DEVELOPMENT OF A FRAMEWORK AND METHOD TO FORMULATE A SUSTAINABLE PACKAGING DEVELOPMENT STRATEGY

HEMA

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Master Thesis - Industrial Design Engineering
University of Twente - HEMA
Femke Veldhuis
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INFORMATION

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PREFACE

To finish the study Industrial Design Engineering with the track Management of Product Development, I had to do a graduation assignment and write a thesis at an external company. During my master's, I built an interest in sustainability and packaging development and I decided to graduate in this field. Finding a graduation assignment in the summer of 2020 during the Covid-19 pandemic wasn't easy. I was thrilled that after contacting 35 companies, I was able to do my graduation assignment at HEMA on the exact topic that interested me the most.

I'm very pleased that I was able to spend the first few weeks part-time at the Support Office in Amsterdam and work alongside Nienke van der Veen. Unfortunately, the Covid situation in the Netherlands forced everyone at HEMA to work from home from October onward. Writing a thesis from home was not the company experience I hoped for; alongside changing supervisors at HEMA, it made my graduation rather challenging.

Through all the direction I researched, of which many are not included in this thesis, I came in contact with various people from different departments within HEMA. This let me understand HEMA as a company and the retail branch better, which will be helpful in my career.

I'm very grateful for everyone that helped me along the way. First of all, a special thanks to Nienke van der Veen for giving me this opportunity and helping me settle at HEMA. Those first few weeks at the office were very helpful to get an idea of HEMA as a company and the assignment itself. Next, I want to thank Fabeel, who took over for a couple of weeks after Nienke left on her maternity leave, for showing me another point of view on the assignment from the sustainability team. I want to thank Maartje for taking the role of supervisor after Fabeel left and helping me for the rest of my graduation internship. Even though your daily tasks did not cover packaging development, your knowledge about HEMA and your ability to overview the graduation process really helped me when I was stuck.

Apart from my HEMA supervisors, I want to thank Eva Ronhaar for always making time for me, because I know the time was scarce. Also, for the positive vibe you brought to our meetings, for encouraging me and for acknowledging my work. I want to thank Sean Thistleton, my manager, for giving me hands-on experience through the opportunity to help product- and category managers with their packaging questions and allowing me to send the monthly Sustainable Packaging Solution presentation to the commercial teams. Also, thanks to Trevor Perron, the CCO, for the interesting meeting we had and the opportunity to present the monthly commercial update meeting about sustainable packaging for all commercial teams. I want to thank Annebeth, who replaced Nienke, for answering all my packaging related questions.

A special thanks to Jos de Lange, my UT supervisor; I really would not know what I had done without your ability to overview the assignment. Your help and genuine feedback during the whole assignments were of great value. Lastly, a huge thanks to Sietze Berends for brainstorming with me when I felt I had no one else to do that with, for motivating me when I didn't see how to continue and for always supporting me.

SUMMARY

Markets and businesses are increasingly focusing on producing sustainable goods due to raising public consciousness of environmental and social responsibility and direct confrontation with the results of environmental problems. This is due to shifting consumer demands and the emergence of government legislation and policies to address these environmental issues. Packaging contributes to major environmental issues such as litter, the plastic soup that pollutes the ocean, micro- and nano plastics, and health concerns resulting from packaging additives.

HEMA addresses these packaging-related environmental issues by using less, more sustainable and better recyclable packaging materials and replacing harmful materials with sustainable alternatives. HEMA established five concrete and ambitious packaging targets that have to be reached by 2025. However, HEMA desires to continue to address the packaging-related environmental problems after 2025 and has the ambition to become the most sustainable value variety brand. This thesis focuses on providing a solution that enables HEMA to formulate a sustainable packaging development strategy for after the targets of 2025.

Analysing HEMA's current sustainable packaging development strategy, its sustainable packaging development, the brand HEMA and theories and models on sustainable packaging development gives insights for developing the solution. This analysis concludes that HEMA has the desire to become the most sustainable value variety brand but does not align its practice to achieve that. The term itself is illogical; it is not included in the general sustainability strategy. Furthermore, the current targets are dependent on others, very few resources are available to formulate a sustainable packaging development strategy and execute this, the product- and category managers and the purchasers lack the required packaging knowledge, and there is a discrepancy between the values price and sustainability in the brand. Additionally, there is a gap between the theories and HEMA's practices.

To close this gap and to make HEMA independent of others for strategy formulation, a solution based on theory is developed, consisting of a framework and a method. The base of the framework explains is build on the explored theories and describes that to preserve the earth for future generations, packaging has to be developed within the constraints of the earth by increasing eco-efficiency and eco-effectiveness. The latter divides the framework into two main directions, eco-efficiency and eco-effectiveness. The framework describes the different directions within sustainable packaging development and how to implement those. The visualisation of the framework contains elements on different levels. This framework does not enable the formulation of a strategy; therefore, a method is developed.

The method translates the different directions into a sustainable packaging development strategy. It consists of four steps: choose direction, goal/target setting, plan and conclusion. The method allows choosing a direction within sustainable development that aligns with the general sustainability strategy. The directions will be included in the sustainable packaging development strategy by setting goals and plans for each direction and combining these into one overview in the conclusion, forming the sustainable packaging development strategy.

However, the evaluation shows that in the current state, the solution does not always lead to a sustainable pa¬ckaging development strategy. However, the method in its current state does not always lead to a sustainable packaging development strategy. This is because some implementation elements, which are used for goal setting and plan-making, are too specific for an overarching sustainable packaging development strategy. Moreover, due to time constraints, only one target was formulated, and it was not possible to combine the targets into a sustainable packaging development strategy. Therefore the evaluation did not prove that the solution can enable HEMA to formulate a sustainable packaging development strategy for after the targets of 2025.

Concluding, HEMA can be supported in formulating a sustainable packaging development strategy after the current targets of 2025 by the developed framework and method. However, the method has to be improved first before it can be used. Furthermore, to continue to address the packaging-related environmental problems after 2025, HEMA must reconsider the term most sustainable value variety brand and make sustainability a higher priority.

LIST OF ABBREVIATIONS

B2C:	Business-to-Consumer
B2B:	Business-to-Business
Bio-PET:	Bio-based PET, bio-based polyethylene terephthalate
Bio-PE:	Bio-based PE, bio-based Polyethylene
Bio-PP:	Bio-based PE, bio-based Polypropylene
BIP:	Brand Identity Prism
CE:	Circular Economy
C2C:	Cradle to Cradle
FSC:	Forest Stewardship Council
GHG:	Greenhouse gas
HEMA:	Hollandsche Eenheidsprijzen Maatschappij Amsterdam
ISO:	International Organization for Standardization
KIDV:	Kennis Instituut Duurzaam Verpakken (Netherlands Institute for Sustainable Packaging)
LC:	Life cycle
LCA:	Life Cycle Analysis
LDPE:	Low-density polyethylene
PB:	Planetary boundary
PE:	Polyethylene
PET:	Polyethylene terephthalate
PP:	Polypropylene
PU:	Picking Unit
PS:	Polystyrene
rPET:	Recycled PET, recycled polyethylene terephthalate
SDG:	Sustainable Development Goal
SU:	Sales Unit
TPP:	Transport Packaging
UN:	United Nations

LIST OF TERMS

Eco-efficiency
Using natural resources more efficiently and create more value with less environmental impact.

Eco-effectiveness
Maximising the use of resources and maximising the positive environmental impact of products.

Framework
Refers to the developed framework in this thesis that describes different directions within sustainable packaging development.

Life cycle
The life cycle of a product or packaging encompasses all issues involved from the start to the end of the existence of the physical product or packaging.

Packaging
Refers to products that can be used to contain, protect, inform and facilitate transport, consumption and end-of-use of other products.

Sustainable development
Refers to development that facilitates the needs of the present without compromising the needs of future generations, by preserving the earth through development within the constraints of the environment.

Strategy
A broad approach taken by a company to sustain or improve its performance; it is primarily long-term and unlikely to change significantly in the near future.

Method
Refers to the method in this thesis that enables HEMA to formulate a sustainable packaging development strategy after 2025.

TABLE OF CONTENTS

1.

INTRODUCTION

This thesis is performed at the Dutch retailer HEMA and is the result of the master assignment for Industrial Design Engineering. This introductory chapter elaborates on the starting points of the thesis, including the company profile, research motive and the assignment.

COMPANY PROFILE

This thesis is performed at the Dutch retailer HEMA, the Hollandsche Eenheidsprijzen Maatschappij Amsterdam (Hollandic Standard Prices Company Amsterdam). HEMA opened its first store in 1926 in Amsterdam and now has over 775 stores in twelve countries. Most stores are located in the Netherlands and Belgium. The products are found in every Dutch households and range from apparel, household goods and self-care products to food, toys and much more. HEMA's mission is to make customer's daily lives better, easier and more fun with products that are high quality, well designed and affordable. HEMA looks for convenient solutions to everyday problems when designing its products and services. The products are designed and developed in house in the support office in Amsterdam and are purchased through the purchase offices in Hong Kong, Shanghai and Dakha (HEMA, 2019, 2020a).

RESEARCH MOTIVE

SUSTAINABILITY STRATEGY

Markets and businesses are increasingly focusing on producing sustainable goods due to raising public consciousness of environmental and social responsibility and direct confrontation with the results of environmental problems. This is due to shifting consumer demands and the emergence of government legislation and policies to address these environmental issues. HEMA noticed this as well and made its sustainability strategy an essential part of its corporate strategy. It focuses on the whole supply chain, from the support office, purchasing offices, and distribution centre to the bakeries and stores (HEMA, 2019). This strategy was formulated using international guidelines, regulations, market analysis, stakeholder discussions and materiality analysis.

The sustainability strategy is divided into three pillars (HEMA, 2020b):

1. **Responsible supply & production chain:** HEMA provides transparency in its supply & production chain and complies with legislation (social and environment).
2. **Sustainable & circular design and assortment:** HEMA is leading in its circular action plan, including sustainable designs and innovations
3. **Diversity and inclusion, community, governance & culture:** HEMA is for everyone and shows a diverse picture of society and promotes to use of our design for inclusion.

Sustainable packaging development is included in the second pillar, sustainable & circular design and assortment.

PACKAGING TARGETS

Packaging causes significant environmental problems such as litter, the plastic soup that is polluting the ocean and harming marine life, micro- and nano plastics, which are currently found in almost every part of the biosphere and health concerns as a result of the use of additives in packaging, (Bruijnes et al., 2020). HEMA addresses these packaging-related environmental issues by using less, more sustainable and better recyclable packaging materials and replacing harmful materials with sustainable alternatives. In 2019 the following sustainable packaging targets were established, with that year as a baseline (HEMA, 2019):

- 25% reduction of plastic in primary packaging (2022)
- 100% of paper packaging comes from sustainable sources (recycled and/or FSC) (2022)
- 100% recyclable primary packaging (2025)
- 100% recycled or bio-based plastic for all packaging (2025)
- 25% reduction of primary packaging (2025)

The targets are based on weight in kg. HEMA already implemented measures to reach those targets. For example, in beauty product bottles made of rPET, the plastic box around party hats is replaced by a carton sleeve and styrofoam around the birthday candles is replaced with cardboard (HEMA, 2019).

THE MOST SUSTAINABLE VALUE VARIETY BRAND

HEMA has ambitions to become 'the most sustainable value variety brand'. This refers to begin the most sustainable option on the market within a specific price range; this thesis will further clarify this term in chapter 4. HEMA has defined concrete and ambitious packaging targets until 2025. However, what actions HEMA needs to take after 2025 on sustainable packaging development is unclear.

ASSIGNMENT

RESEARCH QUESTIONS

HEMA established five concrete and ambitious packaging targets that have to be reached by 2025. However, HEMA desires to continue to address the packaging-related environmental problems after 2025. Therefore, this thesis focuses on providing a solution that enables HEMA to formulate a sustainable packaging development strategy for after the targets of 2025. As a response, the following research question is established:

How can HEMA be supported in formulating a sustainable packaging development strategy after the current targets of 2025?

This primary research question is further divided into multiple sub-questions.

1. What is HEMA's current position in sustainable packaging development?
2. How can a method be developed to help HEMA formulate a sustainable packaging development strategy after the targets of 2025?
3. Does the developed method enable HEMA to formulate a sustainable packaging development strategy after the current targets of 2025?

THESIS APPROACH

This thesis is divided into four parts, the first three parts based on the stated research questions and a concluding part. figure 1 shows an overview of the structure of the thesis. Each subquestion is answered by multiple chapters.

Part A, the analysis, answers the first subquestion by analysing the current sustainable packaging development strategy at HEMA in chapter 2 and the current sustainable packaging development in chapter 3. Chapter 4 analyses the brand HEMA and addresses the term most sustainable value variety brand. Next, theories on sustainable packaging development are explored in chapter 5, and different models on sustainable packaging development are discussed in chapter 6. In Part A, the specific focus for the rest of the assignment is determined. Part B, the solution, answers the second subquestion by providing a solution. Within part B, chapter 7 lists the solution requirements. In chapter 8, the first part of the solution, the framework is, developed. The second part of the solution, the method, will enable strategy formulation and is developed in chapter 9. To see if the proposed solution meets the requirements, Part C answeres the third subquestion by evaluating the developed method in chapter 10. Part D is the concluding part and includes the conclusion, discussion, recommendations and appendices.

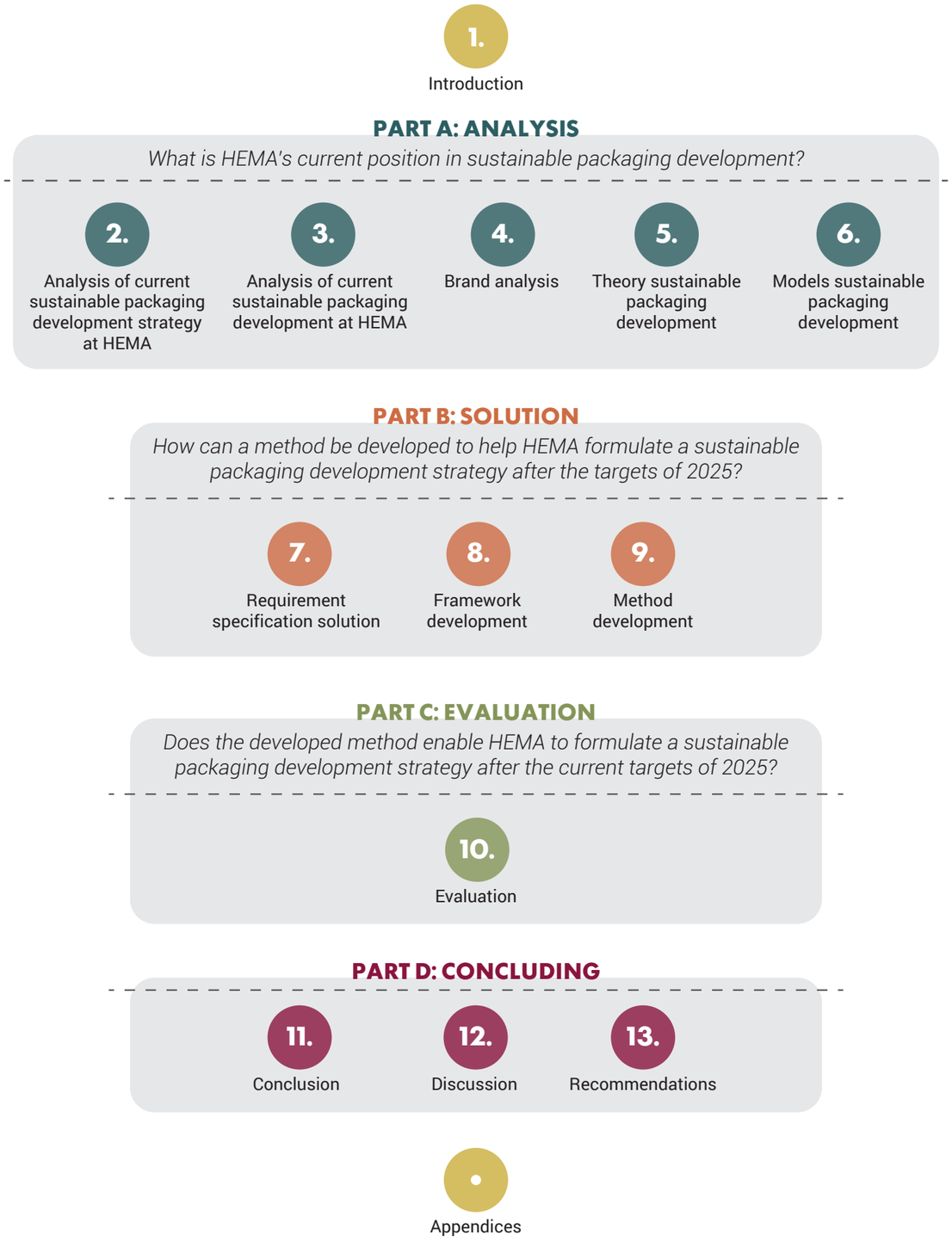


Figure 1 Overview chapters thesis

RESEARCH QUESTION 1

What is HEMA 's current position in sustainable packaging development?

PART A: ANALYSIS

Part A revolves around answering the first research question, What is HEMA's current position in sustainable packaging development? This research question is answered by analysing HEMA's sustainable packaging development strategy in the second chapter through the general sustainability strategy and current packaging targets.
In the third chapter, the current packaging development at HEMA is explored, and HEMA as a brand is analysed in the fourth chapter through HEMA's brand position, brand identity and the term most sustainable value variety brand. Chapter 5 and 6 focus on theory and models of sustainable packaging development, which end with comparing HEMA's practices with these theories and models.

Chapter 2
Analysis of current sustainable packaging development strategy at HEMA

Chapter 3
Analysis of current sustainable packaging development at HEMA

Chapter 4
Brand analysis

Chapter 5
Theory sustainable packaging development

Chapter 6
Models sustainable packaging development

2.

ANALYSIS OF CURRENT SUSTAINABLE PACKAGING DEVELOPMENT STRATEGY AT HEMA

This chapter addresses the analysis of the current sustainable packaging development strategy. This is done by analysing the current general sustainability strategy and current packaging targets. The foundation on which these targets are based is explored by analysing relevant legislation and competitors' targets.

2.1. CURRENT GENERAL SUSTAINABILITY STRATEGY

The introduction already discussed the general sustainability strategy and mentioned that this strategy is formulated with the use of international guidelines, regulations, market analysis, stakeholder discussions and materiality analysis. The circular action plan that is part of the second pillar has yet to be developed. This plan includes a strategy on non-virgin materials and circular business models. Towards the end of the graduation assignment, the plan had not been developed yet. Therefore, this thesis is not based on and does not incorporate this action plan.

Sustainable packaging development is included in the second pillar, sustainable & circular design and assortment. The following section explores the current sustainable packaging development strategy at HEMA by defining packaging, exploring the current packaging targets and researching the foundation of these targets.

2.2. CURRENT SUSTAINABLE PACKAGING DEVELOPMENT STRATEGY

2.2.1. DEFINITION PACKAGING

Before progressing towards the current packaging targets, the definition of packaging has to be clarified. In Article one of the Act on Packaging Management Decree of 2014, a very elaborated definition of packaging is given (Staatssecretaris van Infrastructuur en Milieu, 2014). The definition can be scaled down to, packaging is all products, made of material of any kind, that can be used for the containment, protection, loading and delivery of other products, disposable items that are used for this purpose included, along the entire route from producer to user or consumer. This definition includes the functions of packaging. Ten Klooster divided the direct packaging function that packaging needs to fulfil into five groups (ten Klooster, Dirken, Lox, & Schilperoord, 2018):

- To inform
- To contain the content of the packaged product
- To Facilitate transport, storage and transhipment of the packaging-product combinations
- To protect from the environment, the product or the packaging-product combination
- To facilitate consumption and end-of-use

These functions differ on several points with the definition of packaging given by the previous mentioned Act. The Act describes the route from producer to consumer but does not include the end of the life cycle. Ten Klooster, on the other hand, explicitly mentions that packaging could facilitate consumption and end-of-use. Furthermore, he mentions that packaging could function to inform along the life cycle of the packaging. The definition of packaging as described by the Act combined with the described functions by ten Klooster form the following definition of packaging:

Packaging is all products, made of material of any kind, that can be used to contain, protect, inform and facilitate transport, consumption and end-of-use of other products along the entire life cycle, disposable items that are used for this purpose included.

This definition of packaging includes primary, secondary and tertiary packaging. The previous mentioned Act explains the distinction between these three types of packaging. Primary packaging is described as 'packaging that is designed in such a way that it forms a sales unit for the end-user or consumer at the point of sale' (Staatssecretaris van Infrastructuur en Milieu, 2014). Secondary packaging is described as 'packaging designed to form a collection of a number of sales units at the point of sale, which can be removed from the product without affecting its characteristics' (Staatssecretaris van Infrastructuur en Milieu, 2014). Lastly, tertiary packaging is 'packaging designed to facilitate the loading and transportation of a number of sales units or collective packaging to prevent physical damage from loading or transport' (Staatssecretaris van Infrastructuur en Milieu, 2014). This research only focuses on primary packaging. Now that the definition of packaging is given, the following section elaborates on the current packaging targets at HEMA.

2.2.2. CURRENT PACKAGING TARGETS

The general sustainability strategy integrates the current packaging targets into the second pillar. The targets are shown in the introduction; this section explains them more elaborately. Recyclable packaging, recycled packaging and bio-based plastic will be further explanation, assuming the other targets speak for themselves. Recyclable packaging is packaging that is made of materials that are in theory and practically recyclable. However, they are not necessarily recycled due to considerations (mainly financially driven) in the packaging industry. The target, 100% recycled packaging for all packaging, means that 100% of the packaging should have at least 20% of recycled content; this percentage is not necessarily 100%. Bio-based plastic in this context means polymers made (partly) from biomass that are not biodegradable, such as Bio-PET and Bio-PE. These plastics can be recycled with conventional fossil-based plastics. HEMA does not include biodegradable plastics in its portfolio because they are mostly only industrially compostable and are often disposed of wrongly by the consumer, where they contaminate the current recycling streams. More information on bio-based plastics can be found in Appendix E. The outcome of this research should ensure a smooth transition between these targets and future strategies.

This thesis focuses on providing a solution that enables HEMA to formulate a sustainable packaging development strategy for after the targets of 2025. To develop this solution, it is essential to understand how the current targets are set up. Therefore the next section will explore the foundation of the current targets.

2.2.3. FOUNDATION CURRENT PACKAGING TARGETS

HEMA set the current targets in 2019 with the help of Kennis Instituut Duurzaam Verpakken (KIDV) (Netherlands Institute for Sustainable Packaging). This section explores the foundation that was used to formulate the current targets.

In 2019 HEMA signed the Dutch Plastic Pact, a covenant signed by more than 70 Dutch businesses and environmental organisations. The targets included in this covenant are:

1. 100% recyclable packaging, where possible reusable
2. 20% reduction of packaging
3. At least an average of 35% of recycled content in packaging and replace virgin plastics with sustainably produced bio-based plastics

These targets need to be achieved by 2025. HEMA integrated these targets into its current packaging targets. HEMA went further than a 20% reduction of packaging by dividing the targets in reducing plastic and reducing primary packaging and aiming at 25% for both. In retrospect, for the Plastic Pact at least an average of 35% recycled content is needed, while HEMA aims to have at least 20%. In practice, HEMA could still meet the goal of an average of 35% but is not guaranteed with this interpretation of HEMA's current target. The current targets also include the use of bio-based plastics but do not emphasise it comes from a sustainable source. Additionally, HEMA does not state anything about reusable packaging. A part of HEMA's targets is based on the signed covenant, yet, HEMA should be aware of other targets and legislations that apply to packaging.

The targets and legislations that HEMA has to comply with are listed in Appendix A. The current targets partially cover the relevant targets of Sustainable Development Goal (SDG) 12 of the United Nations (UN, 2020). The topics that are not covered are the responsible management of chemicals by reducing the use of chemicals to minimise the impact on human health and the environment, and ensuring the consumers have the relevant information for a sustainable lifestyle. The SDG targets function as a guideline since they are not legislation. Legislation that HEMA has to comply with are different EU directives and taxes. The requirements of the Packaging Waste Directive as proposed by the European Parlement and Council focus on the recycling rates of the countries, not the recyclability of the packaging. However, HEMA contributes to these targets by making its packaging 100% recyclable.
The legislations that the current targets do not cover are the measures of the Single-use Plastic Directive, although it is taken into account in the second pillar of the sustainability strategy. This includes informing consumers about waste management of single-use plastic products (European Parliament, 2019). Apart from this, the Dutch government has the goal to have the Dutch economy run entirely on reusable raw materials by 2050. HEMA should take this into account for the long term. Furthermore, the EU agreed on a packaging waste tax as a part of the coronavirus pandemic recovery package, and the UK introduced its own plastic packaging tax. These apply to HEMA's packaging and could add up to a significant sum.

Apart from analysing the targets and legislation that apply to HEMA, the packaging targets of competitors were analysed as well. The targets of these competitors, which are supermarkets and other own-brand retailers, were compared with HEMA's current targets and are listed in Appendix B. All companies have similar ambitions; these can be summarised into:

- Reduction of packaging in total
- Reduction of plastic
- Sustainably sourced paper
- Recyclable/reusable/compostable packaging
- Recycled/bio-based content
- Eliminate single-use
- Reuse/recycle waste

HEMA's targets are very similar to its competitors' targets. This is partly due to the fact that some of these companies signed the Dutch Plastic Pact as well. However, the target to change to sustainably sourced packaging is not included in the Pact, and it is clear that HEMA used its competitors as an example to set this target. HEMA's targets are very ambitious, more ambitious than some competitors. However, HEMA lacks the ambition to incorporate reusable packaging. Additionally, HEMA does not state anything about recycling or reusing its waste. Although in practice, the secondary and tertiary packaging are recycled as well as the plastic clothing hangers. In summary, this part of the analysis clarifies the foundation HEMA used to determine the current targets. HEMA based its targets on the signed covenant, legislation and the targets of its competitors.

2.3. CONCLUSION ANALYSIS OF CURRENT SUSTAINABLE PACKAGING DEVELOPMENT STRATEGY AT HEMA

This chapter includes the analysis of the current sustainable packaging development strategy. This was done by analysing HEMA's general sustainability strategy, the current packaging targets and the foundation of these targets. There can be concluded that HEMA based the current packaging targets on the signed covenant, legislation and the targets of its competitors. HEMA went further than the Dutch Plastic Pact with a 25% reduction of both plastic and packaging but does not meet the requirement of an average of 35% recycled content when aiming at at least 20%. HEMA complies with most targets and legislation relevant to packaging. However, it does not include reducing the use of chemicals to minimise the impact on human health and the environment, and ensuring the consumers have the relevant information for a sustainable lifestyle. Furthermore, the Single-use Plastic Directive is not included in the targets; however, it is mentioned in the second pillar of the general sustainability strategy. Additionally, HEMA should take the goal of the Dutch government to run entirely on reusable raw material by 2050 and the different taxes on packaging waste into account. When comparing HEMA's packaging targets with its competitors, it is clear that HEMA took those as an example for setting the sustainably sourced paper target. However, HEMA lacks the ambition to incorporate reusable packaging as stated in the Dutch Plastic Pact, competitor's targets, and the Dutch Government's ambition to run entirely on reusable raw materials by 2050. To develop a solution that enables HEMA to formulate a sustainable packaging development strategy, a better understanding of how the current sustainable packaging development targets are directed is needed. The following section includes an overview of who is responsible for packaging within HEMA, how this is managed and the main challenges in changing to a more sustainable portfolio.

3.

ANALYSIS OF CURRENT SUSTAINABLE PACKAGING DEVELOPMENT AT HEMA

The previous chapter analysed the current sustainable packaging development strategy and its foundation. This chapter focuses on the analysis of the current sustainable packaging development at HEMA and how this is managed. This is done by exploring the organisational structure and the current packaging portfolio.

3.1. PACKAGING IN ORGANISATIONAL STRUCTURE

To clarify how packaging is organised throughout the organisation, the relevant parts of HEMA's organisational structure are provided. Figure 2 shows the basic organisational structure. The blue rectangles are teams or functions related to packaging. The sustainability team, in Innovation, Sustainability & Foundation, developed the sustainability strategy and set the packaging targets. The secondary and tertiary packaging used during transport is coordinated by a Packaging Specialist located at the distribution centre. The Packaging Design & Translation team is responsible for the graphics on packaging.

The commercial department, shown in figure 3, is divided into four product units, Planning & Supply chain and the buying desk. The product units are further divided, figure 4 shows the unit apparel. Each category has a category manager who coordinates one or multiple product managers. The product and category managers are responsible for all packaging of the products and develop packaging with suppliers. These managers have to change the current packaging for more sustainable packaging to reach the set packaging targets. They also have to accurately enter the data about their products and packaging in SAP, a software that manages business operations. Within HEMA, there are different ways on how packaging purchasing is managed; the category manager or a purchaser can either do this. However, in general, these managers and purchasers do not have a sustainability background and therefore lack knowledge about sustainable packaging, and some do not find sustainable packaging a priority. The Technical Packaging Specialist helps the category- and product managers with making the packaging portfolio more sustainable.

The Technical Packaging Specialist works under Sourcing and needs to ensure that the earlier described packaging targets are reached. This is done through data management of HEMA's packaging portfolio, helping category- and product managers with packaging choices and pushing for a more sustainable packaging portfolio. The data management includes a quarterly report of the progress on the different targets and the main packaging types that form a problem and have to be addressed the next quarter. The data management and helping the category- and product managers take up two-third of the time and pushing for a more sustainable packaging portfolio about one-third. This thesis is directed from the Sourcing department.

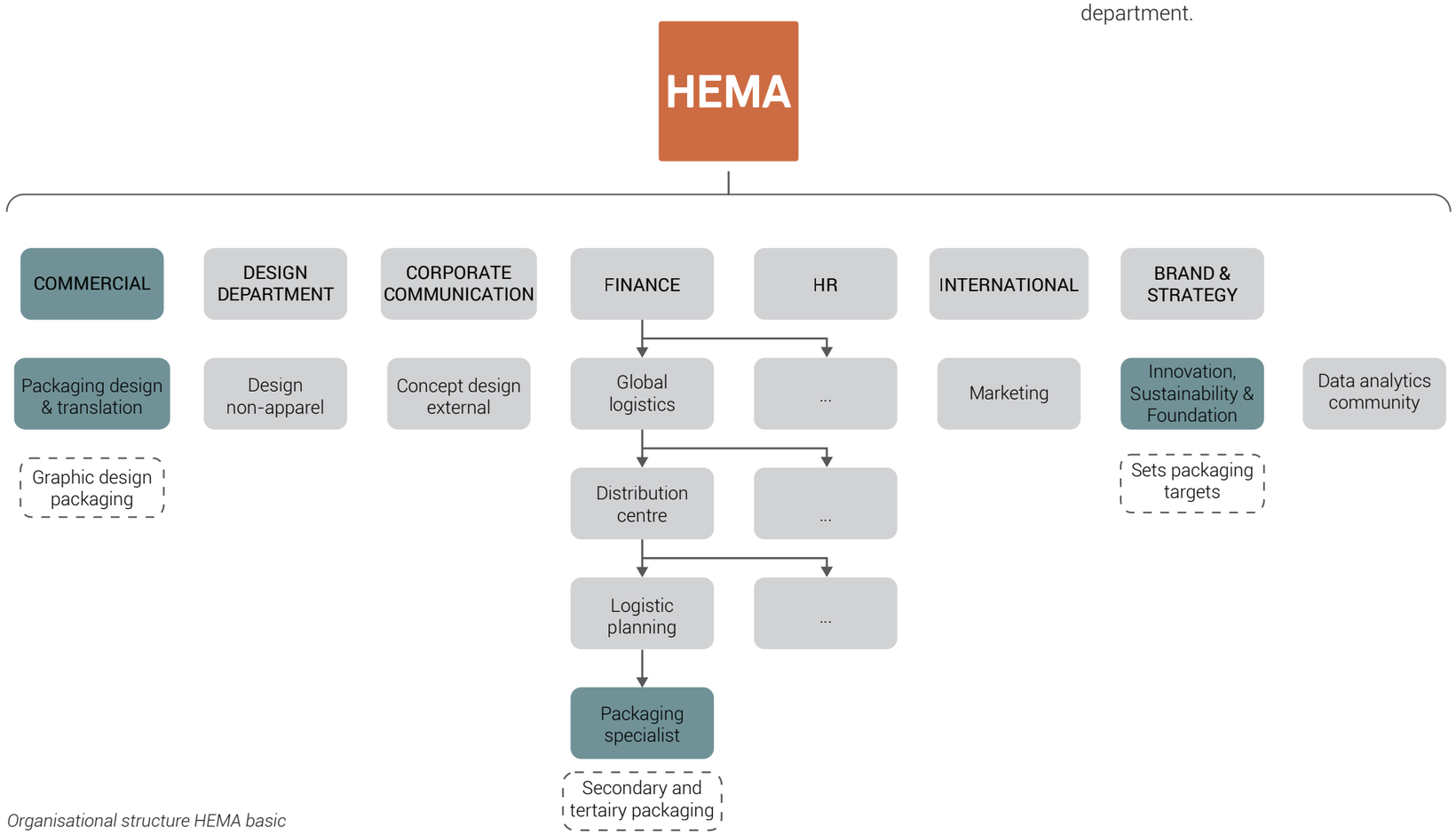


Figure 2 Organisational structure HEMA basic

Eventually, the director of Innovation, Sustainability & Foundation and the Technical Packaging Specialist have to formulate the sustainable packaging development strategy and are the primary stakeholders. The secondary stakeholders are the category- and product managers, purchasers, Packaging design & translation team, Packaging specialist responsible for secondary and tertiary packaging and the board members.

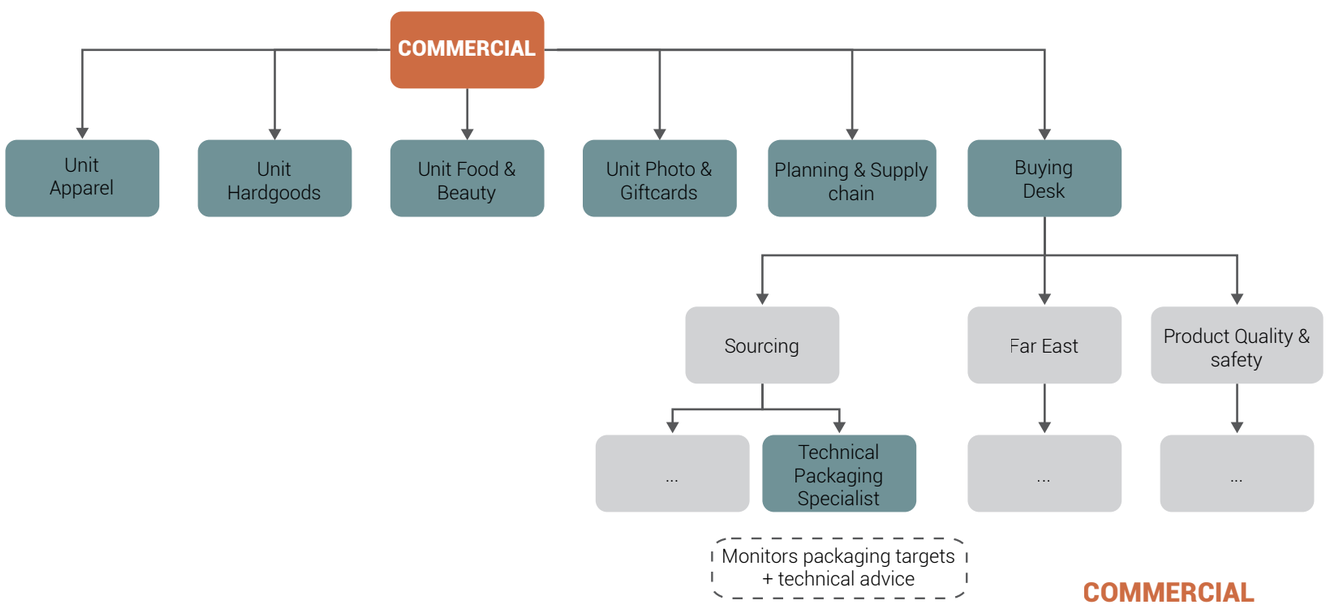


Figure 3 Organisational structure HEMA Commercial

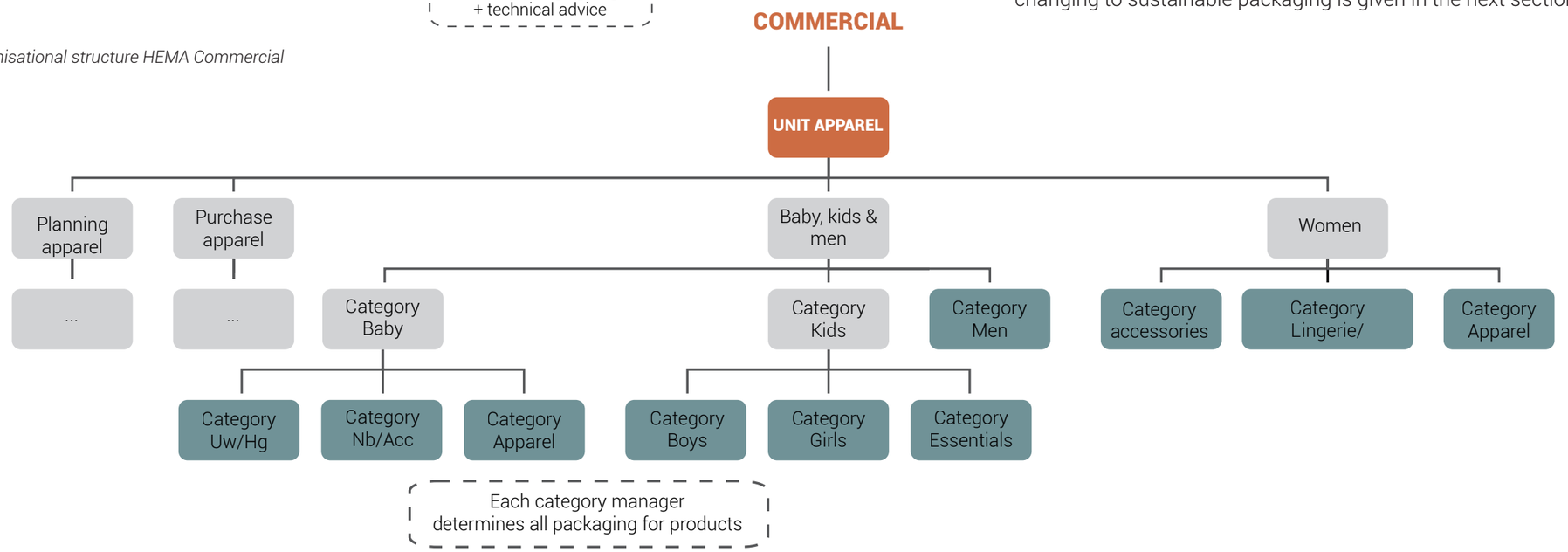


Figure 4 Organisational structure HEMA Unit Apparel

This organisational structure shows that packaging is not developed by one team. It requires close cooperation between different people to develop sustainable packaging and to reach the set packaging targets. Consequently, it will require cooperation between these people to implement the sustainable packaging development strategy. This strategy needs to be developed by the sustainability team in Innovation, Sustainability & Foundation and executed with the help of the Technical Packaging Specialist by product- and category managers and purchasers.

However, the sustainability team in Innovation, Sustainability & Foundation only has four employee functions that focus on sustainability and not on innovation or the HEMA Foundation. These four functions include the director of Innovation, Sustainability & Foundation and the Responsible Production Chain manager, leaving only two functions that focus on the second pillar of the general sustainability strategy where product and packaging are targeted. These functions focus on making the assortment more sustainable, transitioning towards circularity and helping the commercial teams implement sustainability. These functions are at the moment of writing this thesis not filled. Furthermore, the Technical Packaging Specialist only has one-third of the time to push for a more sustainable packaging portfolio. Overall, the resources available to focus on formulating the sustainable packaging development strategy and implementing this strategy are very little for a brand with over 775 stores.

HEMA's packaging portfolio has to change to reach the current targets and meet the requirements of future sustainable packaging development strategies. Therefore insight into the current packaging portfolio, how this is managed and the main challenges around changing to sustainable packaging is given in the next section.

3.2. MANAGEMENT PACKAGING AT HEMA

To provide a solution that helps HEMA formulate a sustainable packaging development strategy, the current packaging portfolio and how this is managed needs to be explored. HEMA has a broad packaging portfolio with more than 850 different types of packaging for more than 32.000 products. HEMA divided packaging into three groups: The consumer packaging is referred to as Sales Unit (SU) (primary packaging), multiple Sales Units are packed in a Picking Unit (PU) (secondary packaging), and multiple Picking Units are packed in Transport Packaging (TPP) (tertiary packaging). This packaging structure is shown in figure 5. The number of Sales Units in a Picking Unit depends on the demand of the smallest stores. For example, if the smallest store needs a delivery with only two boxer shorts of size M, only two boxer shorts are combined in a Picking Unit. This packaging structure results in a lot of plastic waste for the bigger stores, which might need more boxer shorts of size M. Furthermore, E-commerce does not have its own supply chain. Therefore, all customers will receive this plastic as well when ordering a product, which gives HEMA a bad sustainability reputation. The SU differs per product, but the PU is, for most products, a transparent LDPE polybag, so the articles inside can be scanned in the distribution centre, and the products are kept clean during transport. The TPP is a Fefco 0201 box, or American folding box, made from corrugated board. These different types of packaging are used during different stages in the supply chain.

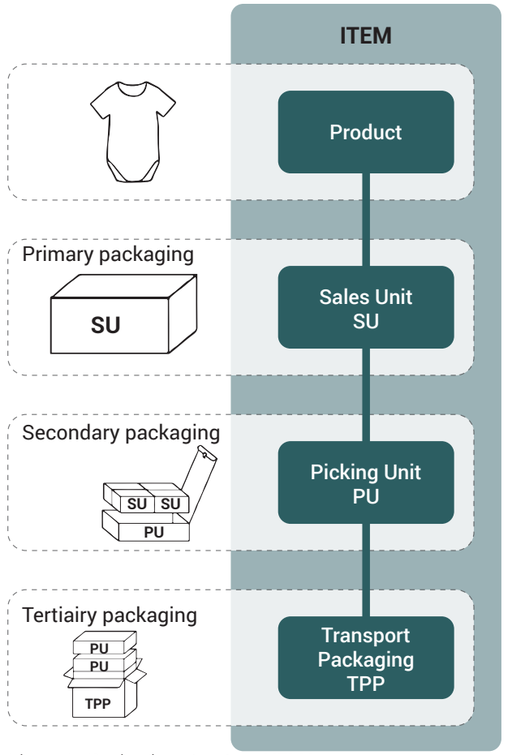


Figure 5 Packaging structure HEMA

As mentioned earlier, the category- and product managers are responsible for the packaging of their designed products. In the design phase, the product is designed or developed first, after which fitting packaging is chosen. Most suppliers for products are located in China, apparel in Bangladesh and food in the Netherlands. The suppliers need to deliver their products with SU, PU and TPP. They either produce the packaging themselves or use a packaging manufacturer. Therefore, HEMA depends on the capability of the suppliers when it comes to changing to sustainable packaging. Some supplier may not have access to new techniques or production methods to realise more sustainable packaging. The biggest hurdle in developing sustainable packaging is price. Often sustainable packaging is more expensive than its counterpart, especially when new materials or techniques are developed, and does not fit within HEMA's margins. The price is leading at HEMA; sustainability is not equally important. Apart from that, it often takes time to change to a more sustainable option or set up a new project. Therefore, the category- and product managers have to start planning the change to sustainable packaging in advance to be on time for the ordering.

The suppliers ship their packaged products to the Netherlands, primarily by boat, after which it is distributed to the distribution centre in Utrecht. Here the carton TPP is removed, which will be recycled, and the PUs are divided into different crates. The crates are distributed by truck to the stores. The PU, the LDPE polybag, is removed in the store before displaying the Sales Unit. The polybags are sent back to the distribution centre and are recycled. The PU and TPP are optimised for the distribution process and the system in the distribution centre. Therefore this thesis only focuses on the SU, the primary packaging.

The packaging data of HEMA's packaging portfolio needs to be managed to change to a more sustainable packaging portfolio. In 2019, a reorganisation of the packaging database and its reporting took place. This reorganisation allows for clear insights into the amounts and weight of purchased and sold packaging. These insights help to keep track of HEMA's packaging sustainability targets every quarter. The amount of packaging material sold in 2019 is shown in table 1. The three main materials, all roughly one third, are paper and cardboard, plastic and glass.

Amount of packaging sold in 2019
1.997.316 kg paper & cardboard
1.767.892 kg plastic
2.107.125 kg glass
135.632 kg aluminium
84.894 kg other materials

Table 1 Amount of sold packaging at HEMA in 2019 (HEMA, 2019)

3.3. CONCLUSION ANALYSIS OF CURRENT SUSTAINABLE PACKAGING DEVELOPMENT AT HEMA

This chapter analysed current sustainable packaging development at HEMA. This was done by analysing the organisational structure and the current packaging portfolio and how this is managed. There can be concluded that the main challenges that currently occur with sustainable packaging development are the price of new sustainable materials and techniques, the supplier's capability to produce these sustainable options, the time it takes to change packaging, and the lack of knowledge among purchasers and category- and product managers about sustainable packaging. Furthermore, very few resources are available to push for a more sustainable packaging portfolio and develop future strategies. The next chapter focuses on the brand HEMA and how sustainability is integrated into the brand.

4.

BRAND ANALYSIS

The previous chapters explored the current sustainable packaging development strategy and how the current packaging is developed and managed—this chapter analysis the brand HEMA and how sustainability is integrated into the brand. The analysis is performed through the brand position and the brand identity of HEMA, both using models of Kapferer. Lastly, the term most sustainable value variety brand is researched.

4.1. BRAND POSITION

In 2019, HEMA started the transition from a Dutch retailer to a global lifestyle brand (HEMA, 2019). This transition means that the HEMA is becoming a product-oriented instead of a store-oriented organisation. HEMA did and continues only to sell its own brand. The transition suits HEMA very well since the products are designed and developed in-house. Through new forms of collaboration with supermarkets and online retailers, HEMA makes sure that the HEMA brand is available to customers everywhere. Due to this shift from retailer to global brand, it is advantageous to analyse the brand HEMA and how sustainability is integrated.

The term brand needs to be explained to understand the brand position and brand identity. According to Keller, "a brand is a set of mental associations, held by the consumer, which adds to the perceived value of a product or service" (Keller, 2013). Kapferer clarifies that 'a brand is not the name of a product, but the vision that drives the creation of products and services under that name' (Kapferer, 2008). Combining these point of views leads to the following definition of a brand:

A brand is a vision that stimulates the creation of products and services, which results in a collection of mental associations, kept by a customer, that contribute to the perceived value of these products and services.

Now that the definition of a brand is clear, HEMA's brand position will be explored. According to Kapferer, the brand position creates a preference in a specific market at a specific time for its products by emphasising the distinctive characteristics that are different from its competitors and are attractive to the public. Brand positioning is essential since consumer choices are made on comparison; it explains why HEMA's products are the best choice. The goal is to identify and take a strong purchasing rationale that gives an advantage (Kapferer, 2008). Kapferer describes a diamond model, based on the four pillars For what, For Whom, Against Whom and Why, to determine the brand position. The answers on each pillar are retrieved from HEMA reports ((HEMA, 2019), (HEMA, 2018), (HEMA, 2016)) and are shown in figure 6.

In conclusion, HEMA's brand position shows that HEMA is a brand on the market for money-conscious consumers, making daily life better, easier, and more fun through simple functional but affordable own designed products while competing with other value brands in the same market. The following section will explore the brand identity and how sustainability is integrated into the brand HEMA..

4.2. BRAND IDENTITY

This section explores HEMA's brand identity to get a more detailed picture of the brand HEMA and how sustainability is integrated. Brands distinguish themselves from competitors through brand identity, a common feature that sends a single message across a wide range

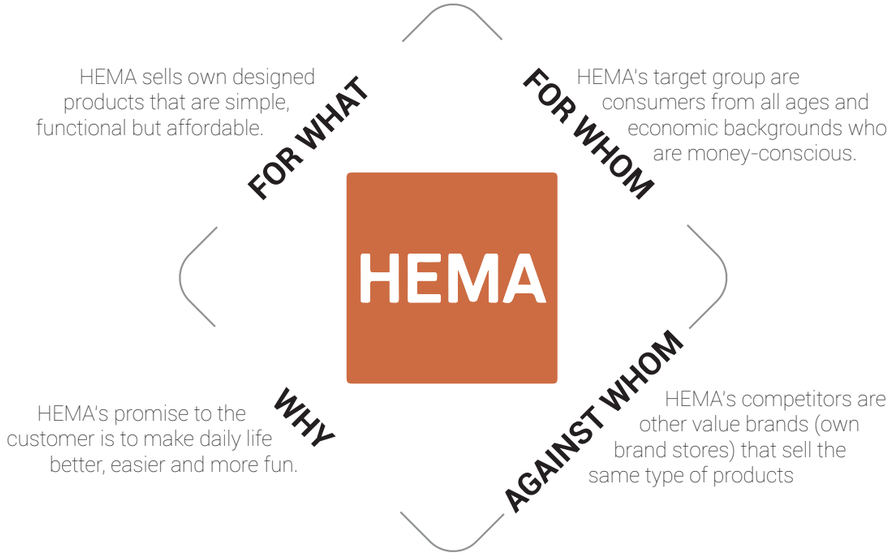


Figure 6 Brand position HEMA, using the diamond model by Kapferer

of products, actions and communications. Brand identity differs from brand image, where brand image focuses on how a brand is perceived on the receiver's side; the purpose of brand identity is to specify the brand's meaning, aim, and self-image (Kapferer, 2008). Kapferer explains that brand identity has six assets, which together form the Brand Identity Prism (BIP). The BIP is used to define HEMA's brand identity and is shown in figure 7. The corresponding answers to the assets are retrieved from HEMA reports ((HEMA, 2019), (HEMA, 2018), (HEMA, 2016)).

1. **Physique:** This includes the physical specificities and qualities of a brand, also described as the tangible added value. For HEMA, this is Dutch-designed, simple, functional products of high quality. Examples of corresponding HEMA values are 'We keep things simple' and 'Quality in everything we do'.
2. **Personality:** By communicating the personality, it builds up a character, the kind of person the brand would be if it were human. The consumer perceives HEMA as reliable, optimistic and unique (HEMA, 2019). The HEMA values related to this is are 'We do what we say', which indicates reliability and 'Act as an entrepreneur' for which optimism is needed.
3. **Culture:** A brand is a culture, and much more than product benefits or personality, they are an ideology for people that share the same ideas, ideals and values. Culture is the most important asset of brand identity. The value 'We win together' implicates a culture of teamwork to reach the desired goal. 90% of Dutch citizens shop at HEMA at least once a year (HEMA, 2016). HEMA is made accessible and affordable for everyone and is close to Dutch culture. Dutch are known to be greedy, HEMA is cost-conscious and is sales-driven, the value 'Every penny counts' fits this perfectly.
4. **Relationship**: Brands are a relationship; they are often at the heart of transactions and exchanges between people. HEMA's value, 'Our customer first', strengthens the

customer relationship. Within this relationship, HEMA aims to 'Making daily life better, easier and fun' for their customers (HEMA, 2019) while offering a fair exchange of value and clear communication.

5. **Reflection:** A brand is a customer reflection; the customer must be reflected as he or she wants to be seen as a result of using a brand. This reflection is not the actual target group but instead how the target group wants to be perceived. HEMA's target group wants to act according to the norm.
6. **Self-image:** This reflects the targets own internal mirror. Customers create an inner relationship with themselves through an attitude towards a specific brand. HEMA's customers are located in an inclusive target group, from young to old and from all economic backgrounds, but generally, they are money-conscious.

Although HEMA is typically Dutch, it does not only target Dutch customers since the brand has expanded to other parts of the world. The latter is the reason that HEMA's customers might not reflect as typically Dutch.

Sustainability is integrated into the brand HEMA by the adjective 'better' in the value 'making daily life better, easier and more fun'. Better refers to better for the environment by reducing the negative impact, better for people by increasing social impact and better for the consumer by sustainably sourced materials and designing products that last (HEMA, 2019). However, sustainability is not as well integrated into the brand as other values. The value 'every penny counts' is the most important to HEMA.

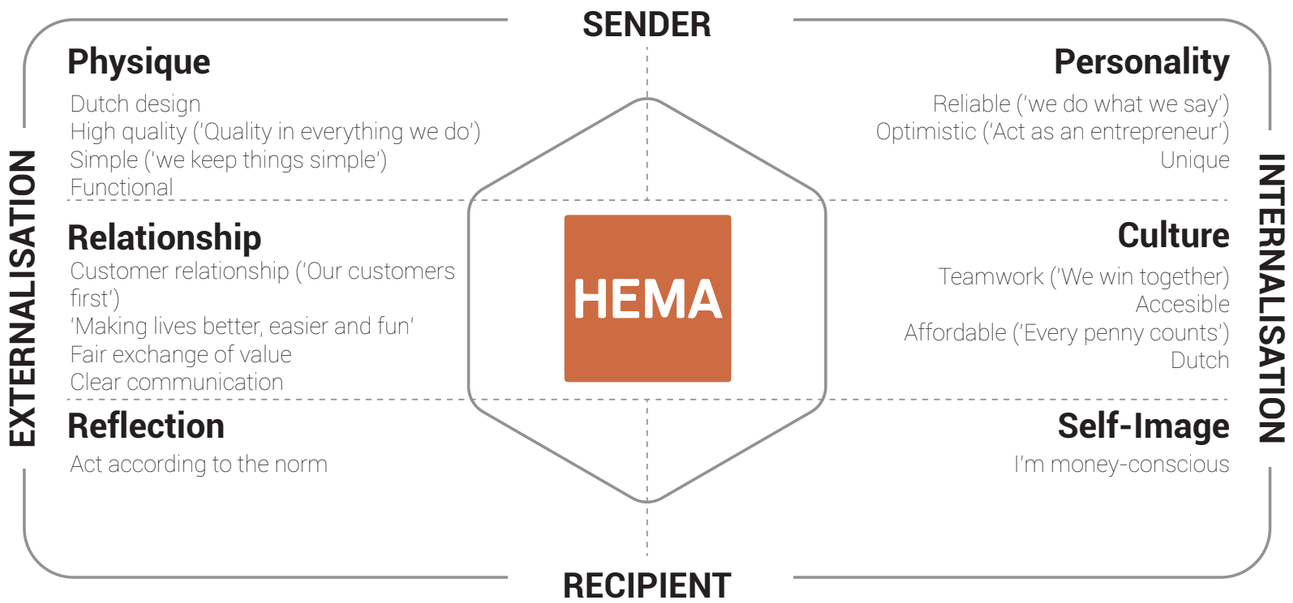


Figure 7 Brand identity HEMA, using Brand Identity Prism (BIP) by Kapferer

HEMA distinguish itself from competitors through its brand identity by sending a single message across a wide range of products, actions and communications. This message can be concluded as simple and functional Dutch-designed products of high quality that are accessible and make daily life better, easier and more fun for its consumers at an affordable price. In this message, 'better' refers to sustainability for the planet, people and consumers. With these products, HEMA wants to be perceived as reliable, optimistic and unique by money-conscious consumers. HEMA wants to develop sustainable products for the planet, people and consumers and desires to become the most sustainable value variety brand. The following section explores this term.

4.3. THE MOST SUSTAINABLE VALUE VARIETY BRAND

Apart from its focus on the current general sustainability strategy and the current packaging targets, HEMA desires to become 'the most sustainable value variety brand'. From being a brand doing sustainability to a sustainable brand. A value variety brand is a brand or a retailer that only sells its own brand, that offers affordable products with a lot of variety in its product portfolio. HEMA has a lot of variety in its portfolio and sells all sorts of products from food, self-care products and clothes to household appliances, study material and toys. The term most sustainable means that HEMA is the most sustainable compared with competitors. The most sustainable value variety brand sits at the crossline between price, sustainability and design. The most sustainable value variety brand always aims at the most sustainable option within its financial margins.

The definition of most sustainable value variety brand can be summarised into:

The most sustainable value variety brand is a brand that offers a wide variety of affordable products, including packaging, that are most sustainable in their price range and scope of assortment on the market while always aiming at the most sustainable option.

To understand HEMA's position as the most sustainable value variety brand better, HEMA is compared with its competitors. The targets of HEMA's competitors were already researched in chapter 2. HEMA distinguishes two competitor segments, the leaders and the followers. Figure 8 shows the two competitor segments and HEMA's position in relation to those. The followers are the competitors that HEMA wants to leave behind, such as Action (which is also not an own-brand store), Primark, Zeeman and Miniso. HEMA is inspired by the leaders in the field of sustainability, such as IKEA and H&M.

The term most sustainable value variety brand sounds very promising, but it does not work out when laid next to the competitor segments. HEMA wants to be the most sustainable in their price range while following the leaders on sustainability. However, these leaders on sustainability are in the same market and price range as HEMA, making it impossible for HEMA to become the most sustainable in this price range. HEMA argues that these competitors are not variety brands, which makes HEMA the only value variety brand and

automatically makes them the most sustainable value variety brand. This rationale is illogical; the term ‘to become the most sustainable value variety brand’ needs to be critically looked at by HEMA's policymakers.

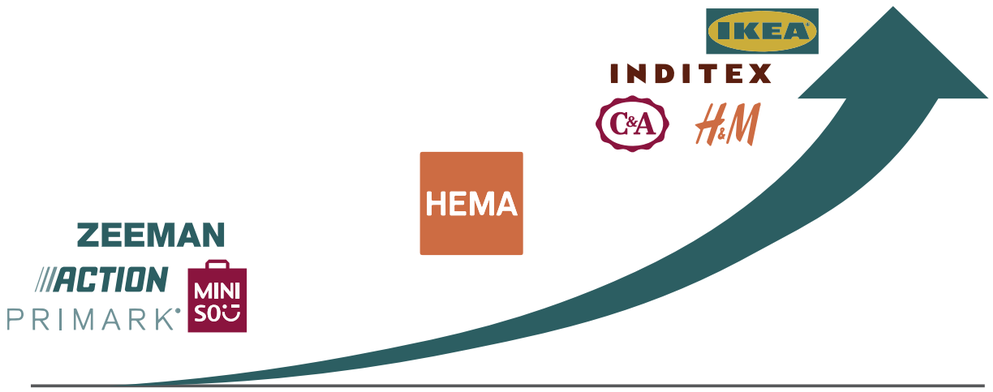


Figure 8 Two competitor segments HEMA

4.4. CONCLUSION BRAND ANALYSIS

This chapter focuses on the analysis of the HEMA brand and how sustainability is integrated through its brand position and brand identity. Additionally, the term the most sustainable value variety brand is explored.

HEMA has the desire to become the most sustainable value variety brand; however, the definition of this term does not work in practice. HEMA can not be the most sustainable value variety brand in a certain price range if it follows the leaders on sustainability that are in the same price range. This term needs to be reconsidered by HEMA's policymakers. Additionally, this desire is not incorporated into the general sustainability strategy, although it might be included in the to be developed circular action plan. Furthermore, the most sustainable value variety brand does not match with HEMA's sustainable packaging development strategy. The current targets are based on the signed covenant, legislation and competitor's targets. These need to be considered when formulating a sustainable packaging development strategy; however, HEMA is now dependent on them. When dependent on others, HEMA cannot formulate a strategy after the targets of 2025 on its own, which does not match the ambition to become the most sustainable value variety brand.

Furthermore, the organisational structure shows that there are very few resources available to formulate a sustainable packaging development strategy and execute this. HEMA cannot become the most sustainable value variety brand when only having these few resources available to do so. Moreover, the product- and category managers and the purchasers responsible for packaging their products lack the needed sustainable packaging knowledge. Additionally, the brand analysis concluded that sustainability is not well integrated into the brand HEMA. With the discrepancy between the values price and sustainability, it will be hard to push for a more sustainable packaging portfolio and become the most sustainable value variety brand. In conclusion, HEMA desires to become the most sustainable value variety brand; however, the term does not work in practice and does not match with HEMA's sustainable packaging development strategy and its execution. Since HEMA is dependent on others for target setting, has very few resources to formulate and execute a sustainability strategy, the people responsible for packaging lack the required knowledge and because there is a discrepancy between the values price and sustainability in the brand. To develop a solution to help HEMA formulate a sustainable packaging development strategy that is not dependent on others, theories about sustainable packaging development will be explored in the next chapter.

5.

THEORY SUSTAINABLE PACKAGING DEVELOPMENT

Currently, HEMA is dependent on others to formulate its targets. To develop a solution for HEMA to formulate a sustainable packaging development strategy that is independent of others, this chapter focuses on exploring theories about sustainable packaging development. First, different definitions of sustainable development and sustainability are explored. Next, the terms eco-efficiency and eco-effectiveness are explained. Lastly, the role of packaging and its functions within sustainable development is investigated.

5.1. DEFINITION SUSTAINABLE DEVELOPMENT

To develop a solution to help HEMA with formulating a sustainable packaging development strategy, different definitions of sustainable development are explored. The term sustainable development is interpreted broadly; therefore, this section will discuss multiple definitions of sustainable development and sustainability from literature.

In 1987 the definition of sustainable development was introduced by the World Commission on Environment and was described as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (Brundtland, 1987). This means that the development that facilitates the current needs should not destroy the ability of future generations to meet their needs.

To make sure that the future generations are able to meet their needs, the planet needs to be preserved for these generations. How to preserve the earth is described by the Planetary Boundary approach (PB), introduced in 2009 by the Stockholm Resilience Centre (Steffen et al., 2015). The Planetary Boundaries, shown in figure 9, define a safe operating space for humanity to thrive while staying within the resilience of the earth. Crossing these boundaries could result in irreversible environmental changes with great consequences, which could affect the needs of future generations. Therefore, it is of great importance that product and packaging that facilitate the needs of the present are developed within the resilience of the earth to preserve the planet for future generations.

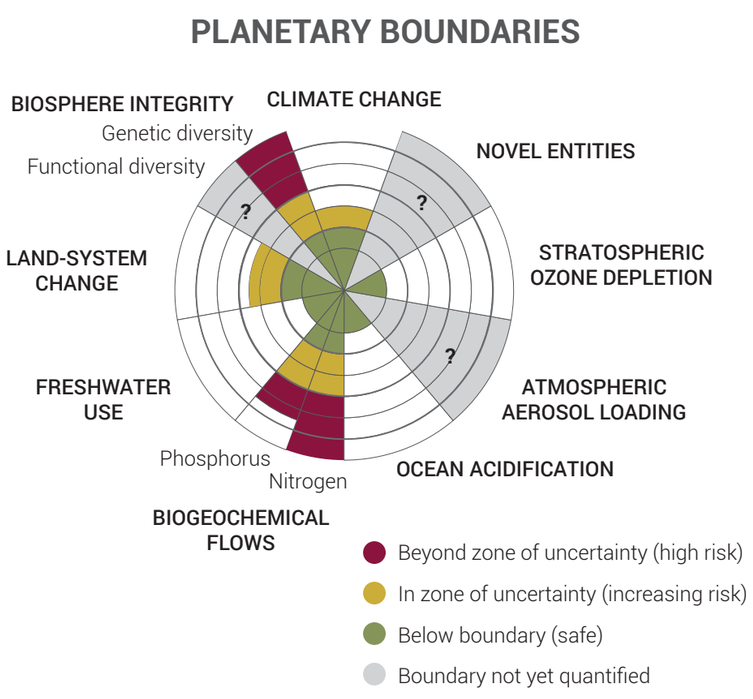


Figure 9 The Planetary Boundaries by the Stockholm Resilience Centre (Steffen et al., 2015)

BACKGROUND INFORMATION PLANETARY BOUNDARIES

Back in 1798, Thomas Malthus already discovered that the exponential growth of the human population was going to exceed the ability of the planet to sustain (Hauschild, Kara, & Røpke, 2020). The ability of the planet with its corresponding boundaries is described in the Planetary Boundary (PB) approach (Steffen et al., 2015). The problem the authors describe is taking place in the Holocene phase, the current period that started 12.000 years ago, which is the only period in earth's history that can support human development and is now threatened by human activities. To keep this period stable, a framework with nine Planetary Boundaries is developed, shown in figure 9. These boundaries describe a safe operating space for human activity while staying within the resilience of the earth. The PBs, including the release of greenhouse gases to the atmosphere, use of land, and nutrient cycling, are essential for self-regulation of central planetary processes to ensure a stable earth system. The green zone represents the safe zone where humanity can thrive; the yellow zone is uncertainty, where risk is increased, and the red zone is the high-risk zone. The Planetary Boundaries lay on the crossline between the green and the yellow zones. Crossing these boundaries could result in irreversible environmental changes with great consequences for the earth. Five Planetary Boundaries have already been crossed, and three have exceeded into the red zone. The Planetary Boundaries are not equal to global thresholds but are placed well before the tipping point to respect the estimated threshold's accuracy and give society time to react to early warnings (Steffen et al., 2015).

Apart from the Brundtland definition, the definition of sustainability defined by John Elkington in 1994 is widely adopted. Elkington describes sustainability with the triple bottom line, a model that incorporates three dimensions of performance: social, environment and economy, also known as people, planet and profit. This model, shown in figure 10 was introduced to measure performance in corporate America and went beyond the traditional measures and suggests that there is not just one bottom line, profit, but three, which are all equally important (Elkington, 1994). This means that apart from focussing on the environment, social and economic aspects need to be considered. However, Mitchell argued this concept in 2000 and came with a different representation of the relationship between these three terms (Mitchell, 2000).

Figure 10 Triple bottom line model (Elkington, 1994)

As a response to Elkington's model, Mitchell defined sustainability with the relation between environment, society and economy in the form of a concentric model (Mitchell, 2000), shown in figure 11. This model is based on the constraints set by the environment. The needs of the society can only exist within the constraints of available resources, and consequently, the economy can only exist in the constraints of the society. Since society and economy will directly be influenced, this research will only focus on the environment. The constraints of the environment are described by the PBs. The next section will discuss what needs to be done so products and packaging could be developed within the constraints of the environment.

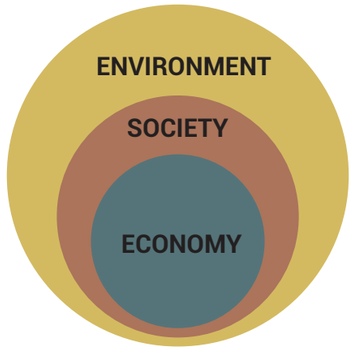


Figure 11 Concentric model (Mitchell, 2000)

5.2. ECO-EFFICIENCY AND ECO-EFFECTIVENESS

Sustainable development focuses on development within the constraints of the environment and meeting the needs of the present without compromising for future generations. When looking at these constraints in the form of the Planetary Boundaries, of which three are already crossed, it highlights the need for structural changes. To stay within the constraints of the environment, the absolute environmental impact of man-made inventions needs to decrease by increasing the efficiency of the use of resources (Mitchell, 2000). Hauschild estimates a needed efficiency increase of factor 10 between now and 2050 to keep the global temperature rise below 2 degrees Celsius and up to a factor 50 to reach the limit of 1,5 degrees Celsius as in the Paris agreement (Hauschild et al., 2020). Making more efficient use of resources is called eco-efficiency; this section highlights the importance of increasing eco-efficiency and eco-effectiveness.

5.2.1. ECO-EFFICIENCY

Eco-efficiency is needed to reduce the environmental impact of products and packaging, to stay within the constraints of the environment. Eco-efficiency was first coined by the World Business Council for Sustainable Development in 1992 and is a management strategy that combines environmental and economic performance (Madden, Young, Brady, & Hall, 2005). It means that businesses use natural resources more efficiently and create more value with less impact. The ISO standard 14045:2012 describes eco-efficiency as an "aspect of sustainability relating the environmental performance of a product system to its product system value" ("Environmental Management - Eco-Efficiency Assessment Of Product Systems - Principles, Requirements And Guidelines," 2012). The aim is to have a high eco-efficiency resulting in products that offer more functionality per amount of resources or environmental impact (Hauschild et al., 2020). In other words, increasing eco-efficiency is decreasing the environmental impact per product or packaging. To preserve the planet for future generations, the development of current products and packaging needs to stay within the environmental constraints. Since some PBs are already crossed, the absolute environmental impact of man-made innovations needs to decrease. For this, the environmental impact of the products or packaging needs to be minimised by increasing eco-efficiency.

IN-DEPTH INFORMATION ECO-EFFICIENCY

IPAT equation

The reason behind why the environmental impact of man-made innovations needs to decrease to stay within the constraints of the environment is shown in the IPAT equation. This equation was developed in the 1970s to focus attention on the key factors driving man-made environmental impact and is based on the work of Ehrlich, Holdren and Commoner. It shows the total absolute environmental impact (I) that is based on three main factors, total human population (P), affluence (A), in other words, the material standard of living or the number of products per person, and technology (T), the total amount of environmental impact per product or the inverse of eco-efficiency, (Hauschild et al., 2020).

$$I = P * A * T$$

When the world's population (P) and affluence (A) grow, which is currently the case, the eco-efficiency of that product or technology also needs to grow, which is the inverse of technology (T), to prevent increased environmental impact (I). To stay within the constraints of the environment, the absolute environmental impact needs to decrease. As earlier stated, the eco-efficiency of the technology needs to increase by a factor 10 to keep the global temperature rise under 2 degrees Celsius.

Rebound and backfire effect

Eco-efficiency focuses on the reduction of environmental impact. Despite making products or packaging more eco-efficient, it does not always reduce resource use or environmental impact. For example, manufacturing a car with greater fuel efficiency will result in more miles driven, leading to greater net fossil fuel consumption than initially. The smaller than expected decrease in environmental impact, even though an increase in eco-efficiency is present, is better known as the rebound effect (Hauschild et al., 2020). Another cause of this effect is the cycle of investments and demand. For instance, when a new more eco-efficient technology is introduced, the price decreased due to investments, which results in demand stimulation and further investments and ultimately, this technology replaces the old technology.

When the technology changes result not in a smaller than expected decrease in environmental impact but result in an increased environmental impact, it is referred to as the backfire effect. On the other hand, the environmental savings could also be greater than expected; this is referred to as the reverse rebound effect (Chenavaz, Dimitrov, & Figge, 2020).

Due to the rebound and backfire effect, eco-efficiency will not be enough to preserve the planet for future generations. There is a need to analyse the overall outcome of a product or technology's environmental impact to ensure that it is not only more sustainable than what they replace but sustainable in absolute terms (Hauschild et al., 2020).

To decrease the environmental impact of products or packaging, the cause of the environmental impact needs to be determined. This is done by a Life Cycle Assessment (LCA), which captures potential problems that occur between life cycle stages and between categories of environmental impact when products are compared on sustainability (Hauschild et al., 2020). Within an LCA approach, the product life cycle can be viewed as a black-box process, where only interactions with its surroundings occur at clearly stated points. Accordingly, from an environmental point of view, it does not matter what happens inside the life cycle; only the substances crossing the system boundaries between the world and the product life cycle are essential and used for an LCA[1]. Examples of these substances are electricity as input and CO2 emissions as output. This principle is shown in figure 12 Increasing eco-efficiency will lower the environmental impact; however, substances will always cross the system boundary and continue to harm the environment (McDonough & Braungart, 2002). While an increase in eco-efficiency is needed to ensure a certain level of environmental impact is met, a focus on this alone is not enough. A shift towards eco-effectiveness is required (Hauschild et al., 2020).

5.2.2. ECO-EFFECTIVENESS

Eco-effectiveness targets the optimisation of products' positive environmental impact. It proposes the transformation of products so that it has a supportive relationship with ecological systems and future economic growth (Ellen MacArthur Foundation, 2012). Eco-effectiveness can be divided into two directions. First, it would mean endless cycles of materials without loss of quality, and second the opportunity to provide a positive environmental impact (de Koeijer, Wever, & Henseler, 2017). The latter is, for example, providing nutrients to the soil instead of polluting the soil with plastic. The focus shifts towards designing in a way that waste becomes nourishing, where waste of one system is food for another (McDonough & Braungart, 2002).

1 Retrieved from Ir. Marten Toxopeus Product Life Cycle lectures, 2019.

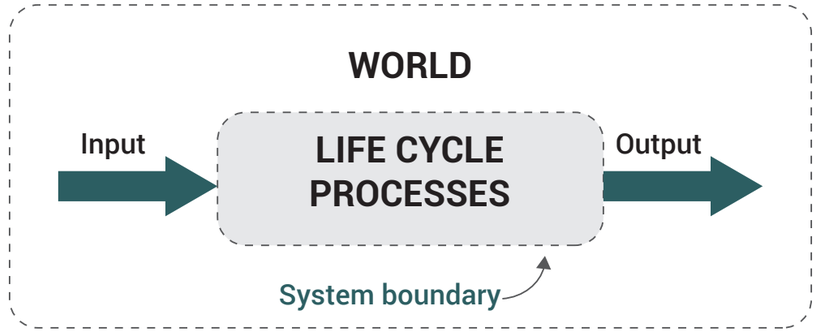


Figure 12 LCA black-box principle

5.2.3. RELATIONSHIP BETWEEN ECO-EFFICIENCY & ECO-EFFECTIVENESS

Eco-efficiency is described as using natural resources more efficiently and creating more value with less impact. Whereas eco-effectiveness is focussed on the positive impact on the environment and achieving endless cycles of resources without loss of quality. The relationship between eco-efficiency and eco-effectiveness is visualised in figure 13.

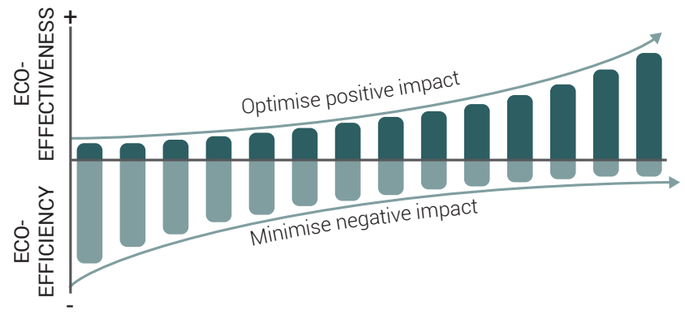


Figure 13 Relationship between eco-efficiency and eco-effectiveness (de Koeijer et al., 2017)

To preserve the earth for future generations, products and packaging that fulfil the needs of the present need to be developed within the constraints of the environment. Since some PBs are already crossed, the absolute environmental impact of man-made innovations needs to be minimised by increasing eco-efficiency. Eco-efficiency can be defined as minimising the input and output of the system. However, only focussing on eco-efficiency is not enough. It can lead to an increase in consumption, and it will still allow substances to cross the system boundary, which can harm the environment. Therefore, a shift towards eco-effectiveness is needed by maximising the use of resources and maximising the positive impact. The role of packaging within these constraints is discussed in the next section.

5.3. PACKAGING WITHIN SUSTAINABLE DEVELOPMENT

As the previous section concluded, the eco-efficiency and eco-effectiveness of products and packaging have to increase. The definition of packaging was earlier given in chapter 2, and described which functions packaging needs to fulfill. The relation between the impact on the environment and packaging functions is further explained in this next section.

5.3.1. FUNCTIONS PACKAGING

The way packaging fulfils its functions can have a negative impact on the environment. As earlier mentioned in chapter 2, Ten Klooster divided the direct packaging function that packaging needs to fulfil into five groups (ten Klooster et al., 2018):

- To inform
- To contain the content of the packaged product
- To Facilitate transport, storage and transhipment of the packaging-product combinations
- To protect from the environment, the product or the packaging-product combination
- To facilitate consumption and end-of-use

The extent to which the packaging fulfils its functions affects the significance of the environmental impact. For example, when the consumer is not or incorrectly informed about waste management, when the volume affects the number of shipped products per truck, when the packaging does not protect the product well enough or when the packaging is not separable in regular recycling streams, the environmental impact increases.

Packaging is often seen separate from the product and is repeatedly negative daylight when it comes to sustainability due to the perception of enormous amounts of packaging and packaging waste (de Koeijer et al., 2017). However, these opinions are based on features that become visible after purchase in the later stages of the supply chain. By viewing packaging separate from its contained product, the functions a packaging fulfils in a supply chain are ignored and with that, the integration of product and packaging. Packaging should not be viewed separately from the product; instead, it should be seen and developed as a product-packaging combination (de Koeijer et al., 2017).

Without packaging, it would be extremely difficult to distribute the products to the consumer in a state they are intended to be (de Koeijer et al., 2017). Product protection is one of the main functions of packaging; this could be hazardous bacteria, mechanic pressure or UV light. The environmental impact of the product-packaging combination is highly influenced by the ability of the packaging to protect the product.

Often, a product has a bigger environmental impact than the packaging, when losing the product due to lack of protection by the packaging, the environmental impact will be substantially greater (KIDV). Using fewer resources for a product-packaging combination by increasing eco-efficiency could result in a lack of protection. This is also called underpacking.

In 1990 Kooijman stated: 'To pack, not too much, not too little, just enough' (Kooijman, 1990). When not done so and a product is under- or overpacked, the environmental impact of the product-packaging combination increases. This relation is visualised by the Optimum Pack Design, also known as the Soras Curve, developed by Innventia AB and shown in figure 14. This curve illustrates an optimum amount of material in packaging that ensures a sustainable balance between reducing packaging and loss of product (Retail Forum for Sustainability, 2011). The curve shows that reducing the impact of packaging can increase the total impact of the product-packaging combination. Therefore, the packaging should just fulfil its functions to reach the Optimum Pack Design.

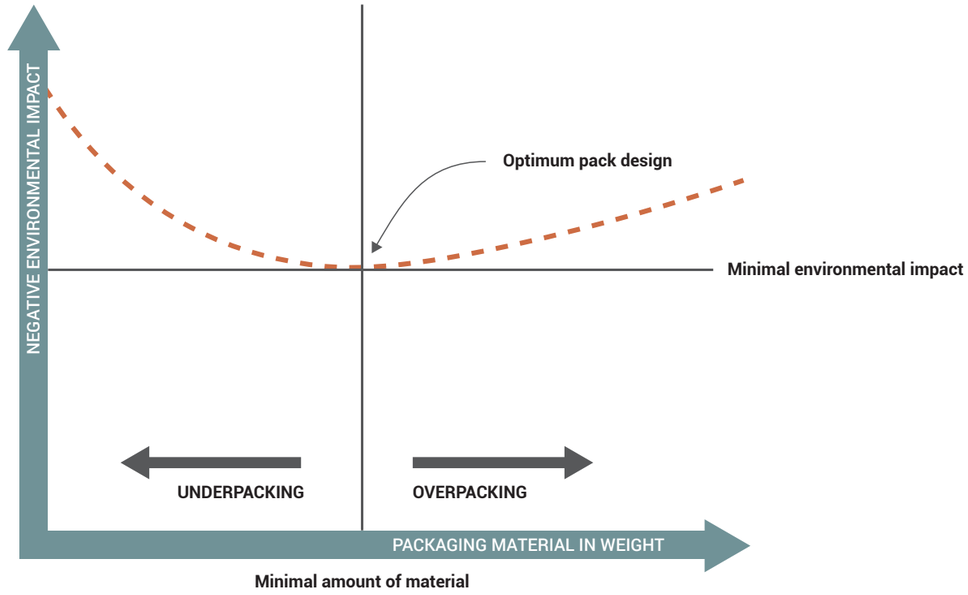


Figure 14 Optimum Pack Design (Retail Forum for Sustainability, 2011)

Not only protection should be considered, every other function during the life cycle of the product-packaging combination is important to prevent an increase in environmental impact. For example, the consumption phase can increase the environmental impact dramatically when food is lost during or after consumption (Wikström, Williams, Verghese, & Clune, 2014). Currently, HEMA sees the product separately from the packaging instead of as a product-packaging combination. In the design phase, the product is designed or developed first, and the packaging is0 relatively late incorporated into the design phase.

The functions of packaging highly influence the environmental impact of the product-packaging combination. It is of great importance that the eco-efficiency and eco-effectiveness of the product-packaging combination increase to reduce the environmental impact and stay within the constraints of the environment. However, the packaging needs to fulfil its functions, as described by Ten Klooster. Not doing this optimally by over- or underpacking, the environmental impact can be greater. So, to stay within the constraints of the environment, the

eco-efficiency and eco-effectiveness of the product-packaging combination have to increase while making sure its functions are fulfilled.

5.4. CONCLUSION THEORY SUSTAINABLE PACKAGING DEVELOPMENT

To develop a solution to help HEMA with formulating a sustainable packaging development strategy that is independent of others, this chapter described different theories on sustainable packaging development. There can be concluded that the earth needs to be preserved for future generations; therefore, products and packaging that fulfil the needs of the present need to be developed within the constraints of the environment. Since some PBs are already crossed, the absolute environmental impact of man-made innovations needs to be minimised by increasing eco-efficiency. However, this can lead to an increase in consumption, and it will still allow substances to cross the system boundary, which can harm the environment. Therefore, a shift towards eco-effectiveness is needed by maximising the use of resources and maximising the positive impact. When increasing eco-efficiency and eco-effectiveness, the product-packaging combination should be seen as a whole. The functions that packaging fulfils highly influence the environmental impact of the product-packaging combination. When the packaging does not fulfil its functions optimally, by over- or underpacking, the environmental impact can be greater. Therefore, to stay within the constraints of the environment, the eco-efficiency and eco-effectiveness of the product-packaging combination have to increase while making sure its functions are fulfilled. The next chapter explores existing models on sustainable packaging development.

6.

MODELS SUSTAINABLE PACKAGING DEVELOPMENT

The previous chapter discussed theories about sustainable packaging development. This chapter explores existing models of sustainable packaging development and how eco-efficiency and eco-effectiveness can increase. Next, the impact of the packaging life cycle is explored, and a model of the sustainable packaging life cycle is shared. The chapter concludes with additional information on the topic retrieved from expert interviews.

6.1. MODELS TO INCREASE ECO-EFFICIENCY AND ECO-EFFECTIVENESS

The eco-efficiency and eco-effectiveness of the product-packaging combination have to increase while making sure its functions are fulfilled. As mentioned in the previous section, the goal is to minimise the environmental impact by minimising the input and output of the system, by maximising the use of resources and maximising the positive impact. This section discusses different models that can be used to increase eco-efficiency and eco-effectiveness.

6.1.1. CRADLE TO CRADLE

Cradle to Cradle (C2C) is a design framework for designing in a circular economy; it emphasises transforming today's industry by designing completely ecologically and mainly focuses on eco-effectiveness. The aim of C2C is to close the biological cycle and the technical cycle, where biological materials and technical materials have to be separated when continuously circulating in their cycle, as shown in figure 15. The materials in the biological cycle are raw materials that animals and microorganisms can consume, such as wood and biodegradable plastics. The materials in the technical cycle cannot biodegrade, such as metals and plastics, and are therefore reintroduced so that the manufacturer can use it again as a nutrient for a new product. Additionally, the environment must not be damaged, and the waste that remains is taken up again in these cycles and used as food for the environment or subsequent products. Furthermore, the concept includes striving for local material and

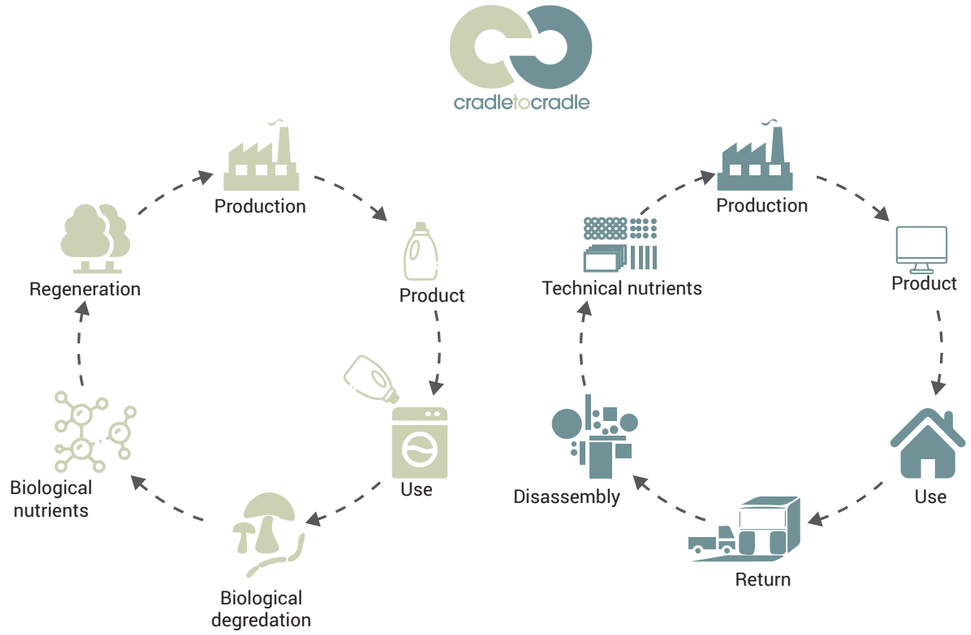


Figure 15 Cradle to Cradle concept (William McDonough, 2002)

energy flows to minimise environmental impact (McDonough & Braungart, 2002). Concluding, Cradle to Cradle is a design framework for a circular economy that focuses on increasing eco-efficiency by minimising the input and output of the system through Sourcing locally. Second, it increases eco-effectiveness by maximising the use of resources through making biological- and technical materials continuously circulate in their cycle, where waste functions as food.

6.1.2. CIRCULAR ECONOMY

The Circular Economy (CE) is a concept explored by the Ellen MacArthur Foundation and looks beyond the current linear economy and aims to redefine growth, focusing on positive society-wide benefits. It includes gradually decoupling growth from the consumption of finite resources (Ellen MacArthur Foundation). The Circular Economy is based on three principles:

- Design out waste and pollution
- Keep products and materials in use
- Regenerate natural systems

These principles are supported by the butterfly diagram. The diagram, shown in figure 16, is inspired by the two material cycles of C2C and illustrates the continuous flow of technical and biological materials. It is specifically aimed at industrial and economic activity and displays the flow of materials, nutrients, components, and products while adding an element of financial value (Ellen MacArthur Foundation). The technical cycle shows the strategy of keeping materials in use. The biological cycle describes a process where materials can safely re-enter the environment to biodegrade and be used as nutrients. These nutrients could also be used to produce energy through biogas (Ellen MacArthur Foundation). The goal is to keep the materials in their cycles and minimising the use of virgin materials. Landfilling is not a part of the Circular Economy since every material is food for another application. Nonetheless, the Circular Economy includes leakage, which has to be minimised.

Design out waste and pollution

Landfilling is not a part of the CE. There is no waste when materials fit the biological or technical cycle and continuously circulate. Waste has a negative impact on human health and natural systems. This includes material waste, greenhouse gas (GHG) emissions and hazardous substances such as toxins. Waste is the consequence of decisions made during the design stage, where around 80% of the environmental impact is determined. The aim is to ensure no waste is created in the first place.

Keep products and materials in use

The technical cycle shows the strategy of keeping materials in use by reducing the pace at which they lose value; this aligns with eco-effectiveness. This strategy is performed by reducing the progression to the outer circle since the value of the product is greatest in the inner circle (maintenance) and lowest in the outer circle (recycle). A way to support this is to slow the consumption rate by making durable products (Ellen MacArthur Foundation). This can be physical durability, which extends a products lifetime through physical abilities, or emotional durability, extending product longevity through emotional relationships with products. The latter explains why some products are consumed and discarded faster than others (Haines-Gadd, Chapman, Lloyd, Mason, & Aliakseyeu, 2018).

Not all loops of the technical cycle are directly relevant to primary packaging. Maintenance and refurbishing are only related to tertiary packaging, such as crates, pallets and trolleys, which is not in the scope of this research. Reuse and recycle are of high importance when it comes to circular packaging. The Ellen MacArthur Foundation claims that for at least 20% of the plastic packaging (by weight), reuse provides an economically attractive opportunity worth at least USD 9 billion (Ellen MacArthur Foundation, 2017). To use reusable packaging, packaging should be designed for reuse, a design method in which the ability to reuse a product or packaging is considered from the beginning of product conceptualization.

CE distinguishes four types of reuse models, as shown in figure 17:

1. **Refill at home:** A refill that can be placed in a parent packaging, the refillable packaging has a lower environmental impact than the parent packaging.
2. **Refill on the go:** A packaging that can be refilled by bulk dispensers in a store or on a mobile truck.
3. **Return from home:** Packaging that is collected by door delivery/pick up or through the post.
4. **Return on the go:** The packaging can be returned in-store, the packaging will be cleaned and reused by the retailer or producer. This is often combined with a deposit system.

With refillable packaging, the consumer is the owner of the packaging and can refill it him or herself. With returnable packaging, the retailer or producer is the owner of the packaging, and the consumer returns the packaging where after the supplier can reuse it. These models are elaborately discussed in Appendix C.

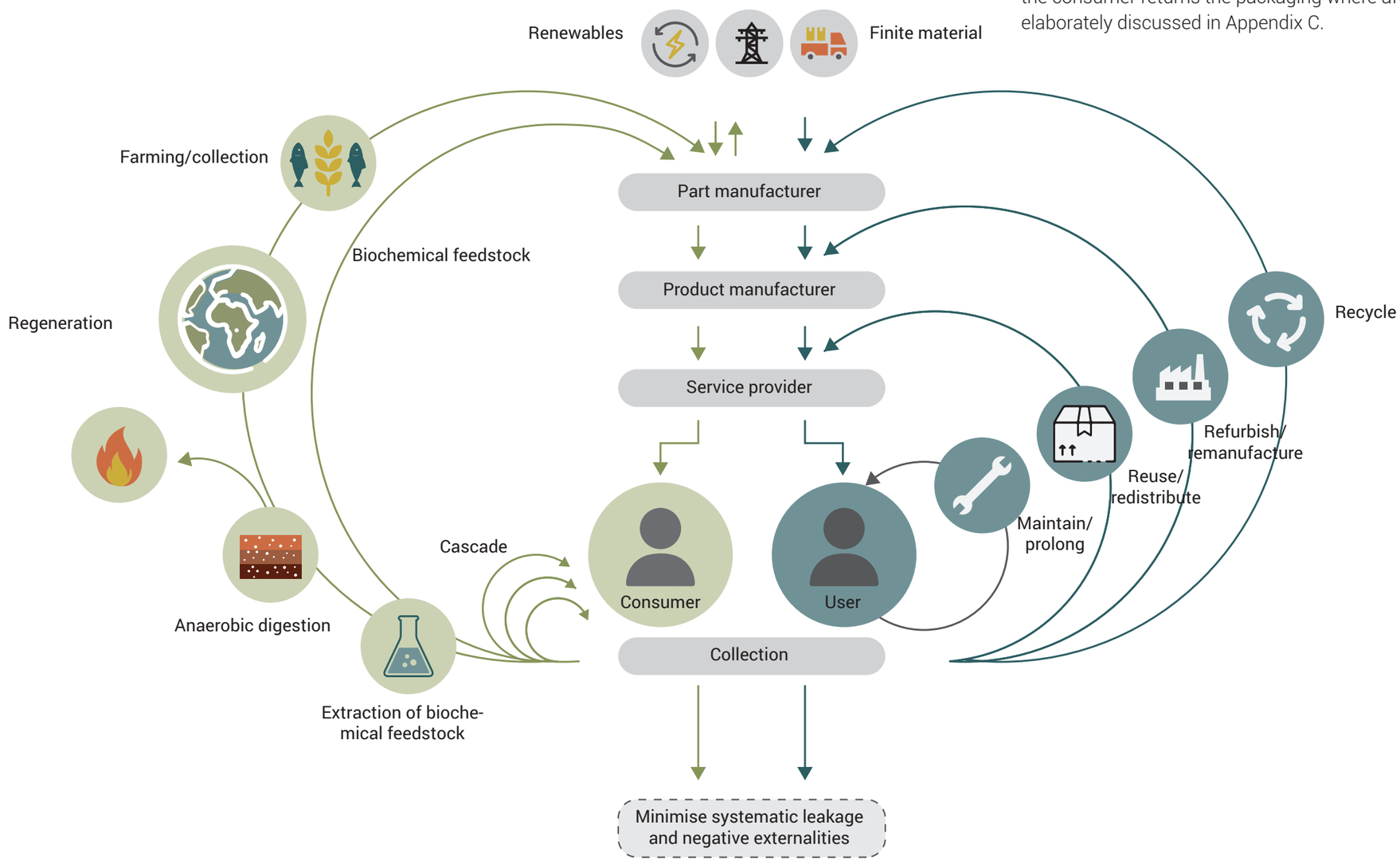


Figure 16 Butterfly model of Circular Economy (Ellen MacArthur Foundation)

Figure 17 Four reuse models (Ellen MacArthur Foundation, 2019)

As said, 20% of today's plastic packaging is suitable for reuse, which means that other solutions need to be in place to keep materials and their value in the economy. After maintenance and refurbishing, which are not relevant for primary packaging, the butterfly diagram suggests recycling. In order to recycle packaging, it needs to be designed to be recycled, also referred to as Design for Recycling. In this design method, the ability to recycle a product is considered from the beginning of product conceptualization. Design for Recycling can increase recycling rates worldwide by raising the value and yield of recyclate (The Pew Charitable Trusts, 2020). Therefore, businesses should adopt this design technique at the beginning of product development. To improve the recyclability of packaging, KIDV developed the Recycle Check for multiple types of materials (KIDV). Furthermore, the consumer should know how to dispose of packaging for it to be correctly recycled; this way, contamination is kept at a minimum, resulting in high-quality recyclate. Informing consumers about waste management is also needed by July 2021 for the Single-use plastic directive by the European Union (European Parliament, 2019). A disadvantage of recycling is that the material properties are almost always degraded, only allowing for use in lower-quality applications. Appendix D elaborates on recycling.

Regenerate natural systems

The third principle focuses on regenerating living natural systems. In nature, there is no waste, and everything is food for another system. Instead of trying to do less harm, the aim is to provide a positive impact, as described by eco-effectiveness. This means returning valuable nutrients to the soil to support regeneration, providing renewable resources for the economy (Ellen MacArthur Foundation).

Additionally, the use of non-renewable energy or resources should be avoided, and the use of renewable resources by decoupling from finite resources should be enhanced. Examples of renewable materials are bio-based plastics, wood and paper; these materials cycle between the economy and natural systems. Examples of renewable energy are solar-, hydro- and wind power.

Concluding, the Circular Economy focuses on increasing eco-efficiency by minimising the input and output of the system through minimising the use of virgin material and designing out waste and pollution, including material waste, GHG emissions and toxins. It focuses on increasing eco-effectiveness by maximising the use of resources by keeping materials in use through reuse, recycle and keeping value and providing a positive environmental impact by regenerating natural systems through returning nutrients to the soil. CE both focusses on eco-efficiency and eco-effectiveness, which shows that while striving for circular, optimising the input and output of the system should not be forgotten.

6.1.3. LANSINK'S LADDER

Other ways to increase eco-efficiency and eco-effectiveness are described by Lasink's ladder. Lansink's Ladder, also known as Waste Hierarchy, is based on waste management and gives an overview of the resource and energy consumption in six actions. These actions are displayed from most favourable to least favourable, as shown in figure 18 (Lansink, 2014). The first step is to prevent packaging where possible and stimulates reuse and recycling of packaging. When that is not possible, packaging will be incinerated to generate heat or electricity, and the least favourable option is to dump packaging in landfill (Tweede Kamer der Staten Generaal, 1989).

In the report 'The State of Sustainable Packaging', KIDV elaborated on this model, shown in figure 19. To increase eco-efficiency by minimising the input and output of the system, the amount of material used for packaging needs to be reduced, this is described as Prevent in Lansink's ladder and as Reduce in the KIDV ladder. Reduction can be achieved by elimination and substitution. Elimination is reducing the amount of material without

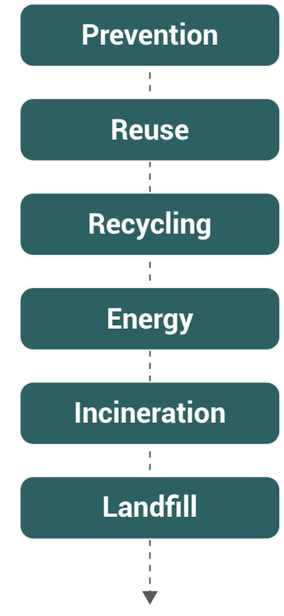


Figure 18 Lansink's Ladder (Lansink, 2014)

substituting it with other short-lived materials (The Pew Charitable Trusts, 2020). Substitution can be of an undesired material, which can be based on weight, environmental impact or company preference. For example, glass can be substituted by plastic to reduce weight. However, the substitution of materials does not necessarily lead to a lower environmental impact (The Pew Charitable Trusts, 2020). More information on the controversy about paper as a substitute for plastic and biobased as a substitute for fossil-based plastic can be found in Appedix E.

The ladders also show ways of increasing eco-effectiveness by maximising the use of resources through reuse and recycling as described by CE, and it covers steps less relevant to primary packaging, repair, refurbish and remanufacture. However, the KIDV ladder adds another form of reuse, repurpose. Repurpose refers to discarded products or their parts that are used in a new product with a different function (Potting, Hekkert, Worrell, & Hanemaaijer, 2017). With repurposing, the purpose of the packaging is of the same quality as originally intended, without downgrading. For example, a glass jar for peanut butter can be repurposed into a drinking glass; this type of reuse is further explained in Appendix C.

Another step that contributes both to eco-efficiency as eco-effectiveness is Rethink, which stimulates innovation and pioneering to lower the environmental impact of the product-packaging combination. This is done during the design phase; as earlier mentioned, around 80% of the environmental impact is determined during this phase. Therefore rethinking the product-packaging combination can make a significant impact. An example of this is how HEMA changed from liquid shampoo in relatively big plastic bottles to a small shampoo bar packed in a carton box. This solution prevents unnecessary water transport and unnecessary packaging materials, resulting in a lower environmental impact.

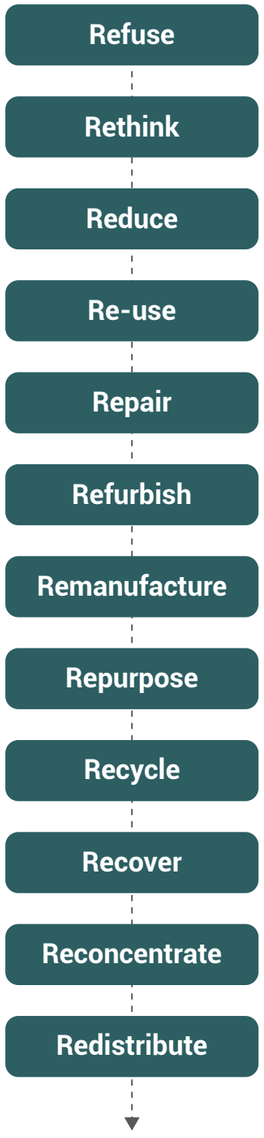


Figure 19 R-ladder KIDV (C. Bruijnes, 2020)

Lansink's ladder adds a valuable step in minimising the input and output of the system by reducing the amount of material needed for packaging. Furthermore, it adds a step to maximise use of resources by another form of reuse, repurpose. Lastly, it mentions Rethink, which contributes both to eco-efficiency as eco-effectiveness by stimulating innovation and pioneering during the design phase to lower the environmental impact of the product-packaging combination.

6.2. LIFE CYCLE PACKAGING

The eco-efficiency and eco-effectiveness of the product-packaging combination have to increase while making sure its functions are fulfilled. As earlier described in the definition of packaging, the functions of packaging: to contain, protect, inform and facilitate transport, consumption and end-of-use, have to be fulfilled along the entire life cycle. Therefore, after describing how eco-efficiency and eco-effectiveness can be increased, this section gives more information about the life cycle of packaging.

The life cycle of a product is defined as "encompasses all issues involved from the start to the end of the existence of the physical product" [2]. The current world economy, and with that the life cycle of packaging, is linear where raw materials are extracted, processed, used and disposed of without regaining the resources (Ellen MacArthur Foundation). Figure 20 shows the linear life cycle of the product-packaging combination.

To increase the eco-efficiency of every stage of the life cycle, the amount of resources put in those stages and the waste or substances coming out should be minimised. However, this approach still results in a depletion of raw materials and excess waste; this makes linear system by definition finite (de Koeijer et al., 2017). Any system that is focussed on consumption rather than restorative use of resources entails significant losses of value (Ellen MacArthur Foundation, 2013). To reduce the value loss, and to change to a finite system, a shift towards eco-effectiveness is needed. Therefore, life cycles should be circular instead of linear, where waste functions as input for a new cycle (McDonough & Braungart, 2002). C2C and CE are circular life cycle models; however, these theories include less relevant steps for packaging, such as maintenance and refurbish. Therefore, the next section will give a circular life cycle model of packaging.

Figure 20 Linear life cycle product-packaging combination

2 Retrieved from Ir. Marten Toxopeus Product Life Cycle lectures, 2019.

6.2.1. MODEL LIFE CYCLE SUSTAINABLE PACKAGING

A switch from a linear to a circular life cycle is needed to increase the eco-efficiency and eco-effectiveness of the product-packaging combination. A total overview of a packaging's life cycle is created by combining Cradle to Cradle, Circular Economy and the R-ladder; this model is shown in figure 21. The first two steps, rethink packaging through innovation and reduce packaging, are no steps in the life cycle itself but are covered during the design phase. The model shows the biological and technical cycle, similar to the Circular Economy and Cradle to Cradle concepts. The highest economic value will be captured with reuse (Refill, Return and Repurpose) followed by recycle.

Materials from the biological cycle can circulate in the technical cycle, for example, paper or wood, which will return to the biological cycle after its lifespan. Biodegradable materials can be used to produce biogas or as nutrients for bio-regeneration. The technical cycle distinguishes three categories of reusable packaging, Refill, Return and Repurpose, as earlier explained. The last loop shows the recycling of the packaging materials into raw material, allowing for usage in other applications since the material properties are almost always degraded. Reusable

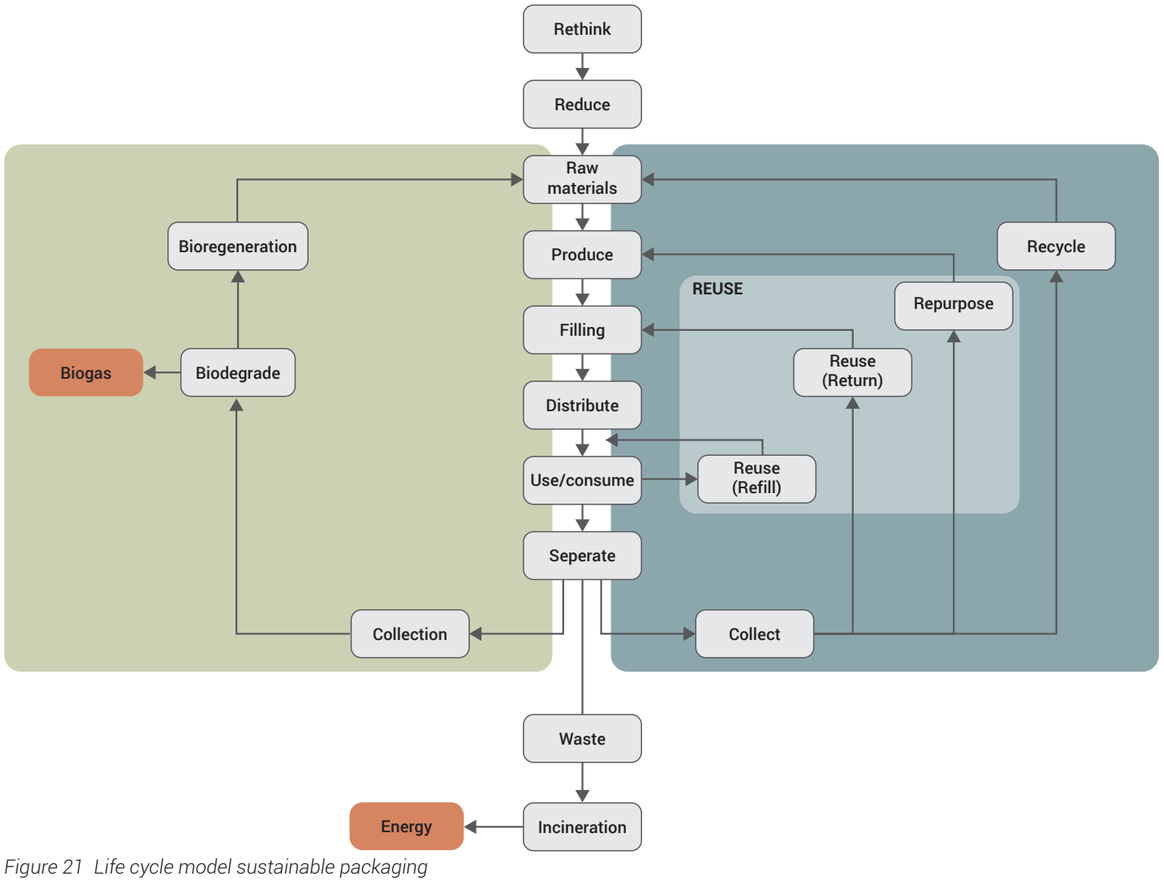


Figure 21 Life cycle model sustainable packaging

packaging will, after its lifespan, end up in the recycling loop. After the separation in the correct recycling streams by the consumer, the materials can be collected by the supplier or through the municipal waste collection. If there are no other applications after reuse and recycling, which is highly undesirable, it is waste. This waste can be incinerated to restore energy.

During the life cycle, eco-efficiency can increase by minimising the input and output of every life cycle stage. The eco-effectiveness can increase by maximising the use of resources, by materials continuously circulating in their cycle and by providing a positive impact.

6.3. ADDITIONAL INFORMATION FROM EXPERT INTERVIEWS

Apart from literature, information about sustainable packaging was retrieved from conducted interviews with the following experts on sustainability and packaging: Eva Ronhaar (Director of Innovation, Sustainability & Foundation at HEMA), Dr. Alan Campbell (Packaging technologist at LCA Centre), Prof.dr.ir Roland ten Klooster (Professor Packaging Design and Management at the University of Twente) and Marcel van Keuenhof (Sustainable packaging expert at KIDV). The interviews can be found in Appendix F. The relevant information, additional to the information from literature, is summed up.

6.3.1. CONSUMER AND REUSE

- **Design for consumer behaviour:** When designing for sustainability, according to Ten Klooster, not only the environment has to be considered, consumer behaviour as well. Whether reuse products work for HEMA depends on the location of the store and the product conforming to Ronhaar. HEMA is not always a destination location; people also visit the store when walking by. Such concepts require careful consideration since not everyone will always bring their refillable packaging when implementing refill on the go. Currently, the customer does not come to HEMA for its sustainable products, according to Ronhaar, but there is the ambition to reach that position. Ten Klooster mentions that becoming more sustainable through reuse will only work when people change their behaviour and, for example, are willing to bring pots and containers from home and, on some occasions carrying them empty and dirty.
- **Inform consumers during purchase:** Ronhaar distinguishes two factors on which consumers base their purchase. The first is on a brand level, 'this is my favourite brand', and the second is the information at the time of purchase. Therefore, HEMA should provide enough and clear information about sustainability and why certain packaging is better for the environment. Campbell adds that these claims should be underpinned by LCA's to make them credible.

6.3.2. RECYCLE

- **Use recyclate:** Keuenhof points out that Design for Recycling results in better recyclable packaging, but a shift towards using this recyclate is needed. He states that financial incentives, such as taxes, are very helpful to achieve this. For using the recyclate, the quality should be high with as little contamination as possible.
- **Recycle after reuse:** Campbell mentions that reusable packaging should be recycled after as many reuse cycles as possible.

6.3.3. OTHER

- **Keep material in the same application:** Campbell points out that retailers can use innovations to take ownership of their packaging, implementing a system where polymers are leased and detected by recyclers so that retailers can get their own recyclate back.

6.4. CONCLUSION MODELS SUSTAINABLE PACKAGING DEVELOPMENT

The previous chapter concluded that to preserve the earth for future generations, product-packaging combinations need to be developed within the constraints of the environment by increasing eco-efficiency and eco-effectiveness while fulfilling its packaging function. This chapter discovered that eco-efficiency could increase by minimising the input and output of the system by sourcing locally, minimising the use of virgin material, designing out waste and pollution and reducing the amount of material. Eco-effectiveness can increase by maximising the use of resources through making biological- and technical materials continuously circulate in their cycle; waste functions as food; by keeping materials in use by reuse, recycling, and keeping value. Second, eco-effectiveness can increase by providing a positive environmental impact by regenerating natural systems through returning nutrients to the soil. Lastly, Rethinking product-packaging combinations contribute to both eco-efficiency and eco-effectiveness by stimulating innovation and pioneering during the design phase to lower the environmental impact of the product-packaging combination.

Increasing eco-efficiency can be done by minimising the input and output of every phase of the life cycle. Eco-effectiveness strives for maximising use of resources and providing positive impact; therefore, a packaging lifecycle should be circular instead of linear.

CONCLUSION PART A: ANALYSIS

Part A revolved around answering the first research question, What is HEMA's current position in sustainable packaging development?

The first part of the Analysis concluded that HEMA desires to become the most sustainable value variety brand but does not align its practice to achieve that. The term itself is illogical, and it is not included in the general sustainability strategy. Furthermore, the current targets are dependent on others, very few resources are available to formulate a sustainable packaging development strategy and execute this, the product- and category managers and the purchasers lack the required packaging knowledge, and there is a discrepancy between the values price and sustainability in the brand. To develop a solution to help HEMA formulate a sustainable packaging development strategy that is not dependent on others, theories about sustainable packaging development were explored in the second half of the Analysis. When comparing these theories to HEMA's current practices, there can be concluded that on some points they align, and on others there is a gap.
For example, currently, tertiary and secondary packaging are recycled, which is in line with C2C and CE. Furthermore, the current packaging targets contribute to increasing eco-efficiency and eco-effectiveness. The reduction of plastic and packaging in general can be found in Lansink's ladder and contributes to eco-efficiency. The targets to use recycled and make packaging recyclable are in line with C2C and CE to keep materials in use, contributing to eco-effectiveness. The target to incorporate bio-based plastic packaging into its packaging portfolio aligns with CE to use renewable materials and resources and contributes to eco-effectiveness. Lastly, sustainably sourced paper is in line with both C2C and CE. Overall the current packaging targets are directed towards a circular instead of a linear lifecycle.
However, there are also gaps between the theory and HEMA's practices. The theory describes multiple definitions of sustainable development or sustainability; HEMA does not have a clear definition of sustainable development that is used throughout the organisation. Although, it does have a general sustainability strategy with three pillars. Moreover, sustainability, in general, is not addressed from an academic or theoretical point of view. Furthermore, the packaging functions are not explicitly addressed, and it is not known whether a product is overpacked; the Optimum Design Pack is not strived for. Additionally, the packaging is viewed separately from the product instead of a product-packaging combination. This is why the packaging is relatively late incorporated in the design process and why the Rethink principle as described by KIDV is not applied. Lastly, reuse is an important part of all described models, legislation and is widely used among competitors; however, HEMA does not incorporate this in its sustainability strategy. Since reuse has multiple different models, it gives HEMA enough opportunity to integrate this into its packaging portfolio.
In conclusion, HEMA's current position in sustainable packaging development is that it desires to become the most sustainable value variety brand but does not align its practices. There is a gap between HEMA's practices and the sustainable packaging development theory. To formulate a sustainable packaging development strategy for after the targets of 2025, this gap needs to be closed. The next part will focus on providing a solution that enables HEMA to formulate this strategy.

RESEARCH QUESTION 2

How can a method be developed to help HEMA formulate a sustainable packaging development strategy after the targets of 2025?

PART B: SOLUTION

Part B revolves around the second research question, How can a method be developed to help HEMA formulate a sustainable packaging development strategy after the targets of 2025? This research question is answered by first defining the requirement specification of the solution. After, multiple theories are combined to function as a base for the framework, and the framework is developed. Lastly, a method is developed that, combined with the framework, enables the formulation of a sustainable packaging development strategy.

7.

REQUIREMENT SPECIFICATION SOLUTION

Before developing a solution that will enable HEMA to formulate a sustainable packaging development strategy, the requirement specification of the solution has to be defined. This chapter lists these requirements, which are divided into the goal of the solution, functions and performance requirements.

The analysis insights need to be translated into a solution that can help HEMA with formulating a sustainable packaging development strategy. This section lists the requirements that need to be taken into consideration whilst developing this solution. The requirements describe the outcome of the solution and are divided into the goal of the solution, the functions and performance requirements.

7.1. GOAL, FUNCTIONS & PERFORMANCE REQUIREMENTS

Goal

The solution's goal is to enable HEMA policymakers to formulate a sustainable packaging development strategy after the targets of 2025.

Functions & perfomance requirements

The functions and performance requirements allow for the development of a solution to reach that goal. The functions overarch the performance requirements.

THE FRAMEWORK SHOULD:

Enable the user to formulate a sustainable packaging development strategy

- Enable goal formulation and quantified target setting in the chosen direction
- Remind the user of researching the latest targets and legislations related to packaging.
- Enable to make a plan on how to achieve the set goals and targets, including the responsible stakeholders, the resources needed, a timeline and an overview of the next steps to be taken
- Combine multiple goals or targes into a sustainable packaging development strategy

Allow the user to choose a direction within sustainable packaging development

- Provide different directions within sustainable packaging development and how to implement those
- Enable to align the chosen direction with the general sustainability strategy of HEMA
- Enable to prioritise directions or ways of implementation within sustainable packaging development, so the direction or implementation with the most impact can be chosen

Provide a clear visualisation of sustainable packaging development

- Include a graphical overview of sustainable packaging development
- Show how different directions within sustainable packaging development can be implemented.
- Provide a clear visualisation of different parts/steps in the strategy formulation
- Give a visual distinction between directions that increase eco-efficiency or eco-effectiveness

Take the whole life cycle of the product-packaging combination into account

- By including the different life cycle phases

Take all functions of packaging into account as described in the definition of packaging

- By addressing the importance of fulfilling these functions

Allow for adjustments for future use

- Enable to add or change information to the solution when new theories arise
- Enable to add or change information to the solution when developments in the market arise

Fit the brand HEMA

- Include HEMA's values in strategy formulation
- Be applicable to HEMA's wide variety of packaging
- Be applicable to HEMA's changing packaging portfolio

Be understandable for HEMA 's sustainability policymakers (director of Sustainability, Innovation and Foundation and the Technical Packaging Specialist)

- Align with the knowledge level in sustainability and strategy making
- Include a manageable amount of information

Enable HEMA to formulate a sustainable packaging development strategy that is understandable for the secondary stakeholders (the category- and product managers, purchasers, Packaging design & translation team, Packaging specialist responsible for secondary and tertiary packaging and the board members)

8.

FRAMEWORK DEVELOPMENT

The solution that will enable HEMA to formulate a sustainable packaging development strategy consists of a framework and a method. This chapter focuses on developing the framework. First, the solution is explained, and different theories discussed in the analysis are combined, forming the framework's base. Second, the structure of the framework is explained, whereafter, a detailed description of the framework is given.

8.1. SOLUTION

The current packaging targets are based on the signed covenant, competitors' targets and legislation. This makes HEMA dependent on others. Furthermore, the different models and theories describe sustainable packaging development and what directions within sustainable packaging development exist; however, these models individually do not show a complete overview of all directions and do not describe precisely how these directions need to be implemented. Moreover, there is a gap between the theories and HEMA's practices, and HEMA does not use a definition of sustainable development. To close this gap and to make HEMA independent of others for strategy formulation, a solution based on theory is developed. The different theories and definitions of sustainable development are combined into a solution. The proposed solution will enable HEMA to formulate a sustainable packaging development strategy by providing an overview of directions within sustainable packaging development, including how to implement those and how to translate this into a strategy. The solution consists of a framework and a method, as shown in figure..... The framework visualises the directions within sustainable packaging development, and the method helps to choose one or multiple directions and translate this into a sustainable packaging development strategy. The method will be explained in the next chapter. The next section combines the theories that form the base of the framework.

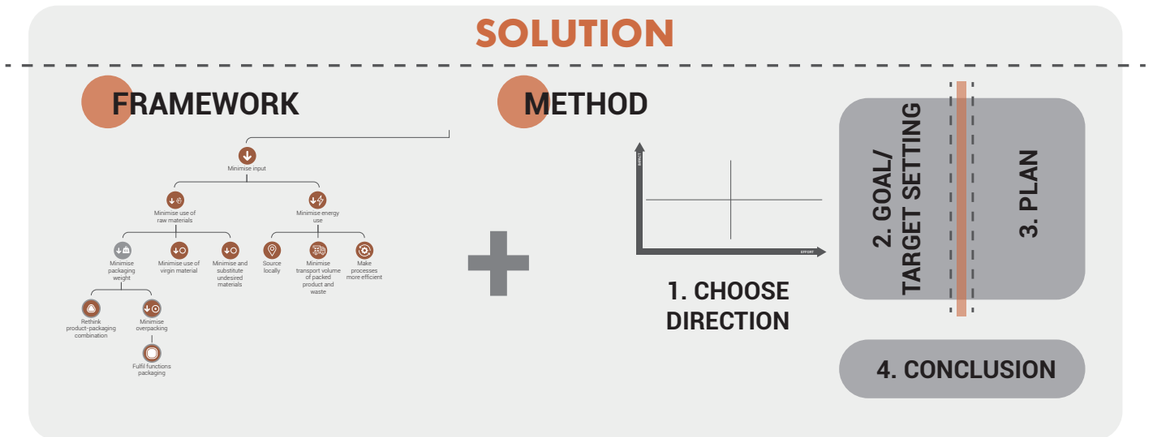


Figure 22 Overview solution

8.2. THEORY SOLUTION PRINCIPLE

This section will combine the different definitions of sustainable development as discussed in chapter 5, which can then be used as a base for the framework. The definition of Brundtland of sustainable development describes that the development which facilitates the current needs, in this case, the development of products and packaging, should not destroy the ability of the future to meet their needs. Accordingly, the planet should be preserved for future generations by developing within the BPs of the earth, in other words, by Mitchell, the constraints of the environment. By combining the definition of sustainable development by Brundtland, the PBs and the definition of sustainability by Mitchell, the following definition of sustainable development is derived:

Sustainable development is development that facilitates the needs of the present without compromising the needs of future generations, by preserving the earth through development within the constraints of the environment.

This interpretation of sustainable development describes a space in which products and packaging can be developed in the present while preserving the earth. This definition will serve as the base of the framework. The next section will further elaborate on the foundation and discuss what needs to be done so products and packaging could be developed within the constraints of the environment.

The analysis concluded that to preserve the earth for future generations, product-packaging combinations need to be developed within the constraints of the environment by increasing eco-efficiency and eco-effectiveness while fulfilling its packaging function. From an LCA based point of view, eco-efficiency and eco-effectiveness can be subjected to the black box principle explained in chapter 5. Eco-effectiveness would be inside the black box since the goal is to keep resources in a loop. Every substance that crosses the system boundary during these loops, such as energy as input and CO2 emissions as output, has an impact on the environment. The world outside the black box is the impact on the environment and can therefore be represented by eco-efficiency. This concept is presented in figure 23. When eco-efficiency increases, the input and output of the system decrease. The substances stay within the black box by maximising the use of resources and maximising the positive impact, resulting in increasing eco-effectiveness. This is in line with the relationship between eco-efficiency and eco-effectiveness, as shown in figure 13. The goal is to minimise the environmental impact by minimising the input and output of the black box, and to maximise the use of resources and to maximise the positive impact.

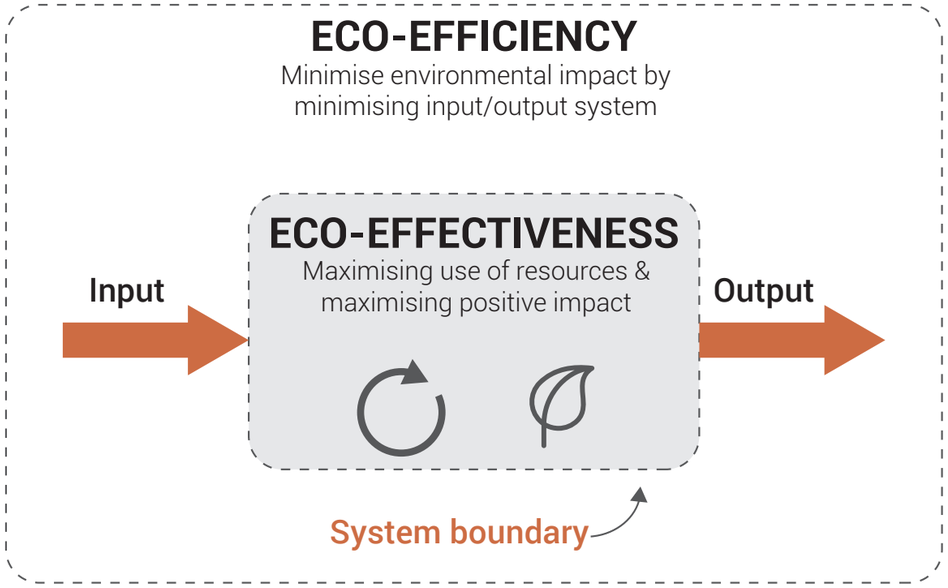


Figure 23 Eco-efficiency and eco-effectiveness in LCA black-box principle

8.3. FRAMEWORK DEVELOPMENT

The previous section discussed and combined theories. This section translates these theories into the base of a sustainable packaging development framework, after which the two directions of the framework, eco-efficiency and eco-effectiveness, are elaborated. This developed framework was established after multiple iterations.

8.3.1. FRAMEWORK BASE

This section defines the base of the framework. The base of the framework is described as follows; the goal is to preserve the earth for future generations by developing packaging within the constraints of the environment. Currently, some of the constraints of the earth, in the form of Planetary Boundaries, are already crossed. To prevent others from crossing and to stay within these constraints, the environmental impact per product should be lowered by increasing the eco-efficiency and eco-effectiveness of the product-packaging combination while making sure its functions are fulfilled. Eco-efficiency can be increased by minimising the input and output of the system during the whole life cycle of the product-packaging combination. Eco-effectiveness can be increased by maximising the use of resources and maximising positive impact. This base is shown in figure 24 The next section elaborates on the structure of the elements within the framework.

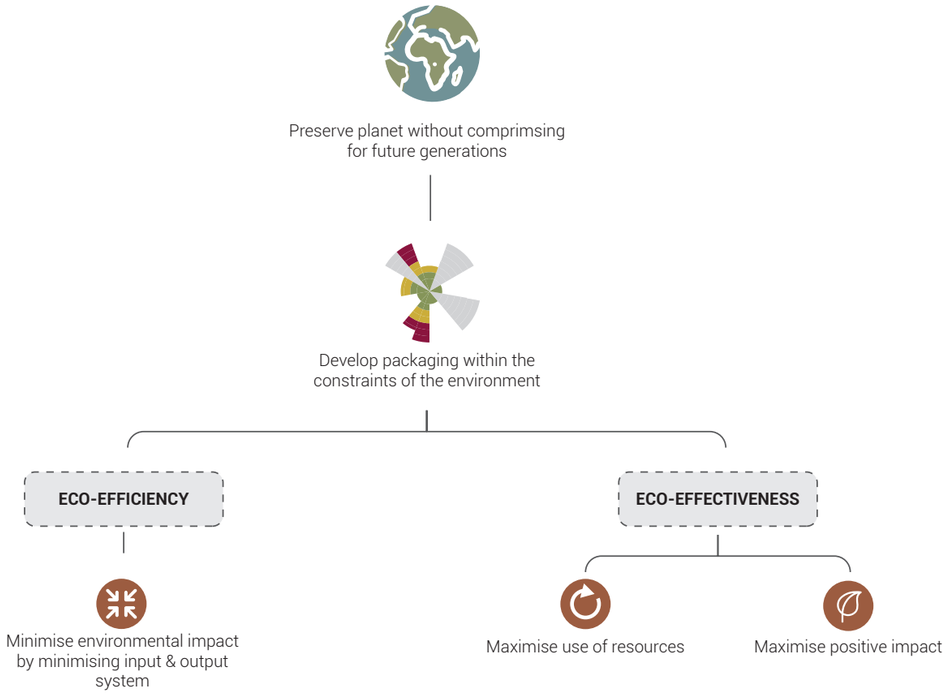


Figure 24 Base of sustainable packaging framework

8.3.2. FRAMEWORK STRUCTURE

The framework describes the different directions within sustainable packaging development and how to implement those. The framework consists of multiple elements on different levels. This section describes the structure of the framework, as shown in figure 25. The description of each element of the framework can be found in Appendix G.

The framework is divided into eco-effectiveness and eco-efficiency; the corresponding elements, the base elements, form the base of the framework. In the case of eco-efficiency, these are 'Minimising environmental impact by minimising input & output system', 'Minimise input' and 'Minimise output'. The elements that come next are the direction elements, which support the base elements and describe the main directions within sustainable packaging development. These are, for example, 'Minimise use of raw materials' and 'Minimise energy use'. However, these elements are not precise enough in describing how this needs to be implemented in practice. Hence, the last level of elements is the implementation elements that describe how the different directions within sustainable packaging development, the direction elements, can be implemented in practice. For example, 'Minimise packaging weight'. Some of these elements are further divided into parent elements and child elements. For example, 'Minimise packaging weight' and 'Rethink product-packaging combination'. The parent element is coloured, which matches the child element coloured ring. This is to distinguish the different implementation elements in the strategy formulating process. The following sections give a detailed description of the framework.

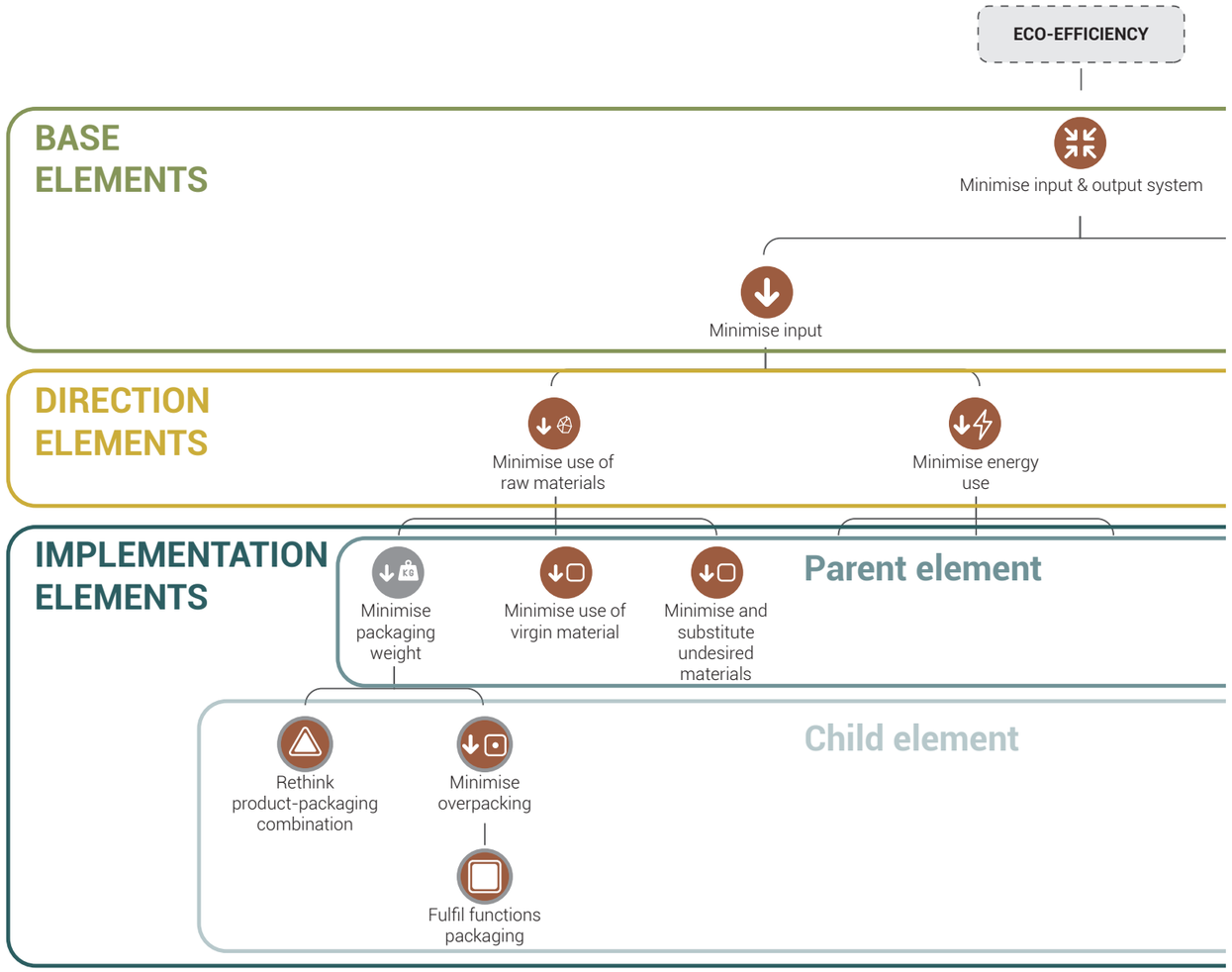


Figure 25 Overview structure framework

8.3.3. ECO-EFFICIENCY

Minimise input

The eco-efficiency part of the framework is shown in figure 26. The goal is to minimise the input and output of the system during the whole life cycle. The input of a packaging life cycle phase is raw material and energy. To minimise the use of raw materials, the total packaging weight has to be minimised, described by the KIDV ladder as Reduce. As explained by de Koeijer in chapter 5, packaging should not be viewed separately from the product. Instead, it should be seen as a product-packaging combination. To minimise packaging weight, the product-packaging combination has to be critically looked at, and the Rethink principle of the KIDV ladder can be applied. Furthermore, the product should not be overpacked; it should just fulfil its five main functions, as described in the definition of packaging, while striving for the Optimum Pack Design, as described in chapter 5. The analysis concluded that HEMA currently does not see the packaging as an integrated part of the product-packaging combination and that it does not address the packaging functions specifically. A second way to minimise the use of raw materials is to minimise the use of virgin materials, as described by CE. Lastly, undesired materials need to be minimised, as described by Reduce by the KIDV R-ladder and substituted as described by The Pew Charitable Trusts.

Apart from materials, energy use has to be minimised as well. A way to minimise the total amount of energy is to source locally, as mentioned by C2C; this minimises the amount of energy needed during transport. Additionally, during transport, energy use can be minimised by minimising the volume of the product-packaging combination and the waste after the packaging's life cycle. This way, more products can be distributed in one truck resulting in fewer emissions per product-packaging combination. Furthermore, energy must be minimised during the whole LC; processes, such as production and waste management, should be more efficient.

Minimise output

The output of a packaging life cycle phase is greenhouse gases, waste and toxins. As described in Design out waste and pollution by CE, this should be minimised. To minimise greenhouse gases, renewable energy should be utilised during the entire life cycle, as described by CE. Another way to minimise GHG emissions is to choose materials that are low in GHG emissions. The environmental impact per material type was researched through the Sustainable Packaging Compass tool by KIDV, of which the results are shown in Appendix H. There can be concluded that the production of the material itself, which includes extraction, has the highest impact of the whole packaging life cycle. Therefore it is relevant to consider the type of material when designing sustainable packaging.

To minimise material waste, packaging should be optimised for recycling through Design for Recycling. Furthermore, the product generally has a higher environmental impact than the packaging and therefore should be protected against product loss by preventing underpacking while striving for the Optimum Pack Design. The packaging should just fulfil its functions. Additionally, material waste during production should be minimised through minimising materials waste and packaging waste. The amount of material needed to produce the packaging should be used as efficiently as possible; for example, carton die cuts or vacuum-formed plastic cups result in more waste than injection moulded packaging. Furthermore, packaging can be wasted when, for example, the packaging easily tears during packing. Another way to reduce materials waste is to reduce packaging weight in the first place, so less packaging (in weight) becomes waste as earlier described in minimise input. Lastly, the consumer should be provided with information about correct waste management; this is mentioned by SDG 12, which can be found in Appendix A. This is also needed by July 2021 for the Single-use plastic directive by the European Union (European Parliament, 2019). This way, the material can be properly recycled, and contamination is kept at a minimum, resulting in high-quality recyclate.

8.3.4. ECO-EFFECTIVENESS

Maximise use of resources

The eco-effectiveness part of the sustainable packaging framework is shown in figure 27. The environmental impact, the substances that cross the system boundary, can be minimised in two ways, by maximising the use of resources and by maximising positive environmental impact.

To maximise the use of resources, materials should be kept in a loop, as described by CE. This can be done through reuse, recycle and keeping financial value, as integrated into the principle 'Keep products and materials in use' by CE. The analysis concluded that multiple competitors, legislation and the theory addresses reuse, but that HEMA lacks in this ambition. In order to bring reusable packaging to the market, it should be considered during the design phase by rethinking the product-packaging combination. By looking at the functions of the product and the packaging, product innovations can lead to reuse concepts. Apart from rethinking the concept, other requirements have to be considered during the design phase by using Design for Reuse, including the different reuse models that can be found in Appendix C. Since the success of a reuse system really depends on consumer behaviour, this should be considered during packaging development, as earlier mentioned by Ronhaar and Ten Klooster. This includes providing the right information during purchase.

After reuse, or when packaging cannot be reused, the packaging should be recycled. Therefore, Design for Recycling must be contemplated. Furthermore, this recyclate should be used to keep the materials in a loop, as described by Keuenhof. Not only recyclate from material recycling should be used, material waste as well. Waste material from one system can function as food for another, as stated by C2C.

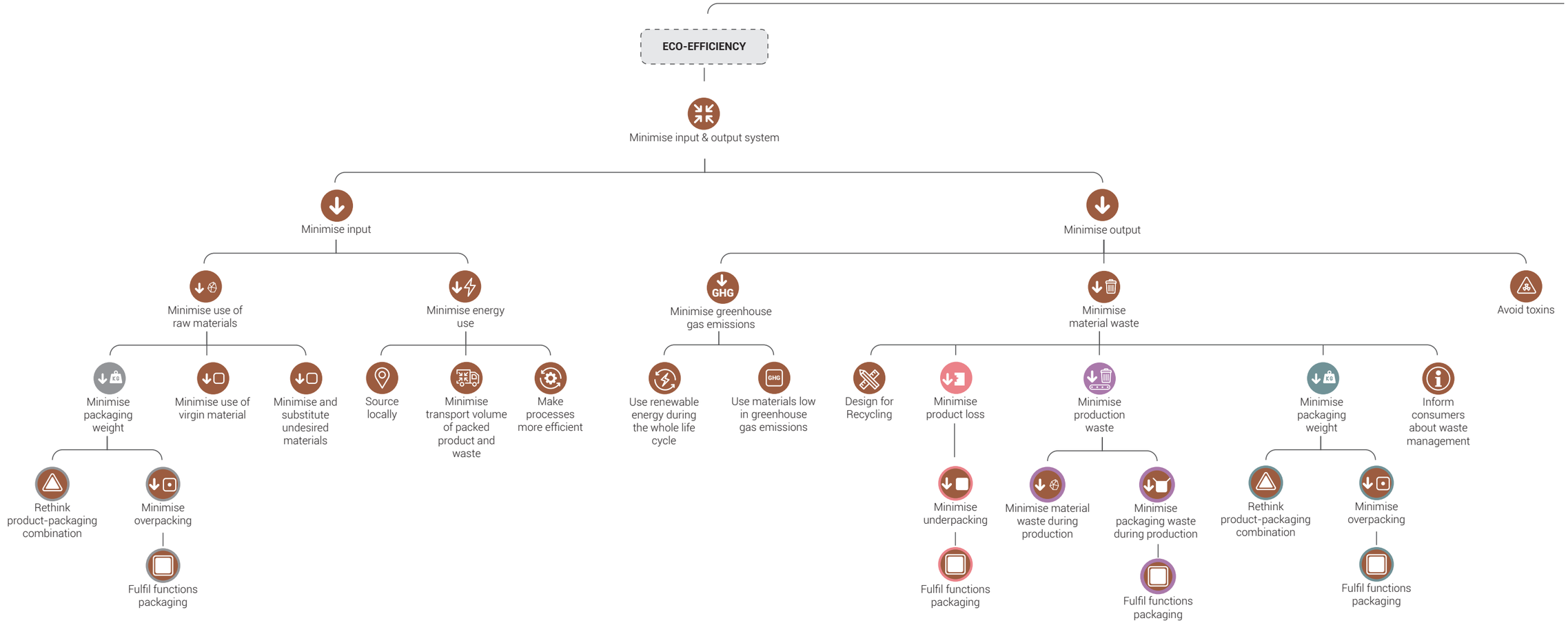


Figure 26 Sustainable packaging development framework eco-efficiency

Lastly, when the material circulates, it should keep its financial value as long as possible. This can be done by slowing the consumption rate of products, as described by CE. When done so, the replacement of products and their packaging is slow, resulting in a delay of value degradation, less packaging needed per capita and fewer resources needed. This can be achieved by stimulating consumers to consume less and by providing both physical and emotional durable products, as stated by CE and Haines-Gadd. This way, products will be used longer and prevent packaging production for a replacement. Additionally, as obliged by the Single-use Plastic Directive, single-use products have to be eliminated (European Parliament, 2019). Another way to keep financial value is by providing high-quality recyclate, through keeping the biological and technical materials separated, as described by C2C, and through Design for Recycling. Lastly, keeping materials in the same type of application and preventing it from progressing towards lower grade applications will preserve the financial value as long as possible.

The second approach in maximising the use of resources is to make use of circular resources, as described by CE. This is done by decoupling from finite resources, such as fossil-based plastics and fossil fuels. Instead, renewable materials and renewable energy should be utilised.

Maximise positive impact

The second approach within eco-effectiveness is to maximise positive impact. Instead of trying to do less harm, the aim is to provide a positive environmental impact. This can be done through regenerating natural systems by returning nutrients to the soil, as described by CE.

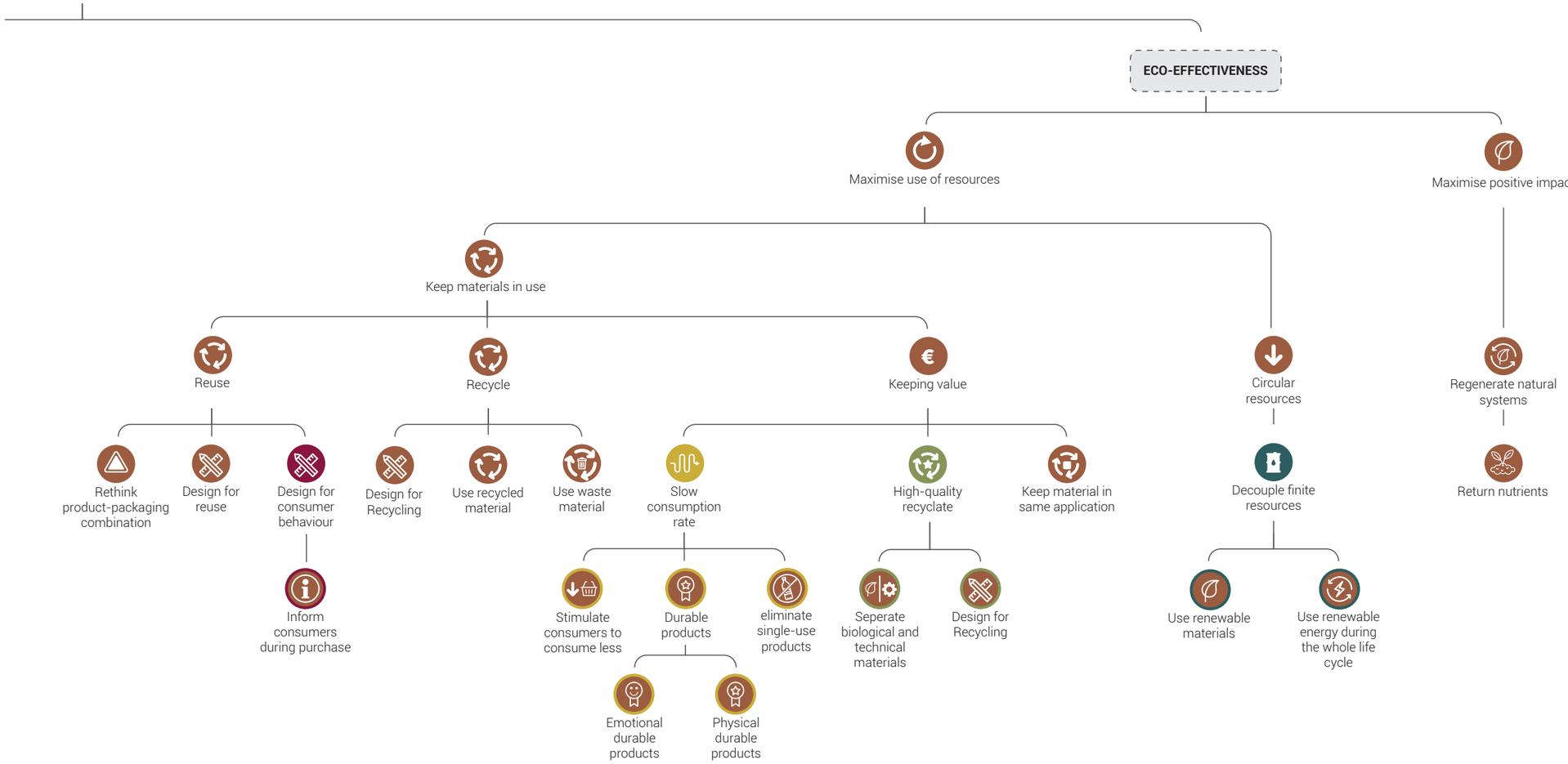


Figure 27 Sustainable packaging development framework eco-effectiveness

8.4. CONCLUSION FRAMEWORK DEVELOPMENT

The current packaging targets are based on the signed covenant, competitors' targets and legislation. This makes HEMA dependent on others. Furthermore, the models and theories discussed in the analysis do not show a complete overview of all directions and do not describe precisely how these directions need to be implemented. Moreover, there is a gap between the theories and HEMA's practices, and HEMA does not use a definition of sustainable development. To close this gap and make HEMA independent of others for strategy formulation, the solution is based on combined theories. The solution is divided into a framework and a method. This chapter combines the definitions of sustainable development and eco-efficiency and eco-effectiveness and translates this into a sustainable packaging development framework.

The base of the framework describes that to preserve the earth for future generations, packaging has to be developed within the constraints of the earth by increasing eco-efficiency and eco-effectiveness. The latter divides the framework into two main directions, eco-efficiency and eco-effectiveness. The framework describes the different directions within sustainable packaging development and how to implement these directions in practice. The framework consists of multiple elements on different levels. The base elements describe the base of the framework; the direction elements describe the different direction within sustainable packaging development and further elaborate on how to increase eco-efficiency and eco-effectiveness. Lastly, the implementation elements show how these directions can be implemented in practice. This framework in itself does not enable HEMA to formulate a strategy. Therefore, the following chapter focuses on developing a method that, in combination with the framework, enables HEMA to formulate a sustainable packaging development strategy for after the targets of 2025.

9.

METHOD DEVELOPMENT

The solution is a framework and a method that will enable HEMA to formulate a sustainable packaging development strategy. The previous chapter showed the development of the framework. The framework gives an overview of the directions within sustainable packaging development, including how to implement those. However, the framework in itself does not lead to strategy formulation. Therefore, this chapter discusses the development of the method that enables the translation of the different directions into a sustainable packaging development strategy. The chapter starts with theory about strategy formulation, next the method is explained, and lastly, an illustration of usage is given.

9.1. THEORY METHOD DEVELOPMENT

The framework developed in the previous chapter shows the different directions within sustainable packaging development and how to implement those. The method will include the framework and translates the different directions into a sustainable packaging development strategy. In order to build this method, a better understanding of strategy formulation is needed. Therefore, this section discusses different theories on strategy formulation.

9.1.1. STRATEGY

The method needs to enable formulating a strategy. A strategy is defined as a broad approach taken by a company to sustain or improve its performance; it is primarily long-term and unlikely to change significantly in the near future (Andrews, Boyne, Law, & Walker, 2009). In this case, HEMA desires to improve its performance on sustainability in packaging development with a strategy after 2025. How the strategy should be formulated is discussed in the next section.

9.1.2. STRATEGY FORMULATION

Two main directions are distinguished within strategy formulation: goal setting and plan-making, or implementation (Cohen & Cyert, 1973). Both are needed to reach the desired improvement of the organisation's performance. Therefore, it is important that the process of strategy formulation is directed and the strategy itself is tracked. The task of strategy formulation should be put on relevant executives (Cohen & Cyert, 1973), in this case, the director of Innovation, Sustainability and Foundation and the Technical Packaging Specialist.

Goal setting

To achieve the desired improvement of the organisation's performance, goals or targets need to be set. The goals set by the organisation must be viewed from the standpoint of the values that are held by the organisation (Cohen & Cyert, 1973). When the goals of a strategy align with the values of the organisation, it is likely that the strategy aligns with already occurring processes, which makes it easier for employees to work with. When a goal within the sustainable packaging development strategy has been formulated, a quantitative target can be determined (Cohen & Cyert, 1973).

A widely used goal setting method is SMART, which was first introduced in the Management Review by Doran in 1981 (Doran, 1981). SMART is an acronym that stands for:

- **S – Specific:** The set goal needs to be specific; otherwise, it is hard to make a plan, and it is not clear when it is achieved.
- **M – Measurable:** The goal has to be measurable to track progress and see whether the goal and the desired improvement are achieved. This also matches with Cohen & Cyert, who say that after a goal has been formulated, quantitative goals can be established.
- **A – Acceptable:** The goal needs to be acceptable within an organisation; it has to align with the organisation's values and laws or guidelines that are relevant to the strategy.
- **R – Realistic:** The goal needs to be realistic to achieve in terms of the market opportunity, the number of resources available etc.
- **T – Timebound:** The goal needs a deadline when it needs to be achieved. This way, progress can be measured, and it gives project management a point to aim for.

The acronym can have different meanings; A is also referred to as Achievable, Attainable, Ambitious or Assignable. R is also referred to as relevant. However, the meaning of the acronym as explained above will be used for this research. This method gives clear guidance for goal setting by addressing the most important factors.

Plan

Without a dedicated plan for achieving the goal, a set goal will not result in the desired outcome; therefore, plan-making is needed. Plan-making focuses on turning a set goal into action assignments and ensures that these are executed in a way that contributes to the desired performance improvement (Engert & Baumgartner, 2016). It is essential to map the stakeholders involved and the resources needed to achieve the set goals. Another important aspect is time. Each strategy has a time horizon, which can vary depending on the field of the organisation, but five years is a typical time horizon for planning (Cohen & Cyert, 1973). Furthermore, it is essential to decompose the strategy into clear actions and the next steps that have to be taken.

The implementation of the set targets requires time as well as acceptance and motivation from the employee. A significant driver of this motivation is that the employee is sufficiently qualified to understand the impact of the sustainability strategy on their daily activities. This qualification can be delivered through training (Engert & Baumgartner, 2016).

9.1.3. PRIORITISE

The elements of the framework will be used to formulate a strategy. Since there are many elements in the framework on different levels to choose from, these elements should be prioritised.

This prioritisation can be done through an impact matrix, as shown in figure 28. This is a management tool that helps to focus on what activities have the highest priority and need to be tackled first. The matrix maps the impact of an activity compared to the amount of effort needed to achieve it. It is based on four quadrants with the y-axis impact and the x-axis effort. The matrix can give organisations a better understanding of high impact activities that can be achieved with relatively little effort (Tan & Raghavan, 2004). The matrix is widely used and is based on the prioritisation matrix of Stephen Covey, and it is also very similar to the Eisenhower matrix.

In the top-left quadrant, elements are placed that take relatively little effort and have a high impact; these are the activities to focus on. The bottom-left activities take relatively little effort but have limited impact. These activities can be easy to complete but should not be solely focused on. The activities in the top-right quadrant take a lot of effort but have a relatively high impact. These activities might be something for long-term goals, where the effort can be spread over a significant period. The activities in the last quadrant, the bottom-right quadrant,

take a lot of effort but have little impact. These activities should not be focussed on since these are time-consuming tasks that result in little impact.

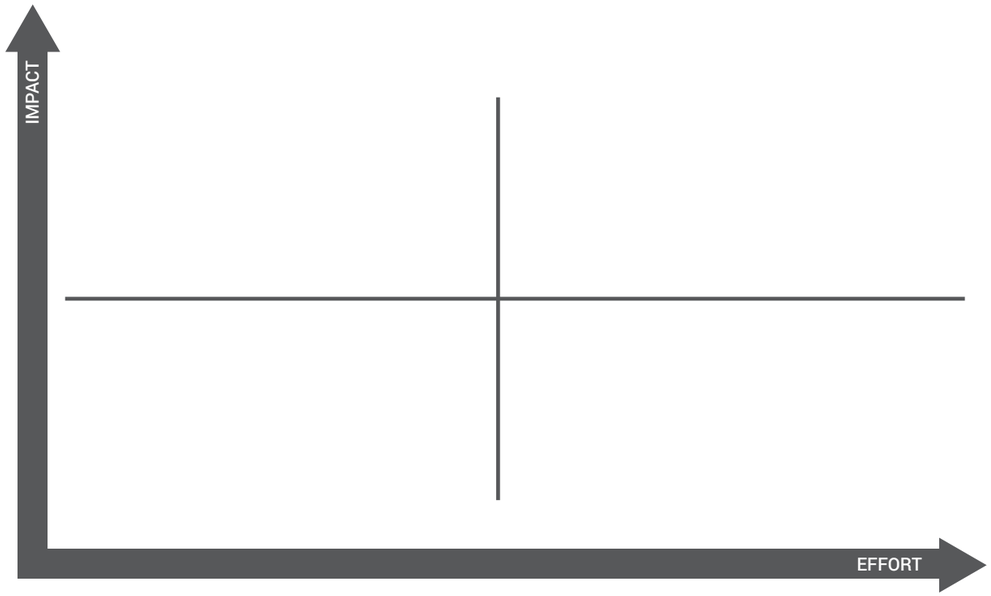


Figure 28 Impact matrix

9.2. METHOD DEVELOPMENT

The aim of the method is to enable HEMA to formulate a sustainable packaging development strategy for after the current targets of 2025. The method includes the developed framework and builds on the discussed literature at the beginning of this chapter, taking the drafted requirements into account. The method is divided into the following four steps:

1. Choose direction
2. Goal/target setting
3. Plan
4. Conclusion

A visualisation of the whole method, and parts that are not visualised in this section, is given in Appendix I. Before progressing towards explaining the different steps, the method is explained in general. The method is made in Miro, a web application that allows teams to brainstorm. One requirement of the method was a clear visualisation. Therefore the visualisation of the method consists of the framework itself, the background information behind sustainable development, the description of the different elements of the framework and the four steps. The yellow rectangles show the direction elements of the framework. The blue rectangles show the implementation elements. The green rectangles show where the user has to take action. Some of the implementation elements in the framework have different colours. This is to show which elements belong to each other when filled in the impact matrix. The parent element is fully coloured, and the child elements have a matching coloured ring. The description of each element can be found in Appendix G.

9.2.1. CHOOSE DIRECTION

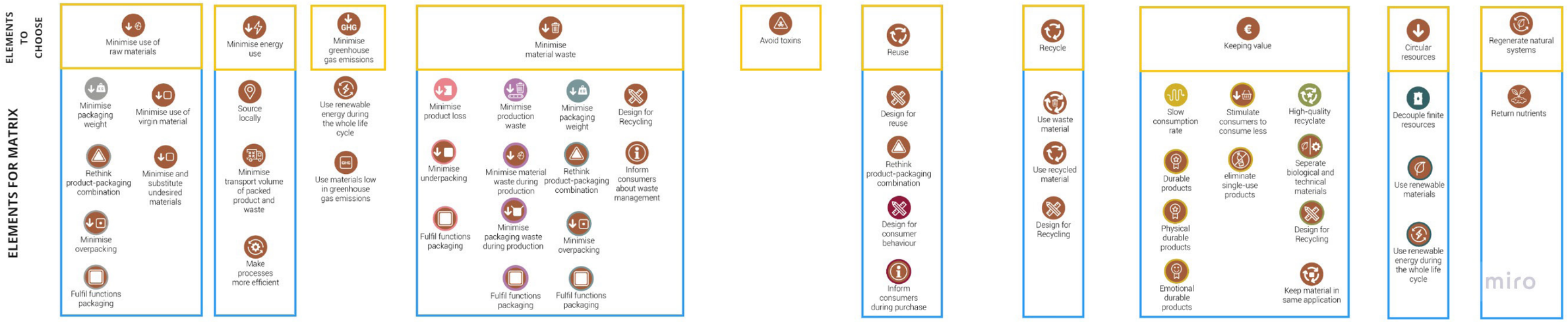
As explained in theory, strategy formulation consists of goal or target setting and plan-making. However, first, a direction within sustainable packaging development needs to be determined to be able to set a goal. The first step of the method is to choose a direction within sustainable packaging development that aligns with the general sustainability strategy. This step consists of the following three steps:

1.1 Describe general sustainability strategy
1.2 Choose elements that align with sustainability strategy
1.3 Impact matrix and choosing direction

Describe general sustainability strategy

HEMA has a general sustainability strategy; it is of importance that the sustainable packaging development strategy fits within this general strategy. This way, the different sustainability strategies can be directed in the same direction, and it will be much more apparent to employees than when the strategies aim in different directions. This also enables a smooth transition between the current targets and future strategies. In the method at 1.1, the general sustainability strategy needs to be described, as shown in figure 29.

Figure 29 Method, choose direction, describe general sustainability strategy



1.2 ELEMENTS THAT ALIGN WITH SUSTAINABILITY STRATEGY

Copy elements that align with sustainability strategy in the yellow box and the corresponding elements in the blue box

ELEMENTS TO CHOOSE

ELEMENTS FOR MATRIX

miro

Figure 30 Method, choose direction, elements that align with sustainability strategy

Choose elements that align with sustainability strategy

When the general sustainability strategy is clear, the direction of the sustainable packaging development strategy can be determined by selecting the elements that align with the general sustainability strategy. The elements that are on a level that can align with this strategy are the direction elements, which describe the main directions of sustainable packaging development. Above 1.2, all direction elements with their implementation elements are summed up to give a clear overview, as shown in figure 30. In this step, the user has to choose the direction elements that align with the general sustainability strategy. The chosen direction elements can be copied into the yellow rectangle in 1.2, after which the corresponding implementation elements can be copied in the blue rectangle. There is no limit to the number of chosen direction elements. The elements placed in 1.2 are the directions that the sustainable packaging development strategy could focus on.

Impact matrix and choosing direction

In the previous step, the directions in which the sustainable packaging development strategy could focus are determined. To find out which of the implementation elements can make the most impact, they should be prioritised. This can be done through the earlier described impact matrix. The y-axis displays the impact, which is the difference in environmental impact by implementing element, times the impact HEMA can make. For example, a certain technology might halve the carbon emissions when implemented, but if HEMA is only able to implement it for a very small amount of its portfolio, it still won't have a big impact. On the other hand, if an element can reduce a small amount of weight but is implemented in a large number of packaging, the impact will be relatively big. Effort, on the x-axis, is the estimated effort to implement the element.

The first step of 1.3, as shown in figure 31 is to place all elements in the matrix that were placed in the blue rectangle in 1.2. The user needs to place the elements according to its own knowledge and experience. The elements in the top-left corner are the elements that make the most impact while taking the least effort. After placing the elements in the matrix, the elements in the top-left quadrant need to be prioritised and placed in the blue rectangles on the left of the impact matrix, with the most important element on top. This prioritisation needs to be done according to the user's own knowledge and experience.

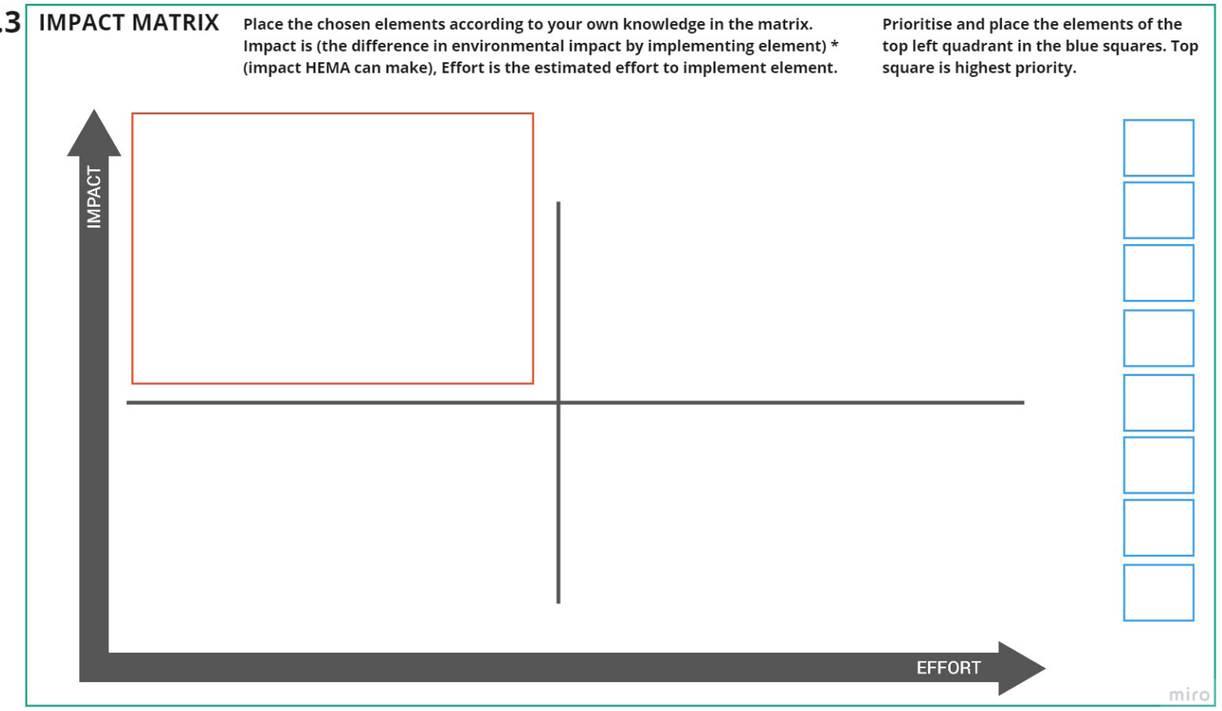


Figure 31 Method, choose direction, impact matrix

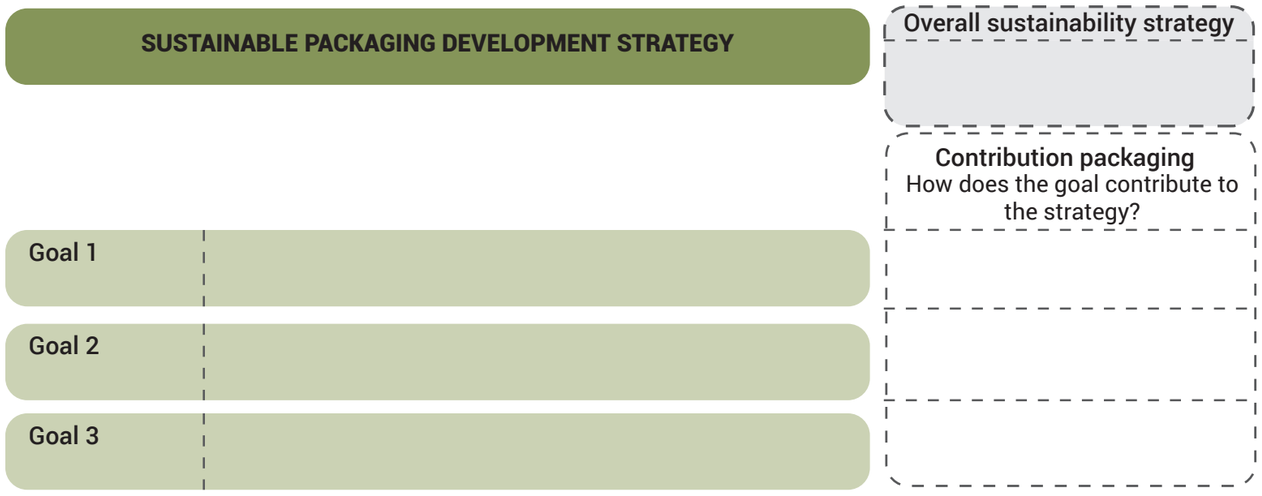


Figure 32 Method, conclusion

9.2.2. GOAL/TARGET SETTING

When the elements are prioritised in 1.3, goals can be set, and a plan can be made for the most important elements. These elements are addressed one by one. Step 2 is goal/target setting, and step 3 is plan-making and are together shown in figure 33. One requirement of the method was to provide a clear overview; therefore, steps 2 and 3 are shown so that all answers can be seen at once. The visualisation was inspired by the widely used Business Model Canvas. The user can give the answers in the assigned text boxes.

The aim of step 2 is to formulate a goal or target for one of the chosen elements in the blue rectangles of step 1.3. Step 2 starts with contribution; since the sustainable packaging development strategy has to align with the general sustainability strategy, the contribution of the element to this strategy needs to be clear. The next steps are the SMART guidelines as earlier described. It is important to describe the goal specifically. Specific is divided into two questions, the first 'What would you in the most ideal situation want to achieve?' and the second 'What would you want to achieve in this strategy?'. These questions allow the user to look into the future and see the ultimate goal while breaking this down into a goal that is achievable in the near future. With measurable, the user must think about how much needs to be achieved and how this is going to be measured. This is the step where the goal gets quantified into a target, as described by Cohen and Cyert. This step will determine when the goal is achieved and progress could be mapped. Acceptable is divided into two questions as well, the first 'How does the goal align with HEMA's values?' and the second, 'Which laws and guidelines do you have to take into account'. The first question is based on the requirement that the method must fit the brand HEMA and the viewpoint of Cohen and Cyert, who state that the goals must be viewed from the values that are held by the organisation. Furthermore, the strategy must comply with the laws and guidelines that apply to the area of the goal. If not, the goal cannot be acceptable to the organisation.

Next, the goal must be realistic to achieve. To determine whether this is the case, HEMA could perform a SWOT analysis, market analysis, or ask KIDV for their opinion. Lastly, the goal must be timebound; it must include a timeframe in which the goal needs to be achieved. All the information given in the previous steps needs to be combined in one goal or target at the bottom of the visual.

9.2.3. PLAN

Next is step 3, plan-making. It is important to address the responsible stakeholders and what resources are needed to achieve the goal as described earlier. Therefore, step 3 starts with the following two questions 'Who is responsible for what?' and 'What is needed to achieve the goal?'. Another important step of strategy formulation, according to Cohen and Cyert, is planning. Therefore a timeline is included that shows the planning of achieving the goal. The last step includes listing the first next steps that have to be taken in achieving the goal.

The elements that were prioritised in 1.3 that are thought to have potential in formulating the sustainable packaging development strategy and are important have to go through step 2 and 3 as well. The goals of these elements combined will be the sustainable packaging development strategy.

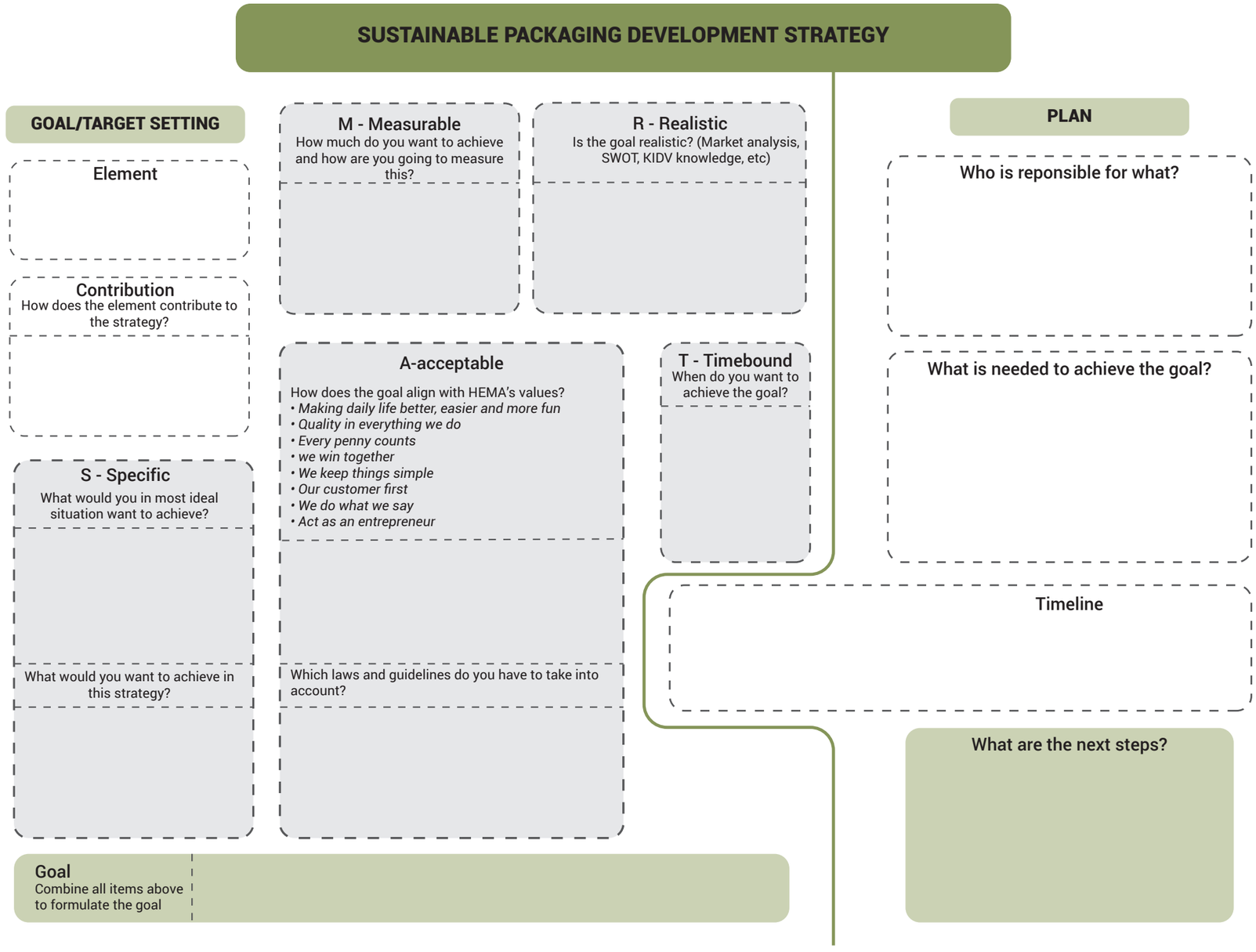


Figure 33 Method, goal/target setting and plan

9.2.4. CONCLUSION

The last step of the method is the conclusion, as shown in figure 32. The goals that were set in step 2 are summarised in this step. All goals are filled in, including the contribution they have to the general sustainability strategy. This conclusion is the overview of the sustainable packaging development strategy.

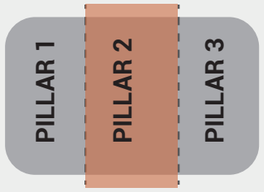
9.3. ILLUSTRATION OF USAGE

The previous section discussed the development of the method; this section will focus on how to use the method. Figure 34 illustration of usage. The method can be used by one or multiple people. Eventually, the director of Innovation, Sustainability & Foundation and the Technical Packaging Specialist have to formulate the sustainable packaging development strategy and are the primary stakeholders. The secondary stakeholders are the category- and product managers, purchasers, Packaging design & translation team, Packaging specialist responsible for secondary and tertiary packaging and the board members. These people have to work with the developed strategy. The illustration of usage shows a simplified example of the use of the method.

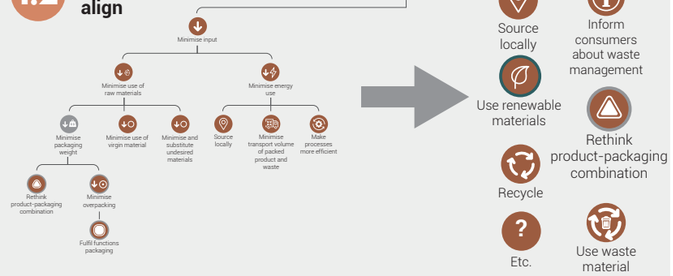
First, one or multiple directions within sustainable packaging are chosen by describing the general sustainability in 1.1, and choosing elements that align in 1.2. In 1.3 the elements are prioritised in the impact matrix. The elements that have the highest impact and need the least effort, the top-left quadrant, are selected and listed in the blue rectangles in step 1.3. Next, a goal or target is set for each of those elements, and a plan is made. This will happen consecutively; first, the goal is set and a plan is made for the first element, next the goal is set and the plan is made for the second element, etcetera. Finally, all goals or targets are combined in the conclusion; this is the sustainable packaging development strategy. There is no limit in the amount of goals/targets for this strategy; however, a manageable number of targets should be chosen. The illustration gives relatively compact answers; when the method is used, a more detailed answer could be given.

1. CHOOSE DIRECTION

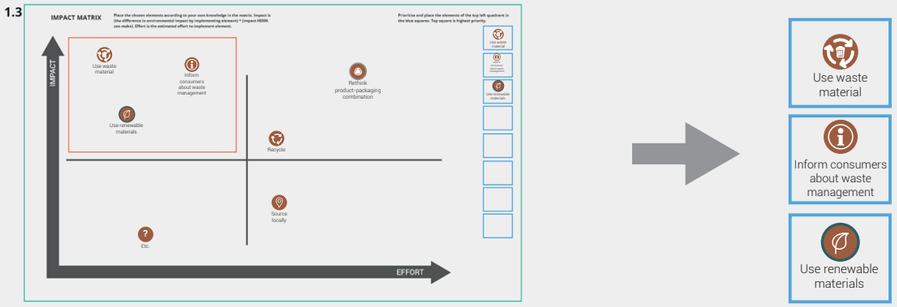
1.1 Describe general sustainability strategy



1.2 Choose elements that align



1.3 Prioritise elements



2. GOAL/TARGET SETTING 1

Use waste material → SMART

Goal/target 1:
100% of plastic packaging waste in stores will be used for new HEMA products or packaging by 2030

3. PLAN GOAL/TARGET 1

Who is responsible Sustainability director and Technical Packaging specialist for execution, store managers

What is needed Insights in store waste, innovative application ideas, collaboration with recycling plant

Timeline

2026	2027	2028	2029	2030
Store waste data collection	25%	50%	80%	100%

Next steps Collect store waste data, contact recycling plants, start ideation with designers, research relevant legislation

2. GOAL/TARGET SETTING 2

Inform consumers about waste management → SMART

Goal/target 2:
100% of the packaging inform the user on how to dispose the packaging by 2030

3. PLAN GOAL/TARGET 2

Who is responsible Sustainability director and Technical Packaging specialist for execution, packaging designers

What is needed Insight in related legislation per country, universal system of informing

Timeline

2026	2027	2028	2029	2030
10%	20%	40%	80%	100%

Next steps Research relevant legislation, design an universal system of informing on packaging

2. GOAL/TARGET SETTING 3

Use renewable materials → SMART

Goal/target 3:
30% of all packaging is made of renewable materials (e.g. bio-based plastic, paper) by 2030

3. PLAN GOAL/TARGET 3

Who is responsible Sustainability director and Technical Packaging specialist for execution, category- and product managers

What is needed Posibilities renewable materials suppliers, market research renewables, data current porfolio

Timeline

2026	2027	2028	2029	2030
2%	10%	20%	25%	30%

Next steps Collect data current portfolio, contact suppliers about renewables, market research renewables

4. CONCLUSION

Goal/target 1:
100% of plastic packaging waste in stores will be used for new HEMA products or packaging by 2030

Goal/target 2:
100% of the packaging inform the user on how to dispose the packaging by 2030

Goal/target 3:
30% of all packaging is made of renewable materials (e.g. bio-based plastic, paper) by 2030

Goal/target x

SUSTAINABLE PACKAGING DEVELOPMENT STRATEGY

Figure 34 Illustration of usage method

9.4. CONCLUSION METHOD DEVELOPMENT

This chapter described the development of the method that enables HEMA, in combination with the framework, to formulate a sustainable packaging development strategy after the targets of 2025. The method consists of four steps: choose direction, goal/target setting, plan and conclusion. The method allows choosing a direction within sustainable development that aligns with the general sustainability strategy. The visualisation of the method consists of the framework, background information about sustainable development, a description of the different elements of the framework, and the four steps. The method enables the user to choose one or multiple directions within sustainable packaging development that align with the general sustainability strategy. The directions will be included in the sustainable packaging development strategy by setting goals and plans for each direction and combining these into one overview in the conclusion. The illustration of usage shows a simplified example of the use of the method.

CONCLUSION PART B

Part B revolved around answering the second research question, How can a method be developed to help HEMA formulate a sustainable packaging development strategy after the targets of 2025?

The current packaging targets are based on the signed covenant, competitors' targets and legislation. This makes HEMA dependent on others. Furthermore, the models and theories discussed in the analysis do not show a complete overview of all directions and do not describe precisely how these directions need to be implemented. Moreover, there is a gap between the theories and HEMA's practices and HEMA does not use a definition of sustainable development. To close this gap and to make HEMA independent of others for strategy formulation, a solution based on theory is developed. This solution combines the different theories and definitions of sustainable development and shows an overview of the directions within sustainable packaging development.

The proposed solution will enable HEMA to formulate a sustainable packaging development strategy by providing an overview of directions, including how to implement those and how to translate this into a strategy. The solution consists of a framework and a method. First, requirements for the solution were set. Second, the theories discussed in the analysis were combined, which formed a base for the framework. This base describes that to preserve the earth for future generations, packaging has to be developed within the constraints of the earth by increasing eco-efficiency and eco-effectiveness. The latter divides the framework into two main directions, eco-efficiency and eco-effectiveness. The framework describes the different directions within sustainable packaging development and how to implement those in practice. This framework does not enable the formulation of a strategy; therefore, a method was developed.

The method translates the different directions into a sustainable packaging development strategy. It consists of four steps: choose direction, goal/target setting, plan and conclusion. The method allows choosing a direction within sustainable development that aligns with the general sustainability strategy. The directions will be included in the sustainable packaging development strategy by setting goals and plans for each direction and combining these into one overview in the conclusion. The illustration of usage shows a simplified example of the use of the method. The next part will evaluate the method.

RESEARCH QUESTION 3

Does the developed method enable HEMA to formulate a sustainable packaging development strategy after the current targets of 2025?

PART C: EVALUATION

Part C answers the third research question, Does the developed method enable HEMA to formulate a sustainable packaging development strategy after the current targets of 2025? This question is answered by chapter 10, which includes evaluating the solution by the set requirements and through evaluation sessions with the director of Innovation, Sustainability and Foundation at HEMA.

10.

EVALUATION

This chapter evaluates the developed solution and starts with evaluating the requirements. Next, the used quantitative evaluation method, direct observation and interviewing, is explained. After the evaluation method is defined, the findings from the different evaluation sessions with the director of Innovation, Sustainability and Foundation at HEMA are listed.

10.1. EVALUATION REQUIREMENTS SOLUTION

The usability and applicability of the solution for formulating a sustainable packaging development strategy are assessed by evaluating the solution with Eva Ronhaar, director of Innovation, Sustainability & Foundation at HEMA. This included evaluating whether the set requirements are met. table 2 shows whether the requirements are met by addressing the requirements from solution development and the evaluation session. Green means the requirement is met, orange that the requirement is partially met and grey that the requirement was not tested. The detailed insights of the evaluation sessions are shared in the following sections.

FUNCTION	PERFORMANCE REQUIREMENT	MET	EXPLANATION SOLUTION DEVELOPMENT	MET	EXPLANATION EVALUATION SESSION
Enable the user to formulate a sustainable packaging development strategy					
	Enable goal formulation and quantified target setting in the chosen direction		Is included in step 2, Goal/target setting, of the method		Eva was able to formulate a quantified target, however it became clear that it is not always possible to set relevant targets for the strategy with the implementation elements.
	Remind the user of researching the latest targets and legislations related to packaging.		Is included in step 2 of the method, in A-acceptable		Eva listed the legislation that she knew by heart, with more time elaborate research was conducted
	Enable to make a plan on how to achieve the set goals and targets, including the responsible stakeholders, the resources needed, a timeline and an overview of the next steps to be taken		Is included in step 3, Plan, of the method		Eva was able to make a plan,including the responsible stakeholders, a timeline and an overview of the next steps to be taken. However, no clear resources were given. The question 'what is needed' was not precise enough.
	Combine multiple goals or targes into a sustainable packaging development strategy		Is included in step 4, Conclusion, of the method		Due to time constraints Eva was only able to formulate one target
Allow the user to choose a direction within sustainable packaging development					
	Provide different directions within sustainable packaging development and how to implement those		The framework shows the different directions within sustainable packaging development, the direction elements, and shows how to implement those by the implementation elements		Eva mentioned that normally, it is not very clear which directions are included in sustainable packaging development; this framework gives a clear overview of all directions.
	Enable to align the chosen direction with the general sustainability strategy of HEMA		This is included in step 1, choose direction, of the method. In step 1.1 the user can describe the general sustainability strategy. In step 1.2 the elements of the framework that align with this strategy can be chosen.		Eva formulated the general sustainability strategy and choose elements that aligned with this strategy

	Enable to prioritise directions or ways of implementation within sustainable packaging development, so the direction or implementation with the most impact can be chosen		This is included in step 1, choose direction, of the method. In step 1.3 the user can prioritise the chosen elements with the help of the impact-matrix. The elements in the top-left quadrant have the most impact		Eva was able to prioritise the chosen elements with the impact-matrix. The evaluation session was split in two, in the second session, some changes to the elements with most impact were made, so the matrix is subjected to change
Provide a clear visualisation of sustainable packaging development					
	Include a graphical overview of sustainable packaging development		The framework is the graphical overview of sustainable packaging development		
	Show how different directions within sustainable packaging development can be implemented.		The different levels are provided by the framework structure. It starts with the base elements, after are the direction elements, which are overarching the implementation elements. The implementation elements describe how to implement the direction elements.		Eva mentioned that when currently doing projects, the levels as shown in the framework are often mixed up. These different levels also make sure that the proposed solution is actually contributing to solving the problem during projects.
	Include descriptions of details of the solution		The method includes a description of all elements		
	Provide a clear visualisation of different parts/steps in the strategy formulation		All steps of the method, 1-4, are clearly visualised through graphics		Eva mentioned that the visualisation of the framework and method is very clear, and the structure gives much guidance when using the method
	Give a visual distinction between directions that increase eco-efficiency or eco-effectiveness		Eco-efficiency and eco-effectiveness are clear distinctions		
Take the whole life cycle of the product-packaging combination into account					
	By including the different life cycle phases		Different life cycle phases are included in the framework; raw material, production, transport, consumption and end-of-life are taken into account		
Take all functions of packaging into account as described in the definition of packaging					
	By addressing the importance of fulfilling these functions		The importance of fulfilling these functions are included into the framework,		
Allow for adjustments for future use					
	Enable to add or change information to the solution when new theories arise		The framework and the method are made in Illustrator and Miro and allow for adjustments, however skills in those softwares are needed		Eva mentioned that the solution shows a clear overview of what is currently on the market, but the market changes and the method and framework allow for a change in the future.
	Enable to add or change information to the solution when developments in the market arise		The framework and the method are made in Illustrator and Miro and allow for adjustments, however skills in those softwares are needed		Eva mentioned that the solution shows a clear overview of what is currently on the market, but the market changes and the method and framework allow for a change in the future.

Fit the brand HEMA					
	Include HEMA's values in strategy formulation		HEMA's values are included in step 2 of the method, goal/target setting, in A-acceptable		Eva listed how the chosen direction was related to HEMA's values
	Be applicable to HEMA's wide variety of packaging		The framework and method can be used on any packaging portfolio since it is not fixed on a type of packaging		
	Be applicable to HEMA's changing packaging portfolio		The framework and method can be used on any packaging portfolio since it is not fixed on a type of packaging		
Be understandable for HEMA's sustainability policymakers (director of Sustainability, Innovation and Foundation and the Technical Packaging Specialist)					
	Align with the knowledge level in sustainability and strategy making				Eva was able to understand all parts of the framework and the method.
	Include a manageable amount of information				Eva mentioned that the solution covers a very complex concept, but the amount of information is very manageable.
Enable HEMA to formulate a sustainable packaging development strategy that is understandable for the secondary stakeholders (the category- and product managers, purchasers, Packaging design & translation team, Packaging specialist responsible for secondary and tertiary packaging and the board members)			This was not tested, since the end result of the evaluation was not a full strategy		

Table 2 Requirements solution

10.2. EVALUATION METHOD

The usability and applicability of the method for formulating a sustainable packaging development strategy are assessed by evaluating the solution with Eva Ronhaar, director of Innovation, Sustainability & Foundation at HEMA. Preferably the solution is evaluated with multiple participants. However, at the time of the evaluation, only Eva Ronhaar was working in the field of sustainability. No other functions in the sustainability team were filled, and the Technical Packaging Specialist was on leave. This is a limitation of the evaluation. A qualitative evaluation was performed through direct observation and interviewing.

10.2.1. DIRECT OBSERVATION

The purpose of direct observation is to see what is happening rather than assuming the outcomes directly. One important aspect of direct observation is that the observer must be open to what emerges during the observation (Patton, 2015). The observation setting was a Microsoft Teams meeting since in-person observation was not possible; the participant shared her screen while working on the method in Miro. The observer could see the actions that were taken, which were also saved by the software. The observation method was based on formal interactions and planned activities, as described by Patton. This means that the observation included planned steps that the participant had to follow. The observer talked the participant through each step of the method while the participant took action on planned moments.

10.2.2. INTERVIEW

The second method used for the evaluation is interviewing. The interview took place after the observation; however, the participant offered opinions and insights during the observation. These opinions and insights are also added to the interview content. The interview method used is described by Patton as the Social constructionist interviewing. This method is a dialogical performance while facilitating knowledge exchange. Instead of asking standardised questions, the interviewer engages in dialogue with the participant. The goal of the interview is to examine how the participant experienced certain activities. The interview for the evaluation aims to gather opinions on the method and framework on usability, clarity, applicability and the added value.

The observation was held split in two due to time constraints. The first session stopped after placing the elements in the matrix; the second session started with reviewing this matrix again. This session ended in making a plan for one element; there was no more time for more elements. During the observation, the elements were copied instead of dragged in Miro, so the taken actions could be viewed afterwards. The interview was held in another session after the observation.

10.3. EVALUATION THROUGH OBSERVATION

The sessions are summarised by describing the relevant outcomes of the evaluation through observation.

10.3.1. FORMULATION OF SUSTAINABLE PACKAGING DEVELOPMENT STRATEGY

The following points were observed that affect whether the method leads to the formulation of a sustainable packaging development strategy.

- **Choosing elements:** The chosen implementation elements, in the blue rectangle of 1.2, are placed in the matrix. The elements in the left top quadrant are chosen, prioritised and used for goal setting. However, these elements describe how the direction elements (in the yellow rectangle) can be achieved; some implementation elements are too specific or detailed to be used as a target in the sustainable packaging development strategy. During the evaluation, this was confusing since the chosen element was Design for Reuse, which was interpreted as Reuse. The target that was drafted was addressing Reuse and not Design for Reuse. Design for Reuse is too specific to make an overarching target in the sustainable packaging development strategy; Reuse would be a better target. Some implementation elements could be used for target setting, such as 'Minimise packaging weight', however targets that are too specific should not be used for target setting, then the corresponding parent or direction element should be used.
- **Impact matrix:**
    - The user needs to place the elements in the impact matrix based on their knowledge and experience. Therefore it is objective to own interpretation and estimation, resulting in different outcomes depending on the user.
    - The evaluation session was split in two; this gave the participant the opportunity to look at the impact matrix twice; Eva made some changes to the matrix on the second day.

10.3.2. VISUALISATION

The following points were observed regarding the visualisation of the method and the framework.

- **Contribution:** To answer the question, 'How does the element contribute to the strategy?', the user had to scroll up and down between the general sustainability strategy and the visualisation of step 2, which was inconvenient.
- **SMART:** During the design of the method, the blocks that include the SMART questions were not placed in a specific order, but during the evaluation, it became clear that they are consecutive and should be answered in that order.

10.3.3. USABILITY AND UNDERSTANDABILITY

The following points were observed regarding the usability and understandability of the method and the framework.

- **Reading all elements:** The description of each element was shown on the side for the user to look up the meaning of the elements when not directly clear. However, when the user sees the elements in the framework, assumptions are made, and the descriptions are not always read. Eva did not pick 'Minimise underpacking', even though this has a very high impact on sustainability because she thought it meant something different.
- Element choosing: When choosing the direction elements that align with the general sustainability strategy, all corresponding implementation elements were supposed to be copied in the next frame (in 1.2). However, Eva only copied the elements that were relevant for HEMA. This way, the elements are already filtered for HEMA's needs before placing it in the matrix, which is more valuable than the original method.
- **Timing:** Both goal/target setting and plan-making can be executed in two phases of formulating a strategy. At the beginning to make the stakeholders think about what needs to be considered for formulating the strategy, such as laws and guidelines and whether the goal/target is realistic. It could also be executed at the end of formulating the strategy to check whether the goal/target actually meets the requirements.
- **Different colours:** Parent implementation elements and their corresponding child elements are coloured, so when placed in the matrix, it is clear which elements belong together. However, when the elements are prioritised and an element is chosen for target setting, this element loses the relation to its parent- or child elements since these are not considered during goal setting or plan-making. Furthermore, when displayed in a description list, it is not clear what the relationship between the coloured elements are.
- **What is needed:** The question 'What is needed to achieve the goal' is not very clear, and no specific answers were given. This question might have been too big or vague.

Framework elements

- **Design for consumer behaviour:** The description of Design for consumer behaviour was not entirely clear. Eva interpreted it as incite people to think about their impact and how to be more sustainable through design.

Other aspects were observed as well. Eva was able to formulate a general sustainability strategy and choose direction elements that aligned with this strategy. After that, the corresponding implementation elements were placed in the matrix, and the elements could be prioritised by impact and effort. Lastly, Eva was able to set a goal and a plan for this element.

10.4. EVALUATION THROUGH INTERVIEW

The answers given during the sessions are summarised by describing the relevant outcomes of the evaluation through interview.

10.4.1. VISUALISATION

- **Visualisation:** The visualisation of the framework and method is very clear, and the structure gives much guidance when using the method. The method exists of multiple elaborate steps, which guide in making the right choices that lead to a good strategy. Apart from that, the method shows the rationale behind choices, which is of high value. Currently, at HEMA, when decisions are made during a discussion, it is later hard to find why someone made the decision. Also, the team's change would not affect the strategy-making as much compared to when not documented.
- **Overview of sustainable packaging development:** Normally, it is not very clear which directions are included in sustainable packaging development; this method gives a clear overview of all directions.
- **Distinction linear and circular:** It is very pleasant that there is a distinction between linear and circular, although overlapping each other, due to the visualisation of eco-efficiency and eco-effectiveness. This distinction gives clear insights into the transition from linear to circular development, in which HEMA is interested.
- **Framework levels:** The framework shows an overview of the elements within sustainable packaging development and distinguishes the relationship between the direction elements and the rest. Currently, when doing projects, those levels are often mixed up. These different levels also make sure that the proposed solution is actually contributing to solving the problem during projects.

10.4.2. USABILITY

- **Instruction:** During the evaluation, Eva was talked through the process. For future use, an instruction guide or video needs to be developed to help others use the solution.
- **Framework:** The elements in the framework are very hands-on and give practical advice, but also allows for deeper thinking and considering changing the way of working. Some elements are more directed towards a business model and not only at the product level. This is integrated very naturally and objective and is not communicated aggressively.
- **Use of method:** The person responsible for strategy formulation can use the method alone; however, it is an excellent opportunity to do this with a team. Doing this would make the impact matrix less objective, and it would strengthen the overall outcome of the method. When involving secondary stakeholders, they can be given ownership of the process.
- **Plan:** The questions asked in the plan-making section are very relevant for executing a strategy and communicating the needed resources when the strategy is proposed to the board. In general, everyone would agree to improve a part of the organisation. However, not everyone would agree on the amount of resources that should be available in doing so. So the third step is very valuable when communicating the set goal or target to internal stakeholders.

10.4.3. UNDERSTANDABILITY

- **Description elements:** The description of the elements are very clear, much information is shared, but it is simply explained in just two to three sentences. Reading through the descriptions incite thought.
- **Double elements:** Some elements are double in the framework and can therefore end up double in the impact matrix. This was not explained beforehand, and therefore it can look like the user did something wrong.
- **Manageable:** The method covers a very complex concept, but the amount of information is very manageable.
- **Impact:** At the top of the method, the impact of man-made inventions is described in the IPAT equation; however, this is different from impact in the impact-effort matrix. These different definitions of impact are confusing for the user.
- **What is needed:** It would be valuable if 'What is needed to achieve the goal?' would integrate the risks and the preconditions of what is undoubtedly needed to achieve the goal.

Framework elements

- **Inform consumers:** It is very good that this element is included in the framework; often, this is pushed towards Communication, but it is an integral part of achieving a specific impact.
- **Slow consumption rate:** It is very valuable that this is integrated into the framework because it leads to awareness of the retail branch.

10.4.4. DESIRED OUTCOME

- **Goal/target setting:** Many essential questions are asked that are very relevant for formulating a strategy and because they are asked so explicitly, the user will think about it extensively. There will always be exceptions, but the most explicit and clear strategy can be formulated with this method.
- **Conclusion:** At the conclusion, the visualisation combines all goals included in the sustainable packaging development strategy. However, it is not clear how the timeline of these different goals are related to each other.
- **Insights current strategy:** The framework visualises sustainable packaging development; it gives insights for future strategies and the current packaging targets. It gives guidelines and a better understanding of the current direction and how the future strategy can align with the current targets. This framework can therefore directly be used, and not only after 2025.

10.4.5. FUTURE USE

- **Not only packaging: A**part from packaging, this method could also be used for the product assortment, although some changes would be needed. This method includes the steps that are involved in developing something similar for the product assortment.
- **Adaptability:** The solution shows a clear overview of what is currently on the market, but the market changes and the method and framework allow for a change in the future.

CONCLUSION PART C

Part C revolved around answering the third research question, Does the developed method enable HEMA to formulate a sustainable packaging development strategy after the current targets of 2025?

This question was answered by performing a qualitative evaluation through direct observation and interviewing with the director of Innovation, Sustainability and Foundation. The evaluation was performed with only one participant since no other colleagues were working in the field of sustainability or packaging at the time. The evaluation aimed to determine whether the method would enable HEMA to formulate a sustainable packaging development strategy after 2025 and gather information on the method and framework on usability, clarity, applicability, and added value.

There can be concluded that most requirements are met. The concept of sustainable packaging development is complex, but the method offers a manageable amount of information. Furthermore, the framework gives clear insights into the different directions and levels of sustainable packaging development and how these relate to each other. Also, the method enables the user to choose a direction within sustainable packaging development that aligns with the general sustainability strategy. Moreover, it is able to set a target and make a plan for the chosen direction. Overall, the visualisation of both the framework and the method is very clear and understandable. The framework takes the whole life cycle and the packaging functions into account and is applicable to HEMA's wide variety and changing packaging. The method also enables the user to align the strategy with HEMA's values. Apart from that, the solution also gives insights into the current strategy, which can lead to a smooth transition from the current target to future strategies. Lastly, both the framework and the method are adaptable for future change.

However, the part in plan making where the resources should be listed was not clear. Furthermore, the method in its current state does not always lead to a sustainable packaging development strategy. Even though the method enables to set a goal or target, not all elements that are used lead to a relevant target for the sustainable packaging development strategy. This is because some implementation elements that are used for goal setting and plan-making are too specific or detailed to be used as a target in the strategy. A clear distinction between which elements can and cannot be used for target setting is needed. If the targets are too specific, it would be useful to use the parent element or direction element for goal or target setting. The specific implementation element can still be used as a way how to achieve to set target. Moreover, due to time constraints, only one target was formulated, and it was not possible to combine the targets into a sustainable packaging development strategy. Therefore the evaluation did not prove that the solution can enable HEMA to formulate a sustainable packaging development strategy for after the targets of 2025.

Lastly, the method is used by the primary stakeholders; the secondary stakeholders do not necessarily have to understand the method. However, one requirement of the solution was that the formulated strategy would be understandable for the secondary stakeholders. Since the evaluation only set a goal and a plan in one direction, it could not be tested if the strategy was understandable for these stakeholders.

Concluding, the evaluation did not prove that the solution can enable HEMA to formulate a sustainable packaging development strategy after the targets of 2025. Because not all elements lead to relevant targets for the strategy, and not enough targets were set during the evaluation to combine these into a strategy. However, the evaluation showed that the method enables to set a target. Further development of the solution is needed to enable HEMA to formulate a sustainable packaging development strategy.

PART D: CONCLUDING

Part D, the last part of this thesis, summarises the results gathered in Part A, B, and C of this report. First, the research questions are answered in the conclusion. Then, the limitation of various aspects of sustainability at HEMA and the developed solution; and the added value of the solution are discussed in the discussion. Finally, the recommendations propose changes to sustainability at HEMA and the solution and includes further steps.

11.

CONCLUSION

This thesis was focused on answering the primary research question:

How can HEMA be supported in formulating a sustainable packaging development strategy after the current targets of 2025?

This question has been addressed in three sub-questions that are answered in Part A, B and C. This chapter summarises the findings of the subquestions and combines these to answer the primary research question.

What is HEMA 's current position in sustainable packaging development?

This first question is answered in Part A by analysing HEMA's current sustainable packaging development strategy, its sustainable packaging development, the brand HEMA and different theories and models on sustainable packaging development. This analysis concludes that HEMA has the desire to become the most sustainable value variety brand but does not align its practice to achieve that. The term itself is illogical and it is not included in the general sustainability strategy. Furthermore, the current targets are dependent on others, very few resources are available to formulate a sustainable packaging development strategy and execute this, the product- and category managers and the purchasers lack the required packaging knowledge, and there is a discrepancy between the values price and sustainability in the brand.

Different theories and models on sustainable packaging development are explored. These chapters concluded that that to preserve the earth for future generations, product-packaging combinations need to be developed within the constraints of the environment by increasing eco-efficiency and eco-effectiveness while fulfilling its packaging function. Eco-efficiency can increase by minimising the input and output of the system, and eco-effectiveness can increase by maximising the use of resources and maximising the positive impact.
When comparing these theories and models to HEMA's current practices, there can be concluded that on some points they align, and on others there is a gap. HEMA does not clearly define sustainable development, does not explicitly address the packaging functions, views the packaging separately from the product instead of a product-packaging combination, and does not implement reuse. To formulate a sustainable packaging development strategy for after the targets of 2025, this gap needs to be closed. Therefore, the solution will be based on these theories.

In conclusion, HEMA's current position in sustainable packaging development is that it desires to become the most sustainable value variety brand but does not align its practices, and there is a gap between HEMA's practices and the sustainable packaging development theory.

How can a method be developed to help HEMA formulate a sustainable packaging development strategy after the targets of 2025?

The second question has been answered in part B. The current packaging targets are based on the signed covenant, competitors' targets and legislation. This makes HEMA dependent on others. Furthermore, the models and theories discussed in the analysis do not show a complete overview of all directions and do not describe precisely how these directions need to be implemented. Moreover, there is a gap between the theories and HEMA's practices, and HEMA does not use a definition of sustainable development. To close this gap and to make HEMA independent of others for strategy formulation, a solution based on theory is developed. The different theories and definitions of sustainable development are combined into a solution. The solution provides an overview of directions within sustainable packaging development, including how to implement those and how to translate this into a strategy. The solution consists of a framework and a method.

First, the framework is developed, which is based on the explored theories. The base of the framework describes that to preserve the earth for future generations, packaging has to be developed within the constraints of the earth by increasing eco-efficiency and eco-effectiveness. The latter divides the framework into two main directions, eco-efficiency and eco-effectiveness. The framework describes the different directions within sustainable packaging development and how to implement those; and consists of multiple elements on different levels. This framework does not enable the formulation of a strategy; therefore, a method was developed.

The method translates the different directions into a sustainable packaging development strategy. It consists of four steps: choose direction, goal/target setting, plan and conclusion. The method allows choosing a direction within sustainable development that aligns with the general sustainability strategy. The directions will be included in the sustainable packaging development strategy by setting goals and plans for each direction and combining these into one overview in the conclusion, forming the sustainable packaging development strategy.

Does the developed method enable HEMA to formulate a sustainable packaging development strategy after the current targets of 2025?

The third research question is answered by part C by performing a qualitative evaluation through direct observation and interviewing with the director of Innovation, Sustainability and Foundation. There can be concluded that most requirements are met. However, the method in its current state does not always lead to a sustainable packaging development strategy. This is because some implementation elements, which are used for goal setting and plan-making, are too specific or detailed to be used as a target in the sustainable packaging development strategy. Moreover, due to time constraints, only one target was formulated during the evaluation, and it was not possible to combine the targets into a sustainable packaging development strategy. Therefore the evaluation did not prove that the solution can enable HEMA to formulate a sustainable packaging development strategy for after the targets of 2025. However, the evaluation showed that the method enables to set a target. Further development of the solution is needed to enable HEMA to formulate a sustainable packaging development strategy.

How can HEMA be supported in formulating a sustainable packaging development strategy after the current targets of 2025?

The three subquestions combined answer the primary research question. HEMA can be supported in formulating a sustainable packaging development strategy after the targets of 2025 by the developed framework and method. The framework describes the different directions within sustainable packaging development and how to implement those. This gives insights in the current packaging targets and allows choosing a direction that aligns with HEMA's current sustainability strategy. The method translates the different directions into a sustainable packaging development strategy. This strategy is independent of others and closes the gap between the theories and HEMA's practices. However, this solution needs to be further developed before it can be used. Furthermore, to continue to address the packaging-related environmental problems after 2025, HEMA must reconsider the term most sustainable value variety brand and sustainability has to become a higher priority.

12.

DISCUSSION

In the previous chapter, the research questions defined at the beginning of this thesis were answered. This section discusses various aspects of sustainability at HEMA and the developed solution, and its limitations. The chapter ends with the added value of the solution for HEMA.

12.1. SUSTAINABILITY AT HEMA

Before addressing discussion points of this thesis, a few aspects of sustainability at HEMA are highlighted. HEMA has the ambition to become the most sustainable value variety brand; however,
this will never be achievable with HEMA's current approach of this term. With the desire to be the most sustainable within a certain price range, leadership, innovation and active development in sustainability are needed. However, HEMA does not have and does not predict to have enough resources to do this, and therefore chooses to follow the leaders on sustainable development. It is impossible to be the most sustainable within a certain price range when following the leaders on sustainability that share the same price range. Therefore, more thought should be put into this term. The insights of this thesis might help in evaluating and redefining this term.

Furthermore, although this thesis was only focused on primary packaging, the current secondary packaging system is worth mentioning. This system contributes a lot to plastic packaging waste through the LDPE polybags. This transparent polybag is is needed for scanning the items that are in the bag as well as keeping them clean during transport. The number of Sales Units in this polybag depends on the smallest store's demand, resulting in a lot of unnecessary plastic waste in the bigger stores. It would be a very big project to change this system, but it would result in a steep decline in packaging waste. This change would also significantly impact e-commerce waste and customers' perception of HEMA on sustainability through e-commerce.

12.2. SOLUTION

This thesis provided a solution for HEMA to formulate a sustainable packaging development strategy. However, different aspects in the developed solution show limitations, which will be discussed in this section.

The method allows the user to base the sustainable packaging development strategy on the general sustainability strategy for a smooth transition and a general direction on sustainability within the organisation. However, when the general sustainability strategy lacks this direction, it significantly influences the quality of the sustainable packaging development strategy. When the direction is not explicit, it could result in an unclear directionless sustainability packaging development strategy.

Furthermore, the elements in the framework each have a short description; however, these elements cover big complex concepts, and the descriptions are limited to two to three sentences. Therefore, the elements are to some level open to interpretation of the user, which could lead to incorrect assumptions, wrong prioritisation of the elements, and weak spots in the sustainable packaging development strategy.

Additionally, the impact matrix needs to be filled in based on the knowledge and experience of the user. The results are therefore objective and very dependent on the ability of the user. Predicting the impact that a certain element would have could be biased by marketing claims rather than quantitative research. Since the impact matrix determines the direction of the sustainability packaging development strategy, the user's ability has a significant effect on the outcome.

Another limitation of the prioritisation in the impact matrix is that only the elements in the top-left quadrant are selected. However, the elements in the top-right quadrant could be directions for long-term goals and should be considered; even though they might take more effort, they contribute to the overall direction of the sustainable packaging development strategy.

Eventually, when multiple elements are prioritised and different goals are set, the implementation of the goals could contradict each other. For example, when minimising the packaging weight and recyclable packaging are both goals. What needs to be chosen when comparing a lighter non-recyclable packaging with heavier recyclable packaging? The chosen goals could currently contradict each other, and the managers who have to make those choices lack the required knowledge. Since every element contradicts many elements, it is hard to incorporate a coping system in the framework itself.

Another discussion point on the solution is the software used to build the framework and the method. Adobe Illustrator was utilised to make the framework and the visualisation sheet for step 2, 3, and 4; however, not everyone can work with this advanced graphic software. To change the framework, the user needs the skills in and the license of the software.

The framework and the method were built on product-packaging combinations rather than just packaging. This might not be clear enough to users that are not familiar with this concept. Although it comes back in the element 'Rethink product-packaging combination', this might not suggest that packaging should be seen in combination with the product with other elements as well.

Finally, the solution was only evaluated with Eva Ronhaar, the director of Innovation, Sustainability & Foundation, since she was the only person within HEMA during this graduation assignment responsible for formulating sustainability strategies. The evaluation would be more reliable when conducted with multiple participants.

12.3. ADDED VALUE

The discussion points above elaborate on the limitations of sustainability at HEMA and the solution; this section discusses the added value of the solution for HEMA.

Currently, HEMA is dependent on others since the packaging targets are based on the

signed covenant, competitors' targets and legislation. The first added value of the solution is that, after the solution is further developed, HEMA can formulate a sustainable packaging development strategy that is not dependent on others.

Second, the framework shows different levels and which elements contribute to others. Currently, when HEMA is executing projects, those levels are often mixed up. This framework captures a complete overview of all directions within sustainable packaging development and shows how to implement those. This can help HEMA with the implementation of sustainable development.

Furthermore, the framework not only helps formulate a future strategy it also gives insights into the current packaging targets and their position within sustainable packaging development. This allows for a smooth transition between the current targets and future strategies.

Additionally, the framework applies to every stage of the life cycle of the packaging and throughout the supply chain. This gives HEMA an overview and control of the decisions that have to be made during the life cycle.

Moreover, the visualisation of the method captures the rationale behind decisions, which is of high value. Currently, the sustainability team has had many changes in employees. This makes it harder to find out why certain decisions were made; this method captures this.

The method, in Miro, allows for group sessions with secondary stakeholders who can be involved in formulating the strategy and given ownership after the first drafts are made. This link is essential since product- and category managers have to implement sustainable development and have another perspective on the impact and effort some directions might have. Furthermore, by giving these stakeholders ownership, it is assumed that they are more likely to be committed to reaching the targets.

The method, goal setting and plan-making, can be used in two stages. It can be used at the beginning of strategy formulation to find out what needs to be considered when formulating a strategy and at the end to make sure all requirements are met and all needed steps are done. Furthermore, the questions asked in the plan-making section are very relevant for executing a strategy and communicating the needed resources when the strategy is proposed to the board

The developed method and framework are adaptable for future use since they are not static and can be adjusted as the market and sustainability theories change. Additionally, the method not only gives insights into packaging, it could also give an idea of sustainable product development. However, future research is needed to make changes to the solution to develop something similar for products.

Lastly, when the solution leads to a sustainable packaging development strategy, HEMA's packaging portfolio will become more sustainable, contributing less to environmental problems. Additionally, sustainable packaging could cut costs on material significantly and therefore the production costs of products and packaging. Besides, when reducing the input of raw materials and using more recycled materials, the supply of materials is not disrupted by natural disasters. Additionally, implementing specific elements would create more opportunity for service offering, resulting in new profit streams and improved customer interaction and customer loyalty.

13.

RECOMMENDATIONS

This thesis provides a solution to help HEMA with formulating a sustainable packaging development strategy. The evaluation and the discussion showed that the results could be further improved and supplemented beyond the scope of this research. Therefore, this chapter gives recommendations for sustainability within HEMA and further development of the method.

13.1. SUSTAINABLE PACKAGING AT HEMA

The analysis of this thesis shows the lack of resources available to formulate a sustainable packaging development strategy and implement the developed measures. Due to the current closure of the stores in many countries as a result of the Covid-19 lockdown, HEMA is financially not stable. Nevertheless, when financially recovered, HEMA should invest in resources to formulate and implement sustainability strategies. With the desire to become the most sustainable value variety brand, HEMA should make sustainability a higher priority. Currently, there is a discrepancy between the values price and sustainability in the brand.

When making sustainability a higher priority, people at different levels of the organisation and the board should bear sustainability and have the same mindset regarding sustainable packaging development. It takes time and requires knowledge and training to understand the possibilities of sustainable packaging development and to be able to apply this knowledge. To create the same mindset, the designers and category- and product managers need to be trained on sustainability and sustainable packaging development. These are the people that eventually need to implement solutions to meet the targets of the sustainability strategies. The framework and method could be used as a starting point for developing training materials. This way, the framework could be understood by secondary stakeholders as well.

Currently, packaging is viewed separately from the product and is only considered in the later stages of the design phase. As mentioned by de Koeijer, packaging should not be viewed separately from the product; instead, it should be seen and developed as a product-packaging combination. By seeing the product-packaging combination as a whole, the environmental impact could be lowered significantly. Therefore, HEMA should implement a system where not only data of packaging is collected, but also of products. Also, HEMA should train the designers and managers to consider packaging early in the design phase.

Lastly, many competitors, the Dutch Government with the goal to have a circular economy and different theories and models address reuse. HEMA lags behind in actively addressing this, and therefore, it is recommended to not wait until 2025 to incorporate reuse in the packaging strategy. Reuse has multiple different models, it gives HEMA enough opportunity to integrate this into its packaging portfolio.

13.2. SOLUTION

This thesis provided HEMA with a solution for formulating a sustainable packaging strategy. During the evaluation of the solution, different points of improvements were found.

Currently, the method allows setting goals and plan-making based on the implementation elements; however, if these are too specific, they are not suitable for target setting. The following improvements to the method should be made to enable HEMA to formulate a sustainable packaging development strategy:

- **Impact matrix:** The impact matrix is based on the implementation elements; some of these elements are too specific. Therefore, a clear distinction of which elements can and cannot be used for target setting has to be made. The elements that are too specific can still contribute by showing how the set target can be reached. Furthermore, other related elements should be considered, especially the elements in the top-right quadrant for long term goals. For example, if 'Reuse' is chosen, 'Design for reuse' should still be considered in implementing how to reach the Reuse target. Currently, the link between those elements is lost, a different colouring system could help.
- **Step 2 and 3:** With a clear link between the chosen and corresponding elements, the visualisation of step 2 and 3 should include space for plan-making for the corresponding elements.
- **Conclusion:** The fourth section of the method, the conclusion, summarises the set goals and how these contribute to the general sustainability strategy. This is a visualisation of the sustainable packaging development strategy. This visualisation would need to include the chosen goals of the choosen elements, but it would also be helpful to include a timeline of the different goals and a timeline of the whole sustainable packaging development strategy. Also, the next steps for each goal could be added to the overview.

Other points of improvement that are smaller and not necessarily related to the points mentioned above are the following:

- **Explanation**: The following points need elaborate explanation in the method:
  - The difference between man-made impact in the IPAT equation and impact in the impact matrix.
  - The importance of seeing the packaging not separately from the product but as a part of the product-packaging combination.
  - Why there are double elements in the framework and therefore could end up double in the impact matrix.
  - Why some elements have different colours and what their relationship is when placed in a matrix or description list.
  - Only the relevant implementation elements should be copied into the matrix in step 1.2.
  - Change the explanation of the element 'Design for consumer behaviour', so this is less open to interpretation.
- **Visualisation**: The following adjustments in the visualisation are needed
  - Include space for the description of the general sustainability strategy in step 2
  - Place the SMART elements in consecutive order.
  - The visualisation of step 2 and 3 should include space for plan-making for the corresponding elements.
- **Usability:**
  - Include a user guide for the method.
  - Include a step that requires reading the element description before starting step 1.
  - To decrease the influence of the user's ability, the impact matrix could be filled in by multiple users. Furthermore, the evaluation showed that revising the matrix the next day influences the outcome of the matrix. To get the best results, the matrix should be filled in by a number of experts in the field and split into two sessions.

- The elements in the top-right quadrant should be integrated into prioritising the elements for long-term goal setting.
- The question 'What is needed to achieve the goal' should be split into multiple questions, including the risks and the preconditions of the goal and what resources are needed.

13.3. FURTHER RESEARCH

The previously mentioned points show that the method can be further improved; this section includes how the method can be supplemented beyond the scope of this thesis.

To further develop the solution, the improvement points mentioned previously need to be tackled, and the solution needs to be re-evaluated. The evaluation should be done with multiple experts in the field to get the best results. When the method is finished, it should be discussed with the board and used to make a sustainable packaging development strategy. The strategy should be made in cooperation with secondary stakeholders.

Furthermore, the relation between different elements and how dilemmas could be tackled should be researched. The chosen goals could contradict each other, and the managers who have to make those choices lack the required knowledge to make the right decision.

Additionally, the framework and the visualisation of step 2, 3 and 4 need to be converted to more commonly used software like Microsoft Powerpoint, Microsoft Publisher or Miro.

The method and the framework could function as a guide in building training material for designers, category-and product managers about sustainable packaging development. As the analysis concluded, they currently lack knowledge in sustainable packaging development. Furthermore, it could be further developed into a method and framework for sustainable product development.

REFERENCES

1. Andrews, R., Boyne, G. A., Law, J., & Walker, R. M. (2009). Strategy Formulation, Strategy Content and Performance. Public Management Review, 11(1), 1-22. doi:10.1080/14719030802489989
2. Bruijnes, C., Diepenmaat, H., ten Klooster, R., van Soest, J. P., Langeveld, G., & Balk, V. (2020). The State of Sustainable Packaging (K. I. D. Verpakken Ed.): Kennis Instituut Duurzaam Verpakken.
3. Brundtland, G. H. (1987). Report of the World Commission on Environment and Development: Our Common Future. Retrieved from Geneva: http://www.un-documents.net/ocf-ov.htm
4. Chenavaz, R. Y., Dimitrov, S., & Figge, F. (2020). When Does Eco-Efficiency Rebound or Backfire? An Analytical Model. European Journal of Operational Research. doi:https://doi.org/10.1016/j.ejor.2020.08.039
5. Cohen, K. J., & Cyert, R. M. (1973). Strategy: Formulation, Implementation, and Monitoring. The Journal of Business, 46(3), 349-367. Retrieved from http://www.jstor.org/stable/2351385
6. de Koeijer, B., Wever, R., & Henseler, J. (2017). Realizing Product-Packaging Combinations in Circular Systems: Shaping the Research Agenda. Packaging Technology and Science, 30(8), 443-460. doi:10.1002/pts.2219
7. Doran, G. T. (1981). There's a S.M.A.R.T. way to write management's goals and objectives. Management Review, 70 (11): 35–36.
8. Elkington, J. (1994). Enter the Triple Bottom Line.
9. Ellen MacArthur Foundation. What is the circular economy? . Retrieved from https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy
10. Ellen MacArthur Foundation. (2012, 9-10-2012). Efficiency vs Effectiveness. Retrieved from https://www.ellenmacarthurfoundation.org/news/efficiency-vs-effectiveness
11. Ellen MacArthur Foundation. (2013). Towards the Circular Economy. Retrieved from https://www.ellenmacarthurfoundation.org/assets/downloads/publications/Ellen-MacArthur-Foundation-Towards-the-Circular-Economy-vol.1.pdf
12. Ellen MacArthur Foundation. (2017). The new plastic economy: Rethinking the future of plastics & catalysing action. Retrieved from https://www.ellenmacarthurfoundation.org/assets/downloads/publications/NPEC-Hybrid_English_22-11-17_Digital.pdf
13. Ellen MacArthur Foundation. (2019). Reuse Rethinking Packaging. Retrieved from https://www.ellenmacarthurfoundation.org/assets/downloads/Reuse.pdf
14. Engert, S., & Baumgartner, R. J. (2016). Corporate sustainability strategy – bridging the gap between formulation and implementation. Journal of Cleaner Production, 113, 822-834. doi:https://doi.org/10.1016/j.jclepro.2015.11.094
15. Environmental Management - Eco-Efficiency Assessment Of Product Systems - Principles, Requirements And Guidelines, (2012).
16. Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment, (2019).
17. Haines-Gadd, M., Chapman, J., Lloyd, P., Mason, J., & Aliakseyeu, D. (2018). Emotional Durability Design Nine-A Tool for Product Longevity. Sustainability, 10. doi:10.3390/su10061948
18. Hauschild, M. Z., Kara, S., & Røpke, I. (2020). Absolute sustainability: Challenges to life cycle engineering. CIRP Annals, 69(2), 533-553. doi:https://doi.org/10.1016/j.cirp.2020.05.004
19. HEMA. (2016). for everyone, sustainability report 2016. Retrieved from
20. HEMA. (2018). better, easier, more fun, sustainable report 2018. Retrieved from
21. HEMA. (2019). good for tomorrow, sustainability report 2019. Retrieved from https://sustainability.hema.com/wp-content/uploads/2020/07/Hema-MVO-2019-English.pdf
22. HEMA. (2020a). Our Story. Retrieved from https://www.hema.net/about/our-story
23. HEMA. (2020b). Post COVID-19 focus sustainability. Retrieved from
24. Kapferer, J. (2008). The new strategic brand management Kogan Page.
25. Keller, K. L. (2013). Strategic Brand Management: Building, Measuring and Managing Brand Equity (S. Wall Ed. 4th ed.). Essex: Pearson.
26. KIDV. KIDV model 'Five perspectives on sustainable packaging' ®. Retrieved from https://hoeverpakjeduurzaam.kidv.nl/?lang=en#
27. KIDV. KIDV Recycle Checks. Retrieved from https://kidv.nl/recycle-checks-en
28. Kooijman, J. M. (1990). Verpakken: niet te veel, niet te weinigh, juist van passe. Retrieved from
29. Lansink, A. (2014). Ladder van Lansink. Retrieved from https://www.adlansink.nl/voorbeeld-pagina/
30. Madden, K., Young, R., Brady, K., & Hall, J. (2005). eco-efficiency, Learning Module (F. W. International Ed.): World Business Council for Sustainable Development.
31. McDonough, W., & Braungart, M. (2002). Cradle to Cradle: Remaking the Way We Make Things. New York: North Point Press.
32. Mitchell, C. (2000). Integrating Sustainability in Chemical Engineering Practice and Education: Concentricity and its Consequences. Process Safety and Environmental Protection, 78(4), 237-242. doi:https://doi.org/10.1205/095758200530754
33. Patton, M. Q. (2015). Qualitative Research & Evaluation Methods: Integrating Theory and Practice (Fourth ed.). Thousand Oaks, California: Sage Publications, Inc.
34. Potting, J., Hekkert, M., Worrell, E., & Hanemaaijer, A. (2017). Circular Economy: Measuring innovation in product chains. Retrieved from https://www.pbl.nl/en/publications/circular-economy-measuring-innovation-in-product-chains
35. Retail Forum for Sustainability. (2011). Packaging optimisation. Retrieved from https://ec.europa.eu/environment/industry/retail/pdf/packaging_%20issue_paper.pdf
36. Besluit beheer verpakkingen 2014, (2014).
37. Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., . . . Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. Science, 347(6223), 1259855. doi:10.1126/science.1259855
38. Tan, K. C., & Raghavan, V. (2004). Incorporating Concepts of Business Priority into Quality Function Deployment. International Journal of Innovation Management, 08(01), 21-35. doi:10.1142/s1363919604000927
39. ten Klooster, R., Dirken, J. M., Lox, F., & Schilperoord, A. A. (2018). Zakboek verpakkingen Delft: Plato product consultantsoi.
40. The Pew Charitable Trusts. (2020). Breaking the Plastic Wave Retrieved from https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf
41. Tweede Kamer der Staten Generaal. (1989). Preventie en hergebruik van afvalstoffen Retrieved from https://repository.overheid.nl/frbr/sgd/19881989/0000095844/1/pdf/SGD_19881989_0006096.pdf
42. UN. (2020). The Sustainable Development Goals Report 2020. Retrieved from https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf
43. Wikström, F., Williams, H., Verghese, K., & Clune, S. (2014). The influence of packaging attributes on consumer behaviour in food-packaging LCA studies - a neglected topic. Journal of Cleaner Production, 73, 100-108. doi:10.1016/j.jclepro.2013.10.042

APPENDICES

This chapter includes the appendices that support the report.

Appendix A Target and legislation overview regarding sustainable packaging
Appendix B Target Comparison
Appendix C Reuse
Appendix D Recycle
Appendix E Substitute
Appendix F Interviews experts
Appendix G Description framework
Appendix H Environmental impact packaging materials
Appendix I Visualisation method

APPENDIX A: TARGET AND LEGISLATION OVERVIEW REGARDING SUSTAINABLE PACKAGING

This Appendix focuses on the relevant targets and legislations concerning packaging that HEMA needs to take into account. Firstly, targets are shown, these do not have any financial consequences. After, this Appendix shows the legislation that is in place, which could have financial consequences for HEMA when not followed.

TARGETS

Targets HEMA

The first targets that HEMA needs to take into account are its own targets. HEMA focuses on using less, more sustainable and better recyclable packaging materials and replacing harmful materials with sustainable alternatives. In 2019 the following sustainable packaging targets were established, with that year as a baseline (HEMA, 2019):

- 25% reduction of plastic in primary packaging (2022)
- 100% of paper packaging comes from sustainable sources (recycled and/or FSC) (2022)
- 100% recyclable primary packaging (2025)
- 100% recycled or bio-based plastic for all packaging (2025)
- 25% reduction of primary packaging (2025)

These targets and the other targets and legislation are shown on a timeline in figure 36.

UN Sustainable Development Goals

In 2015 the United Nations (UN) published the 17 Sustainable Development Goals (SDGs), as shown in figure 35. These goals were set to end poverty and set the world on a path of peace, prosperity and opportunity for all on a healthy planet. The goals advocate that eradicating poverty and other forms of deprivation must be combined with efforts to improve health and education, minimise inequality, and boost economic development – all while combating climate change and protecting our oceans and forests (UN, 2020). The Sustainable Development Goal that is directly related to this research is goal 12: Responsible consumption and production.

Sustainable Development Goal 12, responsible consumption and production, is divided into 11 targets, of which the following time-bound targets are related to this thesis (UN) :

- **12.2** By 2030, achieve sustainable management and efficient use of natural resources by reducing the amount of material extraction and material consumption required to meet a person's needs.
- **12.4** By 2020, Responsible management of chemicals and waste: reduce the amount of chemicals released to air, water and soil to minimise the impact on human health and the environment
- **12.5** By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse
- **12.8** By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

There are no measurable indicators for these responsible consumption and production targets, making it hard to know whether governments or companies achieved them. Therefore, HEMA should use these targets as a guideline.

Figure 35 Sustainable Development Goals of the United Nations (UN, 2020)

Dutch Plastic Pact targets

State Secretary of the Ministry of Infrastructure and Water Management Van Veldhoven adopted the Dutch Plastic Pact (Plastic Pact NL) in February of 2019, which focuses on closing the cycle for single-use plastic products and packaging in the fast-moving consumer goods sector. More than 70 Dutch businesses and environmental organisations signed the pact, including HEMA. The pact makes a distinction between Plastic Using Companies and Plastic Producing Companies. Since HEMA is a Plastic Using Company, it only has to commit to those corresponding targets. The following targets, to reduce the environmental impact of plastic and to stimulate circularity, are set for 2025 (van Veldhoven, 2019):

1. All single-use plastic products and packaging, which is defined as products that are intended to be used just once or for a short period before being disposed of, have to be 100% recyclable, where possible reusable.
2. The total plastic volume (in kg) has to be at least 20% lower than the base year 2017, by not using more plastic than necessary, through reuse, and/or through alternative, more sustainable materials.
3. All single-use plastic products and packaging will contain the highest possible percentage of recycled plastics (in kg), with an average per company of at least 35%. Besides, sustainably produced biobased plastics will be used as much as possible to reduce the use of virgin plastics.

HEMA's current packaging targets cover the targets of the Plastic and therefore only prove to be a challenge when HEMA does not achieve its own targets.

Circular Economy Dutch Government

In 2016 the Dutch government proposed a transition towards a circular economy with the program' Programme Netherlands Circular in 2050'. In 2017, this was strengthened by the 'Resource Agreement' signed by companies, governments, unions, and many other organisations. Both initiatives include agreements to have the Dutch economy run on entirely reusable raw materials by 2050. Reusable materials are sustainably produced renewable (inexhaustible) and widely available raw materials. The goal is to reduce finite raw material consumption (minerals, metals and fossil fuels) by 50% by 2030 (Government of the Netherlands, 2017). Both the 'Programme Netherlands Circular in 2050' and the 'Resource Agreement' have been elaborated into five transition agendas: Biomass & Food, Plastics, Manufacturing Industry, Circular Building Economy and Consumer Goods (Bruijnes et al., 2020).

LEGISLATION

Packaging Waste Directive

In 2018 the European Parlement and Council proposed Directive (EU) 2018/852, the Packaging Waste Directive, which states improvement of waste management in the EU to protect, preserve and improve the quality of the environment. This directive includes measures to reinforce prevention and to stimulate reuse and recycling of packaging waste. The directive describes required recycling targets, as shown in table 3 (European Parliament, 2018). Currently, the Netherands meets these targets (Afvalfonds Verpakkingen, 2019). These targets focus on the actual recycling rates, not the recyclability of the packaging. However, HEMA contributes to these targets by making its packaging 100% recyclable.

Required recycling rates EU

	Current targets	By 2025	By 2030
All packaging	55%	65%	70%
Plastic	25%	50%	55%
Wood	15%	25%	30%
Ferrous metals	50% (incl. Al)	70%	80%
Aluminium	-	50%	60%
Glass	60%	70%	75%
Paper and cardboard	60%	75%	

Table 3 Required recycling rates EU (European Parliament, 2018)

Single-use Plastic Directive

The Directive (EU) 2019/904 focuses on reducing the impact of certain plastic products on the environment. It mainly focuses on the single-use plastics found on beaches in Europe and fishing gear and oxo-degradable plastics. The following measures were given (European Parliament, 2019):

- By 3 July 2021:
  - EU states have to prohibit the placing of single-use plastics on the market, such as plates, cutlery, cotton buds, beverage stirrers, etcetera.
  - EU states shall ensure that single-use plastic products placed on the market, such as sanitary towels and wet wipes, have clear marking to inform the consumer about waste management, plastic in the product and the negative effect of littering.
- By 3 July 2024: the EU States shall ensure that plastic single-use products containing plastic caps and lids can be put on the market only if the caps and lids remain attached to the containers during the planned use phase of the goods.
- By 2025: beverage bottles made of PET contain at least 25% recycled plastic
- By 2030: beverage bottles made of PET contain at least 30% recycled plastic

In June 2020, the Ministry of Infrastructure and Water Management proposed a draft for a law, based on the EU directive 2019/904, which covers the above targets almost identically (van Veldhoven, 2020). HEMA will need to comply with this law.

EU plastic packaging waste tax

As part of the coronavirus pandemic recovery package, which consists of the Multiannual Financial Framework (MFF) and a specific Recovery effort under Next Generation EU (NGEU), EU leaders agreed on a packaging waste tax. The tax will apply as of 1 January 2021 calculated on the weight of nonrecycled plastic packaging waste with the rate of 0,80 euro per kilogram, including a mechanism to avoid excessively regressive impact on national contributions (General Secretariat of the Council, 2020). This tax could result in 1.4 million euros a year based on HEMA's current plastic footprint.

UK plastic packaging tax

HEMA has ten branches in the UK (HEMA, 2019); therefore, local taxes apply to HEMA products and packaging. The government of the UK announced in 2018 the introduction of a plastic packaging waste tax to reduce the environmental impact of plastic packaging, which will come into effect from April 2022. The tax, £200 per tonne plastic, will apply for plastic produced or imported into the UK, which does not contain at least 30% recycled plastic (HM Revenue & Customs, 2020). With this, the government offers an incentive for businesses to use recycled plastic since virgin plastic is on average £500 cheaper than its recycled counterpart ("Future of Packaging," 2020).

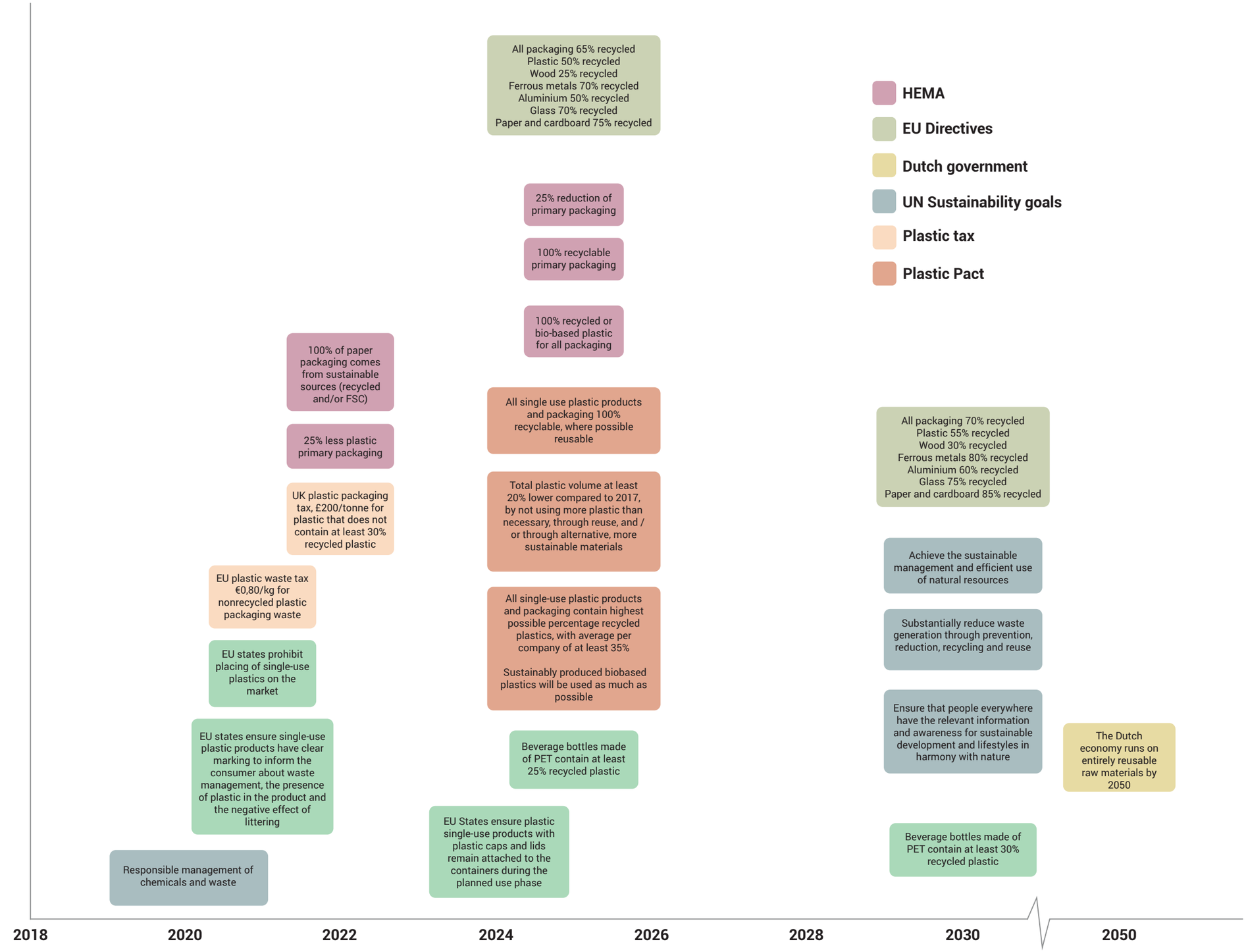


Figure 36 Overview targets and legislation

APPENDIX B: TARGET COMPARISON

Targets of competitors are compared with HEMA's targets and shown in table 4. The targets are retrieved from (Ahold Delhaize; Flying Tiger, 2019; H&M, 2019; HEMA, 2019; IKEA, 2019; Inditex, 2019; Rituals; Unilever)

	Targets HEMA	25% less plastic primary packaging (2022)	All paper packaging comes from sustainable sources (recycled and/or FSC) (2022)	100% recyclable primary packaging (2025)	100% recycled or bio-based plastic for all packaging (2025)	25% reduction of packaging (2025)	Extra 1: Eliminate single-use	Extra 2: Reuse/recycle waste
Supermarkets	Jumbo	Less use of fossil-based materials, more sustainable alternatives	Cardboard or paper packaging as much as possible made of recycled material or else 100% FSC certified (2025)	100% recyclable packaging (2025)	Plastic packaging consists of an average of 35% recycled and / or biobased plastics (2025)	20% less packaging material (2025)		Make new products from waste
	Albert Heijn	Eliminate problematic or unnecessary plastic packaging		Innovate to ensure 100% of plastic packaging can be easily and safely reused, recycled, or composted (2025)	Circulate the plastic produced, by significantly increasing the amounts of plastics reused or recycled and made into new packaging or products		Move from single-use to reuse packaging models	
Apparel	H&M	Take action to eliminate all unnecessary and problematic plastic (2025)		All packaging should be designed to be reusable, recyclable or compostable (2025)	25% post recycled plastic across all packaging used (2025)	Reduce packaging across the value chain by 25% (2025)	Take action to move from single-use towards reuse models where relevant (2025)	Reuse or recycle 100% of packaging waste from our own sites (2025)
		Reduce plastic packaging by 25% (2025).			100% of packaging made from recycled or other sustainably sourced material, with a preference for recycled materials where possible (2030)			
	Inditex						100% elimination of single use plastic for customers. (2023)	100% collection of all packaging materials for recycling or reuse in the supply chain (Green to Pack). (2023)
Hardgoods & textiles	Flying tiger			100% recyclable packaging (2022)		20% reduction of packaging materials (2022)	50% reduction of single use products (2025)	
	IKEA		To resource 100% of our paper-based packaging from more sustainable sources (2020)					Actions are taken to prevent, reduce, reuse and recycle retail operation waste
Other	Unilever	Halve the amount of virgin plastic we use in our packaging (2025)		Ensure that 100% of our plastic packaging is designed to be fully reusable, recyclable or compostable (2025)	Increase the recycled plastic material content in our packaging to 25% (2025)			Help collect and process more plastic packaging than we sell (2025)
	Rituals			Making products/packaging zero waste (recyclable or refillable) by 2025				

Table 4 Overview targets competitors

APPENDIX C: REUSE

The Ellen MacArthur Foundation claims that for at least 20% of the plastic packaging (by weight), reuse provides an economically attractive opportunity, worth at least USD 9 billion (Ellen MacArthur Foundation, 2017a). The goal of reusable packaging is to keep materials in use and reducing packaging waste. However, the environmental impact of reusable packaging will depend on the design and implementation of reuse systems and could have a bigger impact than single-use packaging. For example, by an increase in transport, more complex logistics and the use of non-recyclable materials, such as refill laminate pouches (Coelho, Corona, ten Klooster, & Worrell, 2020). Therefore, when designing reusable packaging, the environmental impact should be taken into account.
According to the report' Reuse, Rethinking Packaging' of the Ellen MacArthur Foundation, there are six benefits of reuse (Ellen MacArthur Foundation, 2019), as shown in figure 37:

- **Compact products**: By offering refills for reusable containers or concentrates, packaging will be more compact and save packaging and transportation costs.
- Deposit and reward: Deposit or reward systems are a great way to increase brand loyalty
- **Superior design:** The look and feel of reusable packaging can be more high-end since the cost is divided over many uses. This will improve the user experience of the products.
- **Smart systems:** Digital technologies, such as RFID and sensors, can be incorporated into the reuse system and gather valuable data about consumer behaviour.
- **Shared design**: When reusable packaging are shared across brands and companies, economies of scale for distribution and logistics can be achieved.
- **Customisation:** Reuse systems can address customisation by mixing and matching products, choosing flavours and personalise packaging.

Figure 37 Six benefits of reuse (Ellen MacArthur Foundation, 2019)

The report provides a classification of reusable primary packaging systems, based on Refill and Return, resulting in the following four types of reuse models (Ellen MacArthur Foundation, 2019), as also shown in figure 38:

- **Refill at home:** A refill that can be placed in a parent packaging, the refillable packaging has a lower environmental impact than the parent packaging.
- **Refill on the go**: A packaging that can be refilled by bulk dispensers in a store or on a mobile truck.
- **Return from home:** Packaging that is collected by door delivery/pick up or through the post.
- **Return on the go:** The user can return the packaging in-store; the packaging will be cleaned and reused by the retailer/producer. This is often combined with a deposit system.

These models will be further elaborated, as well as the forms of repurpose, which is another form of reuse.

Figure 38 Four reuse models (Ellen MacArthur Foundation, 2019)

REFILL AT HOME

With a refill at home, the customer buys a container including the product, uses the product, acquires refills when the product is finished and refills the packaging, as is shown in figure 39 This reuse model works particularly well for e-commerce as communication about the product is possible through the online interface, and brands do not have to compete for shelf space as in regular stores. This type of refill combined with e-commerce is the perfect combination for offering products in the form of subscriptions with the possibility of automatic reordering, which will increase brand loyalty (Ellen MacArthur Foundation, 2019). Refill packaging are often smaller and more compact than their counterparts and can reduce

transport and production costs for the retailer (Coelho et al., 2020). This benefits the customer as refills are often smaller and lighter to carry and store and cheaper to buy than products in standard packaging (Ellen MacArthur Foundation, 2019).
The challenges of this type of reuse model are attracting customers to smaller refill packaging compared to full-size products on shelves when not sold through e-commerce, communicating the benefits of the product packaging combination, and the retailer has to ensure that refills come in packaging that is either reusable, recyclable or compostable packaging. The latter refers to non-recyclable refill pouches (Ellen MacArthur Foundation, 2019). This type of refill model is often used for cleaning, hygiene and beauty products (Coelho et al., 2020) and e-commerce products used at home or offices, such as beverages (Ellen MacArthur Foundation, 2019).

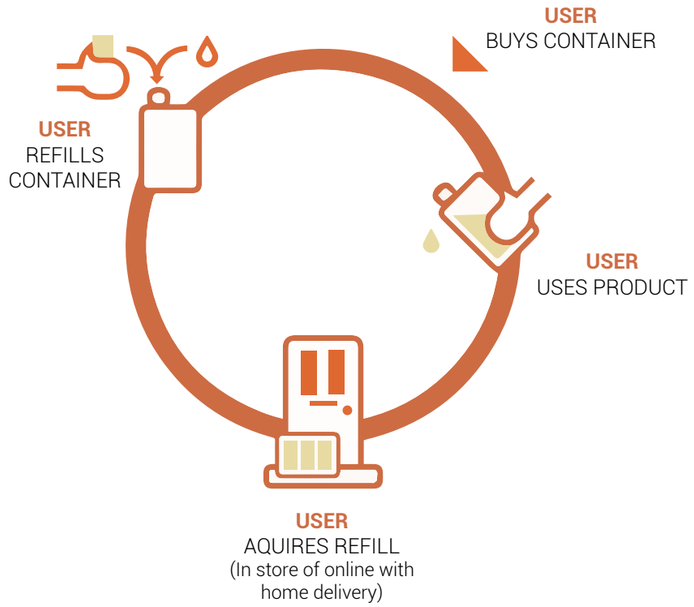


Figure 39 Overview refill at home (Ellen MacArthur Foundation, 2019)

REFILL ON THE GO

Products suitable for the refill on the go model are often limited to dry products such as cereals, nuts, grains, or homecare supplies. With this model, the consumer can reuse their containers and bags by refilling them at a bulk dispenser in a store or at a mobile truck that delivers at home (Coelho et al., 2020), as shown in figure 40. For low-income customers, this reuse model can offer small quantities for an affordable price without relying on single-use sachets. When offered on a mobile truck, customers can benefit from its improved accessibility. This type of reuse model also offers an opportunity to collect customer data through smart innovative dispensing systems. Retailers can reduce transport cost when mixing concentrates with water at location (Ellen MacArthur Foundation, 2019).

However, retailers often avoid bulk dispensers due to strict regulations and additional

complexity around food safety and the necessity of a different operating system (Coelho et al., 2020). Other challenges are motivating the consumer to carry and clean empty containers, match the brand experience, and build the proper logistics and network to make the dispenser system work (Ellen MacArthur Foundation, 2019).

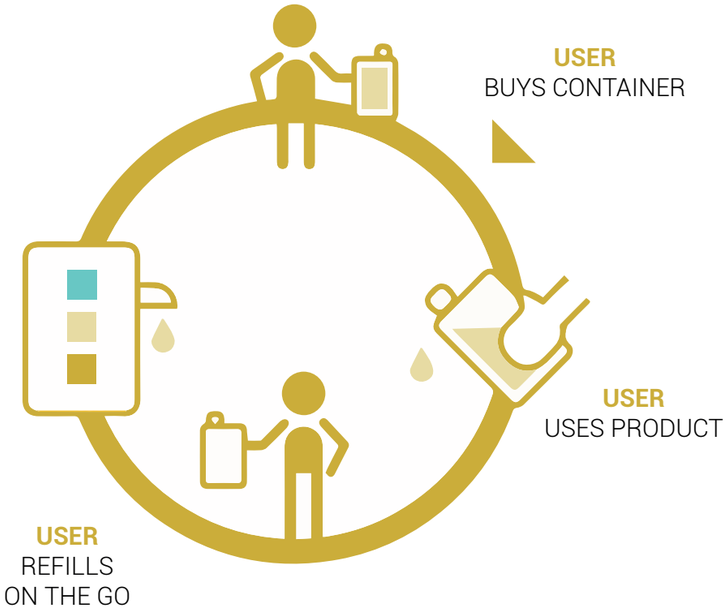


Figure 40 Overview refill on the go (Ellen MacArthur Foundation, 2019)

RETURN ON THE GO

With returnable packaging on the go, the customer purchases the product, uses the product and returns the packaging at a collection point, whereafter the retailer cleans and refills it again, as shown in figure 41. This type of reuse model often works with a deposit system, for example, beer in beer bottles and crates. Deposits, as well as rewarding systems, help businesses to improve brand loyalty. When implementing standard packaging, businesses can collaborate across brands to facilitate logistics, cleaning and transport, resulting in a higher density of drop off points for the consumer. Another benefit for the consumer is the customer experience through improved functionality and aesthetics. When introducing smart technologies to the system, retailers can collect valuable customer data (Ellen MacArthur Foundation, 2019). This system is, apart from the beverages, limited in the Business-to-Consumer (B2C) market but is widely used in the Business-to-Business (B2B) market (Coelho et al., 2020).

This system comes with many challenges. It is very hard to get the concept financially and environmentally beneficial due to the complex logistics, including the infrastructure, storage of empty packaging, cleaning and refilling of the packaging and a tracking system of the deposits. Furthermore, the deposit or reward system and the number of drop-off points have to be attractive to the customer (Ellen MacArthur Foundation, 2019).

Return on the go is not a solution for HEMA since HEMA stores have a minimal amount of storage room in the stores. Hence, storing the returned packaging will be a major issue.

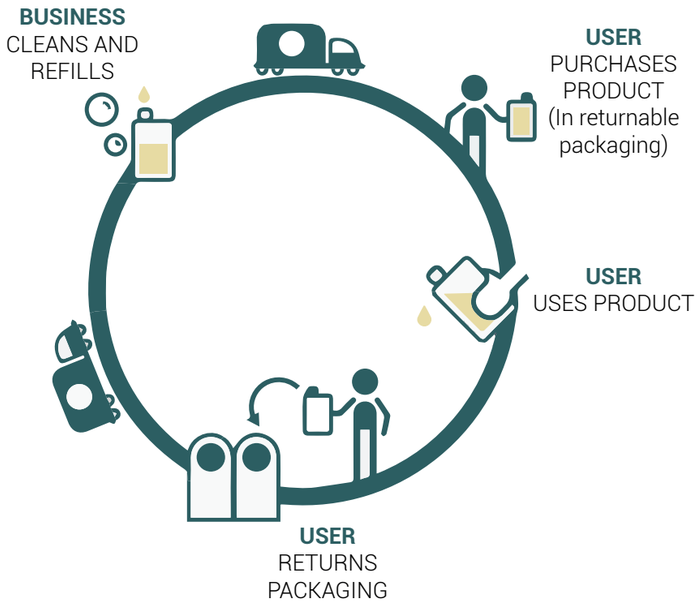


Figure 41 Overview return on the go (Ellen MacArthur Foundation, 2019)

RETURN FROM HOME

Reusing systems in B2B are commonly used across industries because they can have a significant amount of cost savings in the long term. Examples are pallets, crates, drums, bulk containers and big bags, which are often standardised and run in automated processes in all sorts of markets. Although this can be integrated into consumer systems, customers can return the packaging through the post or when the packaging is picked up from home (Coelho et al., 2020). The latter is often combined with e-commerce and is very well suited for urban areas with short travel distances between deliveries (Ellen MacArthur Foundation, 2019). With return from home, the consumer subscribes to or orders a product, uses the product, the business company picks up the packaging, cleans and refills it again, as shown in figure 42

Through this type of reuse model, the customer experience can be improved by upgraded functionality and aesthetics of the packaging. Brand loyalty can increase by a reward or deposit system and by subscription-based purchases—the latter benefits the consumer since it does not have to keep track of stock. By standardising the packaging, retailers can collaborate with other businesses to share the logistics, cleaning and transport networks (Ellen MacArthur Foundation, 2019).

The challenges of this reuse model around logistics are equal to those of the return on the go model, namely to make the packaging financially and environmentally beneficial with the

infrastructure, cleaning and refilling of the packaging and a tracking system of the deposits. Although with this model, no storage of the empty packaging is needed since these are stored at the customer. Furthermore, scaling quickly is essential to maintain affordable prices for customers (Ellen MacArthur Foundation, 2019).

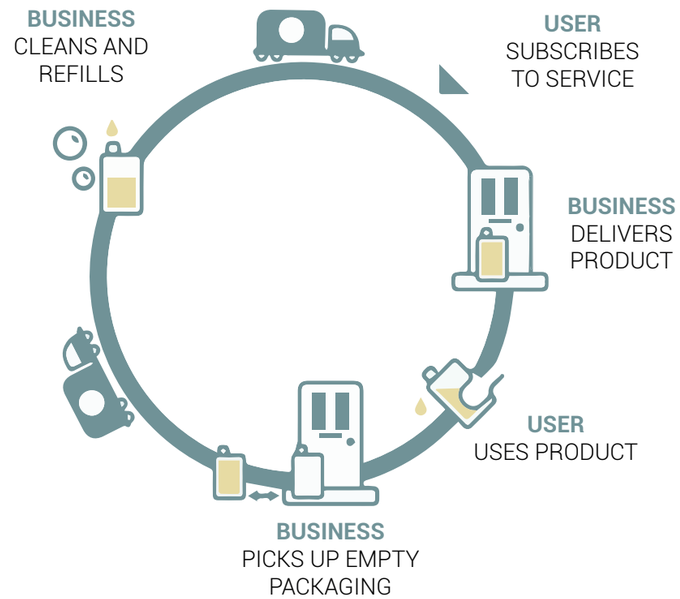


Figure 42 Overview return from home (Ellen MacArthur Foundation, 2019)

REPURPOSE

Repurpose is not integrated into the four reuse models of the Ellen MacArthur Foundation but is described by the R-ladder by KIDV. Repurpose refers to discarded products or their parts that are used in a new product with a different function (Potting, Hekkert, Worrell, & Hanemaaijer, 2017). Repurpose can be divided into two types, repurpose by consumer and repurpose by business. Repurpose by consumer means that the consumer buys a product and after use cleans and or disassemblies the packaging, after which it is used in another application, as shown in figure 43. An example repurpose by consumer is a peanut butter jar that turns into a drinking glass. With repurpose by business, the consumer buys and uses the product, after which either the consumer returns the packaging or the business collects the packaging. The packaging is then cleaned and or disassembled and is used in another application by the business, as shown in figure 44. It is important that the packaging is reused at the same quality level for its purpose; otherwise, this is referred to as downcycling (Ellen MacArthur Foundation, 2013). Repurpose should take place when the product cannot be reused for its original purpose.

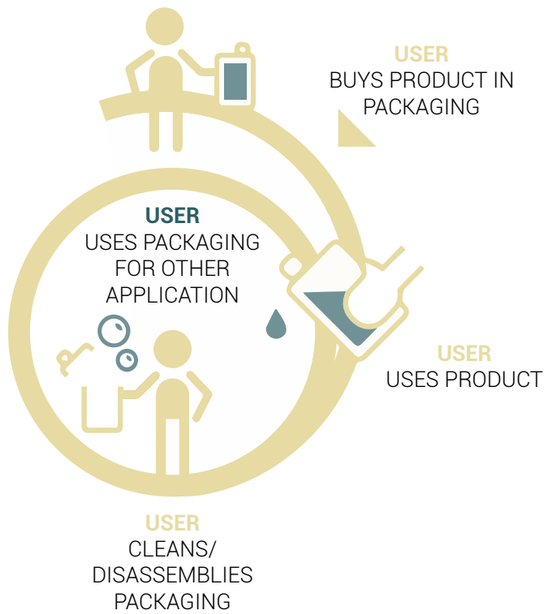


Figure 43 Overview repurpose by consumer

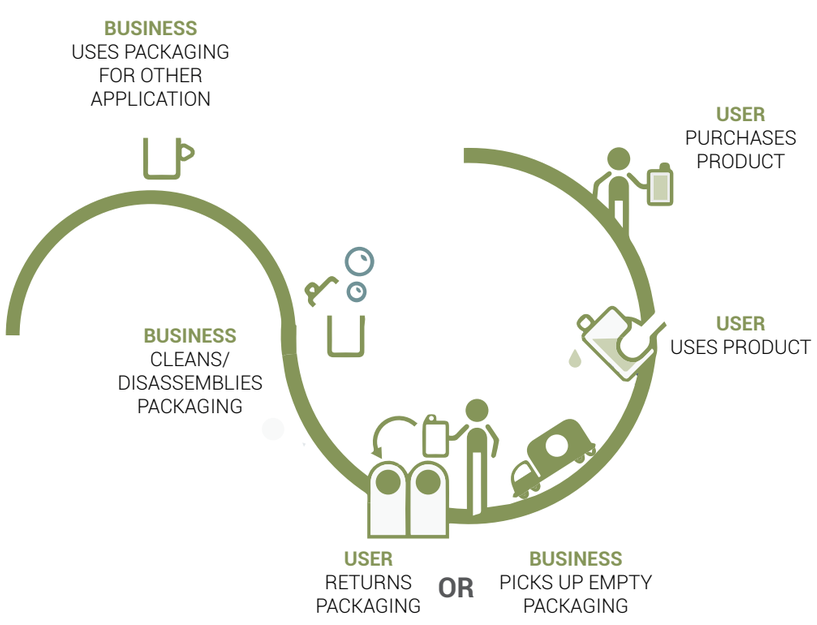


Figure 44 Overview repurpose by business

APPENDIX D: RECYCLE

CURRENT RECYCLING NETHERLANDS

Afvalfonds Verpakkingen monitors the recycling rate of different types of materials in the Netherlands (Afvalfonds Verpakkingen, 2019). Table 5 shows that the recycling rates of 2019 were well above the European targets and exceed the Dutch targets as well, apart from glass. Packaging is sorted by the consumer in different bins and sorted during the processing of rest waste. Plastic has the lowest recycling rate currently, but much innovation is taking place in this field (Afvalfonds Verpakkingen, 2019).

Recycling rates the Netherlands 2019				
Material	**Result 2018**	**Result 2019**	**Objective EU 2019**	**Objective NL 2019**
Glass	86%	87%	60%	90%
Paper and cardboard	89%	91%	60%	75%
Plastic	54%	57%	22,5%	49%
Metals	95%	95%	50%	85%
Wood	77%	70%	15%	39%
Total recycling	**80%**	**81%**	**55%**	**70%**

Table 5 Recycling rates The Netherlands 2019, translated from (Afvalfonds Verpakkingen, 2019)

PLASTIC RECYCLING

The three primary materials used in packaging at HEMA are glass, paper and plastic. Since HEMA does not have much influence on most glass packaging and the collection and recycling rates of paper are very high, it is valuable to look into the different types of plastic recycling and how HEMA can increase the recycling rate. Within plastic recycling, the following three recycling methods are distinguished and are here presented in order of preferability (Ellen MacArthur Foundation, 2017a):

1. **Mechanical recycling in closed loops**: This method captures most of the economic value by keeping the plastic polymers intact. Closed-loop recycling keeps the materials cycling into the same application where a certain level of quality is guaranteed (e.g. from PET bottle to PET bottle).
2. **Mechanical recycling in open-loops**: Due to quality loss within closed-loop recycling, this cannot continue indefinitely and therefore, this degraded material should be used in other lower quality demanding applications, resulting in open-loop recycling. The number of recycling loops can be maximised by implementing the material in the highest-value application possible.

3. **Chemical recycling:** Chemical recycling breaks polymers down into individual monomers, which can be used as building blocks to produce polymers again. This process is less value preserving than mechanical recycling and is not economically beneficial for most plastics. However, this could offer a solution to plastics that cannot be mechanically recycled (anymore) as the polymers can be upcycled to virgin polymers again.

The three methods in combination with the life cycle of packaging are shown in figure 45.

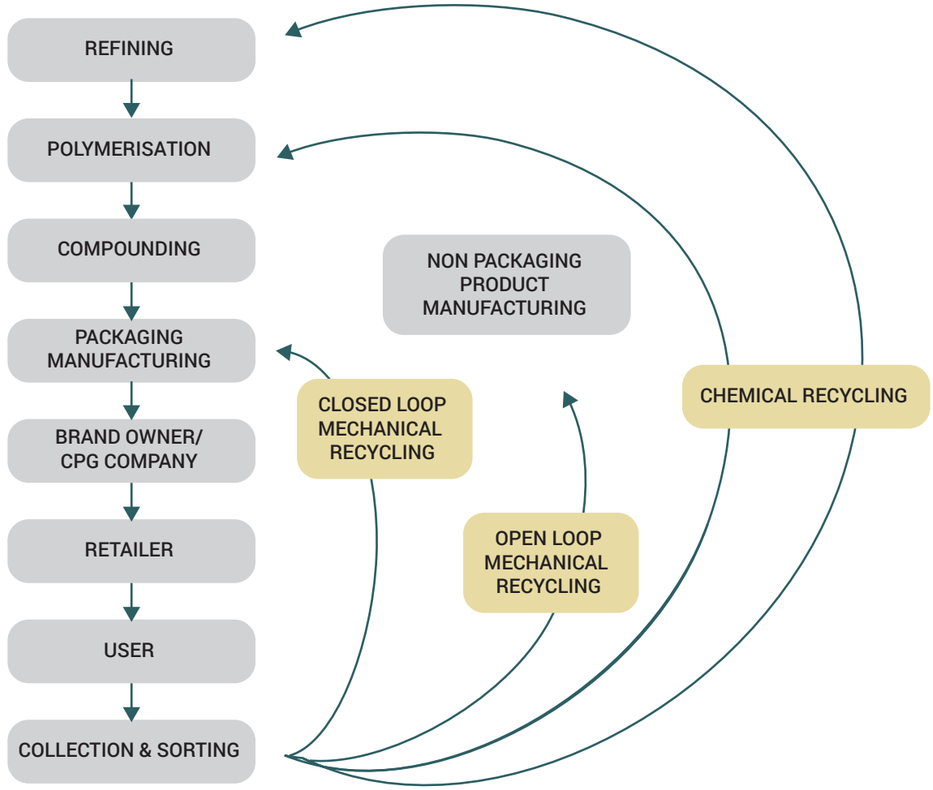


Figure 45 Overview recycling types and the life cycle of packaging (Ellen MacArthur Foundation, 2016)

Mechanical recycling

Mechanical recycling is a process where plastic packaging waste is washed, sorted and shredded, after which it is melted into plastic granulates that can be reused (Jeswani et al., 2021). Currently, only 57% of plastic packaging in the Netherlands is mechanically recycled (Afvalfonds Verpakkingen, 2019). Although, this could increase with the use of innovation, such as watermarks, small 3D textures that can be indicated by sensors and tracers and chemical compounds that are added to plastic mixtures to indicate the type of plastic (Bruijnes et al., 2020). This allows for high-quality recyclate and the separation of exact grades of materials.

Mechanical recycling is more attractive than chemical recycling from an economic and environmental point of view, where closed-loop recycling is preferred over open-loop recycling. However, plastic packaging can go through a limited number of recycling cycles, because the quality decreases after every cycle. To maintain quality, it is necessary to mix it with virgin plastic (KIDV, 2018). This makes it hard to decouple from fossil-based plastics.

There are currently various application options for mechanically recycled PE, PP and PET. Therefore, the demand for these sorted and recycled plastic flows arises. However, the quality of the recyclate varies more than the quality of virgin plastics (KIDV, 2018).

Chemical recycling

Chemical recycling is a collective name for different techniques where polymers are broken down into individual monomers, which can be used as building blocks to produce polymers again (Ellen MacArthur Foundation, 2017a). Closed Loop Partners identifies the following three categories of chemical recycling, as shown in figure 46, also referred to as transformational technologies (Closed Loop Partners, 2019):

1. **Purification:** A process where plastic is dissolved in a solvent, after which it is separated and purified from all additives and dyes to obtain a purified plastic ultimately. This process does not change the polymer on a molecular level.
2. **Decomposition:** A process, also called depolymerisation, where polymers are broken down into their monomer molecules, which could be single molecules or short fragments of molecules. These can be reconstructed into new plastics.
3. **Conversion:** A process similar to decomposition, where polymers are broken down into monomer molecules, albeit that the end products are often liquid or gasses that are similar to products from an oil refinery. These raw materials are often used in other applications and supply chains. This is also known as plastic to fuel (The Pew Charitable Trusts, 2020)

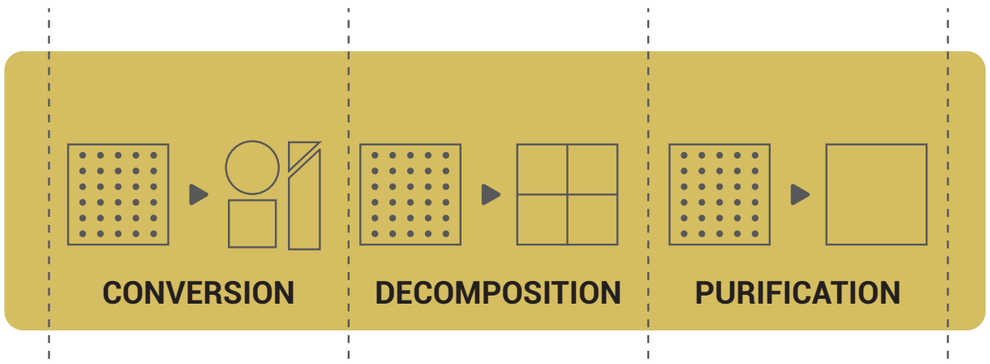


Figure 46 Three chemical recycling technologies (Closed Loop Partners, 2019)

Each technique has its own requirements for the input stream of plastic packaging. Only the first two categories are seen as relevant recycling technologies for packaging, since the output is used as raw material for new products or packaging. Chemical recycling allows for the separation of colours and additives from the plastics, increasing purity, and it offers some perspective for the use of recyclate in food packaging (KIDV, 2018). For food applications, recycled materials in direct contact with food are not allowed. Plastic packaging waste may contain residues from previous use, contaminants from misuse and contaminants from non-authorised substances. Therefore, it is only allowed only under strict requirements and circumstances (The Commission of the European Communities, 2008).

Chemical recycling comes with its own challenges and downsides. Not all plastic packaging can be recycled to high-quality virgin material, and the different techniques require different specific input streams. Compared with mechanical recycling, chemical recycling is higher in costs, energy use and greenhouse gas emissions. Apart from that, it is not yet applied on a large scale (The Pew Charitable Trusts, 2020). Although, given the current developments on a pilot scale, the realisation of chemical recycling on an industrial scale appears to take shape in the Netherlands. Commitment and investments in the different techniques by the packaging industry are necessary to get chemical recycling off the ground (KIDV, 2018).

These insights show that currently not recyclable packaging might be recyclable in the future through improved mechanical recycling techniques and different chemical recycling techniques. The possibilities for plastic applications, therefore, might be different in five or ten years.

APPENDIX E: SUBSTITUTE

The substitution of an undesired material depends on what the goal is of the sustainable packaging development strategy. If the goal would be to eliminate all fossil-based plastics, a renewable source such as paper or bio-based plastic could serve as an alternative (Ellen MacArthur Foundation, 2017a). If the aim is to reduce packaging weight, to reduce emissions during transport, glass and paper could be substituted by plastic. Substitutes paper and bio-based plastics for fossil-based plastics are further elaborated.

PAPER AS SUBSTITUTE FOR PLASTIC

Paper is often suggested as an alternative material for plastic packaging, although this comes with its own challenges. A great example is the plastic carrier bag dilemma. Most single-use plastic carrier bags are made of HDPE and are generally less than 20 microns thick and are therefore very light (Lewis, Verghese, & Fitzpatrick, 2010). The Directive (EU) 2015/720 has obliged all member states in 2015 to reduce the consumption of lightweight plastic carrier bags (European Parliament, 2015); consequently, retailers are looking at single-use paper bags as an alternative. LCA's have shown that plastic carrier bags require less energy, contribute to less solid waste and have less atmospheric emissions than paper bags. Which single-use bag is most environmental friendly varies depending on the environmental impact categories included in the LCA. However, paper has the highest impact in most categories, mainly due to consequences of the paper production and the higher amount of material needed per bag for the same properties (Lewis et al., 2010). When using paper as a substitute, recycled paper or other pulp-based materials should be chosen, ensuring a sustainable resource. Paper substitutes are innovating fast, barriers properties and cost/weight ratio are improved, and a high content of recycled paper is possible in non-food applications (The Pew Charitable Trusts, 2020).

BIOBASED AS SUBSTITUTE FOR FOSSIL-BASED PLASTIC

Bio-based plastics, also referred to as bioplastics, are polymers made partially or entirely from a renewable plant-based source. Although the name implies that it is biodegradable, this is often not the case (van Eygen, Laner, & Fellner, 2018). Their biodegradability does not depend on the origin of the raw material but on their chemical composition. Bio-based plastics can be divided into four types (Lacovidou & Gerassimidou, 2018) as shown in figure 47:

- Polymers made entirely from biomass and are biodegradable, e.g. polylactic acid (PLA);
- Polymers made entirely from biomass and are not biodegradable, e.g. bio-PE
- Polymers made partly from biomass and are biodegradable, e.g. some starch-based plastics
- Polymers made partly from biomass and not biodegradable but can be disintegrated, e.g. bio-PET.

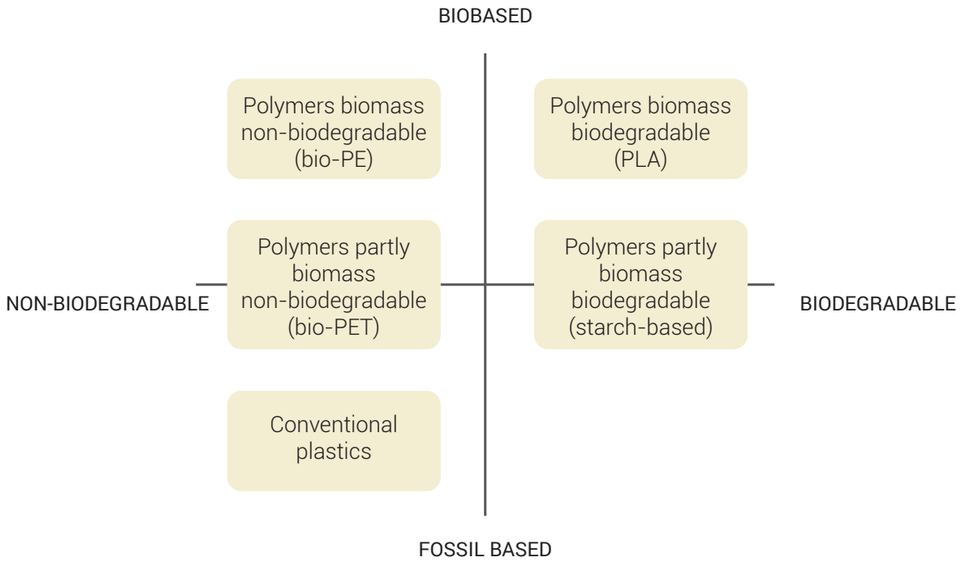


Figure 47 Overview bio-based plastics

The Ellen MacArthur foundation announces the ambitious goal to develop 'bio-benign' plastic packaging that would not negatively impact when leaked into the biosphere while being recyclable with conventional plastics and competitive in functionality and costs (Ellen MacArthur Foundation, 2017a). As described by Lacovidou & Gerassimidou, the current biodegradable packaging rarely lives up to this since they are generally only industrial compostable under controlled conditions, not home compostable (Ellen MacArthur Foundation, 2016). Furthermore, with current materials, technologies, and disposal infrastructure, it is often impossible to have biodegradable and recyclable packaging. Moreover, although compostable packaging strengthens consumer perceptions of sustainability, consumers often wrongly dispose of these packaging contrary to bio-based non-biodegradable packaging (Taufik, Reinders, Molenveld, & Onwezen, 2020). These biodegradable plastics contaminate the current recycling streams, resulting in lower quality recyclate.

Recycling is, for most applications, preferable as it keeps the material in the economy, where biodegradable materials break down into low-value elements (Ellen MacArthur Foundation, 2016). The foundations suggest only scaling industrial biodegradable packaging for closed systems such as organic waste garbage bags and food packaging for events and canteens. These are places where the risk of mixing with regular recycling streams is low and where the combination of compostable packaging and its organic contents helps to return nutrients into the soil if coupled to the appropriate collection and recovery infrastructure (Ellen MacArthur Foundation, 2017a). Therefore new materials are needed, for example based on nano-cellulose and micro-cellulose (Ellen MacArthur Foundation, 2017a).

The bio-based plastics that remain are made wholly or partially of biomass and are non-biodegradable but recyclable. These plastics, such as bio-PE and bio-PET, can mechanically be recycled in the conventional recycling streams. Bio-based plastics are made of a renewable source and, based on LCA's, have lower greenhouse gas emissions and save non-renewable energy (Lacovidou & Gerassimidou, 2018). However, conventional farming cultivation is a key contributor to the high eutrophication and stratospheric ozone depletion of bio-based plastics (Weiss et al., 2012). The Ellen MacArthur Foundation refers to the book Creating the Next Industrial Revolution by Paul Hawken and state that negative externalities of these issues could be reduced by applying regenerative principles (Ellen MacArthur Foundation, 2017a, 2017b). The book describes natural capitalism, where waste is eliminated and where every output functions as an input (Hawken, Lovins, & Lovins, 1999). This means that waste from agriculture of bio-based plastic is reused, but more ideally, bio-based plastics are made from the waste of already existing agriculture.

Another challenge of bio-based plastics is to make them cost-competitive. Due to higher manufacturing costs than fossil-based plastics, the usage of bio-based biodegradable synthetic biopolymers is limited (Stoica, Antohi, Zlati, & Stoica, 2020). Although, it is anticipated that through widespread use, their prices will decrease in the future, making it more favourable (Lacovidou & Gerassimidou, 2018).

APPENDIX F: INTERVIEWS EXPERTS

EVA RONHAAR: DIRECTOR OF INNOVATION, SUSTAINABILITY & FOUNDATION

(25-9-2020)

Is er een definitie van duurzaamheid volgens HEMA ?
HEMA heeft geen definitie van duurzaamheid die in één zin samen te vatten is, dit heeft ook geen zin. Duurzaamheid bij HEMA is onderverdeeld in de volgende drie specifieke gebieden:

1. **Responsible supply & production chain:** HEMA provides transparency in its supply & production chain and complies with legislation (social & environment).
2. **Sustainable & circular design and assortment:** HEMA is leading in its circular action plan, including sustainable designs and innovations
3. **Diversity and inclusion, community, governance & culture:** HEMA is for everyone. We show a diverse picture of society and promote to use our design for inclusion.

Is er een duurzaamheid gerelateerd gedachtegoed wat HEMA aanhangt?
HEMA laat zich leiden door internationale wetgeving, theoretische concepten en de transitie van linear naar circular economy zit er aan te komen. Ook maakt HEMA gebruik van FSC-katoen en papier.

Hoe verhoudt zich dit tot verpakkingen?
Voor circulaire verpakkingen moet je eerst terug naar wat het doel is van de verpakking. Daarbij moet niet alleen gekeken worden naar de verpakking, maar ook naar het product, naar hoe lang het product mee gaat (durability). Verder moet er rekening gehouden worden met de wetgeving die van toepassing is op de verpakkingen en wat het doel hiervan is. Daarnaast moet er duidelijk zijn wat de rol van HEMA is in de gehele keten en hoe de materiaal stromen zich daartoe verhouden. Worden de verpakkingen bijvoorbeeld van gerecycled materiaal gemaakt en worden deze weer gerecycled? En hoe moeten we consumenten aanzetten om aan duurzaamheid bij te dragen?

Zou een reusable concept werken voor de HEMA ?
Dat hangt ervan af. We hebben tegenwoordig bijvoorbeeld vaste shampoo bars die verpakt zijn in een kartonnen doosje, dat gaat meer richting hoe je het product zou kunnen aanpassen. Als het om refill gaat, hangt het heel erg van de locatie en het product af. HEMA is soms een bestemmingslocatie, maar soms loopt de consument toevallig langs en gaat dan naar binnen. Als er bijvoorbeeld een hervulbare shampoo fles is die de consument kan vullen in de winkel, dan heeft de consument deze fles niet altijd bij zich. Voor zo'n concept moet goed nagedacht worden over hoe het er precies uit gaat zien, anders werkt het niet. Je zou kunnen testen wat wel en niet werkt en waarom.

Heeft het verduurzamen van de HEMA nog invloed op de brand perception van de klant?
In uitgebreide consumenten interviews komen twee verschillende assen naar voren. De eerste is dat de consument op het moment van aankoop informatie wilt over duurzaamheid en waarom dit product beter is voor de wereld. De tweede as is op brand niveau, wie is mijn favoriete brand en waarom? Dit heeft veel meer te maken met de complete look en feel. Op dit moment komt de klant niet naar HEMA voor de duurzame producten, maar de ambitie om dit te bereiken is er wel. Verder moet duurzaamheid op meerdere manieren geuit en gecommuniceerd worden, dus bijvoorbeeld door het deelnemen aan de gaypride en de katoen campagne.

Wat houdt de HEMA op dit moment tegen, wat zijn de moeilijkheden wat betreft het implementeren van duurzaamheid?
Voor een bedrijf wat bijna 100 jaar oud is, doen we supermooie dingen en gaan we soms juist sneller dan verwacht. De moeilijkheden zitten in het gebrek aan kennis, mensen snappen niet goed wat er nodig is om duurzamer te worden, de KPI's die aansturen op marge, je zou ook kunnen zeggen we gaan voor minder marge, maar wel meer winst. Verder faciliteren de huidige softwaresystemen de processen niet, wat het proces afremt. Ook willen we een heleboel, maar maken we te weinig keuzes. Daarnaast is duurzaamheid een van de tien dingen is die moet gebeuren en dit wordt vaak niet als prioriteit gezien.

Wat verpakkingen specifiek betreft, zit de moeilijkheid in dat de verpakking wordt afgeschoven naar de leverancier. Voor de productmanagers is de verpakking een extra ding waar ze naar om moeten kijken en bestellen daarom de verpakking die de leverancier voor handen heeft en stelt hier voor de rest geen duurzaamheidseisen aan. Daarnaast is de vraag of de productmanagers en purchasers wel goed getraind zijn om te onderhandelen op het gebied van duurzaamheid. Op dit moment wordt er nog wel eens een eigen graf gegraven, maar we moeten richting een actievere aanpak en zeggen 'we willen dit voor deze prijs, regel het maar'. De ambitie is er binnen HEMA, we willen veranderen wat duurzaamheid betreft, maar we organiseren ons voor iets anders.

Wat voor verpakkingen zou de meest duurzame retailer hebben in de meest ideale situatie?
Ten eerste moet de hoeveelheid verpakkingen verminderen. Wat de meest duurzame verpakking is hangt af van welke richting wij kiezen als HEMA. Gaan we voor hernieuwbare materialen of voor CO2 footprint verminderen? Welke van de twee de beste oplossing is, is niet duidelijk, de data is niet beschikbaar. De discussie is op dit moment wel gaande binnen de HEMA, Trevor Perren (Board member) focust op het verminderen van plastic. Dit neigt richting hernieuwbare materialen, al is dit niet zo gedefinieerd. Er kan wel vanuit het verminderen van plastic terug geredeneerd worden, minder plastic, vervangen door hernieuwbare materialen, dus minder CO2 uitstoot.

DR. ALAN CAMPBELL: PACKAGING TECHNOLOGIST AT LCA CENTRE

(25-9-2020)

What is sustainable packaging according to you?
Packaging is a function, not a product and it's a verb, not a noun (packaging/package/pack). If I'm a consumer how would I perceive a sustainable product? For example, when a cup on a flight is biodegradable, it doesn't make sense because a flight is hugely impactful, and a cup is much less so. Product and packaging are often seen separately, except during purchase, but product and packaging are heavily linked throughout the lifecycle.

Sustainability is the ability to sustain. I don't believe in recycling. Recycling today, especially as relates to plastics, is just an excuse to delay the process of conversion to a more sustainable option. Recycling should be what you do when your plastic, glass or metal packaging function fails, after as many reuses as possible. Thereafter you need to return the exact material type to the material leaser so they can make a very high quality of recyclate that is as good as the original raw material grade. When you recycle material into raw material, you only get a portion of the lifecycle back. Therefore reduce, reuse and recycle are presented in that order. Reuse is the only thing that will work since the maximum value of the function and materials is obtained through reuse. That is why legislation is moving that way. Currently, the European Union is working on directives that include reuse. 'This may be idealistic but just think of the literally hundreds of different grades of plastic there are and how their mixture risks a poor quality resultant recyclate. Reuse will help to make recycling an activity that produces quality raw material and not substandard materials.'

When looking at intrinsically sustainability, does it mean that there will only be materials that can re-enter the biosphere?
Not necessarily. There should be a reuse system in place where polymers stay within the system by leasing the polymers. The polymers should be watermarked in order to return to the polymer leaser. When the quality of the product is rejected, the leaser should recycle the polymer, allowing for exact grades to be returned to the polymer leaser for highly efficient recycling. A company should get its own recycled plastic granulates back. For example, a cup manufacturer that has a cup leasing or renting system with polymers of a certain grade. After use, collection and recycling the granulate has to be brought back to the cup manufacturer.

We have to reduce spilling into the biosphere, spilling is a lot better preventable with reuse than with single use. Currently, in recycling, many different types of plastic mix up and end up in a substandard product of rather low quality. With reuse, it is much clearer and more specific what type of waste is produced compared to single-use, and therefore, that waste will have a higher value.

To make materials compatible with the biosphere, they should be compostable or biodegradable. In most biodegradable plastics, the polymers are highly processed, after which they are not adaptable to the biosphere anymore. Soil depletion is taken into account in LCA's. Bio-based packaging act in the same way, but cost a lot of direct land use. These materials are referred to as being from “renewable resources”. This term is misleading because many bioplastics are derived from primary agriculture which is in itself a highly resource-intensive process. “Renewable” is an impossible situation (law of thermodynamics).

A big global company launched a bio-based bottle with a lot of PR and made bio-based plastics big and sexy, except in Denmark. In Denmark, you need scientific evidence before making an environmental claim; therefore there are very few sustainability claims on packaging in Denmark. This big global company could not deliver this evidence and thus are seen to have greenwashed their product. People are not thinking it through properly. Packaging and environment are not a trend, but there are trends within it. Every time names are changed (biodegradable became compostable then industrially compostable and then bio-based).

What kind of packaging would the most sustainable retailer have in the most ideal situation?
The EU is promoting reuse, so that would be most logical. Although we do not have all systems in place yet, which requires a temporarily fix. The best thing cannot be done entirely right now, but try to advocate for reuse and refill. Take the example of bags taken to the shop or the sour cream cups that are used as a drinking glass. Always think from a life cycle perspective; if it is used once it requires 1 LC; if it is used twice it requires 0.5 LC, etcetera. In 2019 50% we earned in research was on reuse, so companies want to know.

Please remember how aggressive the single plastic directive is. It includes cigarette buds, but also tampons. 50% of the users of tampons are also voters. The packaging and packaging waste directive is also getting tighter. The EU also has concerns about environmental claims. How are we going to have centralised claims? What is permitted and what not? For example, type three LCA based claims.

In the example of a shampoo bottle for HEMA, all packaging components have to be of the same material, the lid must stay attached, be careful with heavy printing, make it less elaborate and transparent materials have a higher value when recycled.

PROF.DR.IR ROLAND TEN KLOOSTER: PROFESSOR PACKAGING DESIGN AND MANAGEMENT AT UNIVERISTY OF TWENTE

(28-9-2020)

U heeft bijgedragen aan het schrijven van The State of Sustainable Packaging van het KIDV, waarom staat er Repair en Refurbish in de ladder? Dit lijkt meer product dan verpakking gerelateerd.
Deze stappen zijn gericht op dragers, bijvoorbeeld pallets, kratten en karren. Deze worden gerepareerd. Maar dit is natuurlijk niet van toepassing op een koekjes verpakking.

In The State of Sustainable Packaging staat het volgende: ‘Whatever resources we extract from our biosphere must never be missed (scarcity possibly towards exhaustion), and whatever waste disappears back into our biosphere must never contaminate.’ Betekent dit dat intrinsically sustainable alleen maar materialen in de biosphere heeft?
Er wordt mee bedoeld dat biologisch afbreekbare materialen ook echt biologisch afbreekbaar moeten zijn in de biosfeer. Het proefschrift van Alan Campbell laat zien dat additieven vaak niet gespecificeerd zijn. Een materiaal krijgt bijvoorbeeld de claim dat het biologisch afbreekbaar is, terwijl er een dunne laag PVC op aangebracht is. Of het voorbeeld van de koffieverpakking die ‘biologisch afbreekbaar’ is waar een laag PE met opgedampt aluminium in zit om te zorgen voor de juiste barrières.

Wat is uw visie op de verpakking van de toekomst?
Ten eerste wordt het aantal verpakkingen dat gerecycled wordt verhoogd door bijvoorbeeld betere sensoren om materiaaleigenschappen te meten tijdens het plastic scheiden en recyclen. Ook wordt binnen in de keten recyclen gemakkelijker. De kunststoffen PP en PET zijn mechanisch opnieuw inzetbaar en als de kwaliteit daarvoor te laag wordt, kan het chemisch

gerecycled worden. Als dan de kwaliteit verder daalt kan het materiaal met pyrolyse ontleed worden. De eerste twee zijn op dit moment winstgevend (voor het milieu, in vergelijking met een nieuwe polymeer), de laatste nog niet altijd. De kunststofketen draait op dit moment slecht, er zit namelijk een systeemfout in recycling. Bij recycling van glas, papier en metaal gaat het materiaal terug naar de producent van de grondstof, bij kunststof gaat dit terug naar de converter, bijvoorbeeld de spuitgieter. Het recyclaat zou terug moeten gaan naar de producent van de korrels.

Mensen steken over het algemeen steeds minder tijd in het aanschaffen, bewaren en bereiden van eten, vandaar dat er bijvoorbeeld veel voorgesneden groenten te koop is. Desondanks zal de hoeveelheid verpakkingen voor hergebruik stijgen, omdat mensen weer meer bereid zijn om daar tijd in te stoppen. Het wordt alleen duurzamer als mensen hun gedrag veranderen en meer potjes en bakjes vanuit huis meenemen. Ook zal er een verschuiving zijn naar meer lokale winkels met kortere kringlopen, mensen zijn namelijk geïnteresseerd in waar hun eten vandaan komt. Al wilt niemand meer terug naar de jaren 60 waarbij er alleen maar seizoen groenten en fruit beschikbaar is. Het meest lastige aan de verpakking van de toekomst is dat we nu nog niet weten hoe intrinsically sustainable moet. We moeten het als het ware uitvinden.

Wat voor verpakkingen zou de meest duurzame retailer hebben in de meest ideale situatie?
Wat voor verpakkingen de meest duurzame retailer zouden hebben? Optimaal gezien van alles wat. Meer recycling, meer reuse, meer lokaal en gedragsverandering van de consument.

Reuse wordt vanuit verschillende hoeken gestimuleerd, wat is uw mening over reuse?
Er zijn veel vormen van reuse, bijvoorbeeld een waarbij de consument eigenaar is van de verpakking en deze bijvult en een ander waarbij de retailer of producent eigenaar is van de verpakking en deze inzamelt, schoonmaakt en weer vult. Reuse waarbij de retailer of producent eigenaar is van de verpakking is logistiek gezien heel lastig en het is erg afhankelijk van de doorloopsnelheid. Bier bijvoorbeeld heeft 7 keer zoveel flesjes nodig, omdat mensen gemiddeld 7 weken wachten met hun flesjes en kratten terugbrengen. Ook worden vaak single-use flesjes vergeleken met 1 retour flesje, dit klopt dus niet. De paper van Patricia Coelho gaat verder in op hergebruik. In veel gevallen is reuse niet haalbaar. Futurumshop heeft een test gedaan met herbruikbare verzend verpakkingen. Zij concludeerden dat een herbruikbare verpakking al snel inefficiënt is, bijvoorbeeld als de transportwagen een stukje om moet rijden voor het ophalen van een verpakking en daarbij energie verbruikt. In hun geval kon de herbruikbare verpakking niet uit en was een eenmalige verpakking toch nog beter.

Paardekoper Groep produceert de bekertjes voor op stations, daar zou een herbruikbare beker beter zijn, maar de consument is niet altijd bereid om een vieze lege beker weer mee terug te nemen in de tas. Bij het meten van verpakkingen moet niet alleen het milieu meegenomen worden, maar ook het menselijk gedrag. Hoeveel mensen scheiden nou uiteindelijk het materiaal als het bijvoorbeeld uit een plastic bekertje met kartonnen sleeve bestaat? Er is altijd een risico dat het residu op je kleren terecht komt bij het uit elkaar halen, dus veel mensen doen het uiteindelijk niet.

Verder zijn er simpelere retour systemen nodig met duidelijke communicatie vanuit de overheid. Mensen gooien bijvoorbeeld nog steeds drinkglazen in de glasbak in plaats van bij restafval.

Denkt u dat bio-based plastics een optie zijn?
Bio-based plastics kunnen iets van CO2 footprint weghalen, maar we moeten niet massaal landbouwgrond gebruiken om plastic te produceren. Ook wordt er veel greenwashing gebruikt terwijl veel processen niet beter zijn dan synthetisch kunststof. De Ellen MacArthur Foundation meldt ook dat bestaande biodegradable materialen niet voldoen aan de huidige processen, daarom zijn nieuwe materialen nodig bijvoorbeeld gebaseerd op nano-cellulose en micro-cellulose.

De papierindustrie denkt dat ze met coatings de plasticindustrie kunnen overwinnen, maar ze saboteren en voegen plastic toe in plaats van alleen een coating. Dit soort dingen maken het enorm complex.

Zijn er nog meer dingen waar ik rekening zou moeten houden in mijn onderzoek?
Ten eerste vergeet niet additionele processen zoals gedefinieerd door Recyclass, inkt, coating, kleur kunststof, zware metalen etc. Probeer eens in kaart te brengen waar alles vandaan komt om de materiaal stromen te laten zien. De kwaliteit van papier verschilt bijvoorbeeld erg per land van herkomst door de conflicten die spelen tussen China, Thailand en andere landen. Verder moet je kijken hoe people en profit in dit verhaal verwerkt kunnen worden, dat is ingewikkeld. Als laatste is er nog een paper uit Packaging Technology and Science door de Universiteit van Lund waar ze een methode omschrijven die waardes hangt aan de 4 segmenten materiaal, transport, foodwaste en end of life keten. Deze methode is heeft iets weg van een LCA maar neemt veel minder tijd in beslag.

MARCEL KEUENHOF: SUSTAINABLE PACKAGING EXPERT AT KIDV

(16-10-2020)

Wat is duurzaam verpakken volgens u?
Bij het KIDV hebben we daar niet één definitie van, het is eerder het kiezen van een strategie. Een veelgehoorde strategie is de CO2 footprint, waarbij je de impact van verpakkingen terugrekent naar CO2 equivalent en daardoor de verpakkingen met elkaar kan vergelijken. Een andere strategie is het kiezen voor hernieuwbare grondstoffen, het vermijden van plastic of het voorkomen/reduceren van verpakkingsmateriaal. Het is lastig om 1 sluitende definitie te geven. Er is altijd het klassieke voorbeeld van de komkommer in folie, waarbij het verlies van de komkommer een veel grotere impact heeft dan de plasticfolie.

De afgelopen paar jaar is er vooral focus gelegd op het recyclebaar maken van de verpakkingen. Dit is nog steeds geen slechte zaak, al is dit maar één kant van het plaatje. Als we alles recyclebaar maken, dan ontstaan er enorme bergen van recyclaat van verschillende kunststoffen. Recyclebaarheid is onzin als het recyclaat niet ingezet wordt. Daarom gaat de focus nu ook richting het verwerken van recyclaat in verpakkingen. Hier helpt de nieuwe Europese wet, waarbij bedrijven 80 eurocent per kilo plastic moeten betalen, ook aan mee.

Dit zijn enorme bedragen voor grote bedrijven. Dit bedrag kan omlaag gebracht worden door de verpakking recyclebaar te maken. Vaak is een economische prikkel nodig om verandering teweeg te brengen.

Wat voor impact heeft een verpakking in meest ideale situatie op het milieu? En hoe is dat te bereiken?

In de meest ideale situatie voorkomt de verpakking milieu impact. En dit gebeurt al, afhankelijk vanuit welke hoek je kijkt. Als een televisie bijvoorbeeld vanuit China los op een scooter en vervolgens los op een schip vervoerd worden gaat er heel veel materiaal en energie verloren doordat het product kapot gaat. Dit kan voorkomen worden door verpakking. Natuurlijk heeft een kartonnen doos met aan de binnenkant piepschuim een milieu impact, zelfs biologisch afbreekbaar schuim of andere dergelijke materialen hebben een milieu impact. Maar als je kijkt naar het doel om schade en daarmee energie en materiaalverlies te voorkomen, voorkomen verpakkingen een grotere impact op het milieu.

Wat voor verpakkingen zou de meest duurzame retailer hebben in de meest ideale situatie?

Dit is verschillend per productgroep. Hiervoor is de belangrijkste leidraad de 7 tips van het KIDV, (KIDV, 2017).

1. Always put the functionality of the packaging first.
2. Avoid the use of harmful substances in packaging materials.
3. Use materials sparingly.
4. Create a clean material stream that can be recycled easily.
5. If possible, use recycled or renewable raw materials.
6. Keep logistical efficiency in mind when developing packaging.
7. Include information on the packaging concerning the proper disposal behaviour for consumers.

Een voorbeeld is het idee dat wijn alleen verpakt kan worden in glas. Glas is erg zwaar en heeft een hoge CO2 footprint, maar is wel heel goed recyclebaar. Een multilayer pak als alternatief daarentegen is heel licht, maar slecht recyclebaar. Of een gekoeld getransporteerd melkpak die verse melk bevat heeft geen aluminium laagje nodig, maar heeft vervolgens wel een hoge CO2 footprint door het koelen. Dit zijn altijd afwegingen. Dit hangt ook samen met de levensstijl en het gemak dat verpakkingen biedt. Mensen kiezen toch eerder voor de voorverpakte salades dan dat ze op die fiets langs de boer en de slager gaan. Het is gewoon heel makkelijk dat alles op 1 plek te vinden is. Ook kunnen supermarkten bijna niet draaien zonder verpakkingen. Het voorbeeld van de komkommer weer, een biologische en niet biologische komkommer moeten van elkaar te onderscheiden zijn. Er worden minder biologische komkommers verkocht en daardoor is het vanuit duurzaamheidsoogpunt beter om deze te verpakken om plastic te besparen, terwijl biologisch en verpakt in plastic vaak geen logische combinatie is voor de consument. Per productcategorie zou een beste/meest duurzame verpakking gedefinieerd kunnen worden.

Welke technieken gaan volgens u in de toekomst bijdragen aan duurzame verpakkingen en wanneer verwacht u dat deze op schaal gebruikt gaan worden?

Ten eerste gaat er flink ingezet worden op herbruikbaar. Dit kan een stukje van de markt helpen, maar lang niet alle verpakkingen lenen zich hiervoor. Dit heeft te maken met de voedselveiligheid, dat het niet altijd de duurzaamste oplossing is, hoe vaak het hergebruikt wordt, hoeveel energie nodig is om het schoon te maken etc. Ten tweede wordt er meer recyclaat ingezet. Tot nu toe is de kwaliteit nog niet op het gewenste niveau, zo wordt recyclaat zelden ingezet in voedselverpakkingen. Er wordt op dit moment hard gewerkt en geïnvesteerd om het recyclaat zo hoog mogelijk in te zetten. De moeilijkheid in mechanisch recyclen zit in het scheiden van multilayer kunststoffen, maar ook mono plastics worden soms niet goed herkend door bijvoorbeeld papieren labels. Er zijn nieuwe innovaties omtrent de herkenning van de materialen tijdens het scheiden van afval op het gebied van laser, infrarood, artificial intelligence, watermarking en de standaardisatie van kunststoffen. Voorbeelden van watermarking zijn het toevoegen van een stof waardoor het oplicht met UV licht, maar liever voeg je niets toe aan een materiaal om de hoogste kwaliteit recyclaat te krijgen, voor het oog onzichtbare bedrukking, door er met logaritmes een boodschap aan te geven of door trackers waardoor het molecuul herkent kan worden. Bij de standaardisatie van materialen gaat het bij kunststof vooral over PP, PE en PET, omdat deze goed uit te sorteren zijn en al veel gebruikt worden. Naast mechanisch zal chemisch recyclen ook meer optreden. Dit heeft ook zijn uitdagingen, hoeveel energie is er bijvoorbeeld nodig om recyclaat te kunnen maken? De olieprijs helpt op dit moment ook niet mee, deze is erg laag doordat er veel minder gevlogen en getransporteerd wordt. Het recyclen van plastic moet dan gesubsidieerd worden door bijvoorbeeld de kunststofbelasting. Idealiter betaalt het recyclaat zichzelf door een hoog kwaliteit recyclaat aan te bieden aan de markt, zoals bij papier.

Wat is uw visie op de verpakking van de toekomst?

De verpakking van de toekomst gaat er denk ik niet bijzonder ander uit zien. De verpakking van nu is helemaal geoptimaliseerd op de supply chain, logistiek, maar ook op de consument. Een verpakking moet een product heel vervoeren van A naar B, dit gaat niet veranderen. Mensen gaan niet opeens hun eigen groente verbouwen, hun koe melken of hun eigen brood bakken, wat overigens ook niet per se duurzamer is. Er zou misschien verandering plaatsvinden als we meer ruimte zouden krijgen, maar de wereldbevolking blijft groeien en de levenstandaard ook. Ik weet niet hoe we alles moeten omgooien. Neem als voorbeeld biologisch eten. Het is misschien beter, maar het neemt veel meer landbouwgrond in beslag dan monocultuur verbouwen, dat is namelijk heel efficiënt ingericht om zo veel mogelijk mensen te kunnen voeden. De moeilijkheid bij producten zit in de producten die eenmalig gebruikt worden en dat het goedkoper is om een nieuw product te kopen dan om het te repareren. Hopelijk komen er andere modellen. Verpakkingen van de toekomst gaan er niet anders uit zien, maar worden beter recyclebaar en waar mogelijk zo min mogelijk variaties aan materialen. Waar zinnig worden herbruikbare systemen toegepast.

U werkt bij het KIDV en bent daardoor met veel bedrijven in contact, hoe definiëren andere bedrijven hun doelstellingen omtrent reuse en andere concepten?

In het verleden focusten bedrijven zich vooral om van eenmaligheid af te komen en begonnen zich meer in te zetten op hergebruik, hier viel ook recycling onder. Een tot twee jaar geleden hebben veel bedrijven gezegd dat hun verpakkingen in 2025 100% recyclebaar, herwinbaar (natuurlijk composteerbaar of bio-based materialen) of herbruikbaar zijn. Hiervoor gebruikt iedereen verschillende tactieken en het wordt langzaam duidelijk of deze tactieken zinnig zijn en het haalbaar is. Voor sommige bedrijven waar met alleen maar mono materialen is dit niet zo lastig, maar voor een bedrijf met een heel scala aan producten is dit een stuk moeilijker.

Op dit moment wordt er meer intelligentie ingezet, worden doelen scherper gesteld, en wordt er steeds meer gekeken naar het inzetten van recyclaat. Echter zijn sommige dingen technologisch niet haalbaar voor 2025, bijvoorbeeld complexe multilayer verpakkingen recyclebaar maken, tenzij je het verwerken in asfalt ook recyclebaar noemt. Stel HEMA maakt zich hard voor 25% herbruikbare producten, ondanks dat het logistiek lastig is, kan het als HEMA echt wilt. Het is lastig om concrete getallen te hangen aan doelstellingen die ver weg liggen, omdat het lastig in te schatten is waar we als maatschappij op dat moment zijn. Misschien is er wel weer herwaardering in kunststof, doordat er aan de afvalverwerkingskant grote verbeteringen zijn en we daardoor niet per se al het plastic willen bannen. Het is soms niet goed te voorspellen wat mensen bereid zijn om te doen in de toekomst. Om iets op te stellen voor 2025 is al lastig genoeg, laat staan 2030. Je zou eerder een richting kunnen geven voor de strategie die toepasbaar is.

Zijn er nog meer dingen waar ik rekening mee zou moeten houden in mijn onderzoek?

Op dit moment zijn er allerlei onderzoeken en trajecten gaande waar ik al een aantal dingen van genoemd heb. Op dit moment is Seflex bezig met de standaardisatie van multilayer en met een mono materiaal oplossing met dezelfde barrière. Op dit moment ben ik bezig met een wegwijzer herbruikbare verpakkingen, deze komt over twee tot drie maanden uit. Verder kan je nog kijken naar de R ladder. Bijvoorbeeld Remove, haal weg wat je weg kan laten en Rethink, stel je zou de kans hebben om de systemen opnieuw op te bouwen, wat voor nieuwe ideeën zouden daaruit komen. Op dit moment wordt er bijvoorbeeld onnodig heen en weer gesleept met lucht en water, daar heeft Sodastream op ingespeeld. Waar mogelijk, moeten we daarnaar kijken. In het begin waren supermarkten met valide redenen ook tegen het statiegeldsysteem, maar op macro schaal is het wel een goede oplossing. Consumeren zal niet drastisch veranderen en uiteindelijk is de footprint van verpakkingen heel klein vergeleken met andere dingen die mensen doen in hun leven.

APPENDIX G: DESCRIPTION FRAMEWORK

ECO-EFFICIENCY, MINIMISE ENVIRONMENTAL IMPACT BY MINIMISING INPUT & OUTPUT SYSTEM

Minimise input: Input, such as energy and raw materials, is needed during the whole life cycle of packaging. To minimise the environmental impact, the input of the system needs to be minimised.

- **Minimise use of raw materials:** To minimise the environmental impact, the amount of raw material needed to develop product-packaging combinations have to be minimised.
- Minimise packaging weight: The total weight of the packaging, inherent to the amount of material used and energy needed during transport, should be minimised.
- **Rethink product-packaging combination:** Packaging should not be viewed separately from the product but instead as the product-packaging combination. By looking at the functions of the product and the packaging, product innovations can minimise packaging weight—for example, a solid shampoo bar in a carton box instead of liquid shampoo in a plastic bottle.
- **Minimise overpacking:** Overpacking is when more material is used than necessary, this will lead to a higher than needed environmental impact. The packaging should use just enough packaging material to fulfil its functions, not more.
- **Fulfil functions packaging:** The packaging should just fulfil its functions, to inform, contain, protect and facilitate transport, consumption and end-of-life. Not more material should be used than necessary in doing so.
- **Minimise use of virgin material:** The amount of virgin material should be minimised by minimising the total weight of the packaging and using recycled material instead.
- **Minimise and substitute undesired materials:** Undesired materials should be minimised depending on the sustainable packaging development strategy. This could be unrecyclable materials or materials that do not align with the sustainability strategy.
- **Minimise energy use:** To minimise the environmental impact, energy use should be minimised and made more efficient.
- **Source locally:** By sourcing locally, the amount of energy needed for transport will be saved, resulting in a lower environmental impact.
- Minimise transport volume: Energy use can be minimised by reducing the volume of the product-packaging combination during transport. This way, more products can be distributed in one truck resulting in fewer emissions per product-packaging combination.
- **Make processes more efficient:** The processes that require energy, for example, production and transport, need to be more efficient to save energy.

Minimise output: Processes that use raw materials and energy generate output, such as greenhouse gas emissions, waste and toxins. To minimise the environmental impact, the output of the system needs to be minimised.

- **Minimise greenhouse gas emissions:** GHG emissions contribute to the global warming effect and therefore have to be minimised.
- **Use renewable energy during the whole life cycle:** Energy is needed during the whole life cycle of packaging, for example, during production and distribution. By using renewable sources to produce energy, such as solar and wind, instead of fossil-based sources, greenhouse gas emissions will be minimised.
- **Use materials low in greenhouse gas emissions:** The environmental impact of the packaging highly depends on the type of material used; therefore, materials low in greenhouse gas emissions should be used.
- **Minimise material waste:** The amount of material that is used to develop the product-packaging combination should be used as efficiently as possible by minimising material waste during its whole life cycle.
- **Design for Recycling:** Design for Recycling is a design method in which the ability to recycle a product or packaging is considered from the beginning of product conceptualisation. When applied, the packaging will be recyclable. The KIDV recycle check can help with this.
- **Minimise product loss:** The product generally has a higher environmental impact than the packaging and therefore should be protected against product loss. For example, if the product is lost due to a lack of protection, the environmental impact of the product-packaging combination will be significantly higher.
- **Minimise underpacking:** Underpacking is when too little material is used for packaging to protect the product. When the packaging is not able to protect the product sufficiently, it can lead to product loss, which makes the environmental impact of the product-packaging combination significantly higher.
- **Fulfil functions packaging:** The packaging should just fulfil its functions, to inform, contain, protect and facilitate transport, consumption and end-of-life. Enough material needs to be used, but not more than necessary in doing so.
- **Minimise production waste:** The amount of waste that is produced during the production of packaging should be minimised.
- **Minimise material waste during production:** The amount of material needed to produce the packaging should be used as efficiently as possible, preventing material from going to waste. For example, carton die cuts or vacuum-formed plastic cups result in more waste than injection moulded packaging.
- **Minimise packaging waste during production:** The production process should be as efficient as possible where the produced packaging should not go to waste due to, for example, challenging packing methods or insufficient filling.
- **Minimise packaging weight:** The total weight of the packaging, inherent to the amount of waste created, should be minimised.
- **Rethink product-packaging combination:** Packaging should not be viewed separately from the product but instead as the product-packaging combination. By looking at the functions of the product and the packaging, product innovations can lead to a minimisation of packaging waste. For example, a solid shampoo bar in a carton box instead of liquid shampoo in a plastic bottle.
- **Minimise overpacking:** Overpacking is when more material is used than necessary, this will lead to a higher than needed environmental impact. The packaging should use just enough packaging material to fulfil its functions, not more. Overpacking results in more waste than necessary.
- **Fulfil functions packaging:** The packaging should just fulfil its functions, to inform, contain, protect and facilitate transport, consumption and end-of-life. Not more material should be used than necessary in doing so.
- **Inform consumers about waste management:** The consumer should be informed on which waste stream to dispose of the packaging. This way, the material can be properly recycled, and contamination is kept at a minimum, resulting in high-quality recyclate.
- **Avoid toxins:** Toxins are harmful to both the environment and human health and therefore should always be avoided.

ECO-EFFECTIVENESS, MINIMISE ENVIRONMENTAL IMPACT BY MAXIMISING USE OF RESOURCES

Keep materials in use: Materials need to be kept in use to make maximum use of the available resources. When materials are reused and recycled, less virgin material will be needed. Materials and products will more likely be reused and recycled when value is kept.

- **Reuse:** Packaging could be reused for its original purpose or to fulfil another function. When packaging is reused, less virgin material will be needed.
- **Rethink product-packaging combination:** Packaging should not be viewed separately from the product but instead as the product-packaging combination. By looking at the functions of the product and the packaging, product innovations can minimise packaging weight—for example, a solid shampoo bar in a carton box instead of liquid shampoo in a plastic bottle.
- **Design for reuse**: A design method in which the ability to reuse a product or packaging is considered from the beginning of product conceptualisation. Reuse distinguishes five different models: Refill at home, Refill on the go, Return on the go, Return from home and repurpose.
- **Design for consumer behaviour:** The reusable packaging should align with consumer behaviour; otherwise, consumers will not purchase the product. For example, with a Refill on the go concept, the consumer needs to be willing to bring the packaging to the store to get a refill.
- **Inform consumers during purchase:** Consumers base their purchase on the information available at the time of purchase; therefore, information about the sustainability of the product or packaging should be given.
- **Recycle:** Packaging should be recycled, where the packaging can be used as a raw material again, most preferably to produce new packaging. It, therefore, should fit the main material streams of recycling plants.
- **Use waste material:** Materials that are wasted from another application or process should be used as raw material for packaging. This way, the material is kept in use.
- **Use recycled material:** To keep materials in a loop, not only should packaging be

recycled, the recycled raw material should again be used.

- **Design for Recycling:** Design for Recycling is a design method in which the ability to recycle a product or packaging is considered from the beginning of product conceptualisation. When applied, the packaging will be recyclable. The KIDV recycle check can help with this.
- **Keeping value:** When the value of the materials of packaging or product is kept, it will be financially feasible to reuse and recycle packaging, resulting in fewer resources needed.
- **Slow consumption rate:** When the consumption rate of products is slow, the replacement of products and their packaging is slow, resulting in a delay of value degradation, less packaging needed per capita and fewer resources needed.
- **Stimulate consumers to consume less:** By consuming less, less material and resources are needed. Fewer products, and with that, fewer packaging will be consumed.
- **Durable products:** When products last long, emotionally and/or physically, products and their packaging don't often need replacement, resulting in fewer resources needed.
- **Emotional durable products:** Extending product longevity through emotional relationships with products, resulting in slower rate of replacement and fewer resources needed.
- **Physical durable products:** Products of good quality that last long and do not often need replacement. Less packaging is needed with fewer product replacements, resulting in fewer resources needed.
- **Eliminate single-use plastics:** Single-use plastics, products made of plastics that can only be used once, such as plastic cutlery and cotton buds; need to be eliminated. This is also integrated into EU legislation.
- **High-quality recyclate:** After collecting and sorting, packaging can be recycled. Low contamination results in high-quality recyclate that can be used for high-end solutions, downgrading to lower-end solutions as slow as possible. This way, value is kept as long as possible, and resources are optimally used.
- **Separate biological and technical materials:** For high-quality recyclate, it is important not to contaminate the recycling stream. The biological and technical materials should continuously cycle in their own loop and not contaminate the other.
- **Design for Recycling:** Design for Recycling is a design method in which the ability to recycle a product or packaging is considered from the beginning of product conceptualisation. When applied, the packaging will be recyclable. The KIDV recycle check can help with this.
- **Keep material in same application:** To prevent recycled material from down-grading in a lower quality application, the material should be used for the same application again, for example, from shampoo bottle to shampoo bottle.

Circular resources: To preserve the earth for future generations, infinite/circular resources should be used.

- **Decouple finite resources:** To change to infinite circular resources, finite resources need to be decoupled. These are, for example, oil and coal.
- **Use renewable materials**: Decouple from finite resources using renewable materials, such as paper and bio-based plastics.
- **Use renewable energy:** Decouple from finite resources by using renewable energy, such as wind and solar power.

ECO-EFFECTIVENESS, MINIMISE ENVIRONMENTAL IMPACT BY MAXIMISING USE POSITIVE IMPACT

- **Regenerate natural systems:** As a positive impact on the environment, natural (eco) systems should be regenerated.
- **Return nutrients:** Natural (eco)systems can be regenerated by returning nutrients to the soil, water or air.

APPENDIX H: ENVIRONMENTAL IMPACT PACKAGING MATERIALS

The Sustainable Packaging Compass tool of KIDV is used to estimate the environmental impact per material type, (KIDV, 2020). This tool was developed in 2020 and HEMA was one of the beta users. The results in the figures of this Appendix are based on a 100-gram mono-material packaging.

PE

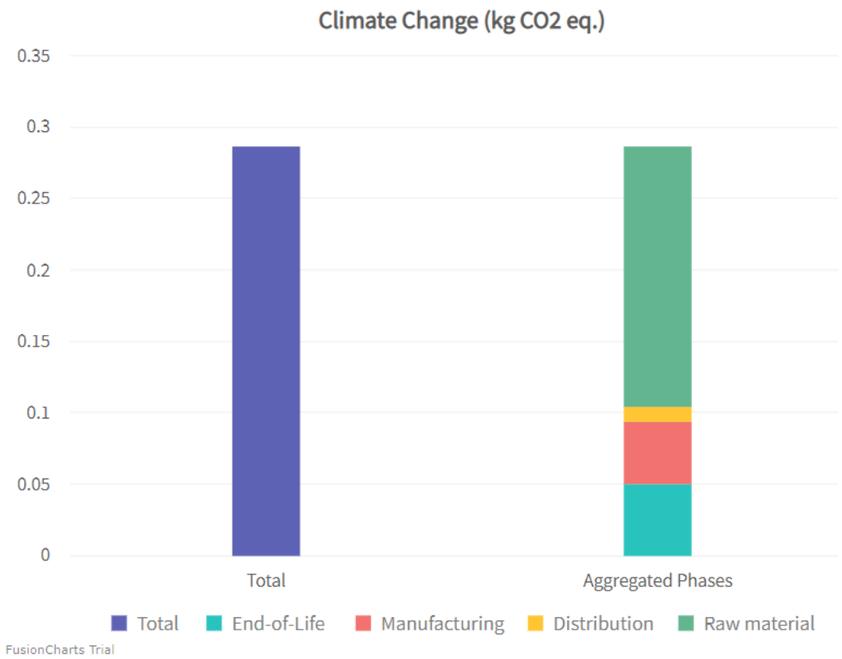


Figure 48 Environmental impact PE (KIDV, 2020)

Bio-PE

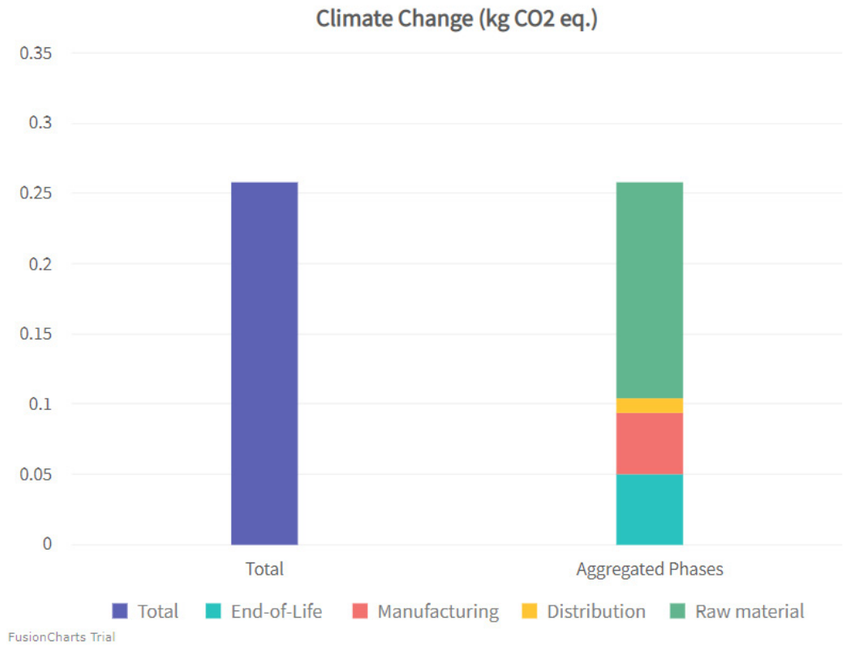


Figure 49 Environmental impact Bio-PE (KIDV, 2020)

PET

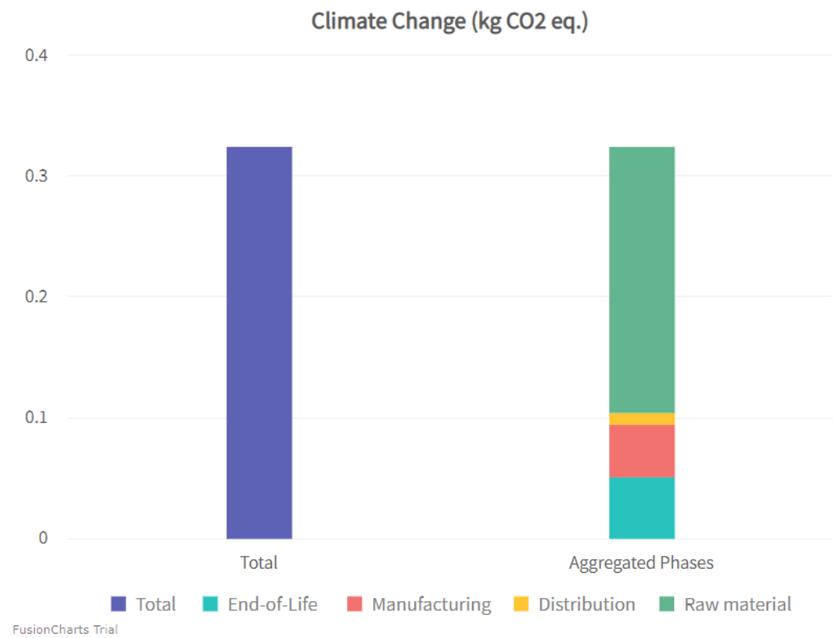


Figure 50 Environmental impact PET (KIDV, 2020)

Bio-PET

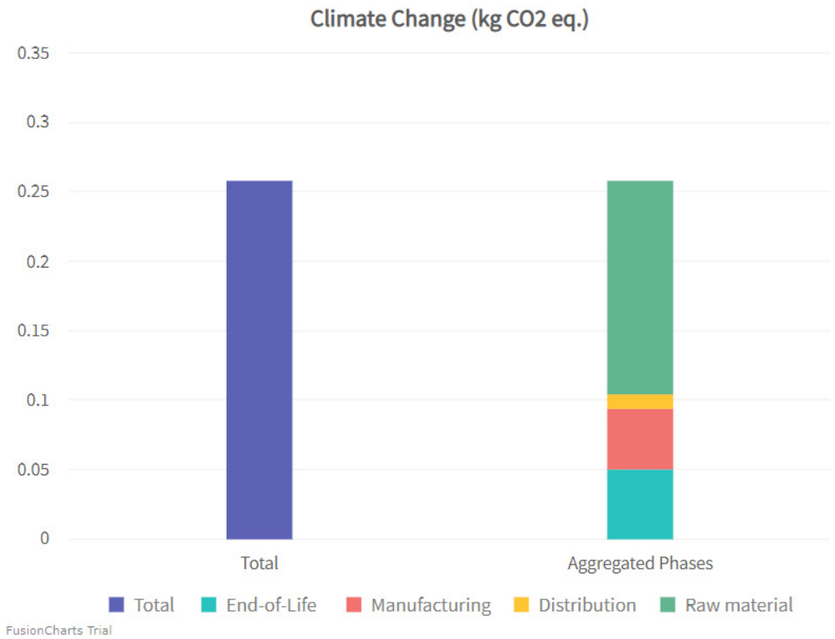


Figure 51 Environmental impact Bio-PET (KIDV, 2020)

PP

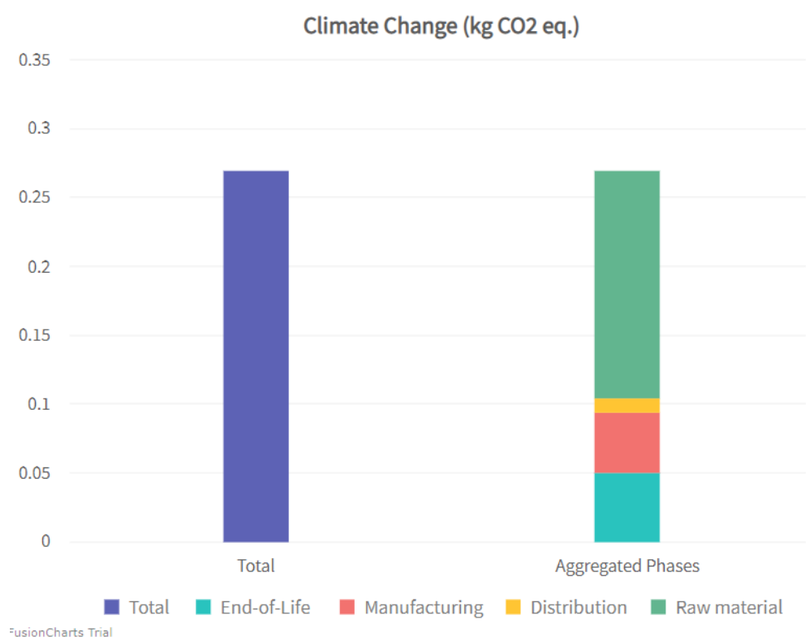


Figure 52 Environmental impact PP (KIDV, 2020)

PS

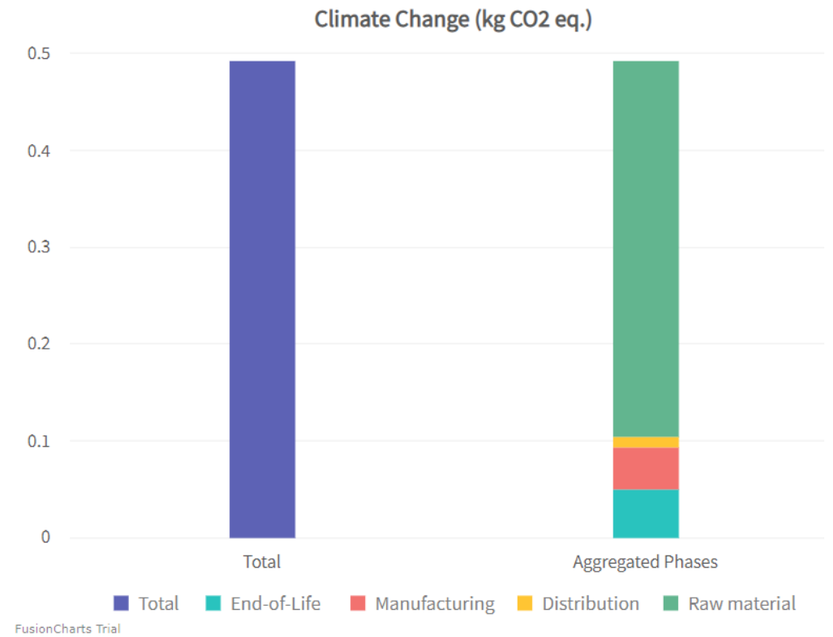


Figure 53 Environmental impact PS (KIDV, 2020)

PVC

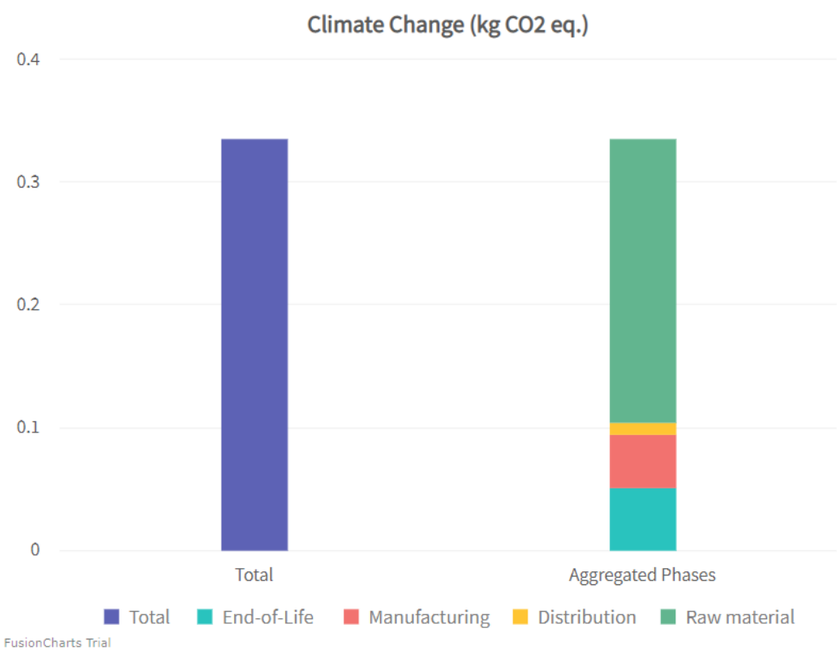


Figure 54 Environmental impact PVC (KIDV, 2020)

Paper

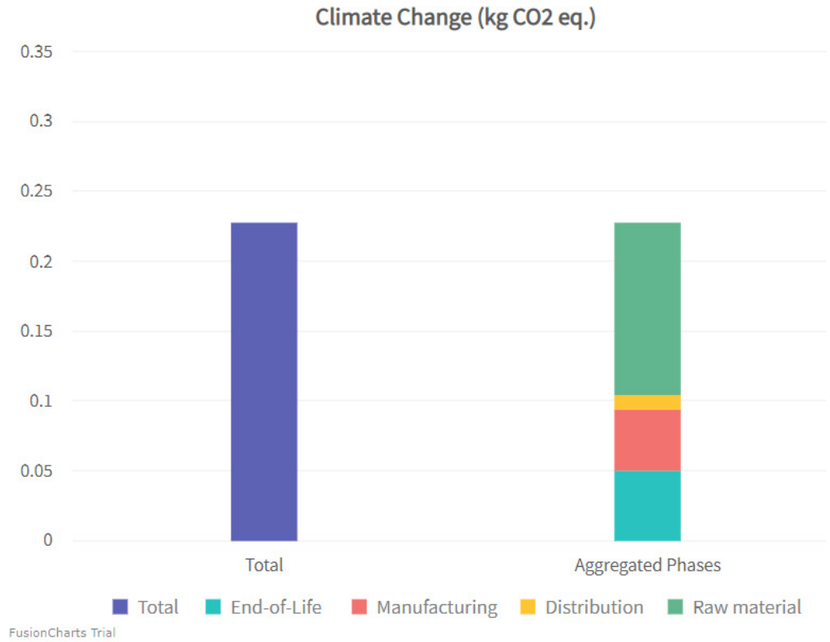


Figure 55 Environmental impact paper (KIDV, 2020)

Aluminium

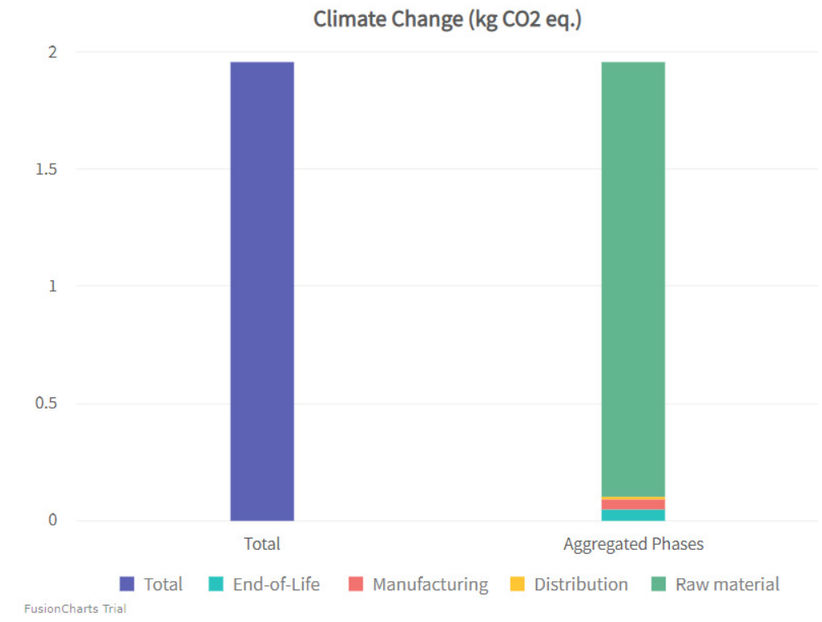


Figure 56 Environmental impact Aluminium (KIDV, 2020)

APPENDIX I: VISUALISATION METHOD

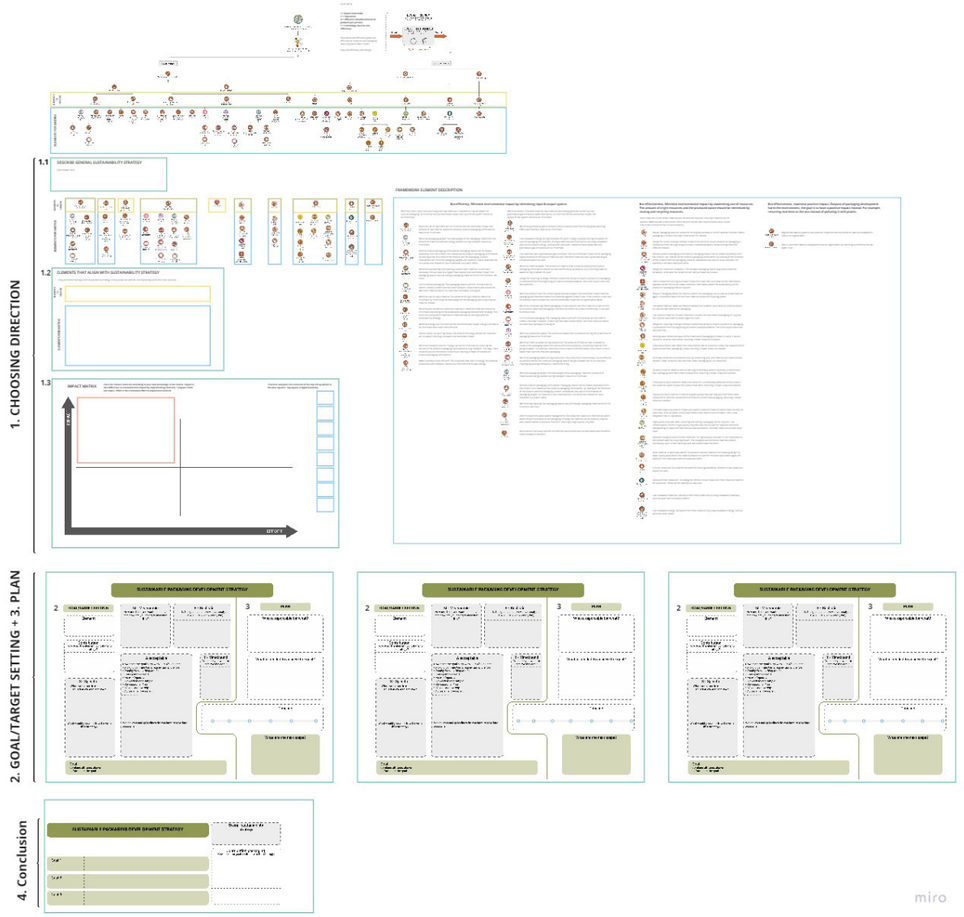


Figure 57 Overview visualisation method

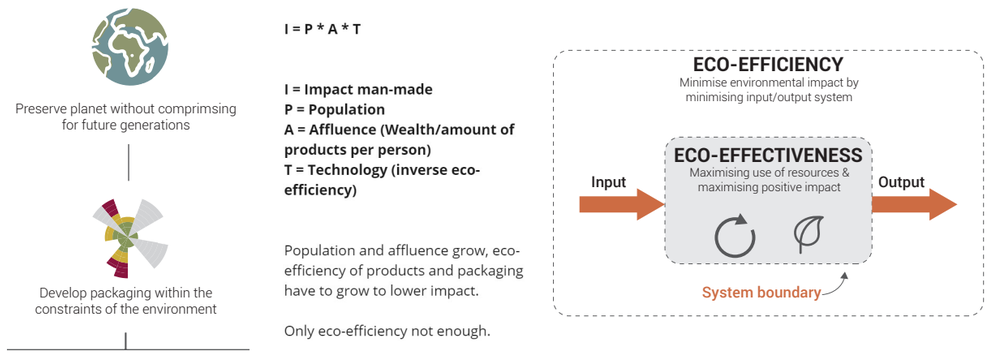


Figure 58 Visualisation method background information

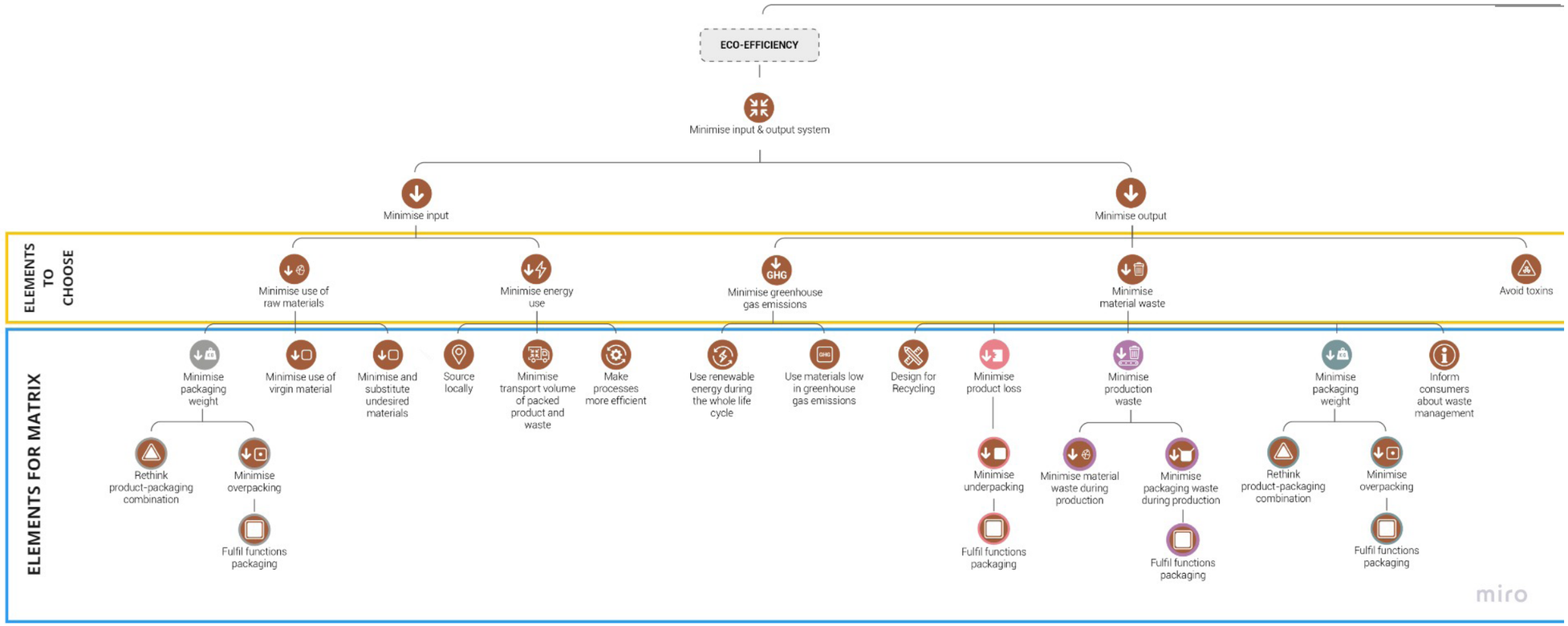


Figure 59 Visualisation method framework eco-efficiency

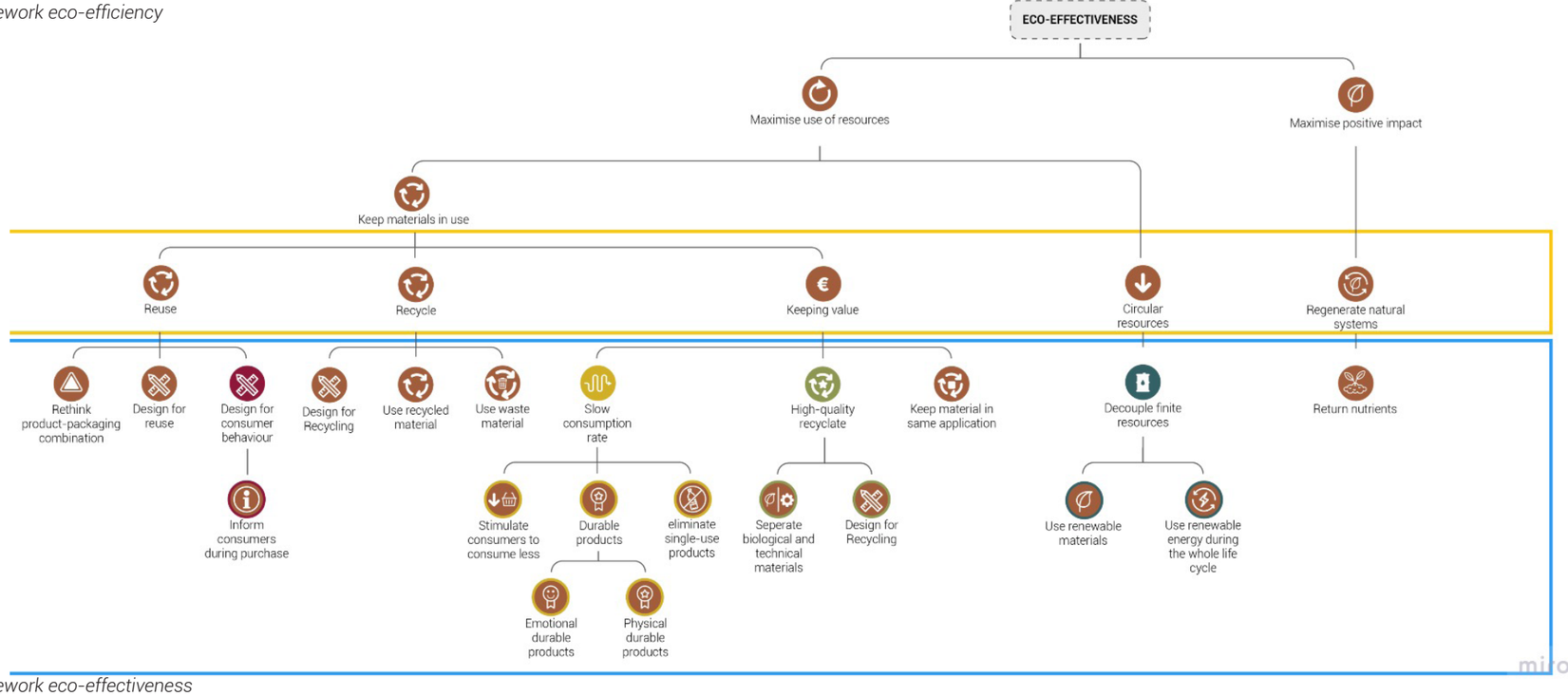


Figure 60 Visualisation method framework eco-effectiveness

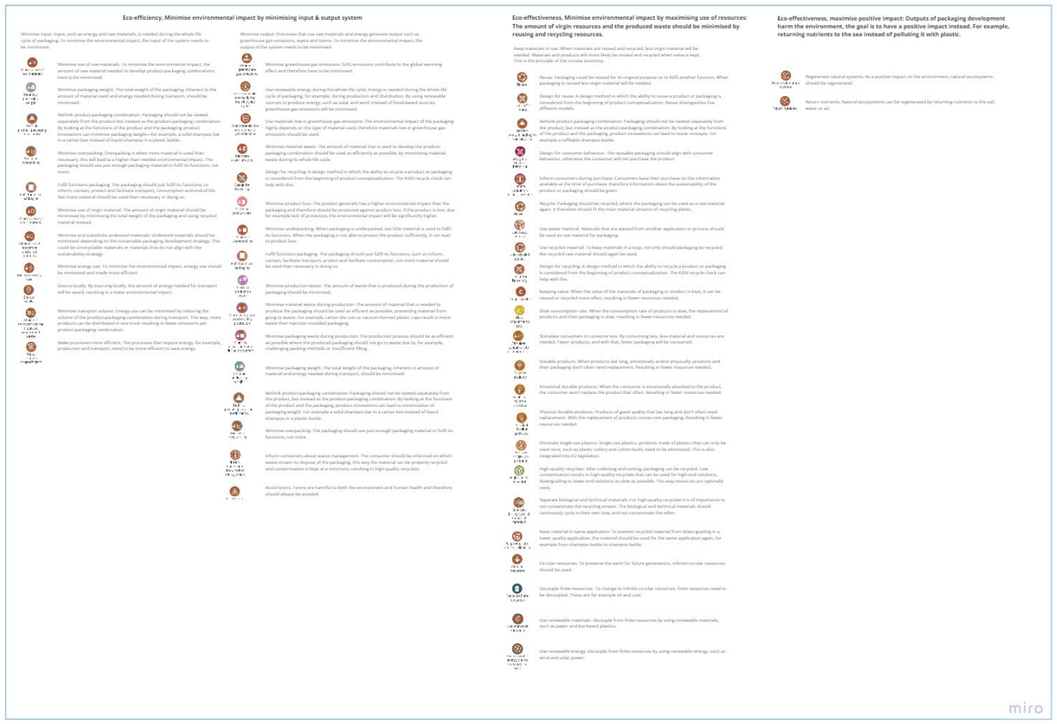


Figure 61 Visualisation method overview element descriptions

Minimise input: Input, such as energy and raw materials, is needed during the whole life cycle of packaging. To minimise the environmental impact, the input of the system needs to be minimised.

Minimise use of raw materials: To minimise the environmental impact, the amount of raw material needed to develop product-packaging combinations have to be minimised.

Minimise packaging weight: The total weight of the packaging, inherent to the amount of material used and energy needed during transport, should be minimised.

Rethink product-packaging combination: Packaging should not be viewed separately from the product but instead as the product-packaging combination. By looking at the functions of the product and the packaging, product innovations can minimise packaging weight—for example, a solid shampoo bar in a carton box instead of liquid shampoo in a plastic bottle.

Figure 62 Visualisation method element descriptions detailed

APPENDIX J: OUTCOMES EVALUATION

The solution is evaluated with Eva Ronhaar, director of Innovation, Sustainability & Foundation. This appendix sums the answers given in the method.

1.1 DESCRIBE GENERAL SUSTAINABILITY STRATEGY

HEMA wants to become the most sustainable value variety brand. Meaning that within our price range and scope of assortment, we are the most sustainable player in the field. This means we do not only want and need to minimize our negative impact, but also strengthen and optimize our positive impact. This requires us to go from a linear model to move to a circular model and system.

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Figure 63 Evaluation, choose direction, describe general sustainability strategy

1.2 ELEMENTS THAT ALIGN WITH SUSTAINABILITY STRATEGY

Copy elements that align with sustainability strategy in the yellow box and the corresponding elements in the blue box

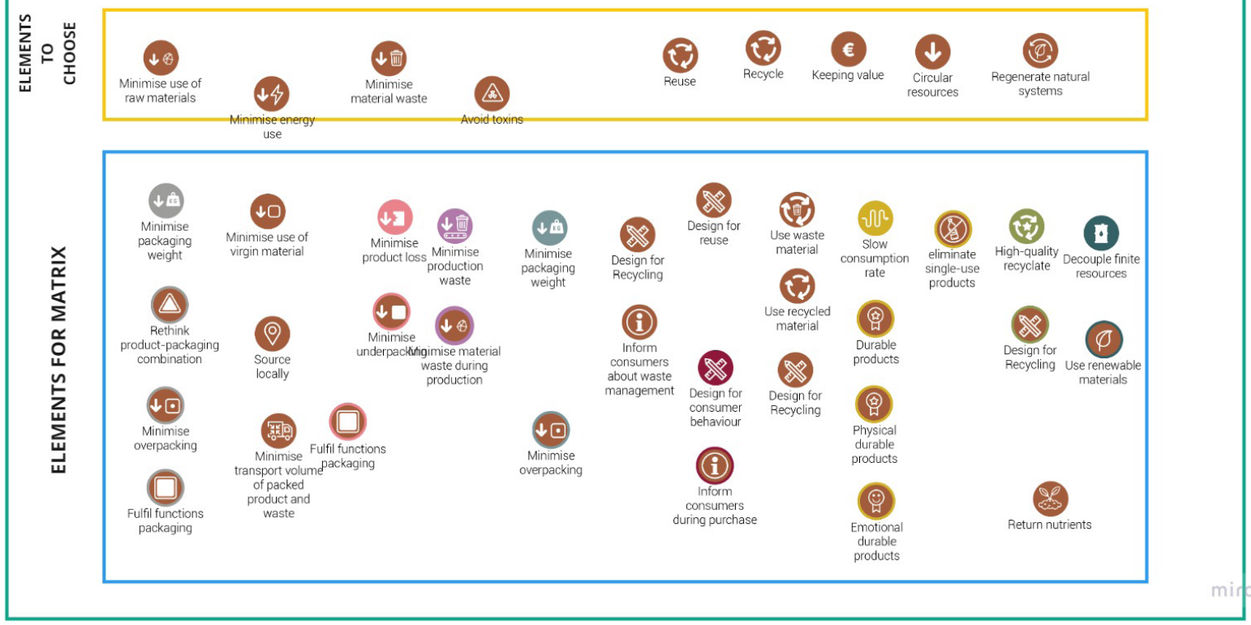


Figure 64 Evaluation, choose direction, elements that align with sustainability strategy

1.3.1

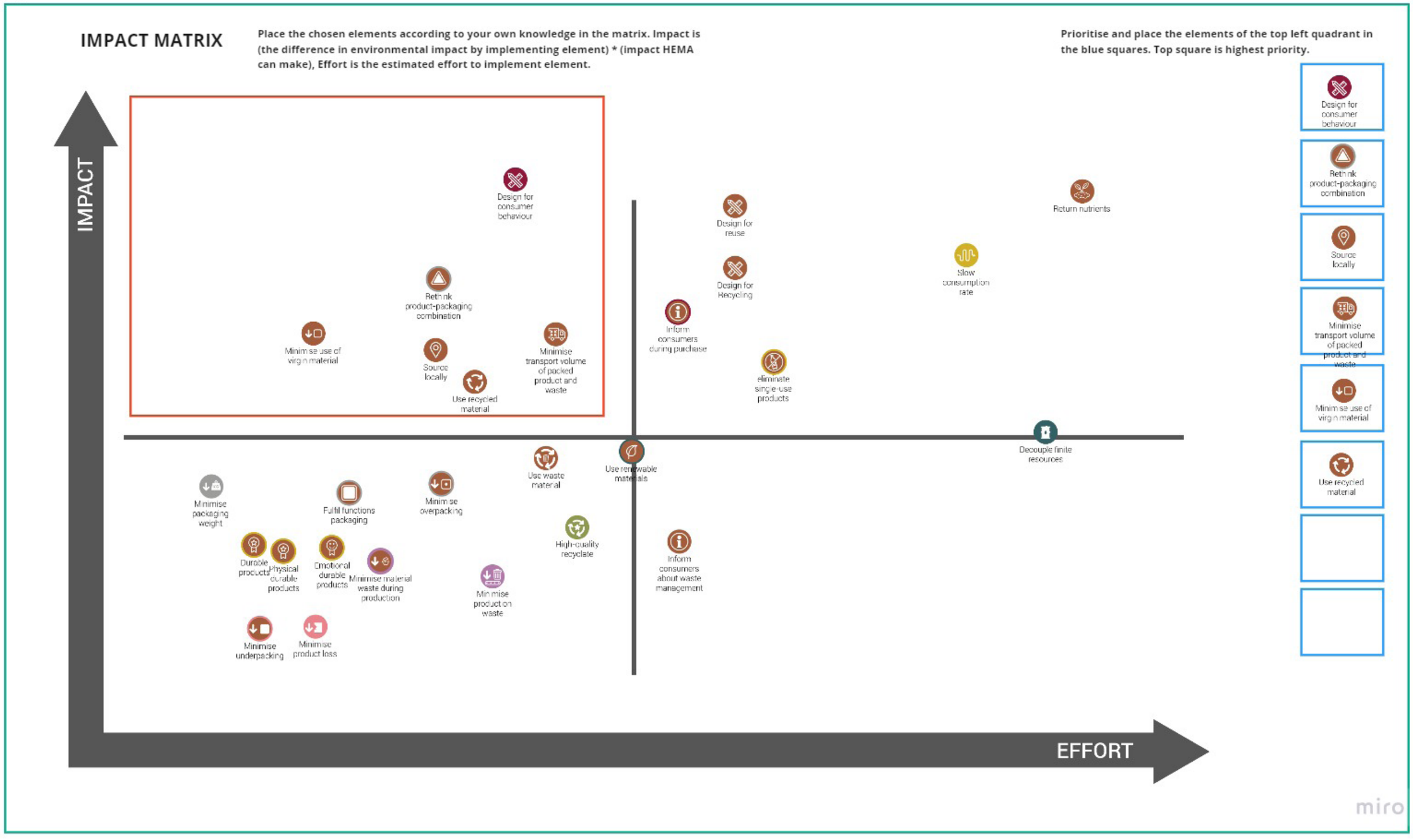


Figure 65 Evaluation, choose direction, impact matrix 1

1.3.2

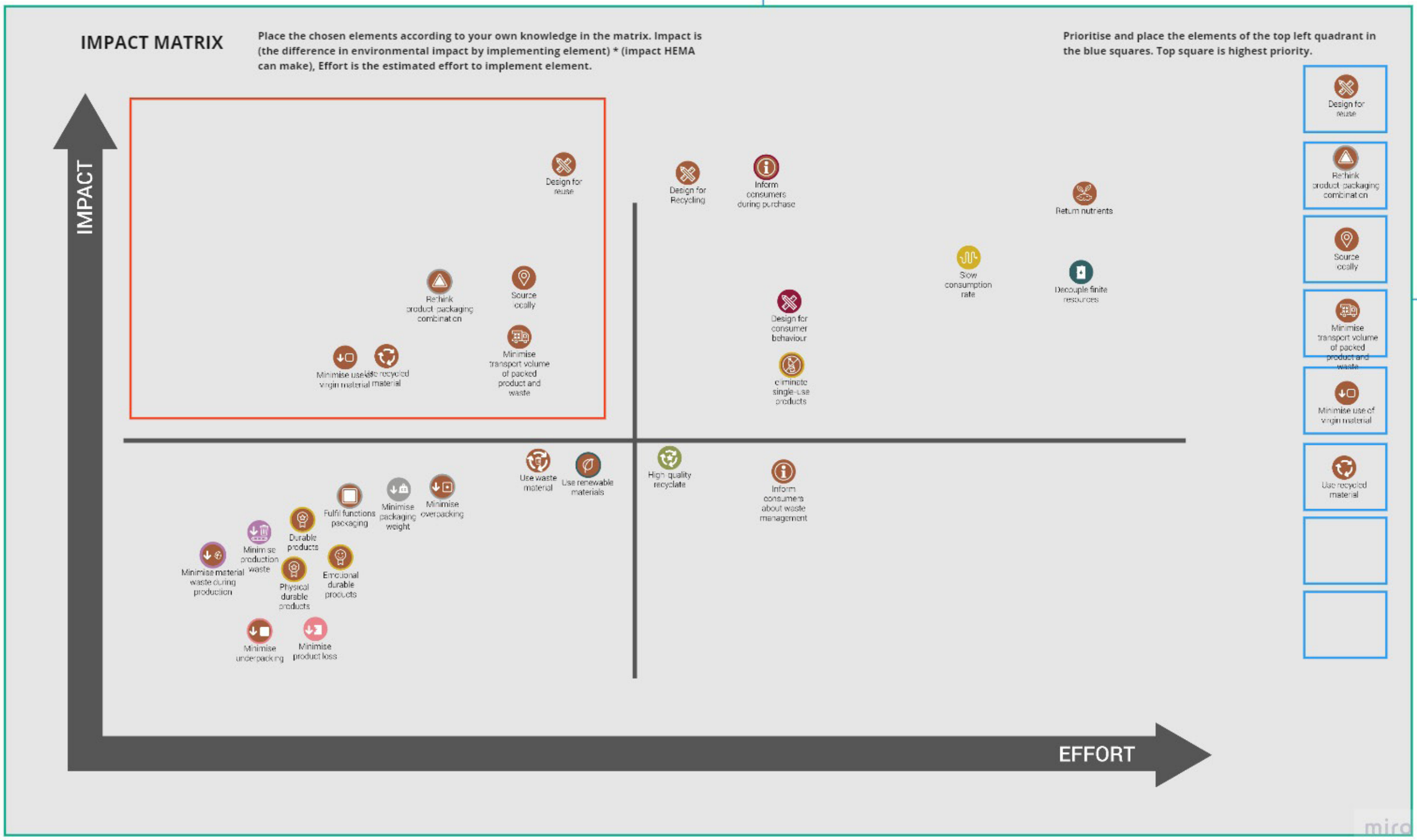


Figure 66 Evaluation, choose direction, impact matrix 2

SUSTAINABLE PACKAGING DEVELOPMENT STRATEGY

2 GOAL/TARGET SETTING

Element

Design for reuse

Contribution
How does the element contribute to the strategy?

By already thinking in the design phase about how to prolong the use of the product and when it does become the end of life, and the product can easily be repaired, reused and recycled, we make an important step in designing for circularity.

S - Specific
What would you in most ideal situation want to achieve?

All our products are designed for circularity and waste is a non-existing concept

What would you want to achieve in this strategy?

A to be defined percentage of our products, or a specific assortment, is designed for reuse - target needs to be set and assortment to be selected. In x years, this should be selected.

M - Measurable
How much do you want to achieve and how are you going to measure this?

In total, about 10 per cent is designed for reuse (focus to be decided) and this will be measured quarterly using SAP data queries.

R - Realistic
Is the goal realistic? (Market analysis, SWOT, KIDV knowledge, etc)

This percentage seems realistic for a 5-year journey, but would have to be tested with internal stakeholders (procurement, commercial teams, finances), external stakeholders (a.o. KIDV, Ministries) and market analysis and developments.

A-acceptable

How does the goal align with HEMA's values?
- *Making daily life better, easier and more fun*
- *Quality in everything we do*
- *Every penny counts*
- *we win together*
- *We keep things simple*
- *Our customer first*
- *We do what we say*
- *Act as an entrepreneur*

This is a new way of working for HEMA, in which it is required to be entrepreneurial, its answers the customers demand for a more sustainable assortment and support in a more sustainable daily life, thereby making daily life better, but in an easy, fun, and affordable manner.

Which laws and guidelines do you have to take into account?

Among other things, sector plan circularity, the sequel of the IMVO covenant sustainable clothing and textile. This needs further research.

T - Timebound
When do you want to achieve the goal?

The ambition would be to achieve the 10 percent designed for reuse in a 5 years timeframe.

Goal
Combine all items above to formulate the goal

Within 5 years, 10 percent of our assortment (specific assortment to be determined) is designed for reuse.

3 PLAN

Who is reponsible for what?

Lead: Sustainability
Feasibility check: Procurement (including technical packaging specialist), design
Implementation: Procurement ((including technical packaging specialist), Worlds, design, supported by sustainability
Ambassadors at the board: Chief brand and strategy officer and CEO
Marcomms: communication (later stage)

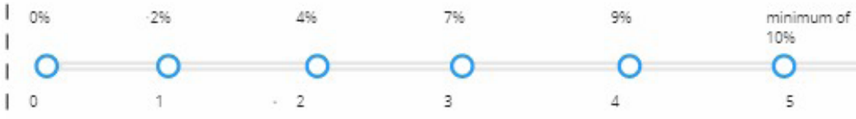
What is needed to achieve the goal?

Commitment on:
- time dedication
- financial support

trainings and practical guidance on design for reuse

alignment of KPIs

Timeline



What are the next steps?

Share this document with the key internal stakeholders, to check feasibility, align on ambition and ensure ownership and commitment.
This also includes the checks mentioned under "realistic".

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Figure 67 Evaluation, goal/target setting and plan

SUSTAINABLE PACKAGING DEVELOPMENT STRATEGY

Goal 1	Within 5 years, 10 percent of our assortment (specific assortment to be determined) is designed for reuse.
Goal 2	Type here
Goal 3	Type here

Overall sustainability strategy

HEMA wants to become the most sustainable value variety brand. Meaning that within our price range and scope of assortment, we are the most sustainable player in the field. This means we do not only want and need to minimize our negative impact, but also strengthen and optimize our positive impact. This requires us to go from a linear model to move to a circular model and system.

Contribution packaging

How does the goal contribute to the strategy?

By already thinking in the design phase about how to prolong the use of the product and when it does become the end of life, and the product can easily be repaired, reused and recycled, we make an important step in designing for circularity.

Type here

Type here

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Figure 68 Evaluation, conclusion

REFERENCES APPENDICES

1. Afvalfonds Verpakkingen. (2019). Verpakkingen in de Circulaire Economie, Recycling Verpakkingen Nederland 2019. Retrieved from Leidschendam: https://afvalfondsverpakkingen.nl/a/i/Verpakkingen-in-de-circulaire-economie-recycling-verpakkingen-Nederland-2019.pdf
2. Ahold Delhaize. Plastic waste, Reducing plastic packaging and single-use plastics. Retrieved from https://www.aholddelhaize.com/en/about-us/stakeholder-interests/plastic-waste/
3. Bruijnes, C., Diepenmaat, H., ten Klooster, R., van Soest, J. P., Langeveld, G., & Balk, V. (2020). The State of Sustainable Packaging (K. I. D. Verpakken Ed.): Kennis Instituut Duurzaam Verpakken.
4. Closed Loop Partners. (2019). Accelerating Circular Supply Chains For Plastics. Retrieved from https://www.closedlooppartners.com/wp-content/uploads/2020/01/CLP_Circular_Supply_Chains_for_Plastics.pdf
5. Coelho, P. M., Corona, B., ten Klooster, R., & Worrell, E. (2020). Sustainability of reusable packaging–Current situation and trends. Resources, Conservation & Recycling: X, 6, 100037. doi:https://doi.org/10.1016/j.rcrx.2020.100037
6. Ellen MacArthur Foundation. (2013). Towards the Circular Economy. Retrieved from https://www.ellenmacarthurfoundation.org/assets/downloads/publications/Ellen-MacArthur-Foundation-Towards-the-Circular-Economy-vol.1.pdf
7. Ellen MacArthur Foundation. (2016). The New Plastics Economy Rethinking the Future of Plastics. Retrieved from https://www.ellenmacarthurfoundation.org/assets/downloads/EllenMacArthurFoundation_NewPlasticsEconomy_26-1-2016.pdf
8. Ellen MacArthur Foundation. (2017a). The new plastic economy: Rethinking the future of plastics & catalysing action. Retrieved from https://www.ellenmacarthurfoundation.org/assets/downloads/publications/NPEC-Hybrid_English_22-11-17_Digital.pdf
9. Ellen MacArthur Foundation. (2017b). Schools of Thought. Retrieved from https://www.ellenmacarthurfoundation.org/circular-economy/concept/schools-of-thought
10. Ellen MacArthur Foundation. (2019). Reuse Rethinking Packaging. Retrieved from https://www.ellenmacarthurfoundation.org/assets/downloads/Reuse.pdf
11. Directive (EU) 2015/720 of the European Parliament and of the Council of 29 April 2015 amending Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags (2015).
12. Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste, (2018).
13. Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment, (2019).
14. Flying Tiger. (2019). Annual Report 2019. Retrieved from Copenhagen: https://corporate.flyingtiger.com/en/Financials
15. . Future of Packaging. (2020, 18-9-2020). Future of Packaging, 4. Retrieved from https://raconteur.uberflip.com/i/1289441-future-of-packaging-2020/3?m4=
16. Special meeting of the European Council (2020).
17. Government of the Netherlands. (2017). Circular Dutch economy by 2050. Retrieved from https://www.government.nl/topics/circular-economy/circular-dutch-economy-by-2050#:~:text=The%20government%2Dwide%20programme%20for,smarter%20and%20more%20efficient%20way.
18. H&M. (2019). Sustainability Performance Report 2019. Retrieved from https://sustainabilityreport.hmgroup.com/wp-content/uploads/2020/04/HM-Group-Sustainability-Performance-Report-2019.pdf
19. Hawken, P., Lovins, A. B., & Lovins, L. H. (1999). Natural capitalism: Creating the next industrial revolution. Boston: Little, Brown and Co.
20. HEMA. (2019). good for tomorrow, sustainability report 2019. Retrieved from https://sustainability.hema.com/wp-content/uploads/2020/07/Hema-MVO-2019-English.pdf
21. HM Revenue & Customs. (2020). Plastic Packaging Tax. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/871559/Plastic_Packaging_Tax_-_Consultation.pdf
22. IKEA. (2019). Bringing IKEA to more people in new ways. Retrieved from https://www.ingka.com/wp-content/uploads/2020/01/Annual-Summary-Sustainability-Report-FY19.pdf
23. Inditex. (2019). Annual Report 2019. Retrieved from https://www.inditex.com/documents/10279/645708/2019+Inditex+Annual+Report.pdf/25aa68e3-d7b2-bc1d-3dab-571c0b4a0151
24. Jeswani, H., Krüger, C., Russ, M., Horlacher, M., Antony, F., Hann, S., & Azapagic, A. (2021). Life cycle environmental impacts of chemical recycling via pyrolysis of mixed plastic waste in comparison with mechanical recycling and energy recovery. Science of The Total Environment, 769, 144483. doi:https://doi.org/10.1016/j.scitotenv.2020.144483
25. KIDV. (2017). Goed verpakken = duurzaam verpakken, 7 tips van het KIDV.
26. KIDV. (2018). Chemisch recyclen van kunststof verpakkingen. Retrieved from https://kidv.nl/media/rapportages/chemische_recycling_analyse_en_opschaling.pdf?1.1.3
27. KIDV. (2020). Sustainable Packaging Compass.
28. Lacovidou, E., & Gerassimidou, S. (2018). Sustainable Packaging and the Circular Economy: An EU Perspective. In Reference Module in Food Science: Elsevier.
29. Lewis, H., Verghese, K., & Fitzpatrick, L. (2010). Evaluating the sustainability impacts of packaging: the plastic carry bag dilemma. Packaging Technology and Science, 23(3), 145-160. doi:10.1002/pts.886
30. Potting, J., Hekkert, M., Worrell, E., & Hanemaaijer, A. (2017). Circular Economy: Measuring innovation in product chains. Retrieved from https://www.pbl.nl/en/publications/circular-economy-measuring-innovation-in-product-chains
31. Rituals. Conscious choices.
32. Stoica, M., Antohi, V. M., Zlati, M. L., & Stoica, D. (2020). The financial impact of replacing plastic packaging by biodegradable biopolymers - A smart solution for the food industry. Journal of Cleaner Production, 277, 124013. doi:https://doi.org/10.1016/j.jclepro.2020.124013
33. Taufik, D., Reinders, M. l. J., Molenveld, K., & Onwezen, M. C. (2020). The paradox between the environmental appeal of bio-based plastic packaging for consumers and their disposal behaviour. Science of The Total Environment, 705, 135820. doi:https://doi.org/10.1016/j.scitotenv.2019.135820
34. The Pew Charitable Trusts. (2020). Breaking the Plastic Wave Retrieved from https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf
35. UN. Goal 12: Ensure sustainable consumption and production patterns. Retrieved from https://www.un.org/sustainabledevelopment/sustainable-consumption-production/

36. UN. (2020). The Sustainable Development Goals Report 2020. Retrieved from https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf
37. Unilever. Waste & packaging. Retrieved from https://www.unilever.com/sustainable-living/reducing-environmental-impact/waste-and-packaging/
38. van Eygen, E., Laner, D., & Fellner, J. (2018). Circular economy of plastic packaging: Current practice and perspectives in Austria. Waste Management, 72, 55-64. doi:https://doi.org/10.1016/j.wasman.2017.11.040
39. van Veldhoven, S. (2019). Plastic Pact NL. (IenW/BSK-2019/32831). Den Haag
40. Besluit kunststofproducten voor eenmalig gebruik en wijziging BBV 2014.pdf, (2020).
41. Weiss, M., Haufe, J., Carus, M., Brandão, M., Bringezu, S., Hermann, B., & Patel, M. K. (2012). A Review of the Environmental Impacts of Biobased Materials. Journal of Industrial Ecology, 16(s1), S169-S181. doi:10.1111/j.1530-9290.2012.00468.x