AALBORG UNIVERSITY
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MASTER THESIS

A stakeholder based approach to identify and select key environmental indicators – a case study of the J. Schmalz GmbH

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Abstract

A rising interest in environmental impacts from different stakeholders such as society at large, governments, investors, customers and employees puts pressure on companies to take responsibility for their impact on the environment. In order to monitor and communicate the environmental performance of a company a strategic measurement and management is essential. Key environmental indicators (KEIs) are a first step towards reliable and data driven measurements for environmental performance.

The thesis identifies and selects KEIs, for a case company, based on external and internal stakeholder expectations. The indicators are analysed and evaluated regarding their advantages and disadvantages as well as their alignment with the business strategy of the case company.

Interviews, observations, workshops and literature review where used to collect information and data. The insights into the company's structures and processes are used in order to define a set of KEIs tailored to the company's future strategic orientation.

The proposed set of indicators provides a basis for future strategic management of environmental issues. The selection process can be used for identifying additional material sustainability topics in the future.

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Preface

This Master thesis was written as the final piece on the way to finish the master's program 'Environmental Management and Sustainability Science' at Aalborg University.

The thesis was written in collaboration with the J. Schmalz GmbH during an internship in the sustainability department. The time at Schmalz not only provided me with interesting experiences and new knowledge, it also served as the basis for parts of the data collection done in this thesis.

I would like to thank my advisors and colleagues at Schmalz for their help, support and advice they provided me with. Furthermore, I would like my supervisor Henrik Riisgaard for giving me guidance and constructive critique throughout the project.

Aalborg University, June 7th, 2019

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1 Introduction

Sustainability has become a buzzword in society, politics and economy in the last couple of years. The trend towards a sustainable development of our world has made its way up from a niche to become mainstream in recent times. Even though the concept of sustainability has been around for some decades already, the publication of the United Nations Agenda 2030 and the associated Sustainable Development Goals (SDGs) stirred up the sustainability landscape in recent times. It is not only politics being held responsible for fostering sustainable development but the economy as well. After scandals such as the diesel-affair the pressure on companies regarding their responsibility towards environment and society has become higher than ever (Clean Energy Wire 2019). More and more stakeholders, especially in Europe, are getting more interested in the social and environmental impacts and performance of companies: Consumers and end-users are getting more conscious, investors more cautious and customers more demanding.

Examples for this rising consciousness can be seen in the "Friday for future" movement (Fridays for Future 2019), the *"proposal for a regulation on disclosures relating to sustainable investments and sustainability risks and amending Directive (EU)2016/2341"* from the European Union regarding sustainable financing (European Commission 2018) and the increase in votes for the green parties in the recent elections of the European parliament (euronews.com 2019).

All of this puts pressure on companies in playing a crucial role in addressing sustainability issues. To this aim, companies have to show their commitment and responsibility towards sustainability in order to meet the needs of their current stakeholders without hindering future generations to meet their needs.

These circumstances increased the strategic relevance of social and environmental issues for businesses. They can represent risks (e.g. negative press coverage or consumer boycotts) or opportunities (e.g. positive effects on employees and corporate reputation, increased competitiveness through eco-products) (Hansen and Schaltegger

2016). The increased strategic attention to environmental and social issues is stimulating the demand for systematic measurement and management of these issues. Together with the demand from external stakeholders a growing interest in corporate sustainability performance measurement and management can be observed (Hansen and Schaltegger 2012; Hansen and Schaltegger 2016).

In order to monitor and present their commitment and responsibility companies need to make their impacts visible and accountable. They have to be able to make decisions regarding sustainability aspects based on reliable and rigid information.

The challenge is to provide rational, coherent and transparent decision-making support towards sustainable production and consumption patterns for a company. To provide this information relevant indicators have to be established and monitored (Dong and Hauschild 2017; Nikolaou et al. 2019).

Key performance indicators have long been used to measure and monitor the most critical aspects of organisational performance in order to ensure the current and future success (Knura 2014). With the appearance of sustainability as a critical and strategic aspect for a company's performance and success it is necessary to create key sustainability indicators (Schaltegger and Dyllick 2002; Di Vaio et al. 2018; Kasem et al. 2015; Epstein and Roy 2001).

Even though corporate sustainability should cover all three dimensions - economic, social and environmental – one could argue that the environmental dimension is the basis for the other two dimensions. Only with a functioning environment it is possible to conduct business and live in a functioning society (Knura 2014). Therefore, the present thesis is dealing with questions regarding the identification and definition of key environmental indicators using a stakeholder-based approach. The introduction is going to present the underlying problem and case company. After this the research question is presented and the research design illustrated.

1.1 Problem description

More and more companies are tackling the ecological (and social) challenges which accompany the economic value chain and open themselves up to sustainability related issues in the sense of a sustainable development. The implementation of environmental goals and indicators into conventional strategic and operational processes can however be challenging. Especially smaller companies that lack the knowledge and/or resources often face hard times when trying to integrate these topics into their strategic direction (Falle et al. 2016).

The management of environmental issues is a company-wide task. As a consequence, the successful pursuit of environmental goals is impeded when the environmental perspective is viewed from one perspective only. Internal coordination and decision processes regarding environmental topics can be slowed down by having a separate sustainability or environmental strategy (Schaltegger and Dyllick 2002). Smaller companies often do not only have deficits in their sustainability management but also in their conventional strategic management. The reason for this is on the one side the lack of resources and knowledge, and on the other side the lower weighting of strategic tasks in the operational daily business (Deimel and Kraus 2008). Therefore, it may not be surprising that not only the conventional strategic management but also the sustainability management is hardly anchored in the structures and methods of a company.

The reviewed company, the J. Schmalz GmbH (in the following Schmalz), is a market leader in the vacuum-technology on a European as well as global level. The company is already actively promoting sustainability through several initiatives and processes but sees potential of improvement in the strategic implementation of environmental indicators. Until recently the company had a separate sustainability strategy. The sustainability as well as the business strategy have been known to only a few people (Interview 1 2019). In order to give the strategic topics, conventional as well as sustainability, a wider outreach the strategy was reformulated recently. In doing so the sustainability strategy was partly implemented into the overall business strategy

(Interview 1 2019). This was followed by a structural change in which an independent sustainability department was established. In the course of this re-organisation it also became clear that so far, sustainability management was not structurally anchored (J. Schmalz GmbH 2019e). The company is already capturing data on sustainability issues. Especially the social indicators are already used for strategic purposes. The monitored environmental indicators however have not been selected on an informed basis and only a few of them are used systematically or for strategic purposes. As the goal is to make the topic of sustainability more visible inside the company as well as to the outside it is necessary to base the selection of the indicators on data and information retrieved from internal as well as external sources.

1.2 Research question

The aim of this thesis is to define and select key environmental indicators for a strategic management of environmental, and prospectively sustainability issues. The thesis is going to define a set of initial key environmental indicators which are identified and selected using external and internal stakeholder expectations. The results of the thesis should provide the company with not only a set of KEIs but with the skills and processes to identify further environmental and potentially sustainability indicators. Therefore, the thesis is going to answer the following research question:

"How can the J. Schmalz GmbH identify and select key environmental indicators based on external and internal stakeholder expectations?"

In order to answer this question, the following sub-questions have to be answered as well:

- What are key environmental indicators?
- What are the relevant external and internal stakeholders?
- What are the advantages and disadvantages of the proposed indicators?

The sub-questions are going to be answered in the course of this thesis in order to aid answering the main research question and provide important background information.

1.3 Research design

In order to answer the sub-questions and the research question the thesis is divided into different analytical phases. These phases can be seen in Figure 1-1.

There are two major parts: a theoretical part and an empirical part. The theoretical part (theoretical framework in Figure 1-1) defines concepts, elaborates on theories used and establishes the theoretical framework. It describes the underlying concepts of corporate and environmental sustainability and defines and describes the

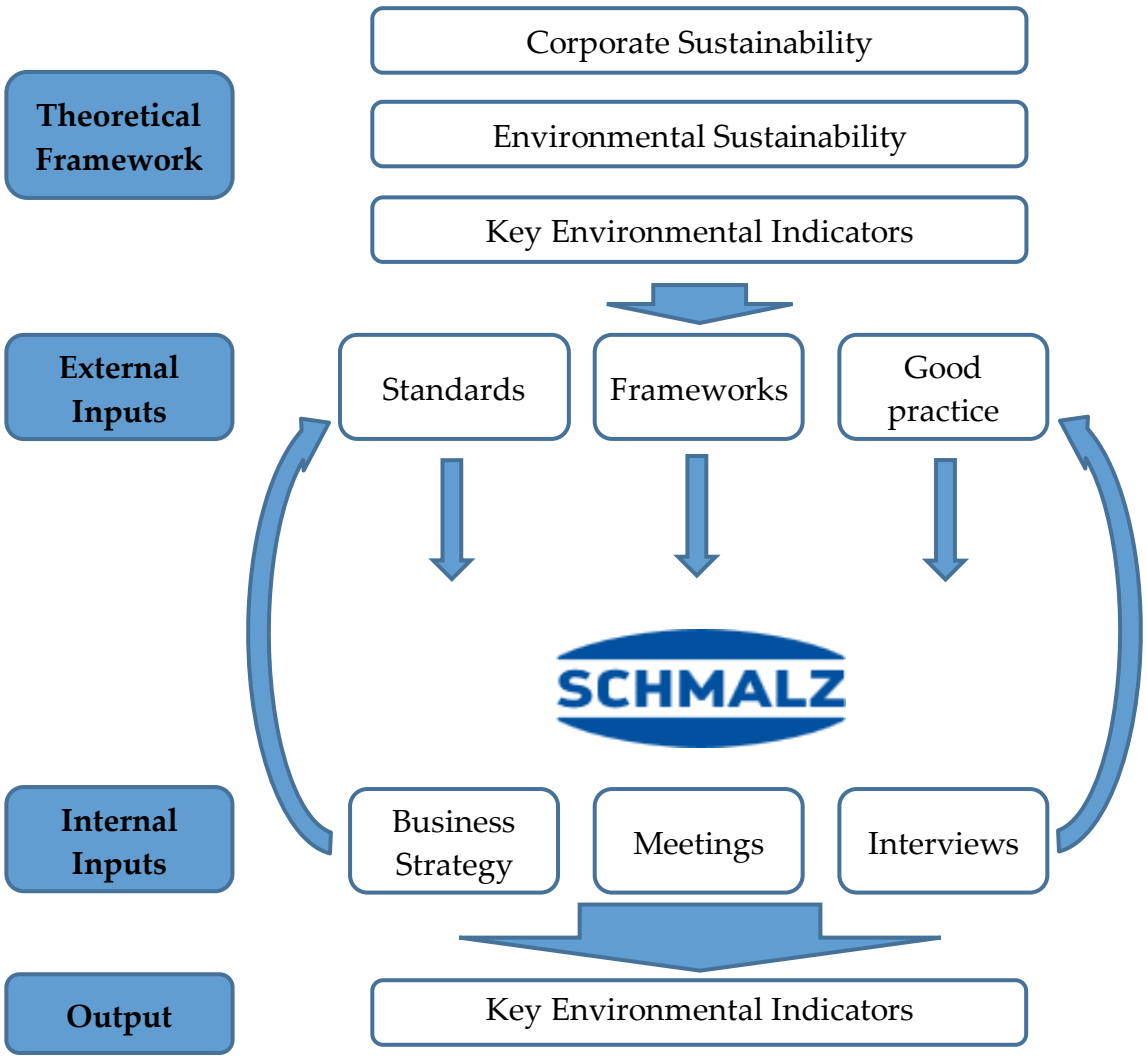

Figure 1-1 Research structure

characteristics of key environmental indicators. This assures a clear and comprehensive understanding of the terms which are central to the thesis.

The empirical part (external and internal inputs in Figure 1-1) uses the gained knowledge and information to identify and select key environmental indicators. It is divided into two steps. The first step (external inputs in Figure 1-1) consists of a review of external stakeholder expectations including standards, frameworks and good practice examples for environmental indicators. The information is derived mainly from publicly available sources such as the sustainability reports of selected sample companies or the publications available on the websites of the different standards and frameworks. These sources are analysed and evaluated resulting in a first preliminary set of potential environmental indicators.

The second step (internal inputs in Figure 1-1) of the empirical part is evaluating the preliminary set with the aid of internal stakeholder expectations. Hereby, different primary and secondary materials are used. The primary sources consist mainly of company internal documents, such as the business strategy or meeting notes, and publicly available information from the company's website, e.g. sustainability report, company brochure. In addition to this, interviews with key stakeholders as well as the results from an internal meeting with employee representatives provide valuable insights and lead to the selection of a final set of key environmental indicators.

2 Corporate sustainability and environmental sustainability

The following sections give an overview on the conceptual frame which is guiding the systematic research process and shows from which perspective the underlying issues are examined.

Even though the study is focusing on indicators to measure the environmental performance of Schmalz it is still important to get an understanding of the concept of sustainability. The environmental actions and strategies of the company are derived from the overall goal to become more sustainable and foster the sustainable development as such. Thus, a short introduction into the concept of sustainable development and corporate sustainability is given. Afterwards the relationship with and (special) role of the environment for sustainability is illustrated.

2.1 Definition of sustainable development and corporate sustainability

The concept of sustainability or sustainable development has been around for some time. It originated from forestry in the 17th century and came to academic interest in the 1970s and 1980s. With the path leading *'Brundtland report'* from 1987 the concept of sustainability escaped from the academic world and became recognized by and important for politics and economy. It defines sustainable development as

> *''development that meets the needs of the present without compromising the ability of future generations to meet their own needs'' (World Commission on Environment and Development 1987, p. 54)*

The definition of the Brundtland report focuses on the consideration of future generations and intergenerational justice in order to ensure a development that is responsible and sustainable. During the last two decades the focus of sustainability has shifted to a three-dimensional approach. Sustainability evolved to a holistic concept that considers economic, social and environmental aspects of economic development and their interrelationship (Schaltegger and Burritt 2005).

The most recent big step towards a global approach for sustainable development was taken when in late 2015 the UN's *Sustainable Development Goals* (SDGs) have been

formulated. The SDGs, which have been adopted by all UN member states, are said to provide a blueprint for building a peaceful and prosper planet, now and in the future (UN 2015b). The 17 goals are backed up by 169 targets in order to achieve and measure the progress towards a sustainable development. The SDGs combine goals from all three dimensions of sustainability and set a focus especially on people, planet, prosperity, peace and partnerships (UN 2015b).

As a multinational agreement the SDGs are an ambitious plan for reducing human impacts on society and environment. It is, however, questionable if and how these goals and targets are reached due to the fact that this agreement is completely voluntarily, and the goals and targets are kept rather broad to fit for every UN member state (both developed and developing countries) (UN 2015b).

Bringing together sustainability and economic development is the goal of the Brundtland Commission as well as of the SDGs. Only if there is a balance between economic growth, creating fair and sufficient living conditions for all humans and maintaining and protecting nature and the environment this goal can be reached. When the concept of sustainable development entered the corporate world, it became clear that sustainable development of society and economy requires sustainable development of corporations. This is due to the fact that corporations play a pervasive role in the transformation process (Schaltegger and Burritt 2005).

Changing from a macro perspective to the business perspective many different concepts such as CSR (Carroll 1979; Lee 2008; Schwartz and Carroll 2003; Maon et al. 2010), corporate social performance (Carroll and Shabana 2010), the triple bottom line (Elkington 1998) and corporate sustainability (Dyllick and Hockerts 2002; Schaltegger and Burritt 2005; Epstein and Roy 2001) are discussed in scientific research and used in corporate management. They all have in common that environmental and social issues should be explicitly consider in addition to financial issues when conducting business.

The term *corporate sustainability* aggregates all of these systematic management efforts to voluntarily integrate social and environmental issues into general business management. With these efforts companies are aiming at contributing to sustainable development (Hansen and Schaltegger 2016).

Corporate sustainability is based upon the integration of the three dimensions (economic, social, environmental) of sustainability into a company's core business (see Figure 2-1). Just as in conventional business management there are challenges for corporate sustainability management.

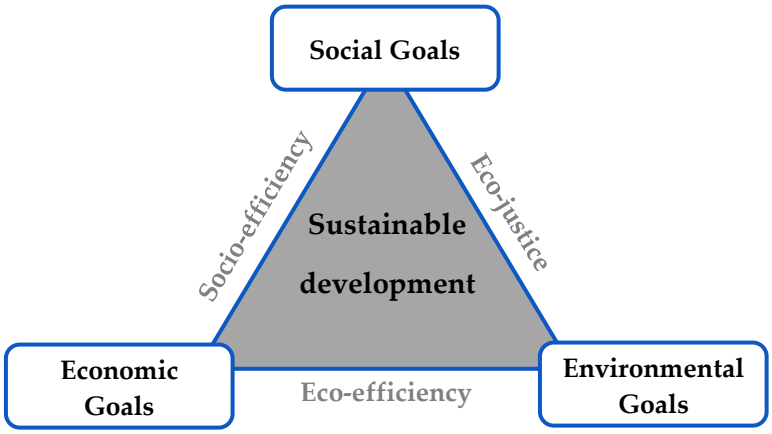

Figure 2-1 Main goals of sustainable development

Whereas economic efficiency would be the challenge addressed by conventional business management the *economic challenge* in corporate sustainability is represented by ensuring the long-term existence and competitiveness of a company while improving socio-efficiency and eco-efficiency. This means the economic sustainability challenged is concerned with managing social and environmental issues in an effective and the most economical way possible (Schaltegger and Dyllick 2002).

The *social challenge* urges companies to take account of the different social, cultural and individual demands of their stakeholders and decrease the negative social impacts. This ensures the social acceptance and legitimacy of business activities and safeguards the license to operate (Schaltegger and Dyllick 2002). The interplay between social and economic goals is aiming at socio-efficient actions by improving the relation between economic value added and social stress caused by the business activities.

The *ecological challenge* in sustainability management or corporate sustainability lies in reducing the direct or indirect negative impacts on the environment resulting from business activities. The goal is to protect the environment in a long-term fashion and maintain its regenerative capacity and biodiversity. Eco-efficiency as the interplay between the economic and environmental dimension is seeking a relative improvement from environmental impacts caused by business activities (Knura 2014). The *integration challenge* is represented by bringing together the first three challenges and integrate environmental and social management into conventional economically oriented business management. To address this challenge systematic efforts of managing social and economic issues are needed to satisfy the three goals described above (see Figure 2-1).

It becomes clear that companies have to pay similar attention to these three dimensions in order to ensure sustainability to be inherent in their activities. The social dimension is essential for e.g. gaining and retaining employees or customers as well as building the social legitimacy and the license to operate. The ecological dimension has to be considered in order to ensure the availability of resources and services provided by nature. The economic dimension finally is essential because it provides the money and keeps up the business (Schaltegger and Dyllick 2002; Mata-Lima et al. 2016; Knura 2014).

2.2 The (special) role of the environment

It is clear that the environment is inevitably linked to the concept of sustainability as it is essential for life on earth and is one of the primary needs of present and future generations (Knura 2014). The classical view on sustainability and corporate sustainability management assumes that each dimension should be, at least to a certain degree, addressed equally in order to create equilibrium between them. However, one could also take a different view that puts a greater emphasis on one of the dimensions. Senge et al. 2010 have argued that there can be two perspectives on how the three dimensions of sustainability can be seen from businesses and society. The first

perspective (see Figure 2-2, left side) is the one that is most present in companies nowadays: the two dimensions of environment and society are secondary systems to the overall system of economy. The secondary systems are always linked to the economic success of the company and they are often only considered if they do not negatively affect the economic goals or if they support the achievement of the economic goals. Companies having this perspective often (not always) view the environment as a public good for which they do not have any responsibility. Therefore, they only seek to maintain their licence to operate when considering the dimensions of society and environment (Senge et al. 2010; Knura 2014).

However, this perspective can be challenged by the one on the right side of Figure 2-2. This perspective goes away from the business-centric view towards looking at the relation between the dimensions from a rational viewpoint: Environment as the foundation of the other two systems.

Without environment there would be no society, which then could conduct business and form an economy. Of course, this view is very idealistic and is partly in conflict with the purpose of a company to make money and profit. However, if companies do look at the three dimensions from this perspective they might more easily realise and acknowledge their responsibility towards environment and society and therefore do follow the concept of corporate sustainability to a higher degree (Senge et al. 2010).

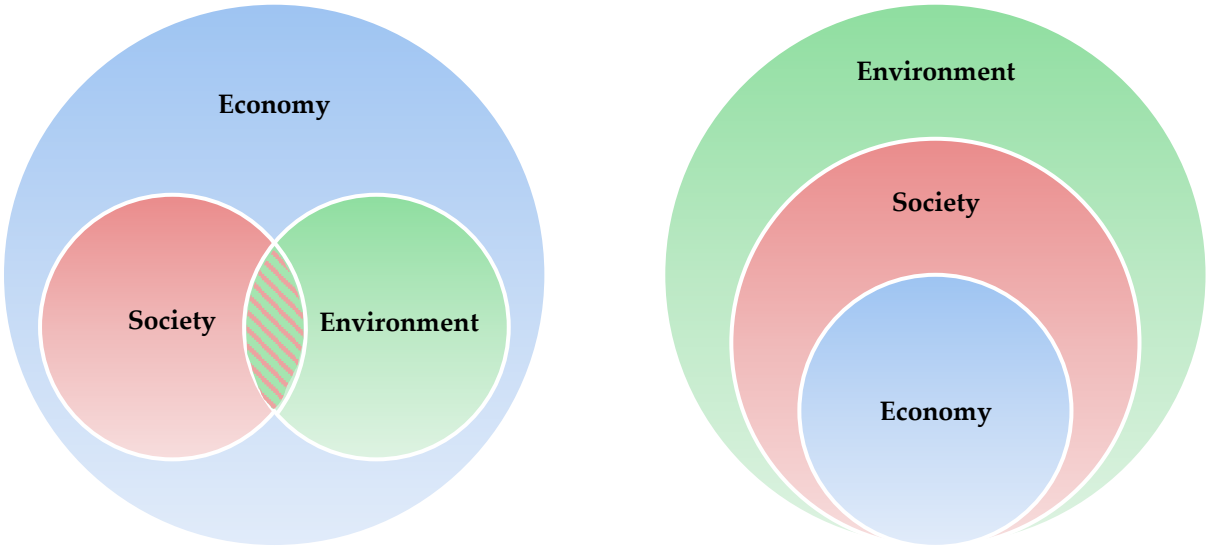

Figure 2-2 Different perspectives on the dimensions (own illustration, adapted from (Senge et al. 2010))

Originating from the second perspective, Schmalz is seeking to implement sustainability into its business by acknowledging its responsibility towards society and environment in particular. The first step for Schmalz therefore is to focus on environmental issues as the systematic and strategic implementation of sustainability is currently being revised and established. As described above, the goal is to maximise the final result in each of the three dimensions to successfully implement corporate sustainability. This maximisation however has to be measured and monitored somehow, which can be difficult especially for social and environmental issues. It is often not possible to use common indicators and measures to quantify the performance of a company in these dimensions. Therefore, a special set of indicators is required to enable Schmalz to track its environmental performance.

3 Environmental key performance indicators

Similar to ordinary business management it is essential to make progress measurable and visible in order to successfully implement sustainability systematically and strategically (Bai and Sarkis 2014). Key performance indicators provide a simple yet effective tool to measure and strategically anchor business performance. This begs the question if key performance indicators can also be used to measure the environmental performance of a company. To answer this question the following chapter takes a look at key performance indicators and what has to be considered when applying them to sustainability management and environmental issues in particular.

3.1 Indicators

First of: what is an indicator in a business context? An indicator can be defined as a quantitative measure used to illustrate and communicate complex phenomena in a simple and comprehensive way. Furthermore, an indicator can reveal a trend or phenomenon which might not be perceptible at first look and provides a reasonable degree of certainty. Hence, an indicator gives evidence and its significance extends beyond the sole purpose of measuring to a larger matter of interest (European Environment Agency 2005; Perotto et al. 2008).

Especially the last point is interesting for this study. When talking about environmental issues and sustainability one has to keep in mind the bigger picture at all time, as one is dealing with things that might have far greater effects then immediately visible.

Besides simplifying and exemplifying phenomena indicators can also have different dimensions: there are present, past and future oriented indicators. *Present* and *past* oriented indicators can be used to measure the current internal situation and assess them with regard to former data. *Future* oriented indicators are often normative indicators setting targets by defining a quantitative value to be reached (Knura 2014). *Orientation* indicators form a subgroup of the before mentioned present oriented indicators, they can be used for comparison with external business situations (e.g. industry average) but can also help defining new normative target indicators (Knura 2014). The indicators identified in this study may belong to more than one of these categories as sustainability has always to be looked at on a timeline – looking back onto the past and present as well as planning ahead to the future.

Given these understandings and kinds of indicators three essential functions of indicators can be derived:

1. Representation function: indicators provide comprehensive information of internal and external situations of companies.

2. Management function: indicators help managing and lead companies in a target-oriented manner by communicating target values and provide a robust and significant basis for management decisions.
3. Communication function: indicators make it easy to communicate complex situations by condensing information into a single score.

3.2 Key performance indicators

As mentioned above an indicator is used to represent internal or external business situations. This can be translated into the internal and external performances of the company. Key performance indicators (KPIs) consists of two parts: *Performance indicators* are used to measure and monitor how well the company is performing internally and/or externally (Knura 2014). The term *'key'* indicates that this type of indicator is more relevant and/or most essential to the current and future performance of the company (Parmenter 2015). Therefore, KPIs have to be linked to strategic targets and have to show the difference between the current situation and the set target situation.

According to Parmenter 2015 KPIs have the following characteristics:

1. They are non-financial measures
2. They are measured frequently (daily, weekly, monthly, yearly)
3. They are acted on by the senior management team
4. They tie down responsibility to a department or individual
5. They indicate which action has to be taken by those responsible
6. They are significant (e.g. affect more than one critical success factor and more than one balanced scorecard perspective)
7. They encourage the appropriate action by being tested to ensure they have a positive impact on performance

This means, among other things, that KPIs should be derived from the executive strategy and its objectives. If they are not related to the strategy, they will most likely report what *can* be measured and not what *should* be measured.

3.3 Key environmental indicators

Having discussed indicators and key performance indicators it is now time to show how to incorporate the concept of environmental sustainability into performance measurement.

Key environmental indicators combine the importance (*key*) and the three functions of *indicators* with the environmental dimension of sustainability. Therefore, they could be described as an environmentally relevant quantity, in the form of an absolute or relative number, which shows how much the company uses environmental functions and services or how big the impact of the business is on the environment (Knura 2014; European Environment Agency 2005). KEIs will monitor whether a company is meeting its environmental goals and targets and can at the same time communicate the need for additional measures. In contrast to a descriptive KPI, KEIs focus on the distance from a target, comparing the actual situation with a specific set of reference conditions. They should report on results (e.g. declining CO_2-emissions) rather than efforts (e.g. number of projects related to environmental protection) (European Environment Agency 2005; Knura 2014; Perotto et al. 2008)

This means that in contrast to a KPI the environmental impact is the primary aspect of a KEI rather than the overall performance of the company (Heslouin et al. 2017). In addition to this, key environmental indicators show environmental information that is strategically relevant. Therefore, KEIs can be seen as a special set of KPIs with a shifted focus on environmental impact performance rather than overall business performance (Knura 2014). KEIs are therefore indicators that represent the key environmental impacts of a company related to a particular, actual business situation. In addition to this they are, just like KPIs, tied to the business strategy and set concrete target values to make differences between the strategically desired and the actual business situation visible. KEIs therefore can be used to accurately evaluate the situation of the environmental sustainability management of a company and support the future improvement.

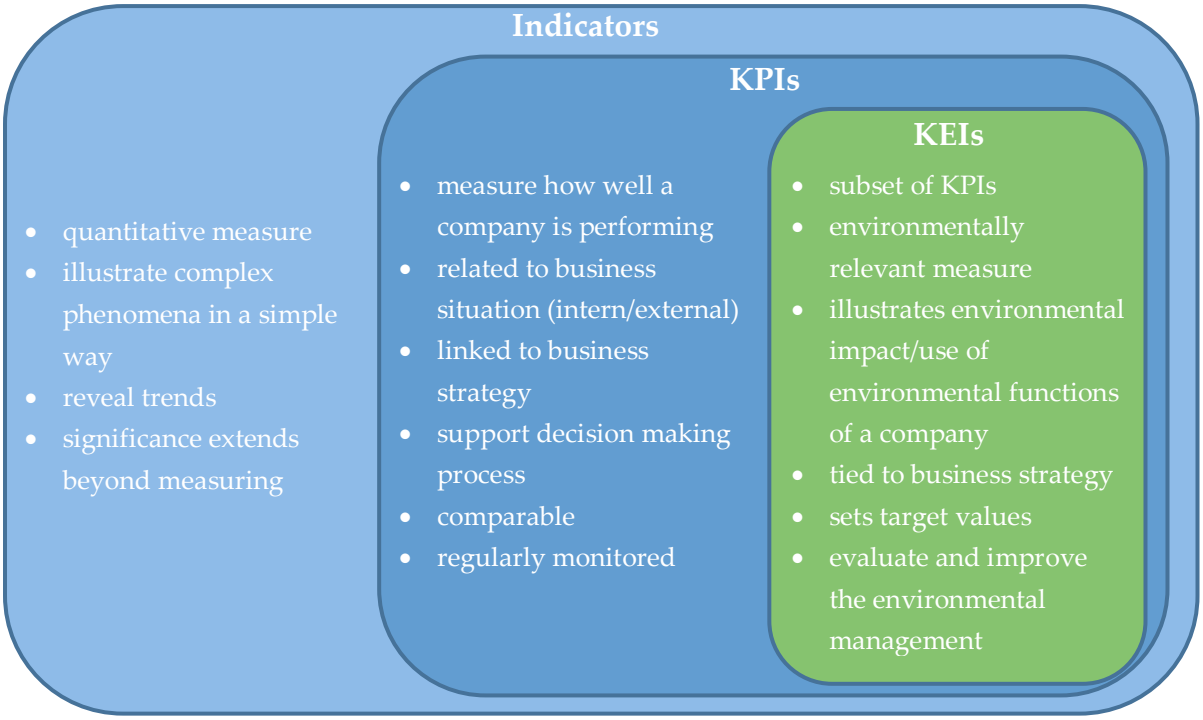

Figure 3-1 Characteristics and relation of indicators, KPIs and KEIs

Figure 3-1 shows a summary of the characteristics and relation of indicators, KPIs and KEIs. It shows that KPIs as well as KEIs are indicators and therefore share the basic characteristics of indicators. KEIs are a special sub-set of KPIs and therefore hold the same characteristics plus the special environmental characteristics.

4 The case company J. Schmalz GmbH

Founded in 1910 by Johannes Schmalz as a razor blade factory in Glatten in South-West Germany the J. Schmalz GmbH can look back on a long and divers history. During the years 1945 to 1984 the company ventured into producing sturdy transporting equipment, trailers for the agricultural sector, transporting devices for the postal and railway services as well as airport apron equipment (J. Schmalz GmbH 2018a). Since 1984 the third generation of the Schmalz family, Dr. Kurt Schmalz and his brother Wolfgang Schmalz (since 1990), switched the company's focus to vacuum technology. Until today vacuum technology is the core business of Schmalz, which employs more than 1,400 employees at 19 locations worldwide. The company is

currently working in three business units (see Figure 4-1): Vacuum Automation, Handling Systems and Energy Storage (J. Schmalz GmbH 2018a).

Figure 4-1 The three business units of Schmalz: Vacuum Automation, Handling Systems and Energy Storage (J. Schmalz GmbH 2018a, p. 6, 11, 17)

The business unit Vacuum Automation is divided into *components, gripping systems* and *clamping solutions*. Schmalz provides its customers with over 6000 *components* that serve as the foundation of every vacuum system such as suction cups, vacuum generators, switches and system monitoring. In addition to this there are ready-to-connect *gripping systems* available which can be directly mounted onto a handling robot and provide customers with an easy to install solution. With the *clamping solutions*, workpieces (e.g. wood, metal or glass) in CNC machining or assembly processes can be secured in place for precise and distortion free handling.

The second business unit Handling Systems consist of vacuum lifters that allow for ergonomic handling and transport of heavy loads, complemented by crane systems as the perfect supplement for mounting the vacuum lifters.

With the newly founded internal start-up for Energy Storage, Schmalz develops and produces redox flow stacks for energy storage in stationary large battery systems. Schmalz utilizes its expertise in the handling of sensitive components, in modern production methods and in plastics and process technology to drive innovation in the field (J. Schmalz GmbH 2018a).

As for customers Schmalz claims to have customers in around 14 different industries ranging from metal and woodworking, over automotive to the wind and solar energy industry. Due to its diversified customer portfolio the company claims to be able to compensate fluctuating markets and ensure continuous growth and revenues (J. Schmalz GmbH 2019d).

4.1 Sustainability at Schmalz

As a family owned company Schmalz states to take a special viewpoint on how to conduct business: it is not thinking from quarter to quarter but in terms of generations. The company has had a manifold history which shows how Schmalz has always been able to adjust to shifting markets and trends as well as technological change (J. Schmalz GmbH 2018a).

The focus of the company has always been on exploiting the opportunities and chances of new business areas and changing social, economic and ecological circumstances. Schmalz states that it wants to act (in advance) rather than react on such changes. These characteristics helped to become one of the market leaders in the niche-market of vacuum automation and fostered the implementation of sustainability and sustainable processes into the core of its business (J. Schmalz GmbH 2018b, 2018a).

Sustainability at Schmalz is guided by the three pillars ecology, economy and social engagement (see Figure 4-2). The company sees sustainability as an integrated system of business success, ecological responsibility and social commitment.

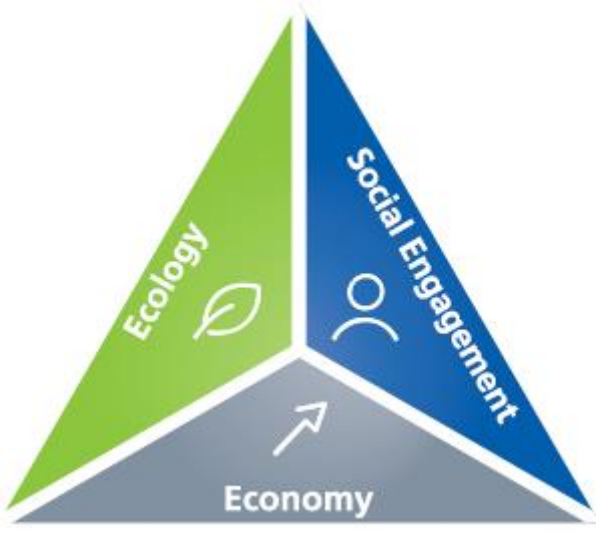

Figure 4-2 Sustainability pyramid of Schmalz (J. Schmalz GmbH 2018b, p. 5)

A solid financial basis is most important for Schmalz in order to retain its independence and freedom as a family owned business. This allows the company to put focus on (sustainability) issues which other (shareholder-owned) companies might

not be able to address. In order to achieve this economic sustainability and independence Schmalz is taking action in several different areas such as knowledge management, innovation, diversifying the products and industries involved, supplier management and value-added oriented processes (J. Schmalz GmbH 2018b).

The social commitment of Schmalz is especially focused on its employees and the community it is operating in. Schmalz is allocating a lot of resources to train and support its employees in order to ensure a high qualification amongst them. In order to make sure Schmalz is prepared for the future, the company is very active in the training of talents and future employees through several educational collaborations, e.g. with universities and schools. In addition to this, Schmalz is offering its employees a comprehensive benefits package that includes for example innovative pay systems, retirement plans, flexible workplaces and hours and different offers to maintain and improve the health and wellbeing of the employees (J. Schmalz GmbH 2018b). In order to support the local communities Schmalz and its employees are involved in different projects such as vacation programs for kids, supporting needy children around the world with donations or renovating the local kindergarten (J. Schmalz GmbH 2018b).With its environmentally conscious business practices Schmalz sees itself as a pioneer and role model for other companies. Especially the areas of energy management and resource efficiency form key parts of the ecological pillar of Schmalz' sustainability strategy. The company is continually expanding its renewable power plants (e.g. wind, solar, biomass or geo-thermal power) and takes various measures to reduce its energy consumption. One of the strategic goals is to become a, what Schmalz calls "Positiv-Energie-Unternehmen" (J. Schmalz GmbH 2018b) again: Schmalz wants to produce more energy (electricity and heat) from renewable sources than it uses. Schmalz already achieved this goal in the past and was a "Positiv-Energie-Unternehmen" from 1999 onwards.

Due to the rapid expansion however, the company missed the goal in the last years. Figure 4-3 shows that the company has managed to cover around 83% of its energy needs in the last five years through the generation of renewable energy. It has however

not yet achieved to become completely net positive energy balanced again. In 2018 it managed to cover 70 percent of its energy consumption by renewable energy sources. By producing that much renewable energy the company is also able to cut its carbon emission down significantly. Theoretically, the company was able to achieve a negative value for net CO_2-emissions in 2017, preventing a total of 1,349 metric tons of CO_2 entering the atmosphere (based on Scope 1&2 emissions) (J. Schmalz GmbH 2018b). However, Schmalz is not only trying to decrease the energy and carbon footprint of its business activities but also of its products. Through the responsible use of non-renewable materials and considering the whole life-cycle of a product the company strives to keep the product carbon footprint as low as possible. Furthermore, it is always looking to improve its products with regards to functionality and efficiency. Hence they managed to reduce the carbon footprint of a new vacuum

generator by 65% compared to the previous generation by saving weight and materials whilst making it more efficient and effective (J. Schmalz GmbH 2018b).

It seems that Schmalz has already internalized the concept of sustainability into its business and behaviour. However, from an internal perspective it becomes clear that

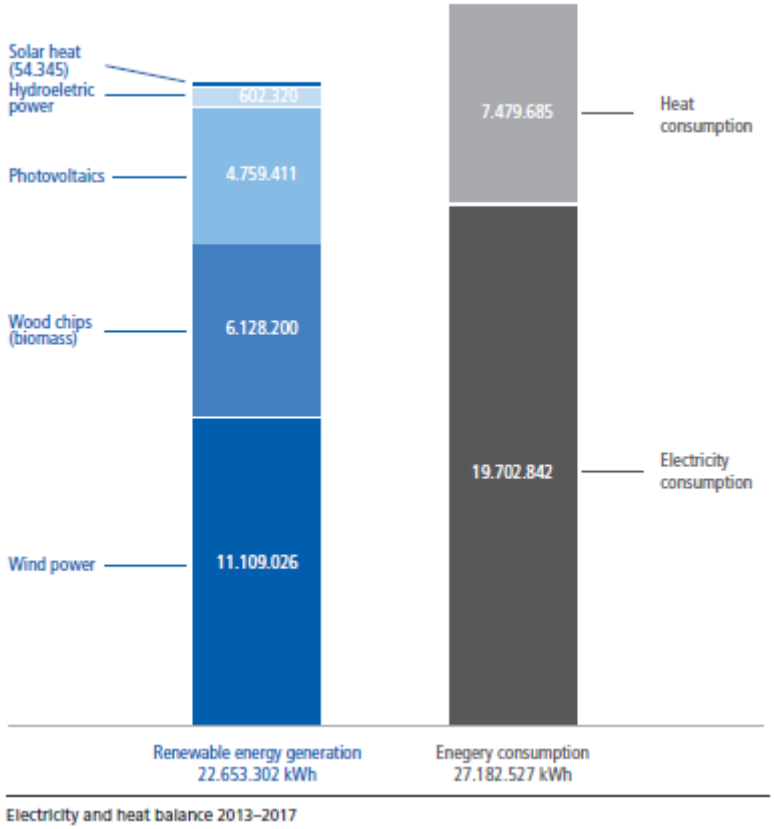

Figure 4-3 Five year overview on energy generation and consumption J. Schmalz GmbH

there is a need to address the issue in a more strategic and systematic way. As the company has identified the ecological dimension as the one in which it could have the biggest leverage the focus is going to be set on environmental sustainability. The company wants to integrate its sustainability strategy into the overall business strategy in order to anchor sustainability even deeper. In order to do this, there is a need for robust and significant indicators on which the future strategic orientation towards environmental sustainability can be based on.

5 Data gathering and methodology

This chapter defines the research methods used to conduct the study. It describes how the necessary data and information to address the research objectives and questions was collected and analysed. Furthermore, the research methods are critically reflected upon and possible limitations are pointed out.

5.1 Literature review

A literature review provides relevant information for the scope of the work as well as definitions of keywords and terminologies. Furthermore, it builds the supportive theoretical framework, identifies the previous research work done on the topic and helps to rationalise the research topic. By conducting a literature review the most relevant available documents on the topic are identified and reviewed. These documents contain information, ideas and data already available and serve as a base for the investigation conducted in this study.

The first step of a literature review is to search for the relevant literature. In this case the literature was primarily searched through the Aalborg University Library search engine *Primo*, which provides access to a wide array of databases and suppliers of scientific documents. The scientific literature was found in the following databases: ScienceDirect, Wiley Online, Elsevier, Springer Link and emerald insight. The literature consists mostly of scientific journal articles from the following renowned peer-reviewed journals:

- Academy of Management Review,
- International Journal of Management Reviews,
- Business Strategy and the Environment,
- Environmental Quality Management,
- Journal of Business Ethics,
- Business Ethics Quarterly,
- Supply Chain Management: An International Journal, and
- Journal of Cleaner Production.

In addition to this, simple research through Google helped to identify non-scientific literature on the topic as many of the practitioner-oriented documents such as frameworks, guidelines and standards are not available through the library catalogue. The relevant literature was identified through using key search phrases which related to the research topic. The key search strings used where *sustainability (key performance) indicators, environmental (key performance) indicators, key environmental indicators* and *environmental performance indicators*.

The titles and abstracts of the documents were then used to identify relevant documents as a first step. Following this, the articles where skimmed and scanned for relevant information before analysing the remaining relevant articles in deep. References in these articles where followed in order to identify additional documents. The literature research and review continued through the whole process of writing this thesis, however the bulk of the work was done initially.

5.2 Case study

There are different methods in order to gather empirical data and information such as experiments, surveys, archival analysis, histories or case studies. In this study the case study method is used to gather empirical data through direct/indirect observation and experience whilst working at Schmalz. One of the main advantages of a case study is to get an integrated and complete overview of an event or phenomenon by studying it from different perspectives (Flyvbjerg 2006; Yin 2009).

According to (Yin 2009) a case study in the preferred method when examining contemporary events by being able to implement direct observation and systematic interviewing. Another strength of a case study is to be able to deal with a variety of evidence like documents, artefacts, interviews, and observations.

As Schmalz is right now in the phase of establishing and implementing a systematic sustainability management direct observations and systematic interviews, focusing on the choice of material topics and key environmental indicators, are an essential part of the research done in this thesis. According to (Flyvbjerg 2006) there are different

strategies to choose cases which serve different purposes. In the underlying case an information-oriented selection strategy was used. This is due to working together with Schmalz gives deep and very detailed insight into a single case, which allows maximizing the benefits of the information derived. As Schmalz is an exceptional example of a family owned company that is greatly investing in and driving sustainability forward it can be described as an extreme as well as a critical case (see Figure 5-1).

It is an extreme case due to the fact that Schmalz could be defined as a hidden champion (Simon 2012) not only regarding its market position but also regarding its sustainability efforts compared to the size of the company. Schmalz has been growing rapidly and almost doubled its number of employees in the last five years (J. Schmalz GmbH 2018a).

Due to this rapid growth the company does not fit into the definition of a medium sized enterprise anymore – less than 250 employees and a maximum of €50 million revenue (European Union 2003).

Strategies for the Selection of Samples and Cases

Type of Selection	Purpose
A. Random selection	To avoid systematic biases in the sample. The sample's size is decisive for generalization.
1. Random sample	To achieve a representative sample that allows for generalization for the entire population.
2. Stratified sample	To generalize for specially selected subgroups within the population.
B. Information-oriented selection	To maximize the utility of information from small samples and single cases. Cases are selected on the basis of expectations about their information content.
1. Extreme/deviant cases	To obtain information on unusual cases, which can be especially problematic or especially good in a more closely defined sense.
2. Maximum variation cases	To obtain information about the significance of various circumstances for case process and outcome (e.g., three to four cases that are very different on one dimension: size, form of organization, location, budget).
3. Critical cases	To achieve information that permits logical deductions of the type, "If this is (not) valid for this case, then it applies to all (no) cases."
4. Paradigmatic cases	To develop a metaphor or establish a school for the domain that the case concerns.

Figure 5-1 Strategies for the selection of samples and cases (Flyvbjerg 2006, p. 230)

However, one can observe that it does still have the characteristics of a medium sized company: flexibility, little bureaucracy, fast responsiveness to changing circumstance

(e.g. technology, market), low degree of formalisation, a strong local/regional focus and customer needs orientation (Bos-Brouwers 2009; J. Schmalz GmbH 2018a; Falle et al. 2016). This combination of being a hidden champion, passionate about sustainability and a fast-growing family owned company that still inherits characteristics of a medium sized company makes Schmalz an 'extreme' and rather unique case amongst German companies.

The fact that Schmalz still got the structure of a medium sized company makes it also a critical case as SMEs represent roughly 99% of the companies in Germany, whereof roughly 73.000, in 2016, are medium sized companies (Statistisches Bundesamt 2016). Therefore, the case can be used to make logical deductions, at least to a certain degree, regarding the systematic selection of environmental indicators for a large share of German companies. If Schmalz can use the proposed approach to identify and define material key environmental indicators other SMEs can do so as well. It would enable them to identify material topics and environmental indicators based upon stakeholder opinions and renowned standards and guidelines with little resources and effort.

However, these special features also limit the application of this case. As the conditions in which SMEs operate are often more dynamic and complex due to e.g. higher price pressure, growing international competition, shorter product and innovation cycles, it is hard to make generalisations valid for every SME (Simon 2012).

Another limiting factor is the circumstance that the company is family owned and the two owners are the biggest drivers for the topic of sustainability. In internal meetings regarding future sustainability topics, this circumstance proved to enable the company to make investments on a long-term basis without getting in conflict with shareholders or other external investors. This puts the company in a special position as it may has more freedom and support from the company owners than other, non-family owned companies. In these companies there might be less support for long-term investments as the short-term profitability of the company is the central aspect of business.

As a consequence, the underlying case is used to analyse the definition and identification of key environmental indicators for a family owned business which is

already actively promoting environmental sustainability in its business activities and still inherits the special characteristics of a medium sized company.

5.3 Interview

Interviewing is the most common method to gather information in a case study approach. Research interviews can be used to get information from a specific individual and give insight into how he/she is perceiving and interpreting the current circumstances. There are three types of interviews: structured, semi-structured and unstructured. The structured interviews have predefined questions to which the research sticks strictly. The unstructured interview is not bound to any questions and is more of a free discussion where no questions are pre-designed. The semi-structured interview combines the advantages of the former two, thus having flexibility to ask non-predefined questions but still stick to a certain degree of standard by having an interview guideline which directs the interview into the right direction. In this study the semi-structured approach was chosen to be able to ask more in depth and comprehensive questions and to not restrict the interviewee's answer by narrow questions. It also allows the interviewer to ask follow-up questions, create a less formal atmosphere and a conversation rather than a straight question – answer scenario (Galletta and Cross 2013).

The interviews conducted where used to aid the decision process of relevant KEIs by identifying environmental topics which are important to different members of the company and directly asking the interviewees to rate the so far identified KEIs according to their relevance for the company.

For a semi-structured interview an interview guideline is needed, which lists the guiding questions and themes that direct the interview into the right direction. The first part of the guideline consists of explanatory and organisational paragraphs which describe the scope and purpose of the interview, explain the rights of the participants (e.g. not answering a question or changing an answer afterwards) and ask for their permission to record and use the interview as a basis for the study.

The first question of the interview is an open question that allows the participant to freely talk about their experiences and opinion on the topic in order to set the base for the following interview (Galletta and Cross 2013). The following questions are more detailed and directed towards the research question to ensure the interviewer gets the relevant information and focuses on the topic.

If there are still gaps or questions that occurred during the discussion the last part of the interview can be used to recap and discuss some questions in more detail. In addition to this the participant is asked if there are any questions he/she has or if there are any thoughts or further recommendations. Thanking the participant for his/her time and providing contact details in case of further questions is wrapping up the interview. A sample interview guideline can be found in Appendix 1.

5.4 Informal information sources

Due to the fact that this thesis is written in collaboration with Schmalz and the author is engaged in the daily business as part of the sustainability team some of the information in this study is derived through informal sources. This informal information was obtained through observations in internal meetings, informal conversations with team members and other employees, and general observations made during the working time.

Observational research is a supplementary research method often used in combination with interviews, case studies and document analysis (McKechnie 2008). Observations are used to capture the daily life as experienced by the observer instead of looking at it through predetermined categories. The strength of observations lies in the flexibility and ability to get close to the subjects. This allows collecting unaltered information and data (McKechnie 2008).

The observations made in this study where mostly conducted in an overt, participatory manner which means the observer was actively involved in the observed situation.

The weaknesses and disadvantages of observations lie in this proximity to the research subject. The objectivity of the observer can be questioned as he/she is actively involved

in the daily work and therefore gets influenced by the surroundings and organisational culture (McKechnie 2008).

As being a part of the underlying case company, it is essential for the observer to keep distance to the observed situations and reflect on the information collected. But even then, observations are still tied to the subjective interpretation of the researcher. It is made evident whenever information from informal sources is used.

5.5 Stakeholder Theory

When talking about corporate sustainability the term *stakeholder* is unavoidable. Stakeholder theory is closely linked to the concept of corporate sustainability. Some scholars see it as a subset of the other (Garriga and Melé 2004; Wood 1991), others see it as competing concepts (Brown and Forster 2013; Schwartz and Carroll 2008), and others built their argumentation on the idea that both concepts are complementary to each other (Jamali 2008; Kurucz et al. 2009; Russo and Perrini 2010; Roberts 1992). Whichever standpoint one wants to take, both concepts have one thing in common: they stress the importance of implementing social interest into the business operations (Freeman and Dmytriyev 2017).

Edward Freeman coined and defined the stakeholder theory and demonstrates that organisations have stakeholders. That is, there are different individuals or groups that have interests in the company's actions. They can on the one side affect the company's actions or can be affected by these actions. If companies want to be successful now and in the future they have to take multiple stakeholder groups and their claims into account (Freeman 2010). The same is true for corporate sustainability. If companies want to be successful in implementing sustainability into their business they have to consider different stakeholders and their sustainability claims toward the company (Hörisch et al. 2014).

The stakeholder theory divides stakeholder groups into internal and external. Internal stakeholders are parties that can directly affect or are affected by the company from within; they do for example include employees, manager and owners. External

stakeholders are entities outside the company such as customers, suppliers, governments, society and shareholders which can affect or are affected by the company's actions (Freeman 2010; Freeman and Dmytriyev 2017; Hörisch et al. 2014; Brunton et al. 2017).

Stakeholder theory was used to select the external and internal inputs used to identify the relevant KEIs. In a first step external stakeholders where identified in internal discussions with the sustainability team (J. Schmalz GmbH 2019b). These stakeholders do not represent the whole stakeholder universe of Schmalz but rather an extract of external stakeholders fitted to the underlying issue.

At first, society at large was identified as a relevant external stakeholder. In order to represent environmental topics and indicators that represent the interest of the whole society the sustainability team wanted to take the SDGs as an overarching framework into account (J. Schmalz GmbH 2019b). The suitability of the SDGs as environmental indicators for a company can be questioned which is discussed further in Chapters 6.1.1 and 8.

Another important external stakeholder group identified where industry initiative in which Schmalz is participating in. The most relevant one regarding sustainability issues is the so called "Wirtschafts Initiative Nachhaltigkeit" (WIN), an industry initiative especially focused on bringing together sustainable companies in the south-west of Germany (J. Schmalz GmbH 2019b).

The next stakeholder group was found in the standardisation organisations: ISO and GRI. As Schmalz has an environmental management system certified by ISO 14001 it was a logic step to take the recommended environmental indicators of ISO 14031 into account (J. Schmalz GmbH 2019b). GRI was chosen with the future advancement of the sustainability reporting in mind. Schmalz is already reporting inspired by the GRI standards but is still a good way from publishing a sustainability report in accordance with the GRI standards. Looking at the environmental indicators from GRI is however a first step in this direction (J. Schmalz GmbH 2019b). The standardisation of environmental management and reporting is also relevant to customers and suppliers

as more and more of them are taking factors like ISO certification or sustainability reporting into their supplier or customer evaluations. Furthermore, Schmalz is recognising an increasing trend of more environmentally conscious suppliers and customers which makes these stakeholders even further relevant.

The last external input consists of environmental indicators derived from sustainability reports of sample companies. This input is also directed towards customers and suppliers as it is looking at the state of the art in environmental indicators in German companies with similar size and structures as Schmalz. It is however also addressing competitors. If Schmalz is adopting KEIs at an early stage, it might give the company a strategic and economic advantage over its competitors who might not yet have recognised these issues.

Other external stakeholders such as authorities, NGOs or users of the products have not been included as they have been identified as less relevant. Authorities and other public institutions have not been included as they have been identified to have only little claims towards Schmalz. For instance Schmalz is not obliged to publish a non-financial report based on EU Directive 2014/95/EU and is covering most environmental requirements through its environmental management systems under ISO 14001 (J. Schmalz GmbH 2019b).

So far Schmalz had no requests or claims made by NGOs or similar institutions. Therefore, this stakeholder group was identified as non-relevant and is not explicitly addressed (J. Schmalz GmbH 2019b).

As a big share of Schmalz products is handled by robots and not directly by humans the users of the products are also considered less relevant when it comes to claims regarding environmental sustainability. Of course there could be issues such as harmful substances or life-time of the products that might affect the users of the products, however these have not been considered relevant for the present study (J. Schmalz GmbH 2019b). Furthermore, are the users of the products most of the time identical to the customers as Schmalz is selling its products directly to the end customer.

The internal stakeholders have also been identified in cooperation with the sustainability team in the internal discussion (J. Schmalz GmbH 2019b). The following stakeholders have been identified and are considered in the identification of the KEIs: the owners, the executive board, the strategy department, the sustainability department (including the environmental department) and the employees. The owners and the executive board have been identified as relevant due to their influence and position as a gate-keeper for the whole sustainable development of the company. Only if these actors provide their support sustainability can be implemented successfully. Furthermore, these actors know the company and the relevant issues very well and are the ones that have to make the decisions which the KEIs are going to support.

The strategy department is relevant for identifying suitable KEIs as they are the ones setting the framework for the company's future development. As sustainability is anchored in the business strategy it is essential that the KEIs are aligned with the strategy. Therefore, input from this department is seen as a crucial part.

As the project for this study was launched by the sustainability department its input is also essential. The department is providing specialised knowledge on sustainability and environmental issues and is constantly involved in discussing and evaluating the results of the study.

The employees are also considered relevant as they are the backbone of the company and are the ones that put the theory behind the KEIs and the strategy into practice. In addition to this they often have deeper insights and knowledge into the structures and processes inside the company and are therefore a valuable source of information.

5.6 The DPSIR Framework

In order to help categorise and determine the variety of the identified indicators from the external sources the DPSIR-framework is used as an analytical framework. To show the relations between the human activities and the environment the DPSIR-framework categorises indicators according to ***d****riving forces* – ***p****ressures* – ***s****tate* – ***i****mpact*

– *responses*. The framework is based on the assumption that social and economic development (*driving forces*) put *pressures* on the environment that alter the *state* of the environment. This change has *impacts* on e.g. human health, ecosystems and materials that may provoke *responses* which feed back to the driving forces (see Figure 5-2). As we can see the model describes a dynamic system including the feedback originating from the different aspects. Indicators represent only a snapshot of the constantly changing system but they help highlighting the dynamic relations as well as the actual state of the system (Gabrielsen and Bosch 2003; Dong and Hauschild 2017).

Indicators describing *driving forces* represent the social, demographic and/or economic developments in societies and businesses. These developments entail changes in, for example, levels of consumption, lifestyles or production patterns. These forces then provoke changes in the production and consumption which can be represented by e.g. energy or resource use. This in turn puts pressures on the environment (Gabrielsen and Bosch 2003).

Pressure indicators therefore describe the release of substances (emissions), physical or biological substances, and the use of resources and land caused by human and

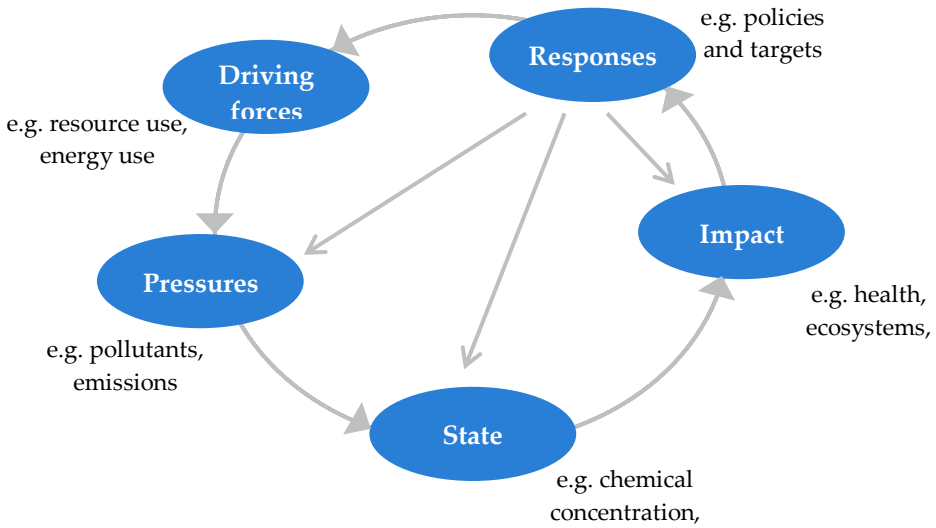

Figure 5-2 DPSIR Framework (adopted from Gabrielsen and Bosch 2003)

business activities. Examples for pressures are CO_2-emissions of businesses or products, the use of fossil-fuels for generating energy or the amount of land used to build infrastructure (Gabrielsen and Bosch 2003).

State indicators describe the actual situation of the ecosystem related to physical, biological and chemical phenomena in a certain area. They describe, for instance, the atmospheric CO_2 concentration or the level of noise in the neighbourhood of airports. The pressures on the environment cause its state to change. These changes can have impacts on environmental functions such as human and ecosystem health, resource availability, losses of manufactured capital and biodiversity. *Impact* indicators are used to describe the changes in these conditions (Gabrielsen and Bosch 2003).

The *response* indicators describe the responses of groups or individuals to prevent, compensate, manage or adapt to the changes occurring in the state of environment. Responses could come in the form of raising the efficiency of products and processes by implementing clean technologies. Examples for response indicator could be the relative amount of renewable energy generated or recycling rates (Gabrielsen and Bosch 2003).

Even though the framework is mostly used on a macro-level (e.g. sector, national, global) to describe the interactions between human and environment it can still be adopted to a micro (business) level as the interaction between business activities and environment follow the same rules. Only the scope of the indicators changes to be directly related to the underlying business activities rather than to societal human activities.

6 Defining the KEIs

The proposed KEIs for Schmalz are identified through two steps (see Figure 6-1). First, external sources such as the previously presented literature, national guidelines and general standards as well as indicators reported by competitors or companies with similar size and structure are used to define a first, broad set of indicators. This set is then filtered and further specified through internal sources such as interviews with internal stakeholders and Schmalz's integrated business strategy.

Using this two-step approach makes it possible to identify KEIs which: are material to external and internal stakeholders, improve the long-term strategic implementation of environmental sustainability and enable the company to improve and communicate its environmental performance internally and externally.

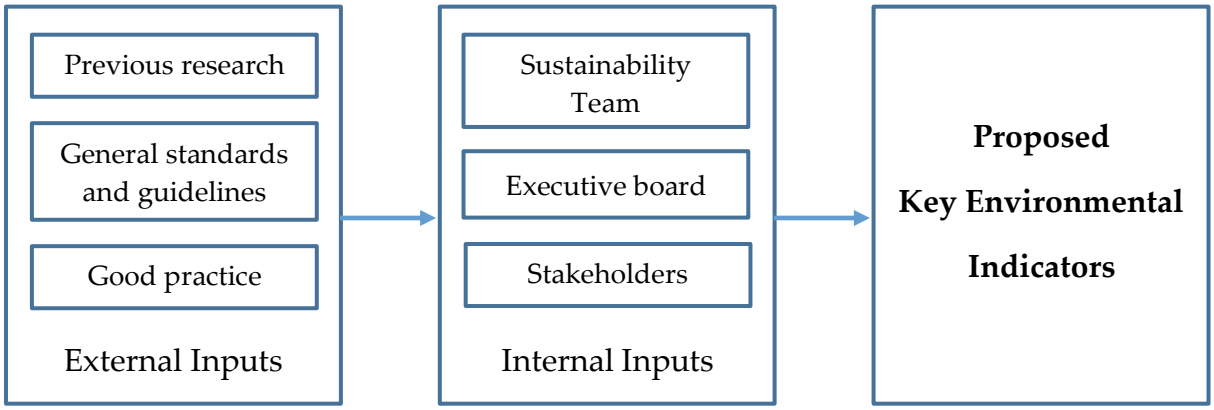

Figure 6-1 Two step framework to identify KEIs

6.1 External inputs

The first step on the way to the proposed KEIs for Schmalz is to consult external sources in order to get an overview on the most common KEIs and define a first set. The external sources consist of: the international guidelines for sustainable development provided by the *UN Sustainable Development Goals*, the internationally recognised *ISO 14034* guideline for environmental performance evaluation, the *GRI Standards* as the most used sustainability reporting standard, the WIN-Charta as a regional management and reporting framework especially for SMEs, as well as good practice examples from six sample companies.

6.1.1 Sustainable Development Goals

During the last couple decades, a lot of environmental targets and indicators came into existence, to promote making decisions towards a liveable and sustainable place for humans. These targets and indicators stem from a human-centred perspective and exist on different decision levels. The SDGs, which have been released by the UN in 2016, are one of the most recent ones. Their goal is to stimulate all nations to "heal and secure our planet" and *"shift the world to a sustainable and resilient path"* (UN 2015a, p. 3).

Consisting of 17 goals supported by 169 targets the SDGs set a clear direction to what has to be attained by 2030.

In order to facilitate the implementation and monitoring of the SDGs, the Sustainable Development Solutions Network has developed several indicators (UN 2018; Sustainable Development Solutions Network n.d.)

As the SDGs are looking at establishing a sustainable world, by assuring common goals between several stakeholders, their scope is often on a regional, national or even global level. This means the goals and indicators cannot be transferred to a company level as such. However, the SDGs can give valuable insight into the global environmental issues, trends and maybe regulations (as a response from regulators to be able to meet the goals) to which companies will be exposed in the future. Adjusting the indicators to fit onto a company level allows for considering global targets from a business perspective. Furthermore, Schmalz is able to contribute, even though it is only a small part, to the fulfilment of the SDGs and play its role as a responsible company.

6.1.2 WIN Charta

The goal of the *Wirtschaftsinitiative Nachhaltigkeit* (WIN) - business initiative for sustainability - is to concentrate the experience and knowledge of engaged companies. In cooperation with the federal administration sustainable pioneer companies are working on success factors for the sustainable development of the economy and businesses in south-west Germany (WIN 2019).

Schmalz is a founding member of the initiative and is therefore eager to align with the strategies, goals and indicators suggested by WIN. The member companies have to produce an annual progress report on their sustainability activities, strategy and goals. These issues are the reason why Schmalz wants to consider the WIN indicators in their selection process of KEIs for their future strategical orientation. The WIN indicators represent more specified indicators than the SDGs with a special focus on the economic region Schmalz is located in.

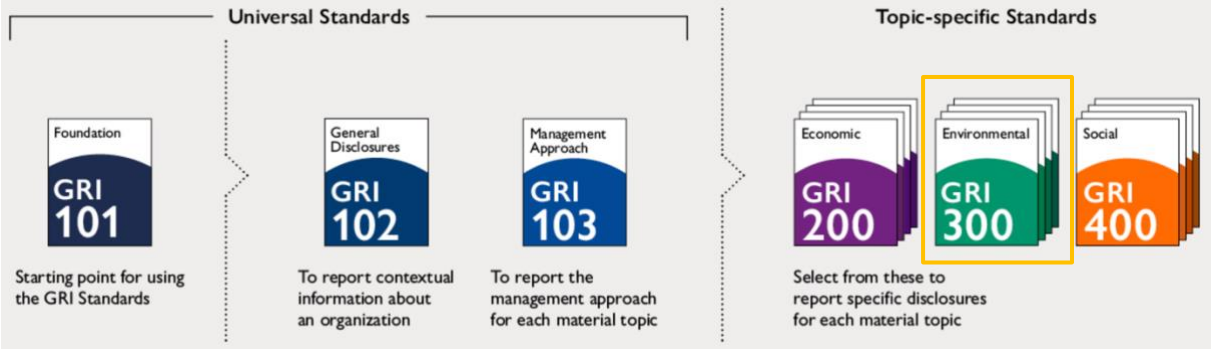

Figure 6-2 Structure of the GRI standards (from GRI 2019)

6.1.3 *Global Reporting Initiative*

The *Global Reporting Initiative* (GRI) is an independent international initiative which aims at helping businesses and governments alike to understand and communicate their sustainability issues and performance to a wide array of stakeholders. Through this the institutions are able to generate meaningful action to create social, environmental and economic benefits for everyone. The GRI standards are developed with a multi-stakeholder approach in order to ensure they are rooted in the public interest (GRI 2019).

GRI is one of the most ambitious and prominent efforts to standardise, streamline and make sustainability reporting reliable. This is done by setting up a framework relying on concrete evidence and performance indicators. These indicators are based on global best practice and multi-stakeholder contributions. The standard itself is built upon interrelated stages (see Figure 6-2). There are universal standards which are divided into *Foundation, General Disclosures and Management Approach,* and there are the topic specific standards for economic, social and environmental issues.

The universal standards define the principles of GRI reporting, ask for general information and context of the reporting company and reports on the management approaches for the material topics within the company.

The topic specific standards then provide a number of indicators to illustrate the sustainability performance of the company (GRI 2019). As this study is dealing with environmental indicators only the topic specific standard GRI 300 *Environmental* is considered (GRI 2018). This standard contains indicators for the categories: materials,

energy, water and effluents, biodiversity, emissions, effluents and waste, environmental compliance and supplier environmental assessment.

6.1.4 ISO 14031 – Environmental performance evaluation

The ISO 14031 standard was created to present a process framework called environmental performance evaluation. This process enables companies to measure evaluate and communicate their environmental performance. It is based on reliable and verifiable key performance indicators. The indicator clearly states that it is applicable to "small and large enterprises" (EN ISO 14031:2013, p. 4), which makes it suitable for this study as Schmalz is, as previously mentioned, not a medium sized company anymore but still inherits characteristics of one.

Environmental performance evaluation (EPE), according to the standard, can be used as a complementary tool besides an already implemented environmental management system (e.g. according to ISO 14001). EPE is defined as a continuous process of collecting and assessing environmental data and information in order to provide a current evaluation of environmental performance as well as trends over time (EN ISO 14031:2013). Therefore, the indicators from this ISO standard are very well suited for getting an overview on possible KEIs for Schmalz. Furthermore, it provides, in contrary to the SDGs, indicators set on a company level which require only little or no further adjustments to fit.

6.1.5 Sample companies

As mentioned in Chapter 6.1 the last external factor analysed for identifying environmental indicators are the sustainability reports and websites of different sample companies. The companies have been selected by the sustainability team based on recommendations from the executive management as examples for companies which are perceived as good practice examples. The selection process was on the one side based on the reputation of the companies with regard to sustainability (e.g. winners of sustainability awards) and on the other side on the size and structure of the companies (number of employees, family owned). Table 6-1 gives an overview on the

selected companies, on their size, their structure, their industry and the number of environmental indicators which have been found.

Name	Size and structure	Industry	Number of environmental indicators
Fischer	5.200 employees, family owned	Fixing systems for the construction industry	13
Viessmann	12.000 employees, family owned	Energy systems (e.g. heating, cooling, solar)	3
Dürr	~ 14.000 employees worldwide, 7.800 in Germany, stock company	Mechanical and plant engineering	9
Neumarkter Landsbräu	137 employees, family owned	Brewery, soft drinks	17
EBM Papst	~15.000 employees worldwide, ~6.000 in Germany, limited company	Ventilation systems	1
Elobau	950 employees, limited company	Electric sensors	10

Table 6-1 Overview on the selected sample companies

The selection ended up with six different companies from varying industries ranging from the beverage to electronics and engineering industry. The companies are also very different regarding the number of employees - they range from 137 to as much as 15.000 employees worldwide. Four out of six companies are family owned businesses. The number and type of indicators varied greatly between the different companies. Some of the companies did report on their sustainability activities but did publish only very few indicators (e.g. EBM Papst). Other companies had very extensive sustainability reporting and a great set of environmental indicators. The numbers varied from as little as one indicator, related to resource savings related to innovative products, to 17 environmental indicators.

As the selection of the companies was made up-front by the company's executive management the sustainability team and in this instance the author had little influence on the process. One factor that is debateable is the choice of industries. The selected companies are not really set in industries related to vacuum technology. Of course, the bigger part of the companies is set in mechanical and engineering industries, however the environmental impacts and issues can vary greatly depending on the products and

its raw material. One factor for this could be that the vacuum technology industry is a niche market and there are only little companies fitting into the profile of being family owned and actively engaged in sustainability activities.

6.2 Identified environmental indicators

The identified environmental indicators have been organised in ten categories:

- Air
- Biodiversity
- Climate Change
- Terrestrial
- Waste
- Water
- Energy
- Transport
- Resources
- Products

These categories have been derived from the European Environmental Agency core set of indicators (European Environment Agency 2005). However, the categories *fisheries* and *agriculture* are not considered because they are not relevant to Schmalz. But the two categories *resources* and *products* have been added as they have been identified as relevant topics for the company (J. Schmalz GmbH 2019e).

In addition to this the indicators have been categorised with the help of the before mentioned DPSIR framework to identify which type of indicators are the most commonly used by companies and recommended by guidelines and frameworks.

In total a number of 258 indicators where identified which are distributed as follows: 0 drivers, 185 pressures, 25 states, 5 impacts, 43 responses (see Appendix 2). The results show that no drivers have been identified amongst the environmental indicators. This could be the consequence from the definition of driving forces as "the social, demographic and/or economic developments in societies and businesses". As we were only looking at environmental indicators it seems plausible that there are no social, demographic or economic indicators present. Furthermore, the external sources provide indicators in order to assess the environmental performance and impacts of businesses (except the SDGs) and therefore do not represent basic sectoral trends or developments. Of course, there are driving forces behind the identified indicators however these drivers are not included as indicators in the analysed sources.

This first set of indicators includes a lot of the same or similar indicators. Therefore, in the next step the indicators were analysed, aggregated and irrelevant indicators which are not applicable to Schmalz have been removed. This leaves us with 52 indicators, which are divided into 23 Pressures, 6 States, 2 Impacts and 20 Responses (see Table 6-2).

In the next step this set of indicators identified through external sources is undergoing an internal assessment in order to further specify the indicators and consider the input from internal stakeholders.

	Pressures	States	Impacts	Responses
Air Total: 7	Emissions of: - Ozone depleting substances - SO_2 - NO_x - VOC - Particulate matter	- Concentration of specific contaminant (e.g. particular matter) in ambient air at selected monitoring locations		- Measured reduction, removal or elimination of air pollutants
Bio-diversity Total: 4		- Proportion of degraded land on production site	- Qualitative/quantitative description of the impacts on the environment caused by activities, products, and services	- Size/location of habitat areas protected/restored, and approved success of restoration measure - Partnerships with third parties to protect or restore habitat areas
Climate Change Total: 5		- Total GHG emissions - Amount of GHG emissions by source - Scope 1, 2, 3 emissions		CO2 emissions reduced through: - reduction initiatives - improved products
Terrestrial Total: 3	- Total land used per unit of product	- Paved and non-fertile area		- Expenditure on preservation, protection and conservation of cultural and natural heritage
Waste Total: 6	- Total amount of waste - Total amount of hazardous waste - Total waste disposed of by category		- Material sent to landfill	- Recycling rate - Quantity of (hazardous) waste reduced through initiatives
Water Total: 4	- Total water use by category (e.g. fresh, drinking, industrial) - Total amount of waste water			- Amount of water saved through initiatives - Amount of water re-used
Energy Total: 6	- Energy intensity, per € revenue - Total energy consumption by sources - Energy efficiency			- Amount of renewable energy used/produced - Energy savings through initiatives - Energy savings through efficient products

Transport Total: 5	- Fleet CO_2 emissions - Number of freight deliveries by mode of transport - Number of business trips - Number of commuted km by mode of transport			- Percentage of business meetings conducted remotely
Resources Total: 8	- Resource use for products and packaging - Percentage of re-used, recycled, renewable material used per product - Percentage of regionally sourced material - Auxiliary material per product - Material efficiency			- Re-used auxiliary materials (e.g. oil, coolant) - Amount of packaging reduced through initiative - Percentage of reduced resource use due to innovative technologies
Products Total: 3				- Percentage of products designed for disassembly, recycling or reuse - Reductions in energy requirements of sold products
Total: 50	**23**	**6**	**2**	**19**

Table 6-2 Aggregated set of environmental indicators from external sources

6.3 Internal Inputs

In order to take the opinions and claims of the internal stakeholders into account, the set of environmental indicators identified through external sources has been evaluated by several internal stakeholders.

As mentioned in Chapter 5.5 the identified internal stakeholders consist of the executive board, the strategy department, the sustainability department and the employees. The executive board is represented by the managing director under whose responsibility the sustainability department is situated. A personal interview was conducted in order to get first-hand information and make sure the KEIs do correspondent with the vision of the executive board. Another personal interview has been conducted with the head of the strategy department and the manager of the sustainability department. In order to obtain information representing the opinion of the employees a group of employees from different departments was interviewed during an internal meeting.

6.3.1 Business strategy

Until recently Schmalz had not integrated sustainability in its business strategy. An internal sustainability strategy existed, however, this strategy was known to only a few people and has never been actively pursued or monitored. In order to give sustainability a higher degree of importance the executives decided to make sustainability part of the overall business strategy for Schmalz.

In the interview, the head of strategy explained this decision with a higher visibility of the topic and a better distribution of responsibilities. If sustainability is anchored in the overall business strategy everyone in the company comes into contact with sustainability topics, no matter from which department. The plan is to embed sustainability into the daily business and make it a habitual part instead of an add-on to the normal business (Interview 1 2019).

In the current business strategy, there are four sustainability related goals: *tackle climate change, reduce the CO_2 footprint of the products, embed sustainability internationally and live sustainability.* As we can see these goals are rather broad and superficial. The reason for this lies in the connection of the strategy with the company's vision: "Schmalz takes the lead worldwide." (J. Schmalz GmbH n.d.).

This vision is rather unspecified. Thus, the goals for the strategy have to be broad as well in order to not create a conflict between the vision and the strategy. The vision is the *where* does the company want to be in the future. The strategy is the *how* is the company going to achieve this. And the measures derived from the strategy are the *what* is the company doing in specific to get to the desired state. Therefore, the strategy and its goals are abstract in order to have the room for manifold measures to reach the goals (Interview 1 2019).

As we can see only the goals *tackle climate change* and *reduce the CO_2 footprint of the products* are directly related to environmental topics. The other two goals are too broad and focused on sustainability as a whole, which is why they are not considered in the further prioritisation of the identified environmental indicators.

For the first goal *tackle climate change* the indicators from the climate change category are going to be relevant. Especially the indicators *Scope 1, 2, 3 emissions* and *CO_2 emissions reduced through reduction initiatives* have been mentioned as the most relevant indicators by the head of strategy (Interview 1 2019). The head of strategy especially stressed the importance of the Scope 1, 2, 3 indicators as this indicator includes several other indicators from other categories such as transport and material/resources (Interview 1 2019). This type of aggregated indicator makes it possible to monitor and communicate a variety of measurements in an accumulated and comprehensive way. In addition of this the goal of tackling climate change includes the use and further expansion of renewable energy. As Schmalz used to be "Positiv-Energie-Unternehmen" in the past the goal is to reach this status again in order to facilitate a carbon neutral production (J. Schmalz GmbH 2018b, 2019c).

Furthermore, the indicators from the categories resources and products are going to be relevant for the second goal *reduce the CO_2 footprint of the products*. In contrast to the climate change indicators the head of strategy has not given any prioritisation of a specific indicator. However, with regard to the aim of reducing the product carbon footprint the strategy names additional environmental issues. The products should become more energy and material efficient as well as less complex in order to increase the reuse- and recyclability. This is going to be achieved by continuous product innovations (J. Schmalz GmbH 2019c). With regard to these issues the following environmental indicators can be identified as relevant for the strategic goal of reducing the product carbon footprint:

- *Resource use for products and packaging,*
- *Percentage of re-used, recycled, renewable material used per product,*
- *Amount of packaging reduced through initiative,*
- *Percentage of reduced resource use due to innovative technologies*
- *Percentage of products designed for disassembly, recycling or reuse* and
- *Reductions in energy requirements of sold products*

As we can see the overall business strategy has already embedded some environmental (and sustainable) issues, however due to its broad and abstract character does not provide us with specific measures or targets that allow for a comprehensive evaluation of the identified environmental indicators. Some indicators have been identified as being relevant from a strategic viewpoint, others may be identified in the following paragraphs with the help of the information gathered from other internal stakeholders.

6.3.2 Employees

In order to get an evaluation and prioritisation of the identified environmental indicators from the employees a selected group of representatives was questioned in the course of a meeting. First of the participants were given background information to the thesis and its purpose. Following this, examples on the current environmental efforts of Schmalz were given and the environmental indicators presented. Questions regarding the indicators, their use or function have been discussed and a more detailed explanation was given if necessary. After having eliminated any uncertainties the indicators have been discussed and evaluated together with the participants. The participants were asked to evaluate the indicators with regard to their materiality for Schmalz. Thereby, they should evaluate the indicators based on their personal opinions, experiences and expectations to represent the significance of the indicators for different internal stakeholders (Calabrese et al. 2017).

During the discussion about the indicators several ideas and comments came up. For example, did some of the participants state that the indicators can be relevant in different ways. Three categories where named most often: internal interests (measure/steer), external communication and legally binding indications (J. Schmalz GmbH 2019a). This corresponds with the three functions of indicators defined in Chapter 3.1.: management, communication and representation. The function of the final KEIs with regard to this is discussed later.

Another discussion that evolved was about whether there should be single or aggregated indicators. For example, a single indicator such as *total amount of waste* is easy to grasp, measure, and put responsibility to. An aggregated indicator such as Scope 1, 2 or 3 is, as mentioned above, useful to monitor and communicate a variety of measurements in an accumulated and comprehensive way. This makes it easier for the management to quickly see changes on the basis of one indicator. However, it also entails the disadvantage that the cause for the change might not become apparent directly.

The last remark regarded the use of absolute versus proportional indicators. The use of either has to be based on the goals which are connected to the KEIs. If the goal is an absolute reduction, an absolute KEI is needed to measure the progress. If the goal is proportional or percentual the indicator has to be proportional as well. It therefore depends on the goals the company is setting itself whether there should be absolute or proportional KEIs.

In the following the results from the evaluation are presented. In total a number of 20 participants were questioned. They represent a broad range of departments: business unit handling systems, pre-development, logistics, knowledge transfer, product designers, quality management, occupational health and safety, plastic competence team, sustainability team and production and assembly planning.

The participants were asked to vote on each indicator. The evaluation categories were: *not relevant, little relevance, relevant, very relevant* and *no evaluation*. The selection of the indicators was based on two criteria. First, all indicators which had more votes for being *very relevant* than any other category have been selected. Then, in order to cover each environmental impact category, the indicators which had the highest number of votes for being *relevant* in each impact category were selected. The result can be seen in Table 6-3.

As we can see the topics of energy, waste and climate change are the most relevant amongst the employees. Issues such as transport, water and biodiversity are not considered as relevant. These results do coincide with the information derived from the business strategy and the interview with the head of strategy. One of the main goals for Schmalz is to become "Positiv-Energie-Unternehmen" again, by producing more renewable energy than it is consuming. It is positive to see that the employees do already see energy and climate change as relevant topics which should be backed up with indicators for a strategic implementation.

Combined Selection		relevant	Very relevant
Air	Measured reduction, removal or elimination of air pollutants		6
Biodiversity	Size/location of habitat areas protected/restored, and approved success of restoration measure	9	2
Terrestrial	Paved and non-fertile area		7
Climate Change	CO2 emissions reduced through reduction initiatives		11
	CO2 emissions reduced through improved products		10
	Scope 1, 2, 3 emissions		9
	Total GHG emissions		9
Waste	Total amount of waste		13
	Recycling rate		12
Water	Amount of water saved through initiatives	10	3
Energy	Total energy consumption by sources		16
	Amount of renewable energy used/produced		16
Transport	Number of commuted km by mode of transport	8	3
Resources	Amount of packaging reduced through initiatives		8
Products	Reductions in energy requirements of sold products	9	5

Table 6-3 Selected environmental indicators based on evaluation from employees

Therefore, it is not surprising that the *total energy consumption by sources, amount of renewable energy used/produced* has the highest rating. Schmalz is already investing heavily into renewable energies and it seems that the employees are already sensitised to the topic.

It is similar with the indicators regarding climate change. Schmalz is already engaged in this topic which means the employees are familiar with this topic and seem to regard it as relevant. In addition to this, another overall business goal stated in the business strategy is to tackle climate change. Therefore, the indicators in this category are very relevant for the company and its strategic development.

Waste being the category including the second highest rated indicators could be explained with the proximity of the issue. Everyone produces waste and has come in contact with the issue whether it is in daily life or work. Nevertheless, it is significant to see that this issue seems to have a high relevance amongst employees. Especially the fact that *recycling rate* is one of the indicators shows that it is not only relevant to avoid waste but also to re-use/recycle the materials and resources. This is aiding the goal of reducing the carbon footprint of the products stated in the business strategy.
To define the final set of environmental indicators the present set is presented to the executive board which is then giving thoughts on prioritisation and relevance of the indicators.

6.3.3 Executive Board

As the executive board is the final gate keeper regarding the implementation of the KEIs into the strategy and structures of the company it was decided to confront them with the environmental indicators as the final step. They are the ones deciding where the company is going and how the goals are going to be reached. The set of indicators from Table 6-3 was presented to the executive board member who is responsible for sustainability. He was asked to evaluate whether the identified indicators represent the interests of the company, there are indicators missing, and which indicators are most relevant.
The first part of the interview was about whether the indicators do cover the relevant issues or if there are any missing. Overall the executive was pleased with the selection and had only minor objections. The first remark regarded the indicator *paved and non-fertile area*. He stated that this indicator is not expedient because if a company decides to build upon and therefore pave an area it is going to do so. There might be compromises possible, for example parking spaces being paved with grass pavers to make them only partially paved, but the car park will still be built (Interview 2 2019). He then mentioned that Schmalz is creating ecological compensation areas if they are building and sealing area. Therefore, his suggestion was to communicate this fact but

do not derive an indicator from it as it has little significance and is not strategically relevant for the company (Interview 2 2019). Furthermore, this indicator is only going to change if something is built. Therefore, a change in the indicator would only occur sporadically.

It is similar with the indicator *Size/location of habitat areas protected/restored, and approved success of restoration measure.* Schmalz has established an "Öko-Lehrpfad" on its premises, which is a protected area with different habitats on which people can take a walk and explore the local flora and fauna (J. Schmalz GmbH 2018b). As this area does already exist since almost twenty years and is a sole showcase project there is no strategic value to it. As Schmalz is not a company with a huge terrestrial footprint such as a mining company or agricultural business there is little need to protect or restore habitat areas. Therefore the executive stated that this is not going to be a key environmental indicator for Schmalz (Interview 2 2019).

The next remark was related to the indicator *Amount of water saved through initiatives*. Because Schmalz has no significant processes using a lot of water the leverage in this indicator is probably very little. This means that there is not a lot of potential for the company to improve on its water consumption and therefore there is only little use for a KEI. He mentioned though that keeping track of the water consumption, which Schmalz is already doing, is useful (e.g. for cost reasons) but not strategically relevant (Interview 2 2019).

Regarding the indicator *Number of commuted km by mode of transport* he added that Schmalz is actually keeping track on the kilometre commuted by the employees but not on the mode of transport yet. This is due to the fact that there are probably very little employees not using a car, as the possibilities of alternative modes of transport are very limited. Schmalz is working on this issue. However, it is not seen important enough to consider it as a key environmental indicator (Interview 2 2019).

The same goes for *Measured reduction, removal or elimination of air pollutants.* There are already legal requirements stemming from the federal immission control act that oblige companies to track different emissions into the air (Bundesamt für Justiz 1974).

The relevant emissions are already tracked in order to comply with the law. Beyond that however, these indicators have only little contact points with the company's strategy (Interview 2 2019). In addition to this, according to a comment from the environmental team, Schmalz has hardly any processes which cause significant emissions to the air (J. Schmalz GmbH 2019a). Therefore, this indicator is also not considered to be a key indicator.

After having discussed the indicators not suitable for being a key environmental indicator the discussion turned to the ones relevant.

As the top priority the executive named all indicators which are related to reach the goal of having a positive net energy balance again (Interview 2 2019). This means that the indicators *Total energy consumption by sources* and *Amount of renewable energy used/produced* are going to be key environmental indicators.

The indicators related to climate change do have a high priority as well, as tackling climate change is part of the business strategy. In order to limit the number of indicators the executive suggested to combine the indicators *CO_2 emissions reduced through reduction initiatives* and *CO_2 emissions reduced through improved products* into one indicator that depicts the overall CO_2 savings from the company. Furthermore, he noticed that when monitoring the Scope 1, 2, 3 emissions the indicator *Total GHG emissions* becomes redundant (Interview 2 2019). As Schmalz wants to tackle climate change along the whole value chain of its production and products it is necessary to monitor the whole spectrum of scopes. The indicators *Overall CO2 emissions reduced* and *Scope 1, 2, 3 emissions* are therefore also set as key environmental indicators.

As mentioned above, Schmalz wants to lower the environmental impact along the whole value chain the topics of resources and waste are relevant too. Even though the indicator *Amount of packaging reduced through initiatives* got the highest vote in the resource category the executive suggested to go with a more comprehensive indicator which shows the resource use along the whole supply chain of the products. He however had no example for a suitable indicator that is able to represent this information in a suitable way (Interview 2 2019).

During the discussion it became clear that the two waste indicators are connected to each other. If Schmalz wants to disclose its *Recycling rate* it has to monitor the *Total amount of waste* as well. Thus, the executive suggested setting both indicators as KEIs as they are relevant for the strategic target of reducing the products footprint along the supply chain (Interview 2 2019). In addition to this, monitoring and improving on the amount of waste produced and the amount of material recycled has also economic benefits. Disposing of waste costs money, avoiding waste and recycle materials saves money and sometimes even earns you money when selling clean scraps (e.g. aluminium, steel) for recycling (Interview 2 2019).

The executive stated that it is important that the indicators do also address the needs of the customers (Interview 2 2019). The indicator *Reductions in energy requirements of sold products* enables the company to do this. Savings in energy consumption of the products increases the value the customers get from the product and makes Schmalz products more efficient and competitive. Thus, this indicator is from strategic relevance as it can be used to decrease the environmental impact of the products as well as satisfy the customers' needs and support the overall goal of creating competitive products (Interview 2 2019).

With the input from the executive board the following environmental indicators have been defined as the final set of key environmental indicators:

Category	Indicator
Energy	Total energy consumption by sources
	Amount of renewable energy used/produced
Climate change	Overall CO_2 emissions reduced
	Scope 1, 2, 3 emissions
Waste	Recycling rate
	Total amount of waste
Products	Reductions in energy requirements of sold products

Table 6-4 Final set of environmental indicators

7 Analysing the proposed indicators

The final set of indicators was identified with the help of the literature, external sources such as standards and guidelines and the evaluation of internal stakeholders. This final set is now to be analysed with regard to the aspects described in Chapter 3 in order to make sure they meet the expectations of key environmental indicators. Furthermore, it is discussed whether the identified indicators are suitable to represent the strategic goals of the company and the advantages and disadvantages of the selected indicators are presented. The last part of this chapter is going to give recommendations on possible targets derived from the indicators in order to support the fulfilment of the strategic goals set by the company.

7.1 Fulfilment of characteristics for key environmental indicators

First of the selected indicators are tested against the seven characteristics describing a KPI.

1. They are non-financial measures
2. They are measured frequently (daily, weekly, monthly, yearly)
3. They are acted on by the senior management team
4. They tie down responsibility to a department or individual
5. They indicate which action has to be taken by those responsible
6. They are significant (e.g. affect more than one critical success factor and more than one balanced scorecard perspective)
7. They encourage the appropriate action by being tested to ensure they have a positive impact on performance

All of the indicators fulfil criterion one as they are measured in different non-financial measurements. Criterion two however, cannot yet be evaluated as the indicators are not yet in place. If Schmalz is going to implement the suggested KEIs they have to make sure to measure them frequently in order to be able to react on changes in time. As the indicators have been identified and defined with the help of the board of executives, criterion three is covered as well. If the executives decide on implementing

the KEIs there is a responsibility bound to them by their involvement in the selection process.

Characteristic number four is also hard to evaluate up front. As the indicators are not yet implemented there is so far no allocation of responsibilities. However, as the company established a new sustainability department the responsibility regarding the monitoring of the KEIs is probably going to lie there. As the KEIs are rather broad it is hard to pin down one department for being responsible to act upon them. The selected KEIs are company-wide, though the responsibility lies at everyone in the company.

Regarding characteristic number five it depends on how one interprets it. As the KEIs are broad the actions that have to be taken can be broad as well. For example, in order to reduce the energy consumption, the office staff could turn off their monitors when they leave their desks, the assembly line workers could optimise their processes or the production could switch out old, inefficient machines. This is linked with the various responsibilities from characteristic number four.

As the KEIs have been developed in alignment with Schmalz's business strategy they cover criterion number six. As shown in paragraph 6.3.1 they do affect more than one strategic goal. Therefore, they are significant and support the future success of the company by reducing the environmental impact and creating added value.

Criterion seven has to be tested by the company when implementing the indicators into their strategic sustainability management. However, as they are broad and affect the company as a whole it can be assumed that an improvement in these indicators will result in an improvement of the performance. There are however several factors which cannot be foreseen, such as costs and effort for improving the indicators or the long-term benefits.

As we can see most of the criteria is met by the identified KEIs. One disadvantage however is that they are rather broad, and it is hard to tie down responsibility to them. This fact has to be kept in mind when the company wants to implement these KEIs. It has to be assured that the responsibility is located in a department that has the knowledge and influence to make sure the KEIs are acted upon. One possibility would

be to anchor them at the very top in the executive board as it is the case with conventional KPIs.

The next step is to make sure the indicators fulfil the criteria for key environmental indicators. As stated in paragraph 3.3 KEIs need to:

- be an environmentally relevant quantity,
- monitor whether the company is meeting its environmental goals,
- at the same time communicate the need for additional measures,
- compare the actual situation with a specific set of reference conditions,
- and report on results rather than efforts.

Criterion one is fulfilled by each indicator. The indicators represent environmentally relevant quantities that show the impact on and use of environmental functions and services of the company. Only the indicator *Reductions in energy requirements of sold products* does not directly show an impact or use of environmental functions. However, it does indirectly show how big the impact of the sold products on the environment is and what has been done to reduce this impact.

As the indicators have been identified by aligning them with the business strategy, they are suitable to monitor whether the company meets its environmental goals. However, these goals are not yet precisely formulated and have to be defined in alignment with the KEIs when implemented.

Due to their broadness, the KEIs enable Schmalz to see with one view if there are changes in the overall environmental performance. Therefore, it can react with additional measures to these changes. But this broadness makes it also difficult to identify the cause for the change directly. This means the cause has to be investigated in order to take the appropriate action rather than just fighting the symptoms.

The way the KEIs have been identified makes it possible to compare the actual situation to a set of reference conditions. The indicators have been derived from internationally renowned standards (GRI, ISO) which are used for sustainability reporting around the world. Therefore, Schmalz is able to compare their

environmental performance with many other companies reporting on the same indicators and create a set of reference conditions from this information.

The last criterion is difficult to evaluate. Not all indicators directly show results. The indicators *Amount of renewable energy used/produced, Overall CO2 emissions reduced, Recycling rate, Reductions in energy requirements of sold products* do show results as they report on reductions of environmental impacts directly. The remaining indicators however report on the overall impact of the company on the environment. By combining both types of indicators Schmalz is able to provide a comprehensive picture of impacts and results.

As we can see the identified KEIs meet the criteria for KPIs as well as KEIs, apart from minor exceptions.

7.2 Advantages and disadvantages of the selected key environmental indicators

The following paragraphs are going to evaluate the KEIs regarding their advantages and disadvantages as well as the possible benefits they could provide to the company. As stated by the executive manager, getting Schmalz to have a positive net energy balance again is one of the top priorities (Interview 2 2019). Even though it is not explicitly stated in the business strategy it is part of the overall goal of tackling climate change. In order to reach this goal, it is essential for the company to track their energy consumption as well as their renewable energy production.

Total energy consumption by sources	
Advantages	Disadvantages
- comprehensive overview on energy consumption - identify changes in energy consumption over time	- difficult to measure - no information on cause of changes

Table 7-1 Advantages and disadvantages of selected indicator

Tracking the total energy consumption by source enables the company to answer several questions. What type of energy are we using (electricity, heat, steam)? How big is the share of polluting energy sources (e.g. coal, oil)? How much energy are we consuming? In addition to this the indicator could be used to estimate if the company is decoupling energy consumption from economic growth by determining the energy

intensity (e.g. energy/€ revenue). By measuring the energy consumption by source Schmalz is able to make changes in the consumption of different energy types visible over time. This enables the company to tailor energy saving initiatives more specific and proactively react to repeating conditions. However, determining the energy consumption by source can be hard. Especially in the case of Schmalz where there is a mix of energy bought from the market and self-produced energy. Another disadvantage of this indicator is that it does not provide information on the causes of changes in the energy consumption directly. If there is an increase in energy consumption it has to be investigated where the change is coming from and what caused it.

In order to get a positive net energy balance again Schmalz has to increase its renewable energy production to cover its energy consumption. In addition to this Schmalz is striving to use as much renewable energy as possible by only buying renewable energy from the market.

Amount of renewable energy used/produced	
Advantages	Disadvantages
- precondition for other indicators (Overall CO_2 emissions reduced, Scope 1, 2, 3 emissions) - positive for external perception	- High fluctuations in production of renewables - Only significant in long-term perspective

Table 7-2 Advantages and disadvantages of selected indicator

Keeping track on the use and production of renewable energy is a prerequisite to minimizing the impact on climate change and steer Schmalz towards becoming CO_2-neutral in the future.

By communicating this indicator to external stakeholders Schmalz can show what and how much it is already doing towards tackling climate change and the transition to renewable energy. As Schmalz is producing renewable energy mainly from wind and solar power there can be big fluctuations due to weather conditions and seasons. Thus, this indicator can only show development in long-term periods.

As one of the top goals in the business strategy, preventing the climate change needs Schmalz to reduce its CO_2 emissions. Measuring this reduction helps the company to

measure the progress towards their strategic targets and goals, estimate the future progress in reducing CO_2 emissions and make the effect of reduction initiatives visible.

Overall CO_2 emissions reduced	
Advantages	Disadvantages
- makes progress, trends and efforts visible - positive for external perception	- High uncertainty, often estimations

Table 7-3 Advantages and disadvantages of selected indicator

In addition to this, communicating the efforts and achievements regarding the reduction of CO_2 emissions to external stakeholders helps Schmalz to build up its image as a sustainable company. A difficulty with measuring the overall CO_2 emissions reduced is that there is no direct way. Reductions can only be estimated and are often based on conversion factors which differ depending from which source is used to define them. Due to this fact it is crucial to use realistic and rigid data in order to avoid green washing the results.

The second indicator regarding CO_2 emissions is probably the most ambitious indicator with regard to measuring and monitoring. Scope 1 and 2 emissions are rather easy to measure; scope 3 emissions however are often difficult to calculate. As these emissions include all up and down stream processes, which are not executed by the company itself, it is hard to get reliable data. Depending on how accurate the emissions should be calculated, one can also turn to use estimations and calculation models which however add uncertainty and discrepancies. If Schmalz is monitoring all scopes of emissions it has a good overview on which processes in the value chain cause the most emissions. Furthermore, this approach is a holistic and comprehensive approach which shows a strong commitment to provide relevant emission data. In addition to this it enables Schmalz to take action where it has the biggest leverage and impact.

Scope 1, 2, 3 emissions	
Advantages	Disadvantages
- represents the whole value chain - helps to identify the process with highest emissions	- scope 3 emissions very difficult to measure, a lot of effort - estimations and models can add uncertainty

Table 7-4 Advantages and disadvantages of selected indicator

As mentioned above the two indicators regarding waste are connected to each other. Only if Schmalz measures the total amount of waste it is able to calculate the recycling rate. By monitoring the total amount of waste, the company can check whether it is reducing its waste generation over time. This information can help to identify processes that cause a lot of waste material and therefore are not very resource efficient.

Total amount of waste	
Advantages	Disadvantages
- Easy to measure - can reveal deterioration of production processes	- does not show the cause for increasing waste generation

Table 7-5 Advantages and disadvantages of selected indicator

Another advantage is that this indicator is rather easy to measure as the company can simply weigh the waste before getting picked up by the disposal company (sometimes this step is even done by the disposal company). In addition to this, the indicator can reveal a deterioration of production processes over time if the amount of waste material is increasing in comparison with the production volume. It does however not show the cause for the increasing waste generation.

The recycling rate can be seen as an extension of the total amount of waste. If the company manages to increase the recycling rate it reduces the waste that goes to landfills or incineration. The indicator is also easy to monitor as it is the same as with the waste, the recycling material can simply be weighted. In addition to this, by monitoring the recycling rate the company can identify additional opportunities to generate revenue from selling recycling material back to raw material producers.

Recycling rate	
Advantages	Disadvantages
- easy to measure - identify additional opportunities for revenue	- recyclability of materials is often influenced by composition and available technology

Table 7-6 Advantages and disadvantages of selected indicator

Depending on the material used for production the recycling rate can be limited by external factors the company cannot influence. For example, the recycling of pure metal scrap is rather easy and sometimes almost one hundred percent of the scrap can

be recycled. This would make a very good recycling rate. Other materials such as plastics or composite materials are difficult to recycle which means a lower recycling rate is possible. In this case the company has a low recycling rate even if it does produce only very little waste.

By monitoring the reduction in energy requirements Schmalz cannot only decrease the impact of its products but also gain competitive advantage and increase the innovation. New and innovative products need less energy, which makes them more attractive to customers and therefore more competitive.

Reductions in energy requirements of sold products	
Advantages	Disadvantages
- high informative value when comparing to competitors - increases the innovation	- does not show the real energy consumption - could generate rebound effects

Table 7-7 Advantages and disadvantages of selected indicator

However, the indicator does not show the real energy consumption when the product is in use at the customer. It could also generate rebound effects. If the product uses less energy, customers might use a bigger number of the product or use it more often. This could then counterbalance the savings made in the first place.

It becomes clear that each indicator has its advantages and disadvantages. However, there are always trade-offs when trying to reduce complex issues, such as environmental impacts, into a single numerical value. Thus, it is from importance that the company makes sure there is a specific definition of the indicator and what it measures and monitors in order to avoid a lack of clarity.

In addition to this, the company has to decide whether it is using the indicators as proposed or if it makes alterations in order to meet their requirements. It could also be the case that over time the expectations of the company change and therefore the KEIs have to be adjusted or newly selected as well.

8 Discussion

After having presented the results and the proposed indicators with their advantages and disadvantages the following chapter is going to answer the research question,

interpret the results and show possible limitations of the research. In addition to this proposal for future research and application of the results are given.

8.1 Answering the research question

The study identified key environmental indicators using external sources to identify potential environmental indicators and internal stakeholders to select the indicators that are key to the company's future strategic development. The external sources, consisting of frameworks, standards and sustainability reports from sample companies, where analysed and possible environmental indicators have been identified. This extensive set of over 250 indicators has been condensed by removing duplicates and summarising similar indicators. The revised set (50 indicators) was then analysed and discussed with internal stakeholders including specialist from the strategy and sustainability department, employees from various departments and a representative from the board of executives. Using the input from these stakeholders the final set of key environmental indicators was generated.

By using this practice-oriented approach the thesis answered the research question: **"How can the J. Schmalz GmbH identify and select key environmental indicators based on external and internal stakeholder expectations?"**. Seven key environmental indicators for Schmalz regarding its future strategic focus have been identified based on the expectations and evaluations of external and internal stakeholders. The indicators cover the areas energy consumption and production, CO_2 emissions, waste generation and recycling, and environmentally friendly products. Representing the key areas of Schmalz' business strategy as well as stakeholder expectations.

Thereby, the approach was designed to take little time and effort in order to be applicable by companies which have little resources and experience with strategic environmental management. The selection of stakeholders and material topics might differ between companies. The approach itself, however, can be used as a guideline no matter what topics or stakeholders are identified. In order to make the approach

practice-oriented the use of academic sources for the selection of the key environmental indicators was reduced to a minimum.

By integrating key environmental indicators, Schmalz is on the one side improving its sustainability management and on the other side is reacting on the growing importance of environmental sustainability deriving from societal and political transformation. With indicators backed up by scientific data and including the expectations from internal and external stakeholder the company is showing its commitment towards sustainable development. By including these indicators into the strategical management, it becomes clear that Schmalz itself is transforming its business. From a medium sized company, a couple of years ago, towards a globally operating company. However, this change is not immediate due to the fact that the structures of the company are not growing at the same speed as the company. Considering sustainability as a strategic topic and prioritising environmental issues as the main focus show that Schmalz is looking at these issues not only as challenges but also chances.

8.2 Interpreting the results

However, due to the lack of resources and knowledge some of the decisions and actions taken seem to be made on a rather un-informed basis.

For example, the choice of the guidelines, standards and frameworks: The ISO 14034 and the GRI standards make sense as a source for potential environmental indicators. The choice of the SDGs however could be questioned. Even though many companies are referring to the SDGs and the contribution they make towards reaching the goals, the SDGs have been developed as goals and targets for nations and countries. Therefore, many of the indicators used by the SDGs are hard to apply to a company level. An explanation for why companies are referring to the SDGs, when communicating their sustainability performance, might be that the SDGs are recognisable and got a lot of attention in the last couple of years.

Another choice that was made by the company during this research was the selection of the sample companies. Even though some of the companies have similarities to Schmalz regarding size, structure or industry others have only little in common. The companies have not been chosen primarily based on their similarities to Schmalz but rather on their reputation regarding their sustainability performance. Even though this approach is useful to identify best practice examples, a selection based on both sustainability performance and similarities to Schmalz may have yielded more coherent and comparable results.

Nevertheless, it became obvious that the environmental indicators, whether taken from guidelines, standards or sustainability reports, are to a great extent the same. A set of 250 indicators has been condensed to a set of 50 by removing duplicates and aggregating similar indicators. There where, in many cases, only minor differences, e.g. slightly different wording, different units. For this reason, selecting other sample companies or guidelines and standard might not have influenced the results greatly.

After identifying and analysing the external sources the research continued by involving internal stakeholders into the decision process. This involvement assured that the selected indicators are aligned with not only external expectations but internal expectations and interests as well. In addition to this it was necessary to involve internal stakeholder, especially the strategy department and the executive board in order to derive indicators which are key to the company and its future development.

When interviewing the head of strategy and looking into the business strategy it became clear that even though sustainability is implemented into the overall business strategy, it is only implemented weakly. Finding this surprising as Schmalz has already been doing a lot of things regarding sustainability for several years. However, it seems that the company never really considered sustainability as a strategic, value creating issues. It seems like sustainability at Schmalz is done from an altruistic standpoint not from a profit oriented one (which is not a bad thing). As the company is now taking on implementing sustainability strategically there might be even more potential to improve the sustainability performance of the company. With the

identified key environmental indicators, the first step towards aligning business strategy and sustainability topics is taken. Nevertheless, including only the environmental dimension is implementing sustainability in a weak way only.

After having talked to the head of strategy and ascertain that the 50 identified indicators could be aligned with the business strategy the employees were asked to evaluate the indicators. As the identified indicators use specific terminology that is not known to everyone it was necessary to ask the employees about their evaluation in the form of a group meeting. Thereby it was possible to explain the terminology and answer upcoming questions in order to ensure that the participants know what they are evaluating. However, this also limited the number of participants which limits the significance and generalisability of the results. Even though only a small group of representatives was asked the results did still show conformities and several topics could be identified as relevant. However, due to the fact that Schmalz is advertising its efforts in the energy consumption and production especially, there may be a chance that the employees are biased and that is why the energy indicators got such high votes. Nevertheless, the results are still useful as they are supposed to represent the subjective expectations of the employees regarding the company's environmental efforts.

With the results from the evaluation through the employees the set of indicators was further reduced and presented to the board of executives. While speaking to the executive it became clear that the energy related indicators are prioritised due to the fact that Schmalz is advertising with its almost net positive energy balance and it is one of the major goals to become a “Positiv-Energie-Unternehmen” again. It is however surprising, that there is no explicit target in the business strategy addressing this goal. It is partly included in the goal of tackling climate change but as it seems to be such an important thing for the company it may be included into the business strategy as a standalone goal. The exclusions of indicators made by the executive seemed to be mainly directed by economic reasons. For example, excluding the indicators for terrestrial and water issues were based on the fact that Schmalz is not

having a big impact on these factors and an improvement would not generate any benefits for the company. At the same time however, the executive said that keeping track of water consumption is interesting for cost reason. This contrary statement could be interpreted as standing in contrast to the statement made above: *Schmalz is doing sustainability from an altruistic standpoint*. It shows that even though the company has not yet implemented sustainability into its strategic management it still makes strategic management decisions regarding sustainability. This fact confirms the importance of establishing a strategic sustainability management, and as a first step introducing key environmental indicators, in order to make informed decisions and avoid conflict of interests.

8.3 Methodological limitations

The study may be subjected to some limitations originating from the methodology and research design as well as limiting circumstances influencing the research.

Although identifying and evaluating the KEIs is based on a stakeholder-oriented approach not all relevant stakeholders might have been included. Due to a lack of time and concerns expressed by the company it was not possible to conduct a comprehensive stakeholder analysis, identify all relevant stakeholders and survey them in order to identify the most relevant indicators for each stakeholder. The results therefore are subjected to a certain degree of uncertainty regarding the completeness of stakeholder expectations. Especially external stakeholder such as customers, that are most of the time critical stakeholders, have not been analysed directly due to the high diversity of customers. Schmalz is supplying over 14 industries which range from textile, to automotive, to aerospace. Each of this industry might expect other environmental indicators to be material which would have made the selection process complicated and would have required a large sample of replies in order to draw significant conclusions. For the future a comprehensive materiality analysis including a stakeholder analysis could be conducted. This would help to identify not only further material environmental topics but could be enlarged to cover all dimensions of

sustainability. Thus, Schmalz could further improve and focus its sustainability management.

As mentioned in the previous section the selection of employees asked to evaluate the identified environmental indicators was also subjected to some limitations. First the sample size was rather small due to the fact that the indicators and their meaning had to be explained to the participants in order to be fully understood (this necessity was recognised when a sample questionnaire was handed out to the sustainability team members and several requests came up). However, this approach also means that the employees made an informed choice and the number of abstentions was very low. Another limiting factor was that it was not possible to get representatives from every department to join the meeting which means there could be divergent opinions on relevant environmental indicators in the company which have not yet be identified.

To get a complete picture of the internal stakeholder expectations the before mentioned materiality and stakeholder analysis can be used to obtain this data. For example, there could be a workshop for representatives from each department in order to make them disseminators and enable them to carry the knowledge into their department and conduct the evaluation of material sustainability topics and indicators. This could not only generate data but also increase the awareness for sustainability amongst the employees.

A limitation to the generalisation of the results is the fact that the research is based on a single case study. Furthermore, the case was defined as being an extreme and critical case at the same time. The single case study makes it hard to generalise the results that fit for this one special, investigated case. As the case is also defined as an extreme case it is even harder to generalise the results, as the case is so special that there might be no second case like this. Even though the circumstances of the case company are rather special and unique it is still possible to adopt the approach of identifying key environmental indicators to companies with similar characteristics. Furthermore Flyvbjerg 2006 states that extreme cases do often reveal more information as the basic mechanisms of the situation are studied more intensely. This gives deeper insight into

the causes and consequences of the problem instead of just describing the symptoms. This can be observed in the underlying case as well. The causes of the problem are the remaining SME structures that do not fit anymore to the size and development of Schmalz. This may not only be the case for the sustainability management but for strategic management overall. With this a generalisation is possible to a certain degree. If companies that have not yet established structures for strategic sustainability management, the approach presented in this study could be used to probe the area and gradually building up the structures backed by key indicators.

8.4 Pursuing work and possible future research

This thesis provides not only a set of environmental indicators to the company but also the skills and process to identify and select other key sustainability indicators in the future. For now, the proposed key environmental indicators represent a short-term solution in order to base the developing strategic sustainability management on. However, for the future the company should strive to include social and economic sustainability indicators which are also based on stakeholder expectations into their sustainability management. This ensures a comprehensive overview on the company's sustainability performance and enables it to steer and communicate this performance and prepares them for possible future reporting and accounting obligations. As this thesis does not cover the actual implementation of the indicators it would be interesting to investigate how the company is doing this and what challenges and insights occur during this process. There might be the necessity to adjust the KEIs, for example regarding them to be absolute or relative indicators. Relating to this it would also be interesting to follow the definition of tangible goals and targets regarding the KEIs.

8.5 Outlook

The issues related to sustainability and especially environmental impacts are ever changing. Take climate change as an example. A couple of years ago there were some

rumours about humanity influencing the climate. Nowadays climate change is the catch phrases when talking about sustainability and environmental impacts. Therefore, it is important to keep in mind that the conditions can change quite rapidly. If the conditions change the indicators measuring and communicating it have to change as well. As mentioned in the introduction many stakeholders are getting more interested in environmental impacts. This increasing interest could cause regulatory changes that might force companies to reduce their environmental impacts or do extensive reporting on them (as it is already the case for some companies under the CSR Directive Implementation Act). But it is not only governments or the society that could influence the necessity to measure and monitor environmental impacts. Bigger natural disasters which are said to occur more often in recent times could force companies to think about their environmental impacts as well. For example, indicators measuring water consumption and wastewater discharge could gain importance in areas becoming prone to droughts in the future. Or biodiversity and terrestrial indicators such as the number of sealed surfaces could move into focus if heavy rainfalls and floods occur more often.

In order to do not get caught by surprise when the circumstances change it is essential for companies to track trends and evaluate risks. The indicators identified in this thesis are only a snapshot of the current state. The relevance of the topics could change over time and probably will. Thus, it is important that companies review their material topics and key environmental (or sustainability) indicators and their management from time to time. The most important thing to keep in mind is however, that corporate responsibility is not only measuring but taking action in order to improve and create added value for every stakeholder. Defining indicators is good but taking the necessary actions is key to a successful and meaningful corporate sustainability management.

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Appendix

Interview Guide

Key Environmental Indicators

David Galla
Environmental Management and Sustainability Sciences (M.Sc.)
Aalborg University

Interviewee Name: _____

Interview date: _____

Purpose of this Interview is to gather information and opinions from internal stakeholders on the identified environmental indicators. The result of the interview should be a prioritisation of environmental indicators with regard to the relevance for Schmalz.

The interview is going to take roughly half an hour.
The results of this interview are going to be used as a qualitative basis for my master thesis at Aalborg University. The interview will be part of the thesis and information derived from it will be used to support the results found through literature research and qualitative research. No complete transcript of the interview will be published, and quotes are only used after you revise them and give your consent. All responses will be kept confidential. I will ensure that any information included in the report does not identify you as the respondent. If you, however, want any part of the interview to be corrected or anonymised you can always say so.

Do you give your consent to recording this interview? ◎yes ◎no
Are you willing to participate in this interview? ◎yes ◎no

_____

Signature

1. What is your position/department at Schmalz?

2. What is your background (e.g. studies, education)?

3. How are you connected to sustainability at Schmalz?

   a. How would you define sustainability?

   b. What are the most important environmental topics from your viewpoint?

   c. What are the most important topics for Schmalz? With regard to current developments, legal issues, trends, etc…

4. Can you further elaborate on the evaluation you have given the different environmental topics and indicators in advance to this interview?

5. If you had to choose one indicator from each category only, which one would it be?

6. Can you elaborate on your choice?

7. Are there any indicators missing you would like to add?

Room for further questions or comments:

Appendix 1 Sample interview guide

	Source	Driving forces	Pressures	States	Impacts	Responses
Air	SDGs	-	-	1	1	-
	WIN	-	-	2	-	-
	ISO 14034	-	-	-	-	1
	GRI	-	8	-	-	-
	Fischer	-	-	-	-	-
	Viessmann	-	-	-	-	-
	Dürr	-	2	-	-	-
	Neumarkter Lammsbräu	-	3	-	-	-
	ebm papst	-	-	-	-	-
	elobau	-	-	-	-	-
Biodiversity	SDGs	-	-	2	-	-
	WIN	-	-	-	1	-
	ISO 14034	-	-	-	-	-
	GRI	-	10	14	-	2
	Fischer	-	-	-	-	1
	Viessmann	-	-	-	-	-
	Dürr	-	-	-	-	-
	Neumarkter Lammsbräu	-	-	-	-	-
	ebm papst	-	-	-	-	-
	elobau	-	-	-	-	-
Climate Change	SDGs	-	1	-	-	-
	WIN	-	1	-	-	1
	ISO 14034	-	2	-	-	-
	GRI	-	10	-	-	1
	Fischer	-	1	-	-	-
	Viessmann	-	-	-	-	1
	Dürr	-	2	-	-	-
	Neumarkter Lammsbräu	-	3	-	-	-
	ebm papst	-	-	-	-	-
	elobau	-	3	-	-	-
Terrestrial	SDGs	-	-	-	-	1
	WIN	-	-	-	-	-
	ISO 14034	-	1	2	-	-
	GRI	-	-	-	-	-
	Fischer	-	-	-	-	-
	Viessmann	-	-	-	-	-
	Dürr	-	-	-	-	-
	Neumarkter Lammsbräu	-	-	-	-	-
	ebm papst	-	-	-	-	-
	elobau	-	-	-	-	-
Waste	SDGs	-	2	1	-	1
	WIN	-	1	1	-	-
	ISO 14034	-	4	-	1	2

	GRI	-	23	-	-	1
	Fischer	-	1	-	-	1
	Viessmann	-	2	-	-	-
	Dürr	-	1	-	-	1
	Neumarkter Lammsbräu	-	6	-	-	-
	ebm papst	-	-	-	-	-
	elobau	-	2	-	-	-
Water	SDGs	-	2	1	2	1
	WIN	-	1	-	-	-
	ISO 14034	-	1	-	-	1
	GRI	-	24	-	-	-
	Fischer	-	1	-	-	1
	Viessmann	-	-	-	-	1
	Dürr	-	2	-	-	-
	Neumarkter Lammsbräu	-	3	-	-	-
	ebm papst	-	-	-	-	-
	elobau	-	1	-	-	-
Energy	SDGs	-	1	1	-	1
	WIN	-	2	-	-	1
	ISO 14034	-	4	-	-	1
	GRI	-	13	-	-	2
	Fischer	-	-	-	-	1
	Viessmann	-	-	-	-	-
	Dürr	-	3	-	-	-
	Neumarkter Lammsbräu	-	7	-	-	1
	ebm papst	-	-	-	-	-
	elobau	-	3	-	-	1
Transport	SDGs	-	1	-	-	-
	WIN	-	1	-	-	-
	ISO 14034	-	3	-	-	2
	GRI	-	-	-	-	-
	Fischer	-	-	-	-	-
	Viessmann	-	-	-	-	-
	Dürr	-	-	-	-	-
	Neumarkter Lammsbräu	-	-	-	-	-
	ebm papst	-	-	-	-	-
	elobau	-	2	-	-	-
Resources	SDGs	-	1	-	-	-
	WIN	-	1	-	-	-
	ISO 14034	-	10	-	-	-
	GRI	-	2	-	-	2
	Fischer	-	2	-	-	4
	Viessmann	-	-	-	-	-
	Dürr	-	-	-	-	-
	Neumarkter Lammsbräu	-	3	-	-	-

	ebm papst	-	-	-	-	1
	elobau	-	1	-	-	-
	SDGs	-	-	-	-	-
Products	WIN	-	-	-	-	-
	ISO 14034	-	-	-	-	8
	GRI	-	-	-	-	1
	Fischer	-	-	-	-	-
	Viessmann	-	-	-	-	-
	Dürr	-	-	-	-	-
	Neumarkter Lammsbräu	-	-	-	-	-
	ebm papst	-	-	-	-	-
	elobau	-	-	-	-	-
Total	**258**	**0**	**185**	**25**	**5**	**43**

Appendix 2 Total number of environmental indicators identified in external sources