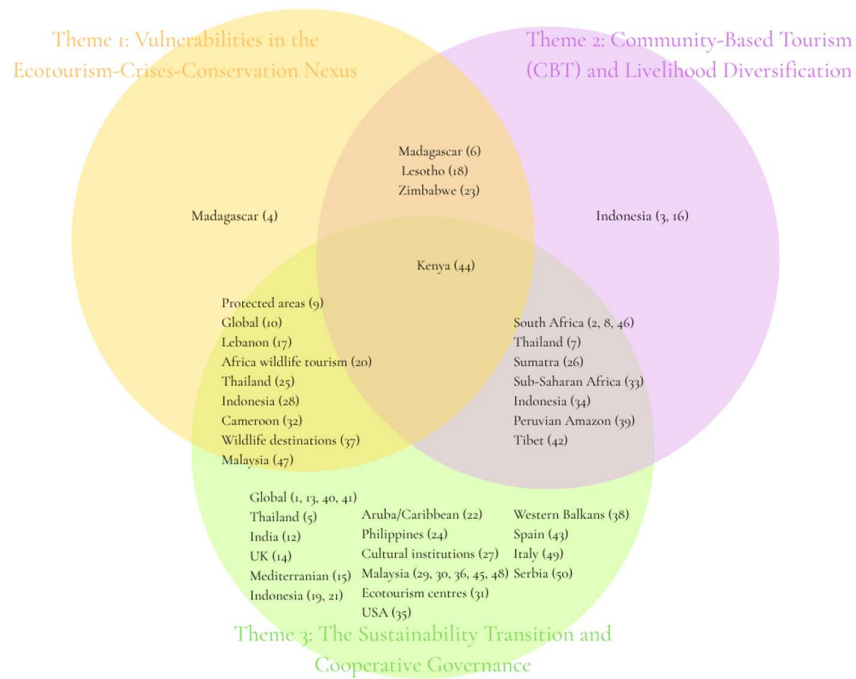


Figure 1: Literature sources, theme distribution

The 50 articles are distributed across the three different themes.

4.1 Theme 1: Vulnerabilities in the Ecotourism-Crises-Conservation Nexus

To fully grasp the current state of knowledge regarding post-pandemic vulnerabilities, Table 2 provides a synthesis of the contemporary literature across four critical dimensions of the ecotourism-crises-conservation nexus: financial collapse, socio-economic shocks, biodiversity threats, and compounding macro-environmental crises (Harilal and Tichaawa, 2025).

Table 2: Synthesis Matrix: Theme 1 Literature Contributions

Article	Context	Contribution to Theme 1
Andrianambinina et al. (2023).	Madagascar	Shows how dependence on park entrance fees created severe conservation-financing vulnerability during COVID-19.
Haynes et al. (2025).	Madagascar	Shows that tourism shutdowns did not remove local forest use, challenging exclusion-based conservation models.
KC (2022)	Protected areas / global	Frames protected-area tourism as structurally vulnerable when conservation and tourism are poorly balanced.
Spalding et al. (2021)	Global	Shows the dual crisis of ecological relief and livelihood collapse during tourism shutdowns.

Article	Context	Contribution to Theme 1
Abdallah & Kataya (2021)	Lebanon	Highlights the vulnerability of protected areas and the need for greener ecotourism recovery.
Sánchez-Sánchez & Sánchez-Sánchez (2023)	Spain	Shows how protected natural areas experienced COVID-19 differently than mass-tourism destinations.
Tlali & Musi (2022)	Lesotho	Documents financial shocks, CSR disruption and community vulnerability in Lesotho ecotourism.
Buckley & Chauvenet (2022)	African wildlife tourism	Shows the broader economic value of wildlife tourism and the consequences of the collapse of international tourism.
Mudzengi et al. (2022)	Zimbabwe	Shows how the collapse of tourism weakened anti-poaching efforts, livelihoods, and local conservation support.
Israngkura (2022)	Thailand	Shows ecological recovery during tourism decline, while exposing previous overtourism pressures.
Abidin et al. (2022)	Indonesia	Demonstrates how perceived health risk reduced coastal ecotourism visit intention.
Harilal & Tichaawa (2025)	Cameroon	Shows how COVID-19 intersected with geopolitical conflict, climate risk and conservation breakdown.
Jones et al. (2024)	Wildlife destinations	Frames wildlife destinations as vulnerable to climate change, demand shocks and pandemic disruption.
Chiawo et al. (2023)	Kenya	Shows conservation, community and tourism-business vulnerability in the Masai Mara.
Samdin et al. (2022)	Malaysia	Shows how travel risk and safety concerns shaped ecotourism decision-making.
Ramaano (2025)	South Africa	Shows how rural ecotourism vulnerability is intensified by poverty, weak infrastructure, climate risk and environmental degradation.

The sudden halt of international travel during the COVID-19 pandemic exposed the critical vulnerability of African protected areas that are heavily dependent on foreign ecotourism revenue (Andrianambinina et al., 2023). Across the continent, the abrupt loss of tourism income severely compromised the financial sustainability of conservation management and operations. In Madagascar, for instance, the pandemic revealed the extreme risk of relying on park entrance fees, as these earnings plummeted to cover only 1% of the required conservation funding in 2021 (Andrianambinina et al., 2023).

This financial collapse rapidly trickled down to cripple essential ecological monitoring and anti-poaching operations. In the Mahenye community in Zimbabwe, anti-poaching efforts by community game scouts were severely hampered by a lack of personal protective equipment, fear of contracting the virus, funding shortages, and low staff morale (Mudzengi et al., 2022). Furthermore, as the pandemic exacerbated local food insecurity and poverty, desperate communities were forced to increase their reliance on surrounding natural resources for survival (Mudzengi et al., 2022). This heightened the threat to biodiversity, as communities

increasingly engaged in illegal hunting for bushmeat and tree-cutting for fuelwood, leading to increased human-wildlife conflicts (Mudzengi et al., 2022).

The vulnerability of the ecotourism-conservation nexus is further magnified when the pandemic interacts with other concurrent macro-environmental or geopolitical shocks. In Cameroon, the pandemic overlapped with a severe ongoing geopolitical crisis, creating total insecurity in affected regions and making it impossible for forestry staff and park management to safely perform their monitoring duties (Harilal & Tichaawa, 2025). Consequently, remote protected areas became inaccessible to conservation authorities and were utilised as refuges for conflict fighters (Harilal & Tichaawa, 2025). This lack of enforcement led to the illicit, uncontrolled exploitation of forests for timber and charcoal, raising grave concerns about habitat degradation and the depletion of protected species (Harilal & Tichaawa, 2025).

To move beyond this crisis-prone model, the post-pandemic ecotourism landscape must transition away from a dangerous over-reliance on international visitor fees to fund environmental protection (Andrianambinina et al., 2023). Future research must prioritise the investigation and implementation of alternative, sustainable financing mechanisms for African protected areas (Andrianambinina et al., 2023; Harilal & Tichaawa, 2025). Strategies such as establishing biodiversity trust funds, enhancing donor and foundation support, or exploring carbon prospecting in tropical forests could play a crucial role in decoupling conservation success from the volatility of international tourist arrivals.

4.2 Theme 2: Community-Based Tourism (CBT) and Livelihood Diversification

In the wake of COVID-19, a primary weakness identified in the literature is the lack of diverse revenue streams in ecotourism businesses. This theme highlights a vulnerability in ecotourism in Africa and the need to understand its impact, along with the principles and practices that can counteract it. Table 3 synthesises the contributions to this theme of diversification and increased community engagement.

Table 3: Theme 2 - Community-Based Tourism and Livelihood Diversification

Article	Context	Contribution to Theme 2
(Kelso and Giddy, 2023)	South Africa	Shows domestic nature-based tourism as a resilience pathway in post-pandemic recovery.
Situmorang & Hussain (2022)	Indonesia	Shows how local intention and community support influence conservation-oriented ecotourism.
Haynes et al. (2025)	Madagascar	Challenges the "empty wilderness" model by showing sustained local presence in protected forests.
Esichaikul & Chansawang (2022)	Thailand	Shows the importance and limitations of community participation in heritage tourism governance.
Ramaano (2025)	South Africa	Positions CBT and local enterprise development as pathways for rural empowerment.
Zubaidah et al. (2023)	Indonesia	Links marine ecotourism management to coastal community economic recovery.

Article	Context	Contribution to Theme 2
Tlali & Musi (2022)	Lesotho	Shows local tourism and community coping strategies as responses to international tourism decline.
(Mudzengi et al., 2022)	Zimbabwe	Demonstrates livelihood diversification through fishing, beekeeping, natural resources and remittances.
Purwoko et al. (2022)	Sumatra	Supports community-based wildlife ecotourism and benefit-sharing models.
Giliberto & Labadi (2023)	Sub-Saharan Africa	Shows local stakeholder perspectives, product diversification and community entrepreneurship as recovery tools.
King et al. (2021)	Indonesia	Critiques exclusive high-end tourism and argues for the resilience of community livelihoods.
Lukacs de Pereny et al. (2025)	Peruvian Amazon	Shows cooperation, product diversification, digitalisation and scientific tourism as resilience mechanisms.
Pu et al. (2023)	Tibet	Shows local guides' cultural knowledge as a mechanism for sustainable host–guest relations.
Chiawo et al. (2023)	Kenya	Shows the need for community livelihood programmes and conservation partnerships.
Ramaano (2025)	South Africa	Connects CBNRM, climate leadership and integrated rural livelihoods.
Shekhar et al. (2026)	India	Links inclusive tourism with bottom-of-the-pyramid participation and shared value creation.
Peterson et al. (2020)	Aruba / Caribbean	Critiques the unequal distribution of tourism benefits and supports inclusive tourism models.

The utilisation and adaptation to community-based tourism are recognised in the Mahenye community in Zimbabwe; resilience was significantly bolstered by broadening income streams beyond ecotourism (Mudzengi et al., 2022). This diversification of income streams strengthens the economic sustainability of ecotourism businesses by creating resilience to external shocks. Additionally, it is seen that locals adapted by shifting toward local natural resource use, such as fishing, beekeeping, and the harvesting of non-timber forest products (like 'mopane worms' and baobab fruits), supplemented by cross-border remittances as community diversification (Mudzengi et al., 2022).

Around the Kilimanjaro heritage site in Tanzania, residents who lost tourism jobs mitigated their financial hardship by pivoting to farming, beekeeping, and other agricultural activities, which not only sustained their livelihoods but also directly supported the achievement of Sustainable Development Goals 1 (Zero poverty) and 2 (Zero Hunger) (Shoo and Songorwa, 2013). This speaks to the applicability of integrating agrotourism with social sustainability support that ecotourism businesses might implement to ensure more sustainable and resilient behaviour (Shoo and Songorwa, 2013). In South Africa's marginalised rural municipalities, such as Musina, establishing CBT initiatives that integrate natural biodiversity with the development of cultural villages and museums is recognised as a vital pathway to empower historically underprivileged groups (Ramaano, 2025; Kelso and Giddy, 2023).

Community resilience in and around these ecotourism businesses contrasts with the ecotourism's previous neoliberal narrative (Haynes et al., 2025). During the pandemic, camera-trap data from protected areas in Madagascar revealed that while international tourists used only 24% of park trails, non-tourist local activity accounted for 76% to 96% of forest use (Haynes et al., 2025). This proves that long-term conservation cannot rely on the total exclusion of locals, but must instead integrate strong community networks and co-management models to support conservation during periods of instability.

Future research must empirically evaluate how specific livelihood diversification strategies. While there is a place for the international tourist market, there is an opportunity to diversify income streams and support social sustainability within the ecotourism industry. By integrating ecotourism with agrotourism, it will not only diversify revenue streams but also mitigate the risks of future crises by avoiding a hostile environment that forces locals to resort to illegal activities for survival (Ramaano, 2025). The empowerment of communities will not only contribute to social sustainability but also provide locals with support and buy-in for ecotourism businesses.

4.3 Theme 3: The Sustainability Transition and Cooperative Governance

The Covid-19 pandemic, though horrific, brought to light the realities of 'business as usual' practices within the tourism industry. The focus on volume-driven operations and income proved a weakness, as the shock of travel bans and restrictions drastically reduced visitor volumes to ecotourism businesses (Spalding et al., 2021). Therefore, an opportunity exists in research to not only identify the state of the art of ecotourism in Africa, but also to identify the long-term operational changes required to support the overall sustainability and stability of the ecotourism industry (Abdallah and Kataya, 2021). See Table 4 for an overview of the contributions to the argument that there is an identified need to transform and reform not only ecotourism operations but also governance to support the regeneration of the ecotourism industry.

Table 4: Theme 3 — Sustainability Transformation, Cooperative Governance and Post-Pandemic Regeneration

Article	Context	Contribution to Theme 3
Singh (2021)	Global / heritage tourism	Reframes post-COVID recovery around safety, proximity, low-density tourism and heritage value.
Kelso & Giddy (2023)	South Africa	Shows domestic tourism as a strategic recovery market.
Kumlangphaet & Tangsanga (2021)	Thailand	Identifies participation, management and marketing adaptation as new-normal priorities.
Esichaikul & Chansawang (2022)	Thailand	Shows the need to move beyond tokenistic participation toward stronger shared management.

Article	Context	Contribution to Theme 3
Ramaano (2025)	South Africa	Links CBT, biodiversity, rural development and local enterprise as transformation priorities.
KC (2022)	Protected areas / global	Calls for stronger regulations, management plans, and alignment with the SDGs in protected area tourism.
Spalding et al. (2021)	Global	Frames COVID-19 as an opportunity to rethink relationships in nature tourism.
Abdallah & Kataya (2021)	Lebanon	Position protected areas as tools for a safer, greener tourism recovery.
Shekhar et al. (2026)	India	Links between creating shared value, the SDGs, and inclusive tourism development.
Zhang et al. (2025)	Global	Expands sustainability transformation to include cultural sustainability.
Wilkinson & Coles (2024)	UK	Shows that sustainability transitions require demand-side support from tourists.
Mancini et al. (2022)	Mediterranean protected areas	Provides ecological footprint tools for monitoring ecotourism impacts.
Sánchez-Sánchez & Sánchez-Sánchez (2023)	Spain	Shows the need for policy support, rebuilding the destination image, and promoting nature tourism.
Osman et al. (2023)	Indonesia	Shows health, safety and carrying capacity as core post-COVID management priorities.
Buckley & Chauvenet (2022)	African wildlife tourism	Revalues wildlife tourism through broader economic and well-being benefits.
Rahman et al. (2025)	Indonesia	Shows that adaptive experiences and perceived control influence the intention to revisit.
Peterson et al. (2020)	Aruba / Caribbean	Supports inclusive governance to counter unequal tourism development.
Tops & Lamers (2024)	Philippines	Adds a justice lens to sustainability transitions and warns against top-down interventions.
Israngkura (2022)	Thailand	Proposes marine zoning, carrying-capacity control, closures, law enforcement and participation.
Purwoko et al. (2022)	Sumatra	Proposes benefit-sharing, community empowerment and institutional strengthening.
Orea-Giner et al. (2022)	Cultural institutions	Introduces AI and digital experience design as future tools for cultural tourism.
Abidin et al. (2022)	Indonesia	Shows that risk communication and tourism knowledge can support the post-COVID recovery of ecotourism.
Salman et al. (2022)	Malaysia	Shows that stakeholder support is essential for ecotourism sustainability.
Yaziz et al. (2024/2025)	Malaysia	Shows heritage and destination attributes as key drivers of post-pandemic revisit intention.
Hosseini et al. (2021)	Ecotourism centres	Prioritises operational recovery solutions, including standardisation and demand planning.

Article	Context	Contribution to Theme 3
Harilal & Tichaawa (2025)	Cameroon	Calls for a dedicated ecotourism policy, collaborative management and strategic regeneration.
Giliberto & Labadi (2023)	Sub-Saharan Africa	Supports inclusive, cooperative and diversified heritage-tourism recovery.
King et al. (2021)	Indonesia	Calls for tourism models that strengthen socio-ecological resilience rather than exclusive growth.
Clark et al. (2022)	USA	Shows scenario planning as a tool for managing uncertainty and adaptive recovery.
Salman et al. (2024)	Malaysia	Demonstrates the positive relationship between stakeholder management and ecotourism sustainability.
Jones et al. (2024)	Wildlife destinations	Integrates resilience and ecotourism principles into a sustainability framework for a wildlife destination.
Knežević et al. (2024)	Western Balkans	Shows sustainable redevelopment as necessary for post-COVID destination competitiveness.
Lukacs de Pereny et al. (2025)	Peruvian Amazon	Shows the importance of policy support, formalisation, cooperation and sustainability governance.
Higgins-Desbiolles (2021)	Global	Challenges industry-first recovery and argues for ethical, responsible tourism reform.
Ioannides & Gyimóthy (2020)	Global	Frames COVID-19 as an opportunity to escape unsustainable tourism pathways.
Pu et al. (2023)	Tibet	Shows sustainable tourism practice through local cultural mediation and value co-creation.
Robina-Ramírez et al. (2022)	Spain	Proposes cooperative governance involving communities, tourism authorities and businesses.
Chiawo et al. (2023)	Kenya	Calls for integrated interventions across SMMEs, community livelihoods and conservation partnerships.
Teo et al. (2025)	Malaysia	Identifies crisis leadership behaviours: partnership, agility, communication, resilience and learning.
Ramaano (2025)	South Africa	Links CBNRM, climate mitigation, leadership and rural ecotourism governance.
Samdin et al. (2022)	Malaysia	Shows health and safety communication as necessary for post-pandemic ecotourism confidence.
Salman et al. (2022)	Malaysia	Develops a multi-stakeholder framework for ecotourism sustainability.
Dini et al. (2024)	Italy	Links cultural reputation, involvement in sustainable activities, and destination loyalty.
Demirović Bajrami et al. (2025)	Serbia	Identifies predictors of pro-environmental tourist behaviour for sustainable tourism planning.

The illumination of local tourism as a form of diversifying income and supporting organisational sustainability. This is seen in the Masai Mara, where in 2020 and 2021, in the middle of the pandemic, lodges and parks sustained their operations and weathered the uncertainty by increasing their reliance on domestic and local tourism (Chiawo et al., 2023). Though this was thought of as a temporary fix to the high-pressure impact of the pandemic, it supports the argument for creating more community engagement, not only for the external impact, but also for the positive impact it would have on the organisational sustainability of ecotourism businesses should a crisis such as the pandemic occur in the future (Chiawo et al., 2023; Ramaano, 2025).

The expansion of focus to not only internal sustainability but also the external sustainability of ecotourism businesses empowers the long-term success of businesses in the industry (Higgins-Desbiolles, 2020). A sustainable model of tourism governance requires cross-institutional engagement. During the pandemic, multi-level partnerships and collaborations successfully supported African communities with basic food resources and halted community projects, proving far more effective than isolated corporate philanthropy (Salman et al., 2024). There is a call for support in the form of policy change and multi-stakeholder engagement to regenerate the ecotourism industry and promote sustainability in this sector (Salman et al., 2024). Additionally, business reform will enable ecotourism businesses to escape the unsustainable, volume-driven tourism pathway followed in the past and create lasting, sustainable businesses (Ioannides and Gyimóthy, 2020).

Despite the recognised importance of ecotourism, the transition is frequently hindered by fragmented management and a lack of institutional support. In Cameroon, the absence of a dedicated guiding policy and strategic plan for ecotourism has severely constrained the sector's development and post-pandemic recovery (Harilal and Tichaawa, 2025). The successful regeneration of ecotourism across Sub-Saharan Africa requires strong policy guidelines that explicitly harmonise tourism business growth, environmental conservation, and community livelihoods (Harilal and Tichaawa, 2025). The evolution of ecotourism businesses is imperative to the survival and stability of the industry, and to facilitate this change, policy and local governance must support it (Lukacs de Pereny et al., 2025).

Therefore, a shift in research within the ecotourism industry is required, focusing on developing policy changes and frameworks to support the expansion of ecotourism. Expansion that supports the sustainable growth of ecotourism to include cross-institutional collaboration and ensure that the socio-economic benefits of ecotourism are achieved. As well as the emphasis on the equitable distribution of benefits to empower marginalised communities and build structural resilience against future global disruptions.

5 Findings: PESTLE

The thematic findings from the state-of-the-art review reveal that the African ecotourism sector is at a critical crossroads. While the thematic analysis outlined the specific vulnerabilities, local resilience mechanisms, and structural shifts required within communities and conservation areas, these findings must be contextualised within the broader macro-environment to

comprehend the necessary sustainability transformation fully. Therefore, a second-level analysis using the PESTLE framework is employed to categorise the overarching structural drivers shaping the sector's post-pandemic recovery.

5.1 Political Factors

The pandemic highlighted the fragile nature of tourism governance, particularly when compounded by ongoing geopolitical instability (Harilal & Tichaawa, 2025). In Cameroon, for example, the pandemic coincided with a severe geopolitical civil conflict, turning remote, protected forested areas into inaccessible refuges for conflict fighters (Harilal & Tichaawa, 2025). Because park management could not safely enforce regulations, these areas suffered from uncontrolled exploitation and illicit harvesting (Harilal & Tichaawa, 2025). Furthermore, post-pandemic recovery is frequently hindered by fragmented management and the absence of dedicated ecotourism policies (Ramaano, 2024b). The successful regeneration of the sector requires strong, integrated policy guidelines from national and local governments that mandate cross-institutional collaboration and harmonise tourism growth with conservation agendas (Chiawo et al., 2023; Ramaano, 2024b).

5.2 Economic Factors

Economically, the crisis ruptured the neo-liberal dependency on international tourist arrivals to fund conservation and local livelihoods (Ioannides & Gyimóthy, 2020; Andrianambinina et al., 2023). The abrupt loss of global mobility decimated conservation budgets and local income streams; in Kenya's Masai Mara, the shortage of tourism revenue led to delayed payments on conservation land leases, threatening the economic viability of the entire community conservancy model (Chiawo et al., 2023). To build long-term economic resilience, ecotourism destinations must aggressively pivot toward domestic and regional tourism markets to buffer against global shocks (Chiawo et al., 2023). Additionally, economic diversification is critical; communities that broadened their revenue streams beyond ecotourism—such as integrating agritourism, beekeeping, and the harvesting of non-timber forest products—demonstrated far greater economic elasticity during the crisis (Mudzengi et al., 2022; Ramaano, 2024b).

5.3 Social Factors

The collapse of ecotourism revenue exacerbated severe social vulnerabilities among communities adjacent to the park. The loss of jobs and property led to heightened food insecurity and poverty, increasing the vulnerability of marginalised groups (Chiawo et al., 2023; Mudzengi et al., 2022). The crisis underscored that ecotourism cannot be sustainable if local communities remain on the fringes as mere spectators (Ramaano, 2024a). Socially just recovery requires Community-Based Tourism (CBT) initiatives that genuinely empower historically underprivileged groups and place indigenous heritage and storytelling at the centre of the tourism experience, rather than relying on foreign-dominated narratives (Higgins-Desbiolles, 2020; Ramaano, 2024a).

5.4 Technological Factors

The pandemic accelerated the necessity for digital transformation and technological integration in the ecotourism sector. To survive the halt in in-person arrivals, ecotourism operations had to

leverage digital platforms, social media marketing, and virtual tours to maintain destination visibility and retain customer engagement (Hosseini et al., 2021). Furthermore, technology proved vital for remote conservation monitoring during lockdowns. For instance, the use of camera traps in Madagascar's protected forests allowed researchers to track both wildlife activity and non-tourist human occupancy when human patrols were limited (Chen et al., 2021; Haynes et al., 2025). Embracing digital capabilities and communication technologies is now a prerequisite for both targeted marketing and effective ecosystem management (Hosseini et al., 2021; Ramaano, 2024c).

5.5 Environmental Factors

The environmental impacts of the pandemic presented a dual narrative. While the halt in global mobility temporarily allowed some ecological biomes to regenerate, the socio-economic desperation of local communities posed severe threats to biodiversity (Bates et al., 2021). A lack of funding for anti-poaching units, coupled with local food insecurity, forced communities to revert to illicit resource extraction, including bushmeat hunting, charcoal burning, and deforestation (Harilal & Tichaawa, 2025; Mudzengi et al., 2022). Compounding these challenges is the accelerating climate crisis, which simultaneously threatens the ecological foundations of ecotourism destinations (Ramaano, 2024f; Scott, 2021). Future sustainability relies on decoupling conservation funding from the volatile fluctuations of tourist arrivals (Andrianambinina et al., 2023).

5.6 Legal Factors

A complex new regulatory environment governs the post-pandemic landscape. Ecotourism operators must now navigate and strictly adhere to enhanced health and safety protocols—such as CHSE (Cleanliness, Health, Safety, and Environmental Sustainability) standards—to restore tourist confidence and ensure safe operational capacities (Tandilino & Rero, 2022). Legally, there is also a critical need to strengthen land tenure legislation and community property rights (Chiawo et al., 2023). Establishing robust legal protections for community land ownership and conservation leases is vital to prevent vulnerable communities from being forced to subdivide or sell off conservation land to meet basic survival needs during prolonged economic crises (Chiawo et al., 2023).

5.7 Synthesis of the Second-Level PESTEL Analysis

By elevating the findings through this second-level PESTEL analysis, it becomes evident that restoring the ecotourism sector cannot involve merely returning to pre-2020 standards. The macro-environmental vulnerabilities exposed by the pandemic demand a structural paradigm shift (Ioannides & Gyimóthy, 2020). For ecotourism to function as a viable tool for sustainable development, recovery strategies must actively integrate robust policy interventions, shift away from international financial dependency, empower local stewardship, and embed resilience against concurrent climate threats (Chiawo et al., 2023; Ramaano, 2025b).

6 Discussion: Future Policies and Practices

The findings of this state-of-the-art review demonstrate that the COVID-19 pandemic presents a unique transformative opportunity to rethink and reset the fundamental nature of the African

ecotourism industry. To move away from crisis-prone models, the following recommendations for future policy and practice are proposed. This is done by addressing three research objectives identified for the research outcome. This is to reflect on the subjective discussion of the research findings; this is the final step of the six-step SoTA research method.

6.1 Research Objective 1 – To determine the systemic Vulnerabilities in Conservation Financing

To address the extreme vulnerabilities exposed within the ecotourism-crises-conservation nexus, it is imperative to decouple vital conservation funding from the volatile fluctuations of international tourist arrivals.

Policymakers and destination managers must prioritise the development of alternative, sustainable financing mechanisms (such as establishing biodiversity trust funds, enhancing donor foundation support, and exploring payment for ecosystem services) to ensure that anti-poaching and ecological monitoring operations survive future mobility shocks (Cumming et al., 2021; Lindsey et al., 2020). Furthermore, adaptive management strategies must be instituted to build resilience against concurrent macro-environmental threats, particularly extreme weather events driven by climate change and geopolitical conflicts (Harilal & Tichaawa, 2024; Ramaano, 2024).

6.2 Research Objective 2 – To highlight community Resilience and Livelihood Diversification

The review explicitly highlights that total reliance on international ecotourism is a highly vulnerable strategy for marginalised rural populations (Mudzengi et al., 2022).

Local governments and NGOs must actively facilitate the diversification of rural livelihoods to build structural resilience. Policies should provide financial and technical support to integrate Community-Based Tourism (CBT) with alternative nature-based economic activities, such as agritourism, beekeeping, and the sustainable harvesting of non-timber forest products (Mudzengi et al., 2022; Ramaano, 2025). Additionally, capacity-building programs must be implemented to empower local communities with digital marketing skills and crisis-preparedness training (Hosseini et al., 2021).

6.3 Research Objective 3 – To explicitly identify actionable priorities for future research and sustainability-driven governance to regenerate African ecotourism.

A return to the pre-pandemic "business as usual" growth model is unacceptable; a structural sustainability transition is required (Ioannides & Gyimóthy, 2020).

The successful regeneration of African ecotourism requires the development of dedicated, integrated policy frameworks that mandate multi-stakeholder cooperative governance (Robina-Ramírez et al., 2021; Wondirad et al., 2020). Destinations must establish formalised partnerships between local communities, private tourism operators, conservation NGOs, and state authorities to ensure inclusive decision-making, equitable wealth distribution, and the prevention of resource exploitation (Salman et al., 2022; Wondirad et al., 2020). Furthermore,

to insulate the sector from global shocks, destination management organisations (DMOs) must strategically pivot their marketing efforts to expand and incentivise domestic and regional tourism markets (Rogerson & Rogerson, 2021; Woyo, 2021).

7 Future research

To establish the long-term sustainability and resilience of ecotourism businesses, research must investigate operational changes they can implement to improve financial performance and diversify revenue streams. Future studies must empirically investigate the long-term effectiveness of these alternative financing models in Sub-Saharan Africa (Cumming et al., 2021) and explore how conservation technologies (e.g., remote camera traps and digital monitoring) can be sustained to measure both wildlife and human activity during periods of restricted human movement (Haynes et al., 2025).

Additionally, it is important to focus on the social sustainability of ecotourism businesses, both internally and externally. This focus on the social sustainability of an ecotourism business will support the community buy-in and help to create positive community relations. There is a critical need for longitudinal studies that track how specific livelihood diversification strategies affect the long-term food security, poverty alleviation, and economic resilience of park-adjacent communities (Mudzengi et al., 2022; Ramaano, 2024). Research should also evaluate the integration of traditional ecological knowledge and indigenous knowledge systems (IKS) into community disaster response plans (Ramaano, 2025).

There is also an opportunity to examine the operational challenges in ecotourism businesses and the improvement strategies to address them. Future academic inquiry should focus on the mechanisms and challenges of implementing these multi-stakeholder governance models in fragile institutional contexts (Robina-Ramírez et al., 2021). Researchers should also investigate the specific product development and pricing strategies required to make African ecotourism more accessible and attractive to domestic travellers without compromising conservation revenues (Chiawo et al., 2023).

8 Conclusion

This state-of-the-art review evaluated the contemporary post-pandemic ecotourism landscape in Sub-Saharan Africa to map vulnerabilities, highlight resilience mechanisms, and identify actionable priorities for a sustainability transformation. In addressing the first research objective regarding systemic vulnerabilities, the findings conclude that the COVID-19 pandemic—compounded by escalating climate change and geopolitical conflicts—severely fractured the nexus among ecotourism, crises, and conservation (Harilal & Tichaawa, 2025). The global mobility freeze exposed the fundamental unsustainability of the prevailing neo-liberal model, demonstrating that overreliance on international visitor revenue poses an existential threat to both biodiversity protection and the socio-economic survival of marginalised rural communities (Andrianambinina et al., 2023; Chiawo et al., 2023).

In relation to the second objective, this review concludes that community-led resilience mechanisms are paramount to surviving macro-environmental shocks. The literature

demonstrates that destinations utilising Community-Based Tourism (CBT) and livelihood diversification strategies, such as integrating agritourism, beekeeping, and the harvesting of non-timber forest products, were significantly better equipped to buffer the economic collapse (Mudzengi et al., 2022; Ramaano, 2025a). Securing indigenous livelihoods and integrating local networks into conservation management is not merely a social benefit, but a critical prerequisite for safeguarding ecosystems during periods of profound instability (Haynes et al., 2025).

Finally, addressing the priorities for future sustainability-driven governance, the review establishes that returning to a pre-pandemic "business as usual" is both precarious and unsustainable (Ioannides & Gyimóthy, 2020). The regeneration of African ecotourism requires a structural paradigm shift driven by multi-stakeholder cooperative management and decisive policy interventions (Robina-Ramírez et al., 2021). By decoupling conservation funding from international tourism volatility and strategically pivoting toward domestic and regional markets, policymakers can build genuine elasticity into socio-ecological systems (Chiawo et al., 2023; Kelso & Giddy, 2023). Ultimately, this review provides a vital framework to ensure that the future of African ecotourism moves beyond crisis management, anchoring instead in long-term sustainability, community empowerment, and the equitable fulfilment of the United Nations Sustainable Development Goals.

This state-of-the-art review makes a critical contribution to the sustainable tourism literature by reconceptualising post-pandemic recovery in African ecotourism, shifting the narrative from short-term operational business survival to a necessary long-term sustainability transformation. The primary insight revealed by this study is the extreme vulnerability of the 'ecotourism-crises-conservation nexus', demonstrating how a neo-liberal over-reliance on international tourism revenues fundamentally threatens both biodiversity protection and the socio-economic survival of marginalised rural communities during macro-environmental shocks.

In terms of its future function, this study moves beyond impact assessment to highlight Community-Based Tourism (CBT) and local livelihood diversification as proven, indigenous-led resilience mechanisms. By mapping these vulnerabilities against successful local coping strategies, the review provides an actionable framework for future research and cooperative governance. This study offers clear, strategic priorities for policymakers, conservationists, and tourism operators to build elasticity into Africa's socio-ecological systems, ultimately driving the sector toward the fulfilment of the United Nations Sustainable Development Goals (SDGs).

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10 Appendix

Table 2: Master Synthesis Matrix of the 50 Included Articles

No.	Article	Context	Main focus	Theme(s)	State-of-the-art contribution
1	Singh (2021)	Global / heritage tourism	Post-COVID "quixotic" heritage/nature tourism	3	Reframes recovery around safety, proximity, heritage and high-value low-density tourism.
2	Kelso & Giddy (2023)	South Africa	Domestic nature-based tourism in Mpumalanga	2, 3	Shows domestic tourism as a recovery and resilience pathway.
3	Situmorang & Hussain (2022)	Indonesia	Community-based wildlife ecotourism post-COVID	2	Demonstrates the role of local intention and behavioural support for conservation.
4	Andrianambinina et al. (2023)	Madagascar	Protected area financing and tourism dependency	1	Shows the danger of conservation systems dependent on tourism revenue.
5	Kumlangphaet & Tangsanga (2021)	Thailand	Ecotourism marketing and business management	3	Identifies management, participation and new-normal adaptation as recovery priorities.

No.	Article	Context	Main focus	Theme(s)	State-of-the-art contribution
6	Haynes et al. (2025)	Madagascar	Human occupancy in parks during COVID-19	1, 2	Challenges exclusionary conservation by showing continued local forest use.
7	Esichaikul & Chansawang (2022)	Thailand	Community participation in heritage tourism	2, 3	Highlights limits of tokenistic participation in sustainable heritage management.
8	Ramaano (2025)	South Africa	CBT and ecotourism in Musina	2, 3	Links CBT, rural development, biodiversity and local enterprise creation.
9	KC (2022)	Protected areas / global	Balancing tourism and conservation	1, 3	Frames protected area tourism as a governance and sustainability challenge.
10	Spalding et al. (2021)	Global	COVID-19, nature and tourism	1, 3	Shows both ecological relief and livelihood risk from tourism shutdowns.
11	Abdallah & Kataya (2021)	Lebanon	Shouf Biosphere Reserve and ecotourism recovery	1, 3	Positions protected areas as tools for greener destination recovery.

No.	Article	Context	Main focus	Theme(s)	State-of-the-art contribution
12	Shekhar et al. (2026)	India	Creating shared value and inclusive tourism	3	Links SDGs, bottom-of-pyramid inclusion and sustainable tourism strategy.
13	Zhang et al. (2025)	Global	Cultural sustainability framework	3	Expands sustainability beyond environmental/economic dimensions to cultural sustainability.
14	Wilkinson & Coles (2024)	UK	Tourist attitudes to sustainability transitions	3	Shows the importance of demand-side support for sustainability transitions.
15	Mancini et al. (2022)	Mediterranean protected areas	Ecological footprint of ecotourism packages	3	Provides tools for measuring and monitoring ecotourism sustainability.
16	Zubaidah et al. (2023)	Indonesia	Coastal community recovery through marine ecotourism	2	Links marine ecotourism to post-COVID community economic recovery.
17	Sánchez-Sánchez & Sánchez-Sánchez (2023)	Spain	Ecotourism and hospitality efficiency	1, 3	Shows how protected natural areas performed differently from mass tourism destinations.

No.	Article	Context	Main focus	Theme(s)	State-of-the-art contribution
18	Tlali & Musi (2022)	Lesotho	COVID-19 effects on ecotourism	1, 2	Documents financial shocks, CSR disruption and local tourism coping strategies.
19	Osman et al. (2023)	Indonesia	CHSE protocol in national park tourism	3	Shows health, safety and carrying capacity as post-COVID management priorities.
20	Buckley & Chauvenet (2022)	Africa wildlife tourism	Hidden economic counterflows	1, 3	Revalues wildlife tourism through mental health and donor-country benefits.
21	Rahman et al. (2025)	Indonesia	Visitor attitudes and adaptive park management	3	Links adaptive experience, perceived control and revisit intention.
22	Peterson et al. (2020)	Aruba / Caribbean	Inclusive tourism	3	Critiques unequal tourism growth and supports inclusive tourism governance.
23	Mudzengi et al. (2022)	Zimbabwe	Mahenye community ecotourism recovery	1, 2	Shows livelihood diversification and community coping under tourism collapse.

No.	Article	Context	Main focus	Theme(s)	State-of-the-art contribution
24	Tops & Lamers (2024)	Philippines	Just tourism transitions	3	Adds justice lens to sustainability policy interventions.
25	Israngkura (2022)	Thailand	Marine resource recovery during COVID-19	1, 3	Shows ecological recovery during tourism decline and proposes marine governance measures.
26	Purwoko et al. (2022)	Sumatra	Orangutan ecotourism	2, 3	Supports community-based wildlife ecotourism and benefit-sharing.
27	Orea-Giner et al. (2022)	Cultural institutions	AI and cultural tourist experience	3	Introduces digital/AI-supported cultural tourism experience design.
28	Abidin et al. (2022)	Indonesia	Risk, knowledge and coastal ecotourism intention	1, 3	Shows perceived risk and tourism knowledge as key to post-COVID visitation.
29	Salman et al. (2022)	Malaysia	Stakeholder perspectives on ecotourism sustainability	3	Shows stakeholder support as essential for long-term ecotourism.

No.	Article	Context	Main focus	Theme(s)	State-of-the-art contribution
30	Yaziz et al. (2024/2025)	Malaysia	Langkawi revisit intentions	3	Shows destination attributes and heritage as post-pandemic revisit drivers.
31	Hosseini et al. (2021)	Ecotourism centres	Recovery solutions using fuzzy methods	3	Prioritises practical recovery actions such as standardisation.
32	Harilal & Tichaawa (2025)	Cameroon	Ecotourism regeneration amid conflict	1, 3	Shows COVID-19 interacting with geopolitical and climate crises.
33	Giliberto & Labadi (2023)	Sub-Saharan Africa	Heritage tourism post-COVID	2, 3	Emphasises local stakeholders, diversification and inclusive heritage recovery.
34	King et al. (2021)	Indonesia	Marine tourism resilience	2, 3	Critiques high-end tourism and argues for socio-ecological resilience.
35	Clark et al. (2022)	USA	Scenario planning for tourism uncertainty	3	Offers scenario planning as a tool for uncertainty and adaptive governance.

No.	Article	Context	Main focus	Theme(s)	State-of-the-art contribution
36	Salman et al. (2024)	Malaysia	Stakeholder management for ecotourism destinations	3	Demonstrates positive link between stakeholder management and ecotourism sustainability.
37	Jones et al. (2024)	Wildlife destinations	Resilience principles for wildlife destination sustainability	1, 3	Integrates ecotourism and resilience principles for post-COVID wildlife tourism.
38	Knežević et al. (2024)	Western Balkans	Sustainable redevelopment of tourism	3	Shows post-COVID redevelopment depends on sustainable destination planning.
39	Lukacs de Pereny et al. (2025)	Peruvian Amazon	Ecolodge sustainability and resilience	2, 3	Identifies cooperation, diversification, digitalisation and scientific tourism as resilience strategies.
40	Higgins-Desbiolles (2021)	Global	Sustainable tourism debate after COVID-19	3	Challenges recovery-only logic and supports ethical tourism reform.

No.	Article	Context	Main focus	Theme(s)	State-of-the-art contribution
41	Ioannides & Gyimóthy (2020)	Global	COVID-19 as tourism transformation opportunity	3	Frames the crisis as a chance to escape unsustainable tourism pathways.
42	Pu et al. (2023)	Tibet	Tour guides and sustainable host-guest interaction	2, 3	Shows local cultural knowledge and guide behaviour as sustainability mechanisms.
43	Robina-Ramírez et al. (2022)	Spain	Tourism governance during COVID-19	3	Proposes cooperative governance model for sustainable tourism restoration.
44	Chiawo et al. (2023)	Kenya	Tourism recovery in Masai Mara	1, 2, 3	Links conservation, community livelihoods, SMMEs and policy intervention.
45	Teo et al. (2025)	Malaysia	Tourism leadership during crisis	3	Identifies crisis leadership behaviours: agility, partnership, communication and resilience.
46	Ramaano (2025)	South Africa	Tourism-oriented CBNRM and climate mitigation	2, 3	Connects ecotourism, CBNRM, climate leadership and integrated livelihoods.

No.	Article	Context	Main focus	Theme(s)	State-of-the-art contribution
47	Samdin et al. (2022)	Malaysia	Travel risk in ecotourism	1, 3	Shows health and safety information as a major predictor of ecotourist behaviour.
48	Salman et al. (2022)	Malaysia	Multi-stakeholder complexity and fsQCA	3	Develops causal understanding of stakeholder management for ecotourism sustainability.
49	Dini et al. (2024)	Italy	Destination cultural reputation	3	Links cultural reputation, sustainable activities, satisfaction and loyalty.
50	Demirović Bajrami et al. (2025)	Serbia	Predictors of tourist pro-environmental behaviour	3	Identifies psychological, social and contextual drivers of sustainable tourist behaviour.

APPENDIX B – ETHICS APPROVAL LETTER



Private Bag X1290, Potchefstroom
South Africa 2520

North-West University Engineering Research
Ethics Committee (NWU-ENG-REC)

Tel: 018 299-1575
Email: ENG-REC@nwu.ac.za

24 February 2025

ETHICS APPROVAL LETTER OF STUDY

Based on approval by the North-West University Engineering Research Ethics Committee (NWU-ENG-REC) on 24 February 2025, the NWU-ENG-REC hereby approves your Research study as indicated below. This implies that the NWU-ENG-REC grants its permission that, provided the general and specific conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: A Lean and Green model for organisational sustainability: A South African ecotourism case study

Student : Mia Kusel

Study leader: Prof Rojanette Coetzee

Ethics number:

NWU-01362-25-S1

Institution Study Number Year Status

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation;
A = Authorisation

Application Type: Single

Approval date: 30 September 2024

Expiry date: 29 September 2025

Risk:

Low Risk

Approval of the study is provided for a year, after which continuation of the research is dependent on receipt and review of annual monitoring report and the concomitant issuing of a letter of continuation.

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, the following general terms and conditions will apply:

- The principal investigator/study supervisor/researcher must report in the prescribed format to the NWU-ENG-REC:
 - Annually on the monitoring of the study, whereby a letter of continuation will be provided annually, and upon completion of the study; and
 - without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.
- The approval applies strictly to the proposal as stipulated in the application form. Should any amendments to the proposal be deemed necessary during the course of the study, the principal investigator/study supervisor/researcher must apply for approval of these amendments at the NWU-ENG-REC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.
- Annually a number of studies may be randomly selected for active monitoring.
- The date of approval indicates the first date that the study may be started.
- In the interest of ethical responsibility, the NWU-ENG-REC reserves the right to:

- request access to any information or data at any time during the course or after completion of the study;
- to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process;
- withdraw or postpone approval if:
 - any unethical principles or practices of the study are revealed or suspected;
 - it becomes apparent that any relevant information was withheld from the NWU-ENG-REC or that information has been false or misrepresented;
 - submission of the annual monitoring report, the required amendments, or reporting of adverse events or incidents was not done in a timely manner and accurately; and/or
 - new institutional rules, national legislation or international conventions deem it necessary.
- NWU-ENG-REC can be contacted for further information via ENG-REC@nwu.ac.za or 018 299 2645

Special conditions of the research approval (if applicable): NA

Special in process conditions of the research for approval (if applicable): NA

The NWU-ENG-REC would like to remain at your service and wishes you well with your study. Please do not hesitate to contact the NWU-ENG-REC for any further enquiries or requests for assistance.

Yours sincerely,



Prof. P. Van Vuuren
Chair NWU-ENG-REC

Current details: (25767984) \NWU\NextCloud\ENG-REC\Letters sent\Date\9.1.5.4.3_NWU-ENG-REC_REC_EAL_[student surname_name]

File Reference: 9.1.5.4.2

APPENDIX C – RESEARCH PERMISSION LETTER



Permission letter to conduct research

This letter serves to confirm that Mia Küsel under supervision of Professor Rojanette Coetzee may conduct research on the premises of Tswalu Kalahari Reserve and may make use of company data, as specified below. Furthermore, the data generated during the research may be used to compile the dissertation.

Tswalu Kalahari Reserve hereby commits to providing the necessary research support in the form of facilities, data, participants.

The researcher may make use of the following data

- Documents that are cleared and permitted by the company.
- Focus group discussions with company employees.

The data may be used on the following conditions

- Only if full permission has been granted by the company.
- Focus group participants have given willing and written consent for their participation in the focus groups.

The researcher may access the following areas within the organisation, while adhering to the state rules/guidelines

- Office/conference venue spaces, for the purpose of focus group discussions as determined by Tswalu

The researcher may specifically not enter the following areas within the organisation

- Any areas of the reserve without getting guided by a Tswalu employee.
- Any office or building on the reserve without approval for Tswalu management.

In terms of Tswalu Kalahari Reserve safety policies, the researcher(s) need to take cognisance of the following applicable matters/rules/policies/induction training and adhere to the full company policy.

Yours sincerely

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APPENDIX D – CODE OF CONDUCT



Research and Innovation

CODE OF CONDUCT FOR RESEARCHERS

This code of conduct is applicable to all NWU researchers.

As a researcher of the North-West University (NWU), I subscribe to the rules of the NWU Senate Committee for Research Ethics (SCRE), all applicable policies of the NWU as well as all national and international laws and regulations applicable to my field of study. Furthermore, I commit myself to abide by the ethical principles and responsibilities as set out in the Singapore statement on Research Integrity (22 September 2010), in any and all research endeavours that I undertake as a researcher of the NWU.

The four major principles of research integrity to which I will adhere and that will guide my research are:

- Honesty in all aspects of research;
- Accountability in the conduct of research;
- Professional courtesy and fairness in working with others;
- Good stewardship of research on behalf of others.

Consequently I will also adhere to the following ethical responsibilities:

1. I will take responsibility for the originality and trustworthiness of my research.
2. I will stay abreast of and adhere to all institutional, national, and international laws, regulations, and policies applicable and related to my research.
3. I will at all times employ appropriate research methods, base my conclusions on critical analysis of the evidence and report my findings and interpretations fully and objectively.
4. I will keep clear and accurate records of all research that I have conducted in a manner that will allow verification and replication of my work by others, if applicable.
5. I will, where applicable, share my data and findings openly and promptly, in line with external funding rules. This will be done as soon as possible after I have had an opportunity to establish priority and ownership claims.
6. I will take responsibility for my own contributions to publications, funding applications, reports and other representations of my research. I will also and only include authors who meet valid authorship criteria.
7. I will acknowledge the names and roles of those who made significant contributions to my research in publications, including writers, funders, sponsors, and others, but do not meet authorship criteria.
8. In my peer reviews, I will provide fair, prompt and rigorous evaluations and I will respect confidentiality when I review others' work.
9. I will disclose all conflicts of interest (financial and other) that could compromise the trustworthiness of my work in research proposals, publications, public communications, and in review activities.
10. When I publicly address a community in the spirit of academic freedom, I will in all stages base my professional comments on research findings (if applicable) and my expertise. I will distinguish between professional comments and opinions based on personal views.
11. Should any irresponsible research practices and/or research misconduct become known to me or brought under my attention, I will report such irresponsible research activities to the appropriate authorities.
12. I will respond to irresponsible research practices or conduct, by taking prompt actions as set out in the procedures of the university. I will also protect those who report misconduct in good faith, to the best of my abilities.
13. I will endeavour to create and sustain an environment that encourage research integrity through education of students, research teams and peers, as well as abide by policies, and reasonable standards for advancement.
14. I will at all times weigh societal benefits against the risks inherent in my work.