THE CONCEPT AND APPLICATION OF SUSTAINABLE BALANCED SCORECARD –
WITH A SPECIAL FOCUS ON A RESOURCE BASED BSC IN THE MANUFACTURING COMPANY POLOPLAST GMBH & CO KG

Masterarbeit
zur Erlangung des akademischen Grades
Master of Science
im Masterstudium
General Management
AFFIDAVIT

I hereby confirm that this master thesis “The Concept and Application of Sustainable Balanced Scorecard – with a special focus on a resource based BSC in the manufacturing company POLOPLAST GMBH & CO KG” has been written and composed by myself. This thesis was written independently and without any assistance or support from external consultants. The applied sources, materials and literature are provided and specified in the thesis.

Furthermore, I confirm that this thesis or parts of this thesis have not been submitted in any other form. This master thesis and the electronically submitted thesis are identical.

____________________  ____________________
Place, Date  Signature
ACKNOWLEDGEMENT

This master thesis is the result of a long time analyzing and writing process and was supported and encouraged by Univ.-Ass.\textsuperscript{in} Mag.\textsuperscript{a} Dr.\textsuperscript{in} Daniela Schrack and a. Univ.-Prof. Dr. Heinz Karl Prammer. Both of them supported me to great extent during the entire writing process. First of all, I would like to thank my first supervisor Univ.-Ass. Mag. Dr. Daniela Schrack for supporting and assisting me during the whole process of my master thesis by giving useful advice and recommendations as well as her great degree of engagement.

Furthermore, I am very grateful for my family, who supported me to a huge extent during my entire studies.

With sincere thanks,
Claudia Molnar
ABSTRACT

The increasing environmental attention pushes the organizations to recreate and reorganize the environmental and social structures of the company. Our natural environment forces us to minimize and reduce the demand for resources with various sustainable improvements in terms of resource management. For this reason, the main goal is focusing on resource saving actions in combination with the management tool of the SBSC. Therefore, this study should provide the application of SBSC concept to the selected company. Resource efficiency is an essential component for identifying potential for improvements in terms of resource saving and additional cost savings. Beside the traditional short-term performance measurements, the focus lies on long-term measurements and moreover on broad measurement concepts. The traditional concepts often do not serve enough information about the performance of the company and hence, new advanced concepts were developed, where the attention lies on a combination of short- and long-term measurements.¹

The combination of short-term measurements and long-term strategic goals caused Kaplan and Norton in 1992 to develop a new framework, which met the requested needs.² This concept, namely Balanced Scorecard, assists managers to understand the overall performance of a company due to cross-functional relationships, the so called causal chains.³

This master thesis deals with the concept and application of a Sustainable Balanced Scorecard with a special focus on a resource based Balanced Scorecard. My intention was to define and examine potential improvements regarding the material and resource efficiency management of POLOPLAST GMBH & CO KG in order to support and build a resource management analysis. The outcomes should assist the company in decision-making by focusing on material efficiency. For analyzing the company, the major analysis area is the internal process perspective as well as, various causal chains, which affects several business levels.

The study starts with providing a theoretical background in order to improve the understanding of the objective of this analysis. Beside this fact, the theoretical part of the study serves as a demarcation of the various definitions, concepts, interpretations and approaches. Additional, the second part is the practical approach of the analysis concerning material and resource management of the selected company. So in this section the SBSC concept will be developed and subsequently applied to POLOPLAST GMBH & CO KG in order to receive information about the company's resource efficiency performance. For the analysis and additional for the application of the SBSC, several company-related data, such as unstructured interviews, email conversations, telephone conferences as well as annual reports, sustainability reports and journals build the basis.

In order to analyse the company in terms of resource efficiency, strategically relevant Key Performance Indicators (KPIs) are identified and analysed for receiving an overall picture of the performance of the company. The results are demonstrated and discussed in the last chapter. This study should provide the procedure of the application of a resource based BSC to a selected company and additionally, should support managers in decision-making in terms of developing new actions regarding resource efficiency.

TABLE OF CONTENT

1 Introduction........................................................................................................................................... 9
2 Importance of Natural Resources & Resource Efficiency .................................................. 13
   2.1 Terminology of natural resources.......................................................................................... 14
   2.2 Importance of Resources........................................................................................................... 19
   2.3 Resource Efficiency .................................................................................................................... 22
3 Sustainable Balanced Scorecard ................................................................................................. 28
   3.1 Balanced Scorecard .................................................................................................................... 28
   3.2 How to integrate Sustainability into BSC................................................................................ 35
   3.3 The Role of Resources & Resource Efficiency in the SBSC .................................................... 41
4 Development of a resource based BSC......................................................................................... 44
   4.1 Theoretical Foundations of Resource Efficiency in the resource based BSC .................... 44
   4.2 Classification of Resources and Resource Efficiency in the four Perspectives ............ 46
   4.3 Conceptual Development of a resource based BSC ............................................................... 53
      4.3.1 Selection of the relevant Strategic Business Unit .......................................................... 53
      4.3.2 Definition and Identification of the Relevance of the Environmental and Social Aspects .... 54
      4.3.3 Determination of the Strategic Relevance of Environmental and Social aspects .......... 55
      4.3.4 Skimming of different Perspectives of a resource based BSC........................................ 57
      4.3.5 Development of a resource based BSC as Strategy Map................................................... 61
5 Application of the resource based BSC in POLOPLAST GMBH & CO KG ......................... 64
   5.1 Case Study Method – analytical descriptive method .......................................................... 64
   5.2 Company Background ............................................................................................................... 65
   5.3 Application of the resource based BSC in POLOPLAST GMBH & CO KG ........................... 71
6 Limitations & Critical Review ........................................................................................................ 83
7 Conclusion & Recommendations ................................................................................................. 84
List of References ............................................................................................................................. 86
## Table of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Classification of resources</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>Natural Resources</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>Resource efficiency</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>Balanced Scorecard Framework</td>
<td>29</td>
</tr>
<tr>
<td>5</td>
<td>BSC as a Strategy Map</td>
<td>32</td>
</tr>
<tr>
<td>6</td>
<td>Implementation forms of environmental and social aspects into the BSC concept</td>
<td>40</td>
</tr>
<tr>
<td>7</td>
<td>SBSC as a Strategy Map</td>
<td>45</td>
</tr>
<tr>
<td>8</td>
<td>Potential impacts for increased resource efficiency - own representation</td>
<td>48</td>
</tr>
<tr>
<td>9</td>
<td>Production and Product related resource efficiency – own representation</td>
<td>59</td>
</tr>
<tr>
<td>10</td>
<td>Strategy Map</td>
<td>63</td>
</tr>
<tr>
<td>11</td>
<td>Delivery of Material – POLOPLAST, Produktionskreislauf</td>
<td>73</td>
</tr>
<tr>
<td>12</td>
<td>BSC of POLOPLAST, own representation</td>
<td>81</td>
</tr>
<tr>
<td>13</td>
<td>Strategy Map of POLOPLAST</td>
<td>82</td>
</tr>
</tbody>
</table>
# Table of Tables

Table 1: Resource efficiency indicators ................................................................. 25  
Table 2: Advantages and Disadvantages of the BSC .................................................. 35  
Table 3: Literature Review ......................................................................................... 43  
Table 4: Strategies for resource efficiency ............................................................... 46  
Table 5: Environmental exposure ............................................................................... 54  
Table 6: Social exposure ........................................................................................... 55  
Table 7: Categorization for lagging indicators ........................................................... 56  
Table 8: Demonstration of leading indicators ............................................................. 57  
Table 9: Comparison of Research Methodologies ...................................................... 65  
Table 10: Business units of POLOPLAST ................................................................. 68  
Table 11: Learning and Growth Perspective of POLOPLAST ................................... 79  
Table 12: Customer Perspective of POLOPLAST ...................................................... 79  
Table 13: Financial Perspective of POLOPLAST ....................................................... 80
## Table of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSC</td>
<td>Balanced Scorecard</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>I</td>
<td>Input</td>
</tr>
<tr>
<td>KPIs</td>
<td>Key Performance Indicators</td>
</tr>
<tr>
<td>NPO</td>
<td>Non-Product Output</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Co-operation and Development</td>
</tr>
<tr>
<td>PO</td>
<td>Product Output</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research &amp; Development</td>
</tr>
<tr>
<td>RE</td>
<td>resource efficiency</td>
</tr>
<tr>
<td>REAP</td>
<td>Resource Efficiency Action Plan</td>
</tr>
<tr>
<td>ROCE</td>
<td>Return On Capital Employed</td>
</tr>
<tr>
<td>ROS</td>
<td>Return On Sales</td>
</tr>
<tr>
<td>SBSC</td>
<td>Sustainable Balanced Scorecard</td>
</tr>
<tr>
<td>WTO</td>
<td>World Trade Organization</td>
</tr>
</tbody>
</table>
1 Introduction

Confronted with an increasing pressure to develop new approaches for environmental, social and economic welfare, companies have to face innovative ways of integrating sustainability into strategic performance in order to be competitive. In this context, sustainability is the umbrella term for environmental, social and economic welfare.

Sustainable and responsible interactions with the environment are more important than ever, thus the terms Sustainability and Sustainable Development gain more and more attention. For many organizations, sustainability is a prior goal in order to meet the needs of today’s stakeholders and shareholders and therefore to increase the competitive advantage. The increasing environmental attention of customers forces the organizations to recreate and reorganize the environmental and social structures of the company. Hence, sustainability is playing an important role for the organization in respect of having a competitive advantage and operating in a sustainable way in order to meet the needs of stakeholders and shareholders. The number of organizations trying to successfully integrate an environmental approach into their business strategy is rising and gaining importance.

For companies the sustainable and responsible dealing is becoming more attention and therefore the companies have to deal with such issues and requirements. Beside the traditional management tools, new performance measurements with more than solely financial criteria come up. Hence, new approaches for measuring the performance of an organization have evolved and supersede traditional short-term performance measurement tools, focusing on financial and operational data. Short-term measurements are problematic and regularly critical for a company’s performance due to a restricted view of the international setting, leading to failure and collapse. The request for a combination of short-term measures with long-term strategic goals builds the basis for a new measurement approach and caused advanced models to come up. In 1992, Kaplan and Norton developed a new framework, which met the requested needs, namely, facing the issue of short-term measurements and long-term strategic goals. The new evolved strategic tool should support managers by understanding the idea of cross-functional relationships and the resulting cause-effect chains. Hence, the concept of the Balanced Scorecard was born.

The Balanced Scorecard (BSC) was accepted by many companies, due to their applicability for variable forms of organizations, such as profit and non-profit organizations as well as schools and institutions.

Supporting the translation of an organization’s strategic objectives into a proper set of performance measures is one of the approaches of the BSC.

---

The strategy map can be seen as core part of the BSC, which builds a graphical snapshot of the strategy, and additionally shows connections between various scorecard components, the so-called cause-effect chains in the BSC. The road map is a picture of these linkages and presents the ties between the different perspectives. For defining such a strategy map two possible approaches can be mentioned. The top to bottom concept as well as the bottom up concept supports the organizations in formulating and defining a route for achieving the settled goals.

The motivation for this study is to analyse POLOPLAST GMBH & CO KG in a sustainable and innovative context with the strategic analysis tool of the SBSC. The special focus is on a resource based Balanced Scorecard, which will be practically developed for the company in order to support the company in decisions making by providing a unique framework. The specially created concept deals with resources within the company and results in a tailor-made framework for POLOPLAST GMBH & CO KG.

The decision to use the BSC was made because the analysis tool combines financial and non-financial data, which support managers in decision-making processes and therefore reveals potentials for optimization. The objective of this study is to specify and adopt the BSC concept to the selected company. In order to design a useful and unique Balanced Scorecard for the manufacturing company, POLOPLAST GMBH & CO KG, a resource based BSC focusing on material and energy efficiency builds the main part of this master thesis.

**Sustainable Balanced Scorecard**

The Sustainable Balanced Scorecard (SBSC) is an advanced development of the traditional BSC and integrates environmental and social aspects into the perspectives. A sustainable strategy is required in order to develop a SBSC, and hence the orientation of the sustainable strategy defines various specifications and contents of the SBSC.

Sustainability in combination with the BSC allows overcoming the weak points of the traditional BSC in terms of environmental and social aspects by incorporating three pillars of sustainability into one management tool. For integrating sustainability into the conventional BSC three approaches can be listed:

1. integration through the existing four perspectives
2. adding an additional perspective, which focuses on environmental and social aspects
3. defining a specific environmental and/or social scorecard

The short description is solely an excerpt of the Sustainable Balanced Scorecard, as Chapter 3 explains the SBSC concept and discusses definitions, aims and purposes.

---

21 Figge et al. (2002b), p. 5-7.
Importance of Natural Resources & Resource Efficiency for Companies

Due to the fact that this study focuses on a resource based BSC concept, natural resources and resource efficiency (RE) is a fundamental part and build one of the core part of this thesis.

Günther and Möller did an empirical study, where the importance and utility of natural resources were analyzed. The study focused on the importance of natural resources, with regard to corporate success. The results illustrate the fundamental role of natural resources and sustainability in terms of the successful performance of companies. The utility of natural resources and sustainability cannot be observed as short-term trend, since companies are convinced that the importance of natural resources will rise. According to the study of Günther and Möller, solely 9 % of the respondents argued that sustainability has limited importance to corporate success. More than 87 % of the companies stated, that natural resources play a fundamental role for the performance of a company.

Research gap

When browsing through the literature issues concerning resources and resource saving actions come up, hence it can be said that the literature provides a good basis about the understanding of resources and resource saving management. As in this study the main focus lies on resource based BSC and hence, the attention is on resource efficiency in the combination with the BSC concept, missing literature in this research area is apparent. For this reason, this research approach should combine resource efficiency and saving options with the BSC concept and may support the company in such issues by proving a framework.

Aim

The aim of this master thesis is to analyze POLOPLAST GMBH & CO KG by using the strategic analysis tool, Balanced Scorecard, with the special focus on a resource based Balanced Scorecard. Hence, the main area within this paper is to define a resource based concept and additionally depict the company with respect to material and energy efficiency. The master thesis is supposed to define and examine the structure of resource efficiency and to discover potentials for optimization.

Research Questions

The research questions build the frame of the master thesis and can be formulated as following:

- Which potential does the BSC have in order to increase the managerial resource efficiency?
- How can a resource based BSC be designed and how can it contribute to increase corporate resource efficiency?
- How does resource efficiency affect other business segments in terms of cause-effect chains?

---

Method

Collecting company-related information, evaluating, analysing and developing the information into a unique and innovative, specially designed resource based Balanced Scorecard will be the core part of the study. The innovative character of this master thesis is designing and creating a resource based BSC, which will be especially developed and evolved for POLOPLAST GMBH & CO KG in order to meet their potentials of optimization in the sense of material and energy efficiency.

There are various reasons for deciding to analyze the company POLOPLAST GMBH & CO KG. Firstly, the company operates in an apparently hardly environmental friendly industry, the plastic-processing sector. Additionally, the industry has gained more reputation regarding the sustainability and environmental friendliness of plastic pipe products over the last years due to several certificates concerning the sustainability of the products as well as research and working groups, such as Österreichischer Arbeitskreis Kunststoffrohr-Recycling.\textsuperscript{26}

Secondly, POLOPLAST GMBH & CO KG is a regional company, which operates since more than 60 years as a leading European supplier of plastic pipe systems focusing on tradition and innovation.\textsuperscript{27} Due to the above mentioned listing, the study allows the combination of my personal knowledge of strategic management with the issue of sustainability.

Structure of the thesis

For a short structural overview of the paper this section provides an extract of the table of content. A short introduction mentioning an overall preamble of the topic is followed by the second chapter which will be “Natural Resources & Resource Efficiency”. In this part of the paper the terminology and importance of resources as well as the meaning of resource efficiency will be discussed. Furthermore, “Sustainable Balanced Scorecard” builds the third chapter of the master thesis and consists of the following subchapters, “Balanced Scorecard”, “How to integrate Sustainability into BSC” and “The Role of Resource based BSC & resource efficiency”. Followed by the fourth chapter “Development of resource based BSC”, where the various stages of developing the resource BSC will be presented. The last chapter of the paper will be the “Application of the resource based BSC in POLOPLAST GMBH & CO KG” which consists of the case study method, the company background as well as the application. To complete the paper, chapter six will discuss limitations and in addition provides a critical review. Chapter seven builds the closure of the study.

\textsuperscript{27} Pipelife (2016), Internet: http://www.pipelife.at/at-de/ueber-uns/oeakr.php, own translation.
2 Importance of Natural Resources & Resource Efficiency

Terms, such as resources, capabilities and core competences are regularly used as synonyms in terms of strategy and corporate success.\(^\text{28}\) For this reason, chapter two deals with the definitions of natural resources and their related issues.

First of all, a rough classification of resources will be shortly presented. A detailed classification of resources will follow in chapter 2.1.

Resources are classified as productive assets and are necessary in order to be viable in terms of the economic sense.\(^\text{29}\)

Resources can be grouped into two main categories: immaterial and material resources.\(^\text{30}\) Immaterial or intangible resources are physically not touchable, whereas, in contrast material or tangible resources are physical touchable.\(^\text{31}\)

Besides this distribution an additional classification of resources is useful. The four main categories are listed below:

- human resources
- financial resources
- physical resources
- intellectual/information resources\(^\text{32}\)

Human resources are resources including employee related issues, such as knowledge, capabilities and know how.\(^\text{33}\)

Examples for financial resources are cash flow, monetary assets and/or account receivables.\(^\text{34}\)

As physical resources buildings, equipment and machines can be mentioned.\(^\text{35}\)

The forth form of resources are intellectual or information resources, including all IT-based resources, such as software and licenses.\(^\text{36}\)

Human resource, structural resources and cultural resources can be stated as immaterial resources.\(^\text{37}\) In contrast, financial and physical resources are material resources, due to physical accessibility.\(^\text{38}\) A detailed description of resources is stated in chapter 2.1. Furthermore, for a better clarification table 1 defines material and immaterial resources.

\(^{29}\) Reisinger/Gattringer/Strehl (2013), p. 70, own translation.
2.1 Terminology of Natural Resources

Definition of Natural Resources

Natural resources play an increasingly fundamental role in companies. Therefore natural resources have to be taken into account in terms of core business activities. When browsing through the literature natural resources have various definitions and meanings. Hence, this chapter deals with these definitions and meanings as well as with the classification of resources and resources in economy. In order to clarify the situation of natural resources and their related objectives, this chapter deals with the definitions of natural resources, the importance of natural resources and resource efficiency.

Before ahead, natural resources are defined as components and/or functions of the natural environment, such as water, air and minerals, which deliver valuable service functions for human beings and society. The use of natural resources allows increasing and guaranteeing growth, wealth and employment, however, the access and availability of natural resources is limited.

Over the last years, Economists have realized, that a third approach of capital can be added. The environmental resources are fundamental for organizations and their performance, and are therefore essential for the unified well-being. For this reason environmental resources can be defined as natural capital.

Classification of Resources

Resources can have several significances, depending on the environmental surrounding, in which they occur. Resources are essential for companies and their corporate success.

---

Figure 1: Classification of resources

---

Narrowing the significance of resources to companies and corporate success, resources are the whole tangible and intangible resources of the company.\footnote{Günther/Möller (2014), p. 547-54, own translation; Reisinger/Gattringer/Strehl (2013), p. 70, own translation.} Tangible resources are raw material, machines and buildings, whereas intangible resources are specified as soft resources, such as knowledge, information and know-how.\footnote{Fernandez/Montes/ Vazquez (2000), p. 81-82; George/ Schillebeeckx/ Liak (2015), p. 1596, 1600, 1602; Reisinger/Gattringer/Strehl (2013), p. 70, own translation.} During the last decades resources have gained and increased significance in terms of resource availability and resource access.\footnote{George/Schillebeeckx/ Liak (2015), p. 1595; Reisinger/Gattringer/Strehl (2013), p. 71, own translation.} 

**Resources in Business Management**

Resources are a major component of the overall performance of a company. The availability and the access of resources are limited and therefore, the allocation of the available resources is essential for achieving the strategic objectives.\footnote{Reisinger/Gattringer/Strehl (2013), p. 169, own translation.} Attention must be paid to a balanced situation of resource allocation and strategy of the company.\footnote{Johnson/Scholes/Whittington (2011), p. 130-131, own translation; Reisinger/Gattringer/Strehl (2013), p. 169, own translation.} Hence, the resource allocation should not solely be the main goal, it is crucial to focus on both approaches, otherwise resource allocation will suffer, or in contrast, the strategy will not be realized.\footnote{Johnson/Scholes/Whittington (2011), p. 130-131, own translation; Reisinger/Gattringer/Strehl (2013), p. 71, 169, own translation.} 

The significance of resources for companies can be classified into four central categories:

- human resources
- financial resources
- physical resources
- intellectual/information

For organizations the above listed resources are essential in terms of corporate management and success. Possessing those resources is not enough for being competitive, the organizations have to apply and utilize the resources in an effective way in order to remain competitive.\footnote{Johnson/Scholes/Whittington (2011), p. 130-131, own translation; Reisinger/Gattringer/Strehl (2013), p. 71, 169, own translation.}

Skimming through the literature reveals some resource failures, such as improper use and application of resources. Having the finest technology and latest production facility does not automatically lead to corporate success, the key point is the usage and utilization of the available resources.\footnote{OECD Glossary (2005b), Internet: https://stats.oecd.org/glossary/detail.asp?ID=1740.}

**Natural Resources**

Referring to literature, the definition of natural resources is highly controversial due to several interpretations and descriptions, but the details of the different definitions will be discussed later. First of all, natural resources can be classified into two main categories, namely renewable and non-renewable.

According to the OECD (Organisation for Economic Co-operation and Development) natural resources are defined as followed: “Natural resources are natural assets (raw materials) occurring in nature that can be used for economic production or consumption.”\footnote{OECD Glossary (2005b), Internet: https://stats.oecd.org/glossary/detail.asp?ID=1740.}
Due to various interpretations, the definition of natural resources is often difficult to precise. Some definitions are hard to communicate, because most of the people have vague ideas about natural resources and therefore thoughts and definitions of their own.\textsuperscript{56}

For some natural resources, the definition is clear and simple, such as for crude oil or wood and for others there are conflicts about the definition and clarification. However, the difficulty to evaluate how final goods and products can be classified, in the sense of natural resources, is valid for all of them.\textsuperscript{57}

As already mentioned above, the definition of natural resources cannot be fixed by a certain model. Finding an appropriate and fitting definition for natural resources is a very important task and therefore some definitions of different sciences will specifically be investigated.

Defining natural resources as \textit{“stocks of materials that exist in the natural environment that are both scarce and economically useful in production or consumption, either in their raw state or after a minimal amount of processing”}\textsuperscript{58} the WTO (World Trade Organization) states the definition focusing on natural environment and economically usefulness. Additionally, the WTO also predicts that the goods have to be scarce in terms of economy in order to be defined as natural resources; otherwise the resources would be unlimited consumable.\textsuperscript{59} An appropriate and valuable definition should draw a line between what can be clarified as a natural resource and what is not a natural resource by definition.\textsuperscript{60}

UNESCO states that, \textit{“natural resources in a broad sense include everything that is derivable for the use of man from any part of the universe. In the physical sphere they include energy from sunshine and gravity as well as mineral deposits and the rain. In the biological sphere they include domesticated as well as wild plants and animals; and they include human resource too.”}\textsuperscript{61}

Natural resources can occur in different forms, such as solid, liquid or gas. Moreover, natural resources can be organic or inorganic and metallic or non-metallic.

To conclude this section and beside the theoretical approaches of natural resources, the next figure shows classification of natural resources. This classification is made by the VDI 4800 and provides a good overview of the different categorization of natural resources.\textsuperscript{62}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{natural_resources.png}
\caption{Natural Resources\textsuperscript{63}}
\end{figure}

\textsuperscript{58} World Trade Report (2010), p. 46–47.
\textsuperscript{60} Barbier (2003), p. 253; World Trade Report (2010), p. 46.
\textsuperscript{61} Worthington (1964), p. 2.
\textsuperscript{62} VDI 4800 (2014), p. 8, own translation.
\textsuperscript{63} Own representation based on VDI 4800 (2014), p. 8
Natural Capital

The OECD states that natural capital, "are natural assets in their role of providing natural resource inputs and environmental services for economic production."\(^{64}\) In other words, natural capital builds the base for the existence of our environment and all the living. Some examples for natural capital are geology, soil, air, and water.\(^{65}\)

The appearance of the approach of “natural capital” in the last decades shows that the environment and environmental systems have gained a real importance in the context of a country’s economic output and social well-being.\(^{66}\) Beside the natural capital, there are also other forms of capital. Considering this direction of thinking, the wealth of a nation can be determined with four core stocks of capital: manufactured capital, human capital, social capital, and natural capital.\(^{67}\) For manufactured capital machines, tools, buildings, and infrastructure can be mentioned as examples. This special form of capital is fundamental for organizations due to the ability of flexibility and competitiveness on the market.\(^{68}\)

Another form is the human capital, which includes skills, talents, knowledge, and abilities.\(^{69}\) Human capital has an essential influence on the internal and external environment, due to different perspectives and backgrounds of the employees.\(^{70}\) Social capital can be defined as norms, values and interaction.\(^{71}\) In other words, social capital is the ability to network with others. The natural capital has already been mentioned above and deals with minerals and ecosystem services. Additionally, financial capital can also be mentioned in this context, and plays a fundamental role in the sense of exchanging between the other forms of capital.\(^{72}\)

Renewable and Non-renewable Resources

As mentioned above, natural resources can be classified in two categories, renewable and non-renewable resources. Renewable resources can recreate their stocks after exploitation by their natural processes of growth.\(^{73}\) Some examples are sun, water, wind, and plants.\(^{74}\) As one definition, the OECD specifies non-renewable natural resources as “exhaustible natural resources such as mineral resources that cannot be regenerated after exploitation.”\(^{75}\)

---


\(^{74}\) OECD (2011), p. 9f.

Biotic and Abiotic Resources

Concerning renewable and non-renewable resources, two important classifications have to be mentioned. Renewable resources are biotic, as they grow and reorganize themselves over time, such as plant and animal population.\textsuperscript{76} In contrast, non-renewable resources are abiotic, characterized by non-biological reproduction.\textsuperscript{77} Examples for this category are stocks of minerals or ore. Non-renewable resources are often called exhaustible or depletable due to the fact of non-restricted usage and access of those resources.\textsuperscript{78}

This paper contains a lot of terms and definitions which are part of the theoretical background. For the sake of completeness the next subchapter “Demarcation of Raw Material and Material” will shortly illustrate Raw Material and Material in order to avoid misinterpretations concerning the expressions.

Demarcation of Raw Material and Material

Raw Material

Raw material defines materials or substances which are used in the primary production and manufacturing process in order to produce goods.\textsuperscript{79} For example, metals, minerals or forest-based materials can be classified as raw material and therefore build the basis for the economic and socio-economic systems. Hence, raw material is necessary for any production and manufacturing process.\textsuperscript{80} It can also be categorised into primary and secondary raw material.\textsuperscript{81}

The primary raw material is a fundamental part of the primary production process, “which encompass the extraction of natural resources from the environment and their transformation through processing or refining.”\textsuperscript{82}

The received raw material is necessary for the manufacturing process and therefore, builds the basic material for continuing processes. In contrast, secondary raw materials are raw materials which have been detected for recycling or reprocessing to generate raw materials.\textsuperscript{83} Mining, manufacturing and processing waste are examples for the above-mentioned raw material category.\textsuperscript{84}

Material

For the sake of completeness a short definition of Material will be mentioned. Material may be defined as the entirety of solid raw material and auxiliary material, which is needed to produce goods.\textsuperscript{85}

\begin{itemize}
  \item \textsuperscript{76} Perman et al. (2009), p. 11.
  \item \textsuperscript{77} OECD (2011), p. 5, 7; Perman et al. (2009), p. 11.
  \item \textsuperscript{78} Perman et al. (2009), p. 11.
  \item \textsuperscript{84} European Commission/Raw Material (2016), Internet: https://ec.europa.eu/growth/sectors/raw-materials_de.
\end{itemize}
According to the ISO 14051, material can be categorized in two groups:

- **materials that are intended to become part of products, e.g. raw materials, auxiliary materials, intermediate products**
- **materials that do not become part of products, e.g. cleaning solvents and chemical catalysts, which often are referred to as operating materials**

Additionally, another classification can be carried out, which is the usage for the material. This study will not focus on the usages of resources. To give an idea about the classification, two examples can be named. As an example, water can be stated in this classification due to several possible uses. As a further explanation, water can be transformed into a product, such as distilled water, though water can also be part in the production process in order to cool down material or processes.

### 2.2 Importance of Resources

Beyond a doubt, the importance of resources has an indispensable role in all respects, irrelevant whether in the context of macroeconomics or microeconomics. For macroeconomics resources take a different part than in microeconomics, especially for companies. For this reason, this chapter deals with the role of natural capital in general and the importance of resources in the macroeconomic and microeconomics.

Building the most fundamental form of capital, natural capital provides a basis for human beings. Natural capital is essential for our living, since it delivers food, clean water and air, and supplies substantial resources. Hence, natural capital has boundaries regarding the availability. Additionally, natural capital deals with ecological limitations in terms of scarcity of resources and socio-economic systems.

Natural capital respects three principal categories: natural resource stocks, land, and ecosystems. In order to achieve a long-term orientation in context of sustainability, all of these approaches have to be considered. For a better categorization, these are labeled as “functions". The “functions" can be classified in resource, sink, or service functions:

- Resource functions, as the name implies, consider natural resources. These resources can be converted into goods or services. Examples for this group are mineral deposits, wood from natural forests, and deep sea fish.
• Sink functions deal with by-products of the production and consumption process, such as water being to clean or needless packaging material. The waste goes into the air, water, or land.94
• Service functions can be classified in two different categories: survival and amenity functions. The survival function is essential for living, for example air for breathing and water for drinking. Amenity functions provide a good quality of life, in improving the infrastructure for leisure activities.95

It is no secret that our resources are limited, and the growing global demand pressures the natural environment. Hence, resource will become more expensive due to their scarcity. For this reason, our consumption pattern has to change in the interest of our environmental future and future generations.96

Reisinger and his colleagues argue that an increasing demand for some materials, such as steel, fossils, food and water will result in price volatilities, which will end in a competition. In the past, when prices were high new, innovative products came up, but nowadays, the change needs to be more sufficient and long-term orientated.97

To make the significance of resource efficiency more visible, the literature provides an appropriate example. In the hunter-gatherer period the consumption of natural resources were approx. 3kg per person per day, this consume increased to 11kg per day, in agricultural society. Nowadays the average consume per person is 44 kg per day.98

Consequentially the significance of natural resources in every context is very high and elementary. The value of ecosystem plays an important role with regard to natural resources due to the maintenance they serve. Taking the function of natural systems for granted is one of the main problematic issues of our society. The entire natural resources and their systems are fundamental for the retention of the economy and humanity.99

As already mentioned above, the ecosystems have a service function in terms of reorganizing the system itself. The ecosystems deal with a wide spectrum of service, such as waste absorption, periodic water refreshing, pollination, controlling and managing.100

Combining all these services, the ecosystems are able to provide and maintain products, namely natural resources. In order to receive and preserve timber, fish, clean water and air, a properly functioning ecosystem is necessary.101

To underline the theoretical approach, this section mentions some fundamental points. Robert Costanza and his colleagues conducted a well-known global study in 1997, regarding the estimation of the value of ecosystem service.102

According to Costanza the estimated annual value of services, such as climate regulation, water regulation and raw material is USD 16–54 trillion; the average value is defined with USD 33

98 Prammer/Schrack (2014), p. 4f, own translation
100 OECD (2011), p. 11; Perman et al. (2009), p. 399-400.
trillion.\textsuperscript{103} Estimating the value gives a visible idea of the importance and significance of the systems, the real value cannot exactly be calculated, but it would be much higher.\textsuperscript{104}

Summarizing the above mentioned theoretical statements, ecosystems and natural resources are a fundamental basis for the functionality of our economy and society. Without ecosystems and natural resources our economy and society would not exist in this form.

**Macroeconomics**

When taking about resources in the context of macroeconomics, some general critical issues can be mentioned. Increasing resource consumption due to higher demand leads to shrinking resource stocks and limiting the availability and access of resources.\textsuperscript{105} Furthermore, the macroeconomic is dependent on resource and their inputs. So, in order to be able to create value, resources build the basis and resource inputs are necessary for the entire economy.

Additionally, raw material is essential for the economy and macroeconomics environment, hence protecting and defending the access to such raw materials is an increasing issue for all related actors. The EU has developed a list of critical raw materials, which play an important role for the economy and environment.\textsuperscript{106} The result of modern technology and our lifestyle is the increasing number of raw material. Additionally, new sustainable technology requires raw materials, in terms of solar panels and wind turbines.\textsuperscript{107} The developed plan should support the industrial competitiveness by providing an industrial policy and establish new trade agreements.\textsuperscript{108}

To summarize the role of natural resources in the context of macroeconomics, some critical issues have to be considered for future developments. Increasing demand of natural resources will limit the availability of resources for future generations and hence, will have irreversible losses in natural environment.\textsuperscript{109}

Over the last decades economists have realized that environmental and natural resources should be seen as economics assets, so in other words, natural capital.\textsuperscript{110}

One critical point is the understanding and awareness of the natural capital stock, so economists found out, the rate of depletion of natural capital stock which has an impact to sustainable economic development.\textsuperscript{111}

Natural capital provides a lot of (economic) services and is consequently rare and limited in availability.\textsuperscript{112} As mentioned above, the awareness and understanding of the entire natural capital stock is not given, hence, it is time to increase and reform the knowledge in this field.\textsuperscript{113}

Another issue is to increase and improve the cooperation between economists, scientists, biologist, ecologists and natural scientists. Such cooperation is increasingly essential due to new relevant environmental problems in the field of sustainable development.\textsuperscript{114}

\textsuperscript{103} Costanza et al. (1997), p. 259.
\textsuperscript{104} Costanza et al. (1997), p. 259.
\textsuperscript{110} Barbier (2003), p. 268-269.
\textsuperscript{111} Barbier (2003), p. 269; Costanza/Daly (1992), p.43-44.
\textsuperscript{112} Barbier (2003), p. 269.
\textsuperscript{113} Barbier (2003), p. 269; Perman et al. (2009), p. 20-21.
Microeconomics

Regarding resources in terms of the microeconomic environment, the importance of resources has different approaches than it has for the macroeconomics due to several reference points. Talking about resources in microeconomics, the main focus in this paper lies on companies and individuals. So as mentioned above, resources can have different meanings and classifications, it strongly depends on the environment.

Natural resources have an essential role for economic success of a company. Therefore natural resources build the basis for corporate management processes and due to that proper resource allocation is mandatory. For companies natural resources are vital in the context of supplying inputs for the production process. The dependence of companies on resources is elementary, in terms of corporate success. Consequently, natural resources are the main input for economy and without resources, no welfare is achievable.

Regarding the natural resource dependency, another issue in this context can be mentioned. As companies are dependent on natural inputs, suppliers of such inputs have a huge impact on the company’s performance, due to access and availability of natural resources, material costs and imports. For this reason, companies have to rely on their suppliers. Hence, agreements for the supply of natural resources and related issue should be considered in the relationship between company and supplier, in order to establish a valuable long-term relationship.

2.3 Resource Efficiency

The “Ressourceneffizienz Aktionsplan” (REAP), in the context of macroeconomics, defines resource efficiency frequently used as synonym for resource productivity, indicates the relation between the monetary output and the resource input. The core measure of resource efficiency is related with GDP. Following the principle of resource efficiency two approaches take part: resource consumption increases slower than GDP and the resource consumption decreases.

The European Commission defines resource efficiency as “using the Earth’s limited resources in a sustainable manner while minimising impacts on the environment. It allows us to create more with less and to deliver greater value with less input.”

---

For this paper the definition of resource efficiency will refer to the definition of the REAP as well as to the OECD. The definition of the REAP focuses more on the economic view, hence resource efficiency is stated as a synonym for resource productivity. On the other hand, the OECD considers the environmental view, by defining resource efficiency as “creating more output with less input”.\textsuperscript{122}

Dealing with the concepts of handling sustainability with natural resources and resource efficiency, have a great importance in terms of ecological, social and economical context.\textsuperscript{123} Beside the environmental aspect, resource efficiency also affects the expenses structure of a company and is therefore able to improve the cost savings of companies.\textsuperscript{124} Resource efficiency can be applied to more than the production process and waste management; changes in product design as well as service management play a respectable role.\textsuperscript{125} Additionally, resource efficiency strategies support and improve the innovation process and strike out in a new direction for future sustainable economic development.\textsuperscript{126}

Beside this, another positive effect of increasing the resource efficiency is to support the world economy in terms of economic opportunities.\textsuperscript{127} So for the above mentioned reasons, new and innovative ways have to be found, in order to improve the overall resource usage situation. Hence, the focus should lie on reducing inputs, optimizing the production process, improve logistical structure, change consumption behaviour and minimize waste or rather increase recycling process.\textsuperscript{128}

According to VDI 4800 resource efficiency is the relation between utilization and necessary resource deployment.\textsuperscript{129} Making the definition more comprehensible, the below stated formula illustrates the relation between usage and input:

\[
\text{Resource efficiency} = \frac{\text{Use (product, function, and functional unit)}}{\text{Input of natural resources}}
\]

Figure 3: Resource efficiency\textsuperscript{130}

To explain the illustration, high resource efficiency is reached when the use of goods or service can be managed with a lower input of natural resources.\textsuperscript{131} The same situation applies when the technical-functional use is higher, while the input of natural resources remains at a constant level.\textsuperscript{132}

\textsuperscript{123}REAP (2012), p. 8-9, own translation.
\textsuperscript{124}REAP (2012), p. 8-9, own translation.
\textsuperscript{125}REAP (2012), p. 8-9, own translation.
\textsuperscript{126}REAP (2012), p. 8-9, own translation.
\textsuperscript{127}Reisinger/Tesar/Read (2015), p. 8f.
\textsuperscript{131}VDI 4800 (2014) p. 7
According to VDI 4800 when defining resource efficiency, the focus is not on the product or process, but the function in combination with the input of natural resources take part. The function is the combination of all related processes; hence the system perspective is fundamental for determining resource efficiency. Additionally, when identifying resource efficiency, the use has to be quantified in monetary units or other suitable forms.

In this context three strategies can be stated. Efficiency, compatibility and sufficiency principles play an important role concerning the sustainable economic systems. One principle takes a major role in this context, which is the efficiency principle. The efficiency principle states that the main aim is to generate a maximum output with the at least possible inputs. In other words, to achieve the greatest potentially economic output with before determined material and energy usage. The main purpose of this efficiency principle is to minimize the exploitation of natural resources.

How to measure resource efficiency

Resource efficiency is a crucial issue in the context of sustainable development and gains more and more importance. This subchapter will present some defined indicators for measuring resource usage and efficiency.

The Future Research Centre of Finland provides a good overview of future resource efficiency. Stating that a lot of indicators are just copied from the past into the future, the research centre is trying to find appropriate indicators to measure for the future in a proper and suitable way. According to the Future Research Center of Finland, indicators have to meet at least three requirements in order to be useful:

1. they must be forward looking instead of backward looking
2. they must take a long term perspective
3. they must assume complexity

Focusing on future resource efficiency, the attention has to be on new solutions and actions, such as energy efficiency improvements and renewable energy supply. The main problem in this context deals with lifestyle and value changes all over the world, hence new trends and

---

137 Prammer/Schrack (2012), p. 3.
For the sake of completeness the other two principles will be mentioned here. The second principle is the principle of ecological compatibility, stating that raw material and resources, coming from the natural environment, circulating into the natural environment do not have overrun the natural capacity limits.
139 Prammer/Schrack (2012, p. 3-4.
consumer behavior have to be taken into account, when providing new sustainable developments.\textsuperscript{142}

To give an overview of some useful indicators and how to measure resource efficiency, the next following theory part will present some resource efficiency indicators. By developing resource efficiency indicators on a company level, it is suggested to develop a specific resource accounting system, focusing on consistent input and output flows.\textsuperscript{143}

Regarding literature reviews, a lot of approaches and indicators are suggested, but in this chapter the focus will be on the approach of manufacturers.\textsuperscript{144}

The following variables are useful for resource efficiency in the context of a sustainable perspective:

- \textit{raw materials as untreated resources}
- \textit{technospheric resource input as already treated resources}
- \textit{product output}
- \textit{non-product output (NPO)}\textsuperscript{145}

For the calculation of resource efficiency, the quantity of product output and the value added is needed.\textsuperscript{146} Additionally, the total amount of output for non-product output is part of the calculation.\textsuperscript{147}

Due to the fact of focusing on resource efficiency indicators for manufactures, the below presented table gives a short overview of useful basic indicators.

<table>
<thead>
<tr>
<th>Reference base in kg</th>
<th>Material input (raw material and supplies)</th>
<th>Raw material input</th>
<th>Operating material input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product output in kg</td>
<td>Operational material efficiency:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>= Total input/product output (kg/kg)</td>
<td>Operational raw material efficiency:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>= Raw material input/product output (kg/kg)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operating material efficiency:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>= Operating material input / product output (kg/kg)</td>
<td></td>
</tr>
<tr>
<td>Value added in €</td>
<td>Operational material productivity:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>= Value added/total input (€/kg)</td>
<td>Operational raw material productivity:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>= Value added/raw material input (€/kg)</td>
<td></td>
</tr>
</tbody>
</table>

\textbf{Table 1: Resource efficiency indicators}\textsuperscript{148}

\textsuperscript{144} Prammer/Schrack (2012), p. 10.
\textsuperscript{147} Prammer/Schrack (2012), p. 10-11.
\textsuperscript{148} Prammer/Schrack (2012) p. 11.
The above mentioned indicators should be an overall extract of the indicators, and can be shaped to further types of materials. For the product output, material intensity can be calculated with the operational material efficiency. The total input divided by the product output reports how much material is needed in order to produce one unit and is defined as material efficiency.\textsuperscript{149} Due to the fact that the entire inserted material do not result in end-products (non-product outputs), having two different approaches for material input calculations is useful. Additionally, the relation between value added and operating material input is very low, because the operating material does not result in an end product and therefore, has no direct impact on the value added.\textsuperscript{150} These indicators are some examples for resource efficiency and can be shaped into other relevant factors and indicators.

**Resource efficiency Initiative**

**The Europe 2020 Strategy**

Focusing on *smart, sustainable and inclusive economy* builds the basis for the particular strategy 2020 of the European Union.\textsuperscript{151} As the name implies, by the end on 2020, five major targets have to be reached. The five targets deal with the field of employment, R&D, climate change and energy sustainability, education and fighting poverty as well as social exclusion.\textsuperscript{152} The answer to the question of implementing such strategy is to use the strategy as a reference model for diverse levels.\textsuperscript{153} Additionally, to be able to see the progress of the achieved targets, Eurostat frequently announce progress reports, to give an overview of the targets.\textsuperscript{154}

The European Commission has established a resource efficiency Roadmap, which is part of the resource efficiency Flagship of the strategy of 2020.\textsuperscript{155} The Roadmap has a major role in the resource efficiency flagship initiative and builds a scheme for realizing future activities.\textsuperscript{156} Beside the plan for future actions, structural and technological changes as well as cornerstones, which have to be achieved by 2020, are part of the framework.\textsuperscript{157} The milestones have a fundamental role; hence they frame the course to a resource efficient Europe.\textsuperscript{158}

\textsuperscript{149} Prammer/Schrack (2012), p. 10-11.
\textsuperscript{150} Prammer/Schrack (2012), p. 11-12.
\textsuperscript{151} European Commission (2016), Internet: http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm
\textsuperscript{153} European Commission (2016), Internet: http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm
\textsuperscript{155} European Commission (2016), Internet: http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm
\textsuperscript{157} European Commission (2016), Internet: http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm
Definition of Efficiency and Effectiveness in Business Management

Supplementary to the chapter resource efficiency will be completed with the definition and significance of efficiency and effectiveness in business management.

Efficiency cannot be defined as single term, due the fact that it has a lot of several meanings; depending in which context the term is used.

Determining efficiency in the context of business management, the Business Dictionary defines efficiency as **“the comparison of what is actually produced or performed with what can be achieved with the same consumption of resources (money, time, labor, etc.).”**¹⁵⁹

In other words, efficiency implies the performance of a company; hence, a company is efficient when generating the maximum of outputs, with the at least possible inputs.

In this thesis efficiency refers to resource efficiency, therefore the main part of this paper is the resource based BSC. For this reason, the other forms of efficiency, such as economic efficiency and social efficiency are not further discussed.

According to the Oxford Dictionary, effectiveness is defined as **“the degree to which something is successful in producing a desired result.”**¹⁶⁰ Hence, effectiveness often refers to things and describes how adequate the task is accomplished.

In order to give a short insight about efficiency and effectiveness, Stefanos Mouzas conducted in 2006 a study where **“the importance of linking efficiency and effectiveness and more widely on companies’ performance in business networks”** is discussed.¹⁶¹

In this article the author Mouzas write about efficiency and effectiveness in the context of business management and corporate performance. He argues that efficiency and effectiveness can be seen as key concepts for companies, but they are often not equalized.¹⁶² A crucial point in this context is that companies regularly cannot manage to achieve differentiation and innovation, because of an imbalance of efficiency and effectiveness.¹⁶³ His study came to the conclusion that managers are preoccupied in processing businesses in an efficient way; as a result, efficiency prevents from accomplishing new directions and sustainable growth.¹⁶⁴ The main point is to have a balanced situation concerning efficiency and effectiveness. Overlooking effectiveness and focusing on efficiency is not enough for achieving corporate success.¹⁶⁵ When enhancing efficiency several managerial modifications are rather needed than for enhancing effectiveness.¹⁶⁶ Efficiency is a necessary requirement and therefore, effectiveness cannot solely be seen as an output, it is an ongoing process, which is fundamental for the business management.¹⁶⁷

To summarize it, sustainable growth depends on the company’s determined scope of business in which they operate.¹⁶⁸

---

As the main part of this paper deals with a resource based BSC and thus focus on efficiency, effectiveness will not be discussed.

### 3 Sustainable Balanced Scorecard

This chapter is supposed to give a theoretical background of the Sustainable Balanced Scorecard (SBSC). The first subchapter is about definitions, aims and purposes of the Sustainable Balanced Scorecard and traditional view is also considered. The aim of the SBSC is the integration of the three pillars of the sustainability concept – economy, environment and society – into successfully implementation of strategies.\(^\text{169}\)

The analysis tool deals with the measurement, documentation and control of operations and activities of a company or an organization, strictly respecting its vision and strategy.\(^\text{170}\)

Regarding the next chapter, the purpose will be the procedure of formulating a Sustainable Balanced Scorecard of the selected company.

#### 3.1 Balanced Scorecard

The BSC consists of four perspectives that can be used to evaluate and measure a company, in terms of their performance. The concept supports the implementation of the strategy of the company and therefore, illustrates the impact.\(^\text{171}\) In other words; it values the success of its strategy implementation.\(^\text{172}\)

The BSC concept is defined by four perspectives, namely the financial, internal perspective, learning and growth as well as customer perspectives.\(^\text{173}\) The figure below shows the basic model of the BSC, with the four perspectives and its objectives, measures, targets and initiatives.

---

\(^\text{171}\) Reisinger/Gattringer/Strehl (2013), p. 217, own translation
\(^\text{172}\) Kaplan/Norton (2010), p. 6f.; Karpagam/Suganthi (2012), p. 7f
The Application of the BSC

Due to the fact that this paper focuses on the Balanced Scorecard, especially on a resource based Balanced Scorecard, this subchapter will give an overview of the structure of a traditional Balanced Scorecard (BSC). The next subchapter considers the integration of sustainability in the BSC and will present the various implementation methods of sustainability in the BSC. The purpose is to get an insight of the topic a more detailed view of the selected analysis tool.

The Balanced Scorecard was developed by Kaplan and Norton in 1992, as a new access to performance measurement.\textsuperscript{175} With the aim of providing a framework for measuring the performance of a company in a more detailed way, the BSC gained high importance in the last decades.\textsuperscript{176} The idea behind the concept is that financial capital is not the single fundamental parameter for competitive advantages, although there are more factors which have a crucial effect on the performance of the company.\textsuperscript{177} Therefore, different points of view build the framework of the BSC.

The BSC integrates four different perspectives, namely financial, customer, internal process and learning and growth perspective and therefore provide understandable cross-functional relationships as well as causal chains. One fundamental aspect is the connection between performance measurement and strategic objectives.\textsuperscript{178}

\textsuperscript{174} Kaplan (2010), p. 4
\textsuperscript{176} Banker et al. (2004), p. 2.
\textsuperscript{177} Figge et al. (2002b), p. 1f.
\textsuperscript{178} Banker et al. (2004), p. 2.
Managers and executives have realized that choosing only one relevant measurement tool out of a pool of various gadgets is not the right way to picture the company’s performance. Hence Kaplan and Norton devised the Balanced Scorecard in order to provide a simple, but complete picture of the company. The authors give a good example of the purpose and aim of the Balanced Scorecard. For flying an airplane from A to B, a lot of information and indicators are necessary to successfully complete this complex task. Therefore, only one measurement cannot picture the entire situation and so, diverse information build the basis for evaluating the situation.

Using different organizational data, such as financial and non-financial data, from four different perspectives, the BSC provides a mixture of the internal and external environment of the organization. The mass of information is minimized by reducing the numbers of measures in every perspective. Hence, the received information is useful due to their compactness.

In every single perspective strategic core issues and performance drivers can be classified. To make it easier to understand, Figge and his colleagues define lagging indicators and long-term strategic objectives as strategic core issues. Lagging indicators imply the achievement of the defined strategic objectives. Performance drivers are defined as leading indicators and are very specific in terms of competitive advantage.

For a better understanding, a short description of the four perspectives will follow. The financial perspective reveals the connection between strategy transformation and the economic success. Regarding the financial indicators, two main tasks can be defined. First, the financial success of a company is linked to their strategy and second, to the cause and effect relationships as well as the connections between the different perspectives. The financial perspective provides a detailed view of whether or not the company is succeeding in terms of profitability and financial performance. A company can only achieve their predefined financial strategic objectives by understanding and committing the company’s strategic vision and mission. Though, in order to be successful, an interaction and connection between the other three perspectives have to be given.

The customer perspective deals with the customer/market section, in which the company operates. In this perspective a “core measure group” can be defined and it deals with market share, customer satisfaction and acquisition, as well as, customer retention. Performance drivers, which support the company’s customer value positions, are for example, quality, time for processing, attributes regarding product and quality, image and relationship.

186 Figge et al. (2002b), p. 4.
187 Figge et al. (2002b), p. 4.
188 Figge et al. (2002b), p. 3-4.
Kaplan and Norton argued that one of the main aspects, regarding the creation of customer value is to focus on continual innovation in products, services and internal processes.\(^\text{194}\)

The third perspective, the internal process perspective supplies a fundamental role in this paper by providing the foundation for the resource based Balanced Scorecard.

The internal process perspective deals, as the name implies, with internal business processes, such as innovation, production and service processes.\(^\text{195}\) The perspective defines those processes, which are fundamental in order to achieve the goals of the customer and financial perspective, and hence, provide a connection. This connection is the so called causal chain and implies the relationship between the perspectives.\(^\text{196}\)

As mentioned above, in every perspective strategic core issues and performance drivers can be defined. In this case, the strategic core issues deal with innovation, production and service processes and the performance drivers handle operating figures which have an effect on the subordinated process.\(^\text{197}\)

The learning and growth perspective describes the abilities, information and motivation of the employees, which are necessary in order to achieve the predefined goals coming from this perspectives.\(^\text{198}\) To improve the understanding of the definition, Figge and his colleagues define employee satisfaction as strategic core issue and employee potentials, technical infrastructure and employee health and safety as performance drivers.\(^\text{199}\)

To conclude and summarize the description of the Balanced Scorecard some critical thoughts about the strategic tool have to be mentioned. Besides the favorable aspects of the BSC also weak points should be part of the theoretical input. A main problem could be the implementation of the BSC in the company itself due to the access to necessary information. It is difficult to serve and maintain all the relevant information in high quality. Another issue is the long-term orientation of the company, the identification of aims and goals and cross-functional measurement of different segments.\(^\text{200}\) For some employees it could be difficult to understand the necessity of the identification of the company and therefore the process is ambitious to enforce.\(^\text{201}\) However, this is an excerpt of some critical points which can be prevented by various measures, such as proper information management, precise vision and clear-cut structures.

Translating the strategy into useful operative objectives, is a further advancement of the BSC and results in a strategy map.\(^\text{202}\) The strategy map is essential for determining the cause-effect chains. The cause-effect chains show the relationship between the perspectives and are discussed in chapter four, hence this chapter deals with the development of the SBSC.\(^\text{203}\)

---


\(^{195}\) Hansen/Schaltegger (2016), p. 197.


In order to receive an overall structure of a strategy map of a traditional BSC, the figure below shows such a strategy map with all relevant cause-effect chains and interrelationship within the four perspectives.

The strategy map shows essential cause-effect chains and so, provides a structured picture of strategic objectives and the resulted goals. Such strategy map consists of all strategically relevant aspects and therefore provides the cause-effect chains. In this strategy map the relationships between perspectives are marked with black arrows, and hence the selected cause-effect chains show accurately how interlinked the different perspectives are and how important such cause-effect networks are. A detailed description of a strategy map can be found in chapter 4.

**Strategy Implementation vs. Strategy Formulation**

As already mentioned in previous chapters, strategy implementation and formulation are often mixed and not comprehensible, therefore this section discusses the differences between strategy implementation and formulation. Strategy implementation is a further step of strategy formulation. Strategy formulation is a key factor for a sustainable success. In the formulation phase the goal is to find the best strategy out of a pool of strategies, which fits the organizational targets and objectives.

---

Strategy implementation as the name implies, is the realization of the before selected strategy into the company. The implementation process is considered as the most challenging part for the company.\(^{207}\) Strategy implementation goes hand in hand with a change within the company. Hence the dynamic and flexible continuing environment of the business forces the company to act and handle the adaption; otherwise the company will not be competitive in the long run.\(^{208}\)

According to Harvath, the literature provides some examples of implementation breakdowns when it comes to realize the BSC concept.\(^{209}\) Having succeeded the implementation phase, some issues of supporting the successful implementation of the BSC, can be mentioned. Harvath suggested some factors that should be contained in the implementation process:

- in-depth and detailed training for all managers in BSC administration
- building confidence and veracity by telling success stories of the implementation process
- well-communicated vision and strategy
- strong communication with the entire organization\(^{210}\)

The above mentioned aspects are solely an extract of Harvath’s list, since for every company other factors and aspects are essential; hence a consolidation into a lump sum is critical and not recommended. Generally spoken, several factors and aspect have to be included when it comes to an implementation process. Therefore, the above list provides an insight of vital components.

**Implementation gap**

When browsing through the literature, several reasons for implementation failures of the BSC concept come up. According to Harvath there are three main causes for implementation breakdown “(a) the performance appraisers’ lack of use of, or bias against, intangible measurements, (b) subjectivity within the organization in the local application of the intangible measures and (c) a lack of two-way organizational communication with regard to the implementation of the approach”\(^{211}\)

In 2000 Lipe and Salterio conducted a study, where they found that the use of common measures implies a lack of use of unique measures resulting in insufficient performance evaluation of individual division’s growth and development.\(^{212}\) A further reason for failing the implementation was determined by Ittner, Larcker and Meyer.\(^{213}\) The subjectivity of managers plays a fundamental role in the implementation process.\(^{214}\) Modifying and establishing new performance measures and criteria in the balanced scorecard can result in failure of implementing the BSC.\(^{215}\)

---


\(^{210}\) Harvath (2010), p. 117-118.


\(^{214}\) Ittner/Larcker/Meyer (2003), p. 726-727, 729.

Finally, communication is the cornerstone of implementation processes and hence, objectives, aims and measures have to be communicated in proper way in order to frame a broad agreement regarding strategic goals.  

When concluding the findings of the literature, implementation failures can be identified constantly. Reisinger, Gattringer and Strehl select three main challenges when implementing the BSC concept. The existence of the BSC is not a guarantee for employees to participate in the analysis process. If the employees are not part of the process, acceptance difficulties and resistance can occur. Hence, using the top-down version means to communicate and actively integrate the employees. The objectives have to be in line with the strategy and should be appropriate and reliable for achieving the goals. Additionally, reward systems are supposed to increase the motivation of the employees when achieving strategic objectives.

When implementing the BSC, the acceptance of the employees take a crucial part and due to this reason, transparency and communication of the strategy are fundamental and indispensable.

Advantages and Disadvantages of the BSC

To summarize the concept of the BSC, the next section will present advantages and disadvantages of this management tool.

The below stated table provides a structured overview of potential positive and negative aspects concerning the BSC concepts in companies.

---

### Advantages

- The key data allows to measure and control the journey of the company and the drifting off is limited
- Focusing on future activities: the BSC prevents the path to a wrong direction due to the pre-defined goals, measurements and key data
- The concept of the BSC is very simplified and understandable, hence the communication of the goals and activities is easy
- The BSC concept can be redeveloped to the actual goals and aims within the company, which safe money and time

### Disadvantages

- Developing a unique BSC concept requires lot of resources (time, employees, data...)
- Missing Know-How and Knowledge when developing and creating the BSC

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>The key data allows to measure and control the journey of the company and the drifting off is limited</td>
<td>Developing a unique BSC concept requires lot of resources (time, employees, data...)</td>
</tr>
<tr>
<td>Focusing on future activities: the BSC prevents the path to a wrong direction due to the pre-defined goals, measurements and key data</td>
<td>Missing Know-How and Knowledge when developing and creating the BSC</td>
</tr>
<tr>
<td>The concept of the BSC is very simplified and understandable, hence the communication of the goals and activities is easy</td>
<td></td>
</tr>
<tr>
<td>The BSC concept can be redeveloped to the actual goals and aims within the company, which safe money and time</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Advantages and Disadvantages of the BSC

Table 2 presents solely some examples of advantages and disadvantages of the BSC concept and hence can be developed and refined in many other ways. The above stated table should just give some examples of potential positive and negative aspects of the BSC, but does not represent the entire scope.

### 3.2 How to Integrate Sustainability into BSC

#### History of Sustainability

The first steps of Sustainable Development happened in 1987, when the World Commission on Environment and Development (Brundtland Commission) published their Brundtland Report. The Brundtland Commission is named after Norway's former Prime Minister, Gro Harlem Brundtland, who acts as chairman. This report presents a new idea and concept of the Sustainable Development. The Brundtland report has gained a lot of importance over many years and supports the international agenda and the international community's attitude in their economic, social, and environmental development.

The Brundtland Report built the base for the Earth Summit in Rio de Janeiro in 1992. In addition, the Rio Summit counts as the largest environmental conference which has ever been

---


organized. Building a crucial roadmap for Sustainable Development, many issues concerning international agreements on climate change, forests and biodiversity were part of the summit. The Brundtland Report was developed to meet the special needs of the environment and picture the limitations of the nature on the one hand and aspirations of mankind towards a better life on the other hand. In the course of time, the concept was recreated and reexplained and so three dimensions (so-called social, economic, and environmental dimension) came up. Sustainable development is defined as the guiding principle for economic, environmental, and social development. According to the United Nations document of 1987, the approach of sustainable development is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Sustainability focuses on the protection of our environment and natural resources in order to ensure social and economic welfare to present and future generations. Nowadays, the concept of the Brundtland Report is seen as a proper regulation principle for the society to secure a long-term orientation focusing on sustainable responsibility. The concept deals with two approaches that should be balanced: development and environment. Additionally, it contrasts needs with resources or short- and long-term orientation. However, the concept was interpreted in many different ways in today’s society. Sustainability is often being seen in the context of three dimensions: social, economic, and environmental. To successfully achieve sustainability, these three dimensions have to be connected and interlinked.

Sustainable Development has many definitions, though these have a common sense of the idea. As mentioned above, the Brundtland Report and other definitions specify Sustainable Development as using and utilizing the resources in a moderate extent in order to not compromise the needs of future generations in meeting their own needs.

The United Nations, for example, state the definition of sustainability as follows: “Development is a multidimensional undertaking to achieve a higher quality of life for all people. Economic development, social development and environmental protection are interdependent and mutually reinforcing components of sustainable development.”

To summarize the definitions of Sustainable Development, Prof. Tilbury, author of the publication commissioned by UNESCO, stated that, “Sustainable development is a way of thinking about how we organize our lives and work – including our education system – so that we don’t destroy our most precious resource, the planet … It must be much more than recycling bottles or giving money to charity. It is about thinking and working in a profoundly different way.”

---

230 Robertson (2014), p. 3-4f.
Design and Structure of the SBSC

As already discussed above, the traditional BSC hardly considers the environmental and social aspects. To summarize it, all aspects which are relevant in a BSC for achieving a permanent competitive advantage, should be included. The objectives and measurements of the BSC have the concentration on long-term strategic financial goals. Regarding environmental and social aspects, the BSC also supplies a valuable strategic tool, as mentioned in the section before.\textsuperscript{237} The particular focus of different SBSC depends on the company itself and of course of the branches in which the company operates. Therefore, the company decides about the special focus in order to concentrate and meet the predefined goals.

As already noted, the aim of the SBSC is the integration of the three pillars – economy, environment and society into the concept of the BSC and moreover a successfully implementation of strategies.\textsuperscript{238} As the SBSC is based on the BSC concept, the structure and design of this concept is redeveloped and exceeded.\textsuperscript{239}

The concept rests on the four perspectives of the BSC and builds the general frame for the SBSC. Additional perspectives can be added, depending on the implementation form of the environmental and social aspects. When integrating environmental and social aspects into the BSC, three possible options come up.\textsuperscript{240} These possibilities will be discussed and evaluated afterwards.

Practical importance of the SBSC

Over the last years, the continuous increasing importance of sustainability and sustainable strategies has high priorities in the business environment.\textsuperscript{241} Therefore the integration of environmental and social aspects beside the economic one, has become a key factor for organizations.\textsuperscript{242} On this account, the Sustainable Balanced Scorecard is a perfect fit for achieving and assisting the sustainability strategy of the company.\textsuperscript{243} The SBSC is an advantageous strategic tool by supporting the implementation of the sustainability strategy of the company.\textsuperscript{244} Beside the supporting factor, the SBSC provides navigation for determining the perspective in order to achieve the defined sustainable objectives of the organization.\textsuperscript{245} Additionally, the concept of SBSC enables determining drivers of sustainability and so, allows monitoring the measures for achieving sustainability.\textsuperscript{246} An additional point is that the significance of measures and actions are graphically illustrated in order to identify the effect on the economic, social and environmental situation.\textsuperscript{247} The SBSC assists managers by giving major information to external stakeholders.\textsuperscript{248}

\textsuperscript{237} Figge et al. (2002b), p. 6.
\textsuperscript{238} Hahn/Wagner (2001), p. 2-3, own translation.
\textsuperscript{239} Hahn/Wagner (2001), p. 2-3, own translation.
\textsuperscript{241} Journeault (2016), p. 214.
For these reasons, the SBSC is a valuable tool, which supports the implementation process of strategies and additionally illustrates their cause and effects.\textsuperscript{249} The advancement of the SBSC, the strategy map, is a useful presentation of cause-effect chains within the perspectives.\textsuperscript{250}

**State of the Art of the SBSC**

Generally speaking and under consideration of some literature reviews, the traditional Balanced Scorecard neither considers environmental nor the social aspects and its related issues. Hence, this subchapter will shortly present the possibilities of how to integrate Sustainability into the traditional BSC.

A problematic issue about the environmental and social aspects in the BSC is that the relevance and the significance are not clearly outlined. Figge and his colleagues argue that a single consideration of the market and economic setting is not sufficient, because environmental and social aspects do not emerge within the market mechanism, though they can be caused by the company's activities.\textsuperscript{251}

**Integration of social and environmental aspects into the BSC concept**

Regarding the integration of social and environmental aspects of the BSC, three possible implementations can be mentioned. First, the integration can be managed through the existing four perspectives.\textsuperscript{252} Another possibility is to add an additional perspective, which focuses on environmental and social aspects. Defining a specific environmental and/or social scorecard builds the third option to integrate sustainability.\textsuperscript{253}

Integrating the sustainability aspect in the four standard perspectives is the first possibility and means an integration process through the four perspectives with strategic core elements or performance drivers, for which lagging indicators (Key performance indicators (KPI), determining the results) and leading indicators (KPIs evaluating the advance of the objectives) are defined.\textsuperscript{254} Environmental aspects are integrated in the four perspectives and in every perspective, relevant environmental performance indicators, aims, measures and characteristic factors are defined. This top-down process allows a determination of environmental and social aspect with strategically relevance in the BSC.\textsuperscript{255}

Using this form of integration, the framework of the BSC consists of the four standard perspectives and therefore, the exchange process with the market barely exists. Figge et al argue that such an integration form is simply favourable for environmental and social aspects which already play a role in the market system.\textsuperscript{256}

Adding an additional, so-called non-market perspective, focusing on environmental and social aspects, represents another possibility of integrating sustainability into the BSC.\textsuperscript{257} The literature

\begin{footnotesize}
\begin{itemize}
    \item \textsuperscript{249} Reisinger/Gattringer/Strehl (2013), p. 217, own translation.
    \item \textsuperscript{250} Reisinger/Gattringer/Strehl (2013), p. 219, own translation.
    \item \textsuperscript{251} Figge et al. (2001), p. 21-22, own translation.
    \item \textsuperscript{252} Figge et al. (2002a) p. 273-275.
    \item \textsuperscript{253} Figge et al. (2002b), p. 7-9.
    \item \textsuperscript{254} Figge et al. (2002a), p. 273-275; Figge et al. (2002b) p.7-9; Gminder (2003), p. 4.
    \item \textsuperscript{255} Figge et al. (2002a), p. 273-275; Figge et al. (2002b) p.7-9; Gates/Germain (2010), p. 2f; Gminder (2003), p. 4.
    \item \textsuperscript{256} Figge et al. (2002a), p. 274 ; Figge et al. (2002b) p.7-9; Gates/Germain (2010), p. 2f; Gminder (2003), p. 4.
    \item \textsuperscript{257} Figge et al. (2002a), p. 274; Figge et al. (2002b) p.7-9; Gates/Germain (2010), p. 2f; Gminder (2003), p. 4.
\end{itemize}
\end{footnotesize}
states that environmental and social aspects are not fully considered in the market price.\textsuperscript{258} The reason for this assumption is that environmental and social aspects emerge from non-market systems and therefore have no allowance and are treated like externalities.\textsuperscript{259} Including another perspective, which integrates strategically fundamental but not market integrated environmental and social aspects, is favorable due to several aspects.\textsuperscript{260} The second alternative is useful, when environmental and social aspects cannot be represented in the four perspectives and significantly impact the company’s success from outside the market mechanism.\textsuperscript{261} This misunderstanding can have potential negative effects for companies due to the strategically relevance and connection within the mechanism.\textsuperscript{262}

The third possibility of integrating sustainability into the BSC is, defining a specific environmental and/or social scorecard. In this case, the third integration option cannot be seen as an independent alternative; it is more an extension of the other two possibilities and only useful in connection with the other mentioned options.\textsuperscript{263} The purpose of this possibility is, to develop a separate scorecard, focusing on concluding and evaluating all relevant environmental and social relevant measures, aims and key figures.\textsuperscript{264} Such separate scorecards are advantageous for companies, which have an autonomous environmental department, where the scorecard supports companies with all relevant environmental actions.\textsuperscript{265}

Figure 6 shows the possible implementation forms and should support the theoretical understanding.

\textsuperscript{259} Figge et al. (2002a), p. 274; Figge et al. (2002b) p. 7-9; Gates/Germain (2010), p. 2f.
\textsuperscript{260} Hahn/Wagner (2001), p. 3f, own translation.
\textsuperscript{261} Figge et al. (2002b), p. 274; Figge et al. (2002b) p. 7-9; Hahn/Wagner (2001), p. 4, own translation.
\textsuperscript{262} Hahn/Wagner (2001), p. 4, own translation.
\textsuperscript{263} Hahn/Wagner (2001), p. 4, own translation.
\textsuperscript{264} Hahn/Wagner (2001), p. 4, own translation.
\textsuperscript{265} Hahn/Wagner (2001), p. 4, own translation.
Evaluation of the three implementation options

In order to better evaluate the three possible implementation forms and additionally to conclude this subchapter, a valuation of the three implementation options is discussed.

Integrating through the existing four perspectives

This integration form brings one major advantage, the environmental and social relevant aspects are included in the entire process, and hence in each of the four perspectives, environmental and social aspects are strategically relevant.\textsuperscript{267} The integration of environmental and social aspects into the four perspectives is favourable for a market system, where these environmental and social aspects are already present.\textsuperscript{268}

Adding an additional non-market perspective

This implementation form is another possible option for including environmental and social aspects into the BSC. However, as already mentioned in the previous chapter, this form of implementation requires a structured and good interlinked environment. The reason for this is apparent; hence this special implementation form is hardly to manage due to the “stepmother effect”. “Stepmotherly” in this context means the hurdle of implementing environmental and social aspects into the BSC by adding another perspective. The major problem in this case is the non-responsibility feeling of the additional perspective, as this perspective may not be fully

\textsuperscript{266} Bieker/Waxenberger (2002), p.7.
\textsuperscript{267} Figge et al. (2002a), p. 274.
integrated into the traditional BSC concept and hence, builds an extra part. However, the main issue is the missing interaction and relationship to the other perspectives.\textsuperscript{269}

**Defining a specific environmental and social scorecard**

The third implementation option is an extension of the other two possible implementation forms and is solely favourable in combination with the other two.\textsuperscript{270} Defining such environmental and social scorecards, approve to control and manage the entire scope of relevant environmental and social aspects in the overall BSC concept.\textsuperscript{271} Combining this form of implementation with the other two, builds a useful option, but as a single implementation form it does not bring desirable results.\textsuperscript{272}

### 3.3 The Role of Resources & Resource Efficiency in the SBSC

In this section the focus is on discussing the connection between SBSC and resource efficiency, hence the relevant theory builds the basis for the subsequent study.

The analysis of the resource efficiency and its effects on several components and indicators of the company build one of the main sections of this master thesis. The results will help to identify potential weaknesses and improvements regarding resource efficiency.

As already mentioned in the sections before, resource efficiency is crucial in the sense of sustainable economic development, welfare and competitiveness.\textsuperscript{273} The literature states that environmental regulations push innovation and therefore companies invest in new technological development.\textsuperscript{274} Additionally, the companies have to go in the direction of resource efficiency in order to stay competitive.\textsuperscript{275} According to literature, innovation allows new niche products, which results from investments in the production process. Especially improvements and developments in the resource efficiency management have a positive effect on sales.\textsuperscript{276}

The result of these developments is an increase in the demand of the environmental friendly products, so the literature argues that environmental regulations and limitations in any form do not only hinder the environmental effects, it also pushes the innovation.\textsuperscript{277}

It is not a secret that natural resources are rare and limited and due to the fact of an increasing scarcity of resources, companies have to develop new approaches in terms of resource efficiency. Natural resources are the basis for living and therefore the consumption of resources has to be limited. Hence, the resource efficiency management gains more and more importance.

\textsuperscript{270} Hahn/Wagner (2001), p. 4, own translation.
\textsuperscript{271} Figge et al. (2002a), p. 275.
\textsuperscript{273} Barbier (2003), p. 270.
The reason for the increasing resource consumption is the economy and the development of consumer behavior.\textsuperscript{278}

For the above mentioned reasons, the companies continually try to be stable at the market with new innovation strategies and developments regarding resources and resource consumption.\textsuperscript{279}

Resources and resource efficiency are a crucial factor in the SBSC due to the relevance in all perspectives. The study focuses on resource efficiency and so the internal process perspective plays a fundamental role. This perspective deals with the internal processes, such as innovation, production and service processes.\textsuperscript{280} Hence, the internal process perspective pictures resource and resource efficiency in a very compact way.

Beside the resource protection, another possibility of resource efficiency and resource saving is significant especially for the high quality products of the company, that is the uses of strengthening material. This usage allows the company to match the specific application characteristics and therefore optimize the resource efficiency.\textsuperscript{281}

**Literature review – (S)BSC with Reference to resource efficiency**

When browsing through the literature, examples of (S)BSC are easily available. Lots of companies have recognized that the BSC concept is an appropriate strategic tool for evaluating the performance, but when leafing through the scientific journals, the concept of the (S)BSCs in combination with resources or resource efficiency is hard to find.

In principle, (S)BSCs are frequently found in literature. As mentioned above, most of (S)BSCs focus on environmental and social aspects, such as emissions to air, water, soil and radiation.\textsuperscript{282} However, (S)BSC with the attention on resources or especially on resource efficiency are hardly investigated.

This section will provide some information about the findings of resources and resource efficiency in the SBSC concept.

In order to get a picture of the literature findings of resource efficiency and sustainable balanced scorecards, as well as related issues, the below stated table will present the results. For this simplified literature review “Google Scholar” and the hits build the basis.

---

\textsuperscript{278} Prammer/Schrack (2014), p. 4f, own translation.
\textsuperscript{279} Prammer/Schrack (2014), p. 4f, own translation.
\textsuperscript{280} Hansen/Schaltegger (2016), p. 197
### Table 3: Literature Review

<table>
<thead>
<tr>
<th>Search bar</th>
<th>Hits in 2017</th>
<th>Result* Skimming through the first 10 pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>resource efficiency and sustainable balanced scorecard</td>
<td>approx. 11.200 hits²⁸³</td>
<td>Articles deal with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- resources in every context</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(human, information, technology, …)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- sustainability itself</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- environmental issues</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- traditional balanced scorecard concept</td>
</tr>
<tr>
<td>resource and sustainable balanced scorecard</td>
<td>approx. 14.600 hits</td>
<td>Articles deal with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- sustainability in several areas (technology, information…)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- traditional balanced scorecard concept</td>
</tr>
<tr>
<td>resources and balanced scorecard</td>
<td>approx. 16.500 hits</td>
<td>Articles deal with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Resource in different contexts (technology, information…)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- traditional balanced scorecard concept</td>
</tr>
</tbody>
</table>

²⁸³ Google Scholar, Internet: https://scholar.google.at/schhp?hl=de&as_sdt=0,5, own interpretation.
*Result in this analysis means: if the article deals with the both topics
²⁸⁴ Own representation, based on Google Scholar Search

The above stated table should give an overview of literature findings of resource efficiency related articles. Approximately more than 11,000 hits seem quite appropriate, but when going through the articles, the conclusion comes up that a lot of the literature deals with different aspects of the selected phrases or terms, and for this reason the hits cannot be considered in this form. Google Scholar often displays articles where the selected phrases are included, but the combination of the selected phrase is missing. However, lots of articles dealing with resources or resource efficiency in many different contexts can be found, but the selection of appropriate articles is challenging. Table 4 should solely provide initial information about hits and effective results when searching for adequate literature.

For this reason, the next chapter deals with SBSC and resource efficiency in the context of theoretical foundations of resource efficiency in the resource based BSC.
4 Development of a Resource Based BSC

4.1 Theoretical Foundations of Resource Efficiency in the Resource Based BSC

Figge and his colleagues, as well as Hansen and Schaltegger deal with SBSCs cause-effect chains and its impacts on several company related fields. For this reason, this section discusses the theoretical approaches of resource efficiency, especially the effects of cause and effect chains.

The authors developed a SBSC, with the advancement of a strategy map of a sample company, called Textil AG.\textsuperscript{285}

The demonstration of the sample company shows the interlinked relationships within the different perspectives. When considering the strategy map of Textil AG, references about the impacts of the cause-effect chains are highly visible. For this reason, the selected strategy map perfectly demonstrates the affects and influences. To make the cause and effect chain relationships and its impacts more comprehensible, the below stated figure will support the understanding.

The top-down process of the concept allows a close look at the different perspectives and so supplies a structured procedure. For this reason, the undermost perspective will be considered firstly.

Starting with the learning and growth Perspective, employee potentials, technical infrastructure and climate for action are categories for the so-called, performance drivers. These performance drivers can be seen as leading indicators, thus they show the way to achieve the strategic objectives.

In contrast, employee satisfaction is a strategic core issue; it affects the internal process perspective. As it is not clear how exactly employee satisfaction affects the internal process perspective, assumptions have to be made. If employee satisfaction is high, it means that employees are satisfied with work, so in other words, employees are content with their work situation and atmosphere. Taking this assumption, high employee satisfaction can have a positive impact on the quality of products, productivity and/or efficiency.

The internal process perspective deals with process-related performance drivers, in this case, these are quality control purchasing, use of harmful substances, and energy-water and material efficiency. These chosen factors have an impact on the production process, especially on production costs and toxically residuals.

One essential cause and effect chain is the relationship between production cost and Return on Sales (ROS). As shown in the figure, energy-, water-, and material efficiency directly influences the production costs of the company and furthermore affect Return On Sales. ROS have an impact on Return On Employed Capital.

Assuming energy-, water-, and material efficiency is improved; it may result in a decrease in the production costs. This result has a positive impact on ROS, due to the fact that the company improve its efficiency.

The toxic residuals affect the image and reputation category of the customer perspective and therefore, have an impact on customer satisfaction, which is a strategic core issue. Customer satisfaction is defined by product attributes (toxin-free products), the relationship to customers as well as image and reputation (environmental friendliness and social responsibility). That means, if customer satisfaction is high, due to the good image and high reputation of the company, this results is an increased market share.

---

Figure 7: SBSC as a Strategy Map

286 Figge et al. (2002a), p. 282
Considering the top perspective, which is the financial one, the strategy map shows that market share directly influences the turnover growth. Furthermore, the turnover growth shapes the ROCE (Return On Capital Employed). Obviously, there are many cause-effect chains which influence the performance of the company in a direct or indirect way. The picked cause-effect chains demonstrate the interlinked relationships of the different perspectives; needless to say, there are further cause-effect chains which have an essential role, but this extract supplies a short declaration.

As this brief description of the impacts of cause-effect chains give a structured overview of how important and significant cause-effect chains are, the next part is to reveal potential cause-effect chains in the context of resources and resource efficiency.

### 4.2 Classification of Resources and Resource Efficiency in the Four Perspectives

What will happen if resource efficiency and resource use will be increased and considered in every perspective; this question is the core issue and will be discussed below.

In the VDI 4800 some examples for resource efficiency strategies are mentioned and provide a good overview of possible options regarding resource efficiency actions within the company. For a better understanding of resource efficiency strategies, within several processes or rather perspectives, some examples are demonstrated in the table below:

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>selection of material/material substitution</td>
<td>consistency through specific selection of raw material; raw material with environmental compatibility or renewable raw material</td>
</tr>
<tr>
<td>lightweight construction</td>
<td>lightweight construction supports savings for raw material</td>
</tr>
<tr>
<td>recyclable product design</td>
<td>adjustment of product design to recyclability and safeguards of resources</td>
</tr>
<tr>
<td>resource efficient product packaging</td>
<td>as less packaging as possible to reduce transport costs</td>
</tr>
<tr>
<td>energy efficiency</td>
<td>usage of suitable primary energy, saving energy</td>
</tr>
<tr>
<td>efficient usage of exhaust heat</td>
<td>usage of exhausted heat for warm up of components; support of building air conditioning</td>
</tr>
</tbody>
</table>

Table 4: Strategies for resource efficiency

---


298 Own representation, based on VDI 4800 (2014), p. 22-27

---
The above shown table should provide an insight of resource efficiency strategies concerning products and production processes.

However, beside the possible strategies for increased resource efficiency, provided by the VDI 4800, the next part is to consider resources and resource efficiency in every perspective of the SBSC. This core issue is discussed and demonstrated in the following section.

For the first visualization, beside the SBSC concept and the strategy map, some examples for (direct) potential impacts of the increase of resource efficiency are demonstrated in the following graph. The visualization of impacts regarding the resource efficiency can have many diverse impacts. Hence the provided process flow gives a first impression what resource efficiency means and how the various sectors are affected.

The created graph shows potential impacts concerning resource efficiency and therefore builds the core part of this visualization. These impacts, with its interlinked connections and relationships, provide a first access to the topic when considering resource efficiency. In this case, the chosen impacts represent only an extract of possible consequences and its relationships in this process. Needless to say, they can be shaped and redefined in many other ways, so it depends on the focus of the analysis.
Figure 8: Potential impacts for increased resource efficiency - own representation

Explanation:
* PO = Product Output
** I = Input
As shown above, some potential impacts for increased resource efficiency can be stated. Furthermore, an increase of resource efficiency can set various impacts on several (company-related) fields; often they do not have direct influences. In other words, resource efficiency affects many business units and therefore, these connections have to be taken into account.

The next step is to describe and declare the above stated graph. Starting with the internal recycling process, as one example for improving resource efficiency, at the top of the graph, the core issue is that the internal recycling process can be stated as an action of resource efficiency. To be clearer, when a company improves the internal recycling process, a reduction in waste will be the result. This in turn, will follow to increased resource efficiency. As for this reason and due to the fact that these are actions and do not have a direct influence on resource efficiency, the upper two columns are colored in lighter grey, in order to show these two as downstream processes.

Please note the afterwards described scenarios should solely provide two possible options of enhancing resource efficiency; hence the next section serves just examples and its related potential results when improving RE. The distribution of scenario 1 and scenario 2 was made due to a better understanding of the theoretical approaches and builds a basis. Needless to say, the decision about how to increase RE is at the sphere of responsibility of the company and hence, this distribution should present both scenarios and potential results, in order to support the company in decision making. However, these detailed described scenarios should solely assist the theoretical understanding and should not hinder the company in deciding about the options of increasing RE.

Furthermore, the next step is to define resource efficiency by focusing on product output and input. In this stage, resource efficiency is defined by two different scenarios. The left column shows the consequence of product output (PO) and input (I), when PO remains at the same level, and I is reduced. Resource efficiency can also be achieved by an increase of PO and a constant level of I which is demonstrated in the right column. As for better understanding, the connections between the columns are specified with letters a, b, c and d. For the detailed explanation, the starting point is the left column, where PO is constant and I is reduced.

Beginning with connection a, the relationship shows the impact of how resource efficiency affects product output and input. As mentioned before, resource efficiency can be achieved by remaining at a constant level regarding PO, while reducing I.

Several possible options for reducing I can be stated:
- optimizing production process by technological advances
- increasing recycling process by reuse of material
- minimizing touch points of raw material
- improving water processing (reuse)
- using solar energy for production
- material substitution

The second scenario, defined by connection b, demonstrates resource efficiency by an increased PO, while I is constant. For this scenario several efficiency actions can be mentioned:

- optimizing production process
- more efficiency regarding employees:
  - increasing employee satisfaction
  - empowered employees
  - further education in production process
- working smarter:
  - by automated processes
  - by intelligent planning (definition of order intake)
  - by reducing time for set-up
- using technology to control and optimize processes

As shown in the graph, the above mentioned actions and impacts have undoubtedly an effect on productions costs. These connections are described as c and d.

Connection c defines the impact on production costs by a constant level of PO and decreased I, while connection d demonstrates the impact, whereas PO is increased and I is constant. Both scenarios can have the same result per product unit concerning the production costs; due to the above mentioned actions, production costs may decrease.

The reasons for a decrease in production costs are apparent and described in the form of scenario 1 and scenario 2.

**Scenario 1:**
If a company is able to reduce the amount of necessarily required input, by several possible actions, such as optimizing production process combined with lean management tools, while the Product Output remains at the same level, the quantity of the required Input may decreases due to an improvement in production and so the production costs decrease.301

As examples for an optimization of the production process, reusing and recycling of material, automation or technological improvements as well as usage of solar energy consumption can be mentioned. So in other words, a company may be able to reduce the I, while the PO is not affected, by several production-related options.

**Scenario 2:**
The second scenario is contrary to the first scenario on the basis of the Product Output and Input. In this scenario I remains unchanged, while PO is increased. Factors for an increase in PO are comparable with scenario 1. Therefore, possible options are the optimization of production processes, such as reducing time for set-up, working smarter by intelligent planning of production settings and developing automated processes. These are examples for production related processes. But in this scenario, another factor plays a major role, namely the factor employee. So, in this case employees can serve as a production output increase factor. To make it clearer, efficiency can be achieved by several employee-related factors, such as motivation, commitment or fluctuation. In other words, if a high level of employee satisfaction, defined by motivation for labour, low fluctuation rate and great commitment, is given, employees

---

301 Delmas/Pekovic (2015), p. 81.
may be more motivated for their work and therefore work more efficient, which can result in an increase of $PO$\textsuperscript{302}.

The graph demonstrates, that both scenarios can positively affect the production costs, resulting in a decrease of costs and thus in an increase of costs savings. The category of the production costs is split into four subcategories, material, labour, machine hour and energy costs. The above mentioned possible options for a decrease of $I$ or rather an increase of $PO$, may have an impact on the subcategories.

Needless to say, less $I$ results in lower material costs\textsuperscript{303}.

Due to an optimized production by technology supported processes, set-up time can decrease and this may result in less material hour costs. Next to the production costs, energy costs have also a major impact; therefore using renewable energy positively affects the production costs. The potential connection among the subcategories is not demonstrated in detail, the brief explanation conduces only for the completeness.

Return on Sales (ROS) demonstrates the endpoint of the graph and implies the cause-effect chains among the processes. An increase of ROS may stem from lower production costs due to the above mentioned possible options. Hence, the company can achieve a boost in ROS by increasing resource efficiency in the production sector, which may result in lower production costs and can have a positive affect for the company in many ways. If the company can transmit the savings of the lower production costs to the customer, several favorable impacts may come up.

Examples for an increase in ROS and resulting lower sales prices could be:

- a possible increase of market share
- a possible increase in customer satisfaction
- a possible increase in image and reputation\textsuperscript{304}

The above defined statements are solely potential impacts and do not have to fit for every situation. In this case, the scenario serves as dependence and can be shaped and redefined in many other courses. For this thesis, these impacts perfectly fit into the concept and for this reason, this process and the related impacts were selected.

Needless to say, there are many more factors affecting the processes, but discussing all potential factors would go beyond the scope of this thesis.

The graph above demonstrates a simple presentation of possible impacts regarding resource efficiency.

When refining the potential impacts of resource efficiency, the next step is to pay attention to the SBSC concept, followed by the strategy map. For every perspective resource and resource efficiency can be classified, which means each perspective deals with resource and resource efficiency in a different way within the perspective.

The core issue in this case is to determine resources and resource efficiency for every perspective. Therefore the classification for each perspective regarding resources and resource efficiency was made. For a better orientation, the classification of resource and resource efficiency is described and followed by the presentation of essential cause-effect chains, as ideal-typical strategy map.

\textsuperscript{303} Delmas/Pekovic (2015), p. 90; Figge et al. (2002b), p. 20; Hansen/Schaltegger (2016), p. 197
\textsuperscript{304} Delmas/Pekovic (2015), p. 90; Figge et al. (2002b), p. 20; Hansen/Schaltegger (2016), p. 197
However, in order to better understand the strategy map, the four perspectives will be shortly discussed in terms of resources and resource efficiency. This approach only serves a quick view of resource and resource efficiency in the BSC. A detailed description is prepared in Chapter 4.3.4.

Learning and Growth Perspective

The learning and growth Perspective deals with aspects such as development of employees as well as training and education and builds the underneath perspective in the BSC concept. This perspective determines employee related issues and has its focus on staff members. In this perspective, resources can be identified and examples are employee, know-how, knowledge, patents as well as staff.

Internal Process Perspective

The internal process perspective is defined as an essential perspective for the accomplishment of the objectives of the customer and financial perspective. The perspective, determined through three major processes, which are innovation, production and service processes, plays an essential role due to direct causal linkages to the financial perspective.

For a more detailed demonstration, the focus lies on the production process, which is necessary due to the resource based aspect in this case.

Classifying resources in this perspective, several examples can be named, such as raw material, time, technology as well as labor. As this thesis focuses on a resource based BSC the main attention lies on the production process.

Increasing resource efficiency by optimizing the production process, increasing material, energy and water efficiency and productivity are only few examples for increasing resource efficiency in this perspective. The specified examples have an impact on production costs which influence the customer and financial perspective.

Customer Perspective

This perspective deals with customer aspects, which are necessary to achieve the predefined economical objectives. Therefore, this perspective directly influences the financial perspective and hence, plays a crucial role for achieving the financial objectives.

By classifying resources in the customer perspective, few examples can be mentioned, such as image and reputation as well as customer loyalty.

Considering resource efficiency in the customer perspective, some propositions come up. For this purpose, increases in image and reputation as well as in customer loyalty are just a few examples.

---

305 Figge et al. (2002b), p. 20.
Financial Perspective

The financial perspective plays two roles, as it is the final perspective and therefore the end of the causal linkages. Furthermore, the strategy is determined through the financial perspective. Classifying resources through this perspective, two major examples, namely capital and cash can be determined. Furthermore, by considering resource efficiency in this perspective, two aspects such as increasing market share and increasing ROS (Return On Sales) can be mentioned.

The next section deals with the development of a resource based BSC and for this reason several stages of the development will be passed.

4.3 Conceptual Development of a Resource Based BSC

The main part of the Master Thesis is the analysis of the resource based Balanced Scorecard on the practical approach of POLOPLAST GMBH & CO KG. The analysis has its focus on the internal process perspective, but also deals with the different perspectives and its interlinked relationships within the perspectives. The SBSC concept followed by the strategy map builds the core part. Before a strategy map can be developed, the SBSC concept has to be applied in an organized process, for this reason the following section deals with this procedure.

Continuing with the next subchapter the following approaches of the resource based BSC will be analyzed and discussed.

4.3.1. Selection of the Relevant Strategic Business Unit

The first step is to define the relevance section for analyzing the performance of company. A careful selection of the relevant strategic business units is the first essential point in this analysis. Needless to say, small and medium sized companies define the business unit differently than big companies. The reason for this is that the business unit level can be seen as the corporate level in small and medium sized companies. In contrast, large companies often have several business units which are to some extent independent and put emphasis on particular aspects. Therefore, the selection of the relevant business unit has to be done in a different way.

Following the above explanation, in this case, the strategic business unit is POLOPLAST GMBH & CO KG.

---

313 Figge et al. (2002b), p. 10.
4.3.2. Definition and Identification of the Relevance of the Environmental and Social Aspects

This subchapter deals with the definition and identification of the environmental and social issues which have a strategic relevance. This step defines the company-specific environmental and social aspects in order to receive all the relevant strategic environmental and social issues.\(^{318}\)

For a better understanding and due to the fact that a clear-cut in this case does not make much sense, a combination of two traditional steps for developing a BSC, namely the definition of the environmental and social aspects and the identification of the relevance of the environmental and social aspects, were made.

So in this case and for an easier handling these two processes are combined, and so provide a structure view of the general procedure.

Figge and his colleagues emphasize the need for the adequate environmental and social aspects in order to develop a profile with all company-specific environmental and social aspects.\(^{319}\)

In this case the environmental exposure can be seen as movement from the general to the specific environmental and social aspects.\(^{320}\) For this reason, the below stated table provides a structured overview of the potential environmental and social aspects, mentioning the general environmental aspect and the specific one.

<table>
<thead>
<tr>
<th>Environmental Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
</tr>
<tr>
<td>Emissions</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Waste</td>
</tr>
<tr>
<td>energy intensity</td>
</tr>
<tr>
<td>use of raw material</td>
</tr>
<tr>
<td>Sewage</td>
</tr>
</tbody>
</table>

Table 5: Environmental exposure\(^{321}\)

The above mentioned statements concerning the environmental exposure in combination with resource efficiency (RE), demonstrates how RE affects the different sections and segments in the company.

\(^{318}\) Figge et al. (2002b) p. 14f.
\(^{320}\) Figge et al. (2002b) p. 14f; Journeault (2016), p. 224-225
Hence, RE can be found in every single process of the company and have interlinked connections among several perspectives. Beside the environmental exposure, defining a social exposure is the next step. For the social exposure the formulation can be accordingly done to the environmental exposure. In this case, the definition of strategically relevant social aspects is challenging due to the difficulty of formulating and deciding which stakeholders play an essential role and which requirements and demands do they have, within the company. For the sake of completeness, table 6 demonstrates a brief exposure of relevant social aspects.

In this case, the essential direct stakeholders are employees and customers and therefore, build a framework for the profile of the SBSC. Figge and his colleagues define the social exposure of their sample company by direct and indirect stakeholders, where many other stakeholder groups, such as employees of suppliers, non-government organizations as well as government play an essential role. But for this resource based BSC concept, the above mentioned groups do not play such an essential role, and thus a high relevance cannot be attributed.

<table>
<thead>
<tr>
<th>Social Exposure</th>
<th>Direct Stakeholders</th>
<th>explanation in terms of resource efficiency (RE)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Internal</strong></td>
<td><strong>External</strong></td>
<td></td>
</tr>
<tr>
<td>Customers</td>
<td>improved Material RE → lower production costs → decrease in sales price → increased customer satisfaction</td>
<td></td>
</tr>
<tr>
<td>Employees</td>
<td>motivated employees → improved productivity</td>
<td></td>
</tr>
</tbody>
</table>

Table 6: Social exposure

4.3.3. Determination of the Strategic Relevance of Environmental and Social Aspects

One of the most essential parts, when developing a SBSC, is the definition of the strategically relevant aspects. In this phase, the translation from a “verbally formulated strategy of business unit into causally linked objectives and indicators” is the core purpose. So in other words, the essential step is to translate the strategy into useful, causally linked and meaningful indicators. The strategically relevant aspects are identified in every perspective and provide a structured approach for developing a SBSC. The authors Kaplan and Norton argue that the BSC concept is handled as top down process, where all strategically relevant aspects are identified and translated into causal and meaningful indicators.

---

324 Figge et al. (2002b), p. 16.
326 Figge et al. (2002b), p. 16.
aspects in every perspective are identified and additionally, where the financial perspective provides performance measures of the company.\textsuperscript{329} The concept of the SBSC and its causal linkages present an overlapping-perspective hierarchical viewpoint, where the financial perspective builds the top.\textsuperscript{330}

For this reason, three different categorizations of strategic relevant environmental and social aspects can be mentioned.\textsuperscript{331} First, environmental and social aspects can depict strategic core issues, which are defined by lagging indications.\textsuperscript{332} Followed by performance drivers (leading indicators), showing how to achieve the pre-defined activities.\textsuperscript{333} Hygiene factors build the third category, but in this case, these factors are not relevant, due to the fact, that hygiene factors are necessary but not vital for the realization strategy of a company.\textsuperscript{334}

- The next step is to identify the lagging indicators, and so the below stated table demonstrates the categorization for lagging indicators (for a detailed explanation please see chapter 3.1)\textsuperscript{335}

<table>
<thead>
<tr>
<th>Financial Perspective</th>
<th>Customer Perspective</th>
<th>Process Perspective</th>
<th>Learning and Growth Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ ROCE</td>
<td>↑ Market share</td>
<td>↓ Production costs</td>
<td>↑ Employee satisfaction</td>
</tr>
<tr>
<td>↑ Growth</td>
<td>↑ Customer satisfaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>↑ ROS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7: Categorization for lagging indicators\textsuperscript{336}

- Needless to say, performance drivers or leading indicators show how the pre-defined strategic core issues can be achieved.\textsuperscript{337} Hence, the next demonstration points out the leading indicators and gives information about how to achieve the strategic core issues.\textsuperscript{338}

\textsuperscript{329} Figge et al. (2002b) p. 16; Hahn/Wagner (2001), p. 8, own translation.


\textsuperscript{331} Figge et al. (2002b) p. 17.

\textsuperscript{332} Figge et al. (2002b) p. 17.

\textsuperscript{333} Figge et al. (2002b) p. 17.


\textsuperscript{335} Figge et al. (2002b) p. 17-18.


\textsuperscript{337} Figge et al. (2002b) p. 17; Hahn/Wagner (2001), p. 9-10, own translation.

\textsuperscript{338} Figge et al. (2002b) p. 17; Hahn/Wagner (2001), p. 9-10, own translation.
Table 8: Demonstration of leading indicators

<table>
<thead>
<tr>
<th>Financial Perspective</th>
<th>Customer Perspective</th>
<th>Process Perspective</th>
<th>Learning and Growth Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• decreased sales price</td>
<td>• optimized make-ready process</td>
<td>• training and education</td>
</tr>
<tr>
<td></td>
<td>• increased image and reputation</td>
<td>• increased material, energy and water efficiency</td>
<td>• increase commitment</td>
</tr>
<tr>
<td></td>
<td>• increased customer loyalty</td>
<td>• increased productivity</td>
<td>• reduce staff turnover</td>
</tr>
</tbody>
</table>

4.3.4. Skimming of different Perspectives of a Resource Based BSC

Financial Perspective

The financial perspective, as already mentioned, presents a double role in the SBSC, which is the endpoint of the causal linkages and determination of the performance of the company.\footnote{Own representation based on Figge et al. (2002b), p. 17}

When considering resources and resource efficiency in this perspective, two main issues can be defined, increased market share and increased ROS.\footnote{Figge et al. (2002b), p. 18; Karpagam/Suganthi (2012), p. 12-13.}

For this perspective, the lagging indicators are already determined by learning and growth, internal process as well as customer perspective, and thus, these lagging indicators represent managing the achievement of the economic targets of the business unit.\footnote{Figge et al. (2002b), p. 18; Hahn/Wagner (2001), p. 14-15, own translation; Hansen/Schaltegger (2016), p. 197, Karpagam/Suganthi (2012), p. 12-13.}

As already mentioned in the previous chapter, every company or business unit has their own targets and objectives, which should be achieved in a specific period of time. For this reason it is not expedient to copy and paste some favorable core targets for the selected company. So, the diligence of selecting the right measures is a core issue and should be adapted to the selected business unit.

Moreover, some favorable measurers of a company can be determined. The core targets of the financial perspective are mostly:

- increase ROCE (somewhere between 1% or 2%)
- increase Turnover Growth (mostly +20%)
- increase Return on Sales (somewhere between +0.5% and 1.0%)\footnote{Figge et al. (2002b), p. 18; Karpagam/Suganthi (2012), p. 14.}

The lagging indicators of this perspective are defined by the other perspectives. Therefore the lagging indicators point out the economic targets of the considered business unit, which has to be achieved.\footnote{Figge et al. (2002b), p. 18; Hahn/Wagner (2001), p. 14, own translation.}
So the financial perspective shows the economic targets of the company and its related causal linkages through the other perspectives.\textsuperscript{345}

**Customer Perspective**

This perspective directly influences the financial perspective and therefore plays a crucial role for achieving the financial objectives.\textsuperscript{346}

In this case, when considering resource efficiency in the customer perspective, some propositions come up. For this purpose, increases in image and reputation as well as in customer loyalty are just a few examples.\textsuperscript{347}

Moreover, the strategic core issues in this case, are customer satisfaction as well as market share.\textsuperscript{348} As mentioned before, the customer perspective affects the financial one and hence, these two core issues directly affect the financial perspective through turnover growth and furthermore ROCE (Return on Capital Employed).\textsuperscript{349}

As already mentioned, lower production costs positively affect the sales price, if the company transmits the savings to the customer and the sales price. As noted, lower sales prices are advantageous for customers and this result in an improvement of image and reputation, but moreover enhance customer satisfaction, and thus the company can achieve a greater market share.\textsuperscript{350}

As mentioned already above, the performance drivers or leading indicators in this case are a decrease in sales price, image and reputation as well as customer loyalty.\textsuperscript{351}

However, for this, a decrease in sales price does not directly have an impact on the customer satisfaction, but also contributes an essential part. A decrease in sales prices may affect the image of the company, and that results in customer satisfaction. So this non-straight connection among decrease in sales prices and market share is essential for the understanding of the cause-effect chains.

So for the question why a decrease in sales prices does not directly result in an increased market share, the reason is apparent. Lower sales prices do not automatically lead to an increased market share, due to the fact that image and reputation are essential for buying a product. Accordingly, customer satisfaction is not only defined by a decrease sales price, it is also specified by image and reputation as well as by customer loyalty.\textsuperscript{352} So for this reason, a column is interconnected.

\textsuperscript{346} Figge et al. (2002b), p. 18.
\textsuperscript{347} Figge et al. (2002b), p. 18-19.
Internal Process Perspective

The internal process perspective is defined as an essential perspective for the accomplishment of the objectives of the customer and financial perspective. The processes, determined through three major processes, which are innovation, production and service processes, play an essential role in the context of causal linkages. But as mentioned above, the focus in this study lies on the production process, so the other two processes will not be described.

Increasing resource efficiency by optimizing the production process, increasing material, energy and water efficiency and productivity are only few examples for increasing resource efficiency in this perspective. The specified examples have an impact on production costs that influences customer and financial perspective.

In the internal process Perspective, especially for the production process, leading indicators can be defined. Such performance drivers are optimizing make-ready processes, increasing material, energy and water efficiency as well as increasing productivity. Performance drivers as mentioned above, strongly influence the lagging indicators of the process perspective, which in this case are the production costs. For this purpose, the lagging indicator (production costs) is directly linked to the financial perspective, and hence this strategic core issue has a strong and direct influence to the Return On Sales.

When increasing resource efficiency (RE) in the internal process perspective, two main clusters have to be mentioned. Resource efficiency can be divided into two categories, production related RE and product related RE. Both approaches have an essential impact on the perspectives in different courses. The figure below shows the two approaches of resource efficiency.

![Figure 9: Production and Product related resource efficiency – own representation](image-url)

---

353 Figge et al. (2002b), p. 20.
This categorization is essential for a clear differentiation of production and product related factors in order to define Key Performance Indicators (KPIs).

For the production related RE several KPIs can be specified:

- internal recycling rate
- proportion of non-product to product
- material input per product output
- water input per product output
- offcuts rate
- waste rate
- material costs
- disposal fees

These selected KPIs are solely some examples for potential KPIs and therefore, can be redefined and redeveloped for many other purposes, depending on the focus. However, in this case, these selected KPIs provide a good basis for the SBSC concept.

The second approach is the product related RE and as the name already implies, deals with product focused factors. So in other words, these factors are associated with the product. Potential KPIs for this categorization are:

- lifetime
- repair rate
- deformation rate
- recyclability of material
- ecological aspect
- weight

As this thesis focuses on resources and the resource based BSC concept, the internal process perspective is described in details and so the attention is on product and production processes which build the basis for the application of the SBSC concept.

**Learning and Growth Perspective**

The last perspective is the learning and growth perspective, where the overall working atmosphere as well as the working climate are core components and hence several resources can be specified.\(^{359}\)

The core resource in this perspective can be defined as all employee related issues. Obliviously, beside employee, know-how, knowledge, patents as well as staff, cover an important part in the context of resources. For a simpler presentation, the primary focus in this case is employee. Considering resources and resource efficiency in this perspective, examples include increasing employee satisfaction by providing individual training and education initiatives, increasing commitment and reducing staff turnover.\(^{360}\)

These mentioned examples can increase resource efficiency due to the connections and relationships between the four perspectives.

---

\(^{359}\) Figge et al. (2002b), p. 21.

Formulating the lagging indicators, employee satisfaction is the core category and therefore can be seen as strategic core issue due to the fact, that satisfied employees are essential for implementing the strategy in a favorable way.\textsuperscript{361}

The leading indicators to ensure the achievement of strategic objectives are training and education, commitment as well as staff turnover.

As all relevant perspectives of the SBSC have been systematically passed, the causal linkages are pointed out. The next part is to demonstrate the cause-effect chains of the perspectives and its related causal linkages in the so called strategy map.\textsuperscript{362} The strategy map provides a structured and detailed picture of strategically relevant aspects of the company and supplies an overall view of the company.\textsuperscript{363}

The strategy map presents an ideal-typical concept, which can be shaped in any other illustration.

4.3.5. Development of a Resource Based BSC as Strategy Map\textsuperscript{364}

The above mentioned statements allow developing the strategy map, with all the strategic relevant indicators and factors. This ideal-typical strategy map should conclude the above mentioned assertions of the four perspectives and is proposed for a better insight.

Starting bottom-up, the learning and growth perspective deals with employee related issues, such as training and education as well as commitment and staff turnover, which build the leading indicators. The strategic core issue \textit{employee satisfaction} is influenced by this three leading indicators.\textsuperscript{365} The performance drivers directly influence the strategic core issue in the same perspective.\textsuperscript{366}

Followed by the internal process perspective, where the performance drivers are optimizing make-ready process, increased material, energy and water efficiency as well as increased productivity, the strategic core issue is production costs and is influenced by these three indicators.\textsuperscript{367}

This connection is apparent, the internal process perspective, especially production costs, has an impact on the next perspective, the customer perspective, due to the connection between production costs and decrease in sales price.\textsuperscript{368}

Additionally, the production costs have a direct influence on ROS, hence if the company can manage it to reduce production costs, the ROS may increase.\textsuperscript{369}


\textsuperscript{364} Figge et al. (2002b) p. 15.


However, skimming through the other perspectives, the customer perspective is defined by a decrease in sales price, increased image and reputation as well as increased customer loyalty.\textsuperscript{370} These three indicators are directly affecting customer satisfaction, which in turn influences the market share. So in this perspective an additional core issue is present, namely customer satisfaction and market share.\textsuperscript{371} The reason is apparent, an increased customer satisfaction does not directly lead to an increase in turnover, and hence an additional stage in-between has to be stated. An increase in the market share has a direct influence on the financial perspective, especially on turnover growth. This connection is crucial due to the next core issue, namely increase ROCE.\textsuperscript{372}

The interlinkages are vital for understanding and using the strategy map as concept. It has to be clear, that an increase in ROCE is solely manageable when the relationships and connections of the other perspectives are given.

So to understand all the causal linkages between the perspectives, an ideal-typical strategy map below shows the above stated theoretical approach and will help to understand the necessity of cause-effect chains.

Figure 10: Strategy Map

Financial Perspective
- Increased ROCE
  - Turnover growth
  - Return on Sales

Customer Perspective
- Increased market share
  - Increased customer satisfaction
  - Increased image and reputation
  - Increased customer loyalty
- Decrease in sales price

Internal Perspective
- Production costs
  - Optimize make-ready process
  - Increased material, energy and water efficiency
  - Increased productivity

Learning and Growth Perspective
- Employee Satisfaction
  - Training, Education
  - Increased commitment
  - Reduced staff turnover

5 APPLICATION OF THE RESOURCE BASED BSC IN POLOPLAST GMBH & CO KG

5.1 CASE STUDY METHOD – ANALYTICAL DESCRIPTIVE METHOD

This section will analyze and present the specific created resource based BSC of POLOPLAST GMBH & CO KG.

For analyzing and evaluating the current sustainability situation of POLOPLAST GMBH & CO KG an (analytical) descriptive method will be used. In order to meet the needs of this method, the analysis of sustainability reports and annual financial statements of the selected company will build the basis of this research method. This research approach is characterized by an in-depth study with the evaluation of afore-collected information and available data. A descriptive research does neither fit in a quantitative nor in a qualitative research, but the term descriptive can be referred to research question, design, and data analysis that will be applied to a certain issue. Descriptive research tries to answer the question “what is” and involves gathering data which describes a certain event and then evaluate and describe the data collection. Using background information and company-related data of POLOPLAST GMBH & CO KG, such as annual reports of the last years, unstructured interviews, sustainability reports, journals, internal and external survey data as well as press release is also part of this analysis. Advantages and disadvantages will be presented regarding the selected method. As in any other qualitative research method, the selected approach will have limitations, due to documents analysis and therefore the interpretations and other factors will limit and influence the outcome. However, to evaluate and analyze a certain specific topic both approaches are required in order to achieve a rich data spectrum and to give appropriate recommendations.

Structure & Method of the BSC

As already mentioned, the core part of the thesis is a specially designed resource based Balanced Scorecard, supported by collected company-related information. For the BSC internal company data has been evaluated, analyzed and developed for designing a unique and innovative BSC concept.

In order to simplify the complexity of analysing a company in terms of resource efficiency management, diverse application options as well as long-term usability were a major aim of this thesis. For this reason, the case study method was the best option to identify and develop the framework.

A case study method has been used, due to several reasons. The decision for using the case study method was supported by the purpose, unit of analysis and data source. Pearson, Albon and Hubball present a table in their article, which lists different methods and their purposes, units of analysis and data sources.

---

376 Pearson/Albon/Hubball (2015), p. 2
377 Pearson/Albon/Hubball (2015), p. 2
The listing below shows the respective method with particular purposes, units of analysis and data sources.\textsuperscript{378}

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Purpose</th>
<th>Unit of Analysis</th>
<th>Data Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Study</td>
<td>in-depth description and analysis of a case</td>
<td>an event, person, or program</td>
<td>interviews, observations, and documents</td>
</tr>
<tr>
<td>Action Research</td>
<td>investigating and improving practices</td>
<td>a classroom or a community</td>
<td>documents and interviews</td>
</tr>
<tr>
<td>Grounded Theory</td>
<td>developing theory from field data</td>
<td>a process, action, or interaction involving many individuals</td>
<td>interviews with a relatively large number of individuals</td>
</tr>
<tr>
<td>Survey</td>
<td>generalizing to a population</td>
<td>a relatively large number of individuals</td>
<td>quantitative data collected via interviews or questionnaires</td>
</tr>
</tbody>
</table>

Table 9: Comparison of Research Methodologies\textsuperscript{379}

The excerpt of the table gives a structured overview of the specific method and therefore, supports by comparing the methodologies. The case study is an appropriate method for the defined task and allows combining multiple data sources, which assists the in-depth analysis.\textsuperscript{380}

As the above mentioned approaches lead to the case study research method, the decision was made to make use of this method.

5.2 COMPANY BACKGROUND

POLOPLAST GMBH & CO KG\textsuperscript{381}, an international supplier of plastic pipe systems, compounding and polymer engineering can look back on a successful history of more than 60 years.\textsuperscript{382}

Focusing on the production of high grade plastic pipe systems for domestic utility management, the main attention lies on sewage systems and water supply systems.\textsuperscript{383}

Considering the field of interior installations, the company emphasizes on pipe systems supporting modern building services engineering, for example living comfort, energy-efficient construction and drinking water supply.\textsuperscript{384} POLOPLAST GMBH & CO KG operates as manufacturer for civil engineering, such as for infrastructure, water supply, drainage and pipe ducting systems as well.\textsuperscript{385} The company is a specialist in the production of high-performance, long-lasting and recyclable pipe systems with focus on innovation, and belongs to the leading manufacturers of high-grade plastic pipe systems using multilayer technology.\textsuperscript{386}

\textsuperscript{378} Pearson/Albon/Hubball (2015), p. 2
\textsuperscript{379} Pearson/Albon/Hubball (2015), p. 2
\textsuperscript{381} Please note that for a better reading flow POLOPLAST GMBH & CO KG will be replaced by POLOPLAST in the next chapters.
Facts and Figures

POLOPLAST with headquarter located in Leonding (Austria) and a subsidiary in Ebbenhofen (Germany) develops and produces plastic pipe systems and polymer compound materials for many applications. POLOPLAST is 100% owned by WIG Wietersdorfer Holding GMBH, headquartered in Klagenfurt (Austria). Since 1893 the Wietersdorfer are a family-owned business in the sectors cement, lime, building materials and pipes. The Wietersdorfer Group is now represented in more than 30 countries within and outside Europe.

Various business segments with intelligent systemic solutions help POLOLAST to be one of the European leaders in the pipe industry. POLOPLAST focuses on three main business lines, “Structural Engineering”, “Civil Engineering” and “Compounding”.

In the section Structural Engineering the attention is on “energy-efficient construction and comfortable living conditions”. The business line Structural Engineering handles the safe and perfect supply of drinking water.

The second business line Civil Engineering is responsible for hydraulic structures for sanitary engineering, and therefore POLOPLAST operates as specialized partner of infrastructure, sewage system and water supply.

Compounding is the third business line of POLOPLAST and in this section, the optimization of substance properties with several special aggregates builds the main task. POLOPLAST develops and manufactures special compounds in order to meet the high requirements for their own needs as well as for other plastic processing companies.

Employees

With more than 370 employees in Leonding the company focuses on innovation, quality and progress. Beside social benefits for the employees of POLOPLAST, the company continually tries to improve working safety by regularly improvements. The developed concept, called GUST (Gesundheit, Umwelt und Sicherheitstechnik) includes three main categories, health, environment and safety technology, in the field of organizational, technical and structural. Due to regularly checks the concept can be refined and hence provides a great working atmosphere in the production as well as in the office.
Turnover

For the first time in history and beside the challenging economic environment, POLOPLAST had achieved the one-hundred-million turnover mark and additionally, growth increased by 10 %, compared to last year. These two historically developments complete the 60th anniversary year. The objectives are still ambitious. The Vision 2020+ is tied to the success history of POLOPLAST with a turnover of 150 million Euro. For the next years, POLOPLAST want to create 50 new jobs and additionally, invest 25 million Euro Leonding's location.

History and Products

The history of POLOPLAST begins in the year 1954, where the Anger brothers start with the production of plastic pipes. After one year, the takeover of POLOPLAST by Durit Werke Kern & Co and Hatschek was made, where the ownership was splitted to 50% each. From that point on, the company’s name was born, POLOPLAST and the focus lies on PVC pressure pipes. In the upcoming years, POLOPLAST developed several products and becomes the new benchmark in the branches. In 1977, six years after the acquisition of the possession in Leonding, POLOPLAST had a new plant area with 55,000 square meters (sqm) space, and 14,000 sqm cultivated area.

In the next years POLOPLAST developed several products with innovative characteristics and became in 1997 a subsidiary of 100% of the Wietersdorfer Group. 2002 and 2003 were two essential years for the company because of the share purchase of 75% of Polymelt Kunststofftechnik. From this point on the name was changed to POLOPLAST GMBH. With the purchase of the shares the extension of the products in domestic installation pipe systems sector was accompanied. 5 years later, in 2007 a logistic centre with 6,500 sqm for more than 12,000 pallet stacking spaces, paperless commission through the usage of barcodes, mobile laser devises, online booking, a drive in commissioning and loading area, was built in Leonding. The next years are characterized by lots of innovation regarding technology and systems. This year POLOPLAST launched a new high-tech technology, funTEC. FunTEC is special technology, which allows the POLO-KAL XS (building drainage) an easier and optimized pushing together even for larger pipe diameters, up to DN/OD 110.

For a better understanding the below stated table demonstrates the business units of POLOPLAST and should give a brief overview of the structure of the products and systems.

<table>
<thead>
<tr>
<th>Core business units</th>
<th>Further business units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Drainage</td>
<td>Building Ventilation System</td>
</tr>
<tr>
<td>POLO-KAL XS</td>
<td>POLO-KWL</td>
</tr>
<tr>
<td>POLO-KAL NG</td>
<td>Siphonic Roof Drainage</td>
</tr>
<tr>
<td>POLO-KAL 3S</td>
<td></td>
</tr>
<tr>
<td>Fire Protective Collar</td>
<td>POLO-UDS</td>
</tr>
<tr>
<td>Cleaning Pipe</td>
<td>Pipe Ducting System</td>
</tr>
<tr>
<td></td>
<td>POLO-RDS evolution</td>
</tr>
<tr>
<td>Water &amp; Waste Water Discharge</td>
<td>Drinking Water Installation Systems</td>
</tr>
<tr>
<td>POLO-ECO plus PREMIUM Sewage Pipe System</td>
<td>POLO-ECOSAN</td>
</tr>
<tr>
<td>POLO-ECO plus PREMIUM Storm Water Pipe System</td>
<td>POLO-POLYMUTAN</td>
</tr>
<tr>
<td>Cleaning Pipe</td>
<td>POLO-UV</td>
</tr>
<tr>
<td>Bridge Drainage</td>
<td>Compounding</td>
</tr>
<tr>
<td></td>
<td>POLO-Compounding</td>
</tr>
</tbody>
</table>

Table 10: Business units of POLOPLAST

**Vision, Mission, Strategy and Strategy Tools**

**Vision**

The vision of POLOPLAST is clear and coherent: “*No building without POLOPLAST-Technology*”

With this tight formulation of the vision, POLOPLAST expresses their innovative capacity, the high quality of products as well as the continuous progress and hence, sets high aims for the upcoming years.

**Mission**

POLOPLAST wants to build the future by customer orientated, efficient processes and innovative resource-saving products and services. Focusing on customer and employee orientation, technology and competence leadership as well as operative excellence allows POLOPLAST looking back on more than 60 years of success.

**Strategy and Strategy Tools**

The strategy of POLOPLAST is built on five pillars:

1. Improvement of Innovation

---

2. Increase of operative excellence
3. Improve efficiency
4. Internationalisation
5. Focus on core competence

With the five pillars the strategic goals are apparent; for this reason the strategic objectives provide a structured guideline for the achievement of the goals.

The five pillars are interlinked with the strategic goals and have a mutual influence. Looking on the mutual influence, five main strategic goals can be mentioned:

1. Profitability
2. Liquidity
3. Growth
4. ROI
5. ROS

Beside the strategy and the strategic tools, POLOPLAST benefits from strategic planning and budgeting. For this reason, POLOPLAST has various management tools in order to continually systematically improve the performance of the company.

One essential strategic tool for POLOPLAST is the BSC, which focus on strategy developing process and implementation. But due to data protection and privacy the access and availability is not given.

Since 1995, the company is certified by EN ISO 9001, and additionally, is a restructured process organization. Process organization within POLOPLAST means continually improvement along the value chain in order to meet the expectations and requirements of customers as well as of stakeholders and hence, create an essential advantage.

Beside this, the Wietersdorfer Group has its focus on risk management and hence, developed in 2014 risk management system across the group, where POLOPLAST is completely integrated.

The role of sustainability in POLOPLAST GMBH & CO KG and the respective industry

Within POLOPLAST sustainability and sustainable development has high priority and great importance. Beside the voluntary publication of sustainability reports, POLOPLAST focuses on resource-saving, efficient and sustainable handling of resources and plants in order to save the environment.

To name only a few resource-saving actions, the company tries to minimize the required input by closed resource cycles, where raw material losses are reduced to a minimum by process optimized handling.
Beside the raw material cycles, production losses, which do not meet the high quality standards of POLOPLAST, are collected by certified recycling partners, where a small amount is used for thermal processing in order to supply energy.\(^{418}\)

Furthermore, the usage of various mineral additives allows POLOPLAST to optimize task-specific raw material to guarantee various requirements.\(^{419}\)

At POLOPLAST respective production losses are prepared by external partners in order to deliver secondary materials for other products. Less than 1% of the production losses does not meet the quality standards of POLOPLAST and are disposed by specialized recycling partners.\(^{420}\)

POLOPLAST is not certified by EMAS and ISO 14001 on the basis of several reasons. The chemical industry has initiate alternative programs for meeting the needs of sustainable development and sustainability. “Responsible Care” is one of these initiatives, and goes beyond the scope of sustainability. Therefore this initiative covers more sustainable issues than EMAS or ISO 14001, such as fire prevention, employee safety and responsible handling. For a detailed description of the initiatives please refer to the next section.\(^{421}\)

ÖAKR - Österreichischen Arbeitskreises für Kunststoffrohrrecycling

POLOPLAST is member of the „Österreichischen Arbeitskreises für Kunststoffrohrrecycling“ (ÖAKR) and contributes an essential part to sustainable development. For more than 25 years ÖAKR is a voluntary comprehensive collecting and recovery system for used pipes and moulded parts.\(^{422}\)

POLOPLAST and ÖAKR have a special relationship due to the fact that POLOPLAST is founding member and hence, the special request to save the environment by various collecting and processing actions have high priority.\(^{423}\)

From 1991 to 2015 more than 19,400 tons of plastic pipes were collected, sorted and recycled.\(^{424}\) Members of ÖAKR and POLOPLAST have set themselves the task to aim responsible handling of the environment and resources.\(^{425}\)

More than 80 collecting plants in Austria provide a nationwide network, where environmental friendly recovery of the disposal is one of the most essential issues. Thanks to the special treatment of the material, new high quality material results and can be used for various product, such as cable conduits. Non-recyclable material is used for industrial plants as coal and heavy oil in order to replace the needed fuel.\(^{426}\)

Responsible Care

Beside the ÖAKR membership, POLOPLAST is active member of “Responsible Care”, a voluntary initiative of the chemical industry to reduce and minimize the environmental impact for beings and nature.\(^{427}\)

\(^{421}\) Data from Mr. Nösterer 31.07.2017, own translation.
Responsible Care is characterized by the support of employee safety; minimize environmental affects as well as responsible handling. The initiative is a voluntarily self-commitment of businesses in the chemical industry. Since 2000 the plant in Leonding is certified by the responsible care initiative.\textsuperscript{428} If the requirements of this initiative are fulfilled, the received certificate is valid for three years.\textsuperscript{429}

**Zero Pellet Loss**

The third detailed described initiative is the "Zero Pellet Loss" campaign, which started in 2015 in cooperation with the Austrian Ministry of Agriculture, Forestry, the Environment and Water Management, where a 10-Point-Programm for avoiding the entry of plastic raw material of companies in waters, were developed.\textsuperscript{430} POLOPLAST is one of the first members of the pact and within the scope of the responsible care, the achievement of the points are proofed.\textsuperscript{431}

The above chosen initiatives are solely some examples and highlight the focus of sustainability within company. As mentioned in the previous chapters, POLOPLAST as well as other companies in the respective industry set a clear focus on sustainable development through several actions and initiatives. Therefore, the plastics industry, especially in Upper Austria has developed an effective network within the industry in order to use synergies and collaborations.\textsuperscript{432}

### 5.3 Application of the Resource Based BSC in POLOPLAST GMBH & CO KG

The application of the resourced based BSC is stated in this chapter and detects potential improvements regarding resource efficiency of POLOPLAST. Focusing on resource efficiency, the main area of the application is the internal process perspective.

When looking at this perspective, the definition of resource efficiency (RE) was made by two main clusters, namely production related RE and product related RE. By increasing RE both approaches have to be taken into account and hence, build an essential part in the concept of SBSC.

As the relevant and useful KPIs have already been defined, the application of POLOPLAST will be the next step. For this reason, substantial production related KPIs are mentioned below:

- internal recycling rate
- proportion of non-product to product
- material input per product output
- water input per product output


• offcuts rate
• waste rate
• disposal fees

The relevant KPIs are converted to POLOPLAST, in order specify potential improvements of product related and production related RE.

**Internal recycling rate:**
As a pioneer in terms of recycling, POLOPLAST has managed it to efficiently optimize the internal recycling rate to a maximum of 99%. Hence, the production waste is less than 1% which reflects the leading role in sustainable development.\(^{433}\) For a declaration, the reason for such an enormous internal recycling rate is related to the products and the raw material. Due to the characteristics of the product portfolio such an internal recycling rate is manageable. POLOPLAST develops various products with different product properties in combination with a special multi-layer technology.\(^{434}\) This special technology allows POLOPLAST to redevelop new products. For a better understanding, the pipes of POLOPLAST consist of three layers, with high technical properties.\(^{435}\) The secret for the high internal recycling rate is the material.\(^{436}\) For the pipes POLOPLAST uses special granulate, which build the basis for the product. If the granulate of the pipes are recycled and melted down, it can be used as raw material for moulded parts. The geometry of the moulded parts allows that one layer is more than sufficient for the high requirements of the quality standards.\(^{437}\) Because of the characteristics of polypropylene one layer can be used as raw material for the moulded parts.\(^{438}\) This special characteristic of the products allows POLOPLAST to minimize the required raw material to minimum and hence RE can be increased. On this account, POLOPLAST can manage this enormous internal recycling rate and is a pioneer in this field.

**Proportion of non-product to product:**
For the analysis of the proportion of non-product to product the special material management allows POLOPLAST to handle the production process in sustainable way.\(^{439}\) Non-product output are all inputs which are part of the production process, but do not result in an end product.\(^{440}\) Regarding the non-product output two main differentiations have to be made: chargeable and free of charge waste. Chargeable waste products are treated wood, household waste and waste paper; however, depending on the demand of the waste products, the cost structure is conditional.\(^{441}\) Beside chargeable waste products, free of charge waste are single-origin plastics, plastic sheets and untreated wood.\(^{442}\) As mentioned before, the price for non-product output depends on the demand and the need for such products. However, hazardous waste such as
used oil, oil-water mixtures as well as batteries are collected and disposed by specialists in order to ensure a proper and environmentally adequate disposal.443

**Material input per product output:**
Poloplast has a material input per annum of approximately 18,900t.444
The amount of material input is split into two processes, namely compounding and extrusion. The compounding process consists of 14,877 tons which are used by POLOPLAST, other companies, as well as for the automotive industry. The rest of the material flows into the extrusion process.445

The graph below presents the delivery of the material and should support the theoretical approaches of compounding and extrusion. Compounding is the process of the right mixture for the products. Extrusion is a manufacturing process for producing polymer products.

---

443 Data of the email conversation with Mr. Nösterer 09.06.2017, own translation.
444 Data of the email conversation with Mr. Nösterer 08.06.2017.
446 Produktionskreislauf provided by Mr. Nösterer 21.12.2016.
Water input per product output:
The required water input for the production is splitted in three different categories, municipal water consumption, well water and well water specific. The entire water consumption is measured in m$^3$/ton.

For the better application of the information, the analysis focus on water input per ton and not per product output. The water is primarily used for cooling down products, tools and plants.\textsuperscript{447} The company has a special access to water, because of their own well. The water consumption, solely used for the production, is 0.76 m$^3$/ton per month and comes from their own well.\textsuperscript{448} But the extraction of water from the well is specifically controlled, which means licenses of the use and conservation of water are required. Beside the extraction controls, well water has to be treated in a special way due to corrosions, water hardness and conductivity.\textsuperscript{449} This is controlled inline by POLOPLAST in order to ensure a correct process water quality. If the water does not meet the requirements, water are feed-out to the sewer, which is also controlled officially. Beside the external controls, feed-out parameters are strictly defined and are also controlled externally.\textsuperscript{450}

Due to continually improvements and controls in terms of process water consumption, water cycles, regular checks of consumption and water analysis, these initiatives support POLOPLAST by requiring water to a minimum. Many filtering, back cooling and other special treatments allow POLOPLAST to keep process water for a minimum of 100 times in the cycle.\textsuperscript{451} Due to these actions and initiatives POLOPLAST can handle this minimum of water input and hence, improve resource efficiency by water cycles, consumption regulations and regularly checks.

Offcuts and Waste rate:
POLOPLAST tries to minimize the offcuts and waste rate to a minimum, which are demonstrated below. The company has special products, which allow melting down the offcuts and re-using it as components for other products. Due to this procedure POLOPLAST can reduce the offcuts and waste rate enormously. The entire offcuts are 1.550t per annum, this means 8.2 % pure offcuts, but this rate cannot be accepted in this form, because ~ 1.100t are recycled (5.9 %), ~ 171t are chargeable disposed (0.9 %), ~ 71t are sold to external partners for the use of high quality products, such as cable conduits. However, the effective offcuts are ~ 189t, in other words 1 %.\textsuperscript{452}

As already mentioned in the section of the internal recycling rate, POLOPLAST can manage such low rates due to unique and intelligent material flow in the production, strong recycling networks within the respective industry, special geometries and characteristics of the products and continually improvement of the processes. For these reasons, resource efficiency can be managed correctly and hence, support the company to act in a sustainable way.

\textsuperscript{447} Data of the email conversation with Mr. Nösterer 08.06.2017, own translation.
\textsuperscript{448} Data of the email conversation with Mr. Nösterer 08.06.2017, own translation; Poloplast Sustainable Report (2016), p. 56-57, own translation.
\textsuperscript{449} Data of the email conversation with Mr. Nösterer 08.06.2017, own translation; Poloplast Sustainable Report (2016), p. 56-57, own translation.
\textsuperscript{451} Data of the email conversation with Mr. Nösterer 08.06.2017, own translation; Poloplast Sustainable Report (2016), p. 56-57, own translation.
\textsuperscript{452} Data of the email conversation with Mr. Nösterer 08.06.2017, own translation; Poloplast Sustainable Report (2016), p. 56-57, own translation.
**Disposal fees:**
As discussed in the previous section, POLOPLAST is a pioneer in terms of sustainability and sustainable development. However, the company continually tries to reduce waste and disposal to a minimum and they have managed it. Due to the above mentioned procedures such as melting down the material to re-use it, as well as having a strong disposal network within the industry, POLOPLAST can arrange the disposal fees for unusable plastic to a minimum. This means € 91.9/t, moreover the container handling fee (providing and emptying container) costs € 1.800/a.

The adequate and environmental friendly disposal processes support POLOPLAST in saving costs and improving resource efficiency by melting down and recycling the material, which results in minimizing raw material input.

The above mentioned indicators are selected KPIs and are solely some examples for potential KPIs and hence, can be redefined and redeveloped for many other purposes and focuses. So, in other words, these KPIs are useful in this analysis case, but they can be interpreted in many other ways. But in this case, these selected KPIs provide a good basis for the SBSC concept.

For the second approach, potential product related KPIs are listed below:
- lifetime
- repair rate
- deformation rate
- recyclability of material
- ecological aspects
- weight

As this thesis has its focus on resources and the resource based BSC concept, the internal process perspective is described in chapter 4.2 in a very detailed way.

The next section demonstrates and discusses the product related KPIs.

**Lifetime:**
POLOPLAST stands for high quality products and this is reflected by high lifetime and guarantee parameters. The company is a specialist in producing pipe systems and hence, demonstrates this success factor by enormous high lifetime.

For every single business line, POLOPLAST has high guarantee requirements. For instance, in the civil engineering sector POLOPLAST guarantees a lifetime of pipe systems for more than 100 years.453 The guarantee in the building service is characterized by more than 25 years. In turn it means that POLOPLAST ensures a lifetime exceeding 25 years for the products.454

On the basis of this high guarantee and lifetime factors, plastic pipes systems are superior in contrast to other raw materials. The material of the plastic pipes in combination with such a high lifetime allows POLOPLAST to link plastic raw material to the environmental aspect of the products. Due to their high lifetime standards, resource efficiency can be managed above a correct manner.

---

454 Data of the email conversation with Mr. Nösterer 08.06.2017, own translation; Poloplast Sustainable Report (2016), p. 56-57, own translation.
Repair rate:
The repair rate is an essential point in terms of products and sustainable development. The main question in this case is, if it is useful to repair the product instead of replace it. In this event, the question is irrelevant for the SBSC concept of POLOPLAST. The reason is appear, POLOPLAST has high quality products with more than 25 or rather 100 years of lifetime, which means, the company knows its products and its product capabilities and is able to ensure such high lifetime.\(^\text{455}\) The repair rate of products of POLOPLAST is equal to zero. The rate does only make sense in terms of damages of the pipe systems, which are not resulting from the company. Examples for damages outside the scope of the company could be bites from rates or damages due to installation errors and construction site mistakes. POLOPLAST solely get involved in the “repair process” if the products are replaced by components from the company, such as pipes or moulded parts.\(^\text{456}\) In case of replacing the product system by various components, the company does not have a detailed knowledge about it.\(^\text{457}\) Moreover, because of the high quality of the products and the enormous great lifetime, POLOPLAST ensures long longevity and hence this results in a low repair rate. Because of the fewer repairs due to the high quality and lifetime of the products, the environmental aspect get positively influenced and POLOPLAST accomplishes sustainability in terms of resource saving. On the basis of the above mentioned statements the sustainability and especially RE has high priority within the company and is an important consideration.

Deformation rate:
The rate shows the deformation of the plastic pipe systems. Because of the flexibility and tension-free properties of the products, the deformation rate has minor importance within the company. The elasticity and resistance result in a very low deformation rate. The deformation rate solely shows products which are damaged in terms of fading or internal transportation.\(^\text{458}\) Beside these damage reasons there are hardly any other explanations for damages.\(^\text{459}\) If the products get damaged within the field (which means after the construction or installation), the company gets informed regarding the complaints.\(^\text{460}\) The reason for such a low deformation rate of the products is present. Underground plastic pipe systems have to withstand a lot, such as surface weights or settlement of the ground and for this reason; POLOPLAST has developed a special geometry in order to avoid deformation caused by the stated weights. The special version allows transmitting the weight into the soil and hence avoiding any deformation of the pipes.\(^\text{461}\) Because of this special geometry of the products, the deformation rate within the company is equal to zero. On the basis of this, POLOPLAST can serve more than 25 or rather 100 years of guarantee, in turn, less raw material is needed, which results in an increased RE.\(^\text{462}\)

Recyclability of material:
As mentioned in the section of the internal recycling rate, POLOPLAST has a leading role in terms of recycling. The company has managed it to optimize the internal recycling rate to

---

\(^\text{456}\) Data of the email conversation with Mr. Nösterer 09.06.2017, own translation.  
\(^\text{457}\) Data of the email conversation with Mr. Nösterer 09.06.2017, own translation.  
\(^\text{458}\) Data of the email conversation with Mr. Nösterer 09.06.2017, own translation.  
\(^\text{459}\) Data of the email conversation with Mr. Nösterer 09.06.2017, own translation.  
\(^\text{460}\) Data of the email conversation with Mr. Nösterer 09.06.2017, own translation.  
maximum of 99%. The production losses are less than 1% and reflect a great rate.\textsuperscript{463} In this case, the focus lies on the recyclability of the material and the characteristics of the products play an essential role.

The products of POLOPLAST have different properties, but with the special multi-layer technology, it is possible to re-develop new products out of production losses.\textsuperscript{464}

Although the reason for such a high recycling rate is already mentioned in the previous section, a short explanation will be reiterated.

The pipes of POLOPLAST consist of three layers, namely outer layer, middle layer and inner layer.\textsuperscript{465} The secret for this high recyclability lies in the material. As for the pipes three special layers are used, the moulded parts consist of Polypropylene, which can be found in the three layers. Therefore, if the material of the pipes is melted down, it can be used for moulded parts, due to the fact that one layer in combination with a special and unique geometry is sufficient for the moulded parts and hence meets the high quality standards of the company.\textsuperscript{466}

On the basis of this material cycle POLOPLAST can manage such a high recyclability of the material and marks a milestone in terms of sustainability and environmental aspect.

As mentioned in the section of the internal recycling rate, the high recyclability of the material and the recycling- and disposal network within the respective industry allows to minimize the required raw material and hence improve RE especially for material, energy and water efficiency.

**Ecological aspects:**

Combining and analysing all the above mentioned information about process and product related KPIs, the ecological aspect of the product can be defined. The high performance of the internal recycling rate, water input per ton as well as offcuts and waste rate, the ecological aspect of plastic pipe systems is better than its reputation in the respective industry. Beside the high performance of the company in several categories, other possible raw material alternatives have to be taken into account. In addition to the classical plastic raw materials, biopolymer is getting more attractive in terms of availability, prices and properties. The issue is that there is the need to go deeper into the topic and additionally conduct a technical study, but this will extend the scope of the analysis and for this reason the next section will solely give an introduction of biopolymers and its related issues.

As short declaration, biopolymer is characterized as plastic raw material from renewable raw material.\textsuperscript{467} One important issue is the structure of biopolymer, because biopolymer is not one common polymer group, on the contrary, biopolymer belongs to a chemical family.\textsuperscript{468} Therefore, a categorization of the material is useful.\textsuperscript{469} The term biopolymer can be splitted into three main categories, biological not degradable, biodegradable from renewable resources and biodegradable from fossil resources.\textsuperscript{470} For plant-based raw material cellulose, sugar and starch

\textsuperscript{466} Poloplast Sustainable Report (2016), p. 61, own translation.
\textsuperscript{467} Beier (2009), p. 3, own translation.
\textsuperscript{470} Beier (2009), p. 4, own translation.
are the main components for biodegradable plastic. Raising the issue of using biopolymer as raw material should solely provide a potential idea for alternative resources. It is not useful to give recommendation about using biopolymer instead of polypropylene due to the lack of technical information and applicability. Considering biopolymer as raw material for POLOPLAST, a technical analysis about properties, technical behaviour, accessibility and applicability have to be necessarily taken into account.

Among other related issues, an assumption about potential improvements can be stated. If POLOPLAST can manage it to use biodegradable biopolymer from renewable resources instead of polypropylene, the ecological aspect of the products would be even greater. Considering this aspect in the production, an assumption may be an increase in image and reputation due to more ecological and environmental friendlier products. As a result, customer satisfaction will be improved, which in turn means market share will be affected positively. A favourable influence of the market share will result in an increase in turnover growth and as a consequence improve ROCE. The ecological aspect does not directly influence the production costs and in addition the ROS, but it can positively affect the customer perspective and moreover can have an impact on ROCE.

Weight:
Due to the fact that POLOPLAST supplies a broad range of pipe dimension, starting from 30 mm to 630 mm, the scope of weights goes from gram to approximately 45 kilogram. Therefore, it does not make much sense to generalize the problem and give any recommendations for this issue. As POLOPLAST continually tries to detect new optimization potentials, regarding products as well as production processes, the factor weight play an essential role.

A simple assumption concerning weight and raw material will be provided shortly and should solely serve some suggestions. If POLOPLAST can reduce the weight of the products by a minimal amount without any technically disadvantage and with the same technical properties, the required raw material would decrease to a certain extent, additionally, the reduce would result in lower purchase costs and hence, could be transmitted to sales prices. A decrease in sales prices results in greater customer satisfaction and thus increases the ROS. But for a detailed explanation, a technically study has to be made in order to identify the potential reduce in weight.

As well as the ecological aspect, the factor weight does not directly influence the production costs and in addition the ROS, but it can have a positively effect on customer perspective and hence improve the ROCE.

The other three perspectives of the BSC of POLOPLAST
As the attention is on the resource based BSC, the internal process perspective is analyzed in a very detailed way due to the fact that for POLOPLAST the production issue is very crucial. For this reason, the focus lies on this single perspective, but for the sake of completeness, the other three perspectives will be shortly examined as well.

The procedure will be shown bottom-up and hence the learning and growth perspective will be the starting point.

---

472 Data of the email conversation with Mr. Nösterer 09.06.2017, own translation.
### Learning and Growth Perspective

<table>
<thead>
<tr>
<th>Strategic goals:</th>
<th>Improved efficiency and safety by reducing work accident in the production</th>
<th>Improved efficiency (in production)</th>
<th>Improved commitment of employees by continuing education programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key figures:</td>
<td>Reduced work accidents</td>
<td>Improved satisfaction</td>
<td>Increased engagement/commitment</td>
</tr>
<tr>
<td>Target value:</td>
<td>10% less accidents</td>
<td>Enhance satisfaction by 25%</td>
<td>Positively affect commitment</td>
</tr>
<tr>
<td>Initiatives:</td>
<td>Information events, system of guiding lines in the production</td>
<td>New reward systems for production staff and non-production staff</td>
<td>More budget on education programs as well as additional days for trainings</td>
</tr>
</tbody>
</table>

Table 11: Learning and Growth Perspective of POLOPLAST

Due to the fact that the internal process perspective is described above in a very detailed way, a repetition is not reasonable and hence this perspective will not be listed in this form.

### Customer Perspective

<table>
<thead>
<tr>
<th>Strategic goals:</th>
<th>Acquire new purchaser</th>
<th>Improved customer satisfaction</th>
<th>Increased market share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key figures:</td>
<td>Acquire new purchaser</td>
<td>Sell more products</td>
<td>Increased market share</td>
</tr>
<tr>
<td>Target value:</td>
<td>Increase number of new purchaser by 7%</td>
<td>Improve price structure</td>
<td>Increase market share by 10% to 15%</td>
</tr>
<tr>
<td>Initiatives:</td>
<td>Aggressive acquiring of new purchaser by selected business development actions</td>
<td>Providing more discount, reconsider discount structure</td>
<td>Improve image and reputation by social media activities</td>
</tr>
</tbody>
</table>

Table 12: Customer Perspective of POLOPLAST

---


### Financial Perspective

<table>
<thead>
<tr>
<th>Strategic goals:</th>
<th>Key figures:</th>
<th>Target value:</th>
<th>Initiatives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>improved annual sales</td>
<td>increased ROS</td>
<td>improve turnover by 15% to 20%</td>
<td>increase market share through higher customer satisfaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>increase ROS by 0.5% to 1%</td>
<td>reduce production costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>improve ROCE by 1% to 2%</td>
<td>reduce production costs and improve ROS</td>
</tr>
</tbody>
</table>

Table 13: Financial Perspective of POLOPLAST

Combining the above analyzed perspectives, the BSC framework of POLOPLAST can be uniquely developed and evolved. The framework below shows all relevant perspectives in a compact form and should assist the comprehension of the BSC concept of POLOPLAST.
The BSC concept for POLOPLAST GMBH & CO KG

<table>
<thead>
<tr>
<th>Goals</th>
<th>Key figures</th>
<th>Initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financial perspective:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>improved annual sales</td>
<td>improved turnover</td>
<td>increase market share through higher customer satisfaction</td>
</tr>
<tr>
<td>increased ROS</td>
<td>increased ROS</td>
<td>reduce production costs</td>
</tr>
<tr>
<td>improved ROCE</td>
<td>improved ROCE</td>
<td>reduce production costs and improve ROS</td>
</tr>
<tr>
<td><strong>Customer perspective:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>acquire new purchaser</td>
<td>increased number of new purchaser</td>
<td>aggressive acquiring of new purchaser by selected business development actions</td>
</tr>
<tr>
<td>improved customer satisfaction</td>
<td>sell more products</td>
<td>providing more product related features, reconsider discount structure</td>
</tr>
<tr>
<td>increased market share</td>
<td>increased market share</td>
<td>improved image and reputation by social media activities</td>
</tr>
<tr>
<td><strong>Internal process perspective:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>increased resource efficiency</td>
</tr>
<tr>
<td><strong>Learning and Growth perspective:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>improved efficiency and safety</td>
<td>reduced work accidents</td>
<td>information events, system of guiding lines in the production, more</td>
</tr>
<tr>
<td>improved efficiency (in production)</td>
<td>improved satisfaction</td>
<td>new reward systems for production staff and non-production staff</td>
</tr>
<tr>
<td>improved commitment of employees by continuing education programs</td>
<td>increased engagement/commitment</td>
<td>more budget on education programs as well as additional days for trainings</td>
</tr>
</tbody>
</table>

Please refer to the very detailed described internal process perspective due to the distribution of product and production related indicators.

Figure 12: BSC of POLOPLAST, own representation

When combining all the four perspectives and its relevant indicators, the resulting strategy map of POLOPLAST is provided below. The strategy map shows the relevant strategic core issues and performance drivers of POLOPLAST and hence builds the end result of this analysis. As the four perspectives are already discussed in the previous chapters, they will not be further discussed.
Figure 13: Strategy Map of POLOPLAST

--

6 Limitations & Critical Review

Needless to say, limitations and restrictions concerning the theoretical as well as the practical part of the analysis are apparent and hence, will be discussed in this section. The theoretical part of this study provides selected concepts and definitions of resource efficiency, but with the addition, RE can be defined and interpreted in many different ways. The chosen interpretations and concepts are appropriate for this study; however that does not mean that they are applicable in other studies.

In this study the focus lies on RE in combination with the SBSC concept, especially which potential does the SBSC has in order to improve the managerial RE. Moreover, the design of the SBSC as well as the influence of other business segments in terms of cause-effect chains was part of the analysis. When considering the limitations of the practical part, some of them can be named. Especially for the concept of SBSC limitations are present. Starting with the determination of the strategic relevance of environmental and social aspects, the select aspects are useful for the company and hence, provide a good basis for further analysis. However, environmental and social aspects can be defined and interpreted in so many other ways and hence, do not work as general framework. Additionally, leading and lagging indicators have to be defined uniquely for the purpose of the study. In this case, the chosen indicators are suitable; however, lagging and leading indicators have to be defined and developed in a proper way and for every single purpose.

Further limitations exist for the defined KPIs, as mentioned already above, KPIs can be developed for many purposes, and the selected factors are suitable in this study and for this special case, but they can also be modelled differently. It depends on the purpose of the study which factors are taken into account, moreover, the selected indicators and factors are useful for the application of POLOPLAST.

As conclusion, the chosen concepts, indicators and factors depend on the focus of the study as well as on the research character. For this reason they may not work as framework for other analysis or studies. Therefore, the provided statements and interpretations are solely one kind of analysing a company with this tool and thus cannot be applied equally for other purposes or studies.
7 Conclusion & Recommendations

Increasing pressure about acting sustainable and save resources and the environment, have made companies more open to new tools and approaches for environmental, social and economic welfare.478

Beside the conventional goals of the companies as achieving the key data and integrating sustainability into the company, sustainable development is getting more attractive to managers due to several factors, such as increasing the competitive advantage, meeting the needs of stakeholders and shareholders as well as contributing something to save the environment.479

In the previous chapters the theoretical and practical approaches of the BSC concept have been identified and applied. The focus of this study is the application of the BSC with the special attention to a resource based approach. For this reason, the first chapters provide a theoretical understanding of the different definitions and concepts and should give an insight into the topic of resource efficiency in combination with the BSC concept.

The decision to apply the BSC concept to POLOPLAST was taken due to the fact that the BSC combines, through the different perspectives, all relevant factors within the company and hence provides linkages and causal chains for supplying an overall picture of the performance of the company.480 These causal chains and linkages are advantageous on the basis of receiving a complete overview of the company and additionally be able to evaluate the performance.

Beside the above mentioned advantages, the SBSC concept points out and values environmental and social aspects in combination with the company’s strategy and hence the strategic relevant environmental and social parameters are taken into account.

To conclude the study, POLOPLAST has been initiated a lot of actions and campaigns in order to increase the overall performance of the company. POLOPLAST continually tries to improve the internal processes in order to increase efficiency. Applying the concept of the BSC to POLOPLAST has detected the situation of the company in terms of resource efficiency.

Starting with the selection of the relevant strategic business unit, followed by the definition and identification of the relevance of the environmental and social aspects, the next step was the determination of the strategic relevance of environmental and social aspects, then skimming of different perspectives of resource based BSC built the forth segment of the analysis and last part built the development of resource based BSC as strategy map, these steps were applied to the company and discussed and demonstrated in detail.481

The SBSC concept allows defining relevant KPIs in order to evaluate the overall performance of the company. The selected KPIs are divided in two main categories, namely product and production related KPIs. These KPIs provide the relevant parameters in order to apply the SBSC concept to the company. The selected indicators are essential for the internal processes perspective as they give exclusion about strategic relevant drivers. As the KPIs are discussed and applied to POLOPLAST, the result goes in a certain direction.

As already demonstrated in the section of the application, POLOPLAST has managed it to integrate resource efficiency within the company to a great extent with various campaigns and actions.

480 Figge et al. (2002b), p. 27.
POLOPLAST has made a lot of steps in terms of resource efficiency and has achieved a sustainable way of managing it. Beside the concerns regarding the integration of sustainability into the company in the respective industry, POLOPLAST is a pioneer in terms of resource efficiency and this is shown and discussed in the previous chapter. As the company has designed their processes and products in a very resource saving way, it is challenging to find possible enhancement.

**Recommendations**

First of all, POLOPLAST has a leading role in terms of sustainability. For this reason, appropriate recommendations are limited. As recommendations for potential improvements concerning resource efficiency, two recommendations can be picked, namely the weight of the products and additionally, the alternative raw material, namely biopolymer. Regarding the first component of the products, some improvements in terms of reducing weight could be developed, but as for this essential parameter the technically data and information is not sufficient, an analysis about reducing weight for several products could result in resource saving alternatives. But as mentioned above, recommendations regarding technical related parameters, such as weight, cannot be made due to two main factors, namely, the large range of the dimension of the pipes and additionally, a lack of technical knowledge. Nevertheless, a study on reducing weight could positively influence resource efficiency in terms of resource and raw material savings.

Beside the weight component another potential improvement option comes up, namely biopolymer. As mentioned before, biopolymer gains more and more importance due accessibility and applicability.\(^{482}\) Therefore, POLOPLAST could consider replacing polypropylene by biopolymer, if the technical requirements are given and the product characteristics will not suffer. As already stated, such technical analysis has to be made by POLOPLAST in order to completely detect potential risks and evaluate the practicability in terms of applicability and accessibility, product characteristics, cost structure, recyclability of the material and environmental aspect. Due to the fact that such technical analysis would go beyond the scope of this study, POLOPLAST should try to consider alternative material for replacing the used raw material.

To sum it up, POLOPLAST is a pioneer and has a leading role in terms of sustainability and sustainable development and for this reason, the potential improvements regrading resource saving are limited. Apart from the environmental initiatives and the recycling disposal concepts, POLOPLAST handle resource efficiency within the company and supports the environment to a large extent, which is also demonstrated in the Sustainability Report of the company. The Report points out the great responsibility toward the environment and society of POLOPLAST and provides a good classification in this field. Moreover, the company has achieved to develop the products in a resource saving way and create the processes as efficient as possible. For his reason, POLOPLAST ranks among the leading company in this field.

LIST OF REFERENCES


Costanza, R. et. al. (1997): The value of the world’s ecosystem services and natural capital. In


DOI: 10.1002/bse.339.


OECD (2013): THE ECONOMIC SIGNIFICANCE OF NATURAL RESOURCES. Key points for reformers in Eastern Europe, Caucasus and Central Asia, pp. 1–42.


Österreichischer Arbeitskreis Kunststoffrohr Recycling: Österreichischer Arbeitskreis


Internet references


