CHALMERS
UNIVERSITY OF TECHNOLOGY

Enhancing Environmental Sustainability in Service SMEs

A Case Study of Antaros Medical

Master's thesis in Industrial Ecology

EMIL LUNDGREN
ALBIN OREBRAND

DEPARTMENT OF TECHNOLOGY MANAGEMENT AND ECONOMICS
DIVISION OF ENVIRONMENTAL SYSTEMS ANALYSIS

CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2024
www.chalmers.se

Enhancing Environmental Sustainability in Service SMEs

A Case Study of Antaros Medical

EMIL LUNDGREN
ALBIN OREBRAND

Department of Technology Management and Economics
Division of Environmental Systems Analysis
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2024

Enhancing Environmental Sustainability in Service SMEs
A Case Study of Antaros Medical
EMIL LUNDGREN
ALBIN OREBRAND

Department of Technology Management and Economics
Chalmers University of Technology
SE-412 96 Gothenburg
Sweden
Telephone + 46 (0)31-772 1000

Cover: A conceptual image showing a lung-shaped lake in a lush and pristine jungle. 3d rendering (iStock, 2021).

Gothenburg, Sweden 2024

Enhancing Environmental Sustainability in Service SMEs
A Case Study of Antaros Medical

EMIL LUNDGREN
ALBIN OREBRAND

Department of Technology Management and Economics
Chalmers University of Technology

SUMMARY
Environmental sustainability has become increasingly significant in recent years, with organisations recognising the need to broaden their goals beyond financial considerations. The Corporate Sustainability Reporting Directive (CSRD) accelerated this trend by mandating environmental reporting. Though unlisted small and medium-sized enterprises (SMEs) were not directly subjected to the directive, they faced environmental inquiries from larger companies. Representing 99% of businesses in Europe and 60% of greenhouse gas (GHG) emissions, SMEs' transition to environmental sustainability was essential. The aim of this study was to assess the environmental practices of a knowledge-creating service SME and the impact of its value chain, to propose a strategy for environmental sustainability change. The focus of this assessment was Antaros Medical, an SME specialising in imaging services for the life sciences sector. The aim was achieved by combining quantitative assessments using the GHG Protocol and industry benchmarking to evaluate Antaros' environmental impact and compare it to peers, along with qualitative interactions with employees and stakeholder analysis to explore potential pathways forward. The results identified key focus areas for the company, including business travel, sustainable procurement and clinical trials. Applying a change management perspective revealed that Antaros could reduce its environmental impact by integrating environmental sustainability into its culture, gathering knowledge, aligning mission and vision, empowering employees, and reinforcing the change. Supply chain greening practices would allow the company to have an impact despite limited bargaining power, while a comprehensive environmental sustainability communication strategy could secure competitive advantages.

Keywords: SME, life sciences, Antaros Medical, environmental sustainability strategy, change management, GHG Protocol, value chain greening.

Acknowledgements

During this project, we received invaluable guidance, support, and data from several individuals. We extend our gratitude to our examiner, Anna Nyström Claesson at Chalmers, for her expertise and guidance throughout the process. We also like to acknowledge Joanna Nyberg, Emil Eriksson, and Alejandro Petrizzo Rengel for their insightful contributions during seminars, which greatly enriched our work, as well as our opponents for their valuable feedback and constructive criticism. Additionally, we express our appreciation to Antaros Medical and its representatives for their active engagement and the insights they provided, which were crucial to the completion of this project.

Emil Lundgren, Gothenburg, June 2024
Albin Orebrand, Gothenburg, June 2024

List of Acronyms

Below is the list of acronyms that have been used throughout this thesis listed in alphabetical order.

CDP	Carbon disclosure project
CSR	Corporate social responsibility
CSRD	Corporate sustainability reporting directive
CO_2e	Carbon dioxide equivalent
EMAS	Eco-management and audit scheme
EMS	Environmental management system
GHG	Greenhouse gas
GRI	Global reporting initiative
GSCM	Green supply chain management
LCA	Life cycle assessment
MRI	Magnetic resonance imaging
NFRD	Non-financial reporting directive
NGO	Non-government organisation
PCF	Product carbon footprint
SBTi	Science-based targets initiative
SDGs	Sustainable development goals
SMEs	Small and medium-sized enterprises
SWOT	Strengths, weaknesses, opportunities, threats

Contents

1 Introduction

Over the past 50 years, environmental issues have gained importance for society and businesses alike, with managers recognising the necessity of expanding their organisations' goals beyond financial considerations (de Lange, Busch, & Delgado-Ceballos, 2012). The EU introduced the Corporate Sustainability Reporting Directive (CSRD) in 2023 to simplify assessing companies' sustainability (European Commission, 2023). This directive heightened the focus on sustainability among firms, increasing reporting demands on large companies (European Commission, n.d.).

These trends also impacted small and medium-sized enterprises (SMEs), which played an important role in the economy and its environmental footprint. SMEs constituted 99% of businesses in Europe (Zorpas, 2010) and accounted for about 60% of greenhouse gas (GHG) emissions from enterprises (European Commission, 2022). Many European SMEs recognised the importance of environmental issues, and more than half had either initiated measures or were planning to take action to reduce their emissions. While non-listed SMEs were not required to report under CSRD, they faced requests for sustainability information from large customers (European Commission, n.d.).

This study was conducted in collaboration with Antaros Medical, a Swedish SME specialising in imaging services for the life sciences sector. The firm could be defined as a knowledge-creating company: an organisation that generates, shares, and applies knowledge to drive innovation and create value (Nonaka, 2007), with no physical manufacturing operations. Since its establishment in 2014, Antaros had experienced rapid growth and served as an imaging partner for some of the world's largest pharmaceutical companies. The company's internal ambition to make a difference in environmental sustainability along with customer interest, prompted the initiation of this study.

1.1 Aim of the study

The aim of this study was to assess the environmental practices of a knowledge-creating service SME and the impact of its value chain, to propose a strategy for environmental sustainability change. This was achieved by quantifying the company's climate impact and gathering insights from stakeholders and industry actors. Three research questions guided the study:

1. How can a strategic environmental work be developed for Antaros?
2. How can Antaros influence the environmental work within its value chain?
3. How can Antaros use strategic environmental work as a competitive advantage?

The first question identified tools and strategies that the case company could implement to achieve an environmental sustainability transition, and key focus areas for the environmental work. The second examined options for influencing the value chain, including the supply chain and clinical trials. The final research question explored how an environmental focus could provide competitive advantages and influence the company's competitors and the industry.

1.2 Delimitations

The study exclusively focused on the environmental aspects of sustainability, excluding social and governance dimensions. In relation to the environmental impact, the study solely quantified the climate impact.

2 Environmental sustainability strategies for SMEs

This chapter provides an overview of relevant topics necessary for understanding what SMEs should consider when developing their strategic environmental work. The tools and processes for navigating environmental sustainability transitions will be explored: change management, SME characteristics, stakeholder theory, value chain greening, sustainability reporting, and description of the environmental work within the life science industry and the case company.

2.1 Environmental sustainability change management

This section examines the integration of environmental sustainability into business strategy, its practical implementation, and potential consequences. As environmental sustainability transitions often require significant adjustments, they are linked to organisational change, which is a constant in the business landscape (Müller, Böhm, & Renz, 2023). Due to evolving customer demands and market conditions, such changes often necessitate investments and increased costs for companies, leading to restructuring and other workforce impacts.

Several accepted models address the change process, but they often cite expert opinions rather than scientific evidence. Therefore, Stouten, Rousseau, & Cremer (2018) created an integrative summary of available evidence and important aspects from seven of these models, which resulted in ten sequential steps for successful organisational change. Steps 1-4 involve integrating the transformation goal into the business strategy, steps 5-7 focus on implementing this strategy, and steps 8-10 reinforce the change in the organisation. Additionally, as the literature on environmental sustainability transformations was limited, Sancak (2023) translated this model into key considerations for organisations aiming to initiate and develop environmental sustainability transformations. Table 2.1 outlines the ten steps (Stouten, Rousseau, & Cremer, 2018), their corresponding phases, aims, and recommended activities.

Table 2.1

The three phases of the change model, the corresponding steps, aims, and activities

Phase	Steps	Aim	Activities
Integrating and communicating	1. Assessment of problems, risks, and opportunities	Understanding problems and change opportunities	Identify external drivers, risks, and opportunities
	2. Selecting and supporting a guiding change coalition	Guide and drive change within the organisation	Establish a guiding coalition Ensure sufficient power and authority
	3. Formulating a clear and compelling vision for environmental sustainability	Give clear targets to the organisation and its stakeholders	Integrate environmental sustainability into the organisation's mission, vision, values, and goals
	4. Communicating the vision	Generate awareness and support for the change	Communicate the environmental sustainability strategy and initiatives Target internal and external stakeholders early
Implementing	5. Mobilising energy for change	Plan the implementation across multiple levels in the organisation	Ensure that concrete implementation steps are in place Mobilise resources
	6. Empowering others to act	Involving employees in the process of change and creating alignment with the organisation's vision	Assign responsibilities and eliminate barriers to change Influence employee behaviour
	7. Developing and promoting change-related knowledge and ability	Ensuring that employees are equipped with the necessary skills and understanding	Gather and develop environmental knowledge within the organisation Establish a circular economy mindset
Reinforcing	8. Identifying short-term wins and using them as reinforcement of the change process	Sustain motivation and reinforce the change process	Use short-term wins in terms of tangible results to motivate and reinforce Distinguish between short-term yields and long-term expectations
	9. Monitoring and strengthening the change process	Ensure continuous and successful implementation over time	Review employed measures, internally and by third-party rating agencies Correct misalignments
	10. Institutionalising change in company culture, practices, and management succession	Ensure that the changes made are embedded in the culture of the company to create lasting change	Embed changes in the company's social norms and shared values Ensure changes are adopted by both current and future leaders

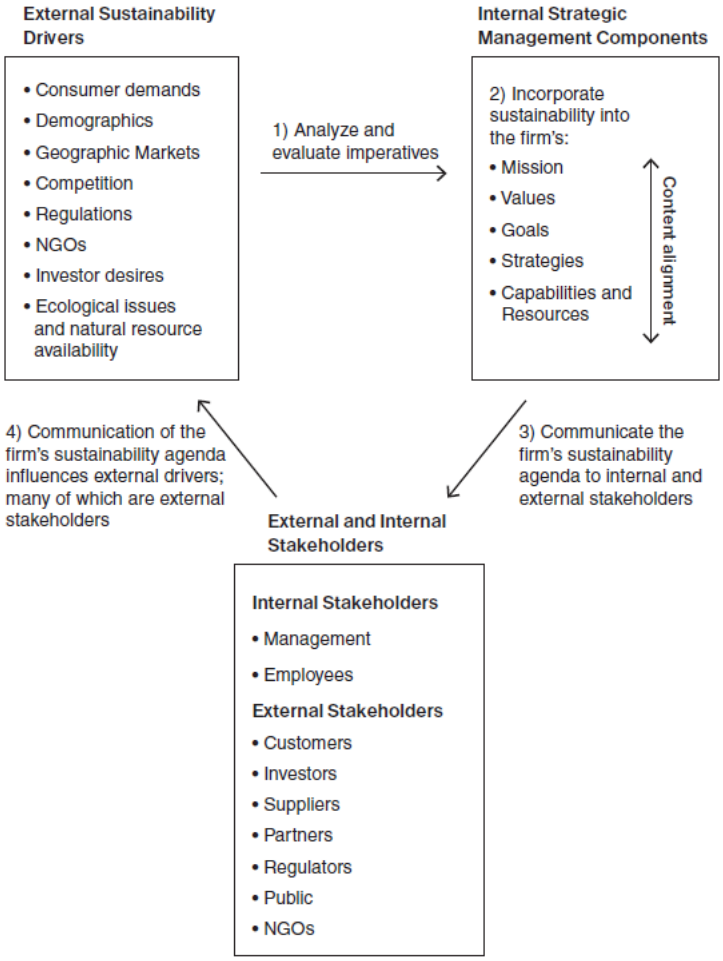
Note. Steps retrieved from (Stouten, Rousseau, & Cremer, 2018).

2.1.1 Integrating environmental sustainability into business strategy and communication

When a company decides to initiate an environmental sustainability transformation, the first phase involves integrating environmental sustainability into the business strategy. This includes assessing problems, risks, and opportunities, formulating and communicating an environmental sustainability vision, and forming a change coalition (steps 1-4) (Stouten, Rousseau, & Cremer, 2018). To illustrate how these steps interrelate, Galpin and Hebard (2018) proposed a four-part framework (Figure 2.1).

Figure 2.1

Incorporating environmental sustainability into a firm's strategic management



Note. Retrieved from (Galpin & Hebard, 2018).

As preparation is essential for environmental transformations, companies need to assess environmental risks, opportunities, and external drivers (Benn, Edwards, & Williams, 2014; Sancak, 2023), aligning with the first step in the change model and the initial part of the framework. Companies can use industry benchmarking, environmental impact assessments, and stakeholder engagement to identify risks and opportunities. Examples of risks are reputational damage or compliance issues, while opportunities might

involve cost savings or market differentiation. Additionally, external drivers (Figure 2.1) can be identified through stakeholder conversation or market analysis and should guide a company's environmental sustainability focus (Galpin & Hebard, 2018).

Companies should then integrate environmental sustainability into their internal strategic management components (Figure 2.1), such as the mission and vision statement, as it embeds the issue within the business rather than treating it separately (Galpin & Hebard, 2018). Connecting environmental sustainability to the company's values can also influence the degree to which it becomes ingrained in the culture, as values shape organisational norms. Furthermore, organisations can use environmental goals to show their roadmap and progress (Locke & Latham, 2013), as well as priorities and intended direction to stakeholders to ensure alignment (Galpin & Hebard, 2018).

The firm's internal strategic management components also require consistent and clear language to prevent confusion among internal and external stakeholders (Galpin & Hebard, 2018). When communicating environmental efforts, companies should consider various factors, including peers' strategies, the use of buzzwords, specificity, greenwashing, and potential impact on external drivers. Competitor's communication can be reviewed to offer examples of topics to address (Reilly & Hynan, 2014), such as climate compensation or energy efficiency. Companies should also avoid using buzzwords, like "natural", "green", and "eco-friendly". Instead, the aim should be specificity in discussing environmental practices and achievements (Reilly & Hynan, 2014), such as detailing GHG emissions reductions or measures taken to reduce waste.

Moreover, firms should avoid overexaggerating environmental efforts since it could be perceived as false information and greenwashing (Reilly & Hynan, 2014). This can include presenting legally required procedures as environmental initiatives (Reilly & Hynan, 2014), such as safe working conditions or avoiding extremely toxic substances. Additionally, communicating the environmental sustainability agenda can influence external drivers by lobbying regulators, advertising environmentally sustainable practices to consumers, or driving competitors to adopt ethical behaviour (Galpin & Hebard, 2018). This can result in a constant cycle where the altered drivers then guide and shape the focus of the environmental work (Figure 2.1). However, companies must remain vigilant about the risk of greenwashing affecting these drivers and continuously reevaluate them.

Companies should form a guiding coalition that can help drive organisational change (Sancak, 2023). The coalition should include diverse internal stakeholders like managers, engineers, and marketing personnel (Beer, Eisenstat, & Spector, 1990), as their varied perspectives can enhance problem identification (Stouten, Rousseau, & Cremer, 2018). Additionally, to facilitate the transition, the coalition must possess authority to implement necessary changes (Kotter, 2009).

2.1.2 Implementing environmental sustainability transitions

Once a company has integrated environmental sustainability into its strategy, the next phase involves implementing the changes. This includes mobilising energy for change, developing change-related knowledge, and empowering others to act (steps 5-7) (Stouten, Rousseau, & Cremer, 2018).

A company needs to mobilise energy for change by declaring implementation steps to eliminate uncertainties that can hamper motivation and learning. This can be done by setting goals and responsibilities, mobilising resources (Sancak, 2023), preparing managers' skillsets, and aligning their interests with the new strategy (Stouten, Rousseau, & Cremer, 2018). For instance, if an organisation aims to reduce the environmental impact of its IT department, its manager must be assigned responsibility, provided with time and funds, and allowed to develop the necessary skills to identify impact areas and potential measures.

As learning is central to all change processes (Stouten, Rousseau, & Cremer, 2018), it is important for organisations to promote environmental skills among internal stakeholders, by developing and gathering new knowledge. For example, employees can be enabled to make environmentally considerate decisions and expand their knowledge through workshops, user groups, coaching, and training. Learning can also be a key factor in the company establishing a circular economy mindset (Sancak, 2023), where natural resources are borrowed, used efficiently, and returned to the environment and society (Penn State Sustainability Institute, 2019). This could help the organisation ensure broader and longer-term perspectives on the transformation.

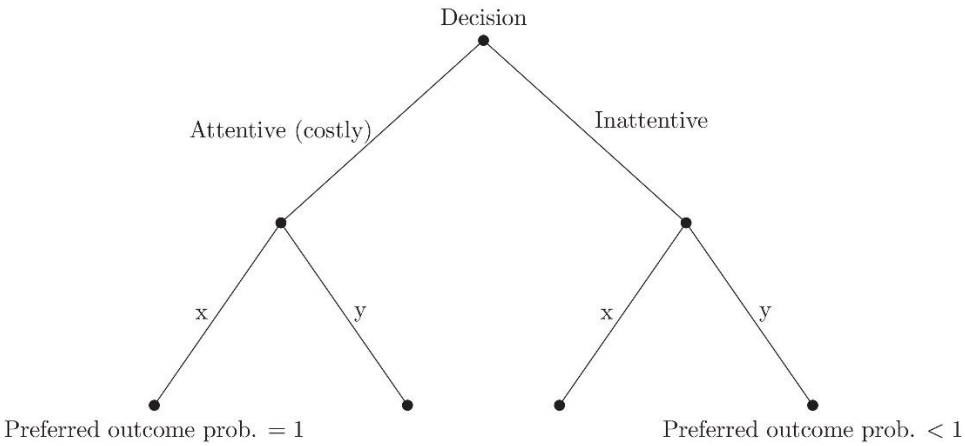
Additionally, companies need to ensure the empowerment of their employees (Sancak, 2023), which aims to create responsibility and remove barriers to sustainable behaviours. This includes eliminating obstacles such as restrictive job descriptions or addressing resistance to change (Kotter, 2009), where employee resistance is a well-documented issue (Blackburn, Ryerson, Weiss, Wilson, & Wood, 2011; Burnes, 2014; Pardo del Val & Fuentes, 2003). For instance, employees may resist taking the train instead of flying due to personal sacrifices in time and comfort, and to address this, the company could use nudges as a cost-effective tool to achieve change (Müller, Böhm, & Renz, 2023).

2.1.3 Nudging to promote environmentally sustainable behaviour

A nudge is "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler & Sunstein, 2008, p. 6), which is a way of influencing employees without having any restrictions in place. To understand this further, a two-step decision model (Figure 2.2) (Löfgren & Nordblom, 2020), based on Kahneman's (2003) system 1 and system 2 thinking can be used. If an individual makes an attentive decision using system 2, for example choosing the vegetarian option at a restaurant for its lower environmental impact, the outcome will be the preferred one. In this case, the individual is immune to nudges. However, nudges can be more effective when an inattentive decision is made using system 1, by for example choosing the first item on the menu out of habit. Changing the plate size or product placements are examples of *pure* nudges where aspects unrelated to preference are changed. Reminding hotel guests that reusing towels benefit the environment is instead an example of a *preference* nudge where information that they already knew is put top of mind.

Figure 2.2

Decision-making process for using system 1 and system 2



Note. Retrieved from (Löfgren & Nordblom, 2020).

When individuals have low confidence in making the optimal choice, pure nudges are more impactful, while preference nudges show higher effectiveness when confidence is high (Löfgren & Nordblom, 2020). Additionally, nudges generally work better when decisions are perceived as unimportant to the individual, but such decisions, like reducing greenhouse gas emissions, can still hold significant societal or organisational value. For instance, combining pure and preference nudges can influence flight choices by prioritising low-emission options and displaying emission estimates within travel booking systems (Sanguinetti & Amenta, 2022). This approach not only leads to increased willingness to pay for low-emission flights, but can also result in emission and cost savings across an organisation.

2.1.4 Reinforcing environmental sustainability transitions

Integrating environmental sustainability into a company's business strategy is a continuous process and to ensure lasting impact, a firm must reinforce implemented changes in the final transition phase. This involves leveraging short-term wins, monitoring progress, and embedding the new practices into the company culture (steps 8-10) (Stouten, Rousseau, & Cremer, 2018).

Companies often face challenges in maintaining motivation during lengthy environmental sustainability transitions, due to a lack of visible results (Stouten, Rousseau, & Cremer, 2018). To counter this, short-term wins can boost morale and reinforce change, by for example showcasing emissions savings from policy changes, to convince sceptics and strengthen supporters' resolve. However, firms must distinguish short-term achievements from long-term objectives (Sancak, 2023), as mistaking short-term wins for the final goal can lead to complacency, jeopardising the transition (Stouten, Rousseau, & Cremer, 2018).

The long-term nature of environmental sustainability transformations requires companies to consistently monitor and evaluate their efforts (Sancak, 2023), through internal reviews or third-party evaluations. Implemented measures should be reviewed and adjusted if they no longer address the initial concerns (Stouten, Rousseau, & Cremer, 2018). Third-party rating agencies, such as EcoVadis, which conducts sustainability assessments (Ecovadis, n.d.), can help eliminate internal biases (Sancak, 2023). Finally, to ensure lasting change, organisations must institutionalise these changes by embedding them into its practices, culture, and leadership. Changes should be rooted in social norms and shared values (Kotter, 2009; Stouten, Rousseau, & Cremer, 2018), especially among current and future leaders, as a poor decision at the top can undo decades of work (Kotter, 2009).

2.1.5 Consequences of environmental sustainability transformations and first-mover advantages

To motivate the significant effort required for environmental sustainability transformations, firms must realise benefits that outweigh costs. Improved environmental practices can lead to numerous advantages for a company, including enhanced financial performance, efficiency, brand reputation, employer branding, employee satisfaction, competitiveness, stakeholder relationships, increased valuation, and reduced costs. For example, organisations that integrate environmental initiatives (Wagner, 2009) and reduce carbon emissions (Gallego-Álvarez, Segura, & Martínez-Ferrero, 2015) often improve their financial performance.

Moreover, service companies that lower their environmental impact have observed improvements in brand reputation, employer branding, and profitability (Jo, Kim, & Park, 2015). Minimising energy, water and toxic product usage in organisations have been shown to reduce costs, increase efficiency, and improve employee satisfaction (Bagur-Femenias, Llach, & del Mar Alonso-Almeida, 2013). Reporting environmental activities demonstrates a company's commitment and transparency, leading to less resistance from suppliers, customers, public authorities, and other stakeholders (Herzig & Schaltegger, 2011). Such a competitive edge can result in higher market valuations (Schadewitz & Niskala, 2010), with higher-quality reporting yielding the greatest valuations (Wang & Li, 2016).

On the other hand, adopting environmental practices can be costly for companies due to the required capabilities and resources (Ciliberti, Pontrandolfo, & Scozzi, 2008). For example, they may need to hire environmental sustainability experts, face higher costs from environmentally conscious suppliers (Dabhilkar, Bengtsson, & Lakemond, 2016), or incur additional expenses for implementing processes to reduce emissions (Alberti, Caini, Calabrese, & Rossi, 2000). However, the disadvantages only affect the individual company, while the potential benefits extend to the community and environment.

The impact of these efforts depends on firms' characteristics and positioning. If a company can position itself as a first-mover (Tetrault Sirsly & Lamertz, 2008), it can gain advantages as a pioneer in the industry, potentially earning positive economic profits (Lieberman & Montgomery, 1988). To achieve these benefits, firms must consider strategic aspects, identify asymmetries, and anticipate outcomes. Companies should ensure environmental benefits are exclusive to the firm, and that initiatives are

integrated into their vision and recognised by stakeholders (Burke & Logsdon, 1996). First-mover advantages can arise when companies identify asymmetries, such as unique environmental efforts compared to competitors, through external assessments and effective stakeholder management. Additionally, outcomes include enhancing the company's image, establishing legitimacy, and setting industry standards.

2.2 Business structures and stakeholder engagement

This section introduces the characteristics of SMEs, their challenges, and opportunities, as well as how stakeholder theory can be an important tool for SMEs when engaging in environmental efforts.

2.2.1 Small and medium-sized enterprises (SMEs)

SMEs represented approximately 99% of European companies (Zorpas, 2010) and were defined as firms with up to 250 employees, a turnover not surpassing €50 million, or a balance sheet total below €43 million (European Commission, n.d.). These businesses were responsible for about 60% of GHG emissions from enterprises (European Commission, 2022). SMEs are typically characterised by streamlined and efficient structures and processes, enabling them to swiftly adapt to evolving customer needs and make quick decisions (Singh & Garg, 2008). However, lack of recourses and technical expertise are common challenges for them. During environmental sustainability transitions, SMEs should evaluate available measures and address potential challenges and opportunities.

Most SMEs in Europe had initiated or were planning measures to reduce their emissions to mitigate their climate impact (European Commission, 2022). A significant portion of the efforts were driven by personal views, economic benefits, good business practice and altruism (Zorpas, 2010). In contrast, motivations arising from competitors or stakeholders such as customers, suppliers, employees, and the public were much less common. As SMEs face less scrutiny from external parties compared to large enterprises, the smaller scale and more personal nature of SMEs could amplify the influence of personal beliefs in driving environmental efforts. Implemented reduction strategies included adoption or creation of new technical solutions, recycling, reuse, and enhancing resource efficiency (European Commission, 2022).

The characteristics of SMEs, such as constrained financial and human resources and a scarcity of best practices, present challenges when undergoing an environmental sustainability transition (European Commission, 2022). Financial limitations hinder environmental investments, while a shortage of human resources, including time and environmental expertise, can impede the effectiveness of their efforts. As SMEs often operate in niche markets, there can be a lack of established best practices which requires them to devise their own path for the transition, which can lead to uncertainties.

Despite these challenges, SMEs' lean structures provide advantages in environmental sustainability transitions, allowing them to quickly implement necessary changes (Singh & Garg, 2008). Furthermore, SMEs can increase their success rate in environmental sustainability transitions through stakeholder engagement and process optimisation (Caldera, Desha, & Dawes, 2019). Stakeholder engagement includes internal collaboration and knowledge-sharing, and external communication and

collaboration with suppliers, customers, as well as seeking financial support from authorities. Process optimisation relates to adopting tools that facilitate environmental sustainability by managing data on GHG emissions, energy consumption, and waste.

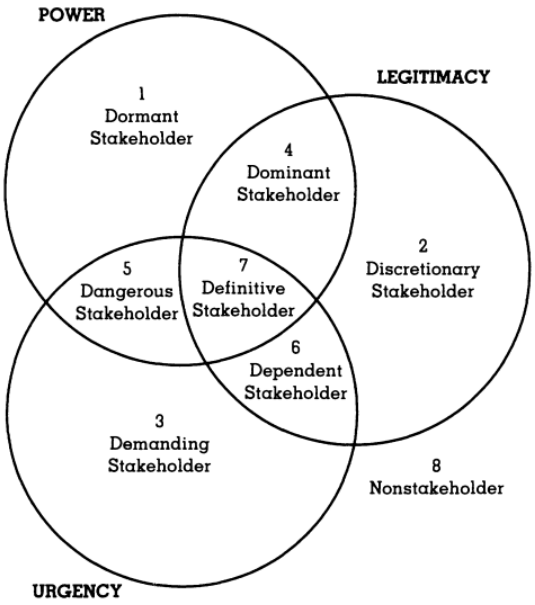
2.2.2 Stakeholder theory

Effective stakeholder engagement is important for SMEs to derive financial benefits from environmental efforts, as they can use it to distinguish and comprehend the needs of various interest groups (Abraham, 2017). Companies addressing these needs can uncover business opportunities and solutions, ultimately leading to financial gains (Kurucz, Colbert, & Wheel, 2008). Key aspects of stakeholder engagement that SMEs should consider include the definition of stakeholders, characterising their interests, and implementing practical strategies.

A stakeholder is an entity with ownership, rights, or interests in an organisation and its operations (Clarkson, 1995). Typical stakeholders for a firm include shareholders, investors, employees, customers, suppliers, and public stakeholders such as governments and communities. They normally exhibit one or more attributes of power, legitimacy and urgency (Mitchell, Agle, & Wood, 1997). Power signifies an actor's ability to impose its will in relationships, legitimacy relates to the perception that an entity's actions align with social norms and values, and urgency arises when a claim or relationship is time-sensitive and essential to the actor. Companies can identify stakeholder classes based on various combinations of these characteristics (Figure 2.3).

Figure 2.3

Stakeholder groups with one, two, or three attributes present



Note. Retrieved from (Mitchell, Agle, & Wood, 1997).

With increasing globalisation, companies must deal with a wider range of actors and groups, making it harder to meet everyone's varied and sometimes conflicting demands (Roloff, 2008). Stakeholder management can be an important tool to help recognise

demands by identifying key stakeholders and understanding their expectations through ongoing communication. Collaboration and open communication are also important, as companies often need to engage with multiple stakeholders simultaneously.

2.3 Processes for value chain greening

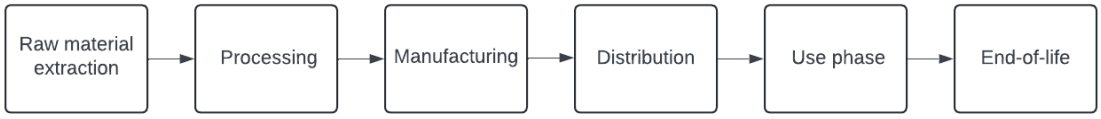
The following section deals with the processes and tools that can be used to improve both the internal and external environmental sustainability work within a company's value chain. This includes green supply chain management (GSCM) and environmental management system (EMS).

2.3.1 Green supply chain management (GSCM)

Companies are responsible for their products and services but often lack full control over production processes (Ibrahim, 2019). This complicates environmental impact reduction, as companies are only as green as their supply chains (Gualandris, Golini, & Kalchschidt, 2014). The supply chain involves sourcing raw materials, manufacturing products, and distributing them to customers (Figure 2.4) (Jenkins A. , 2022). The value chain includes all value-adding activities to the product or service as it moves along the supply chain, such as marketing, innovation, and sales. GSCM involves evaluating, assessing, and selecting suppliers and developing relationships, to minimise the total environmental impact of the value chain (Ibrahim, 2019).

Figure 2.4

Simplified supply chain



Note. Own work.

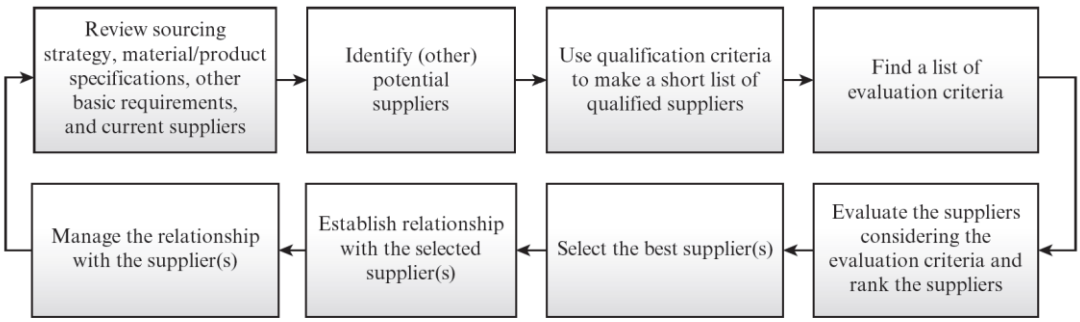
As environmental considerations generally incur higher expenses, the supplier selection process requires balancing environmental responsibility with costs (Sarkis & Dhavale, 2015). The process involves several steps (Figure 2.5), which can be made with varying complexity depending on the size and resources of the company. Organisations should review their current procurement strategy to align it with environmental goals and identify suppliers with a focus on environmental sustainability (Rezai, 2019). As identifying new suppliers can be challenging, especially for SMEs, reviewing the performance of current suppliers against the new strategy is important. Green programs and certifications like ISO 14000 can facilitate the identification of new suppliers.

Companies should incorporate environmental considerations into their selection criteria (Rezai, 2019), including environmental practices, policies, and performance metrics like resource consumption and emission levels (Sarkis & Bai, 2010).Various methods can then be used to rank and select suppliers based on these criteria (Rezai, 2019). Large organisations might utilise extensive methods such as multi-criteria decision-making,

best-worst method, and rough set (Agarwal, Bag, Mishra, & Sahai, 2011; Govindan, Rajendran, Sarkis, & Murugesan, 2015; Igarashi, de Boer, & Fet, 2013), while SMEs may benefit from simpler checklists. Finally, relationships with selected suppliers should be established and governed (Rezai, 2019).

Figure 2.5

Supplier selection process



Note. Retrieved from (Rezai, 2019).

Companies can use formal or informal governance for supplier relationships (Ibrahim, 2019). Formal governance is more suited to larger organisations with the power to enforce contracts, standards and monitoring programs for compliance (Cao & Lumineau, 2015). They also employ informal governance to manage relationships through long-term investments and collaboration (Narayanan & Narasimhan, 2014). As governance effectiveness depends on the power and size of both parties (Ibrahim, 2019), SMEs can face challenges in using formal governance due to limited bargaining power (Lepoutre & Heene, 2006), making informal governance generally preferred.

Transferring environmental sustainability to the supply chain can further be difficult for SMEs, due to high costs in terms of competence and resources (Ciliberti, Pontrandolfo, & Scozzi, 2008). They can however get assistance from third parties like NGOs or industry associations to help monitor suppliers (Ciliberti, Pontrandolfo, & Scozzi, 2008; Stekelorum, 2019). Successful cases highlight how SMEs can promote environmental sustainability by communicating large customer's demands and encouraging responsible behaviour (Ayuso, Roca, & Colomé, 2012; Stekelorum, 2019). Demonstrating best practices together with educating and exerting pressure when possible has also proven effective (Jenkins H. , 2006). Additionally, using strict supplier codes of conduct, while not always enforceable, still establishes expectations (Ciliberti, Pontrandolfo, & Scozzi, 2008). Combined with communication, this can be used to manage long-term relationships. Requesting environmental information from suppliers is often involved, but response rates vary, posing monitoring challenges. Enhancing supplier awareness through information sharing, training, and workshops can help address these issues.

2.3.2 Environmental management system (EMS)

Companies can use an EMS to establish a more systematic approach to enhancing environmental performance (Hillary, 2004), as it is a tool for keeping track of responsibilities, practices, procedures, and processes related to environmental issues (Zorpas, 2010). It started as an instrument for the individual company but can also be used to manage and influence the supply chain. Key considerations for EMS implementation include system components, certification, benefits, and supply chain aspects.

EMSs should include internal evaluation of impacts, measurable goals, provision of resources and training, and regular audits (Coglianese & Nash, 2001). They can be of varying complexity where SMEs might implement simplified versions like checklists, while larger organisations can opt for a certified EMS such as the ISO 14001 standard or the Eco-management and Audit Scheme (EMAS) (Zorpas, 2010). Certification can increase credibility but also incurs extra costs and may not always enhance environmental performance, as it focuses on management rather than outcomes.

Companies can yield several benefits from adopting an EMS, including decreased long-term cost, improved brand image, and better manager-staff interactions (Hillary, 1998). EMSs can also improve and standardise environmental data collection and management (Morrow & Rondinelli, 2002). However, companies may also experience drawbacks in EMS requiring more resources than expected, the benefits failing to meet expectations, and the generally high costs of certification (Zorpas, 2010). These outcomes depend on the implementation of the EMS. For instance, if it is implemented solely due to customer requirements, it may not be fully integrated with the rest of the organisation, thereby potentially preventing the benefits from materialising.

Companies implementing EMSs are more inclined to adopt GSCM practices, like evaluating supplier environmental performance or requiring environmental standards (Darnall, Jolley, & Handfield, 2008). EMS and GSCM can therefore complement each other, as the skills from EMS implementation can aid in adopting GSCM practices, cutting costs. EMS adopters also tend to reduce environmental impacts in their operations and across their supply chain, due to expectations on suppliers.

2.4 Sustainability reporting

This section examines the history of sustainability reporting, CSRD, and one of the tools for measuring companies' GHG emissions, the Greenhouse Gas Protocol (GHG Protocol). Sustainability reporting has been around for a long time, through standards like the EU's EMAS and the voluntary Global Reporting Initiative (GRI), to communicate non-financial information. The first GRI reporting guidelines were launched in 2000, which were adapted from financial accounting and covered economic, environmental, and social performance (Jones, Comfort, & Hillier, 2016). However, companies often omitted sustainability information important to investors and other stakeholders (European Commission, 2023). This was partly due to the voluntary nature of GRI (Levy, Brown, & de Jong, 2010) and its lack of content enforcement, allowing selective disclosure of favourable information (Moneva, Archel, & Correa, 2006). CSRD aimed to address these issues by mandating reporting for relevant companies (European Commission, n.d.).

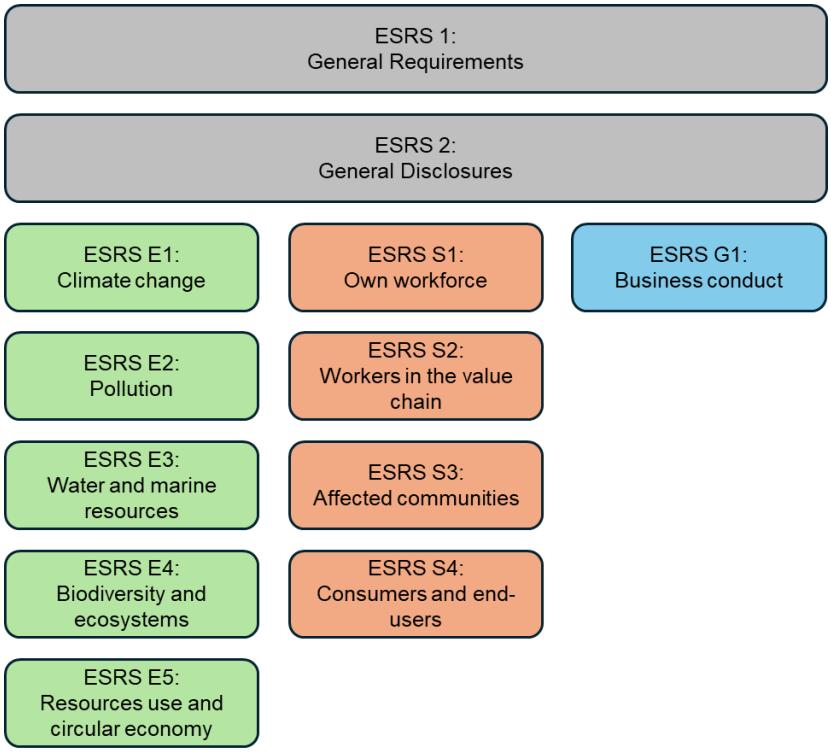
2.4.1 Corporate Sustainability Reporting Directive (CSRD)

CSRD came into effect in January 2023 (European Commission, n.d.), requiring enterprises in Europe to determine if they are subject to the directive and reporting requirements. The directive aimed to help stakeholders better assess companies' sustainability performance (European Commission, 2023). The first companies, previously subject to the Non-Financial Reporting Directive (NFRD), started reporting in 2024, with reports due in 2025 (European Commission, n.d.). These included listed companies, banks, and insurance companies with over 500 employees (European Commission, 2023). Non-listed companies with more than 500 employees were scheduled to start in 2025, and listed SMEs in 2026. While non-listed SMEs were not required to report, they could still face sustainability information demands from stakeholders subject to the directive.

Companies subject to CSRD needed to follow the European Sustainability Reporting Standards (ESRS), which required them to disclose identified risks and opportunities derived from environmental and social issues, as well as the impact of their business operations on people and the environment (European Commission, n.d.). The ESRS comprised 12 standards covering all sustainability aspects (Figure 2.6) (European Commission, 2023). While reporting according to the general standards was mandatory, whether companies should report on the other standards depended on the relevance of each reporting area to the firm's business.

Figure 2.6

Overview of the ESRS standards



Note. Own work.

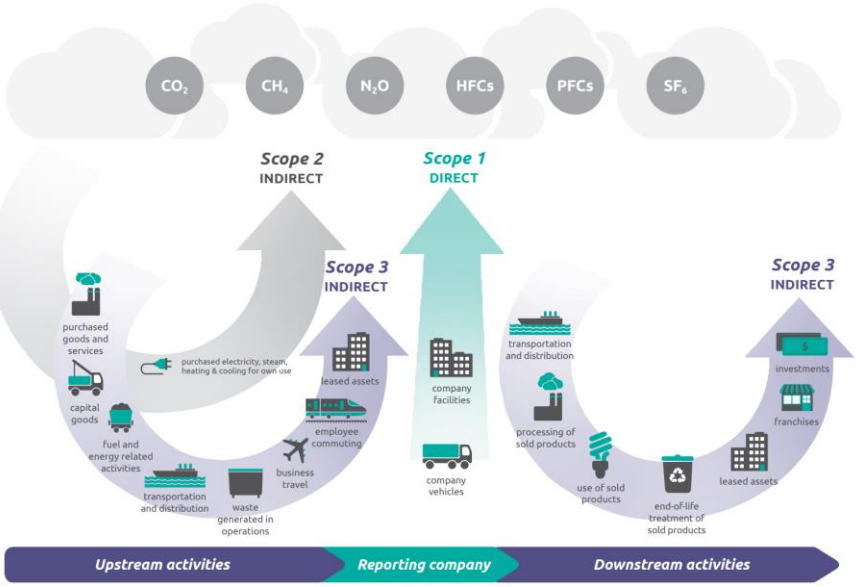
2.4.2 Greenhouse Gas Protocol (GHG Protocol)

The GHG Protocol is a well-established tool for calculating and reporting GHG emissions, offering a comprehensive life-cycle perspective of a company's entire value chain (GHG Protocol, 2004). CSRD integrates the GHG Protocol for calculating GHG emissions from operations (Momblanco, Aiuto, & Huckins, 2024). Constructing a GHG inventory helps identify emission reduction opportunities, manage environmental risks, engage value chain partners in GHG management, and inform stakeholders (GHG Protocol, 2004; GHG Protocol, 2011). However, as it requires extensive data collection and specific knowledge to ensure accurate reporting, implementation could result in higher costs and the need for specific competence. Key considerations for the protocol include setting organisational and operational boundaries, choosing calculation methods, and determining relevant scope 3 categories.

An organisational boundary can be set using either the *equity share approach*, accounting for emissions based on the company's share of equity, or the *control approach*, accounting for emissions from operations controlled by the company (GHG Protocol, 2004). The operational boundary involves identifying emissions as direct or indirect. The protocol categorises emissions into three scopes based on their occurrence within the value chain and the company's level of influence over them (Figure 2.7).

Figure 2.7

Visual representation of the three scope and their subcategories



Note. Retrieved from (GHG Protocol, 2011).

Scope 1 includes direct emissions under the company's control or ownership, such as emissions from combustion in manufacturing processes (GHG Protocol, 2004). Scope 2 covers indirect emissions from the generation of purchased energy, where emissions occur at the production site but are accounted for by the purchasing company (GHG Protocol, 2004). Scope 3 encompasses all other indirect emissions from activities by the company but from sources not under its control, like emissions from the production

of purchased goods (GHG Protocol, 2011). Scope 3 is divided into 15 categories (Table 2.2), where reporting for all of them may not be feasible due to company type or data availability (GHG Protocol, 2011). Different calculation methods are used for each category, ranging from spend-based approaches to supplier-specific methods, with higher specificity yielding higher quality results (GHG Protocol, 2013). The choice of methods depends on company resources, data availability, and ambition levels. Purchased goods and services, along with capital goods, use the same calculation methods, differing only in how the purchased item is characterised (GHG Protocol, 2013). Classification as a capital good follows the reporting company's internal financial procedures.

Table 2.2

The scope 3 categories and their descriptions

Scope 3 category	**Description**
1: Purchased Goods and Services	Upstream cradle-to-gate emissions from extraction, production, and transportation of purchased goods and services
2: Capital Goods	Upstream cradle-to-gate emissions from extraction, production, and transportation of purchased capital goods
3: Fuel and Energy-Related Activities Not Included in Scope 1 or 2	Emissions from extraction, production, and transmissions purchased fuel or energy not included in scope 1 or 2
4: Upstream Transportation and Distribution	Emissions from transportation and distribution of purchased goods
5: Waste generated in operations	Emissions from disposal and treatment of waste generated in the company's operations
6: Business Travel	Emissions from transportation of employees for business-related activities
7: Employee Commuting	Emissions from transportation of employees between their homes and offices
8: Upstream Leased Assets	Emissions from the operation of leased assets
9: Downstream Transportation and Distribution	Emissions from the transportation and distribution of sold products to the end consumer
10: Processing of Sold Products	Emissions from the processing of sold intermediary products
11: Use of Sold Products	Emissions from the end use of sold goods and services
12: End-of-life Treatment of Sold Products	Emissions from the disposal and treatment of sold products
13: Downstream Leased Assets	Emissions from the operation of owned assets that are leased to other entities
14: Franchises	Emissions from franchise operations
15: Investments	Emissions from the operations of investments

Note. Retrieved from (GHG Protocol, 2011).

2.5 The life sciences sector and the case company

The final section examines environmental efforts within the life sciences sector and provides an overview of the case company, including its characteristics, culture, and previous environmental work. The life sciences sector includes companies, universities, and public actors that promote human health through research, innovation, drug development, medical device production, and treatment (Swelife, n.d.) The sector accounted for 4-5% of global GHG emissions at the time of the study (Pichler, Jaccard, Weisz, & Weisz, 2019), with 50-80% of these emissions falling within scope 3 (Eckelman, et al., 2022; Rodríguez-Jiménez, Romero-Martín, Spruell, Steley, & Gómez-Salgado, 2023). Increasing stakeholder demands for environmental sustainability reporting pressured the life sciences industry to adopt more environmentally sustainable practices (Scilife, 2024).

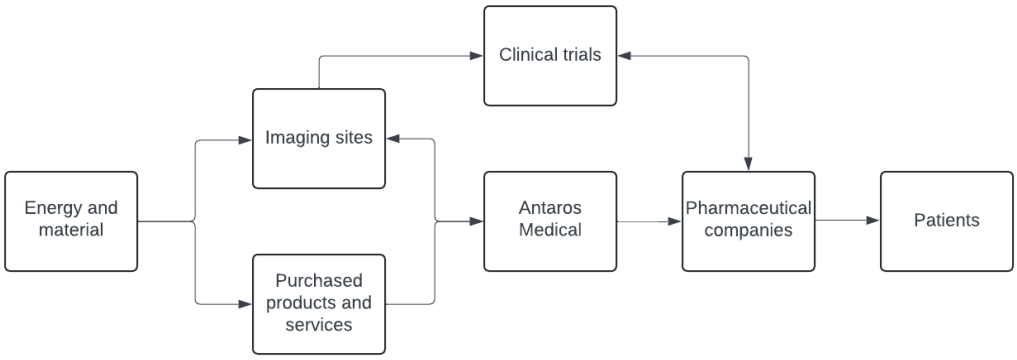
Effective integration of environmental considerations into high-level strategies was essential for environmental sustainability transitions in the industry (Scilife, 2024). Key focus areas included value chain greening and adoption of green technology. These developments presented an opportunity for life sciences firms to position themselves as leaders in environmental sustainability. Leading companies in the sector viewed environmental sustainability as a means of differentiation and value creation for customers, organisations, and the environment, rather than merely a compliance requirement (McKinsey, 2023).

2.5.1 Antaros' operations

Antaros Medical, an imaging service provider in the life sciences sector, had its headquarter in Sweden, and a subsidiary in the US. The company aided decision-making in drug development by designing the imaging components of clinical trials, conducting imaging through third-party sites, and analysing the images using self-developed software (Figure 2.8). Furthermore, their R&D team developed new methods to understand how medicines work in the body. This included creating protocols for scanners, developing software for analysis, and conducting studies to increase disease area understanding. The company was founded in 2014 and had a global network of collaborators and customers.

Figure 2.8

Simplified chart of Antaros' value-chain



Note. Own work.

At the time of the study, Antaros had just over 100 employees and annual revenue >100 M SEK (Table 2.3), classifying it as an SME. In recent years, the company had experienced rapid growth. Antaros prioritised its employees as the foundation of its operations, viewing them as a key differentiator from competitors. The company emphasised innovation, continuously seeking new approaches to tackle clinical trial complexities through its imaging science research. Their culture was reflected in their organisational values (Table 2.3). The value of *Fun* emphasised togetherness and enjoying work. *Solutions* highlighted their solution-focused mindset and creativity in tackling new challenges. *Trust* aimed to foster a flat organisational structure built on mutual trust and respect. *Empowerment* reflected Antaros' belief in employee autonomy in decision-making and workload management. *Ethics* demonstrated respect for individuals, work, customers, and the environment. Lastly, *Growth* symbolised the company's embrace of change and recognition of personal development as essential for overall company progress.

Table 2.3

Information about Antaros Medical

Founded	2014
Revenue 2023 (M SEK)	>100
Number of employees (2023)	>100
Office locations	Uppsala, Gothenburg, Malmö
Imaging sites	>400
Mission	We develop and tailor imaging solutions to help drug developers understand how drugs work on human pathophysiology - to facilitate decision making and in the end get the right medicines available as fast as possible
Vision	To be the company, known globally for having the right people and the right expert knowledge, that drug developers contact when they need to understand the future - now
Values	Fun, Solutions, Trust, Empowerment, Ethics, Growth

2.5.2 Antaros' environmental work

Antaros worked with clinical trials, where the social dimension of sustainability, particularly ethics, was important and strictly regulated. Consequently, the company had a longstanding commitment to this aspect of sustainability. At the time of the study, the environmental dimension was less developed since Antaros, as a knowledge-creating firm, had a smaller environmental impact compared to manufacturing companies. However, in 2023, Antaros initiated environmental efforts in response to customer demands, including developing a sustainability policy, achieving a silver medal in an EcoVadis assessment, committing to Science Based Targets (SBTi), participating in the Carbon Disclosure Project (CDP), and promoting supplier diversity. These actions were necessary to qualify as a valid supplier.

The company had formed a sustainability group, comprising four members from HR, Marketing, and Clinical operations, tasked with developing the environmental work. Antaros had environmental goals and was engaged in various environmental activities aimed at reducing the impact of business travel, procurement, and internal operations, and enhancing employee awareness. The company's environmental policy and staff handbook encouraged employees to choose environmentally friendly transportation modes for business travel when feasible. Although no further travel restrictions were imposed at the time, a travel guidance was under development. Additionally, the company had developed digital solutions to minimise the need for transporting documents for clinical trials.

The company relied solely on 100% renewable energy and aimed to continue this approach in the future. The procurement policy prioritised purchasing with reuse and longevity in mind, with plans for further policy enhancements. When moving to a new office in 2023, the company committed to using second-hand furniture. While Antaros consistently invested in premium-range IT hardware primarily for cost reasons, environmental benefits from this approach were noted. No specific environmental criteria were applied to IT hardware procurement, and no requirements were imposed on software suppliers. Antaros utilised various niche software suppliers, whose environmental impact remained unknown to the company.

The company also prioritised recycling across all offices and provided employee training to encourage extensive recycling practices. Antaros was in the process of securing a contract for proper handling of electronics, including recycling and secure data management. They had not considered the environmental impact of its core business: designing and conducting imaging for clinical trials. Limited knowledge was observed in this area, although some measures, such as a significant shift towards virtual training for clinical trials, had been implemented. While positive environmental effects could be inferred, the shift was primarily driven by cost and efficiency considerations.

The company promoted their strong "bicycle culture", with many employees choosing cycling as their mode of commuting. They allowed remote work for two days a week and were considering ways to encourage more sustainable commuting options. Additionally, the company raised awareness about environmental issues through a sustainability workshop for all employees. However, Antaros had limited

communication about its environmental initiatives, aiming to ensure authenticity and prevent greenwashing. Nevertheless, a communication strategy for environmental sustainability was under development.

3 Method

This chapter outlines how the research was conducted to achieve the aim of the study. It involved answering research questions using a combination of quantitative and qualitative methods. Data collection included a literature review, internal data, industry-specific data of Antaros' peers and companies in its value chain, a survey, interviews, and focus group discussions, forming the basis for data management methods.

Internal data was used to construct a greenhouse gas inventory using the GHG protocol to quantify the company's emissions, while industry-specific data benchmarked Antaros against peers to assess its environmental performance and identify potential improvements. Survey, interview, and focus group materials, along with the other data, were analysed to conduct an environmental SWOT analysis, identifying environmental challenges and focus areas. Lastly, a stakeholder analysis was performed based on these challenges to identify key stakeholders for the company's management to consider when implementing an environmental sustainability strategy. Together, these methods provided nuanced insights into the environmental practices of Antaros and laid the foundation for developing a strategy for environmental sustainability change.

3.1 Data collection

This section aims to describe which data was needed for the study and where it was found. Data was collected from a literature review, internal company documents, external industry data, a survey targeting employees, interviews with internal and external stakeholders, and focus group discussions.

3.1.1 Literature review

The literature review involved examining scientific articles, books, and guidelines given out by organisations. Sources were obtained via Google Scholar, Chalmers Library, and reference lists of reviewed articles. Several topics were covered in the literature review (Table 3.1).

Table 3.1

The topic areas, search engines, and search words

Topic area	Search engine/database	Keywords
Sustainability change management	Google Scholar	Change management, Change management for sustainability transformation
Sustainability communication	Google Scholar	Sustainability communication
Consequences of sustainability transformations	Google Scholar	Benefits for companies reducing environmental impact, Market valuation sustainability communication, Environmental improvements leading to cost reduction service companies
First-mover advantages	Google Scholar	First-mover advantage CSR
SMEs	Google Scholar	SME definition, SMEs environmental work
Stakeholder theory	Google Scholar	Stakeholder theory, Stakeholder engagement, Stakeholder analysis
EMS	Google Scholar	Environmental Management System, Benefits of implementing EMS, EMS SMEs
GSCM	Google Scholar, Chalmers Library	SME CSR supply chain
CSRD	Google	CSRD
GHG Protocol	Google	GHG Protocol
Sustainability in life sciences	Google	Sustainability Life sciences industry

3.1.2 Internal data

Primary data was collected from employees, while secondary data came from company documents. Information on Antaros' environmental impact and activities was gathered from both public and internal sources. Public data included information from the company's webpage. Internal data, such as documents, policies, strategies, purchasing records, energy consumption reports, waste quantity information, and sustainability ratings, were obtained from employees through interviews and email. Sensitive data, like financial information, was password-protected when emailed to ensure confidentiality.

3.1.3 Industry data

Data on the environmental sustainability efforts of competitors and companies with similar business models was collected and reviewed. Information from selected companies in Antaros' value chain was also gathered to showcase available options. Competitors were initially chosen from a list provided by Antaros. Due to the limited number, further competitors were identified via Google searches using terms like "Medical Imaging CRO" and "Clinical Imaging Service Provider". Since competitors had limited environmental initiatives, the scope was broadened to include similar

companies in operations and geography, using keywords like “Medical software”, “Software companies”, and “Software consultants”. The final selection of peers included 39 competitors, 7 medical software firms, 10 general software companies, and 6 software consultants. Environmental information was sourced from Corporate social responsibility (CSR) reports, environmental sustainability materials on websites, and annual reports (Table 3.2).

A detailed analysis was conducted on the three competitors with the most extensive environmental initiatives. To map options for Antaros, the environmental activities of five major suppliers by expenditure, two large cloud providers, and three major MRI producers in the value chain were examined. Various data points (Table 3.2) were collected from these competitors and companies to get a deeper understanding of which measures were common.

Table 3.2

Information gathered from peers

Analysis method	**Data points and information**	**Mentions of environmental sustainability details**
General	Revenue GHG emissions Energy consumption Environmental initiatives Sustainable development goals (SDGs) Environmental goals Environmental activities	Environmental sustainability on the website CSR report Environmental sustainability in the annual report Climate compensation ISO-14001 certification Environmental savings due to product use
Detailed	Suppliers considered for environmental work Integration of environmental work in strategy Specific environmental activities	

3.1.4 Survey

A survey was used to gather information on employees' knowledge and views of Antaros' environmental sustainability efforts, their commuting habits, and business travel practices. It was emailed to all employees by a company representative, achieving a 60% response rate with 65 employees participating. To keep it brief while gathering the essential information, the questions included in the survey aimed to answer the following:

- Employees' knowledge of Antaros' environmental work
- Employees' rating of Antaros' environmental work
- Areas employees believed should be the focus of the environmental work
- Business travel habits and interest in environmentally sustainable travel policy
- Number of days employees worked in the office each week
- Distance employees travelled daily
- Interest in commuting subsidies and initiatives
- Mode of transport to the office, including vehicle fuel type

3.1.5 Interviews

The aim of the interviews was to assess the current knowledge and attitudes towards environmental issues and practices at Antaros, and within its value chain. Internal stakeholders, including Antaros employees, and one external stakeholder, a customer, were interviewed. When an interviewee had specific relevant knowledge, the interviews also helped map environmental impacts and activities throughout the value chain. The goal was to interview two employees from each department, including a manager and a staff member. Based on the HR Manager's recommendations, 10 employees representing HR, Marketing, Software development, IT, Clinical operations, and Imaging science were selected. The customer was chosen due to its close collaboration with Antaros.

The interviews lasted 20-40 minutes and followed a semi-structured format to cover central topics (Table 3.3), while allowing flexibility to explore unanticipated aspects (Longhurst, 2003). Both researchers attended all interviews, with one leading the conversation and the other taking notes. Most interviews were conducted in person, with some via Microsoft Teams. All interviews were recorded with the interviewees' consent to facilitate the transcription process.

Table 3.3

Central topics discussed with the interviewees

Target group	Key areas discussed
All	Interest and knowledge of environmental issues Awareness of Antaros' environmental work Attitude towards Antaros' environmental work Advantages and disadvantages of improving the environmental work Focus areas for improvement of the environmental work
Internal	Company culture concerning environmental sustainability Reasons for prior limited environmental work Environmental impact and activities in the interviewee's areas of responsibility
External	Procurement and partnership practices Supplier expectations
IT department	IT infrastructure and energy consumption Purchasing
Software department	Green coding Environmental sustainability in AI development Purchasing
Imaging Science and Clinical Operations departments	Environmental impact of clinical trials Environmental measures in clinical trials
HR department	Travel policy Work-from-home policy Internal communication of environmental sustainability Environmental sustainability interest of potential employees
Marketing department	External communication of environmental sustainability

3.1.6 Focus group discussions

The company's sustainability group members participated in focus group sessions to emphasise the interactions between them (Longhurst, 2003). Two sessions were conducted: one on focus areas of the environmental strategy and another on the group's dynamics, cultural aspects, and Antaros' indirect environmental impact.

All but one member of the group attended the first session, and all attended the second. Participants received the agenda beforehand to prepare (Table 3.4). During the sessions, the researchers presented data, took notes, answered questions, and facilitated discussions. With permission, the sessions were recorded to aid in compiling findings.

In the first session's initial section, the purpose and goals of the environmental work were discussed. Findings from the benchmarking, interviews, GHG protocol, and SWOT analysis were then presented to provide an accurate understanding of the company's position at the time of the study. Focus areas were chosen based on the company's environmental impacts and operational relevance. In the closing section, these areas were presented with discussion questions on potential improvements and alignment with Antaros' culture. The second session discussed the sustainability group's interactions, both internally and with other stakeholders, as well as the company's culture, employee dependence, and potential indirect environmental impacts.

Table 3.4

Overview of focus group discussions and the topics covered

Session	Duration	Topics discussed
First Session	1.5 hours	Purpose of the environmental work Business travel Sustainable procurement Clinical trials Poor data quality
Second session	1 hour	Sustainability group Company culture Indirect impacts

3.2 Data management

This section outlines the process of managing collected data to produce results. Internal data was used to quantify Antaros' value chain's climate impact in an environmental data inventory. Interviews, survey responses and focus group discussions were summarised and categorised. Industry data benchmarked environmental practices, and data from a SWOT analysis was used in the stakeholder analysis and the first focus group session.

3.2.1 Greenhouse gas emissions inventory

Antaros' climate impact was quantified using a life-cycle perspective, accounting for all emissions the company was responsible for, according to the GHG Protocol. The three scopes of the protocol guided the calculation of the value chain's climate impact (GHG Protocol, 2004). The control approach was applied for the organisational boundary since Antaros wholly owned its operations, making both control and equity approaches equivalent. All three scopes were considered for the operational boundary to determine the company's complete value chain impact. In accordance with the technical calculation guidance (GHG Protocol, 2013), the 15 scope 3 categories and the company's business goals and activities were used as a checklist, resulting in eight categories being considered negligible for a knowledge-creating company, leaving seven relevant categories (Table 3.5).

Table 3.5

The categories, subcategories, sources, and methods used for scope 3

Scope 3 category	Subcategories	Source	Emission factor	Calculation method
1: Purchased Goods and Services	Furniture Paper and packaging Other general products Legal, accounting services Software, hosting activities Insurance and pension funding Financial intermediation	Internal financial data	(Upphandlings myndigheten, n.d.)	Spend-based
2: Capital Goods	Phones Monitors Computers and printers	Internal financial data	(Upphandlings myndigheten, n.d.)	Spend-based
4: Upstream Transportation and Distribution	Air freight	Internal financial data	(Upphandlings myndigheten, n.d.)	Spend-based
5: Waste Generated in Operations	Material recycling	Real estate data	-	Waste-type-specific
6: Business Travel	Train tickets Flight tickets Taxi Car rental Hotel & restaurants	Internal financial data	(Department for Energy Security & Net Zero, 2023; Rome2Rio, 2018)	Spend-based
7: Employee Commuting	Bus Bicycle Diesel car Walking/Running Train Hybrid car Gasoline car Electric car Work from home Electric bicycle	Employee survey	(Ebbesen Jensen, 2020; Naturvårdsverket, 2023)	Distance-based
8: Upstream Leased Assets	Leased cars	Internal data	(Naturvårdsverket, 2023)	Average-data

Categories 1, 2, 4, and 6 utilised internal financial data for the calculations due to limited data quality within the company. The spend-based method under the GHG protocol, along with corresponding emissions factors, was employed to calculate total emissions from each category. Inflation adjustments were made to compare values over time as spend-based emission factors from 2018 and 2021 were used (Table A1).

Category 1: Purchased Goods and Services
The data resolution for this category was different for 2022 compared to 2023, wherein the first year the amounts spent were catalogued into further subcategories. To ensure comparability between the years, the assumption was made that the same proportion was spent on the different subcategories in 2023 (Table 3.5).

Category 5: Waste Generated in Operations
Antaros, being a knowledge-creating company without manufacturing operations, generated close to zero waste outside its offices. Waste management data was obtained from property owners but was of limited quality, calculated based on waste generated per square meter used by each company within the building. As Antaros shared the building with labs, a larger portion of waste may have been attributed to those companies. Due to these uncertainties and limitations, emissions from waste generation were excluded from the quantification.

Category 6: Business Travel
As no spend-based emission factor was found for air travel, one was calculated based on an emission factor and a factor representing spend per passenger-km (1).

$$Kg\ CO_2e/SEK = \frac{Kg\ CO_2e/passenger-km}{SEK/passenger-km} (1)$$

Category 7: Employee Commuting
The data from the employee survey was utilised to calculate emissions from employee commuting. Calculations were based on the daily transportation habits of each employee during an average week to determine total distance by vehicle type (2) and the overall emission impact from commuting (3).

$$\begin{aligned} &Distance\ by\ vehicle\ type\ [km] \\ &= \Sigma(Travel\ distance\ per\ day\ [km] \\ &* \#days\ per\ week\ by\ vehicle\ type \\ &* Average\ \#work\ weeks\ per\ year) \end{aligned} (2)$$

$$\begin{aligned} &CO_2e\ from\ commuting \\ &= \Sigma(Distance\ by\ vehicle\ type\ [km] \\ &* Vehicle\ specific\ emission\ factor\ [kg\ CO_{2e}/km] \end{aligned} (3)$$

Category 8: Upstream Leased Assets
Internal data on leased vehicle quantity, total fuel consumption in 2022, and total km driven in 2023 were collected. Total emissions were calculated similarly to category 7, with total km multiplied by the vehicle-specific emission factor for 2023, and fuel amount multiplied by the fuel-specific emission factor for 2022.

3.2.2 Interviews, focus groups, survey

After conducting interviews, the first step in the transcription process involved listening to the recordings and, along with notes, summarise important sections. The interview material was then organised into central topics (Table 3.3), covering all relevant environmental sustainability aspects, including attitudes and knowledge regarding the company's environmental efforts. These findings were colour-coded to highlight similar opinions among respondents, facilitating the identification of concurrences and discrepancies, and drawing conclusions for each topic.

Similarly, recordings from focus group discussions were reviewed, and important sections transcribed. These transcriptions were summarised based on different discussion topics to identify key findings. Additionally, for the survey, extrapolation was used to derive commuting results applicable to the entire company. As no survey was sent out during 2022, similar travel habits as in 2023 were assumed for 2022, to calculate the corresponding commuting emissions. The outcomes of each question were visualised through the construction of graphs.

3.2.3 Benchmarking

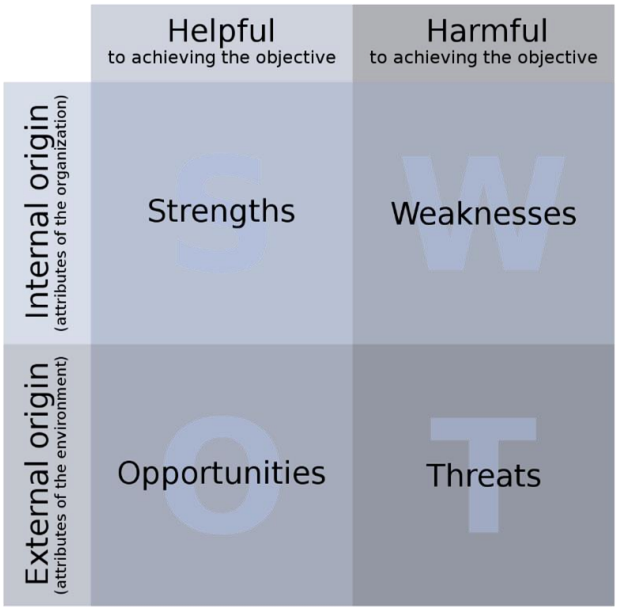
The gathered data on environmental impacts and activities of similar companies to Antaros was used in a benchmarking. This comparative analysis assessed Antaros' environmental performance, identifying strengths and weaknesses, and compiled environmental activities of similar companies to suggest potential improvements for Antaros. Summarised data was tabulated in a Google Sheets document. Companies with environmental sustainability communication were sorted and compiled together with their environmental activities to provide an overview (Table 4.1). Additionally, the data was used to create charts for both competitors and comparable companies, facilitating the comparison of environmental impact and practices during the first focus group session. Finally, the detailed analysis of selected companies' environmental efforts provided concrete examples of potential practices.

3.2.4 Environmental SWOT analysis

A SWOT analysis was conducted to identify strengths, weaknesses, opportunities, and threats regarding Antaros' environmental work. It served as a discussion point in the first focus group and helped identify environmental challenges for the stakeholder analysis. Following a four-step methodology (Harrison, 2010), the analysis began with data collection, incorporating information from benchmarking, interviews, surveys, and environmental data inventory. The collected data was then categorised into strengths, weaknesses, opportunities, and threats based on Antaros' environmental work. Strengths and weaknesses arose from internal aspects, while opportunities and threats were of external origin (Figure 3.1). These issues were organised into a matrix, offering a concise overview of environmental risks and potential opportunities for the company.

Figure 3.1

The SWOT matrix



Note. Retrieved From (Xhienne, 2022).

3.2.5 Stakeholder analysis

A stakeholder analysis was undertaken to identify stakeholders with a vested interest in the company's environmental challenges, based on threats identified in the SWOT analysis. These stakeholders were important for management to consider in successfully implementing an environmental sustainability strategy. The analysis followed three steps (Reed, et al., 2009):

1. Stakeholder identification and their stake
2. Stakeholder categorisation
3. Investigating stakeholder relationships

In the first step, potential stakeholders were identified based on their ability to influence or be affected by environmental challenges. Each respondent's stake was determined from interview responses and documented in a table (Table 4.2). The second step involved evaluating each stakeholder's power, legitimacy, and urgency (Mitchell, Agle, & Wood, 1997). The third step was qualitative, relying on interview material to identify situations where stakeholders shared interests, collaborated, or depended on each other.

3.3 Analysis strategy

The analysis was structured around the research questions, serving as the foundation for understanding results and applying relevant theory to address the study's aim. The first question, *How can a strategic environmental work be developed for Antaros?* focused on describing important aspects for Antaros to consider during environmental sustainability strategy formulation and implementation. The analysis followed steps in the change model (Stouten, Rousseau, & Cremer, 2018), starting with the first phase (Table 2.1) of integrating environmental sustainability into the organisation, and

proceeding to implementation through processes. Emphasis was placed on empowering employees to implement environmental measures and reinforcing the change process.

The second question, *How can Antaros influence the environmental work within its value chain?* centred on Antaros' potential impact within its value chain. Key considerations included sustainable procurement, supplier selection, supplier management, and direct and indirect impacts during clinical trials.

The third and final question, *How can Antaros use strategic environmental work as a competitive advantage?* analysed the significance of sustainable communication for Antaros to potentially gain advantages. It explored the company's potential to position itself as a first-mover and examined its impact on competitors and the industry.

4 Results

This chapter presents the results of the study comprising the quantification of the company's GHG emissions and the awareness and attitudes of its employees. A benchmarking of how the company compared to peers, and potential activities for Antaros is further presented, followed by an investigation into which stakeholders were affected by and can influence the environmental work. The chapter concludes with focus areas for the company going forward.

4.1 Identifying environmental impacts, attitudes and implications

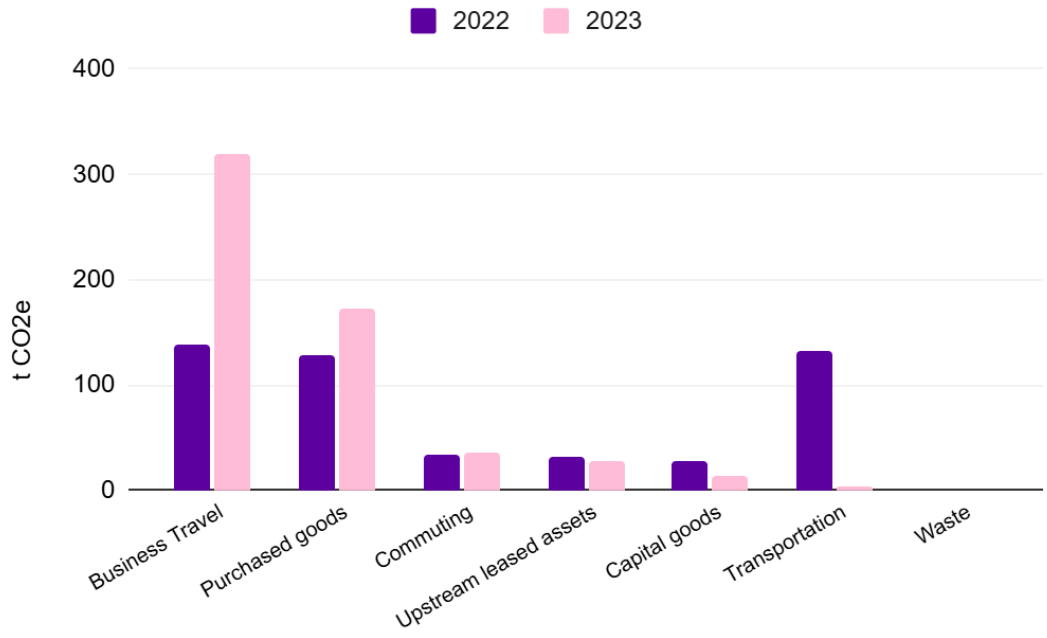
This section highlights where the company's environmental impacts were, the employee's attitudes, and their implications. This is showcased quantitively through the results of the GHG Protocol and survey, and qualitatively through the interviews, and focus group discussions.

4.1.1 Greenhouse Gas Protocol

The emission estimates according to the GHG Protocol were used to quantify Antaros' impacts, compare them with perceived impact areas from interviews and survey, and served as a foundation for focus group discussions, highlighting the company's starting point. The results encompassed scope 1, 2, and 3 emissions, and the recent trends in scope 3 categories. Findings revealed that Antaros had zero scope 1 emissions, as it is a knowledge-creating company without manufacturing operations. Additionally, since the company solely used renewable energy in its offices, it had zero scope 2 emissions. Consequently, all the company's emissions were categorised under scope 3 (Figure 4.1).

Figure 4.1

Scope 3 emissions for Antaros during 2022 and 2023

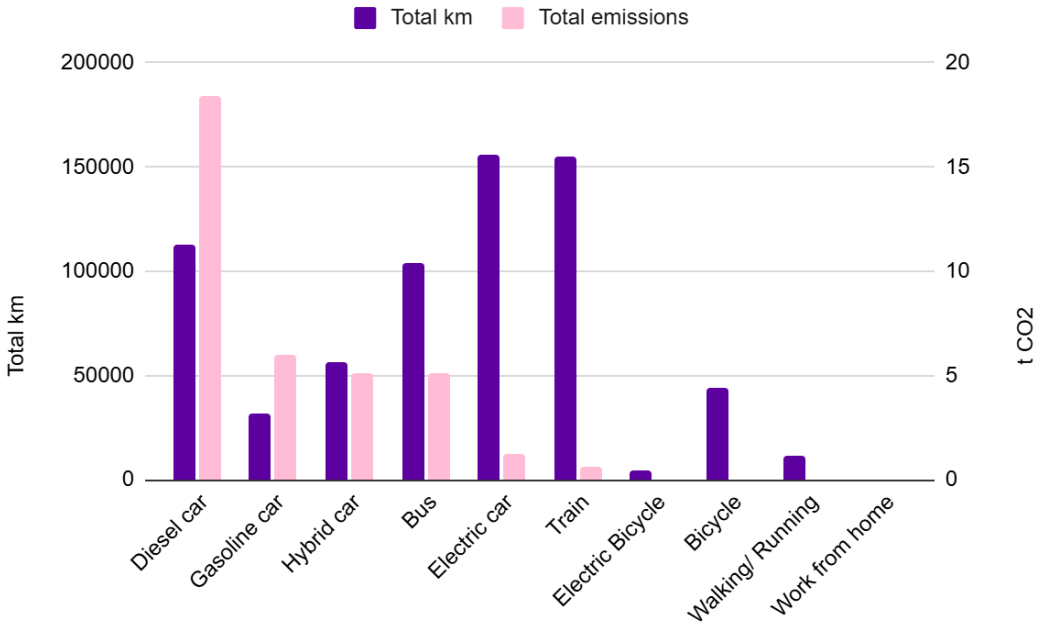


In 2022, Antaros' scope 3 emissions totalled 491 t CO_2e and increased to 571 t CO_2e in 2023. For the scope 3 categories, the emissions distribution highlighted business travel, and purchased goods as the major impact categories for 2023 (Figure 4.1). Business travel emissions primarily originated from air travel, along with contributions from train, taxis, hotels, and restaurants. The increase in emissions between 2022 and 2023 was due to a return to normal flying behaviour post-covid. For purchased goods and services, emissions rose in 2023 despite decreased spending as more was spent on physical goods, which had higher carbon intensity than services. Nonetheless, over 90% of expenditure in this category is related to various services. Transportation emissions significantly decreased in 2023 due to a shift in the company's operating procedures, with a large portion of documents previously transported physically being sent digitally.

The remaining categories had a limited impact, with uncertain effects from waste due to limited data availability. Commuting had a low overall impact, yet the data on commuting habits (Figure 4.2), indicated potential for improvement, showing that a significant portion of emissions came from diesel car usage. Notably, only seven employees used diesel cars, yet they represented most of the commuting emissions.

Figure 4.2

Distribution of kms and emissions from commuting modes during 2023



4.1.2 Purpose, awareness, and attitude of the company's environmental work

To understand the company's previous environmental efforts and related attitudes, the following aspects were examined: the purpose of initiating these efforts, employees' interest in environmental sustainability, the environmental sustainability of their business choices, awareness and opinions of the company's initiatives, their perspective on the company's environmental responsibility, and their views on prioritising environmental sustainability. The main reason for initiating environmental work was due to demands from a large customer. However, this catalyst was accompanied by other driving factors such as branding, attracting employees, business implications, and an existing interest in environmental sustainability among employees.

Generally, there was a high level of personal interest and engagement with environmental sustainability among employees, though this varied somewhat. Some employees frequently considered environmental sustainability in their daily lives, avoiding air travel and buying second-hand items. Others made balanced choices, such as continuing to fly but mitigating their environmental impact through actions like waste sorting and using public transportation. The survey confirmed a high, though varied, consideration of environmental sustainability among employees, represented by their business travel practices and interest in commuting initiatives. Most, 55%, chose the train for travel between offices, while 38% opted for air travel (Figure 4.3). More than 80% considered environmental sustainability when booking travel, such as travel mode or hotel choice (Figure 4.4). Many employees showed interest in public transport and bicycle subsidies, although some had no interest (Figure 4.5).

Figure 4.3
Transport modes used between offices

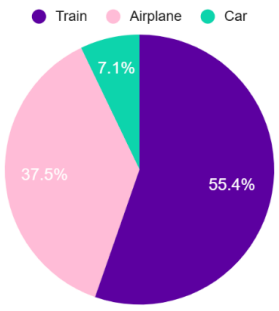


Figure 4.4
Environmental considerations when booking travel

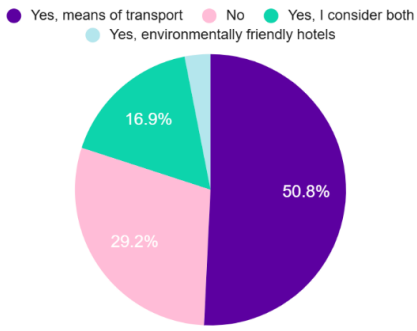
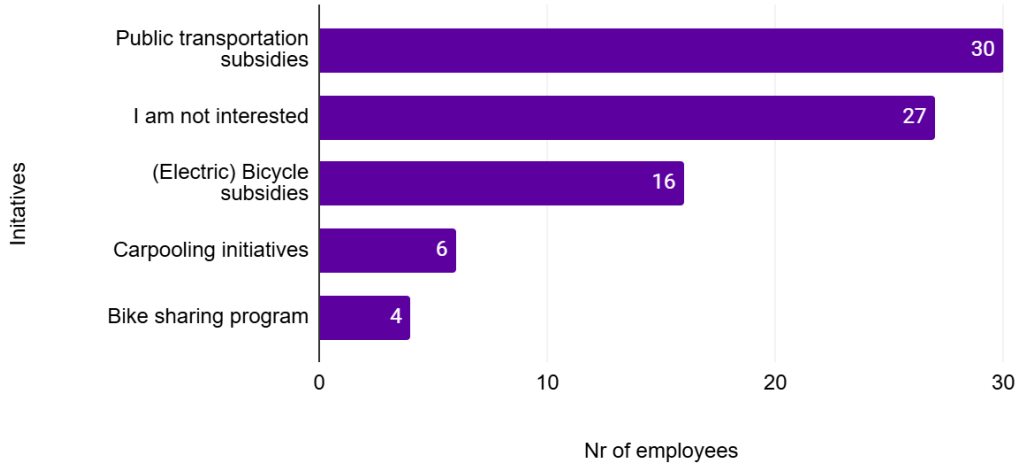


Figure 4.5

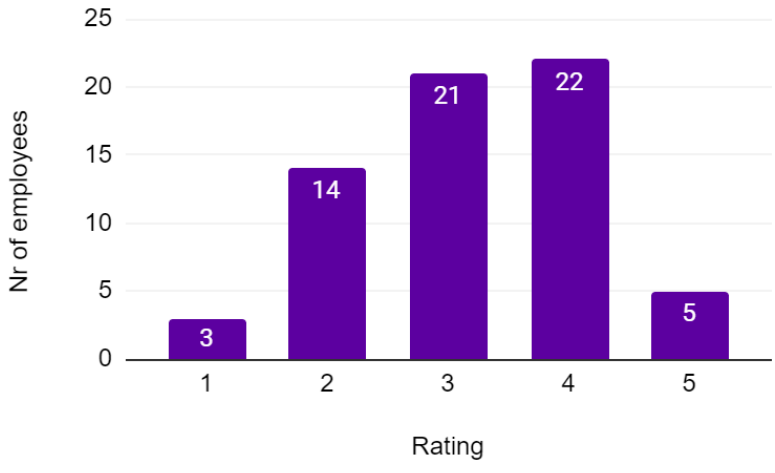
Employee interest in commuting subsidies



The employees' awareness of the company's environmental work showcased that most felt they had some knowledge, but few had a complete understanding of Antaros' initiatives (Figure 4.6). This aligned with interview outcomes, which showed a correlation between awareness level and seniority. Generally, department managers were more informed about practices within their areas, while other employees knew that work was ongoing but lacked specifics. Examples of known environmental activities included recycling, the EcoVadis assessment, and use of renewable energy.

Figure 4.6

Employees' awareness about the environmental work in the company

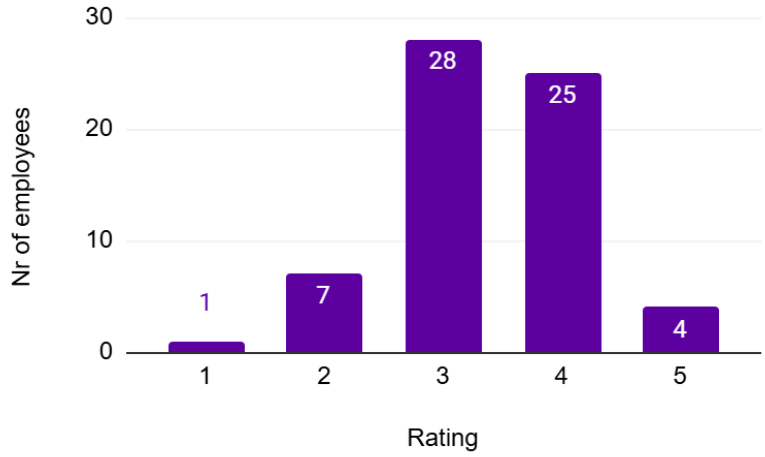


The employees' ratings of Antaros' environmental sustainability work indicated that while many employees were neutral, there were notably more with a positive perception than a negative one (Figure 4.7). The interviews provided a more cohesive picture, with all interviewees stating that the company was doing well considering its smaller size and limited resources. However, some expressed a sense of urgency for improvement, but specifics were not provided.

All interviewees agreed that despite being a smaller, knowledge-creating company without manufacturing operations, Antaros had the same responsibility as larger firms to prioritise environmental sustainability and improve where they could. The significance of establishing environmental targets was emphasised, with several noting the importance of aligning these goals with other company objectives. Some respondents mentioned challenges in defining and prioritising these goals, although one member of the management team noted increased discussion of these topics during management meetings.

Figure 4.7

Employees' rating of the company's environmental work



4.1.3 Reasons for limited environmental work and implications of improving it

To understand the motivations behind the environmental work, reasons for limited prior efforts, and the advantages and disadvantages of improvement were examined. Interviews and focus group discussions revealed that as a small, fast-growing company, Antaros had prioritised central business operations like securing customer contracts and building imaging analysis capabilities over environmental sustainability. The absence of external pressures was cited as another key reason, but emerging customer demands at the time of the study indicated a shift.

Employees recognised several benefits of improved environmental practices, including better sales and vendor branding, competitive advantages, and talent attraction, particularly among the younger generation. However, environmental sustainability had not yet influenced recruitment processes. An environmental sustainability profile was seen as beneficial for securing contracts, though one respondent doubted its impact, believing customers prioritised economic factors. The main disadvantage cited was the increased cost of environmentally sustainable options. One respondent highlighted the need to balance economic and environmental aspects, emphasising that the company had to generate more revenue to sustain increased costs to remain economically viable.

4.2 Environmental benchmarking and value chain activities

This section shows how Antaros compared to peers, including the expanded selection of competitors and similar companies in other industries, in terms of GHG emissions and environmental activities. Furthermore, a mapping of which activities that other companies were engaged in, both among peers and among companies in Antaros' value chain is presented.

4.2.1 Environmental benchmarking

The benchmarking results of Antaros' environmental work, GHG emissions, and activities compared to peers are detailed. Only 32% of competitors disclosed their environmental initiatives on their websites, in CSR reports, or annual reports. Consequently, the benchmarking was expanded to include peers from other industries with similar operations and geography. Antaros' total scope 3 emissions per revenue are displayed alongside its peers to illustrate the industry emission distribution (Figure 4.8), showing Antaros in the middle range.

Figure 4.8

Scope 3 emissions per revenue of Antaros and its peers

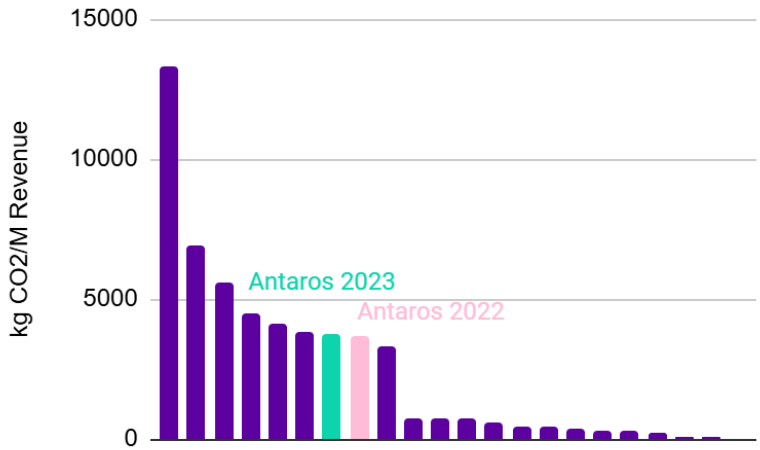


Table 4.1 presents the environmental activities of peers that communicated their environmental efforts, sorted by frequency. Antaros was in the middle range for the number of activities, with larger companies having more diverse initiatives. The table highlights both common and uncommon environmental activities among Antaros and its peers through the number of "x" marks.

Antaros had limited activities in purchasing goods and services, business travel, energy efficiency, and communicating the environmental effects of their products, which were more widespread among peers. Common activities among peers included recycling, waste handling, and virtual communication, where Antaros also had practices. However, Antaros engaged in employee training and used clean energy, which were uncommon among peers. Antaros was not ISO 14001 certified or involved in climate compensation, which were somewhat common among peers. Few companies promoted sustainable commuting, and the low mentions of activities related to clinical trials and water use were likely due to limited lab and trial operations among the companies.

Table 4.1

Overview of environmental activities each company were engaged in

Company / Activity	IQVIA	Salesforce	KnowIT	ICON	Clario	Tietoevry	Cellavision	Softronic	Unilabs	Vitec	Exsitec	Antaros	Medpace	Lime	SAP	Pagero Group	Sectra	Fortnox	Formpipe	ENEA	ContextVision	Rayserach	Ortivus	Radiomics.bio	Adobe	Calyx	Sinch
Purchasing of goods and services	x	x	x	x	x	x	x	x	x	x	x		x			x	x	x	x	x				x	x	x	
Environmental effects of use of product	x	x	x	x	x	x	x	x			x			x	x	x	x			x			x		x		
Business travel	x	x	x		x	x	x	x		x	x			x		x			x		x	x					x
Recycling	x		x	x	x	x	x		x			x	x		x	x		x	x	x							
Waste handling	x			x	x		x		x	x	x	x	x	x							x		x	x			
Energy efficiency	x	x	x	x		x		x	x	x					x				x	x		x		x			
Virtual communication	x	x		x					x			x				x	x	x			x	x	x				x
ISO 14001	x		x		x	x	x	x	x						x		x										
Purchasing clean energy	x	x	x			x		x		x		x						x							x	x	
Climate compensation		x	x		x	x	x			x				x	x												
Training/engaging employees	x	x	x	x				x			x	x															
Investing	x	x											x	x													
Clinical trials	x			x	x																						
Water use	x												x														
Commuting	x										x																

Note. Antaros is marked in yellow, the expanded selection of competitors is marked in grey.

The detailed analysis of selected competitors revealed specific activities in frequently occurring categories like sustainable procurement, business travel, recycling, waste handling, and energy efficiency. In sustainable procurement, competitors highlighted supplier codes of conduct, requiring environmental stewardship and emission reduction commitments, with some not awarding business to non-compliant suppliers. One competitor supported suppliers in setting science-based targets. Related to business travel, competitors implemented travel policies, promoted virtual meetings, assessed travel necessity, and incentivised low or zero-carbon travel options.

For recycling and waste handling, activities included increasing recycling volumes, minimising primary material use, handling hazardous waste, upcycling electronics, promoting reusable items, diverting food waste to bioethanol facilities, extending computer lifespans, returning used cell phones, and integrating circular economy principles. To improve energy efficiency, competitors utilised environmentally certified buildings, monitored office electricity consumption, reduced office numbers and sizes, used LED lighting and motion detectors, and implemented energy-efficient heating and cooling systems.

4.2.2 Value chain activities

Several suppliers including computer and software suppliers, office providers, and magnetic resonance imaging (MRI) machine producers, influenced Antaros' environmental impact throughout its value chain, underscoring the importance of evaluating their environmental practices. For instance, HP, a major computer supplier, had implemented various environmental initiatives. These included conducting life cycle assessments (LCAs) and product carbon footprints (PCFs) for numerous products, utilising recycled materials, optimising energy efficiency, and providing services like compute and print as a service, and refurbished computers.

Additionally, the environmental practices of cloud service providers, such as Amazon Web Services (AWS) and Microsoft Azure, were impactful due to Antaros' reliance on cloud-based software. AWS aimed for 100% renewable energy by 2025, used energy-efficient chips, and extended hardware lifespans through maintenance and repair programs. Similarly, Azure targeted full renewable energy reliance by 2025, reduced server idle power consumption, minimised peak power usage and provided tools like the "Emissions impact dashboard" to estimate emissions related to cloud usage.

Another key supplier, Vasakronan, provided office spaces to Antaros and had an extensive environmental strategy. Initiatives included energy-saving measures like efficient lighting and ventilation, material reuse, sustainable energy production, and transportation minimisation. Moreover, the environmental practices of MRI machine producers, such as GE, Siemens, and Philips, were essential as Antaros utilised MRI machines in clinical trials. These companies focused on energy reduction, and implemented design changes to minimise resource usage and extend system lifespans. They also offered energy-saving features such as GE's machines' built-in sleep mode to conserve energy, Philips offered a function that provided low-energy scanning modes, and Simens utilised AI to shorten scan times without sacrificing image quality.

4.3 Stakeholder analysis

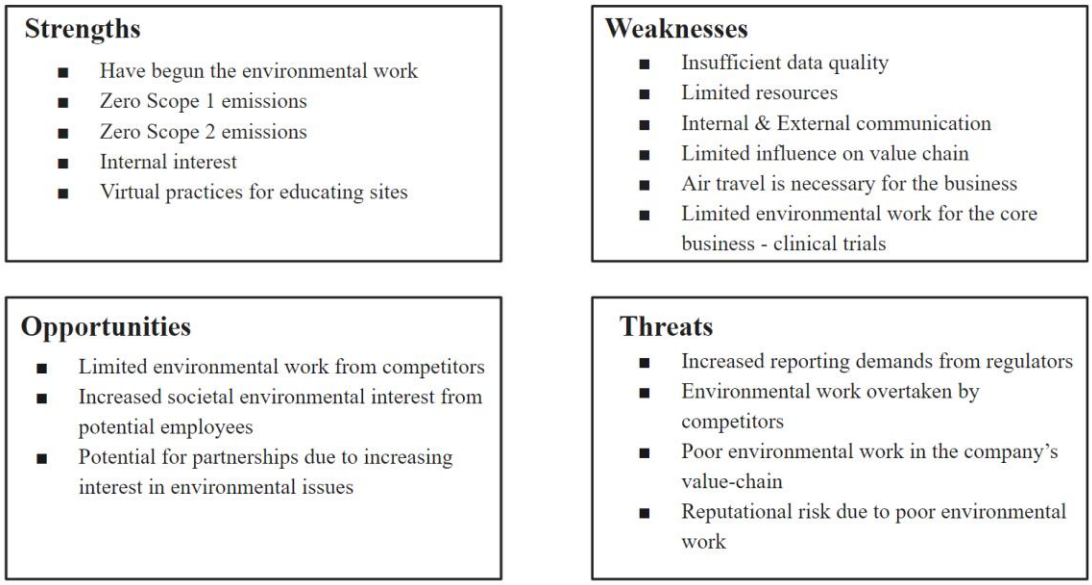
This section outlines the results of the stakeholder analysis, which aimed to identify the company's environmental challenges through a SWOT analysis, determine the stakeholders affected by these challenges by defining their stake, and categorise them accordingly. Furthermore, the most urgent environmental challenge was identified, how the stakeholders could influence it was investigated, and the relationships between the stakeholders were explored.

4.3.1 Environmental SWOT analysis

The SWOT analysis, based on compiled materials from the GHG Protocol, interviews, the survey, and the benchmarking, summarised and visualised the strengths, weaknesses, opportunities, and threats in terms of the environmental work (Figure 4.9). The threats represented significant environmental challenges for the company, such as potential gaps in its environmental efforts and increasing pressures from regulators and competitors. These threats were linked to weaknesses, which primarily arose due to Antaros being an SME with limited resources and influence. However, given limited environmental efforts from competitors and growing societal interest in environmental issues, these challenges could be transformed into opportunities. The company's strengths, including zero direct climate impact, initial environmental efforts, and internal interest, could help leverage these opportunities.

Figure 4.9

Strengths, weaknesses, opportunities, and threats related to Antaros' environmental work



4.3.2 Stakeholder identification and characterisation

Eight stakeholder groups and their stakes were identified based on their potential to be affected by and influence the environmental challenges (Table 4.2). Employees were defined as non-managerial staff, while various departments were represented by their respective managers. The CEO, owners, and board members were also identified as stakeholders with a vested interest in the company's environmental work, but they were omitted from this analysis as no interviews were conducted with them. Secondary stakeholders, such as media, the government, and industry associations, were excluded as they were considered to have no direct interest in the company's environmental work due to Antaros' relatively small size.

Table 4.2

Overview of the stakeholders, their stakes, and their characterisation

Stakeholder	Stakeholder type	Stake in poor internal environmental work	Stake in poor environmental work in the value chain	Stake in environmental regulatory pressures	Stake in environmental work overtaken by competitors
IT	Dominant	B: Operational efficiencies	B: Purchasing responsibility	A: Cost considerations Data requirements	A: Industry expectations B: Operational efficiencies
Software	Definitive	B: Operational efficiencies	B: Purchasing responsibility	A: Cost considerations Data requirements	A: Industry expectations B: Operational efficiencies
HR	Definitive	A: Employee dissatisfaction B: Internal education Internal communication	B: Purchasing responsibility	A: Cost considerations Data requirements	A: Attracting talent
Marketing	Definitive	A: Brand image External communication options	A: Brand image B: Partner/supplier communication	A: Brand image B: Public relations	A: Brand image Marketing strategy B: Communication strategy
Clinical operations	Definitive	A: Partner relationship B: Monitoring and reporting Partner relationship	A: Partner relationship B: Purchasing responsibility	A: Cost consideration Data requirements B: Collaboration and partnerships	A: Industry expectations B: Collaboration and partnerships Monitoring and reporting
Imaging science	Definitive	A: Reputational risk B: Internal training and awareness Monitoring and reporting	A: Reputational risk B: Purchasing responsibility Supplier training/awareness	A: Cost considerations Data requirements B: Monitoring and reporting Training and awareness	B: Training and awareness Monitoring and reporting
Employees	Dangerous	A: Job security Motivation B: Influencing practices	A: Job security Ethical concerns B: Influencing practices	A: Job security	A: Job security Workplace pride B: Influencing practices
Customers	Definitive	A: Reputational risk Regulatory risk B: Improvement expectations	A: Reputational risk Regulatory risk B: Improvement expectations	A: Cost increases B: Improvement expectations	A: Reputational risk B: Improvement expectations

Note. A: How the stakeholder was affected, B: How the stakeholder could influence.

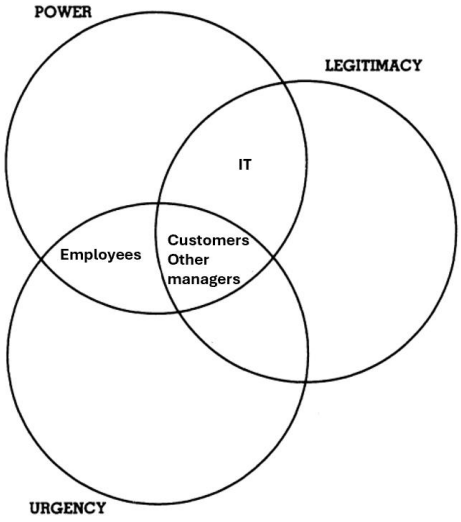
Stakeholders were categorised as *definitive*, *dominant*, or *dangerous* (Table 4.2). Customers were considered definitive stakeholders possessing power, legitimacy, and urgency (Figure 4.10). As major income sources, they held power, while legitimacy stemmed from their status as large companies with extensive environmental knowledge, and expressed urgency through emphasising the importance of Antaros' environmental work for their own environmental goals. Software, HR, Marketing,

Clinical operations, and Imaging science, represented by their managers, were also classified as definitive stakeholders. They had power and legitimacy from experience, and urgency by underlining the significance of the environmental work.

The IT department, represented by its manager, was labelled a dominant stakeholder possessing power and legitimacy but lacking urgency (Figure 4.10). The manager had power and legitimacy from experience, but a lack of urgency was expressed due to a perception of limited environmental impact from the company. The employee group was considered dangerous stakeholders due to their power and urgency, but lack of legitimacy. While influential in organisational changes and expressing urgency for environmental work, their limited knowledge of environmental practices lessened their legitimacy.

Figure 4.10

The characterisation of the stakeholders



Note. Other managers included Software, HR, Marketing, Imaging science, and Clinical operations.

4.3.3 Environmental challenges

The most urgent environmental challenge, determined by the stakeholders' capacity to influence or be impacted by it, was poor internal environmental work. This challenge was prioritised as it could address all other challenges. Enhancing internal environmental practices could enable Antaros to influence practices throughout its value chain, particularly in selecting and engaging with partners. Furthermore, reinforcing internal environmental practices could alleviate the other potential challenges: mounting regulatory and competitive pressures.

Stakeholder groups were affected by and influenced the most urgent environmental challenge in various ways. The IT and Software departments could impact operational efficiency by altering the energy efficiency of IT infrastructure and image analysis software. The HR department could affect the challenge through internal education and

communication, directly influencing employee satisfaction. The marketing department could be affected by the perception of the company's environmental work, as it would impact the brand image and external communication. Clinical operations managed partnerships with customers and suppliers, which could be influenced by the company's environmental reputation. They could also gather data on partners' environmental performance to encourage environmentally considerate practices. The imaging science department's reputation could suffer due to poor environmental performance, impacting partnerships and internal training. Poor environmental practices could affect employee motivation and job security, which could prompt demands for better practices. For customers, poor environmental practices by Antaros could harm their reputation and pose regulatory risks, which could trigger demands for higher environmental standards.

4.3.4 Stakeholder relationships

The relationships among stakeholders were explored, including those within the sustainability group, between managers and employees, and between the company and its customers. The sustainability group, comprised of representatives from HR, Marketing, and Clinical operations, played an essential role in the company's environmental work. With two members being part of the management team, they could swiftly address environmental concerns at a strategic level. The group gained increased influence due to growing customer demands for environmental responsibility at the time of the study. Internally, the group operated with a flat hierarchical structure, evenly distributing responsibilities without conflict of interest.

Another key relationship existed between managers and employees. The company prioritised a culture that recognised employees as the foundation of its value and competence. Employees were empowered to make decisions and take responsibility for tasks, showcasing a higher degree of power compared to companies with different cultures. This approach was evident in the company's guidance-based approach to business travel, instead of a strict policy, prioritising employee well-being without constraints. The relationship between customers and the company, particularly with Clinical operations, was significant. The company closely collaborated with partners during clinical trials, often reliant on decisions from larger partner companies. Customer demands were a main driver of environmental initiatives, underscoring their substantial influence on environmental matters.

4.4 Focus areas for improving environmental work

This section highlights the focus areas that the employees perceived to be most important from the survey and interviews. The three focus areas of business travel, sustainable procurement, and environmental impacts during clinical trials are further described.

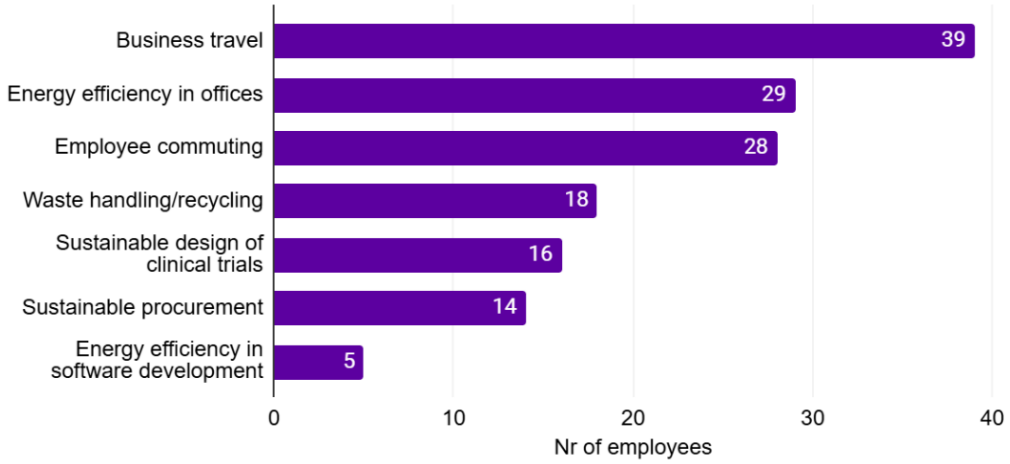
4.4.1 Perceived focus areas

To determine focus areas for Antaros' future environmental work, opinions from survey respondents and interviewees were investigated. The survey identified business travel, office energy efficiency, and commuting as key areas (Figure 4.11). Interviewees also frequently mentioned business travel, internal communication, commuting, and sustainable clinical trial design, though many noted limited knowledge in the last area.

Comparing perceived impacts with actual emissions (Figure 4.1), business travel was correctly identified as the highest impact area. However, there was a knowledge gap: energy efficiency and commuting were perceived as significant but had limited actual impact, while sustainable procurement, which had the second highest impact, was not recognised as important by as many employees.

Figure 4.11

Employees' opinions regarding focus areas for the environmental work



4.4.2 Business Travel

During the first focus group with the sustainability team, business travel, was discussed, being regarded as significant due to its substantial environmental impact. Topics covered included improving data quality, travel guidance, hiring locally, and carbon offsetting. Company representatives recognised the need for higher data quality to replace expenditure data, and considered investigating obtaining additional data from their corporate card provider. The members were also open to the suggestion of implementing a travel booking system to track GHG emissions and simplify the booking process.

A representative mentioned that a travel policy was under development, but called it a "travel guidance" to align with the company's employee-centred culture, aiming to encourage sustainable travel decisions without imposing guilt or forcing decisions. This included enabling the employees to make sustainable decisions through potentially allowing travel during work hours to promote train over flights. The idea of a guidance for essential travel was discussed, but met with scepticism. It was argued that discouraging in-person meetings could potentially have negative impacts on company culture and employee relationships. The strategy of hiring locally to reduce travel needs was already in practice and under consideration for expansion. Carbon offsetting was briefly explained, and participants were positively surprised by its relatively low cost. Interest was further raised by how a customer interview revealed a positive view of carbon offsetting among its suppliers, provided other emission reduction measures were also in place.

4.4.3 Sustainable procurement

The GHG protocol revealed that procurement was a significant environmental impact area for the company. Poor data quality, sustainable procurement policy, and specific guidelines were discussed in the first focus group. As only spend data was available, leveraging supplier-specific data was suggested, but representatives noted challenges in collecting this due to resource constraints and the volume of small transactions. However, they were open to exploring this for larger purchases like for computers.

A participant mentioned a drafted sustainable procurement policy that was yet to be published. Discussions further concluded that clearer and more specific guidelines were needed. For example, the IT manager emphasised the need for environmental procurement requirements for hardware to motivate purchases of replacement parts, prolonging product lifetimes. The head of IT also noted that their software suppliers' data centres significantly impact Antaros' environmental performance based on their choice of energy sources. While it would be challenging to require software suppliers to use clean energy due to their specialised nature and limited competition, there was interest in investigating this further.

4.4.4 Environmental impacts of clinical trials and indirect impacts

The final area discussed in the first focus group was the environmental impacts of clinical trials, the company's core business, though its environmental effects were not well understood. Topics related to potential measures, the environmental impacts of sites, impacts on the industry, and impacts from Antaros' method were raised. Potential measures included reducing patient travel by using sites with imaging capabilities and assessing the energy efficiency and origin at sites.

One participant suggested that understanding the environmental sustainability of trial sites could be commercially valuable, potentially allowing the company to charge more for sustainable sites. A major customer indicated interest in such data, though financial implications were not mentioned. Company representatives saw the potential to influence the industry by requiring environmentally sustainable sites and encouraging sponsors to demand them from all their suppliers. They also considered investigating and communicating potential reduced environmental impact of their medical imaging compared to other methods, but raised resource challenges in assessing these impacts.

In the second focus group, indirect impacts of Antaros' business were discussed. Participants considered the influence of cancelling ineffective drug studies early, yielding positive economic and environmental outcomes. They debated their responsibility for the environmental impact of developed drugs, recognising their role in the drug development chain but believed that it was not their duty to ensure drugs do not contaminate the environment. Additionally, the question of whether to participate in the development of extremely toxic drugs, including oncology drugs, was discussed. It concluded that this issue presented an ethical dilemma of balancing human lives against environmental protection.

5 Analysis

This chapter contains an analysis of how Antaros could enhance their environmental efforts and the potential implications of these improvements. The analysis is structured around the three research questions, with the first focusing on how a strategic environmental work could be developed for Antaros. The second investigates how the company could influence its value chain as a knowledge-creating SME with limited bargaining power. The final section explores the potential advantages that Antaros could gain from improving its environmental work and how this would influence its competitors, partners, and the industry.

5.1 How can a strategic environmental work be developed for Antaros?

The following section explores how environmental sustainability could be incorporated into Antaros' business strategy, how it could be implemented into the company's practices by the adoption of procedures, and how the empowerment of employees can ensure that changes are reinforced in the organisation.

5.1.1 Integrating environmental sustainability in strategies

Antaros was at the start of the greening process and to integrate environmental issues into its operations (Sancak, 2023), the company needed to examine external drivers, build competence, support a guiding coalition, and align its strategic work. Customer demands for environmental information, driven by CSRD requirements, became a key driver for Antaros initiating and developing its environmental work (Galpin & Hebard, 2018). Regulation was therefore an indirect driver for the company since they were not included by the directive as an SME, but felt its effects through customer demands. Such drivers were uncommon motivators to initiate environmental work among SMEs (Zorpas, 2010). The same was true for competition, which was a minor driver for Antaros due to the lack of environmental work among competitors.

As the employees had the power to influence but a general lack of knowledge about environmental practices, and learning is central to all change processes (Stouten, Rousseau, & Cremer, 2018), Antaros needed to improve its environmental competence. This could be done through either recruiting individuals with existing environmental sustainability expertise or building internal knowledge by enhancing the skills of current employees through online courses or external workshops. Additionally, the benchmarking indicated that the environmental knowledge within the industry was limited in general, suggesting a larger problem not specific to the case company.

Such efforts were particularly relevant for the sustainability group, which acted as the organisation's guiding coalition (Sancak, 2023). Despite the members' high interest and engagement, the legitimacy of the group could potentially be constrained by the lack of formal environmental competence. In order for the guiding coalition to drive the transition (Sancak, 2023), it should also be given sufficient authority to implement changes (Kotter, 2009). This was in part provided by the inclusion of two members from the corporate management team, and the diversity of members from HR, Marketing and Clinical operations, ensured a broad range of perspectives (Beer, Eisenstat, & Spector, 1990; Stouten, Rousseau, & Cremer, 2018).

Antaros briefly mentioned environmental sustainability in its values but not in its mission or vision statements, contrasting with literature advocating for its integration into these elements (Galpin & Hebard, 2018; Sancak, 2023). Antaros could therefore revise its mission and vision as it ensures that environmental sustainability is ingrained in the organisation. Antaros had environmental goals but had not yet communicated them. As there was employee support for aligning environmental targets with other goals, which is a success factor SMEs (Caldera, Desha, & Dawes, 2019), the company should share these goals to clarify priorities for stakeholders (Galpin & Hebard, 2018).

5.1.2 Strategy implementation and areas of improvement

Once the company has established an integrated strategy, the next phase is to implement environmental sustainability (Sancak, 2023). This involves allocating responsibilities and resources, preparing managers, adopting an overarching structure for environmental work, gathering and managing environmental data, and monitoring progress.

As Antaros was in the early stages of its environmental sustainability transition, it was essential to examine whether necessary resources and roles were in place for future developments (Sancak, 2023). Such restructuring could be easier for Antaros compared to larger firms, as SMEs typically have lean and efficient structures and decision-making processes (Singh & Garg, 2008). Furthermore, the study indicated that managers generally possessed more knowledge about environmental work than other employees. However, they still require sufficient resources and opportunities to enhance their skillsets to build legitimacy to ensure acceptance of change within their teams (Stouten, Rousseau, & Cremer, 2018).

While Antaros had several environmental initiatives, there was a lack of overarching structure and alignment. An EMS could address this by organising and aligning different components of environmental work, including evaluating impacts, setting goals, and auditing activities (Coglianese & Nash, 2001). As Antaros is an SME, it could begin by adopting a simplified EMS such as a checklist, and then expand it as the company grows. Some of the benchmarked companies had adopted a certified EMS like ISO 14001. However, certification involves additional costs and may not result in reduced environmental impacts (Zorpas, 2010), making its necessity for Antaros debatable. The study also highlighted poor environmental data quality, specifically related to business travel, procurement, and waste. Implementing an EMS could help monitor, enhance and standardise the collection and management of environmental data (Caldera, Desha, & Dawes, 2019; Morrow & Rondinelli, 2002). For instance, Antaros could improve business travel data by adopting a travel booking system that compiles GHG emissions. Organising procurement data by quantity and obtaining company-specific waste data could also enhance quality.

5.1.3 Empowering and nudging for change implementation and reinforcement

Enabling the implementation of the change process requires Antaros to involve the employees and reinforce the change (Stouten, Rousseau, & Cremer, 2018). This involves reflecting on their attitude towards environmental policies, exploring the application of nudging, establishing a circular economy mindset, and anchoring changes in the culture to ensure lasting change.

Antaros' culture placed significant responsibility on its employees, exemplified by allowing them to make their own business travel decisions. This aligns with the importance of empowering employees for successful environmental sustainability transformations (Sancak, 2023). Company representatives preferred guiding employees towards sustainable choices over imposing restrictions, aiming to eliminate barriers. While this approach aligns with achieving environmental sustainability transitions (Kotter, 2009), its long-term environmental impact was uncertain. Without strict policies, achieving long-term environmental goals depends on employees' awareness, motivation, and commitment, which varied within the company. Additionally, the company's limited ability to hold employees accountable could lead to complacency among less interested employees, potentially causing dissatisfaction among engaged employees and resulting in cultural friction.

Business travel was the company's largest climate impact area but remained necessary for operations. Certain meetings could not be replaced virtually without risking competitiveness, making influencing employees' travel choices an important area. Benchmarking revealed how peer companies achieved this through implementing travel policies and incentivising low-carbon options. Antaros representatives expressed interest in allowing travel during work hours to promote the use of trains over air travel. While this approach could yield positive outcomes, being an SME with limited resources, the company could find better use of funds elsewhere.

For Antaros, a mix of pure and preference nudges could promote sustainable employee travel without restrictions or significant costs (Müller, Böhm, & Renz, 2023). Using the travel planning tool, a pure nudge could prioritise sustainable modes of travel, like trains, at the top of search results and sort flights based on climate impacts. Coupled with a preference nudge, informing employees about the climate impact of their chosen mode of transport, the emission and cost reduction results demonstrated in empirical studies (Sanguinetti & Amenta, 2022), could be replicated for Antaros.

Both the company and its employees showed interest in sustainable commuting options. Adjusting the work-from-home policy to allow more days at home and providing subsidies for public transport or electric bikes could reduce emissions. Alternatively, preference nudges could offer a cost-effective approach. For example, informing employees that the majority use sustainable transportation modes, while a small group's diesel car usage significantly contributes to emissions, could have a meaningful impact.

Establishing a circular economy mindset is important (Sancak, 2023), underlined by its prevalence among peers who integrated circular economy principles into their operations. Antaros had initiated some circularity and waste management practices, like recycling electronics and using second-hand furniture, which also could serve as short-

term wins to inspire employees during the transition (Kotter, 2009; Sancak, 2023). However, due to limited data and uncertain impact, it is essential not to overly emphasise short-term wins (Stouten, Rousseau, & Cremer, 2018). These practices could also be expanded to continuously foster a circular mindset rather than implementing individual processes.

Once environmental sustainability has become part of the strategy, processes established, and employees empowered, the final phase for Antaros would be to embed these changes into its culture and operations at all levels (Stouten, Rousseau, & Cremer, 2018). Knowledge gathered during this process only has a significant impact when ingrained as norms (Sancak, 2023). Thus, all internal stakeholders in Antaros, starting from the top, should actively participate to demonstrate implementations. For instance, fostering the bicycle culture within the company or leading sustainable business travel practices sets an example.

5.2 How can Antaros influence the environmental work within its value chain?

This section delves into the analysis of how Antaros as an SME with a limited ability to influence the practices of its value chain, still could have an impact. As it has been shown in the literature that SMEs have been able to transmit the environmental sustainability demands of larger companies to their supply chains (Ayuso, Roca, & Colomé, 2012; Stekelorum, 2019), both Antaros' potential influence in its supply chain and clinical trials is explored.

5.2.1 Green supply chain management

To exert influence over its value chain, Antaros must consider several factors, including aligning its procurement strategy with environmental sustainability goals, undertaking a sustainable supplier selection process, evaluating current suppliers, and engaging in supplier relationship management through both formal and informal governance.

Antaros had considered environmental sustainability in its procurement practices, although a clear policy was still being developed. Additionally, further guidance was needed from employees, especially for purchasing options like battery replacements, which could offer environmental benefits but lacked economic motivation. To address this, the company's procurement policy could be revised to encourage such decisions if significant environmental savings were evident. This aligns with the initial step in the sustainable supplier selection process, which involves aligning the procurement strategy with environmental sustainability goals (Rezai, 2019).

Antaros should aim to complete the remaining steps in the sustainable supplier selection process (Rezai, 2019). However, considering potential challenges and time constraints associated with this, the company could begin by evaluating its current suppliers. Data from this study regarding environmental activities within Antaros' value chain revealed untapped environmental efforts from suppliers. Antaros could educate itself on available alternatives and pose inquiries to determine the most suitable options. It was noted that some of Antaros' choices might be restricted, as the company used niche software with few suppliers. Consequently, the significance of managing supplier relationships (Ibrahim, 2019; Rezai, 2019), is underscored.

The company's perceived limited ability to influence its supply chain aligns with findings in the literature concerning SMEs (Lepoutre & Heene, 2006). Successful cases have highlighted the use of formal and informal governance (Ciliberti, Pontrandolfo, & Scozzi, 2008), where adopting a supplier code of conduct, a formal governance approach common among peers, could prove effective for Antaros. Even if enforcement poses challenges, it nonetheless establishes the parameters of the supplier relationship and sets expectations (Ciliberti, Pontrandolfo, & Scozzi, 2008). Moreover, the company could seek assistance from third-party organisations, such as environmental NGOs and associations, to aid in monitoring suppliers.

Antaros could further leverage supplier communication as informal governance. One effective approach is to convey their customers' demands to the supply chain (Stekelorum, 2019). Combined with communication of their own objectives and practices, it could enhance their credibility when attempting to influence suppliers (Ciliberti, Pontrandolfo, & Scozzi, 2008). For suppliers resistant to influence, Antaros should still request environmental information, signalling customer demand and providing specificity on desired data, such as energy sources, emissions, and climate impact. Energy source information may need to be requested from tier-two suppliers, enabling Antaros to raise awareness among them as well. Although responses may not always be provided (Ciliberti, Pontrandolfo, & Scozzi, 2008), Antaros should persist in establishing dialogues and raising awareness among suppliers to foster long-term change.

5.2.2 Influence in clinical trials

A significant part of Antaros' value chain was linked to clinical trials, yet the company and the industry lacked knowledge on mitigating environmental impact in this area. To address this, key considerations include data gathering, site selection, supply chain management to enhance relationships with imaging partners and sites, and understanding indirect impacts.

To bridge the knowledge gap, the initial step should involve gathering data where feasible and requesting data elsewhere, to catalogue environmentally preferable sites. Despite an anticipated low response rate (Ciliberti, Pontrandolfo, & Scozzi, 2008), such efforts could contribute to raising environmental awareness at the sites. The study also showcased that all three major suppliers of MRI equipment were committed to reducing their machines' environmental impact. The environmental efforts of sites, including energy sources and efficiency, could be presented to sponsors to potentially influence them to select more environmentally conscious sites, thereby reducing the overall trial impact. Additionally, when interest in such recommendations was investigated, a major customer expressed enthusiasm. Therefore, this initiative could have commercial benefits for Antaros, potentially enabling them to charge more for environmentally sustainable alternatives.

Antaros' advisory role during clinical trials presented an opportunity to indirectly reduce environmental impact. By recommending cancellation of studies if drugs proved ineffective, unnecessary environmental impact could be avoided. Moreover, through developing more advanced and effective analysis methods, Antaros could minimise this impact further by identifying and cancelling ineffective drugs at an even earlier stage.

5.3 How can Antaros use strategic environmental work as a competitive advantage?

The final section investigates how Antaros could use communication of their environmental efforts to potentially achieve competitive and first-mover advantages. What these advantages entail and how they may influence their competitors and the industry is further analysed.

5.3.1 Sustainable communication strategy

For Antaros to gain the potential benefits of communicating its environmental sustainability vision (Galpin & Hebard, 2018; Sancak, 2023), establishing a communication strategy is imperative. There are several important considerations for this strategy, including avoiding greenwashing, determining the topics, and efficient and clear communication.

Antaros was careful in its communication on environmental sustainability to avoid greenwashing, which likely was appropriate at the time given the company's limited formal environmental knowledge and the importance of avoiding greenwashing (Reilly & Hynan, 2014). The strategy should assess which subjects to communicate by examining competitors' strategies to identify relevant topics (Reilly & Hynan, 2014), which was partly done through the benchmarking in this study.

The benchmarking revealed that larger companies generally communicated more extensively about environmental activities such as procurement policies, business travel, and recycling efforts. Unlike these larger companies, Antaros did not communicate the environmental impact of the usage of its services. However, highlighting the potential environmental benefits of using Antaros' technology could provide advantages. Additionally, Antaros expressed interest in carbon offsetting parts of its GHG emissions, a practice positively viewed by a major customer and communicated by peers. Besides future measures, Antaros could also communicate past practices with positive environmental impacts, such as using environmentally friendly buildings, reducing GHG emissions through virtual training, and minimising physical transportation of trial documents.

Antaros must prioritise specificity and transparency in their communications by avoiding environmental sustainability buzzwords and incorporating numerical data (Reilly & Hynan, 2014). For instance, when communicating emissions savings from reduced transports, including the exact size reduction enhances transparency. Similarly, carbon offsetting communication should detail other mitigation measures, the rationale for offsetting instead of direct emission reduction, how offsetting is achieved, and its contributions.

5.3.2 Advantages of environmental work and implications for competitors

This study and existing literature underscored the benefits of communicating environmental work, including enhanced relationship building, heightened market valuations, improved financial performance, and strengthened employee branding and satisfaction. It is also important to consider potential first-mover advantages and the implications for Antaros' competitors and the industry at large.

Enhanced environmental efforts benefit relationship-building with both internal and external stakeholders (Herzig & Schaltegger, 2011), which is vital for a company like Antaros in an advisory role. Moreover, environmental engagement correlates with higher market valuations (Schadewitz & Niskala, 2010; Wang & Li, 2016), offering business advantages to Antaros. The correlation between superior reporting quality and higher valuations (Wang & Li, 2016), underlines the importance of enhancing the company's data quality.

The company anticipated increased costs during its environmental sustainability transition, aligning with expectations of higher short-term expenses (Ciliberti, Pontrandolfo, & Scozzi, 2008; Dabhilkar, Bengtsson, & Lakemond, 2016). Yet, literature emphasised their outweighing by long-term benefits (Alberti, Caini, Calabrese, & Rossi, 2000). The study addressed the dilemma of prioritising environmental targets over financial ones. However, a clear correlation between enhanced environmental performance and long-term financial outcomes (Gallego-Álvarez, Segura, & Martínez-Ferrero, 2015; Wagner, 2009), have been observed.

The company perceived that enhanced environmental efforts would improve branding among partners and employees. This is consistent with the literature showing that service companies improved their image (Jo, Kim, & Park, 2015), and increased employee satisfaction (Bagur-Femenias, Llach, & del Mar Alonso-Almeida, 2013), by reducing the environmental impact of internal processes. This highlights the importance of these processes in attracting and retaining employees for a company like Antaros, where the culture prioritises employee satisfaction.

This study highlighted the limited environmental initiatives among Antaros' competitors, presenting an opportunity for first-mover advantages. This could be achieved by implementing environmental sustainability initiatives ensuring exclusive benefits, integrated into the vision, and recognised by stakeholders, in combination with identifying asymmetries with competitors (Tetrault Sirsly & Lamertz, 2008). This underscores the importance of integrating environmental sustainability into the strategy. Regarding identifying asymmetries, the benchmarking revealed that significant environmental efforts were mainly by large companies with multiple divisions, indicating that Antaros could gain first-mover advantages in its niche if its environmental sustainability transition is executed well. Potential advantages include enhanced brand reputation and image, and setting industry standards (Tetrault Sirsly & Lamertz, 2008), ensuring a long and prosperous future for Antaros.

Since imaging analysis is a sector with limited environmental initiatives, Antaros could influence competitors and the industry. Attaining a first-mover position could force competitors to intensify their environmental efforts. If Antaros provides environmental data on sites to partners, they might start requesting the same from other suppliers, leading competitors to seek data from sites. This would increase awareness and pressure to reduce climate impact, improving environmental sustainability across the sector.

6 Discussion

This chapter explores the study's strengths, weaknesses, and contributions. It reviews these aspects through an analysis of available literature, methodological choices, limitations, and assumptions. Additionally, it assesses the study's contributions to both the case company and the literature field, encompassing both supportive and contradictory findings.

6.1 Strengths and weaknesses

Strengths observed in this study include the extensive range of literature and research methods employed, contributing to its thoroughness. The study benefited from a wide array of literature, providing a robust foundation, particularly for the analysis. However, weaknesses included limited literature on environmental management of knowledge-creating SMEs and the rapidly evolving environmental sustainability landscape. Another key strength was the diverse research methods used, as this approach facilitated quantification of the case company's environmental impacts, enhancing internal stakeholders' understanding, and informing future recommendations. Increased awareness and enthusiasm for integrating environmental sustainability into company operations were noted.

Nevertheless, there were occasions requiring assumptions and limitations, primarily regarding stakeholder access and data availability for emission calculations within the company. While improvements in these areas could enhance study reliability, the researchers considered the trade-offs acceptable, considering the limitations not significant enough to hinder achieving the study's aim.

6.1.1 Literature in the field

The study drew upon a wide range of literature, covering sustainability change management, SMEs, stakeholder theory, value chain greening, and sustainability reporting. By integrating theories, concepts, models, frameworks, and empirical studies, a robust foundation was established. This diverse literature facilitated a comprehensive understanding of key subjects and enabled relevant and thorough analysis.

While most theories and frameworks explored in the literature applied to the case company, some were primarily focused on manufacturing SMEs, limiting their relevance. Moreover, there was a scarcity of literature addressing environmental sustainability practices specific to knowledge-creating SMEs in the life sciences sector.

Furthermore, the study considered the rapid and dynamic development in the environmental sustainability field, including best practices, regulations, and associated literature. These ongoing advancements rendered the future relevance of the study and its literature uncertain, necessitating continuous revision to remain on par with new insights.

6.1.2 Choice of methods

The study's broad scope, aimed at developing an environmental sustainability strategy, prompted the selection of a diverse range of methods. Combining interviews, surveys, focus groups, GHG modelling, industry benchmarking, environmental SWOT, and stakeholder analysis enabled a comprehensive understanding of the case company and its potential pathways forward.

In gathering employee opinions through interviews, focus groups, and surveys, ethical best practices ensured the study's integrity. Employee perspectives were invaluable, offering insights into current environmental impacts and guiding future strategies. However, future research could benefit from including additional stakeholders such as CEOs, board members, owners, customers, imaging sites, and potential investors to provide an enriched perspective.

The GHG protocol provided a quantifiable foundation, and the internationally recognised protocol standardised results for comparison during industry benchmarking. This comparison highlighted the limited existing environmental sustainability efforts among competitors and similar companies, showcasing potential areas for improvement within the case company's niche. The environmental SWOT and stakeholder analyses offered insights into the challenges faced by the case company and its stakeholder dynamics. Future research could involve a broader range of stakeholders for a more comprehensive understanding.

While the chosen methods offered a broad perspective on the company's environmental sustainability, their extensive scope limited in-depth analysis due to time and resource constraints. Focusing on specific methods could have provided deeper insights. However, the diverse approach effectively achieved the study's aim of developing an environmental sustainability strategy. In future research, balancing breadth and depth in method selection could yield richer insights while maintaining a holistic view.

6.1.3 Limitations and assumptions

The study encountered limitations due to scope 3 data availability, quality, and access to emission factors, as well as survey response rate and a limited number of competitors. These constraints led to assumptions being made to achieve the study's aim. Mainly, limitations stemmed from using the GHG protocol, with a lack of reliable data affecting the emissions inventory's dependability and transparency. Data constraints prevented the calculation of all scope 3 categories, though assumptions were made that omitted categories had minimal impact. Most calculations relied on spend data, resulting in lower reliability. Additionally, the GHG protocol only considered climate impact, omitting other environmental factors like biodiversity or toxicity.

The study's reliance on low-quality data necessitated several assumptions. For category 1: Purchased Goods and Services, a difference in data resolution required assuming expenditure proportions remained consistent between 2022 and 2023. Category 5: Waste Generated in Operations lacked sufficient data, prohibiting reliable emission calculations due to extensive assumptions. Regarding category 6: Business Travel, the absence of a spend-based emission factor led to the construction of one using an emission per km factor and spend per km metric. While this approach further lowered reliability, it facilitated essential calculations material to the study.

Furthermore, for category 7: Employee commuting, calculations were based on a survey, assuming consistent interpretation of questions and accurate responses from all respondents. As no survey was conducted in 2022, assumptions were made related to the distribution of commuting habits to maintain comparability with 2023 data. Lastly, for category 8: Upstream Leased Assets, differing data availability between years led to the use of two calculation methods, reducing direct comparability despite yielding similar results.

The survey achieved a 60% response rate, considered sufficient to draw conclusions about the entire workforce, though a higher response rate would have increased reliability and reduced the need for extrapolation. The industry benchmarking selection posed a limitation due to the narrow scope of direct competitors engaged in environmental work. The inclusion of similar companies in other industries provided valuable insights, but affected comparability and relevance to the case company's industry.

Assumptions and limitations stemmed from time and resource constraints, impacting GHG protocol results and subsequently the entire study's direction and focus group discussions. Despite possibilities for gathering additional data from suppliers, time constraints necessitated reliance on existing limited data within the case company.

6.1.4 Generality

While the various methods produced company-specific results, the underlying theoretical principles and calculation methods could have broader applicability. Since SMEs share characteristics like resource constraints and similar pressures and motivations, the insights from this study could be valuable for other organisations. The study used a service SME as a case company, which limits direct comparability to SMEs with manufacturing operations. However, since the focus was on scope 3 emissions, which for example include purchased goods, business travel, and commuting that are relevant for all SMEs, the strategies discussed could be implemented across industries.

6.2 Contributions from the study

This study has yielded contributions, benefiting both the case company and the research field. The following section examines these contributions, offering insight into their implications and importance.

6.2.1 Contributions to the case company

This study contributed significantly to the case company by boosting environmental enthusiasm, awareness, and understanding, and providing improvement suggestions. Employee enthusiasm for environmental sustainability increased due to the researchers' presence. Additionally, the company's awareness and understanding of environmental impacts and practices improved. For instance, representatives acknowledged the significance of addressing the environmental impact of clinical trials and considered adopting a travel booking system to gather data on business travel impact. Moreover, the study provided the company with actionable suggestions for enhancing its environmental work and methods for quantifying its environmental impact.

6.2.2 New knowledge contributions to the field

The study's primary contribution to the research field lied in its examination of how a knowledge-creating SME in the life sciences sector could successfully implement environmental initiatives. It offered insights by analysing the case company's business, operations, and cultural aspects. Moreover, the study delved into the challenges and possible strategies for influencing the value chain as an SME with limited influence.

6.2.3 Results contradicting or supporting previous studies

The study's findings supported prior research, highlighting the challenges SMEs encounter in their environmental initiatives due to constraints in bargaining power, resources, and capabilities. Additionally, it reaffirmed the significance of efficient communication of environmental initiatives to internal and external stakeholders, consistent with existing literature. Moreover, it validated the notion from prior studies that strong environmental practices contribute positively to branding with partners and customers. One contradictory result was that customer demands significantly motivated Antaros to improve its environmental work, while the literature indicated that this external driver was uncommon among SMEs in general.

7 Conclusions

The study aimed to evaluate the environmental practices of a knowledge-creating service SME and its value chain impact, proposing an environmental sustainability strategy. The company's environmental impact areas were investigated quantitatively through the GHG protocol and qualitatively through interactions with employees. This was combined with industry inputs and stakeholder assessment to formulate pathways for integrating environmental sustainability into the company's operations. Antaros had limited, and generally unstructured, environmental work. Moving forward, the strategy should focus on alignment and adapting the organisation to the set goals.

RQ1: How can a strategic environmental work be developed for Antaros?
Antaros should enhance its environmental competence and align environmental sustainability with its mission and vision statements. Implementation should be done through a simplified EMS, empowering employees, and nudging them in the right direction, to ensure environmental considerations are integrated for the long-term.

RQ2: How can Antaros influence the environmental work within its value chain?
Managing supplier relationships through effective environmental communication, in combination with formal governance such as supplier codes of conduct, is vital to ensure long-term change. Cataloguing imaging sites could guide partners to choose sites with lower environmental impacts.

RQ3: How can Antaros use strategic environmental work as a competitive advantage?
An environmental communication strategy should prioritise transparency, specificity, and avoiding greenwashing for Antaros to gain competitive advantages. The limited environmental work among competitors presents an opportunity for Antaros to gain first-mover advantages and influence the entire industry to become more environmentally sustainable.

Other conclusions include that environmental competence could be increased by either educating current employees or hiring individuals with the necessary expertise, the importance of adopting clear policies such as a procurement policy, the significance of data quality in environmental work, and the necessity of empowering employees by removing barriers to change. Furthermore, the change process only takes effect when integrated into company norms, which leadership should achieve by actively participating and demonstrating the implementations. Antaros should also investigate and communicate the potential environmental benefits of its services. Combined with identifying asymmetries with competitors and integrating environmental sustainability into its operations, this could help the company gain first-mover advantages.

Bibliography

Abraham, A. (2017). Corporate social responsibility and firm performance of Ghanaian SMEs: The role of stakeholder engagement. *Cogent Business & Management, 4*(1). doi:10.1080/23311975.2017.1333704

Agarwal, P., Bag, M., Mishra, V., & Sahai, M. (2011). A review of multi-criteria decision making techniques for supplier evaluation and selection. *International Journal of Industrial Engineering Computations, 2*(4), 801-810. doi:10.5267/j.ijiec.2011.06.004

Alberti, M., Caini, L., Calabrese, A., & Rossi, D. (2000). Evaluation of the costs and benefits of an environmental management system. *International Journal of Production Research, 38*(17), 4455-4466. doi:10.1080/00207540050205226

Ayuso, S., Roca, M., & Colomé, R. (2012). SMEs as "transmitters" of CSR requirements in the supply chain. *Supply Chain Management*, 497-508. doi:10.1108/SCM-04-2012-0152

Bagur-Femenias, L., Llach, J., & del Mar Alonso-Almeida, M. (2013). Is the adoption of environmental practices a strategical decision for small service companies? An empirical approach. *Management Decision, 51*(1), 41-62. doi:10.1108/00251741311291300

Beer, M., Eisenstat, R. A., & Spector, B. (1990). Why Change Programs Don't Produce Change. *Harward Business Review*, 1-12.

Benn, S., Edwards, M., & Williams, T. (2014). *Organizational Change for Corporate Sustainability* (3rd ed.). London: Routledge. doi:10.4324/9781315819181

Blackburn, S., Ryerson, S., Weiss, L., Wilson, S., & Wood, C. (2011). *How do I implement complex change at scale?* New York: McKinsey & Company.

Burke, L., & Logsdon, J. M. (1996). How corporate social responsibility pays off. *Long Range Planning, 29*(4), 495-502. doi:10.1016/0024-6301(96)00041-6

Burnes, B. (2014). Understanding Resistance to Change – Building on Coch and French. *Journal of Change Management, 15*(2), 92-116. doi:10.1080/14697017.2014.969755

Caldera, H., Desha, C., & Dawes, l. (2019). Evaluating the enablers and barriers for successful implementation of sustainable business practice in 'lean' SMEs. *Journal of Cleaner Production, 218*, 575-590. doi:https://doi.org/10.1016/j.jclepro.2019.01.239

Cao, Z., & Lumineau, F. (2015). Revisiting the interplay between contractual and relational governance: A qualitative and meta-analytic investigation. *Journal of Operations Management, 33*(1), 15-42. doi:10.1016/j.jom.2014.09.009

Ciliberti, F., Pontrandolfo, P., & Scozzi, B. (2008). Investigating corporate social responsibility in supply chains: a SME perspective. *Journal of Cleaner Production, 16*(15), 1579-1588. doi:10.1016/j.jclepro.2008.04.016

Clarkson, M. (1995). A stakeholder framework for analyzing and evaluating corporate social performance. *Academy of management review*, 92-117. doi:10.5465/amr.1995.9503271994

Coglianese, C., & Nash, J. (2001). *Regulating from the inside: Can environmental management systems achieve policy goals?.* Washington: Resources for the Future.

Dabhilkar, M., Bengtsson, L., & Lakemond, N. (2016). Sustainable supply management as a purchasing capability. *International Journal of Operations & Production Management, 36*(1), 2-22. doi:10.1108/IJOPM-12-2014-0609

Darnall, N., Jolley, J., & Handfield, R. (2008). Environmental Management Systemsand Green Supply Chain Management:Complements for Sustainability? *Business Strategy and the Environment, 17*(1), 30–45. doi:10.1002/bse.557

de Lange, D., Busch, T., & Delgado-Ceballos, J. (2012). Sustaining Sustainability in Organizations. *Journal of Business Ethics, 110*, 151–156. doi:10.1007/s10551-012-1425-0

Department for Energy Security & Net Zero. (2023, June 28). *Greenhouse gas reporting: conversion factors 2023*. Retrieved from GOV.UK: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023

Ebbesen Jensen, A. (2020, March 6). *Därför ska du ha en elcykel*. Retrieved from iform.se: https://iform.se/traning/cykling/elcykel-guide

Eckelman, M. J., Huang, K., Lagasse, R., Senay, E., Dubrow, R., & Sherman, J. D. (2022). Health Care Pollution And Public Health Damage In The United States: An Update. *Health Affairs*, *39*(12), 2071-2079. doi:10.1377/hlthaff.2020.01247

Ecovadis. (n.d.). *The World's Most Trusted Business Sustainability Ratings*. Retrieved from Ecovadis: https://ecovadis.com/suppliers/

European Commission. (2022). *Annual report on European SMEs 2021/2022 : SMEs and environmental sustainability : background document.* Publications Office of the European Union.

European Commission. (2023, July 31). *Questions and Answers on the Adoption of European Sustainability Reporting Standards*. Retrieved from European Commission: https://ec.europa.eu/commission/presscorner/detail/en/qanda_23_4043

European Commission. (n.d.). *Corporate sustainability reporting*. Retrieved from European Commission: https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

European Commission. (n.d.). *SME definition*. Retrieved from https://single-market-economy.ec.europa.eu/smes/sme-definition_en

Gallego-Álvarez, I., Segura, L., & Martínez-Ferrero, J. (2015). Carbon emission reduction: the impact on the financial and operational performance of international companies. *Journal of Cleaner Production, 103*, 149-159. doi:10.1016/j.jclepro.2014.08.047

Galpin, T., & Hebard, J. (2018). Strategic management and sustainability. In H. Borland, A. Lindgreen, F. Maon, V. Ambrosini, B. Palacios Florencio, & J. Vanhamme, *Business Strategies for Sustainability*, (pp. 163–178). London: Routledge.

GHG Protocol. (2004). *A Corporate Accounting and Reporting Standard: Revised edition.*

GHG Protocol. (2011). *Corporate Value Chain (Scope 3) Accounting and Reporting Standard: Supplement to the GHG Protocol Corporate Accounting and Reporting standard.*

GHG Protocol. (2013). *Technical Guidance for Calculating Scope 3 Emissions: Supplement to the Corporate Value Chain (Scope 3) Accounting & Reporting Standard.*

Govindan, K., Rajendran, S., Sarkis, J., & Murugesan, P. (2015). Multi criteria decision making approaches for green supplier evaluation and selection: a literature review. *Journal of Cleaner Production, 98*, 66-83. doi:10.1016/j.jclepro.2013.06.046

Gualandris, J., Golini, R., & Kalchschidt, M. G. (2014). Do supply management and global sourcing matter for firm sustainability performance? An international study. *Supply Chain Management, 19*(3), 258. doi:10.1108/SCM-11-2013-0430

Harrison, J. P. (2010). STRATEGIC PLANNING AND SWOT ANALYSIS. In J. P. Harrison, *Essentials of Strategic Planning in Healthcare* (pp. 91-97). Chicago: Health Administration Press.

Herzig, C., & Schaltegger, S. (2011). Corporate Sustainability Reporting. In J. Godemann, & G. Michelsen, *Sustainability Communication: Interdisciplinary Perspectives and Theoretical Foundation* (pp. 151-170). Dordrecht: Springer.

Hillary, R. (1998). *An Assessment of the Implementation Status of Council Regulation (No 1836/93) Eco-management and Audit Scheme in the Member States (AIMS-EMAS)* . London: Imperial College.

Hillary, R. (2004). Environmental management systems and the smaller enterprise. *Journal of cleaner production, 12*(6), 561-569. doi:10.1016/j.jclepro.2003.08.006

Ibrahim, S. E. (2019). Sustainability in the globalization era. In J. Sarkis, *Handbook on the Sustainable Supply Chain* (pp. 11-27). Cheltenham: Edward Elgar Publishing. doi:10.4337/9781786434272

Igarashi, M., de Boer, L., & Fet, A. M. (2013). What is required for greener supplier selection? A literature review and conceptual model development. *Journal of Purchasing and Supply Management, 19*(4), 247-263. doi:10.1016/j.pursup.2013.06.001

iStock. (2021, August 2). *A conceptual image showing a lung-shaped lake in a lush and pristine jungle. 3d rendering. - Bildbanksbild*. Retrieved from istockphoto.com: https://www.istockphoto.com/se/foto/a-conceptual-image-showing-a-lung-shaped-lake-in-a-lush-and-pristine-jungle-3d-gm1331942208-414931960

Jenkins, A. (2022, December 15). *What's the Difference Between Value Chain and Supply Chain?* Retrieved from Net Suite: https://www.netsuite.com/portal/resource/articles/erp/value-chain-supply-chain.shtml

Jenkins, H. (2006). Small Business Champions for Corporate Social Responsibility. *Journal of Business Ethics, 67*, 241-256. doi:10.1007/s10551-006-9182-6

Jo, H., Kim, H., & Park, K. (2015). Corporate Environmental Responsibility and Firm Performance in the Financial Services Sector. *J Bus Ethics, 131*, 257–284. doi:10.1007/s10551-014-2276-7

Jones, P., Comfort, D., & Hillier, D. (2016). Managing materiality: a preliminary examination of the adoption of the new GRI G4 guidelines on materiality within the business community. *Journal of Public Affairs, 16*(3), 222–230. doi:10.1002/pa.1586

Kahneman, D. (2003). Maps of Bounded Rationality: Psychology for Behavioral Economics. *American Economic Review, 93*(5), 1449-1475. doi:10.1257/000282803322655392

Kotter, J. P. (2009). Leading Change: Why Transformation Efforts Fail. *IEEE Engineering Management Review, 37*(3), 42-48. doi:10.1109/EMR.2009.5235501

Kurucz, E. C., Colbert, B. A., & Wheel, D. (2008). The Business Case for Corporate Social Responsibility. In A. Crane, D. Matten, A. McWilliams, J. Moon, & D. Siegel, *The Oxford Handbook of Corporate Social Responsibility* (pp. 83–112). Oxford: Oxford University Press.

Lepoutre, J., & Heene, A. (2006). Investigating the Impact of Firm Size on Small Business Social Responsibility: A Critical Review. *Journal of Business Ethics, 67*, 257-273. doi:10.1007/s10551-006-9183-5

Levy, D. L., Brown, H. S., & de Jong, M. (2010). The contested politics of corporate governance: The case of the global reporting initiative. *Business & Society, 49*(1), 88–115. doi:10.1177/0007650309345420

Lieberman, M. B., & Montgomery, D. B. (1988). First-mover advantages. *Strategic Management Journal, 9*, 41-58. doi:10.1002/smj.4250090706

Locke, E. A., & Latham, G. P. (2013). *New developments in goal setting and task performance.* New York: Routledge.

Löfgren , Å., & Nordblom, K. (2020). A theoretical framework of decision making explaning the mechanisms of nudging. *Journal of Economic Behaviour & Organization, 174*, 1-12. doi:10.1016/j.jebo.2020.03.021

Longhurst, R. (2003). Semi-structured Interviews and Focus Groups. In N. Clifford, & G. Valentine, *Key Methods in Geography* (pp. 103-115). London: Sage.

McKinsey. (2023, August 11). *Accelerating the transition to net zero in life sciences*. Retrieved from McKinsey: https://www.mckinsey.com/industries/life-sciences/our-insights/accelerating-the-transition-to-net-zero-in-life-sciences

Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of Who and What Really Counts. *The Academy of Management Review, 22*(4), 853-886. doi:10.2307/259247

Momblanco, H., Aiuto, K., & Huckins, S. (2024). *Overview of GHG Protocol Integration in Regulatory Climate Disclosure Rules.* GHG Protocol.

Moneva, J., Archel, P., & Correa, C. (2006). GRI and the camouflaging of corporate unsustainability. *Accounting Forum, 30*(2), 121–137. doi:10.1016/j.accfor.2006.02.001

Morrow, D., & Rondinelli, D. (2002). Adopting Corporate Environmental Management Systems:: Motivations and Results of ISO 14001 and EMAS Certification. *European Management Journal, 20*(2), 159-171. doi:10.1016/S0263-2373(02)00026-9

Müller, M. M., Böhm, K., & Renz, E. (2023). Pay or nudge employees into change? A theoretical and experimental investigation of the effect of nudging for organizational change. *Managerial and Decision Economics, 44*(6), 3666-3695. doi:10.1002/mde.3901

Narayanan, S., & Narasimhan, R. (2014). Governance Choice, Sourcing Relationship Characteristics, and Relationship Performance. *Decision Sciences, 45*(4), 717-751. doi:10.1111/deci.12090

Naturvårdsverket. (2023, November 16). *Beräkna klimatpåverkan*. Retrieved from https://www.naturvardsverket.se: https://www.naturvardsverket.se/vagledning-och-stod/luft-och-klimat/berakna-klimatpaverkan/berakna-klimatpaverkan-utifran-ett-livscykelperspektiv/

Nonaka, I. (2007). The Knowledge-Creating Company. *Harward Business Review*, 162-171.

Pardo del Val, M., & Fuentes, C. M. (2003). Resistance to change: a literature review and empirical study. *Management Decision, 412*(2), 148-155. doi:10.1108/00251740310457597

Penn State Sustainability Institute. (2019). *Sustainability Planning Guidebook.* Pennsylvania: Penn State University.

Pichler, P.-P., Jaccard, I., Weisz, U., & Weisz, H. (2019). International comparison of health care carbon footprints. *Environmental research letters, 14*(6). doi:10.1088/1748-9326/ab19e1

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., . . . Stringer, S. L. (2009). Who's in and why? A Topology of stakeholder analysis methods for natural resource management. 1933-1949. doi:10.1016/j.jenvman.2009.01.001

Reilly, A. H., & Hynan, K. A. (2014). Corporate communication, sustainability, and social media: It's not easy (really) being green. *Business Horizons*, 747-758. doi:10.1016/j.bushor.2014.07.008

Rezai, J. (2019). Sustainable supplier selection: a process review. In J. Sarkis, *Handbook on the sustainable Supply Chain* (pp. 136-147). Cheltenham: Edward Elgar Publishing. doi:10.4337/9781786434272

Rodríguez-Jiménez, L., Romero-Martín, M., Spruell, T., Steley, Z., & Gómez-Salgado, J. (2023). The carbon footprint of healthcare settings: A systematic review. *Journal of Advanced Nursing, 79*(8), 2830-2844. doi:10.1111/jan.15671

Roloff, J. (2008). Learning from Multi-Stakeholder Networks: Issue-Focussed Stakeholder Management. *Journal of Business Ethics, 82*, 233–250. doi:10.1007/s10551-007-9573-3

Rome2Rio. (2018, April 16). *2018 Global Flight Price Ranking: What's the world's cheapest airline?* Retrieved from Rome2Rio: https://www.rome2rio.com/labs/2018-global-flight-price-ranking/

Sancak, I. E. (2023). Change management in sustainability transformation: A model for business organizations. *Journal of Environmental Management, 330*. doi:10.1016/j.jenvman.2022.117165

Sanguinetti, A., & Amenta, N. (2022). Nudging Consumers Toward Greener Air Travel by Adding Carbon to the Equation in Online Flight Search. *Transportation Research Record, 2672*(2), 788-799. doi:10.1177/03611981211046924

Sarkis, J., & Bai, C. (2010). Integrating sustainability into supplier selection with grey system and rough set methodologies. *International Journal of Production Economics, 124*(1), 252-264. doi:10.1016/j.ijpe.2009.11.023

Sarkis, J., & Dhavale, D. G. (2015). Supplier selection for sustainable operations: A triple-bottom-line approach using a Bayesian framework. *International*

Journal of Production Economics, 166, 177-191. doi:10.1016/j.ijpe.2014.11.007

SCB. (2024). *Prisomräknaren*. Retrieved from SBC: https://www.scb.se/hitta-statistik/sverige-i-siffror/prisomraknaren/

Schadewitz, H., & Niskala, M. (2010). Communication via Responsibility Reporting and its Effect on Firm Value in Finland. *Corporate social responsibility and environmental management, 17*(2), 96-106. doi:10.1002/csr.234

Scilife. (2024). *2024 Global Quality Outlook: A long term view of sustainability.* Antwerpen: Scilife.

Singh, R., & Garg, S. (2008). Strategy development by SMEs for competitiveness: a review. *Benchmarking: An international journal, 15*(5), 525-547. doi:10.1108/14635770810903132

Stekelorum, R. (2019). The roles of SMEs in implementing CSR in supply chains: a systematic literature review. *International Journal of Logistics Research and Applications, 23*(3), 228-253. doi:10.1080/13675567.2019.1679101

Stouten, J., Rousseau, D. M., & Cremer, D. D. (2018). Successful organizational change: integrating the management practice and scholarly literatures. *Academy of Management Annals, 12*(2), 752-788. doi:10.5465/annals.2016.0095

Swelife. (n.d.). *Swelife*. Retrieved from Vad är life science?: https://swelife.se/vad-ar-life-science/

Tetrault Sirsly, C.-A., & Lamertz, K. (2008). When Does a Corporate Social Responsibility Initiative Provide a First-Mover Advantage? *Business & Society, 47*(3), 267-401. doi:10.1177/0007650307299221

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving Decisions about Health, Wealth, and Happiness.* Yale: Yale University Press.

Upphandlingsmyndigheten. (n.d.). *Verktyg för miljöspendanalys av enskilda organisationer*. Retrieved from Upphandlingsmyndigheten: https://www.upphandlingsmyndigheten.se/om-hallbar-upphandling/miljomassigt-hallbar-upphandling/analysera-inkopen-med-miljospendanalys/verktyg-for-miljospendanalys-av-enskilda-organisationer/

Wagner, M. (2009). Innovation and Competitive Advantages from the Integration of Strategic Aspects with Social and Environmental Management in European Firms. *Business Strategy and the Environment, 18*(5), 291–306. doi:10.1002/bse.585

Wang, K., & Li, D. (2016). Market Reactions to the First-Time Disclosure of Corporate Social Responsibility Reports: Evidence from China. *Journal of Business Ethics, 138*, 661–682. doi:10.1007/s10551-015-2775-1

Xhienne. (2022). *Wikimedia Commons*. Retrieved from The four components of SWOT in a 2 × 2 matrix: https://en.wikipedia.org/wiki/SWOT_analysis#/media/File:SWOT_en.svg

Zorpas, A. (2010). Environmental management systems as sustainable tools in the way of life for the SMEs and VSMEs. *Bioresource Technology*, *110*(6), 1544-1557. doi:10.1016/j.biortech.2009.10.022

A. Inflation data

Table A1

Inflation data

Year range	**Percentage price increase (SEK)**
2018 ⇒ 2022	13.26%
2018 ⇒ 2023	22.93%
2021 ⇒ 2022	8.38%
2021 ⇒ 2023	17.63%

Note. Retrieved from (SCB, 2024)

DEPARTMENT OF TECHNOLOGY MANAGEMENT AND ECONOMICS
DIVISION OF ENVIRONMENTAL SYSTEMS ANALYSIS
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden
www.chalmers.se

CHALMERS
UNIVERSITY OF TECHNOLOGY